

Removing barriers for transitioning into the new space infrastructure paradigm

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PERIOD contributes to prepare building the future space infrastructure.



Airbus and the PERIOD consortium have started to develop solutions to prepare the transition into a sustainable space ecosystem.

- Considering the current trends in the space ecosystem, the evolution the **future space** ecosystem might be at risk.
- The goals of the future space ecosystem shall consider efficiency on energy and materials, large scale infrastructure to manage 100k satellites in orbit and cislunar space and Earth protection.
- New capabilities are required to implement these goals like the ability to build large structures and assemble satellites in orbit.
- Barriers have to be removed to implement the transition from the available capabilities to the future space ecosystem.





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Benefits Stemming from Space Applications

- New means to address global challenges.
- **Telecommunications**
- Global positioning
- Weather forecasting
- Climate change monitoring
- Global search-and-rescue system
- Better understanding of the solar system and our Universe
- New scientific and technological knowledge of inherent value to humankind
- Benefits back to Earth in areas such as materials, power generation and energy storage, recycling and waste management, advanced robotics, health and medicine
- Partnerships and capabilities developed through space exploration create new opportunities for addressing global challenges
- New opportunities for job creation and economic growth







Factors impacting space ecosystem evolution



After 65 years, benefits stemming from space are at risks.

Reduction of launch costs Huge increase of the number of satellites

Launch cost per kilogram to low earth orbit vs first launch date



No proper infrastructure to manage 100k satellites and cislunar space. Uncontrolled increase of space debris Orbital pollution with debris



Risk to end up with unusable terrestrial orbit.

Single sat use without maintenance and recycling Inefficient space systems



Waste of Earth resources not contributing to climate change fight.



Y Take the right direction for a sustainable future



The next sustainable space ecosystem shall reconciliate the trends to maintain and develop the benefits stemming from space.

Goals for the future sustainable space ecosystem in the overall lifecycle

Goal	Meaning	
Space infrastructure to properly manage 100k satellites (Earth orbit and cislunar)	Space infrastructure to provide situation awareness, power, comms, logistic, positioning	
Remove big debris on critical orbits	Take control on space debris evolution	
Use efficiently energy and materials (no waste)	 Design satellite structures for their targeted environment in 0g, not for 5min of launch Reuse satellite platforms in orbit and launch only new elements required for a mission Produce in space for Earth Apply methods for efficient resource utilisation on Earth 	
Access to clean energy from orbit	Generate power in orbit for Earth	
Protect Earth from orbit	Support fight against climat change from space	



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New capabilities required



New robotic capabilities shall be developed, validated and deployed to propose solutions addressing the new goals.

Capability	Level of definition at Airbus & PERIOD	
Rendezvous and Docking	Operational with Airbus ATV Prel. design with DEOS and ADS Spacetug	
Capture	RemoveDebris and prel. design with DEOS Prel. design with e.Deorbit (debris removal)	
Refuelling	ATV and Airbus Spacetug concept Concept with PERIOD based on ASSIST	
Assembly Maintenance	Concept and breadboard with PERIOD Standard Interconnect PERIOD (SENER, SAS)	
Manufacturing	Airbus BB for reflector building and PERIOD IOD with Airbus Metal3D	
Autonomy	ESROCOS and ERGO PERIOD dev. (GMV) Data Fusion InFuse PERIOD dev. (SAS)	



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ADS: Airbus Defence and Space SAS: Space Applications Services



PERI Build structures and assemble satellites in space with PERIOD.

Satellite Antenna Manufacturing

Satellite Body Assembly





Credentials Airbus

Credentials Space Applications Services





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• Obstacles and remediation actions

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This new field requires strong support for de-risking and for the industry to prepare viable commercial applications.

Obstacle	Description	Remediation actions
On-Orbit Servicing market just shaping in uncertain context and without clear business cases	The new space market suffers uncertainties on its orientation like what the first applications will be, either on relocation or maintenance and later manufacturing, in LEO or GEO.	Implement IOD demonstrations with potential users to learn the technology, the operations and the risks, and define business cases.
Institutional customers not using OOS/ISMA	Institutional customers are not baselining OOS and ISMA for their own space missions.	Institutional customers should put OOS and ISMA in their mission requirements.
Technologies related to robotics and autonomy not fully mature	The Technical Readiness for cost-effective In- Orbit Operations is not as high as it should be.	Implement demonstrations to mature the technical readiness of OOS/ISMA and its operations.
Lack of orbital free-flying demonstration platform	Demonstrate the feasibility of repeated IOD demonstrations. Methods for verification of systems produced in space must be established.	Institutional customers should provide an orbital lab to validate technologies (extension of ground facilities).
Lack of standardization for operations and equipment	Standardization is required to accommodate in- space servicing and ISMA, and is seen as a key driver to be able to reduce costs and make the space business attractive.	Prepare an European approach on standards and legal aspects like with the European Operations Framework.
Lack of customer awareness on OOS/ISMA	Space industry customers are not aware enough on the OSS/ISMA potential to build new applications.	Inform transparently customers on capabilities, risks and mitigations.
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Space infrastructure paradigm for sustainability

PERICO

Transitioning into a space ecosystem based on efficiency, an infrastructure to manage 100k satellites and Earth protection from space.











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Thank you!











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