

In-Orbit Assembly Testbed

What is **TRACTOR**?

TRACTOR (Test Rig for Analysis and Control of Traveling Oscillations in a Resonant Beam) is a proprietary GMV dynamic surrogate platform that provides representative dynamics for the validation and maturation of Guidance, Navigation and Control (GNC) technologies for future space systems. Typical applications are In-orbit Servicing Assembly and Manufacturing (ISAM), with in-orbit assembly, large flexible spacecraft, and other missions involving complex structural dynamics.

TRACTOR has been engineered to provide a modular, configurable, and extensible capability for the development and verification of advanced control solutions. The platform reproduces key dynamic phenomena expected in future orbital infrastructures, such as flexible structural dynamics, bending modes, fluid sloshing, changing mass and inertia properties, and disturbances generated by robotic interactions.

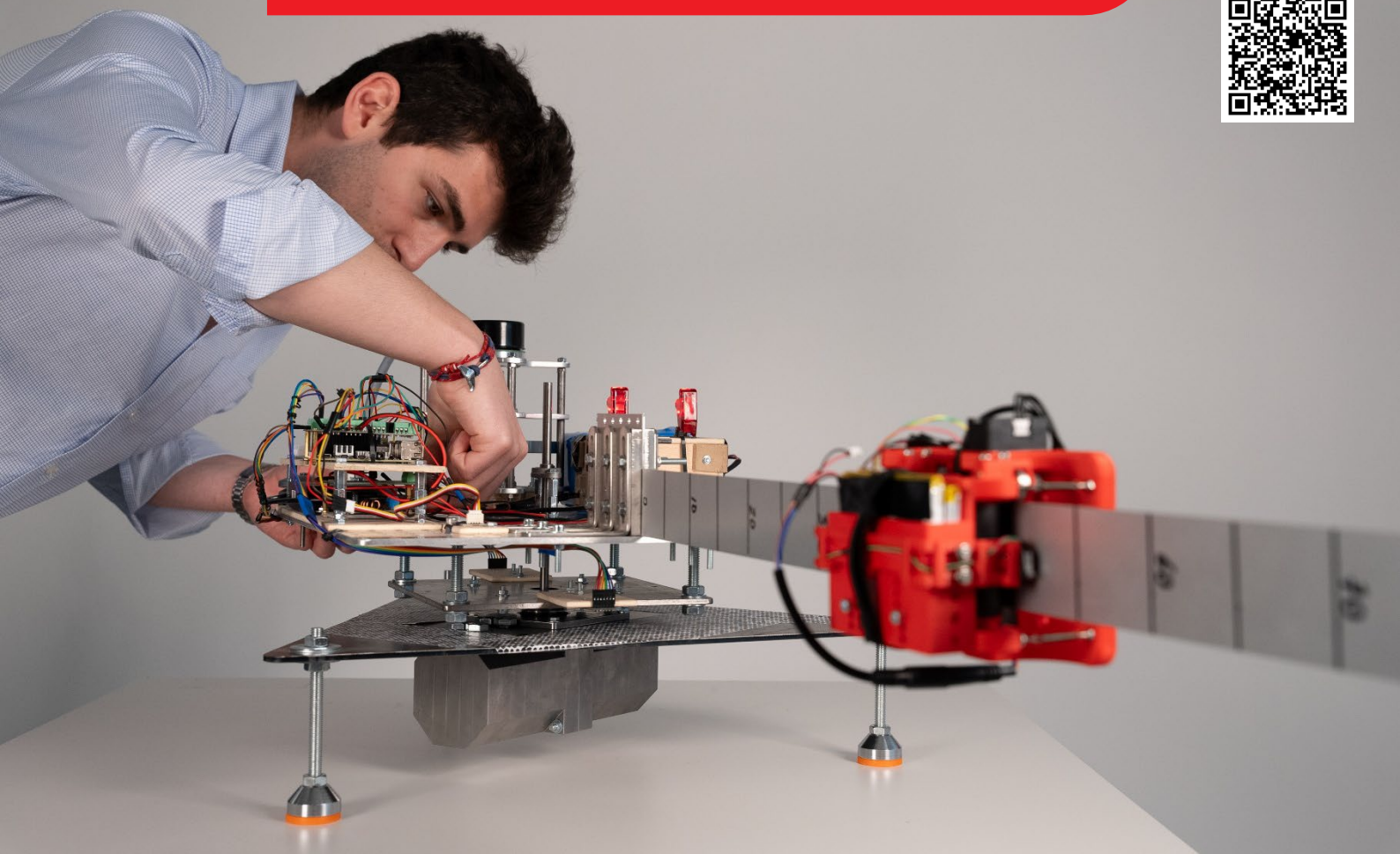
What we offer:

TRACTOR is operated by GMV as part of its GNC engineering services.

Customers can request tailored demonstration sessions to explore mission scenarios, evaluate GNC concepts and discuss engineering trade-offs with GMV specialists. The service combines live Hardware-in-the-Loop demonstrations with technical consultancy, allowing customers to better understand solution maturity, implementation approaches and integration aspects before entering a dedicated development programme.

Interested in assessing your GNC concept?

Contact GMV to discuss a tailored engineering demonstration based on the TRACTOR platform and explore how representative Hardware-in-the-Loop demonstrations can support your project
tractor@gmv.com



How does **TRACTOR** work?

TRACTOR is a one degree of freedom dynamic surrogate platform available for the validation and maturation of GNC technologies for flexible space systems. The platform reproduces the key dynamic phenomena encountered in large orbital infrastructures, enabling realistic testing in a laboratory environment.

Flexible spacecraft elements such as antennas, solar arrays, and truss structures are represented through configurable flexible beams whose dynamic properties and resonant frequencies can be tailored to match customer-specific applications. Robotic assembly and servicing operations are emulated through a proprietary and bespoke robotic walker that traverses the beam, reproducing the disturbances and changing mass properties introduced by robotic interactions with flexible structures.

Propellant sloshing effects are represented using configurable fluid tanks, allowing a wide range of sloshing behaviors to be reproduced and adapted to mission-specific requirements. Spacecraft actuation is provided through an in-house reaction wheel system, while onboard avionics can be represented using Raspberry Pi and LEON-based processors to support software, processors, and hardware-in-the-loop validation campaigns.

A dedicated sensor suite, including inertial measurement units (IMUs) and high-precision absolute encoders, provides a demonstrative analogue of spacecraft navigation sensors, enabling the development and verification of advanced control algorithms under representative metrology.

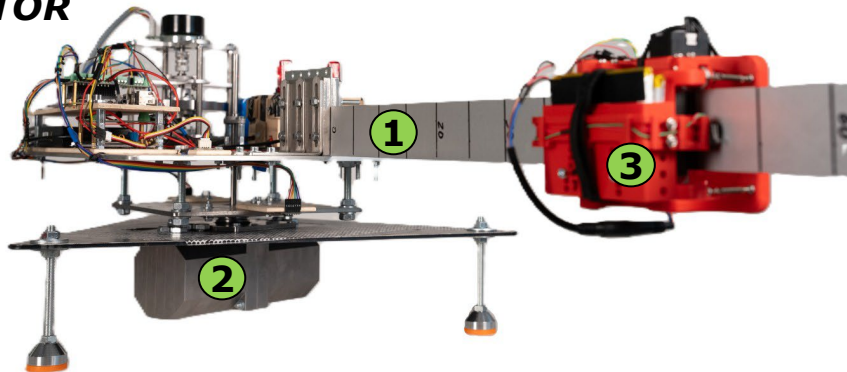
Data sheet:

Product Type	In-Orbit Assembly GNC Validation Platform
Target GNC Applications	- In-orbit Assembly, Servicing and Manufacturing (ISAM) - Flexible Spacecraft & Structures - Launchers GNC Validation
Representative Dynamics	- Flexible Structural Dynamics - Bending Modes - MCI Variations - Robotic Interaction Disturbances - Propellant Sloshing
Configurable Elements	- Flexible Beams - Robotic Walker - Sloshing Tank - Mission-Specific Payloads
Demonstration activities	- Control Algorithm Validation - Closed-Loop Hardware-in-the-Loop - Algorithm Benchmarking - Online Estimation - System Identification
Demonstration Environments	- MIL, SIL, PIL, Closed-Loop HIL - MATLAB / Simulink Digital Twin
Engineering Services	- Tailored GNC demonstration campaigns - Technology assessment workshops - Demonstration planning and execution - Specialized GMV GNC engineering team - Demonstrations supported by the TRACTOR dynamic surrogate platform

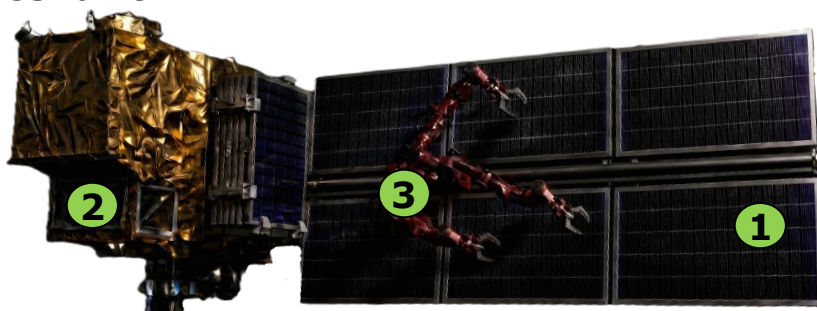
Main features:

- Dynamic Surrogation of Future Orbital Infrastructure
- Bridging Simulation and Experimental Validation

TRACTOR



IOA Scenario



- 1** Solar Panel
- 2** Spacecraft Body
- 3** Assembly Robot

- Accelerating GNC Technology Readiness