

JAPAN BOOTH 2020

**Small Satellite Conference 2020
Virtual Exhibition | August 1 – 6, 2020**

**Crystal Optics Inc./KIYOHARA OPTICS Inc.,
Interstellar Technologies Inc.,
Kyocera Corporation,
NIKON CORPORATION,
Pale Blue Inc.,
Takasago Electric Inc. &
Japan Space Systems**



Japan Booth 2020

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Aluminum Telescope for CubeSat

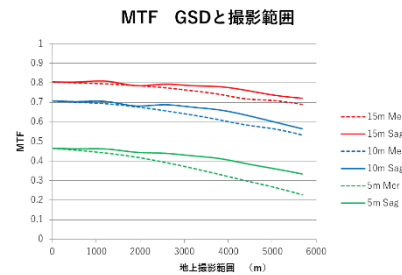
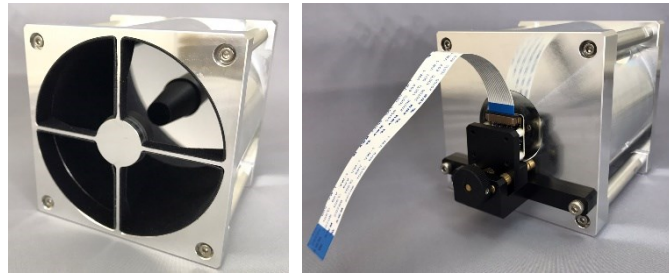
Connect with Raspberry Pi camera



Features

The basic optical configuration is the Cassegrain method, with the aim of using a primary mirror that maximizes the specified area to secure light quantity more efficiently, and to transmit light to a refraction system that removes aberrations with an optimized secondary mirror. Aiming to simplify the assembly adjustment, the most important simplification of the optical axis adjustment was achieved by integrally processing the mounting mechanism and the reflective optical element with aluminum.

Overview



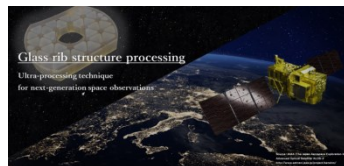
1. Space Telescope 「HODOYOSHI- 4 sat」

We developed Space Telescope for small satellite, it already launch into LEO for HODOYOSHI-4 sat. GSD is 6m, Primary dia: $\phi 150\text{mm}$, FL:1000mm and total unit weight is 3.8kg. We also finished design telescope for Cubesat.



2. Glass rib structure processing 「Advanced Optical Satellite ALOS-3」

We produced Large Diameter Mirror, which was loaded into Advanced Optical Satellite (ALOS-3) of JAXA. We measured length among mirrors and adjusted alignment.

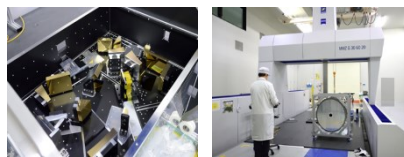


3. Assembled multiple mirrors system, MIMIZUKU

- 50 pieces mirrors (Precision flat, Spherical and Freeform)
- Providing a consistent manufacturing system.
- 6 months delivery from kick-off

Our group provides total optical service solution. Optical Design, Opto-Mechanical Design Precision machining, Optical manufacture Assembly, Mechanical and Optical Test.

Mid-infrared instrument MIMIZUKU



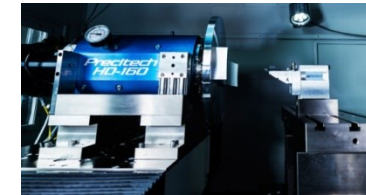
Facility

Our consistent production system

High precision machining and Quality assurance process



3D Coordinate Measuring Machine



Ultra precision diamond-turning machine



Interferometer System with Coherent Artifact Suppression

• Precise Metrology

Dynamic interferometry: 4D Accufiz, Zygo DynaFiz, KIYOHARA SuperFIZ
Extra Large 3D Coordinate Measuring Machine (Carl Zeiss)

Model:MMZ-G30/60/20(Carl Zeiss) Measuring range $3,000 \times 6,000 \times 2,000\text{mm}$

Large Aperture Interferometer System(12") (Zygo)

• Precise Machining

MagnetoRheological Finishing System (QED Technologies)

Model: Q-flex 300

Ultra precision diamond-turning machine (Precitech)

Model:Nanoform700Ultra (Precitech) Swing capacity $\phi 700\text{mm}$ Control axis X,Z,C

Super Precision Forming Surface Grinder (Nagase Integrex)

Model:SGC-840 α S4-Zero3 (Nagase Integrex) Table size

$900 \times 400\text{mm}$

Contact



Kosuke KIYOHARA / Hideyuki MATSUMOTO

kosuke.kiyohara@koptic.co.jp / mhideyuki@crystal-opt.co.jp

Our group proposes consistent manufacturing from design to high-precision parts processing and assembly to realize sustainable space development.

For More Information

URL: <https://www.crystal-opt.co.jp> URL: <http://www.koptic.co.jp>

Contact Point : sales@koptic.co.jp
: web_sales@crystal-opt.co.jp

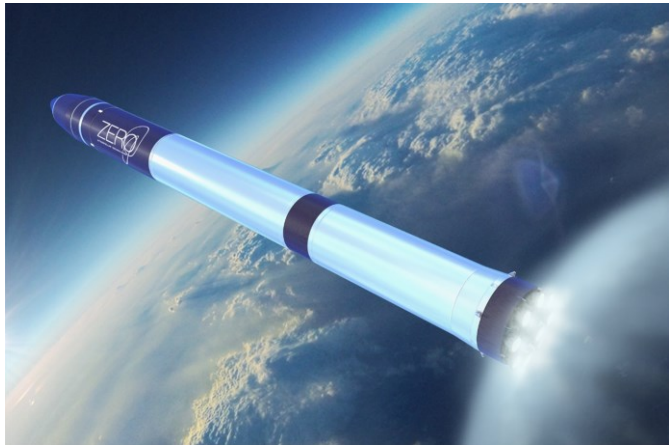
Shiga, Tokyo , JAPAN

ZERO the orbital launch vehicle

Features

- The vehicle is ITAR free.
- Launch price: targeted under \$5M USD.
- IST is located in Taiki, Japan, our launch site allows for launches to various inclination angles.
- The launch site is located in close proximity to our factory, allowing for short lead times and low launch costs.

Overview



Capability

ZERO is designed to launch a 100 kg (220 lbs) payload to a 500 km Sun-synchronous orbit. Suitable for small satellites, it supports a variety of payload attachments for easy integration.

Payload Flexibility

With a payload bay measuring 1.2 m in diameter, ZERO has the largest payload bay in this class of rockets. We can provide customers with customized fairings to support oversized payloads.

MOMO the Sounding Rocket

Successful reach to the space in May of 2019, we hope to provide up to ten launches in a year for payload and advertising purposes.

Payload Constraints and Environmental Conditions are

Max weight: 20kg /Max size: 300x300x300mm

Max acceleration during ascent : 5G

Splashdown speed: 15m/s/12V DC power supply and wireless communication available

Payload Processing Steps

- 1.Flight application submission.
- 2.Payload interface testing.
- 3.Mount payload to vehicle and conduct final testing at launch site in Hokkaido, Japan.
- 4.Launch

Company's Mission

The past few years have seen an explosive growth in the small satellite market,without a carrier to send them up to the orbit. Operators had to purchase a seat on huge rockets, often have to book them years ahead of launch. High cost, long lead time, and unpredictable trajectory was the normal.

The wait is over.

Our goal is to provide ultra low cost, reliable launch services using readily available COTS equipment



For More Information

URL: http://www.istellartech.com/front-page_en

Contact Point: info@istellartech.com

Address: 690-4 Memu, Taiki, Hiroo-gun,Hokkaido, 089-2113 Japan

Fine Cordierite Low Thermal Expansion Ceramic



Features



Light Weighting

Approx. 70% Weight reduction via slim ribbed structure design with high rigidity



Structural Components

Cordierite is applicable to structural components by its superior mechanical property



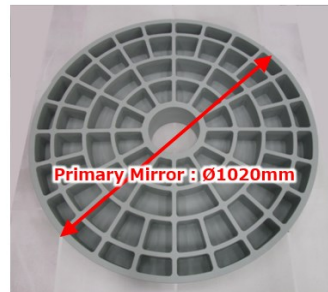
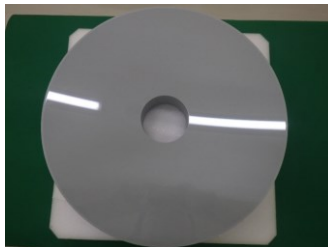
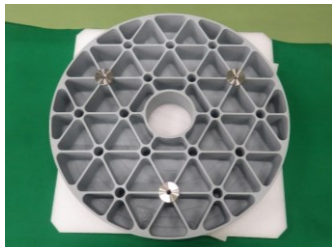
Low Thermal Expansion

Dense cordierite ceramic with extremely low thermal expansion rate
CTE = 0 +/-20ppb at 22deg C

Overview

Optical Telescope Mirror Application

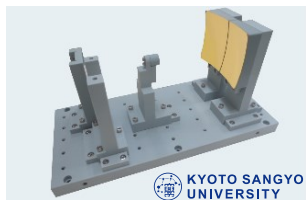
Various optical reflective mirror are feasible with light-weighted back side rib structure



Optical Mirrors for NASA Test Evaluation

Structural Components Application

Monolithic material assembly of mirrors and structural components can achieve superior optical performance



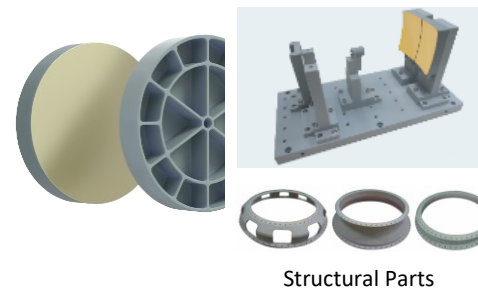
<https://youtu.be/l7YhIKK1jSM>

Combination of Mirrors and Structural Components by Cordierite

Product Line-Up for Space

Low CTE Ceramic : Cordierite

Telescope Mirror and Structural Parts



Structural Parts

SiC and Si-SiC

Telescope Mirror and Structural Parts



SiC Optical Mirror

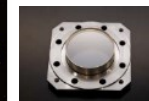
Si-SiC Products

Sapphire and Metallized Product

Metallized Sapphire and Alumina



©JAXA



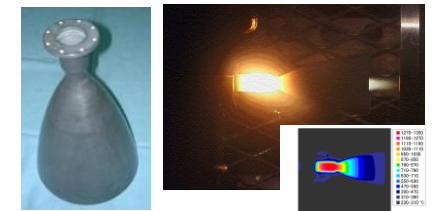
Sapphire Window



Li-Ion Battery Terminal Seal

Silicon Nitride

Ceramic Thruster Nozzle



Ceramic Thruster for AKATSUKI

Contact



Shinobu Nagata (US Contact) Masa Kamiura (Japan Contact)

Shinobu.Nagata@kyocera.com masatsugu.kamiura.gt@kyocera.jp

Pictures are from the last year in Utah Small Sat Conference!
We are happy to support you with any ceramic for Space.

For More Information

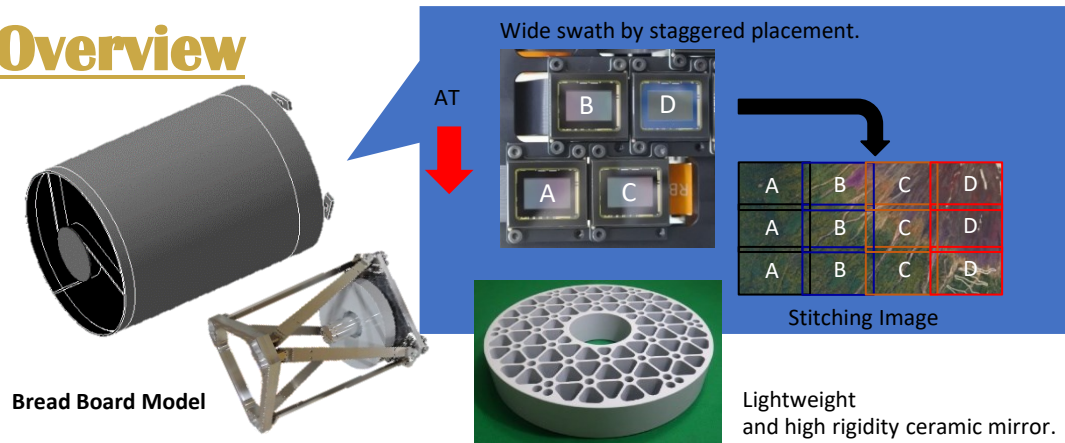
URL: <https://global.kyocera.com/prdct/fc/index.html>

Contact Point: Shinobu.Nagata@Kyocera.com masatsugu.kamiura.gt@kyocera.jp

Features

- Nikon developed two type space cameras for earth observation small satellite.
- One is high resolution type. This one is not only high resolution but also wide swath 8.5km Another one is wide Swath.
- Our focal plane unit have scalability to be able to apply for various image circle by swath by staggered placement.

Overview



Specification

	High Resolution Type	Wide Swath Type
Size	$\leq \Phi 620\text{mm} \times 880\text{mm}$	$\leq \Phi 310\text{mm} \times 600\text{mm}$
Mass	$\leq 30\text{kg}$	$\leq 15\text{kg}$
F-number	8.9	6.3
GSD	$\leq 0.8\text{m}$ (Conditions : Monochrome Altitude 500km)	$\leq 2.2\text{m}$ (Conditions : Monochrome Altitude 500km)
Swath	$\geq 8.5\text{km}$ (Altitude: 500km)	$\geq 22.5\text{km}$ (Altitude: 500km)
Mode	Monochrome , Color • 12bit RAW output • JPEG12/10/8 bit	Monochrome , Color (option) • 12bit RAW output • JPEG12/10/8 bit
Electrical IF	Image data transfer : LVDS, TMTC : RS485 Power : 12Vdc	

Facility

Mito



Production facilities

- Grinding and polishing machines for high-precision

mirror

- Evaporation coating machines.
- Optical test bench for Space telescope
- Wavefront aberration measuring instrument

Test facilities

- Vibration testing, Heat cycle testing
- Vacuum chambers for optical system

Heritage

1978

We first supplied optics for Japanese Mission.

2006

AKARI Astro-F
IR Astronomy telescope
Diameter:680mm

2010

AKATSUKI Planet-C
UVI telescope
Diameter:40mm

2013

HISAKI SPRINT-A :
Planetary EUV Spectroscopy
We supplied primary mirror.
This mirror is made of silicon carbide.
a material that is extremely hard and difficult to work.

Unlock the future with the power of light

Contact

URL: <https://www.ave.nikon.co.jp/cp/index.htm>

Contact Point: Sales.Cp1@nikon.com

Address: Shinagawa Intercity Tower C, 2-15-3, Konan, Minato-ku, Tokyo 108-6290

Features

- Pale Blue provides two types of CubeSat propulsion systems: Water Ion Thruster and Water Resistojet Thruster with affordable price and short lead time.
- The technology of both thrusters is based on years of research at the University of Tokyo and has been flight-proven by HODOYOSHI-4 (2014), PROCYON (2015), and AQT-D (2019).

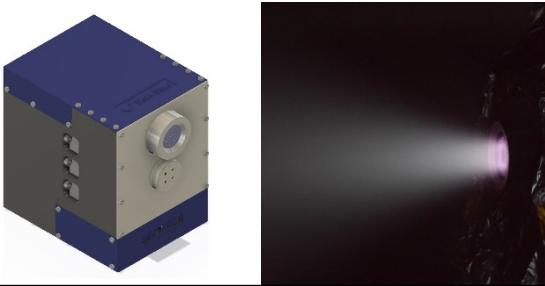
Overview

Water Resistojet Thruster



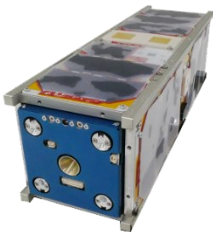
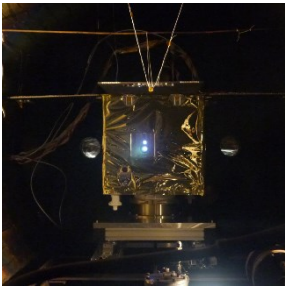
Thrust range	1.0 – 4.0 mN
Nominal Thrust	2.0 mN
Specific Impulse	70 – 100 s
Propellant mass	0.4 kg * upon request
Total Impulse	> 270 Ns
Thrust to power ratio	0.2 mN/W
Volume	1U
Mass (dry / wet)	0.8 kg / 1.2 kg
Command Interface	UART, RS422
Operating temperature	4 – 49 °C
Supply voltage	5 V and 8 V

Water Ion Thruster



Thrust range	100 – 400 μ N
Nominal Thrust	300 μ N
Specific Impulse	600 – 800 s
Propellant mass	0.2 kg * upon request
Total Impulse	> 1100 Ns
Thrust to power ratio	10.0 μ N/W
Volume	1U
Mass (dry / wet)	1.8 kg / 2.0 kg
Command Interface	UART, RS422
Operating temperature	4 – 49 °C
Supply voltage	5 V and 12 V

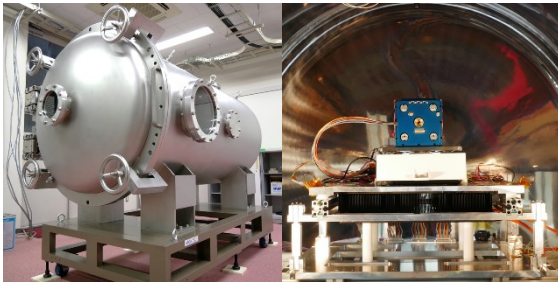
Flight Heritages



- Two miniature microwave discharge ion thrusters have passed safety reviews for secondary payload and successfully operated in orbit.
- Our water resistojet thruster has met the safety requirements and been deployed from the ISS.

Facilities

- In-house manufacturing (assembly, performance characterization, thermal & vibration tests)
- Newly developed thrust stand enables direct measurement of thrust and specific impulse.



Contact



Jun Asakawa, Ph.D. (Pale Blue Inc., Co-founder & CEO)

asakawa@pale-blue.co.jp

Pale Blue Inc. is a Japanese start-up company founded in Apr. 2020. Our “perfectly-safe” water thrusters enable your advanced missions.

For More Information

URL:<https://www.pale-blue.co.jp/>

Contact Point: asakawa@pale-blue.co.jp

Address: 5-4-6-610 Kashiwanoha, Kashiwa-shi, Chiba, 277-0882, Japan

Products

1. Thrusters

• Pressurant-free Propulsion System

EOP Micro Thruster ---New Product!---

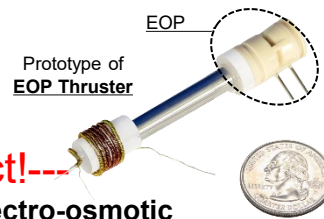
World's first resistojet thruster employing an EOP (Electro-osmotic pump), which generates up to 2MPa pressure despite its compact dimensions (Dia 12mm × L 17.6mm, 1.3g)

Features

- 0.01U system volume excluding propellant tank
- 1.5U total system volume with water to maintain a 6U satellite in orbit for 3 years (450mL water as propellant per year)
- Green propellant: water or alcohol
- Target values: 5mN thrust, 100s specific impulse
- High vibration resistance due to no moving parts
- Stable pressurization unaffected by temperature and pressurant amount
- EOP available as a stand-alone pump product for other propulsion systems

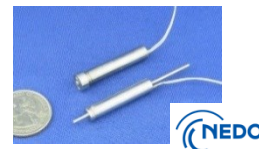
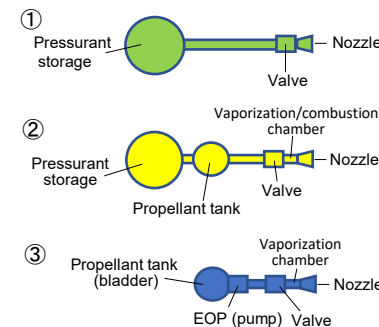
• 0.2N-class Miniature Thruster

- Low-toxicity mono propellant
- Manufactured by YUKI Precision Co., Ltd.



Comparison of CubeSat Thrusters

- ① Conventional Cold Gas Thruster
- ② Conventional Resistojet/chemical Thruster
- ③ New EOP Thruster



2. Solenoid Valves

• 8g Micro Thruster Valve HVA Series

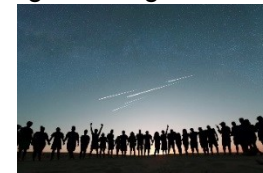
- 2MPa pressure-rated
- For small satellites

• 20N-class Thruster Valve HVC Series

- 2.8MPa pressure-rated
- Frictionless moving core

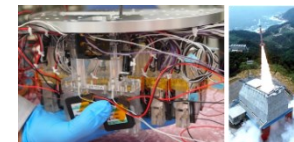
• 10MPa High Pressure Gas Valve HVB Series

→ Our first flight heritage valve on the ALE-1, ALE-2 satellites

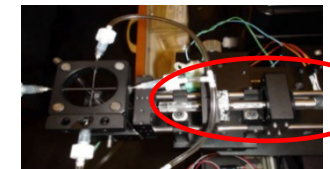


3. COTS Items

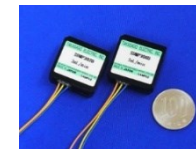
• Space Experimental Units (Application Examples)



Miniature valves (32 units) and pumps (16 units) used in a JAXA observation rocket for a space experiment of crystal nucleation



Micro syringe pump used in the ISS for a NASA/OASIS project



Piezoelectric micro pumps used in the ISS/Japanese Kibo Module



JAXA automated cell culture media exchange unit used in the ISS

Facility

AS/EN9100 and ISO9001 Certified

2020 Global Niche Top 100 certified by Ministry of Economy, Trade and Industry of Japan

Head Office & Main Factory Located in Nagoya, Japan

Contact



Masahiko Inoue

m-inoue@takasago-elec.co.jp

Hello ! We are very excited about introducing our new original product "EOP Micro Thruster". We hope you adopt this unit in your application and are looking forward to hearing your requirements.

For More Information

URL: <https://www.takasago-fluidics.com/>

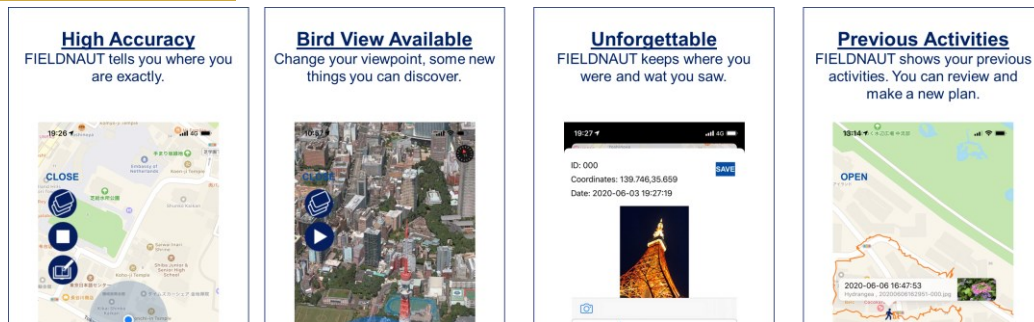
Contact Point: (phone) +81-(0)70-6580-2404

Address: 66 Kakitsubata Narumi-cho, Midori-ku, Nagoya, Aichi 458-8522 Japan

Features

- FIELDNAUT is an iOS App for collecting location information.
- FIELDNAUT overlays maps and satellite images and adds photos and texts with coordinates.
- FIELDNAUT makes your field survey more simple, efficient and effective
- Japan Space Systems accepts customization of FIELDNAUT for your purposes.

Overview



For Field Survey

No pencils, no notebooks for field survey, because you've got FIELDNAUT! FIELDNAUT is originally developed for collecting and comparing survey data with satellite and GIS data on your target areas. FIELDNAUT collect your location information (waypoints) with photos and texts. Those waypoints and tracking record are saved as GeoJSON format, and you can edit with GIS software easily. Your field survey data files (one GeoJSON file for location and several JPG for photos for waypoints) can be shared with your colleagues and friends over SNS and Mail.

For Lifestyle

FIELDNAUT has been developed for field survey originally, but FIELDNAUT makes your lifestyle bit rich. You can use FIELDNAUT for walking with dogs, jogging and cycling as daily activities, for traveling, climbing, skiing, camping, fishing as leisure and vacation, and for marketing to find good location for your business.

Explore the Earth

FIELDNAUT was named after an astronaut (a space explorer). Get FIELDNAUT and explore the Earth. Visit https://ssl.jspacesystems.or.jp/en/_archives/279

Scan and Install
FIELDNAUT



Facility



Japan Space Systems

Japan Space Systems is an organization for contributing Japanese space industry development over 30 years with space system developments, satellite operations, natural resource development by satellite data, and international cooperation.

International Cooperation Department

Japan Space Systems has many joint research projects and internship programs in African, Southeast Asian and South American young engineers. We also develop webGIS and applications for satellite data infrastructure for illegal fishing monitoring, ocean plastic waste monitoring, lead contamination simulation and other purposes.

Contact



Shinsaku Nakamura

Nakamura-Shinsaku@spacesystems.or.jp

Update my life. I won kendo (the Japanese sword fight) tournament in my city and upgraded the grade.

For More Information

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Editor's Note

Japanese Space Technologies

Space technologies are mature in Japan. Many scientists and engineers in universities enliven international magazines and journals by their unique ideas, experiments and results. Various companies apply their own specific technologies to products and services for space systems. The Japanese government also encourages engineers and scientists to develop new equipment, thrusters and bus components, launch rockets, operate satellites and analyze data. And now the Japanese space engineers aim for deep space exploration with small satellites.



Japan Booth

Japan Booth is a unique framework to support the Japanese companies to sell their products and services and to collaborate with many companies in the world since 2015. Visit Japan Booth and feel our six unique companies and products. We all are seeking sales representatives and distributors as partners!

The Japanese Tech Show (17:00 – 18:15, Aug 4, 2020)

Six Japanese companies will introduce their special space technologies, components and services and their secret stories. ONLY at Japanese Tech Show, you can reach more detailed specifications. ONLY at Japanese Tech Show, you can communicate with Japanese engineers and sale directly. Don't miss it! Visit https://us02web.zoom.us/webinar/register/WN_BhaiefsVT-CxVQonRxu9eg and register!

Special Business Talks (17:00 – 20:00, Aug. 4, 2020)

You do not miss another chance to talk with Japanese engineers and sales privately at Special Business Talks. Visit <https://forms.gle/oYaSXau21QHQ292J7> and register now!

Japan Space Systems

Japan Booth and Japanese Tech Show are conducted by **Japan Space Systems**. For more information, visit https://ssl.jspacesystems.or.jp/en/_archives/221.

