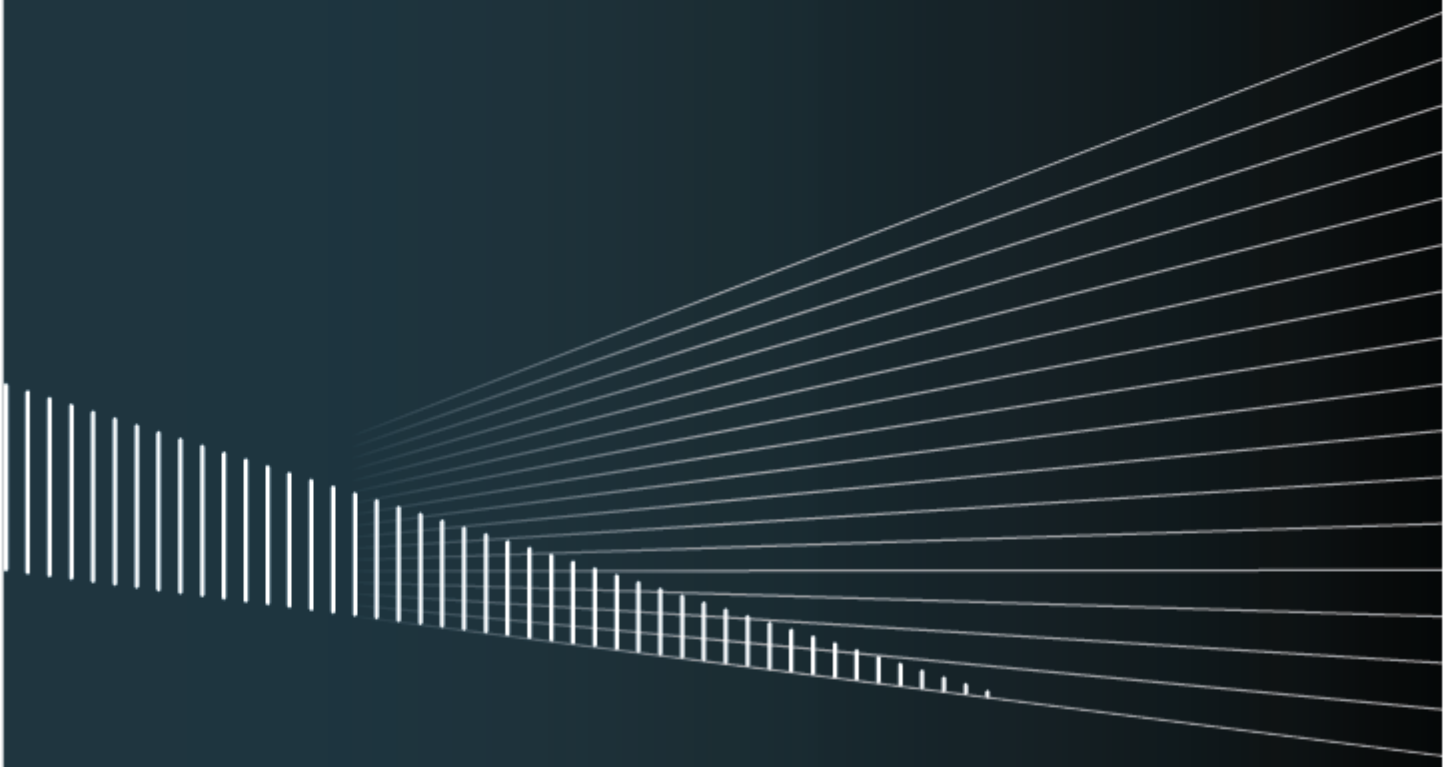
WHY COMMERCIAL SATCOM TECHNOLOGY SHOULD BE LEVERAGED FOR THE MILITARY



Viasat

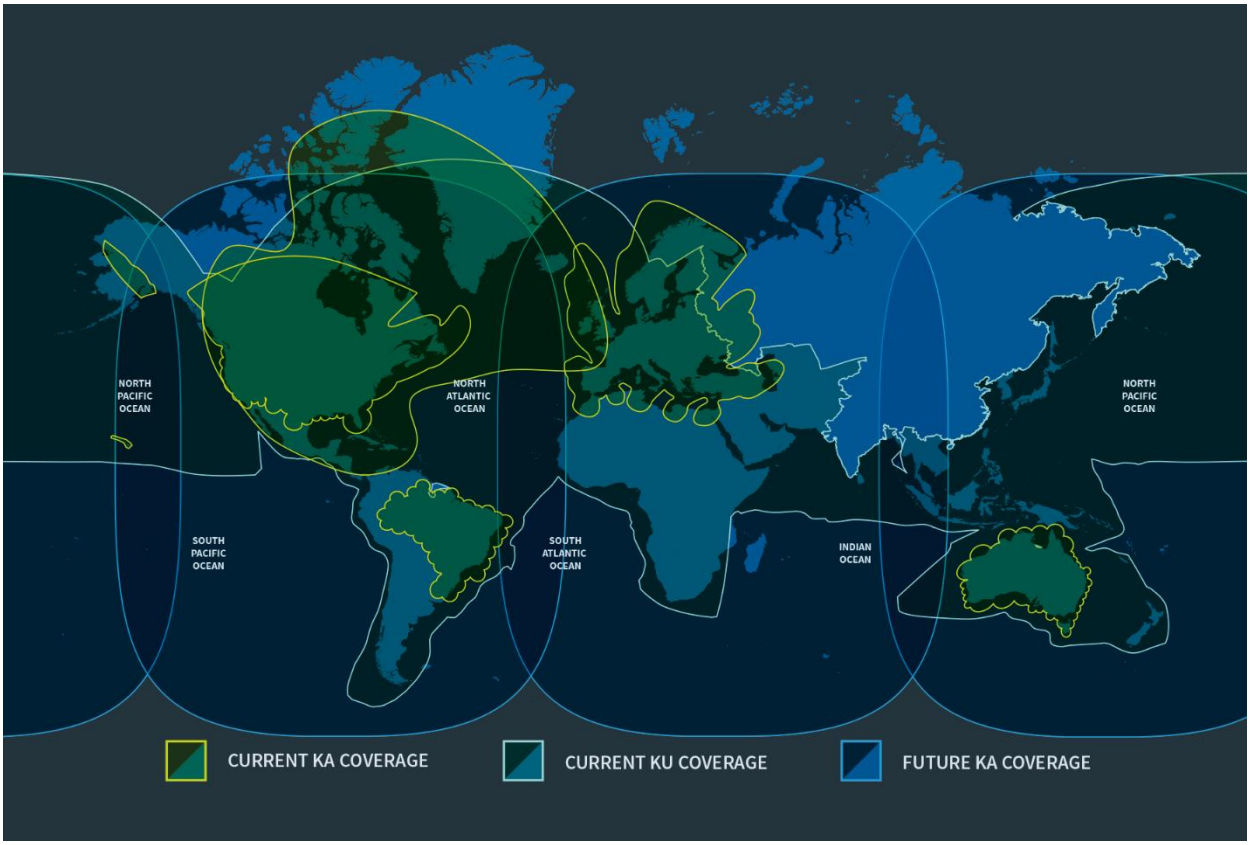
INTRODUCTION

Ken Peterman has a simple question: If the average American can make a cell phone call without worrying about whether the provider has enough bandwidth, shouldn't the nation's warfighters receive the same?

There is no reason why they shouldn't. According to Peterman, President of Government Systems at communication satellite provider Viasat, "The service the Department of Defense (DoD) provides to soldiers should be exactly like their cell phone service: high-quality, dependable and available anywhere at any time with continually expanding speed and capacity to meet next-generation technologies."

Peterman is a passionate advocate of what Viasat calls "satellite communications as a service." He suggests the DoD should contract with private sector satellite communications (SATCOM) companies to satisfy the bandwidth demands that existing military SATCOM systems can't meet, for increased security, resiliency, and agility.

FIGURE 1. VIASAT SATCOM-AS-A-SERVICE: FAST, FLEXIBLE, RESILIENT CONNECTIVITY



A LIFE OR DEATH PROPOSITION

There are more than 5 billion cell phone users around the world. In the United States and many other countries, customers expect their cell phone service to work. Period. If it doesn't, they find another service provider. Peterman believes that the same rigorous service standards should apply to military connectivity.

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“If commercial users lose connectivity, companies lose customers. For warfighters, losing connectivity can mean the difference between life and death," Peterman says. "It is imperative that we maintain constant, dependable connectivity for our warfighters around the globe. By leveraging commercial technology, we will be able to provide military forces with the speed, capacity, security, and lifesaving applications needed to maintain a tactical edge.”

SHARED CHALLENGES

Commercial SATCOM providers often solve for the same technical challenges faced by the military. For example, DoD worries its SATCOM is vulnerable to cyberattacks, hackers and anti-satellite weapons, and with good reason. For decades, U.S. satellites had been fairly safe from all but the most extreme threats. But experts warn that Russia and China have identified what they believe to be the U.S. military's biggest vulnerability: its absolute dependence on satellite communications to deploy, direct and target distributed forces and advanced weapons. Hence, Russia and China are aggressively developing kinetic and non-kinetic weapons aimed at disabling or destroying American satellites. No matter how sophisticated or rugged their design, the handful of DoD satellites presents an adversary with a small number of targets, with the loss of even one resulting in a severe blow to capacity and national security.

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As if that weren't enough, America now faces the prospect of anti-satellite warfare by other nations like Iran and North Korea that know they can't compete with the United States on the battlefield but can deploy armies of hackers to exploit DoD SATCOM vulnerabilities.

For the commercial SATCOM sector, hackers are a common and persistent threat as well. Viasat, for example, says it defends against hacking attempts every single day.

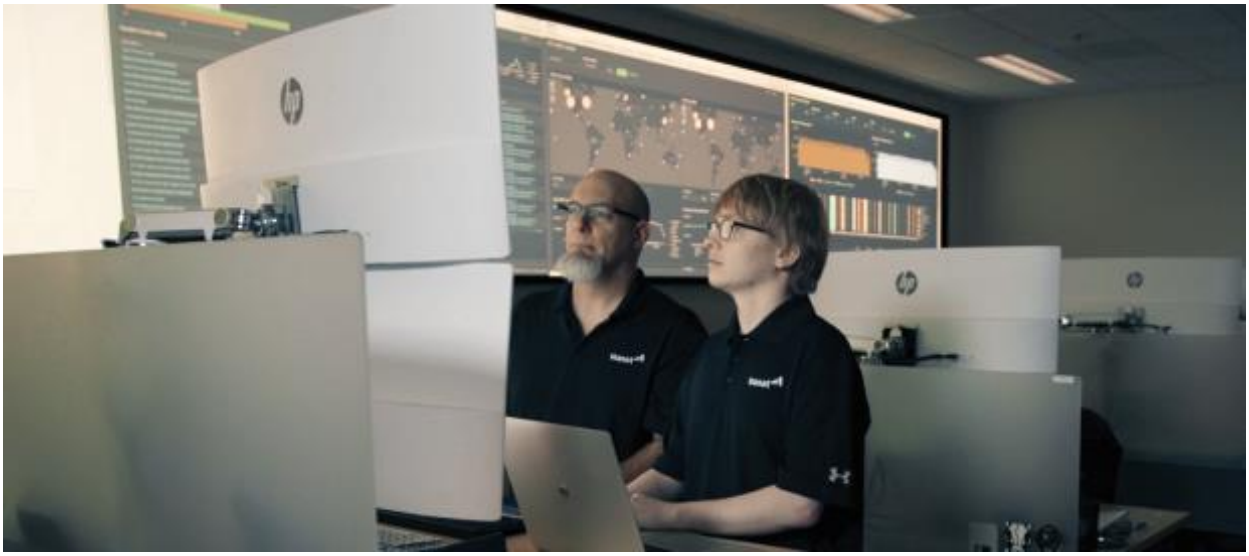
Then there is the threat of jamming. Russia in particular has invested heavily in electronic warfare, including drone- and ground-based jamming systems, and even specially-equipped Unmanned Aerial Vehicles (UAVs) that can act as fake mobile phone base stations to hijack calls.
Commercial satellite firms have been dealing with a similar problem for years. When many frequencies share a narrow spectrum, this can cause interference that is effectively the same as jamming. To keep

their frequencies clear, companies have learned how to minimize interference by boosting capacity and resiliency.

"Having more capacity equals better resistance to jamming," explains Craig Miller, CTO of Viasat Government Systems. Viasat uses many narrow spot beams adjacent in frequency, so it can minimize interference. Similar to how military communications systems employ frequency-hopping to evade jamming and interception, commercial SATCOM reroutes traffic to avoid interference and congestion.

To provide the best service and security to its customers, companies like Viasat have become vigilant in cyber situational awareness, continuously monitoring and instantly responding when they spot trouble on their networks. Their networks are designed with ample redundancy and with no single points of failure in key facilities and components such as teleports and gateways. Commercial providers routinely use advanced techniques to minimize disruption, including various interference rejection methods. To avoid giving intruders an easy road map to their networks, they guard their systems against teleport monitoring, traffic analysis and terminal geolocation. Like the military, they must keep their links secure from eavesdroppers or risk losing customers.

FIGURE 2. VIASAT REAL-TIME CYBERSECURITY: THREAT ASSESSMENT, PROTECTION, AND ACTIVE CYBER DEFENSE



THE DIFFERENCE IS CAPACITY

Ultimately, the advantage of commercial SATCOM is capacity. Commercial SATCOM has far more bandwidth than military satellite systems like the Wideband Global SATCOM (WGS) and Advanced Extremely High Frequency systems.

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The sheer capacity of commercial SATCOM offers enormous advantages, notably in redundancy. If hackers manage to partially disrupt a ~5-7 Gbps WGS satellite -- say, taking down 10 or 15 percent of capacity – the military has little extra bandwidth to work with. If 10 or 15 percent of a commercial SATCOM network with 300 Gbps or 1 Tbps capacity is disrupted, traffic can be easily rerouted and communications maintained.

Capacity is important in other ways as well. More capacity allows for higher-powered waveforms, enabling connectivity with less-efficient antennas. Capacity also makes room for cyber defense, which means DoD could avoid the delicate trade-off between communications bandwidth and communications security. Extra capacity can also accommodate unexpected surges in demand, a problem the U.S. military has dealt with in the past and will inevitably confront again. When Operation Enduring Freedom began in 2001, U.S. forces entering Afghanistan quickly used all the available military capacity, forcing DoD to scramble to lease commercial bandwidth in Asia. Yet if DoD’s purpose-built satellites do not have enough bandwidth to handle surge operations like those during wartime, then what is the alternative?

Commercial services say they have enough capacity to handle surges. Just how much spare capacity commercial SATCOM can offer is illustrated by this simple fact: even if DoD routed all its current SATCOM communications through Viasat’s emerging ViaSat-3 global satellite constellation, it would use up less than 1 percent of commercial network capacity.

FIGURE 3. REDEFINING CONNECTIVITY: THE NETWORK FOR WHAT'S NEXT

It's also important to keep in mind that the military's emerging technologies -- smart weapons, unmanned vehicles, wearable sensors for every soldier -- all rely upon secure and ubiquitous communications links. If there is one Achilles' heel of the modern military, it is that all these systems will be degraded or useless if those links are disrupted. For all the threats posed by hackers, the biggest challenge to U.S. military communications may be high demand and low supply of bandwidth, which is enabled by capacity.

That's why SATCOM privatization advocates like Peterman and Miller say they have their eye not just on satisfying what DoD needs today, but what it will need in the future. How will the DoD respond when warfighters demand high-definition 4K video of such exquisite quality that an imagery analyst can pinpoint the location of a WMD bunker or identify the face of a high-value target? What happens if soldiers are fitted with biometric sensors that continually transmit their health and status to battle command systems? What about the swarms of unmanned air, ground and sea vehicles that will need to be connected to each other and their human controllers? All of these applications will require greater SATCOM capacity, yet they only represent the needs we can anticipate. New bandwidth-hungry apps will be deployed that have yet to be conceived. "There will be a whole new level of things 10 years down the road that we haven't even thought of," Miller says.

NOT AN EITHER-OR CASE

To be clear, advocates such as Peterman and Miller are not calling for commercial SATCOM to replace military systems. There are specialized tasks, such as nuclear command and control, for which the civilian sector has no counterparts. But as Miller sees it, "If DoD can offload 90 percent of demand from military to commercial SATCOM, it can save the remaining 10 percent for the specialized missions."

And it doesn't have to be an either-or proposition. Viasat is developing hybrid adaptive networks that allow users to seamlessly switch between an array of communications networks that are constantly evolving and expanding. In that scenario, whether WGS has less capacity than ViaSat-2 or 3 doesn't

matter. Warfighters can easily move from WGS to commercial SATCOM depending on need and availability.

AGILITY IS KEY

Not surprisingly, commercial SATCOM experts believe the private sector is better positioned than DoD to meet future challenges. It is not that there is anything inherently wrong with government. It's simply that SATCOM plays to the strengths of commercial providers: a vast amount of experience in dealing with massive surges in demand, customers who are demanding when it comes to service and reliability, and most importantly, a competitive industry where survival means agility, innovation and pushing the technology envelope every day.

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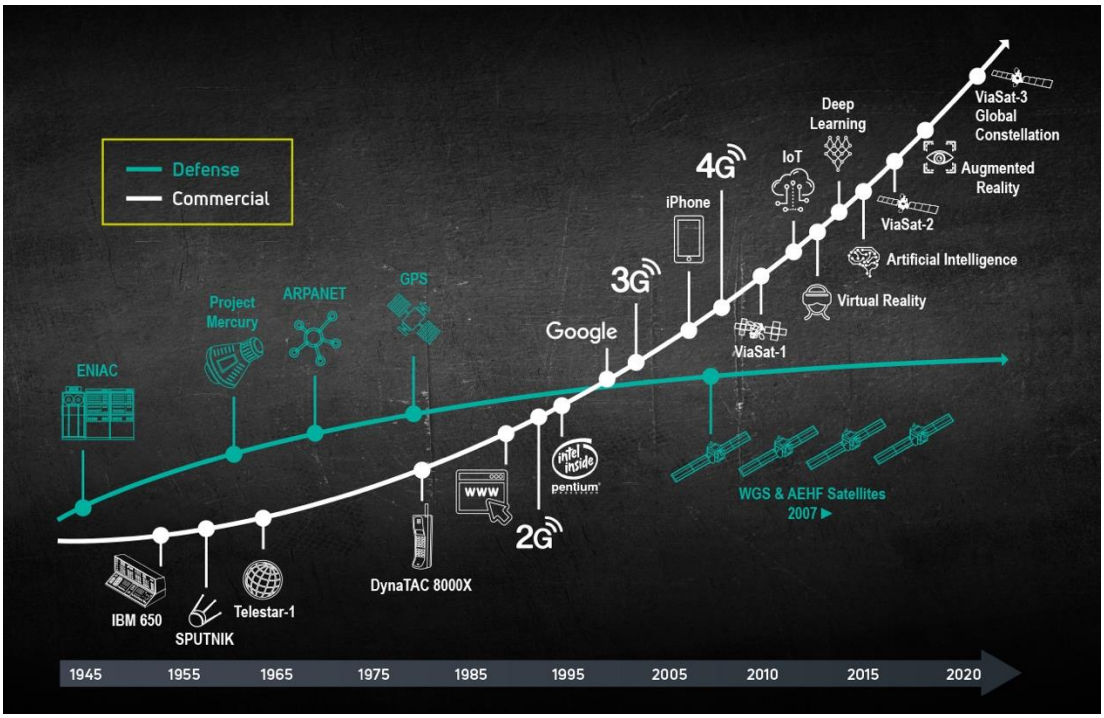
FIGURE 4. ACCELERATING INNOVATION: PRIVATE SECTOR CAPABILITIES GROWING AT UNPRECEDENTED PACE



Consider that DoD's planning for the WGS system dates back to the 1990s, before the first satellite's launch in 2007. By the time the warfighter could use it, the technology was more than a decade old. Compare that to ViaSat-3, which is currently planned to be launched in 2021, with more than triple the capacity than ViaSat-2. It is scarcely conceivable that the government could move that fast in deploying a new satellite system.

DoD has been accustomed to thinking in terms of a small number of expensive SATCOM systems. That paradigm might have worked during the Cold War, when there were relatively few users. But the trend today is toward distributed systems that are more survivable and can be rapidly scaled up to accommodate sudden bursts of demand.

Peterman likens the growth in the SATCOM industry to the development of the mobile phone or internet. The government, notably DoD, conducted the initial groundbreaking research and development. But eventually, the private sector took over, leveraging its agility to turn these technologies into commercial products that have transformed the way we live. And now, people use their phones without knowing or even being aware of what is happening in the background. Likewise, SATCOM users don't need to worry about the satellites, the technicians or the constant stress and strain of keeping the system operational despite hackers and demanding users.

“Vertical integration also plays a big part”

DoD contracts are often awarded piecemeal to internal developers and several outside companies, which can lead to compatibility issues. Thus a satellite may belong to one company, the ground station to another, and network operations and terminals to yet more providers. Commercial SATCOM firms liken this to buying the body of your next car from Ford, the engine from Chevrolet, the electronics from Toyota, and the axels and tires from Volkswagen -- and then wondering why the car doesn’t perform optimally. Alternatively, an integrated approach -- where everything from the satellite to the terminals and software are purposely designed to work together – is much more efficient.

Privatization offers a similar advantage. By letting commercial SATCOM handle the bulk of DoD traffic, which is mostly routine communications, the military can concentrate on the higher priority, specialized tasks. An integrated architecture would allow DoD to select the best available network, such as Viasat's ultra-high-capacity satellites, to meet their current and emerging needs.

“It’s about the warfighter”

Peterman wants the government to give commercial SATCOM a chance to show it can meet much of DoD's bandwidth needs. He believes that if DoD conducts a fact-based assessment of commercial technologies, the government "can harness the power of the private sector to rapidly and affordably bring these capabilities to the warfighter."

For more information on the benefits delivered by Viasat’s Satcom as a Service, please contact:

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