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Approved by Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Michael Hamilton, Student Manager 2010

Authorised for use by Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dr Luis Mejias, Project Coordinator

**QUT Avionics**

Queensland University of Technology

CRCSS-EESE, GPO Box 2434

Gardens Point Campus

Brisbane, Australia, 4001.

Telephone (+61 7) 3864 1772

Facsimile (+61 7) 3864 1517

e-mail luis.mejias@qut.edu.au

web <http://code.google.com/p/ahns10/>

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**Foreword**

This document is a formal representation of the Project Management Plan for the Queensland University of Technology Autonomous Helicopter Navigation System in 2010. The project management plan outlines details for the management structure, document responsibilities, work breakdown structure, work packages and a project timeline. The management structure and document responsibilities outline the roles of each member in the AHNS project. The roles are then divided up into specific tasks outlined in the work breakdown structure and work packages. The work packages describe in detail the work required to be completed. Finally these work packages are then presented on a Gantt chart timeline.

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**Definitions**

|  |  |
| --- | --- |
| QUT | Queensland University of Technology |
| AHNS | Autonomous Helicopter Navigation System |
| GCS | Ground Control Station |
| HLO | High Level Objective |
| SR | System Requirement |
| PMP | Project Management Plan |
| IMU | Inertial Measurement Unit |
|  |  |

# Introduction

The 2010 AHNS project requires constant planning to ensure that it is successfully completed by the scheduled delivery date. This document outlines all the project management guidelines, roles, deliverables and due dates.

## Scope

The purpose of this document is to ensure well-organized and professional operations for the AHNS 2010 project. This document is bounded by the high level objectives and system requirements, RD/1 and RD/2 respectively, and timelines agreed between the client and project manager.

## Background

No Background.

# Reference Documents

## QUT Avionics Documents

|  |  |  |
| --- | --- | --- |
| RD/1 | AHNS-2010-SY-HL-001 | AHNS, High Level Objectives of |
| RD/2 | AHNS-2010-SY-SR-001 | AHNS, System requirements of |

## Non-QUT Documents

|  |  |  |
| --- | --- | --- |
| RD/3 | SP-601S | NASA Systems Engineering Handbook |

In the event of any conflict between this document and any RD referenced herein, such conflict shall be notified to .

In the following text, RD/x identifies referenced documents, where "x" denotes the actual document.

# Project Organisation

## Management Structure

The 2010 Autonomous Helicopter Navigation System project team can be divided into three tiers of management structure. Dr Luis Mejias, the project supervisor and client, is at the top tier overlooking the entire project and the group members. On the middle tier is the project manager, Michael Hamilton, whose responsibility in the management structure is to keep the project supervisor informed of the projects progress. Michael Kincel, Liam O’Sullivan and Tim Molloy make up the bottom tier. Their responsibility, along with Michael Hamilton, is to complete the tasks outlined in this document within the given time frame. The figure below outlines the three tier management structure.



Figure - Team Management Structure

## Organisational Structure

### Members Roles

For any project’s success, the duties and roles it in tales must be divided among the team members that are the most suited person for the responsibility, based on their backgrounds and knowledge. The four members for AHNS were split into several sub-systems within the major project. Each student is responsible for their assigned sub-system, but all students will contribute to the completion of all tasks. Figure 2 outlines the team member’s assigned sub-systems.



Figure - Team Members Sub-Systems

Michael Hamilton’s major role is the project manager, whose responsibility is to ensure that the high level objectives and system requirements are all met, and that the project is completed within the time schedule. He is also responsible for the communications sub-system, which entails organising all communications between the ground control station, platform and any other auxiliary inputs.

All airframe construction, maintenance and hardware integration tasks will be organised by Michael Kincel. This includes incorporating all physical sub-systems on the platform to enable autonomous flight. Michael’s secondary role is the pilot for the platform for takeoff, landing and emergency manoeuvres while in autonomous testing.

Liam O’Sullivan’s major role is to ensure that the platform is localised under a known co-ordinate system using an array of sensors. Liam is also responsible for determining the state estimation for the platform to determine the underlying behaviour of the system at any point in time with the use of the IMU and other sensor data.

To ensure that the platform can remain stabilised without the aid of the pilot, a control system must be developed and refined. Tim Molloy’s major responsibility is to determine the control theory for the chosen platform and assign appropriate gains. His secondary role is to develop the GCS from AHNS 2009 to operate with the new platform design.

All members of the 2010 AHNS are responsible for communication between group members, maintenance of equipment and ensuring safety procedures are adhered to for their respective subsystems.

### Documentation Responsibilities

All students in the 2010 AHNS project will be required to submit documents which will outline steps taken in their respective sub-system. Each document produced must be checked by a person other than the author. It is the responsibility of the author of the document to ensure that it is checked by another group member. The document must also be approved by both the project manager and supervisor. Table 1 outlines the major documentation and responsible team members for the AHNS project.

Table - Documentation Responsibilities

|  |  |
| --- | --- |
| Team Member | Document Responsibilities |
| Michael Hamilton | High Level Objectives  System Requirements  Project Management Plan  Risk Management  Traceability Matrix  Initial Design Document  Detail Design Document  Test Reports |
| Michael Kincel | Trade Studies  Initial Design Document  Detail Design Document  Test Reports |
| Liam O’Sullivan | Trade Studies  Initial Design Document  Detail Design Document  Test Reports |
| Tim Molloy | Trade Studies  Initial Design Document  Detail Design Document  Test Reports |

### Documentation Standards

To ensure consistency between all documentation AHNS will adopt the QUAV documentation standards. All documentation produced will utilise the corresponding document template or program:

Table - Documentation Standards

|  |  |
| --- | --- |
| Document Type | Template / Program |
| Minutes | MoM.dot |
| Test Reports | Avionics\_TR.dot |
| Other Documents | Avionics.dot |
| Project Timeline | Microsoft Project |
| Diagrams | Microsoft Visio |
| Circuit Schematics | CADSoft Eagle |

## 

## Resources

The 2010 Autonomous Navigation Helicopter System project has a range of resources at its disposal, including financial resources, QUT services and facilities, inherited past year equipment and knowledge.

### Financial Resources

The financial resources will be used for purchasing equipment that the 2010 AHNS team require to complete the projects objectives. All purchases will be conducted by the project manager once authorisation from the project supervisor has been granted. It is the project manager’s responsibility to monitor the budget as purchases are made.

Every student within the subject is provided $100 Australian dollars to put towards their project, supplied by Built Environment & Engineering Faculty at QUT. Additional funding was also acquired from Boeing Australia, to the sum of $2000 Australian dollar. This adds to $2400 dollars total for the 2010 AHNS project. Table 3, Table 4 outlines the planned purchases that will be made initially to acquire necessary parts from Germany and USA respectively.

Table - Germany Planned Purchases

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ****Item Name**** |  | ****Quantity**** | ****Price**** | ****Total Price**** |
| MK40 - Frameset |  | 1 | 54.95 EU | 54.95 EU |
| BL-Ctrl V1.2 (SMD preassembled) |  | 4 | 39.95 EU | 159.80 EU |
| Robbe ROXXY BL-Outrunner 2824-34 |  | 4 | 31.90 EU | 127.60 EU |
| MK Propeller Mount 1045 |  | 4 | 7.95 EU | 31.80 EU |
| Propeller pair EPP1045 |  | 10 | 3.89 EU | 38.90 EU |
| Vibration dampeners M3x15 |  | 2 | 5.95 EU | 11.90 EU |
| Vibration dampeners M3x8 |  | 1 | 5.89 EU | 5.89 EU |
| MK FlexLander L |  | 2 | 37.95 EU | 75.90 EU |
| Postage |  | 1 | 33.00 EU | 33.00 EU |
|  |  |  | **TOTAL:** | **539.74 EU** |

Table - USA Planned Purchases

|  |  |  |  |
| --- | --- | --- | --- |
| ****Item Name**** | ****Quantity**** | ****Price**** | ****Total Price**** |
| Overo Fire COM | 1 | 219.00 US | 219.00 US |
| Pinto- TH | 1 | 27.50 US | 27.50 US |
| Summit | 1 | 49.00 US | 49.00 US |
| Gumstix Postage | 1 | 62.82 US | 62.82 US |
| SRV-1 Blackfin Camera | 1 | 175.50 US | 175.50 US |
| Blackfin Postage | 1 | 60.00 US | 60.00 US |
|  |  | **TOTAL:** | **593.82 US** |

### Services and Facilities

The 2010 AHNS team have several services and facilities at their disposal, which provide a range of benefits for the project. Table 5 outlines the available services and facilities located in QUT’s garden point campus.

Table - Services and Facilities

|  |  |  |  |
| --- | --- | --- | --- |
| **Location** | **Availability** | **Access** | **Resources** |
| S-Block Level 11 Avionics Lab | 24 hours/day | Avionics students | Tools, Soldering Iron, electronic parts, computers, storage, electronic measuring equipment. |
| S-Block  Level 11  Computer Lab | 24 hours/day | Electrical and Avionics Students | Computers. |
| S-Block Level 9 Shop | Business hours  (Monday – Friday) | Electrical and Avionics Students | Tools, electronic parts, PCB manufacturing. |
| S-Block Level 9 Lab | Business hours  (Monday – Friday) | Electrical and Avionics Students | Soldering Iron, electronic parts, computers, electronic measuring equipment. |
| J-Block | Business hours  (Monday – Friday) | Engineering Students | Laser Cutter. |

### Inherited Equipment and Information

The AHNS 2010 team has inherited several items from previous year’s helicopter projects, including both documentation and hardware. The table below lists the description and quantity of all inherited hardware.

Table - Inherited Hardware

|  |  |
| --- | --- |
| Hardware Description | Quantity |
| TREX450 (Nancy) | 1 |
| Blade400 (Emily) | 1 |
| TREX450s kit box | 1 |
| Tracking antenna PCB | 1 |
| Sensor dynamics IMU (1 working) | 2 |
| XBEE ground station  box | 1 |
| 325mm wood main rotor blade | 4 |
| Metal tail rod | 1 |
| Stereo camera | 1 |
| Spektrum DX6i | 1 |
| Easy radio | 4 |
| Eflite landing gear strut set | 1 |
| Servo extensions (400 mm) | 5 |
| 6v 2000mAH NiMH | 1 |
| 6v Intellect NiMH | 1 |
| Dean connectors | 2 |
| Eflite 7.4V 800mA | 1 |
| 3-cell 12V 2200 mAH LiPO damaged | 1 |
| 3-cell 12V 2200 mAH LiPO | 3 |
| 7.4V 800mA Li | 1 |
| USB-Serial connector | 1 |
| Twister 2 cell LiPO charger | 1 |
| Eflite O ring set | 11 |
| USB -> blackbox -> Stereo jack | 1 |
| BNC to alligator clips | 1 |
| Zippy ties | 10 |
| Swann webcam | 1 |

## Document Numbering

All documentation within the AHNS project must follow strict naming convention to ensure that system identification and traceability can be maintained. The naming convention for all official AHNS documentation is as follows.

*<Project Name>-<Project Year>-<Subsystem Code>-<Document Code>-<Document Number>*

An example for this is the project management plan, under the system level sub-system, AHNS-2010-SY-PM-001

### Project Code and Year

The project code and year for all official documents will be AHNS 2010. This code allows external readers to indentify the project and year of development.

### Sub-System Codes

To differentiate between each sub-system within the AHNS project, a code is assigned to indentify the document to belonging to that system. Table 7 outlines the corresponding codes for each sub-system.

Table - Sub-System Codes

|  |  |
| --- | --- |
| Subsystem | Code |
| System Level | SY |
| Platform | PL |
| Autopilot | AP |
| Localisation | LO |
| State Estimation | SE |
| Ground Control Station | GC |
| Communication | CO |

### Document Code and Number

All sub-systems will have many different types of documents associated with them. An additional document code will also be included into the name to aid in categorising the reports. Table 8 outlines the all the codes against the type of document that is within the report. Also attached to each document code is a three digit ascending number, which differentiates between multiple documents of the same document code.

Table - Document Codes

|  |  |
| --- | --- |
| Document | Code |
| High Level Objectives | HL |
| System Requirements | SR |
| Project Management Plan | PM |
| Trade Study | TS |
| Design Document | DD |
| Test Report | TR |
| Detailed Drawing | DR |
| Traceability Matrix | TM |
| Operations Manual | OM |
| Minutes of Meeting | MM |

# Work Breakdown

## Project Stages

Large engineering projects are broken down into five primary stages of development, which are outlined in Figure 3 RD/3. Stage one consists of Defining the objectives and system requirements for the project. Initial research is also carried out within each sub-system which can including overview of previous years documents and performing trade studies. Stage two outlines the chosen design that will achieve the HLO’s SR’s prepared in a preliminary design document. Once the design has been finalised, the individual components are acquired and constructed.

Stage three outlines the individual components testing, which ensures that each component achieves its own purpose before integration with the system. Stage four consists of integration of all the individual components into the whole system. The system is then tested to ensure that it achieves the HLO’s and SR’s.

Finally stage five involved the delivery of the product to the customer, which in tales demonstration and presentations. Figure 4 illustrates the work breakdown structure for the 2010 AHNS project utilising the five primary stages as a guideline.



Figure - Project Stages

## Work Breakdown Structure

The work breakdown structure is managed using bottom side up approach, which conforms to NASA’s guidelines for systems engineering RD/3.



Figure - Work Breakdown Structure

# Schedule

The Gantt chart schedule in Figure 5 illustrates the AHNS timeline for each of the work packages mentioned in the Work Breakdown Structure.

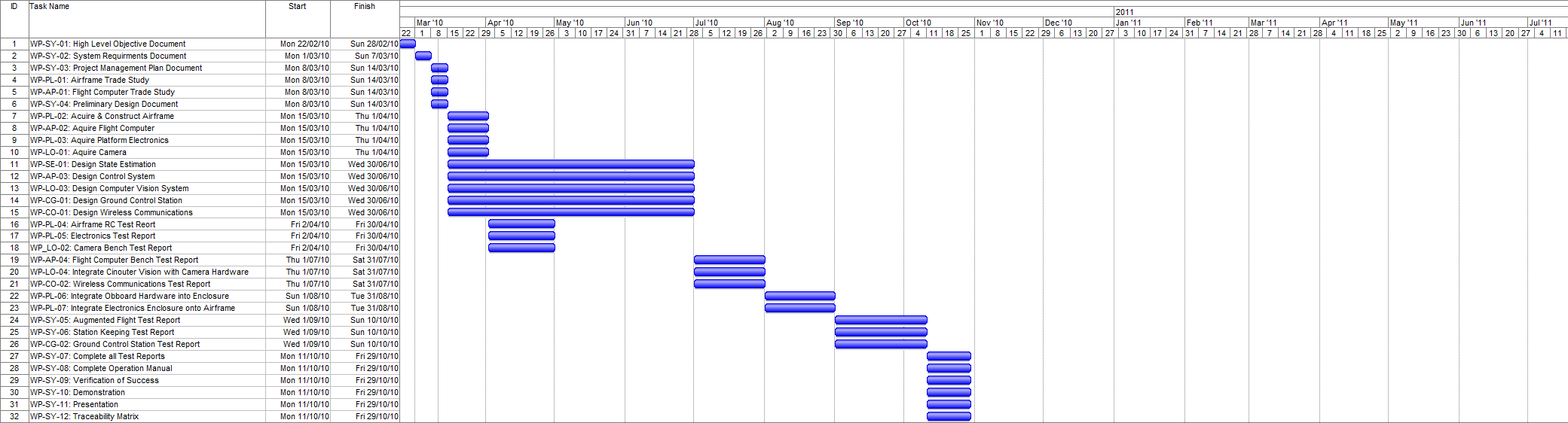


Figure - Work Packages Timeline

# Work Packages

Work Packages outline all the tasks to be completed to achieve the high level objectives and system requirements outlined in RD/1 and RD/2 respectively. The work packages have been produced according to the Work Breakdown Structure in section 4.2 and allocated time frames according to the Project Schedule in section 5. The work packages are categorised using their related sub-system code and numbered in order of their appearance on the Work Breakdown Structure. Work packages outline each task commencement and due dates, person/s responsible, input requirements and output deliverables.

**WP-SY-01 High Level Objectives Document**

**Description:**

Develop a document outlining the High Level Objectives for the 2010 AHNS project.

Work package duration: 7 days

Date of commencement: 22/02/10

Date of completion: 28/02/10

Person Responsible: Michael Hamilton

**Requirements:**

Meeting with project supervisor and team members

**Deliverables:**

AHNS, High Level Objectives of AHNS-2010-SY-HL-001

**WP-SY-02 System Requirement Document**

**Description:**

Produce a System Requirement document, with the information gathered from the supervisor and the Higher Level Objectives. Define each system requirement as either a baseline or derived requirement.

Work package duration: 7 days

Date of commencement: 01/03/10

Date of completion: 07/03/10

Person Responsible: Michael Hamilton

**Requirements:**

Meeting with project supervisor and team members

AHNS, High Level Objectives of AHNS-2010-SY-HL-001

**Deliverables:**

AHNS, System Requirements of AHNS-2010-SY-SR-001

**WP-SY-03 Project Management Plan Document**

**Description:**

Produce a Project Management Plan that outlines how the group will work to complete the tasks in accordance with the supervisors’ expectations. The plan must address the budget, work breakdown structure, timeline, team responsibilities and work packages.

Work package duration: 7 days

Date of commencement: 08/03/10

Date of completion: 14/03/10

Person Responsible: Michael Hamilton

**Requirements:**

AHNS, High Level Objectives of AHNS-2010-SY-HL-001

AHNS, System Requirements of AHNS-2010-SY-SR-001

**Deliverables:**

AHNS, Project Management Plan of AHNS-2010-SY-PM-001

**WP-PL-01 Airframe Trade Study**

**Description:**

Research the information that is required to achieve the System Requirements outlined in [RD/2] for the airframe. Produce a Trade study from this research, and recommend the best option for the project.

Work package duration: 7 days

Date of commencement: 08/03/10

Date of completion: 14/03/10

Person Responsible: Michael Kincel

**Requirements:**

AHNS, High Level Objectives of AHNS-2010-SY-HL-001

AHNS, System Requirements of AHNS-2010-SY-SR-001

**Deliverables:**

Airframe, Trade Study of AHNS-2010-PL-TS-001

**WP-AP-01 Flight Computer Trade Study**

**Description:**

Research the information that is required to achieve the System Requirements outlined in [RD/2] for the flight computer. Produce a Trade study from this research, and recommend the best option for the project.

Work package duration: 7 days

Date of commencement: 08/03/10

Date of completion: 14/03/10

Person Responsible: Tim Molloy

**Requirements:**

AHNS, High Level Objectives of AHNS-2010-SY-HL-001

AHNS, System Requirements of AHNS-2010-SY-SR-001

**Deliverables:**

Flight Computer, Trade Study of AHNS-2010-AP-TS-001

**WP-SY-04 Preliminary Design Document**

**Description:**

Produce a preliminary design document, with the information gathered from the system requirements [RD/2] and the trade studies.

Work package duration: 7 days

Date of commencement: 08/03/10

Date of completion: 14/03/10

Person Responsible: All Students

**Requirements:**

AHNS, System Requirements of AHNS-2010-SY-SR-001

Airframe, Trade Study of AHNS-2010-PL-TS-001

Flight Computer, Trade Study of AHNS-2010-AP-TS-001

**Deliverables:**

AHNS, Preliminary Design of AHNS-2010-SY-DD-001

**WP-PL-02 Acquire and Construct Airframe**

**Description:**

Purchase the Airframe from the supplier, and assemble the platform to a RC flight level.

Work package duration: 11 days

Date of commencement: 15/03/10

Date of completion: 01/04/10

Person Responsible: Michael Hamilton, Michael Kincel

**Requirements:**

AHNS, Preliminary Design of AHNS-2010-SY-DD-001

Airframe, Trade Study of AHNS-2010-PL-TS-001

**Deliverables:**

Completely Build RC helicopter

**WP-AP-02 Acquire Flight Computer**

**Description:**

Purchase Flight Computer from the Supplier.

Work package duration: 11 days

Date of commencement: 15/03/10

Date of completion: 01/04/10

Person Responsible: Michael Hamilton

**Requirements:**

AHNS, Preliminary Design of AHNS-2010-SY-DD-001

Flight Computer, Trade Study of AHNS-2010-AP-TS-001

**Deliverables:**

Acquire Flight Computer.

**WP-SE-01 Design State Estimation**

**Description:**

Design and develop the state estimation from onboard hardware data to allow the controller to predict future actions. Complete a design document outlining the state estimation developed.

Work package duration: 115 days

Date of commencement: 15/03/10

Date of completion: 30/06/10

Person Responsible: Liam O’Sullivan

**Requirements:**

AHNS, Preliminary Design of AHNS-2010-SY-DD-001

**Deliverables:**

State Estimation, Design of AHNS-2010-SE-DD-001

**WP-PL-03 Acquire Platform Electronics**

**Description:**

Purchase all the platform electronics from the Supplier, such as the Coulomb counter, enclosure, temperature sensor, necessary wires and connectors.

Work package duration: 11 days

Date of commencement: 15/03/10

Date of completion: 01/04/10

Person Responsible: Michael Hamilton, Michael Kincel

**Requirements:**

AHNS, Preliminary Design of AHNS-2010-SY-DD-001

**Deliverables:**

Acquire Platform Electronics.

**WP-LO-01 Acquire Camera**

**Description:**

Purchase camera from the Supplier.

Work package duration: 11 days

Date of commencement: 15/03/10

Date of completion: 01/04/10

Person Responsible: Michael Hamilton

**Requirements:**

AHNS, Preliminary Design of AHNS-2010-SY-DD-001

**Deliverables:**

Acquire Camera.

**WP-PL-04 Airframe RC Test Report**

**Description:**

Test the RC airframe for flight characteristics to confirm successful construction. Also test for maximum endurance and total payload.

Work package duration: 29 days

Date of commencement: 02/04/10

Date of completion: 30/04/10

Person Responsible: Michael Kincel

**Requirements:**

WP-PL-02 Acquire and Construct Airframe

**Deliverables:**

Platform, RC Test Report of AHNS-2010-PL-TR-001

**WP-AP-03 Design Control System**

**Description:**

Design and develop the control system to keep the platform stable while in flight. Complete a design document outlining the control system developed.

Work package duration: 115 days

Date of commencement: 15/03/10

Date of completion: 30/06/10

Person Responsible: Tim Molloy

**Requirements:**

AHNS, Preliminary Design of AHNS-2010-SY-DD-001

State Estimation, Design of AHNS-2010-SE-DD-001

**Deliverables:**

Control System, Design of AHNS-2010-AP-DD-001

**WP-PL-05 Electronics Test Report**

**Description:**

Test the onboard electronics to ensure they function correctly before integrating it with the other major components.

Work package duration: 29 days

Date of commencement: 02/04/10

Date of completion: 30/04/10

Person Responsible: Michael Kincel

**Requirements:**

WP-PL-03 Acquire Platform Electronics

**Deliverables:**

Electronics, Test Report of AHNS-2010-PL-TR-002

**WP-LO-02 Camera Bench Test Report**

**Description:**

Test the camera to ensure that it works correctly before integrating it with the developed computer vision system.

Work package duration: 29 days

Date of commencement: 02/04/10

Date of completion: 30/04/10

Person Responsible: Liam O’Sullivan

**Requirements:**

WP-LO-01 Acquire Camera

**Deliverables:**

Camera, Test Report of AHNS-2010-LO-TR-001

**WP-LO-03 Design Computer Vision System**

**Description:**

Design and develop computer vision software to allow an optical camera to locate a known mark on the ground, and determine its distance from that point.

Work package duration: 115 days

Date of commencement: 15/03/10

Date of completion: 30/06/10

Person Responsible: Liam O’Sullivan

**Requirements:**

AHNS, Preliminary Design of AHNS-2010-SY-DD-001

**Deliverables:**

Computer Vision, Design of AHNS-2010-LO-DD-001

**WP-CG-01 Design Ground Control Station**

**Description:**

Design and develop the ground control station to receive and log data sent by the platform. This GCS should also be able to send pre-designed commands to the helicopter.

Work package duration: 115 days

Date of commencement: 15/03/10

Date of completion: 30/06/10

Person Responsible: Tim Molloy, Liam O’Sullivan

**Requirements:**

AHNS, Preliminary Design of AHNS-2010-SY-DD-001

**Deliverables:**

Ground Control Station, Design of AHNS-2010-CG-DD-001

**WP-CO-01 Design Wireless Communications**

**Description:**

Design and develop the wireless communications between the platform, ground control station and future ‘add on’ devices.

Work package duration: 115 days

Date of commencement: 15/03/10

Date of completion: 30/06/10

Person Responsible: Michael Hamilton

**Requirements:**

AHNS, Preliminary Design of AHNS-2010-SY-DD-001

**Deliverables:**

Communications, Design of AHNS-2010-CO-DD-001

**WP-AP-04 Flight Computer Bench Test Report**

**Description:**

Test the control system and state estimation on the flight computer, with all external sensors attached. Ensure that the results appear normal before integrating with platform and flight testing.

Work package duration: 31 days

Date of commencement: 01/07/10

Date of completion: 31/07/10

Person Responsible: Tim Molloy, Liam O’Sullivan

**Requirements:**

WP-AP-02 Acquire Flight Computer

Control System, Design of AHNS-2010-AP-DD-001

**Deliverables:**

Flight Computer, Test Report of AHNS-2010-AP-TR-001

**WP-LO-04 Integrate Computer Vision with Camera Hardware**

**Description:**

Integrate the computer vision software onto the camera hardware processor and test the results on the bench. Ensure that the results appear normal before integrating with platform and flight testing.

Work package duration: 31 days

Date of commencement: 01/07/10

Date of completion: 31/07/10

Person Responsible: Liam O’Sullivan

**Requirements:**

Computer Vision, Test Report of AHNS-2010-LO-TR-001

Computer Vision, Design of AHNS-2010-LO-DD-001

**Deliverables:**

Computer Vision, Test Report of AHNS-2010-LO-TR-002

**WP-CO-02 Wireless Communications Test Report**

**Description:**

Test the wireless communication between the ground control station and onboard processor. Ensure that the results appear normal before integrating with platform and flight testing.

Work package duration: 31 days

Date of commencement: 01/07/10

Date of completion: 31/07/10

Person Responsible: Michael Hamilton

**Requirements:**

Ground Control Station, Design of AHNS-2010-CG-DD-001

Communications, Design of AHNS-2010-CO-DD-001

**Deliverables:**

Communications, Test Report of AHNS-2010-CO-TR-001

**WP-PL-06 Integrate Onboard Hardware into Enclosure**

**Description:**

Integrate all the hardware that is to be mounted inside the enclosure and test to ensure that it is all operational. Ensure that the results appear normal before integrating with platform and flight testing.

Work package duration: 31 days

Date of commencement: 01/08/10

Date of completion: 31/08/10

Person Responsible: Michael Kincel

**Requirements:**

Flight Computer, Test Report of AHNS-2010-AP-TR-001

Computer Vision, Test Report of AHNS-2010-LO-TR-002

Electronics, Test Report of AHNS-2010-PL-TR-002

**Deliverables:**

Enclosure, Test Report of AHNS-2010-PL-TR-003

**WP-PL-07 Integrate Electronics Enclosure into Airframe**

**Description:**

Integrate the enclosure containing all onboard electronics into the airframe and test that all aspects are operational. Ensure that the results appear normal during RC tests before testing in flight modes.

Work package duration: 31 days

Date of commencement: 01/08/10

Date of completion: 31/08/10

Person Responsible: Michael Kincel

**Requirements:**

Enclosure, Test Report of AHNS-2010-PL-TR-003

**Deliverables:**

Platform, Test Report of AHNS-2010-PL-TR-004

**WP-SY-05 Augmented Flight Test Report**

**Description:**

Test the completed platform for its performance of augmented flight.

Work package duration: 40 days

Date of commencement: 01/09/10

Date of completion: 10/10/10

Person Responsible: All Students

**Requirements:**

Platform, Test Report of AHNS-2010-PL-TR-004

Communications, Test Report of AHNS-2010-CO-TR-001

**Deliverables:**

Platform, Test Report of AHNS-2010-PL-TR-005

**WP-SY-06 Station Keeping Test Report**

**Description:**

Test the completed platform for its performance of station keeping flight.

Work package duration: 40 days

Date of commencement: 01/09/10

Date of completion: 10/10/10

Person Responsible: All Students

**Requirements:**

Platform, Test Report of AHNS-2010-PL-TR-004

Communications, Test Report of AHNS-2010-CO-TR-001

**Deliverables:**

Platform, Test Report of AHNS-2010-PL-TR-006

**WP-CG-02 Ground Control Station Test Report**

**Description:**

Test the ground control stations ability to display and log transmitted data from the platform during a flight test. Also test the GCS ability to transmit commands to the platform.

Work package duration: 40 days

Date of commencement: 01/09/10

Date of completion: 10/10/10

Person Responsible: Tim Molloy, Liam O’Sullivan

**Requirements:**

Platform, Test Report of AHNS-2010-PL-TR-004

Communications, Test Report of AHNS-2010-CO-TR-001

**Deliverables:**

Ground Control Station, Test Report of AHNS-2010-CG-TR-001

**WP-SY-07 Complete all Test Reports**

**Description:**

Complete all Test Reports for each subsystem, and the system as a whole. This includes any test reports compiled from flight testing.

Work package duration: 19 days

Date of commencement: 11/10/10

Date of completion: 29/10/10

Person Responsible: All Students

**Requirements:**

Ground Control Station, Test Report of AHNS-2010-CG-TR-001

Platform, Test Report of AHNS-2010-PL-TR-005

Platform, Test Report of AHNS-2010-PL-TR-006

**Deliverables:**

Unmentioned Test Reports

**WP-SY-08 Complete Operation Manuel**

**Description:**

Compile an operations manual that explains to a new user how to operate every component within the project. This will allow easy hand over to future students working on the project.

Work package duration: 19 days

Date of commencement: 11/10/10

Date of completion: 29/10/10

Person Responsible: All Students

**Requirements:**

All Design Documents

All Test Reports

**Deliverables:**

AHNS, Operations Manuel AHNS-2010-SY-OM-001

**WP-SY-09 Verification of Success**

**Description:**

Verify that all high level objectives outlined in RD/1 and all system requirements outlined in RD/2 are completed.

Work package duration: 19 days

Date of commencement: 11/10/10

Date of completion: 29/10/10

Person Responsible: All Students

**Requirements:**

All Documentation

**Deliverables:**

Group agreement of success

**WP-SY-10 Demonstration**

**Description:**

Demonstrate to the supervisor that all high level objectives and system requirements are completed and were successful.

Work package duration: 19 days

Date of commencement: 11/10/10

Date of completion: 29/10/10

Person Responsible: All Students

**Requirements:**

WP-SY-09 Verification of Success

**Deliverables:**

Demonstration of AHNS 2010 system

**WP-SY-11 Presentation**

**Description:**

Produce a presentation of the AHNS 2010 system to the client, industry representatives and peers.

Work package duration: 19 days

Date of commencement: 11/10/10

Date of completion: 29/10/10

Person Responsible: All Students

**Requirements:**

WP-SY-09 Verification of Success

**Deliverables:**

Presentation of the AHNS 2010 system

**WP-SY-12 Traceability Matrix**

**Description:**

Using a Traceability matrix, provide evidence that the System Requirements were met.

Work package duration: 19 days

Date of commencement: 11/10/10

Date of completion: 29/10/10

Person Responsible: Michael Hamilton

**Requirements:**

WP-SY-09 Verification of Success

**Deliverables:**

AHNS, Traceability Matrix of AHNS-2010-SY-TM-001

# Conclusions

In Conclusion, the AHNS 2010 project follows several guidelines to ensure that the work packages are successfully completed by the scheduled delivery date. These guidelines range from division of tasks, documentation responsibilities, document naming standards, work breakdown structure, and task timelines.

# Recommendations

All member of 2010 Autonomous Helicopter Navigation System must follow the guidelines outlined in this document.