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*“A Project”*

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**Foreword**

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**Definitions**

|  |  |
| --- | --- |
| QUT | Queensland University of Technology |
| AHNS | Autonomous Helicopter Navigation System |
| HLO | High Level Objective |
| SR | System Requirement |
|  |  |
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# Introduction

This document outlines the Risk Management Plan developed for the 2010 Autonomous Helicopter Navigation System project. A risk management plan identifies the risks that could potentially effect personal and project objectives. These risks are then pro-actively managed to ensure the safety, health and wellbeing of all staff, students and general public that interact with the project. A detailed risk management document is essential for any project under the jurisdiction of QUT.

## Scope

This document details the risks and prevention methods for mitigating the damage on personal, equipment and project goals. This document will be restricted to the Risk Management Plan for the 2010 AHNS project.

## Background

This document has been written as part of the Project Management Plan RD/1, which overviews how the AHNS’s HLO’s and SR’s will be completed within the specified time frame, financial budget, and safety guidelines.

# Reference Documents

## QUT Avionics Documents

|  |  |  |
| --- | --- | --- |
| RD/1 | AHNS-2010-SY-PM-001 | AHNS, Project Management Plan of |

## Non-QUT Documents

|  |  |  |
| --- | --- | --- |
| RD/2 | 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.

# Risk Management

The following section details the risk management procedure for the 2010 AHNS project. The purpose of the plan is to ensure that any incident with potential to harm a team member or delay in progress of the project can be successfully avoided or appropriately handled by following a detailed mitigation procedure. Risk management is an important consideration for any system engineering process. It is standard to categorise risks into several groups, which are formulated from RD/2.

The risk management process involves:

* Determine responsibilities and context of the project.
* Indentify hazards within the project.
* Assess the risks existing in each hazard.
* Determine control measures.
* Implement control measures.
* Review effectiveness of control measures.

This document forms an important part of the communication and consultation process.

## Context

This Risk Management Plan shall be used by the project manager, team members and supervisors of the AHNS 2010 project to manage the risks associated with all stages of the project.

## Objective

The objective of the Risk Management Plan is to ensure that QUT and persons associated with the AHNS 2009 project are aware of and understand the risks presented by the development and operation of the project, and that no unnecessary risks are undertaken, which do not have a corresponding opportunity or benefit.

## Risk Categories

The following sections detail the risks involved within five categories for the AHNS projects lifecycle.

* Personal Injury
* Property Damage
* Schedule
* Technical
* Budgetary

### Personal Injury

This plan manages the risks related to personal injury of team members, visitors and the general public including;

* Health and Safety risks to the extent to which the operations of the project can impact on group members, visitors and the general public.
* The risks associated with the use of construction and development tools and equipment.
* Personal injury associated with attending testing and demonstrations sites external to the university.

### Property Damage

This plan manages the risks associated with damage to the property of the AHNS group and also any property owned by QUT, such as:

* Damage to or loss of the AHNS Helicopter Platform
* Damage to QUT facilities, or external testing sites.
* Damage to construction or development tools.

### Schedule

This plan manages the schedule related risks to the AHNS 2010 project including;

* Failure to achieve objectives or system requirements of the project.
* The delivery of purchased parts or equipment.
* Student commitments to other subjects and external activities.

### Technical

The plan manages the technical risks to the AHNS 2010 project including;

* Damage to/loss of helicopter platform.
* Failure during development or flight testing of subsystems.
* Errors in design/planning.
* Inexperience of team members.

### Budgetary

This plan manages the financial risks to the AHNS 2010 project including;

* Expenditure due to damaged parts.
* Expenditure due to collateral damage.
* Financial impacts as a result of non-compliance with laws or regulations.

# Risk Mitigation

Once risks for the AHNS project are identified, mitigation procedures must be developed in order to minimise potential hazards. Following this risk mitigation procedure will aid in reducing any potential hazard to the safety of individuals, equipment, and the surrounding environment. The following sections detail potential hazards and their mitigation procedures.

## Risk Identification Methodology

The following spread of strategies is being applied to assist in Risk Identification.

### Brainstorming and Role Play

Brainstorming and role play is a major source or risk identification. This approach essentially involves round table discussions with the AHNS team members and supervisors in order to run through scenarios. This process results in the identification of many hazards which will occur during the development and operation of the project.

### Practical Experience

AHNS personnel have some background experience in their respective subsystems. This experience is important in identifying hazards and risks. Cases where there is a lack of expertise among the team members, experts on the particular subject will be actively approached to provide support and insight.

## Risk Analysis and Control Plan

Guidance for risk analysis and control has been sought from a number of sources and a tailored risk analysis methodology is presented here.

### Likelihood

#### Almost Certain

An event which could be expected to occur multiple times throughout the life of the program.

#### Likely

An event which could be expected to occur a few times throughout the life of the program.

#### Moderate

An event which could be expected to occur once or twice throughout the life of the program.

#### Unlikely

An event which could occur, but is not expected to occur throughout the life of the program.

#### Rare

An event which is not expected to occur during the program;

### Consequence

#### Insignificant

No injuries, low financial implications

#### Minor

Possible injuries requiring no more than first aid treatment, medium financial loss.

#### Moderate

Possible injuries would require medical treatment, high financial loss.

#### Major

Extensive injuries possible, major financial loss.

#### Catastrophic

Death is clearly possible, huge financial implications.

### Risk Rating

The matrix defined Table 1: Risk Evaluation Table is used to evaluate the Risk Rating based on the likelihood and consequence assessments.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Likelihood** | **Consequences** | | | | |
| **Insignificant** | **Minor** | **Moderate** | **Major** | **Catastrophic** |
| **Almost Certain** | Moderate | High | Extreme | Extreme | Extreme |
| **Likely** | Moderate | High | High | Extreme | Extreme |
| **Moderate** | Low | Moderate | High | Extreme | Extreme |
| **Unlikely** | Low | Low | Moderate | High | Extreme |
| **Rare** | Low | Low | Moderate | High | High |

Table : Risk Evaluation Table

The following provides guidance on the required actions based on the risk rating.

Table - Risk Levels

|  |  |
| --- | --- |
| **Risk Levels** |  |
| 1. Immediate Action Required. Do not proceed with activity | Extreme |
| 2. Senior management attention required. | High |
| 3. Proceed with caution. | Moderate Risk |
| 4. Manage by routine procedures. | Low Risk |

### Controls

Each identified risk should have controls applied to ensure that they do not occur. Table 4 and Table 3 provide guidance on how to prioritise and assess the effectiveness of the proposed controls, and how they affect the residual risk.

Note that residual risk can also be assessed by re-assessing the likelihood and consequence of the adverse event occurring, given the proposed controls; however this does not always yield a true picture of the residual risk. The tables below provide guidance on the preferred types of controls to use in such situations.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Control Measure Effectiveness** | | |  |  | |
|  | **Extreme** | **High** | **Moderate** | | **Low** |
| **Excellent** | Low | Low | Low | | Low |
| **Good** | Moderate | Low | Low | | Low |
| **Fair** | High | Moderate | Low | | Low |
| **Poor** | Extreme | High | Moderate | | Low |

Table : Control Measure Risk Reduction

|  |  |
| --- | --- |
| **Control measures** |  |
| 1. Eliminate (Best Solution – Eliminate the Risk) | Excellent |
| 2. Substitute (Replace for a less hazardous outcome) | Excellent |
| 3. Engineer (Re-design or modify to lower risk) | Good |
| 4. Isolate (Remove process or operation to a safer location) | Fair |
| 5. Administrate (Create procedural instructions) | Poor |
| 6. Personal Protective Equipment (Last choice) | Poor |

Table - Control Measure Effectiveness

## Monitor and Review Plan

### Periodic Review

A Periodic Review of the Risk Management Plan and Hazard Log shall be carried out each semester. Review results shall be forwarded to the supervisor for review and acceptance. Significant changes will be explicitly identified in the report.

### Review and Acceptance of New Risks

Newly identified hazards shall be added to the hazard log. The individual carrying out the new risk assessment shall identify any conflicts with existing risks.

# Risk Acceptance Responsibility

Risk acceptance must consider the benefits and opportunities presented as well as the risk rating when considering if a given risk should be accepted.

## Personal Injury

|  |  |  |
| --- | --- | --- |
| **Residual Risk** | **Acceptance Criteria** | **Acceptance Responsibility** |
| High | Not Acceptable | NA |
| Medium | Acceptable with review of supervisor. | Project Manager |
| Low | Acceptable with normal review. | Project Manager |

Table : Personal Injury Risk Acceptance Responsibility

## Schedule

|  |  |  |
| --- | --- | --- |
| **Residual Risk** | **Acceptance Criteria** | **Acceptance Responsibility** |
| High | Not Acceptable | NA |
| Medium | Acceptable with review of supervisor. | Project Manager |
| Low | Acceptable with normal review. | Project Manager |

Table : Schedule Risk Acceptance Responsibility

## Technical

|  |  |  |
| --- | --- | --- |
| **Residual Risk** | **Acceptance Criteria** | **Acceptance Responsibility** |
| Extreme | Not Acceptable | NA |
| High | Not Acceptable | NA |
| Moderate | Acceptable with review of supervisor | Project Manager |
| Low | Acceptable with normal review. | Project Manager |

Table : Technical Risk Acceptance Responsibility

## Budgetary

|  |  |  |
| --- | --- | --- |
| **Residual Risk** | **Acceptance Criteria** | **Acceptance Responsibility** |
| High | Not Acceptable | NA |
| Medium | Acceptable with review of supervisor. | Project Manager |
| Low | Acceptable with normal review. | Project Manager |

Table : Budgetary Risk Acceptance Responsibility

# Conclusion

# Recommendations

# Appendices

The following appendices form part of this document.

1. Appendix A – Risk Hazard Log
2. Appendix B – QUT Risk Management Form