

- **Editorial 01: Where can you find new customers? (Kuzuoka)**
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Editorial 01: Where can you find new customers? (Kuzuoka)

The 2021 edition of *Earth Observation Data & Services Market*, a report published by Euroconsult, has now been published. According to this publication, the market for Earth observation (EO) data in 2020 was \$1.6B, while the market for value-added services using that data was \$2.5B. Also, the compound annual growth rate (CAGR) of each of these markets has been steadily increasing to 5% and 7%, respectively, and it is predicted that the combined market size for data and services will grow to \$7.4B in 2030. It goes without saying that the major uses of this EO data and services involve defense and security. By 2020, 69% of the data market and 29% of the service market was used for defense and security.

As for the largest users regarding defense and security, two organizations, the National Geospatial-Intelligence Agency (NGA) and the National Reconnaissance Office (NRO), raised a budget of \$100M each. In 2010, the NGA promised to spend \$7.3B on high-resolution satellite imagery over a 10-year period under the EnhancedView program (initially). EnhancedView is nearing its end, albeit with some extensions, and EO satellite operators are now each looking for customers in the large market of defense and security.

With the budgets of the NRO and NGA currently significantly reduced, the NRO, which is the single source of image data for U.S. defense and security, announced its "Broad Agency Announcement (BAA) Framework for Strategic Commercial Enhancements" policy in mid-October. This BAA is a high-level mechanism for procuring new EO data such as commercial SAR, hyperspectral images, and radio frequency observation, and based on this mechanism, the NRO has issued a proposal request for commercial SAR data procurement. However, at the current stage, the initial planned order amount is \$1.2M, and the contract period is overwhelmingly short, at 30 months, which is a big difference from the conventional EnhancedView program.

In particular, several startups in the United States, Europe, and Japan have started operations involving SAR satellites, and some have already launched test satellites. Their business aims at customers involved in defense and security, especially in the United States. However, now that it has become clear that the budget scale of the headquarters of the NRO is by an order of magnitude smaller, the search for new customers has begun.

Capella Space, a U.S. SAR operator, not only received a small contract from the NRO in 2019, for which the amount has not been disclosed, but the company has been entrusted with research and data provision contracts from several U.S. defense/security organizations such as the U.S. Navy, the U.S. Air Force, In-Q-Tel, the

Space Development Agency (SDA), and the Space and Missile Defense Technical Center (SDMTC). Umbra, which is also a U.S. SAR operator, has also signed an indefinite-delivery, indefinite-quantity (IDIQ) contract with the U.S. Air Force with an upper limit of \$950M (with data procurement as needed under this upper limit). In particular, SAR has a high rate of dependence on defense security applications in terms of EO data, so there is an urgent need to develop defense and security customers other than the NRO and the NGA. At any rate, Capella Space and Umbra were one step ahead of the competition in terms of U.S. SAR management companies by being the first to secure customers other than the NRO/NGA.

When the EnhancedView program began, several high-resolution satellite companies were eventually integrated into DigitalGlobe (now MAXAR) to suit the program's scale. If the scale of SAR data procurement in defense and security becomes clear this time as well, the question is: Will each company's integration begin to respond to such scale?

Editorial 02: Diversifying and accelerating collaboration between U.S. government agencies and the private sector (Oishi)

Recently, one hot topic is the reference to a certain "gamechanger" that could disrupt the military balance, i.e., the development of hypersonic weapons by China, being termed the new "Sputnik crisis." Due to this backdrop forming a new sense of crisis, U.S. government agencies are now moving in new directions to strengthen and expand on cooperation with the private sector, in addition to conventional imagery and information procurement.

In the past month, there have been three notable trends in relation to collaboration between U.S. government agencies and the private sector. These are:

- 1) Transformation of how meetings hosted by the U.S. Space Force are carried out with defense-related companies (information disclosure levels, attendance requirements)
- 2) Conclusion of the U.S. Space Force's first agreement with a venture capital (VC) firm
- 3) Conclusion of shared technology contracts between the U.S. Air Force Research Laboratory and various startups

Among these, 1) comes with the example of a defense-related company conference held by the U.S. Space Force this month for a next-generation space sensor development plan to counter China's previously mentioned China's (etc.) hypersonic weapons (flying at more than five times the speed of sound)*, where it was mentioned that the U.S. Space Force would disclose confidential threat information at an unprecedented

level of detail. In addition, for the attendees of the conference, it was encouraged that companies dispatch strategists and technical experts instead of the conventional personnel from business development departments, in order for more-strategic and more-technical discussions to occur. Regarding the results of the conference, we feel that the disclosed information was still a bit limited, but we will be watching this closely.

* On the 16th of this month, the *Financial Times*, a British newspaper, reported that China conducted a hypersonic weapon test in August. The hypersonic glider used in the test is believed to have been launched by the Chinese "Long March 5" series rocket used to launch China's unmanned lunar spacecraft.

Then, in 2) is the conclusion of an agreement for cooperation between Embedded Ventures, a venture capital firm, and the U.S. Space Force (forming the first-ever agreement with a VC by the U.S. Space Force). Based on the related Cooperative Research and Development Agreement (CRADA), Embedded Ventures will collaborate with Spacewerx, a new U.S. Space Force organization established for building relationships with commercial industry and various startups, toward realizing R&D opportunities for driving the growth of the U.S. space industry. This will lead to a move to further expand ties between the U.S. military and space-related startups.

Finally, 3) is exemplified in an agreement on R&D through a CRADA with startup Orbit Fab, which aims to become a provider of "gas stations in space," i.e., the RAFTI system. Via technology sharing, the aim is to establish win-win relationships by reducing mutual risk and development cost.

Thus, as mentioned above, U.S. government agencies have been clarifying their stance of strengthening cooperation with private-sector companies, including startups, and are accelerating their speed toward achieving this.

Editorial 03: NASA's direction in the low-Earth-orbit economy (Murakami)

Ten years have passed since the International Space Station (ISS) was completed in July 2011. Since then, the U.S. Space Shuttle was retired, and the long period during which the world relied on Russia for manned launches has finally been resolved by SpaceX's Crew Dragon. This has finally allowed the United States to operate its ISS staff and supplies with some independence. Currently, the ISS is in operation until 2024, but there are moves to extend this until 2030.

It is also true that there are some doubts about maintaining a low-Earth-orbit space facility in a situation where resources must be preferentially allocated to lunar and Mars exploration. However, low-Earth-orbit space facilities are relatively easy to reach when considering future exploration, so it can be said that there are many good reasons to make use of them.

The space efforts of the human race have been ongoing for more than 60 years, yet still the history of humans in space is short. We feel that the more serious the exploration of the Moon and Mars becomes, the greater the difficulty will be. In such a case, we think it is very meaningful to have a facility available that you can

access relatively easily and where you can conduct experiments and tests immediately.

However, the current ISS costs substantial money to maintain, and when looking to the future, all parties involved might have a desire to make it into a more-efficient facility. Fortunately, this year, NASA has requested proposals for low-Earth-orbit commercial space facilities, and we have heard that NASA has received more than 50 proposals. NASA retired persons such as AXION Space are taking the lead in making proposals, and Lockheed Martin is making proposals in collaboration with various startup companies (such as Nanoracks), so we must assume that this situation is live and soon to be realized. We feel that these plans will become narrowed down in the latter half of the 2020s and will shift to full-scale construction. We also think that the direction of the ISS will see a change.

Japan decided last year to continue participating in the ISS program, along with participating in the Artemis program, and will promote Mars exploration projects. Under such circumstances, the direction regarding the use of low Earth orbits is still a live topic.

When Japan joined participation in the ISS, it was the only participating country in Asia, thus its contributions were great. Currently, however, China is building its own space station and will be exploring the Moon. This was unthinkable 30 years ago. It is thus very true to say that space development is greatly affected by the rise and fall of nations.

China has the second-largest GDP in the world and could eventually become no.1. It is also a fact that, in terms of space development, it has become just as strong as the United States. Under such circumstances, we think that Japan's space development should always consider how it can blaze its own trail, while coordinating with the U.S.

It would be inefficient for Japan to operate its own low-Earth-orbit facility. However, if sharing such a facility with others, it could somehow be manageable. Such a shared situation positioned close to Earth could inexplicably become advantageous.

October 2021 Space Business-related Topics by Business Position/Market Field

OldSpace, etc.

Mixed space, etc.

NewSpace, etc.

Satellites

Launches

Others

Japan

- For emerging countries: Dongfanghong 3 enhanced platform released (Fig.1)
- Eutelsat rejects unsolicited takeover bid
- Intelsat selected as IFC solution by Air France
- First swing-by implementation for Mercury exploration by "BepiColombo"
- 5G from space: Airbus and partners research standards
- Lockheed Martin offering new satellite image analysis service
- Euroconsult: Earth observation market to grow to \$7.5B by 2030
- Chinese reference stations to receive full data from BeiDou No. 3 within next year
- SSTL secures ESA InCubed funding to improve data throughput for small EO satellites
- Promotion of industrial application of space data: French business alliance project begins
- Maxar files protest over Space Development Agency's satellite procurement
- U.K. Ministry of Defence procurement starts Skynet 6A satellite production at Airbus
- Betting on flexibility: Intelsat's post-bankruptcy growth strategy
- Telesat selects Ciena for LEO terrestrial network technology
- China launches classified space debris mitigation technology satellite
- IAI announces new small GEO satellite bus (Fig.2)
- Inmarsat GX provides mobile BB service in India
- Thales to manufacture HTS 113 BT for Indonesia
- DoD space agency changes course on satellite procurement in wake of Maxar's protest

- Norway's government approves construction of new spaceport
- Three milestones via the launch of Ariane 5, SES-17, etc.
- Korea's first domestic rocket launched, fails to orbit
- NASA's new rocket "SLS" finally complete

- Soyuz spacecraft moored at ISS makes short flight
- Industry groups working on satellite service standards
- South Korea's air force opens space ops center
- Airbus Zephyr HAPS completes U.S. test flight (Fig.3)
- Australia to provide rover for future NASA lunar lander missions
- "Shenzhou 13" crew head out on space station core module
- U.S. Senate orders NASA to select second company to develop Artemis lunar lander
- Successful launch of NASA "Lucy" asteroid explorer (Fig.4)
- SSC and Bradford ECAPS sign MoU for orbital debris removal services

- Emergency halt to Epsilon Unit 5 launch
- Ministry of Agriculture, Forestry and Fisheries supports food production in space (Fig.15)
- Ministry of Defense considers construction of "space patrol ship" (Fig.16)
- Toward an end to the abolition of foreign capital restrictions on satellite business and Japan's Radio Law
- MHI/JAXA/Cabinet Office: Successful launch of successor to the "Michibiki" satellite
- Provision of JSAT "JSATMarine" marine BB service (Fig.17)

- Tomorrow.io wins U.S. Air Force funding for weather satellite constellations (Fig.5)
- Iceye and KSAT join forces to speed up radar image delivery
- Eutelsat raises OneWeb stake
- NRO utilizes commercial data from space-based radar
- NGA to increase use of business analysis services
- Chinese partnership to create Tianxian SAR satellite constellation
- NRO establishes licenses and cybersecurity rules for commercial imagery providers
- Space Development Agency seeks proposals for 18 satellites with experimental PL
- KSAT + Sony CLS successfully demo SOLISS downlinks to commercial optical ground station (Fig.6)
- Hiber partners with Inmarsat for IoT satellite NW (Fig.7)
- ICEYE joins EU Copernicus program (Fig.8)
- SpaceLink selects OHB as manufacturer of high-capacity optical relay satellites (Fig.9)
- Capella collaborates with U.S. Army Space Missile Defense Technology Center
- Verizon intends use of Amazon's Kuiper constellation
- OneWeb and Saudi Arabia establish a \$200M connectivity JV

- Launch of NASA smallsat by Rocket Lab via SBIR
- OneWeb agrees to launch satellite via ISRO rocket
- Successful launch of Arian's Soyuz ensures midpoint of OneWeb constellation development
- Blue Origin eyes participation in military "rocket cargo" program

- Venture capital firm signs cooperation agreement with U.S. Space Force
- Orbit Fab concludes technology sharing agreement with the U.S. Air Force Research Laboratory
- Ovzon contracts to supply DoD with T6 mobile satellite terminals
- Nanoracks and LM tie up for space station (Fig.10)
- Blue Origin and Sierra Space announce commercial space station program (Fig.11)
- U.K.'s space agency signs research contract with ClearSpace and Astroscale

- JICA and Synspecive begin Guatemala demonstration of disaster prevention information using satellite data
- Strategic partnership agreement concluded between Kokusai Kogyo and AxelGlobe for the sale of AxelGlobe Earth observation data (Fig.18)

- Capella expands staff focused on U.S. government sales & services
- Satellogic reduces data processing times for 300 on-orbit EO spacecraft using AWS
- HawkEye 360 secures contracts with potential for \$1Ms as their smallsats become fully operational
- HySpecIQ turns to BridgeComm for optical downlinks
- Finland's Kuva Space raises funds for hyperspectral constellation
- EO company Satellogic expands partnership with AWS
- Hiber abandons plans for IoT satellite constellation
- Industry skeptical about business case for mega constellations
- Planet unveils Pelican Earth-imaging constellation (Fig.12)
- PlanetIQ announces highest-performance radio occultation satellite
- Mynaric and H3 HATS succeed in world's first industrialized optical communications terminal for airborne applications (Fig.13)
- Hedron (formerly Analytical Space) raises \$17.8M
- Satellogic to develop satellite constellation for Paraguayan space agency
- Synspecive + Orbital EOS sign partnership agreement for SAR imagery data
- Terran Orbital enters SPAC business combo agreement with Tailwind

- Rocket Lab Acquires Advanced Solutions
- Germany's Exolaunch expands overseas to grow its share of U.S. launch market
- ABL Space Systems raises \$200M

- Blue Origin launches second manned New Shepard mission (Fig.14)
- Airbus Ventures invests in Tokyo-based ispace

- Axelspace, Tokyo Institute of Technology data provision R&D (Fig.19)
- Automaker Honda develops reusable rocket for LEO satellites (Fig.20)
- Synspecive integrates into Syrlinks' X-band telemetry transmitter for Strix β mission
- Mitsui Bussan Aero sells *kumade* lucky talisman for launch into orbit (Fig.21)
- Investments made in Infostellar by Mitsubishi Corporation, etc.
- INCLUSIVE and Interstellar Technologies form capital tie-up

スライド 3

JPRO

Red text: I don't think it's "Tuwind社". I believe it's "Tailwind". Please advise if necessary.

JPR, 2021-11-04T02:22:43.455

OldSpace, etc.



Fig.1: CG image of the Dongfanghong 3 enhanced platform, which is a small geostationary orbit satellite platform for overseas markets made by China



Fig.3: The Airbus Zephyr Solar High Altitude Platform System (HAPS)

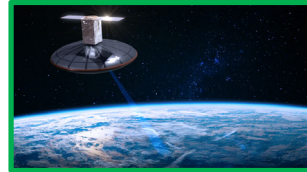


Fig.5: Conceptual image of Tomorrow.io's weather-monitoring satellite (mini-refrigerator size) in orbit; launch is scheduled to start in 2022. (Credit: Tomorrow.io)

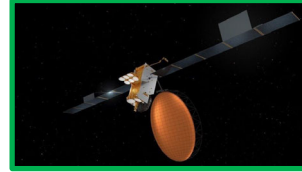


Fig.7: Hiber is planning to use Inmarsat's ELERA network for IOT services. (Credit: Inmarsat)



Fig.10: Nanoracks and LM are collaborating on the development of the Starlab commercial space station. (Credit: Nanoracks)



Fig.12: Planet announces its Pelican "ultra-high resolution" Earth imagery satellite, which is scheduled to be manufactured in-house. (Credit: Planet)

From around the world



Fig.2: According to IAI, the satellite's mass is 600-700 kg, and it can carry the latest digital payloads. (Credit: IAI)



Fig.4: "Lucy" conceptual image; one solar array might not be able to be fully deployed. (Credit: NASA's Goddard Space Flight Center)



Fig.6: KSAT is constructing the world's first commercial optical ground station in Greece. (Credit: KSAT)



Fig.8: ICEYE has inked a deal with Copernicus.

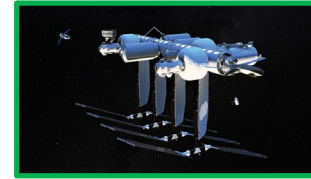


Fig.11: The Orbital Reef space station proposed by Blue Origin and others can be expanded by adding modules. (Credit: Blue Origin)

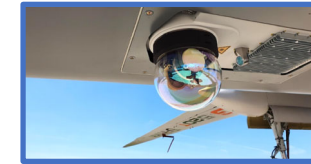


Fig.13: Mynaric's HAWK optical communications terminal can now be integrated into the cargo compartment of an airplane.



Fig.14: Photo of the second launch of Blue Origin's manned New Shepard (Credit: Via a Blue Origin webcast)



Fig.9: SpaceLink made an order with OHB System AG to manufacture a commercial data relay constellation satellite. (Credit: SpaceLink)

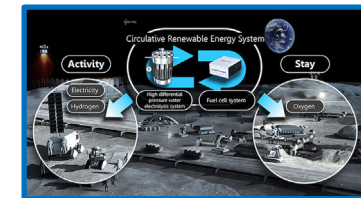


Fig.20: Conceptual image and overview of the use of a circulating renewable energy system on the Moon (Credit: Honda)



Fig.21: The completed original kumade lucky talisman is handed over to the purchaser and then taken over by Mitsui Bussan Aerospace. Then, it is mounted onto a 10 cm cube-sized microsatellite that is independently developed and manufactured.

Mixed space, etc.

NewSpace, etc.

From Japan

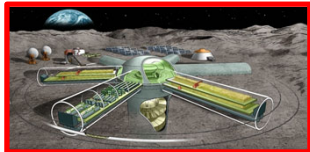


Fig.15: Conceptual image of agriculture being carried out at a base constructed on the Moon (Credit: Photo provided by the Japan Aerospace Exploration Agency)



Fig.16: Conceptual overview of the "space patrol vessel" planned by Japan's Ministry of Defense, featuring alerts/surveillance and satellite repair functions



Fig.17: SKY Perfect's JSAT supports the use of DX and Wi-Fi onboard with the ultrahigh-speed communications marine broadband service "JSATMarine," which will be available from January 2022.



Fig.18: AxelGlobe has concluded a strategic partnership agreement with Kokusai Kogyo regarding the sale of AxelGlobe's Earth observation data.

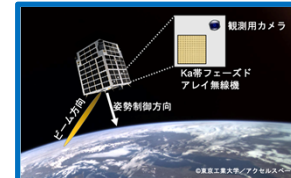


Fig.19: High-speed and high-performance research is now being conducted into microsatellite communications via Ka-band beamforming technology.