Security & Safety - In Orbit Servicing

Space is going to be a very dynamic environment.

The space market is evolving towards in-orbit operations to respond to crucial satellite operators’ needs for new space applications.

A “space servicer” could offer services ranging from station keeping, re-positioning, debris removal, components replacement, satellites inspection, refueling, repairing, in-orbit assembly, asteroid prospecting, return of materials.

Thales Alenia Space Position

Thales Alenia Space believes the market demand is changing:

First Generation Servicing (life extension, orbit recovery and orbit transfer) is leaving place to more ambitious operations like in-orbit inspection & repair, changing/enhancing payloads.
Thales Alenia Space START Project

Thales Alenia Space is promoting a multi-mission vehicle able to fulfill 3-4 main objectives with high Institutional value and Commercial interest.

✓ The vehicle will **keep the space safe, sustainable, and will preserve it for future use**
✓ Thanks to shared solutions and common interfaces, the vehicle will be able **to promote the commercial market with flexible and evolving solutions.**
✓ The vehicle will benefit from several technologies already under development within on-going ESA missions like AIM, e-deorbit, Hera, ESPRIT, and Mars Sample Return.
✓ **Synergies** will allow to optimize system requirements.
In Orbit Servicing: an evolving market

Thales Alenia Space solutions are focusing on the Second Generation of In Orbit Services

Advanced services focus on:
- Precise Inspection
- Robotic Repair
- External Payload Interfaces
- Mission Enhancement

Incumbent secured contracts in life extension

Cooperative services will grow & expand in 7 to 10 years (2027-30)

Life Extension Services have proven value of 20 M$/year

Interfaces for External Payload will allow repair & enhancement of the mission

Security/Defense services have dedicated business cases

Market value evolves

Thales Alenia Space solutions are focusing on the Second Generation of In Orbit Services
Thales Alenia Space Roadmap for the Second Generation of Services

Service Kits Ready
- Refueling berthing connector & fluidic guidelines
- External payloads mounting for robotic operations
- Robotic capture interface (incl. design for removal)

On-ground Technology Demo
- RdV and capture
- Refuelling (berthing & fuel transfer)
- External Payload Robotic attachment
- Robotic arm
- Inspection
- Satellite Functional Simulator
- Prototype Mission Control Centre

Operational Servicer Vehicle

2020

2019

2020

2024

2024

2024

2026

2026

2026

2026

Service Vehicle
- Cooperative services
- Shared launch

In-orbit Demo
- Compact service module
- Mission kits
- Ground - mission control center
Space START vehicle global view

**SVM - Service Module**
- B - Basic
  - X-band comm.
  - 700 kg dry
- E - Enhanced
  - 720 kg dry
  - X-band + Ka-band comm.
  - HGA + APM

**PLM - Payload Module**
- U - Debris Removal & Cargo
  - Ams for Debris
  - RV Sensors (FRC, NRC, IRC, 3D LIDAR)
  - Target illumination system
- P - Prepared cargo
  - Relative Navigation System for RV (Bifocal Metrology)
  - Connection System
- S - Advanced Servicing
  - Advanced Robotic HW (end effectors for robotic arms, tooling, sensors) & SW
- A - Asteroid RdV*
  - RV Sensors (FRC, NRC, IRC, 3D LIDAR)

**Additional Modules**
- K
  - De-Orbiting Kits
- Z
  - Asteroid Prospector
- M*
  - Mining Machinery (to be deployed on NEA)
- T*
  - Pressurized / Un-pressurized transportation modules
- R*
  - Re-Entry capsule

**PM - Electric Propulsion Module**
- C - Small
  - 650 Kg Xenon
  - 200 Kg Hydrazine
- L - Large
  - 1350 Kg Xenon
  - 200 Kg Hydrazine

**Space START**

**Fully modular approach in order to maximize reusability across different applications**

*Out of Space START design perimeter and not influencing Space START configuration
In orbit servicing, a Commercial and Security mission

Thales Alenia Space is promoting missions for the “Next Generation of Services”.

The market is evolving faster than we could envisage with new kind of services beyond life extension.

The missions will have a general Institutional Interest and will also respond to the needs of the Commercial market:

- Precise Inspection
- Robotic manipulation for satellite enhancement
- Deorbiting (cooperative and non-cooperative RdV)
- Life extension through Refueling cooperative interfaces (to prepare next generation of satellites)

The proposed solution will benefit from existing heritage and synergies with other ESA missions.