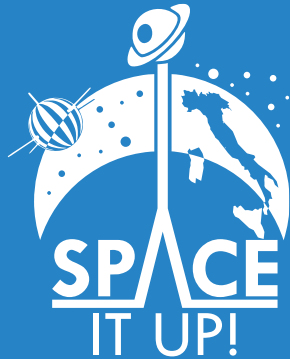




Agenzia Spaziale Italiana



Space It Up!

*SPACE IT UP! COLLABORATIVE
INNOVATION IN SPACE SCIENCE &
TECHNOLOGY*

Coordinator: Prof. Erasmo
Carrera
Politecnico di Torino



2025 Conference

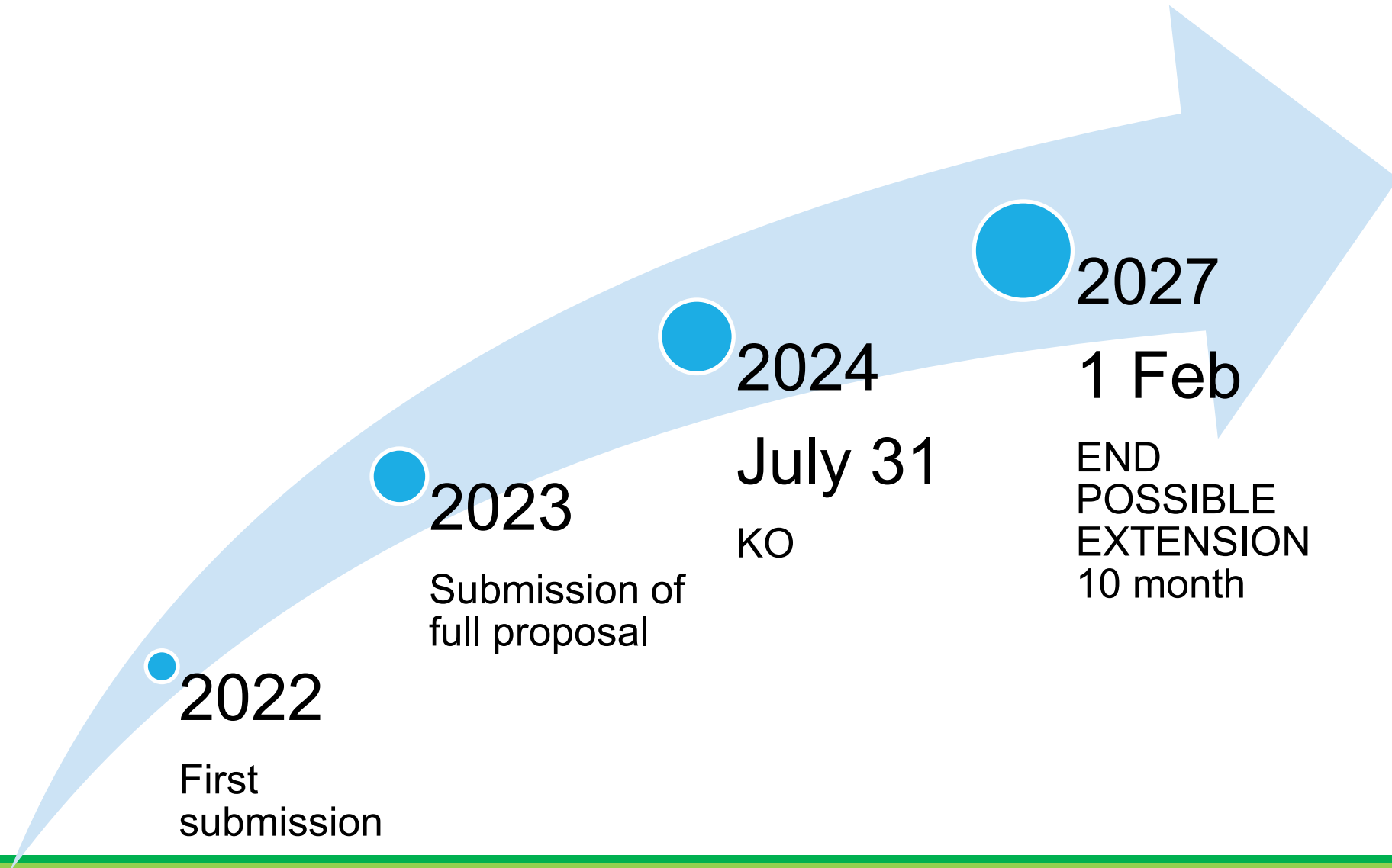




The Space It Up project, funded by the Italian **Space Agency** (ASI) and the **Ministry of Universities and Research** (MUR), brings together Italian expertise in space science and engineering, putting Italy at the forefront of research into Earth observation and protection, extraterrestrial exploration, artificial satellites and remote sensing.



PROJECT TIME SCHEDULE



Objectives



PROMOTE INNOVATION AND EXTEND FUNDAMENTAL KNOWLEDGE

FOSTERING A SUSTAINABLE FUTURE

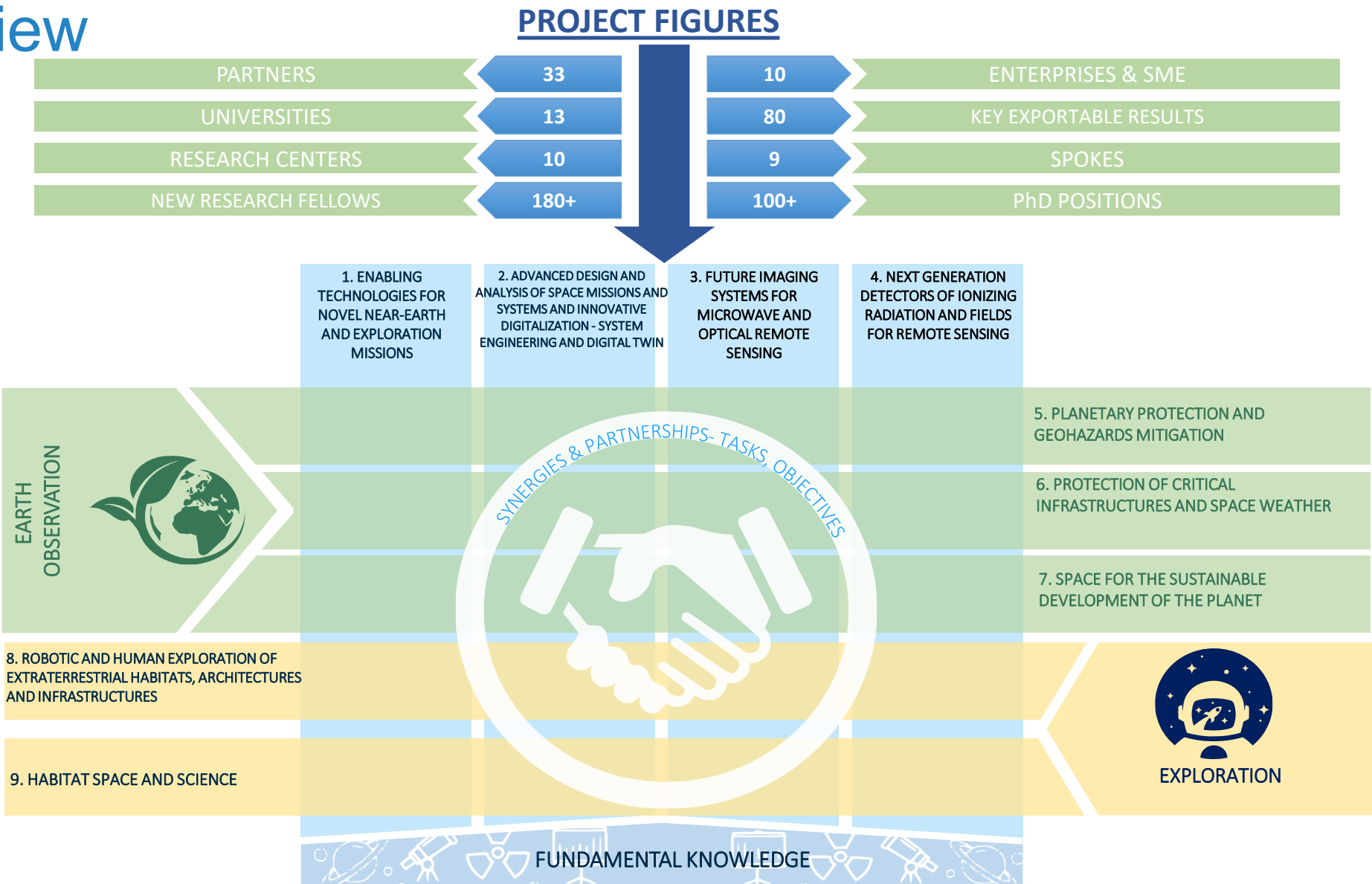


ENSURE LONG-TERM HUMAN PERMANENT IN EXTRATERRESTRIAL SPACE

STRENGTHENING THE SPACE 'ECOSYSTEM' IN ITALY



Overview



33 Partners: 13 Universities, 10 Research Center, 10 Enterprise



Other Partners



Università
degli Studi
di Palermo



UNIVERSITÀ DI PAVIA



Università
degli Studi
della Campania
Luigi Vanvitelli



UNIVERSITÀ
DI SIENA 1240



Università
di Genova



UNIVERSITÀ
DI TORINO



Università degli Studi "G. d'Annunzio"
CHIETI - PESCARA



UNIVERSITÀ
DI PARMA



UNIVERSITÀ DEGLI STUDI
DELLA BASILICATA

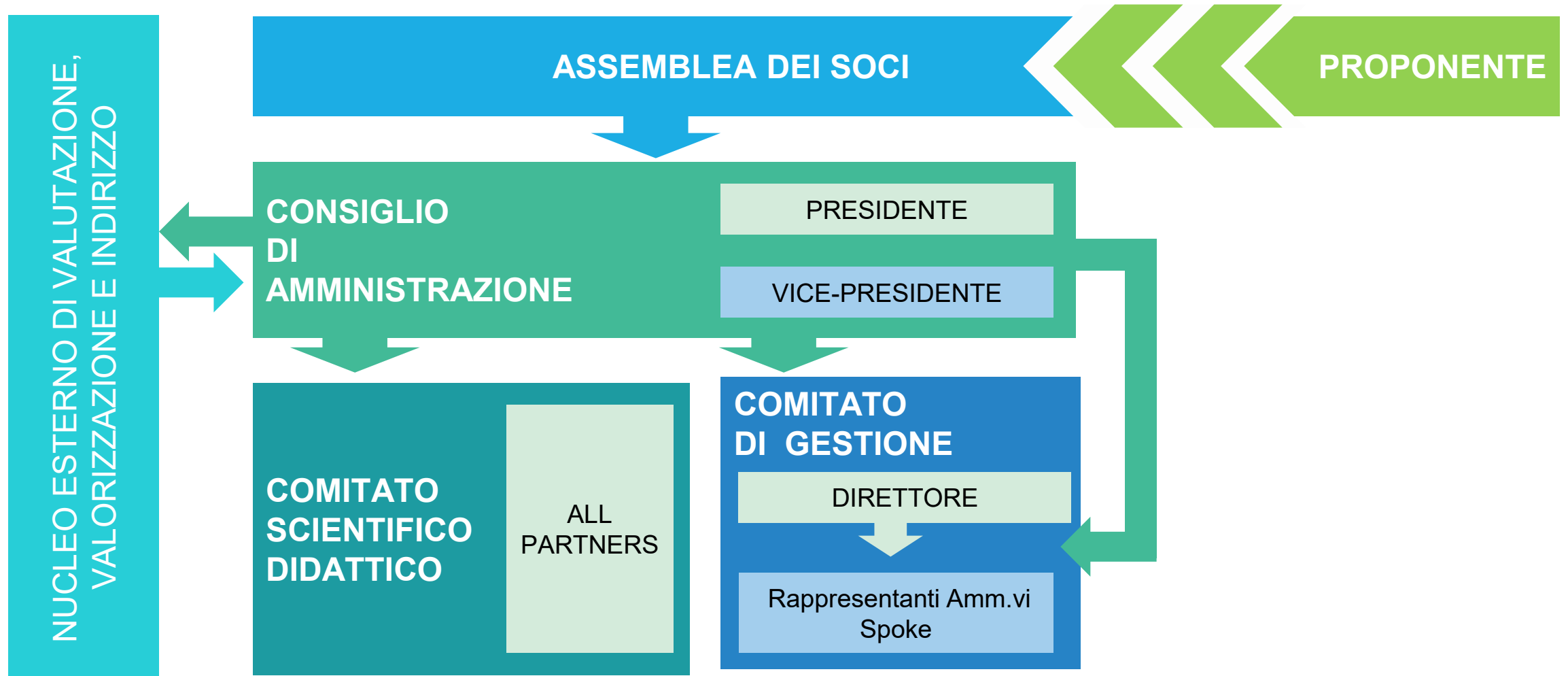


PARSEC

THE SPACE IT UP HUB

The SPACE IT UP Research Programme is an Extended Partnership (EP) on “Space activities” (EP15) and it will have the legal form of a Consortium (in Italian “Società Consortile a Responsabilità Limitata” (S.c.a.r.l)). In addition, as requested in Art. 4 paragraph 2 by the Call, it will be based on a Hub&Spoke architecture.

There are 33 funding members of the Hub, among which 19 are Public Universities and Public Research Institutions (EPR) overseen by MUR, and 14 are other Entities as shown in Table 4, that will participate actively in the governance of the Partnership through the governance bodies illustrated below. As described in Art. 4 paragraph 6 of the Call, the Public Universities and Public Research Institutions (ERP) overseen by MUR will represent the majority of the members in the governance bodies of the Hub.



Spoke 1 Enabling Technologies for Novel Near-Earth and Exploration Missions

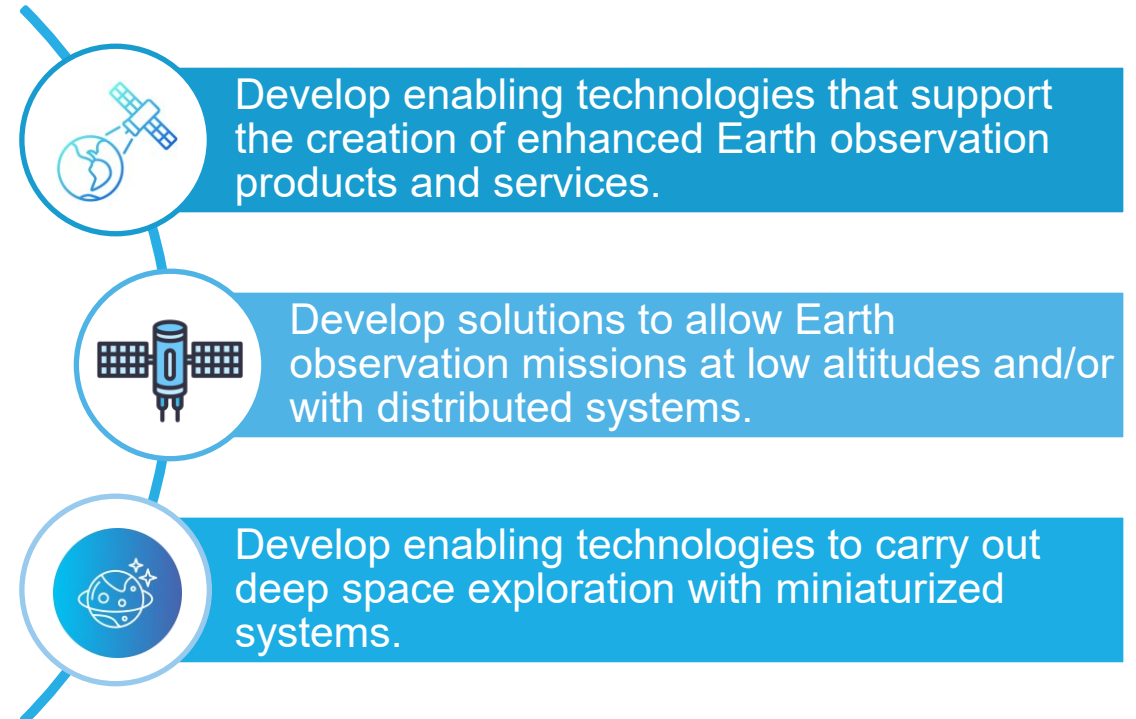


Leader: POLIMI
Co-Leader UNIP I -POLIBA

Mission Statement

Spoke 1 aims to promote a technological push that enables **novel missions for the protection and sustainable development of the planet**, as well as for **planetary exploration** missions. The research carried out in Spoke 1 is **transversal, multidisciplinary, and available to the entire partnership**. The research activity elaborates on emerging technologies (**TRL 1-2**) and develops their basic principles to assess their feasibility up to prototype developments (**TRL 3-4**), using software and hardware tools.

Goals



Spoke 2

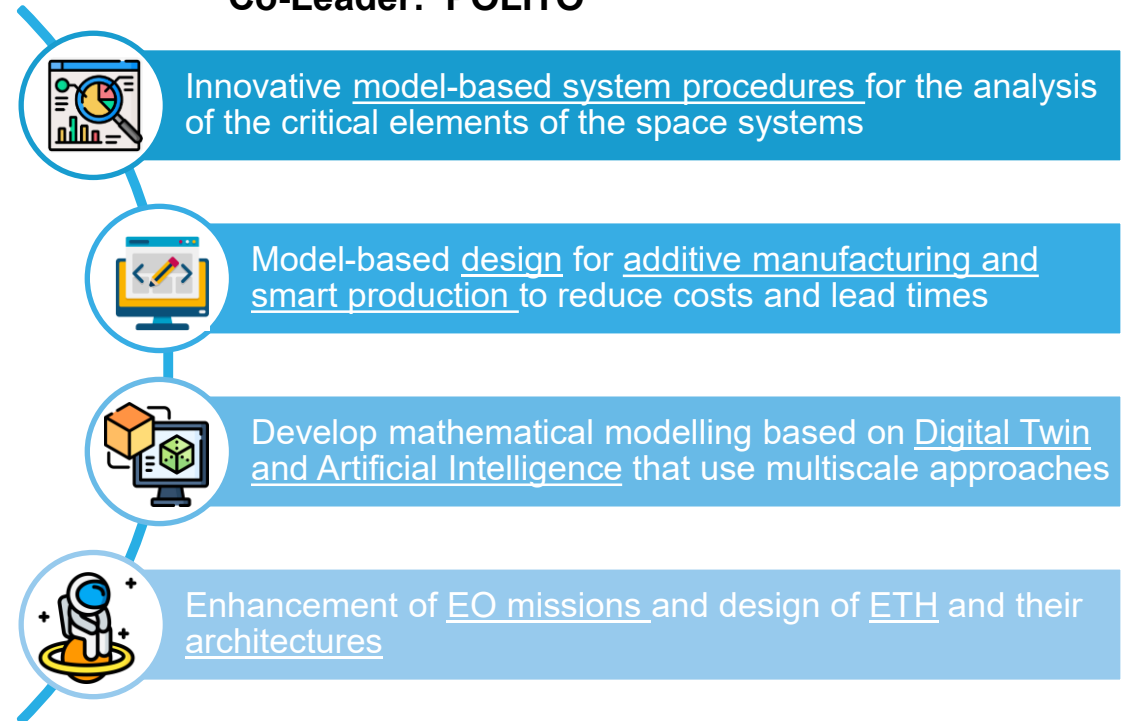
Advanced Design and Analysis of Space Missions and Systems and Innovative Digitalization - System Engineering and Digital Twin



Mission Statement

Spoke 2 will also exploit the strong synergy with most of the largest industries in the aerospace sector in Italy thanks to the ongoing strong and long-lasting collaborations among the **academic and industrial partners** and the Italian and European Space Agencies. In fact, whether it be **design optimization**, **performance improvement**, **product development**, or **predictive maintenance**, **digital twins** are changing the ways work is undertaken in various industries with multiple business applications. The aerospace industry has shown an unprecedented interest in their design, development, and implementation.

Leader: **UNIROMA1**
Co-Leader: **POLITO**

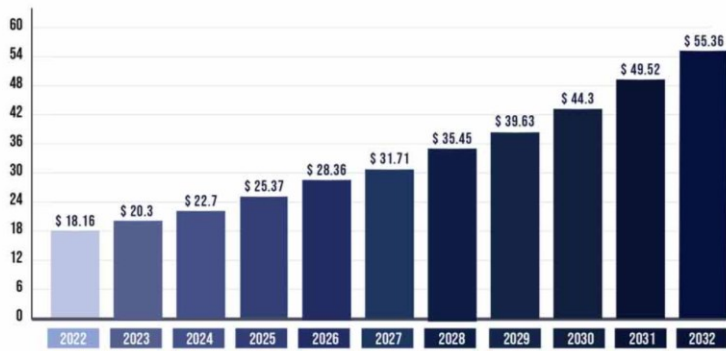


Spoke 3 Future imaging systems for microwave and optical remote sensing

Mission Statement

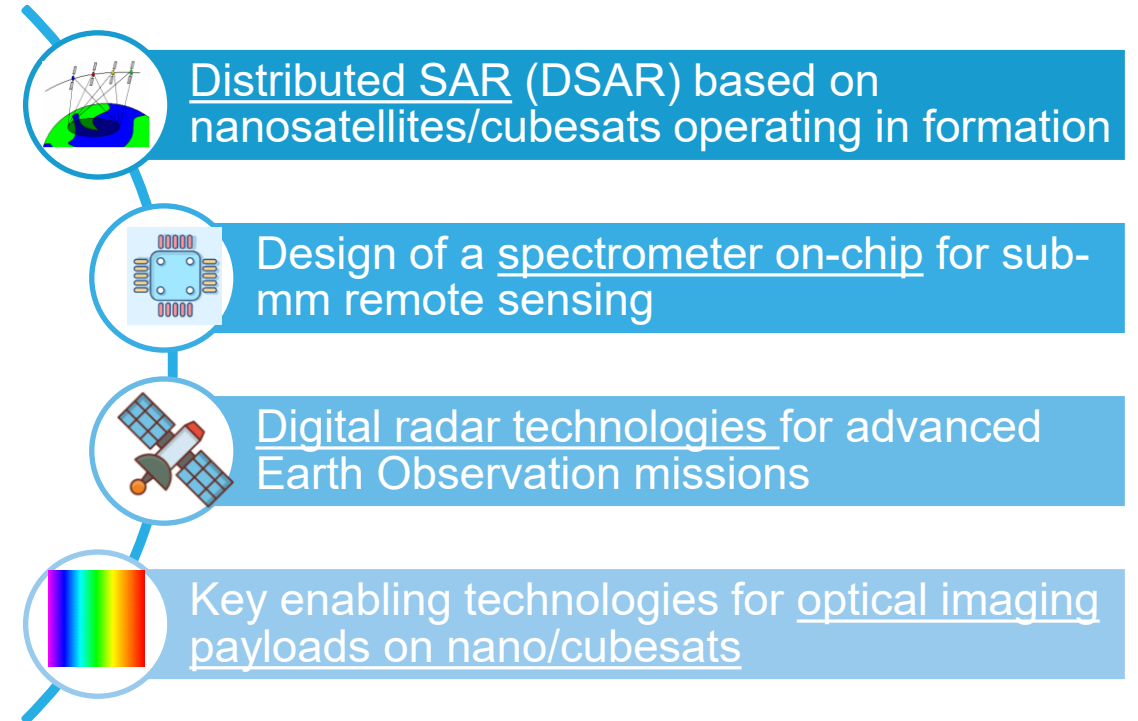
Spoke 3. Research in the field of space **remote sensing** has a long tradition of excellence in Italy. Thanks to effective coordination between Universities and Research Bodies and the qualified system of small, medium, and large industries distributed throughout the country with specific territorial excellence, our country can cover the **entire value chain**. This arrangement has been replicated in the present research proposal. It is important to emphasize the importance of this **interdisciplinary, problem-solving approach**, which is indispensable in a highly complex and competitive sector such as space remote sensing. In this area, international competition is very intense, and maintaining an outstanding position cannot be taken for granted.

PRECEDENCE RESEARCH
REMOTE SENSING TECHNOLOGY MARKET SIZE, 2023 TO 2032 (USD BILLION)



The global remote sensing technology market size was estimated at USD 18.16 billion in 2022 and is expected to hit around USD 55.36 billion by 2032, representing a CAGR of 11.79% from 2023 to 2032. Report Code:2807, April 2023.
<https://www.precedenceresearch.com/remote-sensing-technology-market>

Leader: UNINA
CO-Leader: CNR



Spoke 4 Next Generation Detectors of Ionizing Radiation and Fields for Remote Sensing

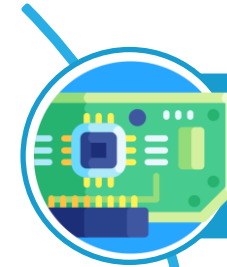


Mission Statement

Spoke 4 offers a group of internationally recognized research professionals with the right balance of **physics**, **engineering**, and managerial skills to ensure the completion of the proposed program's strategic objectives and set up a long-standing reference network of research and industrial infrastructures. The members are active in the same community both nationally and internationally. They will, therefore, naturally engage the program challenges as a team with shared academic backgrounds, professional experience, and a common, **result-oriented working method**.

Leader: INFN

Co-Leader: GSSI



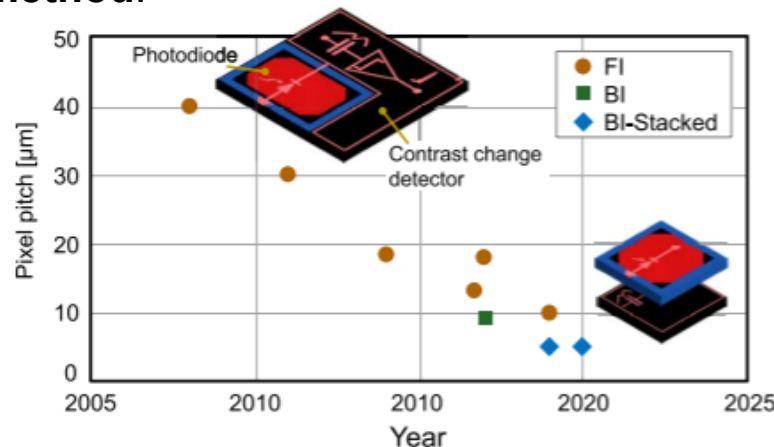
Development and test high efficiency, high resolution (position and energy), low power, miniaturized particle detectors using silicon semiconductor manufacturing processes commercially available in Italy



High sensitivity breadboard of a gravitational reference system with increased sensitivity with respect to existing satellite geodesy missions



Innovative miniaturized detectors for monitoring the Sun radiation and its transient emissions.



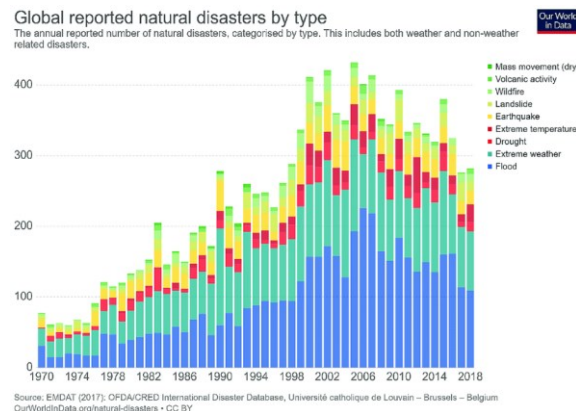
Y. Oike, Evolution of image sensor architectures with stacked device technologies, IEEE, 2022, Vol69, N. 6

Spoke 5: Planetary Protection and Geohazards Mitigation



Mission Statement

Spoke 5 will explore the **frontier of Earth's natural and geo-hazards mitigation** addressing six challenges: (1) the “**near real-time**” challenge, (2) the “**precursor signals**” challenge, (3) the “**big data**” challenge, 4) the “**new sensors**” challenge exploiting previously unused or unfused sets of data, 5) the “**data fusion**” challenge joining diversified EO and in situ data for better natural and geo-hazards mitigation, and 6) the “**modeling and simulation**” challenge. To address these interdisciplinary challenges **holistically**, the highly qualified team includes scientists, engineers, and technologists from **geophysics**, including **volcanology**, **geology**, coastal areas and biomass burning, **atmospheric and plasma sciences**, instrumentation, **satellite engineering**, and data handling.



Leader: UNITN

Co-Leader: INGV



Explore monitoring of rapid hazard phenomena and identify current gaps to be filled.



Mission concepts and tools for mitigating natural hazards induced damages



Design of infrastructures for implementation and operations of sustainable mitigation strategies



Development of innovative technologies for improved mitigation strategies

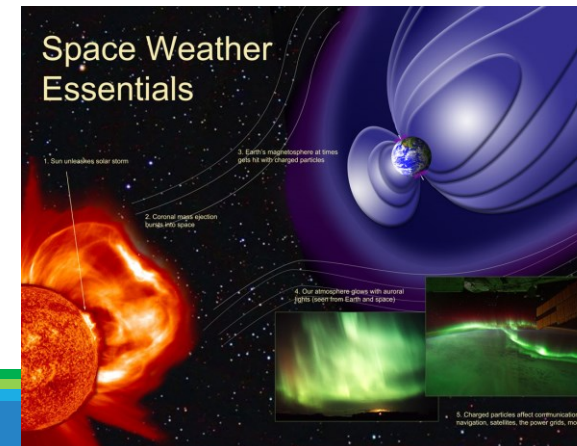
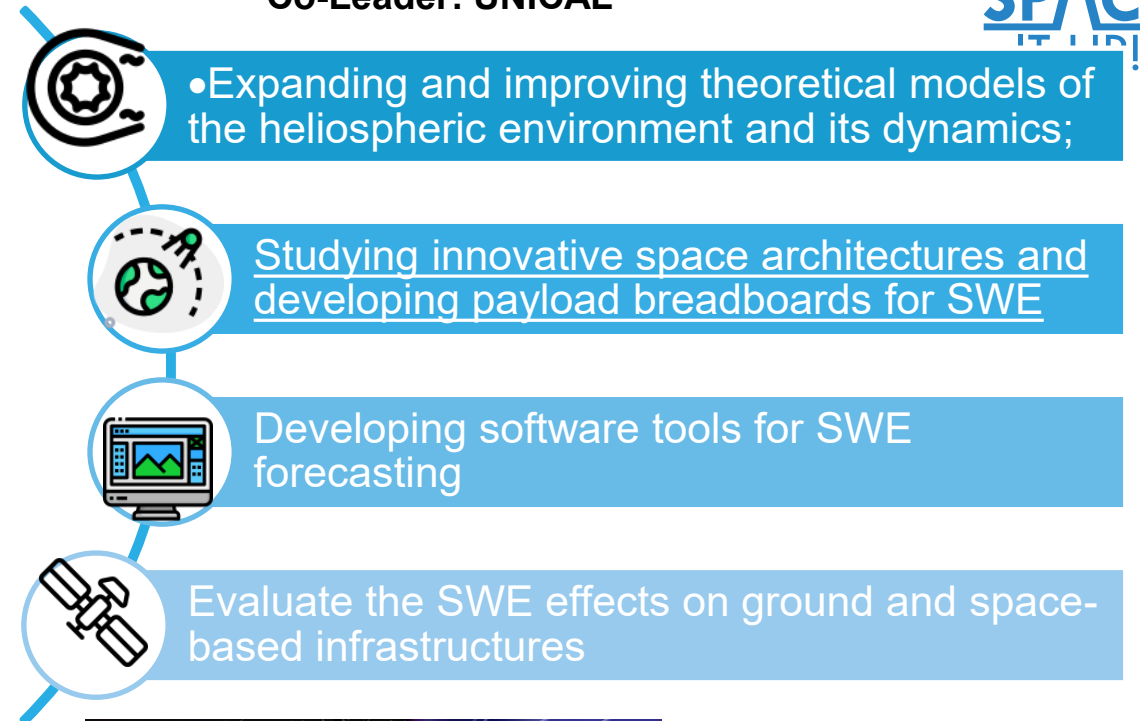
Spoke 6 Protection of Critical Structures and Space Weather



Leader: INAF
Co-Leader: UNICAL

Mission Statement

Spoke 6 will address the SWE challenge through an interdisciplinary approach aimed at investigating significant scientific and technological problems within the network of **physical processes that connect the Sun to society**. Thus, the involved team encompasses the necessary expertise in various disciplinary areas, including **Solar Physics, Space Plasma Physics, Geophysics, and Astroparticle Physics**, as well as spacecraft operations and instrument development. A holistic view will be provided through integrated information obtained by exploiting existing **observations** covering the **terrestrial globe** and spanning the vast reaches of the **heliosphere between Earth and the Sun**, as well as through the design of suited mission architectures. Spoke 6 will adopt a problem-solving approach by identifying and filling the key capability gaps enabling scientific advances and at the same time, providing a powerful base to meet many operational needs.



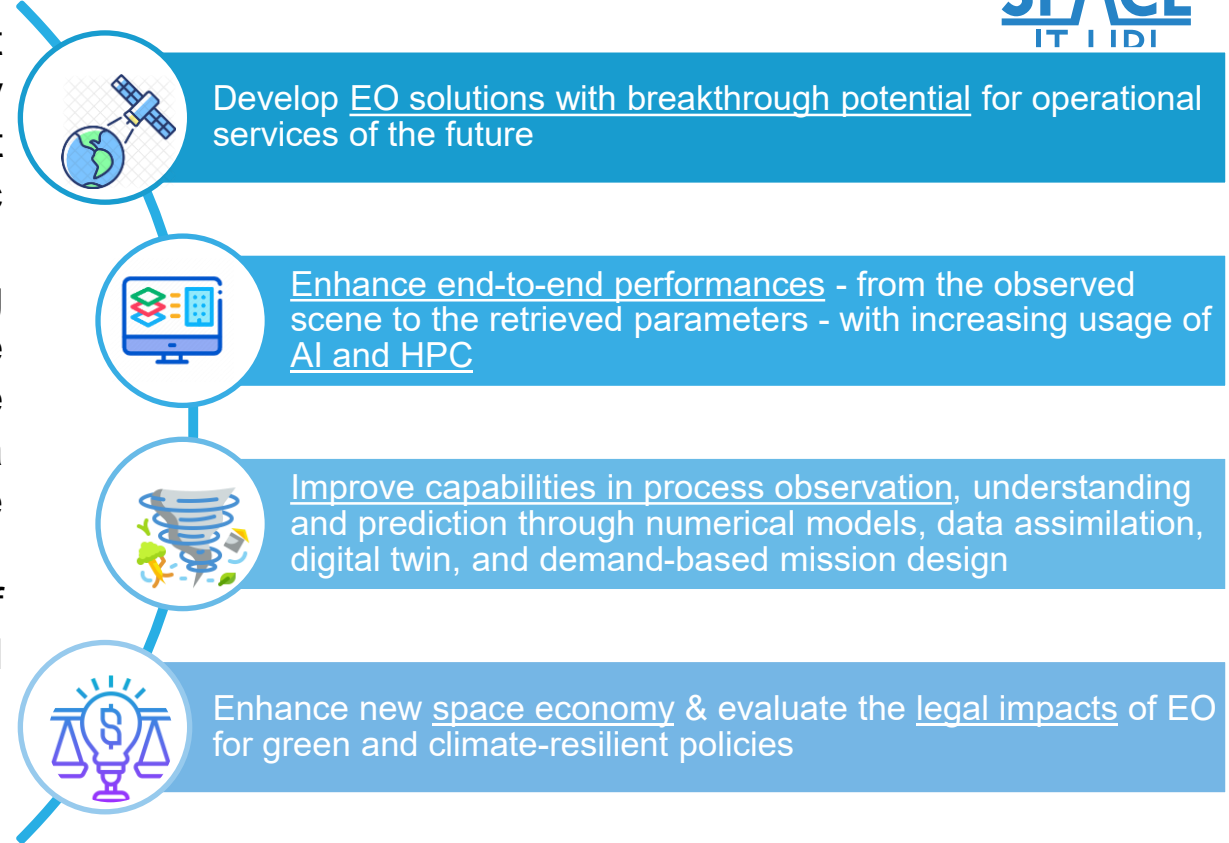
Spoke 7 Space for the sustainable development of the planet

Mission Statement



Leader: CNR
Co-Leader: GSSI

Spoke 7. The **sustainability of human activities** is the most overarching challenge to face for ensuring peace and prosperity for people and health for the planet, now and into the future. It requires a truly interdisciplinary approach, ranging from **basic science to engineering**, from **process understanding** to **big data**, spanning all different spatial and temporal scales, including **social, legal, economic, and industrial aspects**. All these disciplines are represented in Spoke 7. The validation of the proposed advanced EO techniques will be approached as a holistic process, from the beginning of the chain (basic science and process understanding), through **data collection, processing, and analysis of big data**, to the validation of scientific products, and finally the evaluation of social and economic benefits.



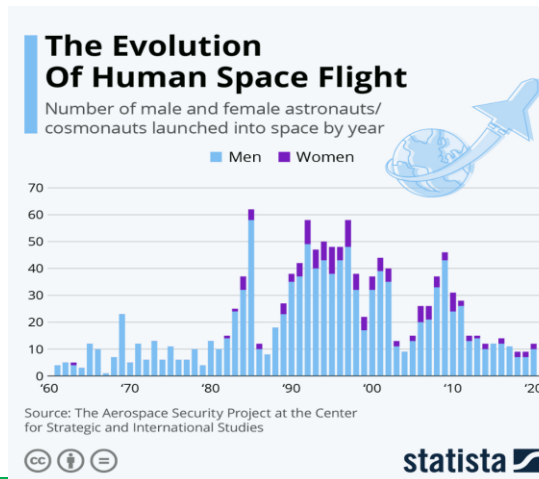
Spoke 8 Robotic and Human Exploration of Extraterrestrial Habitats, Architectures and Infrastructures



Mission Statement

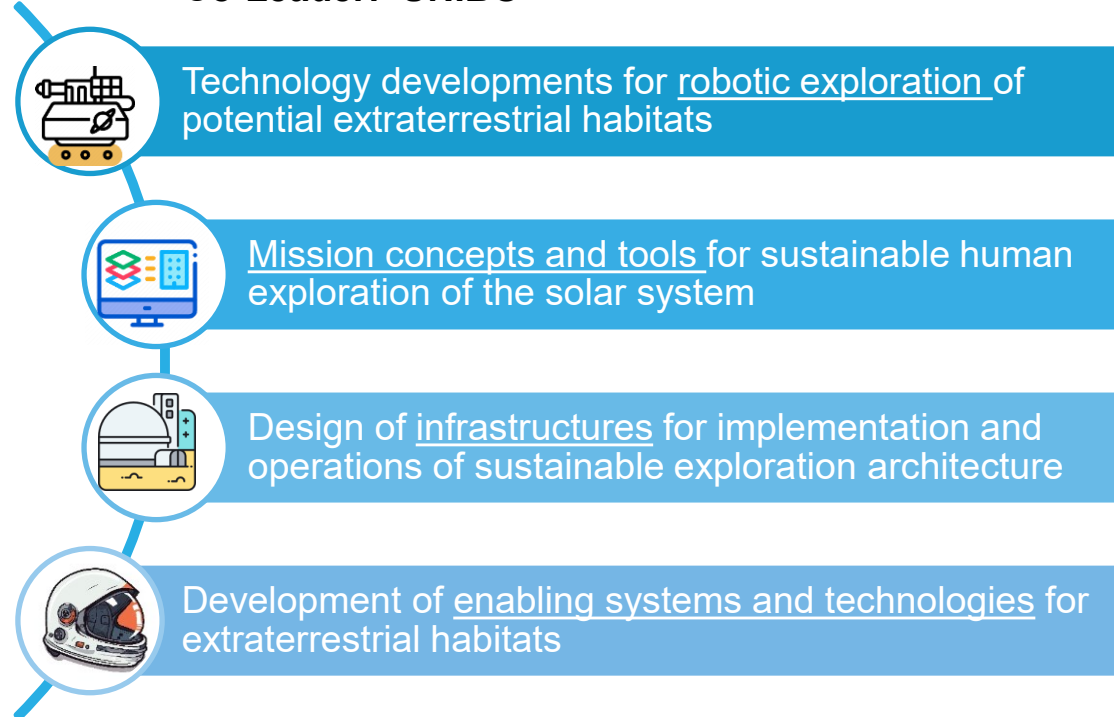
Spoke 8 aims to foster research and development activities to **support future human missions** and will have a strong interdisciplinary connotation. The main activities will involve enhancing current capabilities in **space robotics, sensors, instrumentations, extra-terrestrial habitats, infrastructures, and architectures**. Such a success will be possible with the synergy, holistic approach, and coordination of a group of experts from renewed Universities, Polytechnical schools, research institutes and centers, and the most important Italian space industries.

McCarthy, N. (April 12, 2021). The Evolution Of Human Space Flight [Digital image]. Retrieved November 21, 2023, from <https://www.statista.com/chart/24604/number-of-people-launched-into-space-by-year/>



Leader: **POLITO**

Co-Leader: **UNIBO**



Spoke 9 Habitat, Space and Science



Mission Statement

Spoke 9. Exploration and, especially, **space colonization** necessarily require interdisciplinary figures who can deal with the challenges humans will face during **travel and stay in space** and on **extraterrestrial bodies** (particularly the **Moon** and **Mars**). **Physicists, astronomers, planetary geologists, mineralists, biologists, and physicians** can effectively provide the scientific knowledge that will be able to ensure the right conditions for the achievement of these goals. All these skills are validly represented in Spoke 9. It should also be remembered that the full success of future space missions will not be possible without the fundamental contribution of **engineers** who can develop those technical and technological solutions that will ensure permanence on extraterrestrial bodies. For this reason, the holistic approach will synergistically invest both Spoke 9 and Spoke 8, which will be privileged partners in this path.

Leader: UNIPD

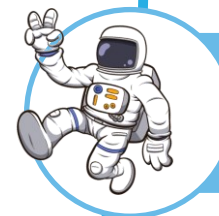
Co-Leader: UNIFI



Performing analyses to study plasma, dust, exosphere/atmosphere interactions, and to check the habitability of extraterrestrial planets or moons. Characterizing the sites in terms of geology, geomorphology, mineralogy, chemistry, and geophysics. Developing methods and techniques for life signature.



Performing mineralogical, petrologic, geochemical and geotechnical studies of lunar, Martian and asteroid meteorites. Developing space mining technologies. Studying terrestrial analogs.



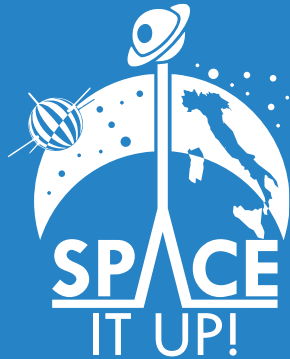
Increasing the knowledge of key physiological functions and organs for long-term space exploration. Identifying early biomarkers of physiological impairment, the time course of alterations, and alterations in organ crosstalk.



Developing high-tech controlled systems to guarantee safe and high-quality food by a seed-to-seed cycle. In situ recycling of the organic waste substance. Studying the regolith as an in-situ resource (ISRU) to be used for human settlements through additive manufacturing.



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2025 Conference

Thank You