PROJECT MANAGEMENT PLAN

EGH450 Group 1

Group Members:

Name	Student Number	Role
Hope Sneddon	n9940359	Project Manager
Ross Watson	n9560807	Airframe, Power and Propulsion
Claire Ulrich	n10083499	Payload Deployment
Monica Fitzpatrick	n9731083	Autopilot Navigation and Localization
Jonathan Salazar	n9969071	Operator interfaces
Elliot McPherson	n9989277	Airframe, Power and Propulsion
Harry Akeroyd	n9997121	Target Acquisition and Image Processing

Version History/ Revision Record

Version	File Name	Description of Issue	Date	Approved
1.0	349G1-PM-PMP-01	Initial Issue	21/03/19	Hope Sneddon
2.0	349G1-PM-PMP-02	Revision of System Requirements and ConOps because of draft feedback	25/03/19	Hope Sneddon
3.0	349G1-PM-PMP-03	Finalisation of week 4 submitted elements, Inclusion of work packet descriptions, budgets and timelines (gantt chart)	03/04/19	Hope Sneddon
4.0	349G1-PM-PMP-04	Week 6 Submission version	14/04/19	Hope Sneddon
5.0	349G1-PM-PMP-05	Semester 1 submission	23/04/19	Hope Sneddon
6.0	450G1-PM-PMP-06	Semester 2 version (updated gantt chart and WBS)	25/07/19	Hope Sneddon

Contents

Tables and Figures

1.0 Definitions

UAVUSR	UAV for Urban Search and Rescue
UAV	Unmanned Aerial Vehicle
QUT	Queensland University of Technology
ConOps	Concept of Operations
GPS	Global Positioning System
PMP	Project Management Plan
TS	Trade Study
RC	Radio Controlled
ESC	Electronic Speed Control
USB	Universal Serial Bus
FTP	File Transfer Protocol
APM	ArduPilot Mega
BEC	Battery Eliminator Circuit
PWM	Pulse Width Modulation
TTL	Transistor-Transistor Logic
UART	Universal Asynchronous Receiver and Transmitter
GCS	Ground Control Station
FTDI	Future Technology Devices International
RD	Reference Document
REQ	Requirement
F	Functional (Requirement)
S	System (Requirement)
U	User (Requirement)

2.0 Introduction

2.1 Scope

This project aims to develop a UAVUSR that is able to successfully and autonomously conduct constant search around a simulated urban environment after a natural disaster event. During its mission, the UAV must identify and locate two human targets and deploy the correct emergency medication. Throughout the design and delivery of this project, the UAVUSR will be designed in accordance with industry-standard Systems Engineering practices (a rigorous and disciplined engineering methodology for complex projects) to ensure all customer requirements are met.

2.2 Background (as per RD/1)

The QUT Airborne Systems Lab (ASL) is a world-leading research centre based in Brisbane, Australia. QUT ASL conducts research into on autonomous technologies which support the development of autonomous aircraft with on-board sensor systems for a wide range of commercial applications. QUT Airborne Sensing Systems is known for its high-quality research and its ability to take leading edge research concepts from paper to flight-tested reality.

3.0 Reference Documents

3.1 QUT Avionics Documents

RD/1	SR19G1-UAVTAQ-2019-Urban Search and Rescue-2019-02-18-Final Customer Needs	UAV for Urban Search and Rescue – UAVUSR: 2019
RD/2	SR19G1-Template-PMP	Template for Project Management Plan

3.2 Non-QUT Documents

4.0 Project Aims and Approach

The following System Requirements have been developed in close accordance with the Customer requirements and High-Level Objectives. Completion of these System Requirements will be achieved via the specified work packets as seen in the Work Breakdown Structure (see section 10.0).

4.1 System Requirements

The system requirements have been derived from the High-Level Objectives presented in the UAV for URBAN Search and Rescue (UAVUSR). The requirements have been separated into three categories – functional (F), performance (P) and user (U) to denote their purpose. The requirements have been broken down from the high-level requirements into sub-requirements where relevant to highlight links between them. These will be used by the project manager to ensure the UAV design is adhering to all customer requirements and they also gives clear objectives for sub-system engineers to meet in their design process requirements.

NOTE: See 349G1-PM-SysReq-01F for full breakdown of system requirements.

4.2 Verification Table

Table 1: Verification of system requirements with high level objectives and project roles.

Requirements	HLO-M-1	HLO-M-2	HLO-M-3	HLO-M-4	HLO-M-5	HLO-M-6	HLO-M-7	HLO-M-8		Functional	Performance	User		PM	AIR/PRO/PWR	NAV	IMP	PAY	COM	OIF	FLT
[REQ-01-F]	X									X					X						
[REQ-01-01-F]	X									X					X						
[REQ-01-02-F]	X									X						X					
[REQ-01-02-01-F]	X									X						X					
[REQ-01-02-02-F]	X									X						X					
[REQ-01-03-F]	X									X				X	X		X	X			
[REQ-01-04-F]	X									X						X					
[REQ-01-04-01-U]	X											X								X	
[REQ-01-05-F]	X									X						X					X
[REQ-02-F]		X								X						X					
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[REQ-08-02-U]												X		X							

5.0 Project Organisation

5.1 Subsystem Roles and Responsibilities

Team Member	Subsystem	Code	Responsibilities
Harry Akeroyd	Target Acquisition and Image Processing	IMP	Designing camera observation systems and processing to determine patient type and location. Responsible for the integration of the image processing hardware and software with the rest of the UAV.
Hope Sneddon	Project Manager	PM	Coordination of Sub-system engineers and their roles. Documentation of management processes, Timelines and deliverables.
Monica Fitzpatrick	Autopilot Navigation and Localization	NAV	Integrating the ROS system with the rest of the UAV hardware and software sub-systems. Implementation of software and protocol to safely direct and land the UAV at a specified position upon completion of mission.
Claire Ulrich	Payload Deployment	PAY	Development through CAD of a payload carrying system that can deploy the correct payload when patient location and type are identified (IMP).
Ross Watson, Elliot McPherson	Airframe	AIR	Development of airframe assembly through the use of Computer-Aided Design (CAD) tools, circuit configuration, positioning of other sub-system hardware on board the UAV.
	Power	PWR	Analysis of electrical componentry and battery capabilities to provide adequate power to all UAV active sub-systems. Connection of power supplies to these sub-systems via circuitry.
	Propulsion	PRO	Configuration and procurement of the quad-motor propulsion system including circuitry and connection to accompanying sub-systems within the UAV.
Jonathan Salazar	Operator Interfaces	OIF	Development of visual displays based on wireless UAV communication and data processing. This includes development of the relevant software to procure the relevant data from the UAV navigation and image processing systems.
	Communications	COM	Responsible for ensuring all on-board and off board computers and corresponding software communicates effectively and as intended. As a result of this, they are also responsible for the relevant information being transferred to and from the UAV via the GCS, VICON and Raspberry PI (this role will require working heavily with Autopilot Navigation and Image Processing).

Table 2: Description of team member roles and responsibilities.

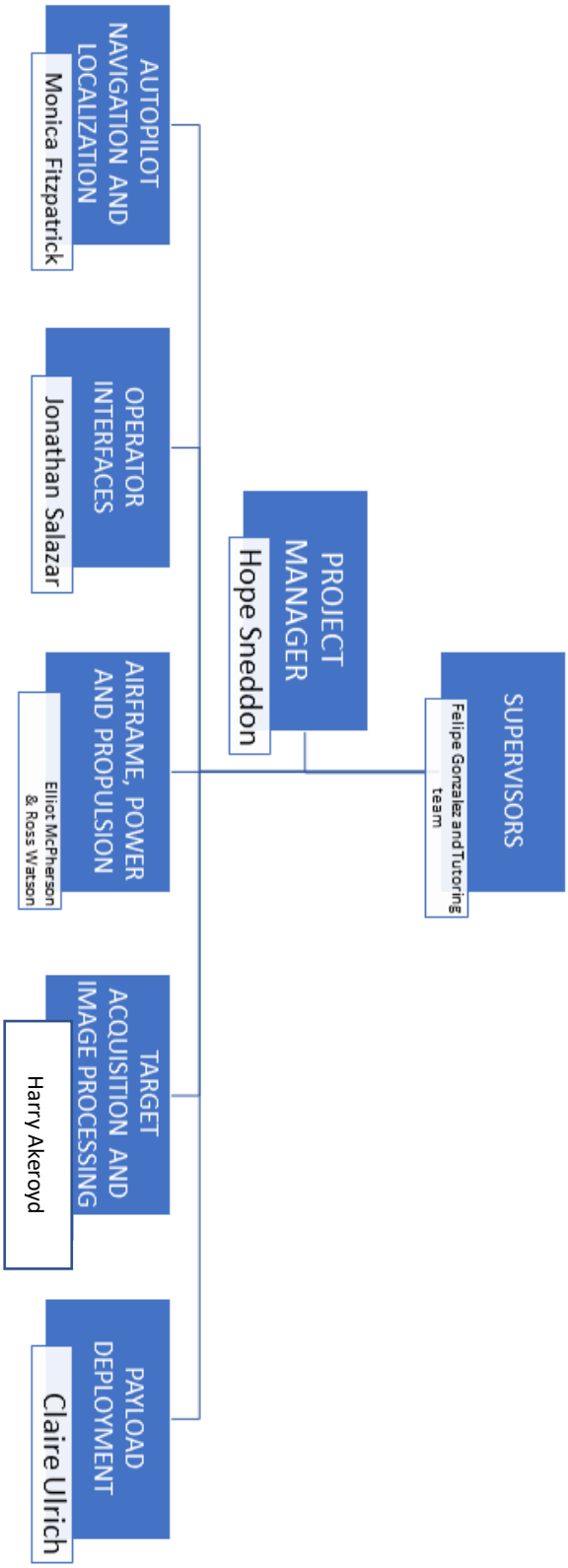


Figure 1: Breakdown of roles and project hierarchy.

5.2 Document Management

5.2.1 Document Templates

The document template used for the development of this report (see RD/2) was provided by the project supervisor, Felipe Gonzalez. The purpose of the template is to ensure that all members follow it as a guideline to ensure consistency and uniformity is maintained throughout this document developed by Group 1. Namely, it is important that the report includes all headings and sub-headings seen in the example documentation.

Additionally, all documentation should use Times New Roman font size 12 with 1.5 spacing. All headings should be formatted using Microsoft word ‘heading 1’ style and all sub-headings using ‘heading 2’. Documents shall be formatted with normal margins, with page numbers and subject code and group number located at the bottom of each page.

All document titles shall be initiated with the code ‘450G1’ to represent the course code (EGH450, documents beginning in ‘349G1’ are semester 1 versions) and group number (Group 1). The name shall then include the relevant subsystem code (see section 5.1), specific document abbreviation and version number. For example, version 1 of the Project Management Plan, predominantly pertaining to project management would be named as follows:

450G1-PM-PMP-01

5.2.2 Revision of Documents

Documents will be revised as the project evolves. For this purpose, documents with significant content changes (as deemed so by the project manager) should be saved as a new version (i.e. version number in document title should ascend upon progression of drafts). Additionally, any changes made to documents after a project deliverable (see 10.0 WBS) are required to be saved as a new version. Once a document has been completed, the final version should be saved separately with an ‘F’ following the version number. For example, the final version of the Project management Plan, assuming 3 versions were required to reach the final document to be submitted, will be labelled as follows:

450G1-PM-PMP-03F

5.2.3 Document and Media Storage

All versions of all documents should be saved to the EGB349/ EGH450 group 1 OneDrive folder. Within this folder, a sub-folder for each deliverable will exist as well as a folder for meeting minutes, a folder for general assessment documentation and a folder for ongoing based system architecture coding. Documents are be saved to the relevant folder based on assessment significance and time of creation.

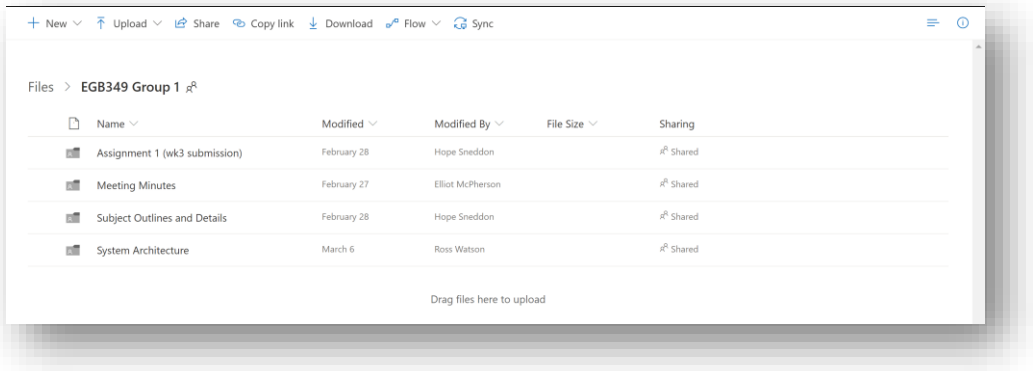


Figure 2: Example of Document Filing Protocol within OneDrive.

6.0 Resource Management

6.1 Human Resources

The project manager is responsible for the allocating an even amount of work amongst team members to achieve project outcomes on time and on budget. It is the responsibility of each team member to complete their allocated work by the specified due date. Team members shall consult with the project manager regarding any concerns that may arise over workload or other team members. In general, unless exceptional circumstances apply, all communication with EGB349 supervisors should be through/ via the project manager.

6.2 Financial Resource, Mass, Data, Power

As stated in the customer requirements (RD/1), the financial budget for this project shall not exceed $500. According to industry standards, 10% of this $500 budget will be set aside for unforeseen expenses and repairs in an emergency fund. The total budgeted cost comes to $449.11, shown in figure 6.2.1. However, many of the materials are simply provided to the group by the customer. Therefore, the budget shall apply only to the list of the materials that will need to be purchased in addition to the provided base kit. The final products that have been selected below varying brand/design based on the criterion of being financially lucrative and reliable while still meeting mass, power and data budgets.

Budgeting of electrical power and memory/ data between the UAV sub-systems is required as it is limited by the capacity of the onboard memory in the Raspberry PI and associated integrated circuits. The total power required for the UAV to function is approximately 222.366 Watts in hover (See power budget below). Given the choice of battery (46.62 Watt-hours), the UAV will be capable of executing mission-capable flight for a total time of 11.32 minutes (leaving 10% battery).

The mass budget is required to ensure the final UAV design is delivered with a final weight under 1.8kg as specified by the customer (See RD/1 and System Requirements). The final mass of the total system is estimated to be 1491.28g. This is 308.72g below the maximum allowable mass of 1800g.

Partitioning of these budgets (as developed below) between team members based on the sub-system requirements will ensure all system requirements are achieved in the most efficient way possible. The products selected to balance the financial, power, mass and data usage budget are outlined throughout tables 6.2.1, 6.2.2, 6.2.3. These criteria must be cohesively adhered to by all sub-systems for the overall project to succeed.

6.2.1 Financial Budget

Table 3: Financial budget including Customer-provided UAV equipment

Part	Link	Quantity	Price (Each)	Net Cost	Purchase Required
Airframe	https://hobbyking.com/en_us/s500-glass-fiber-quadcopter-frame-480mm-integrated-pcb-version.html	1	29.92	29.92	0
Motor	https://hobbyking.com/en_us/multistar-2212-920kv-multi-rotor-motor-set-w-cw-and-ccw-threaded-shafts-4pcs-box.html?___store=en_us&gclid=Cj0KCQjw5J_mBRDVARIsAGqGLZAiaHfBoqSdlpZh0Fm7mJQfK_i2xmgfYVwDeazkWDQLHeIpD1KB0qkaAhMWEALw_wcB&gclsrc=aw.ds	2	19.425	77.7	0
ESC	https://hobbyking.com/en_us/turnigy-plush-30amp-speed-controller.html?gclid=Cj0KCQjw5J_mBRDVARIsAGqGLZArNfwd7qR-5FylpJFkGMaI0vTogAB_Q0ZuS7NbdadCleMocn7BD6saApGsEALw_wcB&gclsrc=aw.ds	4	20.51	82.04	0
Props	*Included in motor package but four additional props were ordered from breaking initial ones during testing*	4	4.72	18.88	18.88
FCU	https://www.getfpv.com/acro-naze32-flight-controller-rev6-w-pin-headers.html	1	24.99	24.99	0
Raspberry Pi	https://www.raspberrypi.org/products/raspberry-pi-2-model-b/	1	64.5	64.5	0
Raspberry Pi camera	https://www.raspberrypi.org/products/camera-module-v2/	1	38.95	38.95	0
Servos	https://hobbyking.com/en_us/hxt900-micro-servo-1-6kg-0-12sec-9g.html	2	4.44	8.88	0
Buzzer	https://hobbyking.com/en_us/piezo-buzzer-for-kk2-kk2-1-naze32-flight-control-boards-1pc.html	1	6.31	6.31	0
Voltage Alarm	https://hobbyking.com/en_us/hobbykingtm-lipoly-low-voltage-alarm-2s-4s.html	1	3.96	3.96	0
USB 2 UART	https://shop.pimoroni.com/products/usb-to-uart-serial-console-cable	1	11.25	11.25	0
Battery	https://hobbyking.com/en_us/zippy-compact-3700mah-3s-25c-lipo-pack.html	1	36.2	36.2	0
Payload	Printed on site	0	0	0	0
Safety Button	QUT, assembled inhouse	1	5	5	0
Emergency financial reserves	10% of Budget	1	27.8	40.8	0
Total				**$430.5**	**$18.88**

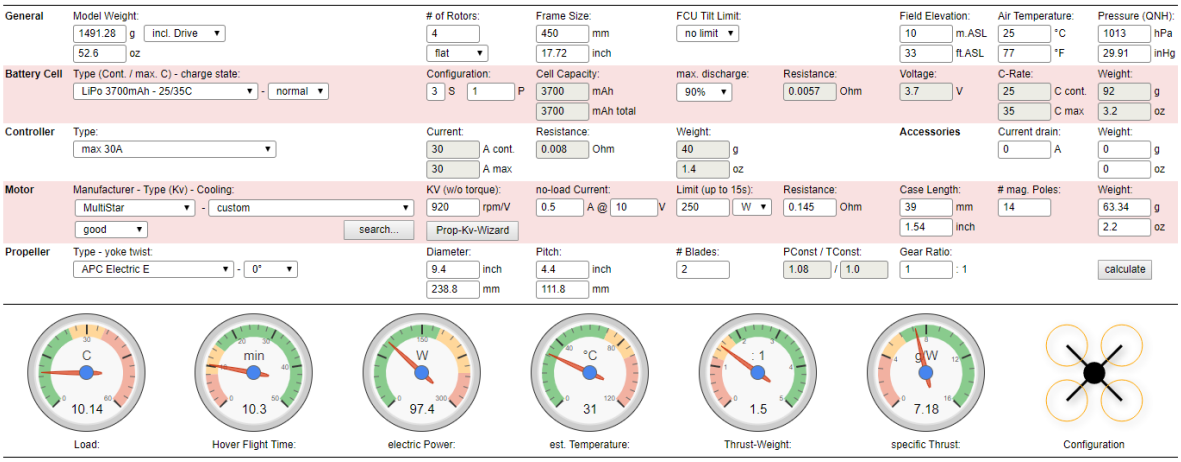
6.2.2 Power Budget

Part	Quantity	Amp draw (hover + idle current for computation)	Voltage (nominal)	Watts
Airframe	1	0	0	0
Motor	4	4.84	11.1	214.896
ESC	4	0	11.1	0
Props	2	0	0	0
FCU	1	0.2	11.1	2.22
PI	1	1	5	5
Pi camera	1	0	0	0
Servos	2	.05	5	.25
Buzzer	1	0	0	0
Voltage Alarm	1	0	0	0
USB 2 UART	1	0	0	0
Battery	1	0	0	0
Safety Button	1	0	0	0
Emergency reserves	1	0	0	0
Total				**217.37**
Total Power available (3700 MaH 3s pack) - full charge		**46.62 Watt-Hours**		

Preliminary in-house flight testing shows that for hover, the 4 motors will consume 114 Watts, producing approximately 372.82 grams of thrust each. Therefore, if the estimated AUW of the aircraft is 1491.28 grams (see mass budget 6.2.3), the system will have a theoretical flight time of 11.32 minutes (leaving the battery at 10%). Calculation:

$$Flight\ time\ in\ minutes = (\frac{46.62 * 0.90}{222.366}) * 60$$

This estimate is further validated by using e-calc - an online multirotor flight time calculator.



Remarks:

Battery	
Load:	10.14 C
Voltage:	10.46 V
Rated Voltage:	11.10 V
Energy:	41.07 Wh
Total Capacity:	3700 mAh
Used Capacity:	3330 mAh
min. Flight Time:	5.3 min
Mixed Flight Time:	8.5 min
Hover Flight Time:	10.3 min
Weight:	276 g
	9.7 oz

Motor @ Optimum Efficiency	
Current:	5.77 A
Voltage:	10.66 V
Revolutions*:	8970 rpm
electric Power:	61.5 W
mech. Power:	51.5 W
Efficiency:	83.6 %

Motor @ Maximum	
Current:	9.38 A
Voltage:	10.38 V
Revolutions*:	8193 rpm
electric Power:	97.4 W
mech. Power:	79.4 W
Power-Weight:	261.3 W/kg
	118.5 W/lb
Efficiency:	81.5 %
est. Temperature:	31 °C
	88 °F

Wattmeter readings	
Current:	37.52 A
Voltage:	10.46 V
Power:	392.5 W

Motor @ Hover	
Current:	4.84 A
Voltage:	10.73 V
Revolutions*:	5900 rpm
Throttle (log):	62 %
Throttle (linear):	70 %
electric Power:	51.9 W
mech. Power:	41.8 W
Power-Weight:	144.1 W/kg
	65.4 W/lb
Efficiency:	80.5 %
est. Temperature:	28 °C
	82 °F
specific Thrust:	7.18 g/W
	0.25 oz/W

Total Drive	
Drive Weight:	758 g
	26.7 oz
Thrust-Weight:	1.5 : 1
Current @ Hover:	19.35 A
P(in) @ Hover:	214.8 W
P(out) @ Hover:	167.2 W
Efficiency @ Hover:	77.8 %
Current @ max:	37.53 A
P(in) @ max:	416.5 W
P(out) @ max:	317.6 W
Efficiency @ max:	76.2 %

Multicopter	
All-up Weight:	1491 g
	52.6 oz
add. Payload:	422 g
	14.9 oz
max Tilt:	39 °
max. Speed:	39 km/h
	24.2 mph
est. rate of climb:	3.3 m/s
	650 ft/min
Total Disc Area:	17.91 dm²
	277.61 in²
with Rotor fail:	

6.2.3 Mass Budget

NOTE: from the System Requirements, the total mass of the UAV shall not exceed 1.8kg.

Table 4: Mass Budget assessed according to element-wise mass contributions

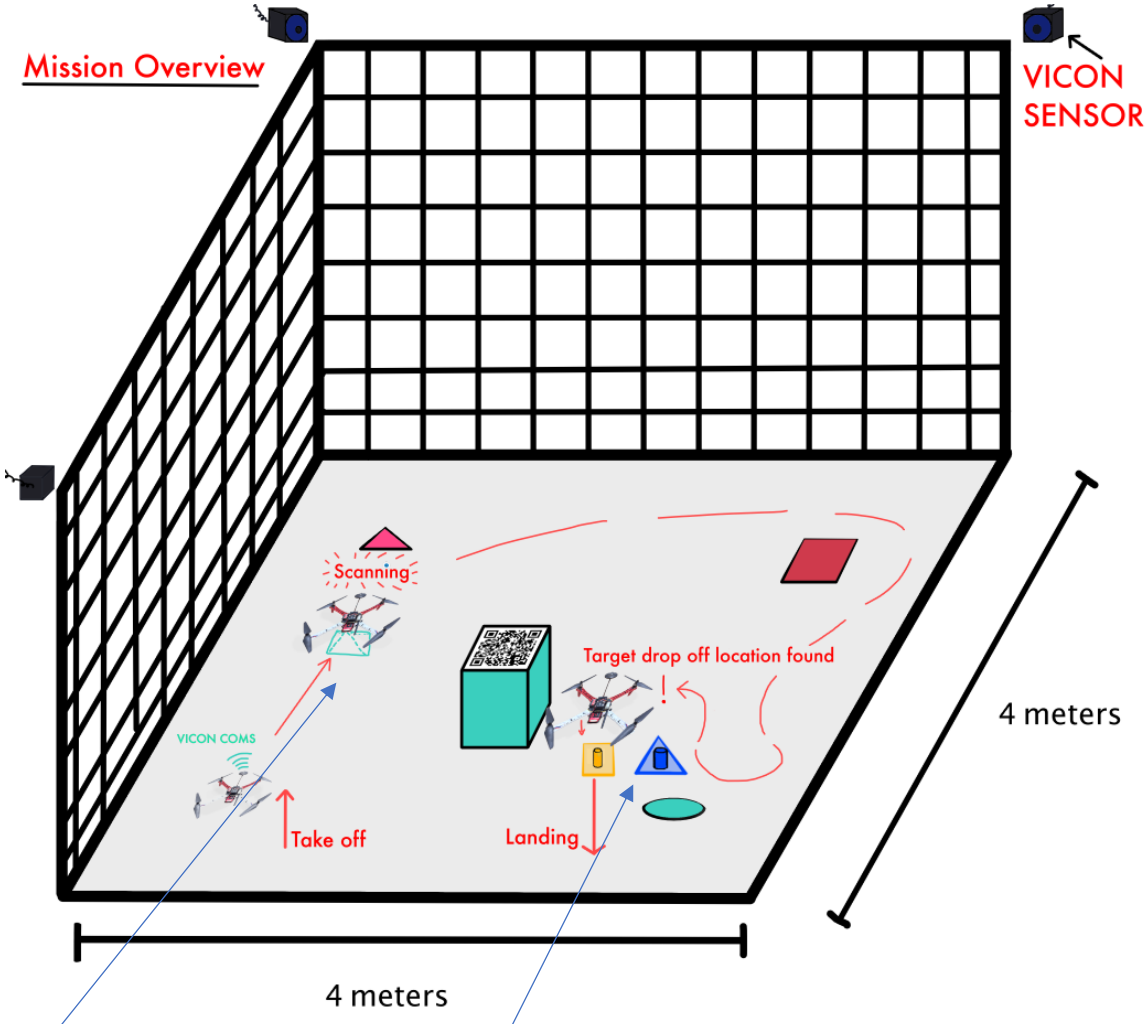
Part	Quantity	Mass (g) Per Item	Net Mass (g)
Airframe	1	435	435
Motor	4	63.34	253.36
ESC	4	27.17	108.68
Props	4	13.8	55.2
FCU	1	23.04	23.04
PI	1	42	42
Pi camera	1	3.47	3.47
Servos	2	9.8	9.8
Buzzer	1	2.42	2.42
Voltage Alarm	1	7	7
USB 2 UART	1	Not onboard	Not onboard
Battery	1	264	264
Safety Button	1	1.74	1.74
Payload estimate	1		150
Safety factor (10%)	1		135.57
Total Estimated Mass		892.78	1491.28
Total Actual Mass			1358

6.3 Physical Resource

Testing of the UAVUSR and UAVUSR sub-systems shall be performed exclusively in the QUT S-block level 9 Labs (S901) as well as in class as permitted by the project supervisors (for example during the week 11 demonstration). Within the S-block lab, a flight area similar to the one seen below will be present.

Figure 3: Flight/ mission testing area setup.

7.0 Concept of Operations



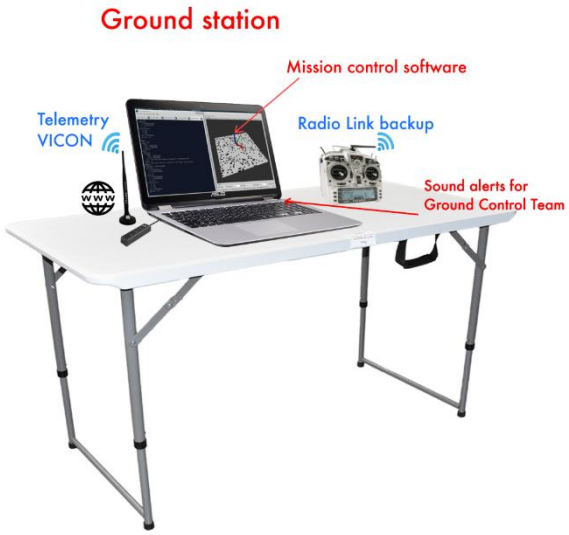


Figure 4: Close up of user interface on ground control station display.

7.1 Description of Concept of Operations Diagram

Operationally, the completed UAV aircraft will take off from a specified point in the flight area (as seen in the system requirements) and begin autonomous flight navigation. This is seen in the "Take-Off" phase above. The UAV will then navigate in stable flight to avoid obstacles within the search area and scan for specific visual markers identifying two different payload drop-off points. This is seen in the "scanning" phase above. The UAV image processing system must have zero tolerance for identifying false positives. All navigation data and images/ telemetry processed by the UAV will be transmitted to the ground station in real time and available on the user interfaces seen in the diagram. Once a marker has been identified, the UAV will hover above the marker for 10 seconds before deploying the appropriate payload. This is seen in the "Drop Off" phase. The UAV will then return to the "scanning" phase and repeat the process to identify the second marker. Finally, the UAV will autonomously land upon deploying both payloads to each marker.

8.0 System Architecture

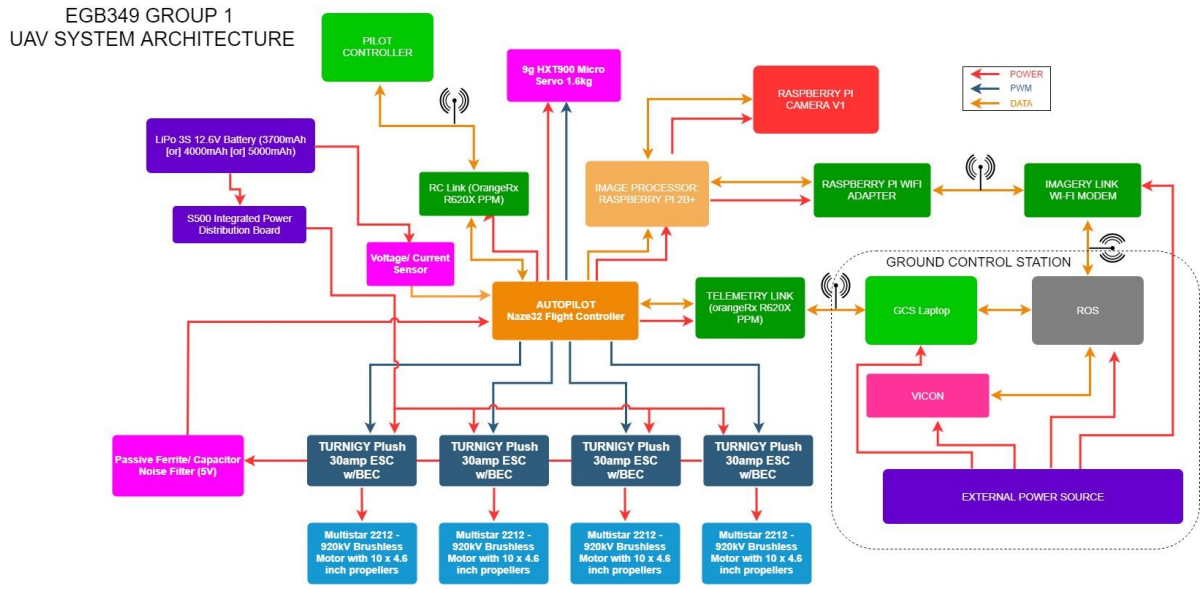


Figure 5: UAVUSR Full Systems Architecture.

The UAVUSR System Architecture is generated by partitioning the relevant subsystems that make up the on-board electronics and is used to clearly indicate how components and sub-systems communicate with each other. The autopilot is responsible for the computational processing required for the aircraft to navigate its mission without human input while remaining airborne. Using inputs taken from the RASPBERRYPI that is responsible for on-board image processing as well the VICON locational positioning, the autopilot can control the movement of the aircraft in a 3-dimensional space via 4 electric brushless motors in a ‘quad-copter’ configuration. The RASPBERRYPI receives raw, unprocessed imagery from a RASPBERRYPI camera module connected by ribbon cable.

The rotational speed of each motor is modulated with the use of an Electronic Speed Controller (ESC). All active electrical and associated mechanical systems are powered via a rechargeable LiPo battery housed on-board the UAVSR.

The autopilot communicates with the GCS via a Wi-Fi link to transmit live telemetry data and imagery. There is also a separate radio link to allow a pilot to take manual control of the UAVSR in the event of a system failure to safely recover the aircraft.

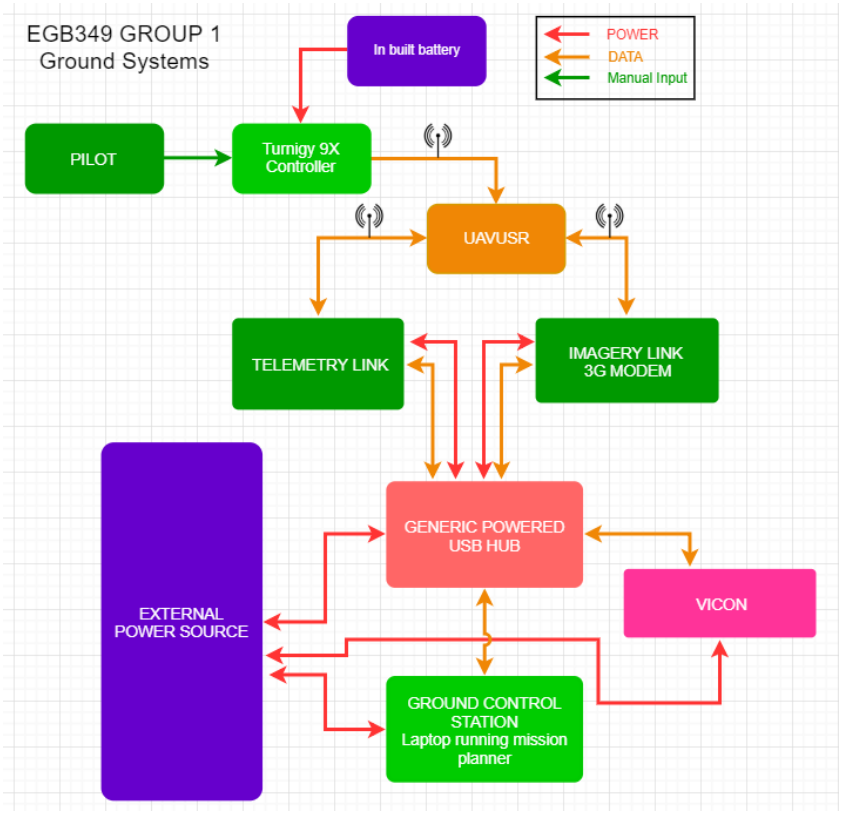


Figure 6: Ground Systems Architecture.

The Ground Systems Architecture displays the subsystems and components that interact with the ground control station. Ground control is responsible for the mission plan design and displaying live telemetry from the UAVUSR. The Ground Control Computer displays all this information to the team via a graphical interface. The mission plan is designed on the system and is sent to the UAVUSR autopilot via telemetry link and the entire ground control system is run and powered by an external power source with battery backup (laptop).

Imagery is taken by camera module which feeds directly into the Raspberry Pi, and software running on Pi will process the picture then find coordinates relative to the camera. The relative coordinates will be transmitted via the GCS, where localisation will occur, transforming relative coordinates into real-world coordinates. Real time location, telemetry and imagery can be received from the UAVUSR via the telemetry links on the connected Ground Control Computer. Instructions are sent back to the UAV autopilot which will then alter its flight course accordingly and any live imagery requested would be sent via the onboard 3G modem, especially for verification of the payload drop off.

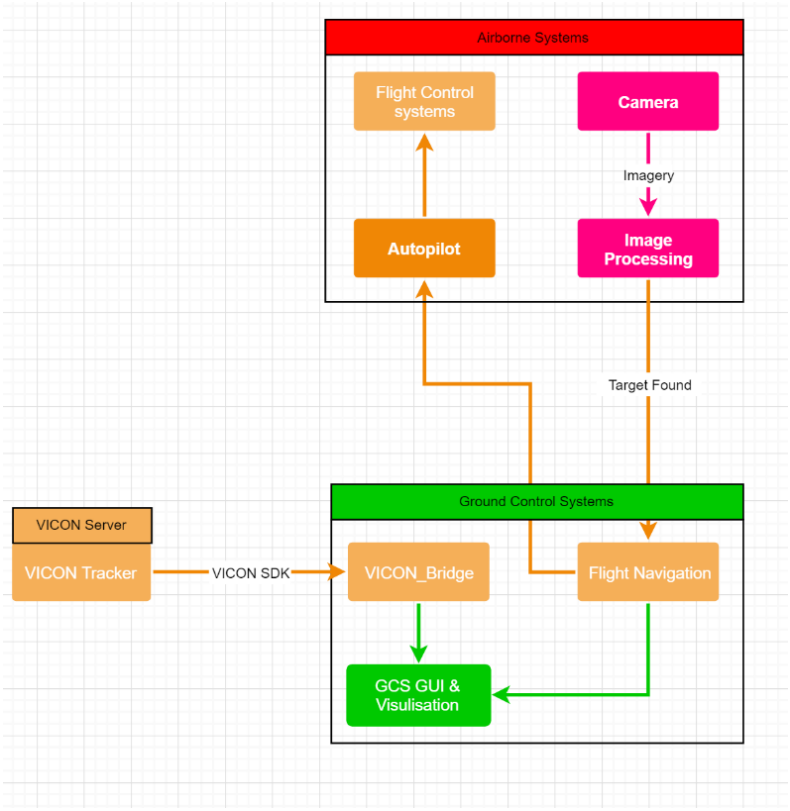


Figure 7: Onboard vs Offboard System relationships.

9.0 Work Breakdown Structure

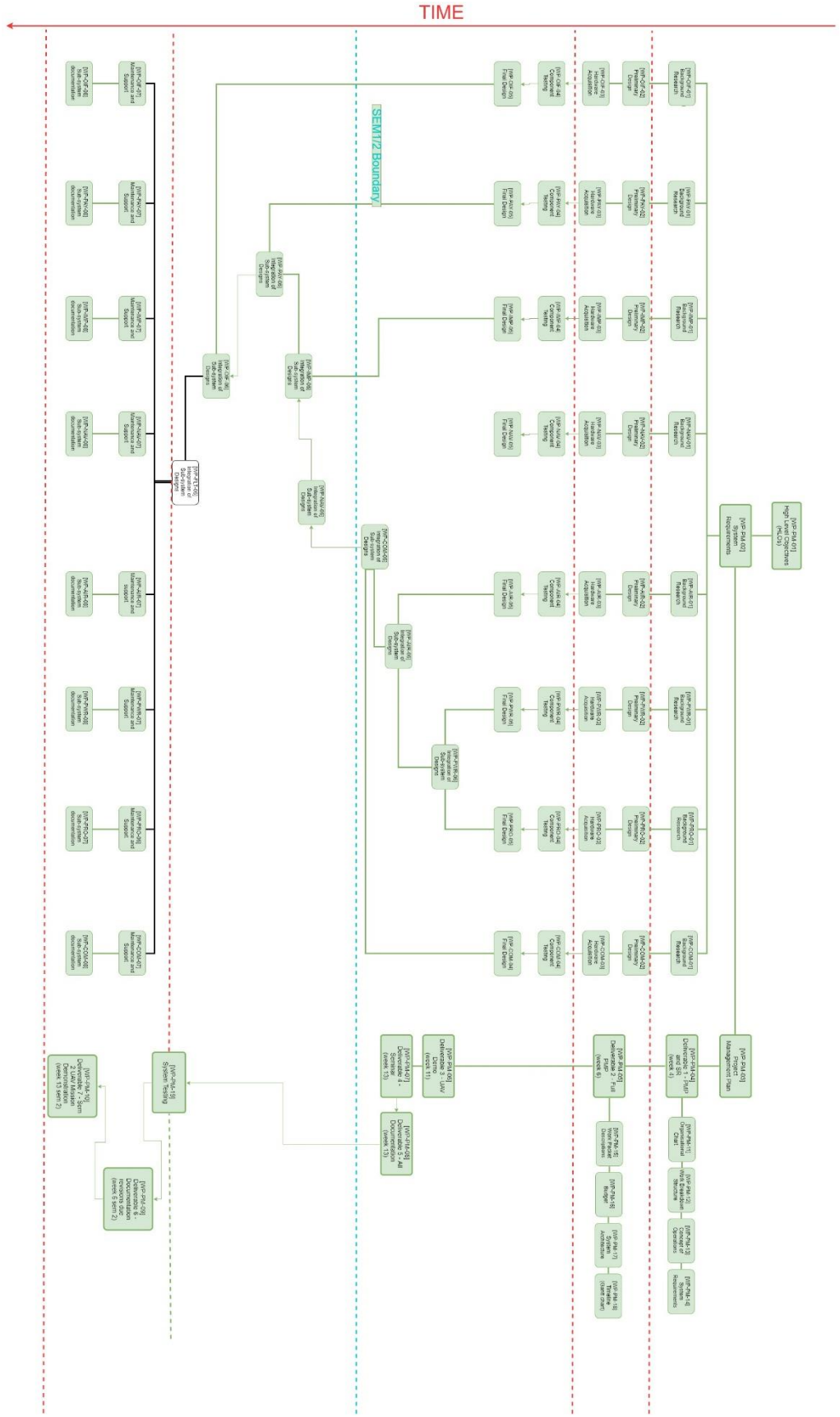


Figure 8: Work breakdown structure for project manager and sub-systems. (Green = completed by mission demonstration)

10.0 Gantt Chart/ Timeline

See separate Gantt Chart document to be able to view in full detail.

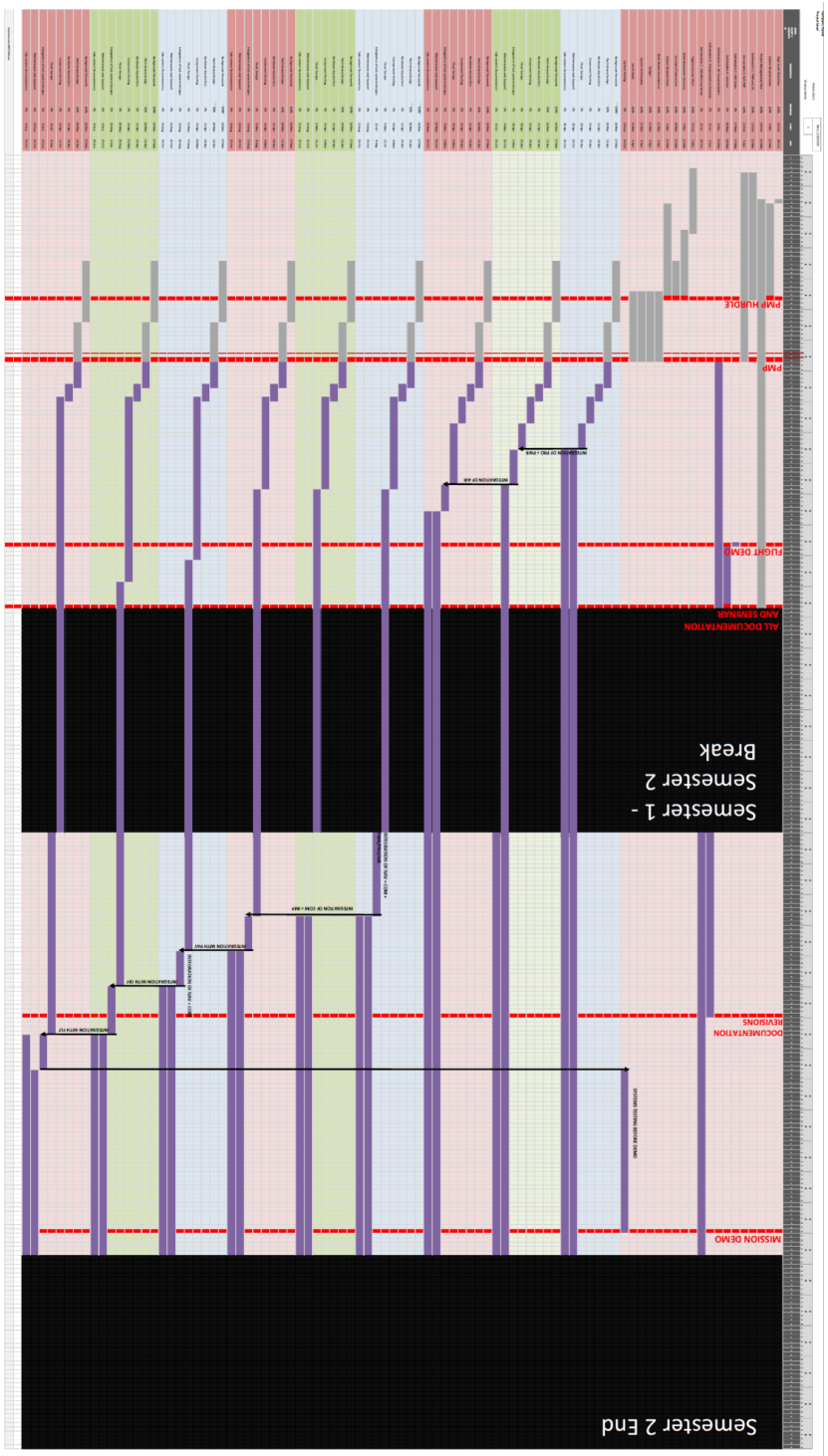
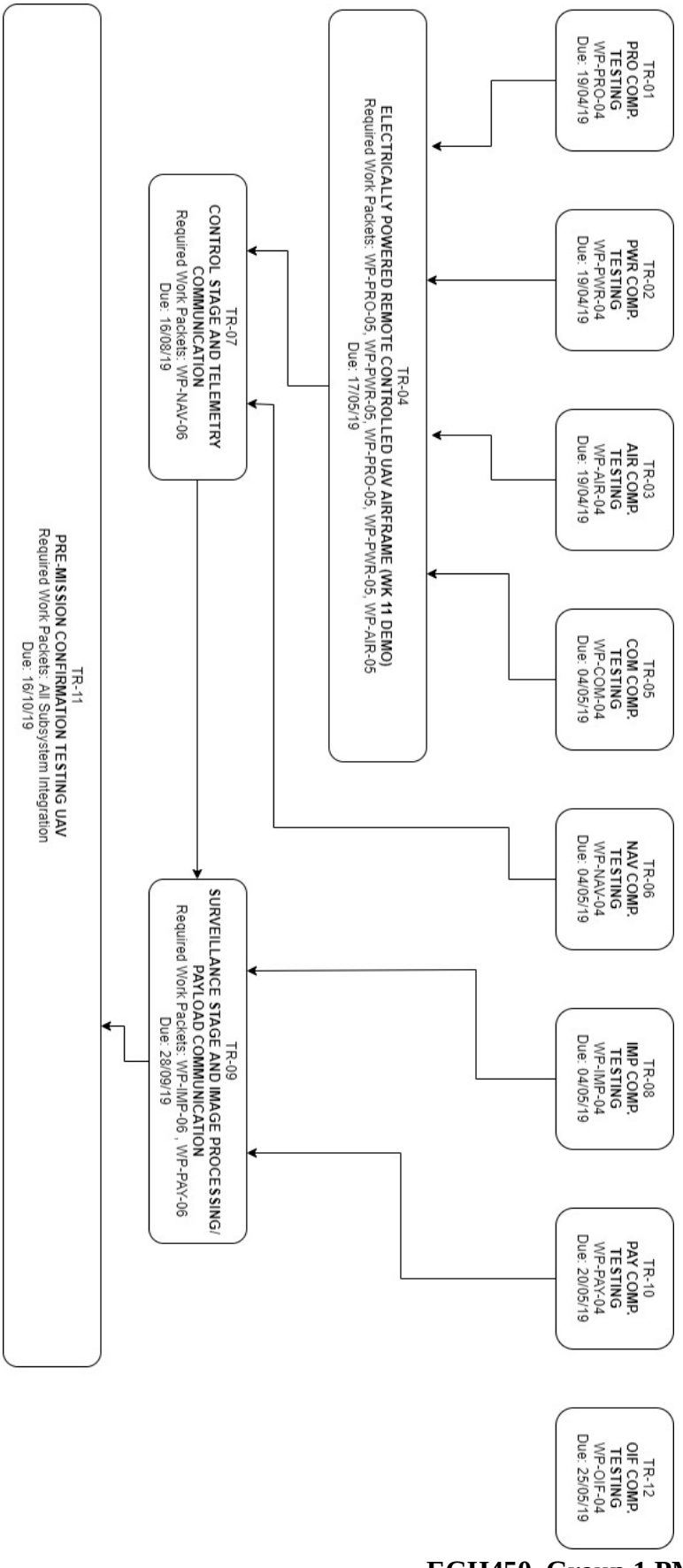


Figure 9: Gantt chart for project timeline and work packet delivery. (Project milestones represented by red lines)

11.0 Test Plan



Note: each box represents a separate test case with its own test document. Boxes highlighted in green are the test cases/ documents that have currently been completed.

12.0 Work Packet Descriptions

WP-PM-01	**High Level Objectives**
Description:	Define and understand the HLO's based on the provided customer needs. These objectives will be the basis for further breakdown in the System Requirements, which pivotal for the success of the project.
Team Member Responsible:	Hope Sneddon
Work Package Duration:	1 Hours
Date of Commencement:	28/02/2019
Date of Completion:	28/02/2019
Requirements:	N/A
Deliverables:	None

WP-PM-02 / 14	System Requirements
Description:	This deliverable is part of the week 4 PMP submission. Define the system requirements. These will be based on the Subsystem requirements and traced from the HLOs. Ensure all HLOs are traced. System requirements are crucial in providing clear objectives for sub-system engineers in the design phase.
Team Member Responsible:	Hope Sneddon, Claire Ulrich
Work Package Duration:	1.5 Weeks
Date of Commencement:	01/03/2019
Date of Completion:	21/03/2019
Requirements:	N/A
Deliverables:	349G1-PM-SysReq-*version number*F and WP-PM-14 (System Requirements as a separate document for readability)

WP-PM-03	**Project Management Plan**
Description:	The project management plan is an ongoing document. It aims to document project planning and management decisions.
Team Member Responsible:	Hope Sneddon
Work Package Duration:	Ongoing until the completion of semester 1
Date of Commencement:	28/02/2019
Date of Completion:	31/05/2019
Requirements:	[WP-PM-04,] [WP-PM-05], [WP-PM-06], [WP-PM-07], [WP-PM-08], [WP-PM-09], [WP-PM-10]
Deliverables:	349G1-PM-PMP-*version number*F

WP-PM-04	Deliverable 1 – Draft PMP (week 4 Submission)
Description:	Week 4 submission: Submission of ConOps, System requirements, Work Breakdown Structure, Org Chart
Team Member Responsible:	All
Work Package Duration:	4 Weeks
Date of Commencement:	22/02/2019
Date of Completion:	22/03/2019
Requirements:	[WP-PM-02], [WP-PM-04], [WP-PM-11], [WP-PM-12], [WP-PM13], [WP-PM-14]
Deliverables:	349G1-PM-PMP-*version number*F

WP-PM-05	Deliverable 2 – Full PMP (week 6 Submission)
Description:	Week 6 PMP documents submission (Due Friday midnight)
Team Member Responsible:	All
Work Package Duration:	6 Weeks
Date of Commencement:	22/03/2019
Date of Completion:	05/04/2019
Requirements:	[WP-PM-04], [WP-PM-15], [WP-PM-16], [WP-PM-17], [WP-PM-18]
Deliverables:	349G1-PM-PMP-*version number*F

WP-PM-06	Deliverable 3 Week 11 – UAV Stable Flight
Description:	A fully functioning manually controlled drone must demonstrate basic flight tests. This requires the successful integration of propulsion, power, airframe and communication systems. Documentation of these sub-systems should also be completed to this point as well as a result.
Team Member Responsible:	All
Work Package Duration:	N/A
Date of Commencement:	17/05/2019
Date of Completion:	17/05/2019
Requirements:	[WP-PWR-06], [WP-AIR-06], [WP-COM-06]
Deliverables:	[WP-PM-06]

WP-PM-07	Deliverable 4 Week 13 – Seminar
Description:	A seminar where the project UAV and supporting documentation is to be presented to a panel of industry professionals.
Team Member Responsible:	All
Work Package Duration:	2 Weeks (preparation)
Date of Commencement:	18/05/2019
Date of Completion:	30/05/2019
Requirements:	[WP-PM-06], [WP-PM-05]
Deliverables:	[WP-PM-06]

WP-PM-08	Deliverable 5 Week 13 – All Documentation
Description:	The project manager ICD, preliminary sub-system design and test plans are to be submitted by the end of week 13.
Team Member Responsible:	All
Work Package Duration:	N/A
Date of Commencement:	06/04/2019
Date of Completion:	31/05/2019
Requirements:	All sub-system documentation
Deliverables:	34G1-PM-ICD-*version number*F and sub-system documents

WP-PM-09	Deliverable 6 Semester 2 Week 6 – Documentation Revisions
Description:	Updated documentation with any changes to timelines or system designs from the previous semester should be reflected in the relevant documentation.
Team Member Responsible:	All
Work Package Duration:	2 Months
Date of Commencement:	22/07/19
Date of Completion:	01/09/19
Requirements:	[WP-PM-09], [WP-PM-05]
Deliverables:	TBD

WP-PM-10	**Deliverable 7 Semester 2 – UAV Mission Demonstration**
Description:	Official demonstration of UAV operation adhering to all high-level objectives and system requirements. This includes submission of all documentation.
Team Member Responsible:	All
Work Package Duration:	3 Months
Date of Commencement:	22/07/19
Date of Completion:	25/10/19
Requirements:	[WP-FLT-06]
Deliverables:	N/A

WP-PM-11	Organisational Chart
Description:	This deliverable is part of the week 4 PMP submission. A description and accompanying diagram of the project hierarchy as well as the engineering sub-systems and their associated responsibilities will be required.
Team Member Responsible:	Hope Sneddon
Work Package Duration:	2 Weeks
Date of Commencement:	21/02/2019
Date of Completion:	07/03/2019
Requirements:	N/A
Deliverables:	349G1-PM-OrgChart-*version number*F and 349G1-PM-PMP-*version number*F

WP-PM-12	Work Breakdown Structure
Description:	This deliverable is part of the week 4 PMP submission. The work breakdown structure develops a clear outline of the project stages in a chronological order to clearly define individual work packets for each project member. It also includes the relevant work packet reference number.
Team Member Responsible:	Hope Sneddon
Work Package Duration:	2 Weeks
Date of Commencement:	07/03/2019
Date of Completion:	21/03/2019
Requirements:	[WP-PM-11]
Deliverables:	349G1-PM-WBS-*version number*F and WBS in 349G1-PM-PMP-*version number*F

WP-PM-13	ConOps
Description:	This deliverable is part of the week 4 PMP submission. Concept of Operations should be developed and discussed. This combined with the HLOs will help to define the Subsystems and the System Requirements. It should be a clear visual representation of the HLO's with relevant labelling.
Team Member Responsible:	Elliot McPherson
Work Package Duration:	1 Week
Date of Commencement:	14/03/2019
Date of Completion:	21/03/2019
Requirements:	[WP-PM-01]
Deliverables:	ConOps in 349G1-PM-PMP-*version number*F

WP-PM-15	**Work Packet Descriptions**
Description:	This deliverable is part of the week 6 PMP submission. Work packets should be developed in detail including description, time allowed, team member allocation, date of commencement and completion as well as any required or resulting documentation from the work packet.
Team Member Responsible:	All
Work Package Duration:	2 Weeks
Date of Commencement:	21/03/2019
Date of Completion:	05/04/2019
Requirements:	[WP-PM-12], [WP-PM-11]
Deliverables:	WPD in 349G1-PM-PMP-*version number*F and 349G1-PM-WPD-*version number*F (separate document for readability)

WP-PM-16	Budgets
Description:	This deliverable is part of the week 6 PMP submission. Financial, mass, power and data budgets should be considered. As further research and testing is completed these budgets should be updated. At no point should the financial budget be exceeded to achieve other budgets.
Team Member Responsible:	Hope Sneddon
Work Package Duration:	2 Weeks
Date of Commencement:	21/03/2019 (and continued updates until project completion)
Date of Completion:	05/04/2019
Requirements:	[WP-PM-02] and [WP-PM-13]
Deliverables:	Budgets in 349G1-PM-PMP-*version number*F

WP-PM-17	System Architecture
Description:	This deliverable is part of the week 6 PMP submission. A detailed diagrammatic description of the system architecture is required. It should detail the individual components, which make up the subsystems of the overall system, including the means by which they integrate and communicate with each other.
Team Member Responsible:	Ross Watson
Work Package Duration:	2 Weeks
Date of Commencement:	21/03/2019
Date of Completion:	05/04/2019
Requirements:	[WP-PM-02] and [WP-PM-13]
Deliverables:	System Architecture in 349G1-PM-PMP-*version number*F

WP-PM-18	Timeline (Gantt Chart)
Description:	This deliverable is part of the week 6 PMP submission. A gantt chart outlining the commencement and completion of project phases based on the WBS and work packets is to be included in the PMP with key timelines and milestones evident.
Team Member Responsible:	Hope Sneddon
Work Package Duration:	2 Weeks
Date of Commencement:	21/03/2019
Date of Completion:	05/04/2019
Requirements:	[WP-PM-15], [WP-PM-12]
Deliverables:	Gantt chart in 349G1-PM-PMP-*version number*F

WP-PM-19	System Testing
Description:	Before the official UAV mission demonstration, testing of the overall system is required. It should be seen from testing that the completed construction of the UAV craft is able to meet all high-level objectives and system requirements in preparation for the mission demonstration. All sub-system engineers are responsible for ensuring their specified components are integrated effectively into the rest of the system and should make any changes required to the final design in order to achieve this.
Team Member Responsible:	All Parties
Work Package Duration:	2 Weeks
Date of Commencement:	14/09/19 (Week 9 Semester 2 2019)
Date of Completion:	20/10/19 (Week 13 Semester 2 2019)
Requirements:	All Sub-system integration and maintenance work packets
Deliverables:	Finalised functional UAV Aircraft

WP-NAV-01	Background Research
Description:	Conduct background research to analyse previous autopilot navigation solutions. Draw from this to investigate possible solutions for this subsystem.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	2 Weeks
Date of Commencement:	14/03/19
Date of Completion:	27/03/19
Requirements:	[WP-PM-02]
Deliverables:	Included in preliminary design document: 349-G1-NAV-PD-*version number*F

WP-NAV-02	Preliminary Design
Description:	Complete a preliminary design of the navigation subsystem including relevant design and construction details.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	1.5 Week
Date of Commencement:	28/03/19
Date of Completion:	11/04/19
Requirements:	[WP-NAV-01] and [WP-PM-02]
Deliverables:	349-G1-NAV-PD-*version number*F

WP-NAV-03	Hardware Procurement
Description:	Obtain the required hardware and equipment to build the subsystem. Investigate specifications of components and determine which items are needed to satisfy both image processing design specifications and System design.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	3 Days
Date of Commencement:	11/04/19
Date of Completion:	14/04/19
Requirements:	[WP-NAV-01], [WP-NAV-02]
Deliverables:	N/A

WP-NAV-05	Final Design
Description:	Complete a final design of the navigation subsystem which includes all revisions to Preliminary design.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	3 weeks
Date of Commencement:	05/05/19
Date of Completion:	21/05/19
Requirements:	[WP-NAV-03] and [WP-NAV-04]
Deliverables:	349-G1-NAV-FD-*version number*F

WP-NAV-04	Component Testing
Description:	Test the navigation subsystem as a standalone system. This shall prepare the system for integration with other subsystems. Ensure functionality of subsystem adheres to system requirements, adjust as needed.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	3 Weeks
Date of Commencement:	14/04/19
Date of Completion:	04/05/19
Requirements:	[WP-PM-02], [WP-NAV-03]
Deliverables:	Physical functioning navigation hardware and software

WP-NAV-06	Integration
Description:	Integrate this subsystem into the main UAV system airframe with connection the relevant communication links, reducing risks to the projects where possible. The sub-system will interact as defined in the system architecture.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	6 Weeks
Date of Commencement:	22/07/19
Date of Completion:	09/09/19
Requirements:	[WP-NAV-05], [WP-AIR-06], [WP-PWR-06], [WP-PRO-06],[WP-COM-06]
Deliverables:	Fully autonomously navigating UAV aircraft with onboard power, propulsion and communication systems

WP-NAV-07	Maintenance and Support
Description:	Have awareness of the requirements of other subsystems, adjust the navigation subsystem accordingly to ensure they can work unanimously. Make any required changes to the subsystem in order to maintain the integrated system without compromising system requirements.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	6 Weeks
Date of Commencement:	10/08/19
Date of Completion:	25/10/19
Requirements:	[WP-NAV-07]
Deliverables:	N/A

WP-NAV-08	Subsystem Documentation
Description:	Produce required navigation subsystem documentation for final submission.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	Throughout semester 2 2019
Date of Commencement:	10/08/19
Date of Completion:	25/10/19
Requirements:	[WP-COM-06]
Deliverables:	All subsystem documentation including final design, testing and integration documentation

WP-IMP-01	**Background Research**
Description:	Conduct background research into image processing systems. Investigate possible new solutions to the problem of developing the described subsystem and analyse previous solutions provided by others.
Team Member Responsible:	Liam Hulsman-Benson
Work Package Duration:	2 Weeks
Date of Commencement:	14/03/19
Date of Completion:	27/03/19
Requirements:	[WP-PM-02]
Deliverables:	Included in preliminary design document: 349-G1-IMP-PD-*version number*F

WP-IMP-02	Preliminary Design
Description:	Complete a preliminary design of the navigation subsystem including relevant design and construction details.
Team Member Responsible:	Liam Hulsman-Benson
Work Package Duration:	1.5 Weeks
Date of Commencement:	28/03/19
Date of Completion:	11/04/19
Requirements:	[WP-IMP-01] and [WP-PM-02]
Deliverables:	349-G1-IMP-PD-*version number*F

WP-IMP-03	Hardware Procurement
Description:	Obtain the required hardware and equipment to build the subsystem. Investigate specifications of components and determine which items are needed to satisfy both image processing design specifications and System design.
Team Member Responsible:	Liam Hulsman-Benson
Work Package Duration:	3 days
Date of Commencement:	11/04/19
Date of Completion:	14/04/19
Requirements:	[WP-IMP-01] and [WP-IMP-02]
Deliverables:	N/A

WP-IMP-05	Final Design
Description:	Complete a final design of the navigation subsystem which includes all revisions to Preliminary design.
Team Member Responsible:	Liam Hulsman-Benson
Work Package Duration:	3 weeks
Date of Commencement:	14/04/19
Date of Completion:	04/05/19
Requirements:	[WP-IMP-03] and [WP-IMP-04]
Deliverables:	349-G1-IMP-FD-*version number*F

WP-IMP-04	**Component Testing**
Description:	Test the image processing subsystem as a standalone system. This shall prepare the system for integration with other subsystems. Ensure functionality of subsystem adheres to system requirements, adjust as needed.
Team Member Responsible:	Liam Hulsman-Benson
Work Package Duration:	3 Weeks
Date of Commencement:	05/05/19
Date of Completion:	09/08/19
Requirements:	[WP-PM-02] and [WP-IMP-03]
Deliverables:	Physical functioning image processing hardware and software

WP-IMP-06	Integration of the Subsystem design
Description:	Integrate this subsystem into the main UAV system, reducing risks to the projects where possible. The sub-system will interact as defined in the system architecture.
Team Member Responsible:	Liam Hulsman-Benson
Work Package Duration:	1 Week
Date of Commencement:	10/08/19
Date of Completion:	17/08/19
Requirements:	[WP-IMP-05] and component testing for power, propulsion, airframe, communication and navigation sub-systems
Deliverables:	Fully functioning UAV structure that utilises all required sub-systems that have been previously integrated and the image processing sub-system.

WP-IMP-07	Maintenance and Support
Description:	Have awareness of the requirements of other subsystems, adjust the image processing subsystem accordingly to ensure they can work unanimously. Make any required changes to the subsystem in order to maintain the integrated system without compromising system requirements.
Team Member Responsible:	Liam Hulsman-Benson
Work Package Duration:	2 Months
Date of Commencement:	18/08/19
Date of Completion:	25/10/19
Requirements:	[WP-IMP-06]
Deliverables:	Fully integrated and functional surround UAV system

WP-IMP-08	Subsystem Documentation
Description:	Produce required image processing subsystem documentation for final submission.
Team Member Responsible:	Liam Hulsman-Benson
Work Package Duration:	2 Months
Date of Commencement:	18/08/19
Date of Completion:	25/10/19
Requirements:	[WP-IMP-06]
Deliverables:	All subsystem documentation including final design, testing and integration documentation

WP-PAY -01	Background Research
Description:	Conduct background research and analyse existing deployable payload solutions for similar problems. Investigate possible solutions for this subsystem to improve/adapt to meet design specifications.
Team Member Responsible:	Claire Ulrich
Work Package Duration:	2 Week
Date of Commencement:	14/03/19
Date of Completion:	27/03/19
Requirements:	[WP-PM-02]
Deliverables:	Included in preliminary design document: 349-G1-PAY-PD-*version number*F

WP-PAY-02	**Preliminary Design**
Description:	Complete a preliminary design of the payload subsystem including relevant design and construction details.
Team Member Responsible:	Claire Ulrich
Work Package Duration:	2 Weeks
Date of Commencement:	28/03/19
Date of Completion:	11/04/19
Requirements:	[WP-PAY-01] and [WP-PM-02]
Deliverables:	349-G1-PAY-PD-*version number*F

WP-PAY-03	**Hardware Acquisition**
Description:	Obtain the required hardware and equipment to build the subsystem. Investigate specifications of components and determine which items are needed to satisfy both payload design specifications and System design. Ensure CAD drawings are delivered to Launchpad for printing.
Team Member Responsible:	Claire Ulrich
Work Package Duration:	3 Days
Date of Commencement:	11/04/19
Date of Completion:	14/04/19
Requirements:	[WP-PAY-01] and [WP-PAY-02]
Deliverables:	N/A

WP-PAY-05	**Final Design**
Description:	Complete a final design of the payload subsystem which includes all revisions to Preliminary design.
Team Member Responsible:	Claire Ulrich
Work Package Duration:	2 Months
Date of Commencement:	21/05/19
Date of Completion:	17/08/19
Requirements:	[WP-PAY-03] and [WP-PAY-04]
Deliverables:	349-G1-PAY-FD-*version number*F

WP-PAY-04	Component Testing
Description:	Test the payload subsystem as a standalone system. This shall prepare the system for integration with other subsystems. Ensure functionality of subsystem adheres to system requirements, adjust as needed.
Team Member Responsible:	Claire Ulrich
Work Package Duration:	5 Weeks
Date of Commencement:	14/04/19
Date of Completion:	20/05/19
Requirements:	[WP-PM-02] and [WP-PAY-03]
Deliverables:	Physical functioning payload deployment device

WP-PAY-06	Integration of Sub-system Designs
Description:	Integrate this subsystem into the main UAV system airframe with connection the relevant communication links, reducing risks to the projects where possible. The sub-system will interact as defined in the system architecture.
Team Member Responsible:	Claire Ulrich
Work Package Duration:	1 Week
Date of Commencement:	18/08/19
Date of Completion:	25/08/19
Requirements:	[WP-PAY-05] and component testing for power, propulsion, airframe, communication, image processing and navigation sub-systems
Deliverables:	Fully functioning UAV structure that utilises all required sub-systems that have been previously integrated and the image processing sub-system.

WP-PAY-07	Maintenance and Support
Description:	Have awareness of the requirements of other subsystems, adjust the payload subsystem accordingly to ensure they can work unanimously. Make any required changes to the subsystem in order to maintain the integrated system without compromising system requirements.
Team Member Responsible:	Claire Ulrich
Work Package Duration:	8 Weeks
Date of Commencement:	26/08/19
Date of Completion:	25/10/29
Requirements:	[WP-PAY-06]
Deliverables:	Fully integrated and functional surround UAV system

WP-PAY-08	Subsystem documentation
Description:	Produce required documentation for payload subsystem for final submission.
Team Member Responsible:	Claire Ulrich
Work Package Duration:	8 Weeks
Date of Commencement:	26/08/19
Date of Completion:	25/10/19
Requirements:	[WP-PAY-06]
Deliverables:	All subsystem documentation including final design, testing and integration documentation

WP-AIR-01	Background Research
Description:	Conduct background research into Airframe systems. Investigate possible new solutions to the problem of developing the described subsystem and analyses previous solutions provided by others.
Team Member Responsible:	Ross Watson
Work Package Duration:	2 Weeks
Date of Commencement:	14/03/19
Date of Completion:	27/03/19
Requirements:	[WP-PM-02]
Deliverables:	Included in preliminary design document: 349-G1-AIR-PD-*version number*F

WP-AIR-02	**Preliminary Design**
Description:	Create a preliminary design of the airframe subsystem and assembly. Include engineering drawings of parts and assemblies with relevant dimensions and construction details.
Team Member Responsible:	Ross Watson
Work Package Duration:	2 Weeks
Date of Commencement:	28/03/19
Date of Completion:	11/04/19
Requirements:	[WP-AIR-01] and [WP-PM-02]
Deliverables:	349-G1-AIR-PD-*version number*F

WP-AIR-03	Hardware Procurement
Description:	Obtain the required hardware and equipment to build the subsystem. Investigate specifications of components and determine which items are needed to satisfy both airframe design specifications and System design.
Team Member Responsible:	Ross Watson
Work Package Duration:	3 Days
Date of Commencement:	11/04/19
Date of Completion:	14/04/19
Requirements:	[WP-AIR-01] and [WP-AIR-02]
Deliverables:	N/A

WP-AIR-05	Final Design
Description:	Complete a final design of the airframe subsystem which includes all revisions to Preliminary design.
Team Member Responsible:	Ross Watson
Work Package Duration:	3 Week
Date of Commencement:	20/04/19
Date of Completion:	03/05/19
Requirements:	[WP-AIR-03] and [WP-AIR-04]
Deliverables:	349-G1-AIR-FD-*version number*F

WP-AIR-04	Component Testing
Description:	Test the airframe subsystem as a standalone system. This shall prepare the system for integration with other subsystems. Ensure functionality of subsystem adheres to system requirements, adjust as needed.
Team Member Responsible:	Ross Watson
Work Package Duration:	3 Days
Date of Commencement:	14/04/19
Date of Completion:	19/04/19
Requirements:	[WP-PM-02] and [WP-AIR-03]
Deliverables:	Physical airframe structure fully assembled and ready to house subsequent sub-systems.

WP-AIR-06	Integration and testing of the Subsystem design
Description:	Integrate this subsystem with the power and propulsion sub-systems, reducing risks to the projects where possible. The sub-system will interact as defined in the system architecture.
Team Member Responsible:	Ross Watson
Work Package Duration:	1 Week
Date of Commencement:	04/05/19
Date of Completion:	09/05/19
Requirements:	[WP-PWR-06] and [WP-AIR-05]
Deliverables:	Fully functioning UAV structure that utilises the power and propulsion subsystem to achieve basic flight.

WP-AIR-07	Maintenance and Support
Description:	Have awareness of the requirements of other subsystems, adjust the airframe subsystem accordingly to ensure they can work unanimously. Make any required changes to the subsystem in order to maintain the integrated system without compromising system requirements.
Team Member Responsible:	Ross Watson
Work Package Duration:	Semester 2 2019
Date of Commencement:	10/05/19
Date of Completion:	25/10/19
Requirements:	[WP-AIR-06]
Deliverables:	Fully integrated and functional surround UAV system

WP-AIR-08	Subsystem Documentation
Description:	Produce required airframe subsystem documentation for final submission.
Team Member Responsible:	Ross Watson
Work Package Duration:	Semester 2 2019
Date of Commencement:	10/05/19
Date of Completion:	25/10/19
Requirements:	[WP-AIR-06]
Deliverables:	All subsystem documentation including final design, testing and integration documentation

WP-PWR-01	Background Research
Description:	Conduct background research into Electrical and power systems. Investigate possible new solutions to the problem of developing the described subsystem and analyse previous solutions provided by others.
Team Member Responsible:	Elliot McPherson and Ross Watson
Work Package Duration:	2 Weeks
Date of Commencement:	14/03/19
Date of Completion:	27/03/19
Requirements:	[WP-PM-02]
Deliverables:	Included in preliminary design document: 349-G1-PWR-PD-*version number*F

WP-PWR-02	Preliminary Design
Description:	Create a preliminary design of the airframe subsystem and assembly. Include engineering drawings of parts and assemblies with relevant dimensions and construction details.
Team Member Responsible:	Elliot McPherson and Ross Watson
Work Package Duration:	1 Week
Date of Commencement:	28/03/19
Date of Completion:	11/04/19
Requirements:	[WP-PWR-01] and [WP-PM-02]
Deliverables:	349-G1-PWR-PD-*version number*F

WP-PWR-03	Hardware Procurement
Description:	Obtain the required hardware and equipment to build the subsystem. Investigate specifications of components and determine which items are needed to satisfy both airframe design specifications and System design.
Team Member Responsible:	Elliot McPherson and Ross Watson
Work Package Duration:	3 Days
Date of Commencement:	11/04/19
Date of Completion:	14/04/19
Requirements:	[WP-PWR-01] and [WP-PWR-02]
Deliverables:	N/A

WP-PWR-05	Final Design
Description:	Complete a final design of the power subsystem which includes all revisions to Preliminary design.
Team Member Responsible:	Elliot McPherson and Ross Watson
Work Package Duration:	1.5 Weeks
Date of Commencement:	20/04/19
Date of Completion:	25/05/19
Requirements:	[WP-PWR-03] and [WP-PWR-04]
Deliverables:	349-G1-PWR-FD-*version number*F

WP-PWR-04	Component Testing
Description:	Perform a full test of the subsystem as a standalone system in preparation for full system integration and assembly.
Team Member Responsible:	Elliot McPherson and Ross Watson
Work Package Duration:	3 Days
Date of Commencement:	14/04/19
Date of Completion:	19/04/19
Requirements:	[WP-PM-02] and [WP-PWR-03]
Deliverables:	Power system designed and functional as specified by [WP-PWR-02]

WP-PWR-06	Integration
Description:	Integrate the power subsystem with the propulsion subsystem, reducing risks where possible. The sub-systems will interact as defined in the system architecture.
Team Member Responsible:	Elliot McPherson and Ross Watson
Work Package Duration:	1 Week
Date of Commencement:	26/04/19
Date of Completion:	03/05/19
Requirements:	[WP-PRO-05] and [WP-PWR-05]
Deliverables:	Fully functioning propulsion system as powered by the integrated power system.

WP-PWR-07	Maintenance and Support
Description:	Have awareness of the requirements of other subsystems, adjust the integrated power and propulsion subsystem accordingly to ensure they can work unanimously. Make any required changes to the subsystem in order to maintain the integrated system without compromising system requirements.
Team Member Responsible:	Elliot McPherson and Ross Watson
Work Package Duration:	Semester 2 2019
Date of Commencement:	04/05/19
Date of Completion:	25/10/19
Requirements:	[WP-PWR-06]
Deliverables:	Fully integrated and functional surround UAV system

WP-PWR-08	Subsystem Documentation
Description:	Produce required documentation for power subsystem for final submission.
Team Member Responsible:	Elliot McPherson and Ross Watson
Work Package Duration:	Throughout Semester 2 2019
Date of Commencement:	22/07/19
Date of Completion:	25/10/19
Requirements:	[WP-PWR-06]
Deliverables:	All subsystem documentation including final design, testing and integration documentation

WP-PRO-01	Background Research
Description:	Conduct background research into UAV propulsion systems. Investigate possible new solutions to the problem of developing the described subsystem and analyse previous solutions provided by others.
Team Member Responsible:	Elliot McPherson
Work Package Duration:	2 Weeks
Date of Commencement:	14/03/19
Date of Completion:	27/03/19
Requirements:	[WP-PM-02]
Deliverables:	Included in preliminary design document: 349-G1-PRO-PD-*version number*F

WP-PRO-02	Preliminary Design
Description:	Create a preliminary design of the airframe subsystem and assembly. Include engineering drawings of parts and assemblies with relevant dimensions and construction details.
Team Member Responsible:	Elliot McPherson
Work Package Duration:	1 Week
Date of Commencement:	28/03/19
Date of Completion:	11/04/19
Requirements:	[WP-PRO-01] and [WP-PM-02]
Deliverables:	349-G1-PRO-PD-*version number*F

WP-PRO-03	Hardware Procurement
Description:	Obtain the required hardware and equipment to build the subsystem. Investigate specifications of components and determine which items are needed to satisfy both propulsion design specifications and System design.
Team Member Responsible:	Elliot McPherson
Work Package Duration:	3 Days
Date of Commencement:	11/04/19
Date of Completion:	14/04/19
Requirements:	[WP-PRO-01] and [WP-PRO-02]
Deliverables:	N/A

WP-PRO-05	Final Design
Description:	Complete a final design of the airframe subsystem which includes all revisions to Preliminary design.
Team Member Responsible:	Elliot McPherson
Work Package Duration:	1.5 weeks
Date of Commencement:	20/04/19
Date of Completion:	25/04/19
Requirements:	[WP-PRO-03] and [WP-PRO-04]
Deliverables:	349-G1-PRO-FD-*version number*F

WP-PRO-04	Component Testing
Description:	Test the subsystem as fully as possible as a standalone system to prepare for integration with other subsystems.
Team Member Responsible:	Elliot McPherson
Work Package Duration:	3 Days
Date of Commencement:	14/04/19
Date of Completion:	19/04/19
Requirements:	[WP-PM-02] and [WP-PRO-03]
Deliverables:	Propulsion system designed and functional as specified by [WP-PRO-02]

WP-PRO-06	Maintenance and Support
Description:	Have awareness of the requirements of other subsystems, adjust the integrated power and propulsion subsystem accordingly to ensure they can work unanimously. Make any required changes to the subsystem in order to maintain the integrated system without compromising system requirements.
Team Member Responsible:	Elliot McPherson
Work Package Duration:	Post Week 10 Sem 1
Date of Commencement:	26/04/19
Date of Completion:	25/10/19
Requirements:	[WP-PWR-06]
Deliverables:	Fully integrated and functional surround UAV system

WP-PRO-07	Subsystem Documentation
Description:	Produce required subsystem documentation for final submission.
Team Member Responsible:	Elliot McPherson
Work Package Duration:	Throughout Semester 2 2019
Date of Commencement:	26/04/19
Date of Completion:	25/10/19
Requirements:	[WP-PWR-06]
Deliverables:	All subsystem documentation including final design, testing and integration documentation

WP-COM-01	Background Research
Description:	Conduct background research to analyse previous communication solutions. Draw from this to investigate possible solutions for this subsystem.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	2 Weeks
Date of Commencement:	14/03/19
Date of Completion:	27/03/19
Requirements:	[WP-PM-02]
Deliverables:	Included in preliminary design document: 349-G1-COM-PD-*version number*F

WP-COM-02	Preliminary Design
Description:	Complete a preliminary design of the communication subsystem. Include engineering drawings of parts and assemblies with relevant dimensions and construction details.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	1 Week
Date of Commencement:	28/03/19
Date of Completion:	11/04/19
Requirements:	[WP-COM-01] and [WP-PM-02]
Deliverables:	349-G1-COM-PD-*version number*F

WP-COM-03	Hardware Procurement
Description:	Obtain the required hardware and equipment to build the subsystem. Investigate specifications of components and determine which items are needed to satisfy both communications design specifications and System design.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	2 Weeks
Date of Commencement:	11/04/19
Date of Completion:	14/04/19
Requirements:	[WP-COM-01] and [WP-COM-02]
Deliverables:	N/A

WP-COM-05	Final Design
Description:	Complete a final design of the communication subsystem which includes all revisions to Preliminary design.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	2 weeks
Date of Commencement:	25/04/13
Date of Completion:	09/05/13
Requirements:	[WP-COM-03] and [WP-COM-04]
Deliverables:	349-G1-COM-FD-*version number*F

WP-COM-04	Component Testing
Description:	Test the communication subsystem as a standalone system. This shall prepare the system for integration with other subsystems.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	3 Weeks
Date of Commencement:	14/04/13
Date of Completion:	24/04/13
Requirements:	[WP-COM-02] and [WP-COM-03]
Deliverables:	Communications system designed and functional as specified by [WP-COM-03]

WP-COM-06	Integration
Description:	Integrate the communication subsystem with the propulsion/power integrated airframe, reducing risks where possible. The sub-systems will interact as defined in the system architecture.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	2 Weeks
Date of Commencement:	10/05/19
Date of Completion:	17/05/19
Requirements:	[WP-COM-05], [WP-PWR-06], [WP-AIR-06] and [WP-NAV-05]
Deliverables:	Fully autonomously navigating UAV aircraft with onboard power, propulsion and communication systems

WP-COM-07	Maintenance and Support
Description:	Have awareness of the requirements of other subsystems, adjust the communication subsystem accordingly to ensure they can work unanimously. Make any required changes to the subsystem in order to maintain the integrated system.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	2 Months
Date of Commencement:	18/05/19
Date of Completion:	25/10/19
Requirements:	[WP-COM-06]
Deliverables:	Fully functioning surrounding system, 349-G1-WP-COM-08

WP-COM-08	**Subsystem Documentation**
Description:	Produce required communication subsystem documentation for final submission.
Team Member Responsible:	Monica Fitzpatrick
Work Package Duration:	2 Months
Date of Commencement:	18/05/19
Date of Completion:	25/10/19
Requirements:	[WP-COM-06]
Deliverables:	All subsystem documentation including final design, testing and integration documentation

WP-OIF-01	Background Research
Description:	Conduct background research into existing operator interface solutions for similar problem. Investigate possible methods to improve/adapt to meet design specifications.
Team Member Responsible:	Jonathan Salazar
Work Package Duration:	2 Weeks
Date of Commencement:	14/03/19
Date of Completion:	27/03/19
Requirements:	[WP-PM-02]
Deliverables:	Included in preliminary design document: 349-G1-OIF-PD-*version number*F

WP-OIF-02	Preliminary Design
Description:	Complete a preliminary design of OIF. Ensure design adheres to Subsystem Requirements. Include engineering drawings of parts and assemblies with relevant dimensions and construction details.
Team Member Responsible:	Jonathan Salazar
Work Package Duration:	2 Weeks
Date of Commencement:	28/3/19
Date of Completion:	11/4/19
Requirements:	[WP-OIF -01] and [WP-PM-02]
Deliverables:	349-G1-OIF-PD-*version number*F

WP-OIF-03	**Hardware Procurement**
Description:	Obtain the required hardware and equipment to build the subsystem. Investigate specifications of components and determine which items are needed to satisfy both communications design specifications and System design.
Team Member Responsible:	Jonathan Salazar
Work Package Duration:	3 Days
Date of Commencement:	11/4/19
Date of Completion:	14/4/19
Requirements:	[WP-OIF-01] and [WP-OIF -02]
Deliverables:	N/A

WP-OIF-05	Final Design
Description:	Complete a final design of the OIF which includes all revisions to Preliminary design.
Team Member Responsible:	Jonathan Salazar
Work Package Duration:	1 Month (excluding holidays)
Date of Commencement:	26/05/19
Date of Completion:	25/08/19
Requirements:	[WP-OIF-03] and [WP-OIF-04]
Deliverables:	349-G1-OIF-FD-*version number*F

WP-OIF-04	Component Testing
Description:	Test the subsystem as fully as possible as a standalone system to prepare for integration with other subsystems.
Team Member Responsible:	Jonathan Salazar
Work Package Duration:	3 Weeks
Date of Commencement:	14/04/19
Date of Completion:	25/05/19
Requirements:	[WP-OIF-02] and [WP-OIF-03]
Deliverables:	Operational interface system designed and functional as specified by [WP-OIF-02]

WP-OIF-06	Integration
Description:	Integrate OIF with contiguous subsystems, reducing risks where possible. The sub-systems will interact as defined in the system architecture.
Team Member Responsible:	Jonathan Salazar
Work Package Duration:	2 Week
Date of Commencement:	26/08/19
Date of Completion:	05/09/19
Requirements:	[WP-OIF-05] and [WP-PAY-06]
Deliverables:	Fully functioning UAV aircraft with only flight termination to be integrated.

WP-OIF-07	Maintenance and Support
Description:	Have awareness of the requirements of other subsystems, adjust the integrated operational interface subsystem accordingly to ensure they can work unanimously. Make any required changes to the subsystem in order to maintain the integrated system without compromising system requirements.
Team Member Responsible:	Jonathan Salazar
Work Package Duration:	5 Weeks
Date of Commencement:	06/09/19
Date of Completion:	25/10/19
Requirements:	[WP-OIF-06]
Deliverables:	Fully integrated and functional surround UAV system

WP-OIF-08	Subsystem Documentation
Description:	Produce required documentation for operational interface subsystem for final submission.
Team Member Responsible:	Jonathan Salazar
Work Package Duration:	5 weeks
Date of Commencement:	06/09/19
Date of Completion:	25/10/19
Requirements:	[WP-OIF-06]
Deliverables:	All subsystem documentation including final design, testing and integration documentation