



DESIGNING THE FUTURE OF HUMANITY AND SPACE

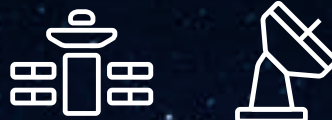
SAFETY AND COMFORT IN THE COSMOS FOR EVERY SPACE UTILIZING PIONEER



HUMANS AND SPACE TO THE NEXT LEVEL



BRIDGING EARTH AND SPACE



001 SAFETY AND MISSION ASSURANCE

| Sustainable Society |

002 LEO COMMERCIALIZATION

| New Value Creation |

003 SPACE SECURITY

| Monitoring safety from space |

004 SPACE EXPLORATION

| Realization of Lunar Society |



001 SAFETY & MISSION ASSURANCE

An accident that seems to be minor on the Earth can lead to catastrophic consequences in the enclosed environment in outer space. Our work “safety and mission assurance” ensures that the three major hazards in space, namely, fire, depressurization, and air contamination, are under control. Additionally, our work includes exhaustive checks on every item delivered to ISS and doing everything within our ability to ensure the safety of the crew through implementation of stringent safety requirements.

We support our customers' development by evaluating the reliability and safety of all equipment delivered into space at all levels, analyzing that the item satisfies the stringent quality standards required by NASA and JAXA. This knowledge is also applied to the fields that require strict safety standards such as aircrafts and railways, The technologies for safety and secure that originated in space development are utilized in the systems more familiar to our life.

01 Safety

We strictly check the safety of space systems, their software, and work conducted by astronauts and on-ground operators according to the space standards of NASA and JAXA.



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02 Reliability and Maintainability

We perform evaluation of durability of devices, materials, and electronic components used in the harsh space environment as well as the evaluation of the impact of their malfunctioning (reliability). Moreover, We evaluate their maintainability to minimize the working time of astronauts.

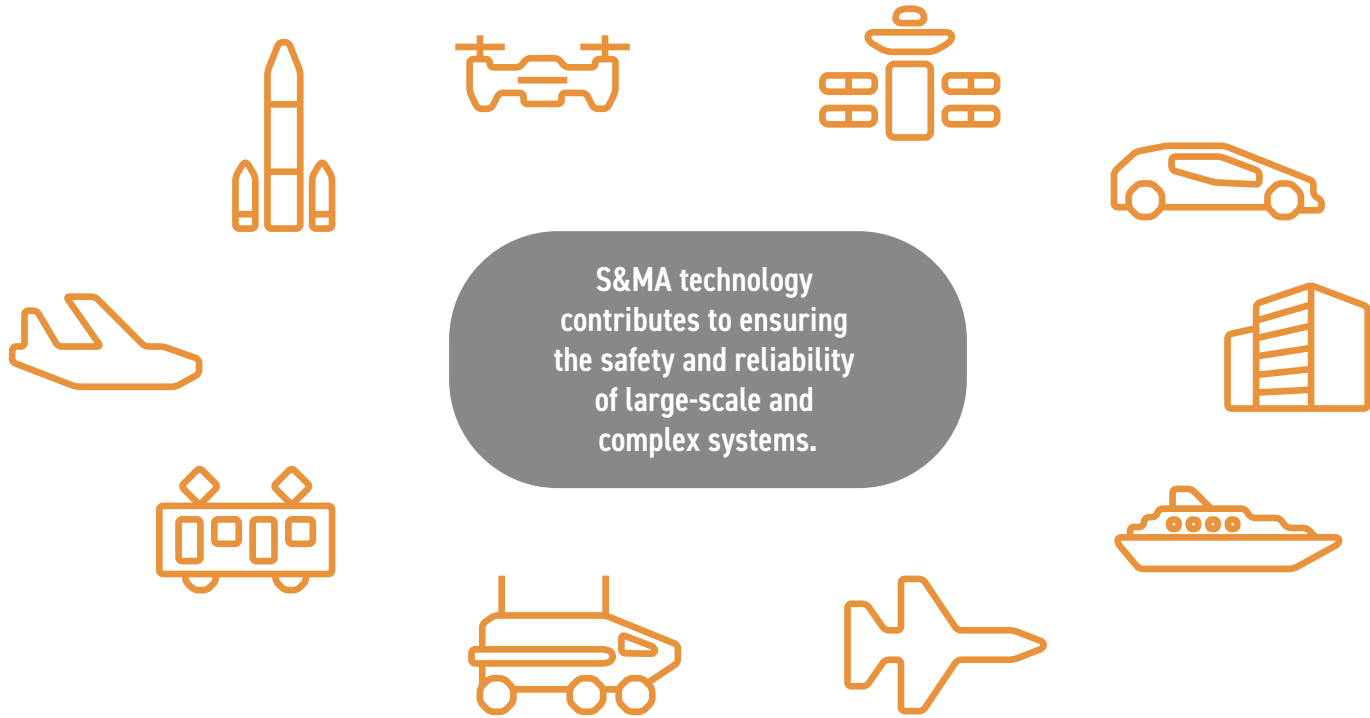


03 Quality assurance

We evaluate devices, their software and their manufacturing and testing processes so that they can perform expected functions and capabilities.



For the promotion and expansion of space utilization, we provide safety and security to all stakeholders involved in space development from both perspectives of "technology" and "management" for the purpose of "Safe and Reliable Mission accomplishment".



Supporting “the new system”

We contribute to the development and operation of new spacecraft systems, such as Moon / Mars missions and next-generation space transportation vehicles, in terms of safety and reliability.

Responding to “new threats”

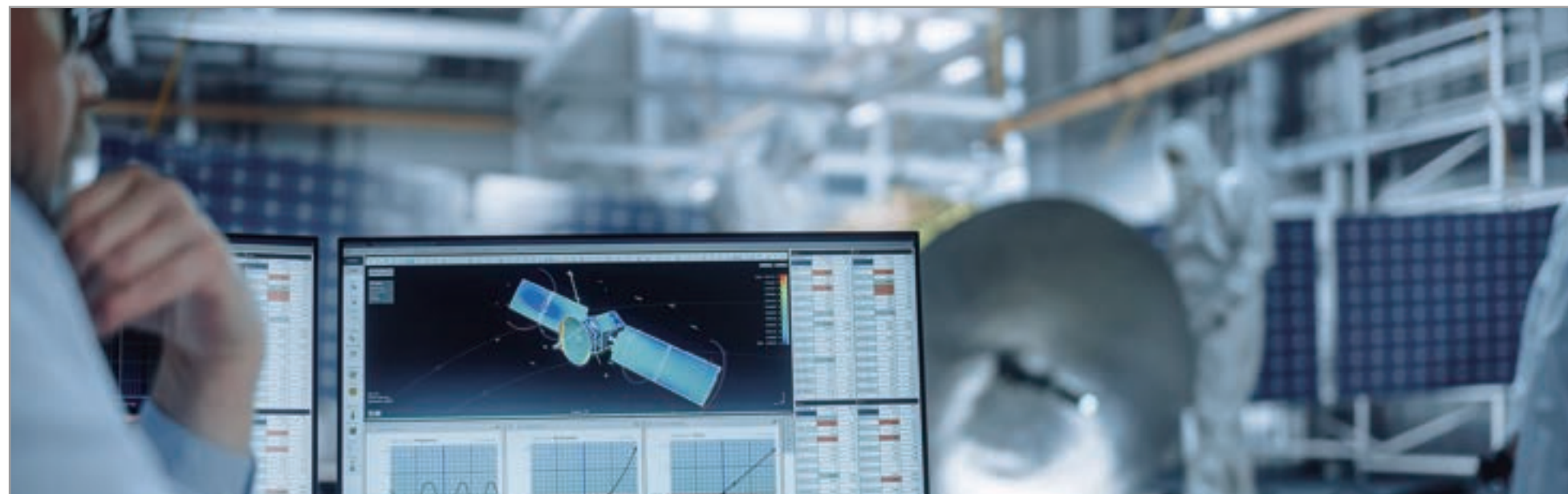
We help to take measures to new threats to space activities, such as space debris recovery and resource development on the moon by providing analysis and evaluation.

Utilization of “cutting-edge analyzing technology”

We are acquiring advanced safety and reliability analysis and evaluation technology that can be applied to new spacecraft systems that utilize AI and other state-of-the-art technologies.

001 THREE KEY POINTS

Safety & Mission Assurance



01 Safety and Mission Assurance for Spacecraft Systems

We evaluate the hardware and software of the spacecraft systems from the development stage to the actual operation of the system. In this evaluation, we verify that the required performance can be achieved while ensuring safety. In JAMSS, there are a number of specialists of spacecraft systems development, and they conduct analysis and evaluation mainly on software analysis to support design and quality assurance efforts.



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02 Aircraft Certification and Safety and Product Assurance

Based on our knowledge and experience in aircraft equipment development and space development, we support our customers' aircraft certification, equipment certification and safety development assurance activities. With our experience in various development assurance processes, we support the management and promotion of our customers' certification activities, including conducting training on various standards, considering certification methods for applicable standards, and coordinating with certification authorities.



03 AI Safety Verification

We verify the safety of AI systems with a brand-new and patented method (Patent Nor. 7007529). This method was developed by integrating a method of Resilience Engineering: FRAM (Functional Resonance Analysis Method) and one of the formal methods known as SpecTRM-RL (Specification Tools and Requirement Methodology-Requirement Language). It enables us to evaluate the reliability of the AI system in terms that 1) how exhaustive the target AI system is tested and 2) how consistent the AI functions for the given input.



002 JAMSS, LINKING HUMANS AND SPACE

Japanese Experiment Module "Kibo"

We, JAMSS, continuously monitors the International Space Station(ISS)/ Kibo 24 hours a day, 365 days a year from the Mission Control Room at JAXA Tsukuba Space Center. We have contributed to the success of various space missions by leveraging operational and integration technologies necessary in the extreme and unique environment that is "space". JAMSS will continue to link humans and space, now and forever.

Each task detail for "Kibo" Operations

Planning

Multilateral Schedule coordination from the daily schedule to the annual schedule.

Training

Provides training to domestic and international astronauts and flight controllers for activities in the space environment.

Technical Support

Engineering assessment for Kibo, and payload interface evaluation and coordination.

Medical Operations

Support medical operations for Japanese astronauts.

Kibo System Operations

Status monitoring of ISS/ Kibo from Mission Control Room at Tsukuba Space Center 24/7.

User Support

Support people in realizing a wide variety of "space utilization" including space experiments conducted in ISS/Kibo.

Payload Operations

Operate and control space experiments conducted in ISS/Kibo

Safety and Mission Assurance

Provides assessment of flight hardware and software for safety, reliability, and maintainability.



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01

Kibo System Operations



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Monitoring and control of experimental equipment, Support for astronauts, etc.



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03

Support medical operations for Japanese astronauts



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Provides training to astronauts

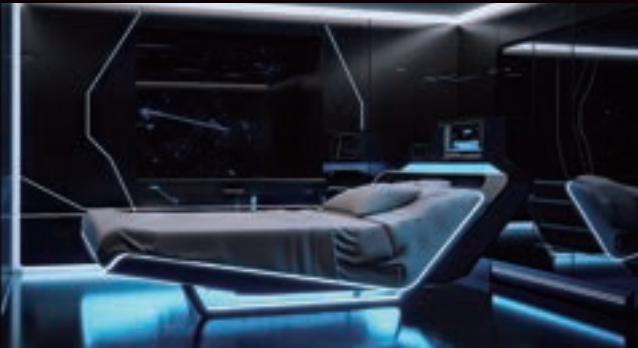
002 SPACE ECONOMY FRONTIER

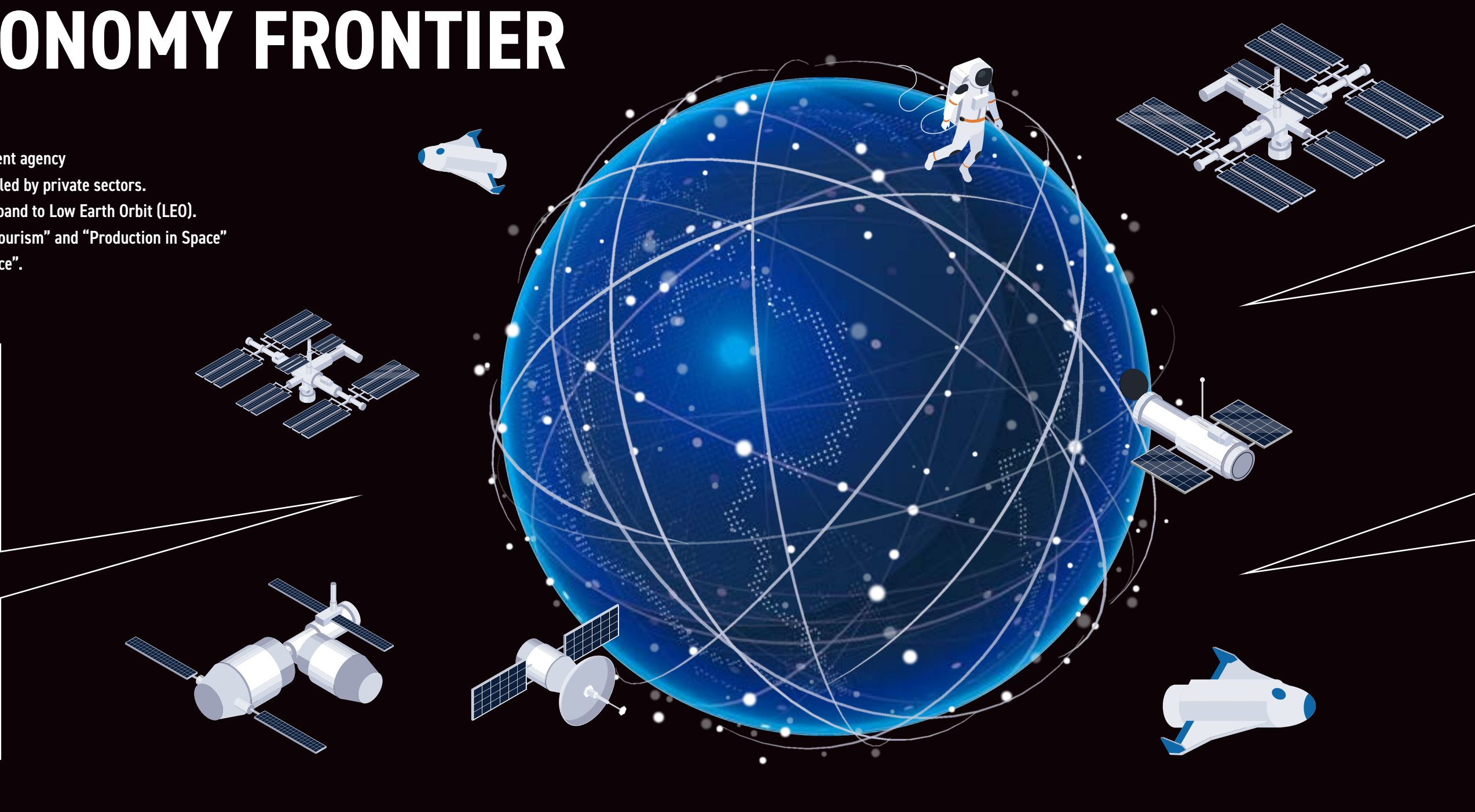
LEO Commercialization

The era of “International Space Station” led by each government agency will be transformed to the era of “Commercial Space Station” led by private sectors. Along with this transformation, the human economy would expand to Low Earth Orbit (LEO). There would be varieties of space utilization such as “Space Tourism” and “Production in Space” in addition to “Research in Space” and “Demonstration in Space”.

“Space Travel” Booming

The travel destination is “Space”. From the sub-orbital flight (around 100km high) to the stay in the Space Stations (around 400km high), everyone can visit the “closer” space, which is changed from the current “far” space only professional astronauts and special persons are allowed to visit. Along with this booming, not only the travel business, but also new businesses related to entertainment in space and QOL(Quality Of Life) improvement in space will be created.





“Commercial Space Station” Construction

Several construction plans of Commercial Space Stations are underway mainly in the US and Europe. From the era of ISS, which is planned to retire in the near future, we are entering an era of the multiple Commercial Space Stations with no gaps. In the Commercial Space Station era, which is just around the corner, they will be constructed and operated to meet various future needs.



Diverse Space Utilization

Space Utilization in the Low Earth Orbit, which has been focused on “Research and Development” and “Technical Demonstration”, will be diversified and expanded to include new utilization such as “Space Tourism” and “Production In Space”, and that will contribute to the vitalization of economic activities in the Low Earth Orbit. “Production In Space”, which is conducted under the space environment characterized by the microgravity, is further developed into “Space Factory”, and then it is expected that it would give a birth of “Made In Space” products that enrich human society on the Earth. Furthermore, the automation manufacturing will evolve depending on each product, and the construction and operation of the Space Factories, not only for the crewed factories but also uncrewed factories, will be also expanded.



002 TOTAL SERVICE PROVIDER

Leading LEO utilization and Space Business

JAMSS will lead LEO utilization as a "Total Service Provider" based on our technologies and experiences acquired through "Kibo" and "KOUNOTORI" missions for 30 years.

Not limited to providing our own services but connecting to services provided by other companies, We will offer various solutions and propose new possibilities, and then, we will lead to the way to realization.

The Space Utilization Support Media

ASMILLA

“ASMILLA” will evolve into a platform that supports various space utilization.



Changing Future of Space Utilization with ASMILLA

Until now

I would like to use space, but I don't know what to do.



From now on

ASMILLA will show you the current state of space utilization and space business.



ASMILLA Evolving into Platform connecting to Services

01 Data Delivery Services

For particularly large files, such as experimental data, packet loss may occur during downlink to the ground due to communication conditions between ISS and Tsukuba Space Center. The request submission for retransmission of the file are basically handled by the operation control personnel, taking into consideration the time window when satellite communications are available, the other payloads operation status, and so on. In LEO commercialization and its market expansion, it is expected to become more autonomous, independent, and efficient. JAMSS aims to contribute to the future LEO commercialization and market expansion by developing a system that executes large file downlink according to schedule file, automatically detects files with packet loss and retransmits them, and providing data delivery services connecting clouds on ground.

02 Efforts toward QOL Improvement

JAMSS is promoting our efforts to improve QOL(Quality Of Life) for the upcoming Space Tourism era. We conducted a technology demonstration of photocatalytic air purification devices and odor sensors in ISS to aim to apply Japanese technology on the future Commercial Space Stations.



left : odor sensor unit
right : photocatalyst device
©NASA/Axiom Space

03 Toward Space Factory, Kirara / In-Space Production

“Kirara” provides services for delivery of high-quality protein crystal which has been grown in our original small incubator unit in ICE Cubes Facility in ISS/Columbus module. Users can easily receive the results obtained without any procedures required for space missions. This is one of our activities targeting Space Factory in the LEO Commercialization era.



Kirara floating on board ISS
©NASA/ESA

04 User Support & Engineering Service

ISS/Kibo provides the platform for various space utilization. JAMSS provides the one-stop service throughout planning, preparation, on-orbit operations and data delivery. In addition to that, JAMSS is able to provide the engineering services to customers whose utilization could be realized with the services provided by space companies in the US or Europe. We will continue to provide these services in the LEO commercialization era.

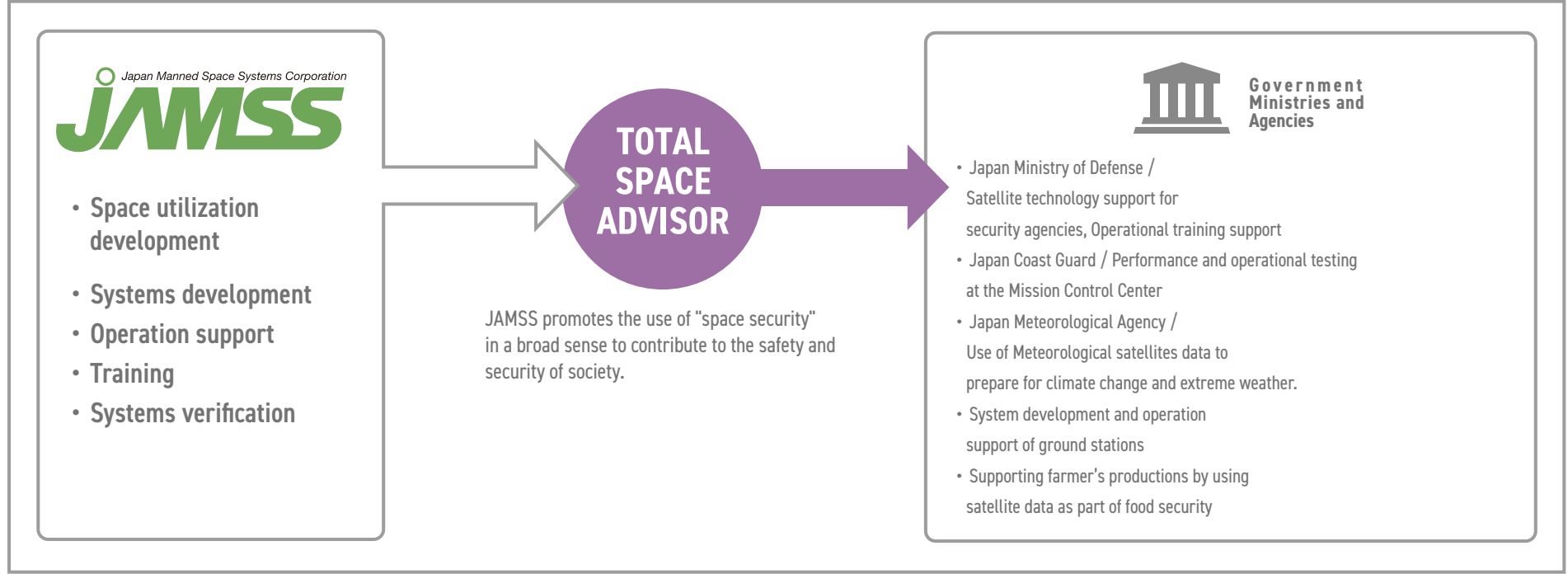
※01-04 are examples of services

003 SPACE SECURITY

JAMSS supports satellite utilization based on operation, utilization, training, and development technologies acquired through “Kibo” and “KOUNOTORI” missions. In addition to ensuring safety in space, JAMSS contributes to the safety and security of society on the ground through the satellite utilization.

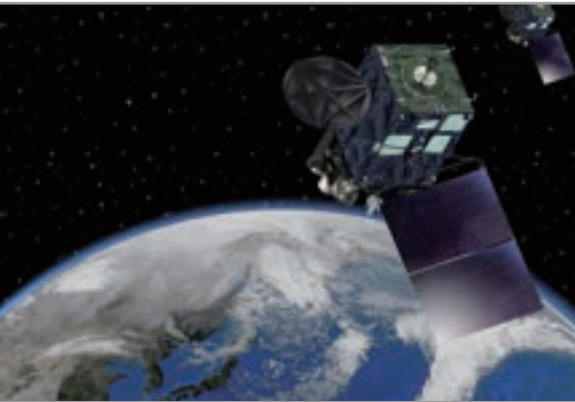


SPACE SECURITY OPERATIONS involving JAMSS



Meteorological satellite data utilization-related activities

JAMSS has been providing technical support for the Japan Meteorological Agency's next geostationary meteorological satellite Himawari-10. As part of the technical support, we had been conducting survey the Himawari-10's simultaneous mountability of Imager, an observation sensor, and IR Sounder, a sensor enabling vertical observation of moisture and temperature in atmosphere, for forecasting liner rainbands. JAMSS is also contributing to data creation based on ERA5 (atmospheric analysis data provided by ECMWF) for simulating observation of IR Sounder for utilization and development.



©Japan Meteorological Agency

Agriculture Business Support Service Based on Satellite Data “Remo Farm®”

The farming support application “Remo Farm®” developed by JAMSS automatically acquires satellite data and weather data, and makes it possible to predict the formation of young ears of rice, the date of ear emergence of rice, and the time of harvest after the auto analysis of acquired data. Farmers can check this information on a tablet, and easily monitor growing status of rice. Our application provides data based on the growth cycle of rice cultivation from the viewpoint of farmers to be useful for the time savings, the reduction of pesticide and fertilizer costs, and the improvement of quality and productivity.



Screen image of “Remo Farm®”

left : Predicted dates for each field are color-coded and displayed on a map.
right : View various data such as growth status and cumulative temperature.



By recording the growth of crops, you can centrally manage the growth status.

004 THE MOON TO MARS

Space Exploration

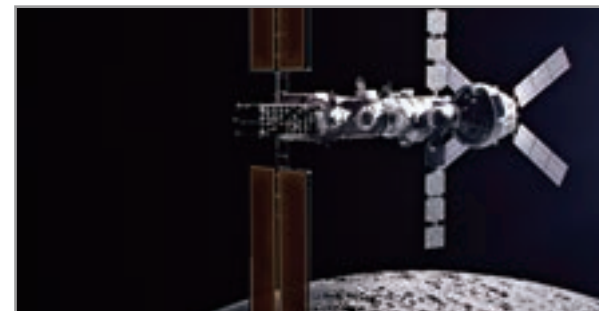
As the next stage of human space activities, various efforts aimed at the Moon and Mars are underway by space agencies and private companies around the world. In this scientific and technological quest to expand the scope of human activity, JAMSS contributes to Japan's efforts in international space exploration, including the Lunar Orbital Platform "Gateway", a manned pressurized lunar rover, and the Martian Moons eXploration "MMX", utilizing human space technology acquired through Kibo.



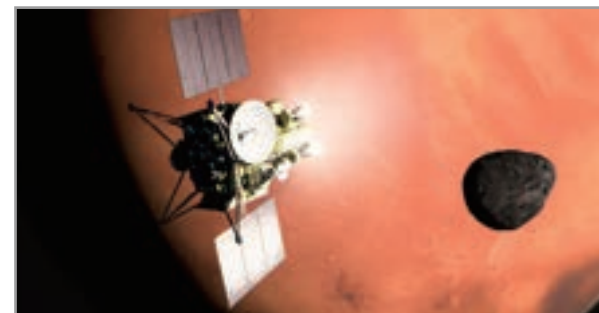
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01 Manned pressurized lunar rover

Research and development of a manned pressurized lunar rover is on-going with the aim of exploring the water resources predicted to exist on the Moon and the Moon's origin. From the conceptual stage, JAMSS has been engaged in conceptual studies of safety design and operational scenarios of the rover, and personal equipment for the astronauts on board. Since then, we are considering how the pressurized space on the Moon should be where astronauts can live comfortably without space suits. Utilizing the development and operation technologies for human space systems acquired through Kibo, we will contribute in every way possible to achieve a safe, secure, healthy and comfortable mission on the Moon.

02 Gateway

Gateway is being developed in the United States, Japan, Europe, and Canada as a relay base for surface of the Moon and Mars. Japan will cooperate in its environmental control and life support system, and logistics vehicle. In human space systems, crew life support is the highest priority. JAMSS is engaged in the integration and safety review of environmental control and life support system, making full use of technologies and knowledge acquired through development, operation and safety and mission assurance of "Kibo". We also conduct international coordination to smoothly promote development the Gateway program with international partners.

03 Martian Moons eXploration (MMX)

MMX is planning to collect surface material from Phobos, one of Martian moons, and bring it back to the Earth. In this project, which is a major step towards human exploration of the Mars, JAMSS is engaged in operation preparation that includes operational design and training of flight controllers to achieve safe and reliable missions. We will contribute to the achievement of the MMX mission by integrating the technologies and knowledge acquired through unmanned exploration to date with those of JAMSS's manned missions and will expand our activities in further exploration missions.