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PERIPHERAL AND REDUNDANCY SWITCH CONTROLLER

EXECUTIVE SUMMARY REPORT

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CHANGE LOG

Reason for change	**Issue**	**Revision**	**Date**

CHANGE RECORD

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1. Table of Contents

List of abbreviations

PRSC – Preliminary and Redundancy Switch Controller
OBC – On board computer

2. Introduction

2.1. Purpose

The purpose of the document is to provide a general overview in a concise format, corresponding to the activity implementation, the timeframe and conclusions.

2.2. Scope

The scope of the document is to deliver to the Agency an executive report with respect to the development objectives, outcome, overall findings and conclusions. The document is to be treated as public and it does not contain any background intellectual property rights.

3. General Objectives

The project called Peripheral and Redundancy Switch Controller is based on the proposal made by Agile Systems Engineering to develop, test and integrate a switch between two on-board-computers (OBCs) that would be connected to a number of peripherals (actuators, components etc.) and sensors in order to allow redundancy at a system level. The project is funded by the de-risk scheme under the European Space Agency (ESA) General and Support Technology Program (GSTP), following an idea coming from the Ascent and Descent Autonomous Maneuverable Platform (ADAMP) development by the Prime INCAS.

4. Activities Overview

As part of the activity implementation, an agile management methodology was used in order to enable a fast prototype development in a short timeframe.

The project management was done using a cloud based digital framework for Gantt chart, requirements engineering, WBS definition, testing plan and test execution as well as a template based automatic documentation generator which pulled data from the elaborated project tasks, issues and work packages.

For the development, electronic architecture, software architecture, mechanical design for the enclosure, procurement of high reliability parts, test planning, execution and environmental testing were elaborated or performed.

Two components were manufactured for the present development, specifically serial number one and two (SN1 and SN2) of the PRSC, called MiniHydra.

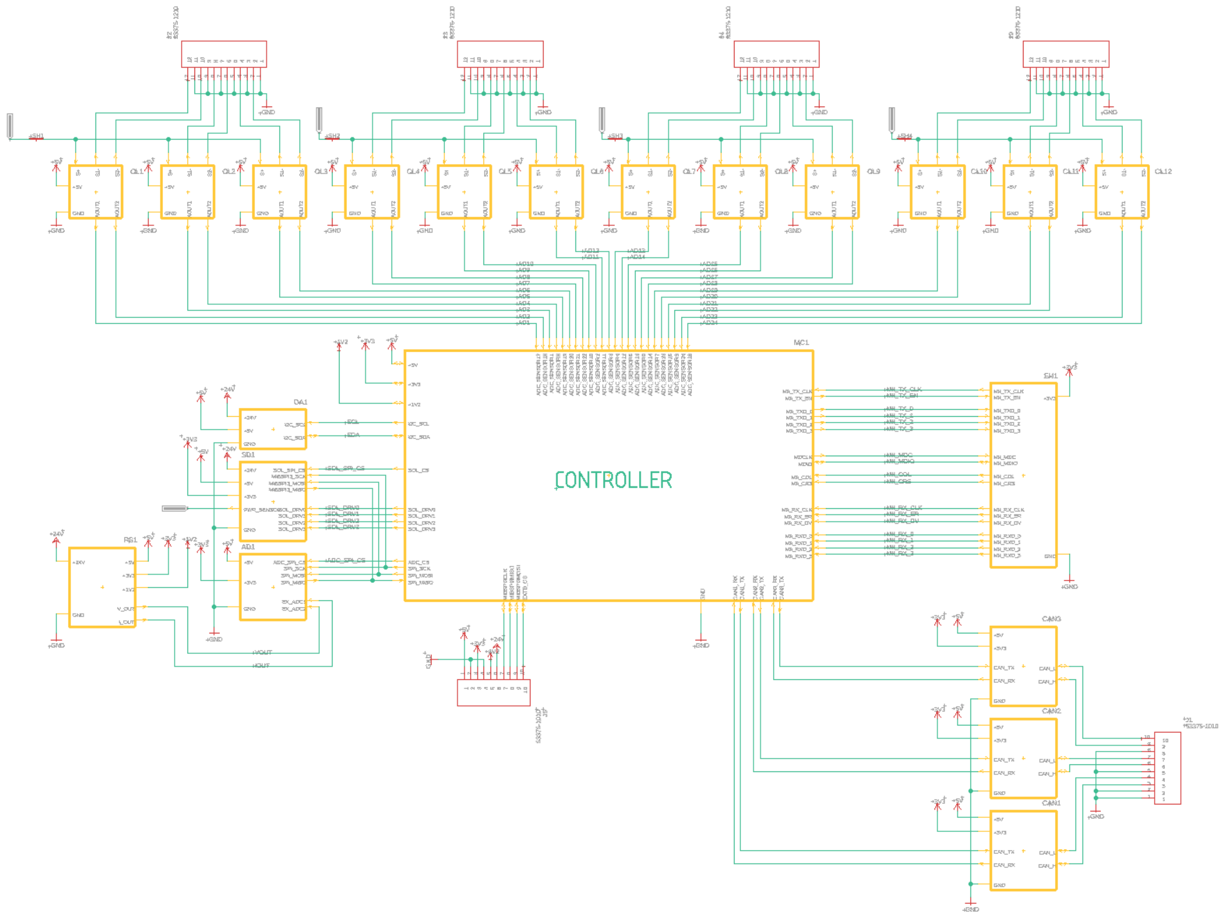

Figure 1 Electronic Architecture

Further to the development and testing of functionality, requirements with respect to environmental loads as per the military standard MIL-STD-810G for operational equipment was performed at a certified facility.

This showed that the component developed can withstand dynamic loads in terms of shocks, vibration and low pressure environment.

As part of the design choices and requirements, the component developed serves as a flight substitute for some of the industrial grade components for the ADAMP system development.

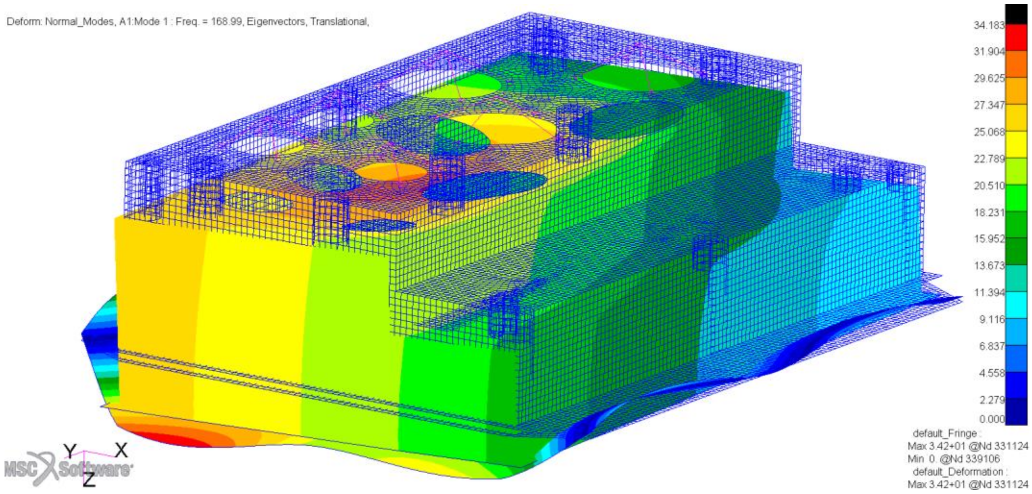

Figure 2 First Mode Shape, Frequency = 168.988 HZ

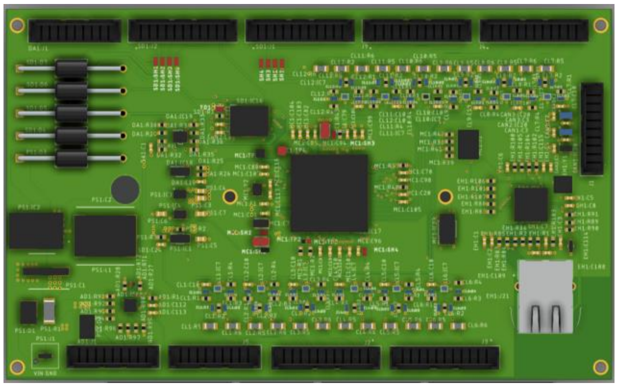

Figure 3 PCB Design

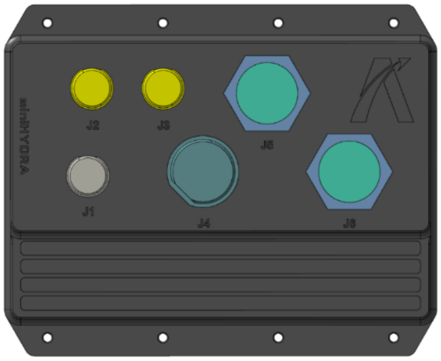

Figure 4 Enclosure Design

Figure 5 MiniHydra integrated

5. Implementation and Timeframe

The development timeframe was based on the initial proposed timeline, however due to supply chain issues on the electronic components - specifically microcontroller and circular connectors availability, the development suffered a 2 month delay on top of the 6 month initially proposed.

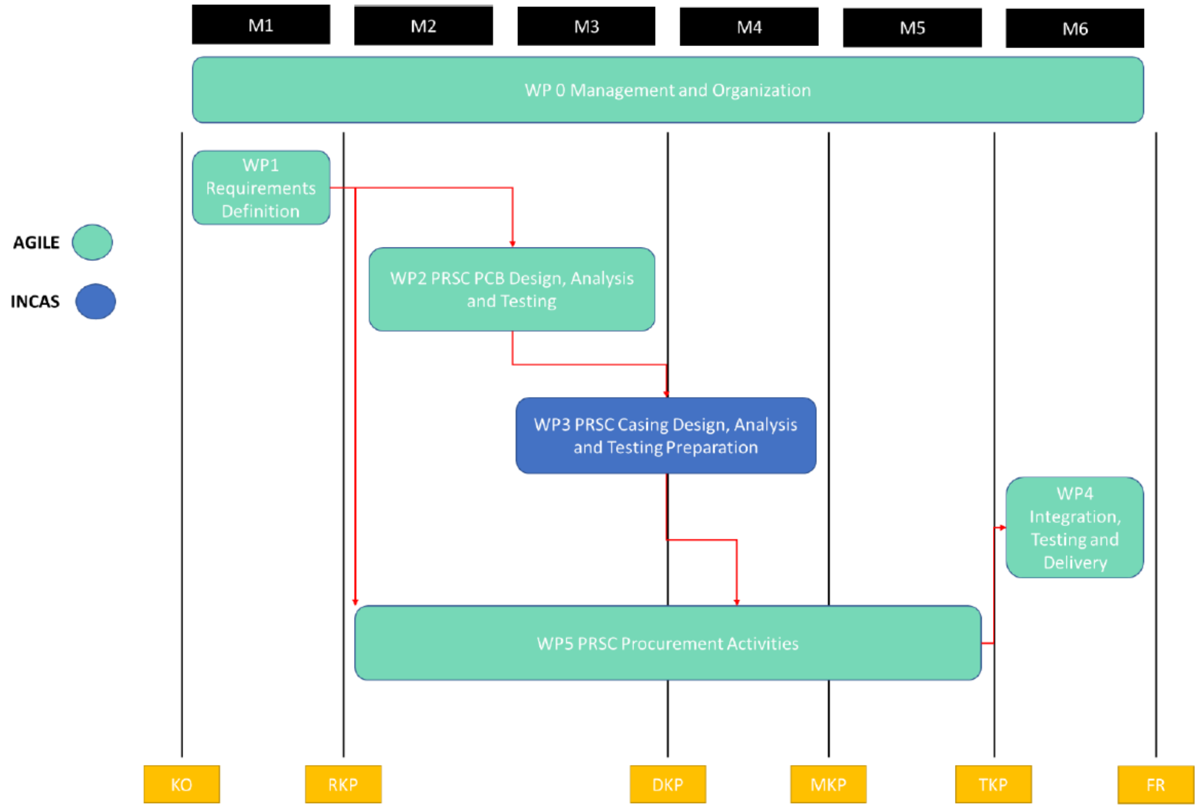

Figure 6 Development timeline and WBS

6. Conclusions

The de-risk implementation was done based on an agile management approach which included fast prototyping and early requirements verification. Based on the initial finding, it was seen that the first architecture suffered from some hardware constraints due to the number of interfaces that required a serial communication expansion component and a port selector to be adopted, which proved that the de-risk approach was well suited for the present development. A new model was designed which included only the reliable communication protocols and which would serve to the ADAMP system as a component to replace the industrial grade controllers currently used, which based on the environmental testing results proves to be adequate for future use.