DIRECTORY OF JAPANESE SPACE PRODUCTS & SERVICES

2023-2024

Who's Who

The Society of Japanese Aerospace Companies

Prologue

The Society of Japanese Aerospace Companies (SJAC) is the sole public entity representing the interests of the Japanese aerospace industry. SJAC was established with the purpose of contributing to the expansion of the Japanese aerospace industry, together with the overall improvement of national welfare −through production enhancement and trade expansion of aerospace related products−, and contributing to the sound growth of the aerospace industry as a whole.

SJAC was founded in 1952, in the year the Japanese aviation industry reopened, as a private forum for aircraft industrialists. Over the years, companies involved with space development gradually began to include themselves as well. SJAC was reorganized in 1974 as The Society of Japanese Aerospace Companies, and has grown steadily to become what it is today. In addition, SJAC joined the International Coordinating Council of Aerospace Industries Associations (ICCAIA) in 1972.

SJAC is active in the International Civil Aviation Organization (ICAO) and ICCAIA, and continually works on increasing both understanding and cooperation with overseas aerospace industrial societies including the AIA in the U.S., the ASD in the EU, the ADS in the U.K., GIFAS in France and AIAC in Canada.

SJAC is now comprised of approximately 140 member companies, and these members represent a majority of the companies engaged in the manufacturing, repairing and trading of aircraft, satellites, launch vehicles and related equipment in Japan.

This catalog “Directory of Japanese Space Products & Services 2023-2024” has been revised from the 2021-2022 edition to include the latest accomplishments, and it introduces a wide variety of Japanese companies, such as launch vehicle manufacturers, satellite manufacturers and components and parts manufacturers in the satellite business. It also includes their contact point information, and presents various attractive systems, components, devices, materials and technical/commercial services regarding the space industry

SJAC believes that the information in this catalog will help your business and greatly improve any projects currently underway, and asks you to contact any listed companies without hesitation. We strongly hope that this will lead to worthwhile business opportunities for you in the world market.

SJAC

DIRECTORY OF JAPANESE SPACE PRODUCTS & SERVICES 2023-2024

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Space Transportation Systems

H3 Launch Vehicle

The H3 Launch Vehicle is Japan's new generation flagship rocket that achieves high flexibility, high reliability, and a high level of cost/performance with the goal of leading in Space Transportation Technology. With two types of fairing, two or three first-stage engines (LE-9), and zero, two or four solid rocket boosters (SRB-3) depending on the required configuration, the H3 is offered in several product lines according to the dimensions, weight, and injection orbit of the mission payload. The capability of launching to a geostationary transfer orbit (GTO) is also the highest ever, exceeding that of the existing H-IIA and H-IIB Launch Vehicles.
The H3 is currently being developed as a successor to these launch vehicles based on their remarkable past results, and it will provide the government with the ability to act independently to access space and launch satellites and probes. The Japan Aerospace Exploration Agency (JAXA*), Mitsubishi Heavy Industries (MHI) as the prime contractor, and other related companies are all working on improving the entire system in order to complete this flexible and reliable rocket to be offered at an attractive price.

Major characteristics of Standard H3 (H3-24L)

Length	63 meters
Total mass	574 tons (without payloads)
Guidance system	Inertial guidance system

Note＊: JAXA was born through the merger of three institutions, namely the Institute of Space and Astronautical Science (ISAS), the National Aerospace Laboratory of Japan (NAL) and the National Space Development Agency of Japan (NASDA). It has been designated as a core performance agency to support the Japanese government's overall aerospace development and utilization

Epsilon Launch Vehicle

The Epsilon Launch Vehicle is a solid-fuel rocket, and its development was commenced in earnest as the next generation of the M-V rocket abolished in 2006. The first experimental model was launched in 2013, and further improvements were completed with Epsilon-2 and Epsilon-3.
Epsilon-4 supported a multi-satellite mount structure as an optional configuration, and it was successfully launched with seven satellites simultaneously in January 2019. This technology was developed to make the Epsilon Launch Vehicle internationally competitive in the launch market because the demand for launching multiple mini-/micro-satellites and/or CubeSats together is gradually increasing globally.
The purpose of new Epsilon S Launch Vehicle Project is to expand the scale of Japan’s space transport industry and to maintain the ability to act independently to access space through a synergistic effect with the H3 launch vehicle program. A demonstration launch of the Epsilon S is currently scheduled for FY2023.

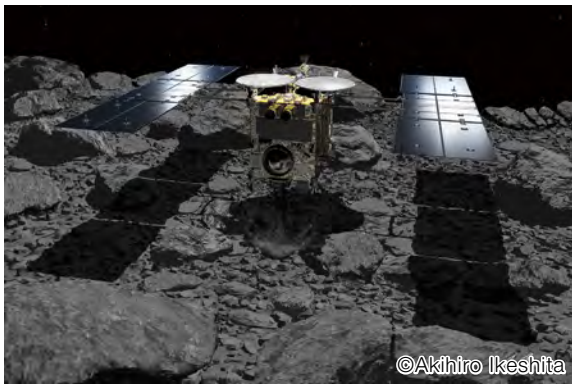
H-II Transfer Vehicle "KOUNOTORI" (HTV)

The H-II transfer vehicle “KOUNOTORI” (HTV) is an unmanned orbital transfer vehicle that measures 10 m in length and 4.4 m in maximum diameter. The vehicle weighs 16.5 tons and can carry a 6-ton payload in logistic carriers. HTV has two types of logistics carrier: a pressurized section where crew members can work when the HTV is berthed to the ISS, and an unpressurized section that accommodates Kibo's exposed facility payloads on the exposed pallet.

Research on the Space Science

HAYABUSA2

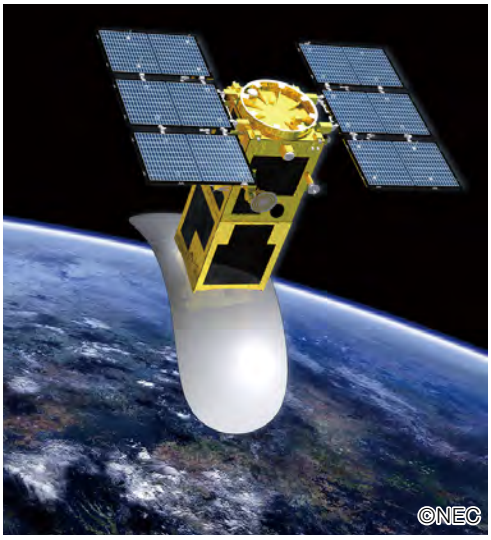
The asteroid explorer Hayabusa 2 was planned based on the heritage of Hayabusa (MUSES-C) that returned to Earth in June 2010. Hayabusa brought back samples from the asteroid “Itokawa” to research the origin of the solar system. Hayabusa 2 targets the C-type asteroid “Ryugu” to continue this purpose by appending the experience acquired from the Hayabusa mission.
To learn more about the origin and evolution of the solar system, it is important to investigate a C-type asteroid, which is the target of Hayabusa 2, because it is a more primordial body than Itokawa, which is an S-type asteroid, and is considered to contain more organic or hydrated minerals. Minerals and seawater, which form the Earth as well as materials for life, are believed to be strongly connected in the primitive solar nebula in the early solar system.



Earth Observation Satellites

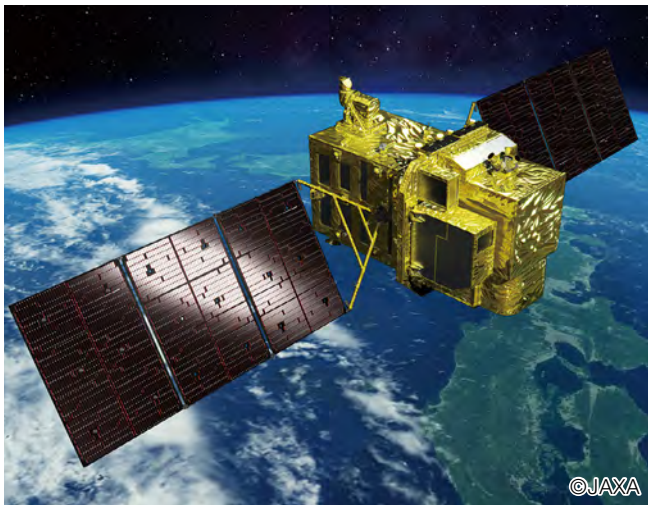
ASNARO-2

NEC's small radar satellite, Advanced Satellite with New system Architecture for Observation-2 "ASNARO-2", was launched from the JAXA Uchinoura Space Center on January 18, 2018.
ASNARO-2 was developed by NEC Corporation as part of a project funded by Japan's Ministry of Economy, Trade and Industry. JAXA, who is NEC Corporation's contractor, is in charge of the launch operations of ASNARO-2.
ASNARO-2's radar sensor has successfully captured details of ground conditions, such as the movement of lava around a crater, even though it was obstructed by smoke, something that is difficult for conventional optical sensors to observe.



Advanced Land Observing Satellite-3 (ALOS-3)

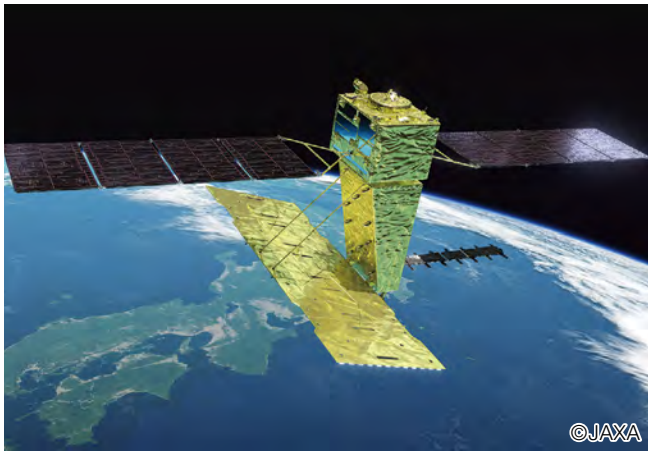
The sensor onboard ALOS-3 is designed for improved ground resolution (0.8 m) and wide-range (70 km) simultaneously by expanding the size and upgrading performance compared to that of the previous ALOS. ALOS-3 observations regularly cover all of the land areas of not only Japan but also across the whole world.
The purpose of ALOS-3 is to become one of the key tools for disaster management and countermeasures of the central and local governments. In addition to that, a system for product distribution has also been developed to deliver images to users swiftly of both before and after a disaster.
This sensor, which is very challenging to achieve, has been developed thanks to our technical heritage accumulated through our experience in manufacturing large optical systems and high-performance detectors.



Advanced Land Observing Satellite-4 (ALOS-4)

ALOS-4 is a satellite that observes the Earth's surface using its onboard phased array type L-band synthetic aperture radar (PALSAR-3). The L-band radar technology has been continuously developed in Japan. With observation performance improved even further compared to the predecessor PALSAR-2 aboard the ALOS-2, JAXA and Mitsubishi Electric Corporation as the prime contractor are developing a satellite that covers both high resolution and a broader observation range.

The ALOS-4 will be equipped with the high performance satellite Automatic Identification System for ships (AIS) receiver to be named the SPace based AIS Experiment (SPAISE3). Effective countermeasures against radio wave interference regions are taken for the SPAISE3 with multiple antennas and ground-based data processing. SPAISE3 development is JAXA's ongoing project in cooperation with NEC Corporation.



The Earth Clouds, Aerosols and Radiation Explorer (EarthCARE)

EarthCARE is an earth observation satellite that Japan and Europe have been jointly developing. Using its four sensors (Cloud Profiling Radar, Backscatter Lidar, Multi-Spectral Imager and Broadband Radiometer), clouds and aerosols (small particles like dust and dirt that exist in the earth's atmosphere) will be observed on a global scale to improve the accuracy of climate change predictions. With the EarthCARE mission, observations will be carried out on the distribution of cloud particles and aerosols in the vertical direction and speed measurements will be performed on cloud particles ascending and descending. Through this, the mechanism of radiation balance in the interaction between clouds and aerosols can be solved and improvements in climate change predictions are expected.

Global Navigation Satellite System (GNSS)

Quasi-Zenith Satellite System (QZSS)

QZSS is a Japanese satellite positioning system composed mainly of satellites in quasi-zenith orbits (QZO). These satellites travel in a geosynchronous orbit at an inclination of 45 degrees in order to pass near the zenith over Japan, thus providing seamless service irrespective of geographical features. They will significantly improve the accuracy of positioning in areas where GPS signals are not fully received due to interference caused by skyscrapers and mountainous terrain. These satellites provide highly accurate centimeter-level positioning information.

The first quasi-zenith satellite was launched in September 2010. Three additional satellites were launched consecutively starting in 2017. QZSS (Michibiki) became a four-satellite constellation in 2018, and three satellites became visible at all times from locations in the Asia-Oceania region. QZSS can be used in combination with GPS, ensuring a sufficient number of satellites for stable, high-precision positioning.

Geostationary Satellite

Engineering Test Satellite-9 (ETS-9)

ETS-9 is a demonstration satellite for realizing next generation geostationary communication that will be internationally competitive in the 2020s. JAXA has been working together with Mitsubishi Electric Corporation to be a prime manufacturer from the design phase in order to obtain highly competitive satellite bus technology in the global market.

ETS-9 employs all-electric satellite technology and electric propulsion, such as ion-engine and hall-thruster, has been chosen instead of chemical propulsion to transfer the satellite to a geostationary orbit after separation from a launch vehicle. This approach will significantly reduce propellant weight, thus allowing heavier communication components, and reducing the launch cost depending on the weight. Unfortunately, electric propulsion has a disadvantage in that the impulsion is smaller than with chemical propulsion, so JAXA will improve this negative point to shorten the orbit raising period as much as possible.

ETS-9 will support a geostationary GPS receiver to enable autonomous control of its orbit by ingesting its orbit information through the receiver to reduce the workload of satellite operators. Furthermore, it will verify the function of the loop heat pipe (LHP) that dissipates the significant heat generated by the 25 kW or more of power consumed by the mission components.

Major characteristics of ETS-9

Designed life	16 years (except payload)
Mass	4.9 t
Orbit	Geostationary orbit 36,000 km
Power generation	Over 25kW

References https://global.jaxa.jp

Japanese companies for space industries

EKK EAGLE INDUSTRY CO., LTD.

Eagle Industry Co., Ltd.

2-4-1, Shiba-koen, Minato-ku, Tokyo 105-8587, Japan
Phone +81-3-3438-2291 **FAX** +81-3-3432-5448
https://www.ekkeagle.com/en/

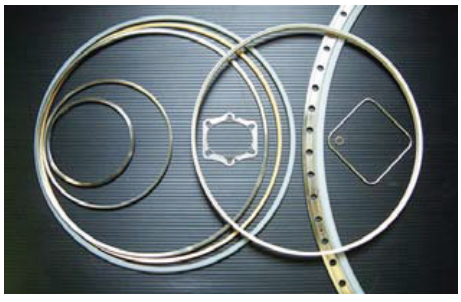
The Company	■ **Capital** **¥10,491** Million ■ **Sales** **¥142,106** Million (Consolidated) ■ **Employee** **6,594** (Consolidated)
Major Customers	・Japan Aerospace Exploration Agency ・Mitsubishi Heavy Industries, Ltd. ・IHI Corporation ・IHI AEROSPACE Co., Ltd.

Space Products & Services

Metal Static Seals

EKK provides several kinds of Self-Actuating Static Seals as ACTISEAL series. Outstanding performance of them can be shown in their low compression load characteristics and pressure resistance. And also, due to pressure effects, sealing surface can follow defl ection of fl ange surface.

Applicable Condition	ACTISEAL -			
	C	E	W	N
Temperature	-270degC to +800 degC			
Pressure	Vac - 300MPa	50MPa	50MPa	Vac - 60MPa
Seal Performance	High	Low	Low	High
Size(DIA)	6-1400mm	20-1400mm	200-1000mm	30-1000mm
Defl ection of Flange	Approx. 0.02-0.26mm	0.7mm/ single, more over/multi	Max. 1.7mm	Max. 0.3mm
Compression Load	250-950 N/CIRC.cm	100-350 N/CIRC.cm	50-150 N/CIRC.cm	600-1200 N/CIRC.cm

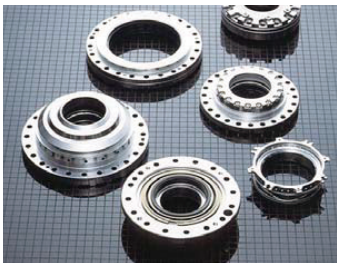


Tank Manhole Seal

EKK provides large size ACTISEAL-N to Rocket Propellant Tanks as Tank Manhole Seal. This seal is designed for large defl ection with plate of bolts to conform to Tank's special requirements.
Maximum size is approximate 1000mm DIA. This seal can maintain high elasticity under severe cryogenic condition. Besides, as this high elasticity contributes to low compression, wall thickness at seal installation can be thinner. It contributes to lightening the weight of Tank Manholes.

Cryogenic Seals

Today, large-high performance rocket uses LOX and LH2 as propellant.
Propellant is injected into engine combustion chamber with high pressure (20-40MPa) by high-speed rotation turbo pump. As this turbo pump is driven by high temp gas (500-700degC), if propellant contacts with high temp gas, it may be exposed very dangerous condition.
EKK provides Cryogenic Seals, which can compose, under such critical high speed condition, seal system preventing fl uid contact and leakage. As a seal type, bellows seal under low pressure, floating seal under high pressure and Segmented seal composing He gas barrier.



Metal Bellows Accumulator

EKK provides the Welded Metal Bellows Accumulators for Japanese Experiment Module (JEM) of International Space Station (ISS).

THE FURUKAWA BATTERY CO., LTD

4-1Hoshikawa 2chome, Hodogaya-ku, Yokohama, 240-0006, Japan
Phone +81-45-336-5034 **FAX** +81-45-333-3511
E-mail : fb@furukawadenchi.co.jp
http : //www.furukawadenchi.co.jp

The Company	■ **Capital** **¥1,640** Million ■ **Sales** **¥42,437** Million ■ **Employee** **1010**
Major Customers	・Japan Aerospace Exploration Agency

Space Products & Services

Ni-Cd Battery Cell (for satellite)

Capacity (AH)	Dimensions (mm)				Weight (g)
	H1	H2	W	T	
4.0	92.2	86.7	38.0	20.0	205
6.0	99.0	87.0	53.5	21.0	318
8.0	118.0	106.0	53.5	21.0	403
10.0	94.5	89.0	70.0	25.0	475
12.0	105.4	100.0	70.0	25.0	565
13.5	129.0	117.0	70.0	25.0	678
19.0	166.0	154.0	70.0	25.0	845
28.0	167.7	155.9	100.5	24.4	1255
30.0	164.8	15.0	100.5	24.4	1098

Li-ion Battery Cell (for satellite)

Capacity (AH)	Dimensions (mm)				Weight (g)
	H1	H2	W	T	
13.2	142.0	132.0	69.3	24.4	570
23.5	162.2	152.2	78.0	28.0	785

Past Participation Projects

☆ **Domestic Scientific Satellite**
SHINSEI, DENPA, TAIYO, KYOKKO, JIKIKEN, HAKUCHO, HINOTORI, TENMA, OHZORA, SUISEI, GINGA, AKEBONO, HITEN, YOKOH, HALCA, NOZOMI,HAYABUSA* , SUZAKU, AKARI, HINODE, HAYABUSA2* , AKATSUKI* , MMO*

*: These satellite wear Li-ion battery cell and the others were Ni-Cd battery cells.

☆ **Domestic Engineering Test Satellite**
KIKU-1, UME, UME-2, KIKU-3, KIKU-4, MOMO-1, KIKU-5, MOMO-1b

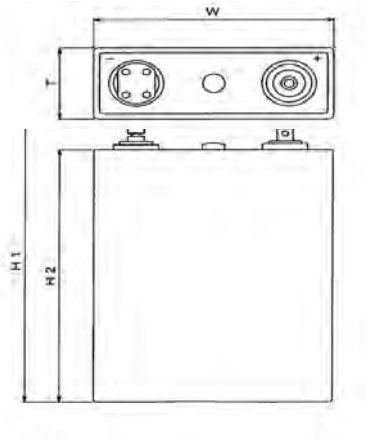
Location

Yokohama Head Office
Tokyo Sales Office
Iwaki Plant(Fukushima-prefecture.)

Correspondence

Industrial Battery Sales & Marketing Div.
Aerospace and Applied Energy Dept.
TEL：+81-3-3492-2972
FAX：+81-3-3492-2973
E-mail：fb@furukawadenchi.co.jp

▼ External View of Battery Cell



▼ Battery Cells

GS Yuasa Technology Ltd.

1-7-13, Shiba-koen, Minato-ku, Tokyo105-0011, Japan
Phone +81-3-5402-5818 **FAX** +81-3-5402-5870
E-mail : gyt@jp.gs-yuasa.com
http://www.gs-yuasa.com/gyt/jp

The Company	■ **Capital** **¥480** Million ■ **Sales** **¥16,400** Million ■ **Employee** **397** (As of March 31,2022)
Major Customers	・Japan Aerospace exploration Agency (JAXA) ・Mitsubishi Heavy Industries Ltd. ・Mitsubishi Electric Corporation ・NEC Corporation

Space Products & Services

Cells / Batteries for space use

GS Yuasa Technology has contributed to the space industries since 1970s, beginning with silver-oxide batteries for rocket. To date, we have delivered batteries and thousands of cells for space use and have built strong working relationships with many battery and spacecraft manufacturers.
We supply nickel-cadmium batteries, thermal batteries and lithium-ion batteries for HII A/B and Epsilon launch vehicles.
We have developed and manufactured the lithium-ion cells for satellite use since the early 1990s. The power systems of more than 200 satellites have relied on GS Yuasa's lithium-ion technology for a total of more than 4,000,000 Wh on orbit without anomaly or failure. On a total energy storage capacity basis (Wh), GS Yuasa Technology is a world leader in lithium-ion for space.

Appearance of thermal batteries

GS Yuasa Group will extend further contributions to space development projects through the development and manufacturing of high performance batteries going forward.

Appearances of lithium-ion cells for space application

Further to the products listed above for satellite application, our product portfolio of lithium-ion cells that are purposely designed for specific applications expands products for other applications such as aviation, deep ocean and defense. GYT also design, manufacture and sell varieties of primary and secondary cells such as metallic lithium cells, silver oxide / zinc cells, seawater cells.

Specification of GYT's lithium-ion cells for space application

Nominal capacity (Ah)	12	42	55	60	110	145/150	160	190	205
Nominal voltage (V)	3.75	3.7	3.7	3.72	3.7	3.7	3.72	3.7	3.72
Dimensions(mm)★1	W 133 D 21 H 69	W 93 D 37 H 159	W 130 D 50 H 131	W 130 D 50 H 131	W 165 D 50 H 216	W 130 D 50 H 271	W 130 D 50 H 271	W 165 D 50 H 271	W 165 D 50 H 271
Mass (kg)	0.39	1.1	1.53	1.57	2.77	3.55	3.69	4.59	4.78
Designed Life	7 years (LEO) , 20 years (GEO)								

★1: Excluding the height of terminals

HARADASEIKI

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Phone +81-53-436-7341 **FAX** +81-53-438-0595
http://www.haradaseiki.co.jp

The Company	■ Capital ¥10 Million	■ Net Sales ¥500 Million	■ Employee 24
Major Customers	・Satellite makers in Japan		

Space Products & Services

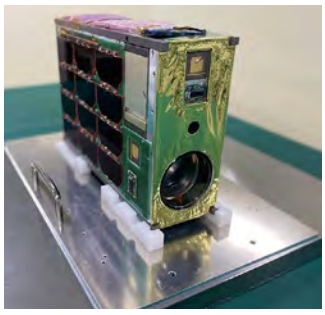
Harada Seiki has been manufacturing Mitsubishi Electric satellite components since 2000.
We have been working on space product development since 2007.
We have developed telescope systems, camera systems, data collection systems, and data transfer systems as products to support various missions.
Rover was developed as a vehicle for planetary exploration.
We have developed 3U and 6U artificial satellites for observation.
All of these developed products are original products of Harada Seiki.

Satellite systems

HSKSAT (3U) : The 3U satellite will be operational in 2021.
KITSUNE (6U) : The operation of 6U satellites is from 2021 to 2022.
We are currently working on orders for 3U and 6U nanosatellites and the next generation of satellites.

3UCubSat HSKSAT experimental Sat

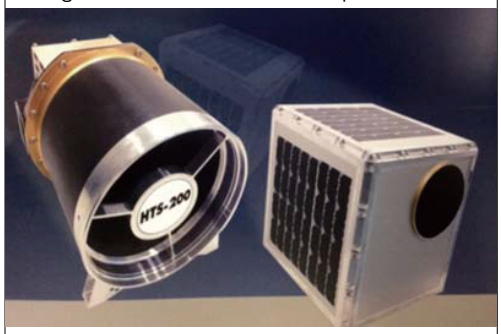
6UCubSat KITSUNE



KITSUNE

Space Product

Design and manufacture Complete



igh Bullitt telescope system

Ground station

Optical communication

Planetary probe vehicle「ROVER」

Design and manufacture Complete

HIREC
High-Reliability Engineering & Components Corporation

High-Reliability Engineering & Components Corporation
Muza Kawasaki Central Tower 12th Floor, 1310, Omiya-cho, Saiwai-ku, Kawasaki-shi, Kanagawa, 212-8554, Japan
Phone +81-44-201-1512 **FAX** +81-44-201-1531
http://www.hirec.co.jp/

The Company	■ **Capital** **¥200** Million (Right-granted capital:¥800 Million) ■ **Sales** **¥904** Million ■ **Employee** **87**
Major Customers	・Japan Aerospace Exploration Agency ・National Institute of Information and Communications Technology ・Mitsubishi Heavy Industries, Ltd. ・NEC Corporation ・Mitsubishi Electric Corporation ・NEC Space Technologies, Ltd. ・Others

Space Products & Services

Scope of HIREC's Products & Service

1. Test & Analysis Service and supply/manufacture(※) of Electric parts and components
2. Consultation for Space Craft's Assurances and Project support

(※) HR5000S 64bit MPU)

Testing and Analysis Service

<Key Features>
– High Reliability Test & Analysis Service for Space requirements
– Covers al l type of Testing and Analysis Service for Space usage.

ENVIRONMENTAL TEST

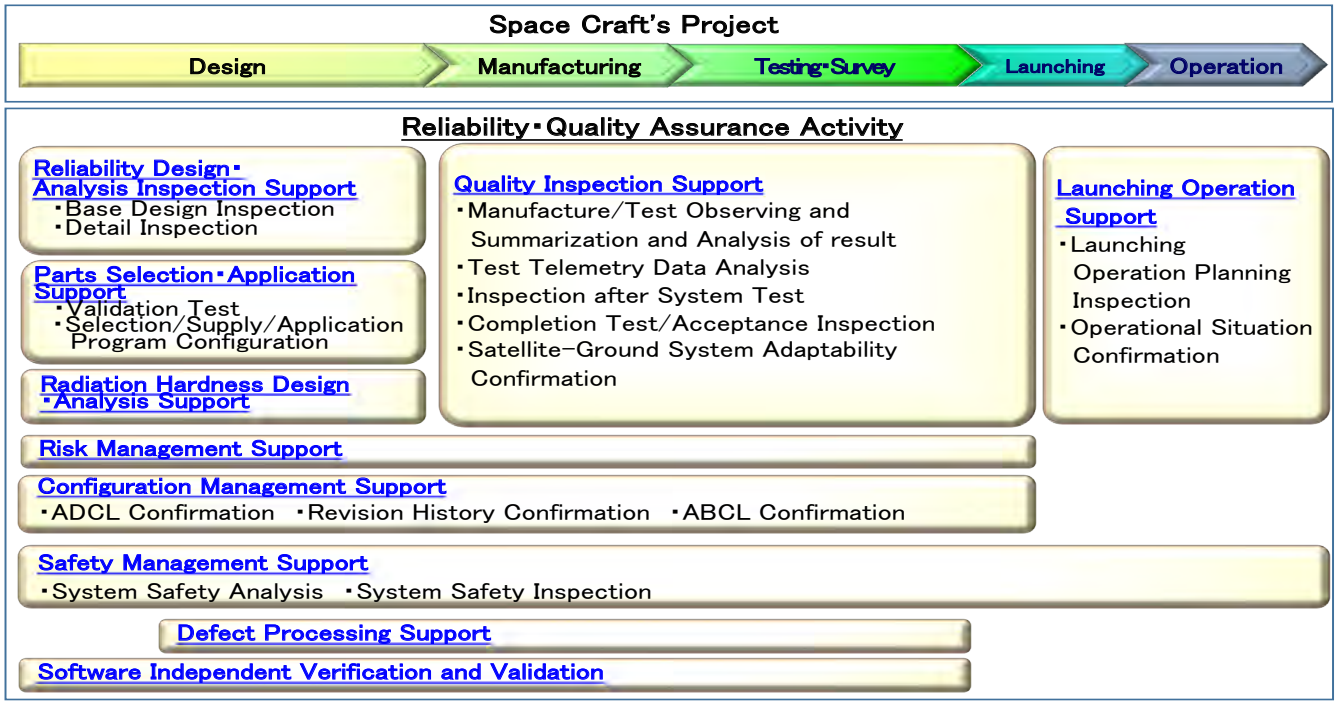
To evaluate a variety of parts used in Space environment.
・Radiation Test
– Total Ionizing Dose Effect (TID) Test
– Single Event Effect (SEE) Test, etc
・Temperature Cycling Test and High Temperature & Humidity Test
・Electro Static Discharge Test, etc

SCREENING/QUALITY CONFORMANCE INSPECTION

To assure the Parts reliability required by JAXA-QTS, MILPRF, etc. The method of respective tests conducted as the screening or quality conformance inspection meets the requirements of MIL-STD-883, 750, 202 etc.
・Screening Test
・Quality Conformance Inspection
1. Electrical parameter test (Group A test)
2. Test related to workmanship (Group B test)
3. Test related to die (Group C test)
4. Test related to packaging (Group D test)
5. Radiation Hardness Assurance Test (Group E test)

・DPA (Destructive Physical Analysis)
・Failure Analysis, etc

Consulting and Technical Support of Space Craft's Project



IHI Corporation

TOYOSU IHI BUILDING., 1-1, Toyosu 3-chome, Koto-ku, Tokyo 135-8710, Japan
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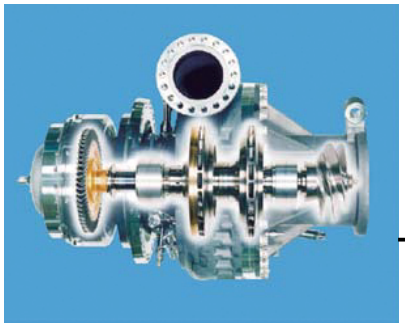
http://www.ihi.co.jp/en/

The Company	■ **Capital ¥107.1** billion (As of March 31,2022) ■ **Sales ¥14,834** billion (As of March 31,2022) ■ **Employee 28,801** (As of March 31,2022)
Major Customers	・Ministry of Defense ・Ministry of Land, Infrastructure, Transport and Tourism ・Japan Nuclear Fuel Limited ・Japan Aero Engines Corporation ・Japan Aerospace Exploration Agency ・Mitsubishi Heavy Industries, Ltd.

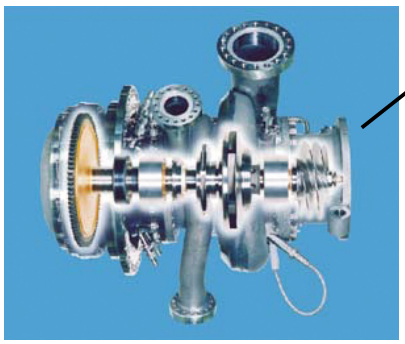
Space Products & Services

LE-7A Turbopump

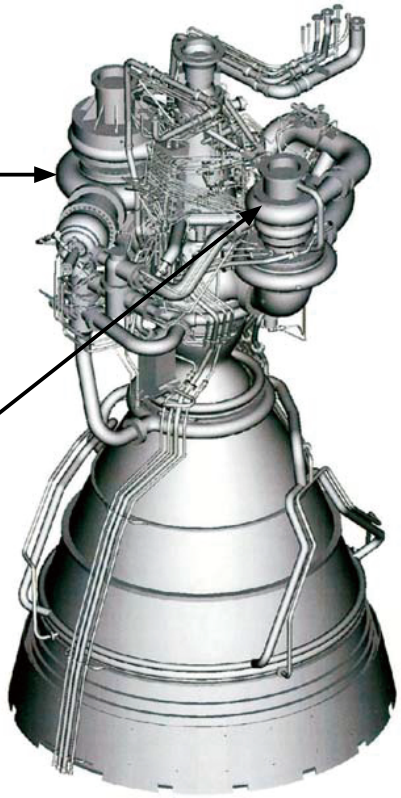
Two turbopumps. developed for the LE-7A engine, a 100 tons class 1st stage main engine of the H-IIA launch vehicle, are designed to meet the conflicting requirements of high performance, high reliability and low cost.



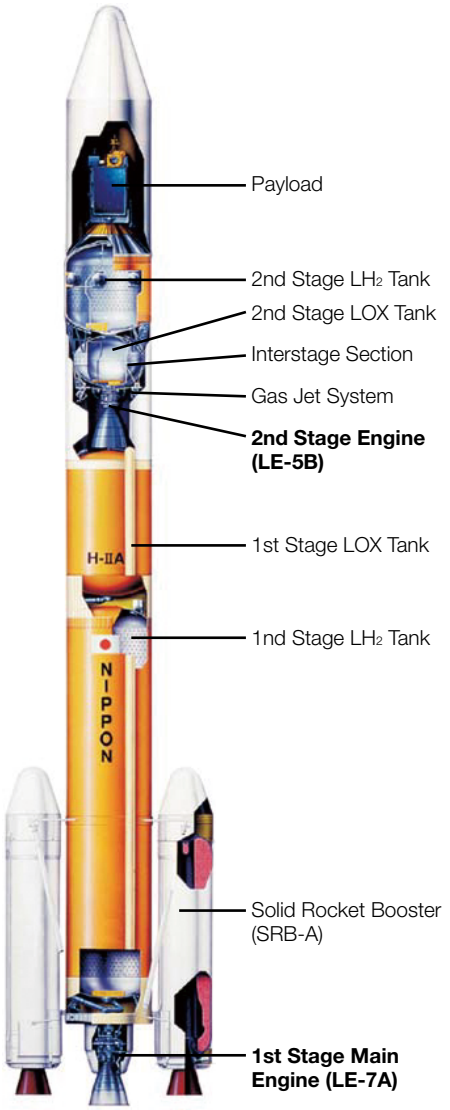
1st stage main engine (LE-7A)
LH_2 turbopump



1st stage main engine (LE-7A)
LOX turbopump



LE-7A engine



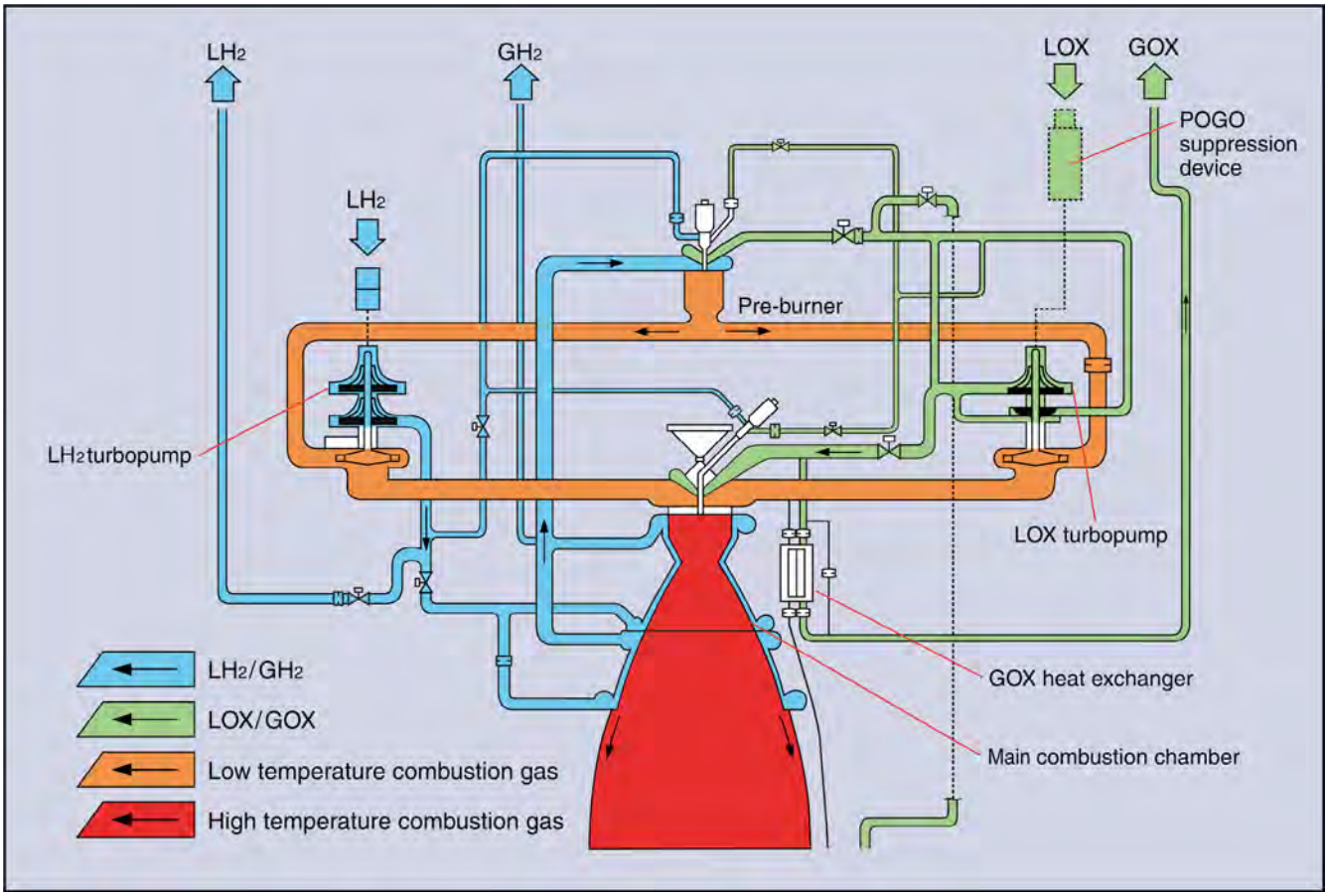
H-ⅡA Launch Vehicle ©JAXA

Specification of LE-7A Engine Turbopump

LE-7A engine specifications		
Propellant		LOX / LH_2
Thrust	[kN]	1,074
Combustion Pressure	[MPa]	12.2

Turbopumps specifications				
Turbopumps		LH_2	LOX	
			Main Pump	Split Pump
Rotation Speed	[rpm]	42,000	18,30	
Flowrate	[kg/s]	37.3	218.8	46.7
Discharge Pressure	[MPa]	28.6	18.0	26.4
Weight[kg]		220	190	

LE-7A Engine Schematic



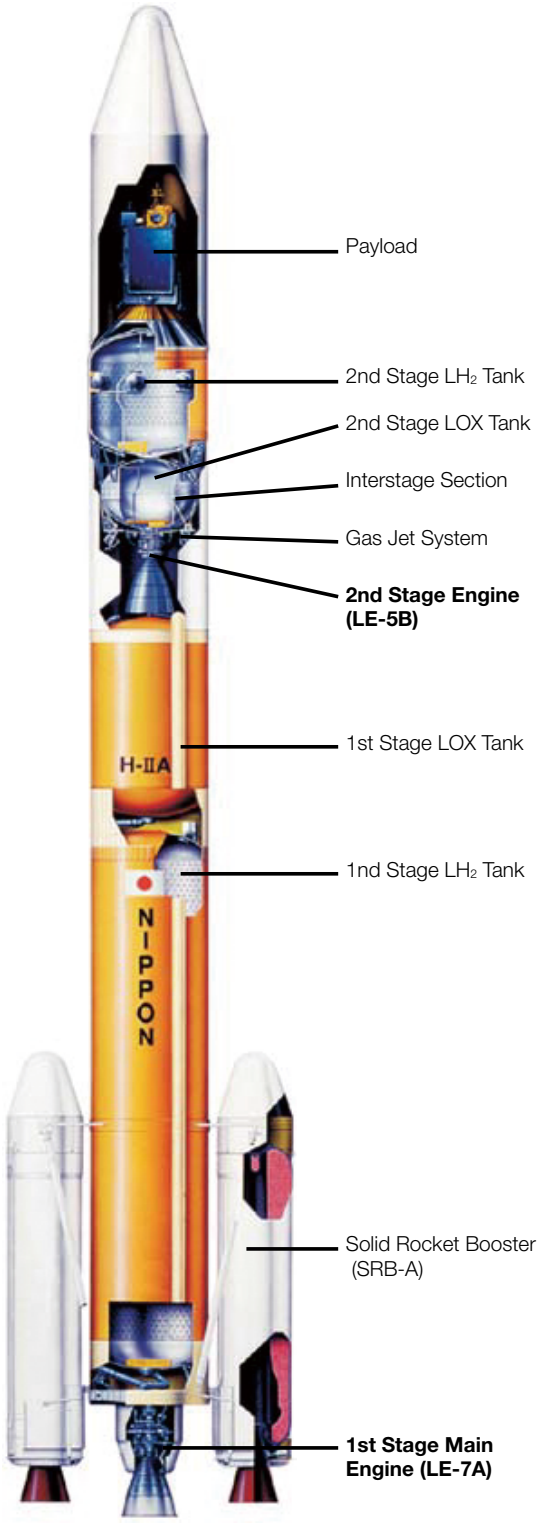
LE-5B Turbopump

A liquid hydrogen and a liquid oxygen turbopumps developed for the LE-5B engine, that power the H-IIA launch vehicle second stage with 10 tons of thrust.
The pumps are provided with throttling and multiple firing capability fulfilling high performance, high reliability and low-cost requirements.

Specification of LE-5B Engine Turbopump

LE-5B engine spacification	
LE-5B engine specification	Liquid Oxygen (LOX)/ Liquid Hydrogen
Operating point	100% thrust
Thrust [kN]	137
Combustion Pressure [MPa]	3.62

Turbopumps specifications		
Operating point (LE-5B thrust)	100%	
Turbopumps	LH_2	LOX
Rotation Speed [rpm]	52,100	17,700
Flowrate [kg/s]	5.2	26.9
Discharge Pressure [MPa]	6.86	5.30
Approx. Weight [kg]	25	25



H-IIA Launch Vehicle ©JAXA

IHI AEROSPACE Co., Ltd.

1-1, Toyosu 3-chome, Koto-ku, Tokyo 135-0061, Japan
Phone +81-3-6204-8000 **FAX** +81-3-6204-8810
http//www.ihi.co.jp/ia/

The Company	■ **Capital** **¥5,000** Million ■ **Sales** **¥48,949** Million (Approx.) ■ **Employee** **1,000** (Approx.)
Major Customers	・Japan Aerospace Exploration Agency ・Mitsubishi Heavy Industries, Ltd. ・Mitsubishi Electric Corporation ・NEC Corporation

Space Products & Services

IHI Aerospace (abbreviated hereafter as IA) is carrying out the development, manufacture, and has been contributing in a big way to the indigenous space development in Japan. Our company started research on rocket projectiles in 1953.
Now we have become a leading comprehensive manufacturer carrying out development and manufacture of rocket projectiles in Japan. IA has also achieved excellent results in development of recovery systems and propulsion systems including the bi-propellant liquid apogee engine and gas jet reaction control system for satellites and spacecraft.

Epsilon Launch Vehicle

Epsilon Launch Vehicle is a solid propellant rocket for a new age, with high performance and best value. It can offer affordable dedicated launch service to customers for small satellites of various LEO missions such as science, technology demonstration and earth observation. IA is engaged in system integration, as JAXA's main contractor. In addition, IA is designated as the prime contractor of rocket system for new Epsilon (named as “Epsilon S”) development and the private operator of launch service business using “Epsilon S”.

Epsilon Launch Vehicle (Enhanced model)

Model		Enhanced Epsilon	
Configuration		Standard Configuration	Optional Configuration
Overal length (m)		About 26	
Overal mass (ton)		About 95.4	About 95.7
Diamter (m)		2.6	
Stages		3 solid-motor stage	3 solid-motor stage + liquid post-boost stage
Launch capacity (kg)	SSO	-	over 590
	Highly ellipitical orbit	over 365	-

H-IIA Launch Vehicle, H3 Launch Vehicle

IA is responsible for the development and manufacture of the solid rocket boosters (SRB-A), 2nd stage reaction control gasjets and the pyrotechnics for the H-IIA Launch Vehicle . And IA is also developing new solid booster (SRB-3) for H3 Launch Vehicle which will be a successor to the H-IIA.

Launch with Solid Rocket Booster (SRB-A)

H-IIA Launch Vehicle

Static Firing Test of Solid Rocket Booster (SRB-A)

Monopropellant Thrusters

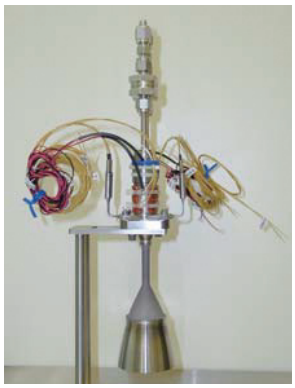
1N Thruster:
Thrus t : 0.29 ～ 1.13[N] (Nom)
@0.55 ～ 2.76[MPa]
Isp : 208 ～ 215[s] (Min)
@0.55 ～ 2.76[MPa]
Number of Pulses : 850,000 over
Throughput : 100 over[kg]
4N Thruster:
Thrust : 1.80 ～ 5.01[N] (Nom) @0.69 ～ 2.76[MPa]
Isp : 212 ～ 225[s] (Min) @0.69 ～ 2.76[MPa]
Number of Pulses : 850,000 over
Throughput : 190 over[kg]


1N Thruster


4N Thruster

Bipropellant Thrusters

22N Thruster:
Nominal Thrust: 21.5 [N]
Nominal Isp: 295[s]
Nominal Inlet Pressure: 1.69[MPa]
Demonstrated life : 87,813[s]
450N Liquid Apogee Engine:
Nominal Thrust: 450[N]
Nominal Isp: 326[s]
Nominal Inlet Pressure: O 1.62[MPa], F 1.69[MPa]
Demonstrated life : 32,850[s]

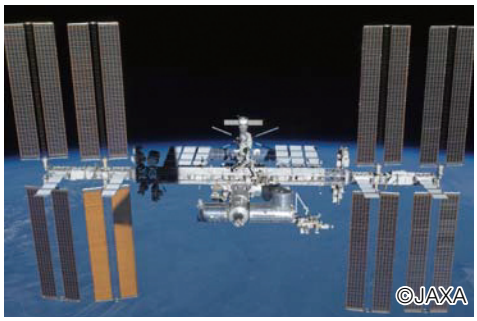

22N Thruster


450N Liquid Apogee Engine

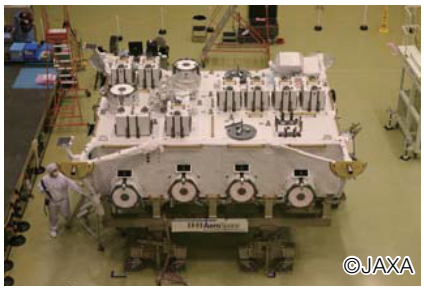
Space Station Equipment

As part of the International Space Station (ISS) project involving Japan, the US, Canada, the EU and Russia, IA is designing and developing the Exposed Facility and the Experiment Logistics Module Exposed Section for JAXA, as well as test equipment for its onboard laboratory.

IA is also participating in the development of a space station supply vehicle (HTV). It succeeded 9 flights and finished its duty. IA has been involved in the development of the propulsion system of the HTV-X, which will be a successor to the HTV.



International Space Station

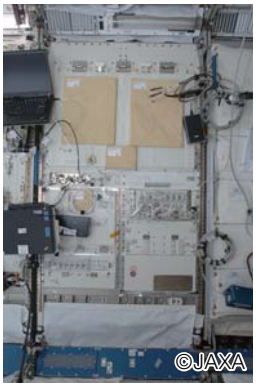


Exposed Facility

Small Satellite orbital deployer

H-II Transfer Vehicle (HTV)

Propulsion Module



Multi-purpose Small Payload Rack

JAMCO Corporation

1-100 Takamatsu-cho, Tachikawa, Tokyo, Japan, 190-0011
Phone +81-42-503-9900
E-mail : marketing_ac@jamco.co.jp
https://www.jamco.co.jp/en/

The Company	■ **Capital** **¥5,359** Million ■ **Sales** **¥39,078** Million ■ **Employee** **2,630** (Consolidated As of April 2022)
Major Customers	・Boeing ・Airbus ・Each Airlines ・Japan Ministry of Defense ・Mitsubishi Heavy Industries, Ltd. ・Kawasaki Heavy Industries, Ltd. ・IHI Corporation ・IHI AEROSPACE Co.,Ltd. ・SHIMADZU CORPORATION

Space Products & Services

JAMCO Aircraft Components Group (Here after JAMCO) is leveraging its expertise in special process techniques to manufacture heat exchangers, jet engine parts, CFRP structural parts, and other aircraft components at a high level of quality and safety.
JAMCO has special process techniques such as, welding, brazing, surface treatments and heat treatments. We also have a capability of special process inspections, including X-ray radiographic tests and ultrasonic tests, for ensuring the quality of products manufactured with those processes.
In addition, we have been accredited by Nadcap for three processes: nondestructive testing (NDT), composites, and Laser machining (NM).

Heat exchanger for Air-conditioning

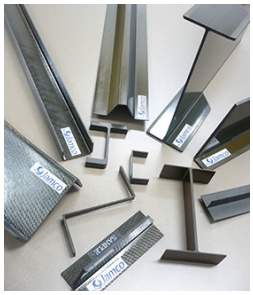
Among JAMCO's mainstay products are heat exchangers, which are core components of air conditioning systems installed in aircraft. Because of the extremely complex structure of these products, JAMCO must apply the advanced special process techniques it has refined over many years, including dip and vacuum furnace brazing, precision welding and machining, and nondestructive testing.
We have succeeded in developing these techniques for various types of metals that are used for aircraft components, including aluminum, stainless steel, titanium, magnesium, and super alloys.
Not only for aircraft, we have enough experiences of supplying heat exchangers for space products, utilizing those process techniques.

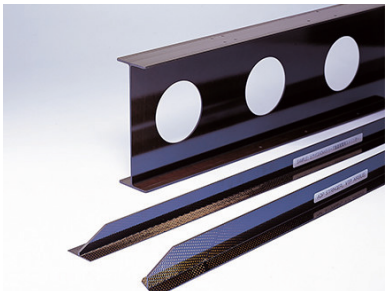
Tubes

JAMCO supplies various types of tubes for Aircraft jet engines and rocket engines with material, such as aluminum, stainless steel, Inconel and titanium.

Composite

ADP is unique process for manufacturing composite profiles using prepregs, solely developed by JAMCO.
JAMCO provides CFRP structural parts for commercial airplane, utilizing with ADP process, Hand lay-up and Hot drape process.





Japan Aviation Electronics Industry, Limited

21-1, Dogenzaka 1-chome, Shibuya-ku, Tokyo 150-0043, Japan
Phone +81-3-3780-2925 **FAX** +81-3-3780-2945
E-mail : JAEaerinfoJAE_AP@jae.co.jp
https://www.jae.com/en/Motion_Senser_Control/Aer/

The Company	■ **Capital** **¥10,690** Million ■ **Sales** **¥225,100** Million ■ **Employee** **9,427**
Major Customers	・Japan Aerospace Exploration Agency (JAXA) ・Mitsubishi Heavy Industries, Ltd. ・IHI AEROSPACE Co., Ltd. ・Others

Space Products & Services

Guidance equipment for Launch Vehicle

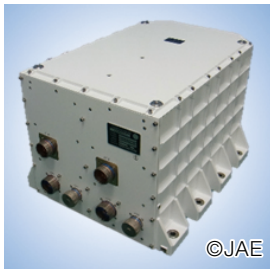
Guidance equipment provides various signals that are required for the guidance system of the Launch Vehicle to put a satellite in orbit.

Inertial Measurement Unit (IMU) for Launch Vehicle (H-ⅡA、H-ⅡB、Epsilon、H3)

The IMU is one of the key components that can affect the flight performance and accuracy of a Launch Vehicle, and it performs inertial measurement by a built-in inertial sensor (gyro, accelerometer) and outputs data that calculate various correction.

©JAE

IMU

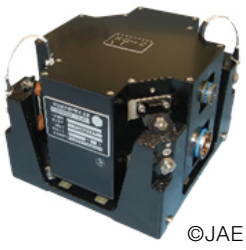


©JAE

IMU

Lateral Acceleration Measurement Unit (LAMU) for Launch Vehiclee (H-ⅡA、H-ⅡB、Epsilon)

LAMU provides signals required for the load relief control performed when the Launch Vehicle is affected by the wind in lateral direction.



©JAE

LAMU

Other

Other various JAE products are used in the Launch Vehicle such as Umbilical Connector that connects between the ground launching facility and Launch Vehicle as well as internal wiring and electrical connections.

©JAXA

H-IIA

©JAXA

Epsilon

©JAXA

H3

Japan Manned Space Systems Corporation

Otemachi Bldg., 1-6-1, Otemachi, Chiyoda-ku, Tokyo
100-0004, Japan
Phone +81-3-3211-2002 **FAX** +81-3-3211-2004
E-mail : jamss-sales@jamss.co.jp
https://www.jamss.co.jp/en/

The Company	■ **Capital** **¥445** Million ■ **Sales** **¥5,000** Million ■ **Employee** **236**
Major Customers	・Japan Aerospace Exploration Agency ・Japan Ministry of Defense ・Japan Meteorological Agency ・Space-related companies in Japan and overseas.

Space Products & Services

Business Activities

- Operations and utilization of JEM (Japanese Experiment Module, "Kibo") / ISS (International Space Station)
- Safety and Product Assurance
- Spacecraft Engineering Support (including satellites)
- Promotion of space commercial utilization at low earth orbit
- Systems Engineering and Technical Assistance (SETA)

Services

Japan Manned Space Systems Corporation (JAMSS) has been involved in the operations of the "Kibo" and "KOUNOTORI", safety and product assurance in space, the training of astronauts and flight controllers and the implementation of space experiments in the International Space Station (ISS). The scope of our space business will continue to gradually expand from low earth orbit to space exploration toward the Moon and Mars.
In response to a widespread demand, we are now providing space-based technical service to other infrastructure industries such as Railway, Automotive, Nuclear, Oil & gas as well as Aerospace industries.

1. Utilization support for space

The International Space Station (ISS) provides a unique experimental environment such as microgravity, high vacuum, Earth / astronomical observation platform, and detailed operational support by astronauts. JAMSS provides ISS/JEM users with engineering support, operational preparations, training for crews and flight controllers, and planning coordination for space utilization on the orbit.
[Commercial facility on ISS]
https://www.jamss.co.jp/en/commercial_facilities.html

2. High Quality Protein Crystal Growth Service "Kirara"

Kirara service is to support drug discovery through the high-quality protein crystallization in space with our original small incubator unit in ICE Cubes Facility in International Space Station.
It is considered that crystallization under microgravity is effective for improving the quality of crystals, since convection caused by the crystallization will be suppressed controlled, leading to less chance of contamination of crystals.

3. Software Independent Verification and Validation (IV&V)

Safety critical system of Aviation, Space, Automotive, Railway, Nuclear, or Medical is required rigorous safety and reliability. The primary threat of system safety is requirements dysfunction. JAMSS conducts IV&V as an organization independent from the development activities, to analyze system including hardware from the perspective of safety and completeness to find requirements dysfunction. Strong point of the IV&V is to detect problems the developers are likely to overlook especially in the earlier stage of development, which leads to cost reduction for reworking. Our knowledge and Know-how based on Space development can be utilized to companies involved in the Aviation industry and Railway industry, for which extremely strict safety standards are in demand.

JUPITOR CORPORATION

3-17-4 Minami Aoyama, Minato-ku, Tokyo 107-0062, Japan
Phone +81-3-3403-1311 **FAX** +81-3-3403-1319
E-mail : info@jupitor.co.jp
http://www.jupitor.co.jp/english/

The Company	■ **Capital** **¥110** Million ■ **Sales** **¥11,314** Million ■ **Employee** **229**
Major Customers	・Japan Aerospace Exploration Agency ・The Ministry of Defense ・Mitsubishi Heavy Industries, Ltd. ・Kawasaki Heavy Industries, Ltd. ・SUBARU Corporation ・IHI Corporation ・Mitsubishi Electric Corporation ・Nabtesco Corporation ・Toshiba Corporation ・NEC Corporation

Space Products & Services

1. Units for ELF: Electrostatics Levitation Furnac

Jupitor Corporation participated in the development of ELF.
ELF is assembled into the Experimental Module (Kibo) of the ISS (International Space Station).
ELF levitates a high voltage electrified sample for high temperature melts to be measured. ELF allows observation of the Liquid-Drop Vibration etc. after an electrified sample is heated and melted down.
Jupitor Corporation developed the Positon Controller and the Position Sensor Head under the guidance of IHI Aerospace.
These devices control the position of an electrified sample to observe various conditions. Presently, various evaluation tests are being conducted.

Position Sensor Head for ELF


High Voltage Power Supply for MIPS


Control Unit for MIPS

2. Control Unit & High Voltage Power Supply for MIPS (Miniature Ion Propulsion System)

Jupitor Corporation contributed to the development of MIPS under the joint development project of Tokyo University Advanced Science Technology Laboratory Center and the Next generation Space System Technology Laboratory Union.
The new Miniature Ion Propulsion System utilizes the Ion Thruster was developed by the cooperation of Tokyo University Advance Science Technology Laboratory Center and the Next Generation Space System Technology Laboratory Union.
MIPS was loaded on Super Small Size Satellite, “Hodoyoshi No.4,”and the Ion Thruster operation was successfully confirmed in space.
The MIPS supplies Miniature Satellites with a light weight, low consumption electrical power gas supply system and controller devices which operate the Ion Thruster for altitude control and other pertinent controls.


Position Controller for ELF

Kawasaki
Powering your potential

Kawasaki Heavy industries, Ltd.

1-14-5, Kaigan,Minato-ku, Tokyo
Phone +81-3-3534-2111 **FAX** +81-3-3436-3037
global.kawasaki.com

The Company	■ **Capital** **¥104,484** Million (As of March 31, 2022) ■ **Sales** **¥1,500,879** Million (Fiscal year ended March 31, 2022) ■ **Employee** **36,587** (As of March 31, 2022)
Major Customers	・Japan Aerospace Exploration Agency ・Mitsubishi Heavy Industries, Ltd.

Space Products & Services

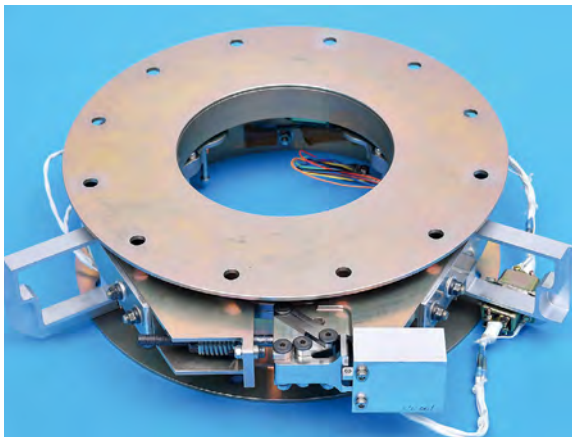
Payload Fairing

Payload fairing is a structure installed on the top of a launch vehicle to protect payloads from aerodynamic heating, acoustic noise and vibration during launch. After a launch vehicle leaves the earth's atmosphere, a fairing is separated into two and is jettisoned. Kawasaki has developed many types of payload fairings; long type (L) and short type (S) for H3 launch vehicle, 4S, 5S and 4/4D for H-IIA launch vehicle, 5S-H for H-IIB launch vehicle, and the one for Epsilon rocket. Type 4S is 4m in diameter for single launch, type 5S is 5m in diameter for single launch, type 4/4D is 4m in diameter for dual launch and 5S-H is 5m in diameter for the HTV (H-II Transfer Vehicle). The Epsilon rocket fairing is 2.5m in diameter for single launch. For the mission modification, access doors, acoustic blankets, internal antennas and RF windows are available according to user's requirements. All fairings operated successfully in the past flights.

Payload Fairing and Payload Support Structure
for H3 launch vehicle

Payload Adapter

A payload is mounted on the launch vehicle using a payload adapter which has a separation system. Kawasaki has several types of payload adapters; model 1194M, 1666MA and 239M. These numbers indicate the diameter of the interface with the payload. They have a separation system with clamp bands and separation springs. In addition, Kawasaki has developed new model "Simple PAF" for small satellites. Simple PAF features low cost, low separation impact and excellent operability.

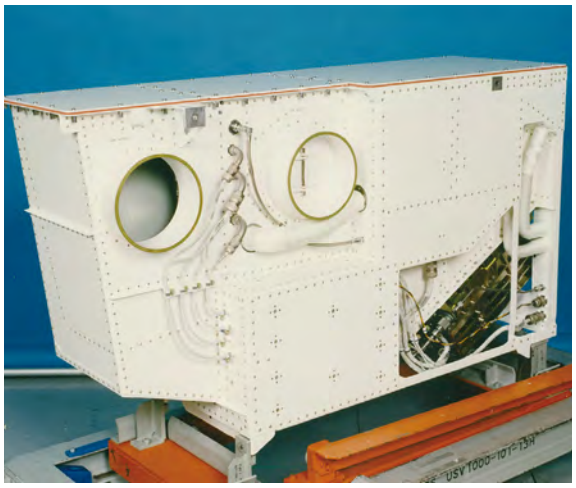


Simple PAF

Manned Space Technologies and Robotics

Kawasaki has unique technologies for manned space and robotics. For the Japanese Experiment Module (JEM) "Kibo" program of International Space Station (ISS), Kawasaki developed berthing mechanism between pressurized module and exposed facility, JEM airlock and the equipment for Environment Control and Life Support System (ECLSS). These mechanisms/equipment has been functioning normally after launch. Currently, Kawasaki is developing the temperature and humidity control device for the Gateway I-HAB in the manned space field, and the sampling system for the Martian Moons eXploration (MMX) in the space robotics field.

"Kibo" Airlock


"Kibo" ECLSS

Heat Shield

Kawasaki has reliable technologies to protect the payload from aerodynamic heating for spacecraft. Kawasaki has experience developing the thermal protection and structure with an ablation type heat shield for the reentry capsule of Unmanned Space Experiment Recovery System (USERS) and HTV Small Re-entry Capsule (HSRC), which were recovered successfully in 2003 and 2018 respectively. Currently, Kawasaki is developing the sample return capsule for the MMX.


USERS Re-entry Capsule

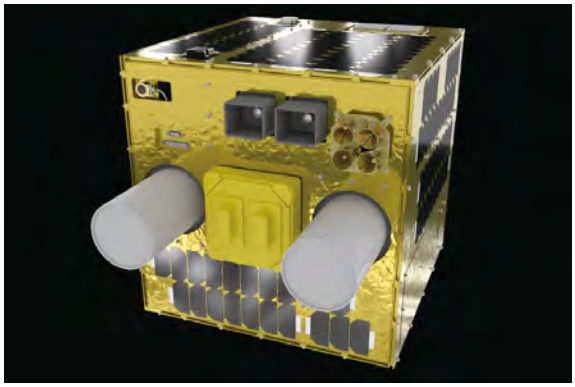
Ground Facility

Since the 1970's, Kawasaki has developed the following ground facilities and been supporting Japan's space activities;
- N-I, N-II, H-I, H-II, H-IIA, H-IIB and H3 launch complex in Tanegashima Space Center
- Acoustic Test Facility for large satellite in Tsukuba Space Center

Acoustic Test Facility

Small Satellite & Space Servicing

Debris Removal Unprecedented Micro-Satellite (DRUMS) has been developed to demonstrate basic technology required for in-orbit services, including debris removal. It is being operated using our own satellite ground station, which is utilized for satellite data application services as well.


DRUMS

Ground Station

THE NEW VALUE FRONTIER

KYOCERA

KYOCERA Corporation

6 Takeda Tobadono-cho, Fushimi-ku, Kyoto 612-8501, Japan
Phone +81-75-604-3651 **FAX** +81-75-604-3472
E-mail : kyocera.tool.web@kyocera.jp
https://global.kyocera.com

The Company	■ **Capital** **¥115,703** Million ■ **Sales** **¥1,838,938** Million (Consolidated) ■ **Employee** **83,001** (Group)
Major Customers	・Japan Aerospace Exploration Agency

Space Products & Services

Cutting Tools (Indexable)

Difficult-to-cut materials such as titanium alloy and stainless steel machining

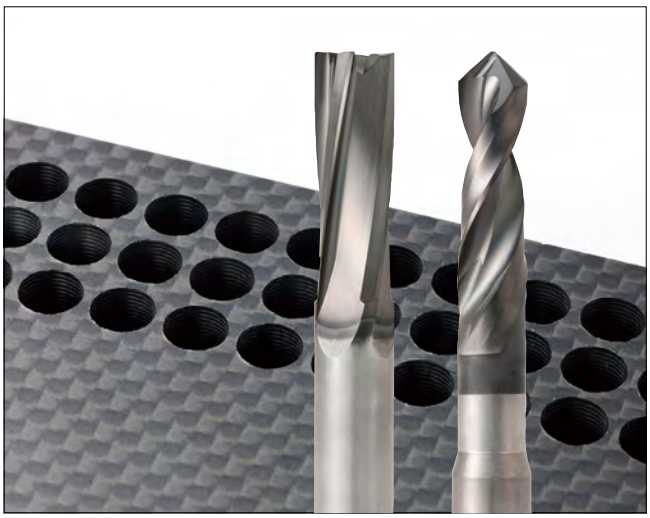
High Feed End Mills with Cutting Dia. Available from ø22 and up to 2.5mm Depth of Cut
- High feed rates increase productivity
- Long tool life through the reduction of tool paths
- Good combination with heat-resistant grade PR1535 provides long tool life and stable machining

MFH Boost

Aircraft Landing Gear Parts (CG Image)

Cutting Tools (Solid Round)

Developing the suitable tool materials, geometries and coatings for aerospace components to optimize production solutions



CFRP Carbon Fiber Machining

Turbine Blade Machining

Marubeni Corporation

4-2, Ohtemachi 1-chome, Chiyoda-ku, Tokyo
Phone +81-3-3282-7338 **FAX** +81-3-3282-3706
E-mail : TAKAO-A@marubeni.com
https://www.marubeni.com/

The Company	■ **Capital** **¥262,947** Million ■ **Sales** **¥6,828** Billion ■ **Employee** **4,379**
Major Customers	・Small Satellite manufacturer and operator

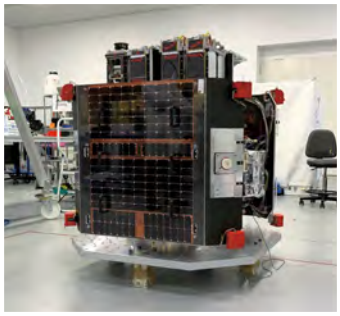
Space Products & Services

Marubeni Corporation (“Marubeni”) <www.marubeni.com> is expanding the “New Space” business mainly as a launch service provider. Under strategic partnership with D-Orbit in Italy and Interstellar Technologies Inc. (“IST”) in Japan. We, as sales representative, support their sales activities all over the world. And we also support to provide satellite data such as Optical, SAR and SIGINT for Japanese Customer.

ION: Orbital Transportation Vehicle

ION SATELLITE CARRIER is a platform capable to modify its own orientation, altitude, and local time of ascending node (LTAN) to quickly deploy CubeSats and microsatellites into precise and independent orbital slots, allowing customers to start their missions faster and in optimal operational conditions.

Multiple form factor support:
a 64 1U volume to accommodate multiple combinations of 1U, 2U, 3U, 3U+, 4U, 6U,6U+, 8U,8UL, 12U, 12U+, 16U CubeSats, or microsatellites up to 160kg, with industry record.

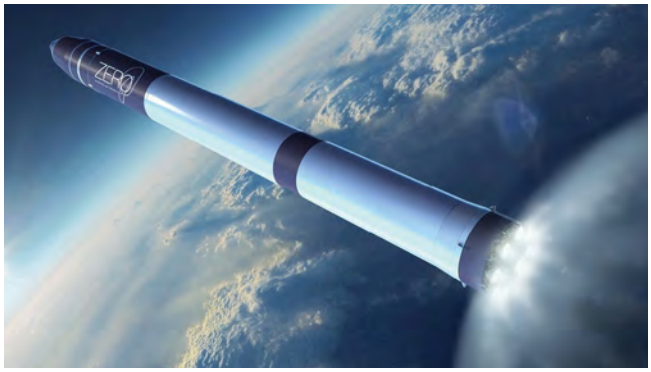


MOMO: Sounding Rocket2019)

Payload : 20kg, Altitude: 100km
Payload processing steps,
1. Flight application submission,
2. Payload mechanical / electrical interface testing,
3. Mount payload to launch vehicle and conduct final testing at launch site in Hokkaido, Japan (3-7 before launch)

ZERO: Orbital Launch Vehicle

Payload : 100-150kg, Altitude : 500 km (SSO)
・The vehicle is ITAR free. All major components are designed and built inhouse.
・Located in Taiki, Japan, their launch site allows for various inclination angles, and it reinforces IST’s competency, short lead time and low launch costs.



MARUBUN CORPORATION

8-1, Nihonbashi Odenmacho, Chuo-ku, Tokyo 103-8577
Phone +81-3-2629-9821 **FAX** +81-3-3661-7473
https://www.marubun.co.jp

The Company	■ **Capital** **¥6,214** Million ■ **Sales** **¥167,700** Million (Consolidated) ■ **Employee** **577**
Major Customers	· Japan Aerospace Exploration Agency · Mitsubishi Electric Corporation · NEC Corporation · NEC Space Technologies, Ltd. · Mitsubishi Heavy Industries, Ltd. · Small Satellite manufactuer's Other's

Space Products & Services

Marubun has over 40 years of experience in supplying various EEE components such as ICs, semiconductors, and passive parts to the Japanese space industry, mainly from Europe and the United States.
Our many years of experience enable us to provide overall support for procurement, including delivery management and specification adjustment, and we offer quality assurance services through our quality assurance company.

EEE Parts Procurement

Since we can deal with multiple manufacturers in Japan and Europe and United States, we can deal with a variety of manufacturers and products together, allowing us to centrally manage procurement.

- ✧ COMTECH TELECOMMUNICATIONS CORPORATION
- ✧ STMicroelectronics
- ✧ SENSITRON SEMICONDUCTOR
- ✧ ISABELLENHUTTE
- ✧ SANADA KOA

etc.

Spacecraft Equipment Procurement

Marubun provides its customers with space-related equipment for Sierra Space and Syrlinks satellites, spacecraft, space stations, and small satellite platforms.

SIERRA™ SPACE

30+ Years of Proven Spaceflight Heritage Sierra Space Corporation and its affiliated companies have produced more than 4,000 space systems, subsystems, and components to customers worldwide while engaging in more than 500 space missions, including to Mars.
The new Space Race demands developing next generation spacecraft, like the Dream Chaser® set to begin NASA resupply missions, and LIFE™ habitat, a modular commercial habitation and science platform.

- ➢ Spacecraft Deployable Systems
- ➢ Electrical Power Systems
- ➢ Mechanical & Structural Systems
- ➢ Pointing & Motion Control Systems etc.

Syrlinks

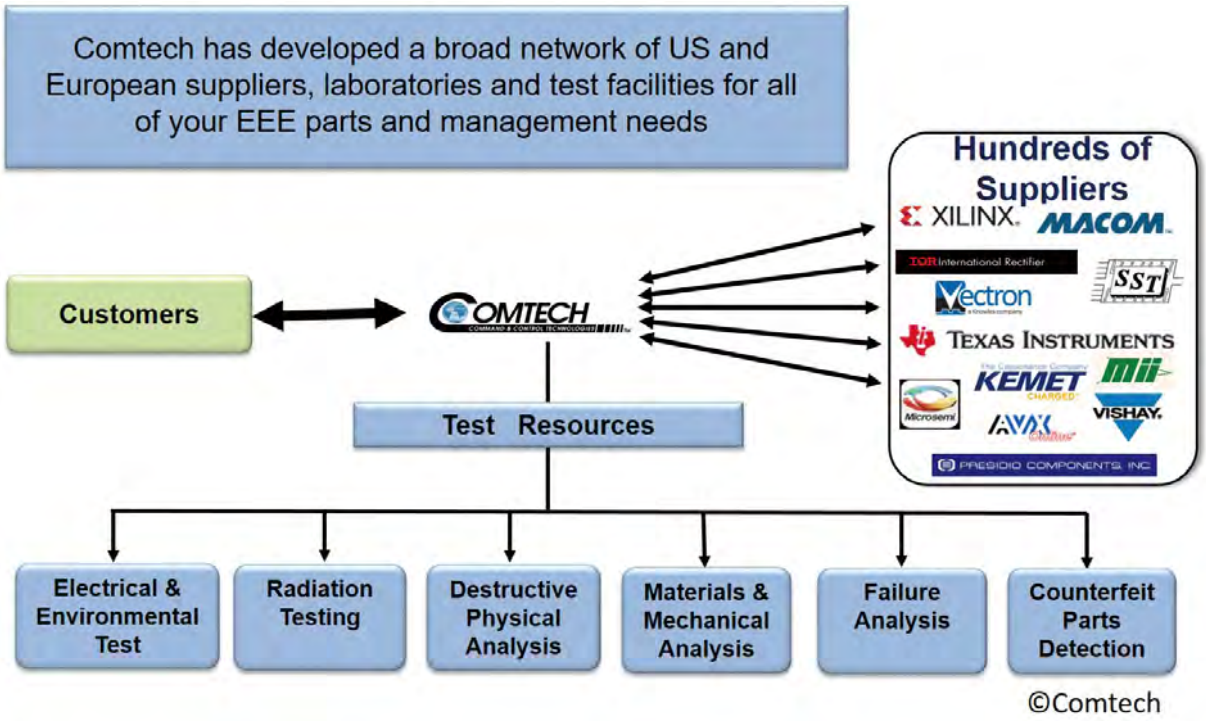
Syrlinks manufactures radio communication equipment for small satellite platforms (mini, micro, nano-cube satellites) in low earth orbit for Earth observation missions or exploration of the solar system. The Syrlinks catalog is the largest on the market, with high data rate transmitters, TT&C - ISL transponders, precise GNSS receivers, data collect payloads, spectrum monitoring payloads and OCXOs.

EEE Parts Quality Assurance Service

COMTECH TELECOMMUNICATIONS CORP.

Supply Chain Management and Engineering Service

- Parts list development and Compliance review.
- Engineering services including specification generation, procurement, test, qualification, quality assurance services, manufacturing of custom parts and special packaging for spacecraft and launch vehicle applications worldwide.



Quality Assurance Services

- Site survey / Source inspection
- Electrical & Environmental Test
- Screening / Additional QCI
- Radiation Test (TID / SEE)
- Destructive Physical Analysis (DPA)
- Failure Analysis Services

MEIRA Corporation

17-15, TSUBAKI-CHO, NAKAMURA-KU, NAGOYA 145-0015, JAPAN
Phone +81-052-459-1276 **FAX** +81-052-459-1284
E-mail : h_yokoi@meira.co.jp
http://www.meira.co.jp

The Company	■ **Capital** **¥330** Million ■ **Sales** **¥23,491** Million ■ **Employee** **710**
Major Customers	・Mitsubishi Heavy Industries, Ltd. ・Kawasaki Heavy Industries, Ltd. ・Mitsubishi Electric Corporation ・NEC Corporation

Space Products & Services

Fasteners

MEIRA has conducted integrated production system by almost own facilities, from purchasing law material to forging/forming, machining (cutting, Grinding), heat treatment, surface treatment, non-destructive testing, inspection, and various testing.
Our fasteners are adopted in following models for space activities;
"Notched Titanium Alloy Bolt for Fairing Separation System" for payload fairing of H-ⅡA/B
Super heat-resistant alloy bolts for main engine of H-ⅡA/B
Various structural titanium alloy fasteners for many satellites
"Bumper Panel EVA Bolts" and various fasteners for JEM


Super Heat-resistan talloy Bolt


Notched Titanium Alloy Bolt


Titanium Alloy Bolts for Structure


Bumper Panel EVA Bolts

Rod Assemblies

"Structural Rod Assemblies" have been adopted in H-ⅡA/B, HTV and JEM.
"N-Brace Assembly" to fix the ruck and "Standoff Frame Assembly" to use for desorption of the rack are mounted on HTV and JEM, MEIRA is the only company in Japan that can manufacture Rod Assemblies for aviation and space throughout from designing to assembling and testing while taking into weight reduction, strength, cost.

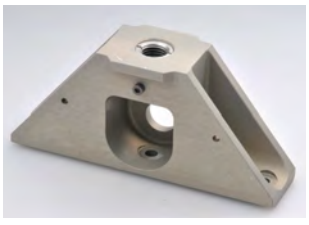

N-Brace Assemblies


Structual Rod Assemblies


Standoff Frame Assembly

Machined Parts

Also, we can supply machined parts by integrated production system from purchasing law material to delivery including special process.
"Preload bolt" to open the solar panels for some satellites, "Fitting Assembly" for HTV are used by our highly manufacturing technology.


Fitting Assembly for HTV


Preload Bolt for Satellites

MinebeaMitsumi Inc.

3-9-6 Mita, Minato-ku, Tokyo108-8330, Japan
Phone +81-3-6758-6711 **FAX** +81-3-6758-6700
https://www.minebeamitsumi.com/

The Company	■ **Capital** **¥68,258** Million(As of March 31, 2022) ■ **Sales** MinebeaMitsumi Group **¥1,124,140** Million (Consolidated April 1, 2021 - March 31, 2022) ■ **Employee** MinebeaMitsumi Group **85,954** (Consolidated As of March 31, 2022)
Major Customers	·Mitsubishi Heavy Industries, Ltd. ·Kawasaki Heavy Industries, Ltd. ·Mitsubishi Electric Corporation ·SINFONIA TECHNOLOGY Co., Ltd. ·IHI Group ·NIPPI Corporation ·Toshiba Group

Space Products & Services

MinebeaMitsumi, known as a global supplier of miniature ball bearings, is also a qualified supplier of rod ends & spherical bearings, fasteners, pressure transducers, special rotary components and brushless resolvers for aerospace applications.

Rod Ends & Spherical Bearings

Having production and R&D bases in Europe, US, and JAPAN, we are positioned well to respond to various customer needs.
Products: Rod end bearings and spherical bearings for support strut of liquid-fuel tank/solid booster, spherical bearings for the expanding of satellite solar battery panels, sliding materials of anti-wobbles support panels for solid booster, and other.

Rod end bearing and spherical bearing for space application

Fasteners

All processes from cold and hot forming to machining, heat treatment and surfacetreatment are conducted in-house to be exceptionally responsible in a timely manner todiversifying market demands and to maintain a stable high quality and supply capabilities.
Products:Bolts for SSB, fl oating nuts for payload fairing, bolts for maruman clamp band,fi ttings, mechanical parts for LE-7.

Fasteners for space application

SOS-type Pressure Sensors

A high-precision SOS(Silicon On Sapphire) type pressure sensor is extremely stabilized both physically and electrically. Approximately 60 units are used in a rocket, and other space rockets and satellites to follow.

SOS type pressure sensor for rockets

Special Rotary Components

Rotary switch assemblies and solenoids for rockets are compact in size with highenvironmental resistance, and are specially designed for each application.

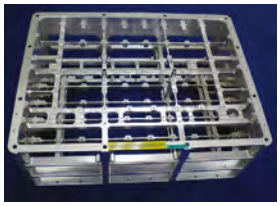
Solenoid for rockets

Brushless Resolvers

Brushless resolvers are angle sensors utilizing rotary transformers.
They are high-performance angle sensors with superior resistance to such environmentalfactors as vibration, shock and temperature.
Their applied technologies have been widely available for use in the aerospace industryand applications for vehicle controls.

Brushless resolvers for rockets

Precision Machined Parts



Satellite components, used for space operation, are meticulously designed for specific applications to withstand extreme environmental conditions.
Ultra-precision machining technology is required to achieve such design requirements.

Precision machined parts for satellite components

Ball and Roller Bearings

A comprehensive range of bearing products and configurations: From standard bearings to custom solutions.

Mitsubishi Electric Corporation

Tokyo Building, 2-7-3, Marunouchi, Chiyoda-ku, Tokyo
100-8310, Japan
Phone +81-3-3218-2111 **FAX** +81-3-3218-3314
http://global.mitsubishielectric.com/bu/space/

The Company	■ **Capital** **¥175,820** Million ■ **Sales** **¥4,476,758** Million ■ **Employee** **145,696**
Major Customers	・Japan Aerospace Exploration Agency ・National Institute of Information and Communications Technology ・Cabinet Office ・National Astronomical Observatory of Japan ・Japan Meteorological Agency ・Mitsubishi Heavy Industries, Ltd. ・Space Systems/Loral ・Thales Alenia Space

Space Products & Services

Mitsubishi Electric's space technology includes the manufacture and implementation of satellites, satellite components, and ground systems. Over the past four decades, we have completed more than 650 satellite projects for communications concerns, government agencies, and other large-scale clients that make us the leading company of space systems in Japan. Also, Mitsubishi Electric can manufacture satellites throughout from designing to assembling and testing. This is because of the varieties of facilities we own including a space chamber, compact antenna test range, acoustic chamber, and vibration table. We announced in February 2020 that it has completed construction of a new facility for the production of satellites at the company's Kamakura Works. Together with existing facilities, Mitsubishi Electric's combined annual capacity will increase to 18 satellites, up from 10 at present, which will enable the company to satisfy the growing demand for governmental satellites in Japan and commercial communication satellites worldwide. We have a distinct advantage when it comes to designing, assembling, launching and controlling satellites because we excel in the solar array panel, heat pipe panel, Li-ion battery, and ground station system technologies that make satellites practical to own and operate.

Satellite systems

Mitsubishi Electric was the first Japanese company to take part in a satellite project in 1960's with Intelsat series. Since then, decades of participation in satellite projects and the successful results have brought Mitsubishi Electric to the forefront of the industry. Mitsubishi Electric has been manufacturing virtually every kind of satellites of Japan Aerospace Exploration Agency (JAXA), and with the technology fostered and R&D efforts in the field, Mitsubishi Electric has developed DS2000 standard geostationary satellite bus platform based on JAXA's ETS-8. DS2000 has now 17 flight records with 4 in production as of August 2022. An original program management system developed based on years of experience in the communications satellite business allows customers to access design data, and request changes during development through testing. This high level of visibility ensures each platform is tailored to exact requirements and is completed in time to meet the delivery schedule, thus allowing DS2000 to meet the needs of communications satellite operators around the world. On top of that, in response to recent requirement in the market for new high-power, high-throughput communications satellites. Mitsubishi Electric has placed top priority on developing a world-class, 25kW-output, all-electric satellite bus system through the Engineering Test Satellite-9 in collaboration with JAXA.

Engineering Test Satellite-9

Ground systems

Mitsubishi Electric first took part in the ground system in 1960's and since then we have distinct records in the field such as the 64m antenna in Usuda Deep Space Center of JAXA, 45m antenna in Nobeyama Radio Observatory of National Astronomical Observatory of Japan(NAOJ), and the 54m antenna in Misasa Deep space station of JAXA. We have been contributing to the development of astronomy through developing/manufacturing numbers of optical and radio telescopes including 8.2m Subaru Telescope (one of the largest of its kind in the world) in Hawaii, Atacama Large Millimeter / submillimeter Array (ALMA) and Atacama Compact Array (ACA) in Chile.

ALMA ACA

54m antenna in Misasa Deep space station

”Himawari-8/9”

Mitsubishi Electric has made a contract with the Japan Meteorological Agency (JMA) for manufacture of the Japanese Geostationary Meteorological Satellites, Himawari-8 and 9. JMA has been operating geostationary meteorological satellite series called Himawari, capturing earth images over East Asia and Western Pacific regions, contributing to natural disaster mitigation of the area. Himawari-8 was successfully launched in 2014, and has been in operation since July 2015.
Himawari-9 was successfully launched in 2016, and has been in operation as back up for Himawari-8 since March 2017.
Satellite Bus: DS2000
Customer: Japan Meteorological Agency
Launch: 2014 (Himawari-8). 2016 (Himawari-9)
Orbit: Geostationary
Design Life: More than 15 years

Satellite programs

Es'hail 2

Es'hail 2 offer direct broadcasting services throughout the Middle East and North Africa, catering to television stations such as Al Jazeera and beIN SPORTS.
Mitsubishi Electric has been awarded a contract to deliver the Es'hail 2 communications satellite to Es'hailSat, a satellite operator in Doha. With a design life of more than 15 years, Es'hail 2 directly broadcast television programs throughout the Middle East and North Africa, serving television stations. From the orbital position of 26 degrees east longitude, its Kuband and Ka-band capabilities also provide government communication services and the world's first geostationary amateur radio service.
Satellite Bus: DS2000
Customer: Es'hailSat (Qatar satellite company)
Launch: 2018
Orbit: Geostationary
Design Life: More than 15 years

QZSS (QZS-2, 3 , 4 and 1R)

QZSS(Quasi-Zenith Satellite System) is a Japanese satellite positioning system composed of three satellites in quasi-zenith orbit and one in geostationary orbit. QZSS will significantly improve the accuracy of positioning in areas where signals from GPS Satellites are not fully received due to skyscrapers or mountains. The first quasi-zenith satellite “Michibiki” (QZS-1) was successfully put into orbit in 2010, and in 2017, QZS-2, 3 and 4 succeeded. In addition, in 2021, the QZS-1R, the successor to the QZS-1, succeeded. QZSS becomes a four-satellite constellation in 2018, and three satellites have been visible at all times from locations in the Asia-Oceania regions. Ensuring a sufficient number of satellites for stable, highprecision positioning, QZSS could been used in an integrated way with GPS.
[QZS-2, 3 , 4 and 1R]
Satellite Bus: DS2000
Customer: National Space Policy Secretariat of the Cabinet Office

Launch: 2017(QZS-2 ,3 and 4) ,2021(QZS-1R)
Orbit: Quasi-Zenith Orbit (QZS-2 , 4 and 1R), Geostationary Orbit (QZS-3)
Design Life: More than 15 years

New unmanned cargo transfer spacecraft (HTV-X)

The HTV-X is a new unmanned cargo transfer spacecraft that takes over the H-II Transfer Vehicle (HTV) and is designed not only to supply cargo to the International Space Station (ISS), but also to provide a platform for on-orbit technology demonstration and experimental utilization, and for future international space exploration. Mitsubishi Electric has been in charge of the development of the brain (electrical module) for all HTVs from HTV-1 to HTV-9, Japan's first cargo supply vehicle, and for HTV-X, we are in charge of the development of the module (service module) that integrates all functions necessary for spaceflight.

Satellite Onboard Equipment

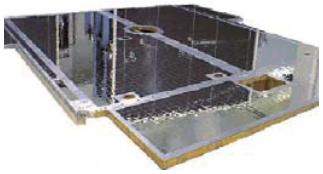
● Heat Pipe embedded honeycomb Panel (HPP)

Features

1. High heat transport capability dual channel heat pipes
2. Extremely Large (up to 6.5m) panel size
3. Light weight thin (0.08mm) OSR installation and paint
4. Various types of heat pipe available, single/double channel and 3-D bent

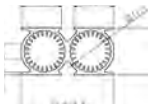
Heritage (as of 2021)

- Intelsat Series
- SES Series
- Eutelsat Series
- Telstar Series
- Asiasat Series etc.
- Launched Q'ty : 12,750Heat Pipes, 1,020 Panels



Heat Pipe Embedded Panel with OSR

Embedded Heat Pipes

Properties	Typical Performance
Burst Pressure Level	15.7 Mpa
Heat Transport Capacity	167 W-m/channel
Nominal Mass	Lateral:315 g/m Header:385 g/m
Cross Section	

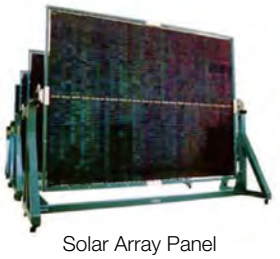
● Solar Array Panel (SAP)

Features

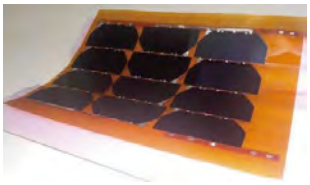
1. Standardized and controlled manufacturing technique on the heritage design
2. Rounded and Simple design for stable manufacturing
3. Combination of High Efficiency Solar Cell and Lightweight Substrate panel structure
4. Lightweight panel structure achieved by Thin High Modules Graphite Epoxy and Low Density Core
5. Covers both Low Cost Si solar cells and High Performance GaAs cells
6. Covers various type of panels for communication satellite (GEO), observation satellite (LEO), scientific satellite (Inter-planet) and transfer vehicle etc
7. Solar Power Module (SPM) for flexible solar array
8. Various cutting-edge automation equipment including large CNC machine and automated welding machine for CIC

Heritage (as of 2021)

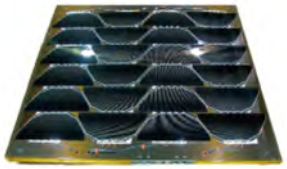
- Intelsat Series - Telstar Series - Eutelsat Series
- SES Series etc. - Launched Q'ty : 1,700panels



Solar Array Panel



Solar Power Module (SPM) for Flexible Solar Array



Coupon with 6” wafer-based triple-junction solar cells

	Power Device	
	GaAs Cell	Si Cell
Specific Power (EOL 15 years: GEO)	0.34 kW/sq-m	0.23 kW/sq-m
Specific Mass	2.5 kg/sq-m	2.0 kg/sq-m

● Li-Ion Battery (LIB)

Features

1. Capacity; 110-190Ah / cell
2. Integrated module design with small footprint
3. Advantage of weight in light of capacity
4. Our typical battery's features are

- Save Mass and Volume
- Save Footprint
- Save Cost
- High Reliability
- Long Life
- Large capacity

Heritage (as of 2021)

- Intelsat Series, INSAT Series, Eutelsat Series

Item	Typical LIB Performance with ten 190Ah Cells
Voltage Range	27.5(V) to 41(V)
Nominal Voltage	37(V)
Capacity	7,030(Whr)
Discharge Current	Max : 570(A) (5sec.)
	Count : 190(A)
Charge Current	95(A) Max
Life Time	Average(47.5Ah):>38,000cycles (LEO:>7years)
	Average(117Ah),Max.(152Ah):>1500cycles (GEO:>15years
Temp. Range	QT:-10 to+35(degrees-C)
	AT:0 to+25(degrees-C)
Mass	63.7(kg)
Dimension	243mm(W) × 683mm(L) × 307mm(H)

Type	Capacity		Dimension				Weight	Specific Energy
	Name plate	Nominal @ Id=1/2C, 15deg.C	Width	Length	Height	Height terminal	Nominal	Nominal @ 3.7V
	Ah	Ah	mm	mm	mm	mm	grams	Wh/kg
LMG 110AR	110	122	50	130	208	214	2,770	163
LMG 145AR	145	161	50	130	263	269	3,550	168
LMG 190AR	190	205	50	165	263	269	4,590	165

MITSUBISHI HEAVY INDUSTRIES, LTD.

2-3, Marunouchi 3-chome, Chiyoda-ku, Tokyo, 100-8332, Japan
Phone +81-3-6275-6200
https://www.mhi.com/

The Company	■ **Capital** **265.6** billion yen ■ **Revenue** **3,860.2** billion yen (Consolidated) ■ **Employee** **78,486** (Consolidated)
Major Customers	·Japanese Government and related agencies ·Commercial satellite operators and Space related companies

Space Products & Services

MHI Launch Services

Mitsubishi Heavy Industries (MHI) is both the launch vehicle manufacturer, and the launch services provider. Such services were initiated from the execution of Flight No. 13 of the H-IIA Launch Vehicle in 2007. Also, since 2013, an upgraded model of the H-IIA, or H-IIB, was newly added to the lineup for the launch vehicles.

H-IIA Launch Vehicle

The H-IIA Launch Vehicle is a high-performance rocket consisted from a First stage, Second stage, fairing, one or two pairs of Solid Rocket Boosters (SRB-As). The propulsion system runs on liquid hydrogen and liquid oxygen. Two models are produced, the standard type H2A202 with two SRB-A's and the H2A204 type with four SRB-A's attached.
The First stage of the H-IIA Launch Vehicle consists of a high-performance LE-7A engine, an engine section, a propulsion system tank charged with liquid hydrogen and liquid oxygen, a center section connecting the tanks, and an interstage section mating the First and Second stages. A Solid Rocket Booster (SRB-A) has also been newly developed to boost the thrust from the main engine. Two or four SRB-A's installed on the H-IIA Launch Vehicle are attached to the First stage.
The Second stage consists of a highly reliable LE-5B engine, a propulsion system tank charged with liquid hydrogen and liquid oxygen, on-board electronic devices, etc. As a key feature for launch mission support, the LE-5B engine can be ignited up to three times.

H-IIA Launch Vehicle Flight No.42

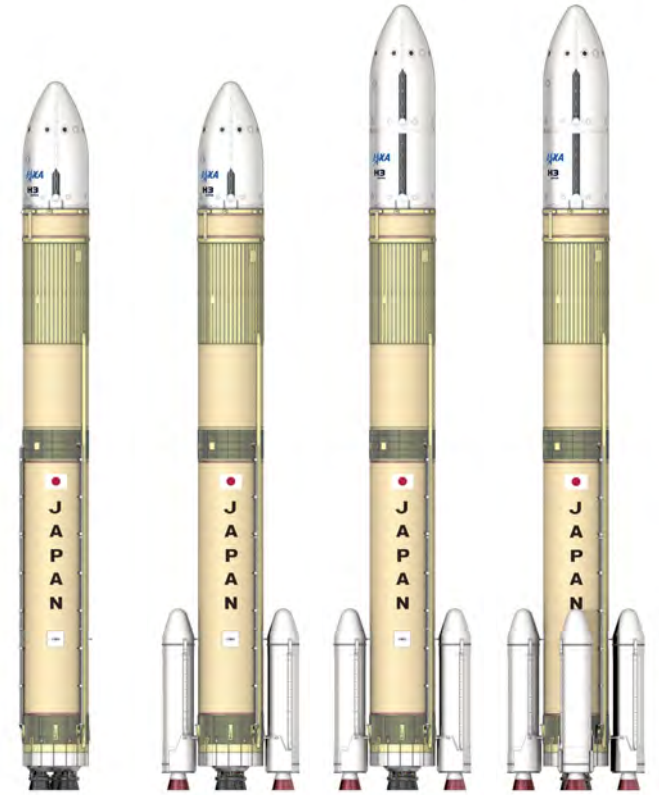
H-IIA Launch Vehicle Flight No.45

Item		H2A202	H2A204	H2B
Length [m]		53	53	56
Mass [ton]		289	443	305
1st Stage	Tank Diameter [m]	4	4	5.2
	Number of 1st Stage Engine (LE-7A)	1	1	2
2st Stage	Tank Diameter [m]	4	4	4
	Number of 2nd Stage Engine (LE-5B)	1	1	1
Number of Solid Rocket Booster (SRB-A)		2	4	4
Launch Capability (GTO) [ton]		4	6	8

Launch Record				
Name	Launch number	First Flight	Last Flight	Remarks
N-I	7	1975	1982	
N-II	8	1981	1987	
H-I	9	1986	1992	
H-II	7	1994	1999	Domestic Development
H-IIA	42	2001		
H-IIB	9	2009	2020	

H3 Launch Vehicle

To meet global launch service demands for a wide range of payloads JAXA and MHI has been developing the H3 as a Japan's new flagship rocket.
To offer even better launch services, the H3 will provide more launch opportunities by shortening the lead-time from contract to launch.
Moreover, the H3 will offer enhanced reliability through improved hardware and software. It will also be designed to provide a more relaxing satellite interface environment for customers.
In addition, costs will be drastically reduced by automating assembly and utilizing commercially available components.

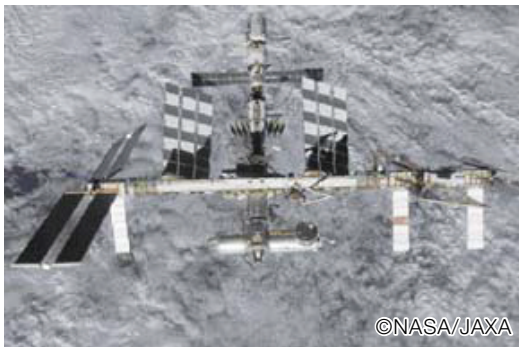


©JAXA

H3 Launch Vehicle

JEM (Japanese Experiment Module) Operation for the International Space Station

Among the various aspects of the JEM developments, MHI is providing support to JAXA by integrating the overall JEM system and taking charge of development of the pressurized module and the pressurized section of the experiment logistics module, which are the critical parts of the JEM system. MHI is putting tremendous efforts into acquiring and developing the technology necessary for manned spacecraft and for building the technological base needed to conduct Japanese manned spacecraft activity.
Both module including life science experiment facilities were carried by the Space Shuttle, and attached International Space Station on 2008. Today, we are technically supporting JAXA system & experiment facilities operation team, and all systems are progressing nicely.



ISS

Experiment logistics module

Pressurized module

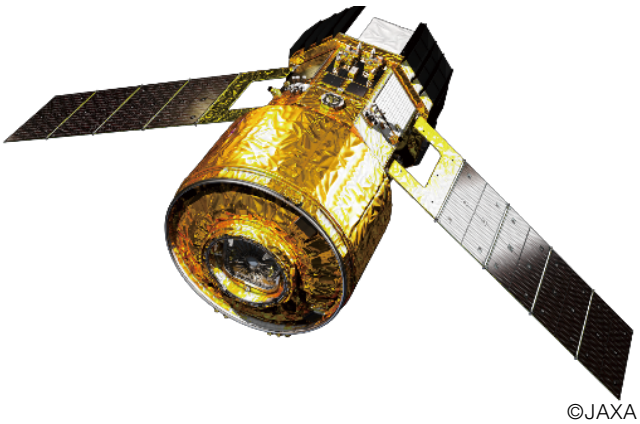
Cell Biology Experiment Facility-Left

H-II Transfer Vehicle (HTV)

The HTV, an unmanned orbital carrier, is the transfer vehicle to deliver daily goods such as food, water, and clothing and experimental equipment to the JEM (Japanese Experiment Module) and other countries' modules of the ISS. This vehicle is launched by H-IIB and approaches the ISS automatically and is maintained and moored to the ISS facility. MHI is providing support to JAXA by integrating the overall HTV system and taking charge of manufacturing the three of four major modules. HTV has successfully accomplished the missions since the first flight, September 2009. Final HTV has completed the whole mission in 2020. As a new generation vehicle to ISS and beyond, HTV-X is currently under development.

HTV Proto Flight Model

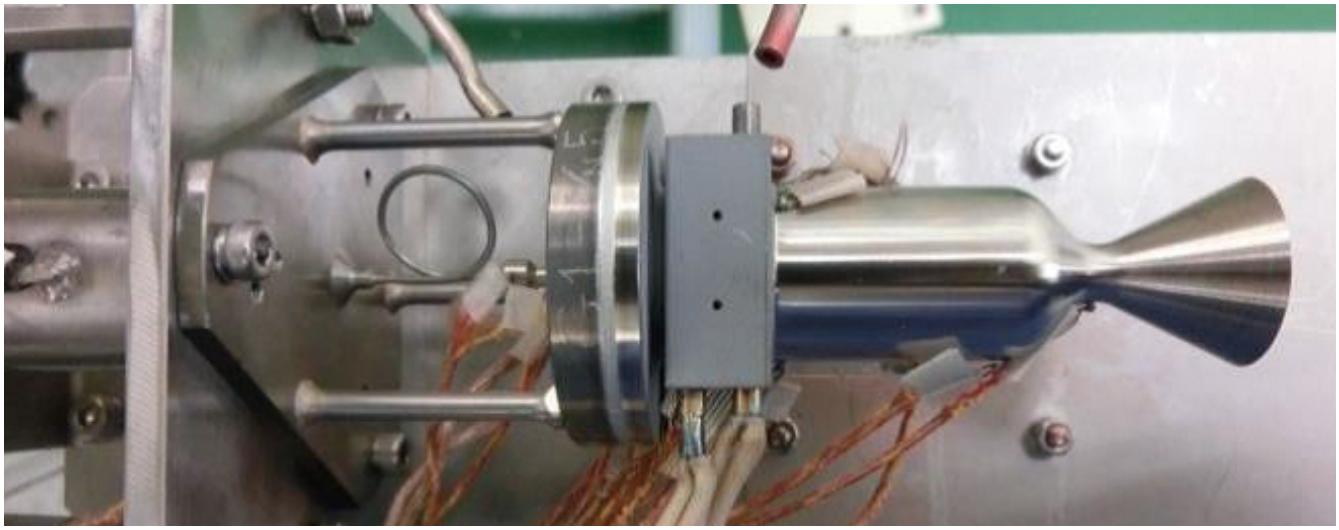
Final HTV berthing to ISS



HTV-X

Green Propellant Thruster (GPRCS) for Smaller Satellites

Based on the trend in the world that downsizing of satellite is accelerating the development of small and “green” propellant thrusters, MHI has developed 1N-class green propellant thrusters with HAN (Hydroxyl Ammonium Nitrate)- based propellant under a contract from Japan Space Systems (JSS) for a project of the Ministry of Economy, Trade and Industry of Japan (METI), in cooperation with Japan Aerospace Exploration Agency (JAXA). The green propellant thruster has the potential to achieve higher performance than toxic hydrazine. The Green Propellant Reaction Control System (GPRCS) including the thruster was selected as one of the mission equipment of the first satellite of the innovative satellite technology demonstration project of JAXA, and successfully space verified in 2019, achieving its extra success until fuel depletion.


External view of GPRCS Thruster QT (Qualification Test) model

MITSUBISHI PRECISION CO.,LTD.

Shibaura Crystal Shinagawa 8F, 6-41 Konan 1-Chome, Minato-ku, Tokyo 108-0075, Japan
Phone +81-3-6712-3740
http://www.mpcnet.co.jp/e/index.html

The Company	■ **Capital** **¥3,167** Million ■ **Sales** **¥17,407** Million ■ **Employee** **852**
Major Customers	・Japan Aerospace Exploration Agency ・NEC Corporation ・Mitsubishi Electric Corporation ・Mitsubishi Heavy Industries, Ltd. ・IHI AEROSPACE Co.,Ltd.

Space Products & Services

High Torque Reaction Wheel

MPC (Mitsubishi Precision Co., LTD.) has been providing Flywheel Assembly for Japanese satellite programs. Remarkable features and benefits of our Flywheel Assembly is High environment capability and Lower disturbance torque characteristics.

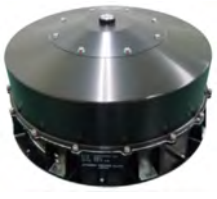
Parameter		Reactin Wheel Type HT
		
Angular momentum	Nms	40
Reaction torque	Nm	>1.2
Dimension (TYP)	mm	RW: Φ 356×151H WDE: W302×D242×H94
Mass (TYP)	kg	RW: 12.2, WDE: 4.8

Inertial Reference Unit (IRU)

MPC has been supporting Japanese Satellite programs by providing the IRU with reliable technologies. Our TDG (Tuned Dry Gyro) IRU provides High performance and long life capability.

Parameter		IRU Type Ⅲ -C
		
Short term Stability	deg/h (1σ)	0.002 max
Dimension (TYP)	mm	W218×D208×H175
Mass (TYP)	kg	7.0 (3Gyros)

Reaction Wheel Line up

Parameter		HMMW	Type S	Type M-A	Type L-A
					
Angular momentum	Nms	0.4	5～10	10～30	30～80
Reaction torque	Nm	>0.012	>0.06	>0.2	>0.2
Dimension (TYP)	mm	W72×D72×H70	Φ222×H98	Φ279×H145	Φ365×H145
Mass (TYP)	kg	1.05 (0.4Nms)	3.9 (5Nms)	8.6 (30Nms)	11.0 (80Nms)

\Orchestrating a brighter world

NEC

NEC Corporation

7-1, Shiba 5-chome Minato-ku, Tokyo 108-8001, Japan
Phone +81-3-3454-1111
https://www.nec.com/space/

The Company	■ **Capital** **¥427,800** Million (As of 31 March 2022) ■ **Sales** **¥3,141,000** Million (As of 31 March 2022) ■ **Employee** **117,418** (As of 31 March 2022)
Major Customers	NEC has been supplying satellite systems and equipment to JAXA as well as to European, American and Asian satellite manufacturers.

Space Products & Services

NEC Space Solutions

Since participating in Kappa rocket program in 1950's, NEC has been played a major contributing role in the growth of national space program. NEC has developed over 70 satellites for a wide range of uses-earth observation, communications and broadcasting, positioning, scientific and space exploration since developing Japanese first satellite "OHSUMI" launched in 1970. And NEC has all space-related assets, including subsystems and components onboard satellites, rockets and ISS, ground systems and space data utilization services.

● Major Japanese Satellites Integrated by NEC

● Earth Observation Sensors

NEC has advanced technologies and abundant experience in both optical sensors and radars.

<Main Supply Records>

Optical	• TANSO-FTS, TANSO-CAI(GOSAT) • PRISM(ALOS) • OPS(ASNARO-1)		• OPS(JERS-1) • MESSR(MOS-1) • SGLI(SHIKISAI)
Radar	• PALSAR(ALOS)	• PR(TRMM)	• DPR(GPM)

NEC standard satellite system "NEXTAR" [NEC Next Generation Star]

High performance, Low cost, Quick turn around

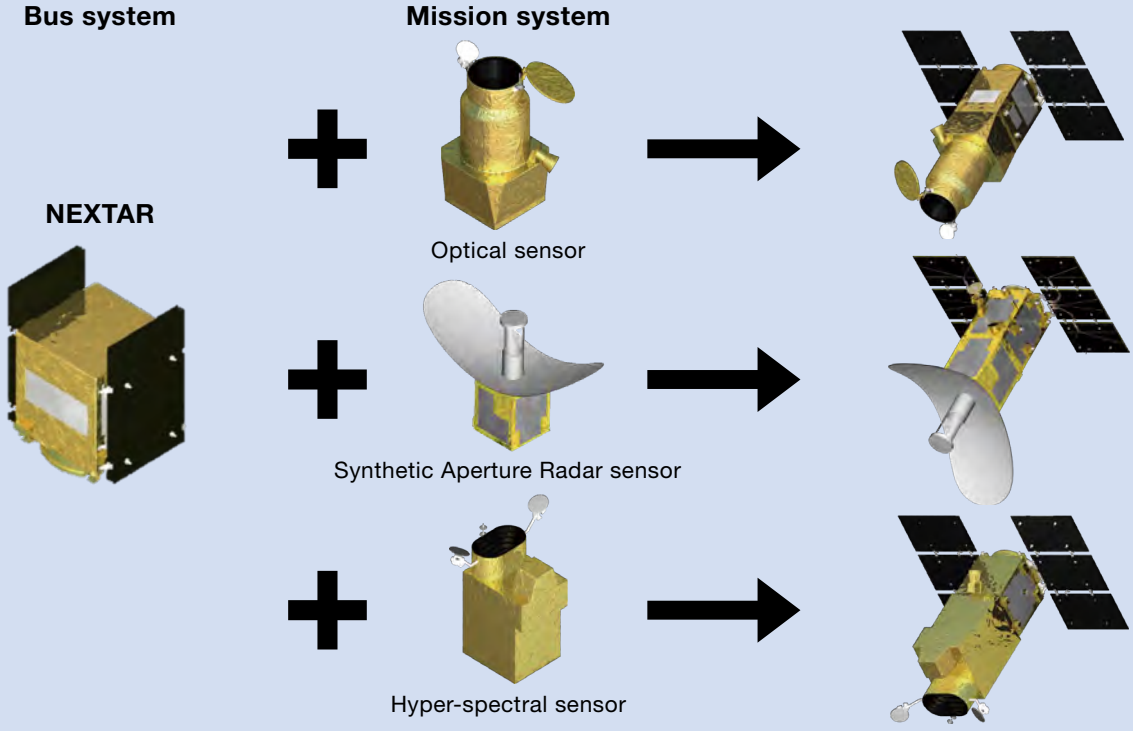
Based on our longtime satellite development experience, NEC has standardized the bus system by plugging components to a standard network and adopting an open architecture and consumer technologies to reduce costs and significantly shorten turnaround while maintaining high reliability.

● Technical Data(Reference:NX-300L)

NX-300L

Core Bus Features	
Bus dry mass	250 kg
Payload mass capability	250 kg max.
Payload power supply	600 w max.
Life	5 years
Telemetry and Command	
Communication frequency	S-band/X-band
Mission Data Handling	
Data bus I/F	SpaceWire(IEEE 1355)
Data rate & storage	800 Mbps, 120 GB
Attitude Control	
Control method	3-axis, zero momentum
Control capability	±6.6×10-2deg
Power	
Bus voltage	50 V
Battery	Li-ion
Solar Array	TJ-GaAs cell
Propulsion(option)	
Structure	
Bus module dimension	W950×D950×H1102(mm)
Module	Bus/Mission separation

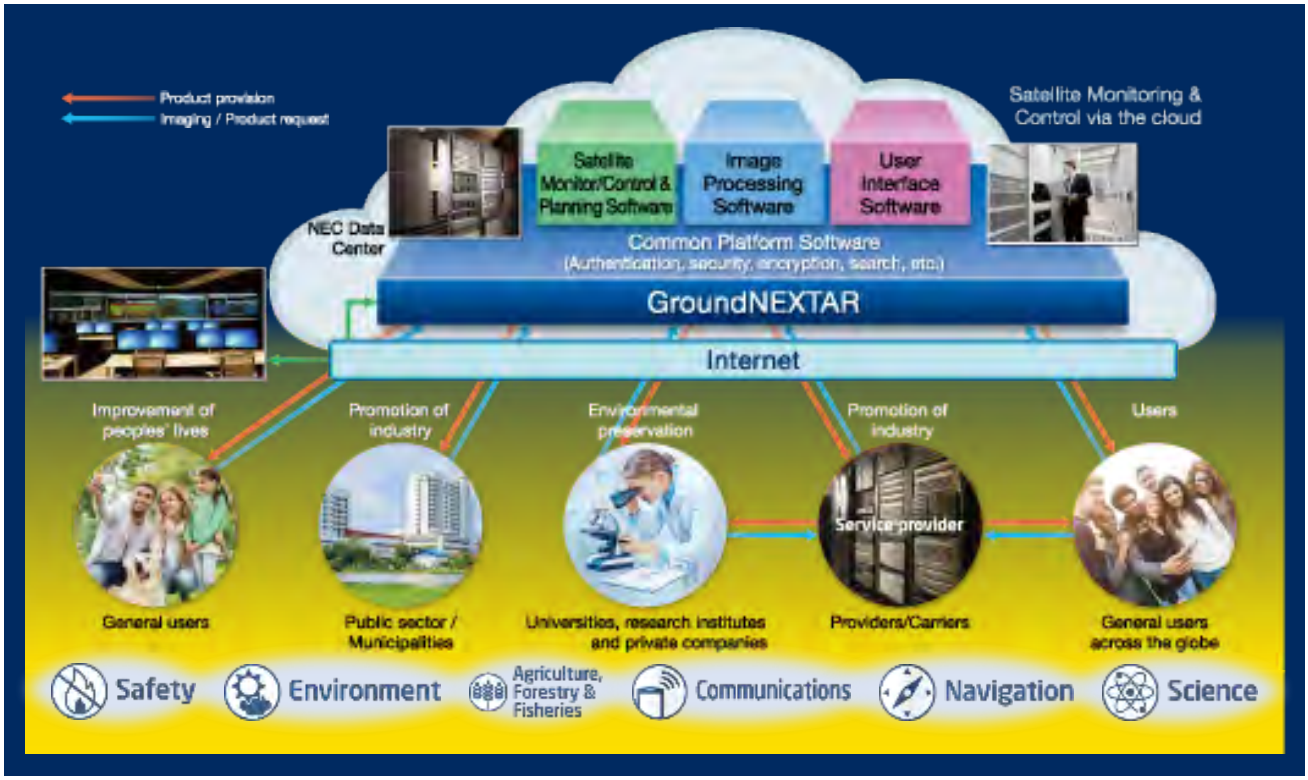
NEXTAR can adapted to many kinds of mission systems. By adding and replacing optional components and adding software packages and boards, NEXTAR meets a wide range of mission requirements and contributes significantly to the beneficial utilization of space.



GroundNEXTAR

GroundNEXTAR provides satellite ground system software package which includes cutting-edge technology and knowledge what NEC put efforts on. GroundNEXTAR is completely compatible with the NEXTAR and is also adaptable to other satellites. In addition, each software package has a specific functionality, allowing customization of the satellite ground system in a wide variety of configurations to meet customer needs.

● Components of GroundNEXTAR



● NEC Satellite Operation Center

NEC Space Technologies, Ltd.

1-10, Nisshin-cho, Fuchu, Tokyo, 183-8551 Japan
Phone +81-42-354-4000
https://www.necspace.co.jp/en/

The Company	■ **Capital** **¥7,000** Million (Including capital reserve) ■ **Sales** **¥15,900** Million (As of March 2022) ■ **Employee** **424** (As of March 2022)
Major Customers	NEC Space Technologies has been supplying satellite onboard equipment to major satellite manufacturers all over the world.

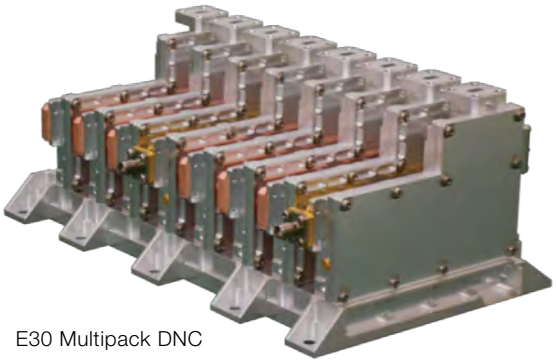
Space Products & Services

Communication Payload Equipment

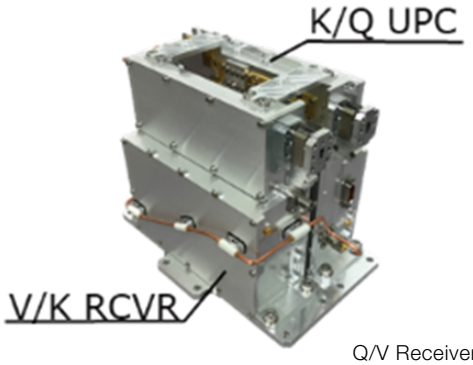
NEC Space Technologies has provided over 8000 units of payload equipment for various satellite missions including communication, broadcast, navigation and Earth observation activities.

L40 Miniature Ka-band LNA

S30 SSPA



E30 Multipack DNC



Q/V Receiver

〈Line up〉

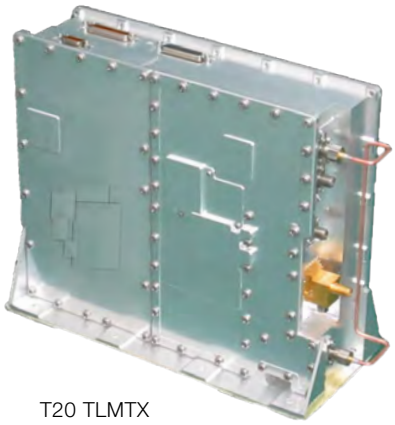
Component	Frequency band
Low Noise Amplifier (LNA)	L, S, C, X, Ku, Ka, V-band
Receiver / Frequency Converter	Input Frequency: L, S, C, X, Ku, K, Ka, V-band Output Frequency: L, S, C, X, Ku, K, Ka, Q-band
Solid State Power Amplifier (SSPA)	L, S, C, X, Ka-band

Satellite Bus Equipment

NEC Space Technologies designs and manufactures key satellite bus components. Some of this equipment, such as TT&C communication components and solar array panels are available to satellite manufacturers worldwide.

● Telemetry, Tracking, and Command Equipment

Supplied more than 500 units for worldwide customers.



T20 TLMTX

C40 CMDRX

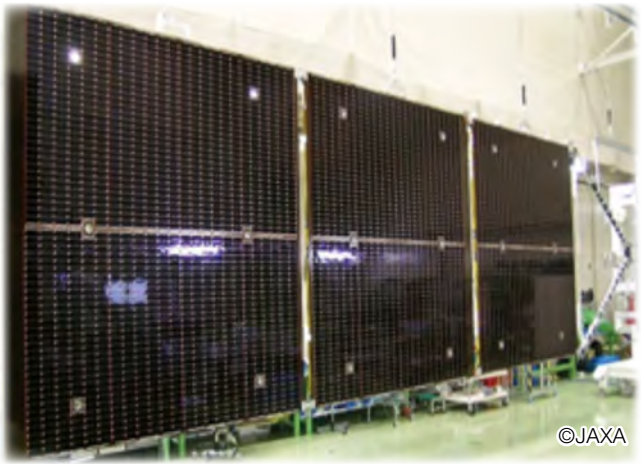
B20 BCNTX

〈Line up〉

Component	Frequency band
Command Receiver (CMDRX)	S, C, X, Ku, K, Ka-band
Telemetry Transmitter(TLMTX)	S, C, X, Ku, Ka-band
Beacon Transmitter (BCNTX)	C, X, Ku, Ka-band

● Solar Array Panels

NEC and NECSpace have supplied solar array panels for 115 satellites worldwide since 1970s. We are able to design solar array panels for various types of spacecrafts.



〈Supply Records〉

- ELSA-d
- GCOM-C1
- HAYABUSA-2
- NEXTAR series
- Worldwide satellites

● GPS Receiver

Multi frequency global positioning system receiver with CMOS direct sampling front end provides high precision navigation.

〈Supply Records〉

- GOSAT-2
- GCOM-C1
- NEXTAR series

Nihon Maruko International Group (Chubu Nihon Maruko Co.,LTD,)

23-3 Noguchi Komaki, Aichi 485-0806, Japan
Phone +81-568-79-6512 **FAX** +81-568-79-6503
E-mail : information@maruco-nmg.co.jp
http://www.nihon-maruko.jp/

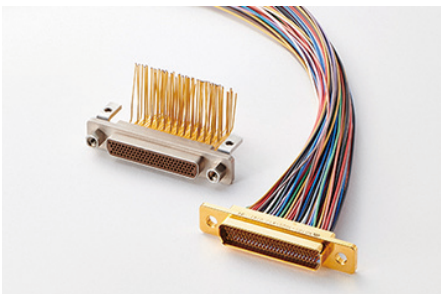
The Company	■ **Capital** **¥40** Million **¥160** Million (Group) ■ **Sales** **¥2,500** Million ■ **Employee** **300**
Major Customers	・Kawasaki Heavy Industries, Ltd. ・Mitsubishi Heavy Industries, Ltd. ・NEC Corporation ・Mitsubishi Electric Corporation ・IHI Aerospace Co,.Ltd.

Space Products & Services

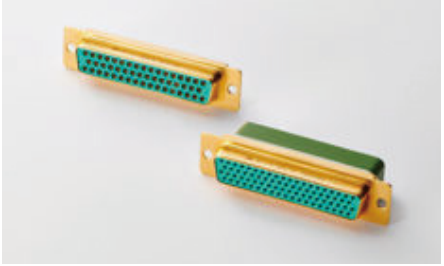
Nihon Maruko International Group(NMIG) specializes in the design, engineering and manufacture of high performance interconnect products for use in defense and aerospace applications. Our products lines include JAXA standard Micro-D and D-sub miniature connectors, complex harness assemblies and a comprehensive line of fiber optic connectors, media converters and harness assemblies.
Established in 1978, today NMIG is one of the most experienced companies in the industry and is highly regarded for its extremely reliable interconnect solutions. We are proud to be an interconnect solution provider for critical missions such as H-IIA, and H-IIB launch vehicles, HTV which delivers supplies to the ISS, and HAYABUSA and HAYBUSA-II for deep space exploration..

JAXA-QTS-2060 Qualified Connector

● Micro Miniature High Reliability Connector for Space
(JAXA-QTS-2060 AppendixF Qualified Connector)



● D-sub Miniature High Reliability Connector for Space
(JAXA-QTS-2060 Appendix C,D,G Qualified Connector)



High Data Rate Harness

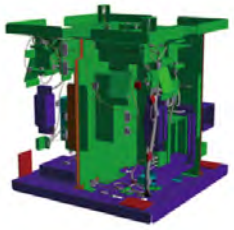
● OPTO-μD
Hybrid Micro-D Connector Harness Assembly
Utilizing Fiber Optic and Electrical Contacts

● SPACE WIRE Cable Assembly
Digital transmission cable with a maximum of 400 Mbps
that satisfies the requirements of ECSS-E-ST-50-12C

HARNESS ASSEMBLY

● 2D Harness Assembly

● 3D Harness Assembly



NIKKISO CO., LTD.

Yebisu Garden Place Tower 22nd Floor, 20-3, Ebisu 4chome, Shibuya-ku, Tokyo 150-6022, Japan
Phone +81-3-3443-3734 **FAX** +81-3-3443-9863
E-mail : t.zuinen@nikkiso.co.jp
http://www.nikkiso.com

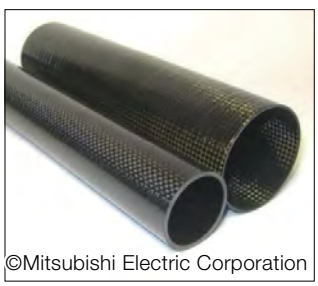
The Company	■ **Capital** **¥6,544** Million ■ **Sales** **¥140,912** Million (Consolidated) ■ **Employee** **1,877**
Major Customers	・Satellite makers in Japan

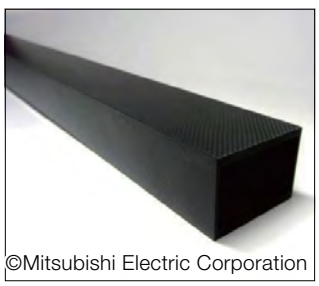
Space Products & Services

Since its foundation in 1953, Nikkiso has been carried out in the three business divisions: Industrial Division, Aerospace Division, and Medical Division. Each division has established its own business operations system that makes optimal use of the highly specialized technologies held by each.
Aerospace Division focuses on design, development, manufacturing and consulting related to carbon fiber reinforced composite products for the fi elds of satellite and aircraft components.
We are proud of the achievement to produce high quality & high performance composite components and the ontime delivery for our customers for a long time.
We have the abilities of performing concurrent engineering with customers by using our designs of 3D model, structural analysis of FEM and manufacturing technologies for components with highly complex confi guration.
Our designs of composite component are validated by own structural testing technologies simulating the multiple load conditions as Static, Fatigue, Environment and Vibrations.
We also produce a variety of products designed by customers with full compliance of customers' specifi cation.
For the satellite, we also produce the high performance composite products that comply with customers' requirements, such as Satellite's Tubes, Barrels, Rings and Structural Panels.

Composites

Tubes - Produced in wide range of thickness and complex fiber directions in accordance with customer's demand.


©Mitsubishi Electric Corporation


©Mitsubishi Electric Corporation

Panels – Experienced in both laminated and honeycomb core sandwich panels with various materials.
Market – In addition to the products for the existing satellites, Nikkiso is actively developing design concepts and test parts for the small satellites constellation market.

Composite Tube for GOSAT / ALOS-2

The image of satellites are not relate with above composite parts for satellite.

NIPPI Corporation

3175 Showa-machi, Kanazawa-Ku, Yokohama 236-8540, Japan
Phone +81-45-773-5100 **FAX** +81-45-773-5102
E-mail : nippi_webchief@nippi.co.jp
http://www.nippi.co.jp

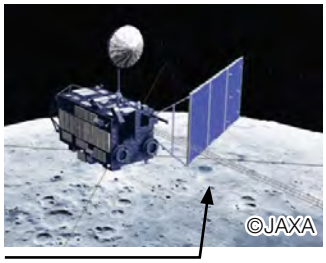
The Company	■ **Capital** **¥6,048** Million ■ **Sales** **¥20,806** Million ■ **Employee** **1,086**
Major Customers	・Japan Aerospace Exploration Agency ・NEC Corporation ・IHI AEROSPACE Co.,Ltd.

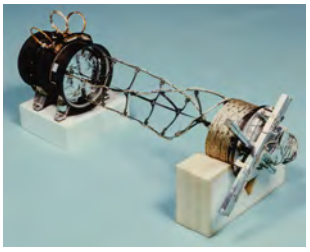
Space Products & Services

Nippi is a unique supplier in Japan of deployable mechanisms and thermally stable structures.

Coilable-Type Extendible Mast

This mast is stowed liked a spring. The elastic energy is stored as the longitudinal element makes the mast extend by itself.

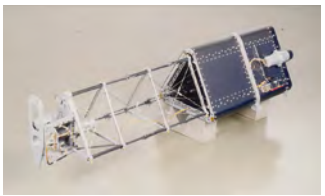




"KAGUYA" 12m Mast

High-stiffness Extendible Mast (HIMAT)

This mast is articulated type. It is called "HIMAT" This mast has higher stiffness and strength compared with the "coilable" one.

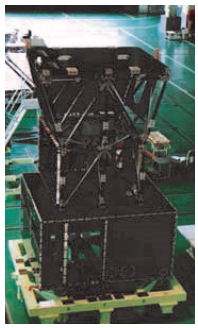


6Sets of HIMATs for "HALCA" (5m long)

Zero Thermal Deformation Structure/Extendible Optical Bench

A structure for earth/astronautically observation and optical experiment mission needs to stable against thermal deformation.
To satisfy such request, this structure has been designed and verified by using composite design technique.
Our "Extendible Optical Bench(EOB)" of "SUZAKU" satellite has satisfied the both requirements for the stableness and the extensibleness.

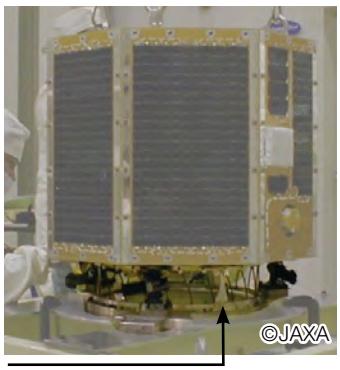
EOB of "SUZAKU"



"DAICHI" bus structure

Payload Separating Mechanism

This mechanism has been developed based on the "coilable mast" design technique.
This mechanism has unique characteristics such as a) long stroke and b) being able to generate axial and rotational (spin) forces simultaneously.
This system has been adopted in several small/micro satellite separation programs.



Separation mechanism.
For "microLabSat"

NIPPON AVIONICS CO.,LTD.

NIPPON AVIONICS CO., LTD.

28-2, Hongou 2-Chome, Seya-ku, Yokohama-shi,
Kanagawa-ken, 246-0015, Japan
Phone +81-45-286-3541 **FAX** +81-45-286-3545
E-mail : uenomachi-shi@avio.co.jp
http://www.avio.co.jp/

The Company	■ **Capital** **¥5,895** Million ■ **Sales** **¥19,230** Million (Consolidated) ■ **Employee** **578**
Major Customers	・NEC Corporation ・Japan Ministry of Defense ・Japan Aerospace Expoloration Agency

Space Products & Services

NIPPON AVIONICS is a key supplier for space components in the Japanese space market for over three decades.
Our technology has been widely used in space, defense and industrial markets.
We are the only company qualified by JAXA for hybrid microcircuits in Japan, approximately 2,500 types of hybrid ICs and modules having been delivered.

Our Radiation Hardened DC/DC Converters, which are JAXA qualified EEE parts and ESA PPL listed, have contributed to improve satellite power consumption and efficiency. Our products have been adopted by many Japanese satellites ranging from scientific observation to communication missions, with high appraisal from our customers.

Radiation Hardened POL DC/DC CONVERTER EPPL Listed and JAXA Qualified EEE Parts

● Line up

【FM】(Radiation Hardened, for Space applications)

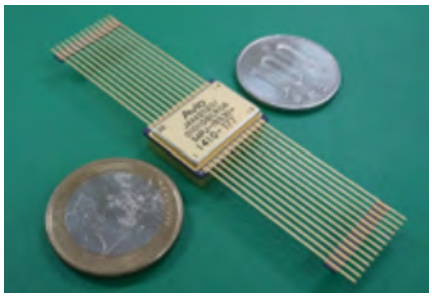
No.	JAXA Part Number	Model number	Specification
1	JAXA2020/01011DBCR06	SAPJ-15S30	1.5V output
2	JAXA2020/01011DBCR09	SAPJ-33S20	3.3V output

【EM】(for development, evolution)

No.	Model number	Specification
1	SAPJ-15S30(EM)	1.5V output
2	SAPJ-33S20(EM)	3.3V output

● Recommended Operating Conditions

No.	Parameter	Operating Condition
1	Operating Temperature Range (Case)	-55°C to +125°C
2	Input Voltage	+5V
3	Output Voltage (1.2V to 1.8V)	Adjust for SAPJ-15S30
4	Output Voltage (2.5V to 3.3V)	Adjust for SAPJ-33S20
5	Output Current	0A to 3A (Vo=1.2V,1.5V,1.8V) 0A to 2.6A (Vo=2.5V) 0A to 2A (Vo=3.3V)
6	Input capacitor (Chip ceramic)	30μF as a minimum 0A to 2A (Vo=3.3V)
7	Output capacitor (Chip ceramic)	160μF as a minimum



NOF CORPORATION

YEBISU GARDEN PLACE TOWER, 20-3, Ebisu 4-chome,
Shibuya-ku, Tokyo 150-6019, Japan
Phone +81-3-5424-6718 **FAX** +81-3-5448-9557
E-mail : g_honc_kayakuinfo@nof.co.jp
http://www.nof.co.jp/english/index.html

The Company	■ **Capital** **¥17,742** Million ■ **Sales** **¥135,865** Million ■ **Employee** **1,737**
Major Customers	・Japan Aerospace Exploration Agency ・IHI Aerospace Co., Ltd.

Space Products & Services

Solid propellant

Rocket propellant is composed of fuel and oxidants to maintain its combustion in space. NOF develops and produces various types of solid propellant. NOF has provided solid propellant for all Japanese rockets, stretching back to 1955 when "pencil rocket" was developed. As rockets grew in size, they required propellant giving higher performance. In response, NOF has carried out research and development of new type of propellants and introduced new and improved manufacturing technologies, production facilities and equipment to ensure the reliability of its products. Currently, NOF has two locations associated with rocket production: Taketoyo Plant in Aichi Prefecture, which manufactures propellant for S-310 and S-520 rockets, used for scientific research; and Tanegashima Works in Kagoshima Prefecture, which produces propellant for SRB-A solid rocket boosters used on H-IIA and H-IIB rockets. Boasting the world's largest solid propellant mixer, Tanegashima Works can efficiently manufacture largescale solid rocket boosters. NOF makes an effort for the development of Solid propellant for H3 rocket following H-IIA and H-IIB rockets.

Applications

Solid propellant: For S-310 rocket, S-520 rocket, Epsilon rocket, SRB-A used on the H-IIA / H-IIB rocket
Igniters: For all types of rockets.

Large-size high-performance solid propellant for H3 rocket boosters

NTN Corporation

1-3-17, Kyomachibori, Nishi-ku, Osaka-shi, Osaka 550-0003, Japan
Phone +81-6-6443-5001 **FAX** +81-6-6443-6966
http://www.ntn.co.jp/english/index.html

The Company	■ **Capital** **¥54,300** Million ■ **Sales** **¥642,000** Million (Consolidated) ■ **Employee** **23,383** (Consolidated)
Major Customers	・Japan Aerospace Exploration Agency ・IHI Corporation ・Mitsubishi Heavy Industries, Ltd. ・NEC Corporation

Space Products & Services

Bearing Manufacturer

NTN is one of the leading bearing manufacturers in the world, with deep experience in aerospace bearing applications. Specifically for space applications, our products are available with grease lubrication or with surface coatings which are suitable for applications such as **rockets**, **artificial satellites** and **space probes**.

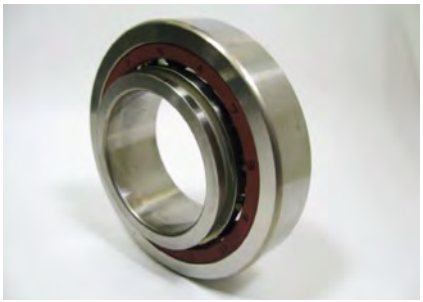
Over 30 years of Contributions to Turbopumps for Rockets

NTN is the only supplier of turbopump bearings for H-IIA and H-IIB rockets.
The bearings rotate at high speed in a cryogenic environment.
We have special lubrication technologies in order to meet such severe requirements.

Challenge for the Future

Our strategy is to challenge ourselves to develop new bearing technologies for the infinite space world, wishing to make new footprints on unexplored fields with you.

Our Products for Space Use



Angular contact ball bearings in cryogenic environment at high speed

Deep groove ball bearing for vacuum environment

Spherical plain bearing for vacuum environment

Sakura Rubber Company Limited.

1-48-3, Sasazuka Shibuya-ku, Tokyo 151-8587, Japan
Phone +81-3-3466-2171 **FAX** +81-3-3460-4910
http://www.sakura-rubber.co.jp

The Company	■ **Capital** **¥506** Million ■ **Sales** **¥10,000** Million ■ **Employee** **350**
Major Customers	・Mitsubishi Heavy Industries, Ltd. ・Kawasaki Heavy Industries, Ltd. ・SUBARU Corporation ・IHI Corporation ・IHI Aerospace Co., Ltd.

Space Products & Services

Products for Hayabusa project

Some of Sakura's products were used the propellant line of the Ionengine for Hayabusa & Hasabusa Ⅱ. Sakura received the commendation from the Ministry of Education, Culture, Sports, Science and Technology Japan as one of the cooperation manufactures that were related to the Hayabusa project.

Hayabusa

Dynatube® Fittings

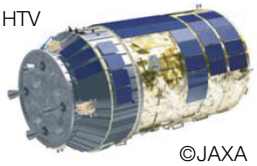
Sakura has been manufacturing and supplying Dynatube® fittings under the license from Parker Hannifin Corp to the Japanese domestic market for many decades.
Sakura can supply Dynatube® fittings to the region of East and Southeast Asia.
Dynatube fittings are used in the H-IIA, H-IIB, HTV, and other various Japanese aerospace systems.bellows seal under low pressure, floating seal under high pressure and Segmented seal composing He gas barrier.


DYNATUBE® FITTINGS

Bending Tubes

Sakura manufactures more than 100,000 bending tubes annually for aerospace application. Thousands of Sakura's products have flown on the Japanese launch vehicles, satellites, and Space Station elements.
Those are made of Titanium, Ni-alloy, CRES, and Aluminum.

HTV


©JAXA


BENDING TUBES

Air Ducts

This picture shows air duct for HTV, which is made of silicone rubber coated glass fabrics. Sakura's air ducts are going to be installed on new transfer vehicle called HTV-X under development.

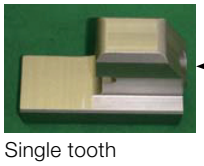

AIR DUCTS

TWINSTAR® Couplings (TS Couplings)

Twinstar® couplings, which were originally developed by Sakura, have following significant features :
(1) Quick connection and dis-connection mechanism
(2) Both halves are identical
(3) For the large size, Separate Teeth Models are available, individual tooth can be replaced in case of damaged
(4) Wide range of sizes and material are available For aerospace, Twinstar couplings were selected as connectors used for the Life Sciences Glovebox.
Twinstar coupling is also expected to be used for the Ground Support Equipment of the aerospace facilities in the future.


TS Couplings for LSG
(Life Science Glovebox)


ϕ300mmTS


Single tooth


ϕ1000 mmTS

SINFONIA TECHNOLOGY CO., LTD.

Shiba NBF Tower, 1-30, Shiba-daimon 1-chome, Minato-ku,
Tokyo 105-8564, Japan
Phone +81-3-5473-1816 **FAX** +81-3-5473-1843
http://www.sinfo-t.jp/eng/index_a.htm

The Company	■ **Capital** **¥10,156** Million ■ **Sales** **¥94,500** Million **¥862** Million (For space) ■ **Employee** **3,700**
Major Customers	・Mitsubishi Heavy Industries, Ltd. ・IHI Aerospace Co., Ltd. ・Japan Aerospace Exploration Agency ・Korea Aerospace Research Institute

Space Products & Services

Electrical Component for Rocket

TVC Actuator

Linear servo actuator for the launch vehicle, built-in large capacity switching device, world-class high power output, and precise control of thrust vectoring.

Electrical Components for Carrier Rocket

HTV Circulation Fan

Adopting low speed motor and dual-stage blade to stabilize air pressure and maintain circulation in HTV (H-IIB transfer vehicle) with minimum acoustic noise.

Experiment Equipment

Oxygen Pump Motor

- This motor (DC brushless motor) is used for water tank in experiment of ecology.
- Application for hermetic seal stator and water lubrication bearing.

Control System for Mouse Habitat Unit

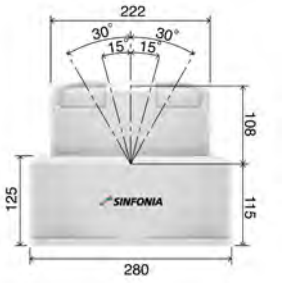
- World's first artificial gravity comparison experiment in the ISS.
- Sinfonia's control systems for feeding cartridge, water supply, fan for excretion cleaning, and camera reduced astronauts' daily workload to once-a-week care.

R&D Program

3D Freedom Actuator

Possible application examples: Robot arm, Control of Thrust Vectoring for Satellite

[Dimensions]



[Specifications]

		θθ	θθθ
Rated Torque	θx , θy	1.5N·m	1.5N·m
	θz	—	5N·m
Max. Torque	θx , θy	4N·m	4N·m
	θz	—	15N·m
Movable Angle	θx , θy	±30°	±15°
	θz	—	±180°
Max. Rotation Speed	θx , θy	3s^{-1}	1s^{-1}
	θz	—	7s^{-1}
Resolution	θx , θy	0.005°(18″)	0.0004°(1.5″)
	θz	—	0.0004°(1.5″)
Weight		8.0kg	15.2kg

SOGO SPRING MFG.CO.,LTD.

2-7-4 Kurigi Asao-Ku Kawasaki City Kanagawa, 215-0033 Japan
Phone +81-44-981-1401 **FAX** +81-44-981-1406
E-mail : sogo3131@sepia.ocn.co.jp
http://www.sogospring.co.jp

The Company	■ **Capital** **¥67.5** Million ■ **Sales** **¥1,100** Million (Consolidated) **¥10.0** Million (Aerospace) ■ **Employee** **80** (Consolidated) **27** (Aerospace)
Major Customers	・IHI AEROSPACE Co., Ltd. ・Kawasaki Heavy Industries, Ltd. ・Mitsubishi Heavy Industries, Ltd. ・Japan Aerospace Exploration Agency ・NIPPI Corporation

Space Products & Services

SOGO SPRING produces various spring in accordance with each customer needs under the certain quality control.

Spring for H-IIA LAUNCH VEHICLE

Customer：Kawasaki Heavy Industries,Ltd.
Function：The lower part fairing isolating mechanism
Material：AMS4928(Ti-6Al-4V)
Wire Diameter：5.40±0.05 ㎜
Outside Diameter：42.8 ㎜ (REF)
Free Length：146.1 ㎜ (REF)
Number of Total Coil：12.0 (REF)
Special Inspection：UT

Spacer for the LE-7 Engine

Material : AMS5512
Sheet thickness : 2.0 ㎜
Diameter of spacer : 418.00 ㎜

Spring for satellites

We are proud to mention that our spring products were used for various Japan's satellites including JEM and HTV. We believe that our persistent quality oriented attitude and the open and fair presentation of our products maintain the solid relation with our customers.

① SPRING
Customer：©JAXA
Function：Component part of the satellite posture control structure
Material：Copper Beryllium alloy
Outside Diameter：41.00±0.15 ㎜
Height：6.80±0.1㎜
Merit：One processing part, combined of a bearing fixed function and spring function

② This spring is for the satellite ETS-VIII (Kiku-8).)
Our spring greatly contributed to success of the large-scale antenna development in the outer space
heet thickness : 1.0mm
Spring diameter : 65.0 mm
In addition, our springs are also used for various aircrafts including commercial and JADF.

SUBARU CORPORATION

1-1-11, Yonan, Utsunomiya, Tochigi 320-8564, Japan
Phone +81-28-684-7777 **FAX** +81-28-684-7778
https://www.subaru.co.jp/en/

The Company	■ **Capital** **¥153,795** Million ■ **Sales** **¥62,291** Million (Aerospace) ■ **Employee** **16,961** (SUBARU CORPORATION) **2,196** (Aerospace)
Major Customers	・The BOEING COMPANY ・Ministry of Defense ・Japan Aerospace Exploration Agency ・IHI Aerospace Co. Ltd. ・National Police Agency ・Ministry of Land, Infrastructure,Transport and Tourism

Space Products & Services

SUBARU originated Nakajima Aircraft Laboratory established in 1917. Since then, SUBARU has been leading the Japanese aerospace industry by developing and manufacturing a variety of aircraft, with advanced technology and spirit. SUBARU is proud of its ability and long-experience in developing and manufacturing UAS (unmanned aerial systems). Among those programs, we developed various experimental unmanned spacecrafts for Japanese spaceplane development programs conducted by JAXA(Japan Aerospace Exploration Agency) .

For future space missions, SUBARU is actively participating in research and development programs funded by JAXA.

Epsilon Launch Vehicle

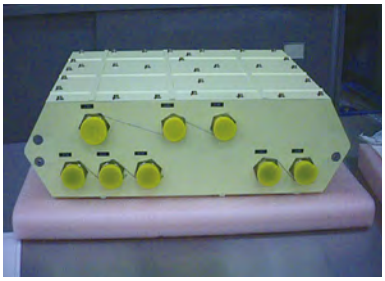
H-IIA/B Launch Vehicle

R&D/Technology Focus

・Low cost composite structure

Space Product

・Power Distribution Box for H-IIA SRB
・Flight Safety Control Box for Epsilon Launch Vehicle 1st Stage


Power Distribution Box for H-IIA SRB

TAMAGAWA SEIKI CO., LTD.

1879, Ohyasumi, Iida, Nagano 395-8515, Japan
Phone +81-265-56-5423 **FAX** +81-265-56-5427
E-mail : kokyaku@tamagawa-seiki.co.jp
http://www.tamagawa-seiki.co.jp

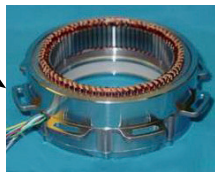
The Company	■ **Capital** **¥100** Million ■ **Sales** **¥68.6** Billion (Consolidated) ■ **Employee** **2,431** (Consolidated)
Major Customers	・Mitsubishi Heavy Industries, Ltd. ・Kawasaki Heavy Industries, Ltd. ・Mitsubishi Electric Corporation ・NEC Corporation ・IHI Aerospace Co. Ltd. ・MEISEI Electric CO., LTD. ・ABB Automation Technology Products AB ・Ministry of Defense ・Japan Aerospace Exploration Agency etc.

Space Products & Services

Angle sensors for space component

We have conducted R&D of a high resolution angle sensor for positioning and speed control of the driving mechanisms of a solar cell paddle and an antenna to ensure the reliable and flexible performance in space

Rotor



Stator

Items	Resolver type	Optical encoder type (Oversea products)
Sensing method	Resolver +RD converter electromagnetic induction type	Optical encoder type
Angle accuracy	<±0.0015° (<±5")	<±0.0015° (<±5")
Resolution	21bit	18bit
Mass	1.8kg	< 2.2kg
Power	1.2W	< 5.0W
Input / Output	Differential type (EIA RS422)	Differential type (EIA RS422)

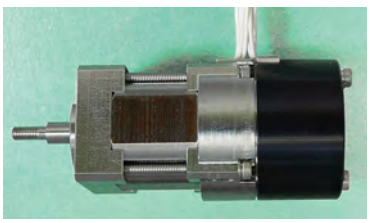
Motors, Sensors & Mechanical units for space components

Our products are equipped with satellite, space station, space probe, rover and anyother space scene.

Actuator -
Antenna drive mechanism

Actuator -
Linear drive mechanism
for Focus adjustment

Reaction Wheel -
Attitude control Unit for
small satellite



Step motor -
Shutter drive mechanism

Actuator -
Cover drive mechanism

FOG Unit -
Inertial Reference Unit for
small satellite

TEIJIN LIMITED

2-1,Kasumigaseki 3-chome,Chiyoda-ku,Tokyo 100-8585, Japan
Phone +81-3-3506-6800 **FAX** +81-3-3506-2261
E-mail : stakeholder@teijin.co.jp
https://www.teijin.com/
Inquiry (https://inquiry.teijin.co.jp/form/contact_cf_en.html)

The Company

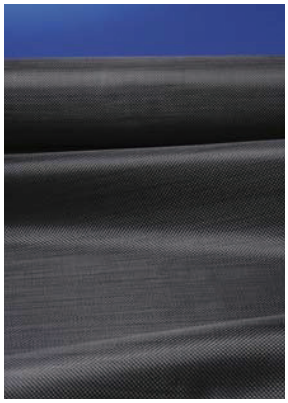
- **Capital** **¥71,833** Million (As of March 31, 2022)
- **Net Sales** **¥926.1** Billion (FY 2022)
- **Employee** **21,815** (As of March 31, 2022)

Space Products & Services

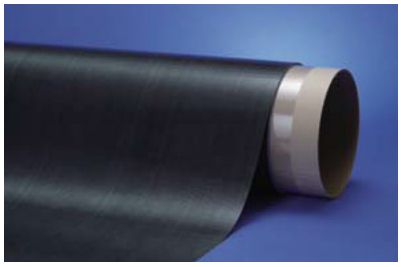
Tenax™ Carbon Fiber

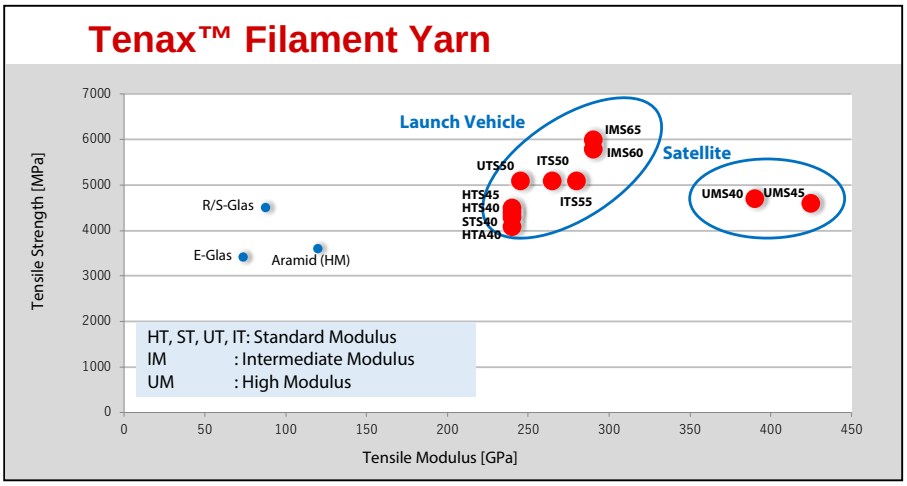
Teijin has over 30 years of pioneering expertise in the manufacture of carbon fiber. Our commitment to quality, innovation and customer-oriented service and technology has given us a leading position in the world carbon fiber market. Tenax™ Carbon Fiber is an incredibly versatile material, with a wide range of applications including satellite, Launch Vehicle, aircraft, car parts, and several sports goods.


FilamentYarns


Dry Reinforcements


Short fibers


Prepreg



Satellite

Satellite and Launch Vehicle application request the ultimate performance for the materials, not only weight saving but also durability of significant temperature fluctuation. Tenax™ carbon fiber has been applied in several Launch Vehicle program and satellite program in the world. Tenax™ has also been applied a tooling material to make parts.

Local sales contacts

- Teijin Carbon Europe GmbH
  Email: aerospace@teijincarbon.com, Address : Kasinostraße 19-21, 42103 Wuppertal, Germany
- Teijin Carbon America, Inc.
  Email: aerospace@teijincarbon.us, Address : 121 Cardiff Valley Road, Rockwood, TN 37854, USA

Toray Industries, Inc.

Nihonbashi Mitsui Tower, 1-1, Nihonbashi-Muromachi 2-chome, Chuo-ku, Tokyo 103-8666, Japan
Phone +81-3-3245-5111 **FAX** +81-3-3245-5054
https://www.cf-composites.toray/

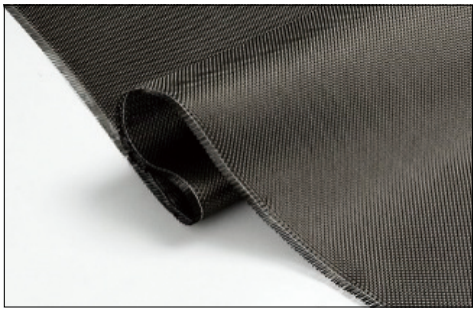
The Company

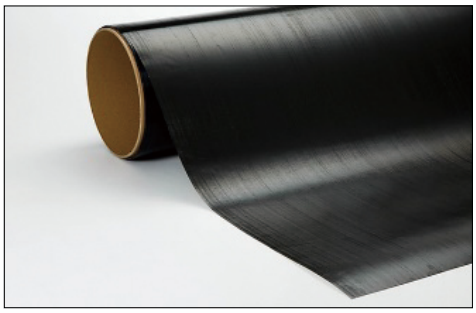
■ **Capital** **¥147,873** Million
■ **Employee** **48,842**
■ **Sales** **¥2,228.5** Million

Space Products & Services

TORAYCA® Carbon Fiber/Intermediate Materials

Toray is the world's largest manufacturer of carbon fiber. Toray started manufacturing and sales of carbon fiber in 1971, and we have more than 50 years of experience. TORAYCA® has been used in various applications including aerospace field which requires high performance materials. In addition to our legacy Thermoset products, Thermoplastic solution has been added to our line-up of intermediate materials by our acquisition of Toray Advanced Composites, formerly known as TenCate Advanced Composites.
Thermoplastic materials offer unique benefits for the space industry, specifically in applications that require extremely high toughness and temperature stability and for the production of high volume clips and brackets.





Launch Vehicles

CFRP is widely applied in launch vehicle structures for its great contribution to weight and cost savings. TORAYCA® has been used in various major rocket programs in the world and has shown excellent performance under ultimate conditions.
With its unrivaled lineups of high tensile strength products and world largest production capacity, we are ready to support customers looking for ideal solutions on scheduled time.
Application : Payload Fairings / Payload Adapter / Nozzle Skirt / Motor Case / Cryotanks / Pressure Vessels / Heat Shield

Satellites

Toray's high modulus fibers have been recognized as standard materials for satellite structures exposed to severe temperature fluctuation and high radiation in the space. Toray's carbon fiber and prepreg materials are used on nearly every major satellite program in Japan, Europe and North America. With high reliability proved by numerous critical missions and in-depth knowledge from working with cutting-edge customers for decades, Toray is your trustworthy partner to make most rigid and lightest satellite structures.
Applications : Satellite Bus / Solar panels / Tubes / Reflectors / Propellant Tanks

Local sales and contact

- Toray Composite Materials America, Inc.
  (Customers in North & South America)
  WEB : http://www.toraycma.com/
  Tel : +1(253)846-3109 / Location: 19002 50th Avenue East, Tacoma, WA 98446, USA
- Toray Carbon Fibers Europe S.A. (Customers in Europe, CIS, and Middle East)
  WEB : http://www.toray-cfe.com/en/
  Tel : +33(0)1 56 61 12 80 / Location: 87, quai Panhard et Levassor 75634 Paris, France
- Toray Advanced Composites, Inc.
  WEB : https://www.toraytac.com/
  Tel : +1(408)465-8500 / Location: 18255 Sutter Blvd Morgan Hill, CA 95037, USA

UACJ Corporation

Tokyo Sankei Bldg., Otemachi 1-7-2, Chiyoda-ku, Tokyo 100-0004, Japan
Phone +81-80-2265-8720 **FAX** +81-3-6202-2042
E-mail : koyama-katsumi@uacj.co.jp
http://www.uacj.co.jp/english

The Company	■ **Capital** **¥52,277** Million ■ **Sales** **¥782,911** Million **¥409** Million (For space) ■ **Employee** **9,571** (Consolidated)
Major Customers	・Mitsubishi Heavy Industries, Ltd. ・Kawasaki Heavy Industries, Ltd. ・IHI Aerospace Co.,Ltd.

Space Products & Services

UACJ is the Japan's top supplier of large aluminum wrought products.


Standoff Frame Assembly

Aluminum Alloy Plates

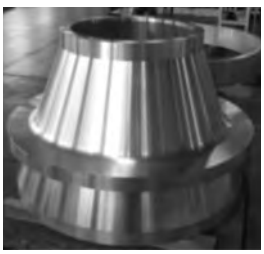
Max.size	t45 × 3000 × (16000) exam.2219 t60 × 2000 × (16000) exam.7050
Max.WT.	6,500kg
Typical Alloy	2219-T851/T87 6061-T651 7050-T7451 7075-T7351 7475-T7351
Typical Application	Skin Plate of Rocket Fuel Tank Dome of Rocket

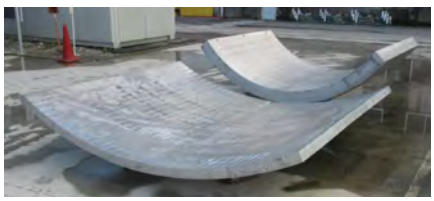
Aluminum Alloy Plates

by the integrated production system from raw material to finished products.

Main Presses	15000t Hydraulic	5000t Hydraulic	3000t Hydraulic	1000t Hydraulic
Hand Forging	○		○	
Die Forging	○	○		○

	Hand Forgings	Die Forgings
Max.size [mm]	1piece Ring ϕ 3600 (Heat Treated) ϕ 4400 (Non Heat Treated) 2piece Ring ϕ 6000 × H600 (Segmented to 2piece) Hemishere ϕ 3000 × H1500	PVA:1,000,000mm^2
Max.WT.	6,000kg	
Typical Alloy	2014-T6/T652 2219-T852/T87 6061-T6/T652 7050-T74/T7452 7075-T73/T7352	
Typical Application	Nozzle Parts of Solid Rocket Booster	Structure Parts of the H-IIA/B





Space Products & Services Matrix

Matrix 1

Spacecraft (Bus)

Matrix 2

Spacecraft (Payload)

Matrix 3

Space Transportation Systems

Parts/Materials

Ground Segment

Services

Spacecraft (Bus)

Bus / Platform

On Board Equipment (Bus)

Company Name \ Products Services	PRIME CONTRACTORS	**Propulsion**	Tanks	Chemical propulsion	Electrical propulsion	Valves/Thrusters	Associated equipment	**Electrical Systems**	TM-TC	Power generation and storage	Power management	Associated equipment and component	Electronic subsystems	**Mechanical Systems**	Structure	Thermal control	Pyrotechnics	Mechanisms/Actuators	Associated equipment	**Attitude and Orbit Control**	On board software	AOCS (Attitude and Orbit Control Subsystems)	On board computer hardware	Associated equipment	**Propulsion**	Tanks	Apogee motors	Chemical thrusters	Tubes/Valves	Command electronics	Electric thrusters	Electric thruster Power conditions	Coolers and filters	**Attitude and Orbit Control**	Optical sensors	AOCS computers	Inertial wheels/Mechanical wheels	Magnetic wheels	**TT&C**	TT&C antennas	Transponders	TM-TC equipment	**Power supply**	Solar Generator	Batteries	BAPTA's(SADA's)	Power conditioning	**Thermal Control**	Thermal blankets	Radiation panels	OSR/Filters	Heat pipes	Coolers	Heaters/Louvers	Structures
EAGLE INDUSTRY CO., LTD.		■						■						■						■					■										■									■																	
THE FURUKAWA BATTERY CO., LTD.		■						■						■						■					■										■									■		■													
GS YUASA TECHNOLOGY LTD.		■						■						■						■					■										■									■		■													
HARADASEIKI CO., LTD.	■	■						■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■					■				■	■	■	■	■		■		■	■	■		■			■							■
HIGH-RELIABIRITY ENGINEERING & COMPONENTS CORPORATION		■						■						■						■					■										■									■															
IHI CORPORATION	■	■		■		■	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■				■	■		■	■	■									■						■	■		■	■	■	■
IHI AEROSPACE CO., LTD.		■	■	■	■	■	■	■						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■						■						■			■	■	■	■
JAMCO Corporation		■						■						■						■					■				■						■									■															
JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.		■						■				■		■						■				■	■										■									■															
JAPAN MANNED SPACE SYSTEMS CORPORATION		■						■						■						■					■										■									■															
JUPITOR CORPORATION		■						■						■						■					■										■									■															
KAWASAKI HEAVY INDUSTRIES, LTD.	■	■						■						■	■	■	■	■	■	■	■	■	■	■	■										■									■						■	■				■	■
KYOCERA CORPORATION		■				■		■						■						■					■										■									■															
MARUBENI CORPORATION		■			■			■						■						■					■										■									■															
MARUBUN CORPORATION		■						■						■						■					■										■									■															
MEIRA CORPORATION		■						■						■						■					■										■									■															
MinebeaMitsumi Inc.		■						■						■						■					■										■									■															
MITSUBISHI ELECTRIC CORPORATION	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					■	■	■	■	■		■				■	■	■	■	■	■	■	■		■	■		■	■	■	■
MITSUBISHI HEAVY INDUSTRIES, LTD.	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■		■	■	■						■	■	■		■	■	■	■	■	■	■	■		■	■				■	■
MITSUBISHI PRECISION CO., LTD.		■					■	■				■		■				■	■	■		■	■	■	■					■						■	■																				
NEC CORPORATION	■	■			■			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					■					■	■				■	■	■	■	■	■	■	■		■	■			■	■	■
NEC SPACE TECHNOLOGIES, LTD.		■						■				■		■					■	■	■		■	■	■					■					■	■				■	■	■	■	■	■	■									
NIHON MARUKO INTERNATIONAL GROUP		■						■						■						■					■										■									■															
NIKKISO Co., Ltd.		■						■						■	■					■					■										■									■															
NIPPI CORPORATION		■						■						■	■			■		■					■										■									■															
NIPPON AVIONICS CO., LTD.		■						■						■						■					■										■									■															
NOF CORPORATION		■						■						■						■					■										■									■															
NTN CORPORATION		■					■	■						■				■	■	■					■										■	■		■						■															
SAKURA RUBBER COMPANY LIMITED		■						■						■						■					■				■						■									■															
SINFONIA TECHNOLOGY CO., LTD.		■						■		■	■		■	■						■					■										■									■															
SOGO SPRING MFG. CO., LTD.		■						■						■						■					■										■									■															
SUBARU CORPORATION		■	■					■						■	■			■		■					■	■									■									■														■	
TAMAGAWA SEIKI CO., LTD.		■						■						■				■	■	■		■		■	■										■	■		■						■															
TEIJIN LIMITED		■						■						■						■					■										■									■															
TORAY INDUSTRIES, INC		■						■						■						■					■										■									■															
UACJ CORPORATION		■						■						■						■					■										■									■															

Spacecraft (Payload)

On Board Equipment (Payload)

Company Name	Antennas	Pointing tracking mechanism	Active antenna	Passive antenna	Reflector <3m	Reflector 3 m < D < 6 m	Reflector > 6 m	Development mechanisms	Transponders	Traveling wave tubes	Electric power conditioning	SSPA including EPC	Channel amplifiers	Low noise amplifiers	Low noise receivers	Up/Down converters	On board processors: analog	On board processors: digital	Filters	Switches
EAGLE INDUSTRY CO., LTD.																				
THE FURUKAWA BATTERY CO., LTD.																				
GS YUASA TECHNOLOGY LTD.																				
HARADASEIKI CO., LTD.																				
HIGH-RELIABIRITY ENGINEERING & COMPONENTS CORPORATION																				
IHI CORPORATION			■	■				■					■	■	■	■	■	■	■	■
IHI AEROSPACE CO., LTD.																				
JAMCO Corporation																				
JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.																				
JAPAN MANNED SPACE SYSTEMS CORPORATION																				
JUPITOR CORPORATION																				
KAWASAKI HEAVY INDUSTRIES, LTD.																				
KYOCERA CORPORATION																				
MARUBENI CORPORATION																				
MARUBUN CORPORATION																				
MEIRA CORPORATION																				
MinebeaMitsumi Inc.																				■
MITSUBISHI ELECTRIC CORPORATION			■	■	■	■	■	■			■	■	■	■	■	■			■	
MITSUBISHI HEAVY INDUSTRIES, LTD.																				
MITSUBISHI PRECISION CO., LTD.																				
NEC CORPORATION		■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■
NEC SPACE TECHNOLOGIES, LTD.			■	■	■						■	■		■	■	■	■	■	■	■
NIHON MARUKO INTERNATIONAL GROUP																				
NIKKISO Co., Ltd.																				
NIPPI CORPORATION					■	■	■	■												
NIPPON AVIONICS CO., LTD.																				
NOF CORPORATION																				
NTN CORPORATION		■						■												
SAKURA RUBBER COMPANY LIMITED																				
SINFONIA TECHNOLOGY CO., LTD.																				
SOGO SPRING MFG. CO., LTD.																				
SUBARU CORPORATION				■				■												
TAMAGAWA SEIKI CO., LTD.		■																		
TEIJIN LIMITED																				
TORAY INDUSTRIES, INC																				
UACJ CORPORATION																				

Company Name	Scientific Instruments and EO payloads	Optronic sensors	Radiometers	Lidars	Radar sensors	Data acquisition and management	Signal conditioning and coding	Data compression and encryption	Data image processing	Instrument control unit	Data handling	Mass memory	Intersatellite links	RF intersatellite links	Optical intersatellite links
EAGLE INDUSTRY CO., LTD.															
THE FURUKAWA BATTERY CO., LTD.															
GS YUASA TECHNOLOGY LTD.															
HARADASEIKI CO., LTD.							■	■	■	■	■				
HIGH-RELIABIRITY ENGINEERING & COMPONENTS CORPORATION															
IHI CORPORATION															
IHI AEROSPACE CO., LTD.							■	■		■	■			■	
JAMCO Corporation															
JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.															
JAPAN MANNED SPACE SYSTEMS CORPORATION								■							
JUPITOR CORPORATION															
KAWASAKI HEAVY INDUSTRIES, LTD.															
KYOCERA CORPORATION															
MARUBENI CORPORATION															
MARUBUN CORPORATION															
MEIRA CORPORATION															
MinebeaMitsumi Inc.										■					
MITSUBISHI ELECTRIC CORPORATION		■	■	■	■		■	■	■	■	■			■	■
MITSUBISHI HEAVY INDUSTRIES, LTD.		■					■	■	■	■	■	■			
MITSUBISHI PRECISION CO., LTD.							■	■							
NEC CORPORATION		■	■	■	■		■	■	■	■	■	■		■	■
NEC SPACE TECHNOLOGIES, LTD.					■		■	■	■	■	■	■		■	■
NIHON MARUKO INTERNATIONAL GROUP															
NIKKISO Co., Ltd.															
NIPPI CORPORATION															
NIPPON AVIONICS CO., LTD.															
NOF CORPORATION															
NTN CORPORATION															
SAKURA RUBBER COMPANY LIMITED															
SINFONIA TECHNOLOGY CO., LTD.															
SOGO SPRING MFG. CO., LTD.															
SUBARU CORPORATION															
TAMAGAWA SEIKI CO., LTD.															
TEIJIN LIMITED															
TORAY INDUSTRIES, INC															
UACJ CORPORATION															

Telecommunication & Navigation

Company Name	PRIME CONTRACTOR	Payload Subsystems	Antennas	Intersatellite links	Travelling wave tubes	Payload Accommodation Transponders	Antennas mechanisms	Mechanical systems	Pointing tracking mechanisms	Electronic subsystems	Associated equipment
EAGLE INDUSTRY CO., LTD.											
THE FURUKAWA BATTERY CO., LTD.											
GS YUASA TECHNOLOGY LTD.											
HARADASEIKI CO., LTD.							■	■			
HIGH-RELIABIRITY ENGINEERING & COMPONENTS CORPORATION											
IHI CORPORATION											
IHI AEROSPACE CO., LTD.											
JAMCO Corporation											
JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.											■
JAPAN MANNED SPACE SYSTEMS CORPORATION											
JUPITOR CORPORATION											
KAWASAKI HEAVY INDUSTRIES, LTD.											
KYOCERA CORPORATION											
MARUBENI CORPORATION											
MARUBUN CORPORATION											
MEIRA CORPORATION											
MinebeaMitsumi Inc.											■
MITSUBISHI ELECTRIC CORPORATION	■		■	■			■	■	■	■	■
MITSUBISHI HEAVY INDUSTRIES, LTD.											
MITSUBISHI PRECISION CO., LTD.											
NEC CORPORATION	■		■	■	■		■	■	■	■	■
NEC SPACE TECHNOLOGIES, LTD.			■	■							■
NIHON MARUKO INTERNATIONAL GROUP											
NIKKISO Co., Ltd.											
NIPPI CORPORATION			■				■	■			
NIPPON AVIONICS CO., LTD.											
NOF CORPORATION											
NTN CORPORATION											■
SAKURA RUBBER COMPANY LIMITED											
SINFONIA TECHNOLOGY CO., LTD.											
SOGO SPRING MFG. CO., LTD.											
SUBARU CORPORATION											
TAMAGAWA SEIKI CO., LTD.								■	■		
TEIJIN LIMITED											
TORAY INDUSTRIES, INC											
UACJ CORPORATION											

Earth Observation

Company Name	PRIME CONTRACTOR	Payload Subsystems	Optical Visible Instruments	Optical infrared instruments	Microwave Instruments	Space telescopes	Payload Accommodation	Mechanisms and thermal control	Signal conditioning and coding	Associated equipment	Electrical subsystems
EAGLE INDUSTRY CO., LTD.											
THE FURUKAWA BATTERY CO., LTD.											
GS YUASA TECHNOLOGY LTD.											
HARADASEIKI CO., LTD.			■			■					
HIGH-RELIABIRITY ENGINEERING & COMPONENTS CORPORATION											
IHI CORPORATION	■							■	■	■	■
IHI AEROSPACE CO., LTD.	■							■	■	■	■
JAMCO Corporation											
JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.											
JAPAN MANNED SPACE SYSTEMS CORPORATION											
JUPITOR CORPORATION											
KAWASAKI HEAVY INDUSTRIES, LTD.											
KYOCERA CORPORATION											
MARUBENI CORPORATION											
MARUBUN CORPORATION											
MEIRA CORPORATION											
MinebeaMitsumi Inc.										■	
MITSUBISHI ELECTRIC CORPORATION	■		■	■	■	■		■	■	■	■
MITSUBISHI HEAVY INDUSTRIES, LTD.			■					■	■	■	■
MITSUBISHI PRECISION CO., LTD.										■	
NEC CORPORATION	■		■	■	■	■		■	■	■	■
NEC SPACE TECHNOLOGIES, LTD.					■				■	■	
NIHON MARUKO INTERNATIONAL GROUP											
NIKKISO Co., Ltd.											
NIPPI CORPORATION						■					
NIPPON AVIONICS CO., LTD.											
NOF CORPORATION											
NTN CORPORATION										■	
SAKURA RUBBER COMPANY LIMITED											
SINFONIA TECHNOLOGY CO., LTD.											
SOGO SPRING MFG. CO., LTD.											
SUBARU CORPORATION											
TAMAGAWA SEIKI CO., LTD.											
TEIJIN LIMITED											
TORAY INDUSTRIES, INC											
UACJ CORPORATION											

Scientific Payload

Company Name	PRIME CONTRACTOR	Payload Subsystems	Optical Instruments	Electronic payloads	Payload Accommodation	Mechanical subsystems	Space medicine	Dedicated processor(H/W and S/W)	Data acquisition and management	Associated equipment	Payload data processing	Microgravity	Parabolic flights	Payload instruments
EAGLE INDUSTRY CO., LTD.														
THE FURUKAWA BATTERY CO., LTD.														
GS YUASA TECHNOLOGY LTD.														
HARADASEIKI CO., LTD.														
HIGH-RELIABIRITY ENGINEERING & COMPONENTS CORPORATION														
IHI CORPORATION	■			■		■		■	■	■	■		■	■
IHI AEROSPACE CO., LTD.	■		■	■		■		■	■	■	■		■	■
JAMCO Corporation														
JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.														
JAPAN MANNED SPACE SYSTEMS CORPORATION										■				
JUPITOR CORPORATION				■										
KAWASAKI HEAVY INDUSTRIES, LTD.						■								
KYOCERA CORPORATION														
MARUBENI CORPORATION														
MARUBUN CORPORATION														
MEIRA CORPORATION														
MinebeaMitsumi Inc.						■								
MITSUBISHI ELECTRIC CORPORATION	■		■	■		■		■	■	■	■			
MITSUBISHI HEAVY INDUSTRIES, LTD.	■					■	■		■	■	■		■	■
MITSUBISHI PRECISION CO., LTD.									■	■	■			■
NEC CORPORATION	■		■	■		■		■	■	■	■			
NEC SPACE TECHNOLOGIES, LTD.				■				■	■	■	■			
NIHON MARUKO INTERNATIONAL GROUP														
NIKKISO Co., Ltd.														
NIPPI CORPORATION				■		■								
NIPPON AVIONICS CO., LTD.														
NOF CORPORATION														
NTN CORPORATION										■				
SAKURA RUBBER COMPANY LIMITED														
SINFONIA TECHNOLOGY CO., LTD.														
SOGO SPRING MFG. CO., LTD.														
SUBARU CORPORATION														
TAMAGAWA SEIKI CO., LTD.						■								
TEIJIN LIMITED														
TORAY INDUSTRIES, INC														
UACJ CORPORATION														

Space Transportation Systems

Company Name \ Products Services	Rocket / Launcher																								Orbital Infrastructures							
	PRIME CONTRACTORS	**Propulsion**	Solid booster	Bi-propellant engine	Mono-propellant engine	Cryogenic engine	Tanks	Valves and fittings	Propulsion filters	**Electrical Systems**	Antennas	TM-TC	Power subsystems	Flight control/Guidance	Computer hardware	On board software	Electronic subsystems	**Mechanical Systems**	Structure	Thermal control	Pyrotechnics	Mechanical subsystems and equipment	**Launch systems**	Launch services	PRIME CONTRACTORS	**Module Subsystems**	Reentry	Life support	On board management systems	Safety	Robotics	Equipment
EAGLE INDUSTRY CO., LTD.																						■										
THE FURUKAWA BATTERY CO., LTD.																																
GS YUASA TECHNOLOGY LTD.																																
HARADASEIKI CO., LTD.																																
HIGH-RELIABIRITY ENGINEERING & COMPONENTS CORPORATION																																
IHI CORPORATION	■					■		■	■		■	■	■	■	■	■	■		■	■		■								■	■	■
IHI AEROSPACE CO., LTD.	■		■	■	■	■	■	■	■		■	■	■	■	■	■	■		■	■	■	■		■	■		■	■	■	■	■	■
JAMCO Corporation																																
JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.														■	■	■	■															■
JAPAN MANNED SPACE SYSTEMS CORPORATION																																
JUPITOR CORPORATION																																
KAWASAKI HEAVY INDUSTRIES, LTD.	■						■							■		■			■	■	■	■			■		■	■	■	■	■	■
KYOCERA CORPORATION																																
MARUBENI CORPORATION																								■								
MARUBUN CORPORATION																																
MEIRA CORPORATION																						■										
MinebeaMitsumi Inc.								■														■										
MITSUBISHI ELECTRIC CORPORATION																													■	■	■	■
MITSUBISHI HEAVY INDUSTRIES, LTD.	■			■	■	■	■	■	■		■		■		■	■	■		■	■		■		■	■		■	■	■	■	■	■
MITSUBISHI PRECISION CO., LTD.														■	■	■	■															■
NEC CORPORATION											■	■		■	■	■	■													■	■	■
NEC SPACE TECHNOLOGIES, LTD.											■	■		■	■		■															■
NIHON MARUKO INTERNATIONAL GROUP																																
NIKKISO Co., Ltd.																																
NIPPI CORPORATION																			■			■										
NIPPON AVIONICS CO., LTD.																																
NOF CORPORATION			■																													
NTN CORPORATION						■		■														■										■
SAKURA RUBBER COMPANY LIMITED																																
SINFONIA TECHNOLOGY CO., LTD.													■	■			■					■										■
SOGO SPRING MFG. CO., LTD.																																
SUBARU CORPORATION											■								■			■					■		■			
TAMAGAWA SEIKI CO., LTD.																						■									■	■
TEIJIN LIMITED																																
TORAY INDUSTRIES, INC																																
UACJ CORPORATION																																

Parts/Materials

Company Name	Parts									Materials			
	Components	Hybrid IC	DC/DC Converter	Multi Layered Board	Other Supply	Evaluation	Up screening	Radiation testing	Construction analysis and DPA	Aluminum	Titanium	Carbon composite	Others
EAGLE INDUSTRY CO., LTD.					■								
THE FURUKAWA BATTERY CO., LTD.													
GS YUASA TECHNOLOGY LTD.													
HARADASEIKI CO., LTD.					■								
HIGH-RELIABIRITY ENGINEERING & COMPONENTS CORPORATION					■	■	■	■	■				
IHI CORPORATION													
IHI AEROSPACE CO., LTD.						■						■	
JAMCO Corporation					■					■	■	■	■
JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.													
JAPAN MANNED SPACE SYSTEMS CORPORATION													
JUPITOR CORPORATION													
KAWASAKI HEAVY INDUSTRIES, LTD.													
KYOCERA CORPORATION													■
MARUBENI CORPORATION													
MARUBUN CORPORATION													
MEIRA CORPORATION													
MinebeaMitsumi Inc.													
MITSUBISHI ELECTRIC CORPORATION					■								
MITSUBISHI HEAVY INDUSTRIES, LTD.		■	■		■	■		■	■				
MITSUBISHI PRECISION CO., LTD.													
NEC CORPORATION		■	■		■								
NEC SPACE TECHNOLOGIES, LTD.		■	■		■								
NIHON MARUKO INTERNATIONAL GROUP					■				■				
NIKKISO Co., Ltd.					■								
NIPPI CORPORATION													
NIPPON AVIONICS CO., LTD.		■	■										
NOF CORPORATION													
NTN CORPORATION													
SAKURA RUBBER COMPANY LIMITED													
SINFONIA TECHNOLOGY CO., LTD.					■								
SOGO SPRING MFG. CO., LTD.					■								
SUBARU CORPORATION													
TAMAGAWA SEIKI CO., LTD.													
TEIJIN LIMITED												■	
TORAY INDUSTRIES, INC												■	
UACJ CORPORATION										■			

Ground Segment

Company Name	**Launch Site Infrastructure**	Management/operations of launch site infrastructures	Engineering and manufacture of launching infrastructure	Associated equipment	**Ground Stations**	Orbit control and command	Payload data processing	Telemetry/tracking and command stations	**End User Equipment**	Antennas	Terminals and Earth station equipment	Mobile stations	Image processing and related equipment	Positioners	Test benches	Test simulators (optical/inertial)	Gondolas for balloons
EAGLE INDUSTRY CO., LTD.																	
THE FURUKAWA BATTERY CO., LTD.																	
GS YUASA TECHNOLOGY LTD.																	
HARADASEIKI CO., LTD.																	
HIGH-RELIABIRITY ENGINEERING & COMPONENTS CORPORATION																	
IHI CORPORATION		■	■	■			■										
IHI AEROSPACE CO., LTD.		■	■	■						■				■			
JAMCO Corporation																	
JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.																	
JAPAN MANNED SPACE SYSTEMS CORPORATION						■	■	■					■				
JUPITOR CORPORATION															■		
KAWASAKI HEAVY INDUSTRIES, LTD.		■	■	■													
KYOCERA CORPORATION																	
MARUBENI CORPORATION																	
MARUBUN CORPORATION																	
MEIRA CORPORATION																	
MinebeaMitsumi Inc.																	
MITSUBISHI ELECTRIC CORPORATION						■	■	■		■	■	■	■	■	■	■	
MITSUBISHI HEAVY INDUSTRIES, LTD.		■	■	■													
MITSUBISHI PRECISION CO., LTD.																	
NEC CORPORATION		■	■	■		■	■	■		■	■	■	■	■	■	■	
NEC SPACE TECHNOLOGIES, LTD.																	
NIHON MARUKO INTERNATIONAL GROUP																	
NIKKISO Co., Ltd.																	
NIPPI CORPORATION																	
NIPPON AVIONICS CO., LTD.																	
NOF CORPORATION																	
NTN CORPORATION																	
SAKURA RUBBER COMPANY LIMITED																	
SINFONIA TECHNOLOGY CO., LTD.																	
SOGO SPRING MFG. CO., LTD.																	
SUBARU CORPORATION																	
TAMAGAWA SEIKI CO., LTD.																	
TEIJIN LIMITED																	
TORAY INDUSTRIES, INC																	
UACJ CORPORATION																	

Services

Company Name	**Engineering services**	Orbit control and positioning	Data acquisition and processing	Software engineering	Software development and qualification	Mission analysis	Information systems	Technical assistance to launch site/tracking stations	**Procurement and test services**	Environmental testing	EEE parts supply	EEE parts screening and radiation testing	Thermal control paints/products application	Thermal control paints and products	Ground equipment filters	**Technical and administrative services**	Industrial survey	Human factors	Consultancy	Space insurance
EAGLE INDUSTRY CO., LTD.																				
THE FURUKAWA BATTERY CO., LTD.																				
GS YUASA TECHNOLOGY LTD.																				
HARADASEIKI CO., LTD.																				
HIGH-RELIABIRITY ENGINEERING & COMPONENTS CORPORATION				■				■		■	■	■					■	■	■	
IHI CORPORATION				■	■	■	■	■					■	■	■					
IHI AEROSPACE CO., LTD.						■				■										
JAMCO Corporation																				
JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.																				
JAPAN MANNED SPACE SYSTEMS CORPORATION		■	■	■	■	■		■										■	■	
JUPITOR CORPORATION																				
KAWASAKI HEAVY INDUSTRIES, LTD.								■		■			■							
KYOCERA CORPORATION																				
MARUBENI CORPORATION																				
MARUBUN CORPORATION																				
MEIRA CORPORATION																				
MinebeaMitsumi Inc.																				
MITSUBISHI ELECTRIC CORPORATION																				
MITSUBISHI HEAVY INDUSTRIES, LTD.						■		■		■	■		■						■	
MITSUBISHI PRECISION CO., LTD.				■	■															
NEC CORPORATION		■	■	■	■	■	■	■									■		■	
NEC SPACE TECHNOLOGIES, LTD.										■										
NIHON MARUKO INTERNATIONAL GROUP											■	■								
NIKKISO Co., Ltd.																				
NIPPI CORPORATION										■										
NIPPON AVIONICS CO., LTD.																				
NOF CORPORATION																				
NTN CORPORATION																				
SAKURA RUBBER COMPANY LIMITED																				
SINFONIA TECHNOLOGY CO., LTD.										■										
SOGO SPRING MFG. CO., LTD.																				
SUBARU CORPORATION																				
TAMAGAWA SEIKI CO., LTD.																				
TEIJIN LIMITED																				
TORAY INDUSTRIES, INC																				
UACJ CORPORATION																				

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2023-2024

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