

Space Business Monthly News

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Editorial 01: 1st business trip overseas in a while – Satellite 2022 (Kuzuoka)

Over April 21–24, 2022, I was able to attend Satellite 2022 in Washington D.C. This business trip has been the first for me since visiting the West Coast of the U.S. in February two years ago. In addition, given that there was a sudden interruption in the middle of Satellite 2020 two years ago due to the urgency of the onset of the COVID-19 pandemic, I was deeply moved to be able to participate in this full-scale resumption.

In the greetings from the organizer, the word "survive" was tossed around a lot, also when they remarked something to the effect of saying, "Welcome everyone! Well, we survived alright, and now we are joining together again!" Of course, I was able to participate this time for the purpose of rebuilding relationships as sort of a reunion at long last, meeting up lots with old friends and acquaintances. When it was all over, I was only able to have participated in two sessions. After that, I ended up enjoying a series of short meetings with my friends and acquaintances. So, with that, let's delve into the details of this business trip (see note).

One of the most-impressive sessions that I attended was "Smallsat Constellation Operators: The Global Race to Reach the Unconnected." Space-X, OneWeb, Telesat, and ViaSat executives also attended this session to discuss COMSAT's non-geostationary (NGSO) satellite constellation. The number of satellites launched on both Space-X and OneWeb missions has reached a considerable number, and it is time to start services in earnest this year.

Space-X has already launched services to 31 regions and can boast that it has 250,000 subscribers, while OneWeb issued a press release that Space-X would help cover their planned launches that had originally been slated to take place using Russian rockets. However, it was also revealed that this would cause a delay in deployment of three months. ViaSat, on the other hand, emphasized that its geostationary SATCOM system should act as a base structure for the use of NGSO satellites, depending on the app. Meanwhile, Telesat emphasized the benefits of operating NGSO satellites by operators familiar with the geostationary SATCOM system. Both companies are showing their ability to compete with Amazon, which didn't attend this time.

Because there was news that the service pricing of Space-X was raised by about 10%, one moderator asked

Space-X what the minimum number of users was that could sustain its business. Space-X declined to give a clear answer, but OneWeb was proud to say that it only needed one user; that is, OneWeb is not a B2C business—it's B2B. So, for this reason, it is possible that it would only need one big customer. Other points of emphasis were the differences between B2C and B2B, along with Space-X's business model, which is oriented toward B2G (business to government).

Note: As a survey for our monthly news readers, in the past, we often created separate business trip reports for each overseas event and sent those out to everyone. However, in April 2020, when business trips became impossible due to the onset of the COVID-19 pandemic, we set the precedent of inserting some business trip reporting into the monthly news. But, now that we can resume overseas business trips, I am wondering what to do with such business trip reports, as creating both monthly news and business trip reports can be a daunting task. If you can, please let us know which is more useful to you: business trip reports or these monthly news reports.

Editorial 02: 3D printing = Shorter delivery times for satellites (Oishi)

Russia's invasion of Ukraine continues to cast a dark and gloomy cloud over all of us. In this month's issue of our monthly news, as just one attempt to tie this all together, I tried to identify the topics related to the invasion of Ukraine in "March 2022 Space Business-related Topics by Business Position/Market Field" on page 3 by signifying them with a pink square (■).

Once again, in all areas of the space business ecosystem, it is recognized that there is more or less some impact here. Regarding an analysis of the impact of this military conflict on the space industry, while various opinions and analyses have already been expressed, what I am mainly concerned about is, along with the use of hypersonic missiles in combat and the mention of the "possibility of the use of nuclear missiles," etc., is a lowered psychological hurdle toward anti-satellite weapon (ASAT) use, or, in the worst case, the forced actual use.

In addition, every day, in reaction to seeing reports detailing the destruction caused and sacrifices made amid the invasion of Ukraine, we also decided to divert some focus to the technological trends that can lead to the sustaining of nature and to the creation of the future.

Among such trends, we focused on the following two topics reported this month as related to 3D printing technology, as this technology is seemingly being gradually incorporated into satellite and rocket development by companies in the West.

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- 1) Boeing increasing the use of 3D printing to accelerate production of wideband global SATCOM (WGS) military communications satellites
- 2) Millennium Space planning to launch a 3D-printed satellite structure

Among the above, Boeing has decided to use more than 1,000 3D-printed parts for the WGS-11+ for the US Space Force so as to bring its normal delivery time of 7 to 10 years for large and complex satellites down to 5 years (targeting a delivery time reduction rate of 30–50%). Aluminum alloy and titanium alloy, etc., can be used in 3D printing, and it seems that such construction can be applied to structures, mechanical systems, and thermal control subsystems, etc.

Meanwhile, Millennium Space Systems, which was acquired by Boeing in 2018, is focusing on smallsats of 1.5 tons or less but plans to space-demonstrate a metal 3D-printed flight structure to be used for manufacturing next-generation satellite buses. According to the company, with the introduction of 3D printing, the development period of a satellite flight structure can be significantly shortened from the 6 months using the conventional aluminum honeycomb manufacturing process to within 100 hours.

This time, Millennium exhibited a 3D-printed structure at the Satellite 2022 venue. Seeing the exhibition's photos, somehow, in a feeling of déjà vu, it reminded me of seeing Boeing's exhibition of its fully electrified 702SP satellite for the first time at the Satellite 2012 venue just 10 years ago.

Ten years have passed since the introduction of all-electric satellites, and they are now fully ubiquitous. On the other hand, 3D printing has not yet replaced conventional satellite manufacturing methods, but 3D printing's range of application is steadily increasing. If 3D printing is applied to the smallsat constellations that the Space Development Agency is constructing, as well as to large satellites such as those of the Wideband Global SATCOM (WGS) system, I suspect that this technology could become fully ubiquitous in the space industry 10 years from now, or much faster, given the speed of recent technological advances, as was done with today's all-electric technology.

Editorial 03: Regarding on-orbit services (Murakami)

Regarding on-orbit services, it has long been said that the market will expand because such services are necessary for the construction of large structures and for the enlargement (and assembly thereof) of satellites in general. In terms of the current reality, large-scale structures are being built at the International Space Station, and China is also building a space station, so I get the impression that demand certainly exists. In the future, we can see the construction of other manned facilities planned for the post-ISS era, such as in the Lunar Gateway project. Therefore, considering these developments, we believe that the sophistication of assembly and rendezvous docking technology will be indispensable for satellite function improvement and for lunar missions. On the other hand, I also have the impression that such developments have not expanded as much as expected compared to 10 years ago, such as in the construction of large structures and in terms of assembly while in satellite orbit.

Regarding satellites, and in looking at the situation there, Northrop Grumman and MAXAR are demomissioning in this area in collaboration with NASA and DARPA. Northrop Grumman offers a service to extend satellite life via refueling and has two service missions under its belt. Going back to the topic of Satellite 2022, Northrop Grumman announced that it is planning such a service using its Hall Thrusters. In the past, it was difficult to establish such a business in terms of pricing, in considering the manufacturing and launch costs of replenishment service machines. In order to improve this though, it is said that replenishment can now occur using three different aircraft and that each satellite can be provided with service via those Hall Thrusters. Certainly, with this, price reduction can be expected, and I feel that the possibility of acquiring customers would increase compared to conventional plans.

As another approach, MAXAR is considering implementing the enhancement of satellite functions post-launch. MAXAR hosts the largest share of commercial satellites, and I feel that, in the future, choosing a company that could change functions or provide additional services as a satellite manufacturer would be attractive as a satellite operator. These movements are not very noticeable given the current boom in smallsats. However, as for technology development in the United States and Europe, national governments cooperate with the private sector toward carrying out technological development, and the private sector moves forward with commercializing that development.

Also, Japan is recognized worldwide for its guidance control technology for H-II Transfer Vehicles (HTVs). Taking advantage of this technology, I think that it is important to lead a project that has strong presence in projects that are international in scope. Also, for the commercial market, I think it's okay for some companies to make quiet moves toward revitalizing the on-orbit services market.

However, this market is currently small, and two U.S. satellite manufacturers are already leading the market. I find that it would be difficult to compete on the same level as these companies, so I think that competing on a different level should be considered.

I would like to see from Japan a business development company that can squeeze the juice out of such a situation.

March 2022 Space Business-related Topics by Business Position/Market Field

■ : Topics related to Russia's invasion of Ukraine

OldSpace, etc.

Mixed space, etc.

NewSpace, etc.

Satellites



- Boeing increases use of 3D printing to speed up production of WGS military satellite
- Commercial spy satellites put Russia's Ukraine invasion in the public eye
- Russian sanctions throw South Korean satellite missions into uncertainty
- Maxar continued satellite image captures the Russian-Ukrainian war
- North Korea launches spy satellite
- Ukraine conflict increases demand for maritime communications
- China planning global satellite network for precision meteorological monitoring
- China launches test satellites for broadband constellation
- Canada answers Ukraine's call for satellite radar imagery
- China's BeiDou navsat system now at new stage of sustainable, stable, rapid growth
- DoD estimates \$2.5B for global constellation to track hypersonic missiles (Fig.1)
- Telesat mulls downsizing delayed LEO plan as costs mount
- Lockheed Martin to launch new satellite bus aimed at mid-size market (Fig.2)
- SES to acquire Leonardo DRS satcom business
- PSN orders Indonesia-focused satellite from Boeing
- Hispasat to acquire AXESS Networks
- SES orders software-defined replacement satellite from Thales
- Lockheed Martin signs deal to use SpiderOak cybersecurity to protect satellite networks



- Lockheed Martin, Northrop Grumman, York Space selected to build DoD's internet-in-space constellation (Fig. 4).
- Commander of U.S. Space Command: Starlink in Ukraine showing what megaconstellations can do
- DoD space agency funds development of laser terminal that connects to multiple satellites at once
- China successfully launches 7 satellites, including 6 5G-compatible communication satellites of a private company aiming to build a satellite network (Fig. 5)
- Speedcast and OneWeb to integrate LEO satellite connectivity into UPG
- Satellite supply chains coming under increasing scrutiny
- Intelsat rolls out network service that integrates Starlink and geostationary satellites



- Capella Space publishes SAR imagery of Ukraine-Russia crisis
- EOS Data Analytics issues urgent plea for imagery of Ukraine
- HawkEye 360 detects GPS interference in Ukraine (Fig.7)
- Cybersecurity shift of resources for Starlink for anti-jamming
- Satellogic, etc., to distribute EO data directly to Ukraine gov
- Satix Fy released through the latest space SPAC transaction
- Acme plans 250-satellite weather data constellation (Fig.8)
- Spire to manufacture space surveillance satellite for NorthStar
- New startups participate in high-speed lunar communications race
- Starlink reaches 250K subscribers
- Swarm launches satellites on Astra mission
- SpaceX raises Starlink/launch prices due to inflation
- Millennium to launch 3D-printed satellite structure (Fig.9)
- Satellogic and HFX collaborate to equip Ukraine with satellite tasking capabilities
- Pixxel raises \$25M for hyperspectral imaging constellation

Launches



- Roscosmos freezes joint venture with Arianespace
- Russia bans rocket engine sales to the US
- China succeeds in launching 6 GalaxySpace 02 communication satellites
- Soyuz embargo strands satellites with limited launch options
- ESA weighs options for replacing Soyuz launches

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- Russian state-owned space company refuses to launch US OneWeb satellites due to stake acquired by British government
- Poland, Virgin Orbit partner on eastern Europe satellite launch initiative



- Electron rocket propels Synspec's SAR smallsat to orbit
- Astra blames launch failure on wiring error and software flaw
- SpaceX gets launch reservations after AST and Soyuz cancellations (Fig.10)
- Astra's Rocket 3.3 returns to flight with successful launch
- SpaceX sets reuse and payload mass records in Starlink launch
- OneWeb signs launch contract with SpaceX
- SpaceX severs ties with longtime partner Spaceflight Inc.
- Spaceflight and Astrocast extend smallsat IoT constellation launch contract

Others



- China launches deep space exploration laboratory with eye on cutting-edge space tech
- Europe's joint Mars mission with Russia postponed by war (Fig.3)
- Congress presses NASA for more details on Artemis costs and schedules
- China to realize manned lunar landing by 2030
- UK announces ban on space-related exports to Russia
- China plans to launch Mars sample-return mission around 2030
- China to open space station to commercial activity
- Ukrainian space companies united in defending the country
- Fear of ISS being allowed to "fall" due to sanctions on Russian state-owned space development company
- Bahrain signs Artemis Accords
- KSAT invests in dedicated monthly communications network
- Comtech announces world's fastest gateway modem for constellations



- SpaceX rejected by NASA's commercial space station development support plan; questions remain regarding reason for exclusion
- Intellian to design and supply dual-parabolic reference user terminals for the Telesat Lightspeed network
- Sierra Space collaborates with MHI on commercial space station technology (Fig.6)
- Nine Canadian space companies establish national space industry association
- DARPA's kicks off NOM4D program to explore space-based manufacturing
- Orbit Logic awarded orders for Lunar Swarms Autonomy NASA Phase II STTR



- Toward carrying out the first private-sector EVA with SpaceX's "Crew Dragon"
- Rocket Lab begins certification for highest-performance cell technology (Fig.11)
- Kymeta secures \$84M to scale up antenna production
- Quilty Analytics announces impact report on Ukraine invasion

Japan



- First time in 13 years: 1,563 JAXA astronaut candidates processed
- Japan's Minister of Education, Culture, Sports, Science and Technology reveals request for consideration of design change to the H3 rocket (Fig.12)
- Japan's Defense Ministry establishes new Air Self-Defense Force squadron for security in outer space (Fig.13)



- IHI launches first satellite equipped with a ship positioning information reception system (Fig.14)
- Kubota and NEC launch smart agriculture demonstration for the optimal harvesting of sugar cane
- Interstellar collaborates with JAXA on rocket engine development
- SKY Perfect JSAT/demonstration experiment simulates actual operation of unmanned vessel (Fig.15)
- Astroscale wins ESA contract (€800K) for collision avoidance maneuver function in crowded orbits



- ElevationSpace and Tohoku University cooperate on atmospheric reentry technology
- Infostellar business expansion with new U.S. subsidiary, etc.
- ALE + Tokio Marine sign MoU to develop space debris mitigation device (Fig.16)
- Announcement of the "Space Denki" electricity provider contract, to benefit spaceport maintenance (Fig.17)
- Harada Seiki launches smallsat for Earth observation
- Takenaka Corporation demonstrates small group robots for construction sites this summer
- IST announces commercialization of ground station service exclusively for satellite operators
- Synspec works with World Bank and NDRRMA to assess slope instability-related geohazards in Melamchi, Nepal

スライド 3

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At first, I couldn't confirm the usage of "銀河航天02" in the English world. GalaxySpace is the company (in Chinese, the name is "Yinhe"), and they launched the satellites via the Long March 2C rocket, but I couldn't confirm what "銀河航天02" really is. I referred to this:

<https://spacenews.com/china-launches-test-satellites-for-broadband-constellation/>

However, from here (<https://www.lightreading.com/asia/galaxyspace-launches-chinas-first-leosat-test-constellation/d/d-id/776086>), it becomes more clear, showing "delivered six Yinhe 02 communication satellites"; thus, I cast the phrasing like this shown here.

JPR, 2022-04-07T13:23:30.224

JPR1

I felt the headline here was a bit unclear, and it was hard to find clear information on this topic. I referred to here:

<https://space-bd.com/en/news/20220228.php>

It was hard to find a reason for "first", but it seems like it is the first project of its kind, but it started in about 2018. Please advise if necessary.

JPR, 2022-04-08T05:43:51.016

JPR2

I wonder if there was a mistake in the Japanese here. Would this be Synspective?

<https://synspective.com/press-release/2022/wb/>

JPR, 2022-04-08T05:56:55.407

OldSpace, etc.



Fig.1: US missile defense conceptual overview (Credit: Government Accountability Office)

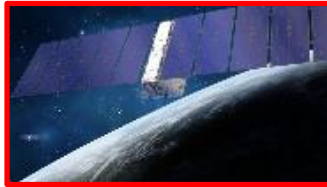


Fig.2: Lockheed Martin LM400 satellite bus in orbit (Credit: Lockheed Martin)



Fig.3: ESA conducts a fast-track industry survey to study ExoMars rover launch options after suspending launch plan using Russia's Proton rocket (Credit: ESA)



Fig.4: Conceptual image of the Space Development Agency's Transport Layer LEO constellation (Credit: Northrop Grumman)

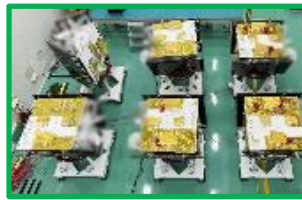


Fig.5: The six LEO broadband communications "Yinhe 02" satellites developed by private space company GalaxySpace (Credit: GalaxySpace)



Fig.6: Sierra Space and MHI examine potential technologies that Japanese companies can provide support for in the development of the Orbital Reef commercial space station. (Credit: Sierra Space)

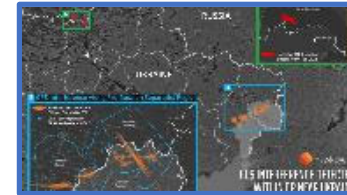


Fig.7: HawkEye 360 detects increased GPS interference around Ukraine after Russia's invasion (Credit: HawkEye 360)



Fig.8: Acme AtronOmatic, the test technology for a weather data constellation in PocketQubes (Credit: Acme)

NewSpace, etc.



Fig.9: 3D-printed satellite structure as designed by Millennium Space Systems (Credit: Sandra Erwin/SpaceNews)



Fig.10: Conceptual image of the BlueBird satellite in orbit (Credit: AST Space Mobile)



Fig.11: Rocket Lab's new IMM-B high-efficiency space solar cell (Photo: Business Wire)



Fig.12: Japan's Minister of Education, Culture, Sports, Science and Technology reveals request for consideration of design change to the H3 rocket; scenes from the press conference on the morning of March 15, with ministry officials



Fig.13: Inaugural photograph for the new Air Self-Defense Force squadron



Fig.14: The IHI-SAT, a 3U-sized microsatellite equipped with the AIS reception system; main mission is to demonstrate AIS functions



Fig.15: Round trip system for the 790 km trip between Tokyo Port and Tsu Matsusaka Port using the SKY Perfect JSAT system for unmanned operations



Fig.16: ALE and Tokio Marine conclude MOU for the development of a space debris mitigation device using EDT; conceptual image of using EDT shown here (Credit: ALE)



Fig.17: The "Space Denki" electricity provider rate plan, for Hokkaido residents (Credit: Space Cotan)