airworks engineering

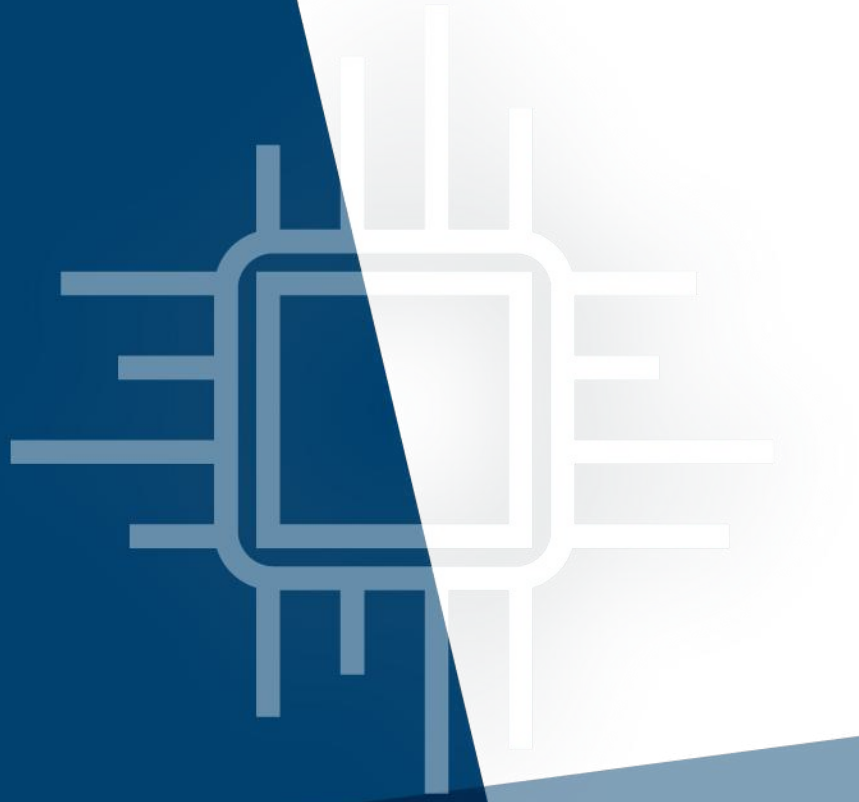
airworks

CAPABILITIES FOR AEROSPACE & DEFENCE

Monfalcone 01.10.2024

AIRWORKS

An engineering,
manufacturing
& testing
service company



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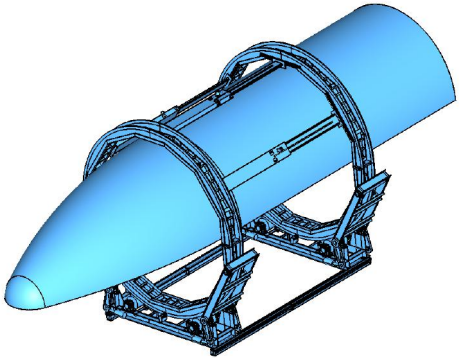
Company Name:	AIRWORKS S.r.l.
Activities:	Engineering, Manufacturing, R&D, Special Projects
Locations:	Monfalcone (Eng), Udine (Manuf+Test), Roma (Eng)
Staff:	27 people
Average export :	75% (EU)
Turnover 2023:	3 Milions
Years of activity:	17

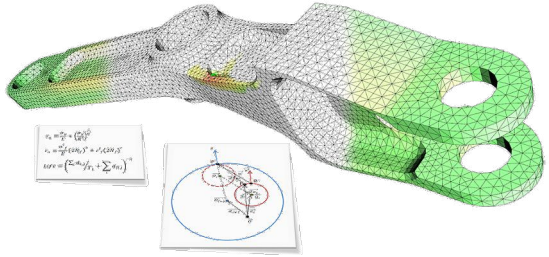
Customers

ENDUROSAT

Elettra Sincrotrone Trieste

SPECTRUM of SERVICES





DESIGN

- Feasibility studies
- Structural and mechanical design
- Detailed CAD design (3D, 2D, BOM)
- Design of ultra-light structures
- Design in composites and ceramics
- Electro-mechanical design
- Opto-mechanical design

Tools
- NX / Inventor / Solidworks / Catia

ENGINEERING

- Software (IoT, Data analysis, AI)
- Thermal and thermo-mechanical analyses
- FEM structural analysis
- Vibration analysis
- Fatigue analysis
- Reliability Analysis (RAMS)
- Analysis of control systems

Tools
- Hyperworks / Nastran / Ansys / ESATAN

MANUFACTURING & TESTING

- Certified MIG/MAG/TIG welding
- Welding of aluminium, INOX, duplex, steel
- Certified non-destructive tests
- CNC machining (mill, lathe)
- Management of heat and surface treatments
- Assembly, testing and commissioning
- Mechanical and vibro-acoustic measurements

Tools
- MAZAK / Fronius / Dewesoft / PCB

Capabilities

Engineering

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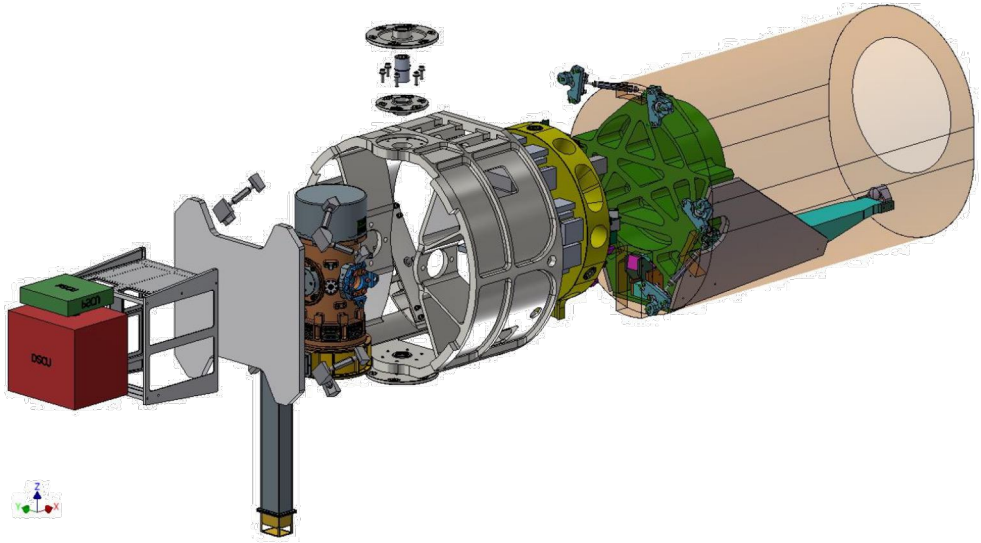
LISA



Client: Albert Einstein Institute (ongoing)

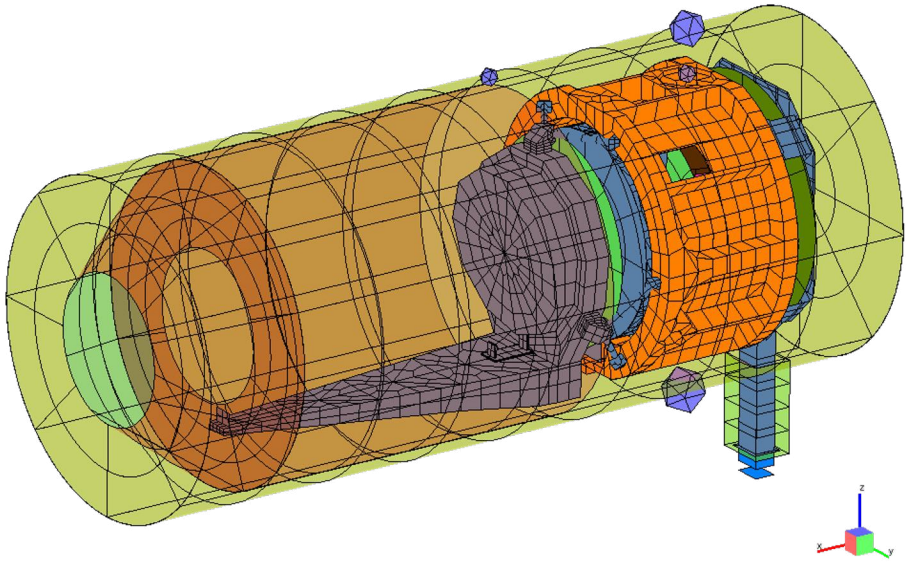
ESA project LISA (Laser Interferometer Space Antenna) will be the first ever mission to study the entire Universe with Gravitational Waves

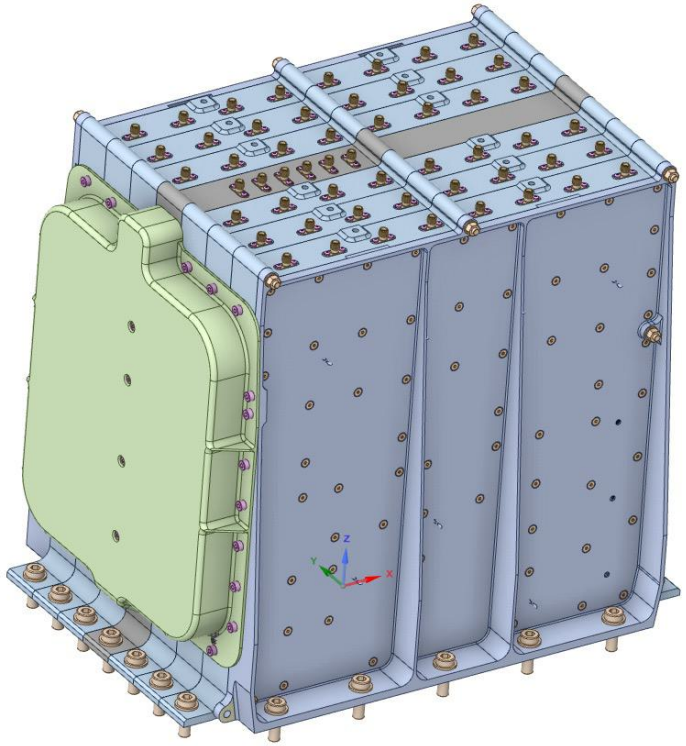
Airworks has been selected by AEI to support the LIG consortium in the development of the MOSA Instrument, IDS and Phasemeter from scratch to proof of feasibility, in perspective of mission adoption by ESA

LISA

Airworks Tasks

- Opto-mechanical design of the instrument
- Architectural trade studies (materials, layouts, subsystem accommodation)
- Thermal modeling & analysis (steady state, thermal stability computations) in ESATAN
- Structural modeling & analysis (quasi-static, thermo elastic, deformation, sine and random vibrations, shock)
- Magnetic & Gravitational modeling & analysis
- Instrument level performance analysis

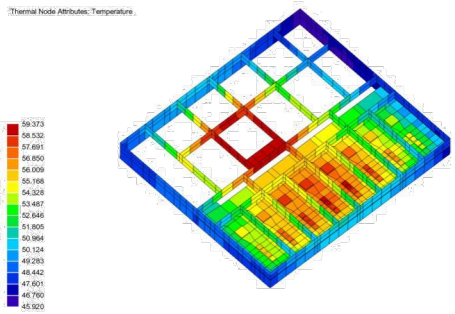


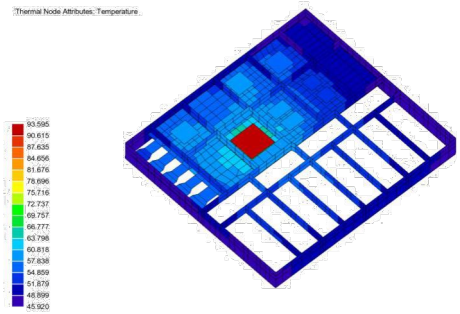


LISA Phasemeter

Client: Albert Einstein Institute (2020- ongoing)

Airworks has been selected by AEI to support the development of the Phasemeter Electronic Box, by performing mechanical design, thermal analysis (ESATAN) and structural calculations





ASTHROS

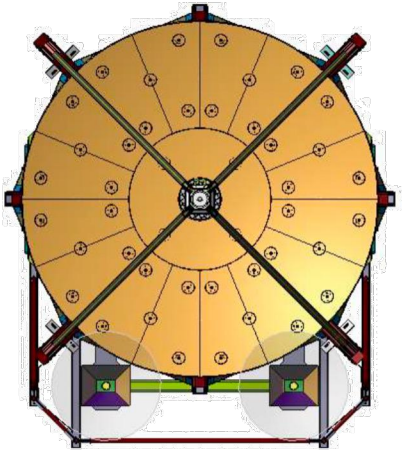
Client: Media Lario & NASA JPL (2019-20)

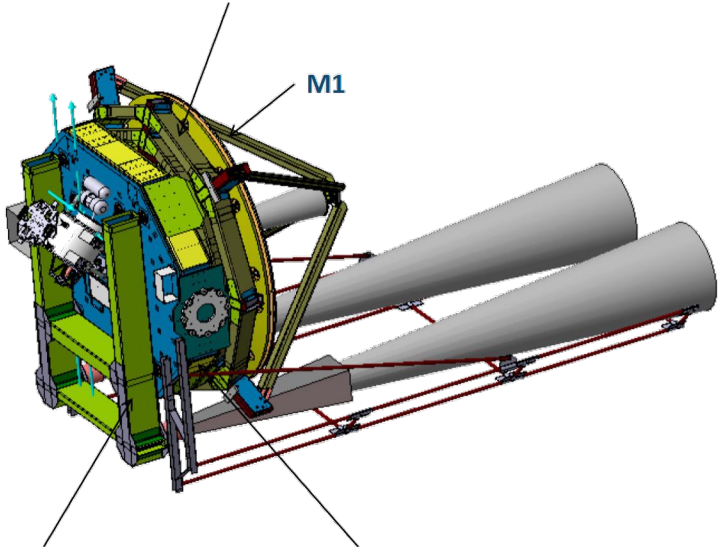
ASTHROS is a high-altitude balloon mission for studying astrophysical phenomena.

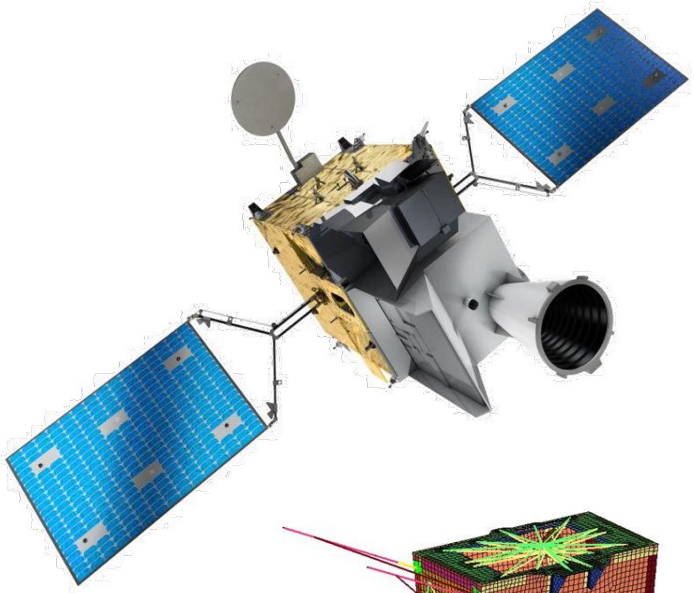
Airworks has been awarded a contract for the design and engineering of the far-infrared Antenna Unit

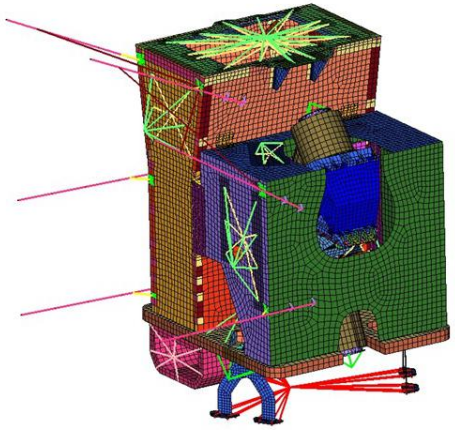
Airworks Tasks

- Opto-mechanical design from scratch
- Structural design (CFRP)
- Thermal modeling and analysis
- Dynamic analysis
- Design of jigs and tools
- Manufacturing support
- Test preparation and support









Space instrument design & engineering

SENTINEL 4 OIMS

Client: OHB System

Subcontractor to OHB System for the structural analysis of the Optical Instrument Module Structure (phase B & C/D)

Project Tasks

Evaluation of structural requirements

Establishment of detailed structural design

Optical Instrument FEM

Trade studies, structural analysis, dynamics, stress analysis

Dimensional stability analysis, optimization

Support technical negotiations with OHB customers (Airbus and ESA)

Support OIM Structure test qualification

Participation to major milestone reviews

ELT Telescope

European Southern Observatory

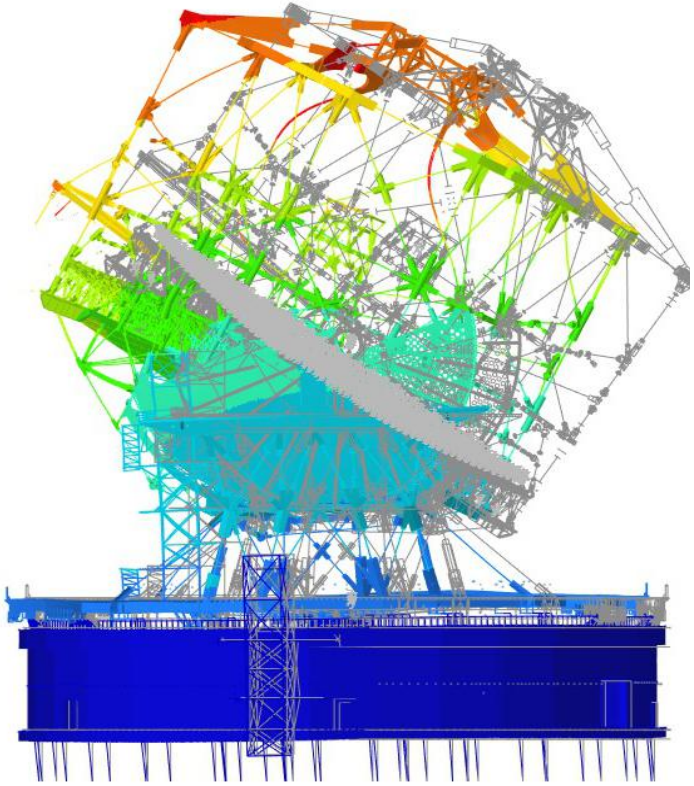
Responsible For:

Dynamic analyses and micro-vibrations
Reliability and safety engineering
Cable wraps vibration contractual testing

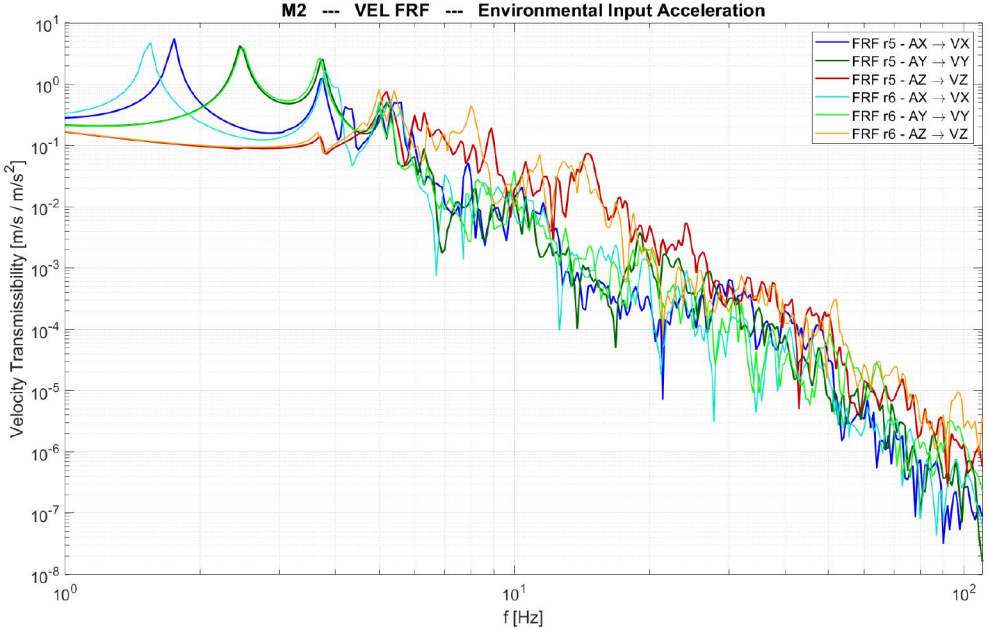
In support of:

Telescope pointing system design
Design of the dome mechanisms
Design of cable wraps systems

ELT Telescope

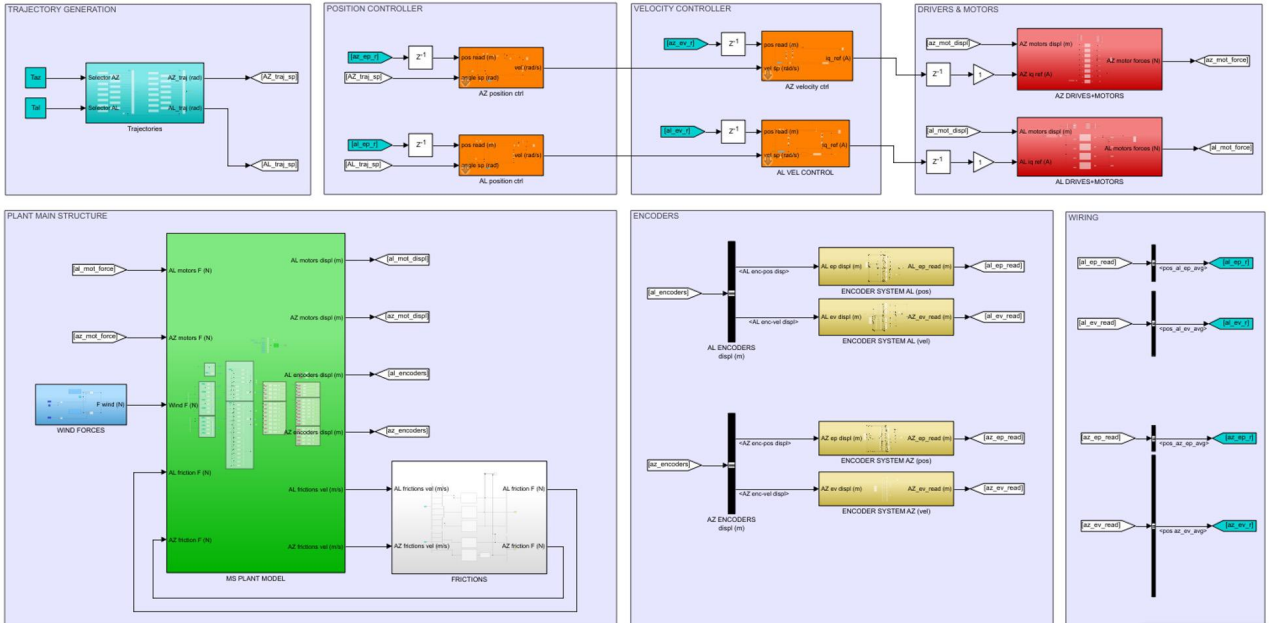


Identification and modeling of all vibration sources
Calculation of frequency response functions at optics



ELT Telescope

Simulation and support to the design of the telescope pointing mechanism control system



Performance challenges

Telescope mass = 4,000 tons

Max allowed error w/o wind = 0,0004°

Activity breakdown

FEM analysis

State space representation of FE model

Control design

Discrete system modeling

Modeling of the perturbations

Analysis and simulations

Optimized vs load perturbations

Dynamic wind load

Motor drive cogging/ripple torque

Motor drive quantization & saturations

Encoder noise & quantization

Friction related effects (stick-slip)

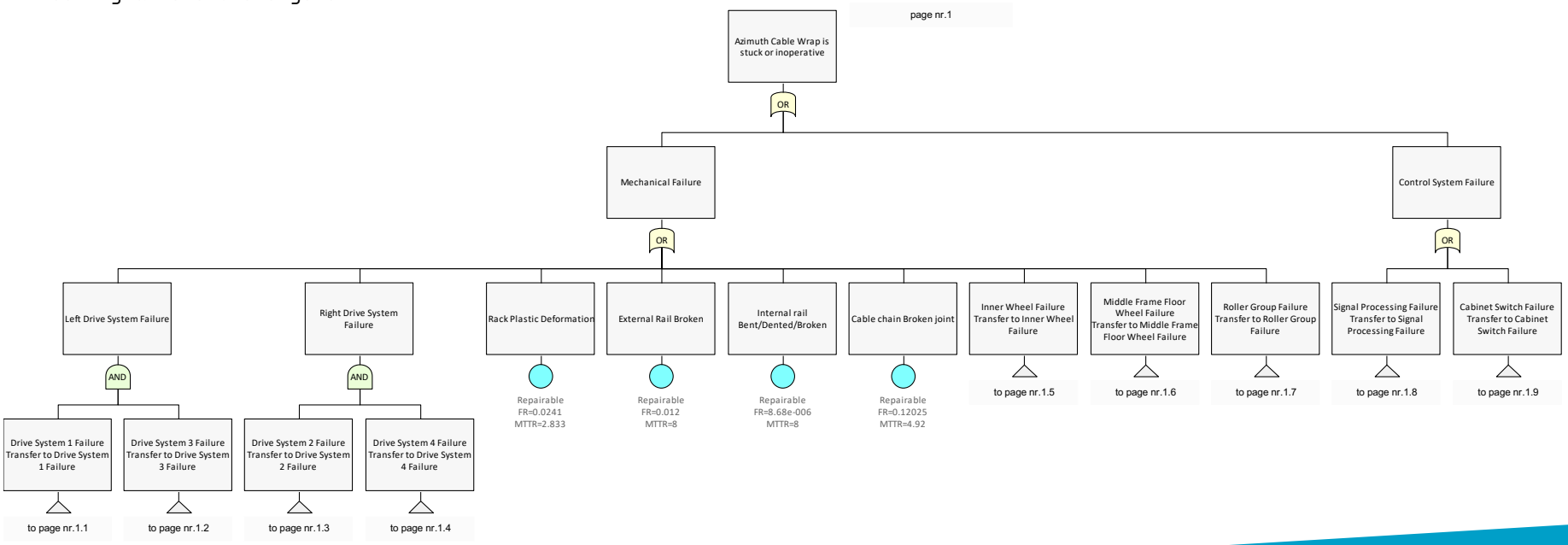
Servo loop sampling & loop latencies

Mechanism failures (motor, brake, etc)

Local modes of the drives

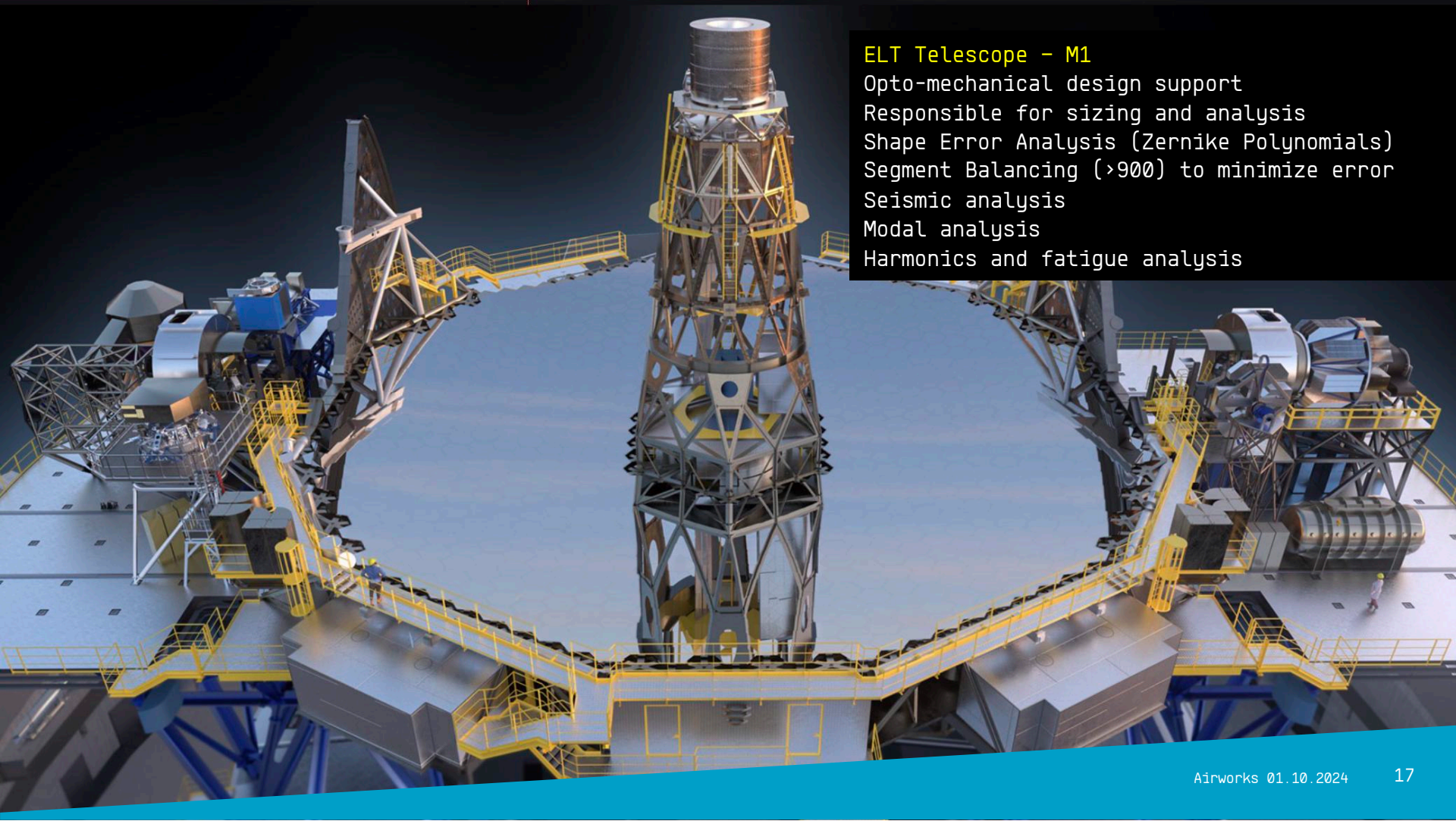
Telescope ELT - RAMS

- Fault Tree Analysis (FTA) of the Dome and the Main Structure
- FMECA and Mean Time Between Failure computations (MTBF)
- Predictive & corrective maintenance analysis
- Mean Time Between Repair calculation (MTTR)
- Definition and optimization of the Spare Parts
- Safety & hazard analysis



ELT Telescope

Azimut cable wrap design (150 tons)
Detailed engineering, mechanical analysis,
Construction drawings



ELT Telescope – M1

Opto-mechanical design support
Responsible for sizing and analysis
Shape Error Analysis (Zernike Polynomials)
Segment Balancing (>900) to minimize error
Seismic analysis
Modal analysis
Harmonics and fatigue analysis

Leonardo Helicopters

AIRWORKS is currently involved in several programmes related rotary wing aircrafts, spanning from early definition studies to certification of the structures

Airworks Tasks

- DFEMs and GFEMs management
- Metallic and composite airframe structures
- Sizings
- Static stress calculations
- Fatigue analysis
- Certification reports

LEONARDO Asio B
Optimization of the Airframe

LEONARDO Spyball
Optimization of the Airframe

LEONARDO CREX
Optimization of the Airframe

SELEX ES Falco:
Optimization of the Airframe with new materials
Complete structural assessment (FE models, Strength, Aeroelasticity)
Structural certification documents

SELEX ES Falco EVO: Structural analysis & documentation

Capabilities

Software

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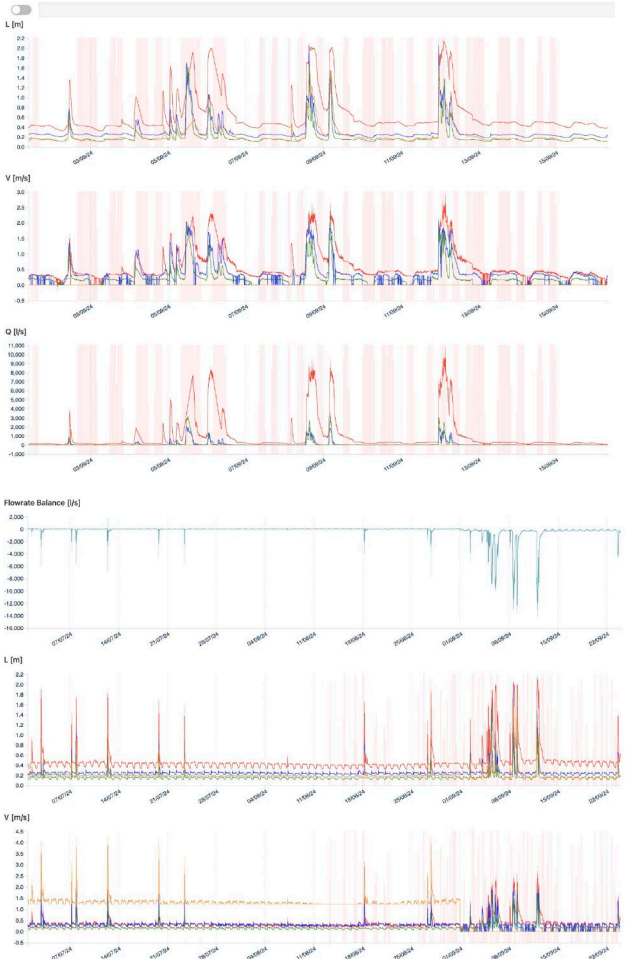

IoT, Data Analysis & AI

- IoT:
  - Acquisition, sending & saving pipelines from devices to the server (HTTPS, MQTT)
  - Development of embedded software on devices (C++, Python)

- Data analysis on Web applications:
  - Data ingestion from different sources
  - Data modeling (resampling, reconstruction, etc) via manual or automatic pipelines
  - Data visualization (scalar quantities, time series, images or geolocalized data)
  - Data analysis via manual or automatic pipelines
  - Web applications for reporting and alarms (anomaly detection)

- Artificial Intelligence:
  - AI algorithms for process automation & scalability (machine learning, LLM)

- Tools:
  - Python, C++, Typescript, HTML/CSS, Matlab, Next.js, React, Node.js, Taiwind CSS, Django, Tensorflow, Keras, Scikit-learn, OpenAI, git, docker, AWS, kubernetes, etc

Capabilities

Testing

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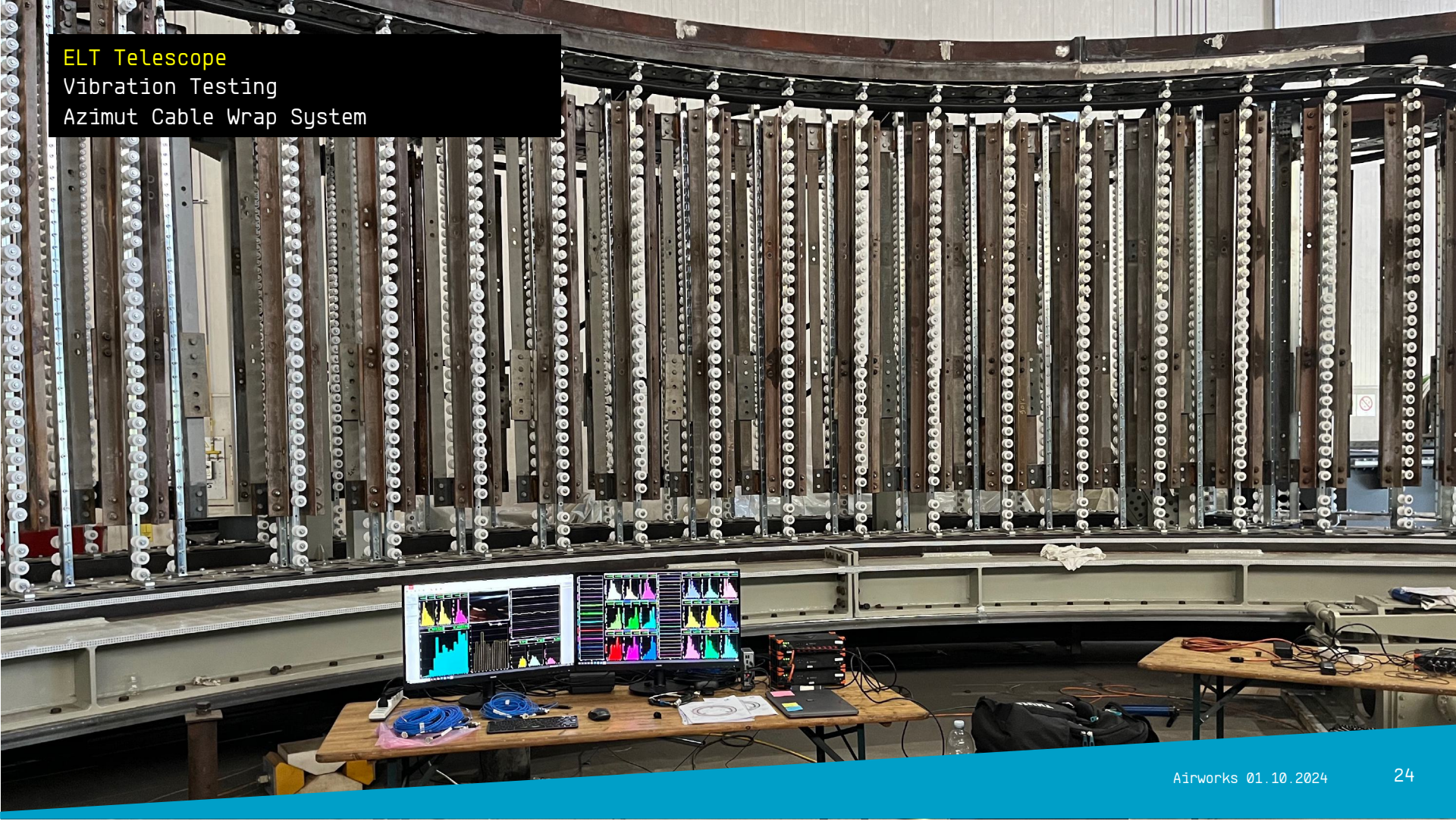
NEOSTED Telescope

Experimental modal analysis (modal test)
Multi-body modeling
SIMULINK modeling
Integrated dynamic simulation
(mechanics, electromechanics, control system, disturbances)


ELT Telescope
Vibration Testing
Azimut Cable Wrap System

Capabilities

Manufacturing

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Design, Development, Production and Testing of:
Umbilical Pneumatic Plug Mechanism of P/L Bay A/C System
Multifunctional jigs for launch vehicle assembly, handling and lifting

Detailed Engineering, Production and Testing of:
HDRM mechanism of the missile from the launch pad

SPECTRUM Launch Vehicle

Client: ISAR Aerospace GmbH

Launch Vehicle HDRM

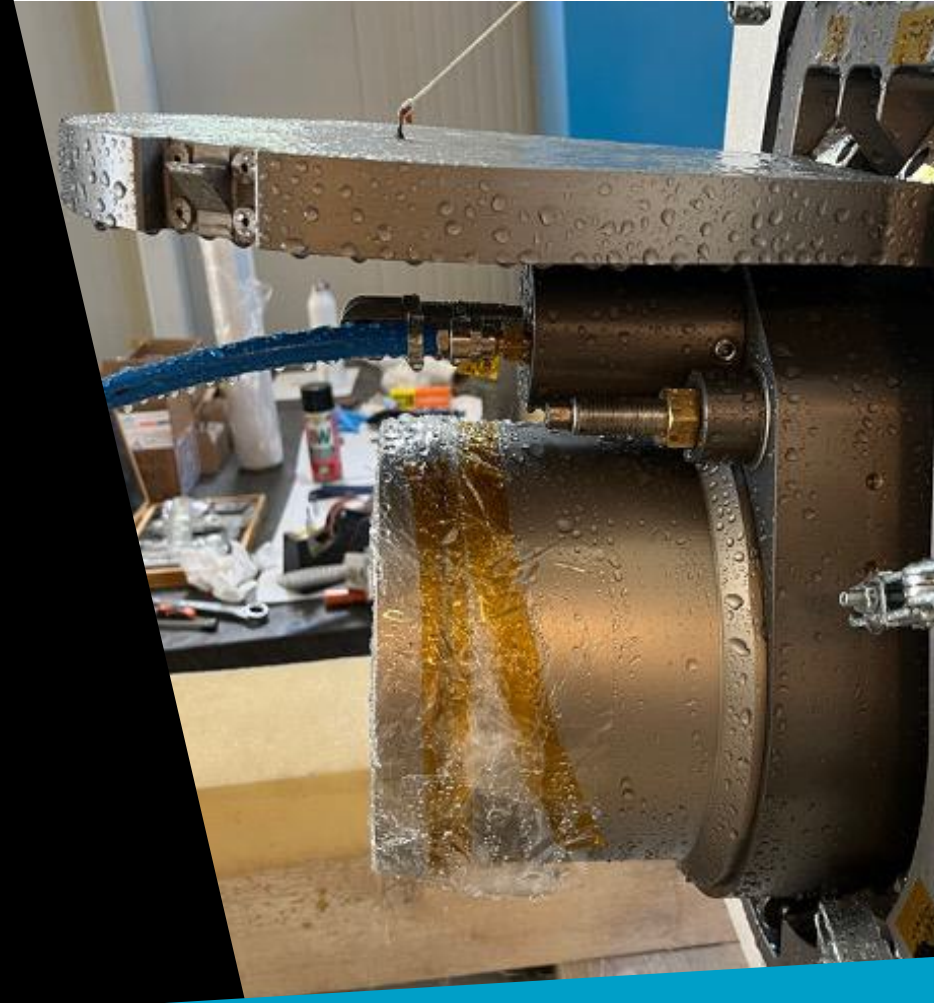
Client: ISAR Aerospace (2023-24)

Detailed engineering, manufacturing and qualification of the SPECTRUM Launch Vehicle Hold Down & Release Mechanism

Pneumatic Umbilical Plug (PUP)

Client: ISAR Aerospace (2021-22)

Design, engineering, manufacturing and qualification of both the ground and flight side of the SPECTRUM Launch Vehicle Air Conditioning retractable interface mechanism



EnMAP Precision Installation Tool

An ISO5 electro-mechanism to intall space optics, equipped with vision system from remote (endoscope)

Accuracy better than 0,01 mm

Design, manufacturing, testing & commissioning

CHIME Turnover Tilting Trolley

An ISO5 trolley to support instrument integration on IBF

Design, manufacturing, testing & commissioning

EnMAP Integration Base Frame

Design, manufacturing, testing & commissioning

- Multipurpose item supporting several assembly and testing operations
- Design compatible with vacuum and ISO 5 cleanliness grade. Polished stainless steel.
- Very high stiffness (displacement < 30 µm at the Instrument feet)
- Isostatic mount
- Legs accommodating ±12.5 mm fine adjustment in all axes
- Mechanical interfaces to approximately 20 OGSE and MGSE items (high precision)

Design and build of 2 satellite trasnport containers for a 6 meter military spacecraft

Design and build of 2 multi-purpose trolley for the assembly and handling of the satellite in the clean room


WARNING
UNLOCK BEFORE
FLIGHT
IDHB
We. Create. Space.
airworks

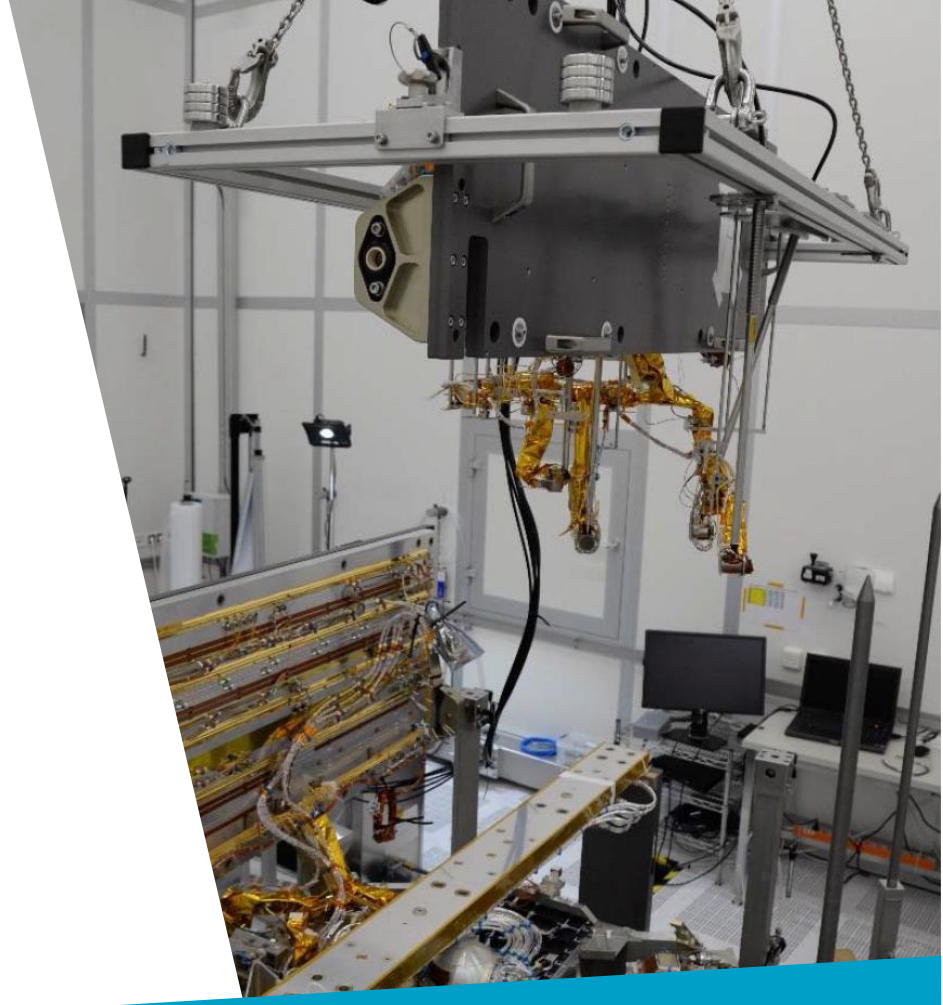
Design and build of 2 multi-purpose trolley for the assembly and handling of the satellite in the clean room

Vibration and thermal-vacuum test adaptor

EnMAP TCSS Lifting Device

Client: OHB System (2018-20)

Special ISO5 hoisting device that supports the integration of the EnMAP NH3 TCSS into the Instrument, by using a failsafe vacuum lifting design principle, with pumps and control electronics



EnMAP Bonding Jigs

Client: OHB System (2013-15)

The optical instruments of EnMAP spacecraft consists of several mirrors and prisms that require extremely precise bonding to the supports. Airworks was selected for the design and manufacture of the bonding jigs (13 items).

MAIN CHALLENGES

- Ensure bonding in a stress-free state, by design
- Very accurate positioning of the optical elements (autocollimator, pentaprism, micrometers, etc)
- Monitor the stability of the optical elements pre, post and during curing using cameras
- Support the final metric and optical measurements of the optical assemblies
- Designed for ISO 5 cleanliness grade

Manufacturing

Airworks workshop provides a highly flexible support to our customers:

- Manufacturing of mechanical parts (welded, machined), from small to large
- Manufacturing of assemblies, including very high precision mechanisms (mass range from a few kilos up to 10-20 tons)
- Design and build of custom electromechanical systems and structures
- Manufacturing of small to mid size series

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