**User Stories**

This is used to document the various user stories associated with various projects within the Autonomous Flight Systems Laboratory.

Note: Only add user stories if you are experienced with the system. Please see Christopher Lum if you have questions.

Table 1: Table showing user story sizing and estimated hours for each

|  |  |  |  |
| --- | --- | --- | --- |
| **Size** | **Points** | **Estimated Hours** | **Comment** |
| XS | 1 | 5 | a few hours |
| S | 2 | 10 | a few days |
| M | 3 | 15 | over a week |
| L | 5 | 25 | a few weeks |
| XL | 8 | 40 | takes entire sprint (4 weeks) |

# Milestones and Events

Table 2: Timeline of major milestones and events in the AFSL.

|  |  |  |
| --- | --- | --- |
| **Date** | **Event** | **Comment** |
| 10/24/14 | IEEE Aerospace paper due |  |
| 10/28/14 | Robert Hodgman visiting AFSL | WSDOT Senior Aviation Planner |
| 10/30/14 | UW-TV filming AFSL lab |  |
| 10/31/14 | Puget Sound Business Journal photo shoot |  |
|  |  |  |
| 11/04/14 | Amazon Prime Air tour of AFSL | Charlie Cartwright |
| 11/04/14 | Aerospace Executives touring AFSL lab (4:30 – 5:30) |  |
| 11/15/14 | Initial flight testing experiments | Flying in RC configuration at 60 Acres in Redmond. |
| 11/21/14 | UWAA Fall Poster Session |  |
| 12/??/14 | Flight test with autonomous waypoint/path navigation | We want to ensure we can accomplish waypoint/path navigation (such as parallel track, expanding square, etc. |
| 03/??/15 | 2016 AIAA GNC Conference abstracts open | Need to check on this date. |
| 03/08/15 | IEEE Aerospace Conference | Big Sky, Montana. Kevin Ueunten to present. |
| 04/??/15 | Fly survey of WA snowpack | Talk with David Shean |
| 09/??/15 | Fly survey of WA glacier | Talk with David Shean |

# User Stories

**Story ID**

## 001 – Perforce Server Setup

**Content**

As a project manager, I would like a Perforce server and depot setup so I can manage all files related to this project

**Definition of Done**

[X] Perforce server setup at UW (including P4Admin)

[X] Users accounts created and setup for all students working on project

[X] Depots setup for both documentation and for code

[X] Initial check-ins of code and file structure

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## 002 – Perforce Visual Client

**Content**

As a software developer, I would like a Perforce client installed on my machine and would like to be comfortable with its use so I may sync files and make code changes.

**Definition of Done**

[ ] Read the document \\AFSL\ComputingInfo\Perforce\PerforceNotes.docx (contact Chris Lum to obtain this document). Follow this document’s instructions to do the following:

[ ] Install P4V (Perforce Visual Client). You can obtain the binary installation file from <http://faculty.washington.edu/lum/AFSL>.

[ ] Successfully create and sync relevant workspaces (both documentation and code)

[ ] Successfully check something into the depot

[ ] Practice resolving merge conflicts (artificially create a test file and work with another group member to create a conflict and resolve this). Make a note of the difference between merging a text file vs. a binary file.

[ ] Read the document \\AFSL\LabInfo\NewLabMemberOrientation.docx and complete the checklist at the end of this document.

**Notes**

* You can usually find help from someone in the lab (AERB 139).
* Do NOT check in large data sets or files into Perforce. Once you check something into Perforce, it takes up hard drive space even if you delete it later (remember that Perforce retains all versions of a file).
* If you need to delete a workspace, talk to Chris Lum before attempting this.
* If you have any questions, please ask a more experienced member before making changes.
* There are several YouTube videos showing how to get started with Perforce. Links to these vides are in the above referenced Perforce document.

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## 003 – Forward State Estimator Feature Level Design

**Content**

As a software and algorithm developer, I would like a completed feature level design of the forward state estimator so I can identify key ideas and features of the algorithm.

**Definition of Done**

[x] Literature review of relevant prior art relevant to forward state estimation.

[x] Look into “Probabilistic Robotics” by Thrun, Burgard, Fox (particularly chapter 5)

[x] Feature level design completed, presented to research group, reviewed, and checked into perforce.

[x] Identify key inputs necessary to perform the forward state estimation (rank them in order of importance)

[x] Discuss how to parameterize conflict entities (3D position, velocity, radius, standard deviations, etc.)

[x] Document the desired inputs/outputs of the estimator

**Notes**

-Refer to slides form 13\_08\_08\_jcati\_collision\_warning.ppt

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## 004 –Literature Review (Collision Avoidance)

**Content**

As a project manager, I would like to perform a literature review of relevant prior art so I can ensure we do not infringe or repeat works by other groups.

**Definition of Done**

[X] Literature review of relevant prior art related to collision avoidance (see work by Lalish et al)

[X] Literature review findings are documented in an electronic document and checked into Perforce

**Notes**

* This user story is continued in 049

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## 005 – ICOMC2 Partners Program

**Content**

As a software developer, I would like to sign up for the ICOMC2 Partners Program so I can access relevant files and software to develop my plug-in against.

**Definition of Done**

[X] Work with Keith Ketring and UW OSP to get ICOMC2 Partners Program Application signed

~~[ ] Work with Keith Ketring to get project plan in place~~

[x] Obtain and install software relevant to this ICOMC2 Partners Program

[ ] Log onto ICOMC2 Partners Program website and familiarize with its operation

[ ] Investigate potential ITAR issues related to non-US citizen students working with program

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## 006 – Software Developer Background Training (Algorithm and Back End)

**Content**

As a software developer, I would like become familiar with common software patterns, data structures, and best practices so I can develop software in an industry proven fashion.

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# or watch video located at [~~https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6~~](https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6)) \\AFSL\TrainingAndTutorials\13\_09\_16\_VisualStudioSolutions.arf (read the READ\_ME.txt file in the same folder for instructions on how to open the file or for a link to the online version of the file)

[x] Create a blank solution

[x] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

[ ] Get this peer reviewed

Optional

[x] Download materials from CSE331 website and post them on Perforce server (only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

**Notes**

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## 007 – Software Developer Infrastructure Setup

**Content**

As a software developer, I would like to setup my hardware and software development environment so I can develop and build software components for this project.

**Definition of Done**

[ ] Obtain developer laptop and login

[X] Obtain keys/access to AFSL lab (or wherever you will be working)

[ ] Setup laptop at a workstation

[X] Install Microsoft Visual Studio 2012

[ ] Install latest update for 2012 (last I checked it was update 3)

[X] Install Perforce Visual Client

[ ] Install Beyond Compare and set this as the comparison application for Perforce diffs

[ ] Install ICOMC2 2.0

[X] Get latest from Perforce depot and build

[ ] Build UW solution

[ ] Build Plugin solution and verify that is loaded by ICOMC2

[ ] Make modification to plug-in code, rebuild, and verify that changes are reflected in plug-in.

[ ] Check in changes to depot

**Notes**

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## 008 – Software Developer Background Training (UI and Front End)

**Content**

As a software developer, I would like to become familiar with common software patterns, data structures, and best practices for developing user interfaces (UI) using the Microsoft Windows Presentation Foundation (WPF) framework so I can develop software in an industry proven fashion.

**Definition of Done**

[ ] Attend research group meeting regarding the Model, View, View-Model (MVVM) pattern (research how events are fired and handled in C#).

[ ] Research the MVVM pattern.

[ ] Research and familiarize with different types of controls (buttons, combo boxes, radio buttons, etc.) available through the WPF API.

[ ] Build a simple WPF application using the MVVM pattern (this should be a standalone project and not require any ICOMC2 or third party code)

**Notes**

-Refer to slides from 13\_08\_08\_jcati\_collision\_warning.ppt

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## 009 – ICOMC2 Operator Familiarization

**Content**

As a software quality assurance engineer, I would like to become familiar with the operation of ICOMC2 so I can fly multiple vehicles and operate the system in a fashion that simulates its usage by actual operators.

**Definition of Done**

[ ] Install ICOMC2 2.0 on system

[ ] Coordinate with Amy Arbeit to conduct training session

[ ] Attend Insitu operator training classes

[ ] Launch single vehicle and command to orbit, active route, control wheel steering, etc.

[ ] Simulate multiple vehicle operation

[ ] Create a collision (or near collision scenario)

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## 010 – Plugin Prototype Development

**Content**

As a software development engineer, I would like to create a prototype plugin so I know how to develop plugins for the ICOMC2 2.0 system.

**Definition of Done**

[ ] Build ICOMC2 2.0 on system

[ ] Build prototype plugin and verify it is loaded by ICOMC2 core.

[ ] TBD…

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## 011 – Forward State Estimator Implementation (Free Flight)

**Content**

As a software developer, I would like a software algorithm/entity to perform the forward state estimation of an aircraft engaged in free flight so that I can use it within the plugin.

**Definition of Done**

[X] Review a prototype/proof-of-concept algorithm in Matlab (see user story 027)

[X] Implement select features outlined in the Feature Level Design (user story 003 – Forward State Estimator Feature Level Design). These should include

[X] Ability to estimate the future state of the aircraft which is engaged in free flight.

[X] Address requirements 2.1.1

[X] Address requirements 2.2.1

[X] Implement code in in UW.sln

[X] Design scenarios showing an aircraft in free flight and the estimator calculating the future state of the aircraft.

[X] Create diagrams, pictures, or movies illustrating how this component works (these can be shown at a demo).

[X] Ensure that unit test for all public methods are written and pass (work with an SQA engineer to do this, you do not need to write these yourself)

[X] Document/comment all public interfaces.

**Notes**

* Requirements can be found in \\JCATI2013\TechnicalDataPackage\RequirementsAndSpecifications\Requirements.pptx

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## 012 – Air Traffic Controller Interaction

**Content**

As an algorithm designer, I would like to interact and interview air traffic controllers so that I can have an idea of how they detect potential conflicts between aircraft.

**Definition of Done**

[x] Contact an air traffic controller and setup and interview/meeting with them

[x] Coordinate with Al Creigh who is in contact with Matt McCully Phone: 360-825-8995 Email: [mattmccully@aol.com](mailto:mattmccully@aol.com) (an air traffic controller)

[x] Arrange visit to Auburn flight control center (include CL on this trip)

[x] Document interview process and present results to research group. Interview document is checked into Perforce.

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## 012 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

Copy definition of done from user story 002 – Perforce Visual Client

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## 013 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

Copy definition of done from user story 002 – Perforce Visual Client

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## 014 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

Copy definition of done from user story 002 – Perforce Visual Client

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## 015 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

Copy definition of done from user story 002 – Perforce Visual Client

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## 016 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

Copy definition of done from user story 002 – Perforce Visual Client

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## 017 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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## 018 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

Copy definition of done from user story 002 – Perforce Visual Client

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## 019 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

Copy definition of done from user story 002 – Perforce Visual Client

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## 020 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

[x ] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[ x] Attended discussion/training with CL regarding Perforce operation and concepts

[ x] Successfully create and sync relevant workspaces (both documentation and code)

[ x] Successfully check something into the depot

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**Story ID**

## 021 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[x ] Create a blank solution

[x ] Create a project of type class library (we now refer to this as the ‘class library project’)

[x ] Build a simple class in C# within your ‘class library project’

[X] Create a project of type console application (we now refer to this as the ‘console application project’)

[x ] Call code from your ‘class library project’ from your ‘console application project’.

[x ] Get UW solution from depot and study it.

Optional

[ ] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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**Story ID**

## 022 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[x] Create a blank solution

[x ] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

Optional

[x] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

**Definition of Done**

Copy definition of done from user story 006 – Software Developer Background Training (Algorithm and Back End)

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**Story ID**

## 023 – Search and Rescue Movie Capture

**Content**

As a participant, I want to download a copy of the Insitu Search and Rescue Plugin Market video and documents so I can archive them.

**Definition of Done**

[X] Go to <http://insitu.com/systems/icomc2/search-and-rescue> and obtain a copy of the webpage (in case Insitu removes it in the future

[X ] Download brochure (pdf)

[X ] Obtain a video capture of the movie (including audio) of the movie on the webpage.

[X] Both brochure and video are checked into perforce

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**Story ID**

## 024 – UW Project Infrastructure Step 1

**Content**

As a project manager, I would like preliminary project infrastructure in place so that I may dedicate human resources towards the project.

**Definition of Done**

[x] Recruit students and personnel to work on the project

[x] Setup email distribution list

[x] Setup software infrastructure including Perforce, file structures, user stories, documentation, etc.

[x] Setup regular meeting times

[x] Setup lab space in AERB139 for student to work in. Facilitate getting keys to students

[x] Organize training lectures to get students up to speed on tools and skills needed for the project

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**Story ID**

## 025 – Perforce Depot Backup

**Content**

As a project manager, I would like to backup the Perforce depot so I can protect against system failures.

**Definition of Done**

[x] Setup a completely separate computer to act as a dummy/test perforce server. We refer to this as dummy machine 1.

[x] Read online documentation on perforce server administration to become familiar with its operation.

[x] On dummy machine 1, install the perforce server application, P4Admin, and P4V

[x] On dummy machine 1, create users and depots which are similar (does not need to be exact copies) to those on mica-e2.

[x] On dummy machine 1, modify various files and check them in several times (to generate a history of files)

[x] On dummy machine 1, backup the depots and whatever other files are necessary to restore the depots in the event of a failure. Move these files to a separate storage medium (another hard drive on the machine or a USB stick). We refer to this backup as backup A.

[x] On dummy machine 1, modify some files to create more file history. Repeat the backup procedure and move backup files to a separate storage medium. We refer to this backup as backup B.

[x] On the dummy machine, pretend there is a system failure (do not actually break anything).

[x] Setup a completely separate computer to act as a new perforce server. We refer to this as dummy machine 2.

[x] On dummy machine 2, install a new perforce server and verify that you can connect to this server from another machine using P4V.

[x] On dummy machine 2, verify that you can restore backup A on this machine.

[x] On dummy machine 2, verify that you can restore backup B on this machine.

[x] Backup the primary perforce depot on mica-e2. Be very careful as this is our primary server. Coordinate with CL before you do this.

[x] Store backup in a separate location and create a recurring task to perform this backup once per week.

[x] Write a document describing exactly how to perform this backup that can be followed by someone who is unfamiliar with perforce. This document is checked into Perforce.

**Notes**

* Mica-e2 is the name of the computer which houses the primary Perforce server and depots
* Do not do any operations on mica-e2 (primary Perforce server) until you are sure these will not disrupt service

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**Story ID**

## 026 – Matlab Simulation Framework

**Content**

As a software developer, I would like to a simulation environment in Matlab which can emulate the ICOMC2 simulation environment (on a very basic level) so I can use it to test various CA algorithms.

**Definition of Done**

[X] Attend Matlab simulation framework discussion with CL.

[X] Review Forward State Estimator Feature Level Design so you have an idea of some of the features that the simulator must supply.

[X] Review \\JCATI2013\JCATI2013\Research\Presentations\ 13\_08\_08\_jcati\_collision\_warning.ppt for definition of conflict entities and basis operation of system.

[X] Meet with CL to discuss other features of the ICOMC2 environment that the simulator should emulate.

[X] Create a basic simulation environment in Matlab which operates at a fixed time step (time step is user defined).

[X] Simulator uses only SI units (no exceptions)

[X] Simulator system uses vehicle class (see user story 031)

[X] Simulator system uses conflict entity class (see user story 035)

[X] Simulator system has hooks for calling other modules (such as the forward state estimator code, separation notifier code, etc.)

[X] Simulator system maintains state history traces (for replaying and logging missions)

[X] Simulator system has been tested with various common and uncommon (edge and corner cases) scenarios including all of the scenarios documented in user story 039.

[X] Movies saved of simulator in action.

[X] Create document (powerpoint slides) describing operation (inputs and outputs) of the simulator. Document has movies showing operation. Document is checked into Perforce.

**Notes**

* Simulator can be a large for loop.
* Simulator should maintain a cell array of vehicles and conflict entities
* This system is designed to be a very light-weight version of ICOMC2 and is intended to be used for internal research and development of prototypes, not final production code.
* This is continued in 050.

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**Story ID**

## 027 – Forward State Estimator R&D Prototype

**Content**

As a software developer, I would like to a research and development (R&D) prototype of the forward state estimator so that I may work out fine details and implementation issues with the system.

**Definition of Done**

[X] Review Forward State Estimator Feature Level Design

[X] Design and document several test scenarios (ie 2 vehicles head on, 3 vehicles with 2 in conflict, 4 vehicles with 2 pairs in conflict, etc.) including their expected/desired behavior. Note: These should be high level test scenarios, not individual code unit tests.

[X] Implement prototype in Matlab as modular, object oriented code. This should be done with the idea that this code will eventually be ported to C# in the final implementation. Code should be well documented and designed to be modified in the future.

[X] System is integrated with R&D simulator (user story 026)

**Notes**

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**Story ID**

## 028 – Image Insitu Development Machines

**Content**

As a software developer, I would like to create disk images of the Insitu development machines so that I may restore them to their original state in the case of HD corruption or failure.

**Definition of Done**

[ x] Talk with Josh Bean in AA department to determine what type of disk imaging software is appropriate (taking into account cost, licenses, ease of restoration, etc.)

[x] Research software choices on internet

[x ] Install software on dummy machine and create disk image of dummy machine. We refer to this as the system at time T.

[x ] Make software and registry changes to dummy machine after making disk image at time T.

[x ] Pretend that the dummy machine becomes corrupt and needs to be restored to time T. Use disk image to restore system. Test restored dummy machine and ensure it passes appropriate tests.

**Notes**

* This user story is continued in 045

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**Story ID**

## 029 – Literature Review (Separation Management)

**Content**

As a project manager, I would like to perform a literature review of relevant prior art related to separation management so I can ensure we do not infringe or repeat works by other groups.

**Definition of Done**

[x] Literature review of relevant prior art related to collision avoidance (focus on separation management as opposed to active collision avoidance)

[X] Also look at literature review for separation management (as opposed to reactive collision avoidance)

[X] Literature review findings are documented in an electronic document and checked into Perforce

[X] Copies of relevant papers are checked into Perforce (hint: try to access papers via Google Scholar and other resources while you are on campus since the UW network will allow nearly unrestricted access to many online databases)

[X] Look up and document functionality and usage of Garmin 430, 530, and other relevant existing technology for collision awareness.

**Notes**

* This user story is continued in 049

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**Story ID**

## 030 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done**

Copy definition of done from user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done (Updated from User Story 006)**

[x] Build a simple C# console application (no UI)

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[x] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

[x] Build a simple class in C# and instantiate it elsewhere in your code.

[x] Get UW solution from depot and study it.

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**Story ID**

## 031 – Vehicle Class for R&D Matlab Prototype

**Content**

As a software developer, I would like a class representing a vehicle so that I can use it in the Matlab simulation environment.

**Definition of Done**

[x] Attend Matlab simulation framework discussion with CL.

[x] Review \\JCATI2013\JCATI2013\Research\Presentations\ 13\_08\_08\_jcati\_collision\_warning.ppt for definition of conflict entities

[x] Talk with CL to review how ICOMC2 Core represents a vehicle (ie what types of information ICOMC2 Core maintains for us).

[x] Create a modular, standalone, class in Matlab which represents a vehicle.

[x] Class uses only SI units (no exceptions)

[x] Test this class for various edge and corner cases (these do not need to be true unit tests but should be able to cover the scenarios documented in user story 039)

[x] Integrate this class into the system in user story 026.

[x] Create document (powerpoint slides) describing operation (inputs and outputs) of the class. Document is checked into Perforce.

**Notes**

* This will represent a vehicle and be used in the Matlab simulation environment (user story 026)
* Coordinate with development champion of user story 026 during development to ensure your system will interface with theirs.
* This class will attempt to emulate some of the functionality and data which will be supplied by ICOMC2 Core.

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**Story ID**

## 032 – Search and Rescue Plugin Familiarization

**Content**

As a software developer, I would like to familiarize myself with the previous effort by Lum and Arbeit (the Search and Rescue Plugin for ICOMC2) so that I may have a good idea of what was accomplished with the system last year.

**Definition of Done**

[ ] Review links at

* <http://www.insitu.com/systems/icomc2>
* <http://www.insitu.com/systems/icomc2/search-and-rescue>
* <http://www.insitu.com/systems/icomc2/rf-link-analysis>

[ ] Read Amy Arbeit’s Master’s thesis (and check in a copy to appropriate place on Perforce)

[ ] Review code structure for SA2Plugin\_VS2010.sln (this is the entire code base for the search and rescue plugin)

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**Story ID**

## 033 – Unit Testing Background Training

**Content**

As a software quality assurance engineer, I would like become familiar with common software unit testing patterns and best practices so I can develop rigorous and automated tests for the software components being developed for this project.

**Definition of Done**

[X] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[X] Attend research group meeting regarding Microsoft Visual Studio and C#

[X] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[X] Get UW.sln solution from depot and study it

[X] Within the UW.sln solution, read the creating\_unit\_tests.docx

[X] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[X] Create a dummy solution within your UserFiles directory.

[X] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[X] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[X] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[X] Check in your dummy solution into Perforce

[x] Peer review this

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at [~~https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8~~](https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8) \\AFSL\TrainingAndTutorials\13\_09\_23\_VisualStudioUnitTesting.arf. Read the READ\_ME.txt file in the same folder for instructions on how to open the file or for a URL to the online version of the file)
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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**Story ID**

## 034 – Review Journal of Aircraft Article

**Content**

As a technical editor, I would like to review the Journal of Aircraft Article so we can focus on other things.

**Definition of Done**

[X] Coordinate with CL to review attack\_trajectory\_online\_planning.pdf paper

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## 035 – Conflict Entity Class for R&D Matlab Prototype

**Content**

As a software developer, I would like a class representing a conflict entity so that I can use it in the Matlab simulation environment and as a prototype for the eventual C# class.

**Definition of Done**

[x ] Attend Matlab simulation framework discussion with CL.

[x] Review \\JCATI2013\JCATI2013\Research\Presentations\ 13\_08\_08\_jcati\_collision\_warning.ppt for definition of conflict entities

[x ] Talk with CL, KU, AC, and any others who have been involved with the modeling of vehicles as conflict entities

[x ] Create a modular, standalone, class in Matlab which represents a vehicle.

[x ] Class uses only SI units (no exceptions)

[x ] Class has a constructor which creates a conflict entity class based on the vehicle class (see user story 031).

[x ] Test this class for various edge and corner cases (these do not need to be true unit tests but should cover the scenarios documented in user story 039).

[ x] Integrate this class into the system in user story 026.

[ x] Create document (powerpoint slides) describing operation (inputs and outputs) of the class. Document is checked into Perforce.

**Notes**

* This will represent a vehicle and collision specific parameters and be used in the Matlab simulation environment (user story 026)
* Coordinate with development champion of user story 026 during development to ensure your system will interface with theirs.
* This class will serve as a prototype and proof-of-concept for the class that we will eventually implement in our CAPlugin.

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## 036 – AFSL Website Update

**Content**

As a marketing representative, I would like the Autonomous Flight System’s Laboratory’s (AFSL) website updated with information about this project so that we can publicize our efforts about this project.

**Definition of Done**

[ x] Review AFSL website at <http://www.aa.washington.edu/research/afsl/>

[x ] Write up project summary (including figures and references) to post on ‘Research’ section of website.

<http://www.aa.washington.edu/research/afsl/research.html> . This should go under strategic level, use ‘Coordinated Search and Target Identification Using Teams of Autonomous Agents’ project as an example. In other words, you’ll need to write up a section of the document which looks like <http://www.aa.washington.edu/research/afsl/strategic/coordinated.html> ). Include acknowledgement that this project is funded by JCATI and partnered with Insitu.

[x ] ~~Add Amy Arbeit’s Master’s thesis to website publications~~ (cannot add due to Insitu wanting to wait 1 year until public release)

[x ] Add Armand Awad’s thesis to website.

[x ] Add Kevin Ueunten and Bao Le as graduate students (include headshots). See people section of website.

[x ] Post ‘UW Controls Breifing.docx’. Add a dedicated page which states this document describes all the controls related research in the department and has a few bullet points about what is included in the document (think advertising/marketing). See email from CL on 09/09/13.

**Notes**

* This is continued in user story 046.

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## 037 – Team Contact Information Document

**Content**

As a team member, I would like contact information for other team members so that I can quickly communicate with others.

**Definition of Done**

[X ] Compile list of cell phones, emails, and other relevant contact information for team members

[X] Create a UW mailman distribution list with CL as administrator. (<http://www.washington.edu/itconnect/connect/email/mailman/#create> ).

[X] Verify that team members can use mailman list.

[X] Document with contact info (including cell phone numbers) is posted on Perforce

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## 038 – Insitu Project Plan Document

DROPPED BECAUSE WE ARE NO LONGER WORKING ON THIS PROJECT.

**Content**

As a project manager, I would like a completed project plan document so that Insitu can allocate resources towards this project

**Definition of Done**

[X] Coordinate with Keith Ketring to fill out project plan document.

[ ] Obtain necessary signatures and approvals for this document

[ ] Ensure that there are no other obstacles which may stop resources from being directed towards UW team.

[ ] Send JCATI progress report to Christy Grimm, Keith Ketring, Amy Arbeit.

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## 039 – Simulation Test Plan Design and Documentation

**Content**

As a software quality assurance engineer, I would like a set of test cases which will stress the system and exercise system functionality so that I can be confident that the system will perform as expected under these scenarios.

**Definition of Done**

[x] Brainstorm with CL, KU, AC, DA, and any others who are involved with ATC interaction, algorithm design, or simulation design to understand features and functionality of system that we would like to stress

[x] Design realistic scenario involving 2 Integrator UAVs

[x] Design realistic scenario involving a mixture of UAVs and general/commercial aviation

[x] Design realistic scenarios which exercise collisions, safe passage, separation violation, and other features.

[x] Document test cases in an appropriate document and place these in \\JCATI2013\JCATI2013\TechnicalDataPackage\TestPlans

**Notes**

* These are designed to be more SQA style test cases. These are not development unit tests.
* We are more interested in stressing the overall application and system behavior as opposed to specific sections of code.

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## 040 – Separation Notifier Feature Level Design

**Content**

As a software and algorithm developer, I would like a completed feature level design of the separation notifier system so I can identify key ideas and features of the algorithm.

**Definition of Done**

[x] Coordinate with development champion of 029 to review existing literature on separation management.

[x] Feature level design completed, reviewed, and checked into perforce.

[x] Identify key inputs necessary to perform the separation notification (rank them in order of importance)

[x] Document the desired inputs/outputs of the manager.

[x] Feature level design slides have recorded narrations and will run as a standalone presentation. In other words, a user can download the file, start the slideshow, and it will automatically play all narrations and slide transitions.

**Notes**

-Refer to slides form 13\_08\_08\_jcati\_collision\_warning.ppt

-This is continued in 051

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## 041 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

[x] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[x] Attended discussion/training with CL regarding Perforce operation and concepts

[x] Successfully create and sync relevant workspaces (both documentation and code)

[x] Successfully check something into the depot

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## 042 – Prepare for Sprint 1310 External Demo

**Content**

As a project manager, I would like a set of slides which summarize the efforts of sprint 1310 so I may use them during the external demo.

**Definition of Done**

[x] Create slides for sprint 1310 (see notes) to be used during external demo

[x] Schedule external demo and send out invitations to appropriate Insitu and UW parties (talk to CL about this)

[x] Coordinate with CL to review draft of slides before external demo.

**Notes**

-Use files from \\JCATI2013\JCATI2013\TechnicalDataPackage\UserStories\ExternalDemo\_1309 as a template

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**Story ID**

## 043 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done**

[X] Research object oriented software development

[X] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[X] Create a blank solution

[X] Create a project of type class library (we now refer to this as the ‘class library project’)

[X] Build a simple class in C# within your ‘class library project’

[X] Create a project of type console application (we now refer to this as the ‘console application project’)

[X] Call code from your ‘class library project’ from your ‘console application project’.

[X] Get UW solution from depot and study it.

**Notes**

Solution file “ClassPractice.sln” generates simple welcome console screen that returns user name and his or her age.

Optional

[] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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**Story ID**

## 044 – FlexRotor Movie Capture

**Content**

As a participant, I want to download a copy of the FlexRotor video and documents so I can archive them.

**Definition of Done**

[X] Go to <http://www.youtube.com/watch?v=m8lvKPuMhTs> and obtain a video capture of the movie (including audio) of the movie on the webpage.

[X] Copy any video descriptions and comments and place them in a document in the same folder as the video

[X] Video and document are checked into Perforce in appropriate location

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**Story ID**

## 045 – Image Insitu Development Machines (part 2)

**Content**

As a software developer, I would like to create disk images of the Insitu development machines so that I may restore them to their original state in the case of HD corruption or failure.

**Definition of Done**

[x] Check with Insitu IT and ensure that they have no immediate concerns with installing this software and using it to restore their machines.

[x] Repeat process of user story 028 for 1 Insitu machine (including restore phase). This is essentially a dry, live run of a system restore.

[x] Test restored system to ensure that it functions correctly.

[x] Estimate size of backup and coordinate with Chris Lum to purchase an appropriately sized external hard drive (we will use this drive for other purposes as well)

[x] Create images of other all Insitu machines. Burn .iso files to DVDs and store digital .iso files in a safe location (coordinate with CL on a place to store these).

[x] Also create an image of the Windows 7 desktop machine that Kevin U is using.

[x] Create a document which details computer names (including desktop mentioned previously) and where the images are located and how to restore from DVD or other means.

**Notes**

* This is a continuation of user story 028

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## 046 – AFSL Website Update (part 2)

DROPPED, REPLACED BY USER STORY ‘460 – AFSL Website Updates’.

**Content**

As a marketing representative, I would like the Autonomous Flight System’s Laboratory’s (AFSL) website updated with information about this project so that we can publicize our efforts about this project.

**Definition of Done**

[x ] Compile all website documents as a list of changes in a Word doc. Also include relevant materials and files in the same folder. Review all documents with CL before submitting to Kim Maczko (see notes).

[ ] Add video from user story 047 on the website as an embedded video (perhaps upload to YouTube first). Coordinate with development champion of user story 047 for this.

[x ] Send proposed website content to Insitu to ensure that it is cleared for public release.

[ ] Verify that changes have been published to website.

**Notes**

* You cannot directly edit the webpage. Instead you will need to write up a list of the changes and supply it to Kim Maczko who will make the actual changes ([Kimberly@aa.washington.edu](mailto:Kimberly@aa.washington.edu) )
* This is continuation of user story 036

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## 047 – JCATI Marketing Video Production

**Content**

As a marketing representative, I would like a marketing video highlighting what we are trying to accomplish with this project so that we can publicize our efforts about this project.

**Definition of Done**

[x ] Coordinate with Chris Lum and JCATI program manager, Patrick Gibbs, regarding video content and message.

[x ] Watch several professional produced videos/interviews of the same type (for example search the UW website for other similar videos).

[x] Create survey to answer the following questions from all team members (some of the answers can be used in the video)

For students on Research Team:

1) How did you become interested in pursuing this particular line of research?

2)  How did you learn about this opportunity to participate on this research project?

3)  Describe your role on the project.

4)  What are the benefits to you in working on a university-industry collaboration?

[x] Create a marketing style, “feel good” video describing our efforts with this project.

[x] Coordinate with development champion of user story 046 to put this video on our website.

[x] Clear video for public release with Insitu legal team.

[x] Verify that video works for JCATI to use as a marketing tool

[x] Final video is saved on Perforce (this should be the edited, final version and should be less than 50 MB)

[x] All raw video files and video production files are saved on lab external hard drive. DO NOT check these files into Perforce.

**Notes**

* See email from Patrick Gibbs on 10/04/13 at 3:13pm for more information

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## 048 – Conflict Entity Iteration 2

**Content**

As a software developer, I would like to address some feedback and criticism regarding the ConflictEntity class so that I may make a better software product.

**Definition of Done**

[x] Coordinate with Kevin Ueunten regarding his concerns about the ConflictEntity class.

[x] KU to add more descriptive task and discussion to this.

**Notes**

* “Discussion needed about Conflict entity, isinairspace function, other than that 3 scenarios were created and documented via a simulation movie. Also need to present simulator to group.”
* This work is done on the Matlab ConflictEntity object, not the C# class.

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## 049 – Literature Review (Part 2)

**Content**

As a project manager, I would like to present findings from the literature reviews so I can inform the group and receive feedback.

**Definition of Done**

[x] Present 004 results to group

[x] Present 029 results to group

[x] Incorporate feedback from group presentation into literature reviews.

[x] Create a standalone document from these literature reviews which concisely and accurately summarizes the current state of available separation management technologies. This document should be designed for external consumption (ie Insitu). Items to include

[x] Summary of ADS-B (both in and out technologies)

[x] Difference between ADS-B and TCAS

[x] How does the FAA currently define airspaces and what are the consequences of this?

[x] Cockpit Display of Traffic Information (CDTI)

[x] Discussion of how we may need to do 3D airspace avoidance (to emulate how airspaces are 3D volumes, not infinite height cylinders)

[x] Record narrations (voiceovers) on slides (see Chris, Kevin, or Matt about how to do this)

[x] Make auto advancements so that a client can just sit back and enjoy the show.

[x] Send separation management technologies summary document to Darcy Davidson and other relevant Insitu parties.

**Notes**

* This is a continuation of 004 and 029

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## 050 – Matlab Simulator Presentation

**Content**

As a software developer, I would like to present the Matlab simulator to the group so I can inform the group and receive feedback.

**Definition of Done**

[X] Present workings of the simulator to the group

[X] Incorporate feedback to improve simulator

**Notes**

* This is a continuation of 026.

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## 051 – Separation Notifier Feature Level Design (Part 2)

**Content**

As a software and algorithm developer, I would like to present the completed feature level design of the separation notifier system to the group so I can inform the group and receive feedback.

**Definition of Done**

[x] As per Darcy Davidson’s comment during sprint 1310 demo, in addition to vehicle-vehicle separation notification, we need to support separation notification with user defined no-fly zones and also user defined no-look zones. Discuss with Chris Lum about these concepts and incorporate them into feature level design.

[x] Coordinate with those involved with the forward state estimator to ensure synergistic efforts.

[x] Feature level design completed, presented to research group, reviewed, and checked into perforce. (this can be presented to the research group on 09/30/13)

[x] Discuss how to parameterize separation notifier scenario (3D position, velocity, radius, standard deviations, etc.)

[x] Incorporate any feedback and prepare feature level design for Insitu consumption

[x] Feature level design is sent to Darcy Davidson (Insitu ICOMC2 technical lead) and other relevant Insitu parties.

[x] Change all nomenclature and reference to “separation manager” to “separation notifier” (this includes in the user stories word/excel documents, feature level designs, etc.)

**Notes**

-This is continued from 040.

-No look would be nice but likely outside the scope of this project (see search and rescue plugin)

## 052 – Perforce Change List Code Review Verbiage

**Content**

As a software developer, I would like perforce to automatically populate the description of a change list with verbiage so that I can ensure that appropriate protocols were followed for each change list.

**Definition of Done**

[ ] All change lists now auto-populate with the verbiage outlined in the notes section of this user story.

[X] Discuss how to parameterize separation notifier scenario (3D position, velocity, radius, standard deviations, etc.)

**Notes**

* Each change list should have a ‘Description’ field as outlined below

[ ] This change list affects production code and a code review was conducted in accordance with policies outlined in \\JCATI2013\DeveloperNotes\code\_reviews.docx.

[ ] This change list does not affect production code.

* Access the server in Dr. Lum’s office to gain super user permission
* The server is Windows XP based.
* Noel (18th-Oct-13) installed Strawberry Perl on G:\perl\perl\bin\perl.exe

Code Reviewer(s):

Issues Found:

* Research Perforce ‘form out triggers’.

## 053 – Forward State Estimator Feature Level Design Update

**Content**

As a software and algorithm developer, I would like to update the feature level design of the forward state estimator so I can incorporate Insitu feedback into our design.

**Definition of Done**

[X] As per Darcy Davidson’s comment during sprint 1310 demo, in addition to vehicle-vehicle conflict awareness, we need to support conflict notifications with user defined no-fly zones and also user defined no-look zones. Discuss with Chris Lum about these concepts and incorporate them into feature level design.

[X] Coordinate with those involved with the separation notifier to ensure synergistic efforts.

[X] Add narrations to feature level design.

[X] Incorporate velocity error to predict future aircraft positions.

**Notes**

-Refer to slides form 13\_08\_08\_jcati\_collision\_warning.ppt

## 054 – Windows Presentation Foundation Controls Familiarization

**Content**

As a software developer, I would like to become familiar with various controls (UI) available in the Microsoft Windows Presentation Foundation API so that I can use them to develop software in an industry proven fashion.

**Definition of Done**

[ ] Research and become familiar with the general concept of Microsoft Windows Presentation Foundation (WPF).

[ ] Create a solution called WPFControls.sln

[ ] Investigate and become familiar with the operation of several WPF controls (ie Button, TextBox, ComboBox, etc). Within WPFControls.sln, create a single WPF project for each control to test how each control functions.

[ ] Present solution and its operation to the group.

**Notes**

* The WPFControls solution should be a standalone, fairly simple solution which is solely designed to illustrate how to use each of these different controls.

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## 055 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

[x] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[x] Attended discussion/training with CL regarding Perforce operation and concepts

[x] Successfully create and sync relevant workspaces (both documentation and code)

[x] Successfully check something into the depot

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## 056 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

[X] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[X] Attended discussion/training with CL regarding Perforce operation and concepts

[X] Successfully create and sync relevant workspaces (both documentation and code)

[X] Successfully check something into the depot

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## 057 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

[X] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[X] Attended discussion/training with CL regarding Perforce operation and concepts

[X] Successfully create and sync relevant workspaces (both documentation and code)

[X] Successfully check something into the depot

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## 058 – Visual Studio Via DreamSpark

DROPPED

**Content**

As a software developer, I would like to investigate the Microsoft DreamSpark program so that I may use it to obtain relevant software.

**Definition of Done**

[X] Investigate what version of Microsoft Visual Studio is available via the DreamSpark program.

[X] Determine usage conditions/restrictions (can we use this for our project)?

[X] Verify if this can be used with Windows 7

[ ] Verify with Darcy Davidson that the version of visual studio that we can obtain can be used to develop software for ICOMC2 2.0.

[X] Download and install visual studio and verify that it can be used to

* Develop a .NET 4.0 class library
* Develop a .NET 4.0 console application
* Develop a .NET 4.0 WPF application
* Develop unit test projects targeting .NET 4.0 code.

[ ] Contact Laura Dorsey at UW C4C to discuss commercialization and how it might affect getting licenses via DreamSpark (Chris Lum)

[X] Figure out how who is going to “own” the laptops that we would be developing on (Chris Lum). Noel K will summarize consequences of each action.

[ ] Difference between individual student license vs. academic institution license (goal: workstation that multiple users can use) (Madison Peck)

**Notes**

* ICOMC2 2.0 is a .NET 4.0 application.
* Talk with Chris about what legal questions need to be answered.
* UWARE provides Visual Studio 2010 Professional (<https://www.washington.edu/itconnect/wares/uware/microsoft/> )
* Visual Studio 2012 Professional on Windows 7 is available via dreamspark
* Download a binary file (.iso image) and mount via virtual drive and install. May or may not come with a key – It comes with a key (Noel)
* Talk with Laura Dorsey about how software dev works
* UW is eligible for DreamSpark premium
* Student vs. Academic institution are different. Student version can be installed in lab computer.
* Possibly use Academic license which may allow multiple student users and pay for it via lab account.
* Can Insitu gift these hardware to us so we can “own them” and then install the software. Can they gift them to our lab specifically, rather than just the department (tax deductible)

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## 059 – C# Vehicle Class

**Content**

As a software developer, I would like a class representing a vehicle so that I can use it in C# CAPlugin application.

**Definition of Done**

[X] Discuss with development champion of user story 031 to get up to speed on the Matlab Vehicle class.

[X] Review \\JCATI2013\JCATI2013\Research\Presentations\ 13\_08\_08\_jcati\_collision\_warning.ppt for definition of conflict entities

[X] Talk with CL to review how ICOMC2 Core represents a vehicle (ie what types of information ICOMC2 Core maintains for us).

[X] Create a modular, standalone, class in C# which represents a Vehicle. This should be a part of UW.sln in the UWCAPlugin project in the ‘Utilities’ folder.

[X] Class uses only SI units (no exceptions).

[X] Class provides a method to serialize itself (ie save itself to disk). See Chris Lum for details.

[X] Test that the output of the serialization can be used to recreate the object in Matlab (so we can use Matlab to analyze scenarios and make movies)

[X] Test this class for various edge and corner cases using an appropriate unit testing project (see Chris Lum for details regarding how to add this project to the solution)

[X] All public API of this class is documented.

[X] Create document (powerpoint slides) describing operation (inputs and outputs) of the class. Document is checked into Perforce.

**Notes**

* This is considered production code, it must be code reviewed, unit tested, and documented before it can be accepted.
* This should use Cartesian coordinates (xyz), not lat/lon/alt.

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## 060 – C# ConflictEntity Class

**Content**

As a software developer, I would like a class representing a conflict entity so that I can use it in C# CAPlugin application.

**Definition of Done**

[x] Discuss with development champion of user story 035 to get up to speed on the Matlab ConflictEntity class.

[x] Review \\JCATI2013\JCATI2013\Research\Presentations\ 13\_08\_08\_jcati\_collision\_warning.ppt for definition of conflict entities

[x] Talk with CL to review how ICOMC2 Core represents a vehicle (ie what types of information ICOMC2 Core maintains for us).

[x] Create a modular, standalone, class in C# which represents a ConflictEntity. This should be a part of UW.sln in the UWCAPlugin project in the ‘Utilities’ folder.

[x] Class uses only SI units (no exceptions).

[x] Class provides a method to serialize itself (ie save itself to disk). See Chris Lum for details.

[x] Test that the output of the serialization can be used to recreate the object in Matlab (so we can use Matlab to analyze scenarios and make movies)

[x] Test this class for various edge and corner cases using an appropriate unit testing project (see Chris Lum for details regarding how to add this project to the solution)

[x] All public API of this class is documented.

[x] Create document (powerpoint slides) describing operation (inputs and outputs) of the class. Document is checked into Perforce.

[x] Retroactively perform a code review.

**Notes**

* This is considered production code, it must be code reviewed, unit tested, and documented before it can be accepted.
* This should use Cartesian coordinates (xyz), not lat/lon/alt.

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## 061 – JCATI Quarterly Progress Report

**Content**

As a project manager, I would like a quarterly progress report prepared so I can inform our sponsors about our progress.

**Definition of Done**

[X] Coordinate with Chris Lum to discuss progress for the quarter.

[X] Obtain information from Patrick Gibbs about what information is to be included in the report (do not contact Patrick directly, coordinate with Chris Lum to obtain this information.

[X] Report draft completed by 10/25.

[X] Report due to JCATI on 10/31.

**Notes**

* See email from Patrick on 10/23/13 for outline of progress report

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## 062 – Prepare for Sprint 1311 External Demo

**Content**

As a project manager, I would like a set of slides which summarize the efforts of sprint 1311 so I may use them during the external demo.

**Definition of Done**

[X] Create slides for sprint 1311 (see notes) to be used during external demo

[X] Schedule external demo and send out invitations to appropriate Insitu and UW parties (do not do this yourself, talk to Chris Lum and have him do this)

[X] All external demo slides or materials are in the 1311 folder (for ease of access during the demo)

[X] Coordinate with CL to review draft of slides before external demo.

**Notes**

* Use files from \\JCATI2013\JCATI2013\TechnicalDataPackage\UserStories\ExternalDemo\_1310 as a template

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## 063 – Continuous Time, Dynamic Vehicle Model

**Content**

As algorithm developer, I would like a continuous time, dynamic vehicle model which represents a fixed wing aircraft with reasonable behavior so I may use it for AA547 and also for the forward state estimator.

**Definition of Done**

[X] Review other dynamic, continuous time models of the form x’ = f(x,u). Examples may include Unicycle or [Frenet–Serret](http://en.wikipedia.org/wiki/Frenet%E2%80%93Serret_formulas) dynamics

[x] Create models with these dynamics and determine analytic solutions so that it may be used in the forward state estimator without needed to be numerically integrated.

[x] Simulation and unit test several cases.

[X] Evaluate if this model can be used in the forward state estimator to predict future states of vehicles.

[x] Evaluate if this model can be used/modified for rotorcraft (helicopters, quadrotors, etc.).

[X] Investigate Dubin’s model (for cars and airplanes). Check out Randall Svac’s masters thesis (with professor Morgansen in 2008)

**Notes**

* This can be used to satisfy AA547 project requirements.
* Frenet-Serret dynamics apply to a well-defined path a vehicle travels. This model cannot be applied to the forward state estimator because the vehicles may not follow a path.
* Dubin’s model is trying to calculate the shortest path a vehicle will travel with constraints on how much the vehicle can turn. (Known final position is required). This can be applied to rotorcraft under the assumption the final position and heading is known.
* Overall these dynamics may be applied to the forward state estimator if we are given aircraft parameters (i.e. turn radius and final positions).
* This type of modeling is beyond the scope of AA547.

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## 064 – Forward State Estimator C# Implementation

**Content**

As a software developer, I would like a C# implementation of the basic functionality of the forward state estimator so that I may work out fine details and implementation issues with the system.

**Definition of Done**

[X] Review Forward State Estimator Feature Level Design

[X] Implement forward state estimator in C# as modular, object oriented code. Code should be as isolated and standalone as possible.

[X] Talk with CL to review how ICOMC2 Core represents data (ie what types of information ICOMC2 Core maintains for us).

[X] Create a modular, standalone, class in C# which represents the forward state estimator. This should be a part of UW.sln in the UWCAPlugin project in the ‘ForwardStateEstimator’ folder.

[X] Class uses only SI units (no exceptions).

[X] Test this class for various edge and corner cases using an appropriate unit testing project (see Chris Lum for details regarding how to add this project to the solution)

[X] All public API of this class is documented.

~~[ ] Create document (powerpoint slides) describing operation (inputs and outputs) of the class. Document is checked into Perforce.~~ (Bao’s thesis and poster explains the operation of this class)

~~[ ] Test various interesting scenarios and visualize the output of the system using Matlab plots and create Matlab figures/movies which are suitable for external demonstrations or proof of concept demonstrations.~~  (Simulator already generates visualizations of scenarios).

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## 065 – Separation Notifier Matlab R&D Prototype

**Content**

As a software developer, I would like to a research and development (R&D) prototype of the separation notifier in Matlab so that I may work out fine details and implementation issues with the system.

**Definition of Done**

[x] Review Separation Notifier Feature Level Design

[x] Implement prototype in Matlab as modular, object oriented code. This should be done with the idea that this code will eventually be ported to C# in the final implementation. Code should be well documented and designed to be modified in the future.

[x] System is integrated with R&D simulator (user story 026)

**Notes**

* Optional(Covered in User Story 112)[ ] Design and document several test scenarios (ie 2 vehicles head on, 3 vehicles with 2 in conflict, 4 vehicles with 2 pairs in conflict, etc.) including their expected/desired behavior. These scenarios may already exist in the ‘UAV test cases.docx’ document. If not, add them to the document. Note: These should be high level test scenarios, not individual code unit tests.
* Optional(Covered in User Story 112)[ ] Generate movies of the output that can be used for the external demo.

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## 066 – New Team Member Orientation

**Content**

As a team member, I would like to train and orient new team members so that they may continue making contributions to the project.

**Definition of Done**

[x] Schedule a training session with new team members. During this training session you should cover the following items:

[x] Perforce usage an policies

[x] Ensure they are on the team email list (send a dummy email to [jcati2013@uw.edu](mailto:jcati2013@uw.edu) and make sure they receive it)

[x] Ensure they have meeting request info (including WebEx links)

[x] Explain how WebEx works and our policies with WebEx

[x] Show them how UserFiles and other various depots function

[x] Explain sprint schedule and scrum procedures

[x] Show them community workspaces within the lab

[x] If necessary, help them obtain keys and access to the lab (see Chris Lum).

[x] Explain how the door lock works. Policy is if you are the last person on our side of the lab, be sure to shut and lock the door.

[x] Add new students to the group contact information document

**Notes**

* New student’s Perforce password should be # followed by student number.
* New students are (they should be on the email list)
  + Henry Qin
  + Keisuke Tsujita
  + Seunghyun Ko
  + Dai Tsukada
  + Richard Fukutome
  + Brian Chang

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## 067 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

[X] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[X] Attended discussion/training with CL regarding Perforce operation and concepts

[X] Successfully create and sync relevant workspaces (both documentation and code)

[X] Successfully check something into the depot

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## 068 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6)

[x] Create a blank solution

[x] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

Optional

[] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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## 069 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

As a software developer, I would like become familiar with common software patterns, data structures, and best practices so I can develop software in an industry proven fashion.

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[x] Create a blank solution

[x] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

Optional

[x] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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## 070 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[x] Create a blank solution

[x] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

Optional

[] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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## 071 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done**

Copy definition of done from user story 006 – Software Developer Background Training (Algorithm and Back End)

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## 072 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[x] Create a blank solution

[x] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

Optional

[ ] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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## 073 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

As a software developer, I would like become familiar with common software patterns, data structures, and best practices so I can develop software in an industry proven fashion.

**Definition of Done**

[X] Research object oriented software development

[X] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[X ] Create a blank solution

[X] Create a project of type class library (we now refer to this as the ‘class library project’)

[X] Build a simple class in C# within your ‘class library project’

[X] Create a project of type console application (we now refer to this as the ‘console application project’)

[X] Call code from your ‘class library project’ from your ‘console application project’.

[X] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

[X] Get UW solution from depot and study it.

Optional

[] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

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## 074 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[x] Create a blank solution

[x] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

Optional

[ ] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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## 075 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

As a software developer, I would like become familiar with common software patterns, data structures, and best practices so I can develop software in an industry proven fashion.

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[x] Create a blank solution

[x] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

Optional

[ ] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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## 076 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[x] Create a blank solution

[x] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

Optional

[] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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## 077 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

[x] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[x] Attended discussion/training with CL regarding Perforce operation and concepts

[x] Successfully create and sync relevant workspaces (both documentation and code)

[x] Successfully check something into the depot

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## 078 – ICOMC2 Operator Familiarization (copy)

**Content**

Copy of user story 009 – ICOMC2 Operator Familiarization

**Definition of Done**

Copy definition of done from user story 009 – ICOMC2 Operator Familiarization

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## 079 – WebEx Account Investigation

**Content**

As a project manager, I would like to investigate using our own WebEx account instead of relying on Insitu’s account so that I can host meetings which are not related to this JCATI project.

**Definition of Done**

[X] Investigate restrictions on the free account.

[X] Sign up for a dummy free account and test to see how it works

[X] Verify possible number of attendees

[X] Investigate how much it would cost to have a WebEx account.

[X] See if the UWAA or UW in general already has a WebEx account that we can use.

[X] Chris Lum: Email Brian Leverson in the UWAA department

[X] Dai: Email IT connect and ask about webex <http://www.washington.edu/itconnect/wares/uware/>

**Notes**

* The end goal is to have access to a WebEx account that we can use for meetings and also unrelated business (ie guest lecturers for classes, etc.)
* 4 types of accounts (1 free and other 3 are paid)
  + Paid type 1: premium 8 (8 allowed in meeting) $24/month
  + Paid type 2: premium 25 (25 allowed in meeting) $49/month
  + Paid type 3: premium 100 (100 allowed in meeting) $89/month
* UW does not appear to have a group WebEx account

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## 080 – Successive Separation Notification

**Content**

As an algorithm developer, I would like to investigate using multiple conflict entities or re-parameterizing the conflict entity to handle successive regions similar to the TCAS system.

**Definition of Done**

[ ]

**Notes**

* See slides from Al’s literature review showing different regions for the warnings (intruder, traffic advisory, etc.)
* These seem to be parameterized in ellipses rather than cylinders.

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## 081 – Windows Presentation Foundation Controls Familiarization (copy)

**Content**

As a software developer, I would like to become familiar with various controls (UI) available in the Microsoft Windows Presentation Foundation API so that I can use them to develop software in an industry proven fashion.

**Definition of Done**

[X] Research and become familiar with the general concept of Microsoft Windows Presentation Foundation (WPF).

[X] Create a solution called WPFControls.sln

[ ] Investigate and become familiar with the operation of several WPF controls (ie Button, TextBox, ComboBox, etc). Within WPFControls.sln, create a single WPF project for each control to test how each control functions.

[ ] Present solution and its operation to the group.

**Notes**

* The WPFControls solution should be a standalone, fairly simple solution which is solely designed to illustrate how to use each of these different controls.

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## 082 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

[x ] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[x ] Attended discussion/training with CL regarding Perforce operation and concepts

[x ] Successfully create and sync relevant workspaces (both documentation and code)

[ x] Successfully check something into the depot

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## 083 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

As a software developer, I would like become familiar with common software patterns, data structures, and best practices so I can develop software in an industry proven fashion.

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[x] Create a blank solution

[x] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

Optional

[ ] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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## 084 – Unit Testing for Sprint 1311

**Content**

As a software quality assurance engineer, I would like to write sufficiently exhaustive unit tests for code produced during sprint 1311 so that I can ensure that all code has been properly tested.

**Definition of Done**

[X] Ensure all unit tests documented in \\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx have been written and passed. (See notes)

**Notes**

* This story will grow in size as the sprint progresses and more code is written that needs to be tested.
* VS2012 appears to execute unit tests out of a different directory, figuring this out has been moved to a new user story.

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## 085 – FAA National Airspace Integration Research and Literature Review

**Content**

As a project member, I would like to perform research into the FAA’s mandate to integrate UAS into the National Airspace so that I can ensure that we are addressing the appropriate problems with our system and use this mandate to motivate our research.

**Definition of Done**

[x] Literature review of relevant prior art UAS integration into the National Airspace

[x] Literature review findings are documented in an electronic document and checked into Perforce

[x] Present results to group

[x] Incorporate feedback from group presentation into literature reviews.

[x] Create a standalone document from these literature reviews which concisely and accurately summarizes the FAA mandate. This document should be designed for external consumption (ie Insitu). Items to include

[x] What does this mandate require from UAS?

[x] What is the exact timeline and plans for integration?

[x] Where are the relevant documents/links to source material

[x] Record narrations (voiceovers) on slides (see Chris, Kevin, or Matt about how to do this)

**Notes**

* New tasks will be added to this user story as questions arise.

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## 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

**Content**

As a software quality assurance engineer, I would like to document all the unit tests that have been previously written in the UW solution so I have a place to lookup if a certain piece of code has been tested.

**Definition of Done**

[x] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[x] test\_AgentBase

[x] test\_AgentWithSensor

[x] test\_ColorInterpolator

[x] test\_Controller\_FlightPathManager

**Notes**

* This user story only involves documenting already existing unit tests. New unit test creation is captured in 087 – UW Solution Missing Unit Testing Creation.
* Many users will be working with the \\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx so only check it out to make changes and then check it back in (do not check it out for extended periods of time)

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## 087 – UW Solution Missing Unit Testing Creation (Group 1)

**Content**

As a software quality assurance engineer, I would like to write unit tests for relevant code in the UW solution that do not have existing unit tests so that I can ensure that all relevant code has been unit tested.

**Definition of Done**

[ ] Study the UW solution (particularly the unit test projects)

[ ] Identify public methods/properties in the following classes that we would like to use for the CAPlugin and determine which of these methods do not have unit tests associated with them.

[ ] UWFunctionsKML

[ ] Write unit tests for these untested methods and document results in the unit testing spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx)

**Notes**

* This entails writing new unit tests for code that may not have unit tests associated with them yet.
* Only public methods and properties should have unit tests associated with them.
* Start this user story after user story 101 – UW Solution Unit Testing Spreadsheet Check has been completed.
* Start this user story only after you have completed your version of user story 033 – Unit Testing Background Training.

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## 088 - JCATI Marketing Video Production (part 2)

**Content**

Assist with user story 047 – JCATI Marketing Video Production.

**Definition of Done**

[x ] Coordinate with Chris Lum and JCATI program manager, Patrick Gibbs, regarding video content and message.

[x ] Watch several professional produced videos/interviews of the same type (for example search the UW website for other similar videos).

[ x] Create survey to answer the following questions from all team members (some of the answers can be used in the video)

For students on Research Team:

1) How did you become interested in pursuing this particular line of research?

2)  How did you learn about this opportunity to participate on this research project?

3)  Describe your role on the project.

4)  What are the benefits to you in working on a university-industry collaboration?

[x ] Create a marketing style, “feel good” video describing our efforts with this project.

**Notes**

* See email from Patrick Gibbs on 10/04/13 at 3:13pm for more information
* Other tasks are captured in user story 047 – JCATI Marketing Video Production.

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## 089 – UW Solution Unit Testing Spreadsheet Backlog (Group 2)

**Content**

See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

**Definition of Done**

[x] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[x] test\_Datum

[x] test\_DistanceFromDatumCostFunctionGenerator

[x] test\_ExhaustiveSearch

[x] test\_ExpandingTracklineType1PatternGenerator

[x] test\_ExpandingTracklineType2PatternGenerator

**Notes**

* See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

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## 090 – UW Solution Unit Testing Spreadsheet Backlog (Group 3)

**Content**

See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

**Definition of Done**

[x] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[x] test\_FlightPath

[x] test\_FlightPathQueue

[x] test\_GeometryUtilities

[x] test\_LineGeometryExtensions

**Notes**

* See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

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## 091 – UW Solution Unit Testing Spreadsheet Backlog (Group 4)

**Content**

See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

**Definition of Done**

[X] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[X] test\_ListPointExtensions

[X] test\_LLAPoint

[X] test\_MatrixContainer

[X] test\_MatrixContainerCore

[X] test\_NumericalGradient

**Notes**

* See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

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## 092 – UW Solution Unit Testing Spreadsheet Backlog (Group 5)

**Content**

See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

**Definition of Done**

[X] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[X] test\_OccupancyMap

[X] test\_OccupancyMapCell

**Notes**

* See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

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## 093 – UW Solution Unit Testing Spreadsheet Backlog (Group 6)

**Content**

See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

**Definition of Done**

[x] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[x] test\_ParallelTrackSingleUnitPatternGenerator

[x] test\_ParallelTrackSingleUnitPolygonPatternGenerator

[x] test\_ParallelTrackSingleUnitPolygonUtilities

[x] test\_PatternFilter

[x] test\_PointExtensions

[x] test\_RectangleGeometryExtensions

[x] test\_RectExtensions

[x] test\_ReliabilityFactorAltitudeLinear

[x] test\_SensorSinglePoint

[x] test\_SimulationEngine

[x] test\_SquareSingleUnitPatternGenerator

**Notes**

* See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

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## 094 – UW Solution Unit Testing Spreadsheet Backlog (Group 7)

**Content**

See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

**Definition of Done**

[X] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[X] test\_StaticSearchPattern

[X] test\_StatisSearchPatternFileIOUtilitites

[X] test\_Type2FiniteStateMachine

[X] test\_UnconstrainedGraidentDescent

[X] test\_UWAngle

[X] test\_UWCanvas

[X]test\_ConversionFactorsLength

[X] test\_ConversionFactorsMisc

**Notes**

* See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

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## 095 – UW Solution Unit Testing Spreadsheet Backlog (Group 8)

**Content**

See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

**Definition of Done**

[x] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[x] test\_UWDistance

[x] test\_UWFunctionsArrays

**Notes**

* See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

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## 096 – UW Solution Unit Testing Spreadsheet Backlog (Group 9)

**Content**

See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

**Definition of Done**

[X] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[X] test\_UWFunctionsFileIO

[X] test\_UWFucntionsKML

[X] test\_UWFunctionsLists

**Notes**

* See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

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## 097 – UW Solution Unit Testing Spreadsheet Backlog (Group 10)

**Content**

See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

**Definition of Done**

[x] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[x] test\_UWFunctionsMath

[x] test\_UWFunctionsMisc

[x] test\_UWFunctionsStrings

[x] test\_UWFunctionsVectorMechanics

**Notes**

* See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

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## 098 – UW Solution Unit Testing Spreadsheet Backlog (Group 11)

**Content**

As a software quality assurance engineer, I would like to document all the unit tests that have been previously written in the UW solution so I have a place to lookup if a certain piece of code has been tested.

**Definition of Done**

[X] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[X] test\_UWMatrix

**Notes**

* This user story only involves documenting already existing unit tests. New unit test creation is captured in 087 – UW Solution Missing Unit Testing Creation.
* Many users will be working with the \\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx so only check it out to make changes and then check it back in (do not check it out for extended periods of time)

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## 099 – UW Solution Unit Testing Spreadsheet Backlog (Group 12)

**Content**

See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

**Definition of Done**

[x] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[x] test\_UWMatrixCore

[x] test\_UWPolygon

**Notes**

* See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

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## 100 – UW Solution Unit Testing Spreadsheet Backlog (Group 13)

**Content**

See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

**Definition of Done**

[x] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that have been previously written for the following unit tests projects

[x] test\_UWPolygonConvex

[x] test\_Vehicle

[x] test\_WaypointBase

**Notes**

* See user story 086 – UW Solution Unit Testing Spreadsheet Backlog (Group 1)

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## 101 – UW Solution Unit Testing Spreadsheet Check

**Content**

As a software quality assurance engineering, I would like to ensure that all unit test that are part of the UW.sln are documented in the spreadsheet.

**Definition of Done**

[X] Look at the unit test spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx) and make sure that every unit test in the UW.sln solution is documented in this spreadsheet.

As of 13-2-14, 9:00 am, All unit tests in the UW.sln is documented in the spreadsheet

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## 102 – UW Solution Missing Unit Testing Creation (Group 2)

**Content**

See user story 087 – UW Solution Missing Unit Testing Creation (Group 1).

**Definition of Done**

Same definition as user story 087 – UW Solution Missing Unit Testing Creation (Group 1) except focus in the following classes

[X ] Study the UW solution (particularly the unit test projects)

[X ] Identify public methods/properties in the following classes that we would like to use for the CAPlugin and determine which of these methods do not have unit tests associated with them.

[X ] UWFunctionsMath

[X ] Write unit tests for these untested methods and document results in the unit testing spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx)

**Notes**

* This entails writing new unit tests for code that may not have unit tests associated with them yet.
* Only public methods and properties should have unit tests associated with them.
* Start this user story after user story 101 – UW Solution Unit Testing Spreadsheet Check has been completed.
* Start this user story only after you have completed your version of user story 033 – Unit Testing Background Training.

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## 103 – UW Solution Missing Unit Testing Creation (Group 3)

**Content**

See user story 087 – UW Solution Missing Unit Testing Creation (Group 1).

**Definition of Done**

Same definition as user story 087 – UW Solution Missing Unit Testing Creation (Group 1) except focus in the following classes

[X] UWFunctionsVectorMechanics

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## 104 – UW Solution Missing Unit Testing Creation (Group 4)

**Content**

As a software quality assurance engineer, I would like to write unit tests for relevant code in the UW solution that do not have existing unit tests so that I can ensure that all relevant code has been unit tested.

**Definition of Done**

[X] Study the UW solution (particularly the unit test projects)

[X] Identify public methods/properties in the following classes that we would like to use for the CAPlugin and determine which of these methods do not have unit tests associated with them.

[X] UWFunctionsKML

[X] Write unit tests for these untested methods and document results in the unit testing spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx)

**Notes**

* This entails writing new unit tests for code that may not have unit tests associated with them yet.
* Only public methods and properties should have unit tests associated with them.
* Start this user story after user story 101 – UW Solution Unit Testing Spreadsheet Check has been completed.
* Start this user story only after you have completed your version of user story 033 – Unit Testing Background Training.

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## 105 – UW Solution Missing Unit Testing Creation (Group 5)

**Content**

See user story 087 – UW Solution Missing Unit Testing Creation (Group 1).

**Definition of Done**

[X] Study the UW solution (particularly the unit test projects)

[X] Identify public methods/properties in the following classes that we would like to use for the CAPlugin and determine which of these methods do not have unit tests associated with them.

[X] UWFunctionsKML

[X] Write unit tests for these untested methods and document results in the unit testing spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx)

Same definition as user story 087 – UW Solution Missing Unit Testing Creation (Group 1) except focus in the following classes

[X] UWMatrixCore

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## 106 – UW Solution Missing Unit Testing Creation (Group 6)

**Content**

See user story 087 – UW Solution Missing Unit Testing Creation (Group 1).

**Definition of Done**

[x] Study the UW solution (particularly the unit test projects)

[x] Identify public methods/properties in the following classes that we would like to use for the CAPlugin and determine which of these methods do not have unit tests associated with them.

[x] UWConversionFactors

[x] UWExtensionsDouble

[x] Write unit tests for these untested methods and document results in the unit testing spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx)

**Notes**

* This entails writing new unit tests for code that may not have unit tests associated with them yet.
* Only public methods and properties should have unit tests associated with them.
* Start this user story after user story 101 – UW Solution Unit Testing Spreadsheet Check has been completed.
* Start this user story only after you have completed your version of user story 033 – Unit Testing Background Training.

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## 107 – UW Solution Missing Unit Testing Creation (Group 7)

**Content**

See user story 087 – UW Solution Missing Unit Testing Creation (Group 1).

**Definition of Done**

Same definition as user story 087 – UW Solution Missing Unit Testing Creation (Group 1) except focus in the following classes

[x] UWFunctionsArrays

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## 108 – UW Solution Missing Unit Testing Creation (Group 8)

**Content**

As a software quality assurance engineer, I would like to write unit tests for relevant code in the UW solution that do not have existing unit tests so that I can ensure that all relevant code has been unit tested.

**Definition of Done**

[X] Study the UW solution (particularly the unit test projects)

[X] Identify public methods/properties in the following classes that we would like to use for the CAPlugin and determine which of these methods do not have unit tests associated with them.

[x] UWFunctionsFileIO

[X] Write unit tests for these untested methods and document results in the unit testing spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx)

**Notes**

* This entails writing new unit tests for code that may not have unit tests associated with them yet.
* Only public methods and properties should have unit tests associated with them.
* Start this user story after user story 101 – UW Solution Unit Testing Spreadsheet Check has been completed.
* Start this user story only after you have completed your version of user story 033 – Unit Testing Background Training.

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## 109 – UW Solution Missing Unit Testing Creation (Group 9)

**Content**

See user story 087 – UW Solution Missing Unit Testing Creation (Group 1).

**Definition of Done**

Same definition as user story 087 – UW Solution Missing Unit Testing Creation (Group 1) except focus in the following classes

[X] Study the UW solution (particularly the unit test projects)

[X] Identify public methods/properties in the following classes that we would like to use for the CAPlugin and determine which of these methods do not have unit tests associated with them.

[X] UWFunctionsLists

[X] Write unit tests for these untested methods and document results in the unit testing spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx)

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## 110 – UW Solution Missing Unit Testing Creation (Group 10)

**Content**

See user story 087 – UW Solution Missing Unit Testing Creation (Group 1).

**Definition of Done**

Same definition as user story 087 – UW Solution Missing Unit Testing Creation (Group 1) except focus in the following classes

[x] UWFunctionsMisc

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## 111 – UW Solution Missing Unit Testing Creation (Group 11)

**Content**

As a software quality assurance engineer, I would like to write unit tests for relevant code in the UW solution that do not have existing unit tests so that I can ensure that all relevant code has been unit tested.

**Definition of Done**

[X] Study the UW solution (particularly the unit test projects)

[X] Identify public methods/properties in the following classes that we would like to use for the CAPlugin and determine which of these methods do not have unit tests associated with them.

[X] UWFunctionsStrings

[X] Write unit tests for these untested methods and document results in the unit testing spreadsheet (\\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx)

**Notes**

* This entails writing new unit tests for code that may not have unit tests associated with them yet.
* Only public methods and properties should have unit tests associated with them.

Start this user story after user story 101 – UW Solution Unit Testing Spreadsheet Check has been completed

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## 112 – Separation Notifier C# Implementation

**Content**

As a software developer, I would like a C# implementation of the basic functionality of the separation notifier so that I may work out fine details and implementation issues with the system.

**Definition of Done**

[x] Review Separation Notifier Feature Level Design

[x] Implement separation notifier in C# as modular, object oriented code. Code should be as isolated and standalone as possible.

[x] Talk with CL to review how ICOMC2 Core represents data (ie what types of information ICOMC2 Core maintains for us).

[x] Create a modular, standalone, class in C# which represents the separation notifier. This should be a part of UW.sln in the UWCAPlugin project in the ‘SeparationNotifier’ folder.

[x] Class uses only SI units (no exceptions).

[X] Test this class for various edge and corner cases using an appropriate unit testing project (see Chris Lum for details regarding how to add this project to the solution)

[x] All public API of this class is documented.

[x] Create document (powerpoint slides) describing operation (inputs and outputs) of the class. Document is checked into Perforce.

Possibly obsolete (unity being used to visualize output):

[ ] Test various interesting scenarios and visualize the output of the system using Matlab plots and create Matlab figures/movies which are suitable for external demonstrations or proof of concept demonstrations.

Note

* Discuss Windows 7 vs 8 problems.
* CompareConflictListToSelf(UserConflict, ObservedSetting) outputs a list in a mixed order in certain occurance. Debugging to find the specific failure mode is under progress (Noel, 13-2-14)

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## 113 – Unit Testing for Sprint 1312

**Content**

As a software quality assurance engineer, I would like to write sufficiently exhaustive unit tests for code produced during sprint 1312 so that I can ensure that all code has been properly tested.

**Definition of Done**

[x] Ensure all unit tests documented in \\JCATI2013\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx have been written and passed.

**Notes**

* This story will grow in size as the sprint progresses and more code is written that needs to be tested.

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## 114 – Developer WebEx Account Setup (Group 1)

**Content**

As a software developer, I would like to obtain a WebEx account so I can hold code reviews with other developers.

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 “mock” code review via WebEx with another team member (ensure that you can share screens)

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## 115 – Developer WebEx Account Setup (Group 2)

**Content**

See user story 114 – Developer WebEx Account Setup (Group 1).

**Definition of Done**

[x ] Sign up for a free WebEx account.

[x ] Verify that you can start schedule a normal meeting.

[x ] Verify that you can start a one-click meeting.

[x ] Conduct at least 1 code review via WebEx with another team member.

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## 116 – Developer WebEx Account Setup (Group 3)

**Content**

As a software developer, I would like to obtain a WebEx account so I can hold code reviews with other developers.

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 code review via WebEx with another team member.

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## 117 – Developer WebEx Account Setup (Group 4)

**Content**

See user story 114 – Developer WebEx Account Setup (Group 1).

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 “mock” code review via WebEx with another team member (ensure that you can share screens)

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## 118 – Developer WebEx Account Setup (Group 5)

**Content**

As a software developer, I would like to obtain a WebEx account so I can hold code reviews with other developers.

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 “mock” code review via WebEx with another team member (ensure that you can share screens)

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## 119 – Developer WebEx Account Setup (Group 6)

**Content**

See user story 114 – Developer WebEx Account Setup (Group 1).

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 “mock” code review via WebEx with another team member.

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## 120 – Developer WebEx Account Setup (Group 7)

**Content**

See user story 114 – Developer WebEx Account Setup (Group 1).

**Definition of Done**

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 “mock” code review via WebEx with another team member (ensure that you can share screens)

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## 121 – Developer WebEx Account Setup (Group 8)

**Content**

See user story 114 – Developer WebEx Account Setup (Group 1).

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 “mock” code review via WebEx with another team member (ensure that you can share screens)

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## 122 – Developer WebEx Account Setup (Group 9)

**Content**

See user story 114 – Developer WebEx Account Setup (Group 1).

**Definition of Done**

[X] Sign up for a free WebEx account.

[X] Verify that you can start schedule a normal meeting.

[X] Verify that you can start a one-click meeting.

[X] Conduct at least 1 “mock” code review via WebEx with another team member (ensure that you can share screens)

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## 123 – Developer WebEx Account Setup (Group 10)

**Content**

As a software developer, I would like to obtain a WebEx account so I can hold code reviews with other developers.

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 “mock” code review via WebEx with another team member (ensure that you can share screens)

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## 124 – Developer WebEx Account Setup (Group 11)

**Content**

See user story 114 – Developer WebEx Account Setup (Group 1).

**Definition of Done**

[X] Sign up for a free WebEx account.

[X] Verify that you can start schedule a normal meeting.

[X] Verify that you can start a one-click meeting.

[X] Conduct at least 1 code review via WebEx with another team member.

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## 125 – Developer WebEx Account Setup (Group 12)

**Content**

See user story 114 – Developer WebEx Account Setup (Group 1).

**Definition of Done**

[X] Sign up for a free WebEx account.

[X] Verify that you can start schedule a normal meeting.

[X] Verify that you can start a one-click meeting.

[X] Conduct at least 1 “mock” code review via WebEx with another team member (ensure that you can share screens

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## 126 – Developer WebEx Account Setup (Group 13)

**Content**

As a software developer, I would like to obtain a WebEx account so I can hold code reviews with other developers.

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 “mock” code review via WebEx with another team member (ensure that you can share screens)

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## 127 – Developer WebEx Account Setup (Group 14)

**Content**

See user story 114 – Developer WebEx Account Setup (Group 1).

**Definition of Done**

[X] Sign up for a free WebEx account.

[X] Verify that you can start schedule a normal meeting.

[X] Verify that you can start a one-click meeting.

[X] Conduct at least 1 code review via WebEx with another team member.

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## 128 – Developer WebEx Account Setup (Group 15)

**Content**

As a software developer, I would like to obtain a WebEx account so I can hold code reviews with other developers.

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 code review via WebEx with another team member.

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## 129 – Visual Studio 2012 Unit Test Workflow

**Content**

As a software quality assurance engineer, I would like to determine an efficient workflow for creating unit tests in Visual Studio 2012 Professional so I can unit test code written in this environment.

**Definition of Done**

[X] Meet with Chris Lum to discuss the context and background of this story.

[X] Read the document UW.sln\UnitTests\creating\_unit\_tests.docx which describes our method for creating unit tests in VS2010.

[X] Ensure that you have VS2012 Professional installed and updated to the latest release on your Windows 7 machine.

[X] Generate an efficient workflow for creating unit tests in VS2012 (see notes)

[X] Update UW.sln\UnitTests\creating\_unit\_tests.docx with this new information (do not erase the old description, instead make another section describing how to create unit tests in VS2012 Professional).

**Notes**

* VS2010 supported a workflow which allowed a developer to right-click on a method/property and select “create unit test…” and then choose which C# unit test project to add this to. This feature appears to have [been removed](http://social.msdn.microsoft.com/Forums/vstudio/en-us/f76aafa9-3ea8-4ff3-940d-0dcf3bb70273/visual-studio-2012-right-click-create-unit-test-is-gone?forum=vssetup) from VS2012 Professional .
* Visual Studio website has a nice tutorial for creating unit tests in 2012, maybe start here (MSDN).

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## 130 – Sprint 1312 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1312 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[X] Prepare for sprint 1312 external demo

[X] Backup Perforce server on external hard drive

[X] Plan training tutorials and lectures

[X] Manage user story generation, assignment, and progress.

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## 131 – Forward State Estimator Improvements

**Content**

As an algorithm designer, I would like to update the forward state estimator design to incorporate new ideas so that I have an up to date description of this component.

**Definition of Done**

[X] Update forward state estimator feature level design for new ideas including

~~[ ] Kalman filter for updated estimates~~ (Bao)

~~[ ] Add other updated features here…~~

[X] Propagation of Error

[X] Update Matlab R&D prototype with these estimates

[X] Generate Matlab plots/movies with these new prototype features

~~[ ] (optional) Update C# production code with these improvements.~~

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## 132 – Unit Testing Background Training (copy)

**Content**

As a software quality assurance engineer, I would like become familiar with common software unit testing patterns and best practices so I can develop rigorous and automated tests for the software components being developed for this project.

**Definition of Done**

[x] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[x] Attend research group meeting regarding Microsoft Visual Studio and C#

[x] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[x] Get UW.sln solution from depot and study it

[x] Within the UW.sln solution, read the creating\_unit\_tests.docx

[x] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[x] Create a dummy solution within your UserFiles directory.

[x] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[x] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[x] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[x] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

**Notes**

* See Copy of 033 – Unit Testing Background Training.

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## 133 – Unit Testing Background Training (copy)

**Content**

Copy of 033 – Unit Testing Background Training.

**Definition of Done**

[x] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[x] Attend research group meeting regarding Microsoft Visual Studio and C#

[x] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[x] Get UW.sln solution from depot and study it

[x] Within the UW.sln solution, read the creating\_unit\_tests.docx

[x] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[x] Create a dummy solution within your UserFiles directory.

[x] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[x] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[x] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[x] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

**Notes**

* See Copy of 033 – Unit Testing Background Training.

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## 134 – Unit Testing Background Training (copy)

**Content**

Copy of 033 – Unit Testing Background Training.

**Definition of Done**

[X] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[X] Attend research group meeting regarding Microsoft Visual Studio and C#

[X] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[X] Get UW.sln solution from depot and study it

[X] Within the UW.sln solution, read the creating\_unit\_tests.docx

[X] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[X] Create a dummy solution within your UserFiles directory.

[X] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[X] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[X] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[X] Check in your dummy solution into Perforce

**Notes**

* Optional: Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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## 135 – Unit Testing Background Training (copy)

**Content**

Copy of 033 – Unit Testing Background Training.

**Definition of Done**

[X] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[X] Attend research group meeting regarding Microsoft Visual Studio and C#

[X] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

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[X] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[X] Create a dummy solution within your UserFiles directory.

[X] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[X] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[X] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[X] Check in your dummy solution into Perforce

**Notes**

* See Copy of 033 – Unit Testing Background Training.

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## 136 – Unit Testing Background Training (copy)

**Content**

Copy of 033 – Unit Testing Background Training.

**Definition of Done**

[X] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[X] Attend research group meeting regarding Microsoft Visual Studio and C#

[X] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

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[X] Within the UW.sln solution, read the creating\_unit\_tests.docx

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[X] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[X] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[X] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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## 137 – Unit Testing Background Training (copy)

**Content**

As a software quality assurance engineer, I would like become familiar with common software unit testing patterns and best practices so I can develop rigorous and automated tests for the software components being developed for this project.

**Definition of Done**

[X] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[X] Attend research group meeting regarding Microsoft Visual Studio and C#

[X] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[X] Get UW.sln solution from depot and study it

[X] Within the UW.sln solution, read the creating\_unit\_tests.docx

[X] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[x] Create a dummy solution within your UserFiles directory.

[x] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[x] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[x] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[x] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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## 138 – Unit Testing Background Training (copy)

**Content**

As a software quality assurance engineer, I would like become familiar with common software unit testing patterns and best practices so I can develop rigorous and automated tests for the software components being developed for this project.

**Definition of Done**

[X] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[X] Attend research group meeting regarding Microsoft Visual Studio and C#

[X] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[X] Get UW.sln solution from depot and study it

[X] Within the UW.sln solution, read the creating\_unit\_tests.docx

[X] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[X] Create a dummy solution within your UserFiles directory.

[X] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[X] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[X] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[X] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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## 139 – Unit Testing Background Training (copy)

**Content**

As a software quality assurance engineer, I would like become familiar with common software unit testing patterns and best practices so I can develop rigorous and automated tests for the software components being developed for this project.

**Definition of Done**

[X] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[X] Attend research group meeting regarding Microsoft Visual Studio and C#

[X] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[X] Get UW.sln solution from depot and study it

[X] Within the UW.sln solution, read the creating\_unit\_tests.docx

[X] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[X] Create a dummy solution within your UserFiles directory.

[X] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[X] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[X] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[X] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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## 140 – Unit Testing Background Training (copy)

**Content**

Copy of 033 – Unit Testing Background Training.

**Definition of Done**

**Content**

As a software quality assurance engineer, I would like become familiar with common software unit testing patterns and best practices so I can develop rigorous and automated tests for the software components being developed for this project.

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**Definition of Done**

[X] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[X] Attend research group meeting regarding Microsoft Visual Studio and C#

[X] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[X] Get UW.sln solution from depot and study it

[X] Within the UW.sln solution, read the creating\_unit\_tests.docx

[X] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[X] Create a dummy solution within your UserFiles directory.

[X] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[X] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[X] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[X] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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## 141 – Unit Testing Background Training (copy)

**Content**

Copy of 033 – Unit Testing Background Training.

**Definition of Done**

[x] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[x] Attend research group meeting regarding Microsoft Visual Studio and C#

[x] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[x] Get UW.sln solution from depot and study it

[x] Within the UW.sln solution, read the creating\_unit\_tests.docx

[x] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[x] Create a dummy solution within your UserFiles directory.

[x] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

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[x] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[x] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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## 142 – Unit Testing Background Training (copy)

**Content**

As a software quality assurance engineer, I would like become familiar with common software unit testing patterns and best practices so I can develop rigorous and automated tests for the software components being developed for this project.

**Definition of Done**

[X] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[X ] Attend research group meeting regarding Microsoft Visual Studio and C#

[X] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[X] Get UW.sln solution from depot and study it

[X] Within the UW.sln solution, read the creating\_unit\_tests.docx

[X] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[X] Create a dummy solution within your UserFiles directory.

[X] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[X] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[X] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[X] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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## 143 – Unit Testing Background Training (copy)

**Content**

As a software quality assurance engineer, I would like become familiar with common software unit testing patterns and best practices so I can develop rigorous and automated tests for the software components being developed for this project.

**Definition of Done**

[x] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[x] Attend research group meeting regarding Microsoft Visual Studio and C#

[x] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[x] Get UW.sln solution from depot and study it

[x] Within the UW.sln solution, read the creating\_unit\_tests.docx

[x] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[x] Create a dummy solution within your UserFiles directory.

[x] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[x] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

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## 144 – Unit Testing Background Training (copy)

**Content**

Copy of 033 – Unit Testing Background Training.

**Definition of Done**

[X] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[X] Attend research group meeting regarding Microsoft Visual Studio and C#

[X] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[X] Get UW.sln solution from depot and study it

[X] Within the UW.sln solution, read the creating\_unit\_tests.docx

[X] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[X] Create a dummy solution within your UserFiles directory.

[X] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[X] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[X] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[X] Check in your dummy solution into Perforce.

**Notes**

* See Copy of 033 – Unit Testing Background Training.

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## 145 – Unity Game Engine Research

**Content**

As a project manager, I would like to research the Unity game engine to assess its potential to be used for visualization purposes in our project.

**Definition of Done**

[X] Research Unity game engine ( <http://unity3d.com/> ). We are specifically interested in

[X] How is Unity used within the game development community

[X] How can this be used to render/draw scenes (like aircraft colliding)

[X] Can the rendering be driven by externally generated data (ie from the Separation Notifier)

[X] Talk with Nathaniel Guy (AA Grad student) about Unity (he may come to one of our group meetings so talk with Chris Lum about this before contacting him)

[X] Download and install Unity engine

[X] Watch tutorials located at <http://unity3d.com/learn/tutorials/modules>

[X] Use Unity engine to produce a movie of something.

[X] Present results and inform group about Unity.

**Notes**

* Our interest in this engine is twofold
  + 1. Can this be used to create advanced visualizations of the conflict situations we are dealing with?
  + 2. Since Insitu is interested in Unity, this will make students more attractive for internships.

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## 146 – Unity Scripting or Module for Automatic Scenario Visualization

**Content**

As a project manager, I would like to use the Unity game engine to visualize various conflict scenarios so that I can produce visually pleasing movies.

**Definition of Done**

[X] Coordinate with development champion of 145 – Unity Game Engine Research to become familiar with the Unity game engine ( <http://unity3d.com/> ).

[X] Generate some dummy data to visualize (in other words, create some data that would have been generated by another entity like the separation notifier).

[X] Use Unity to visualize this scenario. This should be done in an automatic fashion (use scripting or other tools). The goal is that we can use this script over and over again on various data sets.

[X] Document what type of data is required for your script to function.

[X] Present results to group.

**Notes**

* The goal of this user story is to
  + Generate a visually impressive movie of a scenario which has the engineering computations performed by an external application.
  + Illustrate to Insitu that we can use Unity for engineering purposes.
* You can assume that some other application will generate the data and the system described in this user story is only in charge of reading in this data and creating the movie. The scope of this user story is shown in the user\_stories.pptx file within the dashed lines.

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## 147 – Jira Bug Tracker Research

**Content**

As a project manager, I would like to research Jira to assess its potential to be used for bug tracking within our project.

**Definition of Done**

[x] Research Jira (<https://www.atlassian.com/software/jira> ). We are specifically interested in

[x] How is Jira used in the software industry?

[x] How is this used to track bugs and other software issues in a project?

[x] How much does it cost? Can we qualify for academic or open source licenses?

~~[ ] Talk with Nathaniel Guy (AA Grad student) about Jira (he may come to one of our group meetings so talk with Chris Lum about this before contacting him)~~

[x] Sign up for a free trial and play around with it and document your experiences.

[x] Research to see if there are alternatives to Jira.

[ ] Present results and inform group about Jira.

[ ] Create a user story to integrate Jira into the AFSL workflow

**Notes**

* Madison Peck initially worked on this story but it was not successfully completed

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## 148 – Unity Game Engine Training

**Content**

As a software developer, I would like to become familiar with the Unity game engine so that I can use it for various parts of this research.

**Definition of Done**

[ ] Coordinate with development champion of user story 145 – Unity Game Engine Research to familiarize yourself with game engine.

[ ] Attend presentation (or watch recorded video) of unity presentation by development champion of 145 – Unity Game Engine Research.

[x] Download and install Unity engine

[ ] Watch tutorials located at <http://unity3d.com/learn/tutorials/modules>

[ ] Use Unity engine to produce a movie of something.

**Notes**

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## 149 – Unity Game Engine Training (copy)

**Content**

As a software developer, I would like to become familiar with the Unity game engine so that I can use it for various parts of this research.

**Definition of Done**

[x] Coordinate with development champion of user story 145 – Unity Game Engine Research to familiarize yourself with game engine.

[x] Download and install Unity engine

[x] Watch tutorials located at <http://unity3d.com/learn/tutorials/modules>

[x] Use Unity engine to produce a movie of something.

Optional

[ ] Attend presentation (or watch recorded video) of unity presentation by development champion of 145 – Unity Game Engine Research.

**Notes**

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## 150 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done**

Copy definition of done from user story 006 – Software Developer Background Training (Algorithm and Back End)

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## 151 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

As a software developer, I would like become familiar with common software patterns, data structures, and best practices so I can develop software in an industry proven fashion.

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[x] Create a blank solution

[x] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

Optional

[] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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## 152 – Unit Testing Background Training (copy)

**Content**

Copy of 033 – Unit Testing Background Training.

**Definition of Done**

Copy of 033 – Unit Testing Background Training.

**Notes**

* See Copy of 033 – Unit Testing Background Training.

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## 153 – Unit Testing Background Training (copy)

**Content**

As a software quality assurance engineer, I would like become familiar with common software unit testing patterns and best practices so I can develop rigorous and automated tests for the software components being developed for this project.

**Definition of Done**

[X] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[X] Attend research group meeting regarding Microsoft Visual Studio and C#

[X] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[X] Get UW.sln solution from depot and study it

[X] Within the UW.sln solution, read the creating\_unit\_tests.docx

[X] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[X] Create a dummy solution within your UserFiles directory.

[X] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[X] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[X] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[X] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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## 154 – Developer WebEx Account Setup (Group 16)

**Content**

See user story 114 – Developer WebEx Account Setup (Group 1).

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 “mock” code review via WebEx with another team member (ensure that you can share screens)

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## 155 – Developer WebEx Account Setup (Group 17)

**Content**

As a software developer, I would like to obtain a WebEx account so I can hold code reviews with other developers.

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 “mock” code review via WebEx with another team member (ensure that you can share screens)

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## 156 – Perforce Visual Client (copy)

**Content**

As a software developer, I would like a Perforce client installed on my machine and would like to be comfortable with its use so I may sync files and make code changes.

**Definition of Done**

[x] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[x] Attended discussion/training with CL regarding Perforce operation and concepts

[x] Successfully create and sync relevant workspaces (both documentation and code)

[x] Successfully check something into the depot

## 157 – New Team Member Orientation (Sprint 1312)

**Content**

Copy of user story 066 – New Team Member Orientation

**Definition of Done**

[x] Schedule a training session with new team members. During this training session you should cover the following items:

[x] Perforce usage an policies

[x] Ensure they are on the team email list (send a dummy email to [jcati2013@uw.edu](mailto:jcati2013@uw.edu) and make sure they receive it)

[x] Ensure they have meeting request info (including WebEx links)

[x] Explain how WebEx works and our policies with WebEx

[x] Show them how UserFiles and other various depots function

[x] Explain sprint schedule and scrum procedures

[x] Show them community workspaces within the lab

[x] If necessary, help them obtain keys and access to the lab (see Chris Lum).

[x] Explain how the door lock works. Policy is if you are the last person on our side of the lab, be sure to shut and lock the door.

[x] Add new students to the group contact information document

**Notes**

* This user story applies to new members of
  + John Marshall
  + Taylor Campbell

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## 158 – Risk Assessment Website Re-Activation

**Content**

As a project manager, I would like to re-activate the risk assessment website so I can use it for various parts of this research and also so other interested parties can use the tool.

**Definition of Done**

[x] Meet with Chris Lum to discuss the scope of the project.

[x] Meet with Nathan Powell from the NDCL and ask him about what needs to be done to re-activate the web-server.

[x] Re-activate and ensure that basic website functionality is restored.

[x] Email link of website to Chris Lum once everything is basically functional.

**Notes**

* This involves re-activating a server and code which was run by the non-linear dynamics and controls lab (NDCL). You should not have to write any new code, it is mostly updating configuration files or settings and getting it up and running.
* Testing the website functionality is in another user story.

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## 159 – Risk Assessment Website Testing

**Content**

As a software developer, I would like to test the re-activated risk assessment website so I can be sure it functions as desired.

**Definition of Done**

[x ] Meet with Chris Lum to discuss the scope of the project.

[x ] Coordinate with development champion of user story 158 – Risk Assessment Website Re-Activation to figure out how to use website tool

[x ] Download [this](http://www.aa.washington.edu/research/afsl/publications/lum_risk_for_uavs_2010_2.pdf) paper and read it. Use the risk-assessment website to recreate the scenarios discussed in the paper and verify that the tool outputs similar results.

**Notes**

* This involves re-activating a server and code which was run by the non-linear dynamics and controls lab (NDCL). You should not have to write any new code, it is mostly updating configuration files or settings and getting it up and running.
* Testing the website functionality is in another user story.

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## 160 – Visual Studio 2012 Unit Testing Directories

**Content**

As a unit test developer, I would like to understand which directories VS2012 executes unit tests out of so that I can create unit tests that rely on relative directory mappings.

**Definition of Done**

[X] Meet with Chris Lum to discuss some issues with the project.

[ ] Look at the UW solution and several unit tests which rely on relative directory mappings (tests for functions which read/write data to/from a directory).

[X] Verify that these tests pass in VS2012 if you select ‘Run All’ from the test explorer.

[X] Verify that the same test fails in VS2012 if you individually select it to run.

[ ] Determine what is causing this discrepancy and report.

[ ] Verify that all unit tests which read/write info to a directory run and pass on 4 different machines.

[X] Verify that Chris Lum’s build works (on Windows 7 machine)

[ ] Verify that Chris Lum’s build works (on a Windows 8.1 machine)

[ ] Verify that Noel Kimber’s build works

[ ] Verify that Henry Qin’s works (this seems to be causing problems)

[ ] Verify that another build works

**Notes**

* See ForwardStateEstimatorParametersVisualizerTestConstants for a potential solution

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## 161 – JCATI Marketing Video Approval

**Content**

As a marketing representative, I would like a marketing video highlighting what we are trying to accomplish with this project so that we can publicize our efforts about this project.

**Definition of Done**

[X ] Coordinate with development champion of user story 046 to put this video on our website.

[ X] Clear video for public release with Insitu legal team.

[X] Verify that video works for JCATI to use as a marketing tool

[ X] Final video is saved on Perforce (this should be the edited, final version and should be less than 50 MB)

[ X] All raw video files and video production files are saved on lab external hard drive. DO NOT check these files into Perforce.

[ X] Make sure we give a copy of the video to Insitu at our March 7 trip.

**Notes**

* This is a continuation of user story 047 – JCATI Marketing Video Production.

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## 162 – Unity Asset Generation

**Content**

As a Unity user, I would like to investigate tools to create assets which can be used by the Unity engine so that I can create models and assets which are specific to our scenario.

**Definition of Done**

[ ] Coordinate with development champion of user stories 145 – Unity Game Engine Research to become familiar with Unity and its operation.

[ ] Investigate the user of Blender to create assets within Unity.

[ ] Model and design an Insitu Integrator vehicle which can be used in Unity.

[ ] Visualize a scenario with an Insitu Integrator flying around.

**Notes**

* This goal of this user story is to create assets for Insitu aircraft (ScanEagle, Integrator, etc.) that can be used in the Unity visualization.

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## 163 – Software Best Practices Poster and Presentations (Session 1)

**Content**

As a software developer, I would like to investigate some software best practices and present these ideas to the group so the entire group can learn from my research.

**Definition of Done**

[X] Look up a software development best practice and perform research into it (see notes).

[X] Present this best practice to the group and show some code samples or discuss how this can be used to create cleaner code.

**Notes**

* There are several satirical posters of “anti-patterns” (bad ideas and things that you should not do) located at <http://www.flickr.com/photos/lakequincy/sets/72157629316877860/> .

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## 164 – Software Best Practices Poster and Presentations (Session 2)

**Content**

As a software developer, I would like to investigate some software best practices and present these ideas to the group so the entire group can learn from my research.

**Definition of Done**

[x] Look up a software development best practice and perform research into it (see notes).

[x] Present this best practice to the group and show some code samples or discuss how this can be used to create cleaner code.

**Notes**

* There are several satirical posters of “anti-patterns” (bad ideas and things that you should not do) located at <http://www.flickr.com/photos/lakequincy/sets/72157629316877860/> .

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## 165 – Software Best Practices Poster and Presentations (Session 3)

**Content**

As a software developer, I would like to investigate some software best practices and present these ideas to the group so the entire group can learn from my research.

**Definition of Done**

[x] Look up a software development best practice and perform research into it (see notes).

[x] Present this best practice to the group and show some code samples or discuss how this can be used to create cleaner code.

**Notes**

* There are several satirical posters of “anti-patterns” (bad ideas and things that you should not do) located at <http://www.flickr.com/photos/lakequincy/sets/72157629316877860/> .

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## 166 – Software Best Practices Poster and Presentations (Session 4)

**Content**

As a software developer, I would like to investigate some software best practices and present these ideas to the group so the entire group can learn from my research.

**Definition of Done**

[ ] Discuss how we can represent 3D volumes in code.

[ ] Discuss how computer graphics use 3D volumes in various applications (ray tracing, point in polygon algorithms, etc.)

[ ] Discuss other software industry best practices concerning representing and using 3D polyhedrons.

**Notes**

* There are several satirical posters of “anti-patterns” (bad ideas and things that you should not do) located at <http://www.flickr.com/photos/lakequincy/sets/72157629316877860/> .

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## 167 – Perforce Licensing

**Content**

As a project manager, I would like to investigate options for obtaining more licenses for Perforce so that we are not limited by the number of users and/or workspaces.

**Definition of Done**

[X] Coordinate with Chris Lum to discuss the scope of this story.

[X] Investigate how much it would cost to obtain more Perforce licenses (are academic licenses available)?

[X] If we purchase licenses, work with Chris Lum to install them on our server.

[X] Write small document on how to install a license and upload to server at \\JCATI2013\DeveloperNotes\HowToDocuments

**Notes**

* As a ball park estimate, consider up to 40 workspaces with 30 users.
* Be sure to ask about our specific version of Perforce, we do not want to have to change servers or redo anything with the current setup, we simply want more licenses.

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## 168 – Seattle Area Game Developers Association Meetings

**Content**

As a game software developer, I would like to investigate meetings for game developers in the Seattle area so I may network with people in this industry.

**Definition of Done**

[X] Investigate the International Game Developers Association and see what their presence is like in the Seattle area.

[X] Review calendar of events <http://www.igdaseattle.org/wordpress/?page_id=2>. Pay particular attention to any events involving Unity.

[X] Determine if there are any other software meetings in the area which may be relevant to our work.

[X] Notify group of any interesting meetings in the near future.

**Notes**

* Optional: Attend meetings

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## 169 – Software Quality Assurance for Sprint 1401 (Position 1)

**Content**

As a software quality assurance engineer, I would like to write unit tests for production code generated during sprint 1401.

**Definition of Done**

[X] Write test cases for appropriate public entities generated during this sprint. These include

[X ]SNotifier

[X] UserSettings

[X] NotifierPackage

[X ] Work with Matt Davis (author of these classes) to identify how to test these classes.

[X ] Ensure that all unit tests pass

[X ] Ensure that unit testing spreadsheet is up to date.

[X ] Ensure that this works in Visual Studio 2012

[X] Fix unit test names so that it fits with the rest of the UW solution (1 test method per public method). See Chris Lum for more details

**Notes**

* This should be scoped to a medium or less.
* Find someone else to help with the workload and notify Chris Lum about who is helping so we can make another user story.
* Check out windows 7 vs 8 problems – User error: creating a unit test project for windows 8 app prevents windows 7 from opening it, as windows 8 SDK is included in the reference
* NotifyTest() in SNotifier.cs seems to fail when run in bulk, but passes when run individually.
* CompareConflictListToSelf(UserConflict, ObservedSetting) outputs a list in a mixed order in certain occurance.

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## 170 – Software Quality Assurance for Sprint 1402 (Position 1)

**Content**

As a software quality assurance engineer, I would like to write unit tests for production code generated during sprint 1402.

**Definition of Done**

[x] Write skeleton test cases for appropriate public entities generated during this sprint. These include

[x] Probability

[x] GaussianDistribution

[x] GaussianDistribution2D

[x] ComplexNumber

[x] MatrixMath

[x] Ensure that all unit tests pass or are inconclusive

[x] Ensure that unit testing spreadsheet is up to date.

[x] Ensure that all public API has comments and documentation.

**Notes**

* This should be scoped to a medium or less.
* You will need to continually check the unit\_test.xlsx spreadsheet as unit testing requirements may change during the sprint as new functionality is added.

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## 171 – Software Quality Assurance for Sprint 1402 (Position 2)

**Content**

As a software quality assurance engineer, I would like to write unit tests for production code generated during sprint 1402.

**Definition of Done**

[ ] Write skeleton test cases for appropriate public entities generated during this sprint. These include

[ ] AltitudeConflictParameters

[ ] AltitudeConflict

[ ] AltitudeConflictResults

[ ] PlanarConflictParameters

[ ] PlanarConflict

[ ] PlanarConflictResults

[ ] ConflictCalculatorParameters

[ ] ConflictCalculator

[ ] ConflictCalculatorResults

[ ] Ensure that all unit tests pass or are inconclusive

[ ] Ensure that unit testing spreadsheet is up to date.

[ ] Ensure that all public API has comments and documentation.

**Notes**

* This should be scoped to a medium or less.
* You will need to continually check the unit\_test.xlsx spreadsheet as unit testing requirements may change during the sprint as new functionality is added.

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## 172 – Investigate CodeLens in Visual Studio 2013

**Content**

As a software quality assurance engineer, I would like to investigate the capabilities of CodeLens (aka Code Information Indicators) within Visual Studio 2013 so I can become aware of its capabilities.

**Definition of Done**

[ ] Read blog about CodeLens at <http://blogs.msdn.com/b/zainnab/archive/2013/07/09/visual-studio-2013-preview-codelens-aka-code-information-indicators.aspx>

[ ] Assess if this makes the \\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx file obsolete or how the two can work together.

[ ] Determine if this is available in Visual Studio 2012 or is this only part of 2013.

[ ] Create a simple test project to investigate how this works.

[ ] Present findings to research group.

**Notes**

* Bao Le may have visual studio 2013 installed on his machine.

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## 173 – New Team Member Orientation (Sprint 1313)

**Content**

Copy of user story 066 – New Team Member Orientation

**Definition of Done**

[x] Schedule a training session with new team members. During this training session you should cover the following items:

[x] Perforce usage an policies

[x] Ensure they are on the team email list (send a dummy email to [jcati2013@uw.edu](mailto:jcati2013@uw.edu) and make sure they receive it)

[x] Ensure they have meeting request info (including WebEx links)

[x] Explain how WebEx works and our policies with WebEx

[x] Show them how UserFiles and other various depots function

[x] Explain sprint schedule and scrum procedures

[x] Show them community workspaces within the lab

[x] If necessary, help them obtain keys and access to the lab (see Chris Lum).

[x] Explain how the door lock works. Policy is if you are the last person on our side of the lab, be sure to shut and lock the door.

[x] Add new students to the group contact information document

**Notes**

* This user story applies to new members of
  + Robert McSwain
  + Matthew Rasmussen

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## 174 –Risk Assessment Website Re-Activation (Helper)

**Content**

Assist with 158 – Risk Assessment Website Re-Activation.

**Definition of Done**

Assist with 158 – Risk Assessment Website Re-Activation.

**Notes**

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## 175 – Unity Scripting or Module for Automatic Scenario Visualization (Position 2)

**Content**

Copy of 146 – Unity Scripting or Module for Automatic Scenario Visualization.

**Definition of Done**

Copy of 146 – Unity Scripting or Module for Automatic Scenario Visualization.

**Notes**

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## 176 – Unity Asset Generation (Helper)

**Content**

Assist with 162 – Unity Asset Generation

**Definition of Done**

Assist with 162 – Unity Asset Generation

[X] Coordinate with development champion of user stories 145 – Unity Game Engine Research to become familiar with Unity and its operation.

[X] Investigate the user of Blender to create assets within Unity.

[X] Model and design an ~~Insitu Integrator~~ vehicle which can be used in Unity.

[x] Visualize a scenario with an Insitu Integrator flying around. (optional)

**Notes**

* Investigate if it is easy to “skin” or “recolor” a model.
* Move the movie task to optional.

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## 177 – Literature Review (STANAG-4586)

**Content**

As a project member, I would like to perform research into STANAG-4586 so that I can be aware of the details of this protocol and how it may apply to our plugin.

**Definition of Done**

[X] Coordinate with Chris Lum to discuss STANAG-4586 and how it relates to ICOMC2.

[X] Search public documents (mainly internet) about STANAG-4586. See if you can find a document describing all STANAG-4586 messages and their structure.

[X] Literature review findings are documented in an electronic document and checked into Perforce along with other relevant documents.

[X] Present results to group

[X] Incorporate feedback from group presentation into literature reviews.

[X] Create a standalone document from these literature reviews which concisely and accurately summarizes STANAG-4586. Items to include

[X] What is STANAG-4586?

[X] Who uses STANAG-4586?

[X] How is this related to ICOMC2?

[X] Where can we find more information about STANAG-4586?

[X] What are the relevant messages that might be useful for our plugin?

**Notes**

* New tasks will be added to this user story as questions arise.

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## 178 – Sprint 1313 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1313 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint 1313 external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 179 – Unity Asset Generation (Helper)

**Content**

Assist with 162 – Unity Asset Generation

**Definition of Done**

Assist with 162 – Unity Asset Generation

**Notes**

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## 180 – Unity Asset Generation (Helper)

**Content**

As a Unity user, I would like to investigate tools to create assets which can be used by the Unity engine so that I can create models and assets which are specific to our scenario.

**Definition of Done**

[x] Coordinate with development champion of user stories 145 – Unity Game Engine Research to become familiar with Unity and its operation.

[x] Investigate the user of Blender to create assets within Unity.

[x] Model and design an Insitu Integrator vehicle which can be used in Unity.

[ ] (OPTIONAL) Visualize a scenario with an Insitu Integrator flying around.

**Notes**

* This goal of this user story is to create assets for Insitu aircraft (ScanEagle, Integrator, etc.) that can be used in the Unity visualization.

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## 181 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

Copy definition of done from user story 002 – Perforce Visual Client

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## 182 – Developer WebEx Account Setup (Group 16)

**Content**

As a software developer, I would like to obtain a WebEx account so I can hold code reviews with other developers.

**Definition of Done**

[ ] Sign up for a free WebEx account.

[ ] Verify that you can start schedule a normal meeting.

[ ] Verify that you can start a one-click meeting.

[ ] Conduct at least 1 code review via WebEx with another team member.

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## 183 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done**

Copy definition of done from user story 006 – Software Developer Background Training (Algorithm and Back End)

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## 184 – Unit Testing Background Training (copy)

**Content**

Copy of 033 – Unit Testing Background Training.

**Definition of Done**

Copy of 033 – Unit Testing Background Training.

**Notes**

* See Copy of 033 – Unit Testing Background Training.

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## 185 – Risk Assessment Website Testing (Helper)

**Content**

As a software developer, I would like to test the re-activated risk assessment website so I can be sure it functions as desired.

**Definition of Done**

[x ] Meet with Chris Lum to discuss the scope of the project.

[x ] Coordinate with development champion of user story 158 – Risk Assessment Website Re-Activation to figure out how to use website tool

[x ] Download [this](http://www.aa.washington.edu/research/afsl/publications/lum_risk_for_uavs_2010_2.pdf) paper and read it. Use the risk-assessment website to recreate the scenarios discussed in the paper and verify that the tool outputs similar results.

[x ] Familiarize with the operation of the Matlab code for risk assessment (see Chris Lum to obtain a copy of the code)

[x ] Obtain a copy of the website code (either get it from the server or obtain from Chris Lum)

[x ] Step 1: Verify that the Matlab code implements the algorithm described in the paper.

[x] Step 2: Verify that the website code implements the algorithms described in the paper.

[x] Determine where there is discrepancies and fix bugs if necessary.

**Notes**

-See user story 159 for more information.

**Notes**

* See 159 – Risk Assessment Website Testing

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**Notes**

* This involves re-activating a server and code which was run by the non-linear dynamics and controls lab (NDCL). You should not have to write any new code, it is mostly updating configuration files or settings and getting it up and running.
* Testing the website functionality is in another user story.

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## 186 – Sprint 1401 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1401 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[X] Prepare for sprint external demo

[X] Backup Perforce server on external hard drive

[X] Plan training tutorials and lectures

[X] Manage user story generation, assignment, and progress.

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## 187 – Collision Detection Engine (Part 1)

**Content**

As an algorithm designer, I would like develop part of the collision detection engine which can estimate the probability of a conflict if given appropriate information about two aircraft so that I can use it to begin building the collision detection engine.

**Definition of Done**

[X] Create algorithms to calculate overlap of two 1D Gaussians (for example altitude)

[X] Create algorithms to calculate overlap of two 2D Gaussians (for example planar positions)

[X] Create software implementation of these algorithms.

[X] Create automated unit tests for these algorithms.

[X] Design scenarios which illustrate two aircraft with Gaussian distributions and compute the probability of airspace instruction. Perform numerical simulation to show that the algorithm is accurate.

**Notes**

* This is the first part of the collision detection engine sub-system as outlined in the ‘System\_Components\_High\_Level\_Design.pptx’ document.

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## 188 – System Components High Level Design

**Content**

As an algorithm designer, I would like develop a high level design outlining the high level components of the collision awareness system so that I can ensure the entire team has a common vision of the system.

**Definition of Done**

[X] Create high level design outlining the key components/modules of the collision awareness engine.

[X] Include some requirements in the document.

[X] Document is checked into appropriate location in perforce.

**Notes**

* This should be customer facing (ie not technical)

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## 189 – Forward State Estimator Implementation (Orbit)

**Content**

As a software developer, I would like a software algorithm/entity to perform the forward state estimation of an aircraft engaged in an orbit so that I can use it within the plugin.

**Definition of Done**

[X] Review a prototype/proof-of-concept algorithm in Matlab (see user story 027)

[X] Implement select features outlined in the Feature Level Design (user story 003 – Forward State Estimator Feature Level Design). These should include

[X] Ability to estimate the future state of the aircraft which is engaged in an orbit.

[X] Address requirements 2.1.2

[X] Address requirements 2.2.1

[X] Implement code in in UW.sln

[X] Design scenarios showing an aircraft in free flight and the estimator calculating the future state of the aircraft.

[X] Create diagrams, pictures, or movies illustrating how this component works (these can be shown at a demo).

[X] Ensure that unit test for all public methods are written and pass (work with an SQA engineer to do this, you do not need to write these yourself)

[X] Document/comment all public interfaces.

**Notes**

* Requirements can be found in \\JCATI2013\TechnicalDataPackage\RequirementsAndSpecifications\Requirements.pptx

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## 190 – Forward State Estimator Implementation (Flight Path)

**Content**

As a software developer, I would like a software algorithm/entity to perform the forward state estimation of an aircraft engaged in following a flight path so that I can use it within the plugin.

**Definition of Done**

[x] Review a prototype/proof-of-concept algorithm in Matlab (see user story 027)

[x] Implement select features outlined in the Feature Level Design (user story 003 – Forward State Estimator Feature Level Design). These should include

[x] Ability to estimate the future state of the aircraft which is engaged in a flight path.

[x] Address requirements 2.1.3

[x] Address requirements 2.2.1

[x] Implement code in in UW.sln

[x] Design scenarios showing an aircraft in free flight and the estimator calculating the future state of the aircraft.

[x] Create diagrams, pictures, or movies illustrating how this component works (these can be shown at a demo).

[x] Ensure that unit test for all public methods are written and pass (work with an SQA engineer to do this, you do not need to write these yourself) (just skeleton)

[x] Document/comment all public interfaces.

**Notes**

* Requirements can be found in \\JCATI2013\TechnicalDataPackage\RequirementsAndSpecifications\Requirements.pptx

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## 191 – Upgrade UW.sln from .Net 3.5 to .Net 4.0

**Content**

As a software developer, I would like to upgrade the UW.sln to .Net 4.0 so that I can make use of new functionality within the framework.

**Definition of Done**

[ ] Change all projects within UW.sln to .Net 4.0 (currently .Net 3.5)

[ ] Ensure that all unit tests still pass.

[ ] Remove deprecated functionality of

[ ] ComplexNumber should be replaced by System.Numerics.Complex

**Notes**

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## 192 – Fix Method Names in ConflictEntityTest

**Content**

As a SQA engineer, I would like the test method names in ConflictEntityTest to match the rest of the solution so that everything is consistent.

**Definition of Done**

[ ] Rename unit test methods in ConflictEntityTest.cs (should match the rest of the solution, see Chris Lum for more info)

**Notes**

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## 193 – Perforce Visual Client (copy)

**Content**

As a software developer, I would like a Perforce client installed on my machine and would like to be comfortable with its use so I may sync files and make code changes.

**Definition of Done**

[x] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[x] Attended discussion/training with CL regarding Perforce operation and concepts

[x] Successfully create and sync relevant workspaces (both documentation and code)

[x] Successfully check something into the depot

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## 194 – Developer WebEx Account Setup (Group 16)

**Content**

As a software developer, I would like to obtain a WebEx account so I can hold code reviews with other developers.

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 code review via WebEx with another team member.

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## 195 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

As a software developer, I would like become familiar with common software patterns, data structures, and best practices so I can develop software in an industry proven fashion.

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[x] Create a blank solution

[x] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

Optional

[x] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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## 196 – Unit Testing Background Training (copy)

**Content**

As a software quality assurance engineer, I would like become familiar with common software unit testing patterns and best practices so I can develop rigorous and automated tests for the software components being developed for this project.

**Definition of Done**

[x] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[x] Attend research group meeting regarding Microsoft Visual Studio and C#

[x] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[x] Get UW.sln solution from depot and study it

[x] Within the UW.sln solution, read the creating\_unit\_tests.docx

[x] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[x] Create a dummy solution within your UserFiles directory.

[x] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[x] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[x] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[x] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21932127&rKey=95e45f78bb0302e8>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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## 197 – Simulation Test Plan Design and Documentation Part 2

**Content**

See 039 – Simulation Test Plan Design and Documentation

**Definition of Done**

[x] Review and modify \\JCATI2013\JCATI2013\TechnicalDataPackage\TestPlans\UAV test cases.docx

[x] Determine relevant aircraft models (dimensions, uncertainties, etc.)

[x] Move relevant information from the word doc to an excel document which lists relevant parameters for each scenario

[x] Add these scenarios to the ‘UWsolution in the UnitTests\UWUnitTestingUtilities\UWCAPlugin\Utilities\ConflictEntityConstants.cs’.

[x] Once you’ve added the code for the ConflictEntityConstatns, run the UWUnitTestintOutputObjects project to output the files to .kml files (these will be located in UWSDK\UWSDK\UnitTests\UWUnitTestingOutputObjects\bin\Debug\output). Load the ConflictEntityConstants.kml in google earth and verity that things look correct.

**Notes**

* See 039 – Simulation Test Plan Design and Documentation for more info

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## 198 – Conflict Calculator Feature Level Design

**Content**

As a software and algorithm developer, I would like a completed feature level design of the conflict calculator so I can identify key ideas and features of the algorithm.

**Definition of Done**

[X] Literature review of relevant prior art relevant to conflict calculator.

[X] Feature level design completed, presented to research group, reviewed, and checked into perforce.

[X] Identify key inputs necessary to perform the conflict calculator (rank them in order of importance)

[X] Document the desired inputs/outputs of the calculator

**Notes**

-Refer to slides form 13\_08\_08\_jcati\_collision\_warning.ppt

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## 199 – Risk Assessment Website Debugging

**Content**

As a SQA engineering, I would like to debug the risk assessment tool so I can determine where there are discrepancies.

**Definition of Done**

[x ] Familiarize with the operation of the Matlab code for risk assessment (see Chris Lum to obtain a copy of the code)

[x ] Obtain a copy of the website code (either get it from the server or obtain from Chris Lum)

[x ] Step 1: Verify that the Matlab code implements the algorithm described in the paper.

[x ] Step 2: Verify that the website code implements the algorithms described in the paper.

[x ] Determine where there is discrepancies and fix bugs if necessary.

**Notes**

-See user story 159 for more information.

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## 200 – UWKML Refactor

**Content**

As a software engineering, I would like a to refactor code within the UWKML class to make use of the new KML object writers instead of the deprecated UWFunctionsKML so that the code base is cleaner

**Definition of Done**

[X] Mark appropriate methods in UWFunctionsKML as deprecated

[X] Create new KML writer class which uses a writer patterns (similar to xmlwriter) instead of the existing functional approach.

[X] Refactor KMLAnimator to use KML writers classes

[X] Refactor UWPolygonLLAExtensions to use KML writers classes

[X] Refactor UWUnitTestingOutputObjects project to use KML writers classes

[X] Unit tests and check functionality.

**Notes**

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## 201 – CAPlugin vs. TCAS Comparison

**Content**

As a marketing representative, I would like to list the differences in features between the UW CAPlugin and TCAS so I can understand how the two products are similar and differ.

**Definition of Done**

[X] Review TCAS literature review.

[X] Obtain a “marketing product card” for TCAS or a product which supports TCAS

[X] Review the UW CAPlugin components in the \\JCATI2013\TechnicalDataPackage\FeatureLevelDesigns\System\_Components\_High\_Level\_Design.pptx document

[X] Meet with Chris Lum to discuss differences in systems.

[X] Generate a marketing style product card which compares and contrasts the two systems.

[X] Present information to group and apply feedback to marketing card.

[X] Investigate potential academic pricing or alternative means to acquire TCAS pseudo-code. Document where this is located.

[ ] Also investigate ADS-B and add to brochure (OPTIONAL)

**Notes**

* This story will likely be shown at the external demo so prepare accordingly.

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## 202 – Entity Manager Feature Level Design

**Content**

As an algorithm designer I would like a feature level design regarding the entity manager so I can begin implementation.

**Definition of Done**

[X] Create an FLD for the entity manager component.

**Notes**

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## 203 – Entity Manager Implementation

**Content**

As a software engineering, I would like a module within the CAPlugin which implements the entity manager functionality so that I can use it in back-end calculation.

**Definition of Done**

[X] Implement the entity manager component.

[X] Create tests and scenarios showing the system in operation.

**Notes**

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## 204 – Flight Path Class

**Content**

As a software engineering, I would like a module within the CAPlugin which represents a 3D flight path so that I can use it in various system components.

**Definition of Done**

[X] Discuss with Chris Lum about this class design.

[X] Create a class within the UW solution which represents a 3D flight path in XYZ coordinates (east-north-up coordinates).

[X] Create unit tests for all public API of this class.

**Optional:**

[ ] Use UWKML functions to create google earth visualization of some sample paths.

**Notes**

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## 205 – Sprint 1402 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1402 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[X] Prepare for sprint external demo

[X] Backup Perforce server on external hard drive

[X] Plan training tutorials and lectures

[X] Manage user story generation, assignment, and progress.

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## 206 – Software Quality Assurance for Sprint 1402 (Position 3)

**Content**

As a software quality assurance engineer, I would like to write unit tests for production code generated during sprint 1402.

**Definition of Done**

[x] Write test cases for appropriate public entities generated during this sprint. These include

[x] UWEllipse

[x] LLAPoint

[x] ListLLAPointExtensions

[x] UWEllipseLLA

[x] UWNEDVector

[x] ListPointExtensions

[x] PointExtensions2

[x] UWPolygonLLA

[x] UWPolygonLLAExtensions

[x] UWPolygon

~~[ ] Ensure that all unit tests pass~~

[x] Ensure that unit testing spreadsheet is up to date.

[x] Ensure that all public API has comments and documentation.

**Notes**

* This only involves creating “skeleton” unit test. You do not need to write the entire test, just ensure that it has a “skeleton” test and is updated in the spreadsheet.
* This should be scoped to a medium or less.
* You will need to continually check the unit\_test.xlsx spreadsheet as unit testing requirements may change during the sprint as new functionality is added.

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## 207 – Software Quality Assurance for Sprint 1402 (Position 4)

**Content**

As a software quality assurance engineer, I would like to write unit tests for production code generated during sprint 1402.

**Definition of Done**

[X ] Write test cases for appropriate public entities generated during this sprint. These include

[X ] CoordinateFrames

[ X] GaussianDistribution2DExtensions

[ X] UWMatrixExtensions

[ X] ColorUtilities

[ X] ConflictCalculatorVisualizer

[ X] ConflictCalculatorMapObjects

[ X] Ensure that all unit tests pass

[ x] Ensure that unit testing spreadsheet is up to date.

[ X] Ensure that all public API has comments and documentation.

**Notes**

* This should be scoped to a medium or less.
* You will need to continually check the unit\_test.xlsx spreadsheet as unit testing requirements may change during the sprint as new functionality is added.

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## 208 – Software Quality Assurance for Sprint 1402 (Position 5)

**Content**

As a software quality assurance engineer, I would like to write unit tests for production code generated during sprint 1402.

**Definition of Done**

[X] Write test cases for appropriate public entities generated during this sprint. These include

[X] All classes within the UWKML\Writers solution folder.

[X] Ensure that all unit tests pass

[X] Ensure that unit testing spreadsheet is up to date.

[X] Ensure that all public API has comments and documentation.

**Notes**

* This should be scoped to a medium or less.
* You will need to continually check the unit\_test.xlsx spreadsheet as unit testing requirements may change during the sprint as new functionality is added.

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## 209 – Software Quality Assurance Lead for Sprint 1402

**Content**

As a software quality assurance engineer, I would like to lead the SQA efforts during sprint 1402 so that we can make progress towards testing our API.

**Definition of Done**

[X] Ensure that all public API of the UW solution has a unit test (or placeholder). This means that all unit tests will show up in the test explorer of visual studio. Ensure that these are documented in the unit test spreadsheet.

[X] Monitor progress of testing in various SQA user stories in play during this sprint.

[X] Triage backlog of missing unit tests and assign unit test creation as appropriate.

[X] Periodically review the unit\_tests.xlsx file to ensure that SQA engineers are making progress towards writing tests.

[X] Ensure that we write at least 50 unit tests during sprint 1402

[X] Ensure that we have no failing unit tests (skipped tests are acceptable until we have all tests documented) or we are documenting and recording the failing tests.

[X] Compile statistics of the unit tests written and modified during the sprint (we would like to see which developers are creating tests and who is lagging behind).

**Notes**

* You will need to continually check the unit\_test.xlsx spreadsheet as unit testing requirements may change during the sprint as new functionality is added.

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## 210 – Windows Presentation Foundation Controls Research for CAPlugin

**Content**

As a UI designer and engineer, I would like to research what types of Windows Presentation Foundation (WPF) controls may be appropriate for our plugin UI so that I can identify which ones to become familiar with.

**Definition of Done**

[X] Review the entity manager feature level design (pay special attention to the mock-ups of the required UI elements).

[X] Research various WPF controls to determine which ones might be suitable for these various components.

[X] Start a solution with multiple different WPF projects. Each project should illustrate the basic usage of one of the relevant controls.

[X] Review results with Chris Lum

**Notes**

* This is considered a basic research user story. You do not need to build a fully functioning application.

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## 211 – Research Inputs for Risk Assessment Tool

**Content**

As an algorithm designer and developer, I would like to investigate different input sources for the risk assessment tool so that I can obtain different types of reliable inputs to the tool.

**Definition of Done**

[ ] Read Blake Waggoner’s master thesis and several of Chris Lum’s papers regarding the risk assessment tool.

[ ] Identify some web resources which can be used to provide inputs to the system (such as transient flight traffic hours). Be sure to note if these tools have a financial charge associated with them.

[ ] Investigate other resources for finding inputs to the tool (for example census data).

[ ] Review results with Chris Lum

**Notes**

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## 212 – Google Earth KML Research

**Content**

As an algorithm designer, developer, and SQA engineer, I would like to investigate how to perform various tasks in Google Earth KML files so that I can use them to visualize the state of the system.

**Definition of Done**

[X] Familiarize yourself with the functionality within the UWKML project.

[X] Research how to create a 3D volume in google earth. Create a sample kml file which shows a cylinder floating in space

[X] Implement tools in the UW.sln solution to support these objects.

**Notes**

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## 213 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

[X] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[X] Attended discussion/training with CL regarding Perforce operation and concepts

[X] Successfully create and sync relevant workspaces (both documentation and code)

[X] Successfully check something into the depot

[x] Do all this on a Windows 7 machine (do some testing and if things work on a windows 8 machine this is ok)

**Note**

* Talk to Federico Alvarez about getting up to speed. Obviously talk to Henry.

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## 214 – Software Developer Background Training (Algorithm and Back End)

**Content**

As a software developer, I would like become familiar with common software patterns, data structures, and best practices so I can develop software in an industry proven fashion.

**Definition of Done**

[X] Research object oriented software development

[X] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?AT=pb&SP=MC&rID=21853202&rKey=5e5b57d7d513fbc6>)

[X] Create a blank solution

[X] Create a project of type class library (we now refer to this as the ‘class library project’)

[X] Build a simple class in C# within your ‘class library project’

[X] Create a project of type console application (we now refer to this as the ‘console application project’)

[X] Call code from your ‘class library project’ from your ‘console application project’.

[X] Get UW solution from depot and study it.

**Optional**

[ ] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

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## 215 – JCATI Quarterly Progress Report

**Content**

As a project manager, I would like a quarterly progress report prepared so I can inform our sponsors about our progress.

**Definition of Done**

[X] Coordinate with Chris Lum to discuss progress for the quarter.

[X] Obtain information from Patrick Gibbs about what information is to be included in the report (do not contact Patrick directly, coordinate with Chris Lum to obtain this information.

[X] Report due to JCATI on 02/14.

**Notes**

* See email from Patrick on 01/22/14 for outline of progress report

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## 216 – JCATI Symposium Research Poster 1

**Content**

As a project participant, I would like to create a poster about our work so that I can present our research at the annual JCATI Symposium in Pullman, WA.

**Definition of Done**

[x] Coordinate with Chris Lum to discuss content for this poster.

[x] Coordinate with Al Creigh to get the template of the poster.

[x] Come to a consensus on poster dimensions

[x] Data mine existing documents to obtain graphics, equations, verbiage, etc.

[x] In the UW.sln

[\\UWSDK\UWCAPlugin\ConflictCalculator\Entities\PlanarConflict\Notes\PlanrConflict.nb](file:///\\UWSDK\UWCAPlugin\ConflictCalculator\Entities\PlanarConflict\Notes\PlanrConflict.nb)

[x] Bao Le’s master thesis (UserFiles\lebao000\masters\_thesis )

-powerpoint

-pdf of the thesis

[x] Draft poster presented to group. Obtain and incorporate group feedback.

[x] Final poster printed and ready to go by April 14

[x] Talking points rehearsed and ready to present poster at symposium on April 21 (delegate this to the persons that will be presenting the poster).

**Notes**

* Obtain draft outline from Chris Lum (Kevin has already done some of the background work with this poster)
* This story contains more of the technical presentation (FSE, group conflict calculators, separation notifiers, etc.)
* See email from Patrick on 01/22/14 for details about the JCATI Symposium
* JCATI Symposium is on April 21 at WSU in Pullman, WA. This work will be presented at a poster session there.
* Poster dimension should be 36” high by 48” wide (you can leave some room for margins)

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## 217 – JCATI Symposium Research Poster 2

**Content**

As a project participant, I would like to create a poster about our work so that I can present our research at the annual JCATI Symposium in Pullman, WA.

**Definition of Done**

[X] Coordinate with Chris Lum to discuss content for this poster.

[X] Draft poster presented to group. Obtain and incorporate group feedback.

[X] Data mine existing documents to obtain graphics, equations, verbiage, etc.

[x] In the UW.sln

[\\UWSDK\UWCAPlugin\ConflictCalculator\Entities\PlanarConflict\Notes\PlanrConflict.nb](file:///\\UWSDK\UWCAPlugin\ConflictCalculator\Entities\PlanarConflict\Notes\PlanrConflict.nb)

[x] Bao Le’s master thesis (UserFiles\lebao000\masters\_thesis )

-powerpoint

-pdf of the thesis

[X] Final poster printed and ready to go by April 14

[X] Talking points rehearsed and ready to present poster at symposium on April 21.

**Notes**

* See email from Patrick on 01/22/14 for details about the JCATI Symposium
* JCATI Symposium is on April 21 at WSU in Pullman, WA. This work will be presented at a poster session there.
* Poster dimension should be 36” high by 48” wide (you can leave some room for margins)

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## 218 – Unit Testing for Current Sprint

**Content**

As a SQA engineer, I would like to write functioning unit tests for tests that have been assigned to me during the current sprint.

**Definition of Done**

[ ] Write functioning unit tests for tests assigned to me during the current sprint

[ ] Ensure that all of these unit tests pass

[ ] Ensure that unit\_tests.xlsx spreadsheet is updated.

[ ] Code review all unit tests with Chris Lum and check in changes to Perforce.

[ ] Inform SQA overseer of unit tests status.

**Notes**

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## 219 – Unit Testing for Sprint 1403

**Content**

As a SQA engineer, I would like to write functioning unit tests for tests that have been assigned to me during sprint 1403.

**Definition of Done**

[x] Write functioning unit tests for tests assigned to me during sprint 1403 (maximum of 20 tests)

[x] Ensure that all of these unit tests pass

[x] Ensure that unit\_tests.xlsx spreadsheet is updated.

[x] Code review all unit tests with Chris Lum and check in changes to Perforce.

[x] Inform Noel Kimber of unit tests status.

**Notes**

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## 220 – Unit Testing for Current Sprint

See user story ‘218 – Unit Testing for Current Sprint

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## 221 – Unit Testing for Sprint 1403

**Content**

As a SQA engineer, I would like to write functioning unit tests for tests that have been assigned to me during sprint 1403.

**Definition of Done**

[ ] Write functioning unit tests for tests assigned to me during sprint 1403

[ ] Ensure that all of these unit tests pass

[ ] Ensure that unit\_tests.xlsx spreadsheet is updated.

[ ] Code review all unit tests with Chris Lum and check in changes to Perforce.

[ ] Inform Noel Kimber of unit tests status.

**Notes**

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## 222 – Unit Testing for Current Sprint

See user story 218 – Unit Testing for Current Sprint

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## 223 – Unit Testing for Current Sprint

See user story 218 – Unit Testing for Current Sprint

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## 224 – Unit Testing for Current Sprint

See user story 218 – Unit Testing for Current Sprint

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## 225 – Unit Testing for Sprint 1403

**Content**

As a SQA engineer, I would like to write functioning unit tests for tests that have been assigned to me during sprint 1403.

**Definition of Done**

[X] Write functioning unit tests for tests assigned to me during sprint 1403

[X] Ensure that all of these unit tests pass

[X] Ensure that unit\_tests.xlsx spreadsheet is updated.

[X] Code review all unit tests with Chris Lum and check in changes to Perforce.

[X] Inform Noel Kimber of unit tests status.

**Notes**

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## 226 – Unit Testing for Sprint 1403

**Content**

As a SQA engineer, I would like to write functioning unit tests for tests that have been assigned to me during sprint 1403.

**Definition of Done**

[x] Write functioning unit tests for tests assigned to me during sprint 1403

[x] Ensure that all of these unit tests pass

[x] Ensure that unit\_tests.xlsx spreadsheet is updated.

[x] Code review all unit tests with Chris Lum and check in changes to Perforce.

[x] Inform Noel Kimber of unit tests status.

**Notes**

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## 227 – Unit Testing for Sprint 1403

**Content**

As a SQA engineer, I would like to write functioning unit tests for tests that have been assigned to me during sprint 1403.

**Definition of Done**

[X] Write functioning unit tests for tests assigned to me during sprint 1403

[X] Ensure that all of these unit tests pass

[x] Ensure that unit\_tests.xlsx spreadsheet is updated.

[x] Code review all unit tests with Chris Lum and check in changes to Perforce.

[x] Inform Noel Kimber of unit tests status.

**Notes**

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## 228 – Unit Testing for Current Sprint

See user story 218 – Unit Testing for Current Sprint

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## 229 – Unit Testing for Current Sprint

See user story 218 – Unit Testing for Current Sprint

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## 230 – Unit Testing for Current Sprint

See user story 218 – Unit Testing for Current Sprint

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## 231 – Unit Testing for Current Sprint

See user story 218 – Unit Testing for Current Sprint

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## 232 – Test Case for Multiple Entities

**Content**

As a SQA engineer, I would like to generate several tests cases which demonstrate the functionality of the collision awareness plugin so that I can exercises various aspects of the system.

**Definition of Done**

[X] Review the existing objects which are created in the UWUnitTestingOutputObjects (view these in Google earth)

[X] Design a scenario with

[X] 1 or more vehicles are following a flight path

[X] 1 or more vehicles are engaged in free flight

[X] 1 or more cursor on targets are used to represent no-fly zones

[X] Design a scenario where

[X] 2 or more entities come close to each other

[X] 2 or more entities collide with each other

[X] Create these objects in the UWUnitTestingUtilities project (see Chris Lum)

[X] Document these tests cases in a document.

[X] Implement these scenarios in the simulator project (InitializeScenario.cs)

**Notes**

* This will be used for the live demo at Insitu on March 7 so plan accordingly
* Simulator is located in \\JCATI2013\Research\1403\_Simulation\FSESimulation

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## 233 – Sprint 1403 Simulation Project

**Content**

As an algorithm designer, I would like to generate a simulation of a complicated scenario so that I can use it to stress various aspects of the system and generate a visually impressive demonstration.

**Definition of Done**

[X] Briefly read user story 232 – Test Case for Multiple Entities to obtain an idea of the type of scenario we will be using for the demonstration.

[X] Generate an external project which uses the CAPlugin dlls to generate a simulation for the scenario.

[X] Create a movie of the scenario.

**Notes**

* This will be used for the live demo at Insitu on March 7 so plan accordingly
* Simulator is located in \\JCATI2013\Research\1403\_Simulation\FSESimulation

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## 234 – Forward State Estimator Free Flight Simulation

**Content**

As an algorithm designer, I would like to simulate the forward state estimator free flight module in an illustrative example so that I can visualize its behavior and generate a visually impressive demonstration.

**Definition of Done**

[X] Briefly read user story 232 – Test Case for Multiple Entities to obtain an idea of the type of scenario we will be using for the demonstration.

[X] Obtain the relevant inputs at time 0. Use these inputs to propagate the estimate of the state forward in time for an appropriate amount of time.

[X] Coordinate with Chris Lum to incorporate this into 233 – Sprint 1403 Simulation Project.

**Notes**

* This will be used for the live demo at Insitu on March 7 so plan accordingly
* Simulator is located in \\JCATI2013\Research\1403\_Simulation\FSESimulation

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## 235 – Forward State Estimator Flight Path Simulation

**Content**

As an algorithm designer, I would like to simulate the forward state estimator flight path module in an illustrative example so that I can visualize its behavior and generate a visually impressive demonstration.

**Definition of Done**

[x] Briefly read user story 232 – Test Case for Multiple Entities to obtain an idea of the type of scenario we will be using for the demonstration.

[x] Obtain the relevant inputs at time 0. Use these inputs to propagate the estimate of the state forward in time for an appropriate amount of time.

[x] Coordinate with Chris Lum to incorporate this into 233 – Sprint 1403 Simulation Project.

**Notes**

* This will be used for the live demo at Insitu on March 7 so plan accordingly
* Simulator is located in \\JCATI2013\Research\1403\_Simulation\FSESimulation

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## 236 – FlightPathLLA Creation

**Content**

As a software engineer, I would like a class which represents a flight path in terms of lat, lon, alt so that I can use it to represent flight paths in LLA space.

**Definition of Done**

[X] Create a class FlightPathLLA within the UWCAPlugin\Utilities folder which represents a flight path in terms of lat, lon, and alt.

[X] This class should use the FlightPath class as the underlying object to store coordinates.

[X] This class follows the same pattern as how UWEllipse and UWEllipseLLA functions.

[X] Unit tests skeletons are written for this and assigned to an SQA asset.

**Notes**

* UWEllipse is located in UWMath\Geometry\UWEllipse
* UWEllipseLLA is located in UWMapping\Geometry\UWEllipseLLA

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## 237 – FlightPathLLA Visualizer

**Content**

As a software engineer, I would like a class which can visualize a FlightPathLLA object in Google earth so so that I can use it in other components such as demonstrations and movies.

**Definition of Done**

[X] Create a class FlightPathLLAVisualizer within the UWCAPlugin\Visualization\KML\Utilities folder which can create a kml file based on the FlightPathLLA.

[X] This class follows the same pattern as how ConflictEntityVisualizer functions.

[X] Unit tests skeletons are written for this and assigned to an SQA asset.

**Notes**

* ConflictEntityVisualizer is located in UWCAPlugin\Visualizatoin\KML\Utilities\ConflictEntity

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## 238 – Sprint 1403 Unity Visualizer (Position 1)

**Content**

As an algorithm designer, I would like to visualize a complicated scenario in Unity so that I can create a visually impressive movie.

**Definition of Done**

[X] Briefly read user story 232 – Test Case for Multiple Entities to obtain an idea of the type of scenario we will be using for the demonstration.

[X] Review 146 – Unity Scripting or Module for Automatic Scenario Visualization.

[X] Discuss with Chris Lum what inputs and outputs are required for the unity scripting module.

[X] Add ability to visualize 1 aircraft with its associated airspace ellipsoid or cylinder which is created via the sprint 1403 demonstration simulation.

[X] Add ability to visualize an arbitrary number of aircraft with its associated airspace ellipsoid or cylinder which is created via the sprint 1403 demonstration simulation.

[X] Coordinate with the development champion of 239 – Sprint 1403 Unity Visualizer (Position 2) to combine efforts on this story.

**Notes**

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## 239 – Sprint 1403 Unity Visualizer (Position 2)

**Content**

As an algorithm designer, I would like to visualize a complicated scenario in Unity so that I can create a visually impressive movie.

**Definition of Done**

[x] Briefly read user story 232 – Test Case for Multiple Entities to obtain an idea of the type of scenario we will be using for the demonstration.

[x] Review 146 – Unity Scripting or Module for Automatic Scenario Visualization.

[x] Discuss with Chris Lum what inputs and outputs are required for the unity scripting module.

[x] Add ability to visualize 1 aircraft with its associated airspace ellipsoid or cylinder which is created via the sprint 1403 demonstration simulation.

[x] Add ability to visualize an arbitrary number of aircraft with its associated airspace ellipsoid or cylinder which is created via the sprint 1403 demonstration simulation.

[x] Coordinate with the development champion of 238 – Sprint 1403 Unity Visualizer (Position 1) to combine efforts on this story.

**Notes**

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## 240 – Insitu Trip Logistics

**Content**

As a project manager, I would like to manage logistics for the March 7 visit to Insitu so that I can ensure all paperwork and logistics is accounted for.

**Definition of Done**

[X] Coordinate with Chris Lum regarding documentation for the trip.

[X] Ensure that a list of travelers and citizenship is send to Insitu.

[X] Send a draft agenda to Insitu and coordinate with them to ensure that they are able to meet our requests (Chris Lum will send emails to Insitu)

[X] Create a packing list for the trip. This should include

[X] Proof of citizenship

[X] Dress clothes for demo

[X] Multiple laptops for demonstration

[X] Projector

[X] CAPlugin product data cards

[ ] Bao’s scenario handouts

[X] Ensure that we have a briefing about the trip before leaving.

**Notes**

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## 241 – Gaussian Random Number Generator

**Content**

As an SQA engineer, I would like a class that can create a random number or vector which is sampled from a Gaussian distribution so that I can use it to run Monte Carlo simulations and to numerically test several classes.

**Definition of Done**

[X ] Review the definition of a 1D Gaussian/normal distribution.

[X ] Research if this functionality exists within the .Net 3.5 framework.

[X] If this functionality does not exist, create a random number generator which generates a random number sampled from a Gaussian distribution.

[X] Create unit tests for this class. Ensure that all unit tests pass.

[X] Add ability to sample from a 2D Gaussian distribution with a specified mean and covariance matrix.

[X] Add tests cases for 2D Gaussian distributions

[X] Integrate this into the UW solution

**Notes**

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## 242 – ADS-B Literature Review and Assessment

**Content**

As a project manager, I would like to perform a literature review of ADS-B so I can understand how ADS-B can be integrated into our system.

**Definition of Done**

[x] Perform a literature review of ADS-B.

[x] Present literature review to group.

[x] Review user story 201 – CAPlugin vs. TCAS Comparison and add ADS-B this to the product data card as appropriate.

[x] Print several nice, high quality copies of the user story 201 – CAPlugin vs. TCAS Comparison product data card to hand out at the 1403 external demo.

[x] Incorporate feedback, from Insitu, into current product data card.

**Notes**

* See Chris Lum for printing budget.

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## 243 – Sprint 1403 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1403 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[X] Prepare for sprint external demo

[X] Backup Perforce server on external hard drive

[X] Plan training tutorials and lectures

[X] Manage user story generation, assignment, and progress.

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## 244 – Sprint 1403 Simulation Project Helper 1

**Content**

As a software developer, I would like to assist with the sprint 1403 simulation project so that we can generate a visually impressive demonstration.

**Definition of Done**

[x] Briefly read user story 232 – Test Case for Multiple Entities to obtain an idea of the type of scenario we will be using for the demonstration.

[x] Briefly read user story 233 – Sprint 1403 Simulation Project to obtain an idea of the type of simulation we will be using for the demonstration.

[x] Coordinate with Chris Lum to assist with the simulation user story.

[x] Install google earth and test video capture with this

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## 245 – Sprint 1403 Simulation Project Helper 2

**Content**

As a software developer, I would like to assist with the sprint 1403 simulation project so that we can generate a visually impressive demonstration.

**Definition of Done**

[X] Briefly read user story 232 – Test Case for Multiple Entities to obtain an idea of the type of scenario we will be using for the demonstration.

[X] Briefly read user story 233 – Sprint 1403 Simulation Project to obtain an idea of the type of simulation we will be using for the demonstration.

[X] Coordinate with Chris Lum to assist with the simulation user story.

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## 246 – Sprint 1403 Unit Test Triage 1

**Content**

As a SQA engineer, I would like to assist with the sprint 1403 simulation unit test writing so that I can ensure that the appropriate stories are accepted project so that we can generate a visually impressive demonstration.

**Definition of Done**

[ ] Add skeleton unit test code for the following classes

[ ] ModeOfOperations

[ ] ForwardStateEstimatorResults

[ ] ForwardStateEstimator

[ ] Triage high priority unit tests that need to be written to ensure that the associated stories are accepted.

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## 247 – Sprint 1403 Unit Test Triage 2

**Content**

As a SQA engineer, I would like to assist with the sprint 1403 simulation unit test writing so that I can ensure that the appropriate stories are accepted project so that we can generate a visually impressive demonstration.

**Definition of Done**

[ ] Triage high priority unit tests that need to be written to ensure that the associated stories are accepted.

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## 248 – 3D Volumes C# Research

**Content**

As an algorithm designer, I would like to support 3 dimensional volumes so that I can use it for 3 dimensional airspace restrictions within the CAPlugin.

**Definition of Done**

[X] Research the creation of 3D volumes within the native C# framework (.Net 3.5 or earlier) and assess if this is supported and if so, how can we use it.

[X] Research how other software packages (for example video game or graphics packages) support 3D volume creation and interaction.

[X] Investigate the UWPolygon and assess if this can be extended to obtain our functionality.

[X] Build a small sample application showing how 3rd party (either .Net or true 3rd party packages) use 3D volumes.

[X] Build a simple upside down wedding cake restricted airspace entity as a proof of concept.

[X] Discuss findings with Chris Lum.

**Notes**

* We need these volumes to support hit detection (can we determine if a coordinate is within the volume or not).
* These volumes can be potentially non-convex but we can assume that the side walls are vertical (see user\_stories.pptx).
* The likely use case for these will be to create 3D restricted airspaces (see that “upside-down wedding cake” shape of a typical restricted airspace)
* This is a research user story in the sense that you will not be creating any new code within the UW solution but you can create code to test existing .Net packages.

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## 249 – Insitu Trip Logistics Helper

**Content**

As a project manager, I would like to manage logistics for the March 7 visit to Insitu so that I can ensure all paperwork and logistics is accounted for.

**Definition of Done**

[X] Research how we can obtain cars (Prius) from UW.

[X] Can this be charged to a budget number?

[X] How much does it cost?

[X] Are there restrictions for drivers (over a certain age, citizenship, etc.)?

[X] Research lodging options and arrange room shares (who is staying with who in each room)

[X] Organize carpools (email list at jcati2013@uw.edu)

[X] Organize relevant meals

[X] Coordinate with Chris Lum before booking any rooms (see notes)

[x] Obtain travel expense sheets and review them at the pre-departure briefing.

[X] Talk with Jenny Park about the trip and ask her for any details or things that we need to be aware of.

[x] Ensure that all receipts during the trip are saved.

[x] Fill out travel expenses and ensure that all travelers submit for reimbursement after trip.

**Notes**

* We will likely stay in Hood River, OR.
* Chris stayed at the vagabond lodge one time, it was pretty nice <http://www.vagabondlodge.com/> . Try to keep costs down on rooms.

## 250 – Sprint 1403 Unity Visualizer (Position 3)

**Content**

As an algorithm designer, I would like to visualize a complicated scenario in Unity so that I can create a visually impressive movie.

**Definition of Done**

[x] Briefly read user story 232 – Test Case for Multiple Entities to obtain an idea of the type of scenario we will be using for the demonstration.

[x] Review 146 – Unity Scripting or Module for Automatic Scenario Visualization.

[x] Discuss with Chris Lum what inputs and outputs are required for the unity scripting module.

[x] Add ability to visualize 1 aircraft with its associated airspace ellipsoid or cylinder which is created via the sprint 1403 demonstration simulation.

[x] Add ability to visualize an arbitrary number of aircraft with its associated airspace ellipsoid or cylinder which is created via the sprint 1403 demonstration simulation.

[x] Coordinate with the development champion of 238 – Sprint 1403 Unity Visualizer (Position 1) to combine efforts on this story.

**Notes**

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## 251 – Refactor Simulator

**Content**

As a software developer, I would like to refactor the simulator so that it is reusable and suitable for additional test cases.

**Definition of Done**

[ ] Document existing test cases (Taylors simple and the complex scenario)

[ ] Clean up the simulator solution so that it is more modular and able to quickly generate different scenarios.

[ ] Minimize dependencies and other unintuitive workflows

[ ] Document any unintuitive workflows (for example, how do we add new entities, do you use first define ConflictEntities or AgentBase objects)

[ ] Add another scenario to the simulator to test newly refactored simulator (see

[ ] Coordinate with Chris Lum to discuss architecture.

[ ] Coordinate with Chris Lum to discuss results.

**Notes**

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## 252 – Test Cases for 3D Volume Restricted Airspaces

**Content**

As a quality assurance engineer, I would like to develop several test cases for computing probabilistic conflicts with 3D volume restricted airspaces so that I can use it to benchmark and compare various algorithms involving interactions with 3D volume restricted airspaces.

**Definition of Done**

[x] Coordinate with Chris Lum to discuss 3D volume restricted airspace.

[x] Coordinate with development champion of user story ‘253 – 3D Volume Restricted Airspaces Implementation (Method 1)’.

[x] Create code to construct various volumes in UWUnitTestingUtilities.csproj/UWMath/Geometry/SimplyPolygon/UWPolygon3DConstants.cs for

[x] Cylinder 3D volume (same as a ConflictEntity)

[x] Convex extruded polygon

[x] Nonconvex extruded polygon

[x] [Complex polygon](http://en.wikipedia.org/wiki/Complex_polygon) (edges cross over itself)

[x] Other interesting volumes

[x] Run the UWUnitTestingOutputObjects.csproj project to visualize your volumes to make sure they look correct (this outputs to \\UWSDK\UWSDK\UnitTests\UWUnitTestingOutputObjects\bin\Debug\output\UWPolygon3DConstants.kml which you can view in Google Earth)

[x] Coordinate with Chris Lum to discuss results.

[x] Discuss your results with development champion of user story ‘289 – Airspace Conflict Calculator Test Case Generation’ as they may use your result in their code.

**Notes**

* This does not involve writing actual unit tests for methods, it simply involves creating the objects which can be used when writing unit tests later.

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## 253 – 3D Volume Restricted Airspaces Implementation (Method 1)

**Content**

As a software developer, I would like to develop a class to represent 3D restricted airspaces so that I can use it within the plugin in conjunction with other modules such as the conflict calculator.

**Definition of Done**

[x] Coordinate with Chris Lum to discuss 3D volume restricted airspace.

[x] Create a class to represent a 3D volume (polyhedron). This class should support

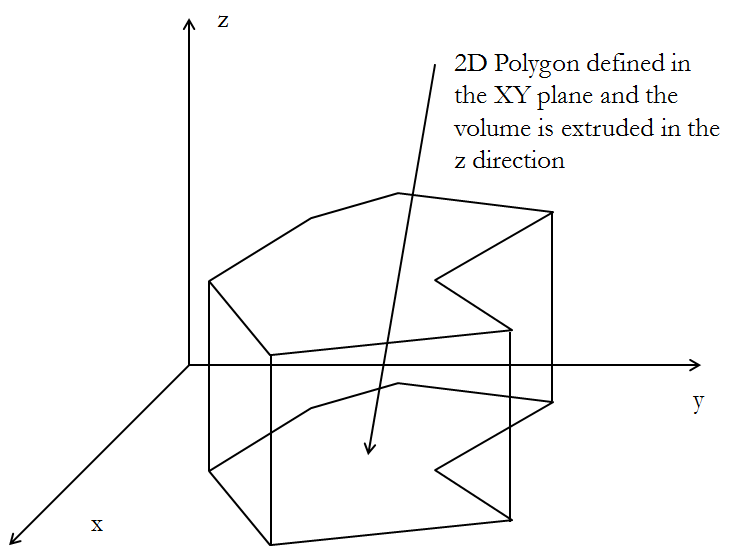
[x] Hit detection (user can specify a point and class can determine if this is inside the polygon)

[x] Determine if it is well formed (ie not [complex](http://en.wikipedia.org/wiki/Complex_polygon))

[x] Class should implement the IHittableCopyable interface

[x] Create a separate project outside of the UW.sln to illustrate how these can be used to compute the probability of ConflictEntity entering this polyhedron (see user story ‘255 – Integration of Position Probabilities Over An Arbitrary Volume’).

[x] Coordinate with Chris Lum to discuss results.



**Notes**

* These polygons are constrained to have vertical side walls.

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## 254 – 3D Volume Restricted Airspaces Implementation (Method 2)

**Content**

As a software developer, I would like to develop a class to represent 3D restricted airspaces so that I can use it within the plugin in conjunction with other modules such as the conflict calculator.

**Definition of Done**

[ ] Coordinate with Chris Lum to discuss 3D volume restricted airspace.

[ ] Create a class to represent a 3D volume (polyhedron). This class should support

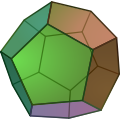
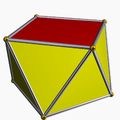
[ ] Hit detection (user can specify a point and class can determine if this is inside the polygon)

[ ] Determine if it is well formed (ie not [complex](http://en.wikipedia.org/wiki/Complex_polygon))

[ ] class should implement the IHittableCopyable interface

[ ] Create a separate project outside of the UW.sln to illustrate how these can be used to compute the probability of ConflictEntity entering this polyhedron (see user story ‘255 – Integration of Position Probabilities Over An Arbitrary Volume’).

[ ] Coordinate with Chris Lum to discuss results.

[](http://en.wikipedia.org/wiki/File:POV-Ray-Dodecahedron.svg)[](http://en.wikipedia.org/wiki/File:Small_stellated_dodecahedron.png)[](http://en.wikipedia.org/wiki/File:Square_antiprism.png)

**Notes**

* This differs from user story ‘253 – 3D Volume Restricted Airspaces Implementation (Method 1)’ because this airspace can have more complex side walls and shapes as shown above)

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## 255 – Integration of Position Probabilities Over An Arbitrary Volume

**Content**

As an algorithm developer, I would like to be able to integrate an entity’s position distribution over an arbitrary volume so that I can compute probabilistic intersections with arbitrary 3D polyhedrons (restricted airspaces).

**Definition of Done**

[X] Review user story ‘253 – 3D Volume Restricted Airspaces Implementation (Method 1)’

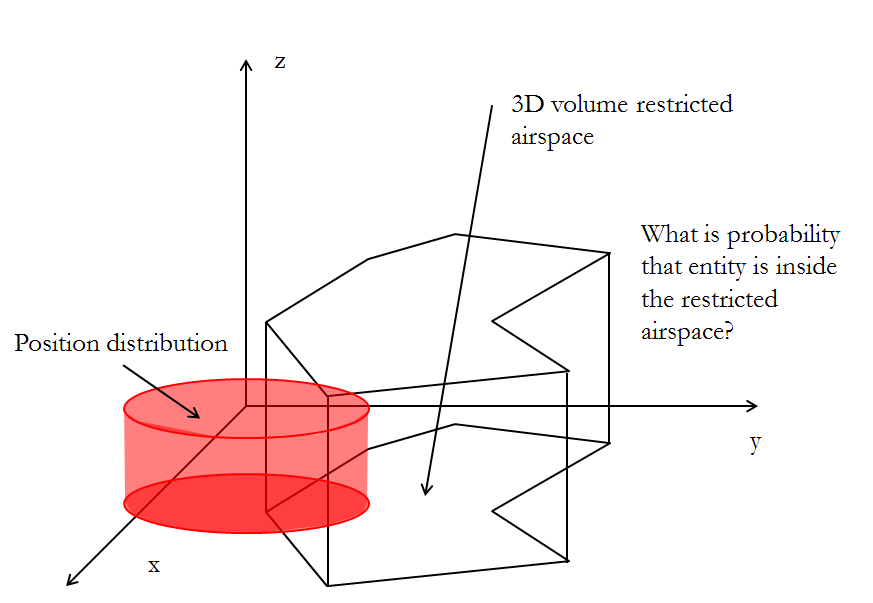
[X] Review user story ‘254 – 3D Volume Restricted Airspaces Implementation (Method 2)’

[X] Investigate methods to perform integration of position probabilities over an arbitrary polyhedron in space. This should yield the probability that the entity is inside the polyhedron.

[X] Implement integration method into UW solution

[X] Create appropriate unit test (coordinate with development champion of user story ‘252 – Test Cases for 3D Volume Restricted Airspaces’)

[X] Ensure that unit tests pass.



**Notes**

* This will be integrated with a module similar to the ConflictCalculator in order to compute an entity’s probability of intersecting an arbitrary restricted airspace.

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## 256 – Augment Forward State Estimator with Environmental Factors

**Content**

As a algorithm developer, I would like to augment the functionality of the forward state estimators to account for environmental factors such as wind so that I can create a more accurate prediction system.

**Definition of Done**

[ ] Investigate if ICOMC2 has support for maintain information about environmental factors such as wind.

[ ] Augment the forward state estimator systems to account for wind.

[ ] Design test cases and unit tests for the newly augmented systems.

[ ] Augment the forward state estimator flight path to take into account specified velocities at each waypoint (essentially each WP can have a velocity associated with it, and therefore this may affect the vehicle’s velocity along each leg)

**Notes**

* This story is the result of a comment made by Rolf Rysdyk at the 1403 external demo at Insitu
* This is not a supported feature of the plugin, it is simply a feature that would be nice to have. As such, this story is somewhat low priority.

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## 257 – Insitu Trip Wrap-Up

**Content**

As a project manager, I would like to wrap up details from the Insitu trip so that I can proceed with the project.

**Definition of Done**

[X] Collect receipts for all student expenses.

[X] All students have filled out reimbursement forms.

[X] Print out documentation showing alternative trip pricing (how much it would have cost to fly and drive, talk with Chris Lum and Justin Yantus)

[X] Obtain physical mailing addresses the following people (do not contact them directly)

[X] Keith Ketring

[X] Dracy Davidson

[X] Amy Arbeit

[X] Rolf Rysdyk

[X] Jeremy Tate

[X] Andrew Hayes

[X] Jim Miller

[X] Christy Grimm

[X] Rebecca Melesko

[X] Create a thank you card (see Chris Lum for the template) and address them to the previous individuals (do not mail them, give cards to Chris Lum)

[X] Add cost of printing/stamps to reimbursements on form.

**Notes**

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## 258 – Critical Code Path Identification

**Content**

As a software developer, I would like to identify the critical code paths in our application so I can direct testing resources appropriately.

**Definition of Done**

[X] Identify classes and methods that are used in the following components

[X] Forward State Estimator

[X] ConflictCalculator

[X] Create a document which lists critical code paths and elements.

-Saved under userfile\yongbong\US258

[ ] Ensure that unit tests for these critical code paths are created and pass.

-A number of methods need unittests

[ ] Delegate some of this work to other helpers.

**Notes**

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## 259 – Master’s Thesis 1

**Content**

As a student, I would like to write my Master’s thesis so I can graduate.

**Definition of Done**

[X] Refactor, document, and finalize code related to forward state estimator flight path.

[X] Ensure that all unit tests for this class are written and pass (you do not need to write all the tests and should get help from appropriate SQA resources)

[X] Write Master’s thesis

[X] Present thesis results at department wide meeting/presentation

**Notes**

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## 260 – 3D Volumes C# Research (Part 2)

**Content**

As an algorithm designer, I would like to support 3 dimensional volumes so that I can use it for 3 dimensional airspace restrictions within the CAPlugin.

**Definition of Done**

[ ] Research the creation of 3D volumes within the native C# framework (.Net 3.5 or earlier) and assess if this is supported and if so, how can we use it.

[ ] Research how other software packages (for example video game or graphics packages) support 3D volume creation and interaction.

[ ] Build a small sample application showing how 3rd party (either .Net or true 3rd party packages) use 3D volumes.

[ ] Discuss findings with Chris Lum.

[ ] Present results to group in user story ‘166 – Software Best Practices Poster and Presentations (Session 4)’.

**Notes**

* We need these volumes to support hit detection (can we determine if a coordinate is within the volume or not).
* These volumes can be potentially non-convex but we can assume that the side walls are vertical (see user\_stories.pptx).
* The likely use case for these will be to create 3D restricted airspaces (see that “upside-down wedding cake” shape of a typical restricted airspace)
* This is a research user story in the sense that you will not be creating any new code within the UW solution but you can create code to test existing .Net packages.

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## 261 – JCATI Symposium Trip Logistics

**Content**

As a project manager, I would like to manage logistics for the April 21 JCATI Symposium so that I can ensure all paperwork and logistics is accounted for.

**Definition of Done**

[x] Coordinate with Chris Lum regarding documentation for the trip.

[x] Obtain a list of students who will be attending the symposium

[x] Ensure that all attendees have purchased tickets (free for students at <http://jcati-2014.brownpapertickets.com/> ). Do this ASAP to get them before they run out.

[x] Ensure all attendees sign up for transportation (JCATI should be providing a bus)

[x] Ensure all attendees sign up for lodging (JCATI should have details of where we will stay)

[x] Create a packing list for the trip. This should include

[x] ID

[x] Dress clothes for symposium poster session

[x] Multiple laptops for demonstration

[x] Projector

[x] Posters, poster boards, easels for display (or see if JCATI will supply)

[x] CAPlugin product data cards

[x] Ensure that we have a briefing about the trip before leaving.

[x] Ensure that Madison is prepared for her panel speaking engagement.

**Notes**

* JCATI website is <http://jcati.org>
* Posters are being made by Taylor and Al, coordinate with them to make sure they are printed and packed up. Final layout should be done by 04/17.

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## 262 – WPF User Control for ConflictEntity

**Content**

As a UI designer, I would like a custom WPF user control which can be used to manipulate and display a ConflictEntity object so that I can use it in the plug-in UI.

**Definition of Done**

[X] Research the model-view-view-model (MVVM) pattern (or discuss with Chris Lum)

[X] Create a separate, external project (not within the UW solution) which instantiates and maintains a ConflictEntity object (this is the model in the MVVM) pattern

[X] Coordinate with Chris Lum to create a simple application with a view-model.

[X] Create a backing view-model of this view/control

[X] Create a WPF user control which displays/manipulates this ConflictEntity object (this is the view in the MVVM pattern)

**Notes**

* The purpose of this story is to obtain a modular, working user control which can be used to manipulate/display a ConflictEntity object. This user control will be integrated into the plugin later in a larger UI element.
* The product of this story will be integrated into the UW solution in user story 293 – WPF User Control for ConflictEntity (Integration into UW Solution).

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## 263 – Unity 3D Polygons and Hit Detection (position 1)

**Content**

As an algorithm designer, I would like to investigate 3D polygons and hit detection within Unity so that I can assess how this is done and possibly integrate this functionality into our systems.

**Definition of Done**

[x] Research how 3D polygons are represented in general computer graphics applications

[x] Research how hit detection is done in general computer graphics applications

[x] Research how 3D polygons are represented in Unity

[x] Research how hit detection is done within Unity

[x] Create an example 3D polygon within Unity

[x] Illustrate hit detection with a simple application within Unity

[x] Research if the functionality (polygons and hit detection) provided in Unity can be used by external applications (do we need to reference a Unity dll?)

**Notes**

* The main functionality that we will need in our plugin is a point-in-polygon test. In other words, if we are given an arbitrary polygon and a 3D coordinate, we need a system that will be able to determine if this point is inside the polygon or not.

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## 264 – Unity 3D Polygons and Hit Detection (position 2)

**Content**

Copy ‘263 – Unity 3D Polygons and Hit Detection (position 1)’ here.

**Definition of Done**

[x] Research how 3D polygons are represented in general computer graphics applications

[x] Research how hit detection is done in general computer graphics applications

[x] Research how 3D polygons are represented in Unity

[x] Research how hit detection is done within Unity

[x] Create an example 3D polygon within Unity

[x] Illustrate hit detection with a simple application within Unity

[x] Research if the functionality (polygons and hit detection) provided in Unity can be used by external applications (do we need to reference a Unity dll?)

**Notes**

Copy ‘263 – Unity 3D Polygons and Hit Detection (position 1)’ here.

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## 265 – Perforce Visual Client (copy)

**Content**

As a software developer, I would like a Perforce client installed on my machine and would like to be comfortable with its use so I may sync files and make code changes.

**Definition of Done**

[x] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[x] Attended discussion/training with CL or other team member regarding Perforce operation & concepts

[x] Successfully create and sync relevant workspaces (both documentation and code)

[x] Successfully check something into the depot

**Notes**

* This is a copy of user story ‘002 – Perforce Visual Client’

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## 266 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

As a software developer, I would like become familiar with common software patterns, data structures, and best practices so I can develop software in an industry proven fashion.

**Definition of Done**

[x] Research object oriented software development

[x] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?RCID=cf5f18e13d9eff3b6cf0208ea53c2775> )

[x] Create a blank solution

[x] Create a project of type class library (we now refer to this as the ‘class library project’)

[x] Build a simple class in C# within your ‘class library project’

[x] Create a project of type console application (we now refer to this as the ‘console application project’)

[x] Call code from your ‘class library project’ from your ‘console application project’.

[x] Get UW solution from depot and study it.

**Optional**

[ ] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

**Notes**

* This is a copy of user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 267 – Developer WebEx Account Setup (copy)

**Content**

As a software developer, I would like to obtain a WebEx account so I can hold code reviews with other developers.

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 code review via WebEx with another team member.

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## 268 – Unit Testing Background Training (copy)

**Content**

As a software quality assurance engineer, I would like become familiar with common software unit testing patterns and best practices so I can develop rigorous and automated tests for the software components being developed for this project.

**Definition of Done**

[x] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[x] Attend research group meeting regarding Microsoft Visual Studio and C#

[x] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[x] Get UW.sln solution from depot and study it

[x] Within the UW.sln solution, read the creating\_unit\_tests.docx

[x] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[x] Create a dummy solution within your UserFiles directory.

[x] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[x] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[x] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[x] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?RCID=432345c6b50ed558d4f79fe171b22954>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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## 269 – Perforce Visual Client (copy)

**Content**

As a software developer, I would like a Perforce client installed on my machine and would like to be comfortable with its use so I may sync files and make code changes.

**Definition of Done**

[ X] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[ X] Attended discussion/training with CL or other team member regarding Perforce operation & concepts

[X ] Successfully create and sync relevant workspaces (both documentation and code)

[ X] Successfully check something into the depot

**Notes**

* This is a copy of user story ‘002 – Perforce Visual Client’

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## 270 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

As a software developer, I would like become familiar with common software patterns, data structures, and best practices so I can develop software in an industry proven fashion.

**Definition of Done**

[X ] Research object oriented software development

[ X] Attend research group meeting regarding Microsoft Visual Studio and C# (or watch video located at <https://insituinc.webex.com/insituinc/ldr.php?RCID=cf5f18e13d9eff3b6cf0208ea53c2775> )

[ X] Create a blank solution

[X ] Create a project of type class library (we now refer to this as the ‘class library project’)

[ X] Build a simple class in C# within your ‘class library project’

[ X] Create a project of type console application (we now refer to this as the ‘console application project’)

[ X] Call code from your ‘class library project’ from your ‘console application project’.

[ X] Get UW solution from depot and study it.

**Optional**

[ ] download materials from CSE331 website and post them on Perforce server(only one person needs to do this)

[ ] Read through some of the materials for CSE331 (see Item above to access materials through perforce)

[ ] Attend research group meeting regarding event driven programming (research how events are fired and handled in C#). Look into the observer pattern.

**Notes**

* This is a copy of user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 271 – Developer WebEx Account Setup (copy)

**Content**

As a software developer, I would like to obtain a WebEx account so I can hold code reviews with other developers.

**Definition of Done**

[ x] Sign up for a free WebEx account.

[ x] Verify that you can start schedule a normal meeting.

[x ] Verify that you can start a one-click meeting.

[ x] Conduct at least 1 code review via WebEx with another team member.

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## 272 – Unit Testing Background Training (copy)

**Content**

As a software quality assurance engineer, I would like become familiar with common software unit testing patterns and best practices so I can develop rigorous and automated tests for the software components being developed for this project.

**Definition of Done**

[x] Research automated unit testing using Microsoft Visual Studio 2012 Professional (see notes)

[ x] Attend research group meeting regarding Microsoft Visual Studio and C#

[x ] Attend research group meeting regarding unit testing using Microsoft Visual Studio.

[x ] Get UW.sln solution from depot and study it

[ x] Within the UW.sln solution, read the creating\_unit\_tests.docx

[x ] Within the UW.sln solution, look at how unit tests are written for various sections of code.

[x ] Create a dummy solution within your UserFiles directory.

[x ] Within your dummy solution, create a simple class and generate some automated unit tests to test some public methods of your class.

[x ] Execute automated unit tests within your solution and verify that they pass appropriately (ensure you check that this tests for exceptions being thrown by the code under test)

[x ] Change code to break your tests and verify that the automated unit tests fail (to simulate breaking the build).

[ x] Check in your dummy solution into Perforce

**Notes**

* Optional: [ ] Audit or sit in on CSE331 lectures
* Recording of Chris Lum’s training lecture on unit testing is located at <https://insituinc.webex.com/insituinc/ldr.php?RCID=432345c6b50ed558d4f79fe171b22954>
* Helpful link to a tutorial and walkthrough of unit testing (which fulfills most of the requirements of this user story) is located at <http://msdn.microsoft.com/en-us/library/ms182532(v=vs.110).aspx>

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## 273 – Sprint 1404 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1404 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[X] ~~Prepare for sprint external demo~~

[X] Backup Perforce server on external hard drive

[X] Plan training tutorials and lectures

[X] Manage user story generation, assignment, and progress.

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## 274 – Sprint 1405 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1404 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 275 – Australia: Research LaTeX Environment

**Content**

As a project manager for the Australia Study Abroad program, I would like to research how the students can obtain and use LaTeX so that they can use it to create papers during the class.

**Definition of Done**

[/] Obtain a windows 7 laptop to perform tests on (see Chris Lum to obtain a UWAA test laptop)

[x] Create a document describing the various workflows (see below) and your recommendation on the best method to use.

Workflow 1

[x] Research what resources the UWAA computers have for creating documents using LaTeX.

[x] Investigate MiKTeX on UWAA computers

[x] Investigate TeXnicCenter on UWAA computers

[x] Verify that these are accessible via remote desktop connections (aaultra.aa.washington.edu or aahydra.aa.washington.edu)

[x] Perform a proof-of-concept install of this workflow on the test laptop.

[x] Produce a demo LaTeX document (see notes for document requirements) using this workflow using remote assets only (via remote login to UWAA)

[x] Produce a demo LaTeX document (see notes for document requirements) using this workflow using standalone (on laptop only to simulate no connections in Australia to UWAA)

Workflow 2

[x] Research installing LaTeX and WinEdt on test laptop

[x] Produce a demo LaTeX document (see notes for document requirements) using this workflow using standalone (on laptop only to simulate no connections in Australia to UWAA)

Workflow 3

[x] Investigate any other options you deem relevant for producing documents via LaTeX.

[x] Produce a demo LaTeX document (see notes for document requirements) using this workflow using standalone (on laptop only to simulate no connections in Australia to UWAA)

**Notes**

* The demo LaTeX document should include (see Chris Lum for a sample document/code)
  + Various sections (Intro, nomenclature, results, conclusion, etc.)
  + Equations
  + Figures
  + Tables
  + Cross references
  + Bibliography
* Upon completion of this user story, you should pretend you are a study abroad student and attempt to follow your recommended workflow to ensure that it is reasonable and understandable.
* Note: Due date for this user story is 05/19/14

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## 276 – Australia: Explore Forest Fire-Line Management Systems

**Content**

As a project manager for the Australia Study Abroad program, I would like to explore and research various techniques and issues related to forest fire-line estimation so that I can create a class curriculum around this topic.

**Definition of Done**

[x] Perform general research into forest fires including

[x] How much economic damage do they cause

[x] What ecological damage do they cause (what about benefits)?

[x] What are other relevant statistics of forest fires?

[x] Perform a literature review/research on previous methods of estimating the fire-line and overall size of a forest fire. We are particularly interested in methods which use UAS.

[x] Download, read, and summarize various research papers.

[x] Discuss results with Chris Lum

**Notes**

* We are particularly interested in discussions of how UAS can be applied to this scenario.
* A good example paper is “Unmanned Aerial Vehicle (UAV) Real-time Video Registration for Forest Fire Monitoring” by Gouqing Zhou, Cahokui Li, and Penggen Cheng.
* Some images of a forest fire-line are shown below

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| http://ww3.hdnux.com/photos/15/10/25/3442034/5/628x471.jpg | http://sofia.usgs.gov/publications/posters/firefreeze/images/fire-forest.jpg |

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## 277 – Australia: Prototype Forest Fire-Line Identification System

**Content**

As a project manager for the Australia Study Abroad program, I would like to develop a prototype algorithm to automatically process an aerial image of a forest fire and identify the fire-line so that I can use it in other components of the system.

**Definition of Done**

[ x] Research existing literature and models basic image processing/computer vision.

[ x] Obtain several aerial images of forest fires (these will serve as test cases). Try to obtain a series of images which show the fire evolving over time (OPTIONAL). Within each of these images

[ x] Identify the fire-line by hand (store this information as a separate object in Matlab)

[ x] Classify all other pixels as a specific type of environment (ie fire, burnt, brush, water, etc.)

[ x] Show all images to Chris Lum before proceeding.

[ x] Research the Matlab Image Processing Toolbox (<http://www.mathworks.com/products/image/> )

[ x] Check if your machine has the toolbox already (‘ver’ command)

[ x] Check with Chris Lum to obtain toolbox

[x ] Check if UWAA has this toolbox on the Matlab available via remote desktop.

[ x] Identify useful functions/methods to use for our application

[ x] Go through several tutorials and examples scripts of the toolbox

[ x] Create several demo scripts to illustrate its functionality

[ x] Create a prototype algorithm in Matlab to automatically identify the fire-line within a given image.

[ x] Generate several test cases for various scenarios to illustrate how your algorithm works.

[ x] Discuss results with Chris Lum

**Notes**

* Remember that this will need to be recreated by somewhat unexperienced teams (freshmen to seniors who may not have software/engineering backgrounds).
* This algorithm should be a simple proof-of-concept which captures some of the basic behavior. It does not need to be a high fidelity model.

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| http://sofia.usgs.gov/publications/posters/firefreeze/images/fire-forest.jpg  Automatically identify the fire-line | http://sofia.usgs.gov/publications/posters/firefreeze/images/fire-forest.jpg |

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## 278 – Australia: Prototype Forest Fire Propagation Model

**Content**

As a project manager for the Australia Study Abroad program, I would like to develop a prototype algorithm for how a forest fire propagates so that I can run simulations of forest fire evolution.

**Definition of Done**

[ ] Research existing literature and models of forest fire propagation.

[ ] Develop a prototype algorithm/model of a forest fire in Matlab. This model should include

[ ] Environmental factors (types of landscape around the fire, rivers, brush, rocks, etc.)

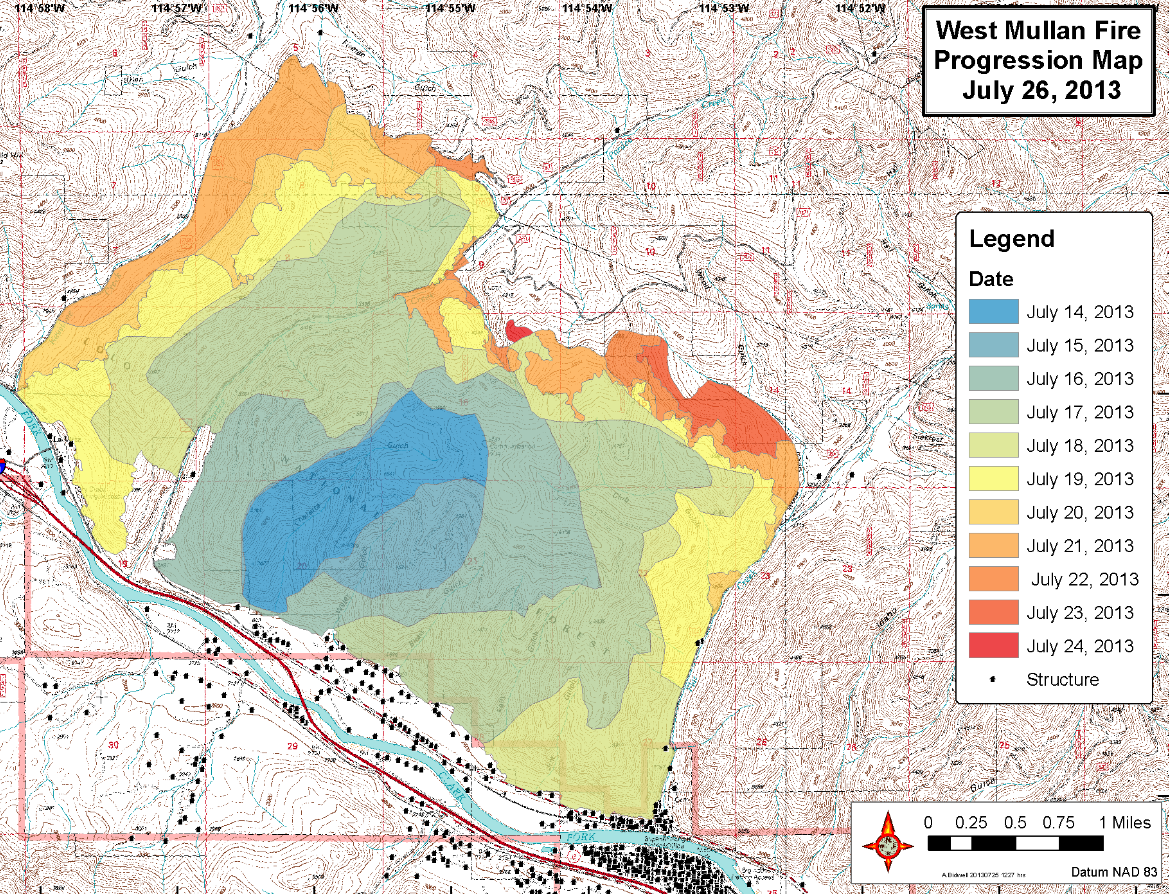
[ ] Spatial/temporal dependence (fire grows spatially over time)

[ ] Generate several movies/animations for various scenarios to illustrate how your model works.

[ ] Discuss results with Chris Lum

**Notes**

* Remember that this will need to be recreated by somewhat unexperienced teams (freshmen to seniors who may not have software/engineering backgrounds).
* This algorithm should be a simple proof-of-concept which captures some of the basic behavior of a forest fire. It does not need to be a high fidelity model. An example fire progression is shown below.
* The simulation model will eventually be initialized using a fire-line determined by user story ‘277 – Australia: Prototype Forest Fire-Line Identification System’



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## 279 – Australia: Research Swinglet UAS

**Content**

As a project manager for the Australia Study Abroad program, I would like to research the Swinglet UAS so that I am familiar with its specifications and functionality so we can use it during the study abroad program.

**Definition of Done**

[x] Read the following user stories to obtain situational awareness of the desired use of the vehicle.

[x] 276 – Australia: Explore Forest Fire-Line Management Systems

[x] 277 – Australia: Prototype Forest Fire-Line Identification System

[x] 278 – Australia: Prototype Forest Fire Propagation Model

[x] Research the Swinglet cam UAS (made by SenseFly).

[x] Watch videos on website and YouTube about the vehicle and associated software.

[x] Create a document summarizing some of the key features and how it can be used for this application. In particular

[x] Resolution of the camera

[x] Field of view of the camera

[x] Typical/recommended height AGL for taking photos

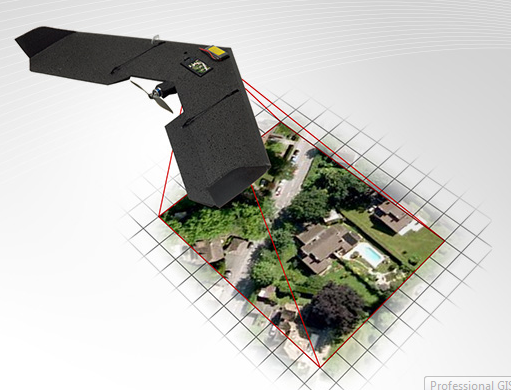
[x] Compare output from your analysis code with example on Swinglet website

[x] Discuss results with Chris Lum.

[x] Present results to group.

**Notes**

* Swinglet website is <https://www.sensefly.com/drones/swinglet-cam.html>
* Research directed towards the groundstation/control software is encapsulated in user story ‘280 – Australia: Research Swinglet Software’



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## 280 – Australia: Research Swinglet Software

**Content**

As a project manager for the Australia Study Abroad program, I would like to research how Swinglet UAS software can be used to create photo mosaics so that the students can use it for their models and projects.

**Definition of Done**

[ ] Read the following user stories to obtain situational awareness of the desired use of the software.

[ ] 276 – Australia: Explore Forest Fire-Line Management Systems

[ ] 277 – Australia: Prototype Forest Fire-Line Identification System

[ ] 278 – Australia: Prototype Forest Fire Propagation Model

[ ] 279 – Australia: Research Swinglet UAS

[ ] Research how the control software is used to control the system.

[ ] Coordinate with Chris Lum to contact the company and see if we can obtain an educational/academic license for the software for free.

[ ] Obtain a copy of the control software to test with.

[ ] Install software on a test machine (laptop).

[ ] Investigate how to plan a flight route (create several example flight paths and simulations).

[ ] Investigate how to take photos to generate a photo-mosaic using the software.

[ ] Generate a simulated photo-mosaic using the system.

**Notes**

* Swinglet website is <https://www.sensefly.com/drones/swinglet-cam.html>
* The overall goal of this user story is to test how this system will be used in Australia to take a photo of a simulated forest fire. Therefore, this is effectively a “dry run” of the process to ensure that this can be used to accomplish our goals.

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## 281 – Australia: Fake Fire-Line Generation

**Content**

As a project manager for the Australia Study Abroad program, I would like to test different methods for simulating a forest fire so that we can use this in technique in Australia during the study abroad class.

**Definition of Done**

[ ] Read the following user stories to obtain situational awareness of the desired application.

[ ] 276 – Australia: Explore Forest Fire-Line Management Systems

[ ] 277 – Australia: Prototype Forest Fire-Line Identification System

[ ] 278 – Australia: Prototype Forest Fire Propagation Model

[ ] 279 – Australia: Research Swinglet UAS

[ ] 280 – Australia: Research Swinglet Software

[ ] Investigate an ecologically and economically friendly way to simulate a forest-fire (for example using plastic tarps, rope, etc.)

[ ] Take various test photos of this system using similar conditions that will be experienced with the actual Swinglet cam (ie at an appropriate altitude which will simulate a similar pixel size of the fire-line).

[ ] Coordinate with the development champion of user story ‘277 – Australia: Prototype Forest Fire-Line Identification System’ to test that their system can recognize the fake fire-line.

[ ] Discuss results with Chris Lum.

**Notes**

* We will be flying the UAS at the Samford Ecological Research Facility (<http://www.serf.qut.edu.au/> ). Perhaps take test shots at locations with similar background features.
* We need to simulate a fire because it is obviously unacceptable to start a real forest fire. In Australia the students will use this method to outline a fake forest fire which we will then take pictures of using the Swinglet system.

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## 282 – Perforce Shelf Sets

**Content**

As a software developer, I would like to investigate how Perforce shelf sets work so that I can use them when developing software.

**Definition of Done**

[x] Research how ‘shelf sets’ work in Perforce.

[x] Test shelving and un-shelving changelists

[x] Discuss results with Chris Lum.

[x] Present results and demonstrate functionality to group at a research meeting.

**Notes**

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## 283 – ScanEagle Simulator: System Architecture

**Content**

As a software engineer, I would like to setup a directory structure and system architecture for the ScanEagle Simulator effort so that I can use it for the project.

**Definition of Done**

[x] Create depot on Perforce

[x] Populate the depot on Perforce appropriately

[x] Create a directory structure for files

[x] Create a Simulink library to hold relevant blocks (the source code for the project)

**Notes**

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## 284 – ScanEagle Simulator: Plant Model

**Content**

As a simulation engineer, I would like to create a plant model of an aircraft so that I can use it for simulation and other components.

**Definition of Done**

[x] Obtain 6DOF model from Chris Lum

[x] Get this model to run on a local build

[x] Port this block to the Simulink library file for the project (see 283 – ScanEagle Simulator: System Architecture)

[x] Study the model and see how to modify it for different aircraft.

[x] Augment this model with a pan/tilt camera.

[x] Verity that you can interface a joystick with this system (see user story ‘285 – ScanEagle Simulator: Joystick Interface’)

[x] Verity that you can ouput/visualize the state in FlightGear.

**Notes**

* This was originally dropped in sprint 1411 and then started again in sprint 1504.
* Most of this functionality has already been created and exists in the UWAerospaceBlockset.

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## 285 – ScanEagle Simulator: Joystick Interface

**Content**

As a simulation engineer, I would like to block which allows us to interface with an external joystick so I can use it in the simulation.

**Definition of Done**

[x] Investigate how the Aerospace blockset uses joystick inputs.

[x] Verify that Simulink can read the inputs from the joystick in real time.

[x] Wrap the native blocks in a custom block within our library to use for the project.

[x] Create a simple demo model which shows the joystick in operation.

**Notes**

* Currently the joystick is in a model, need to integrate into a custom block.

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## 286 – ScanEagle Simulator: X-Plane Interface

**Content**

As a simulation engineer, I would like to setup X-plane to be able to visualize an aircraft’s state vector so I can use it to render the simulation scenario.

**Definition of Done**

[ ] Install the latest version of X-plane.

[ ] Discuss the X-Plane UDP and external simulation structure with Chris Lum

[ ] Discuss the X-Plane SDK with Chris Lum

[ ] Study the existing X-Plane plugins that were created by Chris Lum

[ ] Verify that you can build these plugins with VS2010 and they work with X-Plane 9

[ ] Upgrade the plugins to VS2012 targeting X-Plane 9

[ ] Change the VS2012 solution to target X-Plane 10

[ ] Create a “hello world” application/scenario which outputs dummy data from Matlab, sends it to X-plane over UDP, and X-Plane renders the scenario.

**Notes**

* This was originally dropped in sprint 1411 and then started again in sprint 1504.

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## 287 – Australia: Forest Fire-Line Identification System Homework

**Content**

As a project manager for the Australia Study Abroad program, I would like to create a homework assignment to generate an algorithm to automatically process an aerial image of a forest fire and identify the fire-line so that I can assign it to students during the class.

**Definition of Done**

[x] Read and understand user story ‘277 – Australia: Prototype Forest Fire-Line Identification System’ and the results from this story.

[x] Develop a homework assignment which has the students recreate these results in several structured steps.

[x] Create a solution key for this assignment.

[x] Discuss results with Chris Lum

**Notes**

* Pretend you are the instructor of the class and are actually assigning this to students.

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## 288 – Numerical Validation of Integration of Position Probabilities Over An Arbitrary Volume

As an algorithm developer, I would like to be able to integrate an entity’s position distribution over an arbitrary volume so that I can compute probabilistic intersections with arbitrary 3D polyhedrons (restricted airspaces).

**Definition of Done**

[X] Meet with Chris Lum to discuss the scope of this story.

[X] Review user story ‘253 – 3D Volume Restricted Airspaces Implementation (Method 1)’

[X] Review user story ‘255 – Integration of Position Probabilities Over An Arbitrary Volume’

[X] Review the AirspaceconflictCalculator.ProbabilityOfAirspaceBreach() method.

[X] Create a unit test helper class or method for the AirspaceconflictCalculator.ProbabilityOfAirspaceBreach() as a numerical, monte-carlo style, simulation. This will serve at the “truth” value. Note: This method is not constrained by time or processor power (in other words, it is acceptable to take several seconds to generate a result).

[X] The monte-carlo style simulation/validation package should have the ability to output to both txt and kml files that that a user can manually/visually inspect the outputs to ensure that they are reasonable.

[X] Generate several graphical plots in both Matlab and Google Earth to show results.

[X] Coordinate your efforts with the development champion of user story ‘289 – Airspace Conflict Calculator Test Case Generation’

**Notes**

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## 289 – Airspace Conflict Calculator Test Case Generation

As a software quality assurance engineer, I would like to generate several test cases for the airspace conflict calculator so that I may be sure that I am testing the system sufficiently.

**Definition of Done**

[x] Meet with Chris Lum to discuss the scope of this story.

[x] Review user story ‘253 – 3D Volume Restricted Airspaces Implementation (Method 1)’

[x] Review user story ‘255 – Integration of Position Probabilities Over An Arbitrary Volume’

[x] Review user story ‘252 – Test Cases for 3D Volume Restricted Airspaces’.

[x] Review the AirspaceconflictCalculator.ProbabilityOfAirspaceBreach() method.

[x] Coordinate your efforts with development champion of user story ‘288 – Numerical Validation of Integration of Position Probabilities Over An Arbitrary Volume’

[x] Generate various test cases to ensure that we obtain good code coverage.

[x] Ensure that these examples are visualized and output to google earth files for manual inspection.

**Notes**

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## 290 – UW UAS Use Case Document

As a project manager for the UW UAS effort, I would like to document describing the possible use cases for the platform so that I can use it to create a requirements document.

**Definition of Done**

[x] Meet with Chris Lum to discuss the scope of this story.

[x] Identify relevant research and use-cases for how the UW UAS platform could be used.

[x] Document all use cases in a PowerPoint document.

[x] Present results to group.

[x] Document is reviewed with Chris Lum and checked into Perforce.

**Notes**

* This document will eventually be used to define requirement which will eventually lead to the selection of an airframe and other UAS components. As such, ensure that the use cases you document have supporting documentation and information to distill these requirements from later.

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## 291 – Software Best Practices Poster and Presentations (Session 5)

**Content**

As a software developer, I would like to investigate some software best practices and present these ideas to the group so the entire group can learn from my research.

**Definition of Done**

[x] Discuss how we can use the Matlab image processing toolbox.

[x] Discuss other software industry best practices concerning representing and using image processing techniques.

[x] Present result to group

**Notes**

* There are several satirical posters of “anti-patterns” (bad ideas and things that you should not do) located at <http://www.flickr.com/photos/lakequincy/sets/72157629316877860/> .

## 292 – Sprint 1406 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1406 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 293 – WPF User Control for ConflictEntity (Integration into UW Solution)

**Content**

As a UI designer, I would like a custom WPF user control which can be used to manipulate and display a ConflictEntity object so that I can use it in the plug-in UI.

**Definition of Done**

[ ] Review user story 262 – WPF User Control for ConflictEntity.

[ ] The contents of the previously mentioned story should be integrated into the UW solution in an appropriate location (discuss with Chris Lum)

**Notes**

* The purpose of this story is to obtain a modular, working user control which can be used to manipulate/display a ConflictEntity object. This user control will be integrated into the plugin later in a larger UI element.

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## 294 – Sprint 1407 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1406 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

## 295 – Error Propagation Bug

**Content**

As a software developer and research, I would like to fix a potential bug in the FSE error propagation algorithm so I can ensure that it is correct.

**Definition of Done**

[X] Consult with Chris Lum before starting this user story.

[X] Read ‘Section 3.2 Propagation of Error’ in Bao Le’s master’s thesis

[X] Read ‘Section 3.3 Forward State Estimator Error Propagation’ in Bao Le’s master’s thesis

[X] Eq.3.23 is not correct (note that the units do not match). Find out where this went wrong.

[X] Find what code needs to be refactored to accommodate this update.

[X] Write a unit tests with the original code (this should fail because the code is not correct)

[X] Change source code to reflect the correction.

[X] Ensure that the same unit test now passes.

[X] Create a unit test which compares the outputs from the ForwardStateEstimatorFlightPath and the ForwardStateEstimatorFreeFlight and ensures that they generate similar results along the appropriate dimensions (see Chris Lum and Kevin U before starting this).

[ ] ~~Coordinate with Bao to update his thesis so we have a correct copy on file.~~

**Notes**

* Bao’s master’s thesis is located at (located at \\UserFiles\lebao000\masters\_thesis\Le\_Bao\_Thesis\_Final.pdf).
* This user story involves correcting both the base algorithm and all instances of the code which is affected by this change.
* The code that is likely affected is in the ForwardStateEstimatorFlightPath class.
* Kevin U initially found this bug on 07/10/14.

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## 296 – IEEE Aerospace Conference Paper Writeup

**Content**

As a researcher, I would like to publish the results of the collision awareness plugin research so that others may benefit from the technologies developed during this project.

**Definition of Done**

[X] Prepare an abstract of the paper

[X] Get abstract accepted to the 2015 IEEE Aerospace Conference

[X] Ensure that key dates are on Kevin U and Chris Lum’s calendars

[X] Download paper templates in LaTeX form from the conference website.

[X] Move relevant sections of the existing thesis to the paper.

[X] Complete a draft of the paper at least 2 weeks before the paper’s due date.

[X] Send this paper out to relevant stakeholders for review.

[X] Submit paper to IEEE Aerospace Conference website.

**Notes**

* Upon commencement of this user story, most writing on a thesis should be put on hold while we focus on this paper. This paper will eventually be moved to the thesis later.

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## 297 – IEEE Aerospace Conference Presentation and Logistics

**Content**

As a researcher, I would like to arrange logistics for the IEEE Aerospace Conference so that I can present the paper and disseminate the information generated during the JCATI project.

**Definition of Done**

[X] Familiarize with user story ‘296 – IEEE Aerospace Conference Paper Writeup’.

[x] Register for the conference.

[x] Arrange travel logistics to the conference.

[x] Arrange lodging logistics at the conference.

[X] Prepare a PowerPoint presentation to present at the conference.

[x] Present slides at a group meeting at least 1 week before the conference and incorporate feedback.

[x] Present slides at IEEE Aerospace Conference.

[x] Submit expense report for all costs related to this conference.

**Notes**

* See Chris Lum to discuss conference logistics and ettiqutte.

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## 298 – Master’s Thesis 2

**Content**

As a student, I would like to write my Master’s thesis so I can graduate.

**Definition of Done**

[X] Refactor, document, and finalize code related to code sections for which I am the development champion and are related to my thesis.

[X] Ensure that all unit tests for this class are written and pass (you do not need to write all the tests and should get help from appropriate SQA resources)

[X] Write Master’s thesis

[X] Present thesis results at department wide meeting/presentation

[x] Obtain all necessary signatures and documents required for graduation.

**Notes**

* Plan ahead with respect to obtaining signatures and scheduling presentations. Juris Vagner’s schedule is somewhat erratic and he often travels to Europe for extended periods of time during which he is unavailable.

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## 299 – Migrate Perforce Server

**Content**

As a project manager, I would like to migrate the Perforce server and existing depots to a new machine so I can manage all files related to this project.

**Definition of Done**

[x] Setup AFSLSERVER machine

[x] Create disc image and recovery media

[x] Install all Windows Updates

[x] Install Sophos Anti-Virus

[x] Install Microsoft Office

[x] Install necessary Perforce software.

[x] Perforce server setup on AFSLSERVER (including P4Admin)

[x] Migrate old depots to this new server

[x] Migrate old educational license to this new server

[x] Users accounts created and setup for all students working on project

[x] Set static IP address of AFSLSERVER to 128.95.33.123

[x] Use same port number as previous installation

[x] Ensure that domain name of afslserver.aa.washington.edu maps correctly to static IP.

[x] Depots setup for both documentation and for code

[x] Initial check-ins of code and file structure

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**Story ID**

## 300 – Perforce Visual Client

**Content**

As a software developer, I would like a Perforce client installed on my machine and would like to be comfortable with its use so I may sync files and make code changes.

**Definition of Done**

[x] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[x] Attended discussion/training with CL regarding Perforce operation and concepts

[x] Successfully create and sync relevant workspaces (both documentation and code)

[x] Successfully check something into the depot

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## 301 – Perforce Visual Client (copy)

**Content**

As a software developer, I would like a Perforce client installed on my machine and would like to be comfortable with its use so I may sync files and make code changes.

**Definition of Done**

[x] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/JCATI/> )

[x] Attended discussion/training with CL regarding Perforce operation and concepts

[x] Successfully create and sync relevant workspaces (both documentation and code)

[x] Successfully check something into the depot

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## 302 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

Copy definition of done from user story 002 – Perforce Visual Client

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## 303 – Laboratory Setup

**Content**

As a researcher, I would like a to setup the laboratory to support the UW UAV project so that other researchers may use this this facility to make progress with the project.

**Definition of Done**

[x] Obtain keys and access for students working on project

[x] Setup desk space for student researchers

[x] Setup computing hardware

[x] Setup laboratory hardware (power supplies, multimeters, etc.)

[x] Purchase necessary components (create a system for requesting and obtaining hardware)

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## 304 – Autopilot Familiarization (position 1)

**Content**

As a researcher, I would like to familiarize myself with the basic operation and functions of the ArduPilot Mega (APM) so that I can become aware of its capabilities and operation.

**Definition of Done**

[x] Read documentation related to APM.

[x] Consult with Al Creigh about initial setup to ensure that connections and initial understanding of the system is reasonable.

[x] Setup APM software on ground station computer.

[x] Setup and connect all relevant APM hardware components. (Except Magnetometer Chip)

[x] Ensure communication between APM and ground station in a tethered configuration (ie hard wired cable).

[x] Ensure communication between APM and ground station in a wireless configuration (ie using antennas).

[x] Obtain familiarity with the system to some of the questions as outlined in the ‘Notes’ section of this user story.

**Notes**

Some things to keep in mind while completing this story

* How can we save data from the APM (for example suppose we want to save the altitude profile of a flight)?
* What variables are available for viewing/saving on the ground station?
* What types of commands/controls can we send from the ground station to the aircraft?

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## 305 – Autopilot Familiarization (position 2)

**Content**

As a researcher, I would like to familiarize myself with the basic operation and functions of the ArduPilot Mega (APM) so that I can become aware of its capabilities and operation.

**Definition of Done**

[x] Read documentation related to APM.

[x] Consult with Al Creigh about initial setup to ensure that connections and initial understanding of the system is reasonable.

[x] Setup APM software on ground station computer.

[x] Setup and connect all relevant APM hardware components. (Except Magnetometer Chip)

[x] Ensure communication between APM and ground station in a tethered configuration (ie hard wired cable).

[x] Ensure communication between APM and ground station in a wireless configuration (ie using antennas).

[x] Obtain familiarity with the system to some of the questions as outlined in the ‘Notes’ section of this user story.

**Notes**

Some things to keep in mind while completing this story

* How can we save data from the APM (for example suppose we want to save the altitude profile of a flight)?
* What variables are available for viewing/saving on the ground station?
* What types of commands/controls can we send from the ground station to the aircraft?

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## 306 – Autopilot Familiarization (position 3)

**Content**

As a researcher, I would like to familiarize myself with the basic operation and functions of the ArduPilot Mega (APM) so that I can become aware of its capabilities and operation.

**Definition of Done**

[x] Read documentation related to APM.

[x] Consult with Al Creigh about initial setup to ensure that connections and initial understanding of the system is reasonable.

[x] Setup APM software on ground station computer.

[x] Setup and connect all relevant APM hardware components. (Except Magnetometer Chip)

[x] Ensure communication between APM and ground station in a tethered configuration (ie hard wired cable).

[x] Ensure communication between APM and ground station in a wireless configuration (ie using antennas).

[x] Obtain familiarity with the system to some of the questions as outlined in the ‘Notes’ section of this user story.

**Notes**

Some things to keep in mind while completing this story

* How can we save data from the APM (for example suppose we want to save the altitude profile of a flight)?
* What variables are available for viewing/saving on the ground station?
* What types of commands/controls can we send from the ground station to the aircraft?

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## 307 – Autopilot Documentation

**Content**

As a project manager, I would like to document how the APM functions and operates so that this knowledge can be transferred easily to new team members.

**Definition of Done**

[ ] Coordinate with development champion(s) of user story ’304 – Autopilot Familiarization (position 1)’

[ ] Write a document which describes

[ ] All the components necessary for the autopilot setup (including part numbers and pictures).

[ ] How all components are connected and interact with each other.

[ ] System settings and other information necessary

[ ] Process for re-creating the system from scratch.

[ ] Include a diagram of all relevant system components as well as their communication links/channels. This should be a visual diagram of nearly all of the relevant components that can be posted on the wall in the lab and help others understand the system.

[ ] Incorporate emails and knowledge from Al Creigh into this document.

[ ] Have another team member (who has no familiarity with the APM system) follow these instructions and recreate the system from scratch. Ensure that you are supervising this procedure.

[ ] Present results to the group.

[ ] Document is checked into Perforce in appropriate location.

**Notes**

* This document should serve as a self-sufficient guide which can be used by a completely new team member to recreate the system from scratch if necessary (for example if the aircraft crashes and sinks in the ocean).

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## 308 – Autopilot Simple Demonstration

**Content**

As a researcher and marketing representative, I would like to create a simple demonstration of the autopilot to illustrate how the system can be used in a real world, engineering application.

**Definition of Done**

[x] Coordinate with development champion(s) of user story ’309 – Simple Camera System Familiarization (position 1)’

[x] Write a document which describes the desired demonstration. This demonstration should exercise system components in a fashion similar to how it will be used in the real system.

[x] Setup system to perform this demo and gather data from the experiment.

[x] Present experimental results to the group.

[x] Conduct a live demo with the group.

[x] Document is checked into Perforce in appropriate location.

**Notes**

* This demonstration will serve as an illustrative example so that people working on the autopilot will have a “target to shoot for” when doing initial research and system development.
* See \\JCATI2013\TechnicalDataPackage\UW\_TV\ 14\_10\_30\_internal\_timeline.docx for an outline of a demo used for the UW-TV and other publicity segments. This may be a good starting point.

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## 309 – Simple Camera System Familiarization (position 1)

**Content**

As a researcher, I would like to familiarize myself with the basic operation and functions of the camera system so that I can become aware of its capabilities and operation.

**Definition of Done**

[x] Read documentation related to camera system.

~~[ ] (OPTIONAL) Setup video software on ground station (use the cheap, semi-expendable camera).~~ Moved to User Story ‘322 – Camera Ground Station Software Setup and Proof of Concept’.

[x] Setup and connect all relevant video system components

[x] Ensure that Smash Brothers 64 works on the TV (group testing)

[x] (N/A) Ensure communication between video transmitter and ground station in a tethered configuration (ie hard wired cable).

[x] Ensure communication between video transmitter and ground station in a wireless configuration (ie using antennas).

[x] Mount transmitter on a heat sink and fan system to ensure sufficient cooling and avoid damage.

[x] Obtain familiarity with the system to some of the questions as outlined in the ‘Notes’ section of this user story.

**Notes**

* Do not use the FoxTech camera for this user story as it is expensive and we do not want to risk damaging it until the system is understood and known.

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## 310 – Simple Camera System Familiarization (position 2)

**Definition of Done**

[x] Read documentation related to camera system.

~~[ ] (OPTIONAL) Setup video software on ground station (use the cheap, semi-expendable camera).~~ Moved to User Story ‘322 – Camera Ground Station Software Setup and Proof of Concept’.

[x] Setup and connect all relevant video system components

[x] Ensure that Smash Brothers 64 works on the TV (group testing)

[x] (N/A) Ensure communication between video transmitter and ground station in a tethered configuration (ie hard wired cable).

[x] Ensure communication between video transmitter and ground station in a wireless configuration (ie using antennas).

[x] Mount transmitter on a heat sink and fan system to ensure sufficient cooling and avoid damage.

[x] Obtain familiarity with the system to some of the questions as outlined in the ‘Notes’ section of this user story.

**Notes**

* Do not use the FoxTech camera for this user story as it is expensive and we do not want to risk damaging it until the system is understood and known.

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## 311 – Simple Camera System Documentation

**Content**

As a project manager, I would like to document how the camera system functions and operates so that this knowledge can be transferred easily to new team members.

**Definition of Done**

[x] Coordinate with development champion(s) of user story 309 – Simple Camera System Familiarization (position 1)

[x] Write a document which describes

[x] All the components necessary for the camera system setup (including part numbers and pictures).

[x] How all components are connected and interact with each other.

[x] System settings and other information necessary

[x] Process for re-creating the system from scratch.

[x] Incorporate emails and knowledge from Al Creigh into this document (particularly paying attention to safety considerations, see Chris Lum for email thread).

[x] Have another team member (who has no familiarity with the camera system) follow these instructions and recreate the system from scratch. Ensure that you are supervising this procedure.

[x] Present results to the group.

[x] Document is checked into Perforce in appropriate location.

**Notes**

* This document should serve as a self-sufficient guide which can be used by a completely new team member to recreate the system from scratch if necessary (for example if the aircraft crashes and sinks in the ocean).

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## 312 – Simple Camera System Simple Demonstration

**Content**

As a researcher and marketing representative, I would like to create a simple demonstration of the camera to illustrate how the system can be used in a real world, engineering application.

**Definition of Done**

[ ] Write a document which describes the desired demonstration. This demonstration should exercise system components in a fashion similar to how it will be used in the real system.

[ ] Setup system to perform this demo and gather data from the experiment.

[ ] Present experimental results to the group.

[ ] Conduct a live demo with the group.

[ ] Document is checked into Perforce in appropriate location.

**Notes**

* This demonstration will serve as an illustrative example so that people working on the autopilot will have a “target to shoot for” when doing initial research and system development.
* See \\JCATI2013\TechnicalDataPackage\UW\_TV\ 14\_10\_30\_internal\_timeline.docx for an outline of a demo used for the UW-TV and other publicity segments. This may be a good starting point.

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## 313 – Autopilot Familiarization (Advanced) (position 1)

**Content**

As a researcher, I would like to familiarize myself with the advanced operation and functions of the ArduPilot Mega (APM) so that I can become aware of its capabilities and operation.

**Definition of Done**

[x] Consult with development champion(s) of user story ‘304 – Autopilot Familiarization (position 1)’

[ ] Hook up magnetometer to APM.

[ ] Determine how to perform some of the advanced features of the autopilot including but not limited to

[ ] Google Earth logging of aircraft positions (talk to Al Creigh)

[ ] How do we plan flight paths (parallel track, manual waypoint placement, etc.)?

[ ] How does the orbit/loiter flight mode operate?

[ ] How does the return to home functionality operate?

[ ] How do we switch between flight modes during operation?

[ ] Augment the document generated by user story ‘307 – Autopilot Documentation’ with your findings.

[x] Investigate Mission Planner simulator

[ ] Use simulator to simulate a flight without advanced visualization (FlightGear or X-plane)

[ ] Figure out how to use FlightGear or X-Plane as a visualization engine

[ ] Present result to group.

[ ] Conduct a live demo of the system to the group.

**Notes**

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## 314 – Simple Camera System Familiarization (Advanced)

**Content**

As a researcher, I would like to familiarize myself with the advanced operation and functions of the camera system so that I can become aware of its capabilities and operation.

**Definition of Done**

[x] Consult with development champion(s) of user story ‘309 – Simple Camera System Familiarization (position 1)’

[x] Determine how to perform some of the advanced features of the camera system including but not limited to

[x] What is the camera resolution and frame rate that we can receive at the ground station?

[x] How is the camera image a function of factors like distance, line of sight, environment, etc.?

[x] Augment the document generated by user story ‘311 – Simple Camera System Documentation’ with your findings.

[x] Present result to group.

**Notes**

Some things to keep in mind while completing this story

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## 315 – FoxTech Camera System Familiarization

**Content**

As a researcher, I would like to familiarize myself with the operation and functions of the FoxTech camera system so that I can become aware of its capabilities and operation and integrate it into the camera system.

**Definition of Done**

[ x] Consult with development champion(s) of user story ‘309 – Simple Camera System Familiarization (position 1)’

[ x] Familiarize yourself with the operation of the FoxTech camera system.

[ x] Integrate this camera into the existing camera system (replace the old camera with this one)

[ x] Augment the document generated by user story ‘311 – Simple Camera System Documentation’ with your findings.

[x] Present result to group.

**Notes**

* This camera is somewhat expensive. Therefore ensure that you are very careful when handling the FoxTech camera. Do not make connections unless you are certain of their validity.

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## 316 – Airframe Selection

**Content**

As a researcher, I would like to select an appropriate airframe for the UW UAV so that I can use it for an appropriate range of future science missions.

**Definition of Done**

[x] Consult with Chris Lum to discuss project.

[x] Generate a use-case document which outlines all possible missions that the system might want to support.

[x] Augment the use-case document with a list of engineering specifications and requirements that are needed to support the mission scenarios outlined in the use-case document.

[x] Research various RC aircraft airframes to determine which ones are suitable for our purposes.

[x] Characterize all mission critical components (weight, volume, other technical specs, etc.) and ensure that the selected airframe can carry these.

[x] Present result to group.

[x] Documents are uploaded to Perforce in appropriate location.

[x] Make a recommendation on an airframe to purchase based on your analysis.

[x] Coordinate with Chris Lum to purchase airframe and necessary hardware (engine, servos, etc.)

**Notes**

* The budget is not unlimited, consult with Chris Lum before making purchases or recommendations.
* Mission critical components include (but are not limited to): APM, Camera System, Transmitter/receiver, camera pan/tilt assembly (we may have to make this).

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## 317 – AFSL Website Control

DROPPED AS THIS IS NOT POSSIBLE TO MAKE PROGRESS SINCE WE CANNOT OBTAIN CONTROL AT THIS POINT. WE MAY WANT TO REVISING THIS STORY AT A LATER DATE.

**Content**

As a marketing representative, I would like to obtain control of the Autonomous Flight System’s Laboratory’s (AFSL) website so that we can publicize our efforts about this project without having a 3rd party make these changes.

**Definition of Done**

[X] Coordinate with Chris Lum and cc him on all external communications.

[X] Review AFSL website at <http://www.aa.washington.edu/research/afsl/>

[X] Review user story ‘036 – AFSL Website Update’

[ ] Obtain control of the AFSL website (coordinate with Kris Venden and Kim Maczko to see how we can make our own edits to the website).

[ ] Make some simple changes/edits to show proof of feasibility.

[ ] Once you have shown ability to modify and manage the website, coordinate with Chris Lum to create a user story to update the content of the site.

[ ] Document the process of modifying website content and check this into Perforce.

[ ] Demonstrate process to group.

[ ] Determine if we can update the website with ICOMC2 Partner’s program information. Ensure that we comply with ‘ICOMC2 SDK Agreement Final 2.0.pdf’ section 6.4.

**Notes**

* As of 10/17/14, it is not possible for us to obtain control of the website and all changes must go through Kim Maczko (see email traffic on these dates).

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## 318 – Sprint 1407 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1407 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 319 – Sprint 1408 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1408 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 320 – eMotion 2 Ground Station Familiarization

**Content**

As a research and Australia study abroad participant, I would like to familiarize myself with the Swinglet eMotion 2 ground station software so that I can compare it with our system and be able to use it to gather data in Australia.

**Definition of Done**

[x] Discuss with Chris Lum about this project before starting

[x] Download eMotion 2 software (see notes for instructions)

[x] Familiarize with planning software.

[x] Determine how to plan a path

[x] Determine how to upload flight area to aircraft

[x] Perform a simulated mission. Include the follow features in the workflow

[x] Save aircraft position

[x] Save aircraft photos (if possible)

[x] Visualize flight in GoogleEarth

**Notes**

* From Baptiste Tripard (email on 07/21/14)

Please go on our website and download eMotion 2 – eBee download section:

* [Update bundle 2.3.0 for Windows](https://www.sensefly.com/support/fileadmin/user_upload/releases/eMotion_2.3.0.msi)Latest eMotion 2 software and autopilot firmware (released on 19.05.2014)**121 M**

Use the following password:

**f5qJGg62**

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## 321 – Pan/Tilt Gimbal System Creation

**Content**

As a project engineer, I would like to create a pan/tilt gimbal system for the UW UAS so that I can mount the camera on it and enable the camera to pan/tilt independently from the aircraft.

**Definition of Done**

[x] Discuss with Chris Lum before starting project.

[x] Research if an off-the-shelf component can be purchased which meets our needs.

[x] Design a pan/tilt gimbal system that will allow the camera to pan/tilt independent of the aircraft body.

[x] Manufacture this system.

[x] Test system on lab bench (do not mount on aircraft).

[x] Mount system on aircraft and test.

[x] Demonstrate functionality of pan/tilt gimbal system to research group.

[x] Check in all research, design, and usage documents into appropriate location in Perforce.

**Notes**

* We want panning (side-to-side) angles of at least +/-90 degrees from center (180 degree total range of motion)
* We want tilting (up/down) angles of at least +90 to -15 degrees from center (ability to look straight down and slightly above the horizon)

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## 322 – Camera Ground Station Software Setup and Proof of Concept

**Content**

As a researcher, I would like to setup software on the ground station computer to accept video imagery from the aircraft and capture this so I can use it for closed loop control.

**Definition of Done**

[x] Setup video viewing software on ground station. This software should be in charge of only viewing the video from the aircraft. The purpose of this is so we do not need a full CRT TV in the field when we do flight testing.

[x] Setup video capture software on the ground station. This software should be in charge of capturing video frames and saving it to the hard drive.

[x] Verify that this setup can be used in real-time in conjunction with a computer vision software system (such as Matlab’s Image Processing Toolbox) by creating a very simple demo where the aircraft sends a video signal to the ground station, the operator can view the image, and the computer simultaneously obtains a screen capture that it processes with the computer vision software.

**Notes**

* This is a proof of concept demonstration only, more complex processing will come in a later user story.

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## 323 – Aircraft Construction (RC Configuration)

**Content**

As an RC pilot, I would like to put together the Skywalker 1900 aircraft system so that I can fly it as a radio control aircraft.

**Definition of Done**

[x] Start a document on Perforce to serve as a master log of activity related to the system.

[x] Build the Skywalker 1900 airframe

[x] Integrate propulsion, control actuators, transmitter/receiver equipment, and any other system necessary to make the system airworthy.

[x] Conduct basic pre-flight inspections and tests in the lab.

[x] Ensure all activity is recorded in the master log document.

**Notes**

* This configuration is a pure RC aircraft, there are no advanced systems such as an autopilot nor camera on the aircraft. We would like to pretend that we are a purely recreational hobbyist RC pilot for this portion of the project.
* Do not fly the aircraft. Flight testing is incorporated in user story ‘324 – Aircraft Flight Testing Preparation and Legalities (RC Configuration)’ and user story ‘325 – Aircraft Flight Testing (RC Configuration)’.

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## 324 – Aircraft Flight Testing Preparation and Legalities (RC Configuration)

**Content**

As an RC pilot and program manager, I would like to ensure that we answer questions and establish procedures to ensure that we operate in compliance with all rules and regulations for flying RC aircraft.

**Definition of Done**

[x] Coordinate with development champion of user story ‘323 – Aircraft Construction (RC Configuration)’

[x] Discuss with Chris Lum before starting this story.

[x] Research Academy of Model Aeronautics (AMA, <http://www.modelaircraft.org/>). Some questions to answer include but are not limited to

[x] What does membership buy you?

[x] How is liability insurance handled with the academy?

[x] Are you required to have AMA membership to fly at various locations?

[x] What types of privileges come with AMA membership?

[x] Are we eligible as a public institution to partake in AMA membership or is this for private

individuals only?

[x] Are there certifications or courses that the AMA offers for pilots-in-training?

[x] Research FAA guidelines. Some questions to answer include but are not limited to

[x] What are the rules with respect to flying an RC aircraft in the National Airspace (NAS)

[x] Are you required to be a member of AMA to fly?

[x] What are the specific rules and regulations that are attached to RC aircraft (ie line of sight,

under 400’, etc.)?

[x] Conduct an interview with Chuck Bower (see notes below) and record/log this interview on Perforce in an appropriate location.

[x] Compile all your findings into a coherent document (including references and hyperlinks to your sources).

[x] Create a “field documentation package” which consists of all documentation, regulations, rules, laws, etc. that we can take with us on flight tests. This can be used to refer to in case we encounter any bystanders or civilians who are challenging the legality of our operation.

[x] Present findings to research group.

[x] Create a new user story to deal with unmanned flight legalities and move appropriate tasks from this story to the newly created story.

**Notes**

* As a public institution, we are subject to more scrutiny than a private citizen, therefore, we must ensure that we meet all rules and regulations with respect to our operations. This user story serve ensure we are compliant and have done our due diligence in preparing to fly our aircraft.
* Note that at this point, we are only flying as an RC aircraft, not an unmanned system. Therefore, a guiding question while conducting this story is to ask yourself, “what must the UW do to legally and safety fly an RC aircraft”?
* It is useful to play “devil’s advocate” while researching this story. In other words, always assume a worst case scenario (where our operations may injure bystanders) and ask how do we mitigate these or how are we covered from a liability standpoint.
* Chuck Bower helps the UW senior design group fly their aircraft. He is on campus every Thursday from 2:30 – 3:30 in the senior design room. ~~Talk with Aleksandr T. or Al Creigh. (~~[~~cbower@whidbey.com~~](mailto:cbower@whidbey.com)~~).~~ Chris has arranged for Chuck to come talk to our group at some point about AMA legalities.

## 325 – Aircraft Flight Testing (RC Configuration)

**Content**

As an RC pilot, I would like to flight test the Skywalker 1900 aircraft system in an RC configuration so that I can characterize and quantify its performance characteristics and identify any airworthiness issues/concerns in a flight test.

**Definition of Done**

[X] Coordinate with development champion of user story ‘323 – Aircraft Construction (RC Configuration)’

[X] Coordinate with development champion of user story ‘324 – Aircraft Flight Testing Preparation and Legalities (RC Configuration)’ and ensure this story is completed before flying aircraft. Ensure that the summary document outlining rules and regulations are part of the flight tests package (see notes).

[X] Establish a flight testing procedure and checklist for operating the aircraft.

[X] Plan for a flight test of the aircraft and announce to the group when this will occur (see notes)

[X] Ensure aircraft are airworthy and ready for initial testing. This includes but is not limited to:

[X] Preliminary systems checks on the ground

[X] Weight and balance

[X] Create dummy payloads to fly on initial trials (we do not want to risk actual payloads)

[X] Brief all members of proper protocol and safety procedures to observe during the flight test.

[X] Conduct a flight test experiment with the aircraft. Some questions to answer during the flight test include but are not limited to

[X] What is the estimated endurance/battery life?

[X] Does the aircraft appear statically/dynamically stable?

[X] What are the stall characteristics of the aircraft?

[X] What is the estimated speed range?

[X] What is the estimated rate of climb?

[X] How do the payloads affect the systems (pan/tilt and still camera)

[X] Take photos/videos of the maiden voyage and subsequent flights.

[X] Record activities in the master log document.

[X] Present flight test results with group.

[x] Create a follow up user story to invite UW and other stakeholders to subsequent flight demonstrations if we have worked out all the bugs of the system. People to include (Chuck Bower, Sarah Aitchison)

**Notes**

* The flight test is a purely RC operation (no autonomous functionality).
* The purpose of the flight test it to “get a feel” for the aircraft. We do not need to quantify performance yet (so data logging is not required for this story.
* We will be adding photos/videos to the department/lab website so be sure to document things from a marketing perspective as well.
* Coordinate with development champion of user story ‘417 – Aircraft Flight Testing (RC Configuration) (Position 2)’
* As per Chuck Bower’s recommendation (see interview on 10/23/14), 60 Acres in Redmond is a good location to test at.
* Another location to investigate is Meadowbrook Farm ([link](http://www.meadowbrookfarmpreserve.org/index.html))
* We should bring the Piper J-3 model to fly while we are out at the park.
* We should have a list of documents, rules, regulations in our possession when we fly. This can be used to refer to in case we encounter any bystanders or civilians who are challenging the legality of our operation.

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## 326 – Laboratory Setup (Part 2)

**Content**

As a researcher, I would like a to setup the laboratory in the Kirsten Wind Tunnel to support the UW UAV project so that other researchers may use this this facility to make progress with the project.

**Definition of Done**

[x] Obtain workspace in the Kirsten Wind Tunnel.

[x] Ensure all relevant lab members have Husky Card access to workspace.

[x] Move aircraft, tools, and other necessary equipment to the workspace.

[x] Add signs to claim space in the lab.

~~[ ] Setup a computer with internet connection in the workspace.~~ It was decided not to put a computer in KWT 102 due to excessive dust and lack of an Ethernet hardwire connection.

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## 327 – Autopilot Familiarization (Advanced) (position 2)

**Content**

As a researcher, I would like to familiarize myself with the advanced operation and functions of the ArduPilot Mega (APM) so that I can become aware of its capabilities and operation.

**Definition of Done**

[x] Consult with development champion(s) of user story ‘304 – Autopilot Familiarization (position 1)’

~~[ ] Hook up magnetometer to APM.~~

[x] Determine how to perform some of the advanced features of the autopilot including but not limited to

[x] Google Earth logging of aircraft positions (talk to Al Creigh)

[x] How do we plan flight paths (parallel track, manual waypoint placement, etc.)?

[x] How does the orbit/loiter flight mode operate?

[x] How does the return to home functionality operate?

[x] How do we switch between flight modes during operation?

[x] Augment the document generated by user story ‘307 – Autopilot Documentation’ with your findings.

[x] Investigate Mission Planner simulator

[x] Use simulator to simulate a flight without advanced visualization (FlightGear or X-plane)

[x] Figure out how to use FlightGear or X-Plane as a visualization engine

[x] Present result to group.

[x] Conduct a live demo of the system to the group. (OPTIONAL)

**Notes**

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## 328 – Autopilot Familiarization (Advanced) (position 3)

**Content**

Copy contents from ‘313 – Autopilot Familiarization (Advanced) (position 1)’

**Definition of Done**

Copy contents from ‘313 – Autopilot Familiarization (Advanced) (position 1)’

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## 329 – Establish RC Pilot Training Course

**Content**

As a program manager, I would like to establish an RC pilot training course so that researchers can be trained to fly the UW UAS in an RC configuration.

**Definition of Done**

[x ] Discuss user story with Chris Lum

[ ] Coordinate with development champion of user story ‘324 – Aircraft Flight Testing Preparation and Legalities (RC Configuration)’.

[ ] Research if there are any governing bodies or entities that issue certifications or training courses for RC pilots.

[ ] Research how other RC flight operations operate (i.e. other universities, clubs, etc.).

[ ] Install the RealFlight RC training software on a lab computer and familiarize yourself with its operation. Document how it operates and create a “flight training” computer in the lab to serve as a training simulator.

[ ] Hold a single training session to show lab members the simulator system and how it operates.

[ ] Establish a RC pilot training course to be used to train new pilots on the RC flight operation of the UW UAS.

[ ] Establish a “buddy box” or other system whereby we can allow untrained RC pilots to fly under the supervision of a competent pilot in command.

[ ] See user story ‘433 – Piper J-3 Training RC Aircraft Setup’. Determine how this aircraft can be integrated into the training program.

[ ] Create a database or other means of tracking certifications and qualifications of pilots. This should include but is not limited to:

[ ] Flight hours on simulator

[ ] Flight hours on various airframes

[ ] Training or other special certifications

[ ] Discuss this with Chuck Bower (see Chris Lum before making contact with Chuck)

[ ] Publish the procedures necessary for a new pilot to become certified on Perforce.

**Notes**

* This user story concerns operating in a purely RC configuration (no autonomous functionality).
* This user story should be somewhat completed before going out to fly.
* We should think about how to establish reasonable procedures and processes when training researchers to fly the UW UAS in as an RC aircraft.
* Potentially ask Professor Eli Livne about what procedures senior design (AA410) uses to fly.
* Chuck Bower is another good resource.
* University of Colorado-Boulder and Texas A&M have active flight programs and may be a good place to look for inspiration.
* Investigate David Wallin (Professor at Western Washington University) and their operations.

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## Visual Anchoring 330 –: System Architecture

**Content**

As a software engineer, I would like to setup a directory structure and system architecture for the Skywalker Simulator effort so that I can use it for the project.

**Definition of Done**

[x] Create directory in Perforce

[x] Populate the depot on Perforce appropriately

[x] Create a directory structure for files

[x] Create a Simulink library to hold relevant blocks (the source code for the project)

**Notes**

* Depot for visual anchoring system development is called ‘VisualAnchoring’
* Simulink blocks that are relevant to this are in the ‘UWMatlab’ depot.

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## 331 – Visual Anchoring: RCAM Plant Model

**Content**

As a simulation engineer, I would like to create a plant model of an aircraft (based on the RCAM model) so that I can use it for simulation and other components.

**Definition of Done**

[x] Obtain 6DOF model from Chris Lum

[x] Get this model to run on a local build

[x] Port this block to the Simulink library file for the project (see 283 – ScanEagle Simulator: System Architecture)

[x] Study the model and see how to modify it for different aircraft.

[x] OPTIONAL: Coordinate with members of the ADV-CTRL lab in the AA department to determine if they have plants/controllers available

* ADV-CTRL lab has some aircraft models available. See email from Max Spetzer for one such model.

**Notes**

* This simulation code is based on the RCAM 6DOF nonlinear model.
* Notes for the analytical derivation of this model are located in \\VisualAnchoring\Research\AA516 (see lecture11.pdf, lecture12.pdf, and aa516rcma.pdf)
* This model does not include wind or other disturbances. For disturbances, see user story ‘432 – Visual Anchoring: RCAM Plant Model Augment with Disturbances’

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## 332 – Visual Anchoring: Joystick Interface

**Content**

As a simulation engineer, I would like to block which allows us to interface with an external joystick so I can use it in the simulation.

**Definition of Done**

[x] Investigate how the Aerospace blockset uses joystick inputs.

[x] Verify that Simulink can read the inputs from the joystick in real time.

[x] Wrap the native blocks in a custom block within our library to use for the project.

[x] Create a simple demo model which shows the joystick in operation.

**Notes**

* Currently the joystick is in a model, need to integrate into a custom block.

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## 333 – Visual Anchoring: X-Plane Interface

DROPPED, this user story was replaced by user story ‘454 – Upgrade UW X-Plane Plug-ins to VS2012 and X-Plane 10’

**Content**

As a simulation engineer, I would like to setup X-plane to be able to visualize an aircraft’s state vector so I can use it to render the simulation scenario.

**Definition of Done**

[ ] Install the latest version of X-plane.

[ ] Discuss the X-Plane UDP and external simulation structure with Chris Lum

[ ] Discuss the X-Plane SDK with Chris Lum

[ ] Study the existing X-Plane plugins that were created by Chris Lum

[ ] Verify that you can build these plugins with VS2010 and they work with X-Plane 9

[ ] Upgrade the plugins to VS2012 targeting X-Plane 9

[ ] Change the VS2012 solution to target X-Plane 10

[ ] Create a “hello world” application/scenario which outputs dummy data from Matlab, sends it to X-plane over UDP, and X-Plane renders the scenario.

**Notes**

* You may need to target a newer version of the X-plane SDK in order to get it to run on X-Plane 10.

## 334 – Laboratory Safety

**Content**

As a system operator and RC pilot, I would like to setup a system of safety procedures to ensure that we operate and work with the system in a safe manner so that I can avoid any potential hazards.

**Definition of Done**

[x] Examine all aspects of the UW UAS and identify potential hazards. This include but are not limited to:

[x] Lithium polymer battery charging hazards ([link](http://en.wikipedia.org/wiki/Lithium-ion_battery#Safety))

[x] Spinning propeller hazards

[x] Dangerous constructor materials (noxious fumes, etc.)

[x] Field experiment hazards (driving to test sites, operating in remote areas, etc.)

[x] Research industry-accepted practices for mitigating these hazards.

[x] Research how other research groups

[x] Create a document outlining each hazard and its risk mitigation strategy.

[x] Implement necessary safety protocols in the lab (ie safe battery charging facility/procedures)

[x] Present results to group.

[x] Check all relevant documents into Perforce.

[x] Create a protocol whereby these procedures are constantly enforced even as lab members join/leave the group.

[x] Coordinate with Fiona Spencer to have her review the documents and go over UWAA policies with respect to lab safety (specifically the charging of LiPo batteries is a concern).

[x] Investigate/research the UW Environmental Health and Safety (<http://www.ehs.washington.edu/> ) to ensure we are compliant with their policies and would pass a safety inspection.

**Notes**

* Various researchers in the Nonlinear Dynamics and Controls Lab work with some of these issues.
* UW Environmental Health and Safety conduct annual inspections of labs. We want to ensure that we would pass an inspection when it occurs.

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## 335 – Coordinate with Earth and Space Sciences

**Content**

As a program manager, I would like to coordinate with groups in the Department of Earth and Space Sciences (ESS) and learn about their activities so that I can collaborate and synergize efforts with respect to applications of UAS.

**Definition of Done**

[x] Contact David Shean

[x] Discuss projects with him.

[x] Coordinate for him to talk to our group

[x] Add user stories relevant to his work.

**Notes**

* See \\AFSL\TechnicalDataPackage\Presentations\14\_10\_16\_David\_Shean.pdf

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## 336 – Sprint 1409 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1409 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 337 – Sprint 1410 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1410 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 338 – Project Branding

**Content**

As a project manager and marketing representative, I would like to brand/name the UW UAS project so that I can refer to it in future projects and publicity documents.

**Definition of Done**

[x] Conduct a poll asking the research group for candidate names for the UW UAS.

[x] Coordinate with the group and Chris Lum to choose a name

[x] Solicit or create several template logos for the project.

[x] Coordinate with the group and Chris Lum to choose a logo

[x] Create several high resolution images of the logo to use throughout the project

[ ] Ensure that all documentation is updated to refer to this new branding of the project

[x] Create names/designations for all aircraft/UAS in the hanger.

[x] Create graphics or stickers to place on all of the aircraft (CONDOR, TEDD, and WindTunnel)

[ ] ~~Update the website with information about the system.~~ (this is in another user story)

**Notes**

* The UW UAS project should likely be changed to something like UW Flight Operations. This is meant to encompass all flight operations related to UAS and otherwise.
* Note that we will likely have several aircraft/UAS in the hanger and under the umbrella of this flight operations center. Each aircraft should have its own designation. At the moment, we have at least 3 different airworthy aircraft
  + Visual anchoring aircraft: Skywalker 1900
  + Aerial mapping aircraft: Skywalker 1900
  + Trainer aircraft: Piper J-3
* See a helpful guilde to acronyms at <http://www.phdcomics.com/comics.php?f=1100>
* ~~Possible candidates for Visual Anchoring System~~
  + ~~I.V.A.N.  : Innovative Visual Anchoring eNterprise  (Maxine Tan)~~
* ~~Possible candidates for Aerial Mapping System~~
  + ~~A.M.B.E.R. - Aerial Mapping By Empyrean Reconnaissance (Maxine Tan)~~
  + ~~W.A.M. – Washington Aerial Mapper (Chris Lum)~~
* ~~Possible candidates for Trainer Aircraft~~
  + ~~T.O.F.Y. – Training in Operational Flight Instruction (Maxine Tan)~~
* Winning names are
  + Visual Anchoring aircraft – CONDOR
  + Mapping aircraft – TEDD
  + Piper J-3 Trainer – DubCub
* The aircraft should have similar graphical features so when they are photographed next to each other, it is clear they come from the same research lab. Therefore do no use widly varing color schmes and try to keep a common theme or visual grouping with them.

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## 339 – Australia Results Consolidation

**Content**

As a researcher, I would like to consolidate all the data, results, code, photos, media, etc. from the Australia Study abroad experience so that I can use it for future projects

**Definition of Done**

[x] Obtain all Swinglet data including

[x] Raw images

[x] flight test telemetry (contact Michael Warren)

[x] other information necessary to create an ortho rectified image.

[x] Obtain all photos/videos from the flight test experiment

[x] Obtain all source code for Matlab simulation (optional as we may need to recreate most of this from scratch in a formal software development manner)

[x] Obtain all source code for LaTeX papers (or just get the .pdfs from Chris and reproduce the source code as required)

[x] Obtain any other information that may be useful in the future for this project

[x] Check all information into an appropriate location on the lab server (Perforce) (check with Chris Lum BEFORE checking this into Perforce)

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## 340 – Australia Ortho-Rectified Image

**Content**

As a researcher, I would like to generate an ortho-rectified image of the Australia experiment so I can use it for conference paper results.

**Definition of Done**

[x] Coordinate with development champion of user story ‘339 – Australia Results Consolidation’

[x] Research to see what software options exist for processing this data and creating an ortho-rectified image (see notes)

[x] Watch AgiSoft tutorial at <http://www.youtube.com/channel/UCPheXwPeFLnWHo8u4ksSH7w>

[x] Create one or more ortho-rectified images using the following data sets:

[x] Swinglet data obtained from Australia experiments ([link](https://cloudstor.aarnet.edu.au/sender/?vid=193f48dc-eec9-4d49-53c3-00003423d154))

[ ] A data set generated from a handheld point and shoot camera (OPTIONAL)

[x] Demonstrate functionality and results to research group.

[x] Prepare and save results in a format suitable for integration into a conference paper.

[x] Create a document outlining how to repeat your results and upload it to an appropriate place on Perforce. Put this in a dedicated ‘AgiSoft’ folder in the ‘TechnicalDataPackage’ section.

[x] Review this document with Chris Lum.

[x] Coordinate with development champion of user story ‘428 – UWAA Fall Poster Session (2014)’

**Notes**

* UW Earth and Space Sciences has a license to <http://www.agisoft.com/> (PhotoScanPro). Coordinate with David Shean to obtain access (talk with Chris Lum)
* See \\AFSL\TechnicalDataPackage\Presentations\14\_10\_16\_David\_Shean.pdf

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## 341 – Orientation and Setup

**Content**

As a student, I would like to orient myself at the Queensland University of Technology (QUT) campus and setup my workspace and tools so that I can conduct research related to this project over the course of the class.

**Definition of Done**

[x] Attend orientation with Dr. Matt Dunbabin

[x] Obtain QUT access card

[x] Ensure that you can get online at

[x] QUT campus and classroom

[x] At home at Kangaroo Point Holiday Apartments

[x] Ensure that you can access class website.

[x] Send a test message to the email list ([australia2014@u.washington.edu](mailto:australia2014@u.washington.edu)) to ensure you can communicate.

[x] Complete pre-departure survey (class website under handouts)

[x] Ensure that you can remote log-in to UWAA (see notes)

[x] Ensure that you have U: drive space setup on UWAA servers

**Notes**

* Information to connect to UWAA servers was provided in a technical pre-departure lecture. See class website for these lecture notes if necessary.

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## 342 – Literature Review

**Content**

As a researcher, I would like to conduct a literature review of prior art so that I may familiarize myself with work that others have done in this field and become aware of the state-of-the-art of UAS for forest fire applications.

**Definition of Done**

[x] Read the following paper

Zhou, Gouqing, and Chaokui Li. "UAV Real-Time Data Processing Through Flight Trajectory and Resample Rate Analysis." In ASPR Annual Conference Proc., May, vol. 12. 2006.

[x] Read the following paper

Merino, Luis, Fernando Caballero, J. Ramiro Martínez-de-Dios, Iván Maza, and Aníbal Ollero. "An unmanned aircraft system for automatic forest fire monitoring and measurement." Journal of Intelligent & Robotic Systems 65, no. 1-4 (2012): 533-548.

~~[ ] Prepare to discuss the entirety of these papers in a “journal club” format with the group.~~

~~[ ] Prepare to present your assigned section of these papers in a “qualifying exam” format to the group.~~

**Notes**

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## 343 – Swinglet Familiarization

**Content**

As a UAS operator, I would like to familiarize myself with the operation and capabilities of the Swinglet UAS so that I can use it to conduct field experiments and collect relevant data.

**Definition of Done**

[x] Go to the website for the SwingletCAM and familiarize yourself with it <https://www.sensefly.com/drones/swinglet-cam.html>

[x] Watch videos on website and YouTube about the vehicle and associated software

[x] Download and read all articles/manuals/webpages in data package on the class website (Notes\swinglet\_files.zip)

**Notes**

* Research directed towards the ground station/control software is encapsulated in user story ‘344 – Swinglet Software Familiarization’.
* Our Swinglet serial number is SC-05-086, this is an earlier model which has since been superseded by newer firmware/software.

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## 344 – Swinglet Software Familiarization

**Content**

As a UAS operator, I would like to familiarize myself with the operation and capabilities of the Swinglet ground station software so that I can use it to conduct field experiments and collect relevant data.

**Definition of Done**

[x] Ensure that you have completed user story ‘343 – Swinglet Familiarization’.

[x] Research how the e-mo-tion software is used to control the Swinglet

[x] Research how the e-mo-tion software is used to obtain data from the Swinglet.

[x] In order to perform simulation, we need to use a newer version of the software (eMotion 2). Obtain a workstation with this software installed (or install it yourself, see notes)

[x] Familiarize yourself with the software’s operation.

[x] Perform several simulated missions to become comfortable with the system’s operation (be sure to investigate errors or non-standard operating conditions).

[x] Install Google Earth so you can visualize the flight plan in 3D.

**Notes**

* Some questions to answer during this user story include but are not limited to
  + How do I launch/retrieve the vehicle?
  + What is the default behavior of the system (what does it do immediately after taking off, how does it track to waypoints, etc.)?
  + How does the system respond to errors or other unexpected behavior during the mission?
  + How do I gather, extract, and analyze data obtained by the Swinglet?
* This does not require writing source code as we are just using the application provided by SenseFly.
* The software for the ground station is on the class website under notes\SwingletFiles.zip. You will want to run the ‘04\_swinglet\_CAM\_SC\_01\swinglet\_software\_win\_1.1.4.exe’ file to install the ground station software. Note that this does not have a simulator component and therefore is not helpful unless you want to connect to the Swinglet.
* The newer version of the software which includes a simulator component is version 2.3.1 which is also available for download on the class website. Just note that operation of the actual Swinglet will vary from the system you are training on due to the version mismatch.
* Google Earth will be useful for other operations so it is highly recommended you install this on your machine.

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## 345 – Design Flight Test Experiment

**Content**

As a researcher, I would like to plan and design the flight test experiment so I have a good understanding of the experimental procedure, the data to be collected, and the procedures to follow on the day of the flight test.

**Definition of Done**

[x] Ensure that you have completed user story ‘343 – Swinglet Familiarization’.

[x] Ensure that you have completed user story ‘344 – Swinglet Software Familiarization’.

[x] Obtain a satellite image of the Samford Ecological Research Facility and determine the area where we will be conducting flight tests.

[x] Perform research and calculations necessary to plan a reasonable flight path that will accomplish mission goals.

[x] Create an experimental procedure document. This should include at least the following items

[x] Assignment of duties to various team members

[x] A chronological list of steps to be taken during the test along with expected outcomes

[x] A list of critical data that must be gathered on the flight test

[x] Make a checklist of items to bring for the day of the flight test.

[x] Get your experimental procedure document and checklist peer reviewed by at least 1 other group.

~~[ ] Present one aspect of your experimental procedure to the group. The idea is to get all the groups talking about the experiment and possibly highlight areas that other groups have not thought of yet, and vice versa.~~

[x] Obtain instructor’s signature on both documents (experimental procedure and checklist)

[x] Obtain the QUT “green sticker” to obtain access to SERF (online test is located at <http://www.serf.qut.edu.au/about/propertyaccess>)

**Notes**

* This user story mainly captures any planning that needs to be done before the flight test. Actual work on the day of the flight test is captured in user story ‘346 – Flight Test Experiment Execution’.
* This user story must be completed at least 24 hours before the day of the flight test experiment.

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## 346 – Flight Test Experiment Execution

**Content**

As a researcher, I would like to execute one or more flight tests so that I can gather experimental data to support my research effort.

**Definition of Done**

[x] Ensure that you have completed user story ‘345 – Design Flight Test Experiment’

[x] Execute your flight test document as planned, making any deviations necessary to ensure safe and effective collection of data.

[x] Perform basic data reduction immediately after you obtain your data to ensure its integrity and validity. Repeat flight tests if necessary.

[ ] OPTIONAL: create an orthorectified composite mosaic of the flight area

[x] Photograph and log any necessary information.

[x] Ensure that you have collected all data necessary for the experiment.

**Notes**

* This user story only covers the scope of executing the flight test, other tasks such as data reduction and analysis will be captured in other user stories.
* This includes transportation time and logistic.

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## 347 – Flight Test Data Reduction and Analysis

**Content**

As a researcher, I would like to reduce the data obtained from the flight test so I can identify the relevant data and transform it into useful formats for the rest of the project.

**Definition of Done**

[x] Coordinate with relevant QUT personnel to extract relevant experimental data.

[x] Download all experimental data to a folder (this will serve as your raw data which will not be manipulated/tampered with as it is a backup)

[x] Using copies of your raw data, extract relevant information from the flight test. This includes but is not limited to

[ ] OPTIONAL: A 3D trajectory of the aircraft in Google Earth

[ ] OPTIONAL: An orthorectified mosaic image of the flight area

[x] A zoomed in, cropped photo of the fire area

[x] A downsampled, low resolution image of the fire area (both in color and black and white)

[x] Identify other interesting portions of your high resolution orthorectified image and isolate these into individual, smaller images.

[ ] Additional tasks may be added…

**Notes**

* We will likely rely on QUT personnel to assist with downloading and extracting data from the Swinglet. This will likely be Michael Warren (PhD student/pilot) and Matt Dunbabin.
* You may need additional software (such as Google Earth and Terra 3D) to perform some of this data reduction.
* Some interesting portions of the image might be areas which are occluded by smoke, shadowed areas, etc.

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## 348 – Matlab Image Processing Toolbox Familiarization

**Content**

As a student, I would like to become familiar with the capabilities and functions available in the Matlab Image Processing Toolbox so I can use it for computer vision applications.

**Definition of Done**

[x] Attend lecture discussing computer vision and image processing. (AA499)

[x] Read online documentation about the Matlab Image Processing Toolbox.

[x] Download the custom Matlab functions ‘rbg2gray2’, ‘HighlightRGBImage’ and ‘MaxValueOfDataType’ from the class website and place this in your Matlab path.

[x] Complete hw01 (in class activity)

[x] Familiarize yourself with the manipulation of images using the Matlab Image Processing Toolbox.

**Notes**

* Matlab on the UWAA servers has these toolboxes so you may want to use remote login to access this toolbox.

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## 349 – Computer Vision Fire Line Detection

**Content**

As a researcher, I would like generate a computer vision algorithm which can automatically determine the location of the fire line in an image so I can use it for other algorithms in this project.

**Definition of Done**

[x] Preprocess the imagery collected from your flight experiment to be suitable for computer analysis (see notes)

[x] Generate an automated algorithm which will detect locations in the picture where the fire line is located.

[x] Test you algorithm with other groups’ images to verify that your algorithm is robust to changing conditions.

[x] Identify scenarios where your algorithm breaks down or is not effective (for example: smoke occluded areas, too few pixels of appropriate color, changes in color due to shadows, etc.)

**Notes**

* You may want to use the down-sampled, low resolution image of the fire from user story ‘347 – Flight Test Data Reduction and Analysis’ while prototyping your algorithm and then transition to a higher resolution image once the algorithm is finalized.
* During hw01, problem 2, you will construct a prototype algorithm that has some of this functionality.

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## 350 – Fire Propagation Model

**Content**

As a researcher, I would like to generate a model of how a forest fire propagates and spreads so that I can use it to make predictions and decision on how to combat the fire.

**Definition of Done**

[x] Attend lecture on system modeling. (AA499)

[x] Skim one or two papers by Dr. Alberto Elfes about occupancy maps (see notes)

[x] Familiarize yourself with the provided Matlab functions which can be used to create and manipulate occupancy maps. Perform a soft-installation of these files so they can be used for your simulation and modeling activities.

[x] Create a low, ~~medium, and high fidelity~~ model of the fire propagation using occupancy based maps.

[x] Simulate the system just enough to gain confidence that your system is behaving as expected. More realistic simulations are captured in user story ‘352 – ’.

**Notes**

* You may want to start with a low resolution, simple model with only a few occupancy map cells and then transition to a more complex model once the algorithm is refined.
* We may have a chance to meet Dr. Alberto Elfes on Sept. 17 so it would be prudent to be somewhat familiar with his work, particularly with respect to how it can help our research.
* Closed loop control (where the vehicle makes decisions based on your model) is outside the scope of this story.

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## 351 – Fire Simulation and Analysis

**Content**

As a researcher, I would like generate a model of how a forest fire propagates and spreads so that I can use it to make predictions and decision on how to combat the fire.

**Definition of Done**

[x] Modify the simple fire simulation with some custom behavior that is of interest to your group.

[x] Generate a realistic scenarios for the fire simulation these can include (you do not need to do all of them)

[x] A fire in a dry field with a single point of ignition

[x] A fire in a complicated, heterogeneous environment with multiple points of ignition.

[x] The mock fire you created at the SERF

[ ] OPTIONAL: modify your fire line detection code to automatically identify/classify regions of your SERF aerial photo appropriately.

[x] Perform simulations showing how firefighting efforts can influence the behavior and spread of the fire (see notes).

[x] Based on analysis and simulation, provide recommendations on how to effectively combat an active fire.

[x] Create movies and still sequences showing the progression of interesting cases.

**Notes**

* Firefighting efforts can be modeled by changing the occupancy map. For example, some areas become inflammable (digging a fire break) or change their level of flammability (pouring retardant on an area).
* Pictures and movies generated during this user story will be used in user story ‘352 – Results Dissemination (Paper Publication)’ and ‘353 – Results Dissemination (Project Presentation)’.

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## 352 – Results Dissemination (Paper Publication)

**Content**

As a researcher, I would like to document my project in the format of a conference paper so that I may disseminate my results to my peers.

**Definition of Done**

[x] Read the document ‘FinalProjectDescription.docx’.

[x] Obtain a workstation with a LaTeX document creation system installed (see notes)

[x] Go to the AIAA website to [download](http://www.aiaa-scitech.org/TechPresenterResources/) resources for creating technical conference papers that can be submitted to AIAA conferences. This includes a LaTeX template which will help with automatic formatting for the paper.

[x] Document your groups’ efforts throughout the entire project. Sections to include in the paper but are not limited to

[x] Abstract

[x] Nomenclature

[x] Introduction

[x] Experimental Hardware and Methodology

[x] Image Processing and Fire Detection

[x] Dynamic System Modeling

[x] Simulation Results

[x] Conclusion

[x] Acknowledgements (as per SERF policy, we must credit SERF, the Institute for Future Environments, and QUT. Also thank SenseFly for allowing us to use educational licenses of software)

[x] References

[x] Obtain at least one peer review of your paper from another group.

[x] Submit a final draft of your paper before your presentation.

[x] Print 1 copy of your paper in color to bring to the final presentation for attendees to browse through.

**Notes**

* As discussed in the pre-departure meeting, TeXnicCenter is a good, free LaTeX IDE.
* Refer to the document ‘installing\_latex\_and\_texniccenter.docx’ on class website for more information on setting up your workstation for LaTeX document generation.
* You will be preparing a paper that is ready to submit to the 2016 AIAA Guidance, Navigation, and Control Conference. Here is a link to the [2015 GNC Conference](http://www.aiaa-scitech.org/GNC/).

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## 353 – Results Dissemination (Project Presentation)

**Content**

As a researcher, I would like to present my results to my peers in the format of a public presentation so that others can learn about the study abroad program.

**Definition of Done**

[x] Read the document ‘FinalProjectDescription.docx’ from the class website.

[x] Prepare slides for your section of the final presentation.

[x] Rehearse and prepare your sections.

[x] Integrate your slides into the master presentation

[x] Attend a dry run presentation and incorporate any feedback into the final version of your slides.

[x] Present your results on the final day of class.

[x] Sign thank you cards for all QUT stakeholders

[x] Ensure your presentation is ready to go on multiple computers (including the classroom computer) before the presentation.

**Notes**

* PowerPoint is notorious for being difficult with respect to playing movies on different computers. Therefore, if you are using movies, test to ensure they run on the master computer before the final presentation.

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## 354 – Orientation and Setup

**Content**

As a student, I would like to orient myself at the Queensland University of Technology (QUT) campus and setup my workspace and tools so that I can conduct research related to this project over the course of the class.

**Definition of Done**

[x] Attend orientation with Dr. Matt Dunbabin

[x] Obtain QUT access card

[x] Ensure that you can get online at

[x] QUT campus and classroom

[x] At home at Kangaroo Point Holiday Apartments

[x] Ensure that you can access class website.

[x] Send a test message to the email list ([australia2014@u.washington.edu](mailto:australia2014@u.washington.edu)) to ensure you can communicate.

[x] Complete pre-departure survey (class website under handouts)

[x] Ensure that you can remote log-in to UWAA (see notes)

[x] Ensure that you have U: drive space setup on UWAA servers

**Notes**

* Information to connect to UWAA servers was provided in a technical pre-departure lecture. See class website for these lecture notes if necessary.

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## 355 – Literature Review

**Content**

As a researcher, I would like to conduct a literature review of prior art so that I may familiarize myself with work that others have done in this field and become aware of the state-of-the-art of UAS for forest fire applications.

**Definition of Done**

[x] Read the following paper

Zhou, Gouqing, and Chaokui Li. "UAV Real-Time Data Processing Through Flight Trajectory and Resample Rate Analysis." In ASPR Annual Conference Proc., May, vol. 12. 2006.

[x] Read the following paper

Merino, Luis, Fernando Caballero, J. Ramiro Martínez-de-Dios, Iván Maza, and Aníbal Ollero. "An unmanned aircraft system for automatic forest fire monitoring and measurement." Journal of Intelligent & Robotic Systems 65, no. 1-4 (2012): 533-548.

~~[ ] Prepare to discuss the entirety of these papers in a “journal club” format with the group.~~

~~[ ] Prepare to present your assigned section of these papers in a “qualifying exam” format to the group.~~

**Notes**

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## 356 – Swinglet Familiarization

**Content**

As a UAS operator, I would like to familiarize myself with the operation and capabilities of the Swinglet UAS so that I can use it to conduct field experiments and collect relevant data.

**Definition of Done**

[x] Go to the website for the SwingletCAM and familiarize yourself with it <https://www.sensefly.com/drones/swinglet-cam.html>

[x] Watch videos on website and YouTube about the vehicle and associated software

[x] Download and read all articles/manuals/webpages in data package on the class website (Notes\swinglet\_files.zip)

**Notes**

* Research directed towards the ground station/control software is encapsulated in user story ‘344 – Swinglet Software Familiarization’.
* Our Swinglet serial number is SC-05-086, this is an earlier model which has since been superseded by newer firmware/software.

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## 357 – Swinglet Software Familiarization

**Content**

As a UAS operator, I would like to familiarize myself with the operation and capabilities of the Swinglet ground station software so that I can use it to conduct field experiments and collect relevant data.

**Definition of Done**

[x] Ensure that you have completed user story ‘343 – Swinglet Familiarization’.

[x] Research how the e-mo-tion software is used to control the Swinglet

[x] Research how the e-mo-tion software is used to obtain data from the Swinglet.

[x] In order to perform simulation, we need to use a newer version of the software (eMotion 2). Obtain a workstation with this software installed (or install it yourself, see notes)

[x] Familiarize yourself with the software’s operation.

[x] Perform several simulated missions to become comfortable with the system’s operation (be sure to investigate errors or non-standard operating conditions).

[x] Install Google Earth so you can visualize the flight plan in 3D.

**Notes**

* Some questions to answer during this user story include but are not limited to
  + How do I launch/retrieve the vehicle?
  + What is the default behavior of the system (what does it do immediately after taking off, how does it track to waypoints, etc.)?
  + How does the system respond to errors or other unexpected behavior during the mission?
  + How do I gather, extract, and analyze data obtained by the Swinglet?
* This does not require writing source code as we are just using the application provided by SenseFly.
* The software for the ground station is on the class website under notes\SwingletFiles.zip. You will want to run the ‘04\_swinglet\_CAM\_SC\_01\swinglet\_software\_win\_1.1.4.exe’ file to install the ground station software. Note that this does not have a simulator component and therefore is not helpful unless you want to connect to the Swinglet.
* The newer version of the software which includes a simulator component is version 2.3.1 which is also available for download on the class website. Just note that operation of the actual Swinglet will vary from the system you are training on due to the version mismatch.
* Google Earth will be useful for other operations so it is highly recommended you install this on your machine.

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## 358 – Design Flight Test Experiment

**Content**

As a researcher, I would like to plan and design the flight test experiment so I have a good understanding of the experimental procedure, the data to be collected, and the procedures to follow on the day of the flight test.

**Definition of Done**

[x] Ensure that you have completed user story ‘343 – Swinglet Familiarization’.

[x] Ensure that you have completed user story ‘344 – Swinglet Software Familiarization’.

[x] Obtain a satellite image of the Samford Ecological Research Facility and determine the area where we will be conducting flight tests.

[x] Perform research and calculations necessary to plan a reasonable flight path that will accomplish mission goals.

[x] Create an experimental procedure document. This should include at least the following items

[x] Assignment of duties to various team members

[x] A chronological list of steps to be taken during the test along with expected outcomes

[x] A list of critical data that must be gathered on the flight test

[x] Make a checklist of items to bring for the day of the flight test.

[x] Get your experimental procedure document and checklist peer reviewed by at least 1 other group.

~~[ ] Present one aspect of your experimental procedure to the group. The idea is to get all the groups talking about the experiment and possibly highlight areas that other groups have not thought of yet, and vice versa.~~

[x] Obtain instructor’s signature on both documents (experimental procedure and checklist)

[x] Obtain the QUT “green sticker” to obtain access to SERF (online test is located at <http://www.serf.qut.edu.au/about/propertyaccess>)

**Notes**

* This user story mainly captures any planning that needs to be done before the flight test. Actual work on the day of the flight test is captured in user story ‘346 – Flight Test Experiment Execution’.
* This user story must be completed at least 24 hours before the day of the flight test experiment.

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## 359 – Flight Test Experiment Execution

**Content**

As a researcher, I would like to execute one or more flight tests so that I can gather experimental data to support my research effort.

**Definition of Done**

[x] Ensure that you have completed user story ‘345 – Design Flight Test Experiment’

[x] Execute your flight test document as planned, making any deviations necessary to ensure safe and effective collection of data.

[x] Perform basic data reduction immediately after you obtain your data to ensure its integrity and validity. Repeat flight tests if necessary.

[ ] OPTIONAL: create an orthorectified composite mosaic of the flight area

[x] Photograph and log any necessary information.

[x] Ensure that you have collected all data necessary for the experiment.

**Notes**

* This user story only covers the scope of executing the flight test, other tasks such as data reduction and analysis will be captured in other user stories.
* This includes transportation time and logistic.

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## 360 – Flight Test Data Reduction and Analysis

**Content**

As a researcher, I would like to reduce the data obtained from the flight test so I can identify the relevant data and transform it into useful formats for the rest of the project.

**Definition of Done**

[x] Coordinate with relevant QUT personnel to extract relevant experimental data.

[x] Download all experimental data to a folder (this will serve as your raw data which will not be manipulated/tampered with as it is a backup)

[x] Using copies of your raw data, extract relevant information from the flight test. This includes but is not limited to

[ ] OPTIONAL: A 3D trajectory of the aircraft in Google Earth

[ ] OPTIONAL: An orthorectified mosaic image of the flight area

[x] A zoomed in, cropped photo of the fire area

[x] A downsampled, low resolution image of the fire area (both in color and black and white)

[x] Identify other interesting portions of your high resolution orthorectified image and isolate these into individual, smaller images.

[ ] Additional tasks may be added…

**Notes**

* We will likely rely on QUT personnel to assist with downloading and extracting data from the Swinglet. This will likely be Michael Warren (PhD student/pilot) and Matt Dunbabin.
* You may need additional software (such as Google Earth and Terra 3D) to perform some of this data reduction.
* Some interesting portions of the image might be areas which are occluded by smoke, shadowed areas, etc.

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## 361 – Matlab Image Processing Toolbox Familiarization

**Content**

As a student, I would like to become familiar with the capabilities and functions available in the Matlab Image Processing Toolbox so I can use it for computer vision applications.

**Definition of Done**

[x] Attend lecture discussing computer vision and image processing. (AA499)

[x] Read online documentation about the Matlab Image Processing Toolbox.

[x] Download the custom Matlab functions ‘rbg2gray2’, ‘HighlightRGBImage’ and ‘MaxValueOfDataType’ from the class website and place this in your Matlab path.

[x] Complete hw01 (in class activity)

[x] Familiarize yourself with the manipulation of images using the Matlab Image Processing Toolbox.

**Notes**

* Matlab on the UWAA servers has these toolboxes so you may want to use remote login to access this toolbox.

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## 362 – Computer Vision Fire Line Detection

**Content**

As a researcher, I would like generate a computer vision algorithm which can automatically determine the location of the fire line in an image so I can use it for other algorithms in this project.

**Definition of Done**

[x] Preprocess the imagery collected from your flight experiment to be suitable for computer analysis (see notes)

[x] Generate an automated algorithm which will detect locations in the picture where the fire line is located.

[x] Test you algorithm with other groups’ images to verify that your algorithm is robust to changing conditions.

[x] Identify scenarios where your algorithm breaks down or is not effective (for example: smoke occluded areas, too few pixels of appropriate color, changes in color due to shadows, etc.)

**Notes**

* You may want to use the down-sampled, low resolution image of the fire from user story ‘347 – Flight Test Data Reduction and Analysis’ while prototyping your algorithm and then transition to a higher resolution image once the algorithm is finalized.
* During hw01, problem 2, you will construct a prototype algorithm that has some of this functionality.

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## 363 – Fire Propagation Model

**Content**

As a researcher, I would like to generate a model of how a forest fire propagates and spreads so that I can use it to make predictions and decision on how to combat the fire.

**Definition of Done**

[x] Attend lecture on system modeling. (AA499)

[x] Skim one or two papers by Dr. Alberto Elfes about occupancy maps (see notes)

[x] Familiarize yourself with the provided Matlab functions which can be used to create and manipulate occupancy maps. Perform a soft-installation of these files so they can be used for your simulation and modeling activities.

[x] Create a low, ~~medium, and high fidelity~~ model of the fire propagation using occupancy based maps.

[x] Simulate the system just enough to gain confidence that your system is behaving as expected. More realistic simulations are captured in user story ‘352 – ’.

**Notes**

* You may want to start with a low resolution, simple model with only a few occupancy map cells and then transition to a more complex model once the algorithm is refined.
* We may have a chance to meet Dr. Alberto Elfes on Sept. 17 so it would be prudent to be somewhat familiar with his work, particularly with respect to how it can help our research.
* Closed loop control (where the vehicle makes decisions based on your model) is outside the scope of this story.

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## 364 – Fire Simulation and Analysis

**Content**

As a researcher, I would like generate a model of how a forest fire propagates and spreads so that I can use it to make predictions and decision on how to combat the fire.

**Definition of Done**

[x] Modify the simple fire simulation with some custom behavior that is of interest to your group.

[x] Generate a realistic scenarios for the fire simulation these can include (you do not need to do all of them)

[x] A fire in a dry field with a single point of ignition

[x] A fire in a complicated, heterogeneous environment with multiple points of ignition.

[x] The mock fire you created at the SERF

[ ] OPTIONAL: modify your fire line detection code to automatically identify/classify regions of your SERF aerial photo appropriately.

[x] Perform simulations showing how firefighting efforts can influence the behavior and spread of the fire (see notes).

[x] Based on analysis and simulation, provide recommendations on how to effectively combat an active fire.

[x] Create movies and still sequences showing the progression of interesting cases.

**Notes**

* Firefighting efforts can be modeled by changing the occupancy map. For example, some areas become inflammable (digging a fire break) or change their level of flammability (pouring retardant on an area).
* Pictures and movies generated during this user story will be used in user story ‘352 – Results Dissemination (Paper Publication)’ and ‘353 – Results Dissemination (Project Presentation)’.

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## 365 – Results Dissemination (Paper Publication)

**Content**

As a researcher, I would like to document my project in the format of a conference paper so that I may disseminate my results to my peers.

**Definition of Done**

[x] Read the document ‘FinalProjectDescription.docx’.

[x] Obtain a workstation with a LaTeX document creation system installed (see notes)

[x] Go to the AIAA website to [download](http://www.aiaa-scitech.org/TechPresenterResources/) resources for creating technical conference papers that can be submitted to AIAA conferences. This includes a LaTeX template which will help with automatic formatting for the paper.

[x] Document your groups’ efforts throughout the entire project. Sections to include in the paper but are not limited to

[x] Abstract

[x] Nomenclature

[x] Introduction

[x] Experimental Hardware and Methodology

[x] Image Processing and Fire Detection

[x] Dynamic System Modeling

[x] Simulation Results

[x] Conclusion

[x] Acknowledgements (as per SERF policy, we must credit SERF, the Institute for Future Environments, and QUT. Also thank SenseFly for allowing us to use educational licenses of software)

[x] References

[x] Obtain at least one peer review of your paper from another group.

[x] Submit a final draft of your paper before your presentation.

[x] Print 1 copy of your paper in color to bring to the final presentation for attendees to browse through.

**Notes**

* As discussed in the pre-departure meeting, TeXnicCenter is a good, free LaTeX IDE.
* Refer to the document ‘installing\_latex\_and\_texniccenter.docx’ on class website for more information on setting up your workstation for LaTeX document generation.
* You will be preparing a paper that is ready to submit to the 2016 AIAA Guidance, Navigation, and Control Conference. Here is a link to the [2015 GNC Conference](http://www.aiaa-scitech.org/GNC/).

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## 366 – Results Dissemination (Project Presentation)

**Content**

As a researcher, I would like to present my results to my peers in the format of a public presentation so that others can learn about the study abroad program.

**Definition of Done**

[x] Read the document ‘FinalProjectDescription.docx’ from the class website.

[x] Prepare slides for your section of the final presentation.

[x] Rehearse and prepare your sections.

[x] Integrate your slides into the master presentation

[x] Attend a dry run presentation and incorporate any feedback into the final version of your slides.

[x] Present your results on the final day of class.

[x] Sign thank you cards for all QUT stakeholders

[x] Ensure your presentation is ready to go on multiple computers (including the classroom computer) before the presentation.

**Notes**

* PowerPoint is notorious for being difficult with respect to playing movies on different computers. Therefore, if you are using movies, test to ensure they run on the master computer before the final presentation.

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## 367 – Orientation and Setup

**Content**

As a student, I would like to orient myself at the Queensland University of Technology (QUT) campus and setup my workspace and tools so that I can conduct research related to this project over the course of the class.

**Definition of Done**

[x] Attend orientation with Dr. Matt Dunbabin

[x] Obtain QUT access card

[x] Ensure that you can get online at

[x] QUT campus and classroom

[x] At home at Kangaroo Point Holiday Apartments

[x] Ensure that you can access class website.

[x] Send a test message to the email list ([australia2014@u.washington.edu](mailto:australia2014@u.washington.edu)) to ensure you can communicate.

[x] Complete pre-departure survey (class website under handouts)

[x] Ensure that you can remote log-in to UWAA (see notes)

[x] Ensure that you have U: drive space setup on UWAA servers

**Notes**

* Information to connect to UWAA servers was provided in a technical pre-departure lecture. See class website for these lecture notes if necessary.

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## 368 – Literature Review

**Content**

As a researcher, I would like to conduct a literature review of prior art so that I may familiarize myself with work that others have done in this field and become aware of the state-of-the-art of UAS for forest fire applications.

**Definition of Done**

[x] Read the following paper

Zhou, Gouqing, and Chaokui Li. "UAV Real-Time Data Processing Through Flight Trajectory and Resample Rate Analysis." In ASPR Annual Conference Proc., May, vol. 12. 2006.

[x] Read the following paper

Merino, Luis, Fernando Caballero, J. Ramiro Martínez-de-Dios, Iván Maza, and Aníbal Ollero. "An unmanned aircraft system for automatic forest fire monitoring and measurement." Journal of Intelligent & Robotic Systems 65, no. 1-4 (2012): 533-548.

~~[ ] Prepare to discuss the entirety of these papers in a “journal club” format with the group.~~

~~[ ] Prepare to present your assigned section of these papers in a “qualifying exam” format to the group.~~

**Notes**

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## 369 – Swinglet Familiarization

**Content**

As a UAS operator, I would like to familiarize myself with the operation and capabilities of the Swinglet UAS so that I can use it to conduct field experiments and collect relevant data.

**Definition of Done**

[x] Go to the website for the SwingletCAM and familiarize yourself with it <https://www.sensefly.com/drones/swinglet-cam.html>

[x] Watch videos on website and YouTube about the vehicle and associated software

[x] Download and read all articles/manuals/webpages in data package on the class website (Notes\swinglet\_files.zip)

**Notes**

* Research directed towards the ground station/control software is encapsulated in user story ‘344 – Swinglet Software Familiarization’.
* Our Swinglet serial number is SC-05-086, this is an earlier model which has since been superseded by newer firmware/software.

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## 370 – Swinglet Software Familiarization

**Content**

As a UAS operator, I would like to familiarize myself with the operation and capabilities of the Swinglet ground station software so that I can use it to conduct field experiments and collect relevant data.

**Definition of Done**

[x] Ensure that you have completed user story ‘343 – Swinglet Familiarization’.

[x] Research how the e-mo-tion software is used to control the Swinglet

[x] Research how the e-mo-tion software is used to obtain data from the Swinglet.

[x] In order to perform simulation, we need to use a newer version of the software (eMotion 2). Obtain a workstation with this software installed (or install it yourself, see notes)

[x] Familiarize yourself with the software’s operation.

[x] Perform several simulated missions to become comfortable with the system’s operation (be sure to investigate errors or non-standard operating conditions).

[x] Install Google Earth so you can visualize the flight plan in 3D.

**Notes**

* Some questions to answer during this user story include but are not limited to
  + How do I launch/retrieve the vehicle?
  + What is the default behavior of the system (what does it do immediately after taking off, how does it track to waypoints, etc.)?
  + How does the system respond to errors or other unexpected behavior during the mission?
  + How do I gather, extract, and analyze data obtained by the Swinglet?
* This does not require writing source code as we are just using the application provided by SenseFly.
* The software for the ground station is on the class website under notes\SwingletFiles.zip. You will want to run the ‘04\_swinglet\_CAM\_SC\_01\swinglet\_software\_win\_1.1.4.exe’ file to install the ground station software. Note that this does not have a simulator component and therefore is not helpful unless you want to connect to the Swinglet.
* The newer version of the software which includes a simulator component is version 2.3.1 which is also available for download on the class website. Just note that operation of the actual Swinglet will vary from the system you are training on due to the version mismatch.
* Google Earth will be useful for other operations so it is highly recommended you install this on your machine.

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## 371 – Design Flight Test Experiment

**Content**

As a researcher, I would like to plan and design the flight test experiment so I have a good understanding of the experimental procedure, the data to be collected, and the procedures to follow on the day of the flight test.

**Definition of Done**

[x] Ensure that you have completed user story ‘343 – Swinglet Familiarization’.

[x] Ensure that you have completed user story ‘344 – Swinglet Software Familiarization’.

[x] Obtain a satellite image of the Samford Ecological Research Facility and determine the area where we will be conducting flight tests.

[x] Perform research and calculations necessary to plan a reasonable flight path that will accomplish mission goals.

[x] Create an experimental procedure document. This should include at least the following items

[x] Assignment of duties to various team members

[x] A chronological list of steps to be taken during the test along with expected outcomes

[x] A list of critical data that must be gathered on the flight test

[x] Make a checklist of items to bring for the day of the flight test.

[x] Get your experimental procedure document and checklist peer reviewed by at least 1 other group.

~~[ ] Present one aspect of your experimental procedure to the group. The idea is to get all the groups talking about the experiment and possibly highlight areas that other groups have not thought of yet, and vice versa.~~

[x] Obtain instructor’s signature on both documents (experimental procedure and checklist)

[x] Obtain the QUT “green sticker” to obtain access to SERF (online test is located at <http://www.serf.qut.edu.au/about/propertyaccess>)

**Notes**

* This user story mainly captures any planning that needs to be done before the flight test. Actual work on the day of the flight test is captured in user story ‘346 – Flight Test Experiment Execution’.
* This user story must be completed at least 24 hours before the day of the flight test experiment.

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## 372 – Flight Test Experiment Execution

**Content**

As a researcher, I would like to execute one or more flight tests so that I can gather experimental data to support my research effort.

**Definition of Done**

[x] Ensure that you have completed user story ‘345 – Design Flight Test Experiment’

[x] Execute your flight test document as planned, making any deviations necessary to ensure safe and effective collection of data.

[x] Perform basic data reduction immediately after you obtain your data to ensure its integrity and validity. Repeat flight tests if necessary.

[ ] OPTIONAL: create an orthorectified composite mosaic of the flight area

[x] Photograph and log any necessary information.

[x] Ensure that you have collected all data necessary for the experiment.

**Notes**

* This user story only covers the scope of executing the flight test, other tasks such as data reduction and analysis will be captured in other user stories.
* This includes transportation time and logistic.

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## 373 – Flight Test Data Reduction and Analysis

**Content**

As a researcher, I would like to reduce the data obtained from the flight test so I can identify the relevant data and transform it into useful formats for the rest of the project.

**Definition of Done**

[x] Coordinate with relevant QUT personnel to extract relevant experimental data.

[x] Download all experimental data to a folder (this will serve as your raw data which will not be manipulated/tampered with as it is a backup)

[x] Using copies of your raw data, extract relevant information from the flight test. This includes but is not limited to

[ ] OPTIONAL: A 3D trajectory of the aircraft in Google Earth

[ ] OPTIONAL: An orthorectified mosaic image of the flight area

[x] A zoomed in, cropped photo of the fire area

[x] A downsampled, low resolution image of the fire area (both in color and black and white)

[x] Identify other interesting portions of your high resolution orthorectified image and isolate these into individual, smaller images.

[ ] Additional tasks may be added…

**Notes**

* We will likely rely on QUT personnel to assist with downloading and extracting data from the Swinglet. This will likely be Michael Warren (PhD student/pilot) and Matt Dunbabin.
* You may need additional software (such as Google Earth and Terra 3D) to perform some of this data reduction.
* Some interesting portions of the image might be areas which are occluded by smoke, shadowed areas, etc.

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## 374 – Matlab Image Processing Toolbox Familiarization

**Content**

As a student, I would like to become familiar with the capabilities and functions available in the Matlab Image Processing Toolbox so I can use it for computer vision applications.

**Definition of Done**

[x] Attend lecture discussing computer vision and image processing. (AA499)

[x] Read online documentation about the Matlab Image Processing Toolbox.

[x] Download the custom Matlab functions ‘rbg2gray2’, ‘HighlightRGBImage’ and ‘MaxValueOfDataType’ from the class website and place this in your Matlab path.

[x] Complete hw01 (in class activity)

[x] Familiarize yourself with the manipulation of images using the Matlab Image Processing Toolbox.

**Notes**

* Matlab on the UWAA servers has these toolboxes so you may want to use remote login to access this toolbox.

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## 375 – Computer Vision Fire Line Detection

**Content**

As a researcher, I would like generate a computer vision algorithm which can automatically determine the location of the fire line in an image so I can use it for other algorithms in this project.

**Definition of Done**

[x] Preprocess the imagery collected from your flight experiment to be suitable for computer analysis (see notes)

[x] Generate an automated algorithm which will detect locations in the picture where the fire line is located.

[x] Test you algorithm with other groups’ images to verify that your algorithm is robust to changing conditions.

[x] Identify scenarios where your algorithm breaks down or is not effective (for example: smoke occluded areas, too few pixels of appropriate color, changes in color due to shadows, etc.)

**Notes**

* You may want to use the down-sampled, low resolution image of the fire from user story ‘347 – Flight Test Data Reduction and Analysis’ while prototyping your algorithm and then transition to a higher resolution image once the algorithm is finalized.
* During hw01, problem 2, you will construct a prototype algorithm that has some of this functionality.

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## 376 – Fire Propagation Model

**Content**

As a researcher, I would like to generate a model of how a forest fire propagates and spreads so that I can use it to make predictions and decision on how to combat the fire.

**Definition of Done**

[x] Attend lecture on system modeling. (AA499)

[x] Skim one or two papers by Dr. Alberto Elfes about occupancy maps (see notes)

[x] Familiarize yourself with the provided Matlab functions which can be used to create and manipulate occupancy maps. Perform a soft-installation of these files so they can be used for your simulation and modeling activities.

[x] Create a low, ~~medium, and high fidelity~~ model of the fire propagation using occupancy based maps.

[x] Simulate the system just enough to gain confidence that your system is behaving as expected. More realistic simulations are captured in user story ‘352 – ’.

**Notes**

* You may want to start with a low resolution, simple model with only a few occupancy map cells and then transition to a more complex model once the algorithm is refined.
* We may have a chance to meet Dr. Alberto Elfes on Sept. 17 so it would be prudent to be somewhat familiar with his work, particularly with respect to how it can help our research.
* Closed loop control (where the vehicle makes decisions based on your model) is outside the scope of this story.

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## 377 – Fire Simulation and Analysis

**Content**

As a researcher, I would like generate a model of how a forest fire propagates and spreads so that I can use it to make predictions and decision on how to combat the fire.

**Definition of Done**

[x] Modify the simple fire simulation with some custom behavior that is of interest to your group.

[x] Generate a realistic scenarios for the fire simulation these can include (you do not need to do all of them)

[x] A fire in a dry field with a single point of ignition

[x] A fire in a complicated, heterogeneous environment with multiple points of ignition.

[x] The mock fire you created at the SERF

[ ] OPTIONAL: modify your fire line detection code to automatically identify/classify regions of your SERF aerial photo appropriately.

[x] Perform simulations showing how firefighting efforts can influence the behavior and spread of the fire (see notes).

[x] Based on analysis and simulation, provide recommendations on how to effectively combat an active fire.

[x] Create movies and still sequences showing the progression of interesting cases.

**Notes**

* Firefighting efforts can be modeled by changing the occupancy map. For example, some areas become inflammable (digging a fire break) or change their level of flammability (pouring retardant on an area).
* Pictures and movies generated during this user story will be used in user story ‘352 – Results Dissemination (Paper Publication)’ and ‘353 – Results Dissemination (Project Presentation)’.

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## 378 – Results Dissemination (Paper Publication)

**Content**

As a researcher, I would like to document my project in the format of a conference paper so that I may disseminate my results to my peers.

**Definition of Done**

[x] Read the document ‘FinalProjectDescription.docx’.

[x] Obtain a workstation with a LaTeX document creation system installed (see notes)

[x] Go to the AIAA website to [download](http://www.aiaa-scitech.org/TechPresenterResources/) resources for creating technical conference papers that can be submitted to AIAA conferences. This includes a LaTeX template which will help with automatic formatting for the paper.

[x] Document your groups’ efforts throughout the entire project. Sections to include in the paper but are not limited to

[x] Abstract

[x] Nomenclature

[x] Introduction

[x] Experimental Hardware and Methodology

[x] Image Processing and Fire Detection

[x] Dynamic System Modeling

[x] Simulation Results

[x] Conclusion

[x] Acknowledgements (as per SERF policy, we must credit SERF, the Institute for Future Environments, and QUT. Also thank SenseFly for allowing us to use educational licenses of software)

[x] References

[x] Obtain at least one peer review of your paper from another group.

[x] Submit a final draft of your paper before your presentation.

[x] Print 1 copy of your paper in color to bring to the final presentation for attendees to browse through.

**Notes**

* As discussed in the pre-departure meeting, TeXnicCenter is a good, free LaTeX IDE.
* Refer to the document ‘installing\_latex\_and\_texniccenter.docx’ on class website for more information on setting up your workstation for LaTeX document generation.
* You will be preparing a paper that is ready to submit to the 2016 AIAA Guidance, Navigation, and Control Conference. Here is a link to the [2015 GNC Conference](http://www.aiaa-scitech.org/GNC/).

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## 379 – Results Dissemination (Project Presentation)

**Content**

As a researcher, I would like to present my results to my peers in the format of a public presentation so that others can learn about the study abroad program.

**Definition of Done**

[x] Read the document ‘FinalProjectDescription.docx’ from the class website.

[x] Prepare slides for your section of the final presentation.

[x] Rehearse and prepare your sections.

[x] Integrate your slides into the master presentation

[x] Attend a dry run presentation and incorporate any feedback into the final version of your slides.

[x] Present your results on the final day of class.

[x] Sign thank you cards for all QUT stakeholders

[x] Ensure your presentation is ready to go on multiple computers (including the classroom computer) before the presentation.

**Notes**

* PowerPoint is notorious for being difficult with respect to playing movies on different computers. Therefore, if you are using movies, test to ensure they run on the master computer before the final presentation.

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## 380 – Sprint Metrics

**Content**

As a project manager, I would like to generate a series of automatic metric analysis metrics so I can use it to analyze performance and manage projects.

**Definition of Done**

[ ] Coordinate with Chris Lum to plan metrics

~~[ ] Update the existing Excel spreadsheet with new team member information.~~

[ ] Create a system to automatically import user story data into Matlab (see notes)

[ ] Write a Matlab software module to automatically analyze user stories and generate summaries. Information included in the summary should include but not be limited to:

[ ] Story points per developer (accepted, descoped, dropped, etc.)

[ ] Total team story points

[ ] Story points per developer

**Notes**

* See \\AFSL\UserStories\Analysis\MAIN\_UserStoryAnalysis.m for some skeleton infrastructure.
* The goal of this Matlab software is to generate outputs similar to those shown in the ‘sprint metric’ and ‘developer metric’ tabs of the user\_stories.xlsx spreadsheet.
* The Matlab software should be able to directly import data from the Excel spreadsheet (see <https://www.mathworks.com/help/matlab/ref/xlsread.html> )

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## 381 – UW Engineering Societies Fair

**Content**

As a marketing representative, I would like to prepare for the UW Engineering Societies Fair so that I can promote our activities to the UW community and recruit new members.

**Definition of Done**

[x] Coordinate with Chris Lum to plan booth setup

[x] Obtain necessary videos and props for the booth

[x] Coordinate with Sean O’Dell

[x] Recruit AFSL members to help man the booth and attend the fair on Oct. 8, 2014 in McCarty Hall (ABC rooms)

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## 382 – Apply BSD Software License

**Content**

As a project manager, I would like to apply the appropriate software license to the UW code so that it can be licensed and distributed.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Read the BSD software license and understand it.

[ ] Create a small presentation about the license and present it to the research group

[ ] TBD…

**Notes**

* See email from Laura Dorsey on 08/25/14

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## 383 – Clean Up User Stories

**Content**

As a project manager, I would like to clean up the user stories so that I can continue using a single user story system to capture all work for all projects associated with the AFSL lab.

**Definition of Done**

[x] Coordinate with Chris Lum

[x] Go through the user story document and ensure that all accepted stories have all definition of done tasks marked with an ‘x’

[x] Update user story spreadsheet to have all current lab members captured

[x] Ensure that all user story documents/spreadsheets from past projects have been ported to the single, unified system and these old files are removed from Perforce (to avoid have duplicate data in two separate locations). Note: replace these files with a pointer notifying users where they can now find the information.

[x] Move all user story demos from old projects to the new location

[x] Verify with Chris Lum that all work is completed appropriately.

**Notes**

* We used to have multiple user story documents (one per project) and now we have a single user story system.

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## 384 – APM Firmware Preparation/Installation

**Content**

As a software developer, I want to ensure that I can modify and upload new firmware to the APM 2.6 so that I can eventually add new flight modes to the system.

**Definition of Done**

[x] Coordinate with Chris Lum and Daniel Ablog

[x] Obtain keys/access to AERB 139 (have a member of the lab show you how to lock the door properly).

[x] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[x] Play around with the APM so you are familiar with its “nominal” operation.

[x] Build APM: Plane off-the-shelf firmware using the Arduino IDE by following the directions on the APM website “How to Build Ardupilot with Arduino (Windows)”

http://dev.ardupilot.com/wiki/building-ardupilot-with-arduino-windows/

[x] Verify that APM: Plane off-the-shelf code builds successfully

[x] Verify that you can modify the APM firmware

[x] Verify that you can return the system to factory status. (IMPORTANT)

[x] Upload the firmware onto the ArduPilot 6.0 using directions on APM website “Uploading the Code”

[x] Adjust PIDs and gains via Mission Planner as needed (Could be used as a separate user story)

**Notes**

* Daniel Ablog has expertise in the area of modifying firmware of the APM.
* Justin Taft, Melanie Clark and Angel Rodriguez have experience working with the APM and setting it up.
* You will use the standard Arduino IDE (not Visual Studio) to make these modifications. Later on, when we switch to Visual Studio, your expertise and experience will be helpful to compare and contrast workflows.
* All we care about is establishing a workflow whereby we can make custom changes to the APM autopilot.
* All equipment/hardware/computing is in the lab (AERB139).

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## 385 – APM Editing/Building Code Via Visual Studio 2008-2013

**Content**

As a software developer and algorithm designer, I would like to setup a development environment to modify, compile, and load custom software for the APM system so that I can create custom flight modes and otherwise modify the system for my custom purposes.

**Definition of Done**

[x] Coordinate with Chris Lum and Daniel Ablog

[x] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[x] Investigate “Building APM with Atmel Studio or Visual Studio & Visual Micro” [ ] ([link](http://www.visualmicro.com/))

[x] Download/install a version of Microsoft Visual Studio (2008-2013)

[x] Download/install the latest version of the Arduino IDE

[x] Download/install Visual Micro from APM website:

http://www.visualmicro.com/

[x] Setup Visual Micro on your computer using the directions on the APM website:

http://dev.ardupilot.com/wiki/building-ardupilot-apm-with-visual-studio-visual-micro/

[x] Write simple code in the Arduino IDE

[x] Investigate how to convert .ide files to Microsoft Visual Studio

[x] Upload Arduino IDE code into Visual Studio

[x] Successfully build your simple code in Visual Studio

[x] Verify that you can modify the APM firmware

[x] Verify that you can return the system to factory status.

**Notes**

* Daniel Ablog has expertise in this area.
* Daniel Ablog tried this user story but got stuck. We switch development champions on 11/15/14.
* A lot of good information is located at <http://dev.ardupilot.com/>

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## 386 – Update Laboratory Computing Infrastructure

**Content**

As a project manager, I would like update and computing infrastructure within the AFSL to support various projects in the lab.

**Definition of Done**

[x] Coordinate with Chris Lum to discuss.

[x] Audit and assess existing lab computing hardware.

[x] Distribute computing resources appropriately.

[x] Install relevant software and sync relevant depots to the machines.

[x] Evaluate UWLAB60 computer and install new memory on the computer and possibly upgrade the graphics card. The goals is to have this running X-Plane 10 smoothly.

* Tried this and it is not compatible with the RAM we have so we will leave the computer as is.

**Notes**

* Some lab members will not have individual perforce accounts and as such, they will need to use these existing, shared computing resources to access files.
* This story only entails updating existing hardware systems, another story will cover purchasing new materials.

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## 387 – Purchase Laboratory Computing Infrastructure

**Content**

As a project manager, I would like purchase computing infrastructure to support various projects in the lab.

**Definition of Done**

[x] Coordinate with Chris Lum to discuss.

[x] Audit and assess existing lab computing hardware.

[x] Create a document of computing requirements and usages within the lab (this document should list what different software applications we use in the lab and how we use computers).

[x] Augment the computing requirements document with potential future applications.

[x] Some other computer equipment and accessories that may be required include but are not limited to:

[x] Analog video capture card

[x] USB mouse/keyboard

[x] Joystick 1 (Microsoft SideWinder X05-92626)

[x] Joystick 2 (Microsoft Force Feedback 2 Joystick X05-63776)

[x] Peer review this with Chris Lum and determine what type of computing hardware we need to purchase.

[x] Coordinate to purchase new system(s)

[x] Setup new system(s) within the lab. This includes but is not limited to the following:

[x] Name the computer ‘AFSLCONDOR’

[x] Create an administrator account named ‘root’ with the standard lab password

[x] Create a non-administor account named ‘afsl’ (coordinate w/ Chris L. to choose a password)

[x] Ensure that we have necessary licenses, software, drivers, etc. to rebuild the system from stratch.

[x] Build the computer to standard configuration (a minimal amount of core software). This includes but is not limited to (coordinate with Chris Lum for any of these components):

[x] Windows 8

[x] Matlab w/ an appropriate license (likely a standalong named user to allow remote operation)

[x] Visual Studio 2012

[x] Microsoft Office 2013

[x] VLC Media Player

[x] SSH Tectia (for FTP, see Chris Lum)

[x] Sophos Anti virus

[x] GoogleEarth

[x] Perforce Visual Client (P4V)

[x] PDF Xchange Viewer v2.5

[x] PDFCreator 1.2 (do NOT get the latest version of this as it has spyware, use this version)

[x] Windows Movie Maker

[x] MikTex 2.9

[x] TexMaker

[x] Mozilla Firefox

[x] Create a system restore/image of this at this point so we can quickly wipe the machine and restore it to this configuration. Coordinate with Chris Lum to store this image on the lab’s back up hard drive.

[x] Fix the overheating problem (waiting on the fan).

**Notes**

* Some lab members will not have individual perforce accounts and as such, they will need to use this new, shared computing resource to access files.
* A used computer resource such as PC Recycle ([link](http://www.pcrecycle.net/find-a-location-near-you/)) or REPC ([link](http://www.repc.com/)) may be a good place to purchase equipment.
* Check in the AFSL lab to see if joysticks or other hardware already exist and are simply lost in storage.
* Be sure that you take X-Plane simulation into account with this user story (this is a fairly demanding application).
* This system should also have the capability to house a video capture card (this mean you should have extra PCI or whatever is the relevant interface on the motherboard). Coordinate with Keisuke Tsujita to discuss video capture requirements.
* The system may need to be portable so we can operate it in the field. Weight advantages of a laptop vs. desktop configuration.
* Investigate methods to allow the system to operate without 120 VAC power. Some suggestions linclude but are not limited to:
  + UPS (uninterupped power supplies)
  + A small generator although the noise/emissions created by a generator are undesirable.
  + Inverters and car battery configurations
* This computer should be less than $500 if possible.

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## 388 – Australia Conference Paper (Position 1)

**Content**

As a researcher, I would like to compile the results of the Australia Brushfire project into a conference paper that can be published so that I can spread awareness of our efforts.

**Definition of Done**

Paper Logistics

[x] Obtain source code for the “toy” paper written during the study abroad class during early fall start 2014.

[x] Create a list of deadlines for the conference and ensure that these deadlines are on all relevant people’s calendars.

Paper Creation

[x] Compile all results into a conference paper (this task should be broken up into multiple sub-tasks)

[x] Ensure that Matthew Dunbabin is an author and has been given a copy of the paper to review.

[ ] Ensure that we thank the relevant QUT personnel (this includes but is not limited to: Michael Warren, Ray Russell, etc.)

[ ] Ensure that we thank SERF appropriately.

[ ] Ensure that we thank SenseFly (specifically Baptiste Tripard) for the academic software licenses.

[ ] Send copies of the paper to relevant stakeholders.

Paper Review

[ ] Obtain a review of the paper from Chris Lum.

[ ] Present paper to the group

[ ] Solicit feedback from research group on paper

[ ] Obtain at least 3 independent review of the paper from people outside the research group

[ ] Incorporate all feedback into the paper

More tasks to be added later…

**Notes**

* See Chris Lum for contact information of relevant people.
* We are targeting the SAE Aerotech conference.

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## 389 – TVW Movie/TV Piece

**Content**

As a marketing representative, I would like to obtain the TVW media piece so I can use it to promote our lab’s mission statement.

**Definition of Done**

[ ] Download a copy of the TVW piece called “Flight Plan” (see notes).

[ ] Watch the video to ensure that its message is positive

[ ] Upload this video to an appropriate location in Perforce

[ ] Add the video to the AFSL website (link to the AFSL YouTube website) (with appropriate captions/description).

**Notes**

* Find video on <https://www.youtube.com/user/TVWpublicaffairs>
* See email for Chris Lum on 09/30/14 for background on this piece.

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## 390 – AFSL YouTube Channel

**Content**

As a marketing representative, I would like to create a YouTube channel for the AFSL lab so that I can publicize the lab’s activities.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story.

[x] Obtain access to AFSL YouTube account

[x] Research how YouTube channels operate (how to start, how to link to, how links are created, how it is publicized, etc.)

[x] Research how other, similar labs create/conduct YouTube channels.

[x] Change username to “University of Washington Autonomous Flight Systems Laboratory”

[x] Too long: change username to “AFSL UW”

[x] Update channel icon

[x] Update channel art (banner)

[x] Update channel description

[x] Add watermark branding

[x] Customize channel layout

[x] Organize the content with channel sections

[x] Update Creator Studio tabs

[x] Add channel keywords

[x] Generalize the video uploads for easier edit.

[x] Automatic video description template (upload defaults)

[x] Add playlist

[x] for all flight systems

[x] for all locations

[x] ETC (such as Events, etc.)

[x] for the current year

[x] Set up each playlist to automatically add newly uploaded videos into its playlist

**Notes**

* Think about creating a channel trailer.

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## 391 – IEEE Paper Review and Write Introduction

**Content**

As a paper author, I would like to read the paper and provide comments/feedback so that we can publish the paper.

**Definition of Done**

[X] Build the LaTeX project for “Conservative Algorithms for Collision Awareness for Multiple Aircraft”

[X] Add verbiage to the introduction as appropriate (mostly about TCAS and other existing technologies)

[X] Review the entire paper and provide feedback by directly modifying the source code but only use \textcolor{red}{MY COMMENT HERE} to make your changes clear.

[X] Coordinate with Kevin U to incorporate these changes.

**Notes**

* Files located at \\JCATI2013\TechnicalDataPackage\IEEE Paper

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## 392 – IEEE Paper Review

**Content**

As an uninformed 3rd party, I would like to read the IEEE paper and provide comments/feedback so that we can publish the paper.

**Definition of Done**

[x] Read the paper “Conservative Algorithms for Collision Awareness for Multiple Aircraft” which is in review/creation stage.

[x] Review the entire paper and provide feedback to Kevin Ueunten about anything that is unclear, ambiguous, incorrect, etc.

[x] Coordinate with Kevin Ueunten to incorporate these changes.

**Notes**

* Paper is located at \\JCATI2013\TechnicalDataPackage\IEEE Paper\MAIN\_collision\_awareness\_plugin.pdf

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## 393 – Research Sensors for UAS Measurement of Snowpack and Ecology

**Content**

As a hardware purchaser, I would like to research various sensors that can be used to measure ecological features (such as snowpack in the Cascades) so that I can make recommendations on sensors to purchase for the UW UAS.

**Definition of Done**

[ ] Coordinate with Chris Lum to obtain background history of the project.

[ ] Read the proposal located in \\AFSL\TechnicalDataPackage\Proposals\2013\_JCATI\_snowpack.docx (consider this document confidential and proprietary)

[ ] See \\AFSL\TechnicalDataPackage\Presentations\14\_10\_16\_David\_Shean.pdf for information about a LiDAR sensor.

[ ] Contact Francesca White to discuss her previous research in this area and obtain her results.

[ ] Obtain slides from David Shean (Earth and Space Sciences) and discuss with him about sensors that would be relevant.

[ ] Research sensors that would be pertinent and appropriate for these applications.

[ ] Determine if the resources described at <https://techfee.washington.edu/proposals/2014-059/> would be relevant (these are on campus and free for us to use)

[ ] Prepare a presentation discussing pros/cons and other relevant information about sensors.

[ ] Present results to research group.

[ ] Present results to Professor Juris Vagners.

[ ] Document results a peer reviewed document and upload this to an appropriate location on Perforce.

**Notes**

* Sensors must fit on a small UAS (ScanEagle or FlexRotor size)
* Coordinate with development champion of user story ‘427 – Research Sensors for UAS Measurement of Snowpack and Ecology (Position 2)’
* Some potentially relevant sensors may inclue
  + RIEGL VUX-1 (survey grade LiDAR)
  + Velodyne Puck
  + Investigate Phoenix Aerial Systems
* Email from Juris Vagners (09/29/14) is as follows

Chris,  
  
Attached is the JCATI report of two years ago as the starting point for the snow sensing survey we spoke about. What I am interested in at this point is updating the survey of the state of the art in snow sensing instruments with the obvious filter that to be considered, the sensors have to be small UAS SWAP compatible.  
  
Juris

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## 394 – Research Student Technology Fund (STF) Resources Pertinent to UAS Research

**Content**

As a project manager, I would like to research various Student Technology Funds (STF) resources on the UW campus and identify ones that may be potentially useful to our efforts so that I can utilize these and save time and money.

**Definition of Done**

[ ] Coordinate with Chris Lum to discuss

[ ] Familiarize yourself with some of the projects in the AFSL so you know what type of work is being performed and what types of resources might be useful.

[ ] Coordinate with David Shean to discuss possible STF resources (see notes)

[ ] Compile a list of these potentially useful resources.

[ ] Present results to research group.

[ ] Figure out how to check-out or use the resources listed at:

[ ] <https://techfee.washington.edu/proposals/2013-079/> .

[ ] <https://techfee.washington.edu/proposals/2014-059/>

[ ] Check in documents to an appropriate location on Perforce.

**Notes**

* The UW department of Earth and Space Sciences has a lab that has AgiSoft PhotoScanPro and they should a394 – Research Student Technology Fund (STF) Resources Pertinent to UAS Researchlso have some cameras that may be useful (talk to David Shean for specifics). Note that David Shean will be visiting/presenting to our lab group on 10/16.
* See \\AFSL\TechnicalDataPackage\Presentations\14\_10\_16\_David\_Shean.pdf for information about some existing resources
* A list of proposals are online at <https://techfee.washington.edu/>

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## 395 – Visual Anchoring Literature Review

**Content**

As a researcher, I would like to conduct a literature review of technologies relevant to visual anchoring so that I can be informed of other work in this area and avoid duplicating work.

**Definition of Done**

[X] Read other literature review user stories and copy/update tasks to this user story.

[X] Coordinate with development champion of

[X] 395 – Visual Anchoring Literature Review

[X] 402 – Visual Anchoring Literature Review (copy)

[X] 431 – Visual Anchoring Literature Review (copy)

[X] Research pros and cons of angles, movement for payload gimbal (whether to look straight down, ahead, sweep, zoom in, zoom out)

[X] Research possible vision algorithms available for matching video feed to map data

[X] Research what map data is available to use

[X] Research pros and cons of using embedded vs. ground control logic

[X] Research use of dead reckoning to help with estimation

[x] Consolidate literature review into a document of some sort (PowerPoint) to capture these efforts.

[x] Present results to research group.

[x] Incorporate any feedback into the literature review.

[x] Add all references from your literature review to the AFSL LaTeX bibtex database (\\AFSL\TechnicalDataPackage\Latex\afsl\_bibliography.bib)

[x] Write the introduction of the visual anchoring paper including references to the AFSL LaTeX bibtex database (see \\VisualAnchoring\TechnicalDataPackage\ConferencePaper)

[x] Include this paper ([link](http://www.aa.washington.edu/research/afsl/publications/stolle2003flight.pdf)) and this paper ([link](http://www.aa.washington.edu/research/afsl/publications/Rysdyk_Orbit_Coordination_2005.pdf))

[x] Include references to Dr. Rysdyk’s technical reports (and follow any relevant references)

[x] Read and coordinate with development champion of user story ‘475 – Generate Visual Anchoring Demostrator Scenario’

**Notes**

* Be sure to include the paper “Close-quarters Quadrotor flying for a pole inspection with position based visual servoing and high-speed vision” ([link](http://eprints.qut.edu.au/74394/))
* Look at Demoz Gebre-Egziabher’s work ([link](http://www.aem.umn.edu/people/faculty/bio/gebre_egziabher.shtml)). He will be visiting UW on 11/18 and we will have an opportunity to sit down and talk with him.

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## 396 – Matlab Unit Testing Initial Research

**Content**

As a software quality assurance developer, I would like to investigate unit testing in Matlab so I can write unit tests for the Matlab software modules within the AFSL codebase.

**Definition of Done**

[ ] Coordinate with Chris Lum to discuss this story.

[ ] Research unit testing in Matlab ([link](http://www.mathworks.com/help/matlab/write-unit-tests-1.html?refresh=true))

[ ] Research how to write function based tests as well as class based tests.

[ ] Create a simple example set of source code and the associated unit tests.

[ ] Demonstrate results to the research group.

[ ] Examine the UWMatlab SDK (software development kit) and create recommendations on how to write a unit testing framework for this codebase.

**Notes**

* Unit tests must be able to execute automatically and require little or no human interaction.
* Unit tests must be automated and require no interaction to run/analyze.

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## 397 – LaTeX Environment Setup

**Content**

As a writer, I would like to setup a LaTeX document creation system.

**Definition of Done**

[x] Coordinate with Chris Lum to discuss this story. Check his schedule and make a time to discuss this story next week.

[x] Read Chris Lum’s tutorial on LaTeX document creation (see email on 10/17/14).

[x] Ensure that the bibliography is incorporated via a BibTex file and this is located appropriately on the server.

**Notes**

* The goal of this story is to setup a LaTeX environment that anyone in the research group can use to create LaTeX documents. We will share a common bibiliography and other components.

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## 398 – LaTeX References/Bibliography Research

**Content**

As a writer, I would like to investigate and research methods to keep LaTeX references organized and maintainable.

**Definition of Done**

[ ] Coordinate with Chris Lum to discuss this story.

[ ] Read Chris Lum’s tutorial on LaTeX document creation.

[ ] Coordinate with the development champion of user story ‘397 – LaTeX Environment Setup’.

[ ] Research best practices on how to maintain a large database of LaTeX references. Some systems to investigate include but are not limted to:

[ ] Jabref (<http://jabref.sourceforge.net/> )

[ ] A large list of reference management software is located [here](http://en.wikipedia.org/wiki/Comparison_of_reference_management_software)

[ ] Make recommendation to Chris Lum as to which system to use

[ ] Implement this system and port all references over from the following sources (beware of duplicates):

[ ] lum\_bibtex\_database.bib (see Chris Lum to obtain this)

[ ] \\JCATI2013\TechnicalDataPackage\IEEE Paper\paper\_bibtex\_database.bib

[ ] Ensure that future papers can be written using this system by making a simple example paper that is located on the Perforce server in an appropriate location.

**Notes**

* Investigate using the Google Scholar approach to automatically generating a BibTex citation.
* The goal of this user story is to have a common BibTex database which we can use for all paper writing efforts in the future.
* We have started a bib file located at \\AFSL\TechnicalDataPackage\Latex\afsl\_bibliography.bib

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## 399 – Perforce Visual Client (copy)

**Content**

As a software developer, I would like a Perforce client installed on my machine and would like to be comfortable with its use so I may sync files and make code changes.

**Definition of Done**

[x] P4V (perforce visual client installed on machine, either go to Perforce’s website or download appropriate (64-bit or 32-bit from <http://faculty.washington.edu/lum/AFSL>)

[x] Attended discussion/training with CL regarding Perforce operation and concepts

[x] Successfully create and sync relevant workspaces (both documentation and code)

[ ] Successfully check something into the depot

[ ] Create your folder in the UserFiles depot

**Notes**

* Recall that Perforce cannot create individual folders. In order to create a folder on the depot, you may need to use a dummy, placeholder file within a folder. By checking in this dummy file, Perforce will simultaneously create the desired folder.

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## 400 – Visual Anchoring: RCAM Trim Solution for Orbit

**Content**

As a control engineer, I would like to obtain a trim solution for the RCAM model in a steady state orbit so that I can use it for future analysis (such as linearization)

**Definition of Done**

[ ] Obtain 6DOF model from Chris Lum

[ ] Research dynamics and control inputs necessary to maintain a steady state, level orbit of a fixed radius or turn rate.

[ ] Coordinate with development champion of user story ‘331 – Visual Anchoring: RCAM Plant Model’.

[ ] Read and understand AA516, HW07, Problem 2 (see \\VisualAnchoring\AA516\hw\hw07)

[ ] Find a trim solution for the RCAM aircraft in a steady state, level, orbit. The user should be able to specify the radius of the orbit.

[ ] Verify your trim solution in nonlinear simulation.

[ ] Document results and upload to an appropriate location on Perforce.

**Notes**

* Notes for the analytical derivation of this model are located in \\VisualAnchoring\Research\AA516 (see lecture11.pdf, lecture12.pdf, and aa516rcma.pdf)
* Chris Lum has code from AA516 which numerically computes trim points, coordinate with him to obtain the code and obtain instruction on its operation.

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## 401 – Visual Anchoring: RCAM Linear Orbit Model

**Content**

As a control engineer, I would like to obtain a linearized model describing the system in an orbit so that I can use it for future analysis (such as controller design)

**Definition of Done**

[ ] Obtain 6DOF model from Chris Lum

[ ] Coordinate with development champion of user story ‘331 – Visual Anchoring: RCAM Plant Model’.

[ ] Coordinate with development champion of user story ‘400 – Visual Anchoring: RCAM Trim Solution for Orbit’.

[ ] Linearize the system about the steady state orbit trim solution (see notes)

[ ] Compute eigenvalues/modes

[ ] Verify the linear simulation by comparing it with the nonlinear simulation.

[ ] Document procedures and results.

**Notes**

* Notes for the analytical derivation of this model are located in \\VisualAnchoring\Research\AA516 (see lecture11.pdf, lecture12.pdf, and aa516rcma.pdf)
* Notes for linearization are located in \\VisualAnchoring\Research\AA516 (see lecture14.pdf, and lecture15.pdf)
* Chris Lum has code from AA516 which numerically computes a linear model, coordinate with him to obtain the code and obtain instruction on its operation.

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## 402 – Visual Anchoring Literature Review (copy)

**Content**

Copy of ‘395 – Visual Anchoring Literature Review’

**Definition of Done**

Copy of ‘395 – Visual Anchoring Literature Review’

**Notes**

Copy of ‘395 – Visual Anchoring Literature Review’

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## 403 – UW UAS Wind Tunnel Test Feasibility Study

**Content**

As a project manager, I would like to investigate the feasibility and logistics required to conduct a wind tunnel test of the UW UAS so I can decide whether or not to pursue this avenue of research.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Coordinate with the University of Washington Aeronautical Laboratory (UWAL) (AKA the Kirsten Wind Tunnel) to determine logistics (scheduling, price, pre-requisites, etc.) associated with conducting a student test at the facility.

[x] Figure out other questions to ask before setting up the wind tunnel test.

[x] Coordinate with Professor Livne and see if there is potential overlap between this test and senior design activities.

[x] Read all other wind tunnel related user stories so you have an idea of what we will accomplish with the overall wind tunnel test. This include but are not limited to (you may need to search this document for other related stories):

[x] 403 – UW UAS Wind Tunnel Test Feasibility Study

[x] 404 – UW UAS Wind Tunnel Test Model Preparation

[x] 405 – UW UAS Wind Tunnel Test Plan Preparation

[x] 406 – UW UAS Wind Tunnel Test Execution

[x] 407 – UW UAS Wind Tunnel Test Data Reduction

[x] 408 – UW UAS Wind Tunnel Test Documentation

**Notes**

* This story only involves testing the feasibility of conducting a test, it does not require planning the test or preparing the model (these are captured in other user stories)
* As a student project, we should be able to conduct the test at little or no cost.
* Chris Lum spoke with Jack Ross (operations manager at UWAL) and it sounds like a low speed test is feasible. The only problem is that there may only be availability in Dec. during the winter break.
* Some questions to think about:
  + Do we want to reinforce the airframe or not?

The airframe needs to be reinforced because deformation will effect the aerodybamic data.

* + Does the deformation affect the aerodynamic data? In other words, if it deforms are we now collecting data for a dynamic load configuration as opposed to a static, steady state configuration.
  + What speed ranges do we want to test at? This may require RC flight testing to be completed first so we know the approximate speed ranges (see user story ‘325 – Aircraft Flight Testing (RC Configuration)’)

The wind tunnel could operate at speed ranges from 5 – 200 mph

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## 404 – UW UAS Wind Tunnel Test Model Preparation

**Content**

As a wind tunnel test engineer, I would like to construct and prepare a wind tunnel model of the UW UAS so I can use it in a wind tunnel test.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Coordinate with the development champion of user story ‘403 – UW UAS Wind Tunnel Test Feasibility Study’

[ ] Read documentation on UWAL’s website about model preparation.

[ ] Coordinate with Jack Ross at UWAL to discuss modifying the UW UAS to be wind tunnel test compatible.

[ ] Investigate the feasibility/existence of a fiberglass version of the Skywalker 1900 aircraft (ensure it has the same exterior geometry) ([link](http://www.hobbyking.com/hobbyking/store/uh_viewitem.asp?idproduct=32087))

[ ] Ensure that the wind tunnel model has working control surfaces.

[ ] Ensure that the wind tunnel model has working propulsion (so we can conduct power on testing)

[ ] Ensure that the horizontal tail is removable (for tail off runs)

[ ] Determine a way to instrument or measure control surface deflections (including throttle setting) so that we can record test conditions.

[ ] Read all other wind tunnel related user stories so you have an idea of what we will accomplish with the overall wind tunnel test. This include but are not limited to (you may need to search this document for other related stories):

[ ] 403 – UW UAS Wind Tunnel Test Feasibility Study

[ ] 404 – UW UAS Wind Tunnel Test Model Preparation

[ ] 405 – UW UAS Wind Tunnel Test Plan Preparation

[ ] 406 – UW UAS Wind Tunnel Test Execution

[ ] 407 – UW UAS Wind Tunnel Test Data Reduction

[ ] 408 – UW UAS Wind Tunnel Test Documentation

[ ] 487 – UWAA 3D Printing Investigation

[ ] Obtain a CAD model of the Skywalker 1900 internal geometry (talk to Brendan). Ensure this file is uploade to an appropriate location in Perforce for future use.

[ ] Document construction of the wind tunnel model and other components.

[ ] Upload all relevant documentation to an appropriate location in Perforce.

[ ] Present results to the research group.

**Notes**

* This only involves preparing the wind tunnel model, it does not require planning the actual wind tunnel test.

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## 405 – UW UAS Wind Tunnel Test Plan Preparation

**Content**

As a wind tunnel test engineer, I would like to prepare a run log and test execution plan for the UW UAS wind tunnel test so I can be prepared for the actual test.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Coordinate with the development champion of user story ‘403 – UW UAS Wind Tunnel Test Feasibility Study’

[ ] Coordinate with the development champion of user story ‘404 – UW UAS Wind Tunnel Test Model Preparation’

[ ] Read documentation on UWAL’s website about run logs and test plans.

[ ] Coordinate with Jack Ross at UWAL to discuss best practices when creating a wind tunnel test plan.

[ ] Create a wind tunnel test plan and run log for the test.

[ ] Get the test plan peer reviewed by at least two members

[ ] Get the test plan reviewed by Chris Lum and Jack Ross

[ ] Read all other wind tunnel related user stories so you have an idea of what we will accomplish with the overall wind tunnel test. This include but are not limited to (you may need to search this document for other related stories):

[ ] 403 – UW UAS Wind Tunnel Test Feasibility Study

[ ] 404 – UW UAS Wind Tunnel Test Model Preparation

[ ] 405 – UW UAS Wind Tunnel Test Plan Preparation

[ ] 406 – UW UAS Wind Tunnel Test Execution

[ ] 407 – UW UAS Wind Tunnel Test Data Reduction

[ ] 408 – UW UAS Wind Tunnel Test Documentation

**Notes**

* Be sure to include tail off runs so that UWAL can perform full data reduction.
* Research best practices for power on wind tunnel tests.
* Ensure that we obtain enough data to obtain all force and moment data for the aircraft at multiple different conditions (enough data to populate our 6DOF model)

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## 406 – UW UAS Wind Tunnel Test Execution

**Content**

As a wind tunnel test engineer, I would like to conduct a wind tunnel test of the UW UAS so I can obtain its static aerodynamic properties and use it to create a 6DOF dynamic model of the aircraft.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Coordinate with the development champion of user story ‘403 – UW UAS Wind Tunnel Test Feasibility Study’

[ ] Coordinate with the development champion of user story ‘404 – UW UAS Wind Tunnel Test Model Preparation’

[ ] Coordinate with the development champion of user story ‘405 – UW UAS Wind Tunnel Test Plan Preparation’

[ ] Read documentation on UWAL’s website about conducting a wind tunnel test at the facility.

[ ] Create a schedule to ensure that at least 2 AFSL members are at the wind tunnel test facility at all times during the test.

[ ] Install the model in the tunnel.

[ ] Execute the wind tunnel test.

[ ] Ensure that you take photos and document the test (some photos will be used for publicity as well as for documentation purposes)

[ ] Spot check data during the test to verify its integrity.

[ ] Read all other wind tunnel related user stories so you have an idea of what we will accomplish with the overall wind tunnel test. This include but are not limited to (you may need to search this document for other related stories):

[ ] 403 – UW UAS Wind Tunnel Test Feasibility Study

[ ] 404 – UW UAS Wind Tunnel Test Model Preparation

[ ] 405 – UW UAS Wind Tunnel Test Plan Preparation

[ ] 406 – UW UAS Wind Tunnel Test Execution

[ ] 407 – UW UAS Wind Tunnel Test Data Reduction

[ ] 408 – UW UAS Wind Tunnel Test Documentation

**Notes**

* There may be significant downtime when the model is being installed or runs are being conducted, this is an excellent time to talk to the UWAL crew or Jack Ross to discuss what data is being acquired and how they will reduce the data.
* During the test, be sure to spot check to make sure data is being acquired appropriately and is not corrupted. Remember, we will only have one chance to obtain this data.

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## 407 – UW UAS Wind Tunnel Test Data Reduction

**Content**

As a wind tunnel test engineer, I would like to reduce the data obtained from the wind tunnel test so I can use it in various engineering applications.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Coordinate with the development champion of user story ‘403 – UW UAS Wind Tunnel Test Feasibility Study’

[ ] Coordinate with the development champion of user story ‘404 – UW UAS Wind Tunnel Test Model Preparation’

[ ] Coordinate with the development champion of user story ‘405 – UW UAS Wind Tunnel Test Plan Preparation’

[ ] Coordinate with the development champion of user story ‘406 – UW UAS Wind Tunnel Test Execution’.

[ ] Analyze and reduce all wind tunnel data and process it into a form that is suitable for integration into the 6DOF simulation.

[ ] Read all other wind tunnel related user stories so you have an idea of what we will accomplish with the overall wind tunnel test. This include but are not limited to (you may need to search this document for other related stories):

[ ] 403 – UW UAS Wind Tunnel Test Feasibility Study

[ ] 404 – UW UAS Wind Tunnel Test Model Preparation

[ ] 405 – UW UAS Wind Tunnel Test Plan Preparation

[ ] 406 – UW UAS Wind Tunnel Test Execution

[ ] 407 – UW UAS Wind Tunnel Test Data Reduction

[ ] 408 – UW UAS Wind Tunnel Test Documentation

**Notes**

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## 408 – UW UAS Wind Tunnel Test Documentation

**Content**

As a wind tunnel test engineer, I would like to document all results from the wind tunnel test so I can refer back to the data in the future and understand how it was obtained.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Coordinate with the development champion of user story ‘403 – UW UAS Wind Tunnel Test Feasibility Study’

[ ] Coordinate with the development champion of user story ‘404 – UW UAS Wind Tunnel Test Model Preparation’

[ ] Coordinate with the development champion of user story ‘405 – UW UAS Wind Tunnel Test Plan Preparation’

[ ] Coordinate with the development champion of user story ‘406 – UW UAS Wind Tunnel Test Execution’.

[ ] Coordinate with the development champion of user story ‘407 – UW UAS Wind Tunnel Test Data Reduction’. Include some of these results into the report.

[ ] Archive and store all the raw data from the wind tunnel test in an appropriate location on Perforce.

[ ] Create a standalone document which describes the wind tunnel test and all associated efforts.

[ ] Get this document peer reviewed by at least two members of the AFSL team.

[ ] Get this document peer reviewed by Chris Lum

[ ] Create a PowerPoint presentation which highlights and describes the test process and results.

[ ] Present this presentation at a group meeting.

[ ] Upload this documents to an appropriate location on Perforce.

[ ] Update the AFSL website with information about this endeavor.

[ ] Read all other wind tunnel related user stories so you have an idea of what we will accomplish with the overall wind tunnel test. This include but are not limited to (you may need to search this document for other related stories):

[ ] 403 – UW UAS Wind Tunnel Test Feasibility Study

[ ] 404 – UW UAS Wind Tunnel Test Model Preparation

[ ] 405 – UW UAS Wind Tunnel Test Plan Preparation

[ ] 406 – UW UAS Wind Tunnel Test Execution

[ ] 407 – UW UAS Wind Tunnel Test Data Reduction

[ ] 408 – UW UAS Wind Tunnel Test Documentation

**Notes**

* This document should be at least the quality of a lab report. Ideally it would be at the level of a conference paper in terms of professionalism and polish.

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## 409 – FAA Certificate of Authorization (COA) for CONDOR

**Content**

As a UAS operator, I would like to obtain an FAA Certificate of Authorization or Wavier (COA) so that I can legally fly the CONDOR system.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Schedule a group meeting with Chris Lum and Juris Vagners to discuss how to obtain a COA.

[ ] Ensure that the following children user stories are completed

[ ] 499 – FAA Certificate of Authorization (COA) for CONDOR – Identify Operations Location

[ ] 514 – FAA Certificate of Authoriation (COA) for CONDOR – Register Aircraft

[ ] Fill out the COA application (see notes)

[ ] Review entire COA application with Chris Lum and Juris Vagners

[ ] Submit COA application to the FAA (this should be done through Chris Lum, do NOT submit this yourself)

[ ] Additional tasks TBD…

**Notes**

* Juris Vagners has several UW COAs in place already.
  + Example COAs are placed in \\FlightOperations\Operations\COAs\SupportingDocuments\example\_COAs
* Juris has worked with Josh Brungardt to obtain COAs. Josh is an independent consultant who helps with the process and knows the FAA and the application process. We should coordinate with him.
  + AFSL will be in charge of putting most of the COA together
  + Josh will charge $1000 to help review the COA.
* Link to FAA’s COA website is at (only Chris Lum can actually login to the site) <https://ioeaaa.faa.gov/oeaaa/Welcome.jsp>
* COA documents (including a draft of the application) are located in \\FlightOperations\Operations\COAs\CONDOR

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## 410 – Tabulate UW Course Evaluation Data

**Content**

As an educator, I would like to tabulate and compile data from end of the quarter course evaluations so that I can compare performance across all instructors in the department.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Investigate if there is a database of this information available for public release (see notes)

[x] Obtain end of the quarter course evaluation data for all classes within the Aeronautics and Astronautics department (include both AA and AE classes). You may need to contact the Office of Educational Assessment to determine if we can obtain this data (see notes)

[x] Digitize all data into a spreadsheet

[x] Mine data to find interesting trends or patterns.

[ ] Additional tasks TBD…

**Notes**

* Some data is available from the Office of Educational Assessment at <https://www.washington.edu/cec/a-toc.html>)
* ~~UWAA has some data in paper format but we need to check if we are allowed access to this or not~~. The general public is not allowed access to UWAA files so we will need to find another method (see email from Kim Maczko on 10/08/14)
* Results of this user story are in \\UserFiles\datafr\UW Course Evalulation Data.xlxs

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## 411 – Reorganize UWUAS Depot

**Content**

As a project manager, I would like to reorganize the UWUAS depot so it can hold files for the entire UAS flight program.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Discuss use cases for the UAS flight program with other lab members (Al, Aleksandr, etc.).

[x] Reorganize the depot so that it can hold files for the entire flight program (see notes)

* All info is now in the FlightOperations depot

[x] Ensure that Perforce depot is suitable for future development

**Notes**

* Some things to consider
  + Multiple aircraft/systems need to be supported
  + Flight operations may include safety, checklists, flight logs, training

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## 412 – Document UWMatlab Install Procedure

**Content**

As a software developer, I would like to document the procedure for installing the UWMatlab codebase on development machines so that I can ensure all team members can make use of this codebase.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Finish writing the \\UWMatlab\TechnicalDataPackage\InstallProcedure\InstallProcedure.docx document.

[x] Demonstrate the install procedure to the group on a fresh machine.

**Notes**

* Make sure that the install procedure will work for different users who may have different workspace roots and different versions of Matlab.

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## 413 – Perforce Educational License Addition

**Content**

As a project manager, I would like to investigate options for obtaining more licenses for Perforce so that we are not limited by the number of users and/or workspaces.

**Definition of Done**

[ ] Coordinate with Chris Lum to discuss the scope of this story.

[ ] Coordinate with development champion of user story ‘167 – Perforce Licensing’

[ ] Investigate how much it would cost to obtain more Perforce licenses (are academic licenses available)?

[ ] If we purchase licenses, work with Chris Lum to install them on our server.

**Notes**

* Read over notes from user story ‘167 – Perforce Licensing’

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## 414 – Backup Airframe Procurement and Construction

**Content**

As a project manager, I would like a second, backup airframe in place so that I can use it in field tests if the primary airframe fails or is not airworthy.

**Definition of Done**

[x] Coordinate with previous user stories related to the procurement and construction of the first Skywalker 1900 aircraft. Note the user story numbers in the notes section.

[x] Procure a second airframe

[X] Label all parts for the original aircraft as being aircraft number 1 (use blue tape or some other removable markings).

[X] Label all parts for the backup aircraft as being aircraft number 2 (use blue tape or some other removable markings).

[x] Construct the second airframe

[X] Update budget, activity logs, system component document and other associated paperwork for the new airframe and components.

**Notes**

* This second airframe may be used as a wind tunnel model (see user story ‘404 – UW UAS Wind Tunnel Test Model Preparation’
* We do not need completely redundant systems and therefore, this backup airframe does not need to be completely airworthy as parts from the primary aircraft may be necessary to make this airworthy.
* Coordinate with development champion of user story ‘418 – Backup Airframe Procurement and Construction (Position 2)’

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## 415– UWMatlab Unit Testing Spreadsheet Creation and Population

**Content**

As a software quality assurance engineer, I would like to document all the unit tests that have been previously written or need to be written in the UWMatlab codebase so I have a place to lookup if a certain piece of code has been tested.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Look at the unit test spreadsheet (\\UWMatlab\UnitTests\unit\_tests.xlsx) and fill out entries for all unit tests that need to be written.

[ ] Coordinate with development champion of user story ‘396 – Matlab Unit Testing Initial Research’ to determine a good policy for determining how to proceed and how this spreadsheet will be used in the future.

**Notes**

* Most Matlab functions are a single file. However, some Matlab files are entire classes with multiple methods, properties, or other public entities associated with it. We need to test ALL Matlab code.
* In a similar fashion, many of the Simulink blocksets have many individual blocks contained within a single library file.
* Base this spreadsheet on the \\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx spreadsheet

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## 416– UW UAS Systems Audit

**Content**

As a manufacturing and flight operations engineer, I would like to audit the existing systems on the UW UAS so I can make suggestions on upgrades and improvements as well as identify potential points of failure.

**Definition of Done**

[x] Coordinate with Brendan Doyle Wade before starting this user story.

[x] Review the document located on \\UWUAS\TechnicalDataPackage\UAS Systems\UAS Systems.docx

[x] Ensure that the UW UAS in in flight ready condition.

[x] Audit all the components on the aircraft and update the previously mentioned document with any comments/concerns about any component.

[x] Create a document which enumerates suggestions on upgrades or improvements.

[x] Coordinate with the flight operations manager and augment operational documentation with appropriate warnings or discussion (for example, if a certain servo is notorious for failure, warn operators of ramifications during flight).

**Notes**

* We may want to wait until the UW UAS is in a stable development state before starting this story.

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## 417 – Aircraft Flight Testing (RC Configuration) (Position 2)

**Content**

Copy user story ‘325 – Aircraft Flight Testing (RC Configuration)’.

**Definition of Done**

Copy user story ‘325 – Aircraft Flight Testing (RC Configuration)’.

**Notes**

Copy user story ‘325 – Aircraft Flight Testing (RC Configuration)’

* Coordinate with development champion of user story ‘325 – Aircraft Flight Testing (RC Configuration)’

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## 418 – Backup Airframe Procurement and Construction (Position 2)

**Content**

Copy user story ‘414 – Backup Airframe Procurement and Construction’

**Definition of Done**

Copy user story ‘414 – Backup Airframe Procurement and Construction’.

**Notes**

Copy user story ‘414 – Backup Airframe Procurement and Construction’

* Coordinate with development champion of user story ‘414 – Backup Airframe Procurement and Construction’

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## 419 – Australia Matlab Simulation Environment

**Content**

As an algorithm engineer, I would like to setup a formal Matlab simulation environment so I can use it to test algorithms.

**Definition of Done**

[X] Coordinate with Chris Lum before starting this story.

[X] Coordiante with Chris Lum to create a dedicated depot/repository on Perforce to house this codebase.

[X] Port existing code to this new codebase.

[x] Setup a simulation environment in Matlab to simulate the fire propagation.

[x] All code/functions should be organized in a professional manner that makes code reuse easy.

[ ] Additional tasks TBD…

**Notes**

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## 420 – Software Developer Background Training (Algorithm and Back End) (copy)

**Content**

Copy of user story 006 – Software Developer Background Training (Algorithm and Back End)

**Definition of Done**

Copy definition of done from user story 006 – Software Developer Background Training (Algorithm and Back End)

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## 421 – Aircraft Flight Testing Preparation and Legalities (RC Configuration) Helper

**Content**

As an RC pilot and program manager, I would like to ensure that we answer questions and establish procedures to ensure that we operate in compliance with all rules and regulations for flying RC aircraft.

**Definition of Done**

[ ] Assist development champion of user story ‘324 – Aircraft Flight Testing Preparation and Legalities (RC Configuration)’ as appropriate.

**Notes**

* This story should be time limited to the size assigned to it.

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## 422 – Matlab Image Processing Toolbox Familiarization

**Content**

As a student, I would like to become familiar with the capabilities and functions available in the Matlab Image Processing Toolbox so I can use it for computer vision applications.

**Definition of Done**

[x] Attend lecture discussing computer vision and image processing. (AA499)

[x] Read online documentation about the Matlab Image Processing Toolbox.

[x] Download the custom Matlab functions ‘rbg2gray2’, ‘HighlightRGBImage’ and ‘MaxValueOfDataType’ from the class website and place this in your Matlab path.

[x] Complete hw01 (in class activity)

[x] Familiarize yourself with the manipulation of images using the Matlab Image Processing Toolbox.

**Notes**

* Matlab on the UWAA servers has these toolboxes so you may want to use remote login to access this toolbox.

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## 423 – Perforce Server Security

**Content**

As a project manager, I would like to ensure that the Perforce server is secure so I can protect the integrity of our data and licenses.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Ensure that users are partitioned into super-users and normal users as appropriate.

[ ] Ensure that normal users cannot create additional accounts (only super-users should be able to do this).

[ ] Ensure that anyone with the IP address of the server is not able to create an account and access data.

[ ] Protect the server against other types of attacks or vulnerabilities (search the internet for common Perforce security vulnerabilities)

**Notes**

* You should pretend to be a malicious user and attempt to access data, create additional accounts, hog licenses, etc.

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## 424 – OpenCV Familiarization

**Content**

As a software developer, I would like to familiarize myself with the OpenCV software development kit (SDK) so I can become aware of its capabilities and explore how this can be useful to our visual anchoring project.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Download and install OpenCV on a workstation.

[ ] Read documentation and familiarize yourself with the usage of OpenCV.

[ ] Create a simple example application that highlights and illustrates useful functions and operations in OpenCV.

[ ] Research if there is a .NET implementation of OpenCV (C#)

[ ] Demonstrate your application as well as general OpenCV functionality to the group.

[ ] Check in both your presentation and sample application to an appropriate location on Perforce.

**Notes**

* The goal of this story is to investigate if there is an SDK that we can use for our visual anchoring problem. If there is another library besides OpenCV that can be used (for example a .Net library), we should quickly identify this and abandon/rename this user story.

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## 425 – APM Data Logging

**Content**

As a flight operator, I would like to enable data logging with the APM 2.6 so I can use it to record flight data for offline analysis and data reduction.

**Definition of Done**

[X] Coordinate with Chris Lum before starting this story.

[X] Coordinate with development champions of previous autopilot familiarization user stories (search for the story IDs and record them here)

[X] Familiarize yourself with the operation of the APM 2.6.

[X] Figure out how to use to APM to log flight data. This data should include but is not limited to:

[X] GPS position

[X] Airspeed

[X] Orientation

[X] Other IMU data

[X] Demonstrate this functionality in a simple, ground test (you do not need to fly the aircraft)

[x] Present results and procedures to the research group.

[X] Write up procedures to enable data logging in a “how-to” document and check this into an appropriate location on Perforce.

[x] Based on your results from this user story, coordinate with Chris Lum to create a follow up user story to focus on real-time data telemetry for logging data on the ground station.

**Notes**

* This story only concerns logging data on the aircraft which can then be downloaded later for analysis. It does not require you to figure out how real-time telemetry works (see last task).

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## 426 – Pixhawk Trigger Still Camera and Log GPS Position and Orientation

**Content**

As a user interested in creating ortho-mosaic aerial images using the AgiSoft product, I would like to enable the Pixhawk to trigger a downward facing still camera while simultaneously logging the GPS location and camera orientation so I can use it to gather data that can be used to create the ortho-mosiac aerial images.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Read and coordinate with development champion of the following user stories to gain context:

[x] 313 – Autopilot Familiarization (Advanced) (position 1)

[x] 335 – Coordinate with Earth and Space Sciences

[x] 340 – Australia Ortho-Rectified Image

[x] 393 – Research Sensors for UAS Measurement of Snowpack and Ecology

[x] 394 – Research Student Technology Fund (STF) Resources Pertinent to UAS Research

[x] Read the tutorial at <http://copter.ardupilot.com/wiki/common-apm-to-chdk-camera-link-tutorial/>

[x] ~~Research what is a good, higher resolution, lightweight camera that we can use to take downward facing still images with the aircraft.~~ David Shean has a camera that we can borrow (Sony NEX-5). Coordinate with David Shean to obtain a NEX-5 camera and use this for testing (alternatively, if there is a cheaper camera we can use for testing, coordinate with Chris Lum to obtain one)

[x] Coordinate with David Shean as he has done this successfully. Document his procedure/hardware.

[x] Determine how to get the Pixhawk to trigger the camera (either at a fixed time frequency, by a spatial distance threshold, or ideally remotely controlled from the ground station).

[x] Determine how to get the Pixhawk to log relevant flight data at the same time the picture is taken. This information may include GPS position and IMU orientation (see user story ‘425 – APM Data Logging’ for more information

[x] Perform a simple demonstration of this functionality.

[x] Demonstrate procedure and method to the research group.

[x] Document the procedure in a coherent “how-to” document and upload it to an appropriate location in Perforce.

**Notes**

* The end goal is to use this method on the UW UAS to create ortho-mosaic images using the AgiSoft PhotoScanPro software.
* David Shean is presenting to the research group on 10/16/14.
* It may be useful to look at some existing products like [this](http://www.3dr.com/mapping-drones/?utm_source=3DR+Customers&utm_campaign=dead301a9b-Mapping_Announcement10_7_2014&utm_medium=email&utm_term=0_2b4b1ab5e0-dead301a9b-202254849).
* See \\AFSL\TechnicalDataPackage\Presentations\14\_10\_16\_David\_Shean.pdf for a proof of feasibility.
* This story is the foundation of user story ‘461 – TEDD Systems Integration’
* Email from David Shean (11/10/14) regarding this:

“I think the camera flash hotshoe sync with the pixhawk is a crucial missing piece of the UAV survey, behind the lack of a good differential GPS receiver w/ cm-scale accuracy on board. After giving it a little more thought, it should be pretty straightforward to establish a connection from the hotshoe to an RC-in on the pixhawk. Then you just need to set up the pixhawk to listen for these events and write them to the log - functionality that is already available and might not require any modifications to the code.”

* Technology developed during this user story is relevant to Applewhite Aero’s interests in an Aerial Agricultural Mapping system (see description in user story ‘461 – TEDD Systems Integration’)

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## 427 – Research Sensors for UAS Measurement of Snowpack and Ecology (Position 2)

**Content**

Copy of use story ‘393 – Research Sensors for UAS Measurement of Snowpack and Ecology’

**Definition of Done**

Copy of use story ‘393 – Research Sensors for UAS Measurement of Snowpack and Ecology’

**Notes**

Copy of use story ‘393 – Research Sensors for UAS Measurement of Snowpack and Ecology’

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## 428 – UWAA Fall Poster Session (2014)

**Content**

As a public relations manager, I would like to prepare posters for the annual UWAA Fall Poster Session so I can publicize our research.

**Definition of Done**

[x] Register for the event

[x] Create posters or use existing posters

[ ] Create a new poster focusing on the UW UAS aerial mapping application. Title: Unmanned Aerial Systems for Mapping and Ecological Monitoring (see notes)

[x] Review the new poster with Chris Lum and research group on 11/13

[x] Print poster at UW communications (see Chris Lum)

[x] Generate/compile movies to illustrate some of the research topics we focus on and load them onto a laptop we can bring to the presentation.

[x] Get UW UAS ready to demo (Al and Brendan)

[x] Recruit students to present

[x] Present/attend the session

**Notes**

* See email from Uri Shumlak on 10/13/14
* Chris to present Insitu searching poster
* Keisuke (and Brian C., Angel R. or Alex S.) to present “Unmanned Aerial Systems for Mapping and Ecological Monitoring”
* Kevin to present ”Automated Collision Awareness For Multiple Unmanned Aerial Systems”

Australia Poster

* [ ] Template is located in \\AustraliaBushfire\TechnicalDataPackage\Poster Poster and should be 36” high by 48” wide
* Basically you should convert the slides located at \\AustraliaBushfire\TechnicalDataPackage\StudyAbroadPresentation to a poster.
* Add Matthew Dunbabin to a list of authors.
* This poster should only contain your results from Australia. Do not include information about the UW UAS as we will save this information for another poster later.

Table 3: Posters and presenters

|  |  |  |
| --- | --- | --- |
| **Poster** | **Presenters** | **Comments** |
| Australia Bushfire | Angel Rodriguez, Alex Summers |  |
| JCATI Collision Awareness | Keisuke Tsujita |  |
| Insitu Searching | Christopher Lum |  |
| Aircraft Demos | Al Creigh | Demo the UW UAS with camera and telemetry. Also have a laptop playing movies. |

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## 429 – Image Processing Algorithm Feature Level Design

**Content**

As a software and algorithm developer, I would like a completed feature level design of the image processing algorithm so I can identify key ideas and features of the algorithm.

**Definition of Done**

[X] Coordinate with Chris Lum before starting this story.

[X] Coordinate with development champion of the following user stories

[X] 395 – Visual Anchoring Literature Review

[X] 402 – Visual Anchoring Literature Review (copy)

[X] 431 – Visual Anchoring Literature Review (copy)

[ X] View past examples of feature level designs user stories:

[X] 198 – Conflict Calculator Feature Level Design

[X] 003 – Forward State Estimator Feature Level Design

[X] 040 – Separation Notifier Feature Level Design

[X] View past examples of completed feature level designs (located in \\JCATI2013\TechnicalDataPackage\FeatureLevelDesigns)

[X] Write plan for first prototype of the algorithm and document the key features and issues in a PowerPoint document (this is the actual feature level design)

[ ] Present this feature level design to the research group

[X] Incorporate any feedback and upload the feature level design to \\VisualAnchoring\TechnicalDataPackage\FeatureLevelDesigns.

**Notes**

* This story does not involve writing code or generating a prototype algorithm, it is simply aimed at planning and outline for the algorithm.
* Some skeleton exploratory code may be appropriate but no production code generation is necessary.
* Planned to present at next meeting.

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## 430 – UAS Flight Path Planning for Visual Line Of Sight Operations for Snowpack Monitoring

**Content**

As a UAS operator, I would like to plan paths that maintain visual line of sign from a base station to the aircraft so I can satisfy FAA requirements for operation of UAS.

**Definition of Done**

[X] Coordinate with Chris Lum before starting this story.

[X] Read and familiarize yourself with documents located in \\AFSL\TechnicalDataPackage\Proposals

[ ] Coordinate with Susan Dicerkson-Lange to discuss operations and requirements (obtain contact info from Chris Lum)

[X] Some questions that need to be answered include but are not limited to:

[X] What do the green dots mean on the graphic?

[X] What altitudes will we be operating at?

[X] What range of operations will be using?

[X] Create a document describing relevant mission parameters (desired coverage area, flight elevations, etc.)

[X] Investigate how to obtain digital elevation models of terrain in the area of interest.

[X] Investigate software applications to assist in flight path planning.

[X] Plan several compliant flight paths which maintain visual line of sight with the base station.

**Notes**

* This story only involves visual line of sight flight paths, another user story will involve beyond visual line of sight.
* See email from Juris Vagners on 10/14/14 (attached below)

Jessica,  
  
Thanks!  
  
I assume that the green dots are the ground monitoring stations?  
  
What I would like to do is have one of the undergrads working with Chris Lum sit down with Susan to lay out potential UAS routes. What I would like to develop is a "staged" approach, first defining visual line of sight (VLOS) routes then going to beyond visual line of sight (BVLOS) routes for the FAA CoA application. So what will be needed is some estimate (rough) how many flights we would like, time of year, etc. I expect that the first set would be in the summer to establish altitude maps as a reference then the snow time sets. For the VLOS routes we will not need helicopter or aircraft chase but most likely will for the BVLOS routes. For these we will also need detailed contingency plans. The nominal operating plan would involve launch/recovery from a pickup as shown in the YouTube video so starting and finishing points would be on (accessible) roads. Do we need to get permission from the watershed managements folks for this exercise?  
  
Juris

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## 431 – Visual Anchoring Literature Review (copy)

**Content**

Copy of ‘395 – Visual Anchoring Literature Review’

**Definition of Done**

Copy of ‘395 – Visual Anchoring Literature Review’

**Notes**

Copy of ‘395 – Visual Anchoring Literature Review’

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## 432 – Visual Anchoring: RCAM Plant Model Augment with Disturbances

**Content**

As a simulation engineer, I would like to create a plant model of an aircraft (based on the RCAM model) that includes external disturbances so that I can use it for simulation and other components.

**Definition of Done**

[x] Coordinate with development champion of user story ‘331 – Visual Anchoring: RCAM Plant Model’

[x] Read and coordinate with development champion of user story ‘475 – Generate Visual Anchoring Demostrator Scenario’

[x] Research how the equations of motion change if there is a steady wind field.

[x] Document changes to the equations of motion in a coherent, clear document.

[x] Augment the model to include disturbances including but not limited to:  
 [x] Turbulence

[x] Steady state wind fields

[ ] OPTIONAL: Navigation errors (note: this may be moved to another story about sensor modeling)

[x] Validate the model in simulation.

[x] Investigate potential problem with vertical component of wind (Hao Ruan encountered a problem with this on 01/06/15)

**Notes**

* The goal of this story is to create a model which exhibits realistic behavior with respect to external disturbances. We need the simulation model to capture these disturbances so we can show the effect of our visual anchoring algorithm.
* The augmentation may be as simple as changing the navigation equations by performing a vector sum of the airspeed expressed in the body frame (u, v, w) with the wind vector to obtain the inertial velocity (but it might be more complicated than this)
* There seems to be a problem with the simulation if you have a non-zero vertical component of wind. This needs to be investigated further in a future user story.

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## 433 – Piper J-3 Training RC Aircraft Setup

**Content**

As an RC pilot, I would like to setup the Piper J-3 aircraft so that I can use it for training purposes.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Coordinate with development champion of user story ‘329 – Establish RC Pilot Training Course’

[x] Setup the Piper J-3 training aircraft

[x] Evaluate all subsystems and assess their airworthiness.

[x] Make the system airworthy and prepare it for flight.

[x] Perform a simple systems check on the ground and assess system characteristics (telemetry range, throttle response, etc.). This should be a thorough ground check without actual flight.

[x] Arrange to flight test the aircraft under the supervision of a competent RC pilot.

[x] Film and document maiden voyage.

[x] Update all relevant paperwork and forms to enter this aircraft into the AFSL inventory.

**Notes**

* This aircraft will serve as an RC training aircraft and therefore does not need to carry any special payload.

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## 434 – Aircraft Storage and Display

**Content**

As a project manager and marketing representative, I would like to find a way to store and display all the active aircraft so that I can safely store them and simultaneously create a visually appealing display for visitors and lab tours.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x Find a way to display/store all the active AFSL aircraft. This includes but is not limited to:

[x] Skywalker 1900 #1

[x] Skywalker 1900 #2 (backup aircraft)

[x] Solar UAV (see Al Creigh)

[x] Aerosonde

[x] Yak 54

[x] Piper J-3

[x] Old DBF planes

**Notes**

* These should be stored in AERB139. If we run out of room, we can display these in GUG317A.
* One or two aircraft can also be moved to GUG317A.

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## 435 – New Team Member Orientation Document Creation

**Content**

As a project manager, I would like to create a document which outlines all the procedures and policies for the lab so that new members can read this document to get orientated with the lab and how it operates.

**Definition of Done**

[x] Read the following user stories

[x] 002 – Perforce Visual Client

[x] 066 – New Team Member Orientation

[x] 157 – New Team Member Orientation (Sprint 1312)

[x] 334 – Laboratory Safety

[x] Create a document which outlines how to become oriented with the lab. At a minimum, this document should outline the following items:

[x] Perforce client setup and usage

[x] Scrum/sprint proceedings and process (describe user stories, demoes, etc.). Include a table showing different user story status and their meaning.

[x] Laboratory access and policies (computers, workspaces, locking the door, etc.)

[x] Email list ([afsl@u.washington.edu](mailto:afsl@u.washington.edu))

[x] Chris Lum online calendar access and meeting policies

[x] Lab contact information form

[x] Laboratory safety protocols

[x] RC flight training program

[x] Summary of major projects being addressed in the lab.

[x] Get this document peer reviewed.

[x] Test the document by having a new member read through and execute its steps.

[x] Get document approved by Chris Lum

[x] Upload document to appropriate place on Perforce.

[x] Notify entire research group of this document’s existence and purpose

**Notes**

* This document will be the first file that is given to new members. They should be able to follow the document and become fully integrated into the lab’s research environment.
* A preliminary document outlining general lab policies has been created at \\AFSL\LabInfo\LabPolicies.docx.

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## 436 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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**Notes**

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## 437 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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**Notes**

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## 438 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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**Notes**

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## 439 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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**Notes**

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## 440 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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**Notes**

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## 441 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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**Notes**

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## 442 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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**Notes**

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## 443 – Perforce Visual Client (copy)

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**Notes**

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## 444 – Perforce Visual Client (copy)

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**Notes**

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## 445 – Perforce Visual Client (copy)

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**Notes**

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## 446 – Perforce Visual Client (copy)

**Content**

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**Notes**

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## 447 – Perforce Visual Client (copy)

**Content**

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**Notes**

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## 448 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

Refer to user story ‘002 – Perforce Visual Client’

**Notes**

Refer to user story ‘002 – Perforce Visual Client’

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## 449 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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**Notes**

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## 450 – Perforce Visual Client (copy)

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**Definition of Done**

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**Notes**

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## 451 – Bushfire Detection Depot Creation

**Content**

As a project manager, I would like to create a depot to house all files related to the Australia bushfire detection project so I can use it for future work.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Create a depot to house files.

[x] Populate this depot with appropriate files.

[x] Ensure that we do not have duplicate files in multiple depots (delete extraneous files)

**Notes**

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## 452 – Developer WebEx Account Setup (Copy)

**Content**

As a software developer, I would like to obtain a WebEx account so I can hold code reviews with other developers.

**Definition of Done**

[x] Sign up for a free WebEx account.

[x] Verify that you can start schedule a normal meeting.

[x] Verify that you can start a one-click meeting.

[x] Conduct at least 1 “mock” code review or meeting via WebEx with another team member (ensure that you can share screens)

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## 453 – Visual Anchoring: RCAM Inner Loop Orbit Controller

**Content**

As a control engineer, I would like to obtain create an inner loop controller for the RCAM plant model in so that I can stabilize an orbit at a fixed altitude.

**Definition of Done**

[x] Coordinate with development champion of user story ‘458 – Orbit Controller Feature Level Design’ which should be completed before this current story.

[x] Coordinate with development champion of user story ‘331 – Visual Anchoring: RCAM Plant Model’

[x] Coordinate with development champion of user story ‘458 – Orbit Controller Feature Level Design’ to investigate a trade study of orbit controllers.

[ ] Read and coordinate with development champion of user story ‘475 – Generate Visual Anchoring Demostrator Scenario’

[x] Research dynamics and control inputs necessary to maintain a steady state, level orbit of a fixed radius or turn rate (and maintain a constant altitude)

[ ] Design an inner loop controller which can control the aircraft so that it maintains a steady state, constant radius turn at a constant altitude (see user\_stories.pptx)

[ ] Characterize performance and robustness of this controller.

[ ] Perform simulation of your controller on the non-linear RCAM plant model in both nominal and conditions with disturbance such as wind or sensor drift (see user story ‘432 – Visual Anchoring: RCAM Plant Model Augment with Disturbances’)

[ ] Present results to research group and incorporate any feedback into the controller design.

[ ] Document results, controller design procedure, and upload to an appropriate location on Perforce.

**Notes**

* Traditional control design out follow the following order of operations:
  + Find a trim solution of the non-linear system about an operating point (400 – Visual Anchoring: RCAM Trim Solution for Orbit).
  + Obtain a linear model about this operating point (401 – Visual Anchoring: RCAM Linear Orbit Model).
  + Design a linear controller (this user story) based on the linear model.
  + Augment the linear controller to operate on the non-linear model.
  + Validate the entire non-linear system in simulation.
* This inner loop controller will eventually be one major component of the visual anchoring project (the other being the vision system). Therefore it is acceptable if the controller is “greedy” and uses most if not all of the control surfaces to achieve its goals.
* The overall end goal is to obtain a controller which can hold the aircraft in a stable orbit a specified distance away from a ground target.
* Some documentation on the APM 2.6 autopilot is located [here](http://plane.ardupilot.com/wiki/common-apm25-and-26-overview/) and [here](http://ardupilot.com/).
* Implementation of this controller onto the PixHawk is documented in 486 – PixHawk Custom Flight Mode (Complex).

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## 454 – Upgrade UW X-Plane Plug-ins to VS2012 and X-Plane 10

**Content**

As a software developer, I would like to update the existing UW X-Plane plugins to build with VS2012 and target X-Plane 10 so I can use them in the newest version of the simulator.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story and to view a demonstration of the current simulator setup

[ ] Remove the application that is causing the UWAALAB60 computer to automatically log off after a set time of inactivity.

[ ] Recreate simulation setup in the lab (AERB 139).

[ ] Recreate simulation setup in the lab (GUG105).

[ ] Upgrade simulation to work with a newer version of FlightGear (for example V.2.12 is the highest version that Matlab supports).

[ ] Check with Chris Lum after validating newer version of FlightGear works.

[ ] Briefly look at the solution \\ScanEagleSimulation\xplane\plugins\UWPlugins\Projects\Win\UWPlugins.sln (you do not need to understand it, just view the structure). This code currently is built by VS2010 and targets X-Plane 9.

[ ] Upgrade this solution to VS2012 and verify that it still builds plugins that are X-Plane 9 compliant.

[ ] Upgrade the X-Plane SDK to target X-Plane 10 and repeat the build process to verify that this now builds X-Plane 10 compliant plugins.

[ ] Check for deprecated or obsolete methods in newer version of library/SDK.

[ ] Verify operation of simulator in X-Plane 10.

**Notes**

* The X-Plane SDK is located at <http://www.xsquawkbox.net/xpsdk/mediawiki/Main_Page> .
* Currently, only the following 3 plugins are being used for the simulator:
  + UWDisablePhysicsEngine
  + UWTimedProcessingUDP
  + UWTimedProcesingWithCameraUDP
* The easiest one to start with is UWDisablePhysicsEngine. It is recommended that you focus on porting this project first and verify that it works in X-Plane 10 before starting on the other projects.
* Pre-built release and debug versions of the plugins are located in \\ScanEagleSimulation\user\_files\lum

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## 455 – Field Testing Transportation Boxes (Part 1)

**Content**

As a field test pilot, I would like to create transportation equipment and packaging for all relevant systems so I can safely transport equipment to and from the testing site.

**Definition of Done**

[x] Coordinate with development champion of the following user stories:

[x] 325 – Aircraft Flight Testing (RC Configuration)

[x] 329 – Establish RC Pilot Training Course

[x] Discuss with team members with RC experience (Al Creigh, Brendan Doyle Wade, and Mason Steinbrueck, Chris Lum) about how to best transport equipment to and from a flight tests facility.

[x] Read notes to become aware of design constraints.

[x] Be sure to take into account transportation of the following objects at minimum:

[x] 3 Skywalker 1900 airframes

[x] See if the UWAA department has any salvage boxes or other packing material that can be used for transportation.

[x] For any remaining items that need transportation boxes, see if you can find scrap wood/metal around the department to construct these boxes.

[x] For any remaining items that need transportation boxes, coordinate with Chris Lum to purchase materials and supplies to construct these boxes.

[x] Procure or construct boxes and transportation equipment for all equipment necessary to conduct field experiments.

[x] Update relevant documentation on Perforce for these.

[x] Test fit and functionality

**Notes**

* We would like to be able to transport all equipment in a small pickup truck bed or back of an SUV so size boxes appropriately.
* Each box should be able to be manipulated by a single individual and should not exceed 25 pounds.
* We may need to hike into areas which are not accessible by car and therefore the transportation system should be portable or back-packable. To this end, the external dimensions in terms of width and depth should not be larger than the box the Piper J-3 came in as this is about the largest box that can fit inside a large camping backpack.
* ~~The boxes to carry the Skywalker systems could have a rack that folds up and cradles the fuselage at waist height. This should hold the fuselage with the wings on or off and can be used for system maintencne and control surface deflections (~~**~~Error! Reference source not found.~~**~~). This cradle system does not need to be integrated into the box but it is required we create one.~~ Moved to 521 – Flight Operations Work Items Part 1
* This user story is continued in ‘509 – Field Testing Transportation Boxes (Part 2)’

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## 456 – GitHub Investigation and Preliminary Research

**Content**

As a software developer, I would like to investigate GitHub and determine how it operates so that I can use it for potential future projects and for obtaining code.

**Definition of Done**

[x] Research [GitHub](http://en.wikipedia.org/wiki/GitHub)

[x] Determine how GitHub operates. Some questions to answer include but are not limited to:

[x] How do I create an account

[x] What is a repository?

[x] How do I pull down code from the cloud?

[x] How do I make changes to the code?

[x] Investigate if GitHub can be used as a replacement for Perforce (is it secure)

[x] Create a sample repository and codebase to familiarize yourself with its operation.

[x] Perform any other prudent and relevant tasks to education yourself on GitHub’s operation.

[x] Present results to the research group and educate the rest of the group on GitHub’s operation.

**Notes**

* This user story is to “kick the tires” on GitHub and see how it works.
* It may be helpful to ask, “How does Perforce perform a certain operation and what is the equivalent operation in GitHub”?
* APM code is hosted via GitHub and we may need to familiarize ourselves with its operation in order to obtain the code. Note that obtaining and developing for this codebase is not within the scope of this user story.

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## 457 – Visual Anchoring Simulator Output to Google Earth

**Content**

As a software developer, I would like to have the Matlab simulation output data and have this data converted and visualized in Google Earth so I can visualize relevant information in 3D.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Investigate the Google Earth Toolbox for Matlab ([link](http://www.mathworks.com/matlabcentral/fileexchange/12954-google-earth-toolbox))

[ ] Create a small Matlab application that shows how this toolbox functions and operates

[ ] Create a small application that can convert data from the simulator to a Google Earth KML files (see notes)

[ ] Create a workflow to export data from the simulator, run the KML creation utility, and visualize the results in Google Earth.

[ ] Demonstrate functionality to research group.

[ ] Obtain necessary code reviews.

[ ] Check in relevant code to Perforce.

**Notes**

* The UWSDK already has significant code for creating KML files in C#.
* The goal of this story is to be able to visualize the aircraft’s simulated trajectory in Google Earth.
* The Google Earth toolbox for Matlab maybe useful

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## 458 – Orbit Controller Feature Level Design

**Content**

As a software and algorithm developer, I would like a completed feature level design of the orbit controller so I can identify key ideas and features of the algorithm.

**Definition of Done**

[ x ] Coordinate with Chris Lum before starting this story.

[ x ] Read user story ‘453 – Visual Anchoring: RCAM Inner Loop Orbit Controller’

[ x ] View past examples of feature level designs user stories:

[ x ] 198 – Conflict Calculator Feature Level Design

[ x ] 003 – Forward State Estimator Feature Level Design

[ x ] 040 – Separation Notifier Feature Level Design

[ x ] 429 – Image Processing Algorithm Feature Level Design

[ x ] View past examples of completed feature level designs (located in \\JCATI2013\TechnicalDataPackage\FeatureLevelDesigns)

[ x ] Write plan for first prototype of the algorithm and document the key features and issues in a PowerPoint document (this is the actual feature level design)

[ x ] Present this feature level design to the research group

[ x ] Incorporate any feedback and upload the feature level design to \\VisualAnchoring\TechnicalDataPackage\FeatureLevelDesigns.

**Notes**

* This story should come before ‘453 – Visual Anchoring: RCAM Inner Loop Orbit Controller’ is attempted.
* See block diagram in user story ‘453 – Visual Anchoring: RCAM Inner Loop Orbit Controller’

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## 459 – UW-TV Interviews and Filming

**Content**

As a marketing agent, I would like to prepare for the UW-TV interview so that I can publicize our recent JCATI activities and illustrate how this work has supported the JCATI mission statement as well as lead to new opportunities.

**Definition of Done**

[x] Read notes section of this user story

[x] Watch movie created by Henry Qin (located at \\JCATI2013\Videos\MarketingVideo\JCATIFinal.mp4)

[x] Go to the JCATI website and review its mission statement <http://jcati.org/about>

[x] Go to the JCATI website and watch several of the videos they already have produced (<http://jcati.org/> then click on the movies on the right side)

[x] Read the schedule of events at \\JCATI2013\TechnicalDataPackage\UW\_TV\14\_10\_30\_agenda\_sakamoto.docx

[x] If you are giving an interview, read \\JCATI2013\TechnicalDataPackage\UW\_TV\Video shoot questions.docx to prepare for questions that might be asked of you. Update this document with your responses so we all know what each other is going to say.

[x] If you are giving and interview, practice your responses and conduct mock interview with Chris Lum on 10/28, 3:30 -4:00pm in GUG317A.

[x] Clean-up and prepare KWT 101 and AERB139 in preparation for videos/photography. This includes

[x] Stage multiple aircraft in construction in KWT so we can have footage of students working on aircraft

[x] Move posters from outside AERB 139 to inside and hanging on the wall in a pleasing fashion

[x] Arrange movies to the playing in the background behind interviewers (possibly use projectors)

[x] Coordinate to ensure we have people in the AERB 139 and KWT 101.

[x] Hang AFSL banners in relevant locations

**Notes**

* JCATI would like to film our research group and conduct interviews with investigators and students to publicize our work. They consider our group one of the success stories of the past funding cycle and would like to produce a video showing what we did and how our work fulfilled the JCATI mission statement (to produce technology relevant to WA aerospace as well as provide educational opportunities to students in WA)
* UW-TV will film people on 10/30 at various locations around campus.
* Please dress appropriately. If you are giving interviews, business casual attire is appropriate. If you are an “extra” doing construction of aircraft, please do not wear anything with logos, loud colors, etc.

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## 460 – AFSL Website Updates

**Content**

As a marketing agent, I would like to update the AFSL website with new information so I can publicize our activities.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Read notes section of this user story.

[ ] Update various sections (work with Chris Lum to obtain information to update). Ensure that the following user stories are completed and accepted

[ ] copy of 495 – AFSL Website Updates (People Section)

[ ] copy of 496 – AFSL Website Updates (Facilities Section)

[ ] copy of 497 – AFSL Website Updates (Research Section)

[ ] copy of 498 – AFSL Website Updates (Publications Section)

[ ] Additional tasks are to be coordinated with Chris Lum for the large updates\*\*\*

[ ] Review all materials with Chris Lum

[ ] Send mock ups to Kim Maczko.

[ ] Ensure that changes are made and correct on the final website.

**Notes**

* We will likely need to coordinate with Kim Maczko to have her do the website updates. The easiest way to document the changes we would like is to mock up how we want each page to look in Word and then send her the Word document.
* We should research how other labs have their webpages organized. Visit several other lab webpages (at other universities) and determine how they are organized. For example:
  + <http://icing.ae.illinois.edu/index.html> (Dean Bragg’s old lab)
* All website material is located in [\\AFSL\WebsiteInfo](file:///\\AFSL\WebsiteInfo)
* **This is the original UserStory [Read-Only], this user story is only to be used when the website needs a large update. Please make a copy of this user story when the update is needed. Delete this note in the new copy.**

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## 461 – TEDD Systems Integration

**Content**

As a UAS operator, I would like to integrate camera systems onto the TEDD aircraft so I can make it into a viable aerial mapping platform.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story.

[x] Coordinate with development champion of user story ‘426 – Pixhawk Trigger Still Camera and Log GPS Position and Orientation’

[x] Review \\AFSL\TechnicalDataPackage\Presentations\14\_10\_16\_David\_Shean.pdf for motivation (this is the application we would like to emulate).

[x] Coordinate with Al Creigh and Brendan Doyle Wade to place the camera on the aircraft. Some things to pay attention to include but are not limited to:

[x] weight and balance

[x] payload protection (ensure that camera cannot be damaged during landing or crashes)

[x] extra payload space (we may need to include a recovery system, see user story ‘462 – Aerial Mapper Recovery System’

[x] Demonstrate full functionality of system on the ground (including telemetry and camera triggering).

[x] Validate data integrity (ensure that it is suitable for data reduction, coordinate with development champion of user story ‘340 – Australia Ortho-Rectified Image’)

[x] Make system airworthy and prepare for preliminary flight testing

[x] Upon completion of this system, brief Al Creigh and Chris Lum so that we can relay results to Applewhite Aero (see notes)

**Notes**

* This story involves integrating all necessary components and creating a viable mapping platform. Much of the technical development for the system have been completed in previous user stories.
* Notes from David Shean regarding the mounting of the camera (11/10/14)

“The dimensions of the newer NEX-5T are slightly different than the NEX-5N. Not sure if the team is planning to design a mount or gimbal for the camera. It would also be good to use some vibration dampening material between the camera and anything connected to the airframe. I use Moongel or lightweight neoprene foam for this. If mounting the camera in a static position relative to the airframe (no gimbal), it should be mounted with a slight aft tilt to compensate for the angle of attack in straight and level flight - the camera should be as close to nadir as possible.”

* Technology developed during this user story is of interest to Applewhite Aero. They are interested in an ‘Aerial Agricultural Mapping’ system. Talk to Al Creigh for more information.
  + Low-cost infrared camera
  + GPS linked images/Geo-mapped
  + SEelf-powered with 3 hour endurance
  + Receiving inputs from PixHawk autpopilot
  + Fits in a techpod/Oculus
  + Operating in daylight hours within a mile range
  + Onboard recording required
  + Post mission processing must be included in package

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## 462 – Aerial Mapper Recovery System

**Content**

As a UAS operator, I would like to develop a recovery system to retrieve the aerial mapper aircraft

**Definition of Done**

[X] Coordinate with Chris Lum before starting this user story.

[X] Coordinate with development champion of user story ‘461 – TEDD Systems Integration’

[X] Create a document outlining some of the areas where we may want to operate the mapping system. This document should include at minimum:

[X] Pictures of various, challenging operational areas

[X] Identification/discussion of operational challenges (why is it hard to operate in a given area)

[X] Trade study of existing UAS recovery systems (Skyhook, parachute, net, etc.)

[X] Present previously described document to the group and lead a group brainstorming session.

[X] Implement a prototype recovery system on the aerial mapper aircraft.

[X] Demonstrate functionality of this system.

[X] Perform a successful recovery using this system.

[X] Document results and recovery system.

[x] Upload all pertinent documents to an appropriate location on Perforce.

**Notes**

* See \\AFSL\TechnicalDataPackage\Presentations\14\_10\_16\_David\_Shean.pdf slides, pg. 48 for an example of some terrain with no room for traditional landing.
* Other challenging scenarios include:
  + High wind environments
  + Ship-board operations

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## 463 – Plan and Execute Mt. Rainier Aerial Survey

**Content**

As an environmental scientist, I would like to conduct an aerial survey of areas near Mt. Rainier National Park to show feasibility of using the UW Mapping UAS system to conduct scientific missions.

**Definition of Done**

[ ] Setup meeting with Chris Lum and David Shean before starting this user story.

[ ] More tasks TBD…

**Notes**

* David Shean is in regular contact with some relevant people including:
  + Scott Beason (Park Geologist at Mt. Rainier National Park). He is interested in actively monitoring river systems.
  + Stefan Loftgren (Lead Climbing Ranger). Also a pilot.
  + The Aviation Manager at the park.

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## 464 – Aircraft Flight Testing Preparation and Legalities (UAS Configuration)

**Content**

As an UAS pilot and program manager, I would like to ensure that we answer questions and establish procedures to ensure that we operate in compliance with all rules and regulations for flying unmanned systems.

**Definition of Done**

[x] Discuss with Chris Lum before starting this story.

[x] Research the Academy of Model Aeronautics’ policy on flying with an auto-pilot system (AMA, <http://www.modelaircraft.org/>). Some questions to answer include but are not limited to

[x] Does liability insurance cover a system that is being controlled by an auto pilot system?

[x] What are the specific rules and regulations of flying with this system?

[x] Research the flight operations of other universities of academic entities. Some questions to answer include but are not limited to

[x] How do they log system activity (service log, flight log, combination, etc)?

[x] How do they handle maintenance of the system?

[x] Is there a designated pilot?

[x] Who is liable for accidents?

[x] What is the process they employ for taking the system out to fly (checklists, etc.)

[x] Do they carry independent insurance?

[x] Read documents located at <https://www.faa.gov/uas/regulations_policies/>

[x] Investigate the following websites and assess the validity/credibility of the sites

[x] <http://dronelawjournal.com/>

[x] <https://www.youtube.com/watch?v=6ZjwgSwXfMQ&list=UUJfdBErVr7q8xoeYanwdniA>

[x] [link](http://bigstory.ap.org/article/3c24a3878eb143bca0f80f84c6a96e5b/flying-drones-near-stadiums-could-end-jail-time) about stadiums and raceways

[x] Compile all your findings into a coherent document (including references and hyperlinks to your sources).

[x] Create a “field documentation package” which consists of all documentation, regulations, rules, laws, etc. that we can take with us on flight tests. This can be used to refer to in case we encounter any bystanders or civilians who are challenging the legality of our operation.

[x] Review FAA’s draft small UAS rule (this may not be public information yet)

[x] Present findings to research group.

[ ] Upload document to Perforce.

**Notes**

* As a public institution, we are subject to more scrutiny than a private citizen, therefore, we must ensure that we meet all rules and regulations with respect to our operations. This user story serves to ensure we are compliant and have done our due diligence in preparing to fly our aircraft.
* It is useful to play “devil’s advocate” while researching this story. In other words, always assume a worst case scenario (where our operations may injure bystanders) and ask how do we mitigate these or how are we covered from a liability standpoint.
* University of Colorado-Boulder and Texas A&M have active flight programs and may be a good place to look for inspiration.
* Investigate David Wallin (Professor at Western Washington University) and their operations.
* See potentially pertinent email below
* Eric Frew notes that we need a COA for ALL research activity (see email on 11/19/14)
* <http://knowbeforeyoufly.org>

**From:** "Nykaza, Madeline" <[MNykaza@APLU.ORG](mailto:MNykaza@APLU.ORG)>

**Subject: CGA Action Request (9-29-14): Drone Use on Campus**

**Date:** September 29, 2014 5:03:40 PM EDT

**To:** Undisclosed recipients:;

**CGA ACTION REQUEST**

**(9-29-14)**

**To:        CGA**

From:   APLU Congressional and Governmental Affairs Staff

**Background**

Recent and upcoming Federal Aviation Administration (FAA) actions regarding unmanned aircraft systems (UAS, a.k.a. drones) may curtail university research and academic use of UAS. APLU is working closely with the Association of American Universities (AAU) to pursue a construct for authorized use of UAS for research and academic purposes and to address the uncertainty the recent FAA actions have caused.

**FAA Actions**

·         Upcoming Notice of Proposed Rulemaking (NPRM) governing UAS:  The FAA Modernization and Reform Act ([FMRA](http://www.gpo.gov/fdsys/pkg/CRPT-112hrpt381/pdf/CRPT-112hrpt381.pdf)) of 2012 requires the FAA to develop a plan to “accelerate the safe integration of UAS into the national airspace system.”  Many sectors are anxiously awaiting this rulemaking, including research universities.  The FAA has missed “deadlines” for issuing the NPRM; it is currently expected that the FAA will release a proposed rule by the end of the calendar year.

·         The FAA released a memorandum on [June 13](https://nppa.org/sites/default/files/Williams-AFS-80%20-%20%282014%29%20Legal%20Interpretation%20%2801%29.pdf) addressing the use of UAS by public universities to conduct aeronautical research. The memorandum significantly limits the research that public entities (including state universities) can conduct under a Certificate of Authorization (COA, essentially a license to use UAS). The memo concludes that COAs would only permit researchers to conduct “aeronautical research” and that “expanding the types of research that may be conducted using a public aircraft beyond the categories of aeronautical research described would not be consistent with the intent” of U.S. code. FAA attempts to further clarify the agency’s position in a [July 3](https://www.faa.gov/about/office_org/headquarters_offices/agc/pol_adjudication/agc200/Interpretations/data/interps/2014/Williams-AFS-80%20Clarification%20-%20%282014%29%20Legal%20Interpretation.pdf) memo stating that “if a research project fulfills another governmental function under the statue, then it too may qualify as a public aircraft operation.”  Rather than make things clearer, these memoranda seem to have created a great deal of uncertainty at universities conducting or wishing to conduct research with UAS.

·         The FAA [issued](https://nppa.org/sites/default/files/PetitionExhibit1%2008-22-14.pdf) an ‘Interpretation of the Special Rule for Model Aircraft’ which expands the FAA’s authority to regulate model aircraft operations. APLU and the Association of American Universities (AAU) believe this rule does not apply to university research. This rule specifically applies to aircrafts “flown for hobby or recreational purposes”. Nevertheless, there is concern that the FAA put forth rules to regulate the operation of model aircrafts whereas previously they were exempted by Congress from being subject to FAA rulemaking as long as they met certain criteria.

·         Late last week, the FAA announced that it would be granting waivers to several filmmaking companies for some limited use of camera-equipped drones. This very specific FAA action, which amounts to an exception to the effective ban of commercial UAS use generated much excitement in other sectors interested in using UAS. According to a Wall Street Journal article, “The FAA has said the exemptions are an interim effort to respond to the rapid increase in commercial drone use that has occurred despite the existing ban, while the government works out a comprehensive policy governing the sector.”

**University Strategy**

APLU, together with AAU, is working on a multi-pronged approach to address the effective ban on UAS for most research. Prospective approaches include working with the FAA to develop a procedure allowing for research and instructional UAS activities at universities as well as reaching out to inform Congress of the problems our universities are facing with restrictions on UAS use and possibly pursuing a legislative remedy.  We also are closely communicating with the Council on Governmental Relations ([COGR](http://www.cogr.edu/)) and other interested higher education organizations on this matter.

At this point, we are focusing on the use of UASs for research and academic use. Although universities have other uses for UAS on their campuses (e.g., flying a drone over the football stadium during a game), our primary concern at this point is establishing an effective means by which universities can use UAS for research and academic purposes.

**CGA Action Request**

**To make a compelling case to the FAA and to Congress for a regulatory and/or legislative change, it is necessary to demonstrate that the current environment is preventing valuable research from moving forward.  We strongly encourage CGA to reach out to administrators and faculty on campus to learn about your university’s interest in UAS for research and academic use.**

Some suggested questions to ask include:

·         Are researchers at your university currently using UAS in their work?  In what fields of science? What federal agencies or other sources are funding this research?

·         Are there researchers at your university who want to use UAS in their studies but are suppressed by the current environment?  In what fields of science?

·         How are FAA actions impacting your faculty’s ability to use UAS for research or other academic purposes?

·         Has your campus or have researchers on your campus received any directive or warning from the FAA to stop research using UAS?  Has any other agency or entity directed campus researchers to halt UAS use?

**We are working to collect this helpful information from campuses to help build a necessary rationale for policy change.  Please know we will be discreet with the information you provide us and will not attribute it to your university without your express consent. It would be helpful to have this information as soon as possible, and certainly within the next two weeks.** Please share any relevant information you acquire with Jennifer Poulakidas at [jpoulakidas@aplu.org](mailto:jpoulakidas@aplu.org) and/or Madeline Nykaza at [mnykaza@aplu.org](mailto:mnykaza@aplu.org).

CGA who are interested in further engaging on this issue may join the joint APLU-AAU listserv ([FAA-UAS-RESEARCH@LISTSERV.APLU.ORG](mailto:FAA-UAS-RESEARCH@LISTSERV.APLU.ORG)) by emailing Madeline at [mnykaza@aplu.org](mailto:mnykaza@aplu.org).

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## 465 – Investigate Local Flight Testing Locations and Facilities

NOTE

This user story has been superceded by user story ‘523 – Exploration Trip to Lester, WA’

**Content**

As a flight operations manager, I would like to evaluate and investigate various local flight test locations and facilities so I can identify appropriate places to conduct flight tests.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Coordinate with flight operations team (Al Creigh, Brendan Doyle Wade, Mason Steinbrueck)

[ ] Invetigate various potential flight test locations including but not limited to:

[ ] 60 Acres

[ ] Magnuson Park

[ ] Meadowbrook Farm ([link](http://www.meadowbrookfarmpreserve.org/index.html))

[ ] Marymoor park

[ ] Snohomish Radio Aero Club ([link](http://www.sracinc.com/index.htm))

[ ] Create a document that collects information about each site. This should include photos and info including but not limited to:

[ ] Directions/time to get to site

[ ] Assorted pros/cons of each site

[ ] How many people typically are in the area

[ ] Historical precedence for model aircraft flights

[ ] Present results to group.

[ ] Make a recommendation to group about where to fly.

[ ] Document is reviewed and checked into an appropriate location on Perforce.

**Notes**

* Obtain the picture of the 60 Acres field and their numbering scheme from Chris or Al Creigh and add to the document (see email on 11/07/14). Also add the 60 Acres usage agreement to the folder (see email on 11/13/14)

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## 466 – Develop Flight Operations Policies and Procedures

**Content**

As a flight operations manager, I would like establish flight operations policies and procedures so I can effectively and safety conduct flight operations in the AFSL.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story.

[x] Coordinate with flight operations team (Al Creigh, Brendan Doyle Wade, Mason Steinbrueck)

[x] Establish policies and procedures when it comes to operating AFSL flight operations equipment. Questions to answer include but are not limited to:  
 [x] Who needs to sign off on a flight?

[x] Who needs to sign off on the airworthiness of an aircraft?

[x] How do we schedule flight operations

[x] Create a document that describes all of these procedures

[x] Additional tasks TBD…

[x] Add “flight operation procedures” document to flight operations depot. The document contains general for all flight operations procedures (all aircrafts).

[x] For each individual aircraft, create an “operational checklist” document and put it in aircraft-specific folders. The document contains specific preparational instructions for aircrafts.

**Notes**

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## 467 – UW UAS Wind Tunnel Test Model Preparation (Position 2)

**Content**

As a wind tunnel test engineer, I would like to construct and prepare a wind tunnel model of the UW UAS so I can use it in a wind tunnel test.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Coordinate with the development champion of user story ‘403 – UW UAS Wind Tunnel Test Feasibility Study’

[x] Read documentation on UWAL’s website about model preparation.

[x] Coordinate with Jack Ross at UWAL to discuss modifying the UW UAS to be wind tunnel test compatible.

[x] Investigate the feasibility/existence of a fiberglass version of the Skywalker 1900 aircraft (ensure it has the same exterior geometry) ([link](http://www.hobbyking.com/hobbyking/store/uh_viewitem.asp?idproduct=32087))

[ ] Ensure that the wind tunnel model has working control surfaces.

[ ] Ensure that the wind tunnel model has working propulsion (so we can conduct power on testing)

[ ] Ensure that the horizontal tail is removable (for tail off runs)

[ ] Determine a way to instrument or measure control surface deflections (including throttle setting) so that we can record test conditions.

[x] Read all other wind tunnel related user stories so you have an idea of what we will accomplish with the overall wind tunnel test. This include but are not limited to (you may need to search this document for other related stories):

[x] 403 – UW UAS Wind Tunnel Test Feasibility Study

[x] 404 – UW UAS Wind Tunnel Test Model Preparation

[x] 405 – UW UAS Wind Tunnel Test Plan Preparation

[x] 406 – UW UAS Wind Tunnel Test Execution

[x] 407 – UW UAS Wind Tunnel Test Data Reduction

[x] 408 – UW UAS Wind Tunnel Test Documentation

[x] 487 – UWAA 3D Printing Investigation

[ ] Obtain a CAD model of the Skywalker 1900 internal geometry (talk to Brendan). Ensure this file is uploade to an appropriate location in Perforce for future use.

[ ] Document construction of the wind tunnel model and other components.

[ ] Upload all relevant documentation to an appropriate location in Perforce.

[ ] Present results to the research group.

**Notes**

* This only involves preparing the wind tunnel model, it does not require planning the actual wind tunnel test.

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## 468 – Sprint 1411 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1411 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 469 – Add Desks to AERB 139

**Content**

As a project manager, I would like to add one or more desks to the AERB 139 lab so students can work in the space.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.  
[x] Coordinate with Chris Lum to audit contents of file cabinet and storage locker in AERB 139.

[x] Move file cabinet and storage locker out of AERB 139 and into KWT 102.

[x] Arrange to obtain 1 or more desks for students (either via UW surplus or ask Fiona Spencer)

* UWAL does not have any desks (spoke to Jack Ross on 11/09/14)

[x] Add desks, chairs, computers, monitors, keyboards, Ethernet, etc. to the additional desks.

**Notes**

* Some very good desks at located at UW Surplus at <http://www.washington.edu/facilities/finadmin/movingandsurplus/inventory/item/height-adjustable-l-shaped-desks-tables>

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## 470 – Australia Identify Conference and Create Skeleton Framework

**Content**

As a writer, I would like to identify which conference we will send the Australia bushfire paper to anad setup a skeleton framework so I can start writing the paper.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Investigate call for paper announcements from various technical conferences. Pay attention to due dates of manuscripts/abstracts. Identify which conference fits both the scope and timeline of our desired paper.

[x] Create a folder in the TechnicalDataPackage area of the Australia depot to hold paper information.

[x] Based on the desired technical conference, obtain a LaTeX template file for the paper and save it in the previously mentioned folder.

[x] Create a skeleton draft of the paper.

[x] Work with Chris Lum to get the relevant files upload to Perforce so everyone can work on the paper.

**Notes**

* See \\JCATI2013\TechnicalDataPackage\IEEE Paper for examples
* You should reference the bibliography at \\AFSL\TechnicalDataPackage\Latex\\afsl\_bibliography.bib.
* Some conferecnes to consider are the AIAA GNC, ICUAS, IEEE Aerospace Conference, etc.
* Shoot for the 2015 ICUAS conference. Deadline is full paper on Feb. 6. <http://uasconferences.com/>
* Possible alternate conferece is the AIAA GNC conference (<http://www.aiaa-scitech.org/Call_for_Papers/> )

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## 471 – Aerial Mapper Recovery System (Position 2)

**Content**

As a UAS operator, I would like to develop a recovery system to retrieve the aerial mapper aircraft

**Definition of Done**

[X] Coordinate with Chris Lum before starting this user story.

[X] Coordinate with development champion of user story ‘461 – TEDD Systems Integration’

[X] Create a document outlining some of the areas where we may want to operate the mapping system. This document should include at minimum:

[X] Pictures of various, challenging operational areas

[X] Identification/discussion of operational challenges (why is it hard to operate in a given area)

[X] Trade study of existing UAS recovery systems (Skyhook, parachute, net, etc.)

[X] Present previously described document to the group and lead a group brainstorming session.

[X] Implement a prototype recovery system on the aerial mapper aircraft.

[X] Demonstrate functionality of this system.

[X] Perform a successful recovery using this system.

[X] Document results and recovery system.

[ ] Upload all pertinent documents to an appropriate location on Perforce.

**Notes**

* See \\AFSL\TechnicalDataPackage\Presentations\14\_10\_16\_David\_Shean.pdf slides, pg. 48 for an example of some terrain with no room for traditional landing.
* Other challenging scenarios include:
  + High wind environments
  + Ship-board operations

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## 472 – Camera Image Example/Test Data

**Content**

As an algorithm designer, I would like to generate a series of example/trail pictures and video that can be used to test various visual anchoring algorithms.

**Definition of Done**

[ x] Coordinate with Chris Lum before starting this story.

[ x] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[ x] Generate a series of example/trail videos and pictures from the camera. This media should illustrate a wide range of operating conditions (the target in different locations in the image, at different orientations, different lighting conditions, static/noise, etc.)

[ x] Extract still frames from videos and tabulate/record how to cross reference still images with video files.

[ x] Write a document which describes all the data sets along with how the data was obtained. Some crucial information for each image should include but is not limted to:

[ x] Euler angles of the aircraft

[ x] Pan/tilt angles of the camera

[ x] Coordinates of the camera

[ x] Coordinates of targets/objects of interset

[ x] Upload data to appropriate locations within \\VisualAnchoring\ImageProcessing\TestData.

[x] Present results to the research group.

[ ] Additional tasks TBD…

**Notes**

* This data will be used by other developers to validate their algorithms.
* This data should be as close to flight operations conditions as possible (ensure you are using the FoxCam camera or whatever camera will be used for flight operations)

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## 473 – Create UW Image Capture Application

**Content**

As a software developer, I would like to determine a workflow for processing video streams and obtaining data from the video system so that I can use it to capture data from the system to be used in future visual servoing algorithms.

**Definition of Done**

[X] Coordinate with Chris Lum before starting this story.

[x] Read and coordinate with development champion of user story ‘472 – Camera Image Example/Test Data’.

[X] Read and coordinate with development champion of user story ‘424 – OpenCV Familiarization’.

[X] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[X] Demonstrate a workflow to import/load the example videos from \\VisualAnchoring\ImageProcessing\TestData into a software application which can be used to manipulate/analyze the images.

[X] Demonstrate a workflow to import/load live video data into a software application which can be used to manipulate/analyze the images.

[X] Create a small sample application which can import/load the data described previously.

[ ] Create a document outlining this workflow and any necessary components/steps in the process.

[ ] Upload this document and your sample application/code to an appropriate location on Perforce

[ ] Present results to the research group.

[ ] (NOT APPLIABLE) Fix the problem with the real time VLC capture (this doesn’t seem to update in real time, it only grabs the first frame when it is started).

[ ] Additional tasks TBD…

**Notes**

* This user story only conerns obtaining/processing the video stream, you do no need to create an image processing algorithm or do any significant manipulation to the data once you get it on the computer.
* The end goal of this user story is to identify and demonstrate a viable software application that we can use to analyze video streams. This does not need to be 100% coded by hand. In fact, the use of off-the-shelf software packages and/or components are encouraged.
* Compare the scope of this story with user story ‘477 – Create UW Image Processing Application’

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## 474 – Image Processing Slant Range of Screen Pixels

**Content**

As an algorithm designer, I would like to generate a function which returns the slant range to any given pixel in an image so I can use it in other parts of the visual anchoring system.

**Definition of Done**

[x] Read and coordinate with development champion of user story ‘472 – Camera Image Example/Test Data’.

[x] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[x] Identify one or more of these example images to use as an example for this user story.

[x] Create a function that takes into account the aircraft orientation (φ, θ, ψ), the camera’s orientation (θc, ψc) and zoom factor (λc) and determines the distance from the camera to each pixel in the image.

[x] Verify and validate your function with various test cases.

[x] Generate software/code to implement the algorithm.

[x] Write appropriate unit tests for your software module.

[x] Document your algorithm and outline assumptions, weaknesses, strengths, etc.

[x] Present results to the research group.

[x] Incorporate group feedback into your work.

[x] Upload document to an appropriate location in Perforce.

**Notes**

* You can assume that all pixels are of a flat ground (ie the image does not contain a horizon or large vertical undulations such as buildings)
* This user story may end up being changed or dropped depending if we need this functionality or not.

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## 475 – Generate Visual Anchoring Demostrator Scenario and Project Vision

**Content**

As a project manager, I would like to identify a demonstration scenario for the visual anchoring project so all work related to the project can be done to achieve this goal.

**Definition of Done**

[x] Identify and generate a description of a target scenario for the visual anchoring project.

[x] Document this scenario in a coherent document with diagrams, illustrations, animations, etc. that any team member can read and understand what we are trying to accomplish with this project.

[x] Determine metrics to measure success of the scenario.

[x] Present this to the research group so everyone is aware of the demonstrator scenario.

[x] Upload necessary files to an appropriate location on Perforce.

**Notes**

* This is effectively a “stunt” or high visibility demonstration which will exercise most of the relevant system components.
* This is used as a “target to shoot for” when developing all other work with the project.
* This user story is captured in a large poster style diagram that shows the different compoennts and subsystems associated with the project. Ensure that you look at this diagram and understand all the interactions.
* Question to answer
  + What size target will produce a reasonable number of pixels in the image?

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## 476 – Pan/Tilt Camera Orientation Measurement

**Content**

As an engineer, I would like to devise a system whereby the pan/tilt/zoom of the camera on the visual anchoring aircraft can be measured and recorded so I can use this information in other algorithms.

**Definition of Done**

[x] Coordiante with development champion of user story ‘321 – Pan/Tilt Gimbal System Creation’.

[x] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[x] Read the content of this [link](http://copter.ardupilot.com/wiki/common-camera-gimbal/) to determine if this is a solution to this problem.

[x] Create a system whereby the pan, tilt, and zoom factor of the camera can be measured and recorded by the aircraft’s autopilot or data logging system.

[x] Verify that this information is available in real time at the ground station (see notes).

[x] Calibrate the system and run several validation tests to ensure the system is repeatable and accurate.

[x] Document system accuracy, error bounds, weaknesses, etc.

[x] Generate a document describing the system and its operation.

[x] Present results to the research group.

[x] Upload documents to an appropriate location in Perforce.

**Notes**

* The goal for this is to have the pan, tilt, and zoom angles be available on the ground station so other systems can use this information.

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## 477 – Create UW Image Processing Application

**Content**

As a software developer, I would like to generate an application that can automatically process visual information and extract relevant data from the images so that other algorithms can use this data to complete the visual anchoring task.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Read and coordinate with development champion of user story ‘472 – Camera Image Example/Test Data’.

[ ] Read and coordinate with development champion of user story ‘424 – OpenCV Familiarization’.

[ ] Read and coordinate with development champion of user story ‘473 – Create UW Image Capture Application’.

[ ] Read and coordinate with development champion of user story ‘474 – Image Processing Slant Range of Screen Pixels’

[ ] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[ ] Create an interface document which defines the inputs and outputs of this application. Present this to the relevant people who are developing modules which may interface with the image processing application.

[ ] Create an application that can process the image output and packages relevant data (distance to target, location of target, etc.) into an appropriate packet.

[ ] Create a document outlining this application (with inputs and outputs) and any necessary components/steps in the process.

[ ] Upload this document application/code to an appropriate location on Perforce

[ ] Present results to the research group.

[ ] Additional tasks TBD…

**Notes**

* This is the overall UW Image Processing Appliation. This may be a large application and therefore it may be relevant to break up susbsections of this algorithm into individual user stories (for example, user story ‘474 – Image Processing Slant Range of Screen Pixels’ is a smaller story whose results may be used by the UW Image Processing Application)
* Other user stories capture the efforts to capture and extract the video images, so this user story only encompasses the processing of these images.
* Compare the scope of this with user story ‘473 – Create UW Image Capture Application’

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## 478 – Create UW Visual Anchoring Data Fusion Algorithm

**Content**

As an algorithm designer, I would like to design a visual anchoring data fusion algorithm that runs on the ground station and combines image processing data with aircraft state data to compute relevant parameters or information about the visual anchoring problem so that it can be uploaded to the aircraft and used by the custom autopilot mode to perform visual anchoring.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[ ] Read and coordinate with development champion of user story ‘477 – Create UW Image Processing Application’

[ ] Create an application that can accept the output from the UW Image Processing Application as well as the output from the UW Mission Planner Capture Application and computes relevant information for the visual anchoring algorithm that will be running on the aircraft as a custom flight mode.

[ ] Create a document outlining this application (with inputs and outputs) and any necessary components/steps in the process.

[ ] Upload this document application/code to an appropriate location on Perforce

[ ] Create a skeleton of the algorithm in Matlab to show how the system will operate.

[ ] Present results to the research group.

**Notes**

* This algorithm is designed to be run on the ground station.
* This is in charge of fusing data from the image processing algorithm as well as the mission planner capture application and computing information which may be useful to the actual visual anchoring algorithm which is running on the aircraft.
* This is NOT computing the control surface deflections or inner loop control.
* You may need to modify the definition of done for this user story. Check with Chris Lum before modifying this story.

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## 479 – Student Technology Fee Proposal

**Content**

As a project manager, I would like to submit a proposal to the UW Student Technology Fee to see if we can obtain funding for some of our purchases.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Read about the STF proposal process at <https://techfee.washington.edu/>

[ ] Read past successful proposals in related areas. Two from David Shean are

[ ] <https://techfee.washington.edu/proposals/2013-079/>

[ ] <https://techfee.washington.edu/proposals/2014-059/>

[ ] Coordinate with David Shean and get his advice on successful proposals to the STF.

[ ] Add additional tasks to this user story as appropriate (for example obtaining relevant student testimonials and department support)

[ ] Ensure that deadline for the proposal is being tracked by Chris Lum

[ ] Create a list of equipment to ask for and create an appropriate budget.

[ ] Coordinate with Juris Vagners to see if there are equipment that we would like to add to the procurement list.

[ ] Create proposal and get this reviewed with Chris Lum

[ ] Submit the proposal.

**Notes**

* The main equipment we may want to acquire is a trailer to house, store, and haul equipment to field experiments. We may want this to be an instrumented ground control station with computers and other equipment.
* Some equipment may include a PixHawk and some of the sensors outlined in \\AFSL\TechnicalDataPackage\Presentations\14\_10\_16\_david\_shean
* Investigate if our proposal can be “fast tracked” so we can obtain funding as soon as possible.

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## 480 – Visual Anchoring: RCAM Outer Loop Controller

**Content**

As a control engineer, I would like to obtain create an outer loop controller for the RCAM plant model in so that I can stabilize an orbit at a fixed altitude.

**Definition of Done**

[ x ] Read and coordinate with development champion of user story ‘458 – Orbit Controller Feature Level Design’ which should be completed before this current story.

[ x ] Read and coordinate with development champion of user story ‘331 – Visual Anchoring: RCAM Plant Model’

[ x ] Read and coordinate with the development champion of user story ‘453 – Visual Anchoring: RCAM Inner Loop Orbit Controller’

[ x ] Read and coordinate with development champion of user story ‘458 – Orbit Controller Feature Level Design’

[ x ] Read and coordinate with development champion of user story ‘478 – Create UW Visual Anchoring Data Fusion Algorithm’

[ x ] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.’

[ x ] Coordinate with Chris Lum before starting this story.

[ x ] Generate an outer loop controller which takes input from the UW Visual Anchoring Data Fusion system and creates an input to the inner loop orbit controller.

[ ] Validate entire system performance in simulation investigating some of the following issues

[ x ] disturbance rejection (wind, turbulence)

[ ] effects of latency

[ ] algorithm sensitivity and robustness

[ ] time constants (high tight a turn can we reasonably achieve)

[ ] Document algorithm functionality in a coherent document.

[ x ] Present results to research group

[ ] Incorporate feedback and check in document and code to an appropriate location on Perforce.

**Notes**

* This outer loop controller will work together with the inner loop and likely be executed on the aircraft.
* This algorithm should only use information that is available in a GPS denied environment.

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## 481 – Matlab Computer Vision Systems Toolbox Investigation

**Content**

As a software developer, I would like to familiarize myself with the Matlab Computer Vision Systems Toolbox so I can become aware of its capabilities and explore how this can be useful to our visual anchoring project.

**Definition of Done**

[ x] Coordinate with Chris Lum before starting this story.

[ x] Read and coordinate with the development champion of user story ‘424 – OpenCV Familiarization’

[ x] Read and coordinate with the development champion of user story ‘277 – Australia: Prototype Forest Fire-Line Identification System’

[ x] Find a Matlab license with the Computer Vision Systems Toolbox.

[ x] Read documentation and familiarize yourself with the usage of this toolbox.

[ x] Create a simple example application that highlights and illustrates useful functions and operations in this toolbox.

[ x] Demonstrate your application as well as general toolbox functionality to the group.

[ x] Check in both your presentation and sample application to an appropriate location on Perforce.

**Notes**

* The goal of this story is to investigate if there is an SDK that we can use for our visual anchoring problem. If there is another library besides this toolbox that can be used (for example a .Net library), we should quickly identify this and abandon/rename this user story.
* Matlab released a webinar highlighting the use of this toolbox. Search the Matlab website for the “Face Recognition with MATLAB”. This webinar was presented live on 11/13/14 and several other dates. A recording of this webinar is located [here](http://www.mathworks.com/videos/face-recognition-with-matlab-98076.html?form_seq=conf1260&confirmation_page&wfsid=6026621&s_v1=2659&elq_cid=92406).
* Other webinars about this toolbox are located [here](http://www.mathworks.com/products/computer-vision/webinars.html).
* An alternative toolbox may be Peter Corke’s Machine Vision Toolbox (493 – Matlab Machine Vision Toolbox Investigation)

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## 482 – Setup X-Plane Simulator in AERB139

**Content**

As a simulation engineer, I would like to setup the X-Plane simulation in AERB 139 so I can use it for the visual anchoring project.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[ ] Review the \\AFSL\UserStories\ExternalDemo\_1410\14\_11\_10\_external\_demo.pptx, slides 6-8 for background information on this simulator.

[x] Recreate this setup in AERB 139.

[x] Demonstrate the simulator to Chris Lum to ensure functionality.

[ ] Demonstrate simulator to the rest of the research group.

**Notes**

* As a first step, use the same version of X-Plane and FlightGear that the simulator currently uses (X-Plane 9). User story ’454 – Upgrade UW X-Plane Plug-ins to VS2012 and X-Plane 10’ will focus on upgrading the simulator.
* Ensure that the X-Plane and FlightGear computers have static IP addresses and these do not conflict with anything on the network.

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## 483 – Mission Planner Modifications (Simple)

**Content**

As a software developer, I want to ensure that I can modify the Mission Planner software so that I can use it for custom applications in the visual anchoring project.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story.

[x] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[x] Obtain the source code for Mission Planner (also determine how to make a unique branch of the code if necessary)

[x] Determine how to build the application using Microsoft Visual Studio 2012.

[x] Make a simple change to the application and successfully build the application. This change should include but not be limited to:

[ ] The ability to output aircraft state information to an external file or application (so another application can access real time information from the PixHawk)

[x] Upload information to the PixHawk on the aircraft (for example send an orbit radius)

[ ] Install the modified application on a workstation and verify that the new functionality operates as desired.

[ ] Ensure that you can uninstall the new application and reinstall older versions of Mission Planner.

[ ] Document the workflow for modifying the Mission Planner application

[ ] Demonstrate results to the group.

[ ] Check in relevate code, documents, and notes to an appropriate location on Perforce (consult with Chris Lum before uploading)

[ ] Additional tasks TBD…

**Notes**

* This user story is simply working out an efficient workflow for modifying the Mission Planner application. Future user stories will look at adding the visual anchoring functionality (see user story ‘484 – Mission Planner Modifications (Complex)’

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## 484 – Mission Planner Modifications (Complex)

**Content**

As a software developer, I want to modify the Mission Planner software to accommodate the visual anchoring algorithm so that I can use it for the visual anchoring project.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story.

[x] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[x] Read an coordinate with the development champion of user story ‘483 – Mission Planner Modifications (Simple)’

[x] Get the Mission Planner interface working to support the Visual Achoring project.

**Notes**

* This user story involved making the actual changes to the Mission Planner software to accommodate the visual anchoring algorithm.
* Notes on how to accomplish this are in the Mission Planner build notes document.

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## 485 – PixHawk Custom Flight Mode (Simple)

**Content**

As a software developer and algorithm designer, I would like to setup a workflow to modify, compile, and load custom software for the PixHawk system so that I can create custom flight modes and otherwise modify the system for my custom purposes.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story

[x] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[x] Read and coordinate with the development champion of the following user stories:

[x] 384 – APM Firmware Preparation/Installation

[x] 385 – APM Editing/Building Code Via Visual Studio 2008-2013

[x] 483 – Mission Planner Modifications (Simple)

[x] Custom Flight Mode 1: Add a very simple, open loop custom flight mode to the PixHawk autopilot. This flight mode should be open loop in the sense that it deflects control surfaces in an open loop fashion without feedback form sensor or mission planner data.

[x] Custom Flight Mode 2: Add a very simple custom flight mode to the PixHawk autopilot. This flight mode should be a simple closed loop in the sense that it deflects control surfaces based on onboard sensor data (ie measurements it gets from the IMU). This flight mode does not need to use information originating from the Mission Planner.

[x] Custom Flight Mode 3: Add a very simple custom flight mode to the PixHawk autopilot. This flight mode should be a simple closed loop in the sense that it deflects control surfaces based on onboard sensor data (ie measurements it gets from the IMU) and information originating from the Mission Planner.

[x] Verify that you can return the system to factory status.

[x] Document your results and workflow.

[x] Present results to the group

[x] Upload relevant code, notes, files, to an appropriate location in Perforce (coordinate with Chris Lum before uploading data)

**Notes**

* A suggestion for custom flight mode 1 would be a simple controller that oscillates the elevators at some reasonable rate/amplitude (so we can see the plane’s pitch oscillate up and down when this flight mode is engaged)
* A suggestion for custom flight mode 2 would be a simple controller that adjusts the throttle based on the aircraft’s altitude (so we can see the plane increase velocity as altitude increases when this flight mode is engaged)
* A suggestion for custom flight mode 3 would be a simple controller that adjusts the orbit radius based on a parameter that is set on the ground station via the customized Mission Planner (so we can see the plane increase orbit radius when the operator changes something on the ground station)

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## 486 – PixHawk Custom Flight Mode (Complex)

**Content**

As a software developer and algorithm designer, I would like to add a custom flight mode to the PixHawk to support the visual anchoring project.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story

[x] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[x] Read and coordinate with the development champion of the following user stories:

[x] 384 – APM Firmware Preparation/Installation

[x] 385 – APM Editing/Building Code Via Visual Studio 2008-2013

[x] 483 – Mission Planner Modifications (Simple)

[x] 485 – PixHawk Custom Flight Mode (Simple)

[x] 453 – Visual Anchoring: RCAM Inner Loop Orbit Controller

[x] 480 – Visual Anchoring: RCAM Outer Loop Controller

[ ] Research how the existing APM 2.6/PixHawk autopilot implements the orbit/loiter mode.

[x] Determine if source code for the APM 2.6 autopilot exists and is publically available. If so, download it.

[ ] Add the visual anchoring flight custom flight mode to the PixHawk.

[x] Verify that you can return the system to factory status.

[ ] Document your results and workflow.

[ ] Present results to the group

[ ] Upload relevant code, notes, files, to an appropriate location in Perforce (coordinate with Chris Lum before uploading data)

[ ] Add references to simulator and other user stories which are related to the algorithm generation.

[ ] Additional tasks TBD…

**Notes**

* Ensure that the algorithm is tested and validated before uploading or trying to fly the custom flight mode.
* System was observed to drift. Still having some trouble getting to a stable orbit.

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## 487 – UWAA 3D Printing Investigation

**Content**

As a manufacturing engineer, I would like to investigate the capabilities within the UWAA department for utilizing the 3D printer so that I can use it to manufacture parts and prototypes.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story

[x] Coordinate with Fiona Spencer to ask her about how 3D printing in the AA department functions.

[x] Read about the 3D printer at <http://www.aa.washington.edu/operations/equipment.html>

[x] Read the STF proposal which funded the purchase of this printer at <https://techfee.washington.edu/proposals/2011-102-1/>

[x] Read and coordinate with development champion of user story ‘404 – UW UAS Wind Tunnel Test Model Preparation’

[x] Determine how to use the printer for fabricating parts.

[x] Generate a prototype part (for example the wind tunnel trunnion block)

[x] Document the process/workflow used.

[x] Present results to the research group

[x] Check in document in the appropriate location in Perforce (coordinate with Chris Lum before uploading data)

**Notes**

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## 488 – HAM Radio Operator Licensing

**Content**

As a UAS operator, I would like to investigate legalities regarding HAM radio frequencies and obtain the necessary licenses so that I can operate our systems legally.

**Definition of Done**

[x] Coordinate with Chris Lum, Al Creigh, and Jeremy Brenner before starting this story.

[x] Research the legalities and information related to HAM/ametuer radio in the United States

[x] Audit our systems and identify if any of our systems require HAM radio licensing (in particular look at our video transmitter).

[x] Record/document findings and check into appropriate location in Perforce.

[x] Research how to obtain appropriate licenses.

[x] Identify who in the group needs/wants to obtain licences

[x] Organize study sessions for the group

[x] Register the group to take classes and/or the exam

[x] Document the process/workflow used.

[x] Present results to the research group

[x] Check in document in the appropriate location in Perforce (coordinate with Chris Lum before uploading data)

**Notes**

* You are in charge of helping all the interested people study and pass this test to get the HAM license. Actually taking the exam and obtaining certification is contained in another user story (for example see ‘526 – Obtain HAM Radio Technician Class License (position 1)’)
* Please update this user story with appropriate verbiage/nomenclature as you progress.

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## 489 – AFSL COA (Part 1)

**Content**

As a UAS operator, I would like to investigate obtaining a Certificate of Authorization or Waiver (COA) for flight operations within the AFSL so that I can fly UAS safetly and legally.

**Definition of Done**

[x] Coordinate with Chris Lum, Melanie Clark, and Al Creigh before starting this story.

[x] Attend discussion with UC-Boulder people (11/24/14) to discuss COAs

[x] Arrange a meeting with Chris Lum, and Juris Vagners to discuss COAs at UW

[x] Research FAA COAs

[x] Research UW policies with respect to semi-dangerous operations. Some questions to answer include but are not limited to

[x] Who at the University has the ability to authorize these activities (department chair, PI, etc.)?

[x] Does the University carry insurance for these operations? If so, how do we get covered?

[x] How does the AA dept. carry out their flight tests (ie senior design & flight testing class)? (see notes)

[x] Investigate the UW [Office of Risk Management](http://f2.washington.edu/treasury/riskmgmt/). Determine if we can schedule a meeting with one of their representatives to discuss our activities (note that we may want to talk to them about equipment insurance during this meeting).

**Notes**

* The point of this user story is to get the ball rolling on an AFSL COA application as the process may take a significant amount of time and effort.
* UW Senior design flies at Whidbey Island Naval Air Station with Chuck Bower and the Whidbey Island model RC club. This seems be a somewhat of a grey area.

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## 490 – Image Processing Camera View in Inertial Frame

**Content**

As an algorithm designer, I would like to generate a function which returns the location of the camera view point given the Euler angles of both the aircraft and the camera system so that I can use this information in the visual anchoring and visual odometry systems.

**Definition of Done**

[X] Read and coordinate with development champion of user story ‘472 – Camera Image Example/Test Data’.

[X] Read user story ‘475 – Generate Visual Anchoring Demostrator Scenario and Project Vision’. Ensure you understand the architecture and vision of the project.

[X] Identify one or more of these example images to use as an example for this user story.

[X] Create a function that takes into account the following inputs:

* aircraft orientation (φ, θ, ψ)
* aircraft’s position (x, y ,z) in some GPS-free frame
* height above ground (hAGL)
* the camera’s orientation (θc, ψc) and zoom factor (λc)

and determines the location of the location the camera center point of view in the same GPS-free frame.

[X] Verify and validate your function with various test cases.

[X] Generate software/code to implement the algorithm.

[X] Write appropriate unit tests for your software module.

[X] Document your algorithm and outline assumptions, weaknesses, strengths, etc.

[X] Present results to the research group.

[X] Incorporate group feedback into your work.

[X] Upload document to an appropriate location in Perforce.

**Notes**

* Basically we want to know where the camera is pointed with respect to the aircraft.
* You may need to rotate the camera frame to the body frame and then rotate the body frame to the earth frame to achieve this.
* You can assume that all pixels are of a flat ground (ie the image does not contain a horizon or large vertical undulations such as buildings)
* This user story may end up being changed or dropped depending if we need this functionality or not.

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## 491 – Move Lab from KWT102 to GUG105 (position 1)

**Content**

As a project manager, I would like to move operations out of Kirsten Wind Tunnel 102 and into Guggenheim 105 so I can continue construction and operation.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Coordinate with the flight operations team to survey GUG105 and determine how we want to utilize the lab space.

[x] Clearly demarcate the areas that are being used by AFSL (so we do not have conflicts with DBF or DBL).

[x] Label all AFSL tools, boxes, equipment, tools ,etc.

[x] Move all operations out of KWT102 and into GUG105.

[x] Coordinate Chris Lum to obtain keys for all relevant personnel

**Notes**

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## 492 – Aerial Mapper Systems Integration (position 2)

**Content**

See user story ‘461 – TEDD Systems Integration’

**Definition of Done**

See user story ‘461 – TEDD Systems Integration’

**Notes**

See user story ‘461 – TEDD Systems Integration’

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## 493 – Matlab Machine Vision Toolbox Investigation

**Content**

As a software developer, I would like to familiarize myself with Peter Corke’s Matlab Machine Vision Toolbox so I can become aware of its capabilities and explore how this can be useful to our visual anchoring project.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Read and coordinate with the development champion of user story ‘424 – OpenCV Familiarization’

[x] Read and coordinate with the development champion of user story ‘277 – Australia: Prototype Forest Fire-Line Identification System’

[x] Install the Machine Vision Toolbox ([link](http://petercorke.com/Toolbox_software.html)) in the UWMatlab depot so that all members can use it.

[x] Read documentation and familiarize yourself with the usage of this toolbox.

[x] Create a simple example application that highlights and illustrates useful functions and operations in this toolbox.

[x] Demonstrate your application as well as general toolbox functionality to the group.

[x] Check in both your presentation and sample application to an appropriate location on Perforce.

**Notes**

* The goal of this story is to investigate if there is an SDK that we can use for our visual anchoring problem. If there is another library besides this toolbox that can be used (for example a .Net library), we should quickly identify this and abandon/rename this user story.
* This is a free, third party toolbox created by Peter Corke at QUT.
* An alternative toolbox may be the Matlab Computer Vision Systems Toolbox (481 – Matlab Computer Vision Systems Toolbox Investigation).

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## 494 – Purchase Laboratory Computing Infrastructure (position 2)

**Content**

See user story ‘387 – Purchase Laboratory Computing Infrastructure’

**Definition of Done**

See user story ‘387 – Purchase Laboratory Computing Infrastructure’

**Notes**

See user story ‘387 – Purchase Laboratory Computing Infrastructure’

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## 495 – AFSL Website Updates (People Section)

**Content**

As a marketing agent, I would like to update the AFSL website “People” section with new information so I can publicize our activities.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Update the “People” section

[ ] Obtain photos and short bios of all active members

[ ] Remove all inactive members to past researchers section

[ ] Determine where old members are now and update/highlight success stories

[ ] Review all materials with Chris Lum

[ ] Send mock ups to Kevin Ward.

[ ] Ensure that changes are made and correct on the final website.

[ ] When the user story is coming to 100% completion, please make a new copy user story 495 – AFSL Website Updates (People Section) for the next quarter/year.

**Notes**

* All website material is located in [\\AFSL\WebsiteInfo](file:///\\AFSL\WebsiteInfo)
* Coordinate with development champion for user story ‘460 – AFSL Website Updates’ (the parent user story for this current story) only if this is part of a large update.

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## 496 – AFSL Website Updates (Facilities Section)

**Content**

As a marketing agent, I would like to update the AFSL website “Facilities” section with new information so I can publicize our activities.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Update the “Facilities” section

[ ] Additional specific tasks to be added for this update…

[ ] Review all materials with Chris Lum

[ ] Send mock ups to Kevin Ward.

[ ] Ensure that changes are made and correct on the final website.

[ ] When the user story is coming to 100% completion, please make a new copy user story 496 – AFSL Website Updates (Facilities Section) for the next quarter/year.

**Notes**

* All website material is located in [\\AFSL\WebsiteInfo](file:///\\AFSL\WebsiteInfo)
* Coordinate with development champion for user story ‘460 – AFSL Website Updates’ (the parent user story for this current story) only if this is part of a large update.

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## 497 – AFSL Website Updates (Research Section)

**Content**

As a marketing agent, I would like to update the AFSL website “Research” section with new information so I can publicize our activities.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Update the “Research” section

[ ] Additional specific tasks to be added for this update…

[ ] Review all materials with Chris Lum

[ ] Send mock ups to Kevin Ward.

[ ] Ensure that changes are made and correct on the final website.

[ ] When the user story is coming to 100% completion, please make a new copy user story 497 – AFSL Website Updates (Research Section) for the next quarter/year.

**Notes**

* All website material is located in \\AFSL\WebsiteInfo
* The IEEE paper which outlines all of the work from the JCATI project is located in [\\JCATI2013\TechnicalDataPackage\IEEE Paper\CompiledVersions\MAIN\_collision\_awareness\_plugin.pdf](file:///\\JCATI2013\TechnicalDataPackage\IEEE%20Paper\CompiledVersions\MAIN_collision_awareness_plugin.pdf)
* Coordinate with development champion for user story ‘460 – AFSL Website Updates’ (the parent user story for this current story) only if this is part of a large update.

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## 498 – AFSL Website Updates (Publications Section)

**Content**

As a marketing agent, I would like to update the AFSL website “Publications” section with new information so I can publicize our activities.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Update the “Publications” section

[ ] Additional specific tasks to be added for this update… [ ] Review all materials with Chris Lum

[ ] Send mock ups to Kevin Ward.

[ ] Ensure that changes are made and correct on the final website.

[ ] When the user story is coming to 100% completion, please make a new copy user story 498 – AFSL Website Updates (Publications Section) for the next quarter/year.

**Notes**

* All website material is located in [\\AFSL\WebsiteInfo](file:///\\AFSL\WebsiteInfo)
* Coordinate with development champion for user story ‘460 – AFSL Website Updates’ (the parent user story for this current story) only if this is part of a large update.

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## 499 – FAA Certificate of Authorization (COA) for CONDOR – Identify Operations Location

**Content**

As a UAS operator, I would like to research possible flying locations for the AFSL COA application so that I can legally fly our systems.

**Definition of Done**

[ x] Coordinate with Chris Lum before starting this story.

[ x] Coordinate with development champion and read user story ‘409 – FAA Certificate of Authorization (COA)’ (this is the parent user story to this one)

[ x] Determine what (if any) restrictions are in place for a location for UAS flights (for example required distance from airport, populated areas, public/private land, etc.)

[ x] Read several of the example COAs (only the description of the flying location is necessary) to get an idea of what is required of an operation location (see notes)

[ x] Research and identify possible flying locations to use in the AFSL COA application (see notes)

[x] Coordinate with Chris Lum to review findings

[x] Determine if the site is accessible year round (ie are roads plowed in the winter)

[x] Determine who is the governing agency/entity that has jurisdiction over this area

[x] Find out contact information for this entity

[x] Obtain letter of authorization from this entity

[x] Document findings in \\FlightOperations\Operations\TestSiteInformation

**Notes**

* This user story only focuses on identifying a reasonable flight location.
* Samples of successful COAs are located at \\FlightOperations\Operations\COAs\SupportingDocuments\example\_COAs. All of these have requirements on describing the operation location.
* Some candidate locations are
  + Sunnyside, WA (Robert Hodgman at WSDOT may be able to help)
  + Meadowbrook farm (Chris contacted them via email on 12/13/14, awaiting a response)
  + Near Ellensberg
  + Table Mountain (talk to Melanie Clark)
  + Lester, WA (recommended by Josh Brungard but this doesn’t seem like a likely candidate due to the difficulty in accessing it).

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## 500 – UWAA Fall Poster Session (2014 Helper 1)

**Content**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Definition of Done**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Notes**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

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## 501 – UWAA Fall Poster Session (2014 Helper 2)

**Content**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Definition of Done**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Notes**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

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## 502 – UWAA Fall Poster Session (2014 Helper 3)

**Content**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Definition of Done**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Notes**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

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## 503 – UWAA Fall Poster Session (2014 Helper 4)

**Content**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Definition of Done**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Notes**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

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## 504 – UWAA Fall Poster Session (2014 Helper 5)

**Content**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Definition of Done**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Notes**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

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## 505 – UWAA Fall Poster Session (2014 Helper 6)

**Content**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Definition of Done**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Notes**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

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## 506 – UWAA Fall Poster Session (2014 Helper 7)

**Content**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Definition of Done**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Notes**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

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## 507 – UWAA Fall Poster Session (2014 Helper 8)

**Content**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Definition of Done**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Notes**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

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## 508 – UWAA Fall Poster Session (2014 Helper 9)

**Content**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Definition of Done**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

**Notes**

Help with user story ‘428 – UWAA Fall Poster Session (2014)

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## 509 – Field Testing Transportation Boxes (Part 2)

**Content**

As a field test pilot, I would like to create transportation equipment and packaging for all relevant systems so I can safely transport equipment to and from the testing site.

**Definition of Done**

[ ] Read the user story ‘455 – Field Testing Transportation Boxes (Part 1)’ (the first part of this effort)

[ ] Be sure to take into account transportation of the following objects at minimum:

~~[ ] Piper J-3 airframe~~

[x] All communication equipment

[x] Laptop for APM mission planner ground station (backup)

[x] Backup tools and parts.

[x] Sensors such as GPS, APM, etc.

[x] Cameras for documentation

~~[ ] CONDOR GCS (talk with Alec Bueing)~~ Moved to 544 – Field Testing Transportation Boxes (Part 3)

**Notes**

* This is a continuation of a previous user story (‘455 – Field Testing Transportation Boxes (Part 1)’)
* At the end of this user story, we want a system to packup and transport all our equipment in a partitioned fashion (each aircraft has a dedicated box that can be taken to the field independently of others)

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## 510 – AFSL Website Updates (People Section) (Helper)

**Content**

Help with user story ‘495 – AFSL Website Updates (People Section)’

**Definition of Done**

Help with user story ‘495 – AFSL Website Updates (People Section)’

**Notes**

Help with user story ‘495 – AFSL Website Updates (People Section)’

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## 511 – CONDOR Ground Control Station Construction and Validation

**Content**

As a UAS operator, I would like to build and test the CONDOR ground control station (GCS) so that I can use it for flight operations

**Definition of Done**

[x] Cooridnate with development champion of user story ‘387 – Purchase Laboratory Computing Infrastructure’

[x] Research and implement a safety mechanism to allow the GCS to continue operating even if shore power is temporarily lost (see notes)

[x] Research and implement a mechanism to allow the system to operate in a mobile configuration (ie without continuous 120VAC power)

[ ] Perform a test of the system in a simulated mobile configuration. Present results to group and document this in an appropriate location in Perforce.

**Notes**

* A UPS may be the easiest way to operate if power is lost.
* This system may need to operate in areas without standard 120 VAC power.
* You need to test with the generator in the loop as we experienced issues with this on the 03/19/16 excursion

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## 512 – CONDOR RxMUX Integration

**Content**

As a UAS operator, I would like to integrate the RxMUX system into the CONDOR system to allow for additional redundancy and safety during operations.

**Definition of Done**

[x] Coordinate with Chris Lum and Al Creigh before starting this user story.

[x] Read documents about the RxMUX online ([link](http://www.acroname.com/products/S56-RXMUX-1.html))

[x] Read document \\FlightOperations\UAS\CONDOR\SubSystems\RxMUX\RxMux\_1.0\_datasheet.pdf

[x] Read COA document at \\FlightOperations\Operations\COAs\SupportingDocuments\example\_COAs\COA 2012-ESA-2-COA-R\CONTROL\_STATION.pdf to see how this is integrated into a previously approved COA aircraft.

[ ] Integrate the RxMUX onto the CONDOR system.

[ ] Test and validate this system

[x] Write documentation describing the operation of this system. This should include a signal flow diagram similar to the one shown in the example COA 2012-ESA-2-COA-R.

[ ] Review documentation with Chris Lum and check document into Perforce at \\FlightOperations\UAS\CONDOR\SubSystems\RxMUX.

[ ] Create a block diagram (aka a signal flow diagram) of all the systems including the RxMUX.

[ ] Update poster at \\VisualAnchoring\TechnicalDataPackage\ProjectVision\VisualAnchoringProjectVision.pptx

[ ] Demonstrate functionality to research group and present results.

[ ] Update CONDOR COA with verbiage to reflect the successful integration of this redundancy system. Document is located at \\FlightOperations\Operations\COAs\CONDOR\COA\_CONDOR.docx

**Notes**

* The example COA of “COA 2012-ESA-2-COA-R” has verbiage describing this RxMUX system and how it functions, you may want to copy/paraphrase this verbiage.

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## 513 – FAA Written Exam for Private Pilot Aircraft Certification

**Content**

As a UAS operator, I would like to pass the FAA written exam for a Private Pilot license of the airplane category so that I can use this certification for COA applications as well as moving towards a full private pilot’s certification.

**Definition of Done**

[ ] Coordinate with Chris Lum and Al Creigh before starting this user story.

[ ] Procure study and test material

[ ] ASA

[ ] E6B

[ ] Test supplement

[ ]

[ ] Organize study groups

[ ]

**Notes**

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## 514 – FAA Certificate of Authoriation (COA) for CONDOR – Register Aircraft

**Content**

As a UAS operator, I would like to register the CONDOR aircraft with the FAA so I can proceed with the COA process.

**Definition of Done**

[ ] Coordinate with Chris Lum and Al Creigh before starting this user story.

[ ] Coordinate with development champion and read user story ‘409 – FAA Certificate of Authorization (COA)’ (this is the parent user story to this one)

[ ] Contact the local FAA FSDO and start a dialog with them to determine how to move forward

[ ] Register CONDOR aircraft with the FAA

[ ] Additional tasks TBD

**Notes**

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## 515 – APM 2.6 Hardware-in-the-Loop Simulator

**Content**

As a simulation engineer, I would like to develop a hardware-in-the-loop (HiL) simulator using the APM 2.6 platform so that I can simulate the system operation in a lab environment and become familiar with the system’s operation.

**Definition of Done**

[ x] Coordinate with Chris Lum, Bryan G., and Melanie Clark before starting this story.

[ x] Create a HiL simulator in the lab that allows interaction between X-Plane and the APM2.6.

[ x] Create a document outlining how this system operates.

[ x] Present results to research group (demonstrate how to use the system).

**Notes**

* Bryan has a document outlining the procedure for this located at \\AFSL\HowToDocumentation\SimulatorQuickStartGuide.docx
* This work is continued for the Pixhawk in ‘547 – Pixhawk Hardware-in-the-Loop Simulator’

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## 516 – CONDOR Camera Transmitter/Reciever Upgrade

**Content**

As a CONDOR UAS operator, I would like to upgrade the camera transmitter/receiver system to a system that does not require a HAM radio license to operate so that I can use it more freely and in unlicensed bands.

**Definition of Done**

[ ] Coordinate with Chris Lum, Al Creigh, and Brendan Doyle-Wade before starting this story.

[ ] Upgrade CONDOR camera Tx/Rx package to use the new FatShark – FCC Certified, Cased 5.8 GHz A/V transmitter

[ ] Integrate onto the CONDOR system.

[ ] Test and validate this system

[ ] Write documentation describing the operation of this system. Review document with Chris Lum and check this documentation into \\FlightOperations\UAS\CONDOR\SubSystems

[ ] Update poster at \\VisualAnchoring\TechnicalDataPackage\ProjectVision\VisualAnchoringProjectVision.pptx

[ ] Demonstrate functionality to research group and present results.

[ ] Update CONDOR COA with verbiage to reflect the successful integration of this camera system. Document is located at \\FlightOperations\Operations\COAs\CONDOR\COA\_CONDOR.docx

[ ] Additional tasks TBD

**Notes**

* The basic goal of this story is to upgrade the camera system to an FCC certified system.

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## 517 – Update Component Description Document

**Content**

As a systems manager, I would like to update the UAS component description document so I can have an accurate assessment of components used in the UAS systems.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story

[ ] Review the document at \\FlightOperations\UAS\ComponentDescriptions.docx

[ ] Determine which components need to be moved to which aircraft (each aircraft now has their own folder)

[ ] Move contents of this document to the appropriate UAS

[ ] Update subsystems of each UAS to reflect systems that are used by it

[ ] Mark the file at \\FlightOperations\UAS\ComponentDescriptions.docx for deletion after you have transferred all data out of it.

[ ] Demonstrate and explain the documents to the research group

[ ] Additional tasks TBD

**Notes**

* The basic goal of this story is to update the documentation for the subsystems of the various UAS.

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## 518 – Integrate Backup Skywalker Aircraft into AFSL Systems

**Content**

As a flight operations manager, I would like to integrate the backup Skywalker aircraft into the AFSL systems so I can use it for training, experiments, and other activities.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story

[x] Coordinate with Al Creigh or Brendan Doyle-Wade to assess the state fo the backup Skywalker.

[x] Purchase necessary components for the aircraft

[x] Ensure the aircraft is airworthy

[x] Determine a name for the aircraft

[x] Update relevant documentation in the FlightOperations depot with this aircraft’s information

[x] Demonstrate functionality and present results to the research group.

[x] Hang this aircraft in AERB 139 for display/storage

**Notes**

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## 519 – Investigate Simulink APM Blockset

**Content**

As a simulation engineer, I would like to investigate the Simluink APM blockset to see if we can use this for simulation purposes.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story

[ ] Investigate the links in the notes section to familiarize yourself with the Simulink APM Blockset

[ ] Generate a small, sample Simulink model to illustrate the functionlatiy of this blockset. This should mirror some of the functionliaty of the real APM and be a representative example

[ ] Review model and results with Chris Lum

[ ] Present results to research group

**Notes**

* <http://www.mathworks.com/matlabcentral/fileexchange/39037-apm2-simulink-blockset>
* [APMSimulink - lucas-research - Information on the APM to Simulink MAVLink interface - Loughborough University Centre for Autonomous Systems - Google Project Hosting](https://code.google.com/p/lucas-research/wiki/APMSimulink)
* <http://diydrones.com/forum/topics/ardupilot-2-5-using-matlab-simulink-to-read-the-sensor-data>

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## 520 – Private Pilot Flight Simulator

**Content**

As a private pilot student, I would like to setup a flight simulator so I can practice maneuvers and train for my private pilot’s license.

**Definition of Done**

[X] Coordinate with Chris Lum and Al Creigh before starting this story

[X] Obtain the yoke and pedals controls from Chris Lum and assess their condition/usability.

[x] Research an appropriate flight simulator (see notes)

[X] Integrate hardware controsl with the simulator

[X] Test flight simulator operations with various maneuvers and procedures (take offs, landings, stalls, etc.). These should be performed near Boeing Field.

[X] Update \\FlightOperations depot with relevant documentation about the operation and usage of the simulator.

[ ] Demonstrate simulator and present findings to the research group.

**Notes**

* The goal of this is to setup a high fidelity flight simulator with actual controls (yoke and pedals) that students can use to train on while pursuing a private pilot’s license.
* We have a license for X-Plane so this is the preferred flight simulator

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## 521 – Flight Operations Work Items Part 1

**Content**

As a UAS operator, I would like incorporate feedback and experiences from recent flight operations so I can improve the flight operations workflow and efficiency of the AFSL.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story

CONDOR

[x] Create a flight test box for the CONDOR aircraft equipment. This should contain all the parts, equipment, supplies, etc. for the CONDOR.

[x] Add extra screws to secure the horizontal stabilizer to the fuselage

[x] Include extra gimbal parts

[x] Label all compartments of this box clearly.

[x] Create aircraft cradle for CONDOR (see user\_stories.pptx). Ensure that this cradles does not block the camera doors.

[x] Wire primary and secondary batteries together in parallel

[x] Make an extension from the ESC to battery (it is currently very diffciult to make the connection due to short cabling)

[x] Install and test Pix Hawk in CONDOR

[x] Put a sticker or label all parts of the CONDOR so they don’t get mixed up with other aircraft.

[x] Install external USB port

[x] Install external LED (mount in a location that is visible from the ground during flight)

[x] Install a manual power switch on the side to turn on/off the main aircraft power

-See photos in \\FlightOperations\UAS\Anakin\PhotosMedia for photos/setup to copy

TEDD

[x] Create aircraft cradle for TEDD (see user\_stories.pptx). Ensure that this cradle does not block the camera view port.

[x] Make an extension from the ESC to battery (it is currently very diffciult to make the connection due to short cabling)

[x] Install and test Pixhawk in TEDD.

[x] Put a sticker or label all parts of TEDD so they don’t get mixed up with other aircraft.

[x] Design, install, and test a door to cover the camera bay during landing.

[x] 3D print a mockup of the MicaSense RedEdge camera that we can use for fit checking. CAD files are located at \\FlightOperations\UAS\CommonDocuments\MicaSense\_RedEdge\ManufacturerDoc\MicaSense\_RedEdge\_3\_IGES.IGS (if you need this file converted to another format like STL, please talk with Chris Lum)

[x] Create a system to cover/shield the camera opening during landings.

[x] Fit check the cameras (Sony S100 and Mock RedEdge) into TEDD.

DUBCUB

[x] Fix strut

[x] Find and charge battery for both aircraft and transceiver

GENERAL ITEMS

[x] Organize equipment into appropriate boxes and label compartments.

[x] Wing transportation box is too long to fit in pickup truck. Outer dimension needs to be shortened to 78” or less (preferably 76” if possible).

**Notes**

* Additional notes and lessons learned can be found in
  + \\FlightOperations\Operations\Missions\15\_01\_03\_flight\_test\MissionLog.docx
  + \\FlightOperations\Operations\Missions\15\_01\_03\_flight\_test\MissionLog.docx
* The cradles should a hold the aircraft steady during full power engine tests.

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## 522 – Undergraduate Research Conference Travel Award

**Content**

As an undergraduate research, I would like to apply for a travel grant to present or attend a conference on behalf of the AFSL so I can present results or learn more about UAS.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story

[ ] Apply for a conference travel grant. Info at <http://www.washington.edu/undergradresearch/students/funding/urcta/>

[ ] Additional tasks TBD.

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## 523 – Exploration Trip to Lester, WA

**NOTE: THIS IS TEMPORARITLY ON HOLD AS WE EVALUATE ANOTHER FLYING LOCATION**

**Content**

As a flight operations manager, I would like to visit Lester, WA to determine if this is a viable flight operations area.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story

[ ] Read the document \\FlightOperations\Operations\TestSiteInformation\Lester\lester\_info.docx. Add all pertinent research/findings to this document.

[ ] Research Lester, WA with the goal of determineing if this is a viable flight operations area. Some questions to answer include but are not limited to:

[ ] How do we access the area? How long does it take to drive there?

[ ] Is the area accessible all year round (is it snowed in the winter)?

[ ] Are certain areas off limits to cars? Remember that we will have lots of gear/equipment.

[ ] We will need a letter from someone authorizing us to use the space, who can grant access?

[ ] What type of land is this? Public, private, nation foreste, national park, etc.?

[ ] What utilities are available? Cell phone reception, 120 VAC, water, etc.

[ ] What is the population? Where are the nearby populated areas?

[ ] Where is the nearest city?

[ ] Organize a field trip to this test site so we can explore the area firsthand.

[ ] Document (photo, notes, video) the expedition and add these notes to the information document.

[ ] Identify an area that might be used as a flight test operations area.

[ ] Present results to the group.

**Notes**

* Keisuke Tsujita and Dana Fraij have done some initial research into this.

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## 524 – Sprint 1412 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1412 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 525 – Sprint 1501 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1501 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 526 – Obtain HAM Radio Technician Class License (position 1)

**Content**

As a UAS operator, I would like to pass the FCC written exam for a technician class HAM radio license so that I can use this certification for UAS operations.

**Definition of Done**

[x] Peruse documents and notes in \\FlightOperations\Operators\Certifications\HAM\_radio

[x] Read and study the book “The ARRL Ham Radio License Manual 3rd Edition” (see Chris Lum)

[x] Take multiple practice exams and ensure you pass with sufficient margin.

[x] Schedule a time to take the test

[x] Pass this test and obtain your FCC call sign.

[x] Add your information to the document \\FlightOperations\Operators\Certifications\HAM\_radio\HAM\_radio\_certifications.docx

**Notes**

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## 527 – Obtain HAM Radio Technician Class License (position 2)

**Content**

Copy of user story ‘526 – Obtain HAM Radio Technician Class License (position 1)’

**Definition of Done**

Copy of user story ‘526 – Obtain HAM Radio Technician Class License (position 1)’

**Notes**

Copy of user story ‘526 – Obtain HAM Radio Technician Class License (position 1)’

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## 528 – Obtain HAM Radio Technician Class License (position 3)

**Content**

As a UAS operator, I would like to pass the FCC written exam for a technician class HAM radio license so that I can use this certification for UAS operations.

**Definition of Done**

[x] Peruse documents and notes in \\FlightOperations\Operators\Certifications\HAM\_radio

[x] Read and study the book “The ARRL Ham Radio License Manual 3rd Edition” (see Chris Lum)

[x] Take multiple practice exams and ensure you pass with sufficient margin.

[x] Schedule a time to take the test

[] Pass this test and obtain your FCC call sign.

[] Add your information to the document \\FlightOperations\Operators\Certifications\HAM\_radio\HAM\_radio\_certifications.docx

**Notes**

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## 529 – Move Lab from KWT102 to GUG105 (position 2)

**Content**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

**Definition of Done**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

**Notes**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

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## 530 – Move Lab from KWT102 to GUG105 (position 3)

**Content**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

**Definition of Done**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

**Notes**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

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## 531 – Move Lab from KWT102 to GUG105 (position 4)

**Content**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

**Definition of Done**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

**Notes**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

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## 532 – Move Lab from KWT102 to GUG105 (position 5)

**Content**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

**Definition of Done**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

**Notes**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

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## 533 – Move Lab from KWT102 to GUG105 (position 6)

**Content**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

**Definition of Done**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

**Notes**

Copy of user story ‘491 – Move Lab from KWT102 to GUG105 (position 1)’

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## 534 – Perforce Visual Client (copy)

**Content**

Refer to user story ‘002 – Perforce Visual Client’

**Definition of Done**

Refer to user story ‘002 – Perforce Visual Client’

**Notes**

Refer to user story ‘002 – Perforce Visual Client’

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## 535 – Perforce Visual Client (copy)

**Content**

Refer to user story ‘002 – Perforce Visual Client’

**Definition of Done**

Refer to user story ‘002 – Perforce Visual Client’

**Notes**

Refer to user story ‘002 – Perforce Visual Client’

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## 536 – Flight Operations Work Items Part 1 (Helper 1)

**Content**

Help with user story ‘521 – Flight Operations Work Items Part 1’

**Definition of Done**

Help with user story ‘521 – Flight Operations Work Items Part 1’

**Notes**

Help with user story ‘521 – Flight Operations Work Items Part 1’

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## 537 – Flight Operations Work Items Part 1 (Helper 2)

**Content**

Help with user story ‘521 – Flight Operations Work Items Part 1’

**Definition of Done**

Help with user story ‘521 – Flight Operations Work Items Part 1’

**Notes**

Help with user story ‘521 – Flight Operations Work Items Part 1’

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## 538 – Create UW Visual Anchoring Data Fusion Algorithm (Helper)

**Content**

Help with user story ‘478 – Create UW Visual Anchoring Data Fusion Algorithm’

**Definition of Done**

Help with user story ‘478 – Create UW Visual Anchoring Data Fusion Algorithm’

**Notes**

Help with user story ‘478 – Create UW Visual Anchoring Data Fusion Algorithm’

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## 539 – Obtain HAM Radio Technician Class License (position 4)

**Content**

Copy of user story ‘526 – Obtain HAM Radio Technician Class License (position 1)’

**Definition of Done**

Copy of user story ‘526 – Obtain HAM Radio Technician Class License (position 1)’

**Notes**

Copy of user story ‘526 – Obtain HAM Radio Technician Class License (position 1)’

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## 540 – Generate Brochure for UWAA UAS Activities

**Content**

As a publicity manager, I would like to create a brochure which highlights some of the UAS related activites and projects in the department so I can use it for promotional purposes.

**Definition of Done**

[x] Create a brochure which highlights UWAA projects and activities related to UAS. Be sure to include input from the following labs

[x] AFSL

[x] NDCL

[x] RAIN

[x] ADV-CTRL

[x] Review brochure with Chris Lum and research group

[x] Print several brochures and keep these on file and in the flight operations boxes.

[x] Send this brochure to Robert Hodgman (work with Chris Lum) before 02/10.

[x] Check in file to appropriate location in Perforce.

**Notes**

* This brochure will be used by WSDOT (Robert Hodgman) when meeting with leadership and landowners in Sunnyside.
* This brochure could also be used to inform the general public about our activities.

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## 541 – PixHawk Custom Flight Mode (Simple) (Helper 1)

**Content**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

**Definition of Done**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

**Notes**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

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## 542 – FAA Certificate of Authoriation (COA) for CONDOR – Flight Parameters

**Content**

As a UAS operator, I would like to identify flight parameters about the CONDOR aircraft so I can support the COA application so that I can legally fly our systems.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story.

[x] Coordinate with development champion and read user story ‘409 – FAA Certificate of Authorization (COA)’ (this is the parent user story to this one)

[x] Run the Matlab script located at \\FlightOperations\Operations\Missions\15\_01\_03\_flight\_test\DataAnalysis\MAIN\_data\_analysis.m and become familiar with its operation.

[x] Augment data analysis code to identify parameters in Table 4.

[x] Review results with Chris Lum

[x] Present results to research group.

Table 4: Data required for COA application.

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| --- | --- | --- |
| **Item** | **Value** | **Comment** |
| Climb Rate (feet/min) |  |  |
| Descent Rate (feet/min) |  |  |
| Turn Rate (degrees/sec) |  |  |
| Cruise speed (KIAS) max |  |  |
| Cruise speed (KIAS) min |  |  |
| Approach speed (KTS) |  |  |
| Operating Altitude max (indicate MSL or FL) | 400’ AGL |  |
| Operating Altitude min(indicate MSL or FL) |  |  |
| Gross takeoff Wt (lbs) |  |  |
| Power off glide angle (deg) |  | Not requested by FAA but this is useful for worst case calculations. |
| Power off glide velocity |  | Not requested by FAA but this is useful for worst case calculations. |

**Notes**

* Flight data is located in \\FlightOperations\Operations\Missions\15\_01\_03\_flight\_test.
* Flight log of the aircraft is located at \\FlightOperations\UAS\CONDOR\FlightLog.xlsx. This may be useful for identifying portions of the mission that are required to obtain the data.

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## 543 – Perforce Visual Client (copy)

**Content**

Refer to user story ‘002 – Perforce Visual Client’

**Definition of Done**

Refer to user story ‘002 – Perforce Visual Client’

**Notes**

Refer to user story ‘002 – Perforce Visual Client’

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## 544 – Field Testing Transportation Boxes (Part 3)

**Content**

As a field test pilot, I would like to create transportation equipment and packaging for all relevant systems so I can safely transport equipment to and from the testing site.

**Definition of Done**

[ ] Read the user story ‘455 – Field Testing Transportation Boxes (Part 1)’ (the first part of this effort)

[ ] CONDOR GCS (talk with Alec Bueing)

[ ] Two monitors (the two View Sonic monitors on Melanie’s desk in AERB 139)

[ ] Keyboard, mouse

[ ] all cables

[ ] mouse pads

[ ] USB sticks

[ ] computer speakers

[ ] other GCS related electronics

[ ] extension chord

[ ] power strip

[ ] video capture cables or equipment

[ ] tripod for directional antennas

**Notes**

* This is a continuation of a previous user story (‘455 – Field Testing Transportation Boxes (Part 1)’)
* This is a continuation of a previous user story (‘509 – Field Testing Transportation Boxes (Part 2)’)
* At the end of this user story, we want a system to packup and transport all our equipment in a partitioned fashion (each aircraft has a dedicated box that can be taken to the field independently of others)
* This user story is mostly focused on creating a transportation system for the GCS and related hardware.

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## 545 – Purchase Laboratory Computing Infrastructure (Part 2)

**Content**

As a project manager, I would like purchase computing infrastructure to support various projects in the lab.

**Definition of Done**

[x] Coordinate with Chris Lum to discuss.

[x] Audit and assess existing lab computing hardware.

[x] Coordinate to purchase new system(s)

[x] Setup new system(s) within the lab. This includes but is not limited to the following:

[x] Name the computers ‘AFSL01’, ‘AFSL02’, and ‘AFSL03’

[x] Create an administrator account named ‘root’ with the standard lab password

[ ] Create a non-administor account named ‘afsl’ (coordinate w/ Chris L. to choose a password)

[ ] Ensure that we have necessary licenses, software, drivers, etc. to rebuild the system from stratch.

[ ] Build the computer to standard configuration (a minimal amount of core software). This includes but is not limited to (coordinate with Chris Lum for any of these components):

[ ] Relevant Dell drivers

[ ] Windows 7 x64

[ ] Matlab w/ an appropriate license (likely a concurrent use license to allow multiple computers to share)

[ ] Visual Studio 2012

[ ] Microsoft Office 2013

[ ] VLC Media Player

[ ] SSH Tectia (for FTP, see Chris Lum)

[ ] Sophos Anti virus

[ ] GoogleEarth

[ ] Perforce Visual Client (P4V)

[ ] PDF Xchange Viewer v2.5

[ ] PDFCreator 1.2 (do NOT get the latest version of this as it has spyware, use this version)

[ ] MikTex 2.9

[ ] TexMaker

[ ] Mozilla Firefox

[ ] Create a system restore/image of this at this point so we can quickly wipe the machine and restore it to this configuration. Coordinate with Chris Lum to store this image on the lab’s back up hard drive.

**Notes**

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## 546 – Perforce Visual Client (copy)

**Content**

Refer to user story ‘002 – Perforce Visual Client’

**Definition of Done**

Refer to user story ‘002 – Perforce Visual Client’

**Notes**

Refer to user story ‘002 – Perforce Visual Client’

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## 547 – Pixhawk Hardware-in-the-Loop Simulator

**Content**

As a simulation engineer, I would like to develop a hardware-in-the-loop (HiL) simulator using the Pixhawk platform so that I can simulate the system operation in a lab environment and become familiar with the system’s operation.

**Definition of Done**

[x] Coordinate with Chris Lum, Bryan G., and Melanie Clark before starting this story.

[x] Create a HiL of all the components of the Pixhawk system in a mobile form factor that can be used by multiple developers in the lab.

[x] Replicate the HiL simulator for the APM2.6 with the Pixhawk (see user story 515 – APM 2.6 Hardware-in-the-Loop Simulator).

[x] Create a document outlining how this system operates.

[x] Present results to research group (demonstrate how to use the system).

**Notes**

* See user story 515 – APM 2.6 Hardware-in-the-Loop Simulator).
* The goal of this user story is to have a hardware platform that developers can use to test code and other operations before moving to one of the aircraft systems.

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## 548 – CONDOR Camera Gimbal v2 Design

**Content**

As a payload engineer, I would like to design an improved camera gimbal design so that I can use it on the CONDOR system.

**Definition of Done**

[x] Coordinate with Chris Lum and Brendan Doyle Wade before starting this story.

[x] Design an improved camera gimbal system.

[x] Create a CAD model of this new system.

[x] Print/manufacture the necessary parts.

[x] Procure other necessary components.

[x] Test fit parts to ensure that the sytem works before integrating onto CONDOR.

[x] Check in CAD files to Perforce (see notes)

[x] Check in other design documents (pictures, diagrams, notes, etc.) to Perforce (see notes).

[x] Present results to research group.

**Notes**

* This user story only encompasses the design and parts procurement of the new gimbal system. The actual integration of this onto CONDOR is captured in user story ‘548 – CONDOR Camera Gimbal v2 Design’.
* All design files for the system should be placed somewhere in the \\FlightOperations\UAS\CONDOR\SubSystems\CameraGimbalfolder.

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## 549 – CONDOR Camera Gimbal v2 Integration

**Content**

As a payload engineer, I would like to integrate the improved camera gimbal design onto so that I can use it on the CONDOR system.

**Definition of Done**

[x] Coordinate with Chris Lum and Brendan Doyle Wade before starting this story.

[x] Coordinate with the development champion of user story ‘548 – CONDOR Camera Gimbal v2 Design’

[x] Talk with Keisuke and Kevin to determine requirements for testing

[x] Talk to Jeremy B. and Kevin to determine requiremest for deployment

[x] Integrate the new camera system onto CONDOR.

[x] Test the system in various flights and operating conditions.

[x] Create a document describing the system and its operation.

[x] Demonstrate the system to the group.

**Notes**

* This system should use one of the Turnigy 9x receivers/transmitters to control everything.
* All design files for the system should be placed somewhere in the \\FlightOperations\UAS\CONDOR\SubSystems\CameraGimbalfolder.

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## 550 – PixHawk Custom Flight Mode (Simple) (Helper 2)

**Content**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

**Definition of Done**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

**Notes**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

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## 551 – PixHawk Custom Flight Mode (Simple) (Helper 3)

**Content**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

**Definition of Done**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

**Notes**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

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## 552 – Sprint 1502 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1502 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 553 – Australia Conference Paper (Position 2)

**Content**

Copy of user story ‘388 – Australia Conference Paper (Position 1)’

**Definition of Done**

Copy of user story ‘388 – Australia Conference Paper (Position 1)’

**Notes**

Copy of user story ‘388 – Australia Conference Paper (Position 1)’

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## 554 – Australia Conference Paper (Position 3)

**Content**

Copy of user story ‘388 – Australia Conference Paper (Position 1)’

**Definition of Done**

Copy of user story ‘388 – Australia Conference Paper (Position 1)’

**Notes**

Copy of user story ‘388 – Australia Conference Paper (Position 1)’

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## 555 – Wildfire Reconnaisssance Camera (Preliminary Research)

**Content**

As a researcher, I would like to invesetigate a camera that can be use for wildfire reconnaissance so that I can integrate it into TEDD and use as a proof of concept for autonomous wildfire detection.

**Definition of Done**

[ ] Coordinate with Chris Lum and Al Creigh before starting this story.

[ ] Read notes

[ ] Perform preliminary research into technologies that support these specifications.

[ ] Perform literature review of existing solutions/technology

[ ] Present results to group

[ ] Make recommendations on how to proceed with this research and work with Chris Lum to create an appropriate follow up user story.

[ ] Additional tasks TBD

**Notes**

* Technology developed in this user story is of interest to Applewhite Aero. Some of their desired specifications include
  + Low cost
  + Infrared or thermal camera to map wildfires
  + GPS linked images/Geomapped
  + Self-powered with 3 hour endurance
  + Less than two pounds
  + Receiving inputs from Pixhawk autopilot
  + Fits on a platform measuring 5.5W x 13L x 5H inches
  + Operates mostly at night at up to twenty miles range
  + Onboard recoding required
  + Post mission processing must be included in package
  + Deliverable is a detailed map of hot spots for review by the fire commander
  + Option for airborne transmission of data file
  + Option for live transmission of images.
* The scope of this user story is only preliminary research, no development or procurement should take place in this user story.
* Talk with Cory Hage as she did a lot of research into sensor trade studies.

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## 556 – UAV Flight Termination and Recovery System (Preliminary Research)

**Content**

As a researcher, I would like to invesetigate a flight termination and recovery system so that I can use it on our systems.

**Definition of Done**

[x ] Coordinate with Chris Lum and Al Creigh before starting this story.

[x ] Read notes

[x ] Perform preliminary research into technologies that support these specifications.

[x ] Perform literature review of existing solutions/technology

[x ] Present results to group

[x ] Make recommendations on how to proceed with this research and work with Chris Lum to create an appropriate follow up user story.

[ ] Additional tasks TBD

**Notes**

* Technology developed in this user story is of interest to Applewhite Aero. Some of their desired specifications include
  + Suitable for a 25 pound vechicle using a parachute bsed recovery system.
  + System must be self-powered
  + Operates with an independent transmitter/receiver
  + Three mile range
* The scope of this user story is only preliminary research, no development or procurement should take place in this user story.

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## 557 – PixHawk Custom Flight Mode (Simple) (Helper 4)

**Content**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

**Definition of Done**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

**Notes**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

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## 558 – PixHawk Custom Flight Mode (Simple) (Helper 5)

**Content**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

**Definition of Done**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

**Notes**

Assist with ‘485 – PixHawk Custom Flight Mode (Simple)’

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## 559 – OpenCV Familiarization (Helper)

**Content**

See user story ‘424 – OpenCV Familiarization’

**Definition of Done**

See user story ‘424 – OpenCV Familiarization’

**Notes**

See user story ‘424 – OpenCV Familiarization’

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## 560 – Matlab Computer Vision Processing Algorithm (Position 1)

**Content**

As an algorithm designer, I would like to design an algorithm to automatically process a still or video image and extract relevant data from it.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Generate test data of still imagery with the actual target and camera (see user story ‘472 – Camera Image Example/Test Data’)

[x] Generate a Matlab algorithm to process the imagery and extract relevant features.

[x] Encapsulate this algorithm into a valid function or library within the \\VisualAnchoring\ImageProcessing\Application folder

[x] Review algorithm with Chris Lum

[x] Integrate this algorithm into the main image processing application \\VisualAnchoring\ImageProcessing\Application\MAIN\_Application.m)

[x] Present results to research group.

[x] Document the algorithm and check this file into Perforce.

**Notes**

* See diagram at \\VisualAnchoring\TechnicalDataPackage\ProjectVision\GroundStationRoadMap.pptx. This user story focuses on the “Computer Vision Processing” block.

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## 561 – Matlab Computer Vision Processing Algorithm (Version 2.0) (Position 1)

**Content**

As an algorithm designer, I would like to improve the previously generated vision algirthm so I can make it more robust and increase performance.

**Definition of Done**

[x] Review user story ‘560 – Matlab Computer Vision Processing Algorithm (Position 1)’

[x] Improve the previous algorithm.

[x] Test the improvements on various data sets.

[ ] Integrate this algorithm with the data fusion algorithm (478 – Create UW Visual Anchoring Data Fusion Algorithm)

[x] Test functionality of system with data fusion algorithm (in other words, verify that this system works with the existing infrastructure).

[x] Ensure that the code is documented (both code comments and accompanying notes/diagrams)

[x] Demonstrate functionality to research group.

**Notes**

* This user story focuses on improving the system generated during ‘560 – Matlab Computer Vision Processing Algorithm (Position 1)’
* The vision algorithm should be mostly complete, polished, and ready for field testing at the end of this user story.

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## 562 – CONDOR Demonstration Package

**Content**

As a marketing representative, I would like to create a stable CONDOR demonstration package so that I can use it to promote our research when we have visitors to the lab or public presentations

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story.

[ ] Ensure all decals, sponsor logos, graphics, etc. are on the aircraft (ensure that it is “camera ready”).

[ ] Ensure camera gimbal is fully operational and stable (see notes).

[ ] Create an active cooling system to allow the video transmitter to operate for extended periods of time even though the aircraft is stationary.

[ ] Ensure that we obtain data telemetry from aircraft via Mission Planner on the AFSLCondor computer.

[ ] Ensure that we obtain video telemetry from the aircraft via the capture card on AFSLCondor computer.

[x] Move Ethernet cable next to Kevin’s desk in AERB 139 away from the AFSL banner (so it doesn’t show up in photos).

[ ] Run through the demo procedure to ensure it runs smoothly. Items to highlight during the demo include but are not limited to:

[ ] Data telemetry

[ ] Stabilization or mode switching of the autopilot

[ ] Camera deploy/retract as well as pan/tilt (zoom is optional)

[ ] Live video telemetry

[ ] Live image processing based on the video feed

[ ] Control the camera to track a target (optional as this requires additional capabilities)

[ ] Discussion of possible applications of this technology.

[ ] Create a document which outlines different people and their responsibilities during the demo. This should be similar to a movie script where each actor has a specific role to play at a specific time.

[ ] Review demo with Chris Lum

[ ] Perform demo live to the research group.

[ ] Check documentation into Perforce (talk with Chris Lum to find an appropriate location)

**Notes**

* We have experienced several failures of the camera telemetry/gimbal system in the field. Therefore some of the wiring stability may be suspect. This system needs to be rigorously tested before we consider it demo-ready.
* You can use the Visual Anchoring poster as part of the presentation.
* Upcoming external facing events include but are not limited to:
  + March 6: MicaSense tour (2 people touring AERB 139)
  + March 13: Prospective grad student visits (60+ grad students touring AERB 139)
  + March 17: University of Tokyo visit (2 professors touring AERB 139)
  + March 27: AGORA presentation (Chris presenting to 300+ people at a local conference)
  + April 3: UW UAS Working Group tours (15 UW staff/faculty touring AERB 139)
  + April 10 – 12: Paws on Science (AFSL to man a booth at Pacific Science Center for the Paws on Science event. Outreach to K-12 STEM students).
  + April 16: AUVSI Cascade Event (AFSL to man a booth at this meeting. Large number of UAS stakeholders will be in attendance. AFSL students to accept a gift ($2500) as part of the program)
  + April 24: Engineering Discovery Days (AERB 139 will be open for exhibits. We anticipate 200+ visitors)
  + TBD: Sunnyside city council (Public meeting to promote activities at the UW/WSDOT UAS test area).

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## 563 – TEDD Demonstration Package

**Content**

As a marketing representative, I would like to create a stable TEDD demonstration package so that I can use it to promote our research when we have visitors to the lab or public presentations

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Ensure all decals, sponsor logos, graphics, etc. are on the aircraft (ensure that it is “camera ready”).

[ ] Ensure that this is HiL ready (ie it can be connected to X-Plane and flown in simulation)

[ ] Run through the demo procedure to ensure it runs smoothly. Items to highlight during the demo include but are not limited to:

[ ] Data telemetry (using actual aircraft response, not simulated response)

[ ] Hook up aircraft to HiL and fly it in conjunction with X-plane

[ ] Path a virtual photo mission using the HiL and watch the aircraft fly around in X-Plane

[ ] Watch the camera trigger based on fake GPS data (this may not be possible)

[ ] Show a pre-processed set of results to illustrate how we would obtain an orthophoto.

[ ] Discussion of possible applications of this technology.

[ ] Create a document which outlines different people and their responsibilities during the demo. This should be similar to a movie script where each actor has a specific role to play at a specific time.

[ ] Review demo with Chris Lum

[ ] Perform demo live to the research group.

[ ] Check documentation into Perforce (talk with Chris Lum to find an appropriate location)

**Notes**

* See user story ‘562 – CONDOR Demonstration Package’ for a list of upcoming demos.

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## 564 – Pixhawk Receiver/Transmitter Upgrade

**Content**

As a UAS operator, I would like to upgrade the radio transmitter and receiver used to interface with the Pixhawk to ensure we have a reliable command and control link to the UAS.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Observe that the Turnigy TGY-i10 sporatically loses contact with the Pixhawk. This phenomenon has been witnessed by Chris Lum, Al Creigh, and Gage Winde.

[ ] Research a radio transmitter/receiver system that is known to be good with the desired version of Ardupilot (likely v 3.2.2 but confirm this with Chris Lum)

[ ] Coordinate procurement of this new system.

[ ] Integrate this into the HiL and perform testing.

[ ] Once testing is satisfactory, procure and integrate this new system onto CONDOR and TEDD.

[ ] Demonstrate new functionality to the research group

**Notes**

* Good info is located at <http://copter.ardupilot.com/wiki/common-pixhawk-and-px4-compatible-rc-transmitter-and-receiver-systems/>
* <https://www.youtube.com/watch?v=DHnV6hGH108> (Installing the FrSky 2.4GHz DIY kit in a HobbyKing Turnigy 9X radio)
* A very good video of the process is located at <https://www.youtube.com/watch?v=0_OPLKWEAFY> (Turnigy 9X FrSky Transmitter Upgrade and Binding with TBS Discovery and DJI Naza)
* Several versions of the Ardupilot firmware are known to have issues with certain receiver systems. See the below except from the version 3.2.2 release notes.

Release 3.2.2, February 10th 2015

---------------------------------

The ardupilot development team has released version 3.2.2 of

APM:Plane. This is a bugfix release for some important bugs found by

users of the 3.2.1 release.

The changes in this release are:

**- fixed a bug that could cause short term loss of RC control with**

**some receiver systems and configurations**

  - allowed for shorter sync pulse widths for PPM-SUM receivers on

    APM1 and APM2

  - fixed HIL mode altitude

**The most important bug fix is the one for short term loss of RC**

**control. This is a very long standing bug which didn't have a**

**noticible impact for most people, but could cause loss of RC control**

**for around 1 or 2 seconds for some people in certain circumstances.**

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## 565 – AFSL Mini Quad Research Platform

**Content**

As a UAS operator, I would like to construct a mini-quad rotor platform so I can use it for demonstration purposes as well as research and testing.

**Definition of Done**

[x] Coordinate with Al Creigh before starting this story.

[x] Read the article <http://www.modifiedrc.com/miniquads-how-can-i-get-flying-on-the-cheap/> to obtain a list of parts.

[x] Coordinate with Chris Lum to procure the necessary components.

[x] Assemble the platform.

[x] Perform tethered, indoor flight tests.

[x] Name the system (MARV – Multi-Rotor Autonomous Research Vehicle).

[x] Add appropriate documentation to integrate this system into the AFSL hanger.

[x] Fix broken parts (ESCs, etc.)

[x] Peform a successful flight test (do this indoors, DO NOT fly this outside as this is a violation of FAA regulations)

[x] Present results to the group

**Notes**

* Reuse as many components as possible from existing AFSL stock. For example we have several receivers/transmitters that can be reprogramed to fly this UAS as well as the other systems.
* If possible, obtain the parts through HobbyKing.

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## 566 – GitHub Ardupilot Rollback to Stable Build

**Content**

As a software developer, I would like to rollback to the Ardupilot repository to a stable build so that I can branch/fork from this point and use it for developing the visual anchoring algorithm.

**Definition of Done**

[ ] Coordinate with Chris Lum and Gage Winde before starting this user story to familiarize yourself with the problem of the ardupilot build.

**Simulate/Test the Branching/Forking Process**

[ ] Create a sample GitHub repository using the uwafsltester account (for example uswafsltester\UserStory566) that we can use for testing (see Chris Lum for access to this account)

[ ] Add collaborators (to simulate the larger diydrones community of developers).

[ ] Have all these collaborators make several commits to build the commit history and move this respository to a stable build state. Make a note of this state and create a GitHub release at this point (see user\_stories.pptx)

[ ] Have some of the collaborators make several more commits to the repository to move it to an unstable state.

[ ] Fork this repo from the primary uwafsl account (ie create uwafsl/UserStory566)

[ ] Add collaborators to uwafsl/UserStory566 (to simulate AFSL members working on the forked repo).

[ ] Verify that the forked repo is broken on all developer machines.

[ ] Figure out how to roll back the uwafsl/UserStory566 to the stable release point you noted previously (it may be best to create a branch from this point)

[ ] Verify that the AFSL developers now have a stable build and are able to make forwad progress from this point.

[ ] Go back to the uswafsltester\UserStory566 and have some developers make additional commits (to simulate the diydrones community fixing the broken build).

[ ] Create another release uswafsltester\UserStory566.

[ ] Determine how the uwafsl\UserStory566 repo can be updated/merged with these new commits (to simulate UWAFSL obtaining the community’s fixes on our forked repo).

**Perform the Branching/Forking Process on the Production Repository**

[ ] Repeat the above procedures with the diydrones\ardupilot repository. The goal of this is to obtain a stable build of the ardupilot codebase. Note that this has already been forked to the uwafsl\ardupilot repository). Coordinate with Gage Winde and Chris Lum to determine the stable point from which to branch from.

[ ] Repeat if necessary with the diydrones\PX4NuttX and diydrones\PX4Firmware repositories (these have also already been forked

[ ] Verify that afsl builds are stable and can be modified.

**Documentation**

[ ] Update the \\VisualAnchoring\TechnicalDataPackage\ArduplaneModification\ArduplaneBuildNotes.docx document with this information.

[ ] Present results to the team.

**Notes**

* There is a GitHub training course taking place on March 24. Chris Lum is coordinating attendance so work with him on this to ensure all relevant stakeholders attend this training.
* The document \\VisualAnchoring\TechnicalDataPackage\ArduplaneModification\ArduplaneBuildNotes.docx, Table 1 has a description of stable builds.
* Some good information is located at <https://www.atlassian.com/git/tutorials/comparing-workflows/>

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## 567 – Sprint 1503 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1503 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 568 – TEDD Ground Testing

**Content**

As a TEDD developer, I would like to perform a ground test to test the entire workflow of obtaining aerial imagery and producing a map with digital elevation data using TEDD so I can create a viable mapping platform.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story

[ ] Read user story ‘340 – Australia Ortho-Rectified Image’

[ ] Read user story ‘394 – Research Student Technology Fund (STF) Resources Pertinent to UAS Research’

[ ] Watch the video at <https://www.youtube.com/watch?v=-fYOB8VPDnk>

[ ] Read the document \\AustraliaBushfire\AgiSoft\Agisoft PhotoScan Image Processing Outline.docx

[ ] Peruse the presentation at \\Mapping\TechnicalDataPackage\Presentations\15\_03\_18\_pixhawk\_camera\uav\_camera.pptx and discuss with Al Creigh and Aleksandr T about the contents.

[ ] Arrange a meeting with Chris Lum, Al Creigh, Aleksandr T, Brian Carpenter, Alex Summers, and Angel Rodriguez to discuss next steps.

[ ] Identify several elevated locations from which to conduct the experiments (for example the Hwy-99 bridge and the bridge over Ravenna park). Scout out the area to identify any challenging environmental factors (for example the high fences on the Hwy-99 bridge)

[ ] Create a harness or rigging system that can safetly suspend the aircraft over the bridge. Be sure this creates a clear field of view of the camera.

[ ] Determine what data needs to be acquired in flight in order to produce an orthophoto. Some data should include but is not limited to:

[ ] GPS locations of pictures

[ ] Time stamps of pictures

[ ] Euler angle of aircraft when picture is taken

[ ] Obtain several data sets by moving the aircraft over the elevated surface to simulate flying. Do NOT fly the aircraft. Save both imagery and telemetry log files in appropriate locations. Be sure to take photos/videos of the experiment execution.

[ ] Identify a workflow of how to post process the data into a format that is consumable by Agisoft Photoscan Pro.

[ ] Test processing the data using Agisoft Photoscan Pro.

[ ] Use the ‘\\AustraliaBushfire\AgiSoft\Agisoft PhotoScan Image Processing Outline.docx’ document as a starting point to generate a “how to” document which describes TEDD system can be used to create aerial maps. Delete the ‘\\AustraliaBushfire\AgiSoft\Agisoft PhotoScan Image Processing Outline.docx’ once the newer document is completed as it should now replace the old document.

[ ] Present results to research group.

[ ] Check in files to appropriate location in perforce.

**Notes**

* Additional videos of the Agisoft workflow are located at <https://www.youtube.com/channel/UCPheXwPeFLnWHo8u4ksSH7w>

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## 569 – UW Unmanned Ground Vehicle

**Content**

As an operations manager, I would like to develop a proof-of-concept unmanned ground vehicle so I can become familiar with ground operations and use it as a basic research platform.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Identify desired use cases for the research platform (see folder \\FlightOperations\Research\AircraftSelection)

[x] Based on the use cases, create a systems requirements document.

[x] Based on the system requirements document, research parts/systems that will meet these requirements.

[x] Work with Chris Lum to procure parts for the system.

[x] Assemble the system and perform preliminary testing.

[x] Build a test stand to hold the UGV wheels off the ground during initialization (to prevent runways)

[x] Document results including

[x] Name system (search documentation and replace references to this with the new name)

[x] Create a file/folder infrastructure in the \\FlightOperations\UAS similar to other systems

[x] Integrate this system into the list of research platforms available to the AFSL

[x] Present results to research group.

[x] Fix broken parts and get this into an “airworthy” state.

[x] Investigate camera control issues.

[x] Present new results (including camera)

**Notes**

* This project focuses on constructing an autonomous ground vehicle that can be used as a research platform.
* The system is intended to be a proof-of-concept platform constructed from hobby-grade supplies (see user\_stories.pptx).
* The system will initially be tested in a manual control configuration where an operator maintains direct control of the vehicle. Autonomous functionality will be added in user story ‘570 – UW Unmanned Ground Vehicle Autonomy Integration’.
* Problems with radio calibration.
* One of the motors is burnt out.
* Brendan has encountered a similar problem (might involve inadvertent mixing of channels).

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## 570 – UW Unmanned Ground Vehicle Autonomy Integration

**Content**

As an operations manager, I would like to integrate autonomous capability into the UW UGV so I can use it for more interesting missions.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Coordinate with the development champion of user story ‘569 – UW Unmanned Ground Vehicle’

[ ] Incorportate the [ArduRover](http://rover.ardupilot.com/) firmware running on the [Pixhawk](http://store.3drobotics.com/products/3dr-pixhawk) system and communicating to the [Mission Planner](http://planner.ardupilot.com/) ground station software.

[ ] Create and test Waypoints for Ground Rover use

[ ] Create/Verify Simple “Go from A to B” python script

[ ] Verify GROVER autonomous systems during a Flight test

[ ] Update \\FlightOperations\UAS\GROVER\OperationalChecklistsAndNotes.docx

**Notes**

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## 571 – UW Unmanned Ground Vehicle (Helper 1)

See user story ‘569 – UW Unmanned Ground Vehicle’

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## 572 – UW Unmanned Ground Vehicle (Helper 2)

See user story ‘569 – UW Unmanned Ground Vehicle’

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## 573 – Sprint 1504 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1504 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 574 – Perforce Visual Client (copy)

Refer to user story ‘002 – Perforce Visual Client’

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## 575 – Perforce Visual Client (copy)

Refer to user story ‘002 – Perforce Visual Client’

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## 576 – ScanEagle Simulator: Documentation (position 1)

**Content**

As a project manager, I would like to create a publishable document that outlines how the RCAM simulation functions so that I can disseminate this to students taking AE512 and they can reproduce the results.

**Definition of Done**

[ ] Review the following user stories.

[ ] 283 – ScanEagle Simulator: System Architecture

[ ] 284 – ScanEagle Simulator: Plant Model

[ ] 285 – ScanEagle Simulator: Joystick Interface

[ ] 286 – ScanEagle Simulator: X-Plane Interface

[ ] Create a document that all the necessary steps to recreate the simulation environment. Items to address include but are not limited to:

[ ] Matlab toolbox requirements (how to install demo versions of Aerospace toolbox and Aerospace blockset)

[ ] X-plane requirements (version number)

[ ] FlightGear requirements (version number)

[ ] Hardware setup (joystick)

[ ] X-plane plugings: obtain source code, build instructions, installation, and usage

[ ] Test this document by testing it on a clean laptop.

**Notes**

* A draft of the document has already been created in \\ScanEagleSimulation\AE512\_test\AA512 RCAM Simulator Setup Instruction.docx
* The goal of this will be to give this document to students and have them be able to recreate the system with minimal guidance from the instructor or TA. Inevitably some guidance will be required but this is designed to minimize questions from students.

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## 577 – ScanEagle Simulator: Documentation (position 2)

**Content**

As a project manager, I would like to create a publishable document that outlines how the RCAM simulation functions so that I can disseminate this to students taking AE512 and they can reproduce the results.

**Definition of Done**

[x] Review the following user stories.

[x] 283 – ScanEagle Simulator: System Architecture

[x] 284 – ScanEagle Simulator: Plant Model

[x] 285 – ScanEagle Simulator: Joystick Interface

[x] 286 – ScanEagle Simulator: X-Plane Interface

[x] Create a document that all the necessary steps to recreate the simulation environment. Items to address include but are not limited to:

[x] Matlab toolbox requirements (how to install demo versions of Aerospace toolbox and Aerospace blockset)

[x] X-plane requirements (version number)

[x] FlightGear requirements (version number)

[x] Hardware setup (joystick)

[x] X-plane plugings: obtain source code, build instructions, installation, and usage

[x] Test this document by testing it on a clean laptop.

**Notes**

* A draft of the document has already been created in \\ScanEagleSimulation\AE512\_test\AA512 RCAM Simulator Setup Instruction.docx
* The goal of this will be to give this document to students and have them be able to recreate the system with minimal guidance from the instructor or TA. Inevitably some guidance will be required but this is designed to minimize questions from students.

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## 578 – Matlab Computer Vision Processing Algorithm (Version 2.0) (Position 2)

See user story ‘561 – Matlab Computer Vision Processing Algorithm (Version 2.0) (Position 1)’

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## 579– FAA Certificate of Authorization (COA) for CONDOR (Helper 1)

As a UAS operator, I would like to obtain an FAA Certificate of Authorization or Wavier (COA) so that I can legally fly the CONDOR system.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[ ] Schedule a group meeting with Chris Lum and Juris Vagners to discuss how to obtain a COA.

[ ] Ensure that the following children user stories are completed

[X] 499 – FAA Certificate of Authorization (COA) for CONDOR – Identify Operations Location

[ ] 514 – FAA Certificate of Authoriation (COA) for CONDOR – Register Aircraft

[ ] Fill out the COA application (see notes)

[ ] Review entire COA application with Chris Lum and Juris Vagners

[ ] Submit COA application to the FAA (this should be done through Chris Lum, do NOT submit this yourself)

[ ] Additional tasks TBD…

**Notes**

* Juris Vagners has several UW COAs in place already.
  + Example COAs are placed in \\FlightOperations\Operations\COAs\SupportingDocuments\example\_COAs
* Juris has worked with Josh Brungardt to obtain COAs. Josh is an independent consultant who helps with the process and knows the FAA and the application process. We should coordinate with him.
  + AFSL will be in charge of putting most of the COA together
  + Josh will charge $1000 to help review the COA.
* Link to FAA’s COA website is at (only Chris Lum can actually login to the site) <https://ioeaaa.faa.gov/oeaaa/Welcome.jsp>
* COA documents (including a draft of the application) are located in \\FlightOperations\Operations\COAs\CONDOR

## 580– FAA Certificate of Authorization (COA) for CONDOR (Helper 2)

See user story ‘409 – FAA Certificate of Authorization (COA) for CONDOR’

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## 581 – AFSL Mini Quad Research Platform (Helper 1)

See user story ‘565 – AFSL Mini Quad Research Platform’

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## 582 – Matlab Computer Vision Processing Algorithm (Version 2.0) (Position 3)

See user story ‘561 – Matlab Computer Vision Processing Algorithm (Version 2.0) (Position 1)’

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## 583 - Australia Conference Paper Revisions (Position 1)

**Content**

As a paper author, I would like incorporate feedback from reviewers and finialize the SAE Aerotec paper so I can submit it to the conference.

**Definition of Done**

[x] Incorporate all feedback from reviewers into the paper.

[x] Coordinate with Matthew Dunbabin to obtain additional feedback and incorporate this into the paper.

[x] Finalize the paper and prepare for submission.

[x] Submit the final paper to the SAE conference (Chris Lum should do this action)

**Notes**

* This user story only involves finalizing the paper, it does not encompass creating the presentation slides.

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## 584 - Australia Conference Paper Revisions (Position 2)

See user story ‘583 - Australia Conference Paper Revisions (Position 1)’

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## 585 - Australia Conference Paper Revisions (Position 3)

See user story ‘583 - Australia Conference Paper Revisions (Position 1)’

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## 586 – Perforce Visual Client (copy)

Refer to user story ‘002 – Perforce Visual Client’

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## 587 – Perforce Visual Client (copy)

Refer to user story ‘002 – Perforce Visual Client’

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## 588 – Perforce Visual Client (copy)

Refer to user story ‘002 – Perforce Visual Client’

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## 589 – Image Processing System Integration (Position 1)

**Content**

As an algorithm designer, I would like to integrate the image processing systems into a cohesive system so I can use it to perform visual anchoring.

**Definition of Done**

[ ] Review user story ‘478 – Create UW Visual Anchoring Data Fusion Algorithm’

[ ] Review user story ‘560 – Matlab Computer Vision Processing Algorithm (Position 1)’

[ ] Review user story ‘561 – Matlab Computer Vision Processing Algorithm (Version 2.0) (Position 1)’

[ ] Integrate this algorithm with the data fusion algorithm

[ ] Coordinate with development champion of user story ‘484 – Mission Planner Modifications (Complex)’.

[ ] Determine how the slant range information will be sent to Mission Planner

[ ] Test functionality of system with data fusion algorithm (in other words, verify that this system works with the existing infrastructure).

[ ] Ensure that the code is documented (both code comments and accompanying notes/diagrams)

[ ] Demonstrate functionality to research group.

**Notes**

* The vision algorithm should be mostly complete, polished, and ready for field testing at the end of this user story.

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## 590 – Image Processing System Integration (Position 2)

See user story ‘589 – Image Processing System Integration (Position 1)’

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## 591 – Image Processing System Integration (Position 3)

See user story ‘589 – Image Processing System Integration (Position 1)’

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## 592 – Image Processing System Integration (Position 4)

See user story ‘589 – Image Processing System Integration (Position 1)’

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## 593 – Perforce Branching

**Content**

As a software developer, I would like to investigate braching in Perforce so I can use it to efficiently and professionally develop software features.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story

[ ] Some questions to answer include but are not limited to:

[ ] Does branching use additional space on the server? If we branch a large codebase, does this consume disc space on the server?

[ ] How do you merge branches?

[ ] Do you need to delete empty branches?

[ ] Can other users see/check out a different branch?

[ ] Create a simple/example branch in the depot called \\depot

[ ] Demonstrate the branching process to the group.

[ ] Create a short document describing the branching procedure.

[ ] Review results with Chris Lum

**Notes**

* Look on Youtube for some example of branching using Perforce

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## 594 – Implement Lost Link and Failsafe Protocols

**Content**

As a UAS operator, I would like to implement failsafe procedures and protocols so that the system can be safetly recovered in the event of a lost link.

**Definition of Done**

[X] Coordinate with Chris Lum before starting this user story

Reciever loses communication with transmitter

[X] Reseach and characterize this mode of failure. Some questions to answer include but are not limited to:

[X] How does it occur?

[X] Which components can react to this failure (receiver, Pixhawk, RxMux, etc.)?

[X] Implement a failsafe and lost link protocol for this failure mode

Pixhawk loses communication with GPS

[X] Reseach and characterize this mode of failure. Some questions to answer include but are not limited to:

[X] How does it occur?

[X] Which components can react to this failure (receiver, Pixhawk, RxMux, etc.)?

[X] Implement a failsafe and lost link protocol for this failure mode

Pixhawk loses communication with GCS (3DR Radio)

[X] Reseach and characterize this mode of failure. Some questions to answer include but are not limited to:

[X] How does it occur?

[X] Which components can react to this failure (receiver, Pixhawk, RxMux, etc.)?

[X] Implement a failsafe and lost link protocol for this failure mode

General

[X] Test/implement all failsafe modes on the HiL to verify they operate correctly

[X] Test/implement all failsafe modes on CONDOR to verify they operate correctly (do not fly aircraft)

[x] Augment the \\FlightOperations\UAS\CONDOR\OperationalChecklistsAndNotes.docx document with a table showing all different possible failsafes and behaviors. Include references to external sources and documents in the write up.

[X] Update CONDOR COA with these findings.

[X] Review results with Chris Lum

[ ] (OPTIONAL) Demonstrate results to the research group

**Notes**

* There are several types of failsafes that need to be investigated and implemented
  + Receiver loses communication with transmitter
  + Pixhawk loses communication with GPS
  + Pixhawk loses communication with GCS (3DR radio)
* The goal of the user story is to understand how the aircraft will operate in a lost link scenario.

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## 595 – Matlab Computer Vision Processing Algorithm (Version 3.0) (Position 1)

See ‘561 – Matlab Computer Vision Processing Algorithm (Version 2.0) (Position 1)’. This user story should be of similar scope but making improvements to the system.

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## 596 – Matlab Computer Vision Processing Algorithm (Version 3.0) (Position 2)

See ‘561 – Matlab Computer Vision Processing Algorithm (Version 2.0) (Position 1)’. This user story should be of similar scope but making improvements to the system.

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## 597 – Matlab Computer Vision Processing Algorithm (Version 3.0) (Position 3)

See ‘561 – Matlab Computer Vision Processing Algorithm (Version 2.0) (Position 1)’. This user story should be of similar scope but making improvements to the system.

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## 598 – Wind Tunnel Model Documentation and Archival (Position 1)

**Content**

As a test engineer, I would like to document the progress on the wind tunnel model and prepare the system for archival so that students can continue development on this after knowledgeable students graduate.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story

[x] Update the document \\FlightOperations\UAS\WindTunnelModel\OperationalChecklistsAndNotes.docx with all relevant notes and details which describe progress already completed and work that still needs to be completed on the model.

[x] Archive the data and the hardware

[ ] Review results with Chris Lum

[ ] Present what you have done so far to the group.

**Notes**

* Many of the people who have been working on the wind tunnel model project will be graduating so we do not want to lose all this knowledge.
* The goal of this user story is to archive the wind tunnel model project so that new student(s) can pick up this project in the future.

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## 599 – Wind Tunnel Model Documentation and Archival (Position 2)

See user story ‘599 – Wind Tunnel Model Documentation and Archival (Position 2)’

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## 600 – Sprint 1505 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1505 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[ ] Prepare for sprint external demo

[ ] Backup Perforce server on external hard drive

[ ] Plan training tutorials and lectures

[ ] Manage user story generation, assignment, and progress.

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## 601 – Investigate Hyperspectral Cameras

**Content**

As an algorithm designer and lab operations manager, I would like to investigate the feasibility for using hyperspectral cameras for autonomous missions so I can determine if these are viable sensors for our applications.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Research the [MicaSense Red Edge](http://www.micasense.com/) camera and determine how it compares to other cameras in the field.

[ ] Some research topics include but are not limited to:

[ ] What are some competitors and how much do their products cost?

[ ] Can we simply use a DIY camera with a blocking filter to capture the same data?

[ ] Does this work for targets other than plants (for example on camoflagued animals or humans)

[ ] Create a document compiling your results (include a liste of questions to ask at MicaSense meeting on 05/21/15). Check this into Perforce.

[ ] Present results to research group

**Notes**

* Our primary application is precision agriculture but we may also want to investigate the use of this for wildlife monitoring.
* We have been quoted ~$6000 for a Red Edge camera.
* One goal of this story is to perform due diligence before purchasing such an expensive piece of equipment.
* Some other products to investigate include but are not limited to
  + <https://www.sparkfun.com/products/13233>
  + <http://www.headwallphotonics.com/spectral-imaging/hyperspectral/micro-hyperspec>
  + Tetracam Mini-CMA6 or similar product

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## 602 – Read Documentation on MicaSense Red Edge Camera

**Content**

As a camera operator, I would like to read documentation about the MicaSense Red Edge camera so I can become familiar with its operation and capabilities.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Research the [MicaSense Red Edge](http://www.micasense.com/) camera.

[ ] Read the Camera Integration and User Manual located [here](https://www.dropbox.com/sh/nakur0puwljlkzi/AABHC1-AfTI-I6aBacJfwrCna?dl=0).

[ ] Read documents about the camera interface protocols

[ ] Serial API ([link](https://github.com/micasense/rededge-api))

[ ] Ethernet API ([link](http://micasense.github.io/rededge-api/))

[ ] Download and check in appropriate documents into the appropriate locations in Perforce.

[ ] Present results to research group

**Notes**

* The goal of this user story is to become familiar with the system so we can hit the ground running when a camera is delivered to us.
* Remember that this is a very expensive piece of equipment (~$6500) so we need to understand its operation before attempting to use it.

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## 603 – Weather Ballon Data Acquisition Platform

**Content**

As a data collector, I would like to create a platform that can lift a sensor payload in the air to simulate a flight so that I can legally use this to obtain imagery and other data in lieu of a UAS flight.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Coordinate with Melanie Clark, Alec Bueing, or other lab members who have experience with weather ballons.

[ ] Research the regulatory implications or obstacles involved with using a tethered ballon for research purposes. Does the FAA consider this a UAS? Does the FAA consider this a kite (see notes)?

[ ] Create a requirements/specifications document which outlines mission parameters (altitudes, speeds), payloads, and estimated costs for the system.

[ ] Design a system to carry the TEDD camera payload or the MicaSense Red Edge camera.

[ ] Present 50% design of the system to research group.

[ ] Construct and test the system (consult with Chris Lum before conducting tests).

[ ] Present results to group.

**Notes**

* The goal of this user story is to be able to gather aerial imagery or other data without using a UAS (FAA regulatory problems).
* For information about kites, Brendan Gantner from eWind Solutions may be a good resource. Talk to Chris to obtain contact information.
* This user story only encompasses designing and basic, initial testing of the system. Actual deployment and field trials will be captured in another user story.

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## 604 – Procure HAM Radio

**Content**

As a UAS operator, I would like to purchase a HAM radio so that I can maintain communication with air traffic control and other aviation stakeholder and satisfy requirements of our COA.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Coordiante with Al Creigh to discuss frequency spectrum that we will require.

[ ] Look at the COA application, particuliarly the section described in the “ATC Communications” section. An example of this page is located at \\FlightOperations\Operations\COAs\SupportingDocuments\example\_COAs\2014-WSA-22-COA\application\11\_ATC\_communications.pdf.

[ ] Research HAM radios that satisfy our requirements.

[ ] Ensure that this radio will allow us to communicate with the necessary aviation stakeholders during UAS operations.

[ ] Make a recommendation on what radio to purchase.

[ ] Procure the radio.

[ ] Read documentation and familiarize yourself with its operation (note that you may need a HAM radio license to operate this (see notes).

[ ] Present results to the research group.

**Notes**

* A list of lab members with HAM radio certificates is located at \\FlightOperations\Operators\Certifications\HAM\_radio\HAM\_radio\_certifications.docx
* Al Creigh has worked with this radio <http://www.mypilotstore.com/MyPilotStore/sep/5427?gclid=CNfet6remsYCFc5lfgodGcgOcQ>

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## 605 – Mission Planner Modifications (Simple) (Helper 1)

See user story 483 – Mission Planner Modifications (Simple).

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## 606 – APM 2.6 Hardware-in-the-Loop Simulator

**Content**

As a study abroad instructor, I would like to create a Mission Planner simulator so we can train operators on Mission Planner before going out into the field.

**Definition of Done**

[x] Read user story ‘515 – APM 2.6 Hardware-in-the-Loop Simulator’

[x] Watch videos or read other documentation related to this

[x] [Wiki article](http://planner.ardupilot.com/wiki/common-simulation/common-x-plane-hardware-in-the-loop-simulation/)

[x] <https://www.youtube.com/watch?v=tKr2C_Lrq_4>

[x] Read the document \\FlightOperations\UAS\CommonDocuments\MissionPlanner\OperationalChecklistsAndNotes.docx , especially the section entitled ‘X-Plane Hardware in the Loop Simulator”. Note that this is a work in progress and may contain errors or irrelevant information.

[x] Create a simulator in the AERB 139 lab using an APM 2.6.

~~[ ] Determine if this works with a Pixhawk (the last time someone looked at this, the simulator firmware only ran on the APM 2.6, not the Pixhawk).~~ This does not work with Pixhawk (talk to Bryan G for more info)

[x] Determine how to recreate this simulator at QUT.

[x] Investigate the Plane-Maker.exe program (in the X-Plane folder) to see how we can use this to create a custom aircraft model.

[x] Create an X-Plane model of the Skywalker which is as close to an accurate representation of TEDD as possible. Check this file into Perforce.

[x] Tune autopilot parameters following instructions outlined [here](http://plane.ardupilot.com/wiki/flying/tuning/roll-pitch-controller-tuning/).

[x] Save the ArduPlane parameters and check them into Perforce.

[ ] ~~Present results to the research group.~~

[x] Update relevant documentation on this.

**Notes**

* The goal of this is to create a setup that students can use at QUT during the study abroad 2015 class.
* Another goal of this is to have a simulator in the lab where people can become familiar with the Mission Planner setup and operation.
* You should have a parameter file that is suitable for loading onto the real TEDD aircraft once this user story is complete.
* X-Plane model of the Skywalker is not reasonable and does not simulate reality very well.

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## 607 – Field Box and Supplies

**Content**

As a field experimenter, I would like to put together a field box that contains supplies and materials necessary to conduct field experiments so that I can use it to easily conduct field trials.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[x] Procure a field box that will be used to house supplies (perhaps a similar size to the large computer box)

[ ] Add the following items to the field box:

[ ] Bug spray

[ ] Sunscreen

[ ] Hand santizer

[ ] Soap

[ ] First aid kit

[ ] Fire extinguisher

[ ] Cooking tools (tongs, spatula, etc.)

[ ] Eating utensils

[ ] Small BBQ

[ ] propane tanks for cooking

[ ] Plates

[ ] Cups

[ ] Radios

[ ] Clip board (x2), paper, pencils.

[ ] garbage bags

[ ] paper towels

[ ] gloves (x3)

[ ] safety glasses (x3)

[ ] headlamp and batteries

[ ] weather station

[ ] extra clothes

[ ] Big Buddy propane heater cable

[ ] Label all items as belonging to the field box so they are not used for other purposes.

[ ] Create a list of items that should be in the field box. A hard copy should be in the box and a digital version on Perforce. The digital checklist should be part of the file \\FlightOperations\Operations\Missions\MASTER\ProceduresAndChecklists.docx

[ ] Test this field box

[ ] Present results to the group.

**Notes**

* The goal of this is to have a box that we can easily take out on field excursions.
* We want this box to be self contained and not need to constantly move items in and out of the box (to minimize the chance of something getting lost)

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## 608 – Mission Planner Familiarization (Position 1)

**Content**

As a UAS operator, I would like to become familiar with Mission Planner so I can use it to conduct experiments and missions.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Research Mission Planner and become familiar with its operation. Some things to research include but are not limited to:

[ ] Setting the home location for RTL mode

[ ] Planning a grid survey mission over a predefined space

[ ] Saving flight plans to a file (what are the different types of files/objects that can be saved?)

[ ] Setting up a landing

[ ] throttle arming/disarming

[ ] Read and coordinate with the development champion of user story ‘606 – APM 2.6 Hardware-in-the-Loop Simulator’

[ ] Plan various simulated flights/mission using the APM 2.6 simulator.

[ ] Present results to research group.

[ ] Additional tasks TBD.

**Notes**

* You should be a confident operator of Mission Planner after this user story.
* A good video is located at <https://www.youtube.com/watch?v=r9Y0KxAsPIE>

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## 609 – Procure Weather Station

**Content**

As a UAS operator, I would like to purchase a weather station or other envirionmental recording instrument so I can take measurements during flight tests.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] The weather station should be able to measure at least

[ ] temperature

[ ] wind speed

[ ] wind direction

[ ] static pressure

[ ] humidity (optional)

[ ] Make a recommendation on what weather station to purchase.

[ ] Procure the weather station.

[ ] Read documentation and familiarize yourself with its operation

[ ] Present results to the research group.

**Notes**

* This instrument doesn’t need to be a weather station as long as it can measure this information.

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## 610 – Finalize Aerotec Conference Submission and Presentation

**Content**

As a paper author, I would like to finalize the Aerotec conference submission and prepare presentation slides so I can present the results at the conference.

**Definition of Done**

[x] Finalize the paper and prepare for submission:

[x] Address all reviewers comments (see \\dev\AustraliaBushfire\TechnicalDataPackage\ConferencePaper\Reviews)

[x] Fix references to be automatically generated and cross referenced (currently it seems that these are hard coded).

[x] Ensure that equations, references, figures, etc. conform to the conference style (see \\AustraliaBushfire\TechnicalDataPackage\ConferencePaper\WordVersion\SAEPaper.dotx)

[x] Submit the final paper to the SAE conference (Chris Lum should do this action)

[x] After receiving confirmation of acceptance, register for conference (be sure to talk with Chris Lum to obtain the discounted rate we are entitled to for reviewing a paper)

[x] Determine specifications for presentation (time, date of presentation, format, etc.)

[x] Prepare presentation slides to present at the conference.

[x] Download conference template

[x] Port over previous slides to the template

[x] Present slides to AFSL, NDCL, ADV-CTRL group meeting on 08/18/15 at 10:30am.

[x] Incorporate feedback into presentation.

[x] Send final paper and slides to Matt Dunbabin.

[x] Check in all relevant documents to Perforce.

**Conference Logistics**

[ ] Register for the conference.

[ ] Arrange travel logistics to the conference.

[ ] Present slides at IEEE Aerospace Conference.

[ ] Submit expense report for all costs related to this conference.

[ ] Start thinking about a journal article (Chris to talk with Matt about relevant journals)

**Notes**

* Be careful with movies and how they are linked in PowerPoint.
* We will be presenting in position 3 out of 3 on Sept. 22 in the ATC1507 session (Unmanned Aerial Systems - Avionics, UAS’s Human-Machine Interface and Systems Integration (Part 1 of 2)) [link](http://www.sae.org/servlets/techSession?EVT_NAME=ATC1507&GROUP_CD=TSESS&SCHED_NUM=239578&tab=sessionDetails&REQUEST_TYPE=SESSION_DETAILS&saetkn=7xvgbk1591)
* We are not certain at this point how long the presentation should be but let’s plan on 20-25 minutes with 5-10 minutes of questions.
* We can copy most of the slides from Australia but add more technical details as the audience will be fellow engineers and scientists. Remove cultural, historic, etc content.

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## 611 – Fix and Clean Up RCAM Simulator

**Content**

As a simulation engineer, I would like to fix the RCAM simulation and document the process so that I can use this in the future for other purposes.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Read \\ScanEagleSimulation\AE512\_test\AA512 RCAM Simulator Setup Instruction.docx

[ ] Read user story ‘576 – ScanEagle Simulator: Documentation (position 1)’ and the other stories that it references.

[ ] Ensure that you can build and execute the simulator.

[ ] Roll back or fix the code in \\ScanEagleSimulation\AE512\_test\RCAM\_standard. The current problem is that this appears to run much slower than real time.

[ ] Once the code is fixed, move the appropaite items out of the AE512\_test folder and delete this from the depot.

[ ] Additional tasks TBD…

**Notes**

* The goal of this user story is to clean up the code so that the ScanEagleSimulation depot is in a consistent and usable state and can be used for future development.

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## 612 – Battery Research

**Content**

As a flight operations engineer, I would like to research batteries so I can get a better idea of how they may be used in flight operations.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Research various batteries used in the lab and become familiar with their operation and specifications.

[ ] Some questions to answer include but are not limited to:

[ ] minimum safe levels of discharge (voltage before system becomes uncontrollable).

[ ] best practices for long term storage

[ ] best practices for charging

[ ] Audit all AFSL batteries and assess their status.

[ ] Update the document at \\FlightOperations\UAS\CommonDocuments\BatteryNotes.docx with your results.

[ ] Research “RC Brownouts” and their relevance to this user story.

[ ] Update battery warning limits in Mission Planner and other systems (transmitters).

[ ] Perform a live test of several battery setups to validate your results. Coordinate with Chris Lum before starting this test. See notes

[ ] Single battery (5000 mAH 3S battery)

[ ] Two batteries in parallel.

[ ] Present results to the research group.

**Notes**

* The goal of this user story is to become comfortable with batteries so we do not operate unsafetly and avoid battery failures during operations.
* The live test should try to simulate flight operatinos conditions as much as possible. The goal of this is to determine when a system failure will occur (brownout, loss of control, etc.) and ensure that we do not encounter this during flight operations.

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## 613 – Photogrammary Familiarization (Introductory Level)

**Content**

As a geospatial data analyst, I would like to familiarize myself with methods for analyzing aerial imagery so that I can apply it to our data sets we acquire.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story.

[x] Read and coordinate with the development champion of user story ‘340 – Australia Ortho-Rectified Image’

[x] Read document at \\dev\Mapping\TechnicalDataPackage\AgiSoft\_PhotoScan\Agisoft PhotoScan Notes.docx. Update this document with your notes.

[x] Go to the QRC in Johnson Hall and familiarize yourself with AgiSoft PhotoScan Pro. (See Chris Lum for information before going over there)

[x] Use the software to generate various output data sets

[x] Investigate [CloudCompare](https://en.wikipedia.org/wiki/CloudCompare) as a software tool to analyze the output data.

~~[ ] Investigate QGIS as a software tool to analyze the output data.~~ See user story 748 – QGIS Familiarization

[x] Investigate ArcGIS as a software tool to analyze the output data.

[x] Determine how MicaSense creates NDVI maps (investigate rectification, multi-channel problems, etc.). See notes.

[x] Present results to group

**Notes**

* The goal of this user story is to do initial research and familiarization. More complex manipulation will come in a later user story.
* An example of the MicaSense output for Camp Korey is located at \\OneDrive\AFSL\FlightOperations\Operations\Missions\15\_06\_16\_field\_experiments\DataAnalysis\MicaSense\RedEdge. This data was generated via MicaSense’s cloud processing system.
* MicaSense uses their own custom processing system to generate NDVI maps. This process concentrates on maintaining radiometric values across the mosaic. AgiSoft may try to blend photos across the mosaic which may affect these values.
* CloudCompare is somewhat slow and laggy.
* Gizelle worked with ArcGIS in Australia
* Justin Taft (MicaSense intern) suggested that we investigate QGIS as this is what he uses.
* The login information to the computer in the QRC is
  + Login: geouser
  + Password: temporary

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## 614 – Sprint 1506 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1506 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 615 – Geotagging Photos with Mission Planner

**Content**

As a geospatial analyst, I would like to determine how to embed geodetic position into photos using Mission Planner so I can use this method for analyzing flight data.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story.

[x] Read section in \\FlightOperations\UAS\TEDD\OperationalChecklistsAndNotes.docx that describes how to tag photos.

[x] Perform this using the data set obtained from Camp Korey.

[x] Compare the GPS locations that are automatically tagged by the S100 camera to the GPS locations obtained from the Mission Planner tlog file.

[x] Obtain a new data set using the HiL system and verify that this process works as intended.

[ ] Present results to the group.

[x] Modify/augment the instructions document with your findings and suggestions for improvement. Include discussion about how to deal with cameras that automatically tag the pictures with GPS locations (ie the S100).

**Notes**

* The goal of this story is to become an expert in tagging photos using Mission Planner.
* You should make suggestions to the workflow to ensure that this is a smooth and robust process.

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## 616 – Perforce Visual Client (copy)

**Content**

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**Notes**

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## 617 – Perforce Visual Client (copy)

**Content**

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**Notes**

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## 618 – Perforce Visual Client (copy)

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**Notes**

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## 619 – Perforce Visual Client (copy)

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## 620 – Perforce Visual Client (copy)

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**Notes**

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## 621 – Perforce Visual Client (copy)

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**Notes**

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## 622 – Perforce Visual Client (copy)

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## 623 – Perforce Visual Client (copy)

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## 624 – Perforce Visual Client (copy)

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**Notes**

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## 625 – Perforce Visual Client (copy)

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**Notes**

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## 626 – Perforce Visual Client (copy)

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**Notes**

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## 627 – Perforce Visual Client (copy)

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**Notes**

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## 628 – Perforce Visual Client (copy)

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**Notes**

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## 629 – Perforce Visual Client (copy)

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## 630 – Perforce Visual Client (copy)

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## 631 – Perforce Visual Client (copy)

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## 632 – Perforce Visual Client (copy)

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## 633 – Risk Assessment Paper Setup

**Content**

As an author of the risk assessment paper, I would like to setup infrastructure to support writing the paper so that I can make progress in the future on this publication

**Definition of Done**

[x] Coordinate with CL before starting this user story.

[x] Setup a ‘RiskAssesment’ depot to store files associated with this project.

[x] Print and sign the contributor contract.

[x] Ensure the contributor contract is mailed to Wiley (CL should do this)

[x] Read the specifications document from Wiley.

[x] Determine if we will write the paper using LaTeX or Word.

[x] Create a template for the paper using the appropriate format.

~~[ ] If we use LaTeX, read use story 398 – LaTeX References/Bibliography Research~~

[x] If we use Word, create a user story to create a Word references list (talk to CL)

[x] Obtain a copy of the two relevant risk assessment papers and Blake Waggoner’s thesis and place this in the appropriate place in the depot.

[x] Read the previously mentioned publications.

[x] Track the relevant due dates and ensure these are on the lab calendar as well as on personal calendars (see relevant section of \\AFSL\LabInfo\NewLabMemberOrientation.docx for a discussion of synching the lab calendar)

**Notes**

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## 634 – Risk Assessment Paper Writing (Part 1)

**Content**

As an author of the risk assessment paper, I would like to write a draft of the risk assessment paper so that I can obtain feedback and comments on the paper.

**Definition of Done**

[x] Perform a literature review of other relevant documents in this field.

[x] Discuss the results of your literature review with CL.

[x] Ensure that all references found during the literature review are added to the appropriate bibliography file and referenced in the paper.

[x] Write a rough draft of the paper.

[x] Obtain comments from CL about the paper.

[ ] Revise the paper as appropriate

[ ] Obtain comments/reviews from external, technical parties.

[ ] Revise the paper as appropriate

[ ] Additional tasks TBD…

**Notes**

* ~~The goal of this is to get a rought draft of the paper.~~
* This task only includes writing the paper, porting code and performing simulations is captured in

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## 635 – Risk Assessment Code and Simulation

**Content**

As a risk assessment engineer, I would like to port the existing risk assessment code to the newly created RiskAssessment depot so that code and simulation can be maintained and further developed in a formal, structured fashion.

**Definition of Done**

[ ] Coordinate with CL before starting this task.

[ ] Obtain a copy of the code that was used to generate data in the paper “A Risk Based Paradigm and Model for Unmanned Aerial Systems in the National Airspace”

[ ] Move this code to the RiskAssessment depot and ensure that you can recreate the simulations as outlined in the paper.

[ ] Obtain a copy of the code that was used to generate data in the paper “Assessing and Estimating Risk of Operating Unmanned Aerial Systems in Populated Areas”

[ ] Move this code to the RiskAssessment depot and ensure that you can recreate the simulations as outlined in the paper.

[ ] Augment the code with new analysis and simulations as appropriate for this paper.

[ ] Discuss results with Chris Lum.

[ ] Additional tasks TBD…

**Notes**

* This task only includes getting the software and simulations to run, this does not require any writing for this user story.

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## 636 – AFSL Mini Quad Research Platform (Helper 2)

See user story ‘565 – AFSL Mini Quad Research Platform’

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## 637 – CONDOR RxMUX Integration (Helper 1)

See user story ‘512 – CONDOR RxMUX Integration’

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## 638 – Mission Planner Familiarization (Position 2)

See user story ‘608 – Mission Planner Familiarization (Position 1)’

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## 639 – Mission Planner Familiarization (Position 3)

See user story ‘608 – Mission Planner Familiarization (Position 1)’

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## 640 – Mission Planner Familiarization (Position 4)

See user story ‘608 – Mission Planner Familiarization (Position 1)’

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## 641 – Mission Planner Familiarization (Position 5)

See user story ‘608 – Mission Planner Familiarization (Position 1)’

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## 642 – Mission Planner Familiarization (Position 6)

See user story ‘608 – Mission Planner Familiarization (Position 1)’

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## 643 – Photogrammary Familiarization (Introductory Level) (Position 2)

See user story ‘613 – Photogrammary Familiarization (Introductory Level)’

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## 644 – Canon CHDK Research and Development

**Content**

As a camera operator, I would like to research how to load the CHDK software on the the Canon S100 camera so that I can use this to conduct aerial surveys using a UAS.

**Definition of Done**

[ ] Coordinate with CL before starting this task.

[ ] Research the Canon Hackers Development Kit (CHDK) and familiarize yourself with how it operates.

[ ] Read the appropriate section of the document \\FlightOperations\UAS\TEDD\OperationalChecklistsAndNotes.docx which outlines how this can be accomplished (Aleksandr T. previously worked on this).

[ ] Follow and/or modify the previously described procedure to load CHDK on a new SD card. Do not modify the old SD card.

[ ] Test that the new system operates as expected.

[ ] Check in any necessary binaries or dependencies into the \\FlightOperations\UAS\TEDD\SubSystems\CanonS100 folder

[ ] Review results with Chris Lum

[ ] Present results to research group.

**Notes**

* The goal of this is to gather all the necessary files and dependencies in one location. In addition, we should be able to setup the system from scratch if necessary (ie when we are in Australia with no internet connection in the field).

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## 645 – Australia Preparations and Test Run (Position 1)

**Content**

As a field experimenter, I would like to prepare for and conduct a test run of the field trials and experiments we will conduct in Australia during Summer 2015 so that I can identify anythings we can improve on before conducting the experiments.

**Definition of Done**

[x] Coordinate with CL before starting this task.

[x] Review results with CL.

[x] Create a shopping list of components to re-create the TEDD aircraft in Australia. We will purchase these components and bring them to Australia for assembly.

[x] Allocate a storage box for all Australia related equipment.

[x] Test obtaining some data using the RedEdge camera mounted in portrait mode (as it will be mounted in the aircraft).

[x] Verify that we can mount in portrait mode in the aircraft

[x] Modify the Mission Planner automatic grid generator to accommodate portrait mode

[x] Gather a set of test data.

[x] After conducting successful test run, place all equipment in the Australia specific storage boxes so they are not removed or lost.

[x] Update the notes in \\FlightOperations\UAS\TEDD\OperationalChecklistsAndNotes.docx with new procedures and information. This will be the master flight test procedures document for the experiment.

[x] Gather a test set of data using the procedures described in the modified document.

[x] Analyze and reduce the data to ensure that the workflow is sound.

[x] Present results to research group.

**Notes**

* The goal of this is to conduct a “dry run” of the Australia experiment so we can ensure we have everything we need before starting the expedition.
* Anything that goes in the Australia box should not be taken out. We want to ensure that we have tested every item that we will be taking to Australia.

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## 646 – Australia Preparations and Test Run (Position 2)

See user story ‘645 – Australia Preparations and Test Run (Position 1)’

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## 647 – Australia Preparations and Test Run (Position 3)

See user story ‘645 – Australia Preparations and Test Run (Position 1)’

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## 648 – Australia Preparations and Test Run (Position 4)

See user story ‘645 – Australia Preparations and Test Run (Position 1)’

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## 649 – APM 2.6 Hardware-in-the-Loop Simulator (Position 2)

See ‘606 – APM 2.6 Hardware-in-the-Loop Simulator’

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## 650 – APM 2.6 Hardware-in-the-Loop Simulator (Position 3)

See ‘606 – APM 2.6 Hardware-in-the-Loop Simulator’

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## 651 – APM 2.6 Hardware-in-the-Loop Simulator (Position 4)

See ‘606 – APM 2.6 Hardware-in-the-Loop Simulator’

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## 652 – Integrate Marco Polo Tracking System

**Content**

As a UAS operator, I would like to integrate the Marco Polo tracking system onto the various UAS so that I can use it to find the aircraft if they fly away and become lost.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story.

[x] Purchase a Marco Polo tracking system with 1 tracker and 3 receivers (coordinate with Chris Lum to do this)

[ ] Start a document in \\FlightOperations\UAS\CommonDocuments to document operational notes about the system.

[x] Upload a digital copy of the user manual to the previously specified location.

[ ] Place the hard copy of the user manual in the field box in the user manuals folder.

[x] Familiarize yourself with the operation of the system.

[x] Conduct several field trials of the system to ensure you know how to operate the system (play hide and seek) and are familiar with the system’s limitations/capabilities.

[ ] Integrate the tracking recievers onto CONDOR and TEDD and leave the 3rd one available for floating usage.

[ ] Add appropriate checklists/notes to the document \\FlightOperations\Operations\Missions\MASTER\ProceduresAndChecklists.docx

[ ] Present results to research group.

[ ] Review and upload documents with Chris Lum

**Notes**

* The operational notes will be used in the field in the event of a lost aircraft. Be sure these are easy to follow and can be used by lab members with minimal training.
* Be sure to note any limitations (battery, range, sensitivity to terrain, etc.).

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## 653 – Integrate Moebius Camera System

**Content**

As a UAS operator, I would like to integrate the Moebius ActionCam camera system onto the appropriate UAS so that I can use it to provide life video telemetry and record HD video of flights.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story.

[x] Purchase a Moebieus camera system

[x] Start a document in \\FlightOperations\UAS\CommonDocuments to document operational notes about the system.

[x] Upload a digital copy of the user manual to the previously specified location.

[x] Place the hard copy of the user manual in the field box in the user manuals folder.

[x] Familiarize yourself with the operation of the system. Some things to determine include but are not lmited to

[x] How to obtain live video telemetry out from the camera.

[x] Integrate camera with a video transmitter to stream the video signal to the ground station

[x] What is the resolution of the video on the ground

[x] How do you record video simultaneously with streaming live video

[x] What resolutions can you film and stream at?

[x] How do you start the camera streaming and recording?

[x] Create any cables necessary for the camera’s operation (and backup ones as well)

[x] Conduct several field trials of the system to ensure you know how to operate the system and are familiar with the system’s limitations/capabilities.

[x] Prepare the camera to be integrated onto one of the Australia aircraft.

[x] Add appropriate checklists/notes to the document \\FlightOperations\Operations\Missions\MASTER\ProceduresAndChecklists.docx

[x] Present results to research group.

[x] Review and upload documents with Chris Lum

**Notes**

* Link to the camera at <http://hobbyking.com/hobbyking/store/uh_viewItem.asp?idProduct=65770>
* This camera will be taken to Australia where there is little field support. As such, ensure that the sytem is robust and has spare parts available before leaving the country.

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## 654 – Sprint 1507 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1507 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[ ] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 655 – Sprint 1508 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during sprint 1508 to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 656 – New Computer Construction

**Content**

As a project manager, I would like to have a computer (or two) dedicated to the ADS-B JCATI2015 research effort.

**Definition of Done**

[X] Determine the optimal configuration of components for this project while also making efforts to “future-proof” the system so that it may serve the lab for a long time.

[X] Determine the price of a new system and order accordingly.

[x] Determine an operating system to install on the new system(s).

[x] Assemble the new system(s).

[x] Setup new system(s) within the lab. This includes but is not limited to the following:

[x] Create an administrator account named ‘root’ with the standard lab password

[x] Create a non-administor account appropriately (coordinate w/ Chris L. to choose a password)

[x] Ensure that we have necessary licenses, software, drivers, etc. to rebuild the system from stratch.

[x] Build the computer to standard configuration (a minimal amount of core software). This includes but is not limited to (coordinate with Chris Lum for any of these components):

[x] Whatever OS is chosen

[x] Matlab w/ an appropriate license (likely a concurrent use license to allow multiple computers to share)

[x] Visual Studio 2012

[x] Microsoft Office 2013

[x] VLC Media Player

[x] SSH Tectia (for FTP, see Chris Lum)

[x] Google Chrome

[x] GoogleEarth

[x] Perforce Visual Client (P4V)

[x] PDF Xchange Viewer v2.5

[x] PDFCreator 1.2.0 (do NOT get the latest version of this as it has spyware, use this version)

[x] MikTex 2.9

[x] TexMaker

[x] Mozilla Firefox

[x] Create a system restore/image of this at this point so we can quickly wipe the machine and restore it to this configuration. Coordinate with Chris Lum to store this image on the lab’s back up hard drive.

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## 657 – New Computer Construction (Helper 1)

**Content**

See User Story 656 – New Computer Construction

**Definition of Done**

See User Story 656 – New Computer Construction

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## 658 – Hood River Logistics

**Content**

As a project manager, I would like to manage logistics for the August 20 – 21 visit to industry partners in

Hood River so that I can ensure all logistics are accounted for and all lab members going on the trip are well informed before we go there.

**Definition of Done**

[x] Coordinate with Chris Lum regarding documentation for the trip.

[x] Ensure that a list of travelers (and associated citizenship details) is sent to all industry partners.

[x] Send a draft agenda to industry partners and coordinate with them to ensure that they are able to

meet our requests (Chris Lum will send emails to partners)

[x] Create a packing list for the trip. This should include

[x] Proof of citizenship

[x] Dress clothes

[x] Audio recording device(s) for use in meetings

[x] Ensure that we have a briefing about the trip before leaving.

[x] Research how we can obtain cars (Prius) from UW.

[x] Can this be charged to a budget number?

[x] How much does it cost?

[x] Are there restrictions for drivers (over a certain age, citizenship, etc.)?

[x] Research lodging options and arrange room shares (who is staying with who in each room)

[x] Organize carpools

[x] Organize relevant meals

[x] Coordinate with Chris Lum before booking any rooms (see notes)

[x] Obtain travel expense sheets and review them at the pre-departure briefing.

[x] Talk with Jenny Park about the trip and ask her for any details or things that we need to be aware of.

[x] Ensure that all receipts during the trip are saved.

[x] Fill out travel expenses and ensure that all travelers submit for reimbursement after trip.

**Notes**

* A document organizing this trip is located in Perforce at: JCATI2015/TechnicalDataPackage/Hood\_River\_Trip\_Logistics

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## 659 – ADS-B Basic Concepts & Systems Familiarization

**Content**

As a researcher for the JCATI2015 ADS-B project, I would like to familiarize myself with the systems that will be used for this project in preparation for a meeting with industry partners.

**Definition of Done**

[x] Read the JCATI2015 project proposal.

[x] Research the basic operating principles and any available technical details for the following systems:

[x] ADS-B (FAA and Wikipedia work well for this one)

[x] ANPC-LAMS

[x] Sagetech Clarity ADS-B receiver

[x] Sagetech XPG-TR ADS-B transponder

[x] Insitu ICOMC2 plugin

[x] Summarize each of these topics in a technical briefing document and check these documents in to the appropriate Perforce depot.

[x] Add any unresolved questions to the document “Questions for Hood River Meeting.docx” located in \JCATI2015\Technical Data Package\Kickoff Meeting

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## 660 – ADS-B Basic Concepts & Systems Familiarization (Copy 1)

**Content**

See User Story 659 – ADS-B Basic Concepts & Systems Familiarization

**Definition of Done**

See User Story 659 – ADS-B Basic Concepts & Systems Familiarization

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## 661 – ADS-B Basic Concepts & Systems Familiarization (Copy 2)

**Content**

See User Story 659 – ADS-B Basic Concepts & Systems Familiarization

**Definition of Done**

See User Story 659 – ADS-B Basic Concepts & Systems Familiarization

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## 662 – FAA Certificate of Authoriation (COA) for TEDD

**Content**

As a UAS operator, I would like to obtain an FAA Certificate of Authorization or Wavier (COA) so that I can legally fly the TEDD system.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Copy and modify the CONDOR COA (see notes) for TEDD.

[ ] File and obtain a COA for TEDD (do NOT do this by yourself, coordinate with Chris Lum)

[ ] Additional tasks TBD…

**Notes**

* We have already filed a COA for CONDOR. Documentation related to this is located in the \\FlightOperations\Operations\COAs\CONDOR folder
* This is very similar to user story ‘767 – Obtain COA for CERES Project’ so you should coordinate with them.
* Ensure the home waypoint is included in the application.
* See \\FlightOperations\Research\FAA\16\_01\_12\_FAA\_Mark\_Jordan.docx for more information

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## 663 – ADS-B Basic Concepts & Systems Familiarization (Copy 3)

**Content**

See User Story 659 – ADS-B Basic Concepts & Systems Familiarization

**Definition of Done**

See User Story 659 – ADS-B Basic Concepts & Systems Familiarization

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## 664 – ADS-B Basic Concepts & Systems Familiarization (Copy 4)

**Content**

See User Story 659 – ADS-B Basic Concepts & Systems Familiarization

**Definition of Done**

See User Story 659 – ADS-B Basic Concepts & Systems Familiarization

## 665 – ADS-B Basic Concepts & Systems Familiarization (Copy 5)

**Content**

As a researcher for the JCATI2015 ADS-B project, I would like to familiarize myself with the systems that will be used for this project in preparation for a meeting with industry partners.

**Definition of Done**

[X] Read the JCATI2015 project proposal.

[X] Research the basic operating principles and any available technical details for the following systems:

[X] ADS-B (FAA and Wikipedia work well for this one)

[X] ANPC-LAMS

[X] Sagetech Clarity ADS-B receiver

[X] Sagetech XPG-TR ADS-B transponder

[X] Insitu ICOMC2 plugin

[ ] Summarize each of these topics in a technical briefing document and check these documents in to the appropriate Perforce depot.

[X] Add any unresolved questions to the document “Questions for Hood River Meeting.docx” located in \JCATI2015\Technical Data Package\Kickoff Meeting

[ ] Additional tasks TBD

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## 666 – ADS-B Basic Concepts & Systems Familiarization (Copy 6)

**Content**

See User Story 659 – ADS-B Basic Concepts & Systems Familiarization

**Definition of Done**

See User Story 659 – ADS-B Basic Concepts & Systems Familiarization

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## 667 – ArduPilot Software-in-the-Loop Simulator

**Content**

As a simulation engineer, I would like to set up a software-in-the-loop (SITL) simulator that I can use to test the behavior of custom ArduPlane firmware that was developed for the PixHawk platform.

**Definition of Done**

[x] Set up a SITL simulator that allows custom ArduPlane firmware to be tested without any special hardware.

[x] Create a document outlining how to set up and operate the simulator.

[x] Present results to research group (demonstrate how to use the simulator).

**Notes**

* Simulator will be used primarily to test custom flight control software developed by AFSL.

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## 668 – Sagetech Product Familiarization

**Content**

As an engineer, I would like to understand the Sagetech product family, particularly the products relevant to the JCATI2015 project so that I can determine how they will be used in the JCATI 2015 project.

**Definition of Done**

[ ] Coordiante with Chris Lum

[ ] Evaluate the differences between the Sagetech Clarity and the Sagetech Clarity SV ([link](http://www.sagetechcorp.com/general-aviation-solutions/clarity-ads-b.cfm#.VdpQK87bKzk)) and determine which one to obtain for the research project.

[ ] Evaluate differences between the Sagetech XPC-TR, XPS-TR, and XPG-TR ([link](http://www.sagetechcorp.com/unmanned-solutions/unmanned-solutions.cfm#.VdpRcs7bKzk)) and determine which one to obtain for the research project. See notes.

[ ] Determine how a certified GPS can interface with the Sagetech transponders. Some questions to answer include but are not limited to:

[ ] What type of cetified antennae needs to go with this unit.

[ ] If the Sagetech transponder is connected to a certified GPS, what additional info do we get in the ADS-B out packets? For example uncertainty, number satellites, etc.

[ ] Are there software utilites to interface with their products (see notes).

[ ] Make recommendations on components to purchase/obtain to support the Sagetech product family (see notes). This may include but is not limited to:

[ ] Clarity or Clarity SV

[ ] ADS-B out transponder

[ ] GPS (COTS or TSO)

[ ] GPS antennae

[ ] Document results in a cohesive document (or modify an existing document). Review this document with Chris Lum and check in Perforce in an appropriate location.

[ ] Present results to research group.

**Notes**

* At 08/21/15 Hood River Meeting, Jim Davis suggested the XPS-TR for the project. He also mentioned that Accord Technologies makes certified GPS units ([link](http://accord-technology.com/))
* At the 08/20/15 Hood River flight demo, Kyle Benson was using a Sagetech debugging package to interface with the devices, can we obtain this?
* See email traffic from Jim Davis below (note that you may need to open this with Microsoft Outlook)



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## 669 – Lab Infrastructure: Internet Connectivity

**Content**

As member of the lab I would like to ensure that the infrastructure for critical productivity tools such as the internet are both available and functional.

**Definition of Done**

[x] Using Lucidchart, diagram the current configuration of Ethernet hubs, switches, and cable routes.

[x] Coherently reorganize Ethernet access across the lab by removing unnecessary hubs, cables, etc.

[ ] Prominently label important cables with their source and destination.

[ ] Diagram the streamlined configuration using Lucidchart and present your improvements at a weekly meeting.

[ ] Check in documentation into the \\AFSL\ComputingInfo folder.

[ ] Make recommendations for purchasing wireless cards.

[ ] Purchase equipment to fix internet problems.

[ ] Conduct a speed test to determine internet speed before and after the upgrade.

[ ] Share results with the research group.

[ ] Support the internet system by checking with researchers in the lab to make sure the internet speed is stable and improved after the upgrade.

**Notes**

* Possibly investigate if any of the machines have a static IP address that might be conflicting with other machines in the lab.

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## 670 – Lab Infrastructure: Shelving and Work Bench Area

**Content**

As member of the lab I would like to ensure that the lab is a functional space for all users by improving the wall-mounted shelving in the lab and adding a construction bench so that it can be used by all members.

**Definition of Done**

Shelving

[ ] Consolidate what is currently stored on the shelving.

[ ] Design a new layout for shelving using the existing wall mounted tracks.

[ ] Identify communal and individual needs for shelving.

[ ] Ensure the shelves are structurally sound and there are no cantilevered ends.

[ ] Purchase more shelving brackets and boards as necessary. It is preferable to reuse the existing shelving if possible.

[ ] Install shelving.

[ ] Repopulate shelves with items.

[ ] Label shelves as necessary.

Work Bench

[ ] Identify a suitable work bench or table for this application.

[ ] Identify the shelving requirements for the area – plan for ergonomic access to tools, traffic flow, and easy access to project storage.

[ ] Acquire table and shelving from UW Surplus.

[ ] Prepare the work bench area for lab-wide use.

**Notes**

* If you need to purchase items from UW Surplus, coordinate with Chris Lum to obtain a budget number.

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## 671 – Generate JCATI 2015 Demostrator Scenario and Project Vision

**Content**

As a project manager, I would like to identify a demonstration scenario and project vision for the JCATI2015 project so all work related to the project can be done to achieve this goal.

**Definition of Done**

[x] Identify and generate a description of a target scenario for the JCATI2015 project.

[x] Document this scenario in a coherent document with diagrams, illustrations, animations, etc. that any team member can read and understand what we are trying to accomplish with this project.

[x] Establish a timeline for the project. Send timeline to Mike Van Dooren and other stakeholders.

[x] Determine metrics to measure success of the scenario.

[x] Present this to the research group so everyone is aware of the demonstrator scenario.

[x] Upload necessary files to an appropriate location on Perforce.

**Notes**

* This is effectively a “stunt” or high visibility demonstration which will exercise most of the relevant system components.
* This is used as a “target to shoot for” when developing all other work with the project.
* This user story is captured in a large poster style diagram that shows the different compoennts and subsystems associated with the project. Ensure that you look at this diagram and understand all the interactions.
* Question to answer
  + What are the specific components to be used in the project?

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## 672 – Perforce Visual Client (copy)

Copy of user story 002 – Perforce Visual Client

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## 673 – ADS-B Basic Concepts & Systems Familiarization (Copy 7)

**Content**

See User Story 659 – ADS-B Basic Concepts & Systems Familiarization

**Definition of Done**

See User Story 659 – ADS-B Basic Concepts & Systems Familiarization

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## 674 – Software Developer Background Training (Algorithm and Back End) (copy)

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 675 – Software Developer Background Training (Algorithm and Back End) (copy)

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 676– Software Developer Background Training (Algorithm and Back End) (copy)

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 677 – Software Developer Background Training (Algorithm and Back End) (copy)

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 678 – Software Developer Background Training (Algorithm and Back End) (copy)

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 679 – Unit Testing Background Training (copy)

See user story ‘033 – Unit Testing Background Training’

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## 680 – Unit Testing Background Training (copy)

See user story ‘033 – Unit Testing Background Training’

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## 681 – Unit Testing Background Training (copy)

See user story ‘033 – Unit Testing Background Training’

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## 682 – Unit Testing Background Training (copy)

See user story ‘033 – Unit Testing Background Training’

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## 683 – Unit Testing Background Training (copy)

See user story ‘033 – Unit Testing Background Training’

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## 684 – Lab Infrastructure: Computer Inventory and Upgrades

**Content**

As member of the lab I would like to ensure that appropriate computer resources are available to lab users so that I can conduct research in an efficient manner.

**Definition of Done**

[x] Locate all lab computers.

[x] Characterize computer specifications (name, CPU, RAM, hard drive).

[x] Tape a card with this information to the computer.

[x] Update the document [\\AFSL\ComputingInfo\Computers.docx](file:///\\AFSL\ComputingInfo\Computers.docx)

[x] Make recommendations for:

[x] Low-cost upgrades to existing equipment (increased RAM, a new SSD, updated OS, etc.)

[x] Computers to surplus.

[x] Additional computer resources that are needed (software, monitors, computers, etc.)

[x] Present a summary of initial findings at a lab meeting.

[x] Based on group decision, update the \\FlightOperations\Purchasing\procurement.xlsx document and work with Chris Lum to purchase these components.

[x] Install upgrades on computers and verify performance improvements.

[x] Determine how to get the most amount of monitors per computer functional. This may entail purchasing some specialized monitors (ie equipped with DisplayPort).

**Notes**

* Some computers may be located in AERB 138. AFSL03 is located in GUG114 and is being loaned to the Aircraft Icing and Aerodynamics Research Group.

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## 685 – Multi-Source Position Reports and Data Fusion Literature Review

**Content**

As an algorithm designer, I would like to learn about and leverage the work done by other algorithm designers to identify and fuse data from multiple sources to obtain consistent vehicles trajectories in the presence of redundant or corrupted position measurements so that I can avoid duplicating work already preformed by other parties.

**Definition of Done**

[ ] Ensure that user story ‘398 – LaTeX References/Bibliography Research’ is completed.

[ ] Perform a literature review (aka a prior art search) on techniques related to data fusion and estimation of position information from multiple sources. Sources to investigate include but are not limited to:

[ ] Academic papers

[ ] Patents

[ ] Civil aviation

[ ] Military aviation

[ ] Marine navigation

[ ] Review results with Chris Lum

[ ] Present results to research group.

Word

[ ] Update the \\AFSL\TechnicalDataPackage\Word\AFSLReferences.xml file with your findings.

[ ] Update the \\AFSL\TechnicalDataPackage\Word\AFSLReferences.docx file with your findings (in other words write a small description of what these references are to give greater context to them and allow them to be integrated into other documents.

LaTeX

[ ] Update the \\AFSL\TechnicalDataPackage\Latex\afsl\_bibliography.bib file with your findings

**Notes**

* Note that to avoid duplicating information, we only have a description of the references captured in Word, not in LaTeX although the bibliography file will need to be copied to accommodate software differences.
* This should focus on methods to fuse data from multiple noisy sources into a single consistent estimate of vehicle position.

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## 686 – Multi-Source Position Reports and Data Fusion Development Prototype

**Content**

As an algorithm designer, I would like to design an algorithm to identify unique vehicle positions in the presence of redundant or corrupted position measurements.

**Definition of Done**

[ ] Develop a robust mathematical method for identifying positions for 1 vehicle. This algorithm should handle the following scenarios:

[ ] 2 continuous & accurate data (C&A) streams

[ ] Develop a selection/rejection/combination criteria for GPS data using the self-reported confidence interval of each GPS measurement.

[ ] Develop an extrapolation algorithm in order to sync the timing of GPS positions.

[ ] Develop a robust statistical method for merging multiple GPS measurements into a single position with a common timestamp.

[ ] Write up a summary of the mathematical basis algorithm and submit to the appropriate Perforce depot.

[ ] Implement prototype algorithm in a well-commented MATLAB script and submit to the appropriate Perforce depot.

[ ] Demo the MATLAB script during a group meeting.

**Notes**

* A data stream will contain at a minimum the 3D position (lat, lon, alt) of the vehicle. Additional information such as the errors on these estimates may be included.
* This is a simple prototype, more complicated scenarios and a more rigorous software package to support this type of activity is captured in user story ‘687 – ’.

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## 687 – Kalman Filter Algorithm Development in C#

**Content**

As an algorithm designer, I would like to design an algorithm to identify unique vehicle positions in the presence of redundant or corrupted position measurements.

**Definition of Done**

[ ] Ensure that user story ‘686 – Multi-Source Position Reports and Data Fusion Development’ was completed. Cooridnate with the development champion of this story.

[ ] Develop a robust mathematical method for estimating the position of a vehicle using either ADS-B or LAMS information assigned to a specific vehicle.

[ ] Develop multiple filters with variable measurement error values to accommodate changes in measurement error associated with measurements entering the filter

[ ] Review algorithm with Chris Lum

[ ] Write up a summary of the mathematical basis algorithm and submit to the appropriate Perforce depot.

[ ] Present results to group.

**Notes**

* A data stream will contain at a minimum the 3D position (lat, lon, alt) of the vehicle. Additional information such as the errors on these estimates may be included.
* Keep in mind that this software will need to function for multiple vehicles (each separated by an ICAO identifier). Be sure to design your software to accommodate both single and multiple vehicles.

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## 688 – Multi-Source Position Reports and Data Fusion Unit Testing

**Content**

As a software quality assurance engineer, I would like to rigorously test the Multi-Source Position Reports and Data Fusion algorithm so that I can have confidence in its ability to function correctly.

**Definition of Done**

[ ] Write unit test for all public APIs of the multi-source position reports and data fusion algorirthm and associated software.

[ ] Ensure that edge and corner cases (bad inputs, test all design criterion, etc.) are covered.

[ ] Review unit test coverage with both Chris Lum and the developer of the source code.

[ ] Update the file \\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx

[ ] Ensure that all unit tests pass.

**Notes**

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## 689 – Multi-Source Position Reports and Data Fusion Literature Review (Position 2)

See user story 685 – Multi-Source Position Reports and Data Fusion Literature Review.

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## 690 – Multi-Source Position Reports and Data Fusion Literature Review (Position 3)

See user story 685 – Multi-Source Position Reports and Data Fusion Literature Review.

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## 691 – Multi-Source Position Reports and Data Fusion Literature Review (Position 3)

See user story 685 – Multi-Source Position Reports and Data Fusion Literature Review.

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## 692 – TRAPIS GUI Prototype (Position 1)

**Content**

As a software engineer, I would like to design a prototype of the TRAPIS GUI so that I can become familiar with technologies and items that will be necessary to eventually create the TRAPIS GUI.

**Definition of Done**

Literature Review

[x] Perform a literature review (aka a prior art search) on aircraft display GUIs (see notes). Some sources to consider include but are not limited to

[x] ANPC TLS display

[x] WingX for iPad

[x] ICOMC2

[x] Update the \\AFSL\TechnicalDataPackage\Word\AFSLReferences.xml file with your findings.

[x] Update the \\AFSL\TechnicalDataPackage\Word\AFSLReferences.docx file with your findings (in other words write a small description of what these references are to give greater context to them and allow them to be integrated into other documents.

Prototype GUI

[x] Create a mock up of the GUI (see notes)

[x] Review GUI with research team.

[x] Brush up on the MVVM design pattern (see notes)

[x] Coordinate with Chris Lum to get his example MVVM project on Perforce

[x] Identify relevant technologies necessary for the GUI interface. Write some prototype code to illustrate functionality of these systems. This includes but is not limited to:

[x] Moving maps

[x] Map overlays

[x] Comboboxes, textboxes, etc.

[x] Review prototype GUI with Chris Lum

[x] Upload files to Perforce

**Notes**

* The literature review is less formal than a typical literature review. In other words, you are just trying to familiarize yourself with other existing software applications. You don’t need to read technical papers or academic documents.
* An existing mockup of the GUI is located at \\JCATI2015\TechnicalDataPackage\ProjectVision\UW Data Fusion & Display Application Design Sketch.vsdx
* There is a template of a view-model in the UWSDK.sln (UWWPF\ViewModel\ViewModelBaseUW.cs).
* This prototype GUI does not need to be fully functional, it just serves as a starting point so we can identify some of the obstacles that we’ll need to overcome in the final, working system.

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## 693 – TRAPIS GUI Prototype (Position 2)

**Content**

As a software engineer, I would like to design a prototype of the TRAPIS GUI so that I can become familiar with technologies and items that will be necessary to eventually create the TRAPIS GUI.

**Definition of Done**

Literature Review

[x] Perform a literature review (aka a prior art search) on aircraft display GUIs (see notes). Some sources to consider include but are not limited to

[x] ANPC TLS display

[x] WingX for iPad

[x] ICOMC2

[x] Update the \\AFSL\TechnicalDataPackage\Word\AFSLReferences.xml file with your findings.

[x] Update the \\AFSL\TechnicalDataPackage\Word\AFSLReferences.docx file with your findings (in other words write a small description of what these references are to give greater context to them and allow them to be integrated into other documents.

Prototype GUI

[x] Create a mock up of the GUI (see notes)

[x] Review GUI with research team.

[x] Brush up on the MVVM design pattern (see notes)

[x] Coordinate with Chris Lum to get his example MVVM project on Perforce

[x] Identify relevant technologies necessary for the GUI interface. Write some prototype code to illustrate functionality of these systems. This includes but is not limited to:

[x] Moving maps

[x] Map overlays

[x] Comboboxes, textboxes, etc.

[x] Review prototype GUI with Chris Lum

[x] Upload files to Perforce

**Notes**

* The literature review is less formal than a typical literature review. In other words, you are just trying to familiarize yourself with other existing software applications. You don’t need to read technical papers or academic documents.
* An existing mockup of the GUI is located at \\JCATI2015\TechnicalDataPackage\ProjectVision\UW Data Fusion & Display Application Design Sketch.vsdx
* There is a template of a view-model in the UWSDK.sln (UWWPF\ViewModel\ViewModelBaseUW.cs).
* This prototype GUI does not need to be fully functional, it just serves as a starting point so we can identify some of the obstacles that we’ll need to overcome in the final, working system.

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## 694 – TRAPIS: C# Data Buffer Class

**Content**

As a C# developer I would like to create a streamlined, robust data buffer for storing a time series of UAV states (position, velocity, etc.) and uncertainty parameters.

**Definition of Done**

[X] Familiarize yourself with the data buffer format: \JCATI2015\TechnicalDataPackage\Data Fusion\JACTI 2015 data buffer format.xlsx.

[X] Create a data buffer class identified by the ICAO address of the aircraft.

[X] Build in functionality to limit the maximum size of the buffer to ~10 minutes of data (see the notes in JACTI 2015 data buffer format.xlsx).

[X] The class should be publicly accessible, but must be locked during updates to prevent a race condition.

[X] Ensure that your implementation is sufficiently flexible to readily accommodate changes to the data buffer format.

[X] Write extensive unit tests for all public API:

[X] Perform simple calculations with each state and the resulting round off error is insignificant (e.g. Lat2 – Lat1 = ∆Lat 🡪 ∆x 🡪 ∆Lat + Lat1 = Lat2 + Roundoff error).

[X] Fill the buffer with data and verify that it replaces the oldest row of data as expected.

[X] Adequately comment your code.

[X] Participate in a code review.

[X] Check your code into Perforce.

**Notes**

* Based on “Input Positions Database” and “Output Positions Database”

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## 695 – TRAPIS: Formalization of the Data Fusion Algorithm

**Content**

As an algorithm developer I would like to formalize the Cascaded Kalman Filter Architecture based on the results of the JACATI 2015 Algorithm Literature Review so it can be readily implemented as a MATLAB or C# function.

**Definition of Done**

[x] Familiarize yourself with the proposed architecture: \JCATI2015\TechnicalDataPackage\Data Fusion\Kalman Filter Architecture sept 2015.vdx.

[x] Investigate the specifics of implementing a Kalman Filter:

[x] How to build a Covariance Matrix

[x] How to define and use the Kalman gain

[x] How to implement the Kalman feedback

[x] Generate a detailed Kalman Filter Architecture implementation guide that is directly applicable to the JACTI 2015 TRAPIS.

[x] Participate in an algorithm review.

[x] Upload relevant documents to Perforce.

**Notes**

* Necessary intermediate step before US 686 – data fusion prototype
* See ‘"C:\dev\JCATI2015\TechnicalDataPackage\Data Fusion\KalmanFilterFormalization\JCATI2015\_KalmanFilterFormalization.pdf"

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## 696 – TRAPIS: C# Unit Testing: ADS-B and ASTERIX Packet Parsing Utilities (Position 1)

**Content**

As a C# developer I would like to minimize the JACTI 2015 C# coding workload by creating a Unit Test to vigorously exercise existing ADS-B and ASTERIX packet parsing utilities.

**Definition of Done**

[x] Download and build existing open source solutions:

[x] <https://github.com/CroatiaControlLtd/asterix>

[x] <https://github.com/cgommel/adsbsharp>

[ ] Optional: Any other promising sources you find\*

[ ] Verify the function accurately parses packets.

[ ] Generate your own packets based on the official packet standards (see notes)

[ ] Use publicly available examples of ADS-B and ASTERIX data packets with known content.

[ ] Verify the function accurately parses a data stream.

[ ] Test if the function accurately locates the start and end of packets.

[ ] Test if the function rejects corrupted or incomplete packets.

[ ] Present your results in a group meeting.

**Notes**

* \*There are parsers in other languages such as Python (<https://github.com/junzis/py-adsb-decoder>) and C. Can they be wrapped as C# functions?
* ASTERIX standard: <http://www.eurocontrol.int/services/specifications-documents>
* ADS-B standard may need to be purchased from RTCA. Other sources are:
  + <http://www.icao.int/SAM/eDocuments/ADSB%20Guide%20Vs1.2%20English.pdf>
  + <http://adsb-decode-guide.readthedocs.org/en/latest/>
* Based on “Clarity Interface” and “LAMS Interface”
* “Kick the tires” on these software packages to assess their viability.

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## 697 – JACTI 2015: Administrative Support

**Content**

As a graduate student I would like to contribute to the success of the JACTI 2015 project by assuming an active leadership role.

**Definition of Done**

[ ] Attend weekly AFSL group meetings.

[ ] Identify new tasking and generate User Stories.

[ ] Support, encourage and mentor undergraduate contributors as needed.

[ ] Lay the groundwork for a JACTI 2015+ project proposal.

**Notes**

[Reoccurring catch-all for admin tasks Bobby and I take on like generating user stories, meetings, etc.]

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## 698 – Lab Maintenance: Organization and Upkeep

**Content**

As member of the lab I would like to ensure that the lab remains useful as an organized, uncluttered environment where students can work towards their research goals.

**Definition of Done**

[ ] Check current state of personal workspace

[ ] Organize and bundle computer/monitor cables in a neat fashion

[ ] Clear desk surface of any unnecessary papers and additional items

[ ] Ensure items stacked on any overhead shelving units are neatly organized

[ ] Check current state of communal lab workspaces

[ ] Organize lab construction desk to limit any items not currently in use

[ ] Ensure overhead shelving on lab construction desk is organized

[ ] Check the status of the lab work order document

[ ] Complete any outstanding work order items if possible

[ ] Add additional items to the work order document if necessary

[ ] Check work order document back into Perforce once all changes are completed

**Notes**

* Make sure any equipment associated with communal lab construction desks is not currently in use by other students.
* If you are unsure of the status of projects and supplies located on communal lab desks then please DO NOT move these items
* [Idea is to generate a work order “slush fund” of minor tasks that take time, but do not warrant the creation of dedicated user stories]

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## 699 – Latitude and Longitude Distance Conversion Coding

**Content**

As a software developer, I would like to understand how to establish the distance conversions necessary for converting latitude and longitude measurements to distances for the 2015 JCATI project.

**Definition of Done**

[ ] Review JCATI 2013 final paper for information on coordinate conversions

[ ] Review the UW Solution located in the UWSDK folder on Perforce

[ ] Determine which classes/methods in the solution apply to this project

[ ] Determine how conversion code works for future explanation

[ ] Generate a brief document explaining the use of any applicable code

[ ] Outside Research

[ ] Research additional C# code for conversions as necessary

[ ] Add references for outside source material to UW solution document

[ ] Validate any code written or gathered from other sources

[ ] Generate applicable unit tests for any code written or gathered from other sources

[ ] Ensure code meets code review requirements before checking in to Perforce

**Notes**

* Converting (∆Lat, ∆Lon) into (∆x, ∆y) is a common coordinate transform used by numerous AFSL projects. The point of this task is to reuse previously developed code instead of reinventing the wheel.
* Make sure to thoroughly document any information gathered from outside sources
* Be prepared to present results to research group after completion of user story
* How do we convert between ADS-B and LAMS data to measurements and/or coordinate frames are consistent.
* Check out the LLAPoint, UWNEDVector classes.
* Look up

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## 700 – Kinematic Model Coding

**Content**

As a software developer, I would like to understand how to generate the kinematic model which will be used for estimating state variables based on historical and buffer data in the JCATI 2015 project

**Definition of Done**

[ ] Review JCATI 2013 final paper for information on the Forward State Estimator (FSE)

[ ] Review the UW Solution located in the UWSDK folder on Perforce

[ ] Review the design and implementation of the FSE within the solution

[ ] Determine which methods in the solution apply to this project\*

[ ] Generate a brief Word document explaining the use of any applicable code

[ ] Outside Research

[ ] Research additional C# code for kinematic modeling

[ ] Add references for outside source material to Word document created for UW solution

[ ] Validate any code written or gathered from other sources

[ ] Generate applicable unit tests for any code written or gathered from other sources

[ ] Ensure code meets code review requirements before checking in to Perforce

**Notes**

* \*The JACTI 2015 project requires the use of a simple 6 state model (x,y,z,u,v,w) that uses a time series of data paired with a partial set of current states (e.g. only x,y,z, OR u,v,w) to generate estimates of all 6 current states.
* Make sure to thoroughly document any information gathered from outside sources
* Be prepared to present results to research group after completion of user story
* Examine the JCATI2013 activites (FSE) to see if there is anything useful. I don’t think we had a kinematical model but I could be wrong.

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## 701 – Sprint 1509 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during the current sprint to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[x] Prepare for sprint external demo

[x] Backup Perforce server on external hard drive

[x] Plan training tutorials and lectures

[x] Manage user story generation, assignment, and progress.

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## 702 – Sprint 1510 Administration

**Content**

As a project manager, I would like to perform several administrative tasks during the current sprint to ensure that all work is progressing appropriately during this sprint.

**Definition of Done**

[ ] Prepare for sprint external demo

[ ] Backup Perforce server on external hard drive

[ ] Plan training tutorials and lectures

[ ] Manage user story generation, assignment, and progress.

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## 703 – TRAPIS: C# Data Buffer Class (Position 2)

**Content**

As a C# developer I would like to create a streamlined, robust data buffer for storing a time series of UAV states (position, velocity, etc.) and uncertainty parameters.

**Definition of Done**

[X] Familiarize yourself with the data buffer format: \JCATI2015\TechnicalDataPackage\Data Fusion\JACTI 2015 data buffer format.xlsx.

[X] Create a data buffer class identified by the ICAO address of the aircraft.

[X] Build in functionality to limit the maximum size of the buffer to ~10 minutes of data (see the notes in JACTI 2015 data buffer format.xlsx).

[X] The class should be publicly accessible, but must be locked during updates to prevent a race condition.

[X] Ensure that your implementation is sufficiently flexible to readily accommodate changes to the data buffer format.

[X] Write extensive unit tests for all public API:

[X] Perform simple calculations with each state and the resulting round off error is insignificant (e.g. Lat2 – Lat1 = ∆Lat 🡪 ∆x 🡪 ∆Lat + Lat1 = Lat2 + Roundoff error).

[X] Fill the buffer with data and verify that it replaces the oldest row of data as expected.

[X] Adequately comment your code.

[X] Participate in a code review.

[X] Check your code into Perforce.

**Notes**

* Based on “Input Positions Database” and “Output Positions Database”

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## 704 – Perforce Visual Client (copy)

Copy of user story 002 – Perforce Visual Client

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## 705 – Perforce Visual Client (copy)

Copy of user story 002 – Perforce Visual Client

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## 706 – Software Developer Background Training (Algorithm and Back End) (copy)

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 707 – Unit Testing Background Training (copy)

See user story ‘033 – Unit Testing Background Training’

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## 708 – Perforce Visual Client (copy)

Copy of user story 002 – Perforce Visual Client

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## 709 – Software Developer Background Training (Algorithm and Back End) (copy)

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 710 – Unit Testing Background Training (copy)

See user story ‘033 – Unit Testing Background Training’

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## 711 – Perforce Visual Client (copy)

Copy of user story 002 – Perforce Visual Client

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## 712 – Software Developer Background Training (Algorithm and Back End) (copy)

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 713 – Unit Testing Background Training (copy)

See user story ‘033 – Unit Testing Background Training’

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## 714 – Sprint 1510 Administration (Position 2)

See 702 – Sprint 1510 Administration

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## 715 – Sprint 1510 Administration (Position 3)

See 702 – Sprint 1510 Administration

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## 716 – CONDOR Airworthiness

**Content**

As a UAS operator, I would like to make CONDOR airworthy so that I can use it for future experiments and flight operations.

**Definition of Done**

[x] Assess and audit all of CONDOR’s systems.

[x] Fix any broken components.

[ ] Label all wires using the labelmaker.

[ ] Make any modifications to system to improve performance and/or durability (ie skid-guards to protect camera during landing)

[ ] Update document at \\FlightOperations\UAS\CONDOR\OperationalChecklistsAndNotes.docx with notes about any subsystem’s operation. This document should allow another member to operate the system even if they have never used it before.

[ ] Review results with Chris Lum

[ ] Perform a ground test (AKA a system’s shakedown) to ensure operation of all systems.

[ ] Present results to group by performing a complete demo of the system.

**Notes**

* We especially need to document the construction and operation of the camera gimbal system.
* The system configuration needs to be finalized and airworthy before we apply certification details to the aircraft.

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## 717 – UWSDK Unit Testing Triage

**Content**

As an SQA engineer, I would like to assess the status of the unit tests within the UWSDK so that I can determine what needs to be done to generate a complete set of unit tests.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Familiarize yourself with the C:\dev\UWSDK\UWSDK\UnitTests\unit\_tests.xlsx

[ ] Ensure that all unit tests are captured in the above spreadsheet.

[ ] Run all existing unit tests and make a note of which ones pass and which ones fail in the above spreadsheet.

[ ] Assign priorities to unit tests as appropriate (coordinate with Chris Lum to do this).

[ ] Assign developers to write unit tests.

[ ] Ensure user stories are created to perform the actual testing.

**Notes**

* The goal of this user story to to triage the state of the unit tests in the UWSDK so we can do the following
  + determine which tests need to be written
  + have confidence that the unit test system will catch any errors that may be introduced into the system by code modifications.
* Some of the unit tests that write out to a file may have issues depending if Windows 7 vs. 8.1 are being used.

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**718 – TRAPIS: C# Unit Testing: ADS-B and ASTERIX Packet Parsing Utilities (Position 2)**

See user story 696 – TRAPIS: C# Unit Testing: ADS-B and ASTERIX Packet Parsing Utilities (Position 1)

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## 719 – Design JCATI2015 Flight Test Experiment/Demonstration

**Content**

As a test engineer and project manager, I would like to design the flight test experiment that we will use as a demonstration at the end of the project so that I can use it to motivate and frame the research during the JCATI2015 project.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Design various scenarios that we would like to fly during the demonstration. This should include but is not limited to

[ ] Two aircraft with working ADS-B transponders.

[ ] Two aircraft with one working and one non-functional ADS-B transponder

[ ] A multi-rotor UAS in the theatre of operations

[ ] Additional tasks TBD…

**Notes**

* The project officially ends on June 30, 2016 so we should plan on executing this flight tests in spring 2016.
* We anticipate using the Boardman military operating area (MOA) to execute flight tests.
* A manned aircraft and pilot will be provided by Hood Technologies (this will likely be the same Piper used in the Aug. 2015 demo).
* A document outlining the technical project vision is located at \\JCATI2015\TechnicalDataPackage\ProjectVision\GPSDeniedProjectVision.pptx

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## 720 – AFSL Website Updates (copy)

**Content**

Copy of user story 460 – AFSL Website Updates

**Definition of Done**

Copy definition of done from 460 – AFSL Website Updates

**Notes**

* You may need to login to <https://eranikus-2.engr.washington.edu/login> to access the site (note that this must be done from the UW campus network, you cannot access this URL from home). You will need Chris Lum to login into this site.

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## 721 – Rought Draft for PAM Project Conference Paper

**Content**

As a researcher/publicisit, I would like to generate a rough draft of a conference paper for the Precision Agriculture and Mapping project (PAM), so that I can publicize the work and become a published author.

**Definition of Done**

[x] Coordinate with Chris Lum

[x] Identify an appropriate conference to attend/submit to

[x] Based on the conferences specifications, download an author kit and look at the template.

[x] Port/save the draft from Australia and move it to this new rough draft.

[x] Start a rough draft of the paper and check this into the appropriate location on Perforce.

**Notes**

* The main goal is to identify a conference to go to along with the associated deadlines and deliverables.
* While the main goal of this is to present at a fully technical conference such as AIAA SciTech, it would be very useful and benefical to also present at industry tradeshows or other venues such as farming expos, etc.
* See \\Mapping\TechnicalDataPackage\ConferencePaper\notes\AustraliaNotes.docx

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## 722 – Consolidate and Organize PAM Data

**Content**

As an archivist, I want to organize all of the data that was acquired in Australia during the 2015 expedetion so that I can use it for future analysis.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Consolidate all data from Australia. This includes but is not limited to

[ ] MicaSense photos and datafiles

[ ] Canon S100 photos

[ ] Telemetry and data flash logs from aircraft

[ ] Run notes taken during the experiment

[ ] Mission planner objects (waypoints, flight paths, polygons, etc.

[ ] Notes about envirionmental conditions

[ ] Notes about interesting targets in the environment

[ ] Construction and mission execution logs

[ ] General photos and videos

[ ] anything else of interest

[ ] Put appropriate files on version control (Perforce)

[ ] Put larger files on the K: drive (Network attached storage device)

[ ] Addition task TBD

**Notes**

* The goal of this user story is to get all the data in a archival state so that when someone new wants to pick up the project in a few years, they will be able to understand the data and find information that is relevant.

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## 723 – PAM Software Tools Exploration

**Content**

As a data analyst, I would like to identify the appropriate software tools that I can use to manipulate and view the large amounts of data associated with the PAM project so that I can begin mining the data as well as looking for interesting features/trends.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Coordinate with the development champion of 722 – Consolidate and Organize PAM Data.

[ ] Coordinate with Charlie Shaw-Feather.

[ ] Explore several publically available software tools to to the following operations

[ ] Generate orthomosaics (both EO and Multi-spectral images)

[ ] How to view and/or make 5-channel TIFF files

[ ] Look at DSM (digital surface models)

[ ] Add additional operations as required

[ ] Present results to research group

[ ] Additional task TBD

**Notes**

* Gizelle investigated Global Mapper (elevation maps), ArcMap, etc.
* Cloud Compare (Matt Dunbabin recommended this)
* We have a modest budget so if you need to purchase software talk to Chris Lum.
* Icy and ImageJ are two programs that Jenn Look has investigated.
* The overall goal is to get data into Matlab so we can do engineering analysis.

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## 724 – PAM Client Market Study

**Content**

As a data provider, I would like to perform a market study (or a literature review) to determine who clients (ie farmers) would use data acquired from UAS so that I can direct research efforts to areas that matter to the end user.

**Definition of Done**

[x] Coordinate with Chris Lum

[x] Investigate how operations are currently conducted on farms or by cartographers.

[x] Identify what types of technology or processes might be of actual pratical use to clients (farmers and carthographers)

[ ] Present results to research group.

[ ] Addition task TBD

**Notes**

* AG-Expo in Spokane (February 2016).
* Precision Farming (Kennewick every Jan.)
* Another upcoming trade show/symposium is the “2016 UAS Agriculture and Academic Conference” at City of Sunnyside, Denny-Blaine Building, 810 E. Custer on February 24, 2016

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## 725 – Matlab Familiarization for PAM

**Content**

As a data analyst, I would like to become familiar with Matlab and the associated functions/software so that I can use it for the PAM project.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Obtain computing hardware and software to support this story.

[ ] Go through some tutorials on Matlab (talk to Chris Lum)

[ ] Explore and become familiar with Matlab functions in the \\UWMatlab\UWMatlab\Mapping\MicaSense folder.

[ ] Additional task TBD

**Notes**

* We now have Matlab on the PAM machine in the lab.

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## 726 – ANPC Integration Part 1

**Content**

As a software developer, I would like integrate ANPC technologies into the AFSL system so I can use it to support the JCATI2015 project.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Perform ANPC related tasks for sprint 1510.

**Notes**

* This story is designed to be fluid and dynamic.

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## 727 – ANPC Integration Part 2

**Content**

As a software developer, I would like integrate ANPC technologies into the AFSL system so I can use it to support the JCATI2015 project.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Perform ANPC related tasks for sprint 1511.

**Notes**

* This story is designed to be fluid and dynamic.

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## 728 – TRAPISPacket Position 1

**Content**

As a software developer, I would like to generate a TRAPISPacket class so I can use it in the TRAPIS system.

**Definition of Done**

[x] Coordinate with Chris Lum

[x] Perform necessary tasks for the TRAPISPacket generation

**Notes**

* This story is designed to be fluid and dynamic.

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## 729 – TRAPISPacket Position 2

**Content**

As a software developer, I would like to generate a TRAPISPacket class so I can use it in the TRAPIS system.

**Definition of Done**

[x] Coordinate with Chris Lum

[x] Perform necessary tasks for the TRAPISPacket generation

**Notes**

* This story is designed to be fluid and dynamic.

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## 730 – Generate Sponsor Marketing Packet

**Content**

As a marketing agent, I would like to generate a packet of materials that we can use to approach sponsors or other interested parties and advertise the lab’s activities.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Generate a flyer that talks about the lab’s various activities. Activites to talk about include but are not limited to:

[ ] ADS-B project

[ ] Search and rescue

[ ] Australia study abroad (wildfire and PAM)

[ ] Visual anchoring

[ ] Risk assessment of UAS in the NAS

[ ] Design, Build, Fly

[ ] Also emphasize other activities including

[ ] Student involvement and training

[ ] Educational outreach (Paws on Science, Engineering Discovery Days, etc.)

[ ] Review the packet with Chris Lum

[ ] Present the packet to the group for comments/feedback

[ ] Specialize this flyer for the various sponsors (this should include their logo and thank them explicitly)

[ ] 3DRobotics

[ ] Hood Technology

[ ] Insitu

[ ] AUVSI Cascade

[ ] CD-Adapco

[ ] Boeing

[ ] MicaSense

[ ] Raisbeck Engineering

[ ] USEED

[ ] JCATI

[ ] Aerovel

[ ] ANPC

[ ] Sagetech

[ ] Map the K drive to your machine.

[ ] Upload the file for the brochure to "C:\dev\AFSL\LabInfo\AFSLBrochure" (call it something like AFSLIndustryInteractionFlyer.pptx)

**Notes**

* The purpose of this packet is so we can use it to approach sponsors, benefactors, or other interested parties. This packet should be a short, self-contained set of visually pleasing documents that we can use describe the lab’s activities.
* We will use this packet to ask for gifts/donations as well as show previous sponsors how their gifts are being used
* A sample brochure is located at \\AFSL\LabInfo\AFSLBrochure\UWAA\_UAS\_Brochure.pptx

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## 731 – JCATI2015 FAA Paperwork and COA

**Content**

As a test engineer and project manager, I would like to file paperwork with the FAA to obtain a COA to use for the JCATI2015 projec so I can fly the flight test experiment for the project.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Register the aircraft(s) with the FAA.

[ ] File COA paperwork for the JCATI2015 aircraft(s).

[ ] Ensure that we can fly the desired flight test experiment for the project.

[ ] Additional tasks TBD…

**Notes**

* We have filed for a COA and tried to register the CONDOR system, use this as an example.
* Determine if the Skywalker X8 has already been approved for a COA.
* Ensure the home waypoint is included in the application.
* See \\FlightOperations\Research\FAA\16\_01\_12\_FAA\_Mark\_Jordan.docx for more information

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## 732 – User Story 687 position 2

**Content**

Breaking up JCATI 2015 Data Fusion Algorithm in C# user story. See User Story 687.

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## 733 – General Lab Support: soldering station improvements

**Content**

As a hardware developer I would like to ensure that the AFSL has functional soldering equipment and a supply of basic wiring consumables.

**Definition of Done**

[ ] Identify equipment or consumables that should be purchased.

[ ] Spec parts and add them to the procurement document on perforce (~\FlightOperations\Purchasing\procurement.xlsx)

[ ] Organize electronics equipment and purge any broken or unnecessary equipment that has been accumulated.

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## 734 – JCATI 2015: Wi-Fi Data Packet Sipping

**Content**

As a software developer I would like to design and build the software infrastructure necessary for the TRAPIS system to ingest ADS-B packets relayed via Wi-Fi from the Sagetech Clarity Reciever.

**Definition of Done**

[x] Coordinate with Bobby or Ward.

[x] Identify equipment required to sip Wi-Fi data. See note 1.

[x] Identify which Wi-Fi data acquisition program meets our needs. See note 2.

[x] Acquire a time series of data packets from the Clarity. See note 3.

[x] Once packets are collected, identify which packets contain ADS-B data that need to be passed to the TRAPIS system.

**Notes**

1. Can we use the built in Wi-Fi cards on laptops or some of the lab computers, or do we need a dedicated Wi-Fi receiver (e.g. a usb Wi-Fi antenna)?
2. Possible Wi-Fi acquisition programs are:
   * Aircap (requires a usb antenna)
     + <http://www.riverbed.com/products/steelcentral/steelcentral-riverbed-airpcap.html>
   * Wireshark (I’m unclear if Wireshark can intercept the Wi-Fi packets being received by a computer’s Wi-Fi card, but is a useful tool for reading them)
     + <https://www.wireshark.org/#learnWS>
     + <https://wiki.wireshark.org/CaptureSetup/WLAN>
   * Kali (competition to Wireshark)
     + <https://www.kali.org/>
3. **IMPORTANT!** There are federal and state regulations regarding mass collection of Wi-Fi data. It is important we collect ONLY the data transmitted by the Clarity.

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## 735 – JCATI 2015: Sagetech GPS Solution, Part 1 (Procurement)

**Content**

As a developer of autonomous systems I would like to learn about GPS solutions applicable to UASs, and to specify a GPS solution for the Sagetech XPC-TR.

**Definition of Done**

[ ] Coordinate with Bobby and Ward.

[ ] Identify GPS solutions that will work with the Sagetech XPC-TR (preferably are plug-and-play).

[ ] Spec parts, including wire harnesses or power supplies, and add them to the procurement document on perforce (~\FlightOperations\Purchasing\procurement.xlsx)

[ ] Coordinate with Dr. Lum to get the order placed.

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## 736 – JCATI 2015: iPad and WingX app procurement

**Content**

As an operator of UAVs I would like to improve my situational awareness by monitoring local ADS-B compliant air traffic.

**Definition of Done**

[x] Order an appropriate iPad. See notes.

[x] Register the iPad to the AFSL apple ID.

[x] If necessary, create an AFSL apple ID tied to Dr. Lum’s email

[x] Download and install WingX.

[x] In WingX download local maps, airspaces, etc.

[x] Perform an end-to-end test by connecting the iPad to the Clarity’s Wi-Fi hotspot and displaying local air traffic in WingX (you must go outside to receive ADS-B signals from local traffic).

**Notes**

* Used is fine, but it should be full size and from a recent vintage. Wi-Fi only models are acceptable.

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## 737 – JCATI 2015: Pair aircraft ICAO ID (ADS-B) to Mode C Squawk (LAMS)

**Content**

As an algorithm developer I would like to design and prototype a method for quickly and reliably pairing two aircraft trajectories.

**Definition of Done**

[ ] Algorithm efficiently searches through many aircraft tracks for likely pairings.

[ ] Algorithm reliably pairs tracks based on 5-10 seconds of surveillance.

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## 738 – JCATI 2015: Sagetech GPS Solution, Part 2 (Implementation)

**Content**

As a developer of autonomous systems I would like to learn about GPS solutions applicable to UASs, and to specify a GPS solution for the Sagetech XPC-TR.

**Definition of Done**

[x] Build any wire harnesses necessary for connecting the GPS to the XPC-TR.

[ ] Integrate the GPS and XPC-TR.

[ ] Verify end-to-end functionality.

[ ] Coordinate with Bobby, Ward and Dr. Lum.

[ ] See notes.

**Notes**

* IMPORTANT! This verification test must be thoughtfully designed and VERY carefully implemented due to regulations regarding broadcasting on 1090MHz and the fact that ADS-B broadcasts are ingested by Air Traffic Control. E.g. we do not want to cause a TCAS warning for inbound flights to SeaTac airport!
* This does not require the system to be airworthy, it is merely a proof of concept.

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## 739 – Generate Sponsor Marketing Packet (Position 2)

See user story 730 – Generate Sponsor Marketing Packet

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## 740 – New Computer Construction (DBF01)

See user story ’656 – New Computer Construction’ except name this computer DBF01.

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## 741 – Obtain UW Section 333 Exemption

**Content**

As a UAS operator, I would like to obtain a Section 333 exemption so that I can legally operate UAS.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Coordinate with Luke MacFarlan

[ ] Look at <http://www.faa.gov/uas/legislative_programs/section_333/333_authorizations/> for a list of granted and find one to copy.

[ ] Coordiante with Chris Lum to file a section 333 application with the FAA using the AFSL account.

[ ] See notes.

**Notes**

* Other user stories that may be relevant include
  + 409 – FAA Certificate of Authorization (COA) for CONDOR
  + 514 – FAA Certificate of Authoriation (COA) for CONDOR – Register Aircraft
* The goal of this user story is to obtain a legal way to fly the HAPRA aircraft for the JCATI2015 project demo.
* It appears that the section 333 exemption will come with an automatic blanket COA that allows operations under 200 ft. Some schools like University of Oregon have already acquired a section 333.

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## 742 – UWTRAPIS Unit Testing Scenario Generation

**Content**

As an SQA engineer, I would like generate various scenarios and data sets that can be used to test the various components of the UWTRAPIS project.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Generate some data sets that can be used in the automated unit testing framework within the UWSDK.

[ ] Additional tasks TBD.

**Notes**

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## 742 – Obtain UW Section 333 Exemption (Position 2)

See 741 – Obtain UW Section 333 Exemption.

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## 743 – Register HAPRA with FAA

**Content**

As a UAS operator, I would like to register the HAPRA aircraft with the FAA so I can proceed with the section 333 process.

**Definition of Done**

[ ] Coordinate with Chris Lum and Luke MacFarlan before starting this user story.

[ ] Register the HAPRA aircraft with the FAA

[ ] Additional tasks TBD

**Notes**

* See also user story 514 – FAA Certificate of Authoriation (COA) for CONDOR – Register Aircraft.

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## 744 – TRAPIS Map Prototype (Position 1)

**Content**

As a software developer, I would like to generate a prototype map so I can use it to learn how to build a map control for the TRAPIS system.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Add to PrototypeMapControl

[ ] Additional tasks TBD

**Notes**

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## 745 – TRAPIS Map Prototype (Position 2)

See user story ‘744 – TRAPIS Map Prototype (Position 1)

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## 746 – PAM Initial Data Processing and Analysis

**Content**

As a researcher, I would like to perform some preliminary data processing and analysis so I can become familiar with how to manipulate the data and obtain results from it.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Setup Perforce and map the appropriate files to your machine.

[ ] Obtain access to the K: drive (a mapped network drive) and download copies of the data to your workstation.

[ ] Write a script that extracts all the GPS locations of the photos from the various Helidon missions.

[ ] Process the Helidon data using the MicaSense workflow.

[ ] Look at a single picture from the Helidon mission and use it to count the number of cauliflowers in the picture (do this both manually and automatically via Matlab)

[ ] Count all the cauliflower in the large, mosaic picture from MicaSense

[ ] Investigate if we can find people or other objects within the scene based on multi-spectral imagery.

[ ] Additional tasks TBD

**Notes**

* This story is someone open-ended and we can add/remove tasks as appropraiate.
* See Chris Lum’s Matlab code at \\FlightOperations\Operations\Missions\15\_09\_15\_helidon\DataAnalysis\UWNDVI
* A good picture of human skin at a low altitude is located at "K:\FlightOperations\Operations\Missions\15\_09\_15\_helidon\Data\RedEdge\0014SET\000\IMG\_0624\_1.tif"

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## 747 – PAM Miscellanous Improvements

**Content**

As a researcher, I would like to perform some miscellaneous improvements so that the mapping system will function more efficiently and support future workflows.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Add ability to save a 5 layer TIFF file from Matlab (see the method ‘RectifyImagesBatch’ in the file "C:\dev\UWMatlab\UWMatlab\Mapping\MicaSense\RedEdge.m"

[ ] Additional tasks TBD

**Notes**

* Write a simple 5 channel tiff file.

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## 748 – QGIS Familiarization

**Content**

As a researcher, I would like to become familiar with QGIS so I can use it to manipulate geospatial data.

**Definition of Done**

[x] Coordinate with Chris Lum

[x] Explore ability of QGIS to load in multi-layer TIFF files (the large orthophotos from MicaSense)

[x] Ability of QGIS to manipulate these files and then selectively output differnet layers or mixtures of layers (ie we want to create our own NDVI maps)

[x] Load digital surface models (ie elevation models) (what is the elevation of a given pixel)

[x] Start a QGIS folder in "C:\dev\Mapping\TechnicalDataPackage" and start a document to capture notes.

**Notes**

* The ultimate goal is to get these images into Matlab so we can do engineering analysis. Can QGIS help with this?
* Charlie has notes

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## 749 – MARV Airworthiness (Position 1)

**Content**

As a UAS operator, I would like make MARV airworthy so I can use it for future experiments.

**Definition of Done**

[x] Coordinate with Chris Lum

[x] Make MARV airworthy

[x] Integrate camera

[x] Integrate GPS and compass

[x] Familiarize yourself with Mission Planner and ArduCopter

[x] Tune arducopter parameters and save them in \\FlightOperations\UAS\MARV\Subsystems\Autopilot

[x] Document operation of MARV systems

[x] Present results to group

[x] Generate another user story to capture creating a MARV Aircraft Flight Manual

**Notes**

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## 750 – Obtain UW Section 333 Exemption (Position 3)

See 741 – Obtain UW Section 333 Exemption.

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## 751 – Identify and Obtain Clearance for JCATI 2015 Flight Experiment Base of Operations

**Content**

As a UAS operator, I would like to identify a location for the JCATI 2015 flight experiment so I can use it as a base of operations for the experiment

**Definition of Done**

[x] Coordinate with Chris Lum before starting this user story

[x] ~~Determine if the FAA requirement to fly away from airports is 5 nautical or statute miles~~ (5 nautical miles from an airport having an operational control tower. Other restrictions depend on structure of airport, see <http://www.faa.gov/news/updates/?newsId=82245> )

[x] Identify several candidate flight operations areas.

[x] Ensure that proposed airspace has line of sight to the LAMS at 200’ AGL.

[x] Ensure that the proposed airspace has sufficient radio coverage (see notes)

[x] Determine how to lookup landowners (see notes).

[x] Coordinate with Chris Lum to contact land owners to see if they would allow flight operations. DO NOT contact them yourself and obtain permission to use the land.

[x] Update files at \\FlightOperations\Operations\TestSiteInformation\Dallesport with your research.

[x] Share results with the research group.

**Notes**

* At a flight level of 200 ft AGL, it was recommended by Mike Van Dooren that we conduct operations within 20 statute miles of the Dallesport LAMS installation.
* Perhaps look up county records to determine who owns land in this area.
* See file at \\FlightOperations\Operations\TestSiteInformation\Dallesport\BoardmanArlingtonRF\_Plots\_v1.0.pdf for some information regarding radio coverage at various locations.
* As per Juris Vagner’s suggestion, we should look at areas south or southeast of KDSL.

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## 752 – JCATI 2015: Sagetech GPS Solution, Part 2 (Implementation) (Position 2)

**Content**

Advisory role on ‘738 – JCATI 2015: Sagetech GPS Solution, Part 2 (Implementation)

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## 753 – JCATI 2015: ASTERIX Decoder Development

**Content**

As a software developer I would like to write a utility that will decode ASTERIX packets so the TRAPIS can interface with the ANPC-LAMS.

**Definition of Done**

[ ] The utility can ingest single or multiple CAT 048 messages.

[ ] The utility can identify:

[ ] Packet category, length and number of records encapsulated

[ ] Number and type of data fields

[ ] Utility outputs data field – value pairs. E.g. the variable ‘Altitude’ contains the decimal number 2575 (in feet).

**Notes**

* Only decode CAT 048 messages need to be decoded. If the message is not CAT 048 skip to the next message.
* Assume that the packets are complete and uncorrupted.
* Stretch goal: handle corrupted packets.
* Assume the packets arrive as a simple set of binary numbers like the ‘\*.CAT48’ files output by the LAMS simulator.

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## 754 – Agisoft PhotoScan Pro Familiarization

**Content**

As a geospatial analyst, I would like to become familiar with Agisoft PhotoScan Pro so I can use it to create orthorectified images.

**Definition of Done**

[x] Coordinate with Chris Lum before starting

[x] Explore sensitivity of the output to variations in the inputs and/or settings. In other words, what is the effect of changing some of the settings on the output image.

[x] Question to answer

[x] Can Agisoft show us the actual overlap of the photos (can we see the footprint of the photo)?

[x] How can we incorporate ground control points?

[x] How can we understand the uncertainty bounds on the output measurements?

**Notes**

* The goal of this is to understand how accurate is this digital elevation rending process.

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## 755 – PAM General Remote Sensing Research

**Content**

As a biologist, I would like to explore how NDVI or other remote sensing techniques can be used to differentiate native and invasive species so that I can use this to plan missions and determine how some remote sensing technologies are useful.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting

[ ] Jenn Look to fill in additional tasks and notes

**Notes**

identifying invasive species:

* -baseline measurement on NDVI
* -detection of C13 isotope possible?

identifying general characteristics:

* -absolute values of height--incorporating telemetry logs and elevation maps
* -statistical analysis of accuracy
* -is there software to compile this info?
* -sunlight as a factor during time of imaging--optimal time during day to collect data?
* -soil moisture levels

identifying poachers:

* -car tracks--any way to use micasense in combination with RGB images?
* -trap detection
* -using elevation maps to detect pitfalls

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## 756 – Mapping Utility: Polar Coordinates to Lat/Lon

**Content**

As a software developer I would like to write a general purpose mapping utility that will convert a polar coordinate position (range and angle) to Latitude and Longitude.

**Definition of Done**

[x] Inputs are Range (UWDistance), Angle (UWAngle, measured from east and positive counter clockwise), Origin (Lat, Lon, and alt of the origin, LLAPoint)

[x] Output is in the standard UWSDK format LLAPoint

[x] 2D polar coordinates 🡪 Lat/Lon/unassigned Alt

[x] 3D cylindrical coordinate 🡪 Lat/Lon/Alt

**Notes**

* Add the utility to ~\UWSDK\UWMapping\CoordinateFrames

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## 757 – JCATI 2015: Convert CAT 048 Units to Standard Units

**Content**

As a software developer I would like to write a utility that will convert the range, angle and time stamp output by the LAMS via CAT 048 messages to standard units.

**Definition of Done**

[ ] Inputs are

[ ] Time stamp: Integer with range of values: 0 ≤ Time-of-Day ≤ 24 hrs with resolution of 2^-7 seconds = 1/128 seconds

[ ] Rho: Integer with range of values: 0 ≤ r ≤ 256 nautical miles with resolution of 1/256 nautical miles.

[ ] Theta: Integer with range of values: 0 ≤ θ ≤ 360 degrees with resolution of 360/(2^16) degrees.

[ ] Output is in standard decimal units: meters, radians, and DateTime.

**Notes**

* Add the utility to ~\UWSDK\UWTRAPIS\HardwareInterface\LAMS
* There are many DateTime conversion tools built into C#; Google for more information.

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## 758 – ANPC Integration Part 3

**Content**

As a software developer, I would like integrate ANPC technologies into the AFSL system so I can use it to support the JCATI2015 project.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Perform ANPC related tasks for sprint 1512.

**Notes**

* This story is designed to be fluid and dynamic.

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## 759 – MARV Airworthiness (Position 2)

See user story ‘749 – MARV Airworthiness (Position 1)’

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## 760 – JCATI 2015: Sagetech GPS Solution, Part 2 (Implementation) (Position 3)

**Content**

See user story ‘738 – JCATI 2015: Sagetech GPS Solution, Part 2 (Implementation)

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## 761 – TRAPIS User Settings Control

**Content**

As a UI designer, I would like to create a UI to allow a user to interact with the settings of the TRAPIS system so that they can use it to change the behavior of TRAPIS.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Mock up a UI and review with Chris Lum

[x] Implement a UserSettingsControl that interacts with the UserSettingsController.

[x] Integrate this control into TRAPIS

[x] Validate that the control functions as desired.

[x] Present results to group.

**Notes**

* The goal of this user story is to generate a workable UI that can be used within TRAPIS during development (also also during deployment).
* The UserSettingsController holds all the data that needs to be included in this control.

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## 762 – TRAPIS Non-Blocking UDP Listen on Different Ports

**Content**

As a software engineer, I would like to find a way to listen on two separate UDP ports simultaneously in a non-blocking fashion.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Create a simple test application to illustrate the blocking problem (see notes)

[ ] Research an alternative to using the UdpClient class (see notes) or find a workaround (perhaps investigate timeouts)

[ ] Review results with Chris Lum

[ ] Implement changes in the AsynchronousUDPListener class.

[ ] Verify that these changes fix the blocking problem in TRAPIS.

**Notes**

* The currently implementation using the UdpClient object seems to have a problem being used simultaneously. To manifest the problem, do the following:
  1. Start a UDP sender sending data on port 20550 (LAMS)
  2. Start a UDP sender sending data on port 4000 (Clarity)
  3. Start a repeating asynchronous UDP receive operation on port 20550 (LAMS). Everything should function correctly at this point.
     1. You can still start/stop either UDP sender (20550 or 4000) and everything will function
  4. Start a repeating asynchronous UDP receive operation on port 4000 (Clarity). Everything should function correctly at this point.
  5. Stop either the UDP sender on port 20550 or 4000. This will break both UDP listeners. I believe the problem is that once you stop sending, one of the two UDP listeners will block as it appears that you cannot use the UdpClient class even if it is listening on two separate ports.
* The problem with the current implementation is that if either the LAMS or the Clarity stop sending data over UDP, the entire TRAPIS UDP listening operation will block. One sub-optimal workaround is to periodically broadcast dummy UDP packets on both 20550 and 4000 from within TRAPIS to ensure that even if the LAMS or Clarity stop transmitting, the UdpClient.Recieve does not block.
* You can also see evidence of the problem by changing the LAMS and Clarity polling times within TRAPIS. Even if one if polled very quickly, it appears that the system is constrained by the slowest time span.
* It may be useful to use \\JCATI2015\Software\UW\UDPSender\UDPSender.sln application for sending UDPPackets.

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## 763 – UWSDK Unit Testing Fixes

**Content**

As a software quality assuarance (SQA) engineer, I would like to fix various items in the UWSDK unit tests so that I can ensure all code is functioning correctly.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Fix all failing unit tests and ensure all tests either pass or are inconclusive.

[ ] Identify which unit test take an inordinate amount of time to run.

[ ] Determine how to create a unit test playlist (see notes).

[ ] Augment the unit\_testing.xls spreadsheet with another tab that compiles statistics about the unit tests. There stats should include but are not limited to:

[ ] number of tests that pass, fail, needs more testing, untested, etc.

[ ] number of passed unit tests written by each developer

[ ] Review results with Chris Lum

[ ] Check in appropriate files (ie playlists, etc) into Perforce.

**Notes**

* Some unit tests take a long time to run because they perform Monte Carlo simulations. We do not want to run these long/expensive tests everytime so we would like to determine how to selectively run some test (AKA create a playlist of unit tests to run)

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## 764 – LAMS and Clarity Message Encoding/Decoding

**Content**

As a software engineer, I would like to implement encoding and decoding software for both the LAMS and Clarity systems so I can use it in TRAPIS and elsewhere.

**Definition of Done**

[ ] Coordinate with Chris Lum, Gage Winde, Henry Qin, and Ryan Valach before starting this story.

[ ] Finish implementation of the following classes

[ ] Category48MessageDecoder

[ ] Category48MessageEncoder

[ ] ClarityMessageDecoder

[ ] ClarityMessageEncoder

[ ] Add some sample category 48 and Clarity messages in the appropriate location in the UWUnitTestingUtilities project.

[ ] Write all appropriate unit tests for these classes and ensure they all pass

[ ] Review results with Chris Lum

[ ] Test these classes within the following systems

[ ] TRAPISSimulator

[ ] TRAPIS

[ ] Check in appropriate files into Perforce.

**Notes**

* See Chris Lum to discuss the use of the TRAPISSimulator

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## 765 – Skywalker X8 (HAPRA) Aircraft Flight Manual

**Content**

As a UAS operator, I would like to create an aircraft flight manual for the Skywalker X8 aircraft so I can use it as part of a Section 333 exemption petition.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Research to see if other groups have already created one of these manuals.

[ ] Create an aircraft flight manual for the Skywalker X8 aircraft (see notes)

[ ] Review this document with other group members.

[ ] Once finalized, print out a hard copy of this and store it with out GCS paperwork.

[ ] Check in appropriate files into Perforce.

**Notes**

* An aircraft flight manual has already been started and is located at \\FlightOperations\UAS\HAPRA\HAPRAAircraftFlightManual.docx

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## 766 – Skywalker 1900 (TEDD & CONDOR) Aircraft Flight Manual

**Content**

As a UAS operator, I would like to create an aircraft flight manual for the Skywalker 1900 aircraft so I can use it as part of a Section 333 exemption petition.

**Definition of Done**

Copy all appropriate tasks from user story ‘765 – Skywalker X8 (HAPRA) Aircraft Flight Manual’.

**Notes**

* Do this story once the Skywalker X8 manual has been approved by the FAA to minimize the amount of rewrites.
* This should be a near copy of the Skywalker X8 flight manual.

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## 767 – Obtain COA for CERES Project

**Content**

As a UAS operator, I would like to obtain a COA for the CERES project so I can conduct flight operations for this project.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Read the CONDOR COA (see notes)

~~[ ] Identify a flight operations area for the CERES project that is outside the KSEA Mode C Veil~~

[ ] Investigate feasibility of using use Meadowbrook Farm as a flight area (see notes)

[ ] Generate a Word document that contains all the COA information.

[ ] Work with Chris Lum to file the COA request with the FAA (do NOT do this by yourself).

[ ] Ensure we obtain a signed COA for the CERES project.

**Notes**

* The CONDOR COA (Skywalker 1900) that is mostly approved by the FAA is located at \\FlightOperations\Operations\COAs\CONDOR\COA\_CONDOR.docx
* Notes on Meadowbrook farm are located at C:\dev\FlightOperations\Operations\TestSiteInformation\MeadowbrookFarm
* Apparently we can operate within the Mode C Veil (see notes at \\FlightOperations\Research\FAA\16\_01\_12\_FAA\_Mark\_Jordan.docx)
* Ensure the home waypoint is included in the application.
* See \\FlightOperations\Research\FAA\16\_01\_12\_FAA\_Mark\_Jordan.docx for more information

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## 768 – AFSL Multi-Rotor Purchase

**Content**

As a UAS operator, I would like to research and purchase a large scale, professional multi-rotor system that I can use as a research platform for AFSL endeavors.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Coordinate with people involved in the MARV project.

[x] Research several commercially available multi-rotor platforms and compile statistics/specifications on each platform. Things to note include but are not limited to

[x] Endurance

[x] Payload capability

[x] GCS software (can we modify it or otherwise interact with it)

[x] Has the FAA approved this platform in a previous section 333 exemption (see notes)

[x] Cost

[x] Ability to use without GPS (see notes)

[x] Compile these results into a PowerPoint presentation and present results to the group.

[x] Coordinate with Chris Lum to procure this system.

**Notes**

* We would like have a flexible platform that can lift larger payloads with longer endurances.
* A popular commercially available platform is the DJI Phantom 4 or Spreading Wings S900 or S1000, or S1000+.
* A list of all granted 333 exemptions is located at <http://www.faa.gov/uas/legislative_programs/section_333/333_authorizations/>
  1. To lookup additional details about a petition (such as the actual petition or flight manuals)
     1. Go to <http://www.regulations.gov>
     2. Enter in the Regulatory Docket No (ie FAA-2015-2926) in the search bar.
* The immediate future use of this systems is to hopefully have it participate in the JCATI 2015 flight demonstration.
* Given that it may be difficult to fly outdoors legally, we may want to look at systems that can fly indoors (such as Dempsey Indoor at UW or within a tent).
* S1000+ with Pixhawk - <https://www.youtube.com/watch?v=59ObqXdThFM>

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## 769 – AFSL Aircraft Launcher

**Content**

As a UAS operator, I would like to create a launcher system for AFSL aircraft so that I can safely launch the aircraft.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Design a catapult or launcher system for the Skywalker X8 system. Design constraints to consider include but are not limited to

[ ] Systems should be able to break down and be carried in a backpack.

[ ] System should not require electrical power.

[ ] System should be able to be operated by a single person.

[ ] Review design with the research group

[ ] Purchase materials to build launcher (save receipts so you can be reimbursed)

[ ] Design and build an aircraft stand for the Skywalker X8.

[ ] Build and test launcher (see notes)

**Notes**

* An example of a professional launcher systems is the ScanEagle launcher system. This is much more complicated that what we require but is a good place to get ideas. Al Creigh has also designed some launchers.
* The primary system to launch is the Skywalker X8. It would be nice if this system could also launch the Skywalker 1900 or other vehicles but this is not a requirement.
* We may need to operate in locations reachable only by hiking. As such, the system should be able to be carried by one or more hikers via backpack.
* The system should be as simple as possible, as such, please avoid pneumatic solutions.
* Do not launch a lab vehicle outdoors as this would constitute a flight which we are not authorized to do yet. Coordinate with Chris Lum to use a private, hobbyist vehicle for testing.
* The aircraft stand is completely indepdendent of the launcher. The stand is merely used for holding the aircraft during system’s testing (such as motor run up tests). As such, it should be fairly study and hold the aircraft steady even in the presence of wind, thrust, etc.

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## 770 – Obtain Authorization to Operate in Canada (Preliminary Research)

**Content**

As a UAS operator, I would like to research what is required to obtain authorization to fly in Canada so I can determine if this is a viable option to conduct flight operations.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Research what is requird to fly UAS as a foreign research institution in Canada

[ ] Present results to research group.

[ ] Additional tasks TBD.

**Notes**

* This story only involves conducting research to determine how to obtain authorization, it does not require you to actually file paperwork. In fact, you should not contact any external parties without first consulting Chris Lum.
* <http://www.tc.gc.ca/eng/civilaviation/standards/general-recavi-uav-2265.htm>
* <http://diydrones.com/profiles/blogs/uav-faqs-for-canada>

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## 771 – Sprint 1511 Administration

See prevous sprit administration user stories

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## 772 – Sprint 1512 Administration

See prevous sprit administration user stories

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## 773 – Sprint 1601 Administration

See prevous sprit administration user stories

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## 774 – Sprint 1602 Administration

See prevous sprit administration user stories

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## 775 – Sprint 1603 Administration

See prevous sprit administration user stories

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## 776 – Sprint 1604 Administration

See prevous sprit administration user stories

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## 777 – Sprint 1605 Administration

See prevous sprit administration user stories

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## 778 – Sprint 1606 Administration

See prevous sprit administration user stories

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## 779 – Sprint 1607 Administration

See prevous sprit administration user stories

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## 780 – Sprint 1608 Administration

See prevous sprit administration user stories

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## 781 – Sprint 1609 Administration

See prevous sprit administration user stories

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## 782 – Sprint 1610 Administration

See prevous sprit administration user stories

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## 783 – Sprint 1611 Administration

See prevous sprit administration user stories

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## 784 – Sprint 1612 Administration

See prevous sprit administration user stories

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## 785 – Clarity Message Encoder Prototype

**Content**

As a software developer, I would like to create a prototype class to encode Clarity messages so that I can use it in the TRAPIS simulator.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Tasks TBD

**Notes**

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## 786 – PAM Conference Paper Draft

**Content**

As a writer, I would like to create a draft of the PAM conference paper so that I can use it in the future to write the paper.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Tasks TBD

**Notes**

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## 787 - MARV Aircraft Flight Manual

**Content**

As a UAS operator, I would like to make an aircraft flight manual (AFM) for the MARV system.

**Definition of Done**

[ ] Read the “\\FlightOperations\UAS\MARV\OperationalChecklistsAndNotes” file, include the Checklists and Tuning sections in the AFM

[ ] Conduct ground tests on MARV to determine aircraft performance characteristics

[ ] Battery flight time

[ ] Transmitter range

[ ] Antenna configuration and interference elimination tests

[ ] Conduct extensive airworthiness tests on MARV to determine aircraft’s maneuverability

[ ] From airworthiness tests report recommended operating techniques

[ ] Create a word document tilted AircraftFlightManual containing all relevant information, save and upload to the Perforce server at the file location “\\FlightOperations\UAS\MARV\AircraftFlightManual”

**Notes**

* Definition of Aircraft Flight Manual: A document that contains information (operating limitations, operating procedures, performance information, etc.) necessary to operate the aircraft safely.
* Additional ground or flight tests may be necessary if issues arise.

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## 788 – Unit Testing for Current Sprint

See user story 218 – Unit Testing for Current Sprint

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## 789 – Unit Testing for Current Sprint

See user story 218 – Unit Testing for Current Sprint

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## 790 – Unit Testing for Current Sprint

See user story 218 – Unit Testing for Current Sprint

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## 791 – Unit Testing for Current Sprint

See user story 218 – Unit Testing for Current Sprint

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## 792 – Unit Testing for Current Sprint

See user story 218 – Unit Testing for Current Sprint

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## 793 – CERES Fluids System Prototype

**Content**

As a fluids specialist, I would like to develop a prototype of the planned pressure driven fluid dispersal system for the CERES aircraft to test the feasibility of the design.

**Definition of Done**

[ ] Determine the required materials for the prototype system

[ ] Create an engineering drawing of the prototype system

[ ] Purchase the prototyping materials and submit the receipts for reimbursement

[ ] Construct the prototype system

[ ] Photograph the prototype system

[ ] Test the prototype system in a safe environment

[ ] Record video of the test (DO NOT UPLOAD VIDEOS TO PERFORCE)

[ ] Determine the optimal pressure for the system

[ ] Document the findings of this prototype test in a report and upload this to the appropriate Perforce depot

## 794 – CERES Timeline

**Content**

As a project manager, I would like to create a detailed plan for how the CERES project will progress.

**Definition of Done**

[ ] Determine what work spaces will be available for team members to use for construction and testing of the aircraft

[ ] Draft a schedule for the project to later be confirmed by the team

## 795 – CERES Market Study

**Content**

As a member of the CERES team, I would like to know about the potential market opportunities for a product based on the CERES project.

**Definition of Done**

[ ] Find if any similar systems to the proposed product is currently in use

[ ] Create an estimate for the operating costs of such a system and compare to systems accomplishing similar work today

[ ] Develop a report to be given to our TLG partners to demonstrate that we have fulfilled this requirement for the project

## 796 – CERES Sprint Administration

**Content**

As a project manager, I would like to ensure that all work related to the CERES project is captured in user stories.

**Definition of Done**

[ ] Write user stories for all CERES work items and assign team members appropriately.

[ ] Integrate all CERES project work into the existing lab infrastructure as appropriate.

## 797 – CERES Market Study (Position 2)

See User Story ‘795 – CERES Market Study’

## 798 – CERES Fluids System Prototype (Helper 1)

See User Story ‘793 – CERES Fluids System Prototype’

## 799 – CERES Fluids System Prototype (Helper 2)

See User Story ‘793 – CERES Fluids System Prototype’

## 800 – CERES FAA Test Sites Investigation

**Content**

As a project manager, I would like to study the viability of using an FAA UAS test site for test flights of CERES.

**Definition of Done**

[ ] Investigate the legal/administrative matters that would be involved in using an FAA UAS test site for CERES test flights

[ ] Investigate the logistical considerations of the use of such a test site

[ ] Generate a recommendation on whether to further pursue this option

[ ] Report findings to CERES team at one of the full group meetings

**Notes**

* A good starting point for this investigation would be <http://www.faa.gov/uas/legislative_programs/test_sites/>

## 801 – CERES Preliminary Flight Plan

**Content**

As a flight test engineer, I would like to make preliminary plans for flight tests of the CERES.

**Definition of Done**

[ ] Determine the number and scope of flight tests required for the project

[ ] Develop a flight plan document for the first flight test and share with the team

[ ] include task assignments for team members for the test flight

[ ] assess risks involved in the flight and include these and mitigation options in the document

[ ] prepare a pre-flight briefing for all team members

**Notes**

* This flight plan document is only currently required for the first flight because the group will need to determine that it is the appropriate document type to use for future test flights before time is devoted to making more of the same document type.

## 802 – Perforce Visual Client (copy)

**Content**

Copy of user story 002 – Perforce Visual Client

**Definition of Done**

Copy definition of done from user story 002 – Perforce Visual Client

**Notes**

Copy definition of done from user story 002 – Perforce Visual Client

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**803 – Software Developer Background Training (Algorithm and Back End) (copy)**

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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**804 – Unit Testing Background Training (copy)**

See user story ‘033 – Unit Testing Background Training’

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## 805 – CERES Poster Creation

**Content**

As a project manager, I would like to make a poster giving an overview of the project for display at the department’s poster session.

**Definition of Done**

[ ] Seek input from team members for descriptions and diagrams of subsystems

[ ] Design a poster incorporating all elements of the project

[ ] Print out the poster and bring it to the poster session

**Notes**

* A template that would work well for this is located in \CERES\TechnicalDataPackage\ProjectPlan\CERESProjectVision.pptx
* The creator of the poster will not be the only presenter of the poster. All team members will be required to spend equal amounts of time presenting the poster at the department poster session.

## 806 – CERES Project Management

**Content**

As a project manager, I would like to develop a project planning document.

**Definition of Done**

[ ] Create a project planning document including the following:

[ ] Preliminary timeline

[ ] Initial budget estimate

[ ] Assessment of risks

## 807 – CERES Project Management (Helper)

See User Story 806 – CERES Project Management

## 808 – Perforce Visual Client (copy)

See User Story 002 – Perforce Visual Client

## 809 – Obtain Authorization to Operate in Canada (Preliminary Research) (Helper)

See User Story 770 – Obtain Authorization to Operate in Canada (Preliminary Research)

## 810 – CERES CFD

**Content**

As a fluids specialist, I would like to run CFD simulations of the interaction between the CERES dispersal system and the Skywalker X8 aircraft.

**Definition of Done**

[ ] Create a CFD model for dispersing a fluid from the Skywalker X8

[ ] Determine the wing location for the dispersal system

[ ] Report results to the research group

## 811 – CERES Budgeting

**Content**

As a project manager, I would like to develop a project budget.

**Definition of Done**

[ ] Create a budget spreadsheet for the CERES project and upload it to the appropriate Perforce depot

[ ] Upload the most recent budget spreadsheet to the CERES group Canvas file repository at the end of each week

[ ] Alert the CERES team to any budgetary concerns as they arise

## 812 – JCATI 2015 Symposium Trip Logistics

**Content**

As a project manager, I would like to manage logistics for the April 21, 2016 JCATI Symposium so that I can ensure all paperwork and logistics is accounted for.

**Definition of Done**

[ ] Coordinate with Chris Lum regarding documentation for the trip.

[ ] Obtain a list of students who will be attending the symposium

[ ] Ensure that all attendees have obtained tickets (details TBD).

[ ] Ensure all attendees sign up for transportation (see notes)

[ ] Ensure all attendees sign up for lodging (see notes)

[ ] Create a packing list for the trip. This should include

[ ] ID

[ ] Dress clothes for symposium poster session

[ ] Multiple laptops for demonstration

[ ] Projector

[ ] Posters, poster boards, easels for display (or see if JCATI will supply)

[ ] Ensure that we have a briefing about the trip before leaving.

[ ] Ensure poster is printed (see notes)

[ ] Ensure the person given the “elevator pitch” has practiced and rehearsed in front of the research group (see notes)

[ ] Establish deadlines and ensure relevant milestones are on the lab calendar.

**Notes**

* JCATI website is <http://jcati.org>
* AFSL attended the JCATI symposium in 2013. Notes for this are located at \\JCATI2013\Administrative\Symposium\symposium\_notes.docx
* Notes for this trip are located at \\dev\JCATI2015\Administrative\Symposium\symposium\_notes.docx
* You may want to consult notes about another lab trip/excursion in the \\JCATI2015\TechnicalDataPackage\KickoffMeeting folder
* We can likely use the existing project vision document as our poster \\JCATI2015\TechnicalDataPackage\ProjectVision\GPSDeniedProjectVision.pptx. This may need to be modified to be the appropriate size.

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## 813– ANPC Integration Part 4

**Content**

As a software developer, I would like integrate ANPC technologies into the AFSL system so I can use it to support the JCATI2015 project.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Perform ANPC related tasks for sprint 1601.

**Notes**

* This story is designed to be fluid and dynamic.

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## 814 – Australia Intern Work 1

**Content**

As a research intern, I would like to perform research related to the PAM project so I can use Matlab to quantify data of orthomosaics developed from AGISOFT and QGIS Software.

**Definition of Done**

[x] Gain a better understanding of the use of AGISOFT and QGIS (refer to manuals on perforce)

[x] Research and test the best way of quantifying the orthomosaics

[x] Attain Percentages of RGB through Matlab

[-] See about inputting the RAW red and nIR images in matlab and compare results

[x] Obtain values from -1 to 1 from an image run through matlab (to indicate NDVI)

[ ] Attain average NDVI over selected regions to determine and compare areas of healthy or distressed vegetation. This is in aims of generating an Occupancy Map.

[ ] Relate the relevance of percentages into vegetation research for discussion

[ ] Complete the results section of the experimental

[ ] Add in Matlab Information

[ ] Sensitivity Analysis – parameters input and important factors to consider to attain accuracy

[ ] Evaluate the ‘best’ in terms of accuracy, efficiency and practicality for analysis for certain applications

[ ] Coordinate with Chris Lum

[ ] Fill in tasks for this story

**Notes**

* This story is designed to be fluid and dynamic.

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## 815 – Report Write-up

**Content**

As a research intern, I would like to perform research related to the PAM project to complete the discussion of the conference paper with regards to results, applications and further development.

**Definition of Done**

[ ] Technical write-up with all of the Matlab Data and its role in agricultural contexts.

[ ] Estimation of Vegetation Volume (% within an image)

[ ] Health of Vegetaton Determination (NDVI)

[ ] Summarise the accuracy of imaging software and limitations associated to application including sensitivity of data accuracy

[ ] Thoroughly edit the report once all of the sections are done.

[ ] Compile References and add into the paper as appropriate.

[ ] Coordinate with Chris Lum

[ ] Fill in tasks for this story

**Notes**

* This story is designed to be fluid and dynamic.
* Establish a ‘scope’ within the discussion to ensure that content is cohesive

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## 816 – Matlab Analysis of DSMs

**Content**

As a research intern, I would like to perform research related to the PAM project so I can validate DSM into matlab and compare the data through the google base.

**Definition of Done**

[-] Attain google data (run everyday)

[x] Run the DSM maps into matlab and obtain elevation information from each point of the map

[ ] Compare the elevation information from the maps with data from the google base

[ ] Determine Average Percentage Error

[ ] Discuss and compare within the results

[ ] Note the processes

[ ] Coordinate with Chris Lum

[ ] Fill in tasks for this story

**Notes**

* This story is designed to be fluid and dynamic.

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## 817 – Clarity Message Encoder/Decoder Implementation and Testing

**Content**

As a software developer, I would like to create classes to encode and decode Clarity messages so that I can use it in the TRAPIS system.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Implement a clarity encoder and decoder.

[ ] Capture actual messages from the Clarity and test the decoder against these.

[ ] Test the encoder and decoder against one another

[ ] Integrate this into the TRAPIS system

[ ] Perform testing within TRAPIS to ensure functionality

[ ] Integrate this into the TRAPISSimulator project

[ ] Write documentation about the encoding/decoding algorithms and place these on a relevant location on Perforce

[ ] Present results to group.

[ ] Additional tasks TBD

**Notes**

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## 818 – UWAA Poster Session 2016

**Content**

As a marketing representative, I would like to create 1 or more AFSL posters to present at the UWAA poster session so I can promote our work.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Create a poster covering the PAM

[ ] Create a poster covering the JCATI2015 project (see notes)

[ ] Arrange to have the UWAA department print these for us (see notes)

[ ] Arrange times for people to man the posters during the poster session

[ ] Attend poster session

**Notes**

* For the JCATI2015 project, we can likely use the existing project vision document as our poster \\JCATI2015\TechnicalDataPackage\ProjectVision\GPSDeniedProjectVision.pptx.
* For the PAM project, we have another poster which is related to Australia work located at \\AustraliaBushfire\TechnicalDataPackage\Poster\14\_11\_21\_BushfirePoster.pptx
* Submit the following information to Victor ([vaque@aa.washington.edu](mailto:vaque@aa.washington.edu)) by 01/15/16  
  1) Poster Title, 2) Team Membership, 3) Faculty Adviser, 4) Industry Advisor (and the industry sponsor)
* Max dimensions are 42in x 42in.
* Final, print-ready posters will be due on Friday, 1/29. UWAA will print these, we simply need to provide them with the file.

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## 819 – Radio Mobile Investigation

**Content**

As a flight operations engineer, I would like to investigate Radio Mobile to estimate RF link health at various locations so I can use this to plan flight operations.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story.

[ ] Investigate Radio Mobile (<http://radiomobile.pe1mew.nl/> )

[ ] Determine if you can use this to obtain RF link health estimates for an aircraft flying at a specified AGL altitude (if the terrain varies this means the MSL altitude changes)

[ ] Present results

[ ] Check in files to relevant location in Perforce.

**Notes**

* This was used by Mike Van Dooren at ANPC to create the files
  + \\FlightOperations\Operations\TestSiteInformation\Dallesport\Dallesport\_RFPlots\_Local v1.0.pdf.
  + \\FlightOperations\Operations\TestSiteInformation\Dallesport\BoardmanArlingtonRF\_Plots\_v1.0.pdf
* Insitu has a similar tool at <http://www.insitu.com/information%20delivery/command-and-control/icomc2/icomc2-rfla>

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## 820 – JCATI 2015: Flight Version of TRAPIS Payload

**Content**

As a flight hardware engineer, I would like to refine the engineering model of the TRAPIS payload and make it “Flight Ready.”

**Definition of Done**

[ ] Coordinate with Ward Handley.

[ ] Gather all necessary hardware (enclosures, connectors, etc.).

[ ] Procure any necessary hardware that has not already been ordered.

[ ] Fabricate 2 or more XT-60 chassis mounts using a 3D printer.

[ ] Modify enclosures as necessary to accommodate switches, LEDs, etc.

[ ] Eliminate extraneous wires.

[ ] Ensure that all connections can withstand significant vibration and shocks.

[ ] Show off the end product in an AFSL internal meeting.

**Notes**

* Refer to the latest TRAPIS payload wiring diagram: \JCATI2015\Research\Sagetech\PixhawkIntegration\TRAPIS Payload.pdf
* The final product of this user story will be shown to our industry partners.

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## 821 – CERES Mission Planner Familiarization (Position 1)

**Content**

As an UAS operator, I would like to be familiar with Mission Planner before going out into the field.

**Definition of Done**

[ ] Research Mission Planner and become familiar with its operation. Some things to research include, but are not limited to:

[ ] Setting the home location for RTL mode

[ ] Planning a grid survey mission over a predefined space

[ ] Saving flight plans to a file (what are the different types of files/objects that can be saved?)

[ ] Setting up a landing

[ ] throttle arming/disarming

[ ] Plan various simulated flights/mission.

## 822 – CERES Mission Planner Familiarization (Position 2)

See 821 – CERES Mission Planner Familiarization (Position 1)

## 823 – CERES Mission Planner Familiarization (Position 3)

See 821 – CERES Mission Planner Familiarization (Position 1)

## 824 – CERES Liaison to AFSL Launcher Team

**Content**

As the structures lead for the CERES project, I would like to work with the AFSL team tasked with constructing the X8 launcher system.

**Definition of Done**

[ ] Coordinate with the development champion of user story 769 – AFSL Aircraft Launcher

[ ] Ensure that the launcher design will accelerate the CERES aircraft with full payload to takeoff speed.

[ ] Ensure that the launcher will not break the CERES during the launch.

[ ] If the launcher design calls for it, design a connection apparatus to install on CERES for use with the launcher system

## 825 – CERES FAA Documents Proofreading

**Content**

As a project manager, I would like to ensure that the flight approval application documents that will be submitted to the FAA are error free.

**Definition of Done**

[ ] Coordinate with the development champion of user stories 767 – Obtain COA for CERES Project & 750 – Obtain UW Section 333 Exemption (Position 3)

[ ] Check the UW 333 Petition for exemption for errors and verify that it is consistent in structure and legal references with the University of Wyoming’s petition

[ ] Check the CERES COA for errors and verify that it does not differ significantly in structure or legal reference from the approved CONDOR COA

**826 – JCATI 2015: Flight Version of TRAPIS Payload Software**

**Content**

As a flight software engineer, I would like to refine the TRAPIS payload Arduino software and RC interface to make it “Flight Ready.”

**Definition of Done**

[ ] Set the XPS-TR transponder’s default boot settings:

[ ] Power up: enabled, Squawk: 1200, Mode: STDBY

[ ] Ensure the transponder’s selected mode is readily identifiable and controllable.

[ ] Transponder STDBY and ALT modes should be selectable.

[ ] Transponder ON and ALT-external modes shall not be selectable (both squitter without valid altitude data, which could generate TCAS warnings).

[ ] Enable synthetic GPS-denial.

[ ] Update the TRAPIS payload wiring diagram as necessary: \JCATI2015\Research\Sagetech\PixhawkIntegration\TRAPIS Payload.pdf

[ ] Review with Chris Lum

[ ] Present results to group

[ ] OPTIONAL: Add noise to GPS signal.

[ ] OPTIONAL: Enable IDENT functionality.

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## 827 – Antenna Tracker

**Content**

As a flight operations engineer, I would like to develop an antenna tracking system so I can increase the range of my UAS communication links.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story

[ ] Research how to create an antenna tracking system (see notes)

[ ] Build a prototype system.

[ ] Field test the system.

[ ] Document the operation of the system and ensure they are checked into Perforce in the appropriate location.

[ ] Present results to group

[ ] Additional tasks TBD

**Notes**

* Mission Planner may have this functionality embedded (<http://planner.ardupilot.com/wiki/common-antenna-tracking/> )

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## 828 – UAS Parachute Flight Termination and Recovery System

**Content**

As a flight operations engineer, I would like to develop a system to safetly terminate a flight and land the plane in the case of an emergcy so I can save the aircraft and payload from damage or flyaway.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story

[ ] Design a parachute recovery system that can be used to terminate the flight of an aircraft (see notes)

[ ] Ensure that the system operates on a completely separate power and communication system (in case the primary flight battery or other component fails)

[ ] Present preliminary design to the research group for feedback.

[ ] Incorporate feedback into design.

[ ] Procure parts for the prototype

[ ] Flight test system and collect data during the test to compile a report

[ ] Document operation of system in appropriate user manual

[ ] Upload all documents to appropriate location in Perforce

[ ] Present results to research group

[ ] Additional tasks TBD

**Notes**

* The primary UAS this will be used on is the Skywalker X8 but if the design can be moved to other aircraft that would be desirable.
* The propeller may need to be automatically stopped if the parachute deploys to avoid tangling the lines. Possibly investigate using a circuit that automatically cuts power if the parachute is deployed (see <https://www.youtube.com/watch?v=KkwOLmzYAKc> )
* Some vendors sell parachute solutions (for example <http://www.skycat.pro/> ) . We are open to using already-existing solutions.

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## 829 – Mapping Gimbal Research

**Content**

As a UAS operator, I would like to research different mapping camera gimbal units so I can identify a system we can purchase for our UAS.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Research different camera gimbals that can mount on the Skywalker X8 and Skywalker 1900 and hold a camera in a downward facing configuration.

[x] Ensure the gimbal system can accommodate the following cameras (see notes)

[x] Sony S100

[x] MicaSense RedEdge

[x] Ensure the gimbal system meets the following specifications (see notes)

[x] At least +/- 135 degrees of pan is required (+/- 180 degrees is desirable)

[x] The amount of tilt should be such that the camera can always point down

[x] Has auto-stabilization functionality to maintain a Euler angles regardless of A/C orientation

[x] Present results to research group

[x] Make a recommendation to Chris Lum regarding which systems to procure (see notes)

**Notes**

* The primary UAS this will be used on is the Skywalker X8 AND the Skywalker 1900 but if the design can be moved to other aircraft that would be desirable.
* The primary use case of this gimbal is to ensure the still camera (Sony S100, MicaSense RedEdge) is pointing directly downwards during a mapping mission.

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## 830 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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**Notes**

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## 831 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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**Notes**

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## 832 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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**Notes**

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## 833 – Perforce Visual Client (copy)

**Content**

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**Definition of Done**

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## 834 – Perforce Visual Client (copy)

**Content**

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**Notes**

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## 835 – Perforce Visual Client (copy)

**Content**

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## 836 – Perforce Visual Client (copy)

**Content**

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**Notes**

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## 837 – Perforce Visual Client (copy)

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**Definition of Done**

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**Notes**

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## 838 – TRAPIS Support for Current Sprint

**Content**

As a software developer, I would like to support TRAPIS development for the current sprint.

**Definition of Done**

[ ] TBD

**Notes**

* This user story is fluid and the scope may change during the sprint.

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## 839 – TRAPIS Support for Current Sprint

**Content**

As a software developer, I would like to support TRAPIS development for the current sprint.

**Definition of Done**

[ ] TBD

**Notes**

* This user story is fluid and the scope may change during the sprint.

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## 840 – UW Unmanned Ground Vehicle Autonomy Integration (copy)

See user story ‘570 – UW Unmanned Ground Vehicle Autonomy Integration’

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## 841 – Identify and Obtain Clearance for JCATI 2015 Flight Experiment Base of Operations (copy)

See user story 751 – Identify and Obtain Clearance for JCATI 2015 Flight Experiment Base of Operations.

## 842 – Software Developer Background Training (Algorithm and Back End) (copy)

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 843 – Software Developer Background Training (Algorithm and Back End) (copy)

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 844 – Unit Testing Background Training (copy)

See of 033 – Unit Testing Background Training.

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## 845 – Unit Testing Background Training (copy)

**Content**

Copy of 033 – Unit Testing Background Training.

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## 846 – RC Simulator

**Content**

As a UAS operator, I would like to procure an RC flight simulator so that I can use it to train on so I can effectively operate different aircraft.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story

[x] Research different RC flight simulator packages. These should have the following airframes at minimum

[ ] A fixed wing similar to the Skywalker 1900

[ ] A flying wing similar to the Skywalker X8

[ ] A small racing quadrotor similar to MARV

[ ] A larger quadrotor similar to the DJI S-1000

[x] Ensure that simulator has the ability to interface with the Turnigy TGY-i10 so the operator can use this as the controller.

[ ] Present results to group.

[x] Purchase simulator and setup a lab computer to act as the designated simulator machine.

[ ] Create an infrastructure/logbook whereby members can log simulator time.

[ ] Additional tasks TBD

**Notes**

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## 847 – Software Developer Background Training (Algorithm and Back End) (copy)

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 848 – Unit Testing Background Training (copy)

See of 033 – Unit Testing Background Training.

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## 849 – CERES Power Analysis

**Content**

As a CERES engineer, I would like to conduct a power analysis of the proposed CERES propulsion configuration.

**Definition of Done**

[ ] Determine the thrust output of the proposed motor-prop configuration

[ ] Create a simple MatLab script to Determine the remaining battery capacity as a function of flight time elapsed for multiple throttle settings

[ ] Present results to the team

**Notes**

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## 850 – CERES CDR Assistance

**Content**

As a project manager, I would like to help the subsystem leads with preparing for the CDR.

**Definition of Done**

[ ] Assist subsystem teams with preparing their CDR presentations

**Notes**

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## 851 – CERES Budgeting (Helper)

See User Story811 – CERES Budgeting

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**852 – Mobile Weather Station Shakeout**

**Content**

As a ground support equipment (GSE) engineer, I would like to shake out the recently purchased AFSL Mobile Weather Station so it is ready for future flight tests in the field.

**Definition of Done**

[ ] Procure the Kestrel LiNK 5500, tripod, and wind vane from Ward Handley.

[ ] Connect the Kestrel to the AFSL Condor computer via blue tooth.

[ ] Download Kestrel software as necessary.

[ ] Experiment with different data logging settings.

[ ] Real time logging.

[ ] Creating and reading data files.

[ ] Write a short user manual documenting how to fully deploy the AFSL Mobile Weather Station. Include the following:

[ ] Pictures showing the physical setup/deployment process

[ ] Screenshots of relevant steps on the computer.

[ ] Information about data logging capabilities/settings.

[ ] Information about any necessary calibrations (e.g. compass?).

[ ] Information about best practices (e.g. leveling, staying out of wind shadows, etc.)

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## 853 – FUNRA Airframe Build

**Content**

As a flight operations engineer, I would like to build the FUNRA airframe so I can make the aircraft airworthy and begin developing subsystems for the FUNRA system.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story

[x] Coordinate with CERES team before starting this story.

[x] Review build notes for HAPRA \\FlightOperations\UAS\HAPRA\ConstructionAndMaintenenceLog.docx)

[x] Review build photos for HAPRA ("K:\FlightOperations\UAS\HAPRA\PhotosMedia")

[ ] 3D print a shelf to hold the Pixhawk (see the example inside of HAPRA).

[ ] Build the CERES aircraft and make it airworthy. Some subsystem to consider include but are not limited to:

[ ] ESC

[ ] Battery switches

[ ] Pixhawk

[ ] Video Tx

[ ] Mobius camera

[ ] Review final product with Chris Lum and FUNRA team

[ ] Document all construction in appropriate location.

[ ] Present results to research group

[ ] Additional tasks TBD

**Notes**

* See build notes for HAPRA.

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## 854 – Read Approved COA and Integrate Constraints into Operations

**Content**

As a flight operations manager, I would like to read approved COAs and other legal requirements so I understand the constraints of envelope of operations and then integrate this into the flight operations procedures so I can ensure we comply with all rules, regulations, and constraints during flight operations.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story

[ ] Read through approved CONDOR COA ("C:\dev\FlightOperations\Operations\COAs\CONDOR\Approval\Approved\_2015-WSA-128 (CONDOR, Univ of WA, Sunnyside, WA).pdf")

[ ] Extract any relevant constraints from the approval letter and integrate this into the flight operations checklist and standard operating procedures.

[ ] Apply appropriate N number to CONDOR aircraft.

[ ] Present results to group.

[ ] Check in files to Perforce as appropriate.

[ ] Generate additional user stories to capture required work (such as generating risk mitigation plans, etc.)

[ ] Additional tasks TBD.

**Notes**

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## 855 – Add Stochastic Elements to TRAPISSimulator

**Content**

As a simulation engineer, I would like to add stochastic elements to the TRAPISSimulator so I can use it to simulate realistic scenarios with noise and other degradations.

**Definition of Done**

[ ] Coordinate with Chris Lum, Ward, Bobby, and Gage before starting this story

[ ] Implement the following functionliaty within the TRAPISSImulator

[ ] Noisy Clarity packets

[ ] Noisy LAMS packets

[ ] Ability to intermittently stop/stop broadcasting Clarity packets

[ ] Ability to intermittently stop/stop broadcasting LAMS packets

[ ] Output/save the noisy/corrupted information in addition to the truth data

[ ] Validate your changes with TRAPIS.

[ ] Present results to group.

[ ] Check in files to Perforce as appropriate

[ ] Additional tasks TBD.

**Notes**

* This story is especially important for testing/validating the various estimators and data fusion algorithms we employ in TRAPIS.

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## 856 – CERES Airframe Build (copy)

See user story 853 – CERES Airframe Build.

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## 857 – TRAPIS Map Architecture

**Content**

As a software develper, I would like to develop an architecture to handle integrating and interacting with the map within TRAPIS so that other entitites can draw layers on the map.

**Definition of Done**

[ ] Coordinate with Chris Lum, Henry Qin, and Ryan Valach

[ ] Determine how to instantiate an instance of a map in code behind

[ ] Determine how to draw different layers on this map

[ ] Determine how to rende the map on a control

[ ] Buiild a proof of concept prototype of this architecture and integrate it into TRAPIS.

[ ] Present results to group and ensure others know how to use this to draw on the map.

[ ] Additional tasks TBD.

**Notes**

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## 858 – TRAPIS Map Architecture (copy)

See user story 857 – TRAPIS Map Architecture

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## 859 – Mission Planner Python Interface

**Content**

As a software develper, I would like to determine how to use Python scripts to interface Mission Planner with other software applications running on the GCS so that I can send data from the visual anchoring algorithm to the Pixhawk.

**Definition of Done**

[ ] Coordinate with Chris Lum and Gage Winde before starting this story

[ ] Determine how to execute Python scripts within Mission Planner (Iron Pyton)

[ ] Determine if external Python libraries (such as OpenCV) can be run in this environment.

[ ] Demonstrate the ability to start a UDP sender and output information (such as servo position) from Mission Planner to another software application on the GCS via a UDP stream.

[ ] Demonstrate the ability to start a UDP listener and receive information (such as computed slant range) from another software application (such as the image processing algorithm) and send this to the Pixhawk.

[ ] Start a Python respository on Perforce (for example UWPython) to hold version controlled Python libraries and scripts. See Chris Lum before doing this.

[ ] Review results with Chris Lum

[ ] Present results to research group

[ ] Additional tasks TBD.

**Notes**

* The workflow we envision is that the image processing application will run on the GCS and process video frames in order uplink/downlink information.
  + Downlink: In order to compute the slant range, it will require information from the Pixhawk (for example the pan/tilt angle of the camera). This inform must be extracted from Mission Planner via the Python interface.
  + Uplink: The vision algorithm will then send the slant range (computed on the ground) up to the Pixhawk fia the Python interface.

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## 860 – PAM Paper Submission

**Content**

As a researcher, I would like to submit a final draft of the PAM paper so that I can become published.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story

[ ] Obtain reviewer feedback

[ ] Generate a final draft of the PAM paper

[ ] Obtain at least 2 peer reviews of this paper (people outside the PAM team)

[ ] Ensure that the timeline and format for final paper submission are followed.

[ ] Submit the paper appropriately

[ ] Generate appropriate follow up user stories to capture presenting at the conference..

[ ] Review results with Chris Lum

[ ] Present results to research group

[ ] Additional tasks TBD.

**Notes**

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## 861 – CERES Structural Analysis

**Content**

As a structures engineer, I would like to determine the structural integrity of the CERES aircraft to see how the fluids system can be safely mounted.

**Definition of Done**

[ ] Determine multiple locations for holes to be cut into the fuselage to allow the fluids system to access the exterior of the airframe.

[ ] Research potential mounting solutions for the fluids system.

[ ] Research methods of protecting the airframe during landing.

[ ] Present results to research group

**Notes**

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## 862 – CERES Ground Test Mount Preliminary Research

**Content**

As a structures engineer, I would like to create a preliminary design for a ground test mount for the CERES project.

**Definition of Done**

[ ] Research potential configurations for a testing mount to be placed on the back of a car (pickup truck, SUV, etc.)

[ ] Generate a CAD model for a ground test mount.

[ ] Present results to research group

**Notes**

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## 863 – CERES Fluids System Prototype – Part 2

**Content**

As a fluids engineer, I would like to improve on the previous prototype for the CERES fluids system.

**Definition of Done**

[ ] Determine a performance metric to be used in ranking the capabilities of fluid dispersal systems for the CERES project.

[ ] Construct fluid dispersal system prototypes using different nozzle sizes and provide a recommendation to the research group for which configuration to proceed with.

[ ] Research lighter-weight tank options to be used in the flight version of this fluids system

[ ] Coordinate with the development champion of User Story 861 – CERES Structural Analysis regarding potential mounting systems for connecting the fluids system to the exterior of the CERES airframe  
[ ] Record all test results in photo and/or video form (DO NOT UPLOAD TO PERFORCE)

[ ] Present results to research group

**Notes**

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## 864 – CERES Fluids System Prototype – Part 2 (Helper)

See User Story 863 – CERES Fluids System Prototype – Part 2

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**865 – JCATI 2015: TRAPIS Payload Data Logger**

**Content**

As a flight engineer, I would like to modify the TRAPIS ADS-B payload software and hardware to log the telemetry and status of the payload avionics.

**Definition of Done**

[ ] Procure an Arduino Shield with a SD card interface.

[ ] Physically integrate the Arduino Shield with the existing Arduino Mega 2560 board.

[ ] Modify the sagetech-ardu C++ sketch so telemetry and status messages are stored on the SD card.

[ ] Ensure the logged data is readily readable by a data reduction program (e.g. a .CSV or .txt file that can be parsed by MATLAB or Excel with minimal effort).

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## 866 – TRAPIS payload field testing (round 1)

**Content**

As a flight test engineer I would like to validate the performance of the TRAPIS ADS-B payload in a series of preflight tests.

**Definition of Done**

[ ] Attend RC fun day at Meadowbrook farm.

[ ] Pack all relevant TRAPIS hardware

[ ] Integrate the TRAPIS payload with the GROVER ground vehicle and make the payload “drive ready.”

[ ] Use an appropriate power source.

[ ] Secure wires.

[ ] Protect electronics from water damage.

[ ] Execute ground tests per \FlightOperations\Operations\Missions\16\_02\_06\_meadowbrook\ProceduresAndChecklists.docx

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## 867 – Skywalker X-8 Stability with TRAPIS payload

**Content**

As a flight test engineer I would like to validate the performance and stability of a Skywalker X8 with a TRAPIS ADS-B payload-equivalent mass model.

**Definition of Done**

[x] Locate a collection of dead weights from 10-100 grams.

[x] Weigh and clearly label each weight.

[x] Build several “dummy payloads” to test the range of potential TRAPIS payload configurations.

[x] Situation 1, max weight: independent battery, pixhawk, gps and RC receiver.

[x] Situation 2, min weight: piggybacked on the aircraft’s avionics and battery.

[ ] Execute stability flight tests per \FlightOperations\Operations\Missions\16\_02\_06\_meadowbrook\ProceduresAndChecklists.docx

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## 868 – Software Developer Background Training (Algorithm and Back End) (copy)

See user story ‘006 – Software Developer Background Training (Algorithm and Back End)’

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## 869 – Unit Testing Background Training (copy)

See user story ‘033 – Unit Testing Background Training’

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## 870 – Cesium 1: Orientation

**Content**

As a software developer, I would like become familiar with the powerful mapping functionality contained in the Cesium JavaScript library.

**Definition of Done**

[ ] Read and follow the directions in the getting started tutorial: <http://cesiumjs.org/tutorials/cesium-up-and-running/>

[ ] Download and install Cesium: <http://cesiumjs.org/downloads.html>

[ ] Select and install a suitable IDE (e.g. Notepad++ or Eclipse)

[ ] Start a local webserver

[ ] Open Cesium Sandcastle in the local webserver and explore several tutorials

[ ] Pay special attention to CZML Path, this is quite similar to what we want to implement for the TRAPIS Wake Turbulence add-on

**Notes**

* This should be a relatively quick orientation, limit this to an afternoon.
* If necessary, use Ward’s Bing maps (used to drive Cesium) key
  + An07RXvdYdz93byxffYv\_W4wDzym4euUfN5wWWk\_LC516QWYNUxZoulg4OVJb-Ns

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## 871 – Cesium 2: Polyline Volumes

**Content**

As a software developer, I would like to modify the CZML Path demo to emulate the functionality the TRAPIS Wake Estimator add-on will need.

**Definition of Done**

[ ] Open the CZML Path demo in Sandcastle. Run the simulation.

[ ] Demine how to adjust the amount of historical data that is displayed. I.e. make the trailing polyline shorter or longer.

[ ] Replace the trailing polyline with a polyline volume. The Corridor, Polyline Volume, CZML Rectangle, and CZML Spheres and Ellipsoids demos may be helpful.

[ ] Implement a cylindrical polyline volume with variable radius. E.g. the radius grows as a function of time.

**Notes**

* Feel free to generate your own JS code if the CZML Path demo is not a suitable starting point.
* If necessary, use Ward’s Bing maps (used to drive Cesium) key
  + An07RXvdYdz93byxffYv\_W4wDzym4euUfN5wWWk\_LC516QWYNUxZoulg4OVJb-Ns

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## 872 – Cesium 3: Multiple Aircraft Tracks

**Content**

As a software developer, I would like to simultaneously show the 3D evolution of multiple vehicle paths.

**Definition of Done**

[ ] Start with the code from User Story 871 – Cesium 2: Polyline Volumes.

[ ] Generate several new vehicle paths comprised of ~20 lat/lon/alt (LLA) points.

[ ] Display the evolution of the aircraft trajectories with trailing polyline volumes.

[ ] The demo CZML may be useful.

[ ] Set unique vehicle names to N00001, N00002, etc. and unique vehicle descriptions like Cessna Skymaster, B747-400, etc.

**Notes**

* Vehicle paths can easily be generated in Google Earth and exported as KML files.
* If necessary, use Ward’s Bing maps (used to drive Cesium) key
  + An07RXvdYdz93byxffYv\_W4wDzym4euUfN5wWWk\_LC516QWYNUxZoulg4OVJb-Ns

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## 873 – Cesium 4: Terrain Caching

**Content**

As a software developer, I would like to simultaneously show the evolution of multiple vehicle paths in a terrain rich environment even if the host computer is not connected to the internet.

**Definition of Done**

[ ] Start with the code from User StoryXXX.

[ ] Enable the CesiumTerrainProvider.

[ ] Given a known operational area of ~50km x 50km cache terrain tiles locally for a seamless offline user experience.

[ ] Investigate hosting a local STK Terrain Server: licenses, draw on system resources, memory requirements, etc.

**Notes**

* <http://gis.stackexchange.com/questions/154218/is-there-a-way-to-get-offline-tile-data-for-cesium>
* If necessary, use Ward’s Bing maps (used to drive Cesium) key
  + An07RXvdYdz93byxffYv\_W4wDzym4euUfN5wWWk\_LC516QWYNUxZoulg4OVJb-Ns

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## 874 – Wake Turbulence App: Model Definition

**Content**

As an aerodynamicist, I would like to develop a simple physical model for the time evolution of aircraft wingtip vortices.

**Definition of Done**

[ ] Define the governing equations for wake vortex evolution.

[ ] Write up a short summary of the derivation, including underlying assumptions and approximations.

[ ] Identify information that is needed, but not currently delivered by TRAPIS. E.g. meteorological data.

**Notes**

* <https://github.com/AnalyticalGraphicsInc/czml-writer/tree/master/DotNet>

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## 875 – Wake Turbulence App: TRAPIS output to .czml

**Content**

As a software developer, I would like to output the TRAPIS vehicle data necessary to visualize wake turbulence corridors in .czml format.

**Definition of Done**

[ ] Design an efficient and effective interface between TRAPIS and the Cesium visualization tool.

[ ] Prevent race conditions.

[ ] Data need only be updated every 1-5 seconds.

[ ] Output all information needed by the Wake Turbulence App as a .czml file.

[ ] Vehicle ID and/or ICAO.

[ ] Vehicle N number.

[ ] Vehicle Mode C squawk code.

[ ] Wake category.

[ ] Current positions.

[ ] Current velocities.

[ ] Others as determined necessary.

**Notes**

* <https://github.com/AnalyticalGraphicsInc/czml-writer/tree/master/DotNet>

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**876 – TRAPIS payload field testing anamoly investigation**

**Content**

As a flight test engineer I would like to investigate the failure of the TRAPIS payload during the February 6, 2016 field excursion to Meadowbrook farm.

**Definition of Done**

[ ] Record results of ground tests with the TRAPIS payload.

[ ] Attempt to reproduce the failures of the ground tests.

[ ] Verify the functionality of individual components of the TRAPIS payload.

[ ] Identify the root cause(s) of the February 6th failures and propose corrective actions.

[ ] Execute corrective action and “walk test” the TRAPIS payload using the HiL, or the GROVER.

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**877 – TRAPIS payload field testing (round 2)**

**Content**

As a flight hardware engineer I would like to validate the performance of the TRAPIS ADS-B payload in a second series of preflight tests.

**Definition of Done**

[ ] Attend an RC fun day (place, time TBD).

[ ] Pack all relevant TRAPIS hardware.

[ ] Clarity Receiver.

[ ] iPad with the AFSL WingX Pro 7 account logged in.

[ ] Integrate the TRAPIS payload with the GROVER ground vehicle and make the payload “drive ready.”

[ ] Use an appropriate power source.

[ ] Secure wires.

[ ] Protect electronics from water damage.

[ ] Execute ground tests per the excursion ProceduresAndChecklists.docx document.

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## 878 – Upgrade/Fix GROVER

**Content**

As a flight operations engineer, I would like to fix and upgrade the GROVER system so I can use it in future field excursions.

**Definition of Done**

[ ] Coordinate with Pico Premvuti before starting this story.

[ ] Fix/upgrade GROVER so it is “airworthy” again.

[ ] Update the "C:\dev\FlightOperations\UAS\GROVER\ConstructionAndMaintenenceLog.docx" document

[ ] Creating Pixhawk box (find one one Thingaverse) to protect it from the elements

[ ] Review changes with Chris Lum

[ ] Present results to group

[ ] Additional tasks TBD

**Notes**

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## 879 – TRAPIS NIC and NACp Support

**Content**

As a software developer, I would like to add NIC and NACp support to the TRAPIS system so I can use it to measure uncertainty associated with measurements.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Read appropriate sections of \\JCATI2015\Software\Sagetech\Clarity ADS-B Receiver\Clarity Interface Control Document Rev1.10.pdf

[x] Read appropriate sections of \\JCATI2015\TechnicalDataPackage\ManufacturerDocs\Sagetech\DO-282B\_Unlocked.pdf

[x] Integrate NIC and NACp functionality into TRAPIS in at least the following locations (see notes)

[x] Clarity encoders/decoders

[x] Coordinate with Gage to create a NIC and NACp degrader control.

[x] Ensure unit tests are written and are passing

[x] Review results with Chris Lum

[x] Present results to research group

**Notes**

* We likely want to read/write NIC and NACp using the Clarity encoder/decoders
* Based on the NIC/NACp, we want to be able to generate a Gaussian distribution of the aircraft’s position, velocity, etc.

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## 880 – TRAPIS NIC and NACp Support (copy)

See user story ‘879 – TRAPIS NIC and NACp Support

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## 881 – AFSL Aircraft Launcher (copy)

See user story ‘769 – AFSL Aircraft Launcher’

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## 882 – Develop Flight Crew Communication Solution

**Content**

As a flight operations participant, I would ilke to develop a communication system that allows the PIC, co-pilot, observer, and GCS operator to be in constant verbal communication with themselves and ATC so that I can safetly conduct flight operations.

**Definition of Done**

[ ] Coordinate with Chris Lum and Robert Larson before starting this story.

[ ] Review slide/diagram in user\_stories.pptx that outlines the different entities that need to be incorporated in the solution.

[ ] Research different types of solutions that will satisfy the given constraints (see notes).

[ ] Procure necessary equipment.

[ ] Perform field trials of equipment to ensure functionality.

[ ] Review results with Chris Lum and Robert Larson

[ ] Write appropriate documentation regarding the setup and usage of the system and ensure it is in an appropriate location in Perforce.

[ ] Present results to research group

[ ] Additional tasks TBD

**Notes**

* All participants should be able to talk with one another simultaneously without the need to press buttons to transmit (similar to a conference call).
* The PIC and co-pilot require relatively hands free operation.
* GCS audio will need to be broadcast to everyone (so everyone can hear announcements like “low battery”, “geofence breach”, etc.)
* When PIC wants to transmit to talk to ATC all other inputs should be muted (so the GCS announcements do not get transmitted to ATC). Only the PIC should be able to talk with ATC.
* PIC, co-Pilot will be standing next to one another but the observer and GCS operator may be located in different locations so a wireless solution is preferable.
* Other potential stakeholder include but are not limited to
  + Payload operator
  + Weather station technician (to call out approach vectors, etc.)
* Some related/potential links are
  + <https://www.youtube.com/watch?v=FwOCZVBUoMk>

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## 883 – Flight Operations Work Items Part 2

**Content**

As a UAS operator, I would like incorporate feedback and experiences from recent flight operations so I can improve the flight operations workflow and efficiency of the AFSL.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this story

ANAKIN

[x] Fix FPV camera or replace with a Mobius camera (this camera video connection is spotty and cuts out sometimes)

[ ] Add an on screen display to the video camera (there is a minum OSD in the video and FPV box)

[ ] Update Arduplane firmware to latest. Compare parameters and ensure that old parameter values are successfully mapped to the new parameter set.

[ ] Add LED lights

[ ] Determine why range test function did not appear to function

[ ] Shorten servo wires on the wing (aileron and flap wires are too long)

[ ] Update this aircraft’s maintenance log

HAPRA

~~[ ] Secure Mobius camera mount to fuselabe (it is currently loose and can wiggle). Use CA glue to glue Styrofoam camera mount to fuselage.~~

[ ] Fix Mobius camera mount

[ ] Fix airspeed sensor mout

[ ] Create a 3D printed shelf to mount Pixhawk and other electronics (to replace the existing shelf on HAPRA)

[x] Fix propeller/engine interface using the motor accessory kit (coordinate with Chris Lum to do this)

~~[ ] Ensure that propeller/engine mounting hardware is tight (coordinate with Carter Beamish)~~

[ ] Add LED lights

[ ] Determine why range test function did not appear to function

[x] Fix elevon control surface

[x] Fix wing damage

[x] Fix any other damage to airframe

[ ] Pull power for video TX directly from the battery, not the ESC (talk with Chris Lum or Brendan)

[ ] Update construction/maintenance log.

[ ] Add decals, logos, graphics, etc. to aircraft (these will be used for publicity photos)

[ ] Determine why we were unable to connect to the aircraft via USB on 05/06/16

[ ] Fix transponder antenna to be vertical and place this strategically on the aircraft

[ ] Shield other electronics and components from excess RF signals

[ ] Paint on N-number on aircraft

[ ] Create a dummy payload that weighs the same as the transponder/Arduino package. This will be used for preliminary flight testing where there is a higher probability of crashes or failures.

[ ] Update this aircraft’s maintenance log

CERES

~~[ ] Create a 3D printed shelf to mount Pixhawk and other electronics (to replace the existing shelf on HAPRA)~~

[ ] Install avionics ~~on previously described shelf~~

[ ] Install airspeed sensor

[ ] Fix damage from Dempsey flight test (skids, wing trailing edges)

[x] Add decals, logos, graphics, etc. to aircraft (these will be used for publicity photos)

[ ] Make the aircraft airworthy for the 05/15/16 flight test

[x] Ensure aircraft launcher is ready to perform

[ ] Update this aircraft’s maintenance log

CONDOR

[ ] Install a manual switch to connect/disconnect 2 of the 3 wires going from the ECS to the motor. This will allow the motor to be disabled so the aircraft can be safetly worked on even though the power is on.

[ ] Apply N-number to aircraft

[ ] Add decals, logos, graphics, etc. to aircraft (these will be used for publicity photos)

[ ] Generate documentation describing the operation of the camera gimbal.

[ ] Update \\FlightOperations\UAS\CONDOR\ConstructionAndMaintenenceLog.docx

TEDD

[ ] Install 3DR GPS and compass module (the original was removed and used in the UGV HiL)

[ ] Install external USB port

[ ] Install external LED (mount in a location that is visible from the ground during flight)

[ ] Install a manual power switch on the side to turn on/off the main aircraft power

[ ] Install a manual switch to connect/disconnect 2 of the 3 wires going from the ECS to the motor. This will allow the motor to be disabled so the aircraft can be safetly worked on even though the power is on.

[ ] Update \\FlightOperations\UAS\TEDD\ConstructionAndMaintenenceLog.docx

[ ] Check that the mockup MicaSense camera is the same weight as the original.

[ ] Update this aircraft’s maintenance log

GROVER

[ ] Fix camera (new replacement camera is in the GROVER box)

[ ] Fix motor (spare parts are in the box)

[ ] Update this aircraft’s maintenance log

MARV

[ ] Determine why one of the motors is not functioning

[ ] Update this aircraft’s maintenance log

DUBCUB

[ ] Replace Dubcub receiver with a Turnigy 9x receiver.

[ ] Conduct basic ground tests (do NOT fly the aircraft) to assess airworthiness

[ ] Update \\FlightOperations\UAS\DubCub\ConstructionAndMaintenenceLog.docx

GENERAL ITEMS

[ ] (Optional) Create a copy of the X-Plane 10 DVDs (both North American and Global editions) so we can run on different machines without the original disc.

[ ] Fix transmitter J (see \\FlightOperations\UAS\CommonDocuments\TransmitterNotes.docx)

[ ] Ensure all Turnigy 9x transmitters are fully functional (wire up enough battery packs for all transmitters, purchase or create battery door covers)

[ ] Ensure all transmitters have an aluminum box for storage and transport. Cut foam appropriately to house transmitters and label all boxes.

[ ] Modify the Matlab function drawUAV to be in 3D.

[ ] Wire LiPo batteries to XT60 connectors.

[ ] Clean up table outside lab

[ ] Create DC power supply plug (1 female and 3 male connectors). This will be used to supply power from a DC power supply to the FPV monitor, 915 MHz video RX, and battery charger.

**Notes**

* Additional notes and lessons learned can be found in
  + \\FlightOperations\Operations\Missions\15\_01\_03\_flight\_test\MissionLog.docx
  + \\FlightOperations\Operations\Missions\15\_01\_03\_flight\_test\MissionLog.docx
* The cradles should a hold the aircraft steady during full power engine tests.

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## 884 – LAMS Related Items

**Content**

As a software developer, I would like to address LAMS related issues.

**Definition of Done**

[ ] Tasks TBD

**Notes**

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## 885 – CERES HiL Simulator Construction

**Content**

As a controls developer for CERES/BARNSTORMER, I would like to have a hardware in the loop (HiL) simulator on which to test the controls system.

**Definition of Done**

[ ] Coordinate with Mia Lee for the purchase of materials for HiL Pixhawk 2

[ ] Construct HiL Pixhawk 2

[ ] Watch videos or read other documentation related to HiL simulators:

[ ] <https://www.youtube.com/watch?v=tKr2C_Lrq_4>

[ ] Read the document \\FlightOperations\UAS\CommonDocuments\MissionPlanner\OperationalChecklistsAndNotes.docx , especially the section entitled ‘X-Plane Hardware in the Loop Simulator”. Note that this is a work in progress and may contain errors or irrelevant information.

[ ] (Optional) Tune autopilot parameters following instructions outlined on the following page: <http://plane.ardupilot.com/wiki/roll-pitch-controller-tuning/>

[ ] Save the ArduPlane parameters.

**Notes**

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## 886 – BARNSTORMER Algorithm Development & Support (Part 1, Position 1)

**Content**

As a software developer, I would like to write algorithms to for the BARNSTORMER project and create classes and structures to support its development.

**Definition of Done**

[ ] Write C# code to support the development of BARNSTORMER

**Notes**

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## 887 – BARNSTORMER Algorithm Development & Support (Part 1, Position 2)

**Content**

As a software developer, I would like to write algorithms to for the BARNSTORMER project and create classes and structures to support its development.

**Definition of Done**

[ ] Write C# code to support the development of BARNSTORMER

**Notes**

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## 888 – BARNSTORMER Algorithm Development & Support (Part 1, Position 3)

**Content**

As a software developer, I would like to write algorithms to for the BARNSTORMER project and create classes and structures to support its development.

**Definition of Done**

[ ] Write C# code to support the development of BARNSTORMER

**Notes**

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## 889 – BARNSTORMER Networking Research

**Content**

As a software developer, I would like to develop a framework for BARNSTORMER to communicate with Mission Planner.

**Definition of Done**

[X] Write Python script(s) to send Mission Planner telemetry data to a simple C# program serving as a simple proof of concept of one-way communications from Mission Planner

[ ] Write Python script(s) to receive a command to Mission Planner from another Python script

[ ] Write Python script(s) to receive a command to Mission Planner from a C# application serving as a simple proof of concept of one-way communications to Mission Planner

[ ] Write a Python script to send telemetry data from Mission Planner to a C# application and receive commands from that same C# application

**Notes**

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**890 – Wake Turbulence App: Model Simulation**

**Content**

As an aerodynamicist, I would like to simulate the time evolution of aircraft wingtip vortices using the model defined by 874 – Wake Turbulence App: Model Definition.

**Definition of Done**

[ ] Put the governing differential equation into a format suitable for numerically solving it using MATLAB’s ODE45.

[ ] Generate a conservative table of time series solutions for different wake categories, velocities, etc. using “worst case” parameters.

**Notes**

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**891 – Wake Turbulence App: Model Write Up**

**Content**

As an aerodynamicist, I would like to write up a rigorous white paper on the time evolution of aircraft wingtip vortices using the model defined by 874 – Wake Turbulence App: Model Definition.

**Definition of Done**

[ ] Summarize the relevant results from the Wake Turbulence literature review.

[ ] Summarize the physics of the selected model and why it is appropriate in the context of the Wake Turbulence App.

[ ] Comment on possible extensions and improvements for follow on projects.

**Notes**

* The paper need not include a rigorous derivation of the model.

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**892 – Cesium 1: Orientation (copy)**

**Content**

As a software developer, I would like become familiar with the powerful mapping functionality contained in the Cesium JavaScript library.

**Definition of Done**

[ ] Read and follow the directions in the getting started tutorial: <http://cesiumjs.org/tutorials/cesium-up-and-running/>

[ ] Download and install Cesium: <http://cesiumjs.org/downloads.html>

[ ] Select and install a suitable IDE (e.g. Notepad++ or Eclipse)

[ ] Start a local webserver

[ ] Open Cesium Sandcastle in the local webserver and explore several tutorials

[ ] Pay special attention to CZML Path, this is quite similar to what we want to implement for the TRAPIS Wake Turbulence add-on

**Notes**

* This should be a relatively quick orientation, limit this to an afternoon.
* If necessary, use Ward’s Bing maps (used to drive Cesium) key
  + An07RXvdYdz93byxffYv\_W4wDzym4euUfN5wWWk\_LC516QWYNUxZoulg4OVJb-Ns

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**893 – Fusion of Kalman Filter Vehicle Position Estimates**

**Content**

As a software developer, I would like to develop an algorithm to fuse the estimates from the Kalman Filters for each aircraft into one continuous estimate

**Definition of Done**

[x] Develop a method for fusing Kalman Filter estimates of aircraft positions from both the LAMS and ADS-B systems into one continuous aircraft position estimate for the following scenarios:

[x] 2 continuous & accurate data (C&A) streams

[x] 1 C&A stream + 1 intermittent & accurate stream

[x] 1 C&A stream + 1 continuous & inaccurate stream (white noise)

[x] 1 C&A stream + 1 continuous & inaccurate stream (increasing drift)

[x] 1 C&A stream + 1 continuous & inaccurate stream (DC offset)

[x] 1 C&A stream + 1 intermittent & inaccurate stream (white noise)

[x] Write up a summary of the mathematical basis algorithm and submit to the appropriate Perforce depot.

[x] Present results to group.

**Notes**

* A data stream will contain at a minimum the 3D position (lat, lon, alt) of the vehicle. Additional information such as the errors on these estimates may be included.
* Keep in mind that this software will need to function for multiple vehicles (each separated by an ICAO identifier). Be sure to design your software to accommodate both single and multiple vehicles.

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**894 – Kalman Filter Implementation in Demo Scenarios (Part 1)**

**Content**

As a software developer, I would like to implement the Kalman Filter code written for the TRAPIS project for use with a demo of the proposed JCATI 2015 truck test scenario

**Definition of Done**

[x] Develop a method for implementing Kalman Filter estimates in the current truck test demonstration scenario associated with the JCATI 2015 project

[x] Test the Kalman Filters with a variety of simulated GPS-errors and ensure that the position estimates generated by the filters are accurate

[x] Change the covariance and error matrices as necessary to ensure that the Kalman Filters perform at a desired level for the demo scenarios and ultimately the real flight test.

[ ] Review implementation with Chris Lum

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**895 – Explore Esri Products**

**Content**

As a geospatial analyst, I would like to investigate Esri products so I can determine how to integrate them into our image processing and information acquisition/reduction workflow.

**Definition of Done**

[ ] Coordinate with Christopher Lum before starting this story

[ ] Explore ArcGIS (see notes)

[ ] Explore Drone2Map (<http://www.esri.com/products/drone2map> )

[ ] Review with Chris Lum

[ ] Present results to group

[ ] Document results and check into Perforce in the appropriate location (somewhere in the Mapping depot)

**Notes**

* UW may have licenses for ArcGIS (Britta Ricker might have more information).
* There may have been previous user stories related to this.
* Douglas Ridenour is a good contact at Esri
  + As an example of output here is a web map with some sample ortho-mosaics I made with drone 2 map and a 3DR Solo quadcopter a couple of weekends ago - <http://arcg.is/1VDGioZ>
  + Another thing to check out is the Full Motion Video Tool <https://blogs.esri.com/esri/arcgis/2016/02/19/fmv1_3> for transforming between video and map space.

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**896 – Obtain Landowner Permission for JCATI2016 Flight Test**

**Content**

As a flight operations manager, I would like to obtain land owner permission to operate on their land during the JCATI2016 flight test.

**Definition of Done**

[ ] Coordinate with Christopher Lum before starting this story

[ ] Coordinate with Robert Larson and/or Shida Xu.

[ ] Identify pertinent landowners of the 3 operational areas.

[ ] Draft a letter/email to describe the intent and purpose of the mission. We will send this letter/email to the landowners

[ ] Ask Chris Lum to contact these individual, do NOT contact them yourself.

[ ] Ensure that we obtain written permission from these owners to operate.

[ ] Update/create relevant notes in the \\FlightOperations\Operations\TestSiteInformation folder

[ ] Present results to research group.

**Notes**

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**897 – Incorporate Lessons Learned from RC Fun Day #2**

**Content**

As a flight operations manager, I would like to incorporate lessons learned from RC Fun Day #2 into our flight operations procedure so that I can improve future excusions.

**Definition of Done**

[ ] Get another USB mouse for the payload computer

[ ] Add another power strip to the GCS box

[ ] Get a large plastic box for tent siding and tarps

[ ] Make a note to refill generate every 3 hours

[ ] Figure out what was wrong with UPS.

[ ] Purchase items

[ ] more cell phone head sets

[ ] hand protection to throw X-8 (metal gauntlet, cut resistant glove, etc.)

[ ] hand drill and bits for drilling out props

[ ] spare props for X-8

[ ] stakes and guy wires

[ ] sandbags

[ ] Brendan’s Pixhawk

[ ] Figure out how to record video on Dominator googles

[ ] Fix Meadowbrook geofence to include launch and home location (to avoid immediate geofence breach)

[ ] Modify X-8 launcher

[ ] Change triggering mechanism to just a hand hold

[ ] increase angle of launch

[ ] increase speed of departure

[ ] make arms wider to decrease risk of prop strike

[ ] make arms shorter to reduce rocking effect

[ ] Add cell phone chargers in the tent (or possibly backup batteries)

[ ] BBQ is somewhat messy and takes too long, make a note to buy food that doesn’t require so much preparation.

[ ] We need to add procedures and explicit steps for the appropriate person to download data from the aircraft after each flight.

[ ] Print out AFSL conference line phone number and passcode and post in tent

[ ] Clearly specify what activities occur in which tents

[ ] external relations officer

[ ] Fix battery charging system (DC power jack needs rewiring)

[ ] Reorganize items

[ ] Field tool box

[ ] Spare RC parts box

[ ] make a user story to create a manifest of contents of each box so we know where things go

[ ] Batteries and their status need to be clearly marked and documented (job for the battery charge technician)

**Notes**

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## 898 – Industry Project Presentation (Position 1)

**Content**

As an engineer, I would like to improve my communication and presentation skills by presenting an industry level report to interested parties regarding the current status of the CERES airframe.

**Definition of Done**

[ ] Summarize the Program management, Systems Engineering, GNC, Fluids, Structural, or other element into a concise power point for presentation.

[ ] Travel to TLG Aerospace in South Lake Union to present to the interested parties.

[ ] Maintain a professional attire and manner to represent the CERES team and the University of Washington in a positive light.

[ ] Document the presentation and feedback for future use.

**Notes**

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## 899 – Industry Project Presentation (Position 2)

See 898 – Industry Project Presentation (Position 1)

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## 900 – Industry Project Presentation (Position 3)

See 898 – Industry Project Presentation (Position 1)

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## 901 – Industry Project Presentation (Position 4)

See 898 – Industry Project Presentation (Position 1)

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## 902 – Industry Project Presentation (Position 5)

See 898 – Industry Project Presentation (Position 1)

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## 903 – Industry Project Presentation (Position 6)

See 898 – Industry Project Presentation (Position 1)

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## 904 – College of Engineering CERES Award Submission (Position 1)

**Content**

As CERES Program Manager, I would like to gain experience in submitting professional budget proposals and request in an attempt to acquire additional funds for CERES.

**Definition of Done**

[ ] Follow the rubric on UW Canvas to submit a budget for internal review.

[ ] Based on that feedback present the additional budget request to TLG for review and additional feedback.

[ ] Submit the budget request to the CoE by Friday March 4th, 2016.

[ ] Present results to research group.

**Notes**

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## 905 – College of Engineering CERES Award Submission (Position 2)

**See** 904 – College of Engineering CERES Award Submission (Position 1)

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## 906 – CERES Structural Parts Research

**Content**

As an aerospace structures engineer, I would like to examine the possibilities of using different materials to construct the CERES launcher and ground testing rail.

**Definition of Done**

[ ] Determine the performance criteria the test structure will need to be able to handle during the CERES project duration.

[ ] Research potential alternative materials and providers.

[ ] Research methods of protecting the airframe and ways to prevent racking during testing.

[ ] Present results to research group for feedback.

[ ] Present results to TLG for further feedback.

[ ] Order parts.

**Notes**

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## 907 – CERES Ground Test and Launcher Construction

**Content**

As an aerospace structures engineer, I would like to construct the CERES launcher and ground track for realistic fluid dispersal testing.

**Definition of Done**

[ ] Using the design from 862 to construct a ground testing rail and CERES launcher.

[ ] Construct the entire structure before CERES PDR on 3/11/2016

[ ] Test the entire system at the UW.

[ ] Perform a ‘launch test’ with Chris at the RC Fun Day #2.

[ ] Assemble the entire system and test for use in Dempsey Indoor by April 21.

[ ] Present results to the CERES team.

**Notes**

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## 908 – CFD Hand Calculations

**Content**

As an aerodynamicist, I would like to examine the fluid dynamics around the Skywalker x8 airframe.

**Definition of Done**

[ ] Determine the optimal nozzle placement on the Skywalker x8 airframe using hand calculations.

[ ] Obtain a velocity profile of the wing at different locations.

[ ] Determine the induced velocity caused by wingtip vortices.

[ ] Present results to research group for feedback.

[ ] Document all results in Perforce in \AFSL\CERES\Fluids System.

[ ] Present results to research group for feedback

**Notes**

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## 909 – CERES Fluid System Testing: Part 1

**Content**

As a part of the CERES fluid systems team, I would like to conduct fluid dispersal testing using the methods determined in 863 and documented in \AFSL\CERES\Fluids System\Fluids Testing Matrix.xlsx.

**Definition of Done**

[ ] Complete the matrix from c:\AFSL\CERES\Fluids System\Fluids Testing Matrix.xlsx.

[ ] Give images to the champion of 910 – CERES Fluid System Image Processing.

[ ] Record all findings in \AFSL\CERES\Fluids System.

[ ] Present results to research group for feedback

**Notes**

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## 910 – CERES Fluid System Image Processing

**Content**

As a part of the CERES fluid systems team, I would like to examine the effectiveness of the dispersal system using MATLAB image processing techniques.

**Definition of Done**

[ ] Determine a coverage criteria that will give adequate information about the effectiveness of different nozzles under the set conditions from863 – CERES Fluids System Prototype – Part 2.

[ ] Obtain the images from the champion of 909 – CERES Fluid System Testing: Part 1.

[ ] Use MATLAB image processing to create an intensity map of the image.

[ ] Compare the results of multiple tests.

[ ] Record all findings in \AFSL\CERES\Fluids System.

[ ] Present results to research group for feedback

**Notes**

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## 911 – CERES Ground Testing Site Acquisition

**Content**

As a the CERES Program Manger I would like to gain experience working with the University of Washington to secure a testing time in Dempsey Indoor.

**Definition of Done**

[ ] Coordinate with Professor Livne to determine how his senior design class was able to fly RC aircraft indoors.

[ ] Follow a similar procedure to gain access for the CERES team, the AFSL, and any other interested capstone groups.

[ ] Record all findings in Perforce.

[ ] Present results to research group for feedback.

**Notes**

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## 912 – CERES Preliminary Design Review Presentation (Position 1)

**Content**

As the CERES PDR representative I would like to familiarize myself with the entire CERES project to present this information to the UWAA community on March 11th, 2016.

**Definition of Done**

[ ] Follow the rubric laid out by Professor Morgansen on the AA410AC canvas page.

[ ] Meet with the CERES team to perform a dry run and brainstorm potential questions.

[ ] Document the entire presentation on the CERES google drive.

[ ] Present results to research group for feedback

**Notes**

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## 913 – CERES Preliminary Design Review Presentation (Position 2)

**See** 912 – CERES Preliminary Design Review Presentation (Position 1)

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## 914 – CERES Dempsey Flight Test Logistics Planning

**Content**

As the part of CERES program management team it will be necessary to thoroughly plan a flight test to validate the CERES fluid and launch system prototypes.

**Definition of Done**

[ ] Coordinate with team leads to ensure all necessary preparations have been made to full conduct a flight test.

[ ] Logistically plan the trip for the CERES team to Demosey Indoor, including Professor Lum and Andrew McComas and all necessary test equipment.

[ ] Coordinate with other teams to make full use of the reserved space.

[ ] Attend the flight test.

**Notes**

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## 915 – CERES Dempsey Flight Test Planning

**Content**

As the part of CERES program management team it will be necessary to thoroughly plan a flight test to validate the CERES fluid and launch system prototypes.

**Definition of Done**

[ ] Coordinate with team leads to ensure all system functionality will be tested.

[ ] Document roles for all attending CERES team members.

[ ] Document testing procedure for the indoor flight test.

[ ] Attend the flight test.

**Notes**

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## 916 – CERES Sunnyside Flight Test Logistical Planning (Position 1)

**Content**

As the part of CERES program management team it will be necessary to thoroughly plan a flight test to validate the CERES prototype.

**Definition of Done**

[ ] Research the possibility of flying under the AFSL CONDOR COA at Sunnyside, WA.

[ ] Logistically plan the trip for the CERES team to the test location, including Professor Lum and Andrew McComas.

[ ] If necessary, acquire lodging and food for attending members.

[ ] Attend the flight test.

**Notes**

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## 917 – CERES Sunnyside Flight Test Logistical Planning (Position 2)

**See** 916 – CERES Sunnyside Flight Test Logistical Planning (Position 1)**.**

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## 918 – CERES Sunnyside Flight Test Planning

**Content**

As the part of CERES program management team it will be necessary to thoroughly plan a flight test to validate the CERES fluid and launch system prototypes.

**Definition of Done**

[ ] Coordinate with team leads to ensure all system functionality will be tested on the CONDOR aircraft.

[ ] Document roles for all attending CERES team members.

[ ] Document testing procedure for the indoor flight test.

[ ] Attend the flight test.

**Notes**

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## 919 – Kalman Filter Refinement and Testing

**Content**

As a software developer, I would like to develop an algorithm to fuse the estimates from the Kalman Filters for each aircraft into one continuous estimate

**Definition of Done**

[ ] Ensure that the KalmanFilterEstimator is providing reasonable estimates of aircraft position for a simple demonstration scenario.

[ ] Change the covariance and error matrices as necessary to ensure that the Kalman Filters perform at a desired level for the demo scenario.

[ ] Ensure that all unit tests for the KalmanFilterEstimator and DynamicKalmanFilterEstimator are passing, and ensure that all associated methods are being tested.

[ ] Review implementation with Chris Lum.

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## 920 – Master’s Thesis Rough Draft (Handley)

**Content**

As a student, I would like to write my Master’s thesis so I can graduate.

**Definition of Done**

[ ] Meet with Dr. Lum and Prof. Breidenthal to discuss thesis scope and deliverables

[ ] Write rough draft of Master’s thesis

**Notes**

* Earlier is better
  + Dr. Lum needs insight into WV model
  + Prof. Breidenthal needs insight into TRAPIS and the avionics payload

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## 921 – Master’s Thesis Revisions (Handley)

**Content**

As a student, I would like to write my Master’s thesis so I can graduate.

**Definition of Done**

[ ] Revise thesis rough draft per comments from committee members.

**Notes**

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## 922 – Master’s Thesis Presentation (Handley)

**Content**

As a student, I would like to write my Master’s thesis so I can graduate.

**Definition of Done**

[ ] Polish thesis as necessary

[ ] Incorporate results from latest tests

[ ] Present thesis results at department wide meeting/presentation on 5/31

[ ] Obtain all necessary signatures and documents required for graduation

**Notes**

* 5/31/2016, 10:30-11:30am, Gug 305

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## 923 – TRAPIS Truck Test + RC Fun Day 3

**Content**

As a payload engineer I would like to rigorously field test the TRAPIS payload and ground station to ensure it’s ultimate success in flight tests with our industry partners.

**Definition of Done**

[ ] Perform a full ground test the TRAPIS payload during RC fun day #3 inside the X8 payload bay with both the XPS-TR and the electric motor/servos on

[ ] Setup a mobile TRAPIS ground station using the Clarity

[ ] Perform a “truck test” at KDLS using both of the above plus an Ethernet input from the LAMS.

**Notes**

* RC funday #3 scheduled TBD
* Truck test scheduled for 4/29

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## 924 – TRAPIS Truck Test (Copy 1)

**Content**

See user story 923 – TRAPIS Truck Test + RC Fun Day 3

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## 925 – TRAPIS Truck Test

**Content**

As a payload engineer I would like to rigorously field test the TRAPIS payload and ground station to ensure it’s ultimate success in flight tests with our industry partners.

**Definition of Done**

[ ] Perform a full ground test the TRAPIS payload inside the X8 payload bay with both the XPS-TR and the electric motor/servos operating (i.e. realistic flight environment)

[ ] Setup a mobile TRAPIS ground station using the Clarity

[ ] Perform a “truck test” at KDLS using both of the above plus an Ethernet input from the LAMS

Ward

[ ] Change ICAO address and N-number of transponder to the HAPRA values (see "\\FlightOperations\Operations\AircraftRegistration\AircraftRegistrationNotes.docx").

[ ] Upload iPad capture movies to K:\FlightOperations\Operations\Missions\16\_04\_29\_dallesport\Data\iPadScreenCapture (I will need to grant upload permissions)

[ ] Work with Bobby and Gage to determine success criteria for truck test (how will we know we are successful).

Gage

[x] Fix bug with ClarityMessageDecoder, including rigorous unit testing (some examples of bad values that cause problems are on the desktop of AFSLPrecision02).

[x] Fix bug where ICAO address of ‘000000’ shows up on TRAPIS

[ ] Document which buttons need to be pressed to save all data (KML, CSV, .log, etc.)

[ ] Generate a Matlab script to playback mission data (to use to validate data in the field)

[ ] Change icons on bread crumb layer to be something like dots rather than arrows.

[ ] Add a layer to display a scale or line to give the user a sense of zoom level or scale (this is for the scenario where we have no internet access and the map does not display terrain).

[ ] Redo layout to increase map area and make it so we can view all of the various TRAPIS windows on a single laptop screen if necessary.

Bobby

[ ] Update mission checklists and procedures document.

[ ] Develop ‘pre-briefing’ slides that we can use to show Mike or other external entities what we are trying to accomplish on this test.

Chris

[ ] Fix bug in GMAPMarkerText to support more than 9 vehicles

[ ] Obtain car from UW fleet services

Emil & Scott

[ ] Finalize avionics layout and EM shielding

[ ] Make HAPRA “airwothy” for truck test

[ ] Figure out how to mounting system onto UW fleet services minivan.

Anupam

[ ] Unit test all relevant code

[ ] Test TRAPIS UI functionality

[ ] Validate end-to-end functionality (data collection, saving, and replay/analysis)

**Notes**

* Truck test scheduled for 05/06/16
* We should bring HAM radio so we can practice monitoring/interacting with aviation traffic.

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## 926 – TRAPIS Truck Test (Copy 1)

**Content**

See user story 924 – TRAPIS Truck Test (Copy 1)

Content

See user story 923 **–** TRAPIS Truck Test + RC Fun Day 3

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925 – TRAPIS Truck Test

## 927 – TRAPIS Truck Test Logistics

**Content**

As a project manager, I would like to manage logistics for the Dallesport “Truck Test” so that I can ensure all paperwork and logistics are accounted for.

**Definition of Done**

[x] Find a date

04/29/2016

[x] Coordinate with ANPC

[x] Determine test scenario

[x] Implement test scenario for use with TRAPISSimulator

ICOMC2SimulationScenarioID.JCATI04

[] Complete ProceduresAndChecklist.docx

[ ] Send letter to landowners

[ ] Get directions or maps to where we want to test (approx 3 NM away from KDLS). Coordinate with Bobby to get locations.

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## 928 – TRAPIS Development Miscellaneous

**Content**

As a researcher, I would like to find solutions to miscellaneous issues related to TRAPIS development as they arise.

**Definition of Done**

[] Minor fixes/improvements.

[x] Create a list of TRAPIS packets that can be used to test the Dynamic Kalman Filter

ListTRAPISPacketID.DueEast01ADSBNoisyVarying.

[x] Fix the repeated vehicle problem with the DataLoggerController, include unit testing.

[x] Write TRAPIS database to CVS file.

[x] Log received Clarity and LAMS packets.

[x] Implement multi-digit map numbering.

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## 929 – TRAPIS Development Miscellaneous (Copy)

**Content**

Copy of user story 928

**Definition of Done**

[x] Minor fixes/improvements

[x] Add ComboBoxes to TRAPIS user interface for VehicleIDPairerControl and SelectedVehicleControl

[x] Coordinate with ANPC to obtain real LAMS output

[x] Create a python script to read .cat48 files, parse the ASTERIX packets, and send the packets over UDP to TRAPIS.

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## 930 – TRAPIS Development Miscellaneous (Copy)

**Content**

Copy of user story 928

**Definition of Done**

[x] Minor fixes/improvements

[x] Add InNauticalMiles() to UWDistance class

[x] Add InKnots() to UWVelocity class

[x] Implement CalculatePlanarAndAltitudeVariances() for LAMSPreprocessor

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## 931 – TRAPIS Flight Demo Scenario

**Content**

As a software developer, I would like to create flight scenarios near Dallesport, OR, that can be used to simulate the future flight demo.

**Definition of Done**

[x] Coordinate with Bobby Larson

[x] Decide on most probable test location near Dallesport, OR

[x] Decide on a couple flight routes

[x] Add the flight scenarios to UWSDK so that they can be used in TRAPISSimulator

ICOMC2SimulationScenarioID.JCATI02

ICOMC2SimulationScenarioID.JCATI03

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## 932 – NACp Degrader

**Content**

As a software developer, I would like to add NACp degrader functionality to TRAPIS.

**Definition of Done**

[x] Add NACp degrader controller to TRAPIS

ClartiyNACpDegraderController

[x] Add NACp degrader controls to the TRAPIS Engineering Panel

EngineeringClarityNACpDegraderControl

[x] Add the ability to simulate NACp degradation in TRAPISSimulator

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**933 – TRAPIS X8 Integration**

**Content**

As a mechanical engineer, I would like to design and build the mechanical interfaces between the TRAPIS flight payload and the X8 airframe.

**Definition of Done**

[ ] Coordinate with Dr. Lum before making HAPRA airframe modifications

[ ] Coordinate with Development Champion of User Story 883 – Flight Operations Work Items Part 2

[ ] Review build notes for HAPRA [\\FlightOperations\UAS\HAPRA\ConstructionAndMaintenenceLog.docx](file:///\\FlightOperations\UAS\HAPRA\ConstructionAndMaintenenceLog.docx)

[ ] Review build photos for HAPRA (K:\FlightOperations\UAS\HAPRA\PhotosMedia)

[ ] Determine a suitable location for the XPS-TR monopole antenna, make airframe modifications as necessary

[ ] Determine a suitable method for shielding the HAPRA avionics and the TRAPIS payload from powerful RF signals emanating from the monopole antenna

[ ] Determine a suitable location for an external pressure port for the XPS-TR pressure sensor

**Notes**

* Modifications should be completed before RC Fun Day #3 and the TRAPIS truck test
* HAPRA flight manual: [\\FlightOperations\UAS\HAPRA\HAPRAAircraftFlightManual.docx](file:///\\FlightOperations\UAS\HAPRA\HAPRAAircraftFlightManual.docx)

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**934 – JCATI Symposium Presentation**

**Content**

As a funded graduate student I would like to present the progress and achievements of the JCATI 2015 project to our funding agency and industry partners.

**Definition of Done**

[ ] Coordinate with Dr. Lum

[ ] Modify and reprint poster (if necessary)

[ ] Prepare and practice a 60 second “elevator pitch”

[ ] Travel to Spokane and present as scheduled

**Notes**

* Agenda: <http://jcati.org/sites/default/files/2016%20JCATI%20Symposium%20Agenda.pdf>
* Website: <http://jcati.org/node/194>

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**935 – CONDOR Gimbal Documentation**

**Content**

As a project engineer, I would like to document the operation of the CONDOR camera gimbal so that others can continue to operate gimbal after the original designer has graduated.

**Definition of Done**

[ ] Coordinate with Chris Lum.

[ ] Create a document that outlines the construction, aiframe integration, and operation of the gimbal.

[ ] Include design files (such as CAD and Arduino software).

[ ] Check in all necessary files into "C:\dev\FlightOperations\UAS\CONDOR\SubSystems\CameraGimbal" (ensure this directory is up to date and has relevant files).

[ ] Present results to research group including a demo of the system.

**Notes**

* A new student should be able to re-create the gimbal in the future based on information developed during this story.

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## 936 – Industry Project Presentation (Brian - 1)

**Content**

As an engineer, I would like to improve my communication and presentation skills by presenting an industry level report to interested parties regarding the current status of the CERES airframe.

**Definition of Done**

[ ] Summarize the Program management, Systems Engineering, GNC, Fluids, Structural, or other element into a concise power point for presentation.

[ ] Travel to TLG Aerospace in South Lake Union to present to the interested parties.

[ ] Maintain a professional attire and manner to represent the CERES team and the University of Washington in a positive light.

[ ] Document the presentation and feedback for future use.

**Notes**

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## 937 – BARNSTORMER Algorithm Development & Support (Part 2, Position 1)

**Content**

As a software developer, I would like to write algorithms to for the BARNSTORMER project and create classes and structures to support its development.

**Definition of Done**

[ ] Write C# code to support the development of BARNSTORMER

**Notes**

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## 938 – BARNSTORMER Algorithm Development & Support (Part 2, Position 2)

**Content**

As a software developer, I would like to write algorithms to for the BARNSTORMER project and create classes and structures to support its development.

**Definition of Done**

[ ] Write C# code to support the development of BARNSTORMER

**Notes**

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## 939 – CERES Launcher Modifications

**Content**

As a structures engineer, I would like to use the lessons learn in the experimental testing to modify the existing launcher design to fix the relevant components.

**Definition of Done**

[ ] Modifications for the X-8 launcher

[ ] Change triggering mechanism to just a hand hold

[ ] increase angle of launch

[ ] increase speed of departure

[ ] make arms wider to decrease risk of prop strike

[ ] make arms shorter to reduce rocking effect

**Notes**

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## 940 - CFD Detailed Calculations

**Content**

As an aerodynamicist, I would like to examine the fluid dynamics around the Skywalker x8 airframe.

**Definition of Done**

[ ] Determine the optimal nozzle placement on the Skywalker x8 airframe using hand calculations.

[ ] Obtain a velocity profile of the wing at different locations.

[ ] Determine the induced velocity caused by wingtip vortices.

[ ] Present results to research group for feedback.

[ ] Document all results in Perforce in \AFSL\CERES\Fluids System.

[ ] Present results to research group for feedback

**Notes**

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## 941 – CERES Fluid System Testing: Part 2

**Content**

As a part of the CERES fluid systems team, I would like to conduct fluid dispersal testing using the methods determined in 863 and documented in \AFSL\CERES\Fluids System\Fluids Testing Matrix.xlsx.

**Definition of Done**

[ ] Complete the matrix from c:\AFSL\CERES\Fluids System\Fluids Testing Matrix.xlsx.

[ ] Give images to the champion of 910 – CERES Fluid System Image Processing.

[ ] Record all findings in \AFSL\CERES\Fluids System.

[ ] Present results to research group for feedback

**Notes**

## 942 – CERES Fluid System Image Processing 2

**Content**

As a part of the CERES fluid systems team, I would like to examine the effectiveness of the dispersal system using MATLAB image processing techniques.

**Definition of Done**

[ ] Determine a coverage criteria that will give adequate information about the effectiveness of different nozzles under the set conditions from 863 – CERES Fluids System Prototype – Part 2.

[ ] Obtain the images from the champion of 909 – CERES Fluid System Testing: Part 1.

[ ] Use MATLAB image processing to create an intensity map of the image.

[ ] Compare the results of multiple tests.

[ ] Record all findings in \AFSL\CERES\Fluids System.

[ ] Present results to research group for feedback

**Notes**

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## 943 – CERES Technical Report Writer (Main)

**Content**

As an engineer, I would like to improve my communication and report writing skills by creating an industry level report to interested parties regarding the current status of the CERES airframe.

**Definition of Done**

[ ] Summarize the Program management, Systems Engineering, GNC, Fluids, Structural, or other element into a concise report.

[ ] Travel to TLG Aerospace in South Lake Union to present to the interested parties.

[ ] Maintain a professional attire and manner to represent the CERES team and the University of Washington in a positive light.

[ ] Document the presentation and feedback for future use.

**Notes**

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## 944 – CERES Technical Report Writer (Assistant)

**Content**

As an engineer, I would like to improve my communication and report writing skills by creating an industry level report to interested parties regarding the current status of the CERES airframe.

**Definition of Done**

[ ] Summarize the Program management, Systems Engineering, GNC, Fluids, Structural, or other element into a concise report.

[ ] Travel to TLG Aerospace in South Lake Union to present to the interested parties.

[ ] Maintain a professional attire and manner to represent the CERES team and the University of Washington in a positive light.

[ ] Document the presentation and feedback for future use.

**Notes**

## 945 – CERES Technical Report Writer (Helper)

**Content**

As an engineer, I would like to improve my communication and report writing skills by creating an industry level report to interested parties regarding the current status of the CERES airframe.

**Definition of Done**

[ ] Summarize the Program management, Systems Engineering, GNC, Fluids, Structural, or other element into a concise report.

[ ] Travel to TLG Aerospace in South Lake Union to present to the interested parties.

[ ] Maintain a professional attire and manner to represent the CERES team and the University of Washington in a positive light.

[ ] Document the presentation and feedback for future use.

**Notes**

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## 946 – CERES Technical Report Writer (Helper)

**Content**

* See 909 – CERES Fluid System Testing: Part 1

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## 947 – CERES Technical Report Writer (Helper)

**Content**

* See 909 – CERES Fluid System Testing: Part 1

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## 948 – CERES Technical Report Writer (Helper)

**Content**

* See 909 – CERES Fluid System Testing: Part 1

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## 949 – CERES Aircraft Integration

**Content**

As a systems engineer, I would like oversee and direct the construction and aircraft modifications team in creating a final CERES design.

**Definition of Done**

[ ] Create a final Skywalker X8 modification plan and oversee the construction of the final build.

[ ] Work with the construction team to ensure proper installation, wiring, etc.

[ ] Create a final flight envelope report to present to TLG at the close of the project.

**Notes**

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## 950 – CERES Pixhawk PWM converter

**Content**

As a aeronautics engineer, I want to gain experience converting the Pixhawk’s PWM signal to an analog signal so the solenoid valve can be actuated.

**Definition of Done**

[ ] Design a conceptual layout to convert a PWM signal to 12V DC output.

[ ] Check your work with a member of the AFSL.

[ ] Coordinate with Chris to obtain the necessary parts.

[ ] Assemble a prototype and demonstrate functionality to the CERES team.

[ ] Construct a final configuration for flight testing.

**Notes**

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## 951 – Head-Tracking Unit Research

**Content**

As a UAS operator, I would like to research different head tracking gimbal units so I can identify a system we can purchase for our UAS.

**Definition of Done**

[x] Coordinate with Chris Lum before starting this story.

[x] Research different camera gimbals that can mount on the Skywalker X8 and Skywalker 1900

[x] Determine how the system can be used with a head-tracking unit

[x] Research different FPV Goggle units that can:

[x] Operate independently from the ground station

[x] Compatible with head tracking

[x] Ensure the gimbal system can accommodate the following cameras (see notes)

[X] Mobius ActionCam

[x] Ensure the gimbal system meets the following specifications (see notes)

[X] At least +/- 135 degrees of pan is required (+/- 180 degrees is desirable)

[x] Present results to research group

[x] Make a recommendation to Chris Lum regarding which systems to procure (see notes)

**Notes**

* The primary UAS this will be used on is the Skywalker X8 AND the Skywalker 1900 but if the design can be moved to other aircraft that would be desirable.
* A secondary use case would be to hold a video camera in a forwards facing configuration for FPV use.  This system may also be used to inspect crop dusting performance from the CERES aircraft and will require the user to be able to pan/tilt the camera.
* This user story only involves performing the research to determine what type of system to procure. Installation, initial testing, and field trials of this system are captured in another user story.

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## 952 – Head-Tracking Unit Installation

**Content**

As a UAS operator, I would like to install and implement the units purchased in user story 829b.

**Definition of Done**

[x] Set up FPV goggles to communicate with the FPV transmitter

[ ] Install OSD on aircraft and make sure it is working properly

[ ] Install and set up camera gimbal to work with the head-tracking unit.

**Notes**

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## 953 – Mapping Gimbal Installation

**Content**

As a UAS operator, I would like to install and implement the units purchased in user story 829a.

**Definition of Done**

[ ] Set up and install mapping gimbal unit on aircraft

[ ] Ensure the gimbal can hold the MicaSense RedEdge and the Sony S100

**Notes**

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**954 – Internet Connectivity in the Field**

**Content**

As a network engineer I would like to ensure that AFSL field campaigns have internet connectivity wherever a cellular signal is available.

**Definition of Done**

[ ] Coordinate with Ward Handley.

[ ] Design several solutions that will create a local network of AFSL resources with access to the internet.

[ ] Each should be easily configured to connect to the internet using ALL of the following: 1) Ethernet access point, 2) WiFi access point, and 3) Cellular data via smart phone tethering or dongle.

[ ] Present your solutions to an AFSL group meeting.

[ ] Coordinate with Dr. Lum to purchase the “best” solution.

[ ] Check if files can be transferred between computers on the network without going through the internet.

**Notes**

* Preferably all or most of the components will be battery powered.
* Preliminary parts list:
* TP-LINK OnHub
  + $200
  + <https://store.google.com/product/onhub?gl=us>
  + Any old hub would do. Some are even battery powered for travel, but most of those models only have one Ethernet port for accessing the internet.
  + Possible $30 alternative: <http://www.walmart.com/ip/41279506?wmlspartner=wlpa&adid=22222222227028952195&wl0=&wl1=g&wl2=c&wl3=61827980169&wl4=&wl5=pla&wl6=98335921449&veh=sem#about>
* Verizon MiFi 4G LTE USB modem
  + Hardware is free, but there is a monthly fee and 2 year contract (basically it’s a cell phone plan)
  + <http://www.verizonwireless.com/internet-devices/verizon-mifi-4g-lte-global-usb-modem-u620l/>

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## 955 – CERES Critical Design Review Presenter – Position 1

**Content**

As CERES project manager, I would like to update the University of Washington aeronautics community on the progress on the CERES capstone project through the presentation of a Critical Design Review.

**Definition of Done**

[ ] Create a power point presentation and present to Andrew McComas for verification.

[ ] Make a 20 minute long presentation on April 29th, 2016.

[ ] Updates within the CDR should include the following:

1. System Requirements:  Specifications that must be met and general context of the system to be designed.
2. Problem statement
3. Motivation/background
4. Customer specifications
5. The selected design approach
6. Key features of the selected design in detail
7. Status of design progress covering all systems and subsystems
8. Risks and risk mitigation
9. Budget status
10. Schedule status
11. Environmental implications
12. Ethical considerations

## 956 – CERES Critical Design Review Presenter – Position 2

**Content**

See 955 – CERES Critical Design Review Presenter – Position 1

**Notes**

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## 957 – CERES CDR Fluids Preperation – Position 1

**Content**

As a fluids engineer and a member of the CERES team, I would like to compile the current fluids team progress and post process the Dempsey Indoor Flight test results for the CDR.

**Definition of Done**

[ ] Post process the flights fluid coverage patterns.

[ ] Determine volume flow rates of test.

[ ] Document fluids test cards.

[ ] Analyize the hyperspectral image of the Roma plants.

[ ] Document the weight changes in the butcher paper.

**Notes**

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## 958 – CERES CDR Fluids Preperation – Position 2

**Content**

See 957 – CERES CDR Fluids Preperation – Position 1

**Notes**

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## 959 – CERES GNC CDR Preperation

**Content**

As a GNC engineer and a member of the CERES team, I would like to compile the current GNC team progress and post process the Dempsey Indoor Flight test results for the CDR.

**Definition of Done**

[ ] Document Dempsey flight logs for flight processing.

[ ] Document Dempsey GNC procedure.

[ ] Document upcoming GNC checkpoints.

**Notes**

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## 960 – CERES Structural CDR Preparation

**Content**

As a structures engineer and a member of the CERES team, I would like to compile the current structures team progress and post process the Dempsey Indoor Flight test results for the CDR.

**Definition of Done**

[ ] Document the final test rail and launcher configurations.

[ ] Find final carrier speeds for test rail and launcher tests.

**Notes**

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## 961 – Dempsey Flight Test Structures Preparation - Main

**Content**

As a structures engineer and a member of the CERES team, I would like to ensure the test structures are ready for the indoor flight test.

**Definition of Done**

[ ] Test the flight structures and ensure strucutral integretiy during the flight test.

[ ] Find final carrier speeds for test rail and launcher tests and verify they are in the desired range.

[ ] Make any machine shop modifications to ensure final configurations.

**Notes**

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## 962 – Dempsey Flight Test Structures Preparation - Helper

**Content**

See 961 – Dempsey Flight Test Structures Preparation - Main

**Notes**

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## 963 – Dempsey Flight Test GNC Preparation

**Content**

As a GNC engineer and a member of the CERES team, I would like to ensure the test structures are ready for the indoor flight test.

**Definition of Done**

[ ] Test the GNC and ensure system integretiy during the flight test.

[ ] Make any modifications to ensure final configurations.

**Notes**

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## 964 – Dempsey Flight Test Fluids Preparation – Position 1

**Content**

As a fluids engineer and a member of the CERES team, I would like to ensure the fluids structures are ready for the indoor flight test.

**Definition of Done**

[ ] Test the fluids system and ensure system integretiy during the flight test.

[ ] Make any modifications to ensure final configurations.

**Notes**

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## 965 – Dempsey Flight Test Fluids Preparation – Position 2

**Content**

As a fluids engineer and a member of the CERES team, I would like to ensure the fluids structures are ready for the indoor flight test.

**Definition of Done**

[ ] Test the fluids system and ensure system integretiy during the flight test.

[ ] Make any modifications to ensure final configurations.

**Notes**

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## 966 – Dempsey Flight Test Integration Preparation

**Content**

As a systems engineer and a member of the CERES team, I would like to ensure the CERES system is ready for the indoor flight test.

**Definition of Done**

[ ] Test the CERES system and ensure system integretiy during the flight test.

[ ] Use the CoMotion Maker Space to 3D print the necessary mounts for the CERES fluids system and landing skids.

[ ] Make any modifications to ensure final configurations.

**Notes**

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## 967 – Dempsey Flight Test

**Content**

As a member of the CERES team, I would like to test the CERES system in Dempsey Indoor.

**Definition of Done**

[ ] Participate in the Dempsey Indoor Flight Test on April 24th.

**Notes**

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## 968 – Dempsey Flight Test

**Content**

As a member of the CERES team, I would like to test the CERES system in Dempsey Indoor.

**Definition of Done**

[ ] Participate in the Dempsey Indoor Flight Test on April 24th.

**Notes**

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## 969 – Dempsey Flight Test

**Content**

As a member of the CERES team, I would like to test the CERES system in Dempsey Indoor.

**Definition of Done**

[ ] Participate in the Dempsey Indoor Flight Test on April 24th.

[ ] Archive, label, and document all the data

**Notes**

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## 970 – Dempsey Flight Test

**Content**

As a member of the CERES team, I would like to test the CERES system in Dempsey Indoor.

**Definition of Done**

[ ] Participate in the Dempsey Indoor Flight Test on April 24th.

**Notes**

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## 971 – Dempsey Flight Test

**Content**

As a member of the CERES team, I would like to test the CERES system in Dempsey Indoor.

**Definition of Done**

[ ] Participate in the Dempsey Indoor Flight Test on April 24th.

**Notes**

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## 972 – Dempsey Flight Test

**Content**

As a member of the CERES team, I would like to test the CERES system in Dempsey Indoor.

**Definition of Done**

[ ] Participate in the Dempsey Indoor Flight Test on April 24th.

**Notes**

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## 973 – AFSL Large Multi-Rotor Purchase

**Content**

As a UAS operator, I would like to research and purchase a large scale, professional multi-rotor system that I can use as a research platform for AFSL endeavors.

**Definition of Done**

[ ] Multi-rotor capable of > 15min flight time (longer is better)

[ ] Survey Planning capabilities

                  [ ] Specify area of interest in flight planning software package

                  [ ] Software package will compute appropriate flight path and carry out mission safely with limited user interaction (mission planner)

[ ] Fully-autonomous operation (takeoff, mission execution, landing)

[ ] COTS visible mirrorless DSLR (e.g. Sony NEX-5 with 20mm lens ~450g)

[ ] Remote shutter triggering capability based on time/distance (IR LED trigger for NEX-5 connected to Pixhawk would work)

[ ] GPS logging with time, lat, lon, and elevation (not just altitude) at high sampling rate

                  [ ] Marks for camera trigger events

[ ] Basic RC radio for manual operation if necessary

[ ] 6-8 extra batteries

[ ] Spare parts for 5-10 missions (arms, props, etc.)

[ ] Look into purchasing 3DR Solo edu bundles with remaining funds

                  [ ] Integrate a good survey camera in the accessory bay-- something like the lens-style camera by 3DR and Sony (more info in notes)

[] Look into Piksi high accuracy GPS

[ ] Look into DragonLink long rang UHF

[ ] Look into Head-tracking Gimbal

[ ] Look into mapping gimbal

[ ] Look into antenna tracking

[ ] Look into Parachute system

**Notes**

* We would like have a flexible platform that can lift larger payloads with longer endurances.
* A popular commercially available platform is the Spreading Wings S1000, or S1000+.
* S1000+ with Pixhawk - <https://www.youtube.com/watch?v=59ObqXdThFM>
* We would like to try to keep the budget around $5000
* 3DR recently partnered with Sony to add a lens-style camera (<http://www.sony.com/electronics/attachable-lens/t/lens-style-cameras>) for their enterprise Site Scan service (<https://3dr.com/3dr-launches-site-scan-enterprise-solo-drone/>).
* However, we only need the hardware and mission planning/execution functionality, not the processing/distribution. They don’t sell the hardware only however.
* We should be able to adapt a Solo to do something like this on our own

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## 974 – AFSL Large Multi-Rotor Purchase (copy)

**Content**

Copy of user story 973

**Definition of Done**

Copy of user story 973

**Notes**

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## 975 – Kalman Filter Implementation in Demo Scenarios (Part 2)

**Content**

As a software developer, I would like to implement the Kalman Filter code written for the TRAPIS project for use with a demo of the proposed JCATI 2015 flight demonstration scenario

**Definition of Done**

[x] Develop a method for implementing Kalman Filter estimates in the current flight demonstration scenarios associated with the JCATI 2015 project

[x] Test the Kalman Filters with a variety of scenarios and ensure that the position estimates generated by the filters are accurate

[x] Change the covariance and error matrices as necessary to ensure that the Kalman Filters perform at a desired level for the demo scenarios and ultimately the real flight test.

[x] Present results to group

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## 976 – Enclosed Trailer Purchase

**Content**

As a experimentalist, I would like to research and procure an enclosed trailer to be used as a moble command station for flight operations.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story

[ ] Present results to group

Notes

* Spoke with Dan Alter on 05/12/16 (221-3202, [alterd@uw.edu](mailto:alterd@uw.edu) ) at UW fleet services regarding trailers
  + Trailers do not need to be managed by fleet services as it does not have an engine
  + We should be able to get exempt plates for the trailers so we do not have to continually pay for tabs.
  + If the trailer is new, make sure you get the Manufacture Statement of Origin (MSO) so that you can get a title later.
  + Make sure you obtain a document showing that you paid sales tax otherwise you’ll need to pay this again.
* UW ME Formula SAE and UW CEE Concrete canoe have trailers.
* You need to talk with Office of Risk Management to ensure that insurance is covered. We need to make sure that the vehicle towing the trailer is rated to tow the trailer. This weight is based on the maximum amount the trailer is rated to carry, not the actual weight of the trailer.
* If purchasing used, make sure the title is signed over to ‘University of Washington’, not the private individual who purchases it.
* If possible, obtain a document showing that we paid sales tax otherwise this will need to be paid at the time of registration.
* At time of purchase, make sure to check the trailer plate (usually near the front) to ensure that the VIN, date, etc. line up with the title.
* Once we’ve procured the trailer, get back in contact with Dan Alter and he can help put us in touch with Bill Pierre Auto who is familiar with UW licensing of vehicles.

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## 977 – TRAPIS ADS-B Retractable Antenna Design

**Content**

As a mechanical engineer I would like to design a means of deploying and stowing the ADS-B antenna on a Skywalker X8.

**Definition of Done**

[ ] Coordinate with Ward Handley and Bobby Larson

[ ] Generate one or more designs that meet the following criteria:

[ ] Antenna is belly mounted

[ ] Antenna is 100% within the aircraft body when stowed (does not require bay doors)\*

[ ] Antenna is roughly perpendicular to the aircraft body when deployed

[ ] Antenna can reliably be deployed/stowed by toggling a switch on a standard TGY iA10 controller\*\*

[ ] The antenna cable has strain relief to avoid excessive kinking, twisting or pulling

[ ] There is an RF shield (e.g. sheet metal) between all avionics (pixhawk, GPS, TRAPIS payload) and the ADS-B antenna

[ ] Present ideas (with sketches) to the JCATI-2015 team

Notes

* \* easiest to base your design on a commonly implemented hobby drone landing gear system
* \*\* use a standard servo like the ones used for the aircraft flaps or the CONDOR camera gimbal

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## 978 – TRAPIS ADS-B Retractable Antenna Design (Helper)

**Content**

* See 977 – TRAPIS ADS-B Retractable Antenna Design

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## 979 – TRAPIS ADS-B Retractable Antenna Implementation

**Content**

As a mechanical engineer I would like to implement the design for deploying and stowing the ADS-B antenna on a Skywalker X8.

**Definition of Done**

[ ] Clear all airframe modifications with Dr. Lum

[ ] Modify airframe according to the design in 977 – TRAPIS ADS-B Retractable Antenna Design

[ ] Fabricate/acquire mechanical parts as necessary

[ ] Ensure RF shielding has minimal gaps, holes, etc. One large, smooth, monolithic piece is best.

[ ] Link antenna actuation to an unused transmitter/receiver channel

[ ] Verify functionality through extensive ground testing

[ ] Goal is 100% reliability

[ ] Verify that the antenna cable strain relief minimizes kinking/twisting/pulling during actuation

Notes

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## 980 – TRAPIS ADS-B Retractable Antenna Implementation (Helper)

**Content**

* See 979 – TRAPIS ADS-B Retractable Antenna Implementation

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## 981 – Wake Estimator: C# Mapping Tools

**Content**

As a software developer I would like to build a suite of C# mapping tools to support Wake Estimator visualization.

**Definition of Done**

[ ] Write UWCorridorLLA and UWCorridor3DLLA classes to define wake vortex corridors.

[ ] Write UWCorridor3DLLAExtensions methods to support KML output for Google Earth visualizations of wake vortex corridors.

Notes

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## 982 – Wake Estimator: C# Vortex Evolution Model

**Content**

As a software developer I would like to implement Greene’s wake vortex evolution model in C#.

**Definition of Done**

[ ] Write a set of classes and methods to calculate wake vortex corridors given a VehicleDatabase object and express them as UWCorridor3DLLA objects.

Notes

* Implemented as WakeEstimator, WakeEstimatorModel, and WakeEstimatorParameters.cs

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## 983 – Wake Estimator: C# UI and Database Visualization

**Content**

As a software developer I would like to visualize the VehicleDatabase based on TRAPIS UI inputs.

**Definition of Done**

[ ] Implement TRAPIS UI control of the Wake Estimator using a timer.

[ ] Write WakeEstimatorDatabase and WakeEstimatorDatabaseVisualizer classes to calculate and output wake corridors as KML

Notes

* The WakeEstimatorDatabase and WakeEstimatorDatabaseVisualizer classes are heavily based on the VehicleDatabase and VehicleDatabaseVisualizer classes, but have been created to separate TRAPIS from an extension application (i.e. the Wake Estimator)

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## 984 – Master’s Thesis Polishing (Handley)

**Content**

As a student, I would like to write my Master’s thesis so I can graduate.

**Definition of Done**

[ ] Revise thesis rough draft per comments from committee members.

[ ] Clean up figures, double check calculations, verify correct citations, etc.

**Notes**

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## 985 – Custom Mission Planner Build

**Content**

As a software developer, I would like to build Mission Planner from source code so that I can make custom modifications to it to support custom flight modes.

**Definition of Done**

[ ] Coordinate with Chris Lum AND Gage Winde before starting this user story.

[ ] Follow the steps outlined at \\VisualAnchoring\TechnicalDataPackage\MissionPlannerModification\MissionPlannerBuildNotes.docx and build the custom version of Mission Planner located at \\VisualAnchoring\MissionPlannerUW.

[ ] Walk through the steps outlined at <http://ardupilot.org/dev/docs/buildin-mission-planner.html> to build the latestet version of Mission Planner using Visual Studio.

[ ] Find the latest, stable branch of Mission Planner and download it to a folder similar to the \\VisualAnchoring\MissionPlannerUW folder. Consult with Chris and Gage BEFORE you check this into Perforce.

[ ] Add to the \\VisualAnchoring\TechnicalDataPackage\MissionPlannerModification\MissionPlannerBuildNotes.docx to reflect steps necessary to build the latest version of Mission Planner from source code. Do NOT delete the old notes, simply move these to an Appendix.

[ ] Integrate the custom UW changes into the new version of Mission Planner.

[ ] Verify that you can build this on another machine.

[ ] Verify that this works with the custom flight mode on ArduPlane.

[ ] Check results with Chris and Gage

[ ] Present results to group.

**Notes**

* The goal of this story is to take the existing custom UW version of Mission Planner and move these changes to the newer version.
* Be sure to add notes about the relevant version numbers of Mission Planner.
* Print the above mentioned tutorial to a pdf and embed this into the build notes document so that we have this in case the website/link is ever changed.

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## 986 – Custom ArduPlane Build

**Content**

As a software developer, I would like to build ArduPlane from source code so that I can make custom modifications to it to support custom flight modes.

**Definition of Done**

[ ] Coordinate with Chris Lum AND Gage Winde before starting this user story.

[ ] GAGE TO FILL OUT ADDITIONAL TASKS

**Notes**

* The goal of this story is to take the existing custom UW version of ArduPlane and move these changes to the newer version.
* Be sure to add notes about the relevant version numbers of ArduPlane/ArduPilot.
* Print the above mentioned tutorial to a pdf and embed this into the build notes document so that we have this in case the website/link is ever changed.

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## 987 – Outfit the Mobile Flight Operations Center (MFOC) (Position 1)

**Content**

As a UAS operator, I would like to build the Mobile Flight Operations Center (MFOC) so that I can use it for flight operations.

**Definition of Done**

[ ] Coordinate with Chris Lum before starting this user story.

[ ] Review documents at \\FlightOperations\UAS\MFOC

**Structural**

[ ] Apply an undercoat to the trailer to prevent water damage

[ ] Install an addition ¾” plywood with T-nuts installed on the floor. This will be used to secure various items to the floor and avoid drilling/securing directly to the DryMax board.

[ ] Install jackstands on rear of trailer so it can be used without being hooked up to a tow vehicle.

[ ] Design a computer desk and workspace for the GCS (see notes)

[ ] Design shelving to hold various items (see notes)

[ ] Design a method to route various cables and connectors out of the MFOC while keeping the system enclosed and weatherproof (see notes)

[ ] Design/install a whiteboard

[ ] Design a method to store/house the generator and gas cans outside of the MFOC. This should be lockable.

**Electrical**

[ ] Design an electrical system so that MFOC can be plugged into shore power and run off batteries (see notes)

[ ] Design a audio system (computer, cell phone audio, iPod, etc. can utilize this)

[ ] Install carbon monoxide detector (Chris Lum purchased this unit)

[ ] Install overhead lighting (should be 12 volt so it can be run from battery)

[ ] Review all potential designs with Chris Lum before implementing them.

[ ] Install upgrades to the MFOC

[ ] Update documentation located at

[ ] \\FlightOperations\UAS\MFOC\ConstructionAndMaintenenceLog.docx

[ ] \\FlightOperations\UAS\MFOC\MFOCUserManual.docx

[ ] Field test the MFOC

[ ] Present results to research group.

**Notes**

* Electrical: some applicances to take into account for this system are
  + Two computer monitors
  + GCS computer
  + One TV/VCR combo
  + Aircraft battery charger
  + Cell phone chargers
  + Assorted other small chargers
  + Video Rx unit
  + Air conditioner
  + Microwave
  + Refridgerator
  + Water pump (Chris purchased this already)
* The walls of the trailer are not structural. Therefore, the tables and shelving should have legs so most of the load is transferred to the floor. The shelving can be attached to the wall to provide some lateral stability but the majority of the load should be taken by the legs and the floor.
* Some cabling that may need to be routed out of the trailer include
  + Electrical power
  + Hot air exhaust from air conditioner
  + Ethernet line
* Some good URLs to example trailers include
  + Mobile Laboratory
    - <http://makezine.com/2010/05/14/make-it-anywhere-with-a-mobile-lab/>
    - <http://makezine.com/2010/05/26/make-it-anywhere-part-2-mobile-lab/>
    - <http://makezine.com/2010/05/14/make-it-anywhere-with-a-mobile-lab/>
    - <http://makezine.com/2010/07/26/make-it-anywhere-part-4-mobile-lab/>
  + Cheap RV Living
    - <http://www.cheaprvliving.com/living-converted-cargo-trailer/>
    - <http://www.cheaprvliving.com/conversion-details/converting-a-ford-transit-connect/>
  + University or National Labs
    - <http://nees.ucla.edu/hpmn.html>
    - <http://www.cleggind.com/specialtytrailers/346_Oakridge_Lab/index.htm>

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## 988 – Outfit the Mobile Flight Operations Center (MFOC) (Position 2)

See 987 – Outfit the Mobile Flight Operations Center (MFOC) (Position 1)

## 989 – Outfit the Mobile Flight Operations Center (MFOC) (Position 3)

See 987 – Outfit the Mobile Flight Operations Center (MFOC) (Position 1)

## 990 – Fusion of Kalman Filter Vehicle Position Estimates (Helper)

**Content**

As a software developer, I would like to develop an algorithm to fuse the estimates from the Kalman Filters for each aircraft into one continuous estimate

**Definition of Done**

[ ] Create the events required to log estimated and fused TRAPIS packets.

[ ] Create the EstimateLogger and FusedLogger to store the computed TRAOIS packets.

[ ] Ensure that all unit tests of this software pass.

**Notes**

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## 991 – TEDD Documentation Infrastructure

**Content**

As a TEDD operator, I would like to reorganize the TEDD specific documentation so I can use it to compile notes related to the system and use this for furture documentation.

**Definition of Done**

[ ] Coordinate with Chris Lum

[ ] Create a generic Skywalker 1900 aircraft flight manual (AFM) (see \\FlightOperations\UAS\Skywalker\_X8\UW\_Skywalker\_X8\_AFM.docx

[ ] Reorganize the information in the \\FlightOperations\UAS\TEDD\OperationalChecklistsAndNotes.docx document and use this to create and aircraft flight manual for TEDD (for example see how \\FlightOperations\UAS\HAPRA\HAPRAAircraftFlightManual.docx is derived from the generic Skywalker X-8 manual)

[ ] Delete the old document and ensure the new document has an official publication number and update the file \\TechnicalDataPackage\AFSLPublicationNumbers.docx

[ ] Review results with Chris Lum

[ ] Present results to research group.

**Notes**

* The new TEDD AFM will be used to hold notes on this system in the future

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## 992 – TEDD Flight Testing and Workflow Validation

**Content**

As a UAS operator, I would like to conduct a series of flight tests campaigns with the TEDD aircraft so I can be confident in it’s operation and understand the data processing workflow.

**Definition of Done**

SYSTEM INTEGRATION

[ ] Coordinate with Chris Lum before starting

[ ] Get TEDD airthworthy (Design and 3D print skid to protect camera and camera corver servo during landing process)

[ ] Integrate the the Canon S100 into the system (see notes in the TEDD AFM for instruction)

[ ] Conduct a “ground test” to ensure that the system is operating correctly and taking photos with the Canon S100.

[ ] Use the RedEdge dummy camera for fit checking and integration into TEDD. Check to make sure the weight is correct.

FLIGHT TESTING

[ ] Plan dates for 3 flight test campaigns

[ ] Creating flight plans and test cards for these missions. Examples are located at \\FlightOperations\Operations\Missions

[ ] Additional tasks TBD

DATA REDUCTION

[ ] Download and analyze data

[ ] Create orthorectified mosaics

[ ] Create DEM

[ ] Create NDVI maps

[ ] Other tasks TBD

**Notes**

* The goal of this story is to conduct several flight test campaigns (perhaps 2-3 tests) to collect aerial imagery.
* After we collect aerial imagery, we want to download, geotag, and process this to create orthorectified mosaics, digital elevation maps, and other mapping information. We will use AgiSoft Photoscan Pro to do this.
* Earth and Space Sicences department has a license to Agisoft PHotoscan, we will process the data in the QRC (in Johnson Hall)
* Philipe and Aleksander were two student who worked on this previously.
* The MicaSense RedEdge camera will also be used. (\\FlightOperations\UAS\CommonDocuments\MicaSense\_RedEdge)
* Meadowbrook farm info is located at \\FlightOperations\Operations\TestSiteInformation\MeadowbrookFarm
* Paper describing mosaics, DEMs, and NDVI maps are located at \\Mapping\TechnicalDataPackage\ConferencePaper\Paper\Final Paper 101 Christopher Lum.docx
* Coordenate with Brendan, Tedaj, Vitor and Al Creigh for fligths ops.

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## 993 – BARNSTORMER Walk around test

**Content**

As a part of the CERES GNC team, I would like to rvaluate the effectiveness of the control system by conducting a walk around test on Rainier Vista.

**Definition of Done**

[ ] Determine if the controls system is capable of commubicating with the HIL.

[ ] Physically conduct a walk around test to ensure waypoints are checked met in the right order and the flight plan updates accordingly in Mission Planner.

[ ] Ensure that a dispersal command is sent off.

[ ] If the HiL simulation confirms success, attempt a walk around test with the actually airframe.

[ ] Record all findings.

[ ] Present results to research group for feedback

**Notes**

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## 994 – Meadowbrook Flight Test Structures Preparation and Modification

**Content**

As a structures engineer and a member of the CERES team, I would like to ensure the test structures are ready for the indoor flight test.

**Definition of Done**

[ ] Incorporate changes to the build from lessons learned at Dempsey Indoor.

[ ] Test the flight structures and ensure strucutral integretiy during the flight test.

[ ] Find final carrier speeds for test rail and launcher tests and verify they are in the desired range.

[ ] Make any machine shop modifications to ensure final configurations.

**Notes**

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## 995 – Meadowbrook Flight Test GNC Preparation

**Content**

As a GNC engineer and a member of the CERES team, I would like to ensure the test structures are ready for the indoor flight test.

**Definition of Done**

[ ] Test the GNC and ensure system integretiy during the flight test.

[ ] Make any modifications to ensure final configurations.

[ ] Create any flight test cards necessary to validate the system and record in AFSL\FlightOperations\Operations\Missions\16\_06\_04\_meadowbrook\ProceduresAndChecklists..

**Notes**

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## 996 – Meadowbrook Flight Test Airframe Preparation

**Content**

As an aerospace engineer and a member of the CERES team, I would like to ensure the CERES airframe is ready to preform the necessary flight tests.

**Definition of Done**

[ ] Ensure the internal airworthiness of CERES by checking that the batteries, pixhawk, etc are all secured.

[ ] Install the airspeed sensor to the aircraft.

[ ] Make any necessary repairs after the Dempsey Tests to ensure airworthiness.

[ ] Ensure spare props and any other props are packed with the airframe.

[ ] Attach Brendan’s registration number to the airframe.

[ ] Calibrate the airspeed sensor and autotune controler.

**Notes**

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## 997 – Meadowbrook Flight Test logistic Preparation

**Content**

As an project manager and a member of the CERES team, I would like to ensure the logisitics are ready for the flight test and the necessary parties are informed of the details of the test.

**Definition of Done**

[ ] Hold a join flight test preparation meeting with the CERES team and the attending junior project team and AFSL members.

[ ] Ensure a pilot will be in attendence.

[ ] Make a packing list and ensure everything is documented in AFSL\FlightOperations\Operations\Missions\16\_06\_04\_meadowbrook\ProceduresAndChecklists.docx.

[ ] Contact TLG Aerospace to give times and directions.

**Notes**

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## 998 – Meadowbrook Flight Test logistic Preparation - Helper

**Content**

See 997 – Meadowbrook Flight Test logistic Preparation

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## 999 – Meadowbrook Flight Test

**Content**

As a member of the CERES team, I would like to test the CERES system in Dempsey Indoor.

**Definition of Done**

[ ] Participate in the Meadowbrook Indoor Flight Test on May 14th, 2016.

**Notes**

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## 1000 – Meadowbrook Flight Test

**Content**

As a member of the CERES team, I would like to test the CERES system in Dempsey Indoor.

**Definition of Done**

[ ] Participate in the Meadowbrook Indoor Flight Test on May 14th, 2016.

**Notes**

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