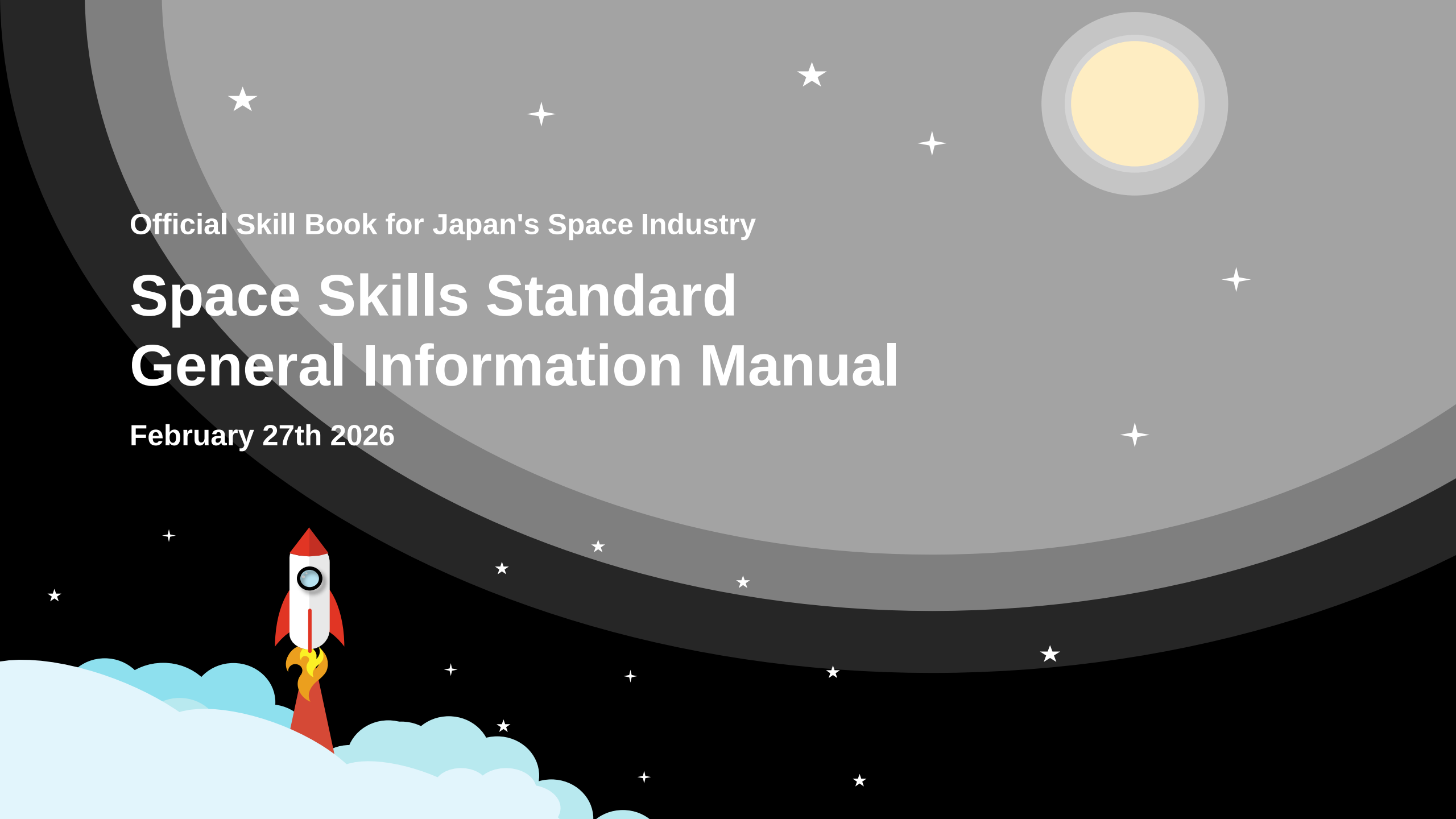
Official Skill Book for Japan's Space Industry

Space Skills Standard General Information Manual

February 27th 2026



Positioning of This Document

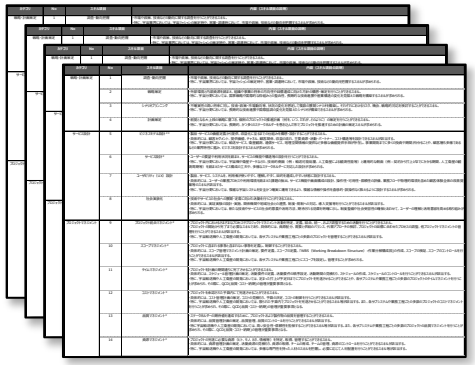
This is a document that concisely organizes the contents of the “Space Skills Standards” compiled in the accompanying Excel file, enabling readers to grasp the overall framework and key points.

GIM (This Document)

This document provides a concise overview of the Space Skills Standards. It is positioned to enable readers to broadly understand the outline of the Skills Standards by reading this document alone, without the need to refer to the Excel files listed on the right.

User Guide

This document explains the background to the development of the Space Skills Standards, as well as specific guidance on how to read and apply them. Readers are strongly encouraged to refer to this document



Space Skills Standard (Detailed Excel)

This document is the detailed version of the Space Skills Standards, providing specific and comprehensive information on skills, tasks, and skill levels. For effective use, readers are advised to review the Overview and the User Guide before referring to this detailed Excel file.

Career Path Examples

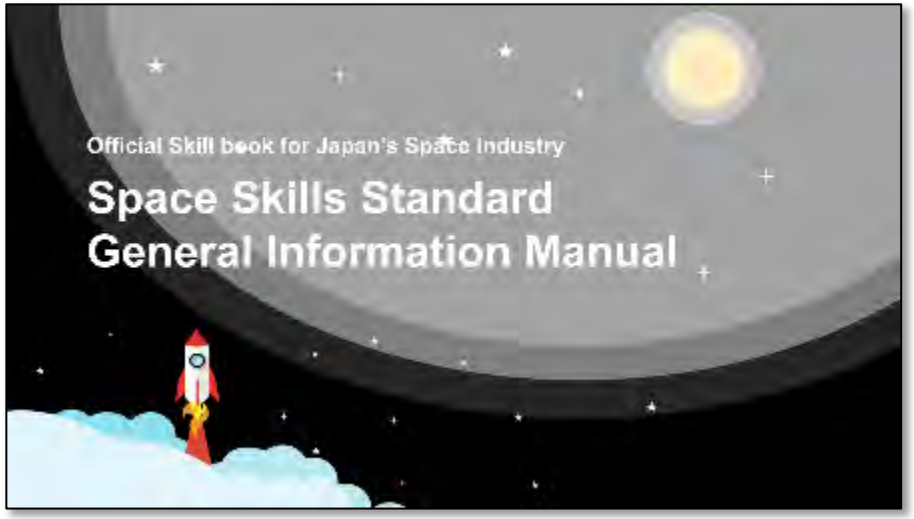
This publication compiles career paths of individuals actively engaged in the space industry and is provided as a reference material to support career planning and development.

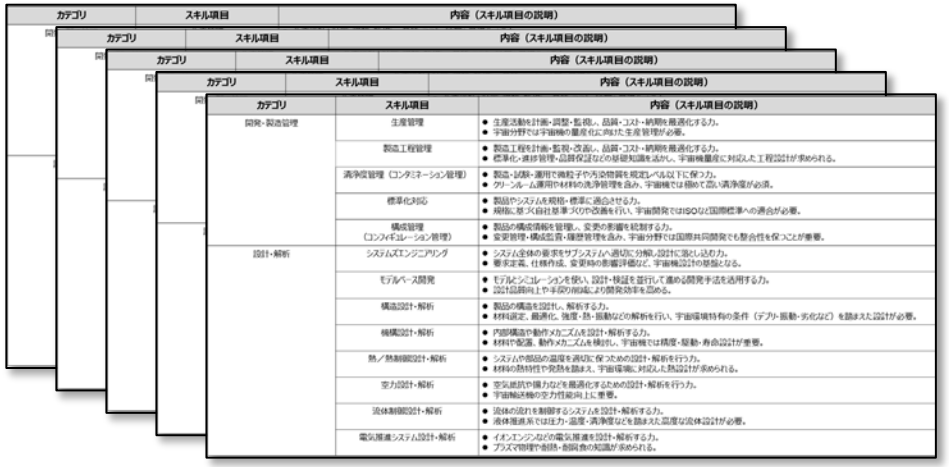
Contents

1. Overview of the Space Skills Standard

What is the Space Skills Standards?

The Space Skills Standard is an official skill framework that systematically organizes and visualizes the skill requirements needed to engage in Japan's space industry.

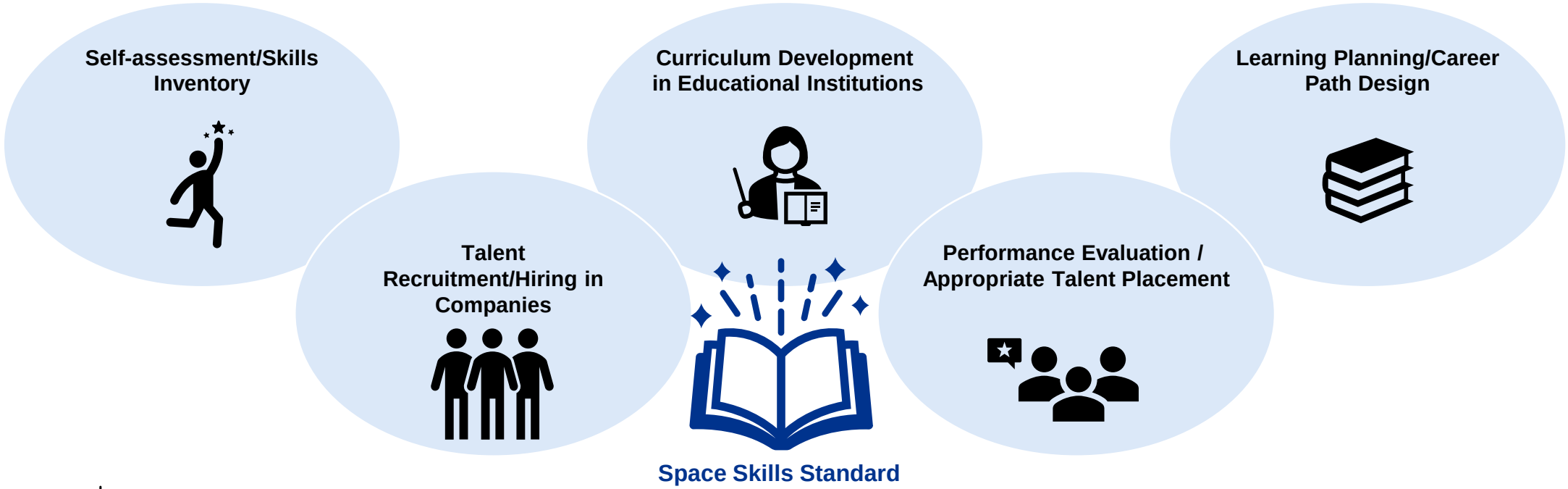




- The Space Skills Standard is a framwork that systematically organizes and visualizes the standard skills required in the space industry.
- It can be utilized as a guiding framework in a wide range of contexts, including skill development, career path design, and human resource development within companies and educational institutions.
- The Standards were developed with the aim of promoting the inflow of talent through the clarification of required skills and contributing to the strengthening of the overall human capital base of the space industry.

The Space Skills Standard as a Guideline for Diverse Applications

The Space Skills Standard is expected to be utilized in a wide range of contexts, including skill development, career path design, and human resource development. It is intended to help individuals gain the awareness that they, too, can take on the challenge of working in the space sector.



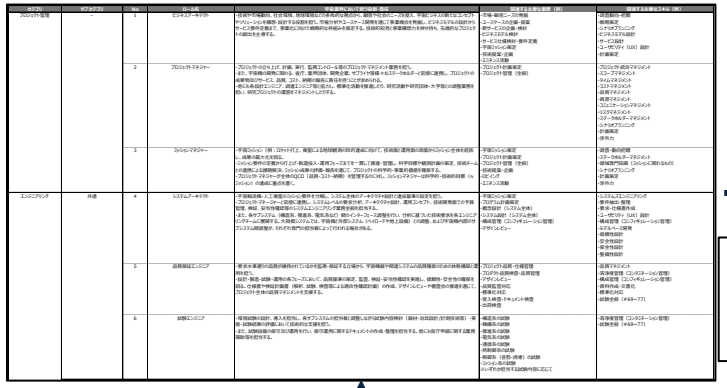
Premises of the Space Skills Standard

- The Space Skills Standard was developed with the aim of encouraging the inflow of talent into the space industry. It is intended to be read as an initial point of engagement for individuals considering involvement in the space field and is positioned as a reference resource that helps individuals realize that they can pursue careers in the space sector if equipped with certain skills.
- This document organizes the major tasks in the space industry and the standard skills required to perform those functions. To ensure usability across a variety of purposes, the items are structured with a certain level of abstraction. Users are encouraged to freely customize the Standards—by further subdividing items, selecting or omitting elements, or interpreting them flexibly—in accordance with their specific objectives.

How to Read the Space Skills Standard

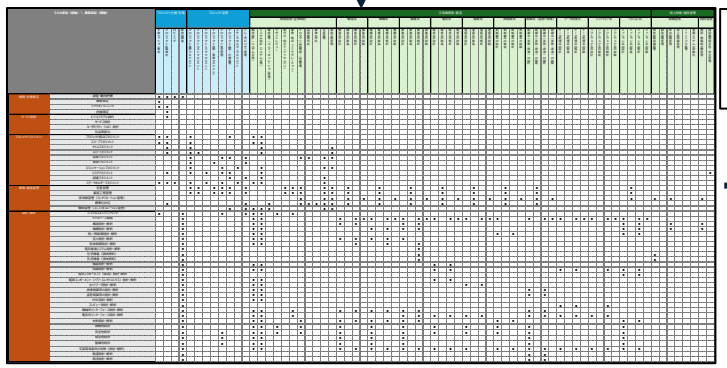
By using the role examples and the Skill Dictionary as entry points, users can further explore and deepen their understanding of specifictasks and skills of interest.

List of Role Examples (Mapping of Roles to Tasks and Skills)



Key Skills Required for the Tasks

Key Skills Key tasks in Which the Skill Can Be Applied



Skill Dictionary (Mapping of tasks to Skills)

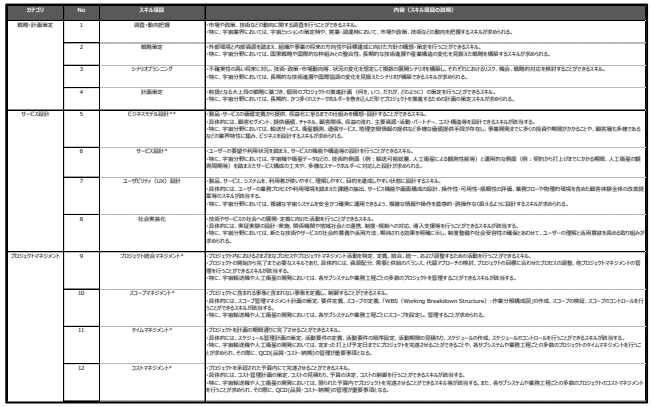
Details of Related Skills

Details of Related Tasks

Details of Skills

Details of Related tasks

Skill List

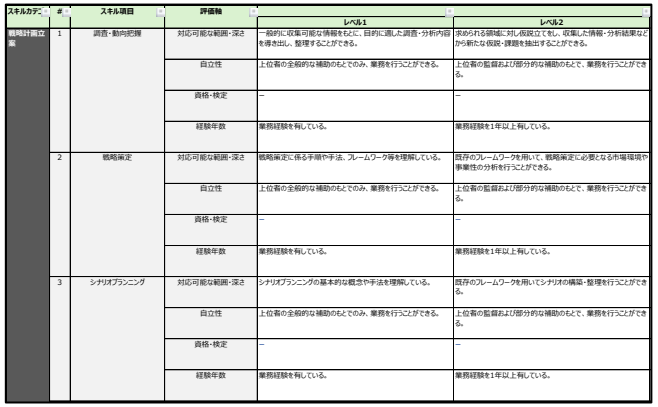


Task List

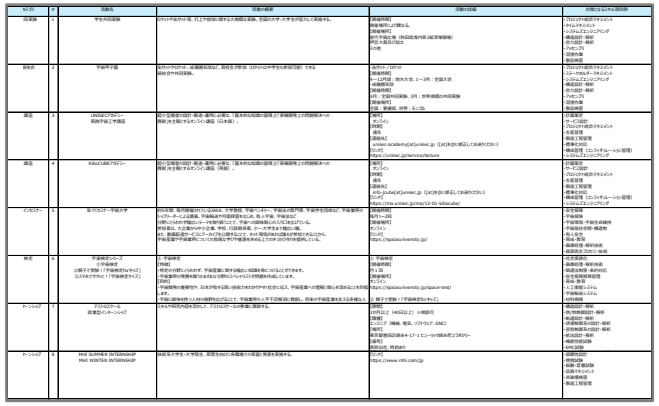
Level Indicators

Details of Programs Leading to Skills Acquisition

Skill Levels and Certification Examinations



Programs and Courses for Skill Acquisition



2. Prerequisite Knowledge for the Space Skills Standard

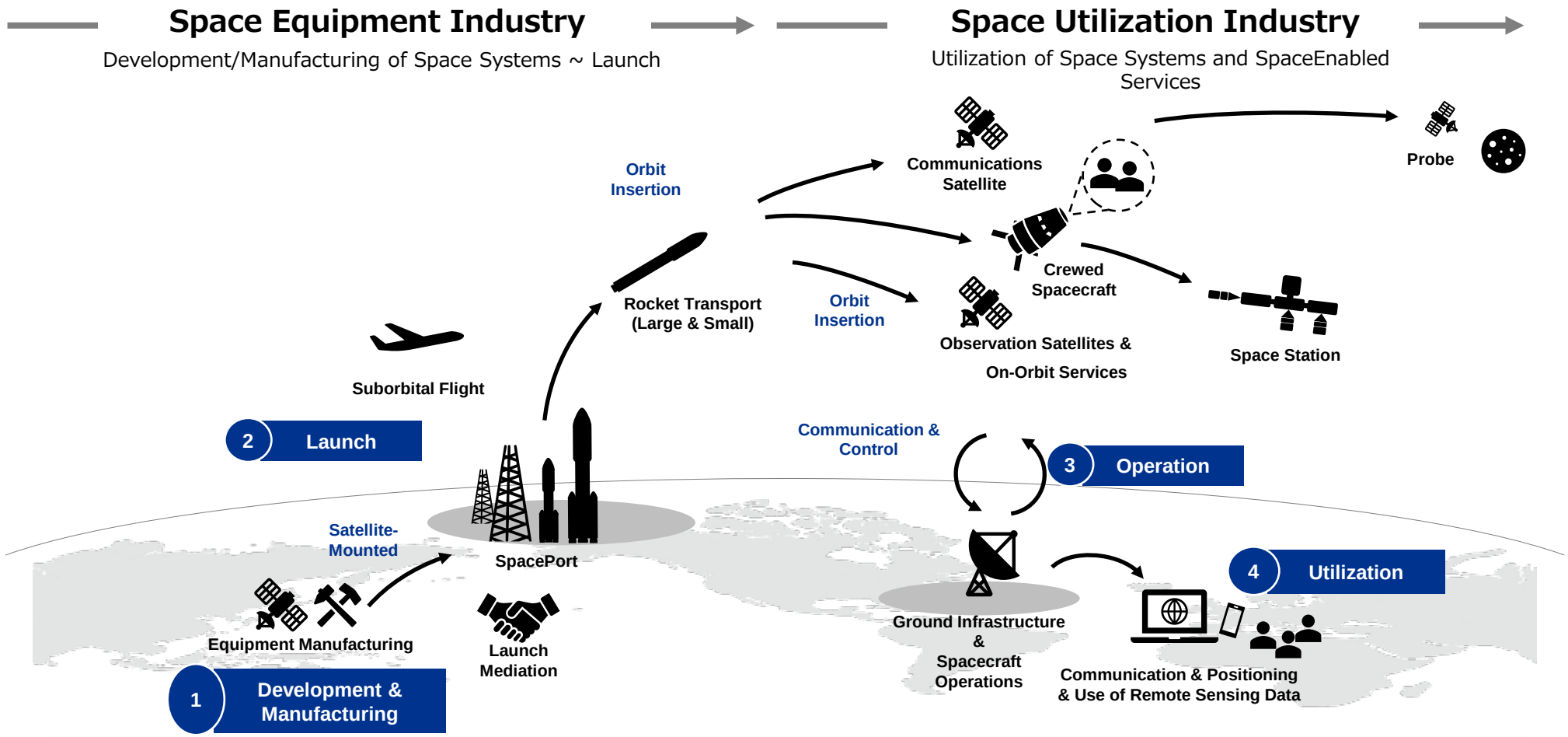
Space Development–Specific Terminology Used in This Document

In the space industry, terminology that is specific to the field is used.

#	Terminology	Explanation
1	system	Overall structure integrating multiple elements (space vehicles and satellites themselves)
2	subsystem	A group that performs a specific function or role among multiple elements that make up an entire system
3	spacecraft	Systems designed and manufactured for use in space, such as satellites, probes, and crewed spacecraft
4	space equipment	Spacecraft and functional units, parts, and subsystems mounted on spacecraft
5	launch vehicle	Transport vehicles (such as rockets) for transporting people and goods in space
6	satellites	satellites that orbit planets and fulfill specific purposes
7	missions	Objectives to be achieved by space vehicles and satellites and how to achieve them
8	conceptual design	Initial design to define the overall picture and requirements for realizing the mission
9	basic design	Design to reduce requirements to specific functions
10	detailed design	Design to materialize structures and elements to realize functions
11	debris	Orbiting space debris such as rocket or satellite debris. It is also called space debris.
12	contamination	Adhesion and contamination by unnecessary materials that impair the functions and reliability of the spacecraft
13	payload	Special-purpose equipment and supplies mounted on the spacecraft
14	fairing	Protection structure to protect against wind pressure, vibration, and frictional heat during payload launch
15	telemetry	Observation and status data transmitted from satellites to ground stations
16	command	Control information transmitted from ground stations to satellites.
17	satellite constellation	Network system for operating a large number of small satellites in cooperation

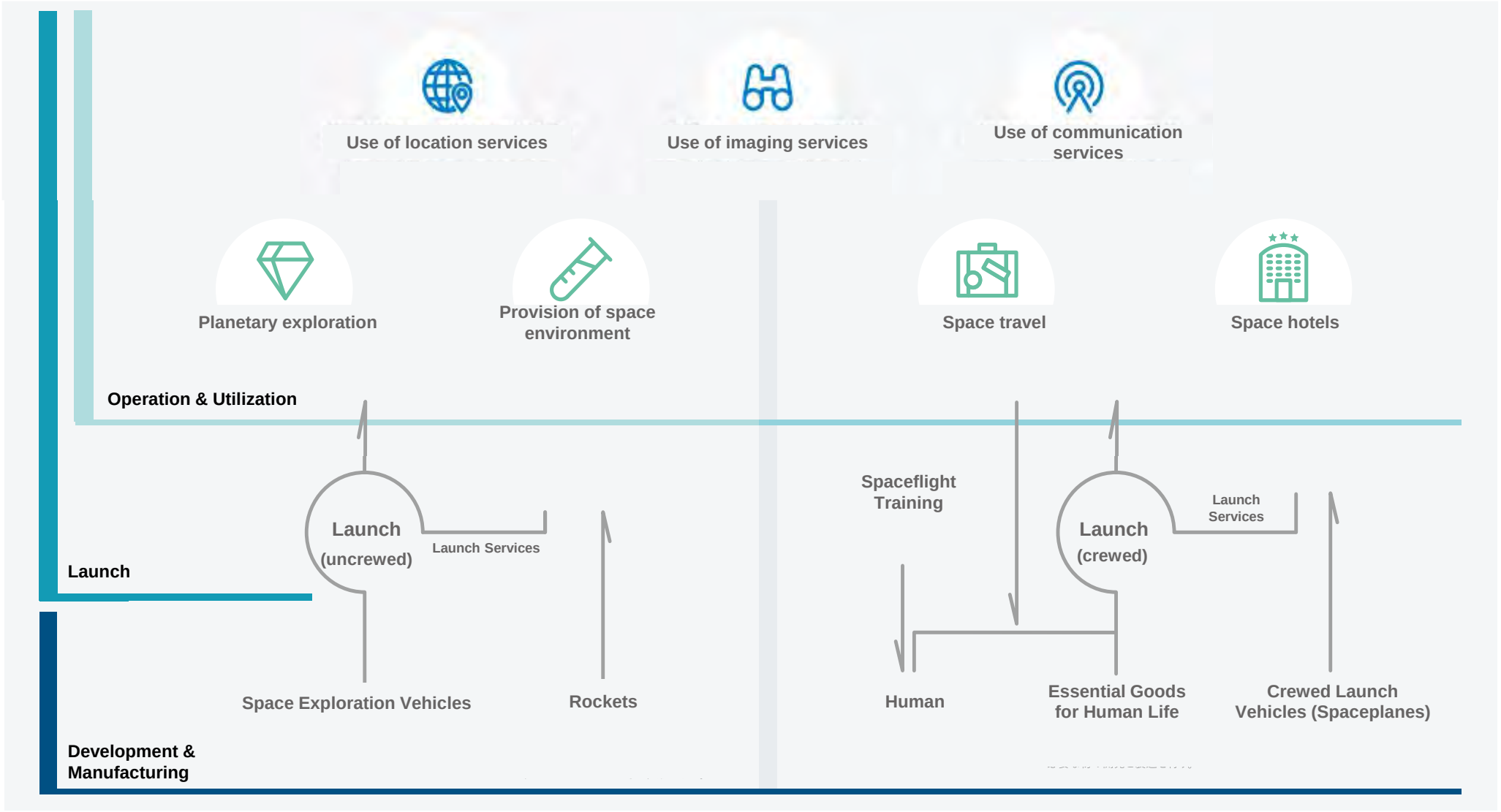
Overview of the Space Industry (1/3)

The space industry encompasses a wide range of domains, including transportation using rockets and other launch systems, the development and operation of satellites, Earth observation, as well as planetary exploration of the Moon, Mars, and beyond. These activities are sustained through collaboration among a diverse range of professional roles.



The Space Skills Standard organizes the standard skills required for thetasks that support the activities described above.
The Standard is scheduled to be revised periodically in response to changes over time and evolving societal and technological needs.

Overview of the Space Industry (2/3)



Adapted from Sorahata owned by Tellus "What is the Space Business? Industry Map, Business Model, Hot Companies, Market Size | Sorahata"

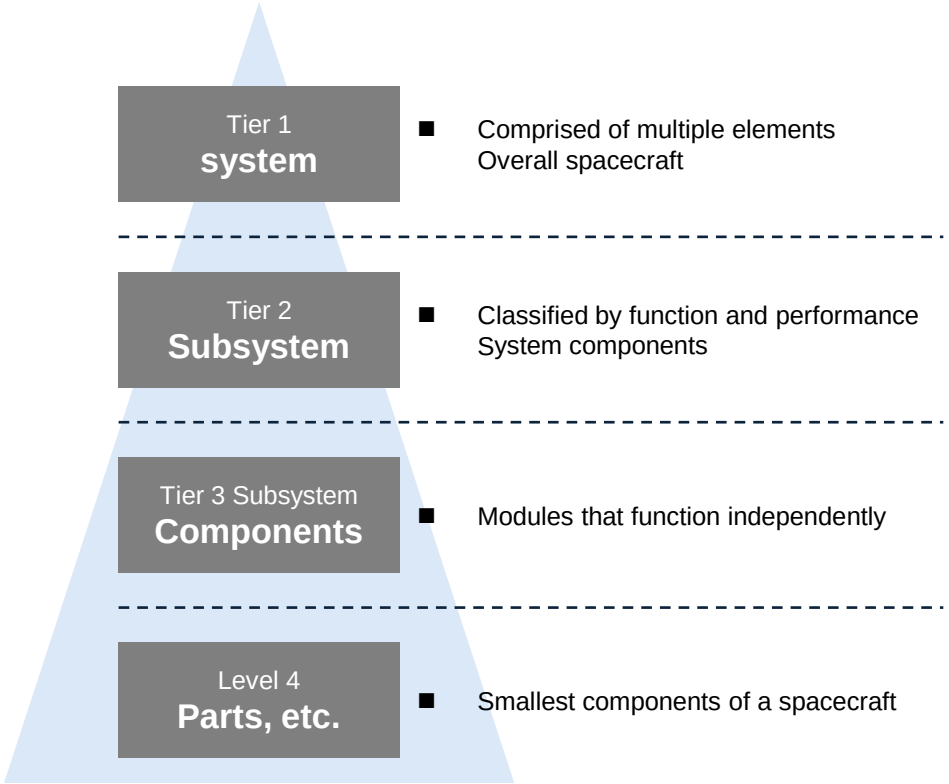
Overview of the Space Industry (3/3) Space Utilization

Source: Sorahata owned by Tellus "What is the Space Business? Industry Map, Business Model, Hot Companies, Market Size | Sorahata"

Spacecraft Configuration

Space transportation vehicles (rockets) and satellites are referred to as “systems,” which are composed of multiple modules with different functions. In particular, for satellites, the common platform is called the “bus,” while the equipment designed to accomplish the satellite's specific objectives is referred to as the “mission payload.”

Configuration of a spacecraft



Composition of the Satellite

Common functions of the satellite (bus)

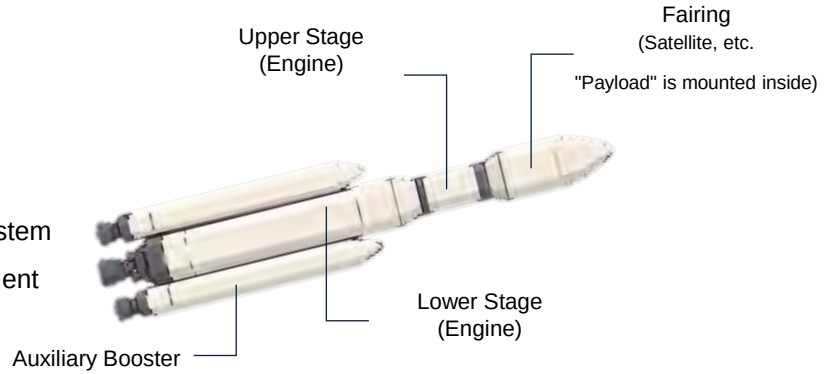
- Power supply system
- Propulsion system
- Control system
- Attitude control system
- Structural system
- Thermal control system
- Communication system
- Data processing system

Functions and equipment specific to satellites (missions)

- Sensors for observation
- Antennas and repeaters communications
- Sampling equipment for etc.

Launch Vehicle (Rocket) Configuration

- Fairing
- Upper stage
- Lower stage (Core stage/booster)
- Guidance and control system
- Communications equipment
- Structures, etc.



Prepared based on information on the JAXA website

Process of spacecraft development, manufacture, and operation

In spacecraft development, objectives and requirements are determined by planning, performance is confirmed by design and analysis, and after launch, orbit insertion and initial operation are performed through manufacturing, assembly, and testing. After that, the general process is to continue the operation and data utilization of satellites and probes.

Planning

- Set the purpose (mission) of using the satellite
- of concepts and specifications Conduct design

Design and analysis

- Determine system configuration and equipment specifications
- Conduct detailed design to meet performance, safety, and reliability
- Conduct thermal, structural, electrical, and track simulations to verify that the design meets requirements

Manufacturing

- Manufacture components and structures based on design drawings
- Assemble, wire, and integrate Conduct

Testing

- Vibration tests, thermal vacuum tests, electrical tests, etc., were conducted to confirm the launch and durability and function in the space environment

Launch

- on the rocket, Launch operations were conducted
- after orbit insertion Initial operations were conducted

Operation and utilization

- Operation control of satellites and probes
- Data acquisition, analysis, service provision, etc. Utilization was conducted

Spacecraft must be highly reliable.
Various tests are conducted in advance.

- Combustion test
- Pressure resistance test
- Impact test
- Vibration/Acoustic test
- Air/Wind tunnel test
- Thermal test
- EMC test
- Radiation test

Launch of rockets at the spaceport

Rockets and satellites are controlled from a ground station
Controllers send commands

*In addition to the above, there are various fields such as basic research fields and utilization in various industries. In the Space Skills Standard, general major tasks in the space industry are organized around the above scope.

Compiled based on information on the JAXA website

3. Foundational Framework Underpinning the Space Skills Standard

Human Resources Targeted by the Space Skills Standards

The Space Skills Standards target human resources who are interested in the space field and those involved in recruitment, development, and management. Individuals can use it to build their own careers, and companies and organizations can use it for sales, recruitment, education, evaluation, and reassignment.

Those interested in the space industry

Individual (Adults and students)

- Understanding the industry
- Job hunting
- Self-improvement

- To understand the tasks and skills required in the space industry.
- To understand the fields of study needed to acquire the skills.

Companies

- Understanding the industry
- Recruitment
- Development

- Understand the operations and skills required in the space industry and use them as hints for entry.
- Define the skills required when considering hiring.

Those currently involved in the space industry

Individuals (Adults and students)

- Self-improvement
- Understanding of other fields

- Facilitate communication between fields by deepening knowledge of work and skills outside one's own field.

Educational institutions (universities and vocational schools)

- Education
- Employment support

- In formulating educational curricula and programs, recognize the level of human resources required by companies.
- Recognize the level of human resources required by companies and provide effective employment support.

Companies and local governments

- Recruitment
- Development
- Placement
- Evaluation

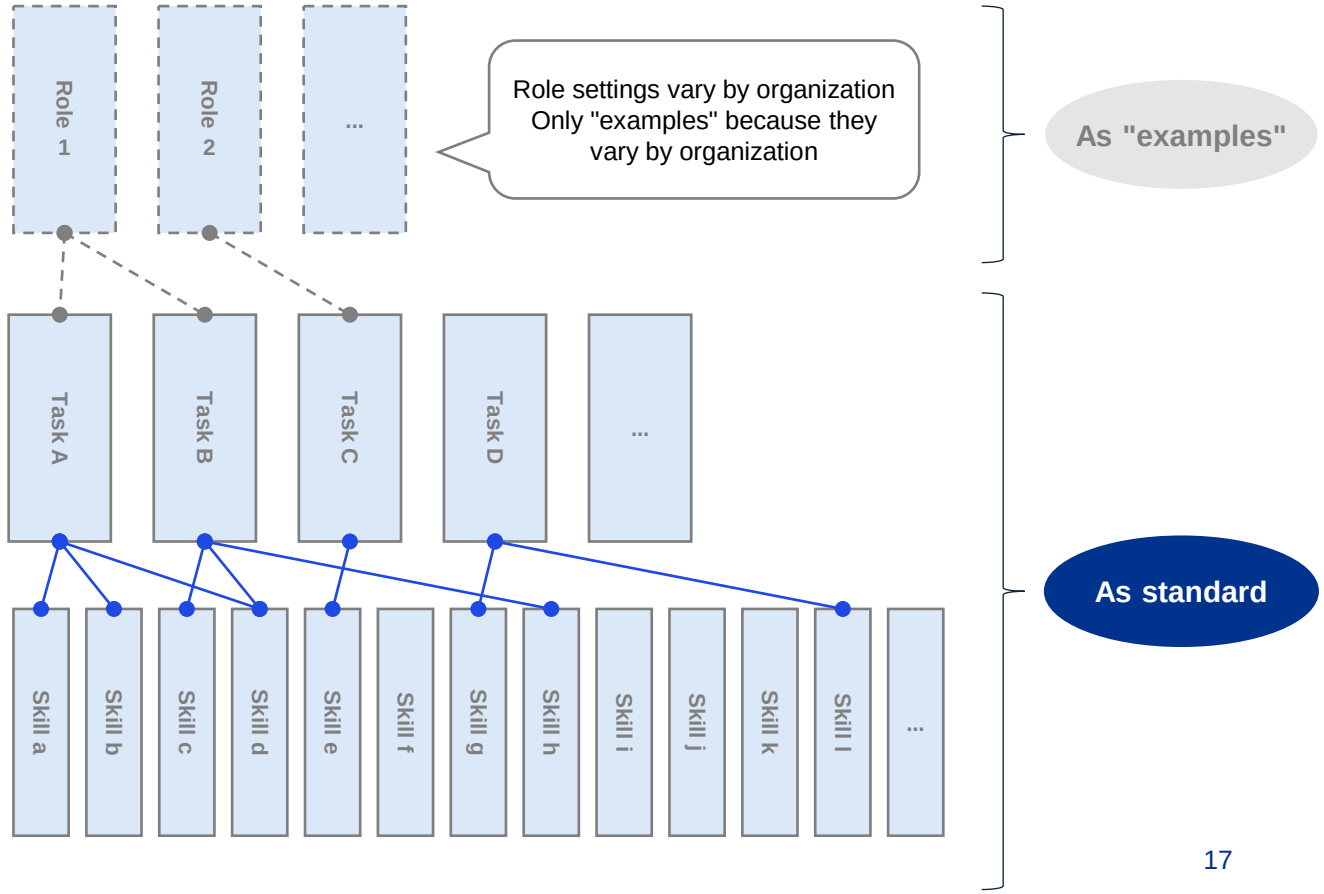
- Define the skills required for human resources responsible for examining and promoting measures.
- Define the skill level of human resources responsible for promoting measures and systematically evaluate them.

Basic organization system for the Space Skills Standard

The Space Skills Standard organizes major tasks and defines and organizes related skills.
Since roles are set differently depending on the organization, they are only examples.
The system allows users to organize related skills by customizing roles and related tasks for their own organization.

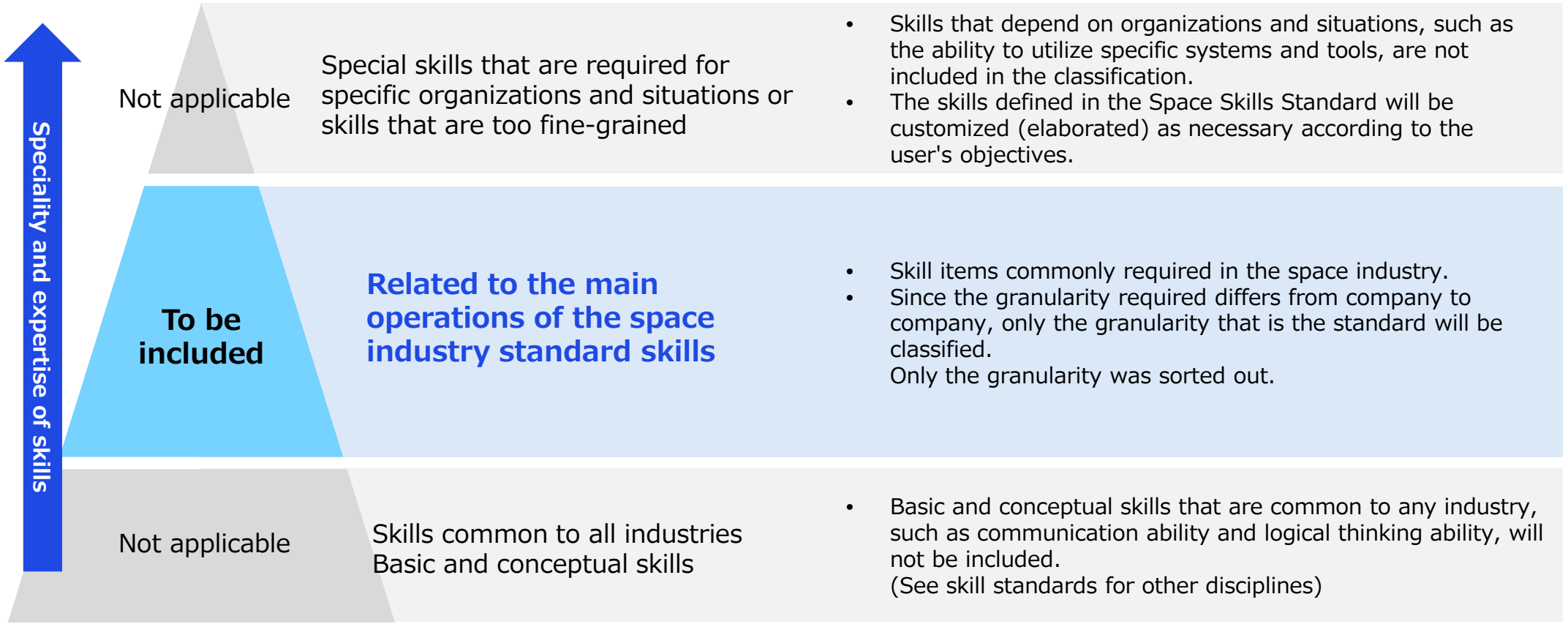
Organized Items	Definition
Roles	**Any in the organization** **Job title Responsible for task** i.e.) Project Manager, Structural Systems Engineer
Task	**To achieve any objective in the organization** **task that indicates functions and roles required** i.e.) Project management, structural design
Skill	**In order to perform the task** **Competence that is recommended to be acquired** **"Skills = knowledge + skills"** i.e.) Integrated project management, structural design and analysis

Image of hierarchy in the Space Skills Standard



Scope of the Space Skills Standards

"Standard" skills related to the main operations of the space industry are organized. Since it is assumed that the industry will develop uniform indicators, special skills that are required only in specific situations or skills that are too fine-grained are avoided.



4. Examples of Key Roles in the Space Industry

Examples of Key Roles in the Space Industry (1/8)

There are 59 major roles in the space industry.
*Roles are defined differently in each organization, so please refer to this as a general example.

Business Architect

- Designs mechanisms and service concepts to realize the objectives of the space business based on technological, market, and social conditions

Generally, related skills include research trends and understanding, strategy formulation, scenario planning, and business model design.

Project Manager

- Manages spacecraft development projects from planning to completion and coordinating with various parties to meet quality, cost, and delivery requirements

Generally related skills include project integration management, scope management, stakeholder management, and external relations

Mission Manager

- Examines and sets achievement standards for spacecraft and satellite missions, and for planning, coordinating, and managing the development and evaluation necessary for launch

Generally, related skills include research and understanding trends, domain expertise related to missions, scenario planning, and plan formulation

System Architect

- Organizes specific requirements for the design of the enclosure structure of space equipment and the electrical components mounted inside, and developing them into specifications

Generally, related skills include systems engineering, requirements extraction and organization, requirements and specification writing, and usability (UX) design.

Quality Assurance Engineer

- Establishes and operates a system to ensure the quality of space equipment and related systems from the viewpoint of ensuring that required levels of quality are maintained

Generally, related skills include quality management, politics and management, configuration management, and general testing.

Test Engineer

- Designs and implements spacecraft environmental tests and providing technical support through evaluation, as well as overall test operations

Generally, related skills include cleanliness management and general testing.

Examples of Key Roles in the Space Industry (2/8)

There are 59 major roles in the space industry.
*Roles are defined differently in each organization, so please refer to this as a general example.

Role of each subsystem in the spacecraft

System Engineer

- Responsible for organizing the functional requirements of each system, establishing design policies and specifications as a system, and formulating integration plans and matching with other systems.

Generally, related skills include systems engineering, mechanical design and analysis, model-based development, reliability design.

System Design Engineer

- Responsible for designing and analyzing equipment and parts for the system in charge based on specifications established by the system engineer

Generally, related skills include materials design and analysis, model-based development, data preparation and documentation, and overall test and evaluation skills.

Subsystem	Details
Structural system	• The "framework" and "exterior" of the spacecraft. • The role of supporting the internal equipment while withstanding the vibration of the launch and the space environment.
Mechanical system	• The system is responsible for the parts that require movement. • Example:Deployment of solar panels, folding and rotating antennas, opening and closing lids, etc. Propulsion system.
Propulsion system	• The engine that powers the spacecraft. • It includes the fuel tank and thrusters used for orbit changes, attitude adjustment, and acceleration to deep space.
Electrical system	• The system that supplies and manages power to the spacecraft. • It includes solar panels, batteries, and power distribution equipment.
Communication system	• The system that sends and receives data between the spacecraft and the ground. • It includes antennas, transmitters, and receivers.
Data processing system	• A computer unit that collectively processes collected data and information about each device. • It also records observation data and controls the entire system.
Software system	• A program that operates a spacecraft. • It manages the operation of each device, processes data, detects abnormalities, and operates autonomously.
Thermal control system	• A temperature control system that protects equipment from the extreme cold and high temperatures of space. • It uses insulation, heaters, and radiators to keep equipment at an appropriate temperature.
Control (attitude and guidance) system	• A mechanism for maintaining the correct attitude and orbit by adjusting the direction and position of the spacecraft. • It includes gyros, star trackers, and reaction wheels.

Examples of Key Roles in the Space Industry (3/8)

There are 59 major roles in the space industry.
*Roles are defined differently in each organization, so please refer to this as a general example.

Manufacturing Process Manager

- Operates the production line for spacecraft engines and satellite parts, and is responsible for field operations such as directing assembly operations and safety management.

Generally, related skills include , cost management, production control, and manufacturing process control.

Manufacturing Technician

- Conducts various operations (soldering, assembly, processing, inspection, etc.) necessary for the manufacture of spacecraft, and performs technical work to ensure manufacturing quality.

Generally, related skills include assembly, soldering, welding, and product inspection.

Production Manager

- Optimizes quality, delivery, and cost in the manufacturing process of space equipment, and oversees planning, process control, quality system construction, and supply chain coordination.

Generally, related skills include , quality management, procurement management, and production management.

Launch Range Operations Manager

- Supervises the operation of launch range facilities, work schedules, and ground support systems in preparation for launch, ensuring safe and efficient launch range operations.

Generally, related skills include range safety management, project management (general), stakeholder coordination, and facilities management.

Launch Range Operator

- Safely moving, installing, and connecting rockets and equipment, and supports launch operations through inspections around the launch pad and on-site operations.

Generally, related skills include range safety management, heavy equipment operation, machinery and equipment management, and hazardous materials management (general).

Safety Manager

- Ensures the safety of launch sites and surrounding areas, operates monitoring, coordination, and emergency response systems in compliance with laws, and coordinates with residents and related organizations.

Generally, related skills include facilities management, hazardous materials management (explosives), range safety management, and stakeholder management.

Examples of Key Roles in the Space Industry (4/8)

There are 59 major roles in the space industry.
*Roles are defined differently in each organization, so please refer to this as a general example.

Launch Equipment Engineer

- Designs, maintains, and operates the fuel, power, communications, and other facilities at the launch site, and maintains the reliability and functionality of the ground support infrastructure.

Generally, related skills include facility management, machinery and equipment management, heavy equipment operation, and building design and management.

Ground Station Administrator

- Supervises communications operations at ground stations and ensures stable communications with satellites through monitoring, maintenance, and operational coordination of antennas and communications equipment.

Generally, related skills include launch control operations, ground station control operations, risk management, and systems engineering.

Ground Station System Engineer

- Designs, builds, and maintains communications, control, and data processing systems for ground stations to ensure performance and reliability as required.

Generally, related skills include network design and analysis, launch control operations, signal processing technology.

Architect

- Designs and supervises the ground facilities required for spacecraft operations, and provides infrastructure that is safe, functional, and compliant with laws and regulations.

Generally, related skills include building design and construction management, civil engineering design, building equipment design and management (electrical and mechanical), etc.

ATC System Engineer

- Designs and operates control systems for rocket launches and ensures safe mission execution through real-time monitoring and abnormal response support.

Generally, related skills include launch control operations, radio communications, signal processing, etc.

Flight Safety Engineer

- Designs flight paths and failure criteria and maintains related systems to ensure flight safety and minimize risk after launch.

Generally, related skills include space transportation systems, range safety management, flight safety management, weather forecasting and judgment, etc.

Examples of Key Roles in the Space Industry (5/8)

There are 59 major roles in the space industry.
*Roles are defined differently in each organization, so please refer to this as a general example.

Orbit Control Engineer

- Responsible for maintaining a stable orbit by analyzing the orbit of the satellite and implementing control plans, as well as propellant management and response to anomalies.

Generally, related skills include orbit design and analysis, satellite control operations, satellite systems, and SSA/SDA (space situational awareness).

Controller Supervisor

- Shift management and education for air traffic controllers engaged in satellite operations, ensuring compliance with procedures and establishing emergency response systems

Generally, related skills include cost management, resource management, satellite control operations, and mission execution operations.

Satellite Control Operator

- Monitors satellite conditions and sends commands, ensuring sound satellite operations through telemetry analysis and anomaly detection

Generally related skills include satellite control operations, mission execution operations, attitude control system design and analysis, and orbit design and analysis.

Satellite Image Data Processing/Analysis Engineer

- Responsible for processing and analysis of image data acquired from the satellite.

Generally related skills include data preprocessing and annotation techniques, numerical data analysis techniques, image processing and analysis techniques, and remote sensing.

AI Development Engineer

- Designs, develops and operates AI models using satellite data, and builds algorithms for classification, prediction and anomaly detection

Generally, related skills include software engineering, back-end design, machine learning and deep learning (AI), and SAR sensors.

Application Engineer

- Designs and develops apps and services that utilize satellite data, and implements practical systems in response to user issues

Generally, related skills include software engineering, front-end design, SRE processes, and remote sensing.

Examples of Key Roles in the Space Industry (6/8)

There are 59 major roles in the space industry.
*Roles are defined differently in each organization, so please refer to this as a general example.

Data Scientist

- Analyzes and visualizes a variety of data, including satellite data, and extracts insights that lead to decision-making and service creation using statistics and machine learning.

Generally, related skills include data preprocessing and annotation techniques, numerical data analysis techniques, and social implementation.

Legal Affairs

- Responsible for legal risk management and development of internal rules, and for legal responses through applications for permits and contract work based on space-related laws.

Generally, related skills include general legal procedures, space-related legal systems and treaties, and security trade management.

Intellectual Property

- Responsible for acquiring and managing intellectual property and advancing intellectual property strategies, and for protecting technology and rights by responding to patent and license agreements.

Generally, related skills include developing intellectual property strategies and managing intellectual property rights.

General Affairs

- Responsible for handling safety, health, and risk management in addition to basic organizational operations such as facility and document management and regulation development.

Generally, related skills include governance management, compliance management, incident response, documentation.

Human Resource

- Responsible for recruitment, evaluation, labor management, and employee education to attract diverse human resources and create a comfortable working environment.

Generally, related skills include recruitment, human resource allocation and evaluation, training and education..

Finance and Accounting

- Responsible for closing accounts and preparing disclosure materials to maintain financial soundness through domestic and overseas cash management and processing.

Generally, related skills include financial accounting, management accounting, foreign exchange and international finance, public funds management, etc.

Examples of Key Roles in the Space Industry (7/8)

There are 59 major roles in the space industry.
*Roles are defined differently in each organization, so please refer to this as a general example.

Procurement

- Responsible for ordering, contracting, and managing delivery dates for materials, ensuring stable supply through fair procurement and supply chain management.

Generally, related skills include procurement management, procurement product selection and management, production management, and quality management.

Information Systems

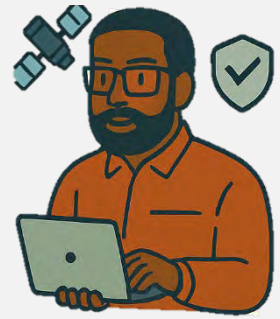
- Constructs and manages design information and server environments, and maintains IT infrastructure including security measures.

Generally, related skills include information systems, cybersecurity (general), and cybersecurity (space systems).

Cyber Security Engineer (Space Systems)

- Responsible for security from cyber attacks by analyzing threats and designing countermeasures for the entire space system, including satellites, ground stations, and communications.

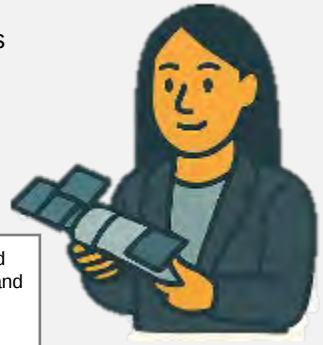
Generally, related skills include software engineering, cybersecurity (general), and cybersecurity (space systems).



Sales

- Responsible for sales of satellites and launch services

Generally related to skills such as sales and customer relations, technology proposals, and new customer development.



Corporate Planning

- Responsible for promoting medium- to long-term management plans for the space business through market analysis and strategy planning, and implementing corporate growth strategies

Generally, related skills include research and understanding trends, scenario planning, planning, and external relations.

Business Development

- Responsible for planning and promoting businesses and services that utilize space technology and creating businesses for commercialization

Generally, related skills include research, understanding trends, strategy formulation, business model design, and social implementation.

Examples of Key Roles in the Space Industry (8/8)

There are 59 major roles in the space industry.
*Roles are defined differently in each organization, so please refer to this as a general example.

Public Relations and Marketing

- Responsible for raising awareness, recruiting human resources, and raising funds through public relations activities and event planning, and disseminating information both domestically and internationally.

Generally, skills such as Public relations, branding, media management, and external relations are involved.
Related

Branding

- Responsible for formulating and implementing strategies to enhance the company's brand value and effectively communicating the technological The ability and significance of the space business.

Generally, skills such as Public relations, branding, media management, and external relations
Relate to

Investor Relations

- Responsible for appropriately disclosing business and financial information to investors and shareholders and building relationships of trust while communicating the characteristics of the space business

Generally, skills such as Public relations, investor relations (IR), external relations, and documentation are involved.

Advisory

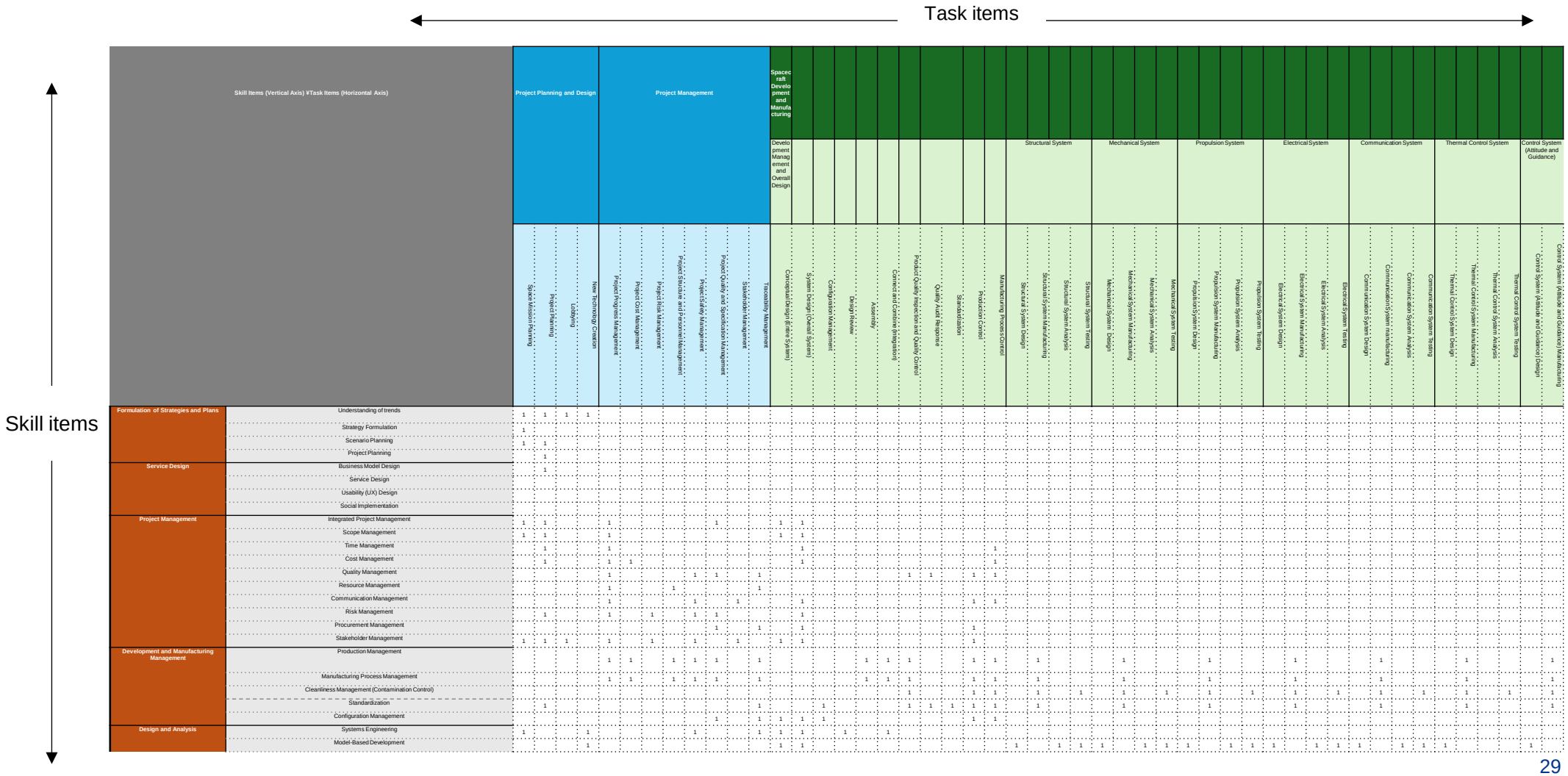
- Providing legal, tax, financial, and strategic expertise necessary for the space business and making decisions for business operators Responsible for supporting business operators (Consultants, etc.)

Various skills are involved depending on thetask type, such as lawyers, tax accountants, accountants, and business consultants.

5. Skill Dictionary

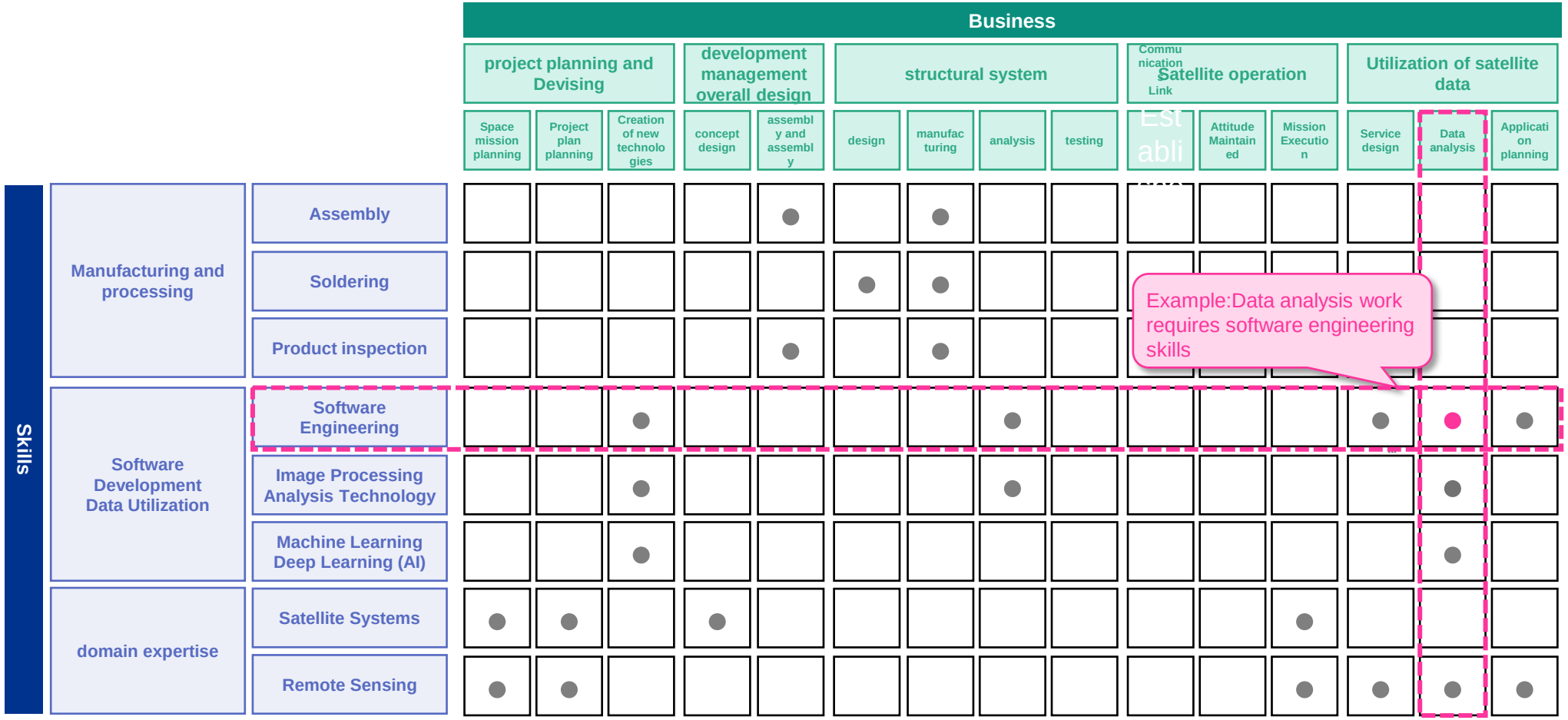
Skill Dictionary

The Skill Dictionary maps common task items in the space industry and examples of skills related to those task items.
Refer to this dictionary to see how jobs and skills correspond.



How to Read the Skill Dictionary

It is possible to grasp what skills are required for the task of interest in the form of a "star chart."
"●" is an example of mapping skills that are considered to be related to the job. You can customize the relationship of "●" according to the purpose and situation.



6. Skill List

Positioning of the Skill List

The standard skill items required in the space industry are organized. Through this document, you will be able to learn about the skills that you can use and the skills that you should develop in the future.

Category | **Unique Number** | **Skill Item** | **Skill Description**

Category	No	Skill Item	Content (Skill Item Description)
Formulation of Strategies and Plans	1	Understanding of Trends	・The ability to conduct research on trends in markets, policies, and technologies. ・In particular, the space industry is required to identify trends in the formulation of space missions and sales and procurement.
	2	Strategy Formulation	・The skill to be able to conceive and formulate the direction of the organization or business and the policy to achieve the goals based on the external environment and internal resources. ・In particular, in the space sector, skills are required to build strategies that are consistent with national strategies and international frameworks and that look at long-term technological progress and changes in industrial structure.
	3	Scenario Planning	・Skill to develop multiple development scenarios that assume changes in technology, policy, and market trends in response to high uncertainty in the future, and examine risks, opportunities, and strategic countermeasures for each scenario. ・In particular, in the space field, skills are required to be able to construct scenarios that take into account long-term technological progress and changes in international cooperation.
	4	Project Planning	・The ability to develop individual project promotion plans (What to do, when, by whom, and how) based on the underlying high-level strategy. ・In particular, in the space sector, planning is required to promote long-term projects involving many stakeholders.
Service Design	5	Business Model Design	・Skills that enable you to conceive and design a system from product and service value definition to provision and monetization. ・Specifically, this includes design skills for customer segments, value delivery, channels, customer relationships, revenue streams, key resources, activities, and partners, and cost structures. ・In particular, in the space field, there are various means of providing value, such as transportation services, satellite observation, communication services, and geospatial information, and the skill of designing businesses is required in light of the industry characteristics, such as the large investment and time required for business development and the diverse customer base.
	6	Service Design	・Skill to design service functions and structures based on user requests and usage conditions. ・In particular, in the space field, service design that accommodates diverse stakeholders is required, taking into account the technical aspects (Examples: Total transportable volume, observation performance by satellites, etc.) and operational aspects (Example: Time from contract to launch, observation cycle of satellite, etc.) of spacecraft and satellite data.
	7	Usability (UX) Design	・The skill of designing products, services, and systems so that they are easy for users to use, understand, and achieve their objectives. ・Specifically, these skills include identifying issues based on the user's business process and usage environment, designing service functions and screen configurations, evaluating operability, availability, and reliability, and proposing improvements to the overall customer experience, including business flow and physical environment. ・In particular, in the space field, skills are required to design complex information and operations so that they can be handled intuitively and without mishandling, so that complex space systems can be operated safely and reliably.
	8	Social Implementation	・Skills that enable activities for the development and establishment of technologies and services in society. ・Specifically, skills such as designing and implementing demonstration tests, working with relevant organizations and local communities, responding to systems and regulations, and supporting implementation are applicable. ・In particular, in the space sector, it is necessary to clearly show the social significance of new technologies and services, how to utilize them, and their expected effects, and to improve the understanding and willingness of users to use them, in addition to developing systems and ensuring social acceptance.

List of Skill Categories

The skill items organized in the Space Skills Standard are roughly divided into 22 categories based on their nature.

#	Skill Category Name	Definition	Skill Item Example
1	Strategic planning development	The ability to plan and formulate strategies that define the medium- to long-term direction of organizations and businesses	● Strategy formulation, Business alliances, etc.
2	Service design	The ability to design structure and delivery method of space-related services based on user value	● Business model examination, service design, etc.
3	Project Management	The ability to plan, execute, and manage projects	● Project integration Management, etc.
4	Development and manufacturing management	The ability to plan, control and improve processes in technical work	● Systems Engineer Ring, configuration management, etc.
5	Design and analysis	The ability related to design and analysis in spacecraft development	● Structural design and analysis, Mechanism design and analysis, etc.
6	Manufacturing and processing	Manufacturing and processing The ability in spacecraft development	● Soldering, 3D printing, etc.
7	Testing	Capability for tests in spacecraft development	● Functional performance tests, Combustion tests, etc.
8	Equipment and facility management	The ability to operate and maintain ground equipment and facilities	● Heavy equipment operation, Electrical equipment management, etc.
9	Launch operation	The ability related to launch site maintenance and launch operations	● Launch control, Launch site safety management, etc.
10	Satellite operations	The ability to operate satellites in orbit	● Satellite control operations, etc.
11	Software development Data utilization	The ability to develop software and utilize data	● Cloud infrastructure, AI, etc.

#	Skill Category Name	Definition	Skill Item Example
12	Governance	Competence in ensuring organizational compliance and transparency	● Governance management, Compliance management, etc.
13	Sales	Sales competencies	● Sales, new customer acquisition, etc.
14	Public Relations	PR competencies	● Branding PR strategy formulation, crisis Communication, etc.
15	Legal Affairs	Legal affairs competence	● Legal affairs response, security trade management, etc.
16	Intellectual Property	Intellectual property competence	● Intellectual property strategy formulation, intellectual property rights management
17	Finance and Accounting	Competence in finance and accounting	● Cost management, International transaction accounting, etc.
18	Procurement	Procurement The ability	● Contract management, delivery management, etc.
19	Human Resources and Labor	Human resources and labor The ability	● Recruitment, human resource development and evaluation
20	Information Systems and Security	Competence related to information security	● Information systems, Cyber security, etc.
21	Basic skills	Basic skills related to the overall space business	● External relations, language skills, etc.
22	Domain Expertise	Specialized knowledge and skills in specific fields and domains necessary for the space industry	● Remote sensing, GIS, etc.

Skill (Strategy Planning and Development, Service Design)

Category	Skill Item	Description
Strategy Planning and Development	Understanding of trends	● The ability to study market, policy, and technology trends and grasp the latest trends necessary for space missions, sales, and procurement.
	Strategy Formulation	● The ability to formulate future policies based on the external environment and the company's strengths. ● In the space sector, a long-term strategy that takes into account national strategies and international trends is necessary.
	Scenario Planning	● The ability to anticipate an uncertain future and organize risks and opportunities by creating multiple deployment scenarios. ● In the space sector, it is important to foresee changes in technological development and international cooperation.
	Project Planning	● The ability to put strategies into concrete project plans and decide what, when, who, and how to proceed. ● In space, it is essential to develop long-term plans with many stakeholders.
Service Design	Business Model Design	● The ability to design a mechanism from value provision to profitability. ● Necessary to design based on diverse service characteristics and large investment scale, such as space transportation, observation, and communications.
	Service Design	● The ability to shape service functions and structures according to user usage. ● It is required to consider the performance of the spacecraft and operating conditions, and to think of a service structure that is suitable for the people concerned.
	Usability (UX) Design	● The ability to design complex systems so that they are easy to use and safe to operate. ● In the space sector, it is important to devise ways to handle advanced information and operations intuitively.
	Social Implementation	● The ability to expand new technologies and services to be used in society. ● Necessary to demonstrate the value and effects of space technology in an easy-to-understand manner through demonstrations, institutional responses, and regional cooperation.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Skill (Project Management)

Category	Skill Item	Description
Project Management	Integrated Project Management	● The ability to organize, coordinate, and optimize the activities of the entire project. ● In the space sector, integrated management of many subsystems is required.
	Scope Management	● The ability to clearly define, control, and manage a project's scope, including explicit decisions on inclusions and exclusions. ● In the space sector, clear scope definition for each project phase and systematic structuring through a Task Breakdown Structure (WBS) are required.
		● The ability to execute projects in accordance with established timelines. ● In the space sector, strict schedule management is critical in alignment with immovable milestones such as launch dates, including comprehensive Quality, Cost, and Delivery (QCD) management.
	Cost Management	● The ability to complete projects within the approved budget. ● In the space sector, where multiple processes must be advanced under constrained financial resources, meticulous cost management is required, including QCD management.
	Quality Management	● The ability to manage the quality of projects and deliverables to meet stakeholder expectations. ● In the space sector, it is ensuring high levels of safety and reliability is required across multiple projects at the subsystem and process levels.
	Resource Management	● The ability to secure and optimally allocate necessary resources such as people, goods, funds, and information. ● In the space sector, it is important to appropriately allocate diverse specialists.
	Communication Management	● The ability to share necessary information accurately and precisely among related parties. ● In the space sector, cooperation with various stakeholders and sharing situations are essential.
	Risk Management	● The ability to identify risks, assess them, and take countermeasures to increase project success rates. ● In the space sector, safety and reliability are emphasized, and it is necessary to minimize cost and delivery risks.
	Procurement Management	● The ability to procure necessary products and services from outside and manage them from contract to delivery. ● In the space sector, procurement management including domestic and international cooperation is important.
	Stakeholder Management	● The ability to identify stakeholders, grasp expectations, and build cooperative relationships. ● In the space sector, the ability to engage diverse stakeholders in projects is required.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Skill (Development and Manufacturing Management, Design and Analysis)

Category	Skill Item	Description
Development and Manufacturing Management	Production Management	● The ability to plan, coordinate, and monitor production activities to optimize quality, cost, and delivery. ● In the space sector, production management is necessary for the mass production of spacecraft.
	Manufacturing Process Management	● The ability to plan, monitor, and improve manufacturing processes to optimize quality, cost, and delivery. ● Process design for spacecraft mass production is required by utilizing basic knowledge such as standardization, progress management, and quality assurance.
	Cleanliness Management (Contamination Control)	● The ability to keep particulates and contaminants below specified levels in manufacturing, testing, and operation. ● Extremely high cleanliness is essential for spacecraft, including clean room operation and material cleaning management.
	Standardization	● The ability to conform products and systems to standards. ● In the space sector, creating and improving in-house standards based on standards, and conformity to international standards such as ISO is necessary.
	Configuration Management	● The ability to manage product configuration information and control the impact of changes. ● In the space sector, it is important to maintain consistency even in international joint development, including change management, configuration audit, and history management.
Design and Analysis	Systems Engineering	● The ability to appropriately break down requirements of the entire system into subsystems and put them into design. ● Requirements definition, specification creation, and impact assessment at the time of change form the basis of spacecraft design.
	Model-Based Development	● The ability to utilize development methods that use models and simulations to advance design and verification in parallel. ● Enhance development efficiency by improving design quality and reducing rework.
	Structural Design and Analysis	● The ability to design and analyze product structures. ● Material selection, optimization, and analysis of strength, heat, and vibration are performed, and design based on conditions unique to the space environment (debris, vibration, degradation, etc.) is necessary.
	Mechanism Design and Analysis	● The ability to design and analyze internal structures and operating mechanisms. ● Materials, arrangements, and operating mechanisms are examined, and precision, drive, and life design are important for spacecraft.
	Thermal/Thermal Control Design and Analysis	● The ability to design and analyze systems and parts to maintain appropriate temperatures. ● Thermal design corresponding to the space environment is required based on thermal characteristics and heat generation of materials.
	Aerodynamic Design and Analysis	● The ability to design and analyze to optimize air resistance and lift. ● Important for improving aerodynamic performance of space vehicles.
	Fluid Control Design and Analysis	● The ability to design and analyze fluid flow control systems. ● Liquid propulsion systems require advanced fluid design based on pressure, temperature, and cleanliness.
	Electric Propulsion System Design and Analysis	● The ability to design and analyze electric propulsion systems such as ion engines. ● Knowledge of plasma physics and heat and corrosion resistance is required.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Skill (Design and Analysis)

Category	Skill Item	Description
Design and Analysis	Chemical Propulsion (Solid Fuel) System Design and Analysis	● The ability to design materials and structures that withstand the combustion conditions of solid fuel rockets, and to study combustion methods and cooling. ● Required for the design of solid propulsion systems for space vehicles.
	Chemical Propulsion (Liquid Fuel) System Design and Analysis	● The ability to design materials and structures, combustion and cooling methods, and thrust control systems for liquid fuel propulsion systems. ● This is required for liquid propulsion systems that allow precise thrust adjustment.
	Outfitting Design and Analysis	● The ability to optimize component placement, installation, and power distribution design inside spacecraft. ● Layout and power design to maximize facility performance.
	Circuit Design and Analysis	● The ability to design and analyze electronic circuits that correctly control electrical signals. ● Includes component selection, layout, and simulation.
	Electrical Components Design and Analysis	● The ability to design and analyze electrical equipment such as transponders and modulators. ● Important to operate highly reliably in the space environment, including signal processing circuit design, EMC countermeasures, and mounting and testing.
	Power Components (Power Electronics) Design and Analysis	● The ability to design and analyze power supply system equipment such as solar cells, batteries, and power controllers. ● Power conversion design, EMC countermeasures, reliability analysis, etc.
	Network Design and Analysis	● The ability to design and analyze data communication networks between equipment. ● Necessary to design networks within satellites and with ground stations, including wiring, protocol design, and security measures.
	Guidance/Control System Design and Analysis	● The ability to design and analyze control systems that guide rockets and satellites to target orbits. ● Includes sensor and actuator selection and control algorithm development.
	Attitude Control System Design and Analysis	● The ability to design and analyze systems that stabilize and control the spacecraft's attitude. ● Includes control algorithms, actuator selection, and simulation.
	EMC Design and Analysis	● The ability to perform design and analysis to prevent interference from electromagnetic waves. ● Noise suppression (EMI) and resistance assurance (EMS) are performed to prevent malfunctions of space equipment.
	Computer Design and Analysis	● The ability to design and analyze computers that process spacecraft data. ● Circuit design and signal processing, and construct onboard computers that control and communicate are implemented.
	Mechanical Interface Design and Analysis	● The ability to design and analyze mechanical conditions for appropriate connection and cooperation between systems. ● Includes design connections between space vehicles and satellites in consideration of load, dimensions, and operating environment.
	Electrical Interface Design and Analysis	● The ability to design and analyze electrical connections for appropriate exchange of power and signals between systems. ● Includes optimizing power supply, command telemetry, etc.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Skill (Design and Analysis, Manufacturing and Processing)

Category	Skill Item	Description
Design and analysis	Material Design and Analysis	● The ability to select, evaluate, and design materials according to required performance. ● Material design suitable for the space environment in terms of strength, heat, and durability is required.
	Reliability Design	● The ability to design for stable operation that is resistant to failure. ● Redundancy and failure mode analysis (FMEA/FTA) are performed to ensure high reliability of spacecraft.
	Safety Design	● The ability to design to prevent hazards. ● In the space sector, Hazard analysis is performed and safety requirements according to operating conditions are reflected in the design. Failure tolerance design and risk minimization are important.
	Maintainability Design	● The ability to design a mechanism for early detection and recovery of failures and abnormalities. ● Includes incorporate maintenance and recovery requirements into the design to detect abnormalities and design recovery of spacecraft.
	Maintainability Design	● The ability to design for ease of repair and maintenance. ● Important to ensure repairability with a view to reuse, and this is important when considering the reuse of spacecraft.
	Reflection of Space Environmental Conditions (Design and Analysis)	● The ability to design and analyze considering the space environment such as temperature, radiation, and electromagnetic waves. ● Thermal analysis, radiation resistance, and EM countermeasures must be taken to ensure a design that can withstand long-term operation and the deep space environment.
	Orbit Design and Analysis	● The ability to calculate and analyze the optimal orbit for mission achievement. ● Includes design launch, transition, and operational orbits, as well as orbital maintenance, collision avoidance, and fuel optimization.
	Navigation Design and Analysis	● The ability to estimate the position and speed of spacecraft, and to design and analyze a mechanism for accurate navigation. ● Includes the design of autonomous navigation, such as astronomical observation and optical navigation that do not rely on GNSS.
Manufacturing and Processing	Assembly	● The ability to assemble multiple parts, devices, and components into subsystems and finished products. ● Essential for precision assembly of spacecraft.
	Soldering	● The ability to join metals together using solder. ● Includes assembly of precision electronic components, and participation in skill training is desirable.
	Bonding	● The ability to fix parts with adhesives. ● Pretreatment such as selection of adhesives and defoaming is necessary, and participation in skill training is desirable.
	Welding	● The ability to join metals by heating and pressurizing. ● It is used in manufacturing parts that require strength, and skill training is recommended.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Skill (Manufacturing and Processing)

Category	Skill Item	Description
Manufacturing and Processing	Riveting	● The ability to securely fasten structural parts using rivets. ● Important for securing the strength of spacecraft, and training is recommended.
	Screw Tightening	● The ability to select appropriate screws and tighten them without looseness, taking environmental conditions into consideration. ● Includes checking torque. Participation in a skill training course is recommended.
	Screw Fastening	● The ability to securely fix screws using adhesives, etc. ● Used in places that require strong tightening. Participation in a skill training course is recommended.
	Caulking Operation	● The ability to correctly crimp wires and terminals to ensure electrical connections. ● Important for maintaining the quality of spacecraft electrical components. A skill training course is recommended.
	Insert Processing Operation	● The ability to properly attach inserts to structural members to reinforce screw holes. ● Important for preventing loosening of metals and composite materials. A skill training course is recommended.
	Harness Assembly	● The ability to manufacture and assemble electric wires and cables in space. ● Understanding of material properties is desirable, including cutting, terminal crimping, wiring, and inspection.
	Antistatic Task for Electronic Components	● The ability related to ESD countermeasures and static electricity management to prevent failure due to electrostatic discharge. ● Essential for assembly and testing of electronic equipment.
	Painting	● The ability to properly paint structural components using special paint for spacecraft. ● Knowledge of base treatment and paint is required, and skill training is desirable.
	Crane/Slinging	● The ability to safely lift and transport spacecraft parts. ● Skill training is recommended, including selection of lifting gear, center of gravity confirmation, and signal coordination.
	3D Printing	● The ability to manufacture required parts with a 3D printer. ● 3D model design, setting printing conditions, and understanding material properties are important.
	Product Inspection	● The ability to inspect whether a product meets standards, such as dimensions, appearance, and electrical properties. ● Defects are determined by measuring and testing each process.
	Non-Destructive Inspection (X-ray, Ultrasonic, Penetrating Flaw Detection)	● The ability to detect internal defects in joints by X-ray, ultrasonic, and penetrating flaw detection. ● Essential for quality confirmation after welding and bonding processes.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Skill (Testing, Facilities and Equipment management)

Category	Skill Item	Description
Testing	Functional Performance Test	● The ability to plan and conduct tests to confirm whether systems and software work as designed. ● Important for demonstrating the mechanical and electrical functions of spacecraft.
	Combustion Test	● The ability to plan and conduct tests to measure thrust, pressure, and temperature by actually combusting rocket engines and thrusters. ● Qualifications may be required to handle high-pressure gases.
	Pressure Test	● The ability to plan and conduct tests to confirm whether pressurized parts such as combustion chambers and valves can withstand design pressures.
	Impact Test	● The ability to reproduce impact environments such as drops and pyrotechnics and to evaluate the strength and durability of parts. ● To confirm whether a spacecraft can withstand launch impacts.
	Vibration and Acoustic Test	● The ability to reproduce the vibration and acoustic environment at launch and to plan and conduct tests to confirm whether equipment can withstand them. ● Also used as feedback to design.
	Aerodynamic and Wind Tunnel Tests	● The ability to simulate air flow in a wind tunnel and perform tests to measure aerodynamic characteristics such as drag and lift. ● Important for aerodynamic design verification of space vehicles.
	Thermal Test	● The ability to simulate thermal vacuum and temperature cycle environments and plan and perform tests to evaluate whether a spacecraft can withstand temperature changes.
	EMC Exam	● The ability to conduct EMI/EMS tests to confirm generation and resistance to electromagnetic noise and evaluate whether equipment malfunctions. ● Important for adapting satellites to electromagnetic environments.
	Radiation Test	● The ability to conduct tests to evaluate deterioration and malfunction of electronic equipment due to space radiation. ● Essential for confirming the reliability of long-term operating equipment.
Facilities and Equipment Management	Facility Management	● The ability to inspect, repair, and renew ground facilities and ensure their safe operation. ● Includes maintenance plans for maintenance buildings, firing stations, and ground stations, as well as emergency response.
	Electrical Equipment Management	● The ability to maintain and operate electrical facilities in buildings, such as power distribution facilities and emergency power sources. ● Important for ensuring safe and stable power supply.
	Machinery Management	● The ability to maintain and operate mechanical facilities in buildings, such as air conditioning, ventilation, water supply and drainage. ● Important for maintaining a stable building environment.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Skill (Facility and Equipment Management, Launch operation)

Category	Skill Item	Description
Facilities and Equipment Management	Heavy Machine Operation	● The ability to safely operate large machines such as forklifts and cranes. ● Necessary to transfer rocket-carrying carts at the launch range.
	Hazardous Materials Management (Cryogenic Fluid)	● The ability to safely handle cryogenic fuels such as liquid oxygen and liquid hydrogen. ● Important to understand physical properties, follow procedures, and take measures against risks of leakage and frostbite.
	Hazardous Materials Management (Explosives)	● The ability to safely store, transport, and use explosives such as propellants and igniters. ● Necessary to understand properties and manage explosion risks.
	Hazardous Materials Management (High Pressure Gas)	● The ability to safely manage high-pressure gases such as helium and nitrogen. ● Includes understanding pressure characteristics, container management, and measures against leakage and burst risks.
	Hazardous Materials Management (Radiation)	● The ability to safely manage radiation sources. ● Shielding, distance, and , dose measurement, and legal compliance are required.
	Hazardous Materials Management (Others)	● The ability to safely handle other hazardous materials such as corrosive, toxic, and flammable materials. ● Includes understanding of properties, storage and handling procedures, and risk measures.
	Building Design and Management	● The ability to design and maintain buildings to ensure their safety, functionality, and durability. ● Includes structural confirmation, inspection of deterioration, and compliance with laws and regulations.
	Civil Engineering Design and Construction Management	● The ability to design and manage civil engineering structures for space facilities. ● Responds to special environments by conducting foundation work, earthquake-resistant design, and ground investigation.
	Building Design and Construction Management	● The ability to design and manage the construction of space facilities such as assembly and test buildings. ● Responds to advanced environmental requirements such as fire and earthquake resistance and clean room specifications.
	Building Equipment Design and Management (Electrical and Mechanical)	● The ability to design and manage electrical and mechanical equipment (power, lighting, air conditioning, water supply and drainage, disaster prevention, etc.) for space facilities. ● Supports advanced environmental controls.
Launch Operation	Launch Control Operation	● The ability to control communications and track during rocket launches. ● Operates radar, telemeters, and commands to monitor flights.
	Range Safety Management	● The ability to ensure safety at the launch site. ● Based on the characteristics of propellant, high-pressure gas, and explosives, take safety measures for emergencies during launch.
	Flight Safety Management	● The ability to ensure safety during rocket flight. ● Verify flight paths based on weather conditions and simulations to minimize risks.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Skill (Launch / Satellite Operation, Software Development and Data Utilization)

Category	Skill Item	Description
Launch Operation	Weather Prediction and Judgment	● The ability to predict future weather using observation data and models and providing weather information necessary for deciding whether or not to launch.
	Stakeholder Coordination	● The ability to explain to local residents and organizations and to deal with issues, adjusting the impact of surrounding industries and ship operations.
Satellite Operation	Formulation of Satellite Operation Plan	● The ability to design satellite operation procedures, systems, and schedules. ● Includes command planning, visibility adjustment, and emergency response policy.
	Ground Station Control Operation	● The ability to accurately direct ground station antennas to satellites, to maintain communication links, and to receive telemetry and sending commands.
	Satellite Control Operation	● The ability to comprehensively manage satellite operations. ● Includes simulation, scheduling, commanding, and data processing.
	Mission Execution Operation	● The ability to control onboard equipment and execute observation and communication missions. ● Includes mode switching and adjustment of data acquisition timing.
	Ground Truth Management	● The ability to acquire and manage field data (correct data) used for satellite data accuracy evaluation, and to use it for analysis and model evaluation.
Software Development and Data Utilization	Software Engineering	● The ability to systematically develop and manage software for control, communications, and mission systems. ● Modularization, testing, and design reflection.
	Front-End Design	● The ability to design and implement user-operated screens and functions. ● UI/UX design, usability improvement, and visualization of specialized information are important.
	Back-End Design	● The ability to build software internal processing infrastructure such as API design, data processing, and authentication. ● High reliability design for satellite data processing is required.
	Database Design	● The ability to design data structures and secure and reliable data management. ● Support for long-term storage of satellite data and operational history.
	Cloud Infrastructure	● The ability to manage and operate data in the cloud. ● Includes storage, security settings, data linkage, and mass processing of satellite data.
	Site Reliability Engineering (SRE) Process	● The ability to link development and operations to enhance service reliability and operational efficiency. ● Responsible for CI/CD, monitoring, fault response, and incident management, supporting stable 24hour operations.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Skill (Software Development and Data Utilization, Governance, Sales)

Category	Skill Item	Description
Software Development and Data Utilization	Data Management	● The ability to maintain data quality, safety, and control, and to build and operate metadata management and data governance. ● Important to ensure the authenticity and confidentiality of satellite data.
	Data Preprocessing and Annotation	● The ability to shape and process data into forms that can be used for learning and analysis. ● Deficit processing, normalization, labeling, etc.
	Signal Processing	● The ability to analyze and restore analog and digital signals from satellites. ● Filters, Fourier transforms, modulation and demodulation, etc. are used for communication processing.
	Numerical Data Analysis	● The ability to perform statistical analysis and visualization of numerical information such as satellite data to extract meaningful information. ● Includes multivariate analysis, feature quantity design, and visualization.
	Image Processing and Analysis	● The ability to detect and classify objects by correcting and analyzing satellite images. ● Performs radiation correction, noise removal, object detection, and change detection.
	Machine Learning and Deep Learning (AI)	● The ability to train AI models to predict and classify. ● They are increasingly used in the space field, including satellite image analysis, orbit prediction, and anomaly detection.
Governance	Governance Management	● The ability to designi and operate mechanisms to ensure organizational transparency and accountability. ● Includes developing regulations, building supervisory functions, and designing information disclosure systems.
	Compliance Management	● The ability to buildi and operate systems to comply with laws and regulations. ● Necessary to understand laws and regulations, conduct education, monitor risks, take corrective measures, and respond to international regulations such as export controls.
	Incident Response	● The ability to quickly respond to failures and problems, analyze the cause, and prevent recurrence. ● In the space sector, real-time response and cooperation with related organizations are important.
Sales	Sales and Customer Relations	● The ability to maintain and strengthen relationships with existing customers, grasping issues, making proposals, making contracts, and dealing with customers after sales. ● In the space sector, the ability to explain specialized technologies in an easy-to-understand manner and deal with public, private, and overseas customers is required.
	Technical Proposal	● The ability to propose solutions that meet customer needs based on technical knowledge. ● Includes understanding product specifications, preparing proposal materials, and explaining and negotiating technical grounds. In the space sector, the ability to translate advanced technical content to suit customer levels is required.
	New Customer Development	● The ability to discover new customers and create business opportunities. ● Market research, approach strategies, relationship building, etc. In the space sector, the ability to propose partnerships with non-space areas and develop overseas customers is also important.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Skill (Public Relations, Legal Affairs, Intellectual Property, Finance and Accounting)

Category	Skill Item	Description
Public Relations	Public Relations	● The ability to communicate corporate activities and values both internally and externally in an easy-to-understand manner. ● In the space sector, responsible for press releases, SNS operations, and handling exhibitions. Building social understanding and trust is important.
	IR (Investor Relations)	● The ability to accurately disclose financial and business information to investors and shareholders. ● In the space sector, competence in preparing materials and responding to briefing sessions, and ability to explain long-term investment risks are uniquely required.
	Branding	● The ability to design and operate brand strategies that enhance the value of companies and services. ● Important to develop and disseminate messages, and in the space sector, strategies that appeal to the company's advanced, reliable, and public nature.
	Media Ready Management	● The ability to accurately disseminate information to news organizations and SNS, and in responding to news reports and managing information in times of crisis. ● In the space sector, it is necessary to quickly respond to high-profile launch and operation events.
Legal Affairs	General Legal Proceedings	● The ability to deal with contracts, intellectual property, and laws. ● Responsible for contract drafting and legal risk assessment, and requires understanding of special legal systems such as space law and export control.
	Space-Related Legal Systems and Treaties	● The ability to obtain permits and licenses and respond to contracts and systems based on space law and international treaties. ● Specialized knowledge to ensure legality and continuity of business is required.
	Security Trade Management	● The ability to appropriately manage exports and technology provision based on the Foreign Exchange Act. ● Essential in the space field, where there are many dual-use technologies, including identification, shipment management, and system development.
Intellectual Property	Formulation of Intellectual Property Strategy	● The ability to design policies for the acquisition, protection, and utilization of patents, trademarks, and other intellectual property. ● Developing strategies for joint development and international expansion is important.
	Intellectual Property Rights Management	● The ability to patent acquisition, application procedures, infringement risk monitoring, and license utilization. ● Necessary in situations related to space technology patent acquisition and rights distribution.
Finance and Accounting	Financial Accounting	● The ability to record, analyze, and report corporate financial information. ● Includes settlement of accounts, cost control, and tax handling. In the space sector, accounting for R & D expenses and international operations is required.
	Accounting Management	● The ability to analyze profitability and cost structure to help make management decisions. ● Responsible for departmental profit and loss, cost management, and budget formulation. Important in the space field, where there are many long-term development projects.
	Taxation	● The ability to file corporate and consumption taxes, respond to tax audits, and tax reduction measures. ● Responsible for handling taxes related to international transactions, research and development expenses, and subsidies.

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Skill (Finance and Accounting, Procurement, HR, Information System and Security)

Category	Skill item	Description
Finance and Accounting	Foreign Exchange and International Finance	● The ability to handle international finance such as payments and remittances in foreign currencies, forward exchange contracts, and issue letters of credit for transactions with overseas companies. ● In the space sector, this is essential for overseas procurement and contracts.
	Financing	● The ability to secure funding through various means such as debt, equity, and subsidies. ● In the space sector, it is important to have the ability to procure large investments, including investor negotiations, grant applications, and business planning.
	Budget and Fund Management	● The ability to prepare budgets and manage cash flow, and manage funds appropriately. ● Careful budget management is required for long-term space development projects.
	Public Fund Management	● The ability to manage public funds such as subsidies and commission fees in accordance with rules, and respond to reports and audits. ● In the space sector, compliance with institutional requirements is particularly important.
Procurement	Procured Goods Selection and Management	● The ability to select necessary parts and services, confirm specifications, select vendors, contract, delivery time, quality, and cost management. ● In the space sector, strict evaluation of highly reliable parts is required.
Human Resources	Adoption	● The ability to recruit and select according to human resource needs and hire appropriate personnel. ● Includes skills assessment of engineers and global recruitment.
	Human Resource Allocation and Evaluation	● The ability to evaluate the ability and aptitude of human resources and place them optimally according to the job. ● In the space sector, placement must take into account specialization and safety.
	Training and Education	● The ability to design development plans and provide training, on-the-job training, and pass on skills. ● In the space sector, it is important to support the acquisition of specialized knowledge and the early development of human resources from different industries.
	Labor Management	● The ability to improve the working environment by managing attendance, social insurance, health and safety, and dealing with labor and management. ● In the space sector, it is also important to deal with labor of foreign nationals.
Information System and Security	Information system	● The ability to introduce, operate, and maintain IT systems. ● Includes network management, server construction, business system introduction, and IT strategy formulation. In the space sector, operations of communication and control systems and satellite data management are important.
	Cyber Security (IT Systems)	● The ability to protect organizations and systems from cyber attacks and information leaks. ● Includes access rights management, threat analysis, security design, encryption, and incident response.
	Cyber Security (Space Systems)	● The ability to address threats specific to space systems, such as satellites and ground stations, and incorporate safety from the design stage. ● Includes advanced safety design, such as command authentication and encryption, anti-jamming and anti-spoofing, network isolation, RTOS vulnerability management, and countermeasures against fake commands.

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Skill (Basic skills and Domain Expertise)

Category	Skill Item	Description
Basic Skills	External Relation Creation	● The ability to build relationships of trust by negotiating and coordinating with diverse parties such as investors, governments, overseas partners, and local residents. ● In the space sector, it is important to respond flexibly with an understanding of systems and cultures, such as responding to launch range operations and international frameworks.
	Language Skills	● The ability to converse, write, and negotiate in a foreign language. ● In the space sector, advanced language skills are required, including handling international conferences, contracts, and coordinating with overseas customers.
	Preparation and Documentation of Data	● The ability to organize technical and business information and accurately document reports, manuals, and procedures. ● In the space sector, clearly communicate specialized information both domestically and internationally is required.
	Requirements Extraction and Organization	● The ability to organize user requirements, organizing them into functional and non-functional requirements, and build consensus with relevant parties. ● Important when clarifying requirements for complex space systems.
	Requirements and Specifications Preparation	● The ability to create requirements definitions and specifications. ● Organizing stakeholder requirements, utilizing requirements management tools, and creating specifications in compliance with international standards are required.
Domain Expertise	satellite System	● The ability to understand and apply key elements such as the overall satellite configuration, bus system, and payload to work. ● Grasp of new technologies and ability to respond to changes are required.
	Space Transportation System	● The ability to understand the configuration and functions of rockets and reusable vehicles, as well as propulsion, control, and ground equipment coordination. ● Utilizing technology trends in operations is required.
	Material Standard	● The ability to understand the characteristics and evaluation standards (ECSS, ASTM, JAXA standards, etc.) of space materials and utilize them in material selection and testing. ● Essential for ensuring reliability in space environments.
	Security	● The ability to understand security policy, international frameworks, and dual-use technology management and respond appropriately. ● In the space sector, it is important to protect sensitive information and respond to technology transfer regulations.
	Wireless Communication	● The ability to understand the principles of radio communications, frequency, modulation methods, antenna design, and apply them to satellite communications link design. ● Essential for stable communications with ground stations.
	Space Insurance	● The ability to understand insurance systems for space-specific risks such as launch, operation, and third-party liability, and select appropriate coverage. ● Risk assessment according to mission characteristics is important.
	Remote Sensing	● The ability to understand satellite orbits, sensor principles, and observation modes, and to apply them to data acquisition design according to observation objectives.

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Skill (Domain Expertise)

Category	Skill item	Description
Domain Expertise	Optical Sensor	● The ability to understand the structure, imaging principle, and design elements of optical sensors such as visible and infrared. ● Wavelength selection and performance optimization according to the object are required.
	SAR (Synthetic Aperture Radar) Sensor	● The ability to understand the principle, observation method, and application technology of SAR and apply it to terrain analysis and displacement measurement. ● Important to utilize the characteristics of all-weather and day-night observations.
	Geographic Information System (GIS)	● The ability to understand GIS operations and spatial data structures and integrate them with satellite data for analysis and visualization. ● Essential for utilizing spatial information in the space field.
	Surveying and Reading	● The ability to accurately understand position information and topography using knowledge of surveying and map reading. ● Important for confirming position accuracy of satellite data.
	Robotics	● The ability to understand actuators, sensors, and control technology and use them for remote control and autonomous control. ● Important for work and maintenance of spacecraft.
	Space Situational Awareness (SSA/SDA)	● The ability to understand and evaluate space conditions, including orbit tracking, debris analysis, and evasion decisions. ● Essential for ensuring the safety of satellite operations.
	Space Environment and Space Life Support	● The ability to understand the environmental conditions and technologies that support life in space. ● Important for long-term stays, including oxygen and temperature control and responses to psychological and physiological effects.
	Space Habitat and Structures	● The ability to understand the design concepts, safety, and functions of space structures. ● Knowledge of pressurized structures, shielding materials, and deployment structures is required.
	Resource Recovery Processes and Technologies	● The ability to understand resource recycling technologies that circulate water, air, energy, etc. ● Important for efficient resource management in closed environments.
	Crewed Safety	● The ability to understand safety design and operation in crewed space activities. ● Knowledge of fail-safe design and emergency escape is required.

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7. Task List

Positioning of the Task List

General task in the space industry is organized. Through this document, you can understand what task exists in the space industry.

Category	Subcategory	Unique number	Task item	Description of Task
Satellite Operation	Operation Design and Planning	96	Operation Concept Design	・The task of designing and documenting an operation concept (CONOPS) to clarify the operation policy of satellite systems. ・Specifically, it corresponds to the work to organize the operation purpose, assumed users, operation system, communication timing, assumed scenario, relationship with ground facilities, etc. and to form a common understanding among the parties concerned.
		97	Operation Planning	・Activity to formulate short-, medium-, and long-term operation plans for stable satellite operation and achievement of objectives. ・Specifically, this includes tasks such as coordinating communication schedules with ground stations, assigning tasks, managing budgets and resources, and evaluating and managing the feasibility of satellite tasks.
		98	Communication Network Design	・Architectural design, construction, and integration testing of terrestrial communications networks (Ground station, network, NOC (network operation center), link) required for satellite operation. ・Specifically, TT&C(Tracking, Telemetry, and Command) ・ Carry out payload communication link design, network topology and redundancy design, capacity planning for bandwidth and throughput, security design, equipment selection and introduction, interconnection testing with other companies and external ground stations, and availability and disaster countermeasure design.
		99	Frequency Ajustment	・The work of frequency adjustment in the frequency band used by satellites to prevent interference with other radio systems. ・Specifically, it covers tasks such as coordination with domestic and overseas frequency management organizations, interference prediction, preparation of application documents, and correspondence to coordination meetings.
		100	Radio License Application	・A service to carry out application procedures based on domestic and overseas systems to obtain licenses necessary for operating radio stations. ・Specifically, in Japan, it covers radio station licensing procedures based on the Radio Law, etc., and internationally, it covers operations to prepare applications, submit registrations, and claim rights to frequencies and orbits at international conferences in accordance with the ITU Radio Regulations (RR) and Rule of Procedure (RoP). ・In particular, in the space sector, the securing of orbital and frequency resources is the foundation of the business, so a high level of expertise is required in both institutional and technical aspects.
		101	Communication Schedule Management	・Management and adjustment of communication intervals for smooth communication between satellites and ground stations. ・Specifically, this corresponds to the task of optimizing the timing of telemetry acquisition and command transmission in consideration of the visible time of the satellite, the operation status of the ground station, the communication capacity, etc.
		102	Communication Network Construction	・Activity to build communication links between satellites and ground stations. ・Specifically, this corresponds to the task of ensuring stable transmission and reception conditions by controlling the antenna orientation according to the visible time of the satellite and setting the frequency, modulation method, and communication protocol.

Approach to the Field of Task

The Space Skills Standard divides tasks into two main categories: (1) Spacecraft Development Project and (2) Organizational Operations. Furthermore, ① is divided into two categories: "1-1. Cross-Project Tasks" and "1-2. Tasks by Process."

① Spacecraft Development Project

1-1. Cross-Project Tasks
Task involving multiple processes, such as progress management

Project Planning and Design
- Space Mission Planning
- Project Planning
- Lobbying
- New Technology Creation

Project Management
- Project Progress management
- Project Cost management
- Project Risk Management
- Project Structure and Personnel Management
- Project Safety Management
- Project Quality and Specification Management
- Stakeholder Management
- Traceability Management

1-2. Tasks by Process
Tasks by Process of space equipment development

Spacecraft Development
- Conceptual Design
- Structural Design
- Electrical Systems Analysis
- Communication Systems Testing etc.

Facilities and Equipment Management
- Fuel Storage Facility Management
- Ground Station Facility Management
- IT Infrastructure etc.

Launch Operation
- Range Operation Plan Formulation
- Airframe Loading
- Explanation to Related Organizations and Local stakeholders etc.

Satellite Operation
- Operation Concept Design
- Communication Network Design and Construction
- Mission execution etc.

Satellite Data Utilization
- Use Case Planning
- Data Analysis
- Insight Extraction etc.

② Organizational Operations

2. Organizational operations
Tasks as organizational functions, such as business and finance

Business Planning
- Management Strategy Formulation
- Business Alliance
- Overseas Expansion Strategy Planning and Coordination
- Utilization of Policies and Public Recruitment Systems Proposal

Sales
- Sales and Customer Relations
- New Customer Acquisition
- Technology Proposal and Planning

Marketing
- Marketing

Intellectual Property
- IP Strategy Planning etc.

Finance and Accounting
- Financial Management
- International Transaction Accounting etc.

Procurement
- Delivery Management
- Export Control and Security Trade Response etc.

Business Development
- Market and Customer Needs Survey
- Use Cases Planning and Proposal
- New Services Planning and Examination
- Business Model Study
- Service Specifications and Definition of Requirements Examination

Public Relations
- Public Relation Activities Formulation
- Branding and PR Strategy Formulation
- Overseas PR
- Eminence Activity
- Crisis Communications
- Investor Relations (Information Disclosure)

Inspection and Acceptance
- Acceptance Inspection and Document Inspection
- Inspection and Acceptance
- Shipping Inspection

Governance
- Organizational Governance Management
- Compliance Management
- Information Leakage Countermeasures
- Incident Response

Legal Affairs
- Contracts Preparation, Review, and Conclusion
- Response to Space-Related Legal Systems etc.

General Affairs
- Internal Regulation Development
- Contract and Document Management

Human Resource
- Recruitment
- Labor management
- Human Resource Development

Information Systems & Security
- Information System and Security Management
- Cyber Attack Countermeasures etc.

Task category

The Space Skills Standard summarizes 174 major tasks in the space industry and organizes them into 21 categories.

Task Category Name	Definition	Task item Example
Project Planning and Design	Projects related to the development of space vehicles and satellites operations related to start-up and planning	● Space mission planning, etc.
Project Management	Projects related to the development of space vehicles and satellites operations related to execution and operation	● Project progress management, risk management, etc.
Spacecraft Development and Manufacturing	Spacecraft development design, analysis, manufacturing, testing, etc.	● Structural design, data processing analysis, etc.
Ground Facility and Equipment Management	Operations related to the management of specific facilities, launch site facilities, and buildings themselves	● IT infrastructure management, facility structural integrity and safety management, etc.
Launch Operation	Operations related to the execution of space transport launch plans	● Range safety management, launch execution, etc.
Satellite Operation	Operations related to the planning and control of satellite operations, execution of satellite missions, and quality assurance of satellite data	● Operation concept design, mission execution, etc.
Satellite Data Utilization	Operations to analyze, process, and utilize images and observation data acquired from satellites	● Service design, data analysis, etc.
Business Planning	Planning of new businesses utilizing space technology and services	● Management strategy formulation, business alliances, etc.
Business development	Assessing customer needs and developing products and services into markets	● Market and customer needs survey, Business model study, etc.
Governance	Establish an organizational decision-making and supervision system to ensure compliance with laws and regulations Operations to ensure transparency	● Organizational governance management, compliance management, etc.
Sales	Sales promotion and customer relations for services and products	● Sales and customer relations, new customer acquisition, etc.

Task Category Name	Definition	Task item Example
Marketing	Market analysis, value promotion, and awareness expansion for space-related services and products	● Marketing
Public relations	Outreach task to communicate corporate activities internally and externally	● Branding and PR strategy formulation, crisis communication, etc.
Legal affairs	Compliance with laws and regulations, compliance, etc. Operations related to organizational laws and regulations	● Response to space-related legal systems, reparation, review, conclusion of contracts, etc.
Intellectual property	Operations related to organizational intellectual property management	● Intellectual property strategy planning, intellectual property rights management
General Affairs	Management of corporate affairs and departments, including development of internal rules	● Internal regulation development, contract and document management
Finance and accounting	Corporate cash management, economic transactions, and taxation Operations	● Financial management, tax processing, etc.
Procurement	Acquisition of external resources necessary for corporate production activities	● Procurement item selection, delivery management, etc.
Inspection and Acceptance	Confirmation and acceptance of deliveries and deliverables that meet required specifications	● Acceptance inspection and document inspection shipping inspection, etc.
Human Resource	Operations related to human resources, such as recruitment, development, evaluation, labor management, and organizational development	● Recruitment, labor management, human resource development
Information System and Security	Design, operation and maintenance of internal IT infrastructure, business systems and security measures	● Information systems and security management, etc.

1-1. Cross-Project Tasks

1-2. Tasks by Process

2. Organizational Operations

Cross-Project Tasks

Category	Task item	Description
Project Planning and Design	Space Mission Planning	● Organize the objectives you want to achieve in space, determine the necessary data and methods, and summarize the mission content.
	Project Planning	● Organize the schedule, costs, and resources required to achieve the objectives, and formulate an execution plan.
	Lobbying	● Coordinate with stakeholders and develop proposals to influence policies and institutions.
	New Technology Creation	● Identify and develop new technologies that are needed, and consider how to incorporate them into the project.
Project Management	Project Progress Management	● Monitor and control whether the project is progressing according to the planned schedule, and revise and optimize the plan as necessary.
	Project Cost Management	● Monitor and control whether the project is progressing according to the cost plan, and revise and optimize the budget and cost plan as necessary.
	Project Risk Management	● Identify and assess project risks, monitor their occurrence, and prevent them from materializing. In addition, when a risk occurs, measures will be taken based on the risk plan.
	Project Structure and Personnel Management	● Manage human resources in the project, and replace or reduce personnel as necessary.
	Project Safety Management	● Ensure the safety of space-related projects, review design and operation policies, and make improvements as necessary.
	Project Quality and Specification Management	● Define the rules for project promotion, the scope of activities, and the quality level of products such as systems and subsystems, etc., to carry out the project, and to carry out periodic checks, and to take necessary measures to meet the specified quality level.
	Stakeholder Management	● Control so that appropriate information is linked with stakeholders in the project.
	Traceability Management	● Record and manage products and components related to space equipment so that they can be tracked to which processes and deliverables.

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Tasks by Process (Spacecraft Development and Manufacturing)

Category	Subcategory	Task Item	Description
Spacecraft Development and Manufacturing	Development Management Overall Design	Conceptual Design (Entire System)	● Organize the requirements and configuration of the entire system and determine the basic mechanism to achieve the objectives.
		System Design (Overall System)	● Organize the specific design and operation of the entire system based on the determined requirements.
		Configuration Management	● Organize and manage the latest information on designs and parts to understand the impact of changes.
		Design Review	● Confirm that there are no problems with the design, and review to prevent development from returning to normal.
		Assembly	● Assemble components accurately to create subsystems and modules.
		Connect and Combine (Integration)	● Connect multiple subsystems and confirm that they work correctly as a whole.
		Product Quality Inspection and Quality Control	● Confirm that parts and materials meet the required quality and establish a system to prevent problems.
		Quality Audit Response	● Prepare for internal and external quality audits, organize records, and make improvements.
		Standardization	● Create rules and make improvements so that products and services meet standards.
		Production Control	● To manage production plans and progress in order to produce products with fixed quality, cost, and delivery dates.
		Manufacturing Process Control	● To arrange manufacturing procedures and processes, and to manage and improve to maintain quality and efficiency.
	Structural System	Structural System Design	● To design structures such as frames and outer plates so that the spacecraft can meet the required functions and strength.
		Structural System Manufacturing	● Based on design drawings, parts are made using appropriate materials and methods, and structures are assembled.
		Structural System Analysis	● Evaluate the structure by simulation to ensure that it can withstand conditions such as temperature and vibration.
		Structural System Testing	● Test to ensure that the materials, parts, and finished structure meet the required performance and safety.

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Tasks by Process (Spacecraft Development and Manufacturing)

Category	Subcategory	Task Item	Description
Spacecraft Development and Manufacturing	Mechanical System	Mechanical System Design	● Design mechanical systems of spacecraft and satellites to meet functional, performance, reliability, and safety requirements under given environmental conditions.
		Mechanical System Manufacturing	● Manufacture and assemble mechanical components and systems in accordance with design drawings and specified processes.
		Mechanical System Analysis	● Conduct simulations and analyses of mechanical systems to derive design solutions that satisfy performance, reliability, and environmental requirements.
		Mechanical System Testing	● Verify through testing that mechanical materials, components, and systems meet functional, performance, reliability, and safety requirements.
	Propulsion System	Propulsion System Design	● Design electrical and chemical propulsion systems to meet spacecraft operational objectives and required reliability and safety under specified environments.
		Propulsion System Manufacturing	● Manufacture and assemble propulsion system components using appropriate materials and fabrication methods based on design specifications.
		Propulsion System Analysis	● Perform simulations and analyses of propulsion systems to optimize designs against performance, reliability, and environmental constraints.
		Propulsion System Testing	● Test propulsion materials, components, and systems to confirm compliance with functional, performance, reliability, and safety requirements.
	Electrical System	Electrical System Design	● Design spacecraft electrical systems, including power generation, storage, distribution, and wiring, to meet operational, reliability, and safety requirements.
		Electrical System Manufacturing	● Manufacture, assemble, and install electrical components and systems in accordance with design drawings and standards.
		Electrical System Analysis	● Analyze and simulate electrical systems to optimize performance and ensure reliability and safety under specified environmental conditions.
		Electrical System Testing	● Verify that electrical systems meet functional, performance, reliability, and safety requirements from design through post-manufacturing stages.
	Communication System	Communication System Design	● Design spacecraft communication systems and networks to meet mission performance requirements and ensure reliability and safety under electromagnetic environments.
		Communication System manufacturing	● Manufacture and assemble communication system components based on approved designs and manufacturing processes.
		Communication System Analysis	● Analyze and simulate communication systems and networks to derive designs that satisfy performance, reliability, and electromagnetic requirements.
		Communication System Testing	● Test communication systems and networks to confirm they meet functional, performance, reliability, and safety requirements.

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Tasks by Process (Spacecraft Development and Manufacturing)

Category	Subcategory	Task Item	Description
Spacecraft Development and Manufacturing	Thermal Control System	Thermal Control System Design	● Design the thermal management method to cope with the temperature environment of the spacecraft.
		Thermal Control System Manufacturing	● Manufacture thermal control components based on the design drawings and perform the necessary assembly.
		Thermal Control System Analysis	● Simulate how temperatures change in the space environment to optimize designs.
		Thermal Control System Testing	● Test to confirm whether parts and systems operate correctly in the thermal environment.
	Control System (Attitude and Guidance)	Control System (Attitude and Guidance) Design	● Design of mechanisms to control the orientation and orbit of spacecraft.
		Control System (Attitude and Guidance) Manufacturing	● Manufacture and correctly assemble the components necessary for control.
		Control System (Attitude and Guidance) Analysis	● Evaluate by simulation whether attitude and guidance control works correctly in the environment.
		Control System (Attitude and Guidance) Testing	● Confirm by testing whether the manufactured control system satisfies performance and safety.
	Onboard Data Handling System	Onboard Data Handling System Design	● Design of computer system for satellite condition monitoring and communication.
		Onboard Data Handling System Manufacturing	● The parts necessary for data processing are manufactured and assembled into a system.
		Onboard Data Handling System Analysis	● Whether the data processing system operates normally in the environment is confirmed by simulation.
		Onboard Data Handling System Testing	● Whether the created data processing system satisfies the required performance is confirmed by test.
	Software System	Software System Design	● Design embedded software that controls each subsystem and optimally operates the whole spacecraft.
		Software System Manufacturing	● Create software based on the design and integrate necessary functions.
		Software System Analysis	● Evaluate by simulation whether the software works correctly in the assumed environment.
		Software System Testing	● Test whether the integrated software satisfies performance and safety.

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Tasks by Process (Spacecraft Development and Manufacturing, Ground Facility and Equipment Management)

Category	Subcategory	Task item	Description
Spacecraft Development and Manufacturing	Mission System	Mission System Design	● Design the mechanism of the mission equipment according to the purpose of observation and communication.
		Manufacturing of Mission Systems	● Make mission equipment parts and assemble them as designed.
		Analysis of Mission Systems	● Use simulations to confirm whether mission equipment works properly under environmental conditions.
		Testing of Mission Systems	● Use tests to confirm whether completed mission equipment meets performance and safety requirements.
Ground Facility and Equipment Management	Equipment Management	Fuel Storage Management	● Manage the condition and environment of facilities to safely store propellants and high-pressure gases.
		Transport Management	● Manage the inspection and operation of transfer facilities to safely transport spacecraft and equipment.
		Launch Site Management	● Check and maintain launch pads and fuel supply facilities to ensure safe use of launch facilities.
		Ground Station Management	● Maintain and manage ground station facilities for communication with spacecraft so that they can be used stably.
		IT Infrastructure Management	● Manage information systems and networks used in spacecraft operations so that they operate safely and stably.
		Automation of Maintenance Systems	● Establish a system to automate inspection, monitoring, and other tasks and to streamline facility operations.
	Facility Management	Management of Facilities and Assembly Buildings	● Maintain work environment and safety by managing facilities for spacecraft assembly and maintenance.
		Facility Structural Integrity and Safety Management	● Prepare for risks in the event of a disaster by inspecting and repairing buildings to keep them in safe working condition.

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Tasks by Process (Launch Operation)

Category	Subcategory	Task item	Description
Launch Operation	Pre-adjustment	Range Operation Plan Formulation	● Organize equipment, personnel, and procedures to safely proceed with launch operations, and create an overall schedule.
		Range Safety Management	● In order to maintain the safety of operations, we will establish a system for permitting and inspecting, and safely control daily operations.
		Range Security Management	● We will manage access to the launch range and information protection to ensure the safety of equipment.
		International Coordination and Export Control Operation	● We will respond to international procedures and export controls to ensure the safe use of technology.
		Flight Range Safety Assurance	● We will confirm the safety of the flight route and surrounding areas and create safety plans to prevent dangers during launch.
		Prior Coordination With Relevant Organizations and Local Stakeholders	● We will coordinate aviation and maritime safety and the impact on the region, and provide necessary communications and explanations.
		Meteorological Observation	● To observe and analyze weather conditions such as thunder and wind in order to determine whether or not to launch.
		Fall Position Simulation	● To predict where rocket parts will fall and share information with relevant organizations.
	Launch Operation	Equipment Inspection	● To confirm whether launch equipment operates normally and to conduct necessary inspections and tests.
		Airframe Loading	● To carry the rocket to the assembly building and carry out necessary preparatory work.
		Airframe Acceptance Inspection	● Check for any damage or malfunction on the delivered rocket.
		Satellite Integration and Inspection	● Attach the satellite to the rocket and make a final check on whether the separation mechanism and other components work properly.
		Spacecraft Integration and Inspection	● Connect the rocket systems and check whether the electricity, structure, and propulsion work properly.
		Spacecraft Transfer and Installation	● Carry the rocket to the launch pad, connect it to the equipment, and fix it in place.
		Fuel Filling	● In preparation for launch, fuel and oxidizer will be injected and leakage and pressure will be checked.

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Tasks by Process (Launch Operation, Satellite Operation)

Category	Subcategory	Task item	Description
Launch Operation	Launch Operation	Launch Decision	● GO/NOGO judgment is performed, and the final operation from countdown to launch command is performed.
		Communication Status Understanding	● Execute the spacecraft launch by issuing final go/no-go decisions, conducting countdown operations, and commanding the launch sequence.
		Launch Execution	● Monitor and manage post-launch safety around the launch site by confirming hazards and executing emergency responses as necessary.
		Surroundings Safety Management	● After launch, ensure safety by checking for fires and falling objects in the vicinity.
		Explanations to Related Organizations and Local Stakeholders	● Report and explain launch results and impacts to related organizations and local stakeholders.
	Spacecraft Operation After Launch	Launch Data Analysis	● Evaluate behavior, performance, and presence of abnormalities by analyzing acquired data.
		Separation Confirmation and Recording	● Confirm and record the separation status of each stage and satellite with data.
		Descent Tracking and Control	● Ensure safe descent by tracking the fall of separated parts.
		Spacecraft Maintenance and Inspection	● Check the condition of recovered spacecrafts and determine if they can be reused.
Satellite Operation	Operation Design and Planning	Operation Concept Design	● Organize the basic policy of satellite operation and summarize the direction of the entire operation.
		Operation Planning	● Make short- and long-term plans for satellite operation and coordinate communications and operations.
		Communication Network Design	● Design and maintain terrestrial networks necessary for satellite operation.
		Frequency Adjustment	● Adjust frequencies in and out of Japan to avoid interference with other systems.
		Radio License Application	● Perform application procedures to obtain licenses required for satellite communications.
		Communication Schedule Management	● Adjust communication time zones with satellites to optimize data reception and command transmission.
		Communication Network Construction	● Set up and control antennas so that satellites and ground stations can communicate stably.

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Tasks by Process (Satellite Operation, Satellite Data Utilization)

Category	Subcategory	Task item	Description
Satellite Operation	Operational Control	Satellite Communications Network Management	● Monitoring the satellite communication network to prevent communication failures through antenna control and radio wave confirmation.
		Satellite Airframe Condition Monitoring	● It uses telemetry to check the status of the satellite, including power, temperature and attitude, in real time.
		Posture Maintenance	● Maintains the orientation of the satellite and adjusts its attitude as necessary.
		Orbit Control	● Monitors the satellite to keep it in the correct orbit and corrects its orbit as necessary.
		Other Orbital Objects Monitoring	● Analyzes orbit information to determine the necessity of avoidance to avoid collisions with other space objects.
	Mission Operation	Observation Demand Adjustment	● Organizes user observation requests and coordinates with satellite operation plans to determine schedules.
		Mission Execution	● Send commands to the satellite and execute missions such as imaging and data acquisition.
		Disposal Operation	● At the end of satellite operation, send commands to deorbit or shut down the satellite and dispose it safely.
	Data Quality Assurance	Calibration Verification	● Confirm whether the acquired data meets specifications and verify whether there are any abnormalities.
		HK Data Processing	● Analyze HK data such as temperature and voltage to determine the soundness and abnormalities of the satellite.
Satellite Data Utilization	Utilization Design	Use Case Planning	● Organize the purpose of utilizing satellite data and plan the usage methods and needs for each field.
		Service Design	● Design the mechanisms, fees, and delivery methods for services using satellite data.
	Data Analysis	Image Analysis Algorithms Design	● Design algorithms for classification and detection to analyze satellite images.
		Training Data Preparation	● Label satellite images to create teacher data for machine learning.
		Data Quality Control	● Set and check quality standards to maintain the accuracy and consistency of satellite data.
		Preprocessing	● Correct and remove noise from satellite images to make data easy to analyze.
		Data Analysis	● Process and analyze satellite data to extract necessary information and create valuable data.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Tasks by Process (Satellite Data Utilization)

Category	Subcategory	Task item	Description
Satellite Data Utilization	Application Development	Application Planning and Requirements Definition	● Organize and plan the purpose and necessary functions of applications that use satellite data.
		UI/UX design	● Design screens and operation methods so that users can easily use them.
		PoC and Use Support	● Conduct demonstration experiments and technical support to confirm the practicality of services.
		Operation and Maintenance	● Monitor, update, and handle failures to ensure stable operation of apps.
	Insight Extraction	Insight Extraction	● Organize analysis results and compile valuable information as reports and suggestions.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Organizational Operations (Business Planning, Business Development, Governance, Sales)

Category	Subcategory	Task item	Description
Business planning	–	Management Strategy Formulation	● Organize future priority areas and directions and formulate long-term strategies.
		Business Alliance	● Establish and promote cooperative relationships with other companies, universities, and research institutes.
		Overseas Expansion Strategy Planning and Coordination	● Develop strategies to promote overseas business and establish a system for cooperation with local entities.
		Utilization of Policies and Public Recruitment Systems Proposal	● Research and support plans and applications for utilization of systems such as subsidies and outsourced projects.
		Market and Customer Needs Identification	● Research customer and market needs to identify potential issues and demands.
Business development	–	Use Case Planning and Proposal	● Consider service usage examples and summarize proposals that are easy to understand for customers.
		New Services Planning and Examination	● Consider new service ideas based on social issues and needs.
		Business Model Study	● Organize what to provide to which customers and how to provide it, and consider business mechanisms.
		Service Specifications and Definition of Requirements	● Organize functions and qualities required for services, and compile requirements for development.
		Organizational Governance Management	● Organize decision-making and operational rules for the organization, and maintain an appropriate system.
Governance	–	Compliance Management	● Establish and operate systems to comply with laws and internal rules.
		Information Leakage Countermeasures	● Manage confidential information to prevent it from being leaked, and conduct education and monitoring.
		Incident Response	● When an accident or trouble occurs, investigate the cause, limit the impact, and prevent recurrence.
		Sales and Customer Relations	● Develop relationships with customers, make proposals, and adjust contracts.
Sales	–	New Customer Acquisition	● Approach new customers and propose services and products.
		Technology Proposal and Planning	● Plan and propose solutions using technology for customer issues.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Organizational Operations (Marketing, PR, Legal Affairs, Intellectual Property, General Affairs)

Category	Subcategory	Task item	Description
Marketing	–	Marketing	● Research the market and customer needs, and conduct analysis and measures useful for business strategy.
Public Relations	–	Public Relation Activities Formulation	● Disseminate corporate information, raise awareness and respond to the media.
		Branding and PR Strategy Formulation	● Plan corporate brands and public relations policies, and develop strategies to convey attractiveness.
		Overseas PR	● Raise international trust by disseminating information overseas.
		Eminence Activity	● Disseminate the expertise of companies and engineers through lectures and paper presentations.
		Crisis Communication	● Provide accurate and prompt public relations in the event of accidents or problems.
		Investor Relations (Information Disclosure)	● Disclose business conditions and risks to investors in an easy-to-understand manner.
Legal Affairs	–	Contract Preparation, Review and Conclusion	● Create, review, and conclude contracts to ensure legal consistency.
		Compliance with Export and Security Trade	● Comply with export controls on products and technologies to ensure thorough security controls.
		Response to Space-Related Legal Systems	● Responds to laws and permits related to space activities and coordinates with government agencies.
Intellectual Property	–	Intellectual Property Strategy Planning	● Formulates strategies to protect and utilize technologies and patents.
		Intellectual Property Rights Management	● Protects technologies by acquiring, renewing, and managing patents and trademarks.
General Affairs	–	Internal Regulation Development	● Develop company regulations and rules to support safety and information management.
		Contract and Document Management	● Store and manage contracts and internal documents, and handle access and updates appropriately.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Organizational Operations (Finance and Accounting, Procurement, Inspection and Acceptance)

Category	Subcategory	Task Item	Description
Finance and Accounting	Financial Strategy	Financial Management	● Manage the procurement and management of funds to maintain a sound financial position.
		Financing	● Securing necessary funds from investors and subsidies.
	Accounting Control	Accounting Management	● Managing income and expenditure for each project or project and understanding profitability.
		Accounting for Subsidies and Government Funds	● Accounting for government funds, including the management and reporting of subsidies.
		International Transaction Accounting	● Accounting and tax handling for overseas transactions.
	Taxation	Tax Processing	● Calculate and declare company taxes and pay taxes appropriately.
Procurement	–	Procurement Items Selection	● Select necessary parts and materials from those that meet standards and select appropriate suppliers.
		Purchase Order Management	● Confirm necessary specifications and delivery dates, and order and manage parts and services.
		Delivery Management	● Confirm deliverables and delivery dates, and respond to delays and defects.
		Export Control and Security Trade Response	● Appropriately manage parts and technologies in accordance with export regulations.
		Procurement Cost and Performance Management	● Manage procurement costs and identify differences from budget.
Inspection and Acceptance	–	Acceptance Inspection and Document Inspection	● Check product inspection and package inserts to check quality and specifications.
		Inspection and Acceptance	● Check quality and specifications of delivered goods and inspect for defects.
		Shipping Inspection	● Final confirmation that the product meets the standards before shipment.

***Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.**

Organizational Operations (HR, Information System and Security)

Category	Subcategory	Task item	Description
Human Resources	–	Recruitment	● In order to secure the necessary human resources, we handle everything from recruitment planning to interviews and task offers.
		Labor Management	● Manage working conditions, safety and health, and create a comfortable working environment.
		Human Resource Development	● Support employee skill improvement and growth through training and on-the-job training.
Information System and Security	–	Information Systems and Security Management	● Perform security operations and incident response to protect information assets and systems.
		Information Security Policy Formulation and Operation	● Create rules to protect confidential information, and conduct education and audits.
		Cyber Attack Countermeasures	● Monitor, defend, and respond to incidents to prevent external attacks.

*Detailed descriptions can be found in the Excel Space Skills Standard. Descriptions are simplified in this document.

8. Other Reference Materials

Skill Level Evaluation Axis

The Space Skills Standard provides "four evaluation axes" and "five levels" for each skill item, so that users can use them as indicators of skills. Four evaluation axes are provided, and users can select and choose according to their needs.

#	Evaluation Axis	Definition	Contents	Example of selection
1	Applicable range and depth	Scope and depth in which the relevant skills are to be demonstrated	● The policy for setting the level is to evaluate whether a person has basic knowledge, whether he/she can perform partial work, whether he/she can perform overall work, whether he/she can manage overall processes, and whether he/she can perform advanced work such as introducing new technologies and proposing system improvements.	**To clarify what a person can do** • Defining Human Resource Requirements (Corporate Recruitment Officer) • Resume/Job Experience (Individual) • Design internal human resource development roadmap • Personnel evaluation (tasks and roles) • Design educational programs and courses
2	Independence	The ability to perform tasks and make decisions and respond to situations	● When performing tasks (explaining knowledge), evaluate whether guidance is required, whether supervision is required, whether the task can be performed independently, whether the task can involve others in making decisions and decisions, and whether the task can provide guidance.	**When determining the extent to which a task can be entrusted** • Human resource requirements definition (Corporate Recruitment Officer) • Internal human resource development roadmap design • Personnel evaluation (Evaluation of promotion and role expectations) • Potential evaluation of inexperienced human resources from different industries • Educational program and course design (Knowledge and understanding)
3	Qualifications and Tests	Level of the relevant qualification	● Evaluate whether the applicant has the relevant qualifications or certifications for each level. Although not a qualification or certification, indicate whether the applicant has taken a skill training course.	**When the applicant wants to show objectively that the applicant has met a certain level** • Resume (individual) • Educational program and course design • Skill visualization and trail management within the company
4	Years of Experience	Length of experience	● Evaluate the number of years of experience in the work related to the skill, such as having work experience, 1 year or more of work experience, 3 years, 5 years, or 7 years.	**When you want to indicate the amount of accumulated experience as a guideline** • Defining human resource requirements (as reference conditions) • Creating an in-house human resource development roadmap (as a guideline)

Use of Skill Level Evaluation Axes

The skill level evaluation axis is assumed to be selected and used by the user. It is not necessary to use all evaluation axes.
Recommend to use appropriate evaluation axes according to your situation.

Examples of Skill Levels (Examples of Structural Design and Analysis)

There are five levels for the four evaluation axes of skill levels. For the levels of other skill items, please refer to the attached Excel file.

[Scope and depth of coverage]
Level 1 is a state of having background knowledge through classroom learning

[Scope and depth of coverage]
As you move up in level, use your skills
The breadth and depth of what you can handle increases

[Independence]
Whether assistance is required for the work to be performed while utilizing the skills, and whether the work can be performed independently

Skill item	Evaluation axis	Skill level				
		1	2	3	4	5
Structural design and analysis	Applicable range and depth	Understands basic concepts of structural design and analysis, Material properties, and typical design and analysis methods.	The ability to use existing design drawings and analysis results to perform design and analysis based on requirements for systems and components.	The ability to define requirements for systems and components based on design requirements for the overall system, and perform design and analysis flexibly.	The ability to reflect technical requirements in the design and analysis of individual systems and components, as well as the overall system design.	They can design and analyze new technologies and advanced missions by defining their own requirements.
	Independence	They can work only under the general assistance of their superiors. They can work only under the supervision and partial assistance of their superiors. They can work on their own.	Supervision of the Superior and with partial assistance. They can work on their own.	They can work on their own.	They can work on their own judgment and decision-making. They can work on their own.	Based on their own decision-making Able to lead organizations and teams Able to provide guidance on business operations.
	Qualifications and Tests	・2D CAD Engineer Test, Grade 2	・3D CAD Engineer Test, Grade 2 ・Mechanical Design Engineer Test (Grade 3)	・3D CAD Engineer Test, Grade 1 ・CAE Engineer Qualification, Grade 2 ・Mechanical Design Engineer Test (Grade 2)	・3D CAD Engineer Certification, Grade 1 ・CAE Engineer Qualification, Grade 1 ・Mechanical Design Engineer Examination, Grade 1	・Professional Engineer
	Years of Experience	Have work experience.	Have at least one year of work experience.	Have at least three years of work experience.	Have at least five years of work experience.	Have at least seven years of work experience.

[Qualifications and certifications]
Major qualifications and certifications for reference

[Years of experience]
Years of experience in performing work while utilizing those skills
*Only as a guide

Programs for Skill Acquisition

Information on programs related to space human resource development conducted by companies, organizations and educational institutions is provided as reference information.
You can refer to programs corresponding to skill items and use them to improve your skills.

Seminar | **Internship** | **Skill training** | **Hands-on Training**

Category	#	Activity Name	Overview of Activities	Activity Details	Link (1)	Link (2)	Examples of target skill items
Joint Experiment	1	Student Experiment	Large-scale experiments on launch and ball release, such as rockets and can-sats. Universities and university students across the country will cooperate to carry out the event.	【Schedule】 It depends on the venue. 【Venue】 Noshiro Space Plaza (Asanai Slag Deposit Site 3, Akita Prefecture) Izu Oshima and Kada Other	–	–	・Integrated Project Management ・Time Management ・Systems Engineering ・Structural Design and Analysis ・Aerodynamic Design and Analysis ・Assembly ・Welding ・Product Inspection
Competition	2	Space Koshien	High school students can participate in can-sat, rockets, stratospheric balloons, etc. (junior high school students can also participate in rockets) Competitions and collaborative experiments.	・Can Sat/Rocket 【Schedule】 Around 9~ 12: local Competitions, January to March: national Competitions ・stratospheric balloon 【Schedule】 September: Nationwide joint experiment; March: Worldwide joint experiment 【Venue】 Japan: Ehime Prefecture; World: Mongolia	–	–	・Integrated Project Management ・Stakeholder Management ・Systems Engineering ・Structural Design and Analysis ・Aerodynamic Design and Analysis ・Assembly ・Welding ・Product Inspection
Course	3	UNISEC Academy Practical Space Engineering Course	"Acquisition of basic knowledge" and "Solution of problems in actual development" are necessary for the design, manufacture and operation of microsatellites. Online course focusing on "contribution" (in Japanese).	【Location】 Online 【Time】 year-round 【Contact】 unisec-academy【at】unisec.jp (replace【at】with @ and send)	https://unisec.jp/service/lecture	-	・Project Planning ・Service Design ・Integrated Project Management ・Production Management ・Manufacturing Process Management ・Standardization ・Configuration Management ・Systems Engineering ・Model-Based Development ・Structural Design and Analysis
Course	4	KiboCUBE Academy	"Acquisition of basic knowledge" and "Solution of problems in actual development" are necessary for the design, manufacture and operation of microsatellites. Online course (English) focusing on "contribution."	【Location】 Online 【Time】 year-round 【Contact】 info-jcube【at】unisec.jp (replace【at】with @ and send)	https://ma.unisec.jp/ma/12-01-kibocube/	https://www.unoosa.org/oosa/en/ourwork/access2space4all/KiboCUBE_Academy_Webinars.html	・Project Planning ・Service Design ・Integrated Project Management ・Production Management ・Manufacturing Process Management ・Standardization ・Configuration Management ・Systems Engineering ・Model-Based Development ・Structural Design and Analysis
online seminar	5	Noticing Seminar Space University	This seminar has been held every month for about five years by top leaders in the space industry, including JAXA, university professors, space ventures, space law experts, and space student organizations. Space transportation, lunar exploration, crewedspace, space law, etc. By dealing with a wide range of subjects regardless of the field, it broadens the entrance of interest in space. The participants range from large companies to small and medium-sized companies, schools, government officials, and students. Also, by opening the archive to a video distribution service, anyone with an internet connection can participate. It provides quality learning about the space industry and the space industry and provides opportunities for career designing.	【Schedule】 1~2 times per month 【Venue】 Online	https://spaceuniversity.jp/	–	・Security ・Space Insurance ・Space Environment and Space Life Support ・Space Habitat and Structures ・CrewedSafety ・Training and Education ・Image Processing and Analysis ・Resource Recovery Processes and Technologies

Specific "How to Read" and "How to Use"

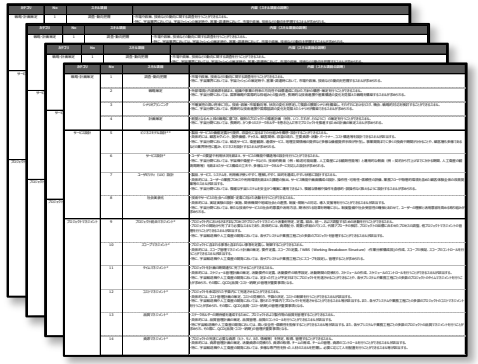
Please refer to the separate "Owner's Manual" for specific "How to Read" and "How to Use."

GIM (This Document)

This is a brief overview of the contents of the Space Skills Standard. Even if you do not refer to the Excel file on the right, reading this book will give you a rough overview of the Skills Standard.

User Guide

This document explains the background to the development of the Space Skills Standards, as well as specific instructions on how to read and use them. Please refer to this document when using Space Skills Standard.



Space Skills Standards (Detailed Excel File)

This is a detailed version of the Space Skills Standards, providing specific and detailed information about skills, tasks, and skill levels.

Readers are recommended to use this document after reading the User Guide.

Career Path Examples

This document summarizes the career paths of people active in the space industry. Please use this document as a reference when designing your career.

National Space Policy Secretariat of the Cabinet Office