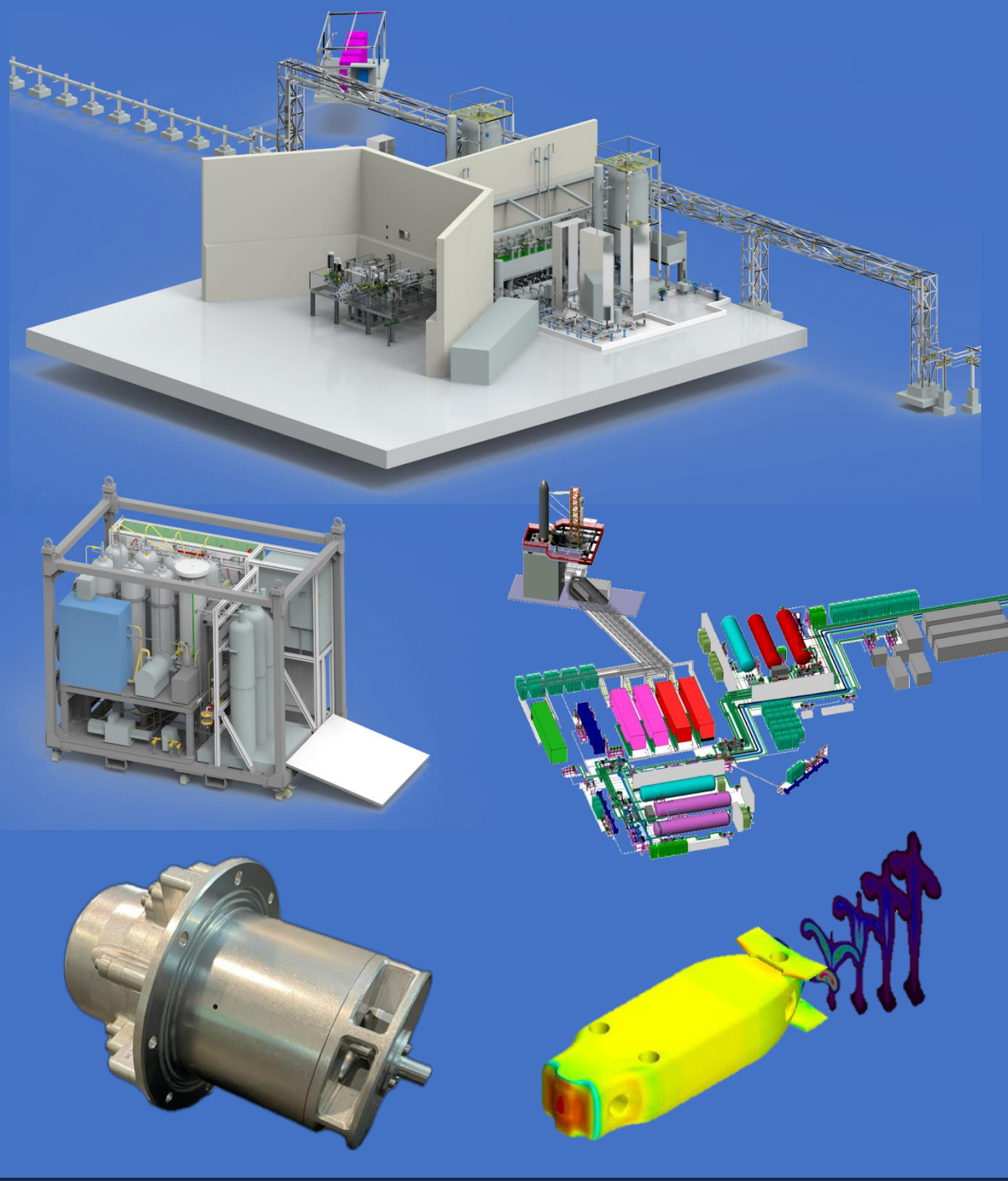

NOVAEKA
novaeka.com

Core Business

The core business of Novaeka is articulated in the following lines

- **Test Facilities for Rocket Engines**
- **Fluidic Ground Means for small launchers and launch base**
- **Fluidic Ground Support Systems for large satellites and spacecrafts** (**FGSE**)
- **Flight components for space stations and cargo**
- **Mathematical Modeling** and **Software Tools**



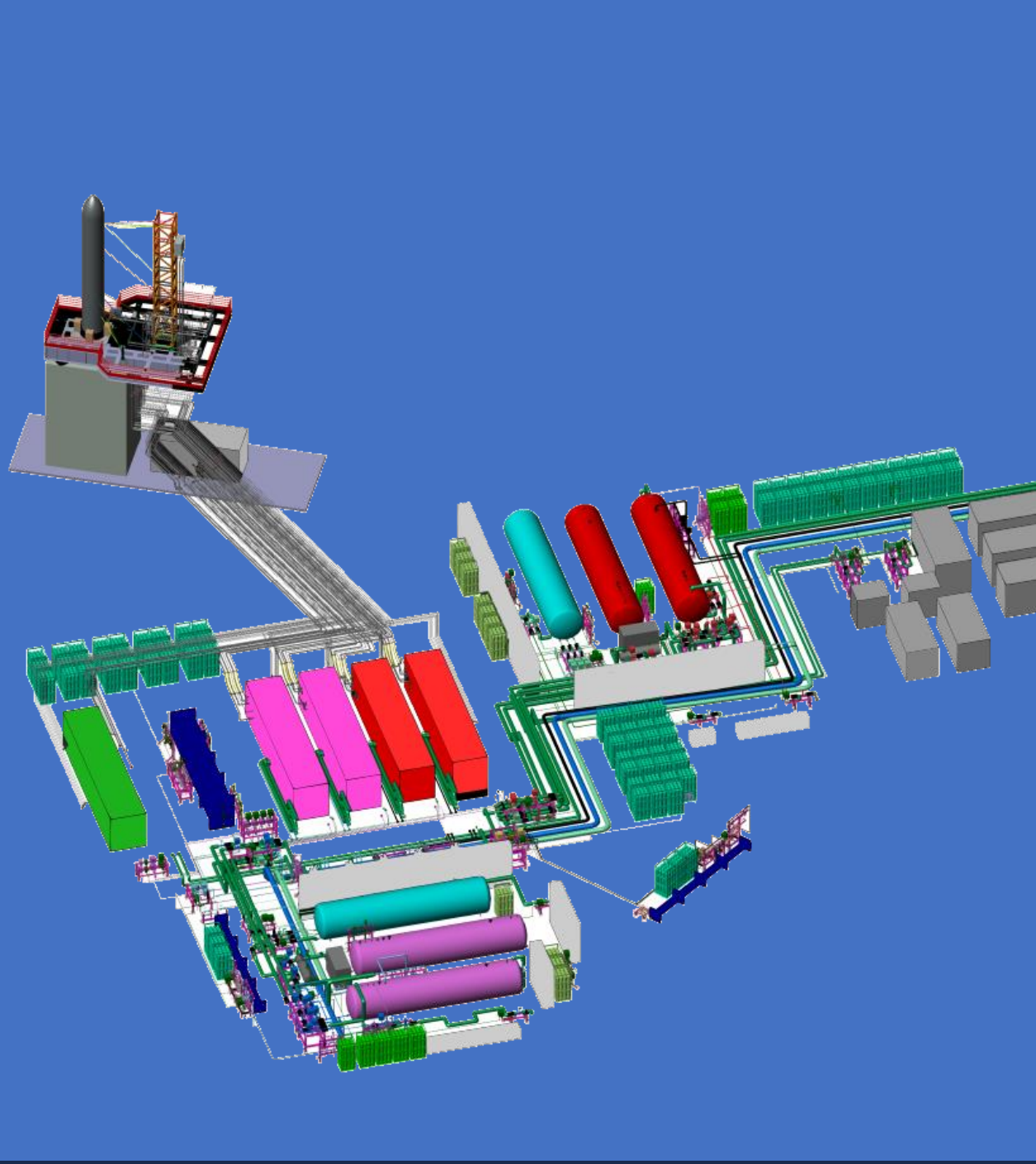

Launch bases
and ground segments for
Small Launchers

F-GSM & F-GPM

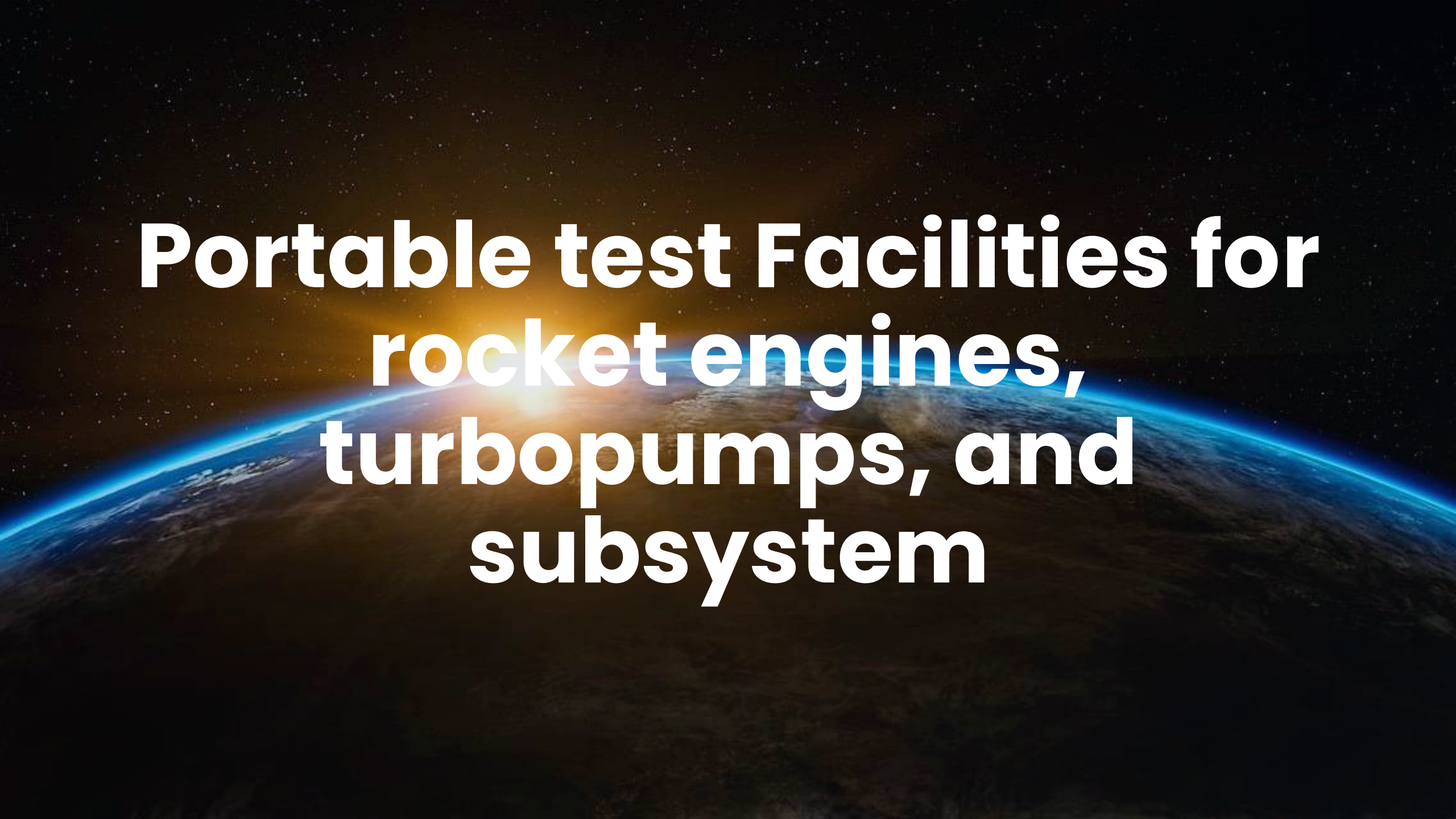
Novaeka is the **designer** of the Fluidic Ground Means for two small orbital launchers that AVIO will test from the Wallops Island spaceport in Virginia (US).

The system is used to load all the fluids into the launchers before take off. This includes the cryogenic propellants (LOX/LCH4) and the various gasses used in the launcher (GOX, GH2, GN2, GHe).

Part of the system is built on portable containers that will be tested in Sardinia and shipped to the final launch location.



F-GSM & F-GPM - LAUNCH PAD


Portable test Facilities for
rocket engines,
turbopumps, and
subsystem

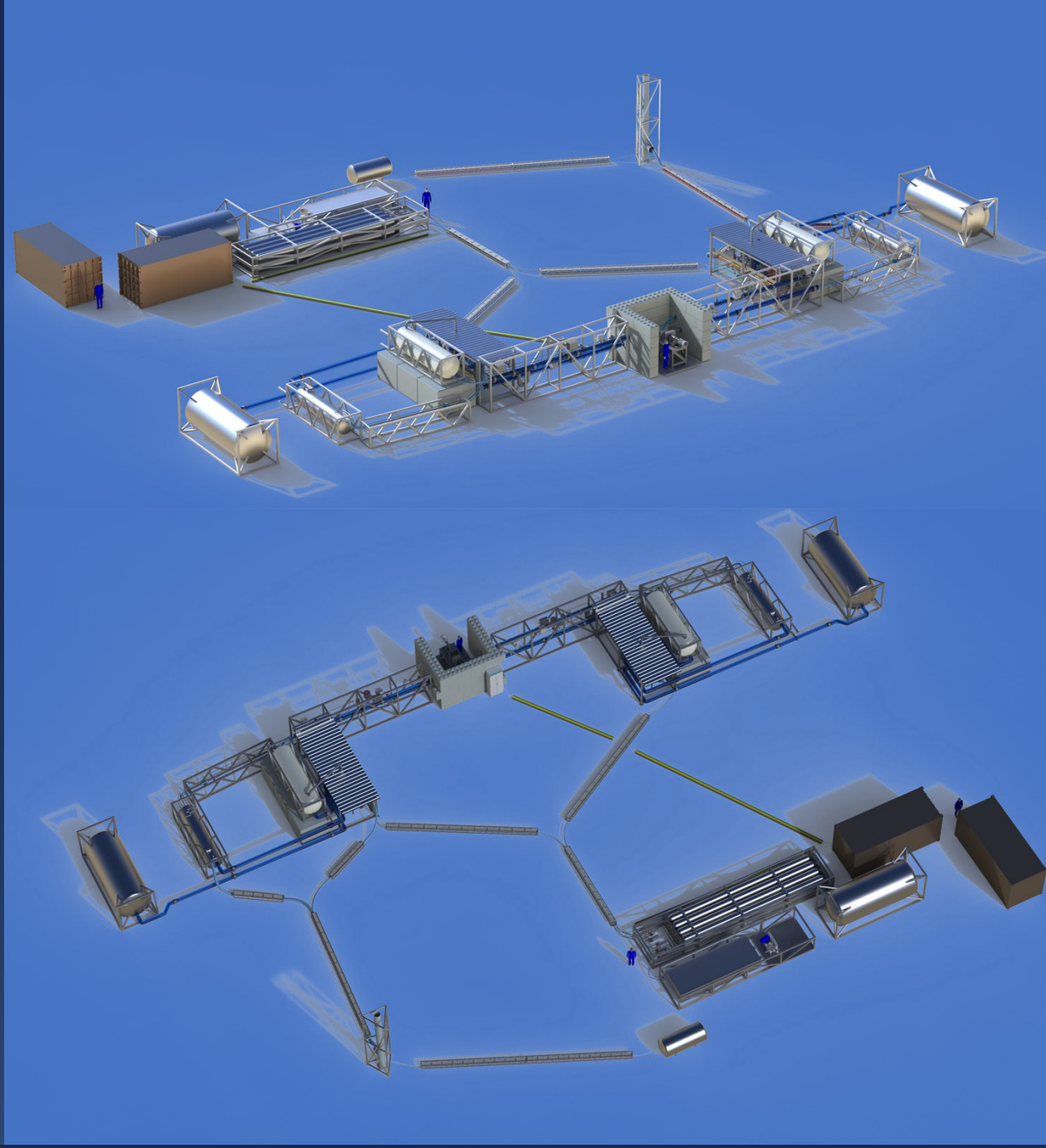
Novaeka Product

Novaeka is working on an innovative product: a **portable**, **modular**, **configurable** test facility that can be rented only for the time it is really needed, deployed and commissioned in a few days at the client site of choice.

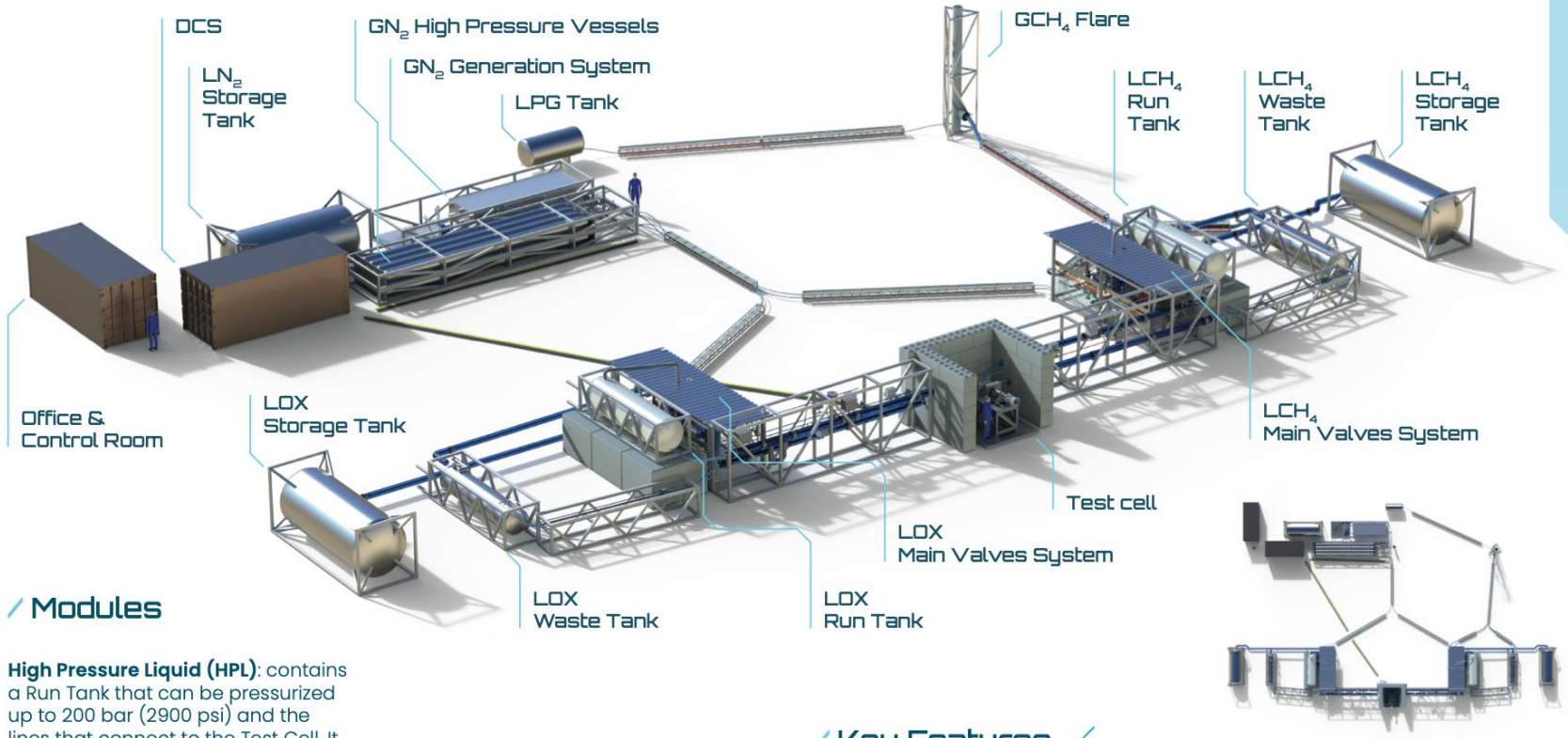
The client can choose the test modules that are needed based on the maturity level of the engine to be tested, quickly iterate through different designs, and rent additional modules only when the development schedule requires additional testing capabilities.

Strict confidentiality on test results is guaranteed by the fact that Novaeka personnel will set up the facility and hand it over entirely to the client for the whole duration of the test campaign.

This requires a training of the client personnel, which can be done in advance thanks to a Digital Twin that simulates the entire facility and its control system. This allows also the client to perform virtual tests to optimize sequences and settings for their specific tests.



The first Portable Modular Test Facility for Rocket Engines



Modules

High Pressure Liquid (HPL): contains a Run Tank that can be pressurized up to 200 bar (2900 psi) and the lines that connect to the Test Cell. It can provide up to 22 kg/s (48.5 lb/s) of LOX or 8 kg/s (17.6 lb/s) of LCH4.

Gaseous Nitrogen Pressurization (GNP): contains high pressure vessels up to 500 bar (7250 psi) that are filled pumping LN2 through a high-pressure vaporizer. The module provides the gas for pressurizing the HPL module, for pneumatic valves actuation and flushing.

High Pressure Gas (HPG): contains a Run Tank that can be loaded with high-pressure gaseous propellant up to 500 bar (7250 psi) and used in blow-down to provide up to 22 kg/s (48.5 lb/s) of GOX or 8 kg/s (17.6 lb/s) of GCH4.

Waste Collection and Disposing (WCD): includes a waste tank to collect propellants depleted by the facility and the Test Article, and a disposal system (vent into atmosphere for gasified LOX, burn through a flare for gasified LCH4).

Test Cell (TC): the protected and shielded area where the Test Article is mounted. It offers multiple connections for the same functional purpose, thus simplifying the design of the Test Equipment (the lines that connect the facility interfaces to the Test Article proper) and provides mechanical interfaces for easy installation.

Key Features

Portable
Can be shipped all around the world, deployed in just a few days exactly where needed, close to the client facilities.

Modular
Different independent interchangeable modules optimized for specific tasks.

Configurable
Based on the tests required by the client only the necessary modules are shipped.

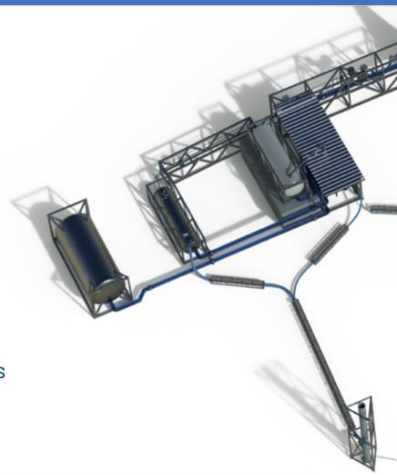
Digital
Training for the personnel available in advance, optimization of bench configuration using virtual testing, real time post-processing of test data.

Multi-propellant
Compatible with Cryogenic (LOX, LCH4) and Storable (HTP, RP1) propellants.

Multipurpose
Not just for hot-firing of engines, but for comprehensive system and subsystem-level investigations and optimizations.

Possible Test Articles

1. **Thrust Chamber** (Liquid/Liquid or Liquid/Gas)
2. **Thrust Chamber + Regenerative-Cooled Nozzle**, for Expander engines
3. **Preburners** for Gas Generator and Staged Combustion engines
4. **Turbopump**
5. **Injectors** (Cold Flow)
6. **Valves** and other flight components
7. **Fully integrated engines**



Tech Spec

Interface	**max flow rate** kg/s (lb/s)	**max pressure** bar (psi)
LOX Main Supply	22.0 (48.5)	180 (2610)
LCH_4 Main Supply	8.0 (17.6)	180 (2610)
GCH_4 Main Supply	8.0 (17.6)	180 (2610)
GOX for igniters	0.05 (0.11)	180 (2610)
GH_2/GCH_4 for igniters	0.05 (0.11)	180 (2610)
GN_2/GHe for purging	0.05 (0.11)	10 (145)
H_2O for TCA cooling	30.0 (66.1)	180 (2610)

Max test duration at max flow rate: 60 seconds.
Max thrust: 100 kN (22,000 lbf).

Use Cases

Development of a Liquid Rocket Engine

The facility is capable of supporting the development of a liquid rocket engine from component level up to fully integrated engine.

Failure Investigations

A portable test facility can be useful to investigate failure causes, by providing a way to rapidly test subsystems and single components. It can be deployed and ready for testing on very short notice, thus speeding up the investigations.

Acceptance Testing for Production

Components and subsystems coming out of the assembly line can be tested for quality acceptance using a lightweight facility that can be installed near the production site, to save time.


Test Facilities for Rocket engine from 0,2ton to 120ton of thrust

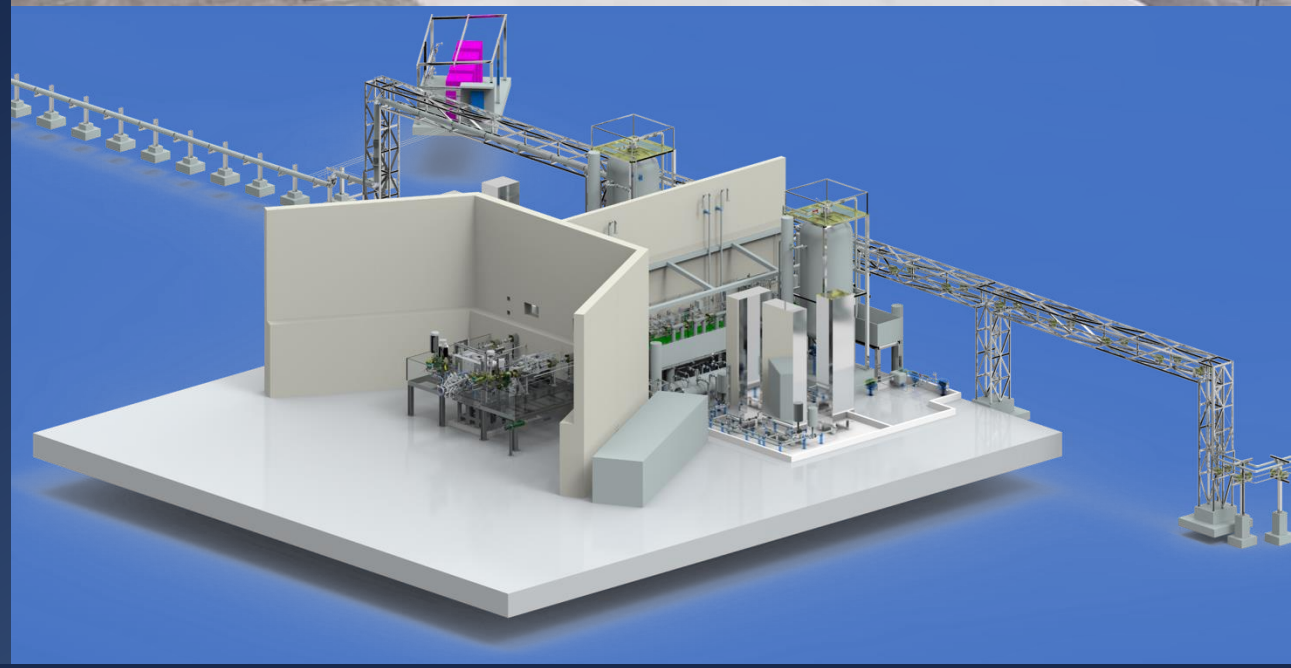
SPTF

Novaeka is the **designer** of the fluidic subsystem of the Space Propulsion Test Facility built by AVIO in Sardinia (IT) in 2021.

The facility is currently being used for the testing of a 100 kN LOX/LCH4 engine.

It is one of the largest test facilities in Europe for the testing of cryogenic liquid rocket engines.

Novaeka was responsible for the definition of the fluidic processes, the selection of the commercial components, the definition of the control logic, the assistance to the installation and commissioning.

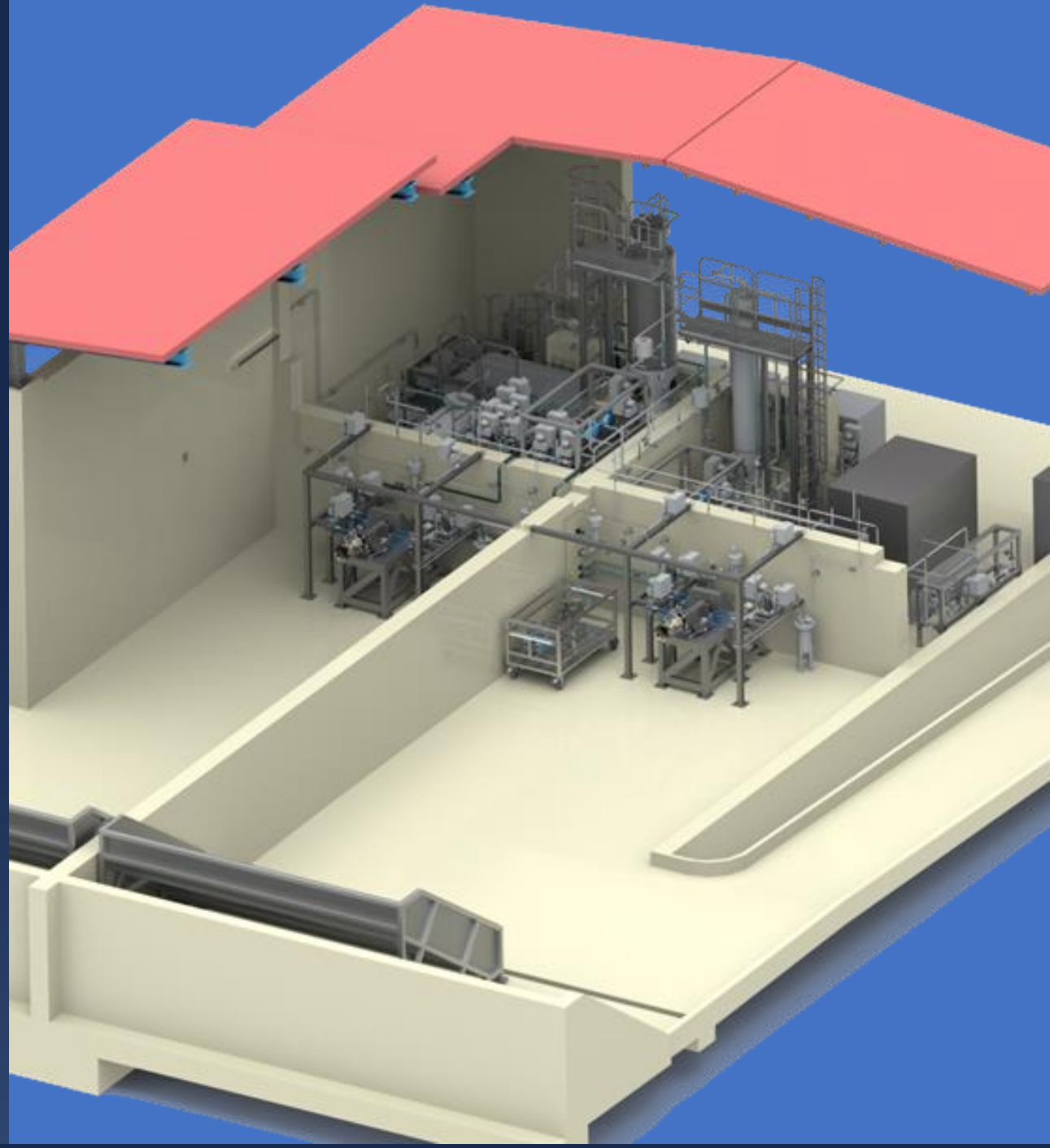


OPTF

Novaeka is the **general contractor for the design** of the Orbital Propulsion Test Facility built by AVIO in Rome (IT) in 2024.

The facility is currently being used for the testing of a 4 kN HTP/RP1 engine for in-orbit propulsion.

Being general contractor means Novaeka was responsible for the design of all subsystems: fluidic, civil works, electric, automation, environmental analysis, permitting.

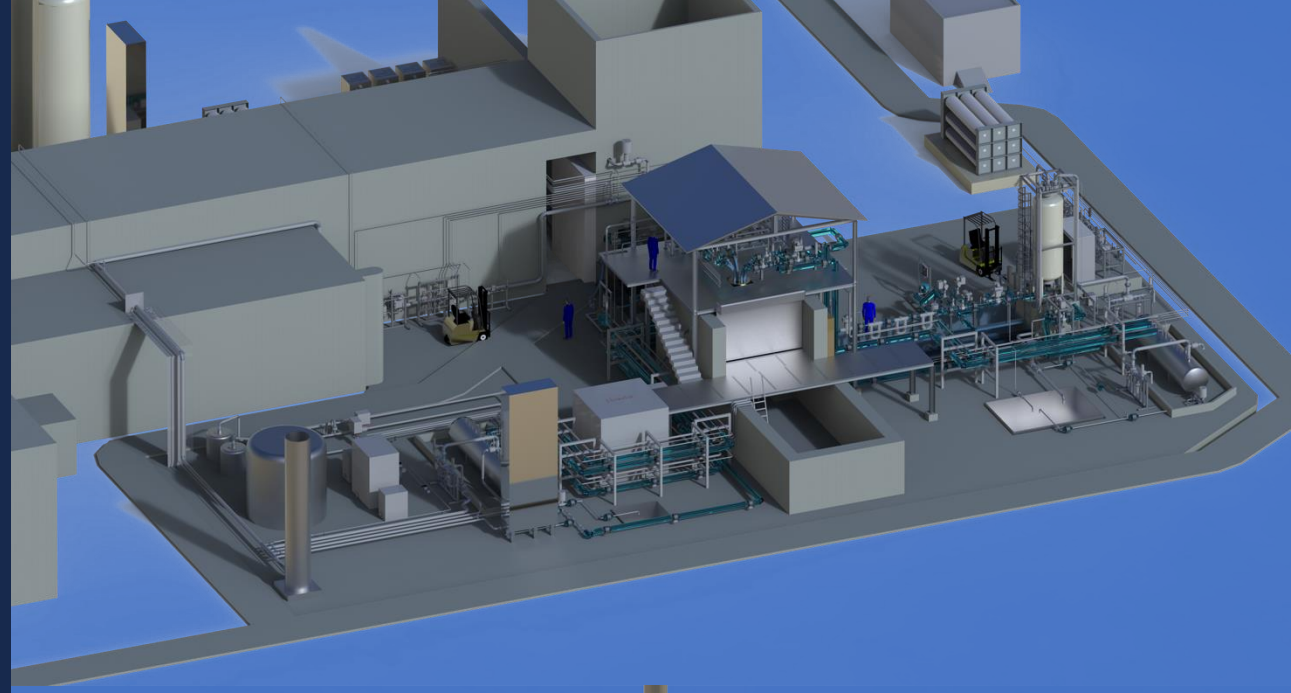


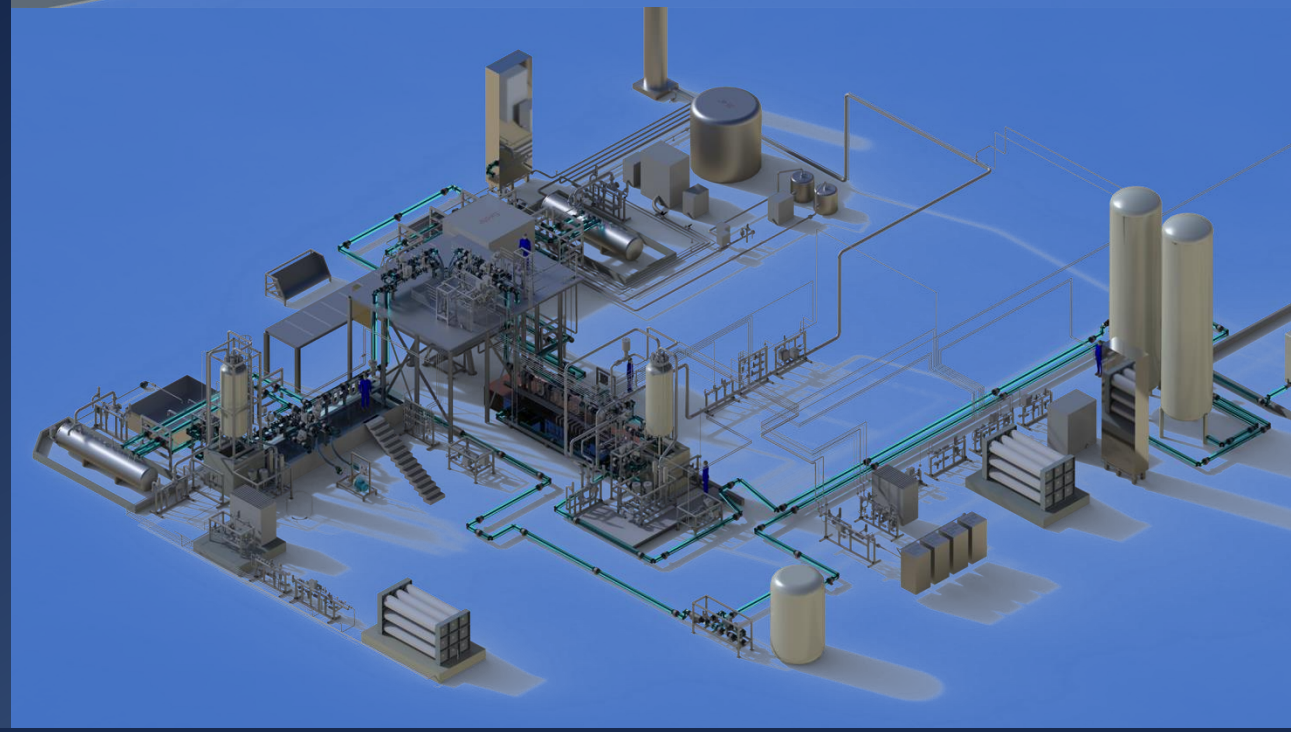
Huracan Test Bench

Novaeka is the **designer** of the fluidic subsystem of the Huracan Test Bench, that will be built in Bordeaux (FR) in 2025 by The Exploration Company.

The facility will be used for the testing of a 25 kN LOX/LCH4 engine for the Nyx-Moon capsule by The Exploration Company. The Nyx-Moon will go back and forth between the Lunar Gateway and the Moon surface.

The facility has been designed to be very flexible, allowing the testing of the engine at different stages of the development. It can handle the testing of the thrust chamber alone, of a cryogenic pump, of a bench-fed engine and of a fully integrated engine, complete of its own propellant and pressurization tanks.





FAST3 Test Facility

Novaeka is the **general contractor for the construction** the FAST3 facility which will be used by AVIO in Rome (IT).

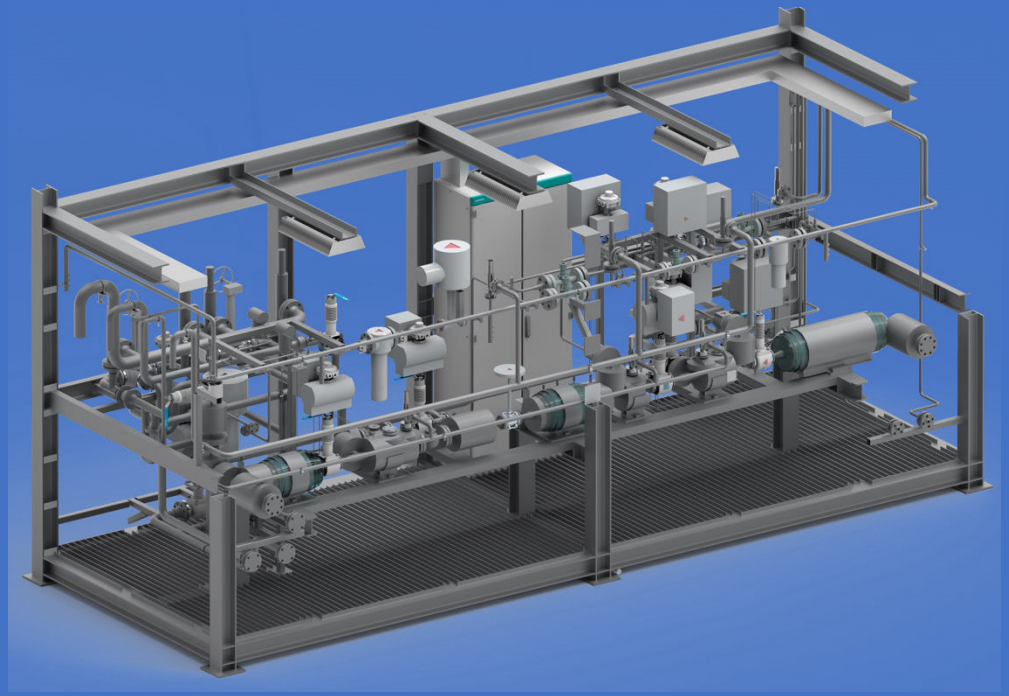
The facility comprises two different LN2 test stands to perform tests on

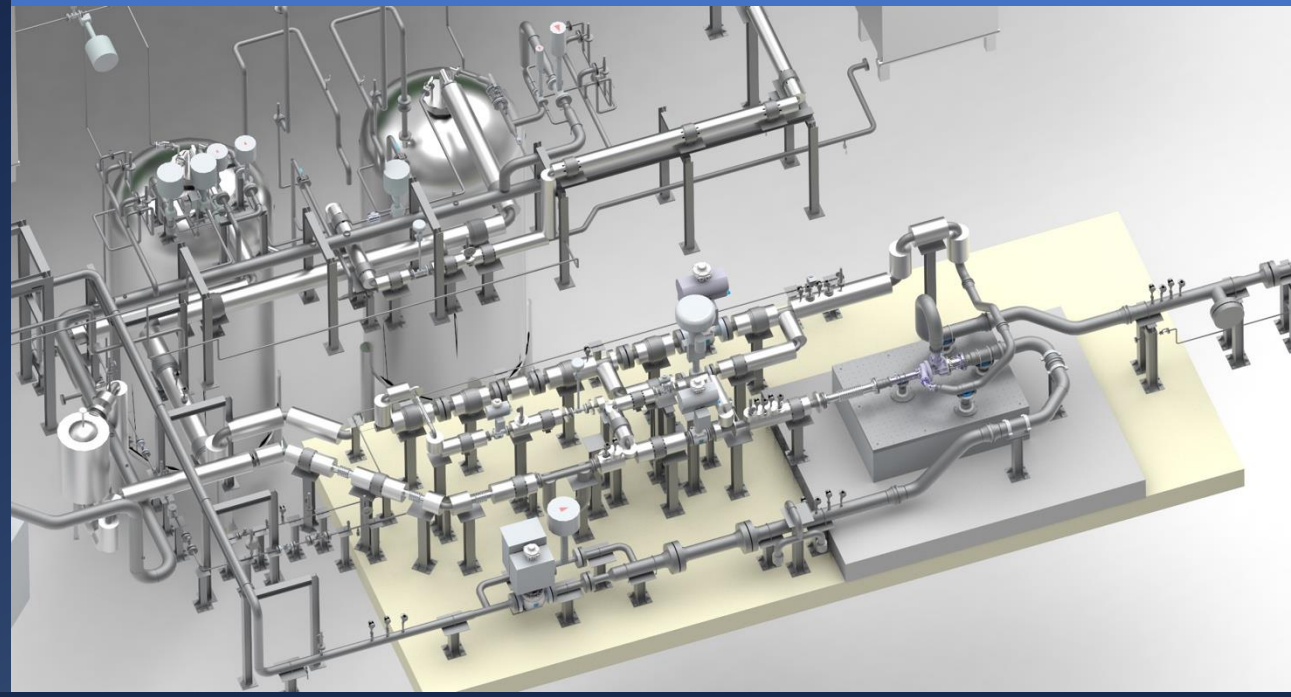
- fuel and oxidizer turbopumps for a 600 kN engine
- propellant tanks for a small orbital launcher

The test facility was entirely designed by Novaeka, it was then assembled on portable containers under Novaeka responsibility and supervision.

It will be delivered and installed at AVIO premises in 2025.

For the first time Novaeka was responsible for the whole project, including manufacturing, hence delivering the finished product to the client.





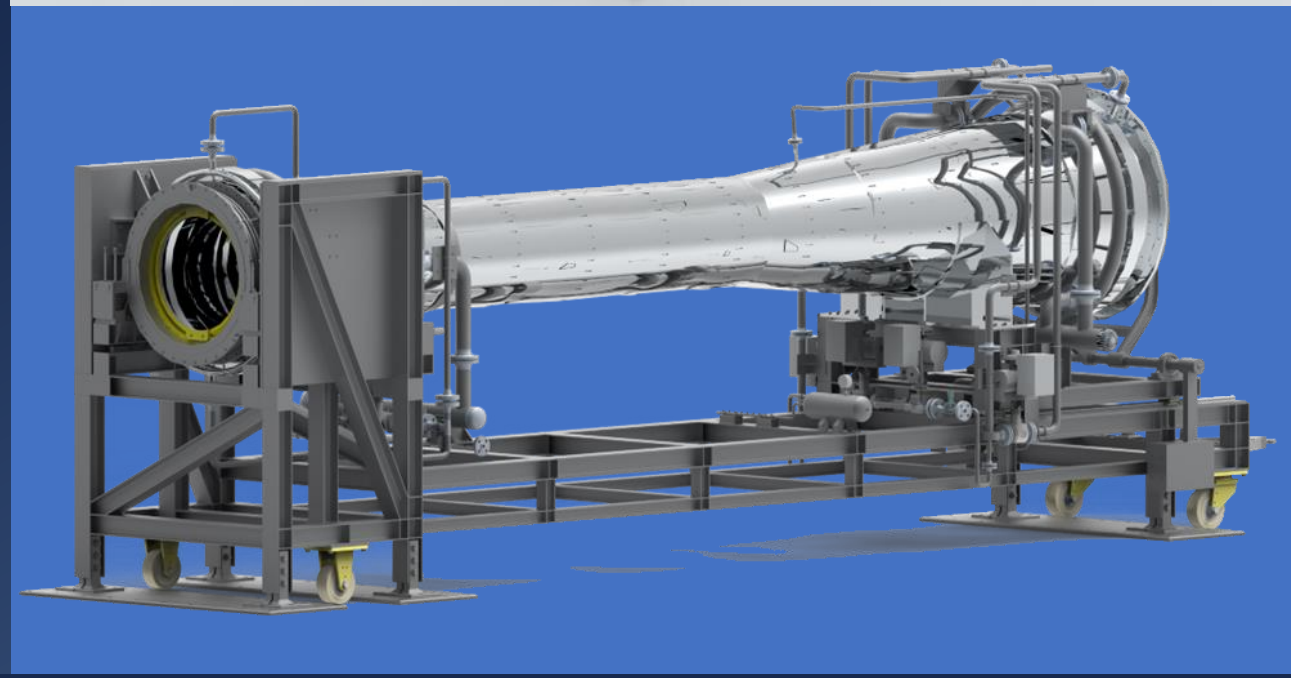
HATF

Novaeka is the **designer** of the High Altitude Test Facility that AVIO will use to perform tests under vacuum conditions for a 100 kN engine inside the SPTF plant.

This second-throat ejector was entirely designed by Novaeka: very detailed fluid-dynamic, thermal and structural analyses were carried out to ensure the correct operation of the system.

A subscale version of the ejector was built and tested by AVIO in Rome to validate the design methodology.

The ejector was manufactured under the supervision of Novaeka and will be installed in the SPTF plant in 2025 to be used in the next testing campaigns.



FGSE – fluid ground support equipments for satellite and spacecraft

Orion – MPCV

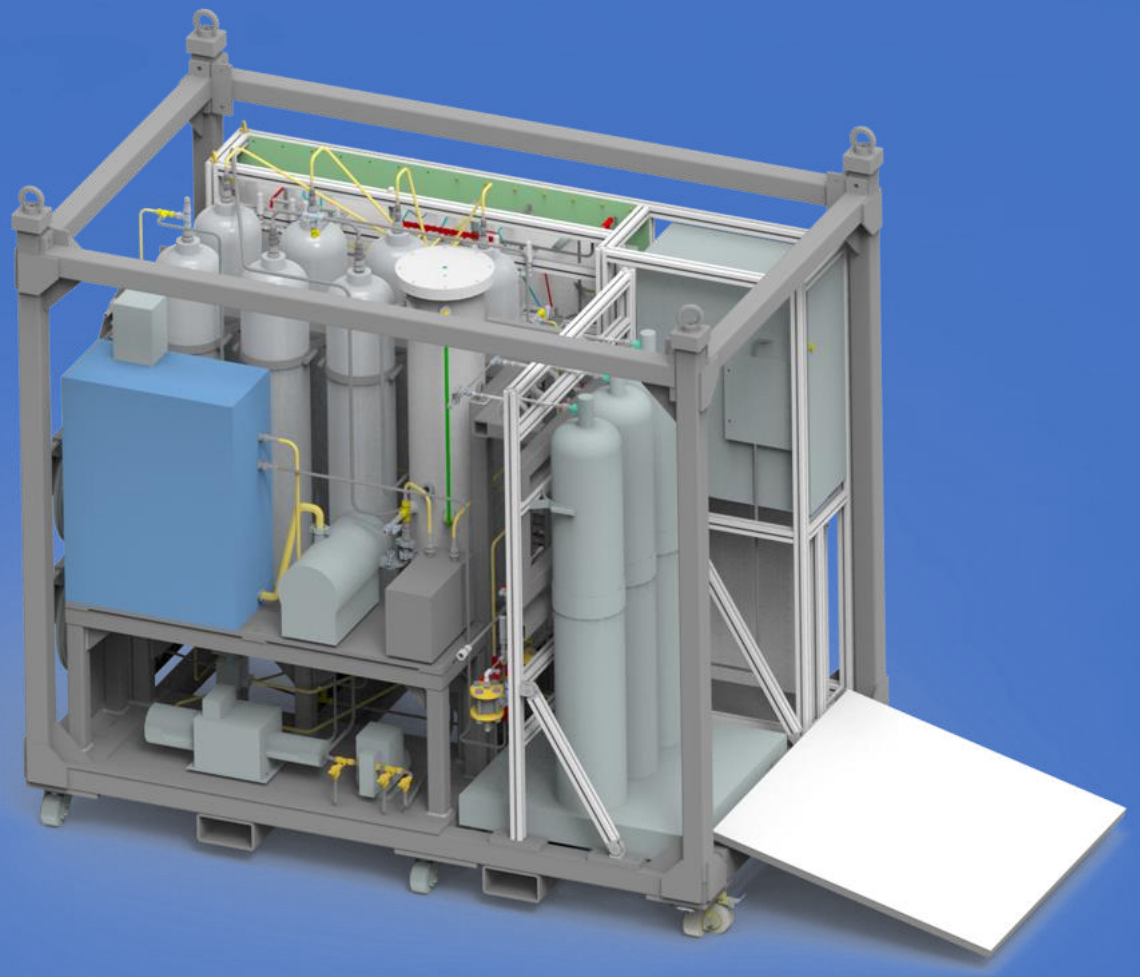
Novaeka is the **designer** of the fluidic skid for loading the refrigerant fluid (HFE) in the thermal control system of the Orion spacecraft for Thales-Alenia Space (IT).

The FGSE was built by a Prime Contractor for Thales-Alenia Space and was used at Cape Canaveral for operations on the Orion.

NEOSAT

Novaeka is the **designer** of the fluidic skid for filling and draining the refrigerant fluid (Ammonia) in thermal control system of the NEOSAT satellite by Thales-Alenia Space (FR).

In this occasion, Novaeka successfully devised an innovative method to cut down the time required to fill the spacecraft from days to hours.

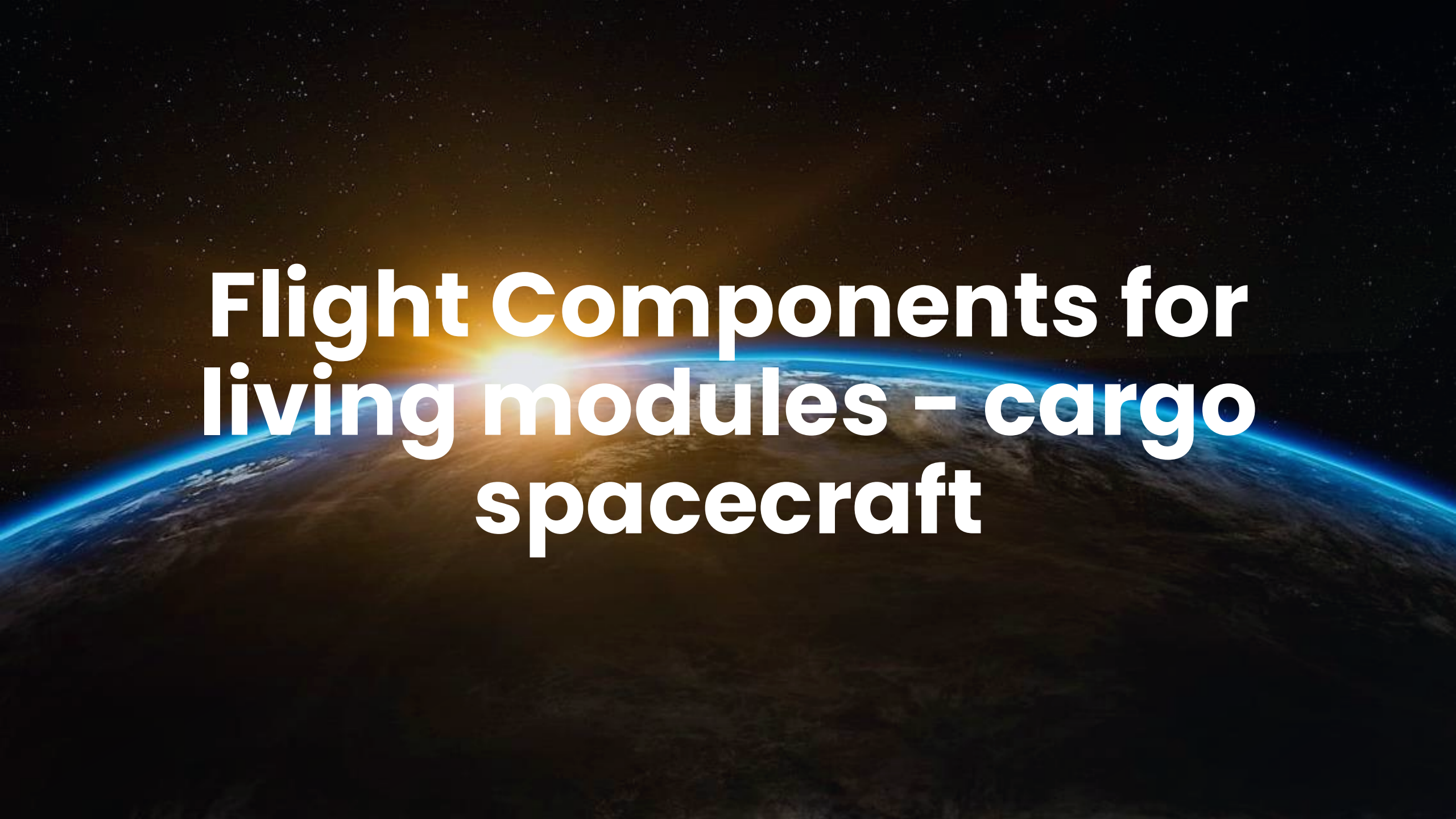


HFE Servicer FGSE

Novaeka is the **general contractor for the construction** of the fluidic skid for filling and draining the refrigerant fluid (HFE) in thermal control system of the I-HAB module for the Lunar Gateway by Thales-Alenia Space (IT)

Pressurization FGSE

Novaeka is the **general contractor for the construction** of three FGSE to provide high and low pressure GN2 and GHe for testing activities on AVIO M60 engine.

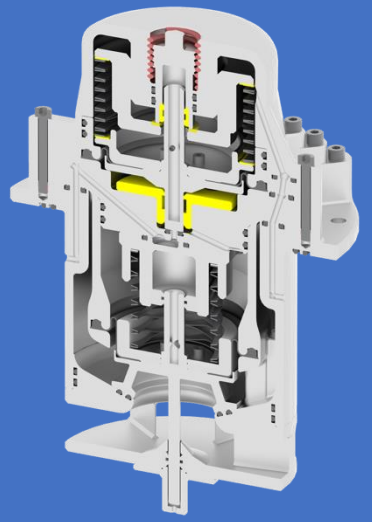

Flight Components for living modules – cargo spacecraft

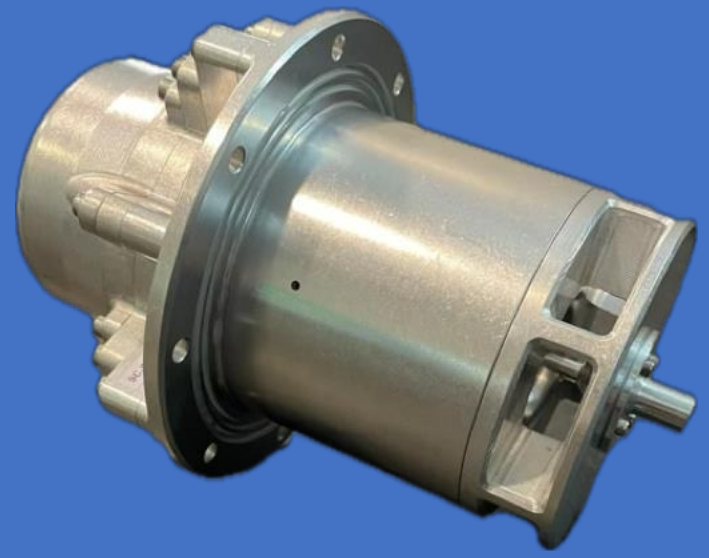
PPRV

Novaeka is the **designer** and **manufacturer** of a Positive Pressure Relief Valve (PPRV) for the pressure control inside a living module for the lunar orbiting space station (Lunar Gateway) for Thales Alenia Space (IT).

A first Breadboard prototype for ground testing was designed and manufactured.

The design of the actual flight component is ongoing, and eventually Novaeka will be the supplier of this component for Thales.





NPRV

Negative Pressure Relief Valve (NPRV)

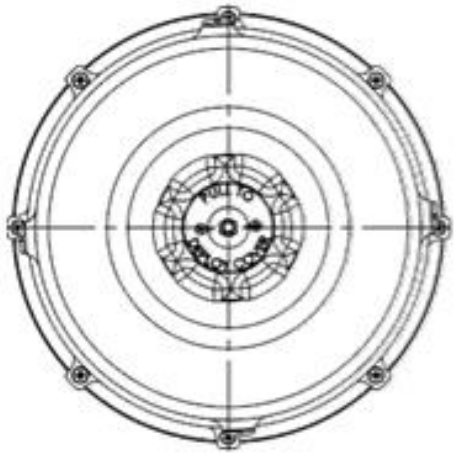
Design Description

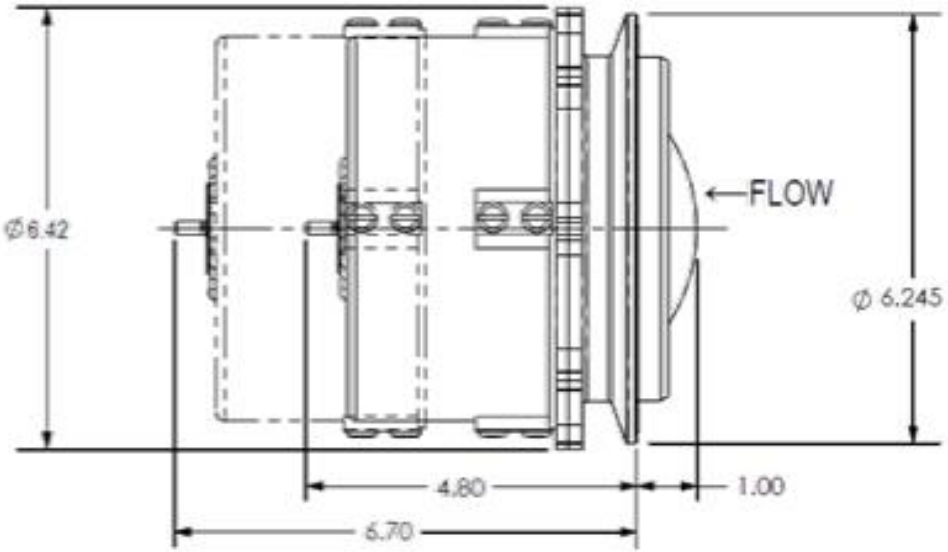
Sierra Space flight-qualified a Negative Pressure Relief Valve (NPRV). This relief valve is designed to open at delta pressures below 1 psid and relieve pressure across the hull of a spacecraft via a large diameter relief valve. Once the delta pressure is reduced, the relief valve closes. This relief valve is also designed with a cap that provides a secondary seal during nominal operations. The cap itself is manually resettable.

These valves are built in cleanrooms and are designed to operate within systems that require high levels of cleanliness. These valves have been qualified and certified for space flight.

Negative Pressure Relief Valve (NPRV)

Dimensions






Modeling and Software

Hardware in the Loop

Novaeka develops together with CAREL Industries a software to perform hardware in the loop testing of PLCs for HVAC units.

The physical hardware is connected to the digital simulation of the cooling machine, controlling it in real-time.

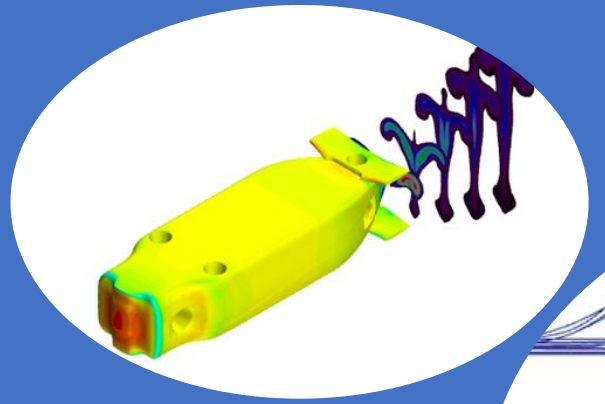
The software includes configurable transient models of different types of cooling machines: heat pumps, air conditioners, chillers, etc.

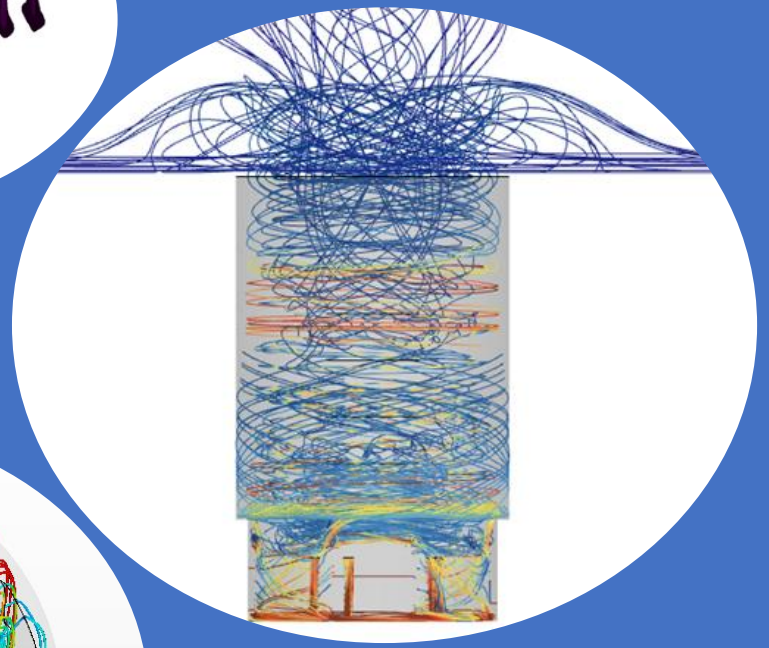
CFD

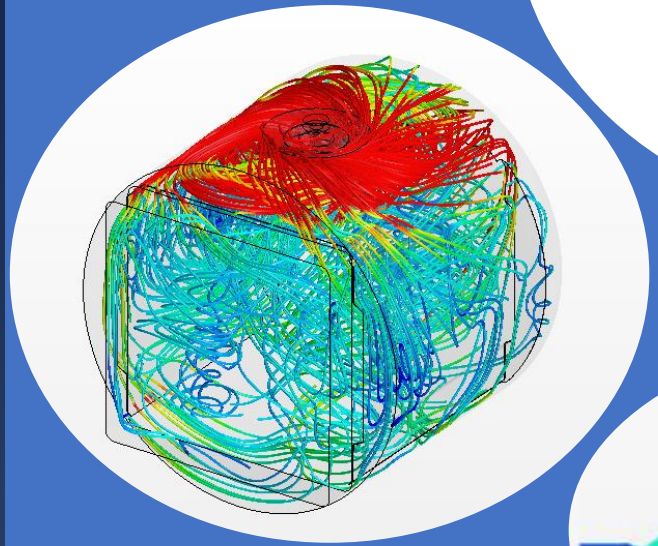
Novaeka performs Computational Fluid Dynamics (CFD) simulations to support its internal design processes and as a service for its clients.

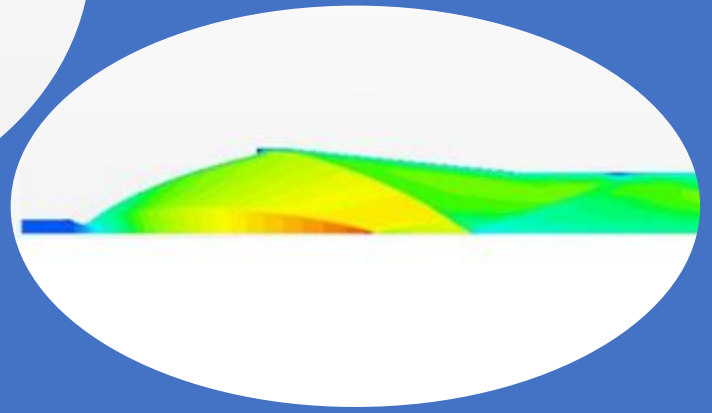
Simulations done in the past include:

- Determination of the hydrodynamic characteristics of underwater autonomous vehicles, for thrusters sizing and operative range maximization
- Study of the flow characteristics inside an underwater drilling shaft for soil stability analysis
- Design of centrifugal and axial fans to optimize the distribution of molecules dispersed in the air stream inside an industrial sterilization autoclave
- Coupled CFD and Thermal simulation of HATF





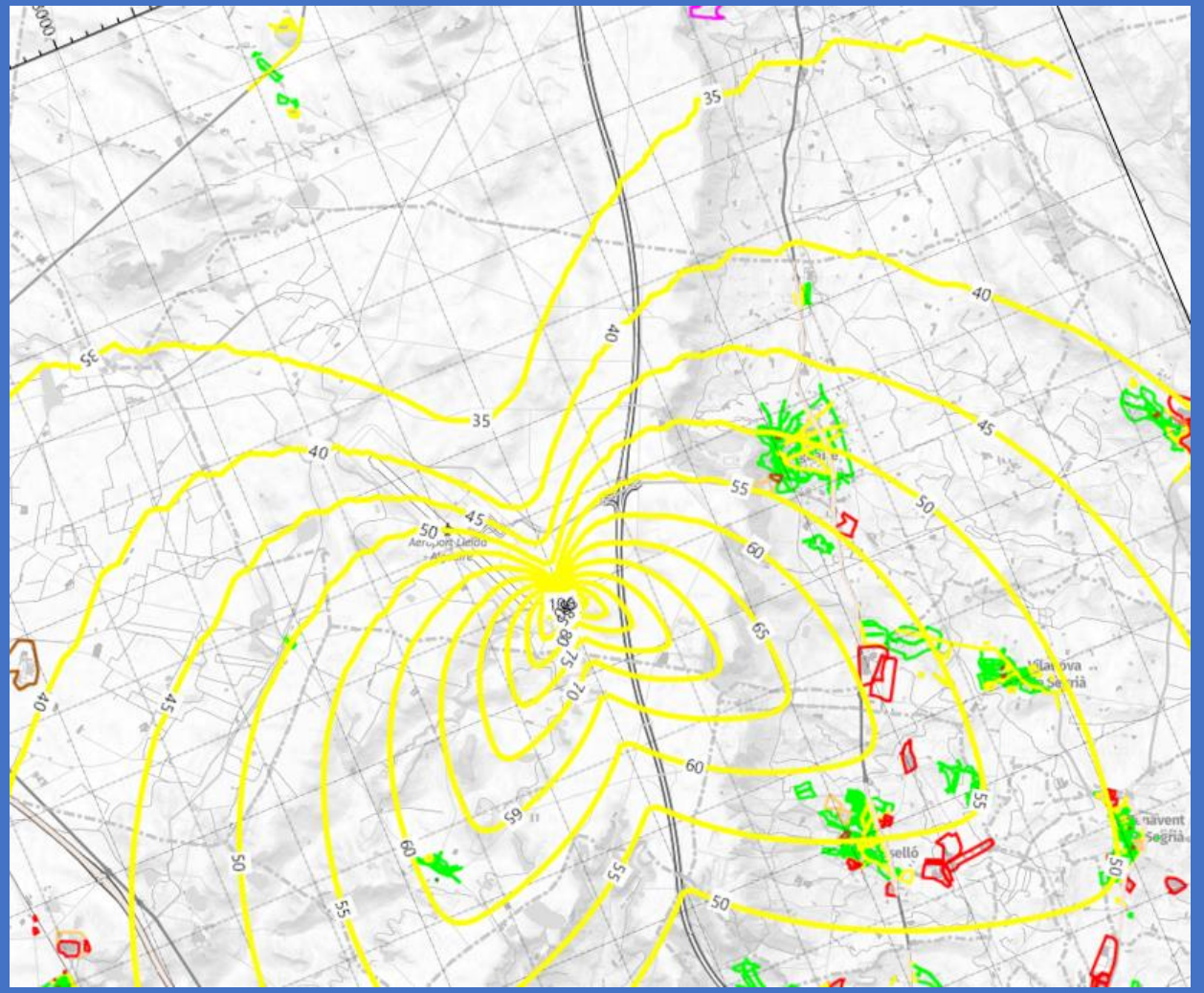




Rocket Engines Noise

Novaeka developed a custom model based on NASA standards to estimate the noise emissions generated by the testing of a rocket engine, including noise reduction due to the presence of a water deluge system, containment walls and other environmental attenuations.

The model is used as part of the environmental analysis that must be provided to the authorities to get the construction of a test facility approved.

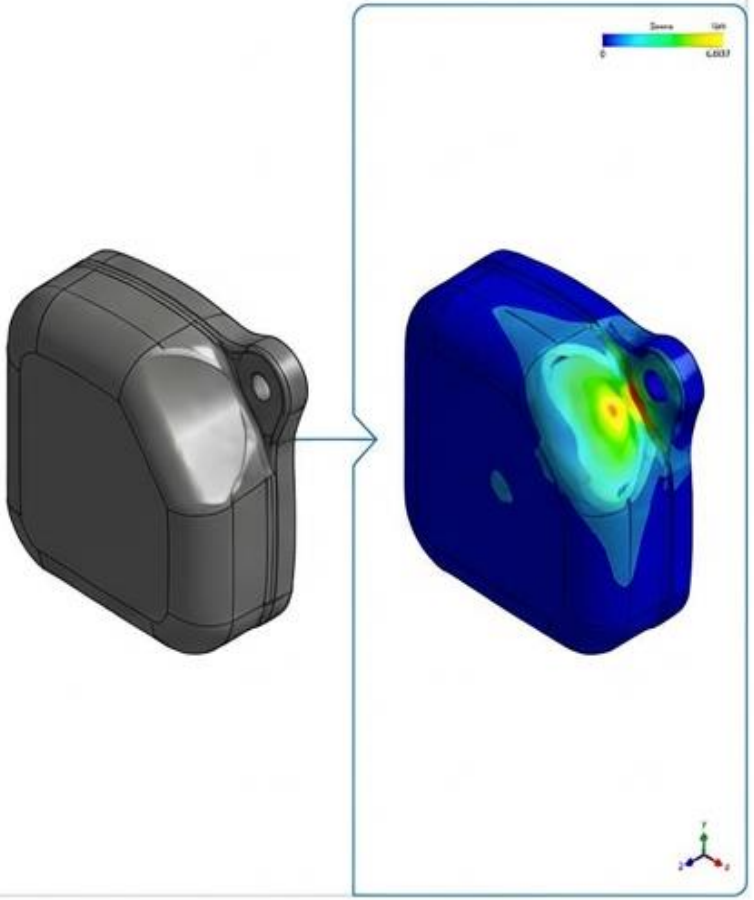



Previous challenge
Underwater

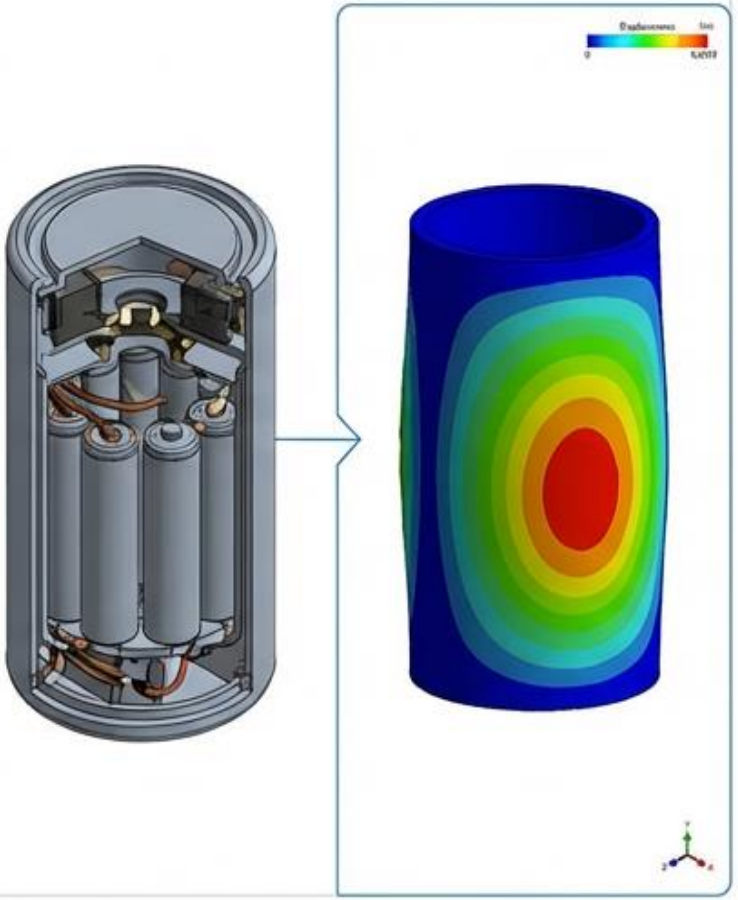
Absolute Reliability for Critical Infrastructure

Design and validation of underwater communication nodes to ensure maximum operational resilience.

ANTI-ENTANGLEMENT CONNECTOR PROTECTION



PRESSURE-TIGHT AUXILIARY BATTERY CONTAINER



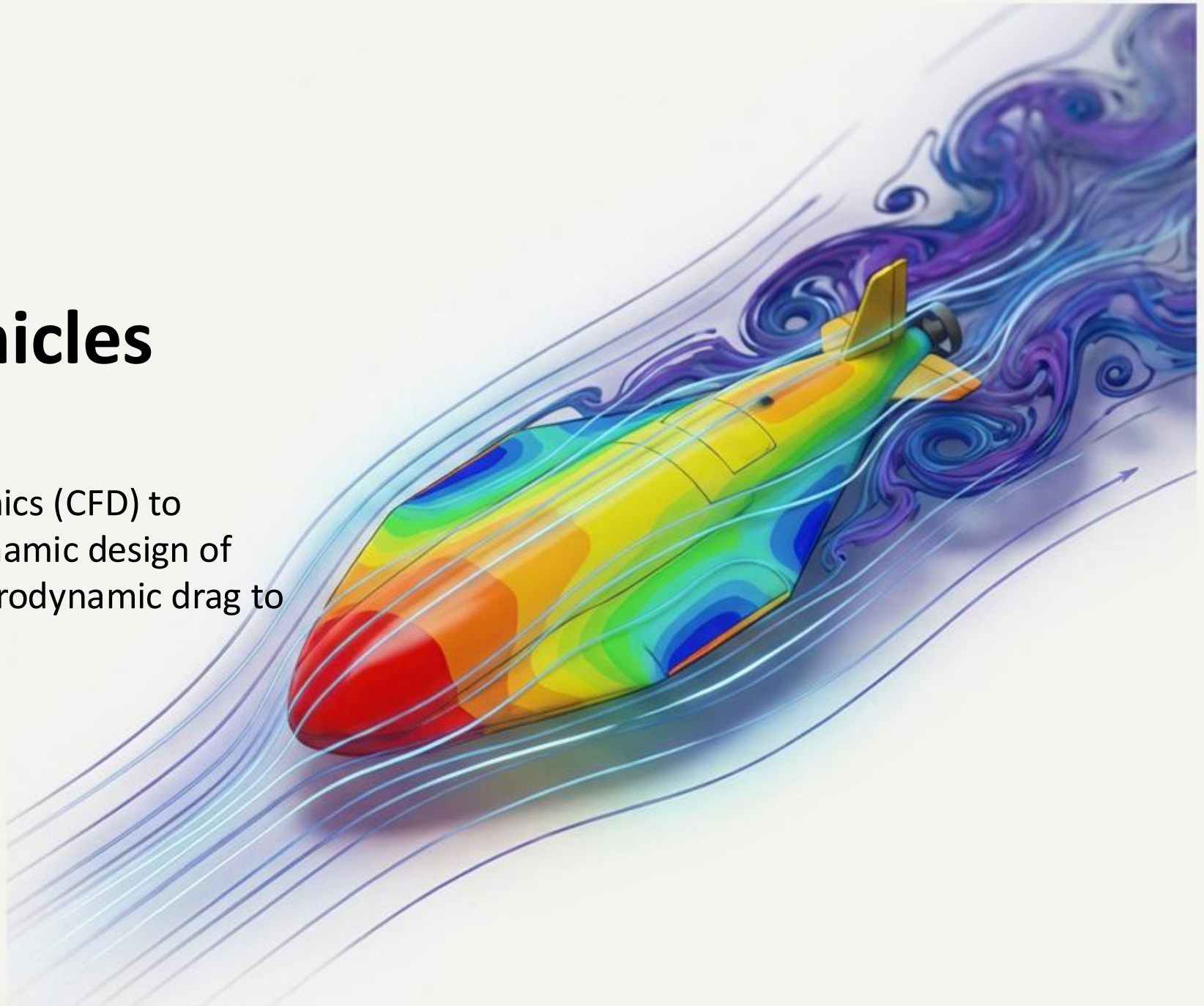
IP67 GATEWAY FOR ON-BOARD ELECTRONICS

Each component is engineered and validated through finite element analysis (FEM) to withstand the most severe operating conditions.

wsense

Maximizing the Performance of Autonomous Vehicles (AUVs)

We use computational fluid dynamics (CFD) to analyze and optimize the hydrodynamic design of underwater vehicles, reducing hydrodynamic drag to maximize endurance and range.



Our Competitive Advantage

INNOVATION CROSS-DOMAIN

We apply aerospace technologies and methodologies to overcome the technological limits of the underwater domain.

ENGINEERING END-TO-END

From system conceptualization to detailed design, through to component validation and qualification.

STRATEGIC RESULTS

We provide concrete solutions that enhance safety, operational efficiency, and tactical superiority.

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