ASCEND

NEAR-EARTH
(Geosynchronous Orbits and Below)
SPACE COMMERCIALIZATION
META-11 Session Summary

Executive Summary

A panel session and a roundtable discussion on Near-Earth (Geosynchronous Orbits (GEO) and Below) Space Commercialization were held at 2022 ASCEND to capture senior leadership visions for a government/commercial partnership approach toward removing remaining barriers and to formulate next steps needed to further commercialization in the near-Earth ecosystem. This report discusses the strategic implications and status, while making actionable recommendations to the government and commercial partners.

Introduction

In 1957 Sputnik was launched and for the next 50 years technical and financial barriers to entry necessitated government-sponsored space exploration and discovery. The Space Race began in the 1960s with the United States and Soviet Union, but the number of spacefaring nations has grown, with 11 countries possessing space launch capability and 75 countries with satellites in orbit. As the cost of space entry has declined, the number of commercial companies has rapidly risen to deliver services to the global markets and disadvantaged citizens that historically could only be provided by governments. Commercial services include launch, communications, all-weather intelligence, weather, servicing, space domain awareness, space tourism, and more. Seeking to incentivize this trend, the Biden Administration has recently shifted more resources in the FY23 National Defense Authorization Act (NDAA) to deep space civil exploration and near-space commercialization. However, current commercial vendors and administration support are insufficient to overcome the years of inertia present in the near-term ecosystem.

The panel session outlined the support from the administration in aiding near-Earth commercialization of traditional government missions and identifying the remaining barriers and next steps required to further commercialization in the near-Earth ecosystem. Participants from commercial companies and industry also provided their inputs. The roundtable session gathered proposals from small group participants on the same topic. The output of these sessions was to formulate an actionable recommendation memorandum for the National Space Council and Secretary of the Air Force/Chief of Space Operations.

Panel Session Conclusions

Space is essential for the U.S. way of life and impacts everything from banking, finance, farming, science, and military operations. At the conjunction of commercial and government space interests, there are somewhat diverging motivations. Some missions are inherently government supported with national security and policy objectives driving investment. Examples include the James Webb Space Telescope and the Apollo program. However, private/public partnerships are becoming increasingly common and are expanding into new areas. Position, navigation, and timing (PNT); terrestrial weather; and science are emerging as new partnership areas beyond the usual remote sensing and satellite communications. For example, 90% of climate change science information comes from commercial remote sensing sources. In addition, national security and economic security go together and the government must be a partner in commercial space.

Near-Earth has massively changed in the past few years with reduced launch costs and the proliferation of small satellites driving innovation. For years, DigitalGlobe's and GEOEye's large satellites produced most of the U.S. commercial remote sensing products. Today, there are multiple vendors (e.g., BlackSky, HawkEye 360, etc.) providing more persistent, lower resolution products at a variety of phenomenologies (e.g., visible, RF, etc.) using small satellite systems. Satellite communications (SATCOM) also has radically changed with Amazon Kuiper and SpaceX providing K-band capability from low Earth orbit (LEO) that directly competes with GEO-based services from other SATCOM providers. There is also a growing membership in the SmallSat Alliance, which advocates for the entire new space industry, not just small satellite vendors. The Alliance has a whole ecosystem including launch companies, ground companies, and cyber companies.

The Department of Defense (DoD) and the U.S. Space Force (USSF) have also recognized the value of small satellites as part of a multi-orbit, multi-satellite constellation architecture that degrades much more gracefully in time of conflict. The Defense Innovation Unit's Hybrid Space Architecture (HSA) is actively being pursued as a possible next-generation military space architecture. Several key tenets of the HSA include mixtures of large and small satellites working together to perform missions; a "buy what we can, build what we must" philosophy; an "outernet" space internet connecting and sharing data between nodes; and hybrid terminals that allow users to connect to a variety of different satellite constellations and providers.

With all this background information, past commercial/government partnerships and the current space business environment provide valuable insight on the way forward. For example, the U.S. National Interstate and Defense Highways Act (1956) provided the infrastructure that enabled trade and movement of people unheard of before its passage. In SATCOM, NASA's Advanced Communications Technology Satellite (ACTS) satellite system and network was designed to provide fiber-compatible Synchronous Optical NETwork (SONET) service to remote nodes and networks through a wideband satellite system. Ultimately, it showed the viability of such space-based architectures and reduced the risk for commercial providers to use K-band frequencies. The technology developed under ACTS is being used by SpaceX's Starlink constellation, ViaSat 3, and many other international SATCOM companies. The lesson learned is that governments can provide commercial users with infrastructure (SATCOM, PNT) and technology risk reduction to ease barriers to entry. This same model could also be applied to new space manufacturing and mining commercial initiatives and could accelerate the growth of the deep space economy.

Overall, today's space government/commercial business environment is moving in the right direction with national security priorities better tied to U.S. innovation, but still not completely synchronized.

U.S. government roadmaps and strategic intents are rarely shared consistently. There are also pockets of good ideas (EXIM Bank, the Strategic Funding Increase and Tactical Funding Increase Program (STRATFI/TACFI) for small businesses, etc.) but an improved all-of-government strategic approach is needed. On the commercial side, venture capital firms are looking for some level of assured funding and the government can be an "anchor tenant" until commercial fully develops. Space domain awareness has been a great example of "build it and they will come," but legal issues with licensing needs to be reconciled with potential subscription services as a better model.

There are also several myths about government/commercial partnerships. First, vendor lock is less of an issue than perceived. In many cases, this is a leftover concern from military acquisitions where the government felt beholden to a particular company on hardware/software procurement. Procurement of services does not naturally lead to vendor lock issues. Second, commercial services are already under attack both directly (e.g., cyber attacks) and indirectly (e.g., competition). However, commercial services are very resilient and multiple examples exist of how companies have responded well to adverse situations.

Roundtable Conclusions and Recommendations

OVERALL CONCLUSIONS:

1. **Private sector needs a clear and consistent demand signal.** The U.S. White House-level National Science and Technology Council outlined this problem in the In-Space Servicing, Assembly and Manufacturing (ISAM) National Strategy, but it is unclear what is happening to implement this recommendation. Given the pivotal role the International Space Station (ISS) has played in ISAM risk reduction and technology innovation, a clear post-ISS strategy is needed in coordination with the many commercial ventures in this area.

2. **Clarity on policy and regulations is needed.** The International Telecommunications Union is a major impediment toward change and needs to be revamped. A subscription services framework may be a better model instead of spectrum licensing.

3. **Several areas are emerging without a clear strategy.** Space rescue, commercialization of the moon, and other areas need clarity and leadership.

4. **Continuous government business process improvements need to continue.**

5. **Improved industry engagement with actionable results needs to occur.**

RECOMMENDATIONS:

1. **Improvements to the small business engagement processes**
   - Streamline contracting for initial awards. The current process still uses too many Federal Acquisition Regulation (FAR) standards that are difficult for new small businesses to navigate.
   - Allow the government to make purchases up to $5M on government credit cards. This would make awards to small business proceed quickly.
   - Create a cross-agency single portal for small businesses to engage with government space. Small businesses have limited business development funds and finding the right agency to work with within the hundreds of programs is difficult. A single-entry point can then direct businesses to the right organizations or programs as needed.
   - Contracting processes need to be less opaque – Space Enterprise Consortium (SpEC) Other Transaction Authority (OTA) is good start, but requires an outside group and "tax" to implement

2. **Better engagement with industry strategic planning process**
   - Go beyond industry days

- Shared roadmaps
- Feedback/involvement from industry
- Actionable output (the State of the Industrial Base output is a good model)

3. **Valley of death transition tax**
   - 5% tax on Program Element (PE) and Small Business Innovative Research (SBIR) programs for technology transition from Technology Readiness Levels of 4 to 6-7 is needed. Right now, Congress mandates a tax on certain PEs within the budget to fund the SBIR program. Consider a similar program for technology transition.
   - Centralized control of process, but decentralized execution — don't create another office that further fractionates government coordination.

4. **Commercial engagement offices need a consistent legal and policy standard on licensing**
   - Establish a more consistent revenue stream under firm-fixed-price contracts. Companies need a more consistent revenue stream to attract venture capital resources.
   - Look at subscription services acquisition models instead of licensing. Many commercial services already use this model (e.g., TV and cellular services).

5. **DoD Platform One is an excellent environment but needs improvement**
   - Less opaque processes for customers and developers
   - A better model where the customer pays the license or for the service is needed.

6. **Improvement in innovation**
   - Larger pots of money – eliminate some offices (competitive skunkworks)
   - The current DoD guideline is for the uniform services to allocate a minimum of 1.9% TOA for science and technology (S&T). This is outdated and too low of an investment – commercial puts much more funding into S&T efforts.

Acknowledgments