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Approaches to Space-Based Information Services Among Actors Without Space Capabilities

A Virtual Think Tank (ViTTa)[®] Report



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What is ViTTa®?

NSI's **Virtual Think Tank (ViTTa®)** provides rapid response to critical information needs by pulsing our global network of subject matter experts (SMEs) to generate a wide range of expert insight. For this SMA Contested Space Operations project, ViTTa was used to address 23 unclassified questions submitted by the Joint Staff and US Air Force project sponsors. The ViTTa team received written and verbal input from over 111 experts from National Security Space, as well as civil, commercial, legal, think tank, and academic communities working space and space policy. Each Space ViTTa report contains two sections: 1) a summary response to the question asked; and 2) the full written and/or transcribed interview input received from each expert contributor organized alphabetically. Biographies for all expert contributors have been collated in a companion document.

¹ For access to the complete corpus of interview transcripts and written subject matter expert responses hosted on our NSI SharePoint site, please contact gpopp@nsiteam.com.

Cover Art: https://www.army.mil/article/152664/future_army_nanosatellites_to_empower_soldiers

Question of Focus

[Q4] What insight can the US/partners obtain from the space-based information service approaches used by international actors that lack their own space capabilities?

Expert Contributors

Major General (USAF ret.) James B. Armor, Jr.² (Orbital ATK); **Mark Berkowitz** (Lockheed Martin); **Caelus Partners, LLC**; **Falconer Consulting Group**; **Lieutenant Colonel Peter Garretson** (USAF Air Command and Staff College); **Gilmour Space Technologies**; **Dr. Namrata Goswami** (Auburn University Futures Lab); **Harris Corporation, LLC**; **Theresa Hitchens** (Center for International and Security Studies at Maryland); **ViaSat, Inc.**

Summary Response

The experts' responses to this question suggest two main insights the US can draw from how actors without space capabilities approach space-based information services. The first relates to the information these actors are seeking: what it indicates about their interests and the potential security implications access to that information has for the US. The second relates to the strategies these states are using to gain access to space-based information, in particular collaboration and reliance on private sector services.

Interests

Major General (USAF ret.) James Armor's³ response to this question focuses on the observation that what actors choose to buy can provide insight into their interests. Consistent with this, the Falconer Consulting Group, focusing their response on international actors as customers and/or as potential combatants, highlights the potential benefit to the US that knowledge of the service provider satellite type and capability provides. Specifically, it would enable the US to ascertain what type of information is of interest to other actors and thus draw conclusions "as to the need for that type of data/information and its attendant purpose." Dr. Namrata Goswami from Auburn University Futures Lab identifies Luxembourg, UAE, Israel, and Iran as states that have all shown interest and capability in using insights drawn from space-based information services.

Security Implications and Threats

Mark Berkowitz of Lockheed Martin and Lieutenant Colonel Peter Garretson of USAF Air Command and Staff College both consider that the increased access to data that space-based information services provides raises security issues. The availability of high-resolution imagery from commercial providers combined with customized data-analytics makes it possible for actors to track military activities and

² The subject matter expert's personal views, and not those of his organization, are represented in his contributions to this work.

³ The responses here represent the sole views of Major Gen (USAF ret.) James Armor, and are not intended to represent the position of Orbital ATK.

capabilities as well as non-military factors, including those that could be used to manipulate economic stability (Garretson), without needing their own space capabilities. Berkowitz suggests that space-based information services can provide the US with insight into threats to intelligence sources and methods, force protection and operations security, as well as countermeasures to mitigate those threats.

Opportunities for Collaboration

Data sharing

Dr. Goswami suggests that India's sharing of satellite services with countries like Bhutan, Bangladesh, Maldives, Sri Lanka, and Nepal could be used to mitigate disasters and detect weather patterns, much as the UN does with its UN-SPIDER space-based information systems. She suggests that countries like the US and India could collaborate in similar data sharing to build disaster mitigation capacity. Consistent with this idea, Caelus Partners suggest "that the US consider providing additional space services and support to all of humanity (as is done with GPS)." They contend that "[c]ertain space-based information services are a basic necessity to operating effectively on Earth."

Capability enhancement

Theresa Hitchens of the Center for International and Security Studies at Maryland states that reliance on outside providers enables states to gain capabilities faster than they can through domestic development, thus resulting in more up-to-date technology. Furthermore, states currently developing space-based infrastructure have a variety of potential partners to choose from, and thus a wider range of capabilities to choose from. The ViaSat team notes that a similar logic applies to the US/partners, where private sector satellite services are faster to develop and deploy than are government systems, and result in more flexible architectures that allow for "near-instantaneous response to continually evolving cyber threats and related security concerns." Leveraging private sector services enables international actors that lack their own space capabilities to rapidly improve their capabilities at a fraction of the time and investment of US/partners. Further, without adherence to installed base solutions, these international actors can adopt so rapidly that they could potentially surpass US/partner capabilities.

Dr. Goswami notes that Iran, UAE, and China all jumpstarted their entry into space activities through partnerships with countries with more advanced space program and capabilities. The effectiveness of this strategy for China is reflected in the fact that it is now offering its own BeiDou2 navigation systems to countries along the One Belt One Road (OBOR).⁴ In its contribution, Harris Corporation suggests that utilizing others' space services also allows actors to benefit from "lessons learned," making their own choices more cost effective.

Brigadier General (USAF ret.) Tom Gould of Harris Corporation suggests, however, that security considerations may limit the potential for such collaboration in support of military operations, as it will require sharing sensitive information about each other's capabilities in a domain that has traditionally stove-piped or highly classified its capabilities.

⁴ The [One Belt One Road initiative](#), launched in 2013, involves China underwriting billions of dollars of infrastructure investment in countries along the old Silk Road. China is spending roughly \$150bn a year in the 68 countries that have signed up to the initiative.

Subject Matter Expert Contributions

Major General (USAF ret.) James B. Armor, Jr.⁵

Staff Vice President, Washington Operations (Orbital ATK)
7 August 2017

WRITTEN RESPONSE

[Q4] What insight can the US/partners obtain from the space-based information service approaches used by international actors that lack their own space capabilities?

The usual: assess the interests of those international actors by what they buy.

Marc Berkowitz

Vice President, Space Security (Lockheed Martin)
25 August 2017

WRITTEN RESPONSE

[Q4] What insight can the US/partners obtain from the space-based information service approaches used by international actors that lack their own space capabilities?

The US and its partners can obtain information about and insights into: threats that may be posed to intelligence sources and methods; threats to force protection and operations security; countermeasures to mitigate those threats; and how to leverage other international actors' investments to avoid costs and innovate with information services.

Caelus Partners, LLC

Jose Ocasio-Christian
Chief Executive Officer

24 August 2017

WRITTEN RESPONSE

[Q4] What insight can the US/partners obtain from the space-based information service approaches used by international actors that lack their own space capabilities?

Caelus Partners chooses not to answer this question in detail at this time. However, Caelus Partners would suggest that the US consider providing additional space services and support to all of humanity (as is done with GPS). Certain space-based information services are a basic necessity to operating effectively on Earth.

⁵ The responses here represent the sole views of Major Gen (ret.) James Armor, and are not intended to represent the position of Orbital ATK.

Falconer Consulting Group

Walt Falconer
President

Mike Bowker
Associate

Mark Bitterman
Associate

Dan Dumbacher
Associate

15 August 2017

WRITTEN RESPONSE

[Q4] What insight can the US/partners obtain from the space-based information service approaches used by international actors that lack their own space capabilities?

This is confusing, not sure what the US would learn from countries that don't have their own space capabilities. Could be asked from the perspective of the international actors as customers of services, and/or as potential combatants, to determine what they "want" or "need".

By being knowledgeable of the service provider satellite type and capability the US can ascertain what type of information is of interest to these parties. Conclusions can then be drawn as to the need for that type of data/information and its attendant purpose.

Lieutenant Colonel Peter Garretson

Lead, Space Horizons Research Group / Instructor of Joint Warfighting, Department of Research
(USAF Air Command and Staff College)

10 August 2017

WRITTEN RESPONSE

[Q4] What insight can the US/partners obtain from the space-based information service approaches used by international actors that lack their own space capabilities?

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Modern AI-driven big data capabilities from commercial partners (Planet, Blacksky, TerraBella, Skybox...even GoogleEarth, as well as foreign start-ups SATSURE, Earth2Orbit) enable not only raw imagery at meter, perhaps sub-meter level, but more importantly pattern-of-life type information. Any interested actor can create custom data-analytic services to track all manner of logistics movements, supply stocks, even real-time order of battle of military systems. They can develop models that allow them to forecast agricultural yields and prices, creating a potentially "weaponizable" data set that could be used to upset economies through time-specific dumping.

Gilmour Space Technologies

Adam Gilmour
Chief Executive Officer

James Gilmour
Director

13 July 2017

WRITTEN RESPONSE

[Q4] What insight can the US/partners obtain from the space-based information service approaches used by international actors that lack their own space capabilities?

Australia purchases data on foreign and domestic commercial satellites.

Dr. Namrata Goswami

Senior Analyst (Wikistrat, Auburn University Futures Lab)
15 August 2017

WRITTEN RESPONSE

[Q4] What insight can the US/partners obtain from the space-based information service approaches used by international actors that lack their own space capabilities?

Countries like Luxembourg, UAE, Israel and Iran will emerge as major players in the future of setting space norms and utilizing insights drawn from space based information services. Already, Luxembourg has risen up to the commercial potential of asteroid mining and has established legislation that enables private companies to set up shop by promising ownership of outer-space resources. Luxembourg aims to establish a knowledge portal for space based activities. Countries like Iran and UAE aims for similar effects, partnering with advanced space faring nations, to develop expertise and jumpstart the process of getting to a space based capability by joining knowledge platforms hosted by space farers. Example of a country that utilized space shuttle technology to develop its own space shuttle is China who developed shuttle technology with Russia sharing its Soyuz space shuttle. This resulted in China's *Shenzhou* unmanned spaceflight in 1999. Transfer of the fundamentals of space technology can augment a country's space capabilities. While most underestimate China's ability to create indigenous space technology by re-engineering, it is a fact that the end product of reengineering involves Chinese engineers fit in additional technology or develop better propulsion systems. In line with the activities of space-based information systems, as part of its 2016 White paper on space, China has offered its Beidou2 navigation systems to the countries along the One Belt, One Road (OBOR) to utilize GPS for communication as well as other services. These regional structures created around space technology is catching up. India offered the "South Asia" satellite to countries in South Asia. This will boost the telecommunications and broadcasting services of countries like Bhutan, Bangladesh, Maldives, Sri Lanka, and Nepal with each country enjoying access to a transponder. This could be utilized to mitigate disasters and detect weather patterns.

The United Nations utilizes its space based information systems, UN-SPIDER, towards mitigating the risks from natural disasters. Space based information gleaned from sensors in satellites could augment a country's capability, especially in the developing world, to respond to natural disasters and develop early warning systems. In event of a flood, earthquake, tsunami or volcanic eruptions, ground based critical infrastructure that offer data are destroyed. Consequently, data and maps procured from satellites can create a response mechanism based on

reliable information. The UN-SPIDER offers a one source knowledge portal to transfer such data between decision makers, responders, and helps those countries without capacity to utilize space data effectively. Countries like the U.S. and India can share in a similar data sharing to augment capacity building in mitigating disasters. They can also share space-based data on movements in the Sea Lines of Communication (SLOCs) in Asia critical for the movement of trade and goods. One such area could be the Indian Ocean region, especially the Malacca Straits area. India is already utilizing its ISRO established “Bhuvan” program nationally to offer space based data on flood warning, agriculture, hailstorms, as well as mapping of the territorial waters, and disaster warning. It could offer this services on a larger regional scale given the vulnerability of South Asian countries to floods and earthquakes.

Harris Corporation

General (USAF ret.) Thomas F. Gould

Vice President, Business Development, Air Force Programs

Colonel (USAF ret.) Jennifer L. Moore

Senior Manager, Strategy and Business Development, Space Superiority

Gil Klinger

Vice President, Senior Executive Account Manager for National Security Future Architectures

15 September 2017

WRITTEN RESPONSE

[Q4] What insight can the US/partners obtain from the space-based information service approaches used by international actors that lack their own space capabilities?

Allied Governments and U.S. and foreign companies that utilize others’ space services, rather than building their own may have significant “lessons learned” about how to establish and manage public/private partnerships, long-term leases, and other service level arrangements. The advantages to the U.S. Government could include: (1) jump-starting its efforts to implement commercial services’ contracts; and (2) provide much-needed empirical data demonstrating that some space services historically provisioned by U.S. Government owned/operated space systems could be off-loaded to lower-cost service providers with no increase in national security risks.

INTERVIEW TRANSCRIPT EXCERPT

Interviewer **[Q4]** Okay. In the second paragraph here, I thought this was a very interesting point about how some of these space programs have a nationalistic element to them. I’m wondering if in this nationalistic pursuit, how much of an opportunity does the US (commercial sector or otherwise) have to cement their role in the development of these programs, If any? Or in the case of French, India and Japan as a pursuit of these capabilities, strictly domestic in their own rights or does the US have an opportunity to play a role there.

T. Gould: **[Q4]** I guess there are two parts to the issue. One is how much do they want/need. The fact that they want to develop this capability indigenously might indicate they want to do it without being reliant on the US for all the reasons that we stated in our written response...like developing one’s own space-based capabilities and leveraging those technologies in other areas. The second part of the equation, is frankly how willing are we to share space technology with our partners and allies.

Security considerations may limit the potential for such collaboration in support of military operations, as it will require sharing sensitive information about each other's capabilities in a domain that has traditionally stove-piped or highly classified its capabilities.

Theresa Hitchens

Senior Research Associate (Center for International and Security Studies at Maryland)

19 July 2017

WRITTEN RESPONSE

[Q4] What insight can the US/partners obtain from the space-based information service approaches used by international actors that lack their own space capabilities?

The ability to rely on multiple providers, weigh costs vs. benefits of different systems – allows more flexibility, as well as negotiation leeway. It also provides resiliency. Further, by relying on outside providers who can deliver full systems, the acquisition process is speedier, and more likely to result in up to date technology than a system based on self-development. Nations new to the game have more ability to partner widely, gaining insights and capability from multiple sources.

ViaSat, Inc.

Richard A. VanderMeulen

Vice President of Space and Satellite Broadband

Ken Peterman

President, Government Systems

Shannon O'Meara Smith

Executive Director of Strategic Initiatives

Fred Taylor

Vice President, Space and Cyber Applications

Bruce Cathell

Vice President of Government Operations

15 August 2017

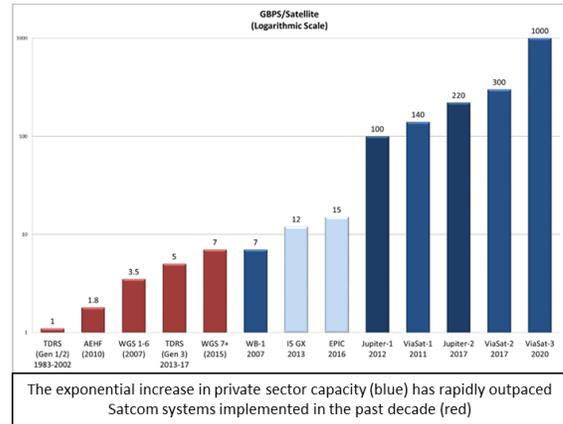
WRITTEN RESPONSE

[Q4] What insight can the US/partners obtain from the space-based information service approaches used by international actors that lack their own space capabilities?

The Department has already recognized that international actors are actively employing innovative private sector solutions, especially when they lack their own capabilities. This insight is the basis of the "Third Offset Strategy" for defense innovation first introduced by Secretary of Defense Chuck Hagel. In addition to leveraging emerging technologies, our adversaries continue to actively look for ways to symmetrically and asymmetrically defeat US forces. Near peer actors have closely observed US operations, especially its dependence on space and Command

and Control (C2) networks, and have created significant force structure to deny, degrade, and destroy US space segments and interfere with the electromagnetic spectrum disrupting our network-centric operational advantage.

The private sector satellite industry has taken notice of the advancing threats and has responded by adding layered threat defense capabilities. Since 2010, private sector Satcom service providers have invested significant capital to harden their satellites and networks against electromagnetic interference and cyber threats, eliminated single points of failure in teleport and ground infrastructure, and automated their network operations, maintenance, and cyber security processes.



These investments have led to exponentially improved hardening, security, and operating concepts based even in the presence of advancing threats to their business and operations models. Whereas purpose-built government systems often take 7-10 years to acquire, develop and deploy, and are very difficult and expensive to modify/upgrade once deployed; private sector satellite communication systems can be conceived from scratch and deployed in under 5 years, and employ flexible architectures and Development and Operations (DevOps) concepts that allow for rapid modifications, agile upgrades, and near-instantaneous response to continually evolving cyber threats and related security concerns.

Since 2005, the state of the art of satellite communications networks have progressed from Satcom systems, like WGS and AEHF, that were capable of 1-5 Gbps and could support hundreds or thousands of users, to Satcom systems in the 2020 era that will provide well over 1Tbps of capacity and support tens of millions of simultaneous users—a 3 order of magnitude improvement over roughly 15 years, which is the average lifespan of a typical Satcom asset.

Beyond the 2020 era, the private sector will undoubtedly create Satcom systems that boast 10Tbps or 100Tbps throughput rates. These capacity increases are merely one measure of the advancement of private sector capability over the last decade. Capacity creates a richer network and highly-affordable capacity which can be employed to overcome inefficiencies such as small antenna apertures and low power transmitters, and/or employed as network overhead to implement techniques such as real time deep packet inspection associated with an active cyber defense – all without negatively impacting user speed or degrading user performance. Security, resilience, flexibility and situational awareness of private sector networks have also made similar improvements over the same time period. Modern private sector networks significantly outperform government purpose-built assets, and the capability gap will continue to widen as private sector providers enjoy a more rapid development cycle and are currently spending far more in research and development in satellite communications than the US government.

So the offset strategy for us, or international actors, is to change the competition to a most favored application of strengths to the problem. In this case, the best possible approach to improve a Satcom disadvantage would be to employ private sector architectures that are focused on state-of-the-art services versus defending the installed base or initiating a new decade-long program to replace the current installed base.