



Low cost Avionics for an European micro Launcher

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Launchers and Entry Vehicles
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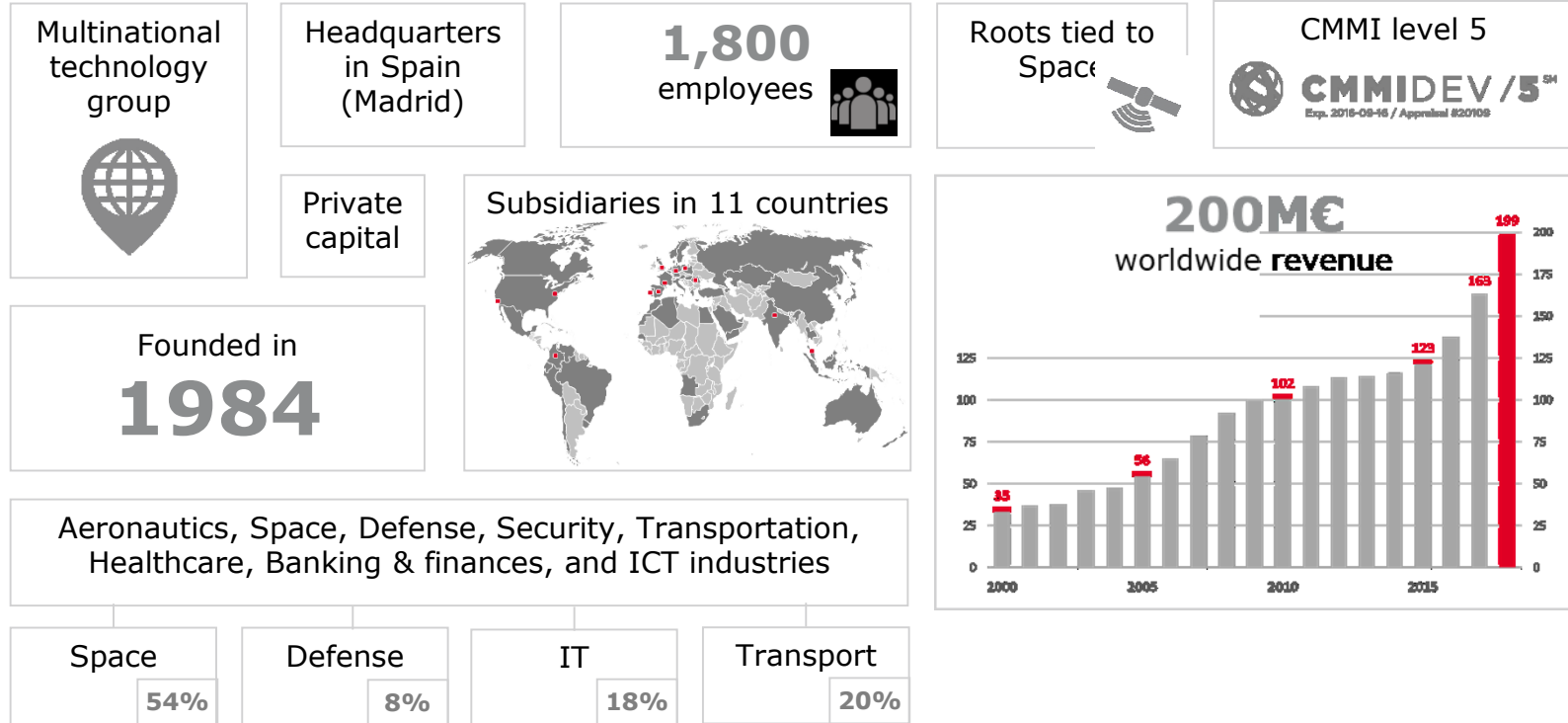
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GMV
WHO WE ARE



INTRODUCTION TO GMV A GLOBAL HIGH TECH GROUP





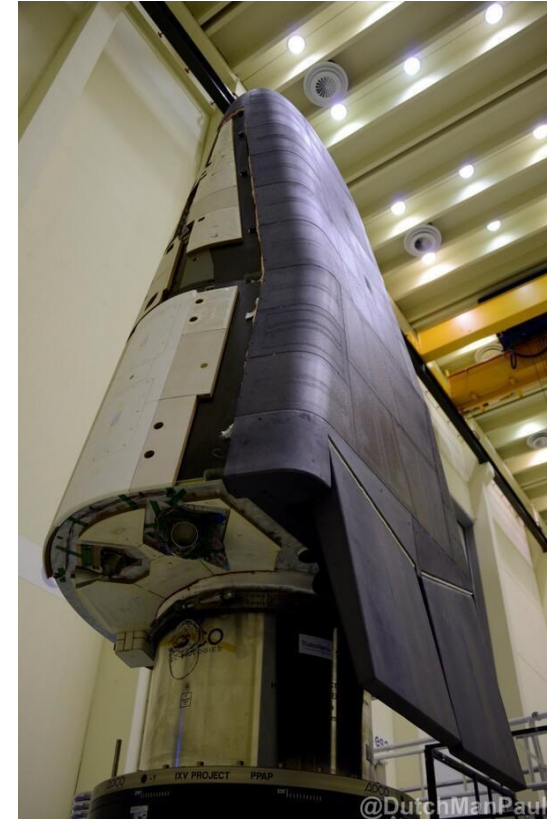
- Satellite Control Centers
- Flight Dynamics Systems
- Mission Planning Systems
- Global Satellite Navigation Systems
- Earth Observation Satellite Data Processing Centers
- Scientific Operations Centers
- Guidance, Navigation and Control (GNC)
- Avionics
- Autonomy and robotics
- Mission analysis
- On-board software
- Simulators development
- Space applications



WHAT WE HAVE DONE FOR LAUNCHERS

GMV activities for European launchers have covered several domains:

- Trajectory Optimization
- Post Flight Analysis
- Missionization Architecture and Tool
- **Expertise in Avionics System Design, Assembly Integration and Validation**
- **Advanced Hybrid Navigation**
- **Onboard SW and GNC Algorithms Design Verification and Validation**
- **Avionics TestBench for GNC and OBSW V&V**
- Independent SW Validation
- Ground Segment Facilities



WHO WE ARE

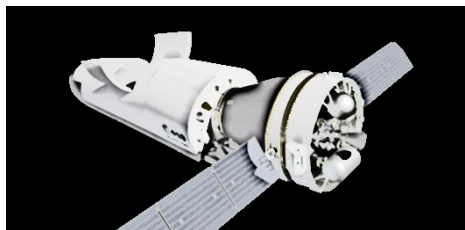
LES-DIVISION: LAUNCHERS AND ENTRY SYSTEMS



**Launchers and
Entry Vehicle**



*Overall Avionics
System Development
and Integration for
Launchers*



*Guidance Navigation
and Control
Development for
Operational Vehicles*



*Rocket Engine Controller:
Design and Integration*



*Adaptive and Innovative
Guidance for Agile
Vehicles*

GMV **MICRO-** **LAUNCHERS**



PLDSPACE™

gmv®

Low-Cost Launcher Services and their Impact-
COMET-ORB (CNES)

04/04/2018



PLD SPACE: Launchers Models Definition



12.700mm



27.000mm

MIURA 1

MIURA 5

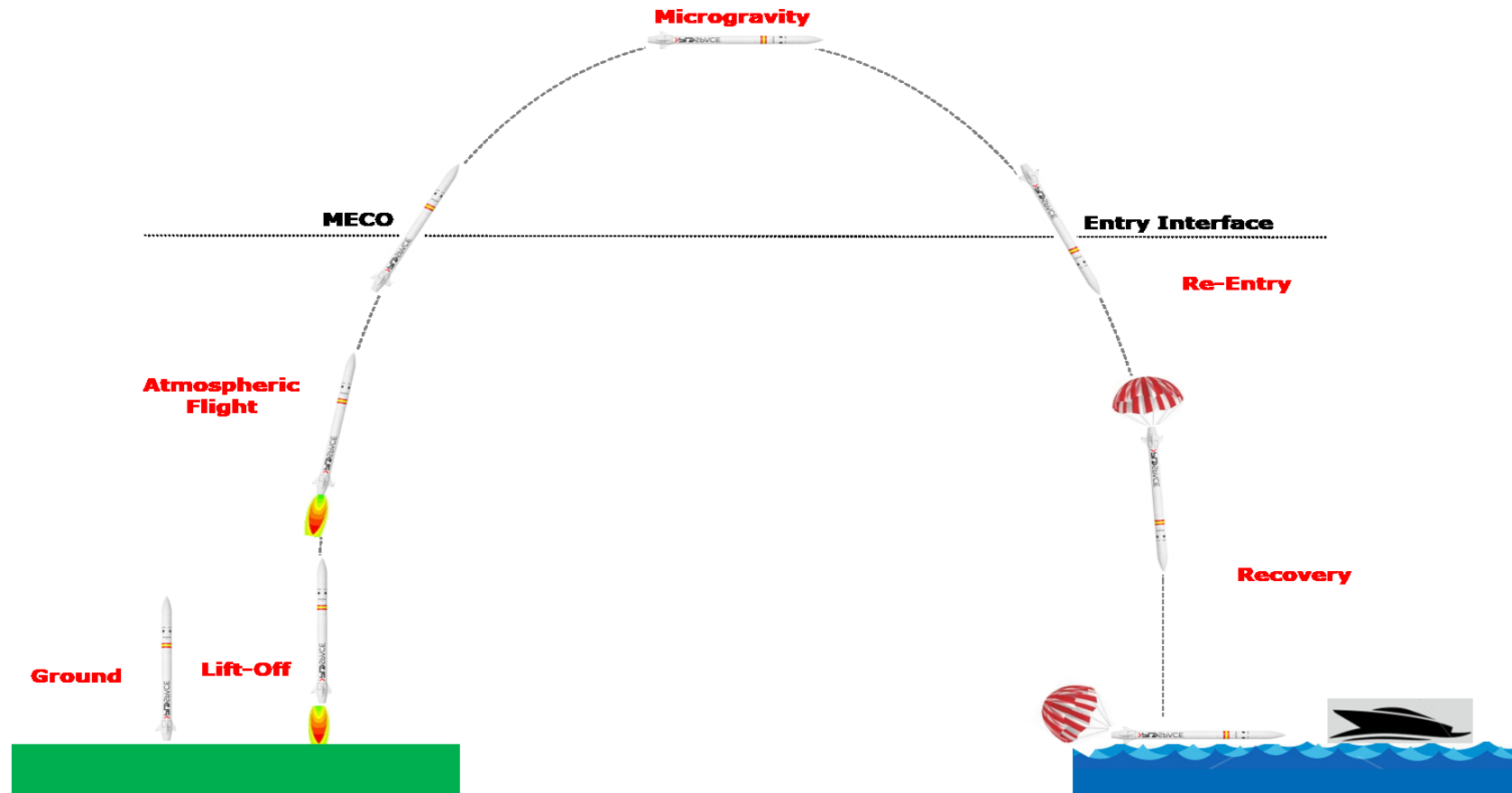
MIURA-1

Main characteristics

- 1 stage, 1 engine KeroLOX, pressure fed (30kN)
- 12 m height, 0.7m diameter
- Payload: 100kg (nominal) (up to 200kg)
- Max apogee: 150km
- Mission duration: 600s
- 5 minutes of microgravity exposure, $10e-3$ baseline
- Recoverable and reusable
- Maiden flight: Q3 2019 from Spain



MIURA-1: Mission Profile



El Arenosillo Launch Base



MIURA-5

Main characteristics

- 2 stages, engine KeroLOX (400kN, 65kN) turbopump and pressure fed
- 27 m height, 1.6m diameter
- Payload: 300 kg in LEO orbit 500km
- 1st stage Recoverable and reusable
- Maiden flight: Q3 2021



TODAY

2+1 LOCATIONS



Main Facts

2011

PLD SPACE
FOUNDATION



Feb. 2015

PROPULSION TEST
FACILITIES

100% PLD Space engineering
development.

100% private.
[\(VIDEO\)](#)



Jun. 2015

FIRST SPANISH LIQUID
ROCKET ENGINE

First European KeroLOX engine to be
fully designed and tested.

[\(VIDEO\)](#)



Main Facts

Dec. 2016

HISTORIC GMV SUPPORT

GMV Joins PLD Space Microlauncher development program as Technological Partner and Shareholder.

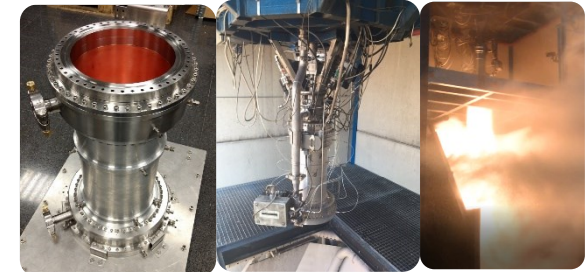
May 2017

20TH EMPLOYEE

PLD Space has 32 full-time employees + GMV Technical staff.

Jul. 2017

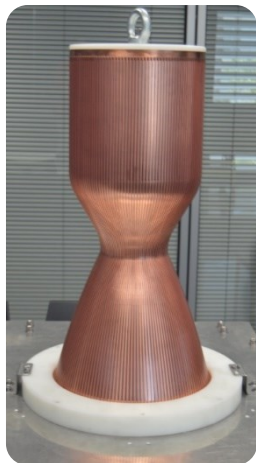
THIRD ENGINE GENERATION DEVELOPED AND TESTED.



Main Facts

JULY 2018

FIRST TEST OF THE
REGENERATIVE
ENGINE



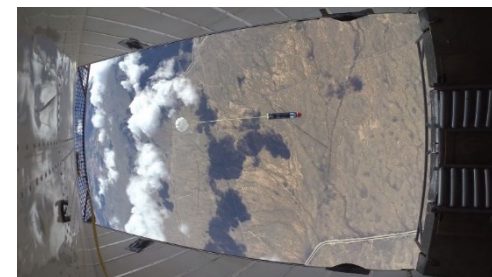
DECEMBER 2018

New Testing Facility
inauguration



MARCH 2019

Flight engine starts
qualification procedure
Recovery system testing

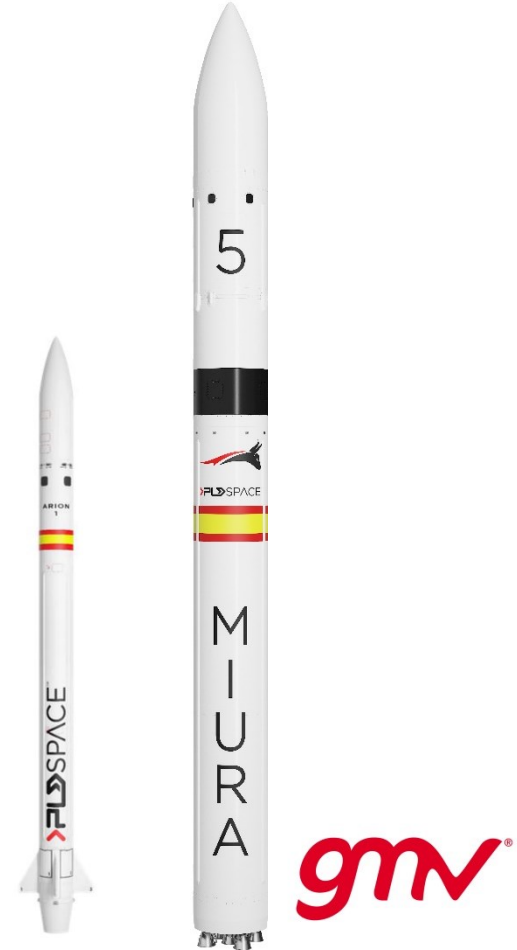


GMV AVIONICS

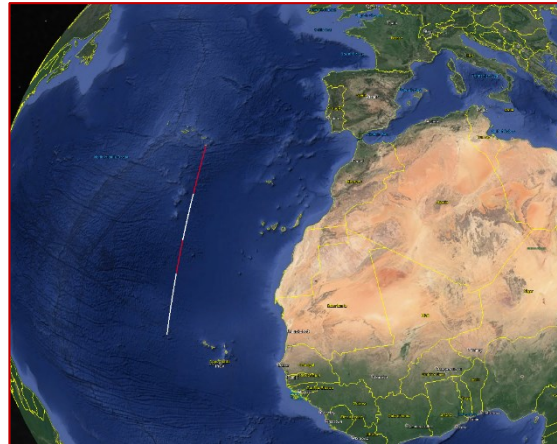
WHAT WE DO FOR PLD LAUNCHERS

GMV has taken the responsibility for the overall AVIONICS desing integration and Validation. This includes:

- The overall OBSW
(including GNC, TLM and Monitoring and Commanding functions)
- Navigation Sensors including
GNSS aided Inertial Navigation System (INS)
- On-board Computer (OBC)
- Communication buses
- Power Storage, Distribution and Conditioning
- Communication systems including TLM antennas,
TLM transmitter and TLM encoder
- On-board Controlled Recovery System
- Payload Management System and Services
- On-board Flight Termination System
- Harness



TRAJECTORY OPTIMISATION AND PERFORMANCES



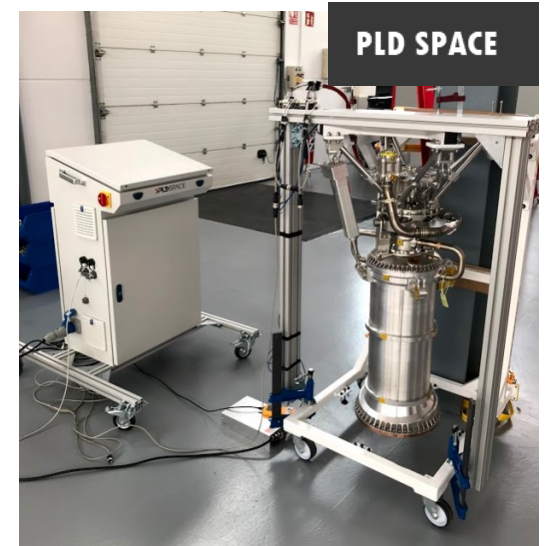
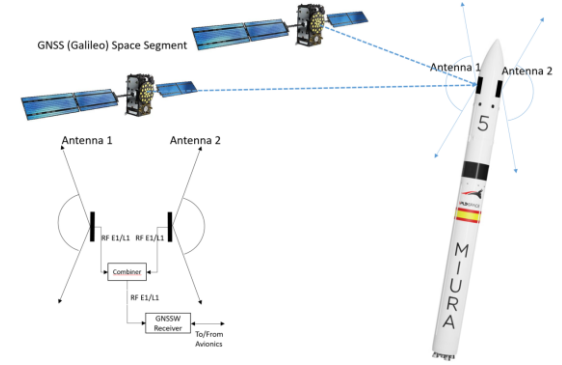
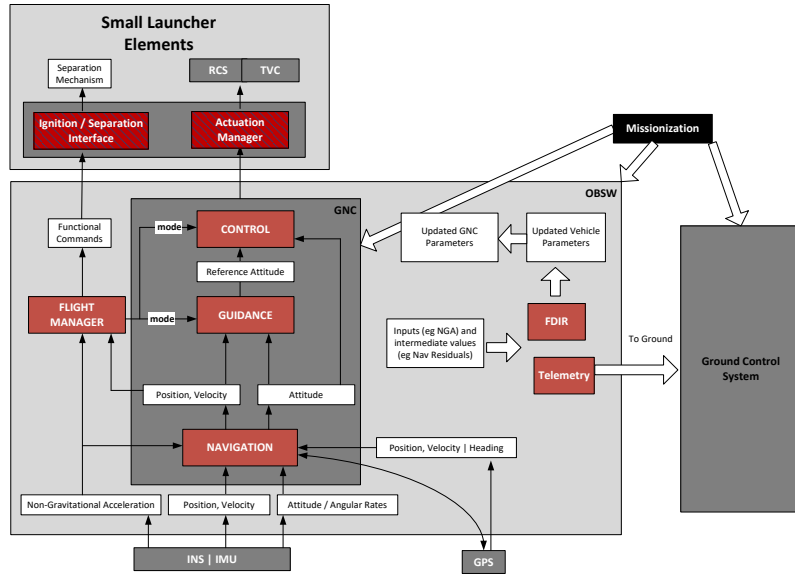
Low-Cost Launcher Services and their Impact-
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04/04/2019

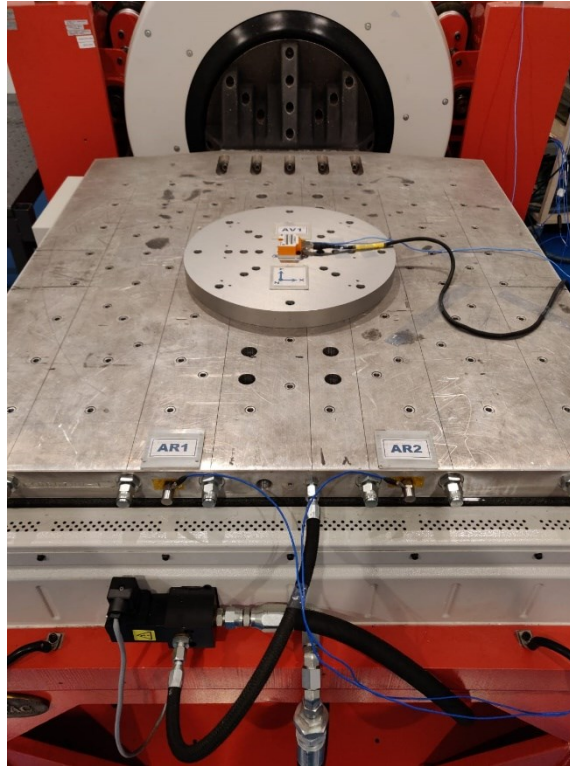
UNCLASSIFIED INFORMATION



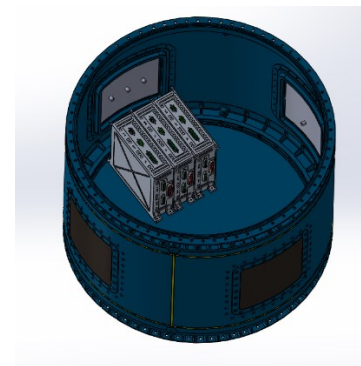
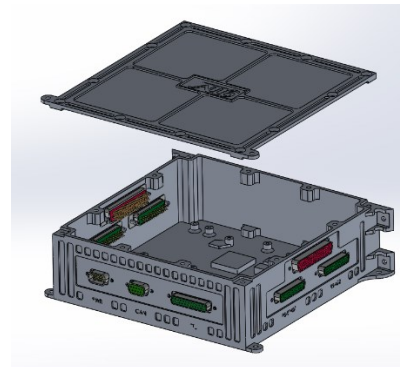
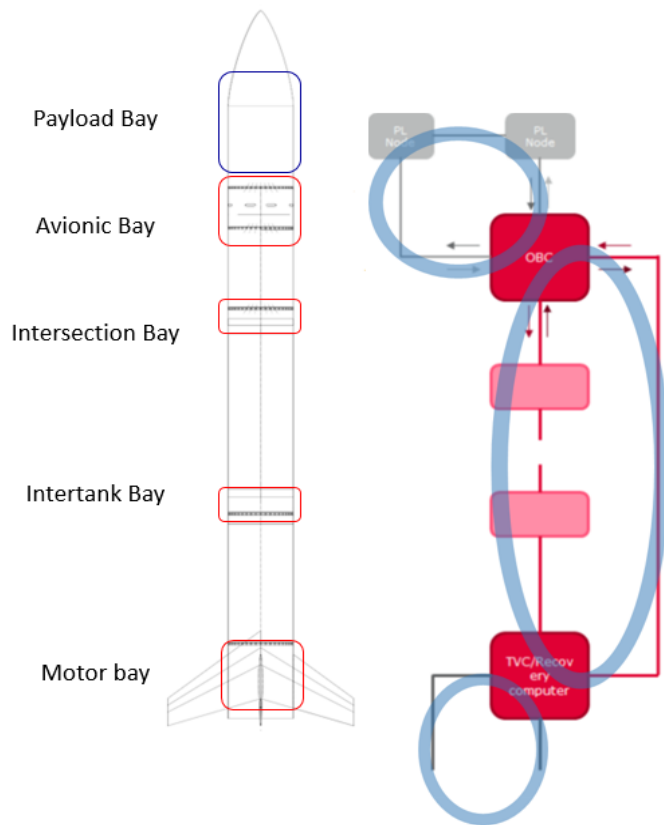
Guidance Navigation And Control

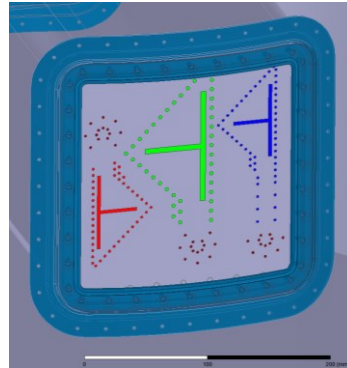
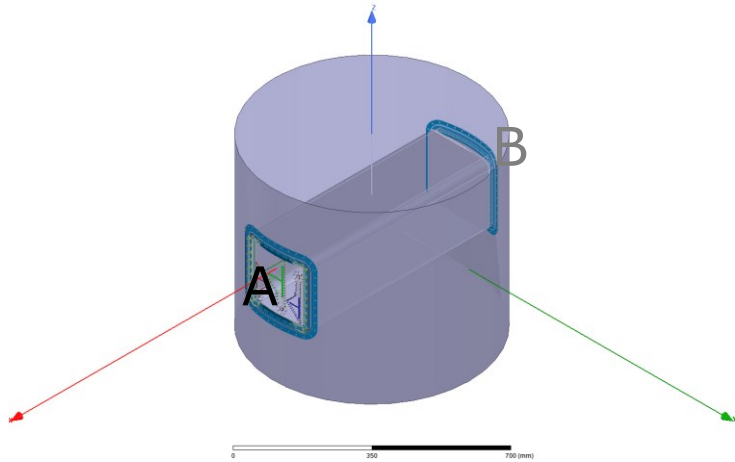


Guidance Navigation And Control



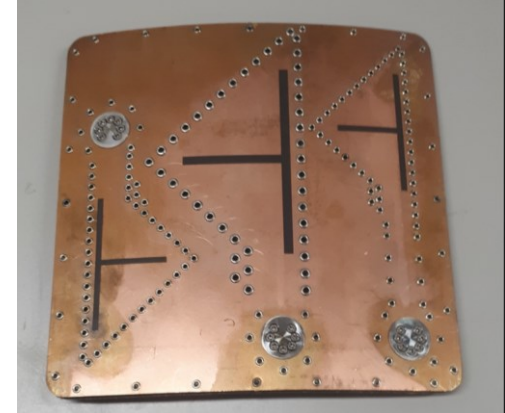
OBC and Data Handling



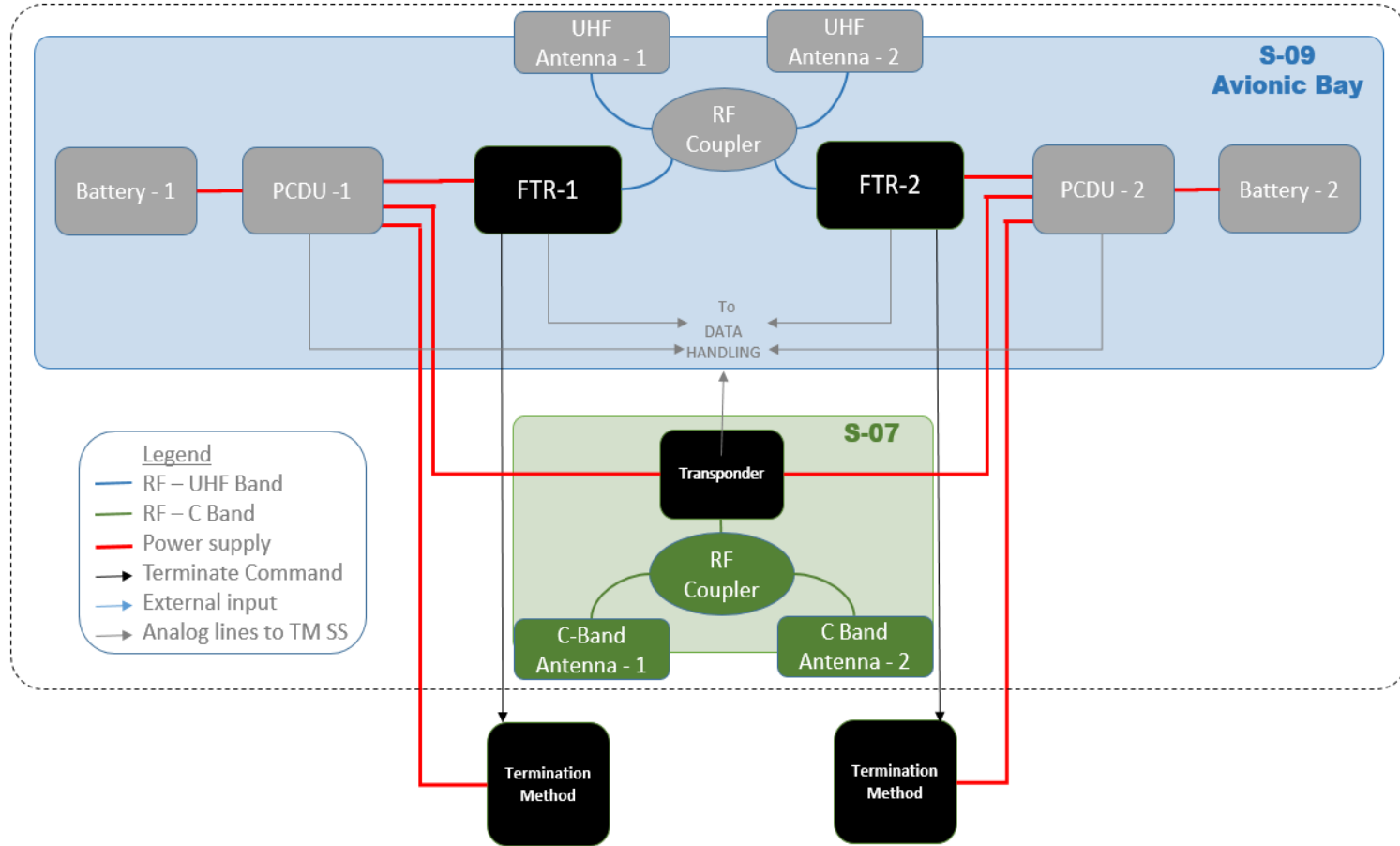


B

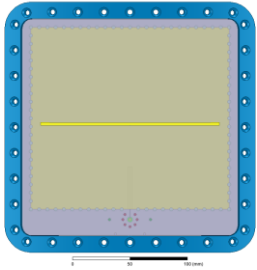
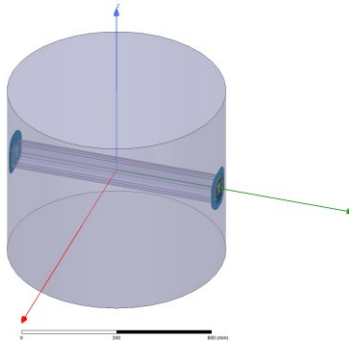
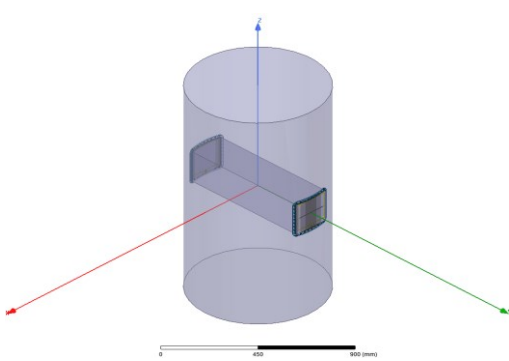
S1-Band RHCP
GNSS-Band RHCP
S2-Band RHCP



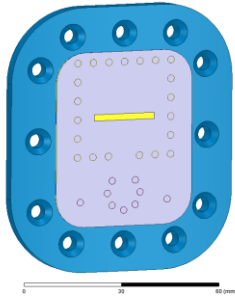
SAFETY



SAFETY ANTENNAS



UHF-Antennas



C-BAND
Antennas

