

FUTURE SPACE TRANSPORTATION FLPP AUTUMN SESSION 2025



INSPOC-2

ARIANE GROUP



- Ecosystem Analysis
- Concept Creation
- Conceptual Design of Demonstrator
- Programme Roadmap
- Technology Identification and Maturation Plan



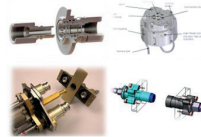
Zero boil off
tank systems



Transfer I/F solutions



Active flow
management



IN-SPACE PROOF-OF-CONCEPT (INSPOC) PROJECT OVERVIEW



- Structure its programmatic roadmap to IOD
- Plan the commercial maturation of in-orbit refilling servicing.

Project name: InSPoC-2: In-orbit cryogenic propellant storage & refilling

Project phase: Preparation Phase (Pre Phase A)

Objectives:

- Analyse the in-space refilling ecosystem for in-space transportation to consolidate targets for the
- InSPoC-2 demonstration
- Specify the InSPoC-2 demonstration to provide utmost added value for these use-cases
- Perform the trade-off and conceptual designs of the enabling functional chains and interfaces for in-orbit refilling
- Synthesise a conceptual design for the InSPoC-2 demonstrator
- Define & plan the required technology maturation for InSPoC-2

Applications

Baseline market dimensioning: Elasticity of market demand led to the definition of multiple cases with varying reference propellant demand hypotheses.

Reference Scenario	Market Share Assumption (SOM)	Scenario Description
Scenario 1 - Worst Case	10%	- Degradation of existing market share due to domination of North American market. - No European in-space fuel depot in service.
Scenario 2 - Base Ambition	25%	- CBE for average market share in Europe based on available literature. - No European in-space fuel depot in service
Scenario 3 - High Ambition	40%	- Appreciation of existing market share through entry into service of Odyssey.

GET IN TOUCH

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ENABLING CAPABILITIES FOR IN-SPACE LOGISTICS

What we developed:

First iterations of the key building blocks have shown the feasibility of the proposed cryogenic solutions. A functional demonstrator architecture has been developed and pre-designed. Flexible operation due to its autonomous functionality, with baseline solution based on ASTRIS for long mission duration.

Concept Superiority:

- Low cost Astris as servicer
- Cryo-concept with LOX/LH2 for high dV missions
- Demonstrator concept adaptable to changing mission objectives, budget limitations and demo objectives

Benefit for the ecosystem:

- The proposed demonstrator mission will enable Europe to claim its share of the in-space cryogenic refilling ecosystem. The gaps to a fully-fledged product and the remaining risks are minimised and offer a significant return on investment for all involved stakeholders.

KEY RESULTS

- Full in-orbit demonstration architecture
- Cryo cooling concept (incl. tanker, long term storage, refilling scenario, zero boil-off feasibility)
- In-orbit demonstrator concept
- Techno roadmap cryogenic components & full integrated system level



NEXT STEPS AND MARKET READINESS

The InSPoC-2 activities are the key enabler for high-energy transfers and large payload delivery applications to the moon and beyond.

- **Roadmap:** Component prototyping and testing, system thermal layout, sloshing behaviour and liquid acquisition simulations, detailed demonstrator concept design
- **Opportunities:** Vanzetti Engineering (cryogenic technologies), iBOSS (cryogenic interfaces), Comoti (structure), Hamburg University of Applied Science (LH2 Sensors)
- **Target launch:** Start integration 2028, in-orbit demonstration 2030