European Innovation Council

Backing visionary entrepreneurs

Stela Tkatchova
EIC Programme Manager for Space Systems
26/01/2023

European Innovation Council and SME Agency

European Innovation Council

EIC Accelerator Space Challenge - 10:00am-11:30am

Time	Topic	Presenter
10:00 – 10:10 **10 Min**	EIC Introduction	Anne-Marie Sassen (EIC/EISMEA)
10:10 – 10:45 **35 Min**	EIC Accelerator – "Customer Driven" innovative space technologies and services	Stela Tkatchova (EIC/EISMEA)
10:45 – 11:00 **15 Min**	Q&A - EIC Accelerator	Eric-Olivier PALLU (EIC/EISMEA)
11:00 – 11:10 **10 Min**	Presentation by DG DEFIS "Future Space Ecosystem (FSE)"	Daniel Noelke (DG DEFIS)
11:10-11:20 **10 min**	Presentation by DG DEFIS "In Orbit Demonstration (IOD)/In Orbit Validation(IOV) EU initiative"	Maria Vittoria D'INZEO (DG DEFIS) Romain Lezier (DG DEFIS)
11:20-11:25 **5 min**	Wrap-up	All

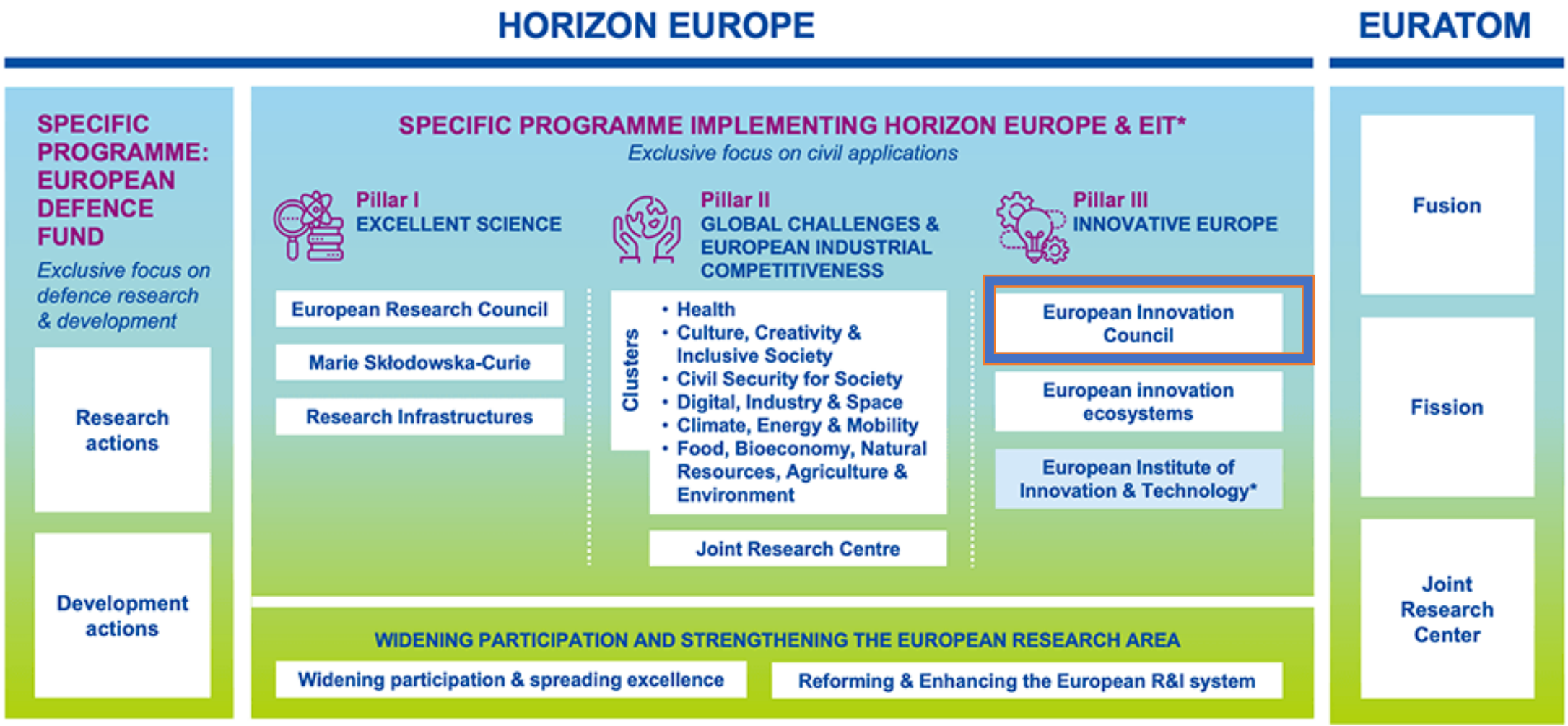
European Innovation Council

EIC Pathfinder Space Challenge - 11:30am-13:00pm

11:30 – 11:50 **20 Min**	**EIC Pathfinder – In-space solar energy harvesting for innovative space applications**	**Stela Tkatchova (EIC/EISMEA)**
11:50 – 12:05 **15 Min**	Q&A - EIC Pathfinder	Pathfinder Unit (EIC/EISMEA)
12:05 – 12:55 **45 Min**	Short presentations of potential applicants for Pathfinder projects in the following running order: 1 OrbitAID 2 CASTRA 3 Share My Space 4 E.T. Pack 5 Neutron Star Systems 6 BullMould 7 AerospaceLab	 8 OHB System AG 9 Luleå University of Technology 10 Emrod 11 Light Mirror 12 Paraloon 13 Neurobus 14 Kurs Orbital 15 SwissSolar Space
12:55 – 13:00 **5 Min**	Wrap-up	All

Horizon Europe Structure

European Innovation Council



* The European Institute of Innovation & Technology (EIT) is not part of the Specific Programme

European Innovation Council

EIC Programs

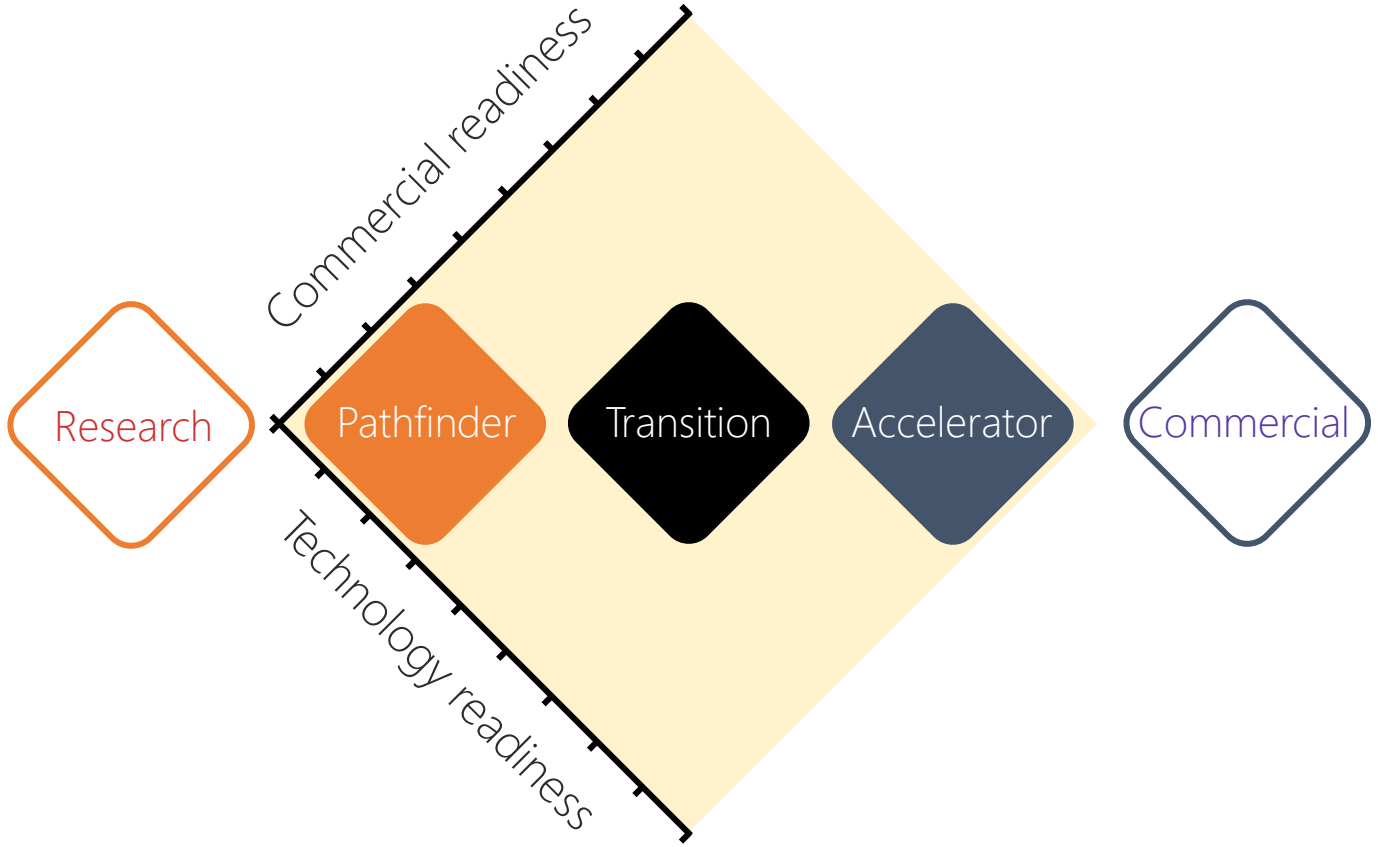
Pathfinder (TRL1-4)
- **For consortia**
- Early stage research on breakthrough technologies
- **Grants up to €3/4 million**

Transition (TRL 4-6)
- **For consortia and single entities**
- Technology maturation from proof of concept to validation
- Business & market readiness
- **Grants up to €2.5 million**

Accelerator (TRL 6-9)
- **For individual SMEs**
- Development & scale up of deep-tech/ disruptive innovations by startups/ SMEs
- Blended finance (**grants up to €2.5 million; equity investment up to €15 million or above**)

EIC stages the entrepreneurial journey as pathfinder, transition, accelerator with increasing readiness levels

WHAT?

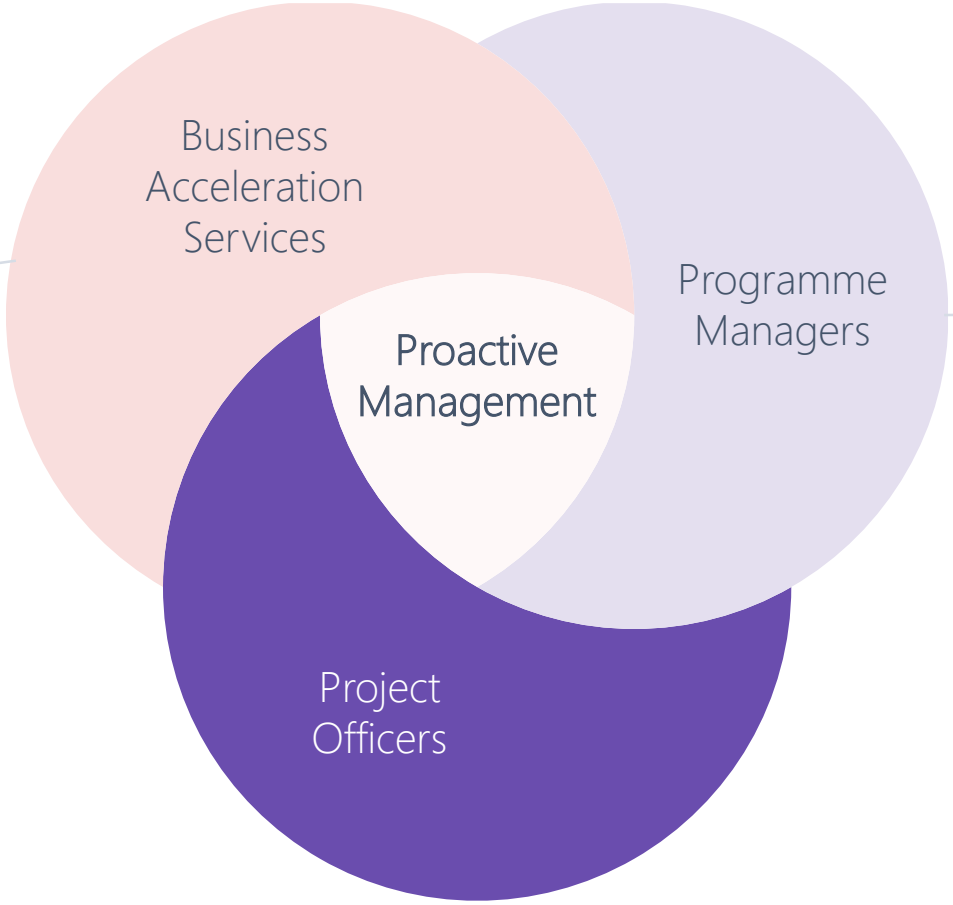


WHY?

European Innovation Council

With proactive management the EIC aims to maximize its support to success of the entrepreneurial journey

- Access to entrepreneurs
- Access to mentoring
- Access to ecosystems
- Access to partners, peers
- Access to trainings
- Access to workshops
- Access to expert advice
- Access to recruitment
- Access to industry

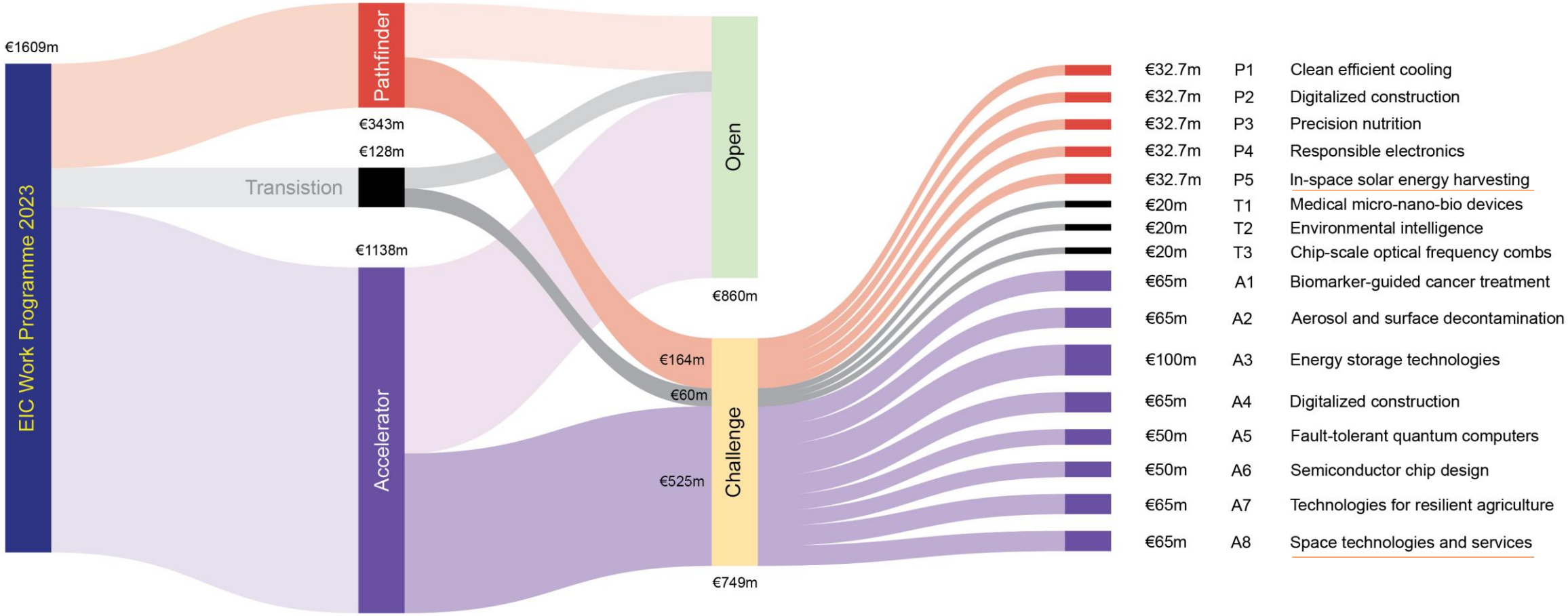


- Health, Biotech
- MedTech
- SpaceTech
- Quantum, electronics
- Greentech materials
- Greentech
- AEC
- Agri-food
- Responsible electronics
- Bio-fuels, E-fuels

Challenges
Portfolios
Outreach

European Innovation Council

In 2023 EIC allocates ~€1.6bn to Open and Challenge calls by its Pathfinder, Transition, Accelerator programs



European Innovation Council

EIC WP 2023 deadlines and budgets

European Innovation Council

Accelerator

Open

11 January 2023
22 March 2023
7 June 2023
4 October 2023

~€611m
(~grant/equity)

Challenges

22 March 2023
7 June 2023
4 October 2023

~€523.5m
(~grant/equity)

Pathfinder

Open

7 March 2023

~€179.50m

Challenges

18 October 2023

~€163.50m

Transition

Open

12 April 2023

~€67.86m

Challenges

27 September 2023

~€60.5m

Introduction

Overview

- EIC role in the EU space industry
- WP 2023 Space Challenges
- WP 2023 Methodology for topics selection
- WP 2023 TRL

Deep-dive

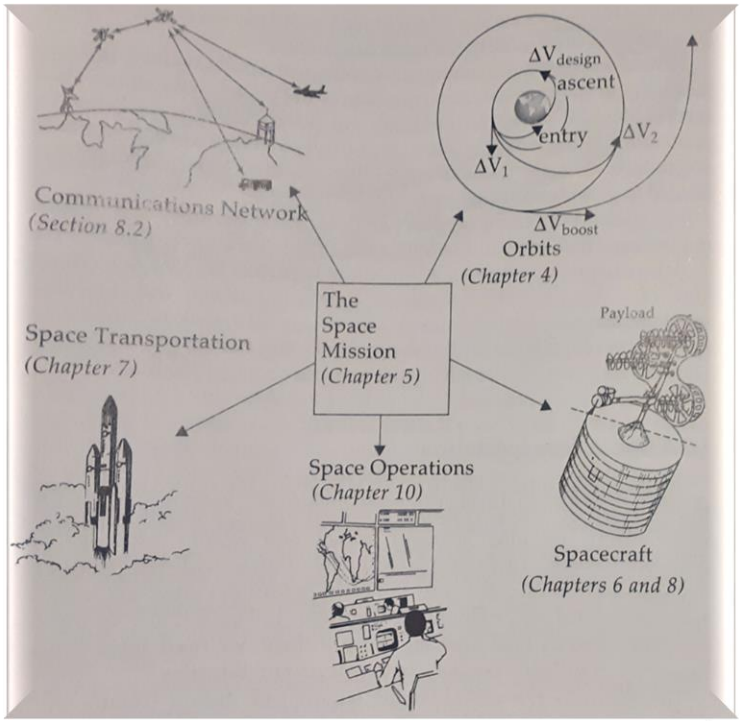
- Background
- Identified GAPs
- “Customer driven” innovative space technologies and services
- EIC Space Portfolio
- Expected outcomes and impacts
- Complementarity to other EU Programmes

Courtesy: Copernicus - Sentinel 3 A ESA image of Europe 2017

European Innovation Council

EIC role in the EU space industry

- EIC funds game-changing innovations and disruptive/high-risk ideas and supports EU space SMEs & start-ups disruptive innovation, demonstration and commercialization with transversal EIC Pathfinder, Transition and Accelerator programs



Courtesy: ISU, Keys to Space

European Innovation Council

What's holding back the European space innovation?

Innovation **performance**	• **Strong research performance not often translated** into commercialisation
Innovation **funding**	Financing gaps (2 "valleys of death") in • **Transition** from lab to enterprise • **Scaling up** for high-risk innovative start-ups • **Limited** VC in EU Newspace SMEs & start-ups
Innovation **ecosystem**	• Newspace SME & start-ups companies emerging in all EU member states • Need to **include all EU regions and all talent** (especially female)

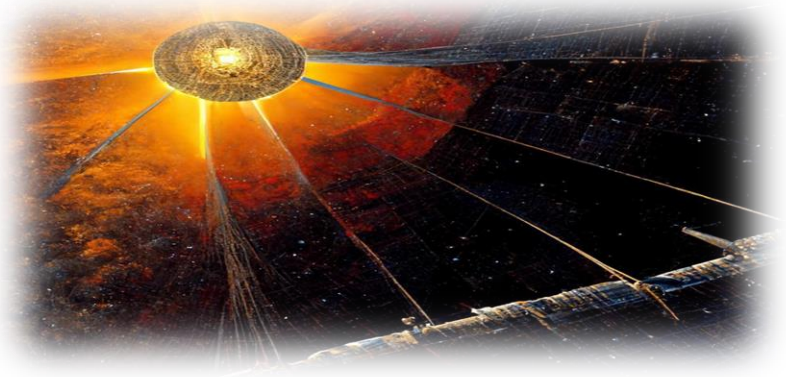
WP2023 Space Challenges

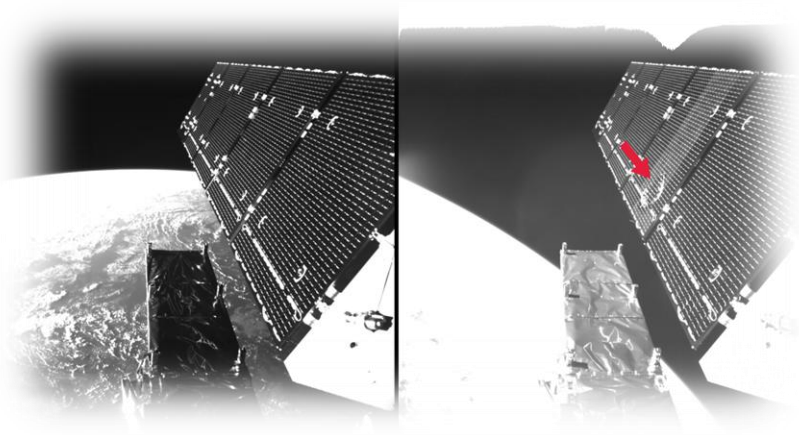
- **EIC Pathfinder (TRL 1-4)** - In-space solar energy harvesting for innovative space applications

Preparing for the long term Future

- **EIC Accelerator (TRL6-9)** - Customer-driven, innovative space technologies and services

Future market opportunities

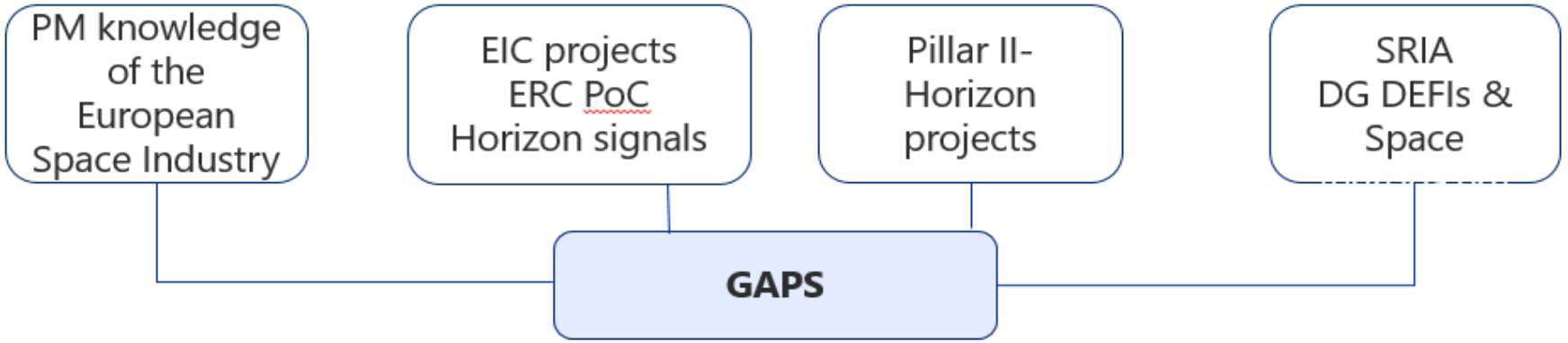




Courtesy: Copernicus - Sentinel 1, ESA

European Innovation Council

WP 2023 Methodology for topics selection



Guiding Principles-Pathfinder

- Ambitious science/radically new technology
- Innovation (TRL)/Safety & Reliability
- Risk Assessment
- EU tech sovereignty

Guiding Principles-Transition

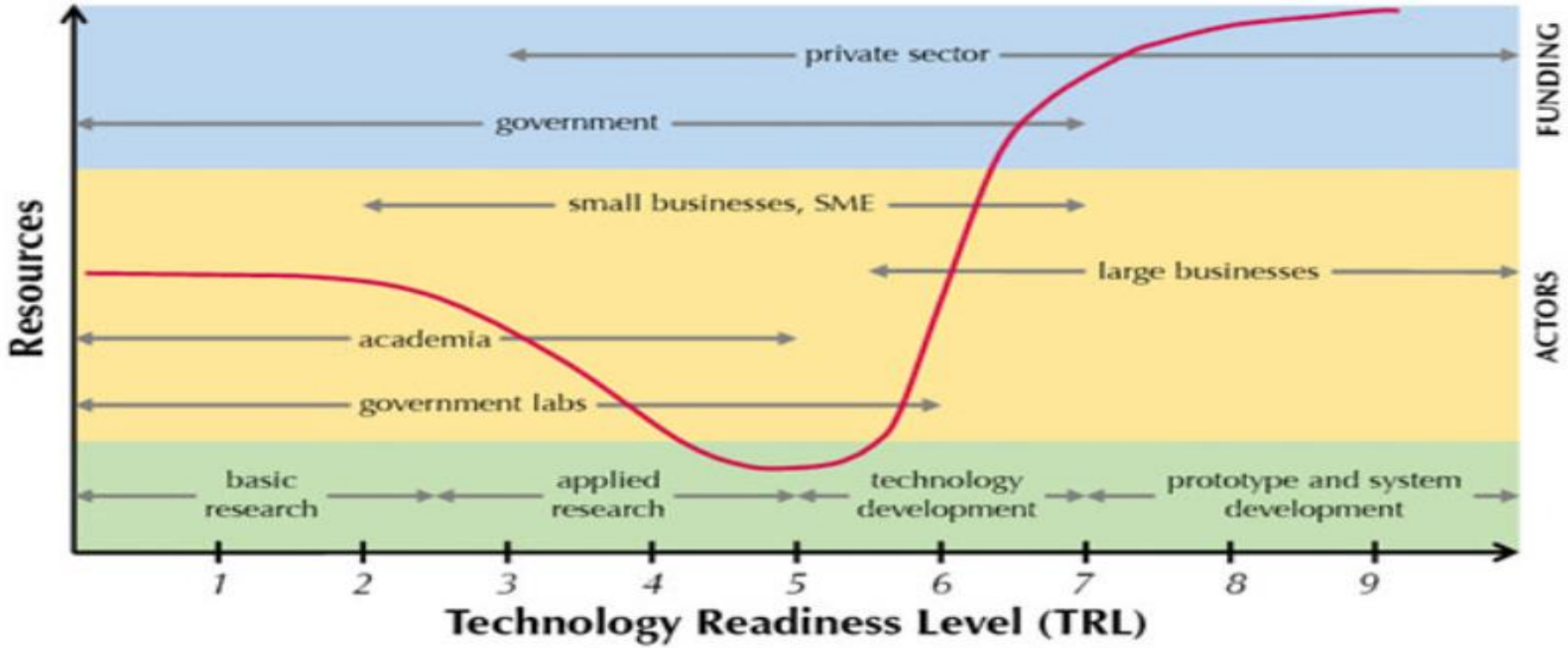
- Mature Innovation (TRL)/Safety & Reliability
- Initial analysis of the potential markets
- Proof of Concept (PoC)
- EU tech sovereignty

Guiding Principles - Accelerator

- Innovation (TRL)/Safety & Reliability
- Time to market/New markets creation/Economies of Scale
- Risk Assessment
- EU tech sovereignty

European Innovation Council

WP 2023 - TRL

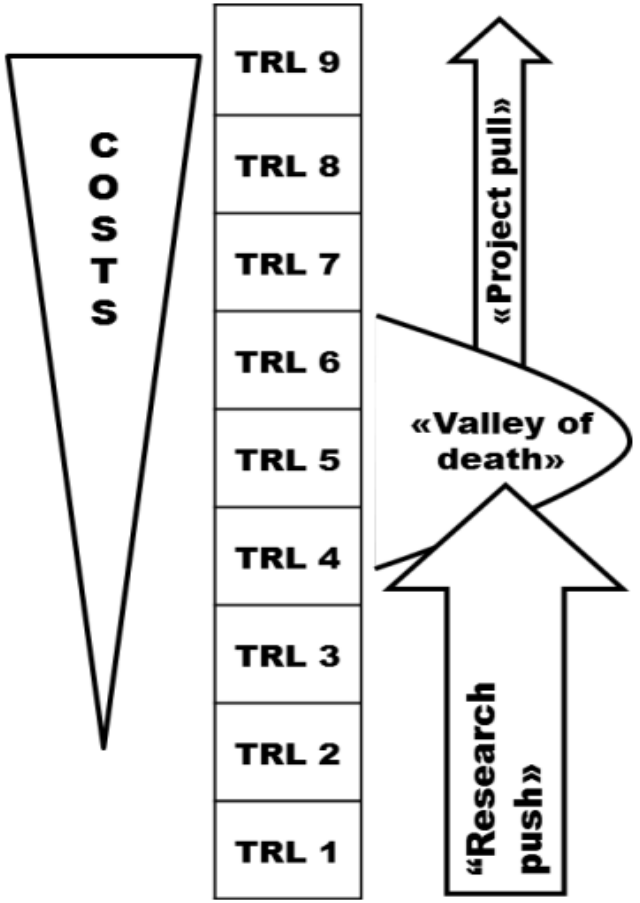


Source: Hensen, Jan & Loonen, Roel & Archontiki, Maria & Kanellis, Michalis. (2015). Using building simulation for moving innovations across the "Valley of Death". REHVA Journal. 52. 58-62.

[TRL | EURAXESS (europa.eu)]

TRL Considerations

- *For EIC Pathfinder and Accelerator projects the* ***relevant TRL levels are in WP 2023 on page 18***



Courtesy: ECSS-E-HB-11A, 1st March 2017

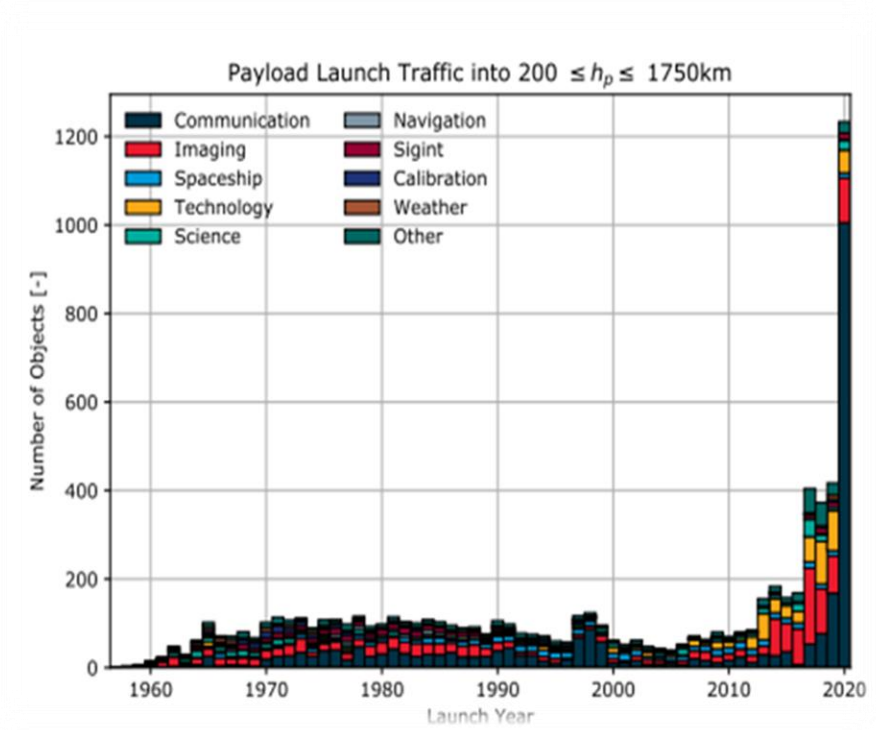
EIC Accelerator

“Customer Driven” innovative space technologies and services

Background- Part I

European Innovation Council

- Increased satellite launches, up to around 5,465 operational satellites in May 2022 (Union Concerned Scientists)
- More than ***10 tonnes*** of space debris August 2022
- EU approach STM, ESA Zero Debris initiative, JAXA commercial removal of debris demonstration (CRD2)
- ASAT tests in Nov 2021 resulted in the creation of more than 1,500 debris reaching up the 1,100km orbits
- Increased ***need*** for collision avoidance capabilities, reliable space-based data and unified space traffic management
- Increased ***need*** for collection, recovering and transforming space debris



Courtesy: ESA

European Innovation Council

How do we develop interoperable, scalable, affordable and cost-effective solutions in order to protect EU space infrastructure?

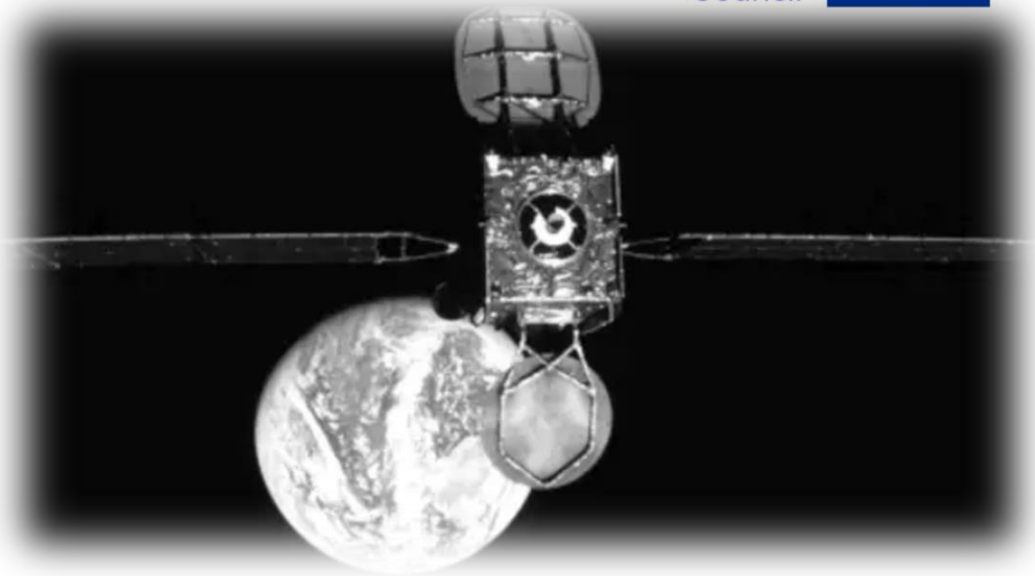
Rockets launched	6.250	(100%)
Rockets still in Space	1.990	(32%)
Satellites launched	13.630	(100%)
Satellites functioning	6.600	(48%)
Dead Satellites in Space	2.250	(17%)
Space objects mass	10.100 tonnes	
Frangmentation events	630+	
Debris tracked	32.070	
Debris >10 cm	36.500	
Debris 1 -10 cm	1 million	
Debris 0.1-1cm	130 millions	

source ESA updated at August 2022

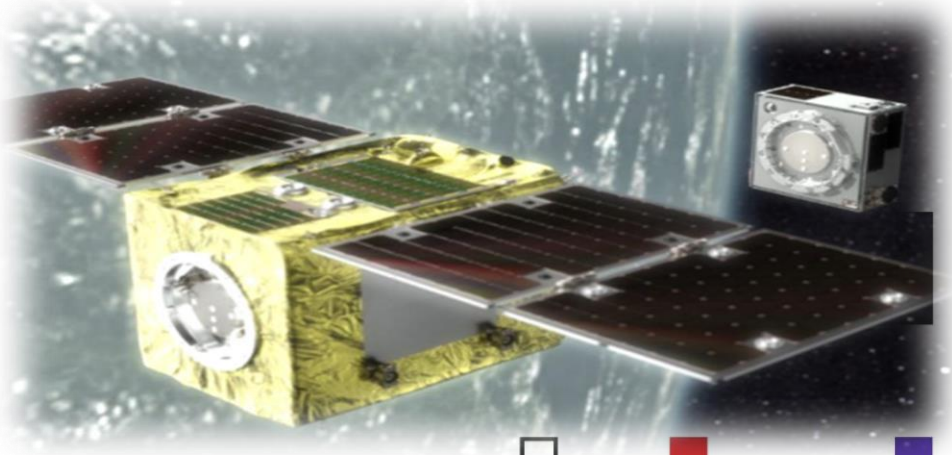
Courtesy: Slide prepared by Lorenzo Tarabini, E.T.Pack-F project coordinator - EIC Transition

Background- Part II

- ***MEV - 1*** and ***MEV- 2*** successful in orbit servicing missions, resulted into the creation of flight proven life extension services and emergence new IOS markets for GEO satellites
- ***ELSA- D*** magnetic capturing mission of a demo satellite
- There is an emerging ***need*** for servicing GEO satellites
- Aging GEO/LEO satellites that need ***refueling***, ***repair*** or ***recycling***. Satellite owners to keep their current ***customers***
- ***Emergence*** of In Orbit Servicing, Active Debris Removal and End-of Life services technology demonstrations



Courtesy: MEV-1 Intelsat's IS-901 in GEO, Northrop Grumman's

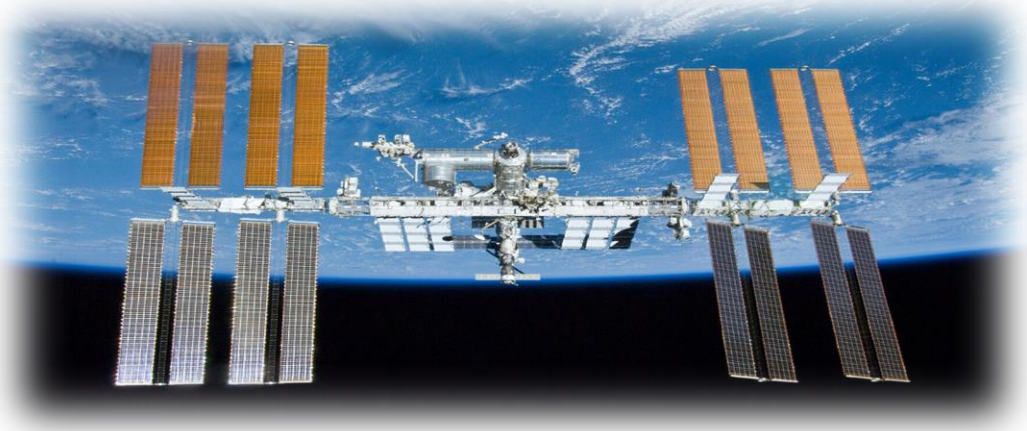


Courtesy: ELSA-D in LEO, Astroscale

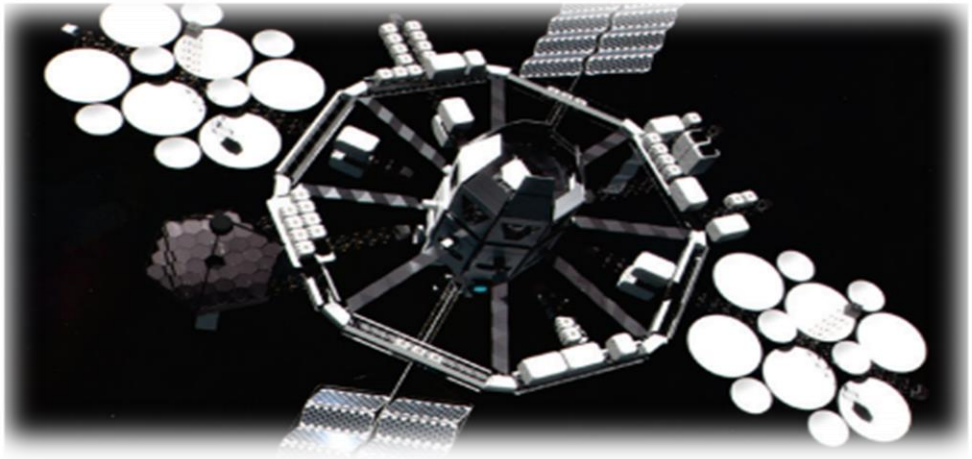
Background - Part III

European Innovation Council

- International Space Station expected retirement in 2030
- Commercial space stations- Axiom, Starlab, Orbital Reef
- Unmanned microgravity and robotic platforms – Outposts, Arkysis
- There will be a ***need*** for access to microgravity environment from European researchers and scientists



Courtesy: ESA



Courtesy: JAXA Robotic platform concept

Identified GAPs

- The **challenge** is that the **EU lacks user driven** in orbit servicing and **recycling satellite capabilities** and **unified space debris management services**
- Current satellites are built so that they **cannot be easily serviced nor recycled**
- **Need** for increased in-space mobility, payload capacity and cost-efficient propulsion
- **Explosions in orbit,** due to left-over energy- fuel and batteries-onboard spacecraft and rockets is the biggest contributor to the space debris problem (ESA)
- Lack of **in-space debris recycling capabilities**
- Emergence of In Orbit Satellite servicing market is estimated to reach between 4.4 Billion USD (UK IOS strategy) and 6.2 Billion USD (NSR)
- Lack of user-driven, cost-effective and affordable commercial IOS, recycling and recovering capabilities and STM in Europe
- Increased competition from non-EU companies, potential loss of future customer and markets

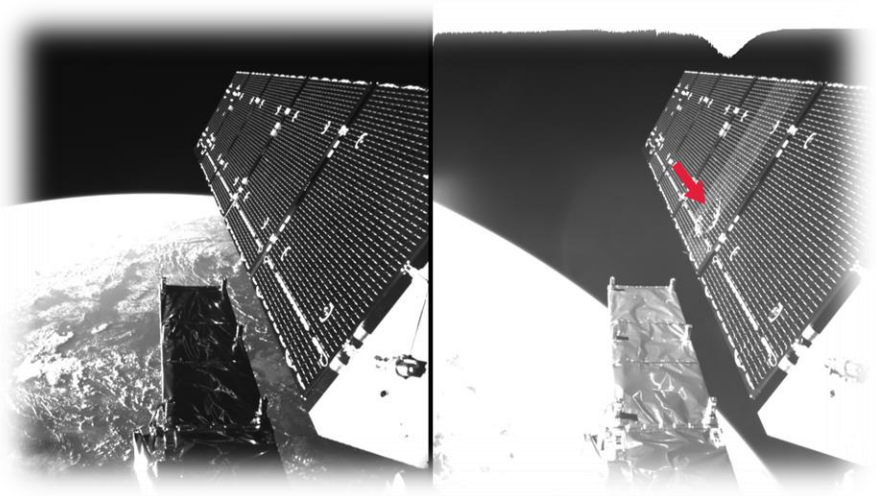
“Customer driven” innovative technologies and services

Goal

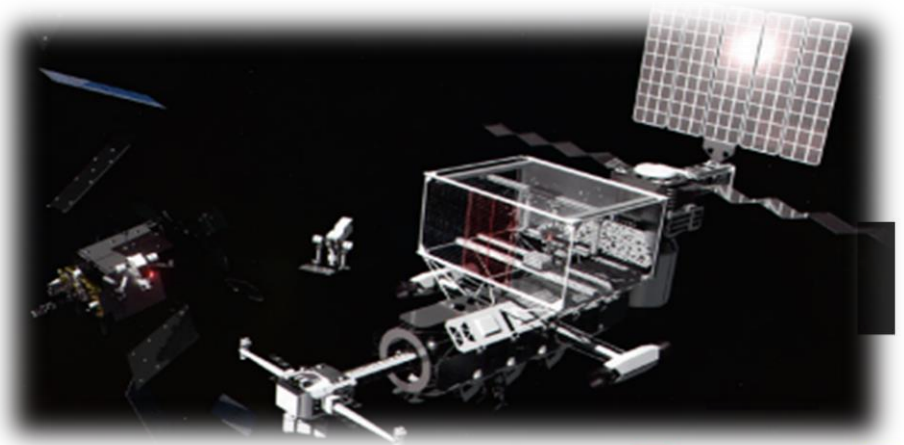
To encourage the emergence of **innovative**, **interoperable**, **scalable**, and **autonomous “customer-driven”** innovative space technologies

Scope/ specific objectives

- To inspect spacecraft in orbit, to augment satellite capabilities and resilience;
- To develop autonomous and in-space collision avoidance capabilities e.g., use of AI/ML for collision avoidance manoeuvres, space debris positioning data, etc. and develop in-space mobility propulsion capabilities;
- To collect space debris with a view for recycling, recovering and transforming purposes (e.g. microgravity platform).



Courtesy: Copernicus - Sentinel 1, ESA



Courtesy: JAXA Recycling Plant concept image

European Innovation Council

“Customer driven” innovative technologies and services

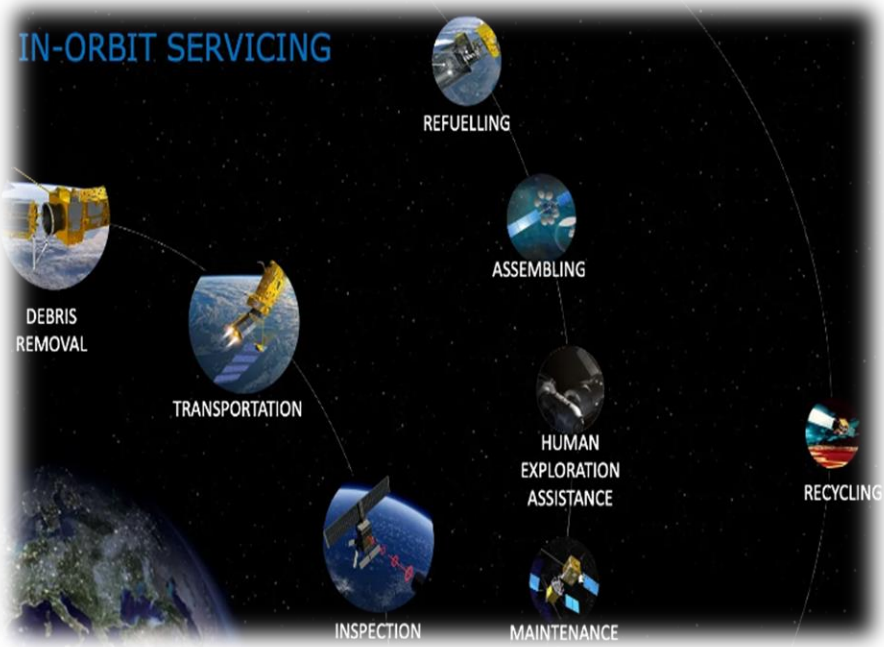
- Some examples of customer-driven = commercial or institutional end users

Spacecraft Inspection	Collision avoidance	Collect, recover and transform space debris
Tracking, locating & describing s/c,(distance & close inspection) Collection of information of s/c anomalies (e.g. antenna deployment anomalies) and p/l ones SSA data for SST and RPO operations, etc.	AI/ML for collision avoidance Space debris positioning data for RPO On-board processing capabilities for debris detection For IOS, ADR, EoL Unexpected s/c rescuing activities	Space debris collection Autonomous Robotic Servicers/Arms/Tools S/C or components recycling, recovering& transformation purposes(e.g. mg platforms) Space Welding

“Customer driven” innovative technologies and services

Scope/ specific objectives

- To further mature self-assembly of spacecraft in orbit with different applications (e.g. in-orbit, cis-lunar exploration, Earth observation, space debris inspection, space situational awareness, etc.);
- To design and construct a R&I low Earth orbit unmanned platform assembled in orbit and to host in-orbit microgravity experiments or collect/re-use space debris considering and make use of a sustainable, modular concept for the platform and its operation;
- To scale up disruptive innovations for space situational awareness (SSA), in-space logistics, EO, navigation, SATCOM and others.



Courtesy: ESA

European Innovation Council

"Customer driven" innovative technologies and services

- Some examples – In Orbit Servicing (IOS), Active Debris Removal (ADR), End-of-Life (EoL) for cooperative and non-cooperative

In orbit servicing, Active debris removal, EoL	In-space Assembly & Manufacturing	Microgravity platforms
Augment s/c or external p/l capabilities & resilience Refuelling Orbit raising In-space docking P/L, antenna's, components replacement or repair Robotic servicing with modular, interoperable or scalable parts Modular payloads Satellite upgrade	Self- sssembly with smallsats, cubesats, etc. GNC capabilities Modular satellites assembly Multi-material manufacturing Materials separation	Design & construct LEO unmanned robotic platform Self-assembled autonomous platform To host internal/external p/l To service smallsats or even cubesats To collect re-use space debris

European Innovation Council

Expected outcomes and impacts

Expected Outcomes

- EU servicing and re-use/recover capability for servicing EU space infrastructure, while contributing to the management and reduction of space debris;
- Timely and cost-effective in orbit satellite servicing (IOS), ADR, EOL and Space Traffic Management services
- Innovative propulsion solutions for in-space mobility of spacecraft
- Innovative technologies for space transportation, EO, navigation, SATCOM, space science, SSA

Expected impacts

- **Research impacts –** EU to be able to inspect, protect and service its spacecraft and develop EU servicing and re-use/recycling capability for servicing EU space infrastructure and contribute to the reduction and management of space debris
- **Innovation impacts** – breakthrough innovations resulting in cost-savings due to the re-use or recycling of components or propellant cost-savings for satellite owners, maturation of scientific and technological solutions for IOS and re-use/recycling of old satellites, "plug-play" satellite modules, affordable modular satellites, innovative propulsion for space tugs, common interfaces standards, simplified maintenance of aging satellites
- **Economic impacts** – EU companies will generate new contracts from new markets, cost-savings for satellite owners, affordable and cost-effective on orbit satellite servicing technologies in benefit for the EU space economy. The new creation of an ***innovative in-space servicing (IISS)*** industry will result in economic and market spillover effects.
- **Competitiveness impacts** - increased competitiveness of EU space industry for On Orbit Assembly and Manufacturing (OSAM)

European Innovation Council

EIC Space Portfolio after selection of proposals

SP 1: Spacecraft Inspection

SP2: Collision avoidance

SP3: Collect, recover and transform space debris

SP4: In orbit servicing, Active debris removal, EoL

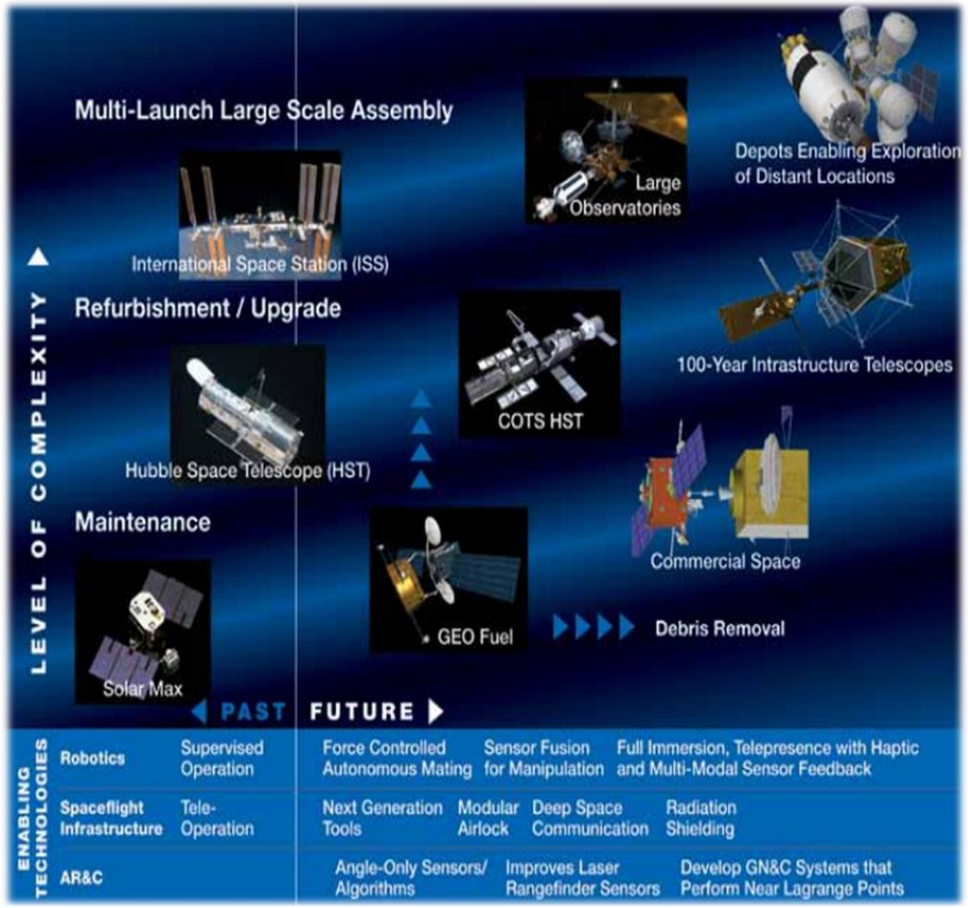
SP5: In-space Assembly & Manufacturing

SP6: Microgravity platforms

European Innovation Council

Complementarity to other EU Programmes

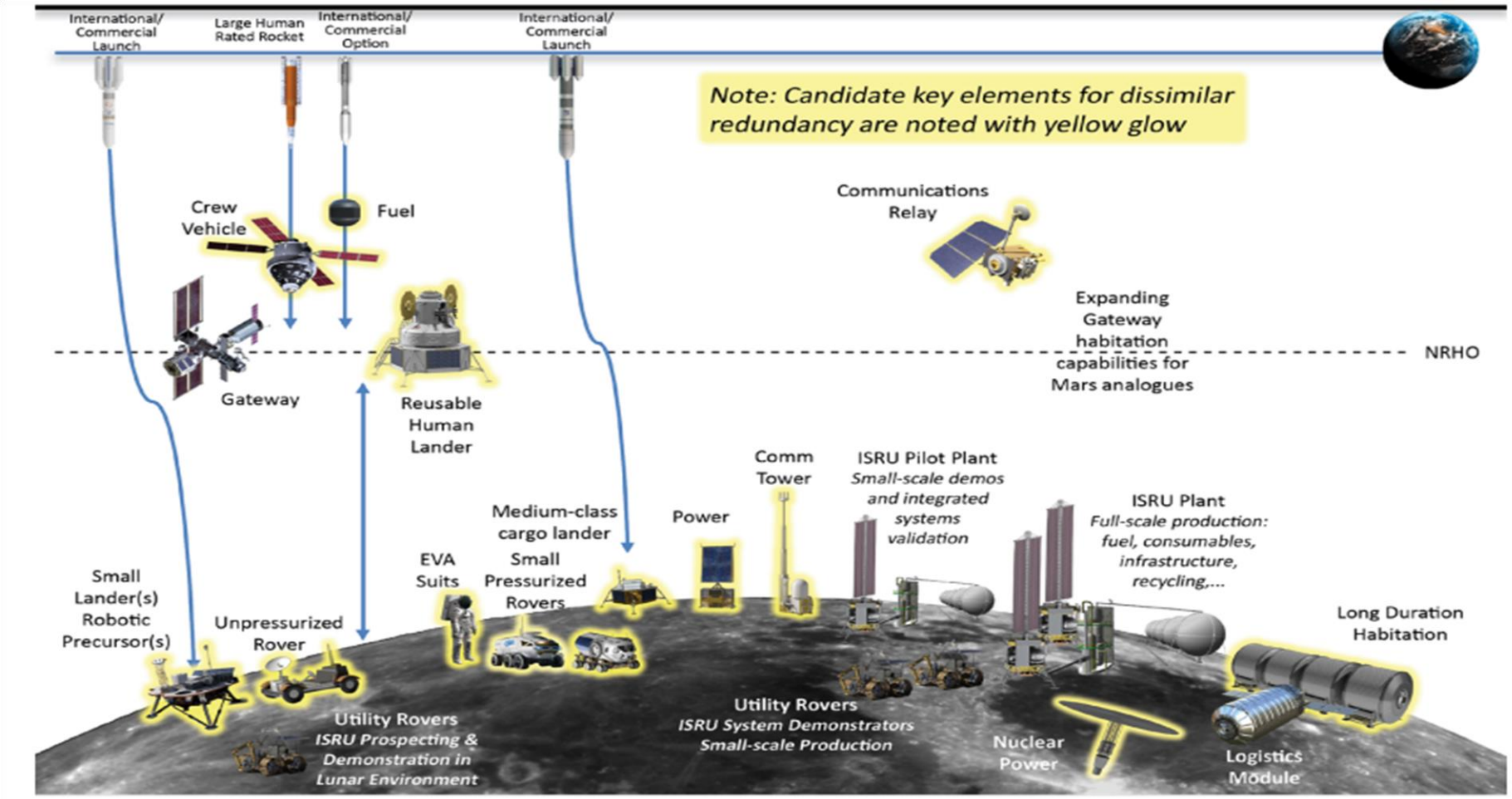
- Strategic Research and Innovation Agenda (SRIA) for EU Space R&I and contribute to the EU Future Space Ecosystem (FSE) Roadmap
- EU Approach to Space Traffic Management and EU SST Partnership activities
- EU In-Orbit Demonstration and Validation initiative (IOD/IOV) – EIC Accelerator companies will have fast track access and opportunity to fly their h/w under the EU IOD/IOV Horizon Europe, Cluster 4



Courtesy: NASA On-Orbit Satellite Servicing Study

Wrap-up

- Long term future



Courtesy: International Space Exploration Coordination Group, Global Exploration Roadmap