SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION: QUESTIONS FOR THE RECORD

HEARING ON
REOPENING THE AMERICAN FRONTIER: PROMOTING PARTNERSHIPS BETWEEN COMMERCIAL SPACE AND THE U.S. GOVERNMENT TO ADVANCE EXPLORATION AND SETTLEMENT
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Submitted by Senator Dan Sullivan

Challenges Hindering DOD-Commercial Partnerships

Question 1. Earlier this year, in response to a provision that I included in the FY2017 National Defense Authorization Act (NDAA), the Department of Defense (DOD) released an Arctic strategy that among other points, highlights severe challenges caused by the limited satellite and terrestrial communications above 65 degrees north. When the DOD needs to quickly address gaps in capabilities, commercial partnerships can—where appropriate—play a key role in filling these needs.

What are the primary challenges that have hindered or prevented you from working with the U.S. government to fill critical gaps in U.S. space capabilities, like the domain awareness and communications gaps in the Arctic?

Answer 1. Thank you for the question sir. The primary challenges I have had have been:

(1) There is no real strategic and coordinated investment in government-related science and technology (S&T) research. There is an army of researchers and academics waiting to tackle our most dire S&T challenges and problems, but we cannot engage this community without a dedicated investment. Moreover, the small investment in S&T research that currently exists is scattered and each government entity funds work without being aware of what other government entities are funding. The U.S. Government is likely paying may times for the same work without knowing it. Each government entity needs to be free to invest in S&T research as it needs to satisfy its own gaps but much benefit could be had by having an office that coordinates this investment such that S&T can be leveraged across the government and to prevent funding the same work more than once. There should also be a strategic roadmap that clearly identifies how the S&T research will be transitioned as it matures. The U.S. Government should also favor companies that propose solutions that leverage or build upon previous U.S. Government (taxpayer) investment. Germany has so called "Fraunhofer Institutes[1]" which are an effective marriage between government,

[1] https://www.fraunhofer.de/en/institutes.html

industry, and academia. The U.K. has the so called "Satellite Applications Catapult.[2]" The U.S. has so called "University Affiliated Research Centers.[3]" These too should be re-energized and enlisted to serve a cohesive government, industry, and academic partnership in S&T research and development and risk retirement. These could be made to augment or compliment Public-Private-Partnerships for space domain awareness, space traffic management, orbital safety, and space commerce.

(2) The National Science Foundation (NSF) has not been historically keen to fund research in space-related technologies, areas where the Air Force Office of Scientific Research (AFOSR) has but AFOSR has a much much smaller budget. If the NSF could be motivated to complement AFOSR's investment areas in these topics, that would be greatly beneficial.

(3) Many U.S. Government meetings have required security clearances which I have, but most researchers do not. More unfortunately is that almost all of these meetings are absent any classified information being exchanged or shown. I've questioned why the U.S. Government continues to over-classify material and the answer is complicated. However, a great effort must be undertaken in making as much information as possible, available to the scientific and technological communities if we wish to empower our country in maintaining a leading edge regarding our space services and capabilities.

(4) The U.S. Government has focused upon developing systems making sure that the space systems (including the ground segments) themselves are robust and work, but paying much less attention to the accuracy of information being generated and distributed by these space systems. No one has been assessing the physical and statistical consistency amongst various space situational/domain awareness funded efforts. The assumption is that as long as different products and applications meet interface control requirements, all is good. This is a flawed assumption that works to our collective detriment. The world's best plumbing can distribute potable water or sewage.

(5) The U.S. Government is losing its internal competency to quantify and assess the goodness and accuracy of funded projects and delivered products. So, it relies strongly on what is called SETA support or FFRDCs. Unfortunately, these oftentimes work in their own self-interest and under the guise of information security, avoid independent scrutiny and peer-review. Many innovative, disruptive, and paradigm-shifting solutions never make it to the U.S. Government's table so to speak. The U.S. Government lacks an independent and unbiased group of people who can help it quantify and assess products to meet its needs for space situational and domain awareness. Scientific and Technological solution developers, providers, and integrators must never be the same people!

(6) Very rigid acquisition processes also hinder rapid and agile deployment of space services and capabilities, like communications in the Arctic. I suspect that initiatives like the Defense Innovation Unit Experimental (DIUx)[4] is a method to remedy this discrepancy.

Internet Access in Rural Areas

[2] https://sa.catapult.org.uk/services/centres-of-excellence/

[3] http://www.acq.osd.mil/chieftechnologist/publications/docs/20130426_UARC_EngagementGuide.pdf

[4] https://www.diux.mil

Question 2. In Alaska, many places do not have any connectivity and many times are not even connected by road. It is costly to deploy telecommunications infrastructure, and while these communities are extremely innovative, a lack of connectivity hinders business growth and increased economic activity.

Commercial space provides the possibility of increased communications, including satellite-based broadband internet, at a reduced cost. Especially if the cost of launches continues to decline, this could provide real benefits to consumers in extremely rural places like Alaska. How can recent advances in commercial space help provide broadband-level internet to the most rural areas?

Answer 2. This is a very relevant question. Companies such as Planet Labs[5] have demonstrated an innate capability to rapidly and effectively deploy space based assets to fill gaps. Planet has paved the way for companies such as OneWeb and SpaceX to deploy massive numbers of space-based assets to deliver the very capabilities that you desire for Alaska and the world writ large. The activities of these companies should be encouraged and assisted as appropriate, without sacrificing the ability to motivate competing technologies. General Hyten created a commercial cell in the National Space Defense Center[6] for Battlespace Management, Command, and Control (BMC2) at Schriever AFB in Colorado Springs. The U.S. Government could take a page from this book and create a commercial cell that addresses communications and global internet to meet our national needs. Perhaps this could be championed under the newly formed National Space Council.

Question 3. Is latency still an issue?

Answer 3. Yes, latency is very much still an issue but this can be mitigated and remedied via (a) leveraging other on-orbit assets as effective relays (b) heavily investing in quantum computing and communications as recently demonstrated by China.[7] (c) investing in autonomous satellite systems and networks (e.g. via the Air Force Research Laboratory's Space Vehicles Directorate[8] including academic partnerships, and the Operationally Responsive Space[9] office) that can capitalize on Machine Learning and Artificial Intelligence to self-heal/repair and reconfigure in near real time in the presence of sensed latencies and/or outages.

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[5] https://www.planet.com

[6] http://breakingdefense.com/2017/04/jicspoc-morphs-to-national-space-defense-center-what-it-means/

[7] http://www.sciencemag.org/news/2017/06/china-s-quantum-satellite-achieves-spooky-action-record-distance

[8] http://www.kirtland.af.mil/Units/AFRL-Space-Vehicles-Directorate/

[9] http://www.kirtland.af.mil/Units/ORS/