Official Skill Book for Japan’s Space Industry

Space Skills Standard User Guide

February 27th 2026

Positioning and Terms for Use of the Document

Positioning

- This document serves as an “instruction manual” for the Space Skills Standard, explaining the background and purpose behind the development of the standard, the conceptual approach used to structure it, and the various use cases for utilizing it.

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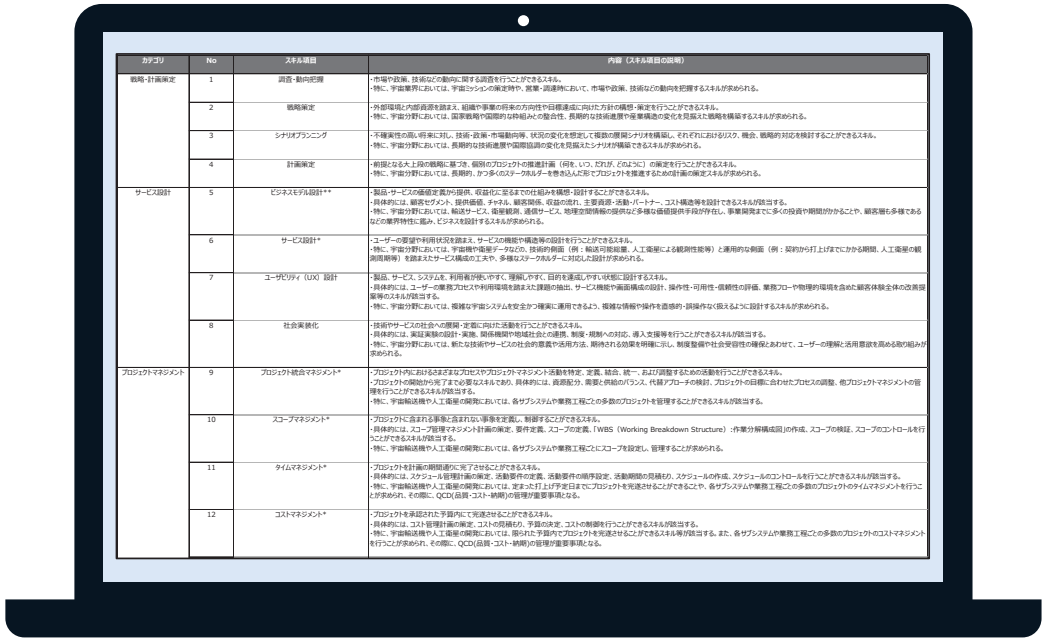
Contents

Summary

What is the Space Skills Standard?

The Space Skills Standard is an official skill book that systematically organizes and visualizes the skill requirements needed in Japan’s space development sector.

A Standardized Skill Book for Japan’s Space Industry



カテゴリ	No	スキル項目	内容（スキル項目の説明）
戦略・計画策定	1	調査・動向把握	・市場や政策、技術などの動向に関する調査を行うことができるスキル。 ・特に、宇宙業界においては、宇宙ミッションの策定時や、営業・調達時において、市場や政策、技術などの動向を把握するスキルが求められる。
	2	戦略策定	・外部環境と内部資源を踏まえ、組織や事業の将来の方向性や目標達成に向けた方針や構想・施策を行うことができるスキル。 ・特に、宇宙分野においては、国家戦略や国際的な枠組みとの整合性、長期的な技術進歴や産業構造の変化を見据えた戦略を構築するスキルが求められる。
	3	シナリオプランニング	・不確実性の高い将来に対し、技術・政策・市場動向等、状況の変化を想定して複数の展開シナリオを構築し、それぞれにおけるリスク、機会、戦略的対応を検討することができるスキル。 ・特に、宇宙分野においては、長期的な技術進歴や国際協調の変化を見据えたシナリオが構築できるスキルが求められる。
	4	計画策定	・前提となる大上段の戦略に基づき、個別のプロジェクトの推進計画（何を、いつ、だれが、どのように）の策定を行うことができるスキル。 ・特に、宇宙分野においては、長期的、かつ多くのステークホルダーを巻き込んだ形でプロジェクトを推進するため計画の策定スキルが求められる。
サービス設計	5	ビジネスモデル設計**	・製品・サービスの価値定義から提供、収益化に至るまでの仕組みを構想・設計することができるスキル。 ・具体的には、顧客セグメント、提供価値、チャネル、顧客関係、収益の流れ、主要資源・活動・パートナー、コスト構造等を設計できるスキルが該当する。 ・特に、宇宙分野においては、輸送サービス、衛星観測、通信サービス、地理空間情報の提供など多様な価値提供手段が存在し、事業開発までに多くの投資や期間が伴うことや、顧客層も多様であるなどの業界特性に鑑み、ビジネスを設計するスキルが求められる。
	6	サービス設計*	・ユーザーの要望や利用状況を踏まえ、サービスの機能や構造等の設計を行うことができるスキル。 ・特に、宇宙分野においては、宇宙機や衛星データなどの、技術的側面（例：輸送可能能量、人工衛星による観測性能等）と運用的な側面（例：契約から打上げまでにかかる期間、人工衛星の観測周期等）を踏まえたサービス構成の工夫や、多様なステークホルダーに対応した設計が求められる。
	7	ユーザビリティ（UX）設計	・製品、サービス、システムを、利用者が使いやすく、理解しやすく、目的を達成しやすい状態に設計するスキル。 ・具体的には、ユーザーの業務プロセスや利用環境を踏まえた課題の抽出、サービス機能や画面構成の設計、操作性・可用性・信頼性の評価、業務フローや物理的環境を含めた顧客体験全体の改善提案等のスキルが該当する。 ・特に、宇宙分野においては、複雑な宇宙システムを安全かつ確実に運用できるよう、複雑な情報や操作を直感的・誤操作なく扱えるように設計するスキルが求められる。
	8	社会実装化	・技術やサービスの社会への展開・定着に向けた活動を行うことができるスキル。 ・具体的には、実証実験の設計・実施、関係機関や地域社会との連携、制度・規制への対応、導入支援等を行うことができるスキルが該当する。 ・特に、宇宙分野においては、新たな技術やサービスの社会的意義や活用方法、期待される効果を明確に示し、制度整備や社会受容性の確保とあわせて、ユーザーの理解と活用意欲を高める取り組みが求められる。
プロジェクトマネジメント	9	プロジェクト統合マネジメント*	・プロジェクト内におけるさまざまなプロセスやプロジェクトマネジメント活動を特定、定義、結合、統一、および調整するための活動を行うことができるスキル。 ・プロジェクトの開始から完了までに必要なスキルであり、具体的には、資源配分、需要と供給のバランス、代替アプローチの検討、プロジェクトの目標に合わせたプロセスの調整、他プロジェクトマネジメントの管理を行うことができるスキルが該当する。 ・特に、宇宙輸送機や人工衛星の開発においては、各サブシステムや業務工程ごとの多数のプロジェクトを管理することができるスキルが該当する。
	10	スコープマネジメント*	・プロジェクトに含まれる事象と含まれない事象を定義し、制御することができるスキル。 ・具体的には、スコープ管理マネジメント計画の策定、要件定義、スコープの定義、「WBS（Working Breakdown Structure）：作業分解構成図」の作成、スコープの検証、スコープのコントロールを行うことができるスキルが該当する。 ・特に、宇宙輸送機や人工衛星の開発においては、各サブシステムや業務工程ごとにスコープを設定し、管理することが求められる。
	11	タイムマネジメント*	・プロジェクトを計画の期間通りに完了させることができるスキル。 ・具体的には、スケジュール管理計画の策定、活動要件の定義、活動要件の順序設定、活動期間の見積もり、スケジュールの作成、スケジュールのコントロールを行うことができるスキルが該当する。 ・特に、宇宙輸送機や人工衛星の開発においては、定まった打上げ予定日までにプロジェクトを完遂させることができるとや、各サブシステムや業務工程ごとの多数のプロジェクトのタイムマネジメントを行うことが求められ、その際に、QCD(品質-コスト-納期)の管理が重要事項となる。
	12	コストマネジメント*	・プロジェクトを承認された予算内にて完遂させることができるスキル。 ・具体的には、コスト管理計画の策定、コストの見積もり、予算の決定、コストの制御を行うことができるスキルが該当する。 ・特に、宇宙輸送機や人工衛星の開発においては、限られた予算内でプロジェクトを完遂させることができるスキル等が該当する。また、各サブシステムや業務工程ごとの多数のプロジェクトのコストマネジメントを行うことが求められ、その際に、QCD(品質-コスト-納期)の管理が重要事項となる。

- A **skill book** that systematizes and visualizes the standard skills required in the field of space development.
- Can serve as a **guiding framework** in a wide range of contexts, including skills enhancement, career-path design, and human-resource development within companies and educational institutions.
- Developed with the aim of clarifying required skills, promoting the inflow of talent, **and strengthening the overall human-resource foundation** of the space industry.

Main Components

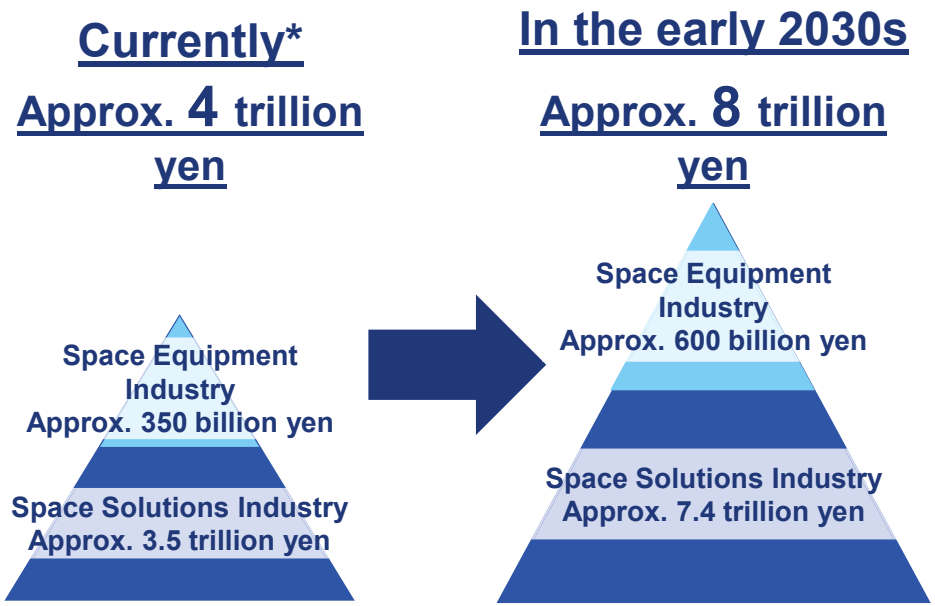
- List of skills required in the space industry
- List of tasks essential to the space industry
- A list of typical roles within the space industry
- A set of skill-level definitions for assessing proficiency in each skill
- A collection of programs and courses for skill acquisition
- Examples of career paths

1. Background and Purpose of the Space Skills Standard

The Importance of Securing Human Resources

In the Basic Plan on Space Policy, the Japanese government aims to double the size of the space-related market over the next decade. As the industry expands, securing sufficient human resources has become essential.

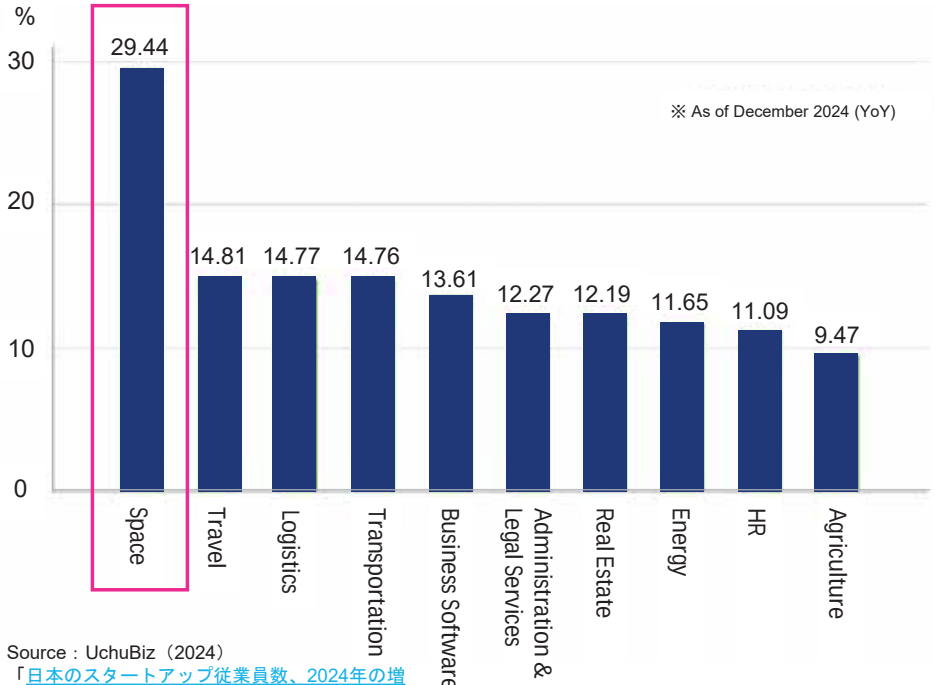
Scale of Japan's Space Industry



∗ "Current" refers to June 2023, the time of the revision of the Basic Plan on Space Policy

Source：From the website of the Cabinet Office（Seen on Jan 20th 2026）

Growth rates of Employment by Sector



Source：UchuBiz（2024）
「日本のスタートアップ従業員数、2024年の増加率1位は「宇宙産業」–ケップルが動向を解説 – UchuBiz」

Although the space industry ranked first in employee growth among Japanese startups in 2024, many space-related startups continue to claim a shortage of talent as a major challenge.

Human Resource Challenges and Proposed Solutions

To sustain the industry's growth, it is an urgent priority to advance efforts in education, talent mobility, and the development of supportive institutional and organizational frameworks.

1. Challenges Faced by Space-Related Companies

- **Not effectively communicating** the desired talent profiles and skill requirements to potential candidates
- More profitable business units are prioritized, resulting in difficulty attracting the talent they need

2. Challenges Faced by Talent in Other Industries

- The perception that **the space industry requires highly advanced technical expertise** removes it from a viable career option
- Individuals often **find it difficult to assess whether their own skill levels would be applicable in the space industry**

3. Challenges Faced by Students

- Without knowing concrete jobs in the industry, students tend to **seek employment in industries that feel more familiar or accessible.**
- The perception that **the space industry requires highly advanced technical expertise** removes it from a viable career option

4. Challenges Faced by Foreign Talents

- Difficult to demonstrate that they are qualified to work in Japan's space industry in terms of language proficiency or technical skills
- **Security-related and administrative barriers that complicate the recruitment** of foreign talents

The shortage of human resources not only hampers development and manufacturing activities but also risks triggering further operational dysfunction across the industry.

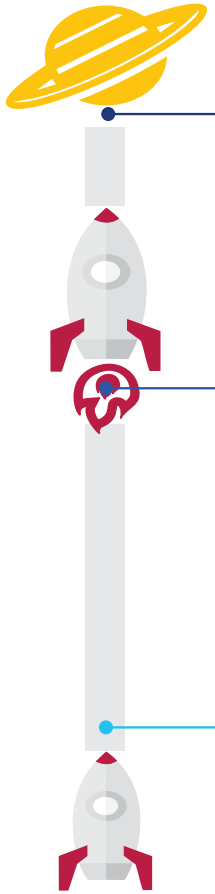
- Shortage of personnel in leadership positions
- Outflow of the next generation of leaders
- Lack of time for mentoring junior personnel due to heavy operational workloads
- Frequent dual-role assignments and the resulting person-dependence of tasks

Promoting "employment among students and talents from other industries" and "educating space-related human resources" are indispensable.

Source : National Space Policy Secretariat 「Survey Results on Human Resource Challenges in the Space Industry」 （Seen on 2025 March 19th）
https://www8.cao.go.jp/space/skill/questionnaire.pdf

Positioning of the Space Skills Standard

The ultimate goal is to strengthen the human-resource foundation of Japan's space industry. The development of the Space Skills Standard is positioned as the first step toward achieving this objective.



【Goal】Strengthening the Human-Resource Base of the Space Industry

- The inflow of talent from other industries accelerates.
- Individuals possessing the advanced competencies required in the space sector are effectively developed.
- The mobility of human resources within the industry increases.

Step2 : Implementation of the Standard

- Corporate recruitment, personnel assignment, and performance evaluation processes become more efficient and sophisticated
- The Standard give rise to certification examinations and educational programs based on the defined competencies.
- New talent-placement and consulting services emerge, utilizing the Standard

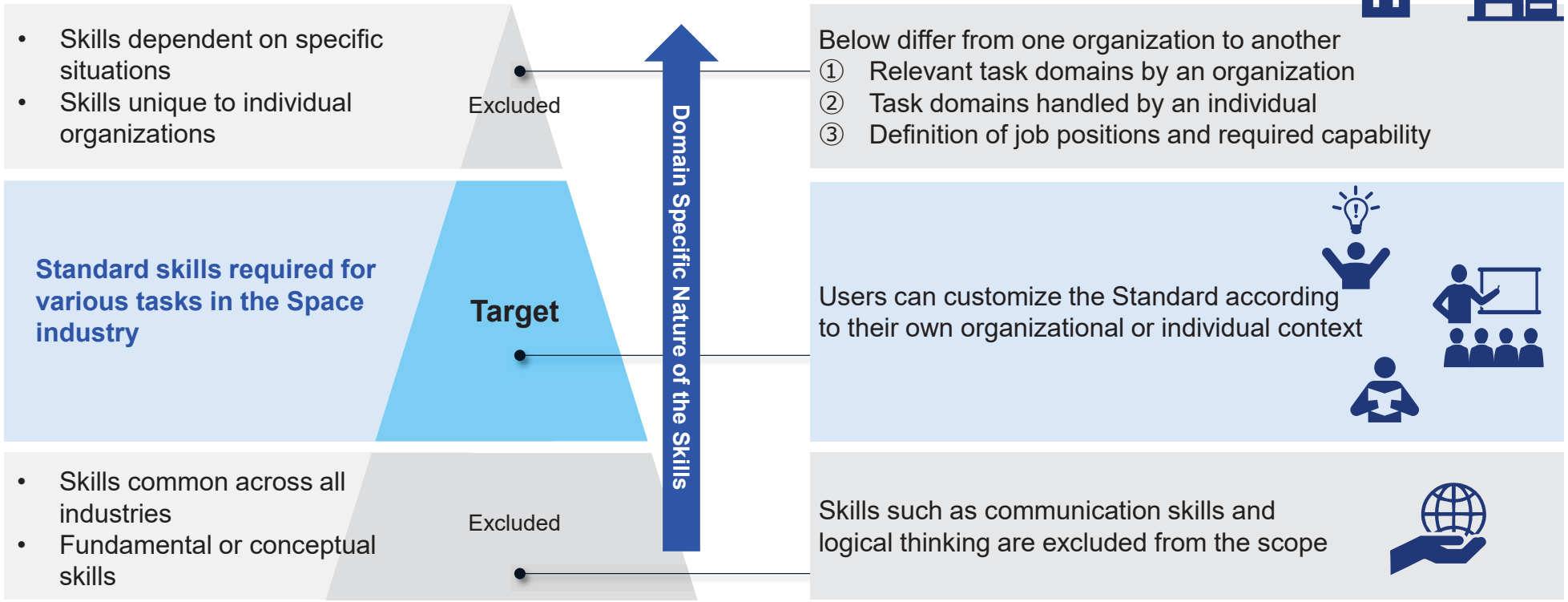
Step1 : Development of the Standard

- A set of standardized skills and proficiency levels for the space industry that serves as a guiding framework for individual skill development, human-resource training, performance evaluation, personnel assignment, and related activities is established

Prerequisite of the Space Skills Standard

The “standard” skills associated with the core tasks of the space industry are structured. As the Standards are intended to serve as a uniform framework applicable across the entire industry, skills required only in specific situations or by particular organizations are excluded from the scope.

Diagram of the Skill Structure



Targeted Personnel

The personnel targeted by the Space Skills Standard include individuals working in all space-related organizations engaged in HR development, as well as those seeking to enhance their skills or considering employment or career changes into the space industry.

Individuals who are interested in the space industry

Individuals

- Understanding of the Industry
- Job Hunting
- Self-Development

- To understand the tasks and skills performed in the space industry
- To gain awareness of the skills to be acquired and the academic fields to be studied

Company

- Understanding of the Industry
- Recruitment
- HR Development

- To leverage an understanding of the tasks and required skills in the space industry to guide entry into the sector
- To define the skill requirements when considering the recruitment of personnel

Individuals currently engaged in the space industry

Individuals

- Self-Development
- Understanding of Other Fields

- To facilitate smoother communication across different domains

Educational Institutions

- Education
- Job Hunting Support

- To appropriately design educational curricula
- To effectively support job-hunting by understanding the levels required by companies

Company/Local Governments

- Recruitment
- Assignment
- HR Development
- Performance Evaluation

- To define skills for initiatives related to the topics left
- To establish systematic evaluations

2. Structure and Contents of the Space Skills Standard

Definitions of Skill Categories

- Skills are broadly classified into 22 categories based on their characteristics.

#	Category	Definition	Skills
1	Strategic Planning	Ability to summarize direction / policies of organizations and projects and to proceed with decision-making	● Strategy formulation, etc.
2	Service Design	Ability to design space-related services based on user needs and issues	● User research, Prototyping, etc.
3	Project Management	Ability to plan, promote, and manage projects	● Schedule management, etc.
4	Development / Manufacturing Management	Ability to plan and manage technical development / manufacturing processes	● Systems engineering, etc.
5	Design / Analysis	Ability related to the design and analysis of space equipment	● Structural design, etc.
6	Manufacturing / Processing	Ability to perform manufacturing and processing in the development of space equipment	● Machining, 3D printing, etc.
7	Testing	Ability to conduct testing required for the development of space equipment	● Thermal vacuum testing, etc.
8	Facility Management	Ability to operate and maintain ground equipment and facilities	● Electrical facilities management, etc.
9	Launch Operations	Ability to maintain launch-sites and to perform launch operations	● Launch control, etc.
10	Satellite Operations	Ability to operate satellites in orbit	● Telemetry monitoring, etc.
11	Software Development / Data Utilization	Ability related to software development and data utilization	● Cloud platforms, etc.
12	Governance	Ability to ensure organizational compliance and transparency	● Governance management, etc.
13	Sales	Ability related to sales activities	● Customer Relations, etc.
14	Public Relations	Ability related to PR and publicity	● Media relations, etc.
15	Legal Affairs	Ability related to legal matters	● Contract management, etc.
16	Intellectual Property	Ability related to intellectual property	● Patent applications, etc.
17	Finance / Accounting	Ability related to finance and accounting	● Budgeting, Cost management, etc.
18	Procurement	Ability related to procurement operations	● Supplier management, etc.
19	Human Resources	Ability related to HR and labor management	● HR planning, labor compliance, etc.
20	Information Systems / Security	Ability related to information systems and/or security	● Cybersecurity, etc.
21	Basic Skills	Basic knowledge required to work in the space industry	● Language proficiency, etc.
22	Domain-Specific Expertise	Specialized knowledge and expertise required in the space industry	● Remote sensing, GIS, etc.

Definitions of Task Categories

- The Space Skills Standard divides tasks into two main categories: (1) Spacecraft Development Project and (2) Organizational Operations. 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

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

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

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

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

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

Marketing
- Marketing

General Affairs
- Internal Regulation Development
- Contract and Document Management

Intellectual Property
- IP Strategy Planning etc.

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

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

Human Resource
- Recruitment
- Labor management
- Human Resource Development

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

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

Overview of the Space Skills Standard

- The Space Skills Standard define the major roles in the space industry, along with the tasks and skills associated with each role.
- A wide range of domains, from program formulation and satellite launch operations to corporate functions, is covered.

	Titles of the Document	Overview of Each Document
1	Skill List	A table listing the skills commonly required across the space industry, including detailed descriptions of each skill.
2	Task List	A table listing the common task domains within the space industry, including detailed explanations of each task.
3	Skill Dictionary	A table that maps each task to the relevant associated skills.
4	Role List	A table presenting examples of major roles in the space industry and examples of the responsibilities assigned to each role.
5	Skill Level List	A framework defining four evaluation axes for assessing each skill, with a five-level proficiency scale established for each axis. The academic disciplines and certification examinations related to each skill are also included.
6	Programs for Skill Acquisition	A table listing programs and activities related to human-resource development for the space industry, published by companies, organizations, and educational institutions.

Skill List

- A table listing the skills commonly required across the space industry, including detailed descriptions of each skill.

Skill Category : Item Indicating the Skill Category

Unique Number : Number Assigned to Identify Each Skill Item

Skill Item : Name of the Skill Defined

Details : Description of the Skill

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.

Task List

- A table listing the common task areas in the space industry, with detailed descriptions of each task.

Task Category : Item Indicating the Task Category

Unique Number : Number Assigned to Identify Each Task Item

Task Item : Name of the Task Defined

Details : Description of the Task

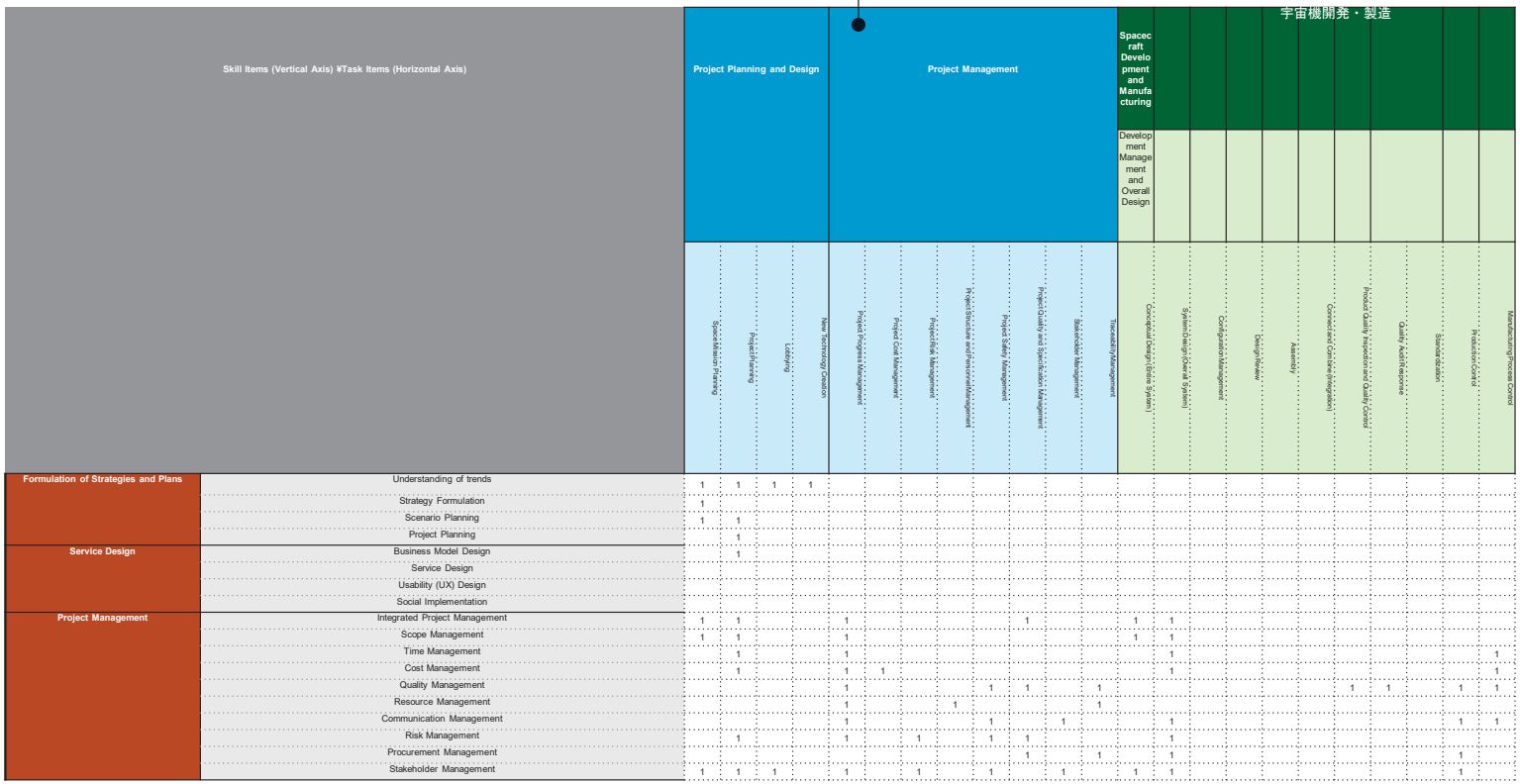
Category	No.	Task Item	Description
Project Planning and Design	1	Space Mission Planning	・Activity to study and determine what should be accomplished (mission) by space transport vehicles and satellites. ・Specifically, this includes work to examine what kind of materials, probes, and satellites should be put into what orbit using space vehicles, and work to examine the type of data to be acquired using satellites, how to acquire it, and how to utilize it, and to clarify expected results and success criteria (success criteria) when executing the plan. ・In particular, in the space field, it is necessary to find out the purpose and significance of various activities such as scientific exploration, communications, earth observation, and transportation, and to design based on technical constraints and international coordination.
	2	Project Planning	・Activity to formulate plans to achieve the operational objectives of spacecraft. ・Specifically, this includes the planning of schedule planning, cost planning, resource planning (materials, people, etc.), risk management planning, trajectory planning, navigation planning, launch site selection, frequency adjustment, etc. ・In particular, in the space field, it is important to plan in consideration of conditions specific to the space development field, such as launch windows (possible launch time zones), international frequency adjustment, and restrictions on the use of launch ranges.
	3	Lobbying	・Operations and activities that strategically influence policy formation and institutional design. ・Specifically, this includes analyzing the legal system and government budget, building relationships with relevant ministries and agencies, legislators, and industry groups, preparing policy proposal documents, and conducting public relations activities to shape public opinion. ・In particular, in the space sector, it is important for activities aimed at creating new institutions, obtaining budgets and deregulation.
	4	New Technology Creation	・Activity to create and introduce new technologies in spacecraft development and conduct technical studies from the project conception stage. ・Specifically, this includes tasks such as grasping technical needs, investigating prior art, drafting technical development policies, implementation of prototypes, and demonstration for practical use. ・In particular, in the space field, the introduction and development of new technologies that exceed the limits of existing technologies are required according to the operational objectives of satellites and space vehicles, and it is important to contribute from a technological perspective from the conceptual stage.

Skill Dictionary

- A skill matrix illustrating the skills associated with each task, showing both the skill requirements per task and the breadth of task to which each skill is applicable.

Task Item : Name of the Task Defined

Skill Item :
Name of the Skill Defined



● **:** Skills that are typically required to execute each task.

Role List

- 59 primary roles are defined, each with clearly described responsibilities and accountabilities.

（Sub）Category : Categories of Job Roles

Unique Number : Number Assigned to Identify Each Role Item

Role : Major job roles in the space industry

Roles and Responsibility : A Detailed Description of the Role's Responsibilities

Related Tasks and Skills : Tasks and Skills that are Relevant to Each Role

Category	Subcategory	No	Role Name	Roles and Responsibilities in the Space Industry	Relevant Key Tasks (Example)	Relevant Key Skills (Example)
Project Management	–	1	Business Architect	・It is responsible for conceiving and designing new concepts and solutions for the space business by grasping the needs of customers and society from multiple perspectives, including technology, market trends, and the social and global environment. Identify business opportunities through market analysis and use case development, and formulate a strategic framework for commercialization, from Business Model Design to service requirement definition. Lead the creation of cutting-edge projects by combining technical knowledge and business planning capabilities.	・Market and Customer Needs Identification ・Use Case Planning and Proposal ・New Services Planning and Examination ・Business Model Study ・Service Specifications and Definition of Requirements ・Space Mission Planning ・Eminence Activity	・Understanding of Trends ・Strategy Formulation ・Scenario Planning ・Business Model Design ・Service Design ・Usability (UX) Design ・Project Planning
		2	Project Manager	・Responsible for project management including project initiation, planning, execution, monitoring and control. ・It is also required to work closely with various stakeholders involved in spacecraft development, including ministries, industry associations, development companies, and suppliers, and to be responsible for reporting project deliverables and services, quality, costs, and delivery dates. ・In addition, they promote standardization activities in cooperation with design engineers and procurement engineers, and manage the operation of research projects by coordinating research activities with research organizations and universities.	・Project Planning ・Project Management (General)	・Integrated Project Management ・Scope Management ・Time Management ・Cost Management ・Quality Management ・Resource Management ・Communication Management ・Risk Management ・Stakeholder Management ・Scenario Planning ・Project Planning ・Public Relations
		3	Mission Manager	・Space missions (e.g., rocket launches and satellite-based Earth observation): Supervise the entire mission from both the technical and operational aspects to achieve its objectives and maximize results. ・From the definition of mission requirements to the launch, orbit, and operation phases, the project is promoted and managed in a consistent manner, and the scientific and business value of the project is ensured through the formulation of scientific objectives and observation plans, the resolution of issues in cooperation with technical teams, and the evaluation and reporting of mission results. ・While project managers manage overall QCD (quality, cost, and delivery), mission managers focus on achieving scientific and technical objectives (mission).	・Space Mission Planning ・Project Planning ・Project Management (General) ・Lobbying ・Eminence Activity	・Understanding of Trends ・Stakeholder Management ・Domain expertise (related to mission) ・Scenario Planning ・Project Planning ・Public Relations ability

Skill Level List

- Each skill can be evaluated using five evaluation dimensions, each rated on a five-point scale.
- Users may select the evaluation dimensions to use based on their purpose.

Skill Category : Item Indicating the Skill Category

Unique Number : Number Assigned to Identify Each Skill Item

Skill Item : Name of the Skill Defined

Evaluation Dimension : A Reference Axis for Evaluating the level of Proficiency of a Skill

Skill Level : A Five-level Metric Used to Evaluate Skill Proficiency.

Category	#	Skill Item	Evaluation Axis	Skill Level				
				Level 1	Level 2	Level 3	Level 4	Level 5
Formulation of Strategies and Plans	1	Understanding of Trends	Applicable range and depth	Based on generally collectable information, it is possible to derive and organize research and analysis content suitable for the purpose.	Hypotheses can be formulated for required areas, and new hypotheses and issues can be extracted from collected information and analysis results.	Through active information collection, it is possible to obtain internal information of the target area and conduct highly accurate hypothesis verification and analysis.	It is possible to collect and analyze necessary information by formulating hypotheses for realizing issues and strategies directly related to business, etc., and to provide a basis for formulating appropriate tactics.	It is possible to gather and analyze necessary information based on a hypothesis that assumes issues and risks that may occur in the future, and to provide a basis for appropriate strategy formulation.
			Independence	Business may be performed only with the general assistance of superiors.	Work may be carried out under the supervision and partial assistance of a superior.	Able to work without any help.	Employees can conduct business based on their own judgment and decision-making.	They can lead organizations and teams based on their own decision-making, and they can provide guidance on operations.
			Qualifications and Tests	–	–	–	–	–
			Years of Experience	Have business experience.	Have at least one year of work experience.	Have at least three years of work experience.	Have at least 5 years of work experience.	Have at least 7 years of work experience.

Programs for Skill Acquisition

- Information on space workforce development programs implemented by companies, organizations, and educational institutions

Category : Item Indicating the Programs' Category

Unique Number : Number Assigned to Identify Each Program Item

Program : Published Program Names and Titles

Program Overview : A Summary of the Program Content

Program Details : Detailed Information About the Program

Targeted Skills : Skill Items that Are Expected To Be Improved Through the Program

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

3. Use Case Examples of the Space Skills Standard

Expected Use Cases of the Space Skills Standard

- Organizing industry-standard skills enables individuals, companies, educational institutions, and local governments to standardize their efforts and achieve more advanced outcomes in activities such as self-improvement, hiring, and workforce development.

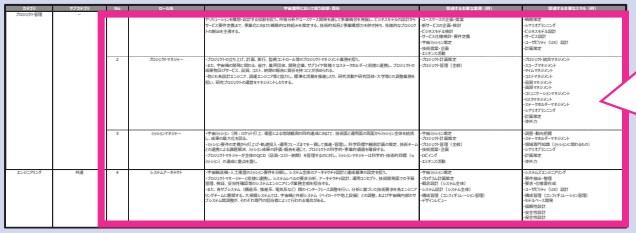
Individual 	**Job Hunting** To understand the functions and the skills required within organizations engaged in space-related businesses.	**Self-Improvement** To understand the skills, the academic disciplines, and the qualification frameworks required in the space industry.
Company 	**Recruitment** To define the skills required when planning talent recruitment.	**Training** To set skill levels and consider the training programs needed to develop talent.
Educational Institutions 	**Education** To understand the level of talent expected by companies when designing educational curricula and programs.	**Employment Support** To identify the level of talent expected by companies to offer effective career and employment support.
Local Government 	**Recruitment** To identify the skill sets necessary for individuals tasked with planning and advancing policy measures or initiatives.	**Evaluation** To establish skill level benchmarks for initiative-driving personnel and perform comprehensive evaluations.

Use Case：Creating Job Description

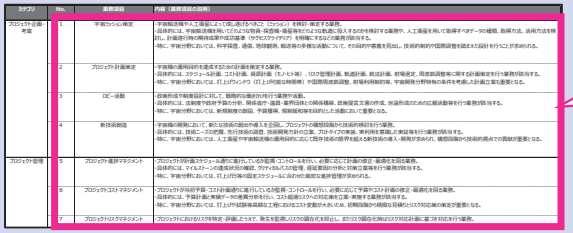
- Referencing the Space Skills Standard can contribute to standardize terminology across the industry, which helps broaden access to job opportunities for potential candidates.

【Space Skills Standard】

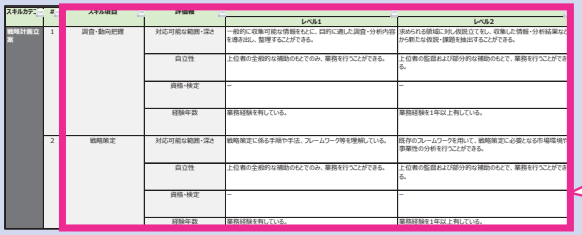
■ Role List



■ Task List



■ Skill Level List



1
- Provides clearer job title descriptions
- Reference for role-related functions and skills

2
- Provides detailed information on the tasks associated with the roles.

3
- Serves as a reference when specifying the required level for a job opening.

Example

【Job Opening: ○○ Position】

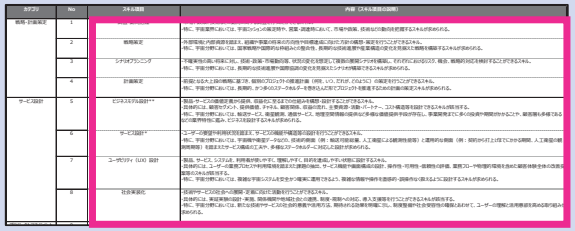
- Job Title **1**
  - ➢ ○○ Systems Engineer
- Primary Tasks **1** **2**
  - ➢ Structural system design and manufacturing
- Required Qualifications **3**
  - ➢ Systems Engineering: Approximately Level 2
  - ➢ ○○ system design and analysis: Level 3 or higher
- Preferred Qualifications **1** **3**
  - ➢ Strong interest in and knowledge of space and satellites
  - ➢ Orbital design and analysis: Level 1 or higher
  - ➢ Language proficiency: Level 4 or higher

Use Case：Designing Educational Program

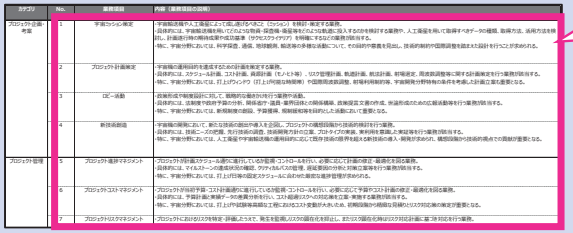
- Referencing the Space Skills Standard streamlines educational program design and contributes to a deeper understanding of real-world job functions among participants and potential candidates.

【Space Skills Standard】

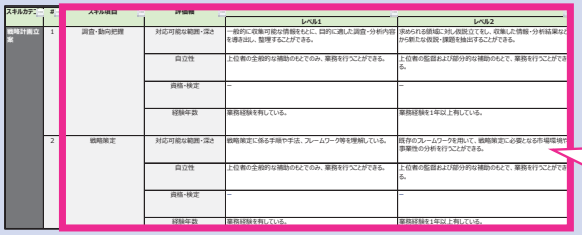
■ Skill List



■ Task List



■ Skill Level List



1

- Provides a reference to the target skills associated with completion of the program.

2

- Serves as a reference for learnable tasks and their related knowledge

3

- Serves as a reference when specifying target proficiency level at course completion

Example

【Structural Engineering Training Program】

- Program Overview **1** **2**
  - ➢ This program enables participants to understand the roles and responsibilities of structural engineers to meet mission requirements and to acquire the essential skills required for structural engineering work.
- Program Learning Objectives **3**
  - ➢ Structural Design and Analysis: Ability to design and・・・ Equivalent to Level 1 as defined in the Standard
  - ➢ Mechanism Design and Analysis: Ability to design and・・・ Equivalent to Level 1 as defined in the Standard

Use Case: Skill Development

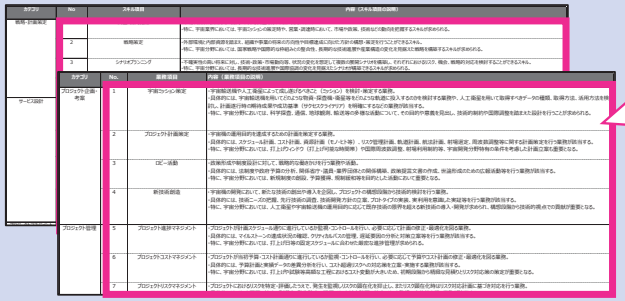
- Referencing the Space Skills Standard helps deepen understanding of various functions and skills, while also supporting personal skill development through awareness of related fields of study and certifications.

【Space Skills Standard】

■ Skill Dictionary

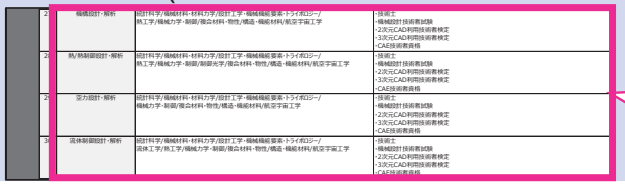
1
- Allows users to understand the skills linked to specific tasks

■ Skill / Task List



2
- Provides detailed information on each task and skill

■ Skill Level (Academic Fields and Certifications)



3
- Allows users to understand the fields of study and certifications linked to each skill.

Before

- **Uncertainty about which functions and skills are required in the space industry**
- **Uncertainty about which academic disciplines and certifications are necessary**

After

1
- **Clarified the skills required!**
- **Increased confidence to challenge new roles using existing skills!**

2
- **Clear understanding of detailed tasks and related skills!**

3
- **Increased motivation to pursue related certification exams!**

Catalog of Use Cases

- This provides a structured overview of use cases of the Space Skills Standard among companies, educational institutions, local governments, and other stakeholders, offering guidance for future initiatives.

Twelve case studies are presented, covering research institutions, space industry organizations, space companies, educational institutions, and recruitment agencies.

4. Career Paths Examples

About the Catalog of the Career Path Examples（in Japanese）

Positioning

- A collection of cases compiled based on interviews with professionals active in the space industry, organizing real-world examples of required skills and career development processes, and providing reference information for career formation.

Contents

1 Career Changers from Other Industries

- Motivation and background for the career transition
- Challenges and barriers encountered during the transition
- Presence or absence of skill gaps before and after the career change
- Visualization of the skills required in the previous role and the current role using the Space Skills Standard

2 Experienced Space Industry Professionals

- Evolution of skill development over time
- Effective learning methods
- How to build and accumulate career and skill development
- Visualization of the skills required in the previous role and the current role using the Space Skills Standard

3 New Graduates in the Space Industry

- Background of employment
- Evolution of skill development over time
- Effective learning methods
- Visualization of the skills required in the previous role and the current role using the Space Skills Standard

4 Advisors to the Space Industry

- Background of involvement in the space industry
- Current form of engagement with the space industry
- Approaches to accumulating and enhancing skills over time
- Visualization of the skills required in the previous role and the current role using the Space Skills Standard

Interviewees of the Catalog

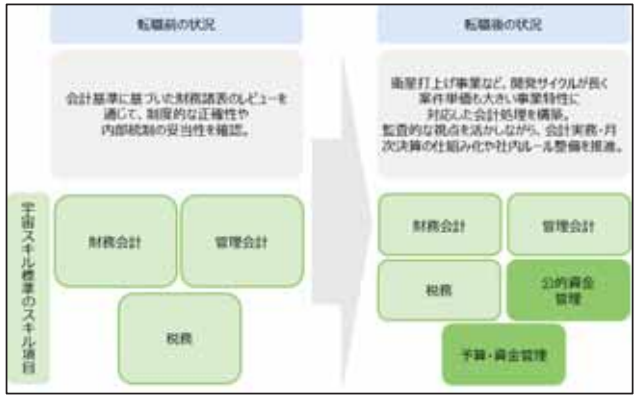
- Seven cases are presented to help students and career changers clearly visualize potential career paths after entering the space industry. Please use these examples as a reference for your own career planning.

#	Talent Types①	Talent Types②	Interviewee
1	Career Changer	Career Changers from Other Industries（Corporate Role)	Space BD Inc. Masayuki Usui
2	Career Changer	Career Changers from Other Industries（Engineering Role）	Space Shift Inc. Tyler Kurahashi
3	Career Changer	Career Changers from Other Industries（Engineering Role）	Innovative Space Carrier Inc. Kazuaki Hirakawa
4	Long Careers in the industry	Individual who has built their careers within the space industry (Business Role)	Astroscale Inc. Miki Ito
5	Long Careers in the industry	Individual who has built their careers within the space industry（Technical Role）	Mitsubishi Electric Corporation Hiroshi Koyama
6	New Graduate	Individual who entered the space industry as a new graduate	Synspective Inc. Yukio Endo
7	Advisory	Individual involved in the space industry as an advisor（Lawyer）	Japan Space Law Association Naohiro Kitamura

How to Read the Figures in the Catalog

①Changes in the Required Skills

Example 1 ：



Example 2 ：

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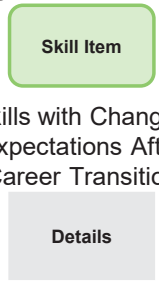
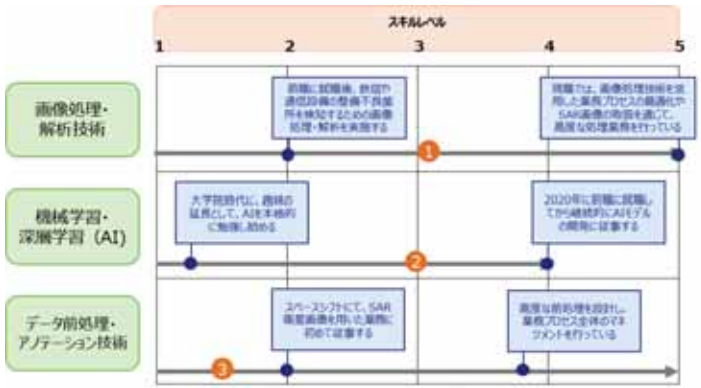


②Evolution of Skill Development



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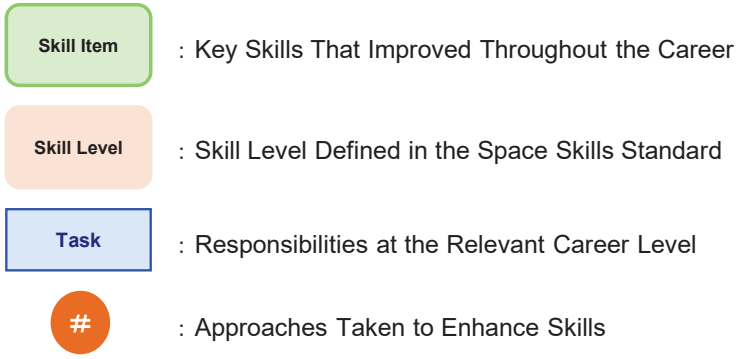

Example: Innovative Space Carrier Inc. – Kazuaki Hirakawa

- This material helps those considering a move into the space industry, and those concerned about post-transition career development, understand how to leverage their skills within the industry.

Current Position	Innovative Space Carrier：VPoE, R&D Director	Background	Aircraft Engineering (Structural Design, Engine Design, etc.) across multiple companies
Summary	Many skills remain applicable both before and after transitioning into the space industry. By using the Space Skills Standard as a reference tool, individuals can visualize the gap between their current skill set and their target level, and consider concrete measures for growth.		

5. Steering Committee of the Space Skills Standard

5. Steering Committee of the Space Skills Standard

Members of the Steering Committee（1/3）

Chair, Vice Chair（Honorifics omitted）

Chair	National University Corporation, Wakayama University, Vice President / Professor	Hiroaki Akiyama
Vice Chair	Next Generation Space System Technology Research Association（NeSTRA）	Koji Yamaguchi

Committee Members（Honorifics omitted）

Chiba Institute of Technology, Faculty of Engineering, Department of Space and Semiconductor Engineering	Yutaka Wada
Keio University Graduate School, System Design and Management	Naohiko Kohtake
Kyushu Institute of Technology, Faculty of Engineering Research Institute	Kentaro Kitamura
Gifu University, Center for Promotion of Space Research and Utilization	Takeshi Miyasaka
Institute of Science Tokyo, School of Engineering / UNISEC	Hiraku Sakamoto
Tohoku University Graduate School of Engineering	Toshihumi Kuwahara
Nihon University, Faculty of Science and Technology	Yasuyuki Miyazaki
Yamaguchi University, Applied Satellite Remote Sensing Research Center	Masahiko Nagai
National Institute of Technology, Akashi College, Department of Electrical and Computer Engineering	Yoshihiro Kajimura
Japan Aerospace Youth League / Space Port Japan (General Incorporated Association)	Naoko Yamazaki
Science Writer	Ayano Akiyama
Japan Aerospace Exploration Agency (JAXA)	Hiroyuki Iwamoto
Japan Aerospace Exploration Agency (JAXA)	Atsushi Fukatsu
Japan Aerospace Exploration Agency (JAXA)・CONSEO	Naoko Matsuo
Mitsubishi Heavy Industries, Ltd.	Toru Kitasaka
Mitsubishi Heavy Industries, Ltd.	Kazunori Mochizuki
IHI Aerospace Co., Ltd.	Masashi Minato
Rocket Link Technology Inc.・The Japan Rocket Society	Yasuhiro Morita

Members of the Steering Committee（2/3）

Committee Members（Honorifics omitted）			
Interstellar Technologies Inc.	Shoko Takeda	Space Shift Inc.	Naruo Kanemoto
Innovative Space Carrier Inc.	Kojiro Hatada	Japan Manned Space Systems Corporation	Takanori Sasaki
PD Aerospace, Ltd.	Shuji Ogawa	Japan Manned Space Systems Corporation	Yoshihiro Iwata
Space BD Inc.	Kohei Kojima	COSMOTEC Co., Ltd.	Takashi Kamiya
Space BD Inc.	Kosuke Maeda	COSMOTEC Co., Ltd.	Ryuji Nagao
Space BD Inc.	Masaki Hirano	Invite You Inc.	Kazuyuki Asano
Mitsubishi Electric Corporation	Rui Hirokawa	Invite You Inc.	Masanori Kawabe
NEC Corporation	Takuya Furukawa	Skillnote Co., Ltd.	Kotaro Kusunoki
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Kawasaki Heavy Industries, Ltd.	Makoto Tutui	The Society of Japanese Aerospace Companies	Takeo Yamaoka
Axelspace Holdings Corporation	Makiko Hamada	Space Liner Association	Yoshifumi Inatani
Astroscale Inc.	Miki Ito	Japan Space Law Association	Yumiko Honma
ispace, inc.	Kenichi Imamura	Remote Sensing Technology Center of Japan	Aya Yamamoto
Synspective Inc.	Shoichiro Asada	Remote Sensing Technology Center of Japan	Eisuke Koizumi
QPS Research Institute, Inc.	Shunsuke Onishi	The Institution of Professional Engineers, Japan	Yuki Watanabe

Members of the Steering Committee（3/3）

Committee Observers（Honorifics omitted）

Ministry of Education, Culture, Sports, Science, and technology, Research and Development Bureau, Space Development and Utilization Division
Ministry of Economy, Trade and Industry (METI), Manufacturing Industries Bureau, Space Industry Division
Hokkaido Government, Department of Economic Affairs, Industrial Promotion Bureau, Industrial Promotion Division
Wakayama Prefectural Government, Department of Commerce, Industry and Labor, Corporate Policy Bureau, Growth Industry Promotion Division
Kagoshima Prefectural Government, Department of Commerce, Industry, Labor and Fisheries, Industrial Location Division, New Industry Creation Office
Oita Prefectural Government, Department of Commerce, Tourism and Labor, Advanced Technology Challenge Division
Ibaraki Prefectural Government, Department of Industrial Strategy, Science and Technology Promotion Division
Gifu Prefectural Government, Department of Commerce, Industry and Labor, Aerospace Industry Division
Kanagawa Prefectural Government, Bureau of Industry and Labor, Industrial Affairs Department, Industrial Promotion Division
Yamaguchi Prefectural Government, Department of Industry and Labor, Management and Finance Division
Fukushima Prefectural Government, Department of Commerce, Industry and Labor, Industrial Human Resource Development Division
Tottori Prefectural Government, Department of Commerce, Industry and Labor, Industrial Future Creation Division
Minamisoma City, Department of Commerce, Industry and Tourism, Commerce and Labor Policy Division, Space-Related Industry Promotion Office
Osaka Chamber of Commerce and Industry
Nagano Chamber of Commerce and Industry

Secretariat Members (Honorifics omitted)

National Space Policy Secretariat of the Cabinet Office	Shinji Ide	KPMG Consulting Co., Ltd.	Susumu Miyahara
National Space Policy Secretariat of the Cabinet Office	Yosuke Miyashita	KPMG Consulting Co., Ltd.	Yuki Hirata
National Space Policy Secretariat of the Cabinet Office	Naoki Kanaya	KPMG Consulting Co., Ltd.	Lisa Kashiwazaki
National Space Policy Secretariat of the Cabinet Office	Shuto Matsui	KPMG Consulting Co., Ltd.	Momoko Kuramochi

6. FAQ

FAQ

#	Question	Answer
1	What is the Space Skills Standard?	The Space Skills Standard is an industry-standard skills book that systematically organizes the skills required in the space industry. It defines standard skills by structuring the job functions necessary for space-related organizations.
2	What can be done using the Space Skills Standard?	The Space Skills Standard can be used by individuals, companies, educational institutions, and local governments. Individuals: Identify potential career opportunities. Companies: Conduct recruitment, evaluation, and training based on common standards. Educational Institutions: Design programs and support career guidance. Local Governments: Evaluate and develop talent using unified criteria.
3	What are the key features of the Space Skills Standard?	The Space Skills Standard provides a common skills language that can be referenced both within and outside the space industry. It was developed in response to human resource challenges in Japan, such as shortages of management-level professionals and highly specialized technical talent. The skills are described in a generic and transferable manner, enabling application across industries.
4	How is the Space Skills Standard structured?	The Space Skills Standard consists of six core components: Skill List, Task List, Skill Dictionary, Skill Levels and Related Certifications, Role List, Programs for Skill Acquisition. In addition, it is accompanied by a User Guide and a General Information Manual, forming a comprehensive and structured skills framework.

FAQ

#	Question	Answer
5	How are the skill items defined?	The skill items in the Space Skills Standard were developed and refined through discussions held in a study group involving space-industry companies, industry associations, and educational institutions related to the space field.
6	What should we do if certain tasks or skills are not included in the Space Skills Standard?	The Space Skills Standard is positioned as a reference standard that organizes skills common across the industry and is intended to be freely customized by each organization. If tasks or skills specific to your organization are not included, it is recommended that you refer to similar items in the Standard and add or expand your own organization-specific skills accordingly.
7	Does the absence of a task or skill mean it is unnecessary?	No. Items not included in the Space Skills Standard are not considered unnecessary or inferior. The Standard extracts common elements across the industry and is designed to be customized to reflect each organization’s actual needs. For details, please refer to the policy described in the User Guide.
8	Are there any certifications, qualification exams, or curricula based on the Space Skills Standard?	As of the release of the final version in FY2025, there are no certifications or qualification exams based on the Space Skills Standard. However, in the future, it may be linked to existing certifications, or new certification systems, qualification exams, and educational curricula aligned with the Space Skills Standard may be developed.

FAQ

#	Question	Answer
9	Who determines the applicable skill level, and how?	Skill levels in the Space Skills Standard define common industry benchmarks, but no unified rules for assessment are prescribed. Each organization determines skill levels independently, based on its own criteria for evaluation, recruitment, and placement.
10	What happens if a person does not meet the conditions for Level 1?	If the conditions for Level 1 are not met, skill level assessment based on the Space Skills Standard cannot be applied as defined. However, the Standard is only a reference framework. Organizations may customize it, for example by setting their own entry-level criteria and applying company-specific skill level assessments.
11	How does the Space Skills Standard relate to other skills standards or qualification exams?	As reference information, related qualifications are listed for each skill, but as of the FY2025 final release, there is no direct alignment with other industry skills standards. In the future, linkages with other standards or qualification exams may be considered. Organizations may also independently map the Standard to other frameworks as needed.
12	Is the Space Skills Standard a uniform standard that does not allow customization?	No. The Space Skills Standard is positioned as a reference scale or template that systematically organizes skills required in the space industry. It does not impose uniform criteria. Organizations are encouraged to customize it according to their size, structure, and operational needs.

7. Appendix

Glossary

Glossary (Term with a Specific Meaning in the Space Skills Standard)

#	Glossary	Explanation
1	Role	This refers to a job title that is responsible for a specific task in an organization.
2	Task	This refers to a task that indicates a function or role required to achieve a specific objective in an organization.
3	Skill	Skills that are recommended to be acquired in order to perform work. Skills consist of knowledge (classroom study and understanding of work) and skills (know-how and experience).
4	Skill Level	Indicator to evaluate skill ability. A five-level indicator is established for each skill.
5	Program	Activities undertaken by organizations in the space industry (companies, organizations, educational institutions, local governments, etc.). The term "spacecraft development program" refers to a series of initiatives to develop spacecraft. The "reference program" in the Space Skills Standard refers to human resource development initiatives promoted by organizations related to the space industry.

Glossary (Space Industry Terminology)

#	Category	Notation in Space Skills Standard	Explanation
1	Spacecraft Configuration	Artificial satellite	A satellite created artificially. It is classified by purpose (Earth observation, communications, broadcasting, positioning, etc.) and varies in size and orbit.
2		Spaceplane	1. A reusable launch vehicle that can recover and reuse major components.A winged spacecraft that can fly and glide like an aircraft in the atmosphere and operate as a spacecraft in space. Many examples are based on the premise of reuse, such as landing on a runway after re-entry.
3		Launch Vehicle	A transport aircraft (generally a rocket) intended to transport people and goods in space (outside the atmosphere).
4		Subsystem	Multiple elements that make up a space transport vehicle or satellite. The name varies depending on the scale and performance of the entire system.
5		System	A whole consisting of multiple elements (a space transport vehicle or satellite itself).
6		Fairing	A structure that protects a satellite (payload) from wind pressure, vibration, and frictional heat when the rocket flies in the atmosphere.
7		Payload	Special-purpose equipment and cargo (Examples: observation equipment, communications equipment, ISS supplies, etc.) to be mounted on the spacecraft.
8		Component	Independently functioning module that constitutes a subsystem.
9		Component	The smallest unit of components, parts, etc.
10		Basic design (system design)	A design phase in which specific functions required as a system are determined in response to the requirements specified in conceptual design.
11		Space mission	Important items to be achieved by space vehicles and satellites and their methods. Complex elements including ground systems and launch systems are examined.
12		Conceptual design	An initial design phase in which operational concepts and overall system requirements are defined after a space mission is formulated.
13		Detailed design (system design)	The phase of designing the structure, mechanism, power supply, and other elements necessary to realize the functions specified in the basic design (covering the entire system and subsystems).
14		Bus system (satellite bus)	The main structure and subsystems responsible for the basic performance and common functions of the satellite.

Glossary (Space Industry Terminology)

#	Category	Notation in Space Skills Standard	Explanation
15	Spacecraft Configuration	Mission system (mission equipment)	Equipment and functions to accomplish the unique purpose of a satellite (space mission).
16		Suborbital spacecraft	A name for a rocket/spacecraft that flies on a suborbital trajectory.
17		Booster	Additional stage/auxiliary rocket to assist thrust (auxiliary booster, etc.).
18		Upper stage	Stage to propel in the latter half of the launch (high altitude) and perform final orbit insertion, etc.
19		Lower stage	A stage (sometimes including a core stage/booster) that propels the rocket at the initial stage of launch (low altitude) and provides speed and altitude to the upper stage.
20		Guidance and control system	A system that controls the rocket's flight path (guidance), attitude, thrust, etc.
21		Countdown	Operations to advance the pre-launch procedures in chronological order (managed in T-xx format). Fuel filling and final inspection are performed.
22	Spacecraft subsystem	Data processing system	Subsystem responsible for data processing, control, data recording and transfer within the satellite.
23		Attitude control system	Subsystem for maintaining and changing the orientation (attitude) of the satellite.
24		Propulsion system	Subsystem for generating thrust for orbit change and attitude control.
25		Structural system	Subsystem that supports the mechanical structure of the satellite, such as the frame and outer plate, and can withstand loads.
26		Thermal control system	Subsystem that maintains the temperature of equipment within an acceptable range in the space environment.
27		Communication system	Subsystem responsible for communication (transmission and reception) between satellites and ground stations/other satellites.
28		Power supply system	Subsystem that generates, stores, and distributes satellite power and supplies it stably to equipment.
29		Sensor for observation	Sensor (optical/radar, etc.) that acquires signals from an object for earth observation, etc.

Glossary (Space Industry Terminology)

#	Category	Notation in Space Skills Standard	Explanation
30	Spacecraft subsystem	Thruster	A small propulsion system mounted on a spacecraft. It is used for orbit maintenance, attitude control, and orbit change.
31		Reaction wheel	An actuator that changes the rotation speed of a flywheel (flywheel) to exchange angular momentum and finely controls attitude (direction) without using propellant.
32	Project management	Assembly	The process/act of assembling parts/units into higher-level components (Equipment, subsystems, etc.). Corresponds to A in AIT.
33		Integration	To connect multiple devices and subsystems and integrate them to operate as a system. Corresponds to I in AIT.
34		Traceability	To enable (or manage) tracking of correspondence between requirements, design, implementation, and testing. Useful for preventing omissions and inconsistencies in requirements.
35		Success criteria	Expected outcomes and goals for space missions. Indicators/criteria that clarify what constitutes success.
36	Standards, Quality, and Safety	Clean Room	A room that maintains cleanliness to control particulates and contaminants. Important for space equipment to prevent contamination.
37		Material Standards	A general term for standards that specify material types, properties, test methods, acceptance criteria, etc. In the space field, ECSS, ASTM, and standards of various organizations are sometimes referred to.
38		Failsafe	The concept of designing a system so that it does not fall into danger (transition to a safe state) even if a failure occurs.
39		Redundancy	A design in which multiple systems or parts with the same function are prepared in case of failure. Example:Duplex (dual), triplex (triple), etc.
40	Satellite Operation and Communications	Wireless Communications	A general term for communication methods that transmit and receive information using radio waves (wireless). In satellite communications, it is used for ground station to satellite (uplink/downlink) and inter-satellite communications.
41		Maneuver	General term for operations (propellant injection, attitude control operation, etc.) to change orbit or attitude.
42		Visibility Window	Time period (path) during which a satellite can be seen and communicated from a ground station. It is determined by orbit and ground station position and is the basis for operation planning and scheduling.
43		Frequency adjustment	To coordinate the frequency bands used by satellites with domestic and overseas management organizations to prevent interference with other radio systems.
44		Radio license application	To carry out application procedures based on domestic and overseas systems in order to obtain licenses necessary for radio station operation.

Glossary (Space Industry Terminology)

#	Category	Notation in Space Skills Standard	Explanation
45	Satellite operation and communications	Tracking	To track the position and speed of a satellite by using the direction of arrival of radio waves, Doppler, ranging, etc.
46		HK data	Housekeeping data. A type of telemetry that indicates the internal health of the satellite (temperature, voltage, etc.).
47		Command	Control information transmitted from the ground station to the satellite.
48		Telemetry	Data transmitted from the satellite to the ground station. Example:HK data (satellite internal health) and mission data.
49		Satellite Constellation	A network system for integrated operation of many small non-geostationary satellites launched into medium and low Earth orbits.
50		Uplink	Radio transmission from the ground (ground station) to the spacecraft. Used for command transmission, software update, and time synchronization.
51		Downlink	Radio transmission from the spacecraft to the ground. Telemetry (state data) and data from observation and communication services are sent to the ground.
52		S band	One of the frequency bands used for satellite communications (generally 2–4 GHz). It is often used for TT & C (tracking, telemetry, and command).
53		X band	One of the frequency bands used for satellite communications (generally 8–12 GHz). It is sometimes used for downlink of earth observation data and for government and military communications.
54		Ka band	One of the frequency bands used in satellite communications (generally 26–40 GHz). While suitable for high-capacity communications (high-speed data transmission), it is susceptible to rain fade.
55	Data/Geospatial	Surveying and reading	Use knowledge of surveying and reading maps to accurately grasp positional information and topography (important for confirming the positional accuracy of satellite data).
56	Remote Sensing	SAR sensor (synthetic aperture radar)	A radar system that irradiates radio waves and observes the shape and changes of the earth's surface from reflected waves. It can be observed even in clouds, rain, and at night, and is used for disaster prevention, topographical understanding, and infrastructure monitoring.
57		Remote Sensing	To understand satellite orbits, sensor principles, and observation modes, and to utilize them in designing data acquisition according to observation purposes.
58		Optical Sensors	To understand the structure, imaging principles, and design elements of optical sensors such as visible and infrared, and to select wavelengths and optimize performance according to the target.
59	Orbit	Orbital insertion	A maneuver/operation to adjust the orbit of a spacecraft into a desired orbit (entering orbit as a satellite). It is performed by the last stage of a rocket or by the propulsion of the satellite itself.

Glossary (Space Industry Terminology)

#	Category	Notation in Space Skills Standard	Explanation
60	Space environment/risk	Contamination	"Contamination" conditions in which gases emitted from satellites adhere to lenses and thermal control materials, reducing function and reliability.
61		Debris	Space debris orbiting in orbit, such as rocket and satellite debris.
62		Meteoroid	Meteor material such as meteorites flying through space.
63	Exploration/Robotics	Robotics	A general term for the field of technology for moving robots (machines). It includes sensors, actuators, control, recognition, remote control/autonomy, etc. It also relates to the mechanisms of exploration robots and satellites.
64	Manned space	Space environment and space life support	General term for the environmental conditions necessary for human life and activities in outer space and the technologies to realize them. Includes oxygen supply, temperature and pressure control, carbon dioxide removal, water and waste management, etc.
65	Propellant	Propellant	A generic term for a substance injected in propulsion (thruster/engine) to obtain thrust. For chemical propulsion, fuels and oxidizers (or one-part type) are often used, and for electric propulsion, gases such as xenon are often used.
66		Hydrazine	A propellant (e.g., one-part thruster) widely used for chemical propulsion of satellites. It is highly toxic and requires careful handling.
67		Xenon	A propellant (inert gas) often used for electric propulsion such as ion propulsion. It is easily ionized electrically and is considered suitable for storage.
68	Security Compliance (Cyber and Export Control)	Dual Use	Technologies and products that can be used for both civilian and military purposes. They are often discussed in space equipment, communications, and image analysis.
69		Security	Policies and activities that protect national and social security. In space, they are also related to satellite use, cyber security, and export control (dual-use).
70		Export Control	A system that controls the export and transfer of specific goods and technologies based on international security and treaties. Space equipment can be subject to this system.

Glossary (Terms Abbreviated in English)

#	Category	Notation in Space Skills Standard	English notation	Explanation
71	Spacecraft Configuration	FTS	Flight Termination System	A safety system (range safety) for stopping a rocket in an emergency, such as when the rocket is out of safety range.
72	Spacecraft Subsystem	RCS	Reaction Control System	Propulsion subsystem that performs attitude control and minute translation (lateral movement) using thrusters. It is used for docking and attitude control before and after re-entry.
73	Project Management	CONOPS	Concept of Operations	An operation concept in which "who, when, where, and how" the system will be operated is expressed in text and diagrams. It is a prerequisite for requirements definition and operation design.
74		QCD	Quality, Cost, Delivery	Abbreviation for Quality, Cost, and Delivery. Used as a key management indicator for a project.
75		RFP	Request for Proposal	A document in which an orderer requests a proposal (proposal) indicating requirements and conditions. Used at the initial stage of procurement and contracting.
76		WBS	Work Breakdown Structure	A framework for hierarchically breaking down and organizing project work. It is the basis for scope management, estimation, and progress management.
77		PMBOK	Project Management Body of Knowledge	A guide (knowledge system) that summarizes standard methods for project management that are widely used worldwide.
78		PMP	Project Management Professional	A project management qualification recognized by the PMI.
79	Standards, Quality, and Safety	CCSDS	Consultative Committee for Space Data Systems	A framework for establishing international standards (protocols and formats) for data communications and operational interfaces between spacecraft and ground stations.
80		ECSS	European Cooperation for Space Standardization	A group of standards (Design, quality, manufacturing, testing, software, etc.) widely referenced in the European space field. It is often adopted by ESA projects.

Glossary (Terms Abbreviated in English)

#	Category	Notation in Space Skills Standard	English Notation	Description
81	Standards, Quality, and Safety	ISO	International Organization for Standardization	Establishes a variety of international standards, including quality (ISO 9001), environment (ISO 14001), and information security (ISO/IEC 27001).
82		CAPA	Corrective and Preventive Action	The concept of quality improvement involves identifying the cause of a problem, taking corrective actions to prevent its recurrence, and managing preventive actions to prevent potential problems.
83		EMC	Electromagnetic Compatibility	A concept, design, and evaluation requirement to ensure that a device operates normally in the surrounding electromagnetic environment and does not cause unacceptable electromagnetic interference (EMI) to other devices.
84		EMI	Electromagnetic Interference	Unnecessary electromagnetic interference from a device or from an external source that interferes with the operation of other devices or the own device. Subject to EMC design and EMC testing.
85		ESD	Electrostatic Discharge	A phenomenon in which electric charge rapidly moves between charged objects and discharges. It can cause damage or malfunction of electronic components. In satellites, it is also related to countermeasures against charging.
86		FMEA	Failure Modes and Effects Analysis	An analysis method that identifies possible failure modes and organizes their causes, effects, detection methods, and countermeasures (redundancy, etc.). Often used in reliability design.
87		FTA	Fault Tree Analysis	An analysis method that represents the logical causal relationship of a serious event (top event) as a tree and examines risk reduction measures.
88		JSA	Job Safety Analysis	A safety analysis that breaks down work into procedures and identifies risk factors and countermeasures for each procedure.
89		LOTO	Lockout/Tagout	A safety procedure in which the energy source is shut off to prevent accidental energization or operation during inspection and maintenance of equipment, and the equipment is locked (Lockout) and displayed (Tagout).
90		PTW	Permit to Work	A system to obtain permission before engaging in hazardous work (such as work at heights, electricity, or fire) by clarifying conditions, procedures, and persons in charge.

Glossary (Terms Abbreviated in English)

#	Category	Notation in Space Skills Standard	English Notation	Description
92	Satellite Operation / Communications	RF	Radio Frequency	General term for radio frequency bands. RF design (Transmitting/receiving, antennas, filters, etc.) such as S, X, and Ka bands is important for satellite communications.
93		ITU	International Telecommunication Union	An international organization involved in international coordination of radio communications resources such as frequency and orbit.
94		NOC	Network Operation Center	A base/function for monitoring and operating terrestrial communications networks and networks.
95		RR	Radio Regulations	Rules for radio communications in the ITU. International rules for frequency, orbit, etc.
96		RoP	Rule of Procedure	Rules for operation procedures in the ITU (rules for operation of Radio Regulations).
97		TT&C	Tracking・Telemetry・Command	General term for communications that form the basis of satellite operations.
98	Software / IT	AI	Artificial Intelligence	General term for technologies that perform recognition, prediction, and optimization using machine learning. It is sometimes used in satellite data analysis and operational automation.
99		CI/CD	Continuous Integration/Continuous Delivery	Concept of development operations that integrate changes frequently (CI) and maintain a continuous releasable state (CD) through automated testing. It is often used in terrestrial software development.
100		FPGA	Field-Programmable Gate Array	An integrated circuit whose circuit configuration can be rewritten even after shipment. It is used for high-speed processing and I/O control. In space equipment, radiation resistance and redundant design are important issues.
101		RTOS	Real-Time Operating System	An OS that emphasizes processing within a specified time (real-time). It is sometimes used in time-constrained control systems such as satellite-borne computers.

Glossary (Terms Abbreviated in English)

#	Category	Notation in Space Skills Standard	English Notation	Description
102	Software / IT	SRE	Site Reliability Engineering	The concept and role of enhancing service reliability (Availability, performance, failure response, etc.) through software engineering methods. Includes operations automation, monitoring, and SLO design.
103		UI	User Interface	Screens and operation systems for users to operate and understand the system. Important for satellite data provision services and operational tools.
104		UX	User Experience	The overall experience that users get through services and products (ease of use, satisfaction, etc.). Discussed along with UI design.
105		VC	Version Control	A mechanism for tracking changes to source code and documentation (e.g. Git). Essential for multi-person development and change control.
106	Data / Geospatial	GIS	Geographic Information System	A system that combines map data with population, land use, and disaster data for management and analysis. It is also widely used as a platform for using satellite data.
107	Positioning / Navigation	GNSS	Global Navigation Satellite System	A general term for satellite positioning systems (satellite constellations) that provide positioning, navigation, and time (PNT) services.
108	Space Situational Awareness	SSA/SDA	Space Situational Awareness/Space Domain Awareness	Ascertain and evaluate the status of space through orbit tracking, debris analysis, and evasion decisions (essential for ensuring the safety of satellite operations).
109	Security Compliance (Cyber Export Control)	IDS/IPS	Intrusion Detection/Prevention System	IDS is a security device/function for detecting and preventing intrusions. It is used to protect terrestrial systems and satellite operating networks.
110		SOC	Security Operation Center	A base/team that monitors and operates an organization's cybersecurity. It is responsible for log monitoring and incident response.
111		ITAR	International Traffic in Arms Regulations	One of the US export control regulations. It regulates the export and transfer of defense goods and technologies related to military applications. In the space sector, it sometimes covers parts and technologies.

Glossary (Terms Abbreviated in English)

#	Category	Notation in Space Skills Standard	English Notation	Description
112	Security Compliance (Cyber and Export Control)	MTCR	Missile Technology Control Regime	An international export control framework for preventing missile proliferation. Since rocket technology can also be targeted, it is related to space transportation and propulsion technology.
113	Human Resource Development	OJT	On-the-Job Training	In-service training to learn knowledge and skills from seniors and superiors through actual work.

SpaceCRAFT Framework

UK SpaceCRAFT Framework

- In the United Kingdom, UKSA (United Kingdom Space Agency) is leading efforts to secure and develop human resources in the space industry through the SpaceCRAFT Framework developed by the Space Skills Alliance.

Oranization	UK Space Agency (UKSA) and Space Skills Alliance * The Space Skills Alliance is a think tank founded in the UK in 2019. It creates a career website for the space industry, conducts social surveys on the space industry, and produces reports on skills.	
Activity Period	Version 1 released in 2021, version 2 released in March 2025.	
Framework Background	While the UK government has set a goal of capturing 10% of the global market by 2030, more than 40% of UK companies are **aware of a talent shortage and skill gaps among current employees.** In addition, there is a **shortage of educational institutions and training infrastructure, as well as worsening retention rates**. Deterioration is a problem. With the support of the UK Space Agency, the Space Skills Alliance, a UK think tank, has developed and published the SpaceCRAFT framework, designed specifically for the space sector.	
Purpose	● This framework enables students and workers **to understand the skills required** in the space industry and chart clear careers. ● The framework aims to enable companies to efficiently identify the shortage or excess of skills and human resources required by their companies, and to **optimize recruitment.** ● Educators and training providers **will develop courses and materials to meet the needs of the space industry.** ● It will enable policymakers to **properly identify the need for investment in the space sector and identify the areas where investment will have the greatest impact.**	
Example of Use	**Social research**	● In 2023, the UK Space Agency conducted a survey of space industry companies and organizations. The framework was used to develop and categorize a wide range of skills and work themes.
Expected Effects	**Adoption**	● By using the framework as a common language for skills, employers, employees, educational institutions, and other space industry players will be able to organize and coordinate their needs and offerings, making recruitment and human resource development easier. ● The framework is expected to be used in conjunction with other Space Skills Alliance research and studies on space talent to stimulate the flow of talent into the space industry.

Source: SpaceCRAFT framework "The SpaceCRAFT Framework" https://craft.spaceskills.org/

History of Space Industry Skills Consolidation in the UK

- With the ultimate goal of capturing 10% of the global market share in the space industry, the UK government has developed the SpaceCRAFT Framework, which can be used by both inexperienced and
  They have developed the SpaceCRAFT Framework, which can be used as an indicator for skill acquisition by both personnel already active in the industry.

Progress in Space Industry Skills Consolidation in the UK

2020

- Space Sector Skill survey 2020 (Space Industry Skills Survey 2020).

The survey revealed the following issues:

- More than 40% of space industry companies in th UK are **aware of talent shortages and skill gaps among current employees.** In addition, **employee retention rates** are deteriorating.
- **There** is **a lack of educational institutions and training infrastructure.**

2021

- **Creation and presentation of SpaceCRAFT Framework** increase the flow of talent into the UK space industry
- Additional tools will be developed to improve the framework

We created a framework that aims to help:

- students, workers, and companies **learn the skills required** for the space industry and companies, **understand** and **chart clear careers**.
- companies **optimize job openings** by identifying skills gaps
- educators and training providers develop courses and materials that **meet the needs of the space industry,** enabling educators and training providers to **develop courses and materials** that meet the needs of the space industry

2023

- Space Sector Skill Survey 2023 (Space Industry Skills Survey 2023).

2024~ 2025 (planned as in 2024)

- **SpaceCRAFT Framework Skills details and levels will be added.**

Repeated maintenance and improvements will help the framework grow to better meet the needs of the industry.

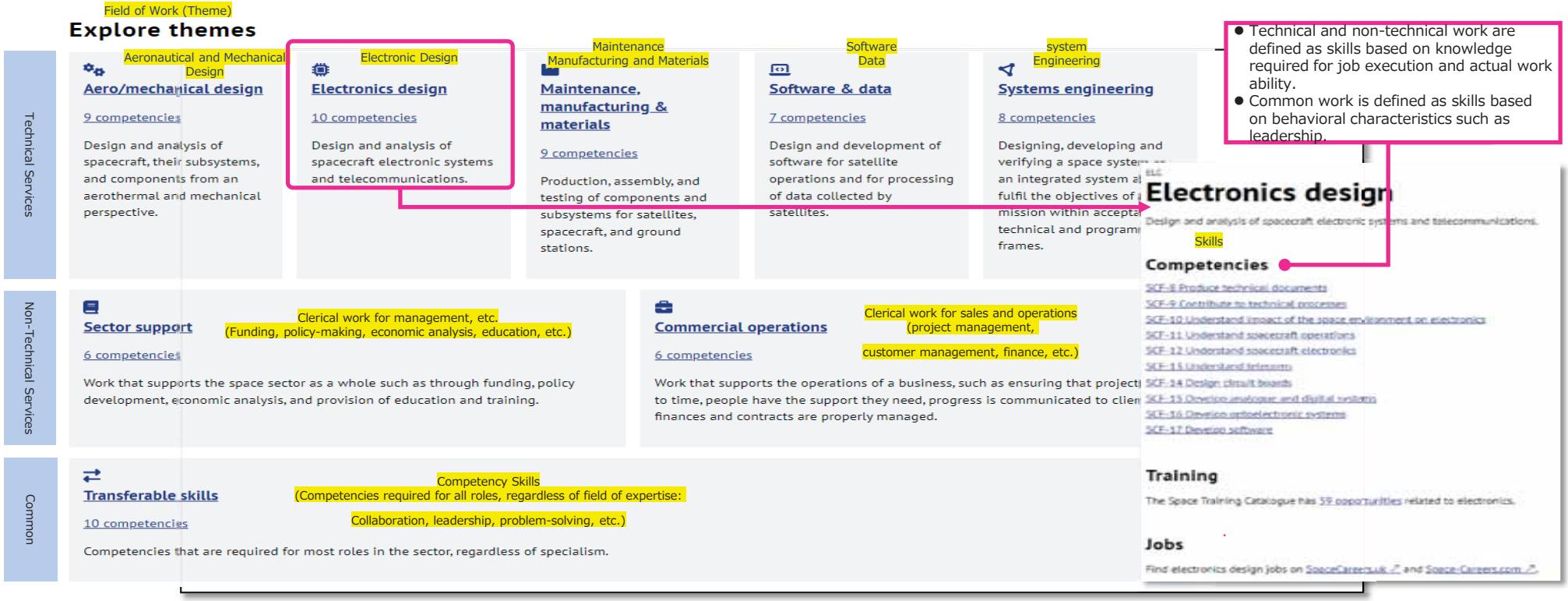
2030 (planned)

- 10% share of the global market in the space industry

Source: SpaceCRAFT framework "The SpaceCRAFT Framework" https://craft.spaceskills.org/

Organization of SpaceCRAFT Framework Scope and Expression Granularity

- In addition to five technology-related jobs, this framework organizes skills related to two non-technology-related jobs: administrative work related to management and administrative work related to sales and operations, as well as competency skills required across jobs.
- In order to make it easy for people with no experience to use the framework, jobs are not broken down and detailed content is explained on the job information website (including the individual website of the hiring company) at the URL indicated.



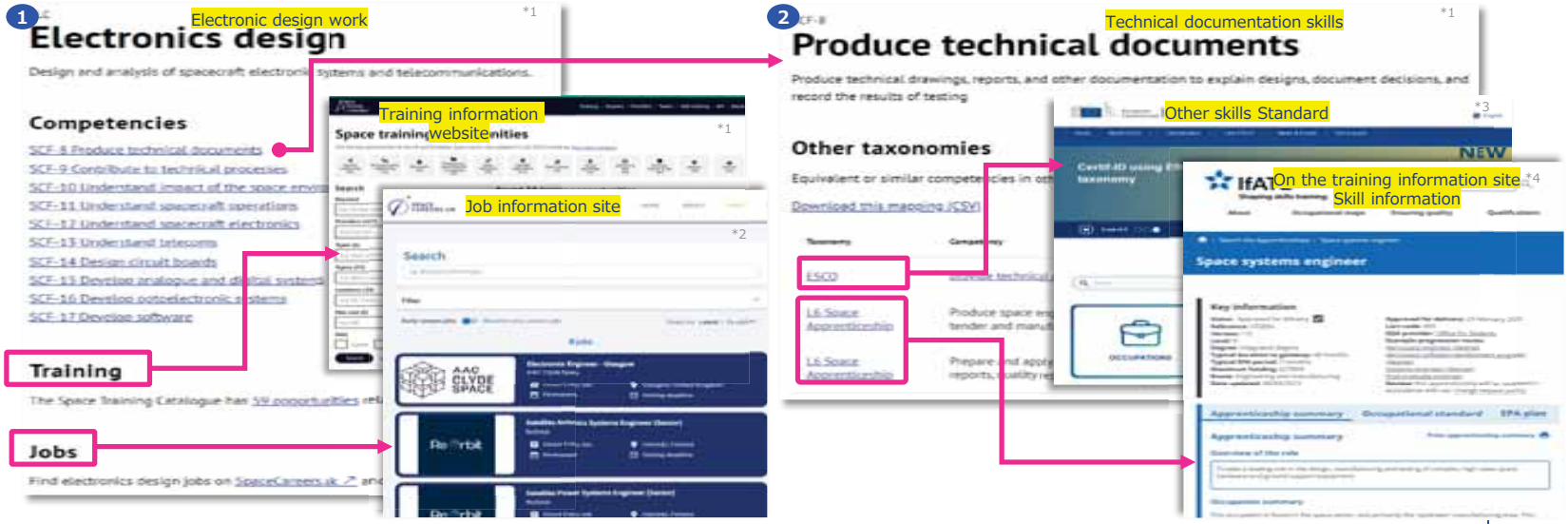
(Source) SpaceCRAFT framework "The SpaceCRAFT Framework" https://craft.spaceskills.org/

Features of SpaceCRAFT Framework

- It is published in the form of a web page and has an internal search function. In addition, it enhances the convenience of job seekers by linking with external job information sites, training information sites, and other skill standards.

Features	Overview
Internal Search Features	Taking advantage of the fact that it is created on a web page, it is possible to search for jobs and skills defined in SpaceCRAFT Framework through keyword search and job theme search. 
Connection to external sites Connecting to	① **Links to job information sites and training information sites** are set for five technology-related jobs and two non-technology-related jobs. ② **Each skill corresponds to skills in existing other skill standards** *1 **and training information sites** *2.

*1 An information site organized by the European Commission (an executive agency of the EU) on occupations and skills in various industries other than the space industry.
*2 An information site organized by IfATE (an independent agency of the UK Government Department of Education) on training information for various industries other than the space industry.



*1 (Source) SpaceCRAFT framework "The SpaceCRAFT Framework" https://craft.spaceskills.org/
*2 (Source) SPACECAREERS.UK https://spacecareers.uk/home
*3 (Source) European Skills, Competences, Qualifications and Occupations (ESCO) Homepage
*4 (Source) IfATE Shaping skills training Home/Institute for Apprenticeships and Technical Education


National Space Policy Secretariat of the Cabinet Office