SATCOM For Net-Centric Warfare – November 2016

MilsatMagazine

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PUBLISHING OPERATIONS

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SENIOR CONTRIBUTORS

Tony Bardo, Hughes
Richard Dutchik, Dutchik Communications
Chris Forrester, Broadgate Publications
Karl Fuchs, iDirect Government Services
Bob Gough, Carrick Communications
Jos Heyman, TIROS Space Information
Koen Willems, Newtec

AUTHORS

Simon Davies
Charlie Kawasaki
Philip Kowng
Randa Elrich Milliron
Bryan Reid
Ryan Schradin

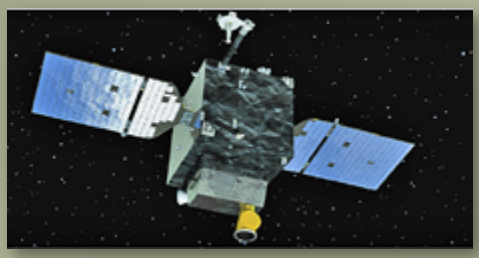
DISPATCHES

USAF's STP-3 Mission Initiates An RFP For Launch Services

The US Air Force recently released a Request for Proposal (RFP) for an Evolved Expendable Launch Vehicle (EELV) Launch Service supporting the Space Test Program (STP) 3 mission, which is scheduled to launch in June of 2019.

After extensive industry engagements, the final RFP was released with proposals due back to the Air Force no later than December 2nd, in accordance with the solicitation instructions. The Air Force will award a firm-fixed price contract that will provide the government with a total launch solution including launch vehicle production, mission integration and launch operations for this mission.

The Air Force's acquisition strategy for this solicitation achieves a balance between mission success/operational needs, and lowering launch costs, through reintroducing competition for National Security Space missions. This will be a standalone contract for the STP-3 launch service.



Orbital ATK's GEOStar-1 is the platform of the SPTSat-6 primary space vehicle for the STP-3 mission.

The STP-3 mission consists of a primary space vehicle (STPSat-6) and a propulsive EELV Secondary Payload Adapter (ESPA) holding as many as six payloads that will be identified no later than 12 months prior to launch.

The STPSat-6 space vehicle will host the National Nuclear Security Administration (NNSA), Space and Atmospheric Burst Reporting System-3 (SABRS-3) payload, and the National Aeronautics and Space Administration (NASA) Laser Communications Relay Demonstration (LCRD) payload. Additionally, seven Science and Technology (S&T) payloads are manifested by the Department of Defense Space Test Program.

This is the third competitive launch service solicitation under the current Phase 1A procurement strategy. The Phase 1A procurement strategy reintroduces competition for National Security Space launch services.

The US Air Force Space Command's Space and Missile Systems Center, located at the Los Angeles Air Force Base, California, is the US Air Force's center of excellence for acquiring and developing military space systems.

Lt. Gen. Samuel Greaves, the US Air Force program executive officer for Space and Missile Systems Center (SMC) commander, stated that through this solicitation for STP-3, SMC hopes to promote healthy competition in order to foster innovation while securing Assured Access to Space through multiple reliable, affordable and efficient launch service providers.

DISPATCHES

General Raymond To USAF Space Command

General John W. Raymond has replaced General John E. Hyten as the commander of the US Air Force Space Command during a ceremony at Peterson Air Force Base, Colorado, that occurred last month—Air Force Chief of Staff Gen. David L. Goldfein presided over the change of command ceremony.

From left, Air Force Chief of Staff Gen. David L. Goldfein passes the guidon of Air Force Space Command to Gen. John Raymond at Peterson Air Force Base, Colorado. US Air Force photo/Craig Denton.

"*General Hyten is nothing short of a pioneer,*" Goldfein said. "*When it was time to pick the next Air Force Space Command commander, General Raymond was the obvious choice.*"

Goldfein spoke of Hyten's progressive vision for the domains of space and cyberspace, calling his experience vital as he takes the helm of the nation's strategic capabilities at the US Strategic Command at Offutt Air Force Base, Nebraska.

"*To the members of the Colorado Springs community, it is absolutely wonderful to be back,*" Raymond said. "*This is the fourth time we've had the privilege to work at Peterson Air Force Base, and I couldn't be happier. To the men and women of Air Force Space Command, I could not be prouder to be back on your team. There's no other organization that does what you do, and you do it so well.*"

The vast majority of Raymond's career has focused on integrating space into the joint environment, and bringing space and cyberspace to the forefront of joint operations. Since 2007, the general has commanded the 30th Operations Group at Vandenberg Air Force Base, California, the 21st Space Wing at Peterson AFB, the 14th Air Force and led the Joint Functional Component Command for space for USSTRATCOM. Raymond revisits his space background as the Air Force Space command commander after serving as the Deputy Chief of Staff for Operations at Headquarters US Air Force, Washington, D.C.

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DISPATCHES

General Dynamics Mission Systems' Succesful Testing Of WIN-T Increments

New and improved versions of two, key, Warfighter Information Network-Tactical (WIN-T) Increment 2 capabilities have begun the test and evaluation process at US Army installations across the country by General Dynamics Mission Systems.

Integrated on HMMWVs instead of five ton FMTVs, both the Tactical Communications Node-Lite (TCN-L) and the Network Operations and Security Center-Lite (NOSC-L) feature a greatly reduced footprint and improved transportability for expeditionary operations (C-130 roll-on/roll off and CH-47 sling loadable).

The TCN-L and NOSC-L provide the same networking and network management capability to command posts while reducing the complexity to install, operate and maintain the Army's mobile tactical communications network.

Mission Systems has delivered four TCN-Ls and two NOSC-Ls to the Army to begin the test and evaluation process as part of the lead up to more formalized operational testing at the Army Network Integration Evaluation 17.2 in 2017. This testing includes wide area network transmission performance, safety and environmental and electromagnetic interference testing.

Additionally, Mission Systems is performing preliminary logistics and software evaluations on a TCN-L and a NOSC-L. Four additional TCN-Ls and one NOSC-L are currently in production and are expected to enter the test and evaluation process by the end of October.

WIN-T Increment 2 is the Army's wide-area tactical communication network that delivers voice and data services across the battlefield and entered full rate production in June 2015 and has been fielded to seven division headquarters and 14 brigade combat teams.

According to Bill Weiss, the Vice President and General Manager of the Ground Systems line of business at General Dynamics Mission Systems, these capabilities provide the Army a more agile network capability and greater expeditionary reach. Additionally, the smaller footprint will result in reduced maintenance and logistics costs, which is crucial in today's resource-constrained environment.

General Dynamics Mission Systems is a business unit of General Dynamics (NYSE: GD).

gdmissionsystems.com

Skynet Comms Stanchion For UK's Red Arrows Tour

SATCOM is going to be delivered by Airbus Defence and Space to the UK Royal Air Force's Red Arrows tour of the Asia-Pacific and Middle East which will include more than 20 flying displays.

The 12 Hawk T1s of the Red Arrows based at RAF Scampton will be performing displays and a series of flypasts across the Asia-Pacific and Middle East regions throughout October and November 2016. The Skynet constellation will provide all assured voice and data communications throughout the tour, primarily through the newly relocated Skynet 5A satellite, and the Airbus Defence and Space managed anchor station in Adelaide, Australia, which was opened in May 2016, in partnership with SpeedCast.

Airbus Defence and Space announced in September of 2015 the successful completion of the 67,000 km move of the Skynet 5A satellite from 6 degrees East to 95 degrees East.

The relocation extended the Skynet constellation's coverage and services from 115 West to 163 East, including the Indian Ocean and Western Pacific region. With the move complete, the Skynet network offers global military X-band and UHF coverage, expanding core service reach for the UK military and augmenting coalition capabilities in the region.

Airbus Defence and Space owns and operates the hardened Skynet X-band satellite constellation of eight satellites and the ground network to provide all Beyond Line of Sight (BLOS) communications to the UK Ministry of Defence.

The contract also allows other NATO and allied governments such as members of the five-eyes community (besides UK, the USA, Australia, New Zealand and Canada) to use the Skynet system to augment their existing services.

airbusdefenceandspace.com

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DISPATCHES

Kratos Defense & Security Solutions Brings DoD Into Their Service Domain

Kratos Defense & Security Solutions, Inc. (Nasdaq:KTOS) has received a Joint Functional Component Command for Space (JFCC Space) contract modification to expand RF monitoring, interference detection and geolocation services to now include all Department of Defense (DoD) leased Ku- and C-band commercial bandwidth worldwide, and X-band geolocation in select locations.

DoD relies on commercial bandwidth to support critical mission needs, including reconnaissance, surveillance and broadband communications between commanders and field units. The contract modification is valued at $6.2 million.

A component of the US Strategic Command (USSTRATCOM), JFCC Space is responsible for executing continuous, integrated space operations to deliver theater and global effects in support of national and combatant command objectives. This includes monitoring and protecting the commercial satellite bandwidth leased by DoD.

Kratos currently provides RF services for the Central Command (CENTCOM) and Pacific Command (PACOM) Areas of Responsibility (AORs).

The contract modification expands Kratos' services to include the four remaining geographic COCOMs: European Command (EUCOM), Northern Command (NORTHCOM), Africa Command (AFRICOM) and Southern Command (SOCOM).

In addition to expanding geographic coverage and infrastructure, Kratos will provide event and trend analysis of Space Situational Awareness (SSA) information for contracted DoD leased commercial bandwidth.

Kratos' Monics® carrier monitoring product.

Kratos delivers these services from an infrastructure that comprises an extensive global network of RF monitoring and interference detection sensors and geolocation systems serving a broad range of commercial and government clients.

To provide the DoD with the increased worldwide coverage, Kratos will significantly expand its current infrastructure.

The upgraded configuration will add seven new worldwide monitoring sites, host more than 60 antennas and provide visibility to over 50 satellites, 100 beams and 200 transponders.

Additionally, Kratos will add X-band geolocation capability, particularly suited to military requirements, greatly increasing the ability to support geolocation tasking on commercial and military X-band satellites in key areas of the world.

The services are anchored around Kratos' Monics®, the industry-leading carrier monitoring product and satID®, its highly accurate geolocation system.

According to Greg Caicedo, Kratos' Vice President who oversees the program, Monics uses a high-speed digital signal processing capability that makes carrier measurements against a monitoring plan, so that his company is notified whenever there is any change to a customer's terminals or bandwidth. satID is a highly accurate system where results are seen within 5 km of the interference location.

For additional insight, please read the feature article in the October issue of MilsatMagazine "*How Commercial SATCOM Managed Services Support The Military's Critical Missions*."

www.kratosdefense.com

DISPATCHES

A MUOS-5 Unfurling

On June 24th, the advanced, new, secure communications satellite—MUOS-5—that was built by Lockheed Martin was launched from the Cape Canaveral Air Force Station.

Now on orbit, the MUOS-5's two unfurlable mesh antenna reflectors manufactured by Harris Corporation successfully deployed on October 30th.

This is the US Navy's fifth Mobile User Objective System satellite and operates similarly to a global military cellular network in the sky, vastly improving current secure communications for mobile forces.

Unlike previous systems, MUOS provides users an on-demand capability to transmit and receive high-quality, prioritized voice and mission data on a high-speed, IP-based system Beyond-Line-Of-Sight (BLOS), nearly anywhere around the world.

This includes connecting into the Global Information Grid (GIG), as well as the Defense Switched Network (DSN). Once fully operational, MUOS will be compatible with, and provide 16-times the capacity of, the legacy UHF satellite system.

The antennas are the ninth and tenth Harris-built reflectors for the MUOS constellation. Harris provides two antennas onboard each satellite—a 14 meter diameter antenna to support new MUOS capabilities and a 5.4 meter diameter antenna to support legacy operations.

Harris has delivered more than 30,000 MUOS-capable AN/PRC-117G tactical radios, which will be able to deliver the enhanced capability to warfighters with a software upgrade, diplexer and an antenna kit.

This innovative and quickly-deployable solution is significantly more cost and time-efficient than procuring new radios.

harris.com/what-we-do/space-antennas

DISPATCHES

Failure Is Not An Option For USMC — Hence, These Exercises

Unwavering heat, storms and strong winds failed to halt approximately 90 Marines during a field exercise conducted by Alpha Company, Marine Wing Communications Squadron 28 aboard Marine Corps Air Station Cherry Point this fall.

The two-week exercise occurs annually to satisfy training and readiness requirements and serve as an opportunity for the Spartans to reaffirm previously learned skillsets.

Alpha Company is using enablers such as Very Small Aperture Terminals (VSAT) Large and Tactical Elevated Antenna Mast Systems allowing the squadron to deliver transmissions between satellites

"*We have different sections of Marines handling a variety of aspects for communications working together*," said Gunnery Sgt. Curtis Myers, the staff noncommissioned officer in charge of the exercise for Alpha Company. "*We have a transmissions section that locks-on to satellites for us, radio Marines that handle our single channel radio networks with the wire sections handling telephone support from the field and data Marines setting up Internet or Internet based capabilities.*"

According to Myers, once a fully operational capable date is set in stone, failure is not an option.

This field exercise allowed Marines to enhance and reaffirm lessons learned during previous training. By conducting this exercise the company of Marines was able to showcase their ability to support units while forward deployed and affirm their state of readiness.

Two Very Small Aperture Terminals (VSAT) Large, are positioned during a field exercise conducted by Alpha Company, Marine Wing Communications Squadron 28. USMC photo by Cpl. Jason Jimenez.

While conducting the exercise, Alpha Company aimed to simulate a deployed environment throughout the exercise. By simulating being forward deployed, Marines are able to gain knowledge that will be beneficial when put in a real world situation.

Myers said it was important for the junior Marines to get hands-on experience, but no matter what, there's always room for improvement.

"*It's very important to simulate that deployed environment*," said Myers. "*It's very different having to set up inside a building as opposed to in a tent.*"

A problem often faced when working from tents, as opposed to cement buildings, is unpredictable weather. Wind, water, and other elements can impact the care of the equipment.

According to Cpl. Michael Lorrey-Every, a data systems technician with MWCS-28, without communications, coordination in the field almost comes to a halt.

"*It's the little things like making sure cords are plugged into the right ports and getting the Marines used to what they need to be looking for when troubleshooting*," said Lorrey-Every. "*We want to uphold our training and readiness standards. [The field exercise] gives us the opportunity to be tested and ready when we come across unexpected situations in the field.*"

With multiple facets of communications equipment needed to work in-sync, the Marines benefit from an increased workload to heighten Marines' skillsets.

"*Marines who aren't directly involved with communications may not realize there's a lot of work that goes in to establishing communications*," said Myers. "*Call for fires, medevacs need communications to communicate back and forth to talk between the infantry side and wing side so they know where they need to go and where the planes are at. Until you go out and do it, you don't see the reasoning for it.*"

DISPATCHES

GovSat SATCOMs Service Assigned To NATO Ground Surveillance

SES' 50 percent owned affiliate GovSat has secured a long term commercial satellite communications contract to support the operational phase of NATO Alliance Ground Surveillance (AGS).

The contract is for an end-to-end service and includes the delivery of satellite capacity in commercial Ku-band—largely coming from the SES fleet—as well as associated capacity management services.

These services support the Command & Control and sensor data communications required by NATO Global Hawk vehicles over the AGS operational area.

The AGS system consists of air, ground and support elements performing all-weather, persistent wide-area terrestrial and maritime surveillance in near real-time.

AGS will be able to contribute to a range of missions such as protection of ground troops and civilian populations, border control and maritime safety, the fight against terrorism, crisis management and humanitarian assistance in areas affected by natural disasters.

GovSat is a public-private partnership between the Luxembourg Government and SES and offers capacity leases and related 24/7 secure operations from facilities with EU and NATO clearances to governments and institutions.

GovSat's first satellite, GovSat-1, is currently under construction and is scheduled for launch in 2017.

govsat.lu

THE MOBILE BATTLEFIELD: THE IMPORTANCE OF COTM & BLOS

By Simon Davies, Chief Executive Officer, Spectra Group (UK) Ltd.

You are faced with the command and control of widely dispersed forces, often in a mobile role, in a hostile environment.

Terrestrial communications networks do not exist or have been destroyed. Deploying ground based repeater stations, due to the tempo of battle and resources to support them is not possible. So what do you do in this challenging situation?

With real-time Command and Control (C&C) and situational awareness crucially important for any mission success, armed forces have a need for cost-effective, Communications-On-The-Move (COTM). Satellite is the ideal technology to provide real-time reliable Beyond-Line-Of-Sight (BLoS) communications between troops on the ground and also strategically back to Headquarters.

With high tempo, short duration deployments becoming more common, Spectra Group (UK) has noted a sharp spike in interest in the firm's innovative man-portable global communications products.

Founded in 2002, Spectra is established as a specialist provider of satellite communications with their SlingShot® and SHADE™ products deployed with small military teams on operations, or peace support missions in remote areas.

The unique SlingShot system, developed and brought to market just three years ago, has rapidly risen to prominence. The lightweight 'bolt-on' comms package is now widely used, with more than 2000 units having been supplied to more than 15 armies in regions as diverse as Central and North America, Europe, Africa, the Middle East, Far East and Australia.

SlingShot is mainly being used by Special Forces and, with the unit's BLoS and COTM capabilities, is ideally suited to a mobile battlefield situation. That is really the differentiator—there is absolutely no need to halt to establish crucial communications. Users can continue to move and communicate wherever they may be located.

A tier 1 SOF operator recently stated that "*SlingShot/L-TAC, because of the reliable COTM, enables us to change the way we carry out operations, it is effectively a Game Changer.*"

SlingShot is a revolutionary advance in the provision of satellite capability to tactical radio users. For many years, there was an awareness that UHF TacSat is a limited resource only available to a small number of high priority radio users. Due to such limitations, a premium price results.

UHF TacSat is also limited in the ability to provide reliable COTM. As a result of this, Spectra worked with Inmarsat to develop a complementary service offering a service that would provide a global solution for armed forces that required BLOS COTM.

In October 2012, confirmation was received from Inmarsat that they could provide an L-band lease service that met company requirements, and from this we developed a SlingShot working prototype within one month that delivered a TacSat capability using a commercial satellite constellation.

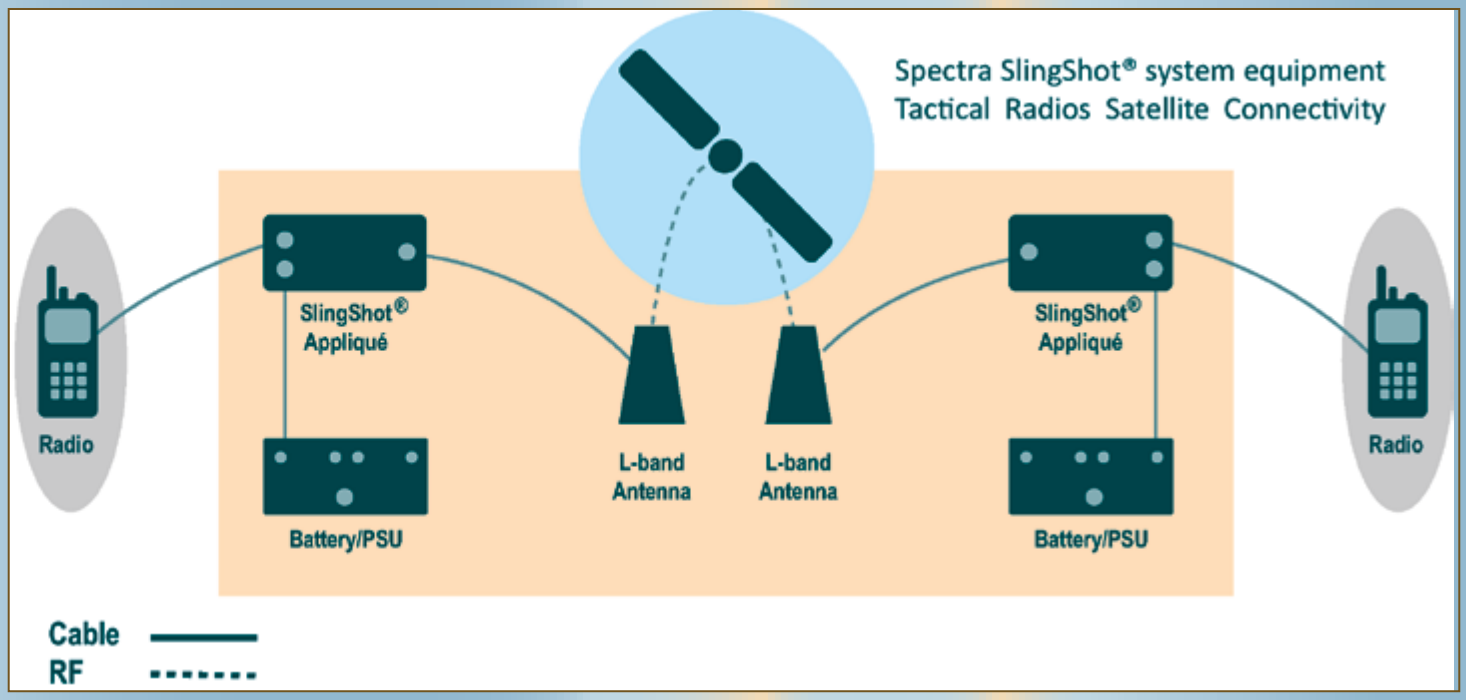
Interest in this capability grew quickly as defense users around the world understood the benefits of a capability that provided BLOS global connectivity using secure tactical radios. The system would enable VHF (Military and Commercial) radio users, for the first time, to have access to BLOS SATCOM. In the past, these users have relied on ground based or airborne repeater stations.

Spectra's small and lightweight system enables in-service government and military radios to operate over commercial L-band satellites to provide users with voice and data capability over tactical, theater and strategic distances on existing equipment. By using secure SATCOM, the need for easily targetable ground based repeaters, or expensive airborne repeaters, is removed and personnel can deploy rapidly and unencumbered.

Slingshot uses Inmarsat's L-TAC™, which provides a flexible service to cater to current, high tempo, operational requirements. The nature of the coverage offered by L-TAC allows beams to be booked on a flexible monthly basis and with the capability of having large, narrow beams, or more specific, multi-headed beams. Such flexibility greatly adds to the ability to move fast and respond to adapting situations.

The I4 satellite constellation covers most of the globe, with the exception of the poles. Inmarsat's L-TAC service delivers dedicated bandwidth. This guarantees quality of service (QoS) and, combined with the SlingShot system, means that even on the edges of the beam, voice and data communication is not compromised.

With Manpack, Vehicle and Maritime systems already established, Spectra launched an Aviation capability offering Command and Control Communications from all platforms.



Unlike other BLOS systems, SlingShot delivers robust voice and data COTM, and now with the aviation development, the same capability on fixed wing aircraft and helicopters can be offered.

Also, in the Spectra portfolio of products, The SHADE (Spectra Hostile Area Deployment Environment) system has been created for small teams needing rapid deployment delivery and availability of 24/7, plug-and-play IT services across any available bearer.

This is a communication system that has been designed to enable multiple nodes to rapidly deploy and deliver voice and data services across any bearer to SHADE Central, a UK hub providing connectivity to the World Wide Web, ISDN, PSTN or dedicated private networks.

This network is fully redundant and SHADE Central is duplicated to provide a fully redundant service.

spectra-group.co.uk

Simon Davies is the CEO of Spectra Group (UK) Ltd. Spectra is a leading provider of Voice and Data services into remote and hostile areas world-wide for Defense, Governmental and Non-Governmental sectors.

Upon leaving the Military in 2004, Simon established Spectra, which has achieved steady growth over the past 12 years even through difficult economic times and is fast becoming a leading Service Provider of reliable, robust, deployable communications. Spectra's services are deployed world-wide in some of the world's harshest environments supporting the UK Military and European Union, Stabilization Unit, to name just two recipients of Spectra services.

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www.dodsatcom.com

GOVSAT INSIGHTS:

C3ISR CAPABILITY & CONNECTIVITY ANYWHERE

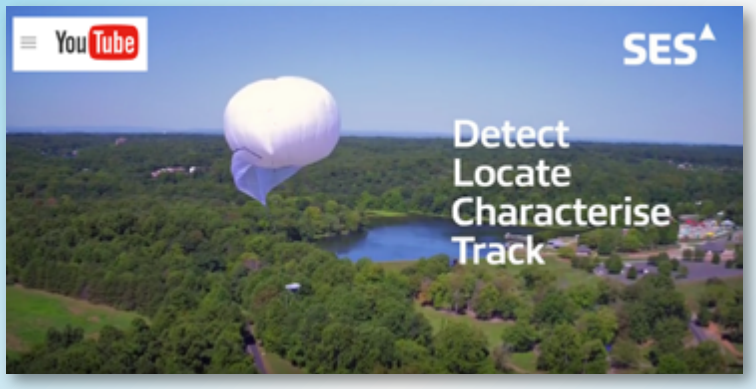
By Ryan Schradin, Executive Editor, GovSat Report

Recently, I had the opportunity to witness a new and exciting solution being demonstrated that will augment the way the US Government (USG) approaches ISR, disaster response, homeland security, disaster recovery and connectivity in theater.

This new solution is a transportable satellite-enabled, lighter-than-air inflatable aerostat that is capable of supporting multiple government organizations, military branches and use cases across the entire C3ISR (Command, Control, Communication, Intelligence, Surveillance and Reconnaissance) mission area.

The new TPS—or Tactical Persistent Surveillance—solution takes an inflatable aerostat platform, many of which are in use across the globe for reconnaissance, and adds connectivity via the SES satellite constellation.

This connectivity, by way of one of the world's largest constellations of MEO and GEO satellites, adds significant capability to the aerostat and opens up a new range of possibilities in the field.



SES Tactical Persistent Surveillance Solution video... select the graphic to play...

The new SES TPS platform is capable of supporting multiple government organizations, military branches and use cases across the entire C3ISR mission area. Photo is courtesy of SES.

Capable of deploying in just minutes, and staying deployed for 60 days on a full provision of helium, the new TPS can do more than deliver video reconnaissance to a screen on the ground.

Using satellite connectivity, the TPS can beam real-time, HD video to any location on the planet. Working in tandem with other TPS solutions, this can provide situational awareness over a wide area to senior decision makers.

The revolutionary new SES TPS platform is capable of supporting multiple government organizations, military branches and use cases across the entire C3ISR mission area.

Depending on the payload attached to the aerostat, TPS can also be used to deliver broadband connectivity to those in the unit's immediate vicinity. This is where some of the truly amazing use cases might come into play.

BETTER & MORE

When disaster strikes connectivity is necessary for ensuring the safety of individuals on the ground. Communications are required to keep all parties collaborating and sharing information. That connectivity can truly be the difference between life and death for both citizens and first responders alike.

Leaders must be aware of the dangers that may stand in the way of a successful disaster response or rescue mission. TPS provides senior decision makers with enhanced situational awareness to those charged with providing help.

For instance, TPS units acting in concert can provide the real-time video intelligence or broadcast a 3G, 4G, WiFi, and/or WiMax signal over 20 miles—each effect creating a dome of connectivity powerful enough to deliver voice, data and video collaboration to those in the field.

This capability is critical in environments where terrestrial networks are knocked out. TPS offers private, secure, and resilient Command, Control and Communications (C3) even in environments where local infrastructure is degraded, destroyed, or oversubscribed.

HUMANITARIAN & REFUGEE RELIEF

This particular use case is extremely important today with the refugee crisis impacting Syria and other nations as a result of political unrest and war.

With the ability to survey and broadcast video intelligence anywhere in the world, the TPS can enable coalition military forces to keep a watchful eye over refugee camps while enabling the delivery of basic services, additional security forces and resources when and where necessary.

With an aerostat in the air above the camp and a strong wireless network signal being broadcast around them, telemedicine and distance learning services can be offered to refugee camps via video teleconferencing (VTC). Additionally, based on the available payload, the TPS could effectively make life safer and better for refugees who are already dealing with difficult circumstances.

ON THE MOVE

TPS is capable of providing a less expensive means to rapidly deploy C3ISR capabilities as well as the means to gather and disseminate intelligence in theater.

The new TPS—or Tactical Persistent Surveillance—solution takes an inflatable aerostat platform, many of which are in use across the globe for reconnaissance, and adds connectivity via the SES satellite constellation. Photo is courtesy of SES.

Expeditionary forces that simply don't have the resources to use terrestrial networks for voice, data and video connectivity can effectively utilize the TPS to construct a 1,000 foot cellular tower that provides them with all of their collaboration and information sharing needs within minutes. The TPS solution is easily towed as a single trailer.

This means that high-bandwidth IT services and capabilities can be deployed quickly and effectively anywhere coalition forces are stationed or on patrol. When deployed, the TPS can provide reconnaissance for miles at a fraction of the cost of a traditional UAV.

The satellite connectivity of TPS ensures that all video intelligence gathered can then be distributed anywhere in the world—even to senior military decision makers back at home. These are just a few of the almost unlimited use cases of the TPS.

A PIECE OF HOME

We've come to expect an incredible amount of connectivity as Americans. When we're at home, we have high bandwidth connections and WiFi networks to allow us to connect mobile devices and smart devices from anywhere in and around our property. When we're on the road, we expect that the only way to lose a cellular signal from our provider is to move far, far off the beaten path.

However, that's not what our government employees, military personnel and coalition partners experience in the austere and disaster relief conditions when they find themselves abroad.

The demonstration of the satellite-enabled TPS was truly amazing to me. Seeing the aerostat deployed and the services that it could deliver made something abundantly clear—we're entering an age where IT is critical and where a network can literally be deployed immediately in any place and at any time.

Additional information is available at these links...

SES launches surveillance and communications system

Tactical Persistent Surveillance (TPS) overview video

*These articles are republished, courtesy of GovSat Report (**ses-gs.com/govsat**), and Executive Editor Ryan Schradin. He is a communications expert and journalist with more than a decade of experience and has edited and contributed to multiple, popular, online trade publications that are focused on government technology, satellite, unified communications and network infrastructure. His work includes editing and writing for the GovSat Report, The Modern Network, Public Sector View, and Cloud Sprawl.*

His work for the GovSat Report includes editing content, establishing editorial direction, contributing articles about satellite news and trends, and conducting written and podcast interviews. Ryan also contributes to the publication's industry events and conference coverage, providing in-depth reporting from leading satellite shows.

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NSA "COMMERCIAL SOLUTIONS FOR CLASSIFIED" ADDRESSES KEY US ARMY IN-THEATER COMMS CHALLENGES

By Charlie Kawasaki, Certified Information Systems Security Professional (CISSP) and Chief Technology Officer, PacStar

Currently, setting up a network in a brigade command post takes hours and requires 17 boxes of 1,000 feet CAT 5 cable, which weigh a total of 255 pounds, and specialized raised flooring.

Like the cabling, the flooring adds weight, footprint and set up time to the command post and takes up vital air cargo and truck cargo space. Why is this a problem? For starters, units often need to change base locations during combat operations to outmaneuver the enemy or avoid attack, requiring the entire command post to be moved, or jumped. The command post has to be set up in phases, with tent infrastructure, generators, network servers and satellite shots established first, after which soldiers run the cable to provide the local area network (LAN) to support the command post. This leads to long delays in availability of critical information services—and vulnerability during that time.

As the Army is rapidly developing numerous, new, network-based battle systems to take advantage of innovative technologies and applications, the complexity of command posts and information services provided to the warfighter continues to increase. These new technologies provide our soldiers with more situational awareness and information capabilities, but they come with a cost—a requirement to forward deploy those services. These added compute and networking resources lead to an even slower deployment.

WIRELESS TO THE RESCUE

The US Army is now developing and testing a variety of wireless technologies including WiFi and LTE to eliminate the delays in setting up command post networks. By going wireless, command posts can eliminate cabling and reduce network set up and tear down times from hours to minutes, making jumps faster and safer.

Lt. Col. Joel Babbitt, product manager for WIN-T Increment 1, which manages the command post wireless capability, recently noted the value of wireless to operations: "*Now, directly after the tents go up, units can turn on the WiFi 'hotspot' and bam—they have a LAN. Instead of the network coming up last, now the network comes up first. Wireless reduces a unit's most vulnerable time period. Plus, by eliminating LAN wiring, the need for specialized flooring is eliminated, reducing setup time further.*"

WIRELESS IS NOT NEW, IS IT?

While IT professionals and civilians are highly experienced with the benefits of WiFi and LTE for business and personal use, WiFi and LTE have not been widely available to the warfighter due to information and cybersecurity issues and expense.

However, benefits are becoming available to soldiers for mission use cases, thanks to the recently launched National Security Agency (NSA) "*Commercial Solutions for Classified*" (CSfC) program.

CSfC enables organizations to transmit classified information using commercial-grade encryption solutions, eliminating the need for expensive, difficult-to-use classified equipment. The enabling technology for this program is an architecture that consists of two layers of Suite-B cryptography, therefore these systems are often referred to as Suite B solutions.

Specifically, this program allows commercial smartphones, tablets and laptops to be used to access classified information over WiFi and LTE.

In addition to these breakthrough capabilities, the CSfC program enables access to classified information using inexpensive, commercial technologies, providing additional benefits such as:

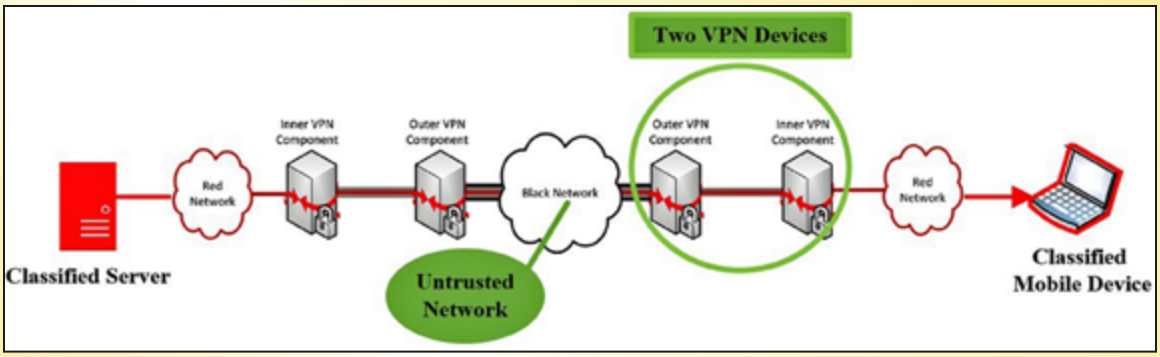
- *Significantly reduced equipment costs*
- *Simplified equipment handling/security procedures*
- *Simplified key management*
- *Simplified personnel training*
- *Enablement of US coalition partners to access classified information without taking possession of controlled cryptographic items (CCI)*

Previously, the only means to transmit classified information was via expensive, controlled, military grade encryption devices that required extensive handling procedures that proved awkward for mobility applications.

The simplified diagram on the following page shows a conceptual architecture of a laptop connecting to a classified server, over an untrusted (wireless) network, with two CSfC-approved VPN encryption solutions on either side of the untrusted network. Of note, the two VPN devices circled in green can be software running on the mobile device—enabling a software-only solution on the mobile device.

WHAT, EXACTLY, IS CSFC?

CSfC is a program that enables the US Army and other Department of Defense (DoD) and government organizations to design and propose network solutions for classified information access using commercial technologies. The CSfC program consists of a set of core technical requirements,



configuration requirements, test requirements, administration requirements and processes as shown in the overview below.

The overview above includes the following main CSfC-related components.

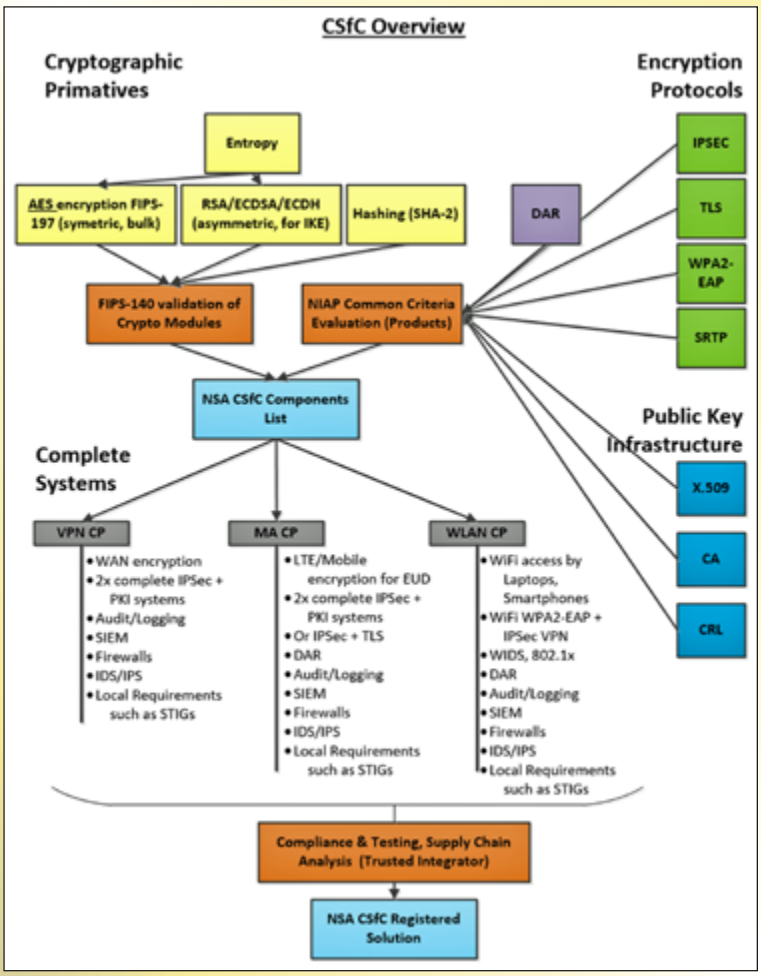
- *Shown in yellow, the "Cryptographic Primitives" are the approved algorithms and mathematics the NSA will allow for transmission of classified information*
- *Shown in green, the "Encryption Protocols" are approved to conduct communications between devices that transmit encrypted data. Most used today are VPN solutions providing data-in-transit encryption*
- *Shown in purple is "DAR" (Data-at-Rest) encryption technology. This type of technology is used to encrypt data stored on media such as hard drives, flash drives, etc.*
- *Shown in blue is "Public Key Infrastructure", the approved technologies and protocols required to manage trust, encryption key generation and sharing*
- *Shown in brown are key validation and testing processes required by the CSfC program in order to comply with CSfC rules*
- *Shown in small gray boxes are the main NSA CSfC "Capability Packages" (CPs) specifying the required architecture, component and technical requirements, testing and personnel roles that must be followed and documented*
- *Shown in light blue are the two major "approval" statuses of technologies. The first is a listing of approved commercial (OEM) components that may be included in solutions. The second and final light blue box shows a completed solution, approved by the CSfC program and ready for deployment*

While the CSfC program has the potential to transform communications for the soldier by enabling wireless, there is one significant issue: complexity. The CSfC program requires solutions to include comprehensive suites of security technologies at the command post or datacenter, and the CSfC program mandates the technologies are provided from different vendors. This creates a system configuration, management and training burden most organizations are under-equipped to solve.

SOFTWARE SOLUTION

A solution the US Army Wireless Command Post program is using to address the added complexity and training burden imposed by the two layers of encryption and extensive security requirements is PacStar's IQ-Core Software. Using the firm's newly released CSfC Plug-in, IQ-Core Software simplifies the setup, configuration, and management of the underlying equipment and devices used in CSfC solutions. The software provides a base level of capabilities including:

- *Enable the deployment of CSfC solutions, with attendant benefits, while reducing the amount of added complexity and training*
- *Provide a unified interface ("a single pane of glass") to underlying equipment from multiple vendors*
- *Provide means to monitor multiple sets of equipment, in fixed/branch offices and tactical settings, enabling lightly trained operators to manage the equipment*



The IQ-Core Software CSfC Plug-in adds functionality specifically designed to make CSfC manageable.

VPN Setup Wizards
IQ-Core Software VPN setup and certificate generation wizards reduce the complexity of providing the correct information to the CSfC devices by providing step-by-step wizards, insulating lightly trained users from dealing with the command line interfaces and multiple UIs across the underlying devices.

VPN Monitoring/Troubleshooting
IQ-Core Software VPN monitoring capabilities include the ability to display, in real time, the connection and configuration status of one or more VPN devices. Within the status is an indicator of the active authentication and bulk encryption settings in use ensuring the connection is compliant with CSfC rules.

Certificate Management
The IQ-Core Software CSfC Plug-in automates the process of managing device certificates, a process that is error prone and requires extensive training. Reducing the opportunity for errors in this process helps ensure communications uptime and allows security administrators to focus on more important tasks. IQ-Core Software capabilities related to CSfC certificates include:

- *—Generation of certificate signing requests*
- *—Display of certificate details and expiration dates, including expiration alerts*
- *—Encrypted transmission of certificate signing requests*
- *—Management of the signing process at either the deployed systems or at the NOC*
- *—Management/monitoring of certificate authorities*
- *—Providing certificate revocation checking via built-in OCSP and CDP functions*

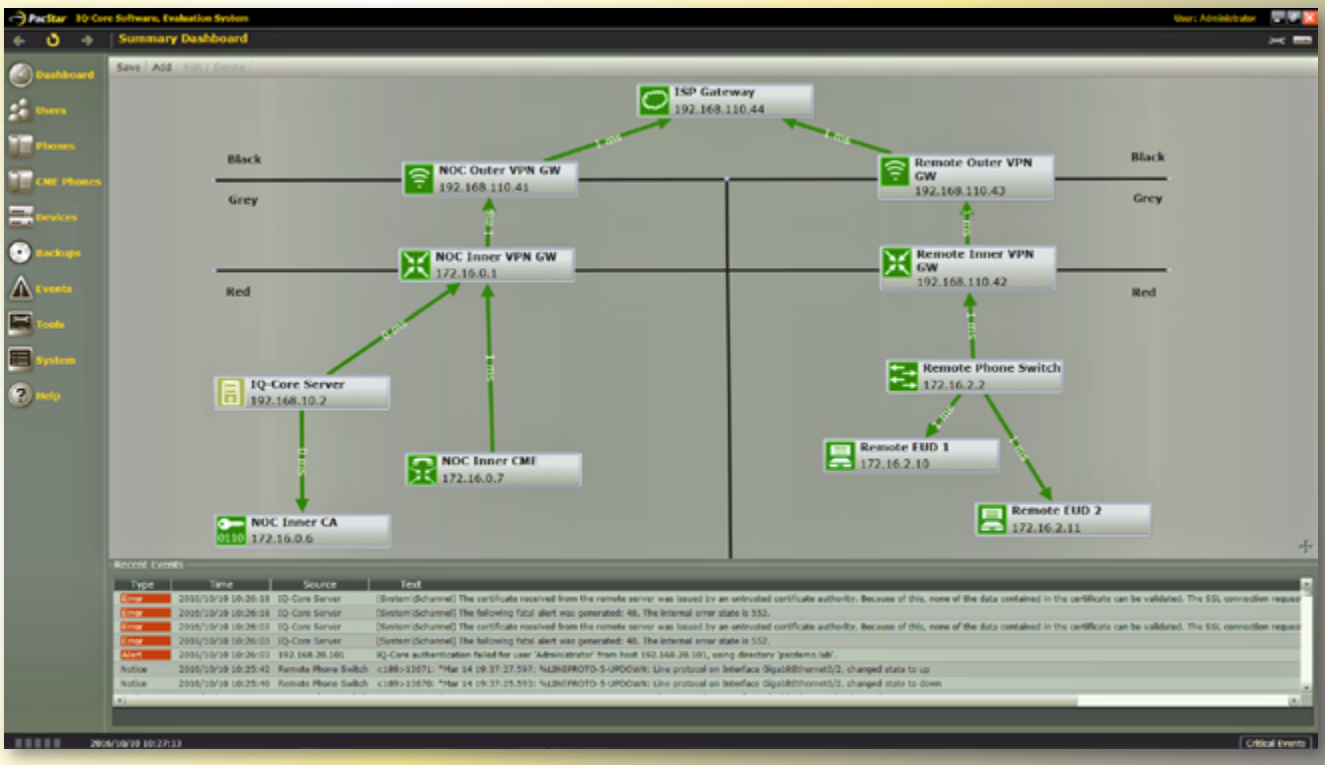
By using management solutions such as the software platform described above, the US Army is deploying CSfC solutions and gaining the benefits of WiFi and LTE in tactical settings, reducing command post setup time and enabling new classes of wireless applications, while limiting management complexity and training burdens.

pacstar.com

Charlie Kawasaki joined PacStar in early 2005 to lead the company's technology strategy and future product roadmap for its proprietary product lines. He continues in that role today. Charlie has extensive experience in product development, software engineering, technology licensing, patent development, business development, product marketing, general management and M&A.

Prior to joining PacStar, Charlie provided his expertise to early stage technology companies, where he created dozens of software solutions in such industries as Internet infrastructure, cybersecurity, energy management, software utilities and relational databases. Charlie served as CEO of RuleSpace, Inc., which created world-leading technology for Internet parental controls applications used by companies such as AOL, Yahoo, SBC, BellSouth, and Microsoft. Before RuleSpace, he held product development and engineering management roles at The Palace, Inc., Creative Multimedia Corp., Central Point Software, Inc., Asymetrix Corp. and Microrim, Inc.

Apart from his various company roles, Charlie has a career long commitment to economic and industry development through association board service, including Software Association of Oregon, Regional Alliance for Infrastructure and Network Security, and Smart Grid Northwest, where he currently serves as development chair.



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Information on 19,000 executives in the commercial satellite industry.

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Finds HPA size, uplink power requirements, bandwidth and power usage per carrier.

Calculates atmospheric losses and rain fade margins for any desired availability on uplink and downlink.

Handles BPSK, QPSK, M-PSK or M-QAM with any FEC code rate.

Determines power or bandwidth limited modes and calculates the power equivalent bandwidth, if appropriate.

Provision for RS codes or 'Turbo' modems. Option for rain up AND rain down scenarios where uplink and downlink are from/to the same city.

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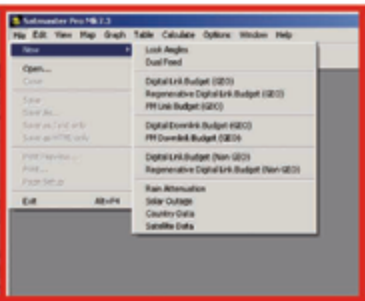


http://www.satnews.com/satfinder

HOSTED PAYLOADS OFFER REMEDY FOR USAF WEATHER FORECASTING GAP

By SatCom Frontier Editors

The importance of accurate weather forecasting to the Air Force can't be overstated. *"Weather can be our greatest ally or our strongest adversary,"* the service says in a pitch to recruit weather officers.

History provides evidence of both points. A sandstorm forecasted five days in advance prompted a change of plans that aided the successful US attack on Baghdad in 2003. Conversely, a surprise sandstorm contributed to the collision of a transport plane and a helicopter in the unsuccessful attempt to rescue US hostages in Iraq in 1980.

Why, then, is the Air Force aborting their pitch to the satellite industry to cope with looming gaps in collecting high-priority weather data? Why is the service turning to an international partnership to gather data when industry offers a solution: hosted payloads.

With an aging constellation of weather satellites, and with the loss of Defense Meteorological Satellite Program Flight 19 (DMSP 19) in February, only two years into its five-year designed life, the Air Force issued a Broad Agency Announcement earlier this year, asking for help from the satellite industry, according to various news articles.

These stories said the Air Force sought solutions to problems anticipated in cloud characterization, needed in long-range operations, and theater weather imagery, used in forecasting and battlespace awareness.

Options were expected to include new weather satellites, international partnerships or buying commercial weather data. Solutions were to be implemented by 2019. Deadlines were set for late summer and fall, with contracts to be awarded in December.

However, four months later, in answer to concerns about the future of forecasting capability, the Air Force sent Congress a long-term weather satellite strategy that relies on international partnerships and data from new satellites from Europe, India and Korea, according to an August 29th *Space News* article.

The missive to Congress outlined a plan using 23 satellite programs over the next decade to meet 12 of the Air Force's most pressing weather forecasting gaps. The plan also calls for a new Air Force weather satellite program that begins in 2022, with replacement satellites launching every five years.

A LESSON OF MILITARY TACTICS FAILING TO KEEP UP WITH TECHNOLOGICAL CHANGES

By Philip Kwong

> ***"Progress is impossible without change, and those that cannot change their minds cannot change anything."***
> **—George Bernard Shaw**

We are in the midst of the Golden Age of Space. Revolutionary technologies are currently being introduced that will change how we communicate, relate, and see the world. The US government must change its concept of how to use these space capabilities to take advantage of new technologies and stay ahead of potential adversaries.

Global Hawk RPA

History provides many examples when military tactics failed to adjust to changing technologies. One comes from 1849, when Claude-Etienne Minié, a French army officer, wanted to make the muzzle loading rifle more reliable.

Minié designed an oblong cylindrical bullet with a point at one end and a hollow base that expanded when fired, significantly increasing accuracy and lethality over much longer distances as compared to its round, lead-ball predecessor.

This was a military game-changer. Long held strategies, tactics and concepts of operations that had been developed for the shorter range and awful accuracy of the muzzle ball no longer applied. However, the military strategists of the time did not adapt.

Even after the British used the better bullet design with devastating effects against the Russians in the Crimean War (1853-1856), these lessons were largely ignored. By the time of the American Civil War in 1861, both Union and Confederate forces were using the "Minié ball" but had not abandoned the tactics from the American Revolutionary War that called for tight formations of men which would approach to within 50 to 100 yards of each other before firing.

The problem was that the Minié bullet could now hit targets accurately at 400 yards. This made these tactics practically suicidal and contributed to the high death toll of the Civil War.

This reluctance to change tactics was not limited to the American military. The lessons from the American Civil War were also largely ignored by Europe, contributing to the

Apparently the reason for the about-face, according to Winston Beauchamp, the deputy undersecretary of the Air Force for space, was that "*we have a very robust capability internationally, and weather data is one of the less sensitive missions when it comes to sharing.*"

Lost in the shuffle was an opportunity to use weather forecasting capability to change the way the Air Force conducts its space business. With hosted payloads, the service could own a weather apparatus it can control and depend on, as it has for decades.

Using hosted payloads would disaggregate satellite capability, answering a need for resilience measures that is a part of every satellite discussion these days. The Air Force also could use existing infrastructure and have more launch flexibility—both leading to more timely implementation.

All of those elements can be accomplished with less expense than this latest plan to use non-US satellites, an important consideration in increasingly austere times.

The Air Force might well consider a decision four years ago by the Australian Defence Force, which decided to buy ultra high-frequency (UHF) communications capability aboard Intelsat 22, which launched in 2012.

Artistic rendition of Intelsat 22

The military has talked about hosted payloads for some years now, but has done little to support the idea, claiming issues such as an established defense architecture in programs of record and a lack of integration in concepts of operations (CONOPS).

Addressing the upcoming Air Force weather forecasting gap is a chance to open a new road to space operations, one that can pay rich dividends in the future while solving a problem that needs to be addressed now.

staggering casualty rates in the early phases of World War I in 1914—a half century after the American Civil War ended.

Large organizations are resistant to change. But the lesson here is that a delay in updating concepts of operations to current technology can have devastating results.

Today we see a revolution in satellite technology. High Throughput Satellites (HTS), such as Intelsat Epic^{NG}, provide an estimated 300 to 400 percent improvement in throughput over traditional wide beam satellites. Low Earth Orbit (LEO) satellites, such as OneWeb, have very low latency and target speeds of 4G+—10x faster than the targeted 512kbps of other planned LEO satellites.

To face the challenges of the future, the US government and the military should work with the commercial space industry to understand how to best integrate this technology and change concepts of operations quickly to leverage these new capabilities. Today's standard of two to four years to change CONOPS and update airworthiness, even for a software patch, are far too long.

A good example of leveraging this technology is by making better use of remotely piloted aircraft (RPAs)—the time has come to think beyond the "*Dull, Dirty and Dangerous*" justification for RPA missions:

- *Start by making RPAs essential tools for immediate, responsive ISR supporting any warfighter mission—from combat to humanitarian instead of settling for the current 2-4 Mbps from RPA feeds, planners should think of bandwidth throughputs of 10 Mbps by using HTS—50 Mbps is feasible by using more efficient waveforms (available now) and even faster speeds in the future*
- *These high throughputs will enable a broad range of different sensors tailorable to the unique mission requirements from traditional electro-optical to hyperspectral imaging, and wide-area, persistent surveillance—video resolution beyond HD to UHD is possible*
- *With this robust bandwidth throughput, RPAs can operate effectively as airborne relays and command and control enablers*

It is not only RPAs. On the ground, this increased bandwidth can enable mobile Wi-Fi hot spots along with Bluetooth wireless tools that can support monitoring body cameras and other "wearables" displaying what every soldier sees. The technology can also monitor their vital functions and locations in real-time, useful for training as well as post-event analysis. Achieving the goal of "every soldier as a sensor" is within reach.

The lesson of the Minié ball still resonates today. Our adversaries are leveraging new technologies now and we must adapt our military thinking and CONOPS faster to adjust to the demands of the modern battlefield.

intelsatgeneral.com/

THE HUNT FOR CYBER THREATS... A DISA PERSPECTIVE

John Hickey, the cyber development director for the Defense Information Systems Agency (DISA), at a recent Federal Computer Week Security Summit in the District of Columbia, said, *"Anyone trying to secure their networks must have some kind of hunt capability."*

Hunt capability is the ability to rapidly discover and eradicate threats that try to evade defenses. Hickey described three components of DISA's hunt capability, people—in the form of Cyber Protection Teams, security integrated in the cyber environment, and identity and access management.

CYBER PROTECTION TEAMS

DISA and the Joint Force Headquarters-Department of Defense Information Networks (JFHQ-DODIN) focus on the hunt mission and put significant emphasis on training cyber protection teams (CPTs), whose job it is to maintain oversight of that mission.

"*The tools available today have seams and gaps, and the enemy is vast, large and global with time and space [to plan and execute], just as in all military operations*," said Hickey.

By training cyber warriors inside the environment, inside key terrain, DISA is reinforcing the skill sets needed to hunt down threats that evade existing tools.

The CPTs under DISA's control receive extensive training, to include immersion training alongside red teams—whose mission is to find vulnerabilities—during exercises and deployments.

All CPTs also receive enhanced training on tools and systems such as the Joint Regional Security Stacks (JRSS), Big Data Platform, Cyber Situational Awareness Analytic Capabilities, which provide the CPTs broad visibility from access points across the DODIN.

INTEGRATED SECURITY

"*It is key to have security early on in our environment, from the development of new technologies to knowing who we allow on our networks*," said Hickey.

Highlighting the recent milCloud 2.0 request for proposal (RFP), Hickey underscored that the emphasis on security and the agency's need for industry to deliver those capabilities in an integrated manner were in the forefront.

He also said JRSS, and fielding it in a joint manner, is his priority, because the solution provides critical visibility all the way to the end points of the network.

"*DISA is correlating all the information, coming in from both unclassified and classified [occurrences], to report where we are from a compliance standpoint in how we've configured our boxes, including servers and workstations*," Hickey said. "*The other critical piece is how well we're patching those [access points]. We need industry's help to develop a more automated means to patch.*"

IDENTITY MANAGEMENT

Protecting networks largely rests on who is allowed to access them, said Hickey.

Public Key Infrastructure (PKI) is still one of the best defenses against adversaries because of the difficulty of breaking into a system requiring a strong credential. DISA is also working on derived credentials and form factor initiatives to support identity management for mobile devices, including tablets and laptops.

Insider threats exist, but learning and knowing user patterns, and key access controls, can help protect against them.

"*If you're not paying attention to your privileged users, you're down the wrong path*," Hickey said.

Adversaries, regardless of their origin, are going after credentials, which gives them access to key information. Whether they gain entry through a phishing attempt, or as an insider, the credentials are the literal key. Once in, they will move laterally through the networks to seek out stronger credentials for further access.

Thwarting these attempts is done through heavy monitoring, from the inside and is dependent upon knowing who has credentials and why, and which back-end tools are available to conduct monitoring.

Hickey concluded by challenging industry and mission partners to not rely on boundaries and barriers when it comes to network defense. Instead, he urges new views and perspectives, based on new technologies, and increased understanding of who has access to our developmental and operational environments.

"*There are some really interesting developing technologies in this area that could allow us to view these threats and protections much differently*," said Hickey.

disa.mil

About DISA's JIMS Structure

The Joint Incident Management System (JIMS) is an application on the Secret Internet Protocol Router Network (SIPRNet) that provides information assurance computer network defense incident management.

JIMS is available for data entry via a SIPRNet website and/or service/capability for users (United States Cyber Command and Tier 2 computer network defense service JIMS unified Web services providers (CNDSPs)) to report, track, and search for incident tickets. In addition, JIMS provides the visualization and information sharing of incident ticket information along with the ability to enter and query data, track incidents, and generate reports via the web.

JIMS is mandated by Chairman of the Joint Chiefs of Staff Memorandum 6510.01B, The Incident Handling Program, to be used by USCYBERCOM to monitor and Tier 2 CNDSPs to enter reportable Department of Defense (DoD) information assurance computer network defense (IA/CND) incidents.

Through JIMS, mission partners have the ability to gain situational awareness regarding reportable cyber incidents across the DoD.

JIMS is the only system mandated for use, in accordance with CJCSM 6510.01B by USCYBERCOM to monitor/search cyber incidents and for Tier 2 CNDSPs to enter reportable DoD cyber incidents.

JIMS is a robust, scalable incident management system that leverages best-of-breed open source commercial off the shelf and computer network defense CND data standards. It provides the incident management community with:

- *Enhanced control, consolidation, and coordination of analysis activities*
- *Improved collaboration*
- *Better data fidelity*
- *Improved automation and data access*

disa.mil/Cybersecurity/JIMS

LAUNCHING INTO SPACE 3.0… AN INTERORBITAL SYSTEMS PERSPECTIVE

By Randa Relich Milliron, Co-Founder and Chief Executive Officer, Interorbital Systems

Lowering rocket manufacturing and launch costs is the goal of many firms and entrepreneurs within this industry as the drive to access New Space—or, Space 3.0—becomes more and more important to revenue health.

SPACE 3.0

"Unlike Government exquisite systems (Space 1.0) or commercial exquisite systems (Space 2.0), Space 3.0 is being driven by venture-backed startups that are leveraging a variety of converging factors to produce a new wave of affordable products and services. From reliable space access to new analytics for remote sensory data, startups are disrupting current processes and establishing a new space ecosystem."—***cosmiqworks.org***.

CosmiQ Works is an IQT Lab that explores how the US government can leverage new and emerging commercial space capabilities against national security problems.

A concise description of Space 3.0 is available from the technology challenge lab CosmiQ Works, which defines this new movement as the natural progression from the 'exquisite' systems of 'Space 1.0'—government-driven, unlimited funding models such as the Apollo and Space Shuttle programs—to 'Space 2.0'—comprised of 'exquisite' systems' from the commercial sector from firms such as SpaceX and Orbital Sciences, which remain, for most of the globe's population, well out of reach for private-citizen access to space.

'Space 3.0' is an environment wherein the upstarts who noted that the Space 2.0 entities as still extortionately priced burst onto the scene with revolutionary concepts to further drive down launch costs. The new price levels provide an affordable gateway for space entrepreneurs targeting the military/agency/government (MAG) and commercial domains with the intention of creating businesses or applications that exploit the new economic zones.

Enter player IOS with their scalable NEPTUNE launchers and new ultra-low-cost modular, mass-produced, unitized space launch vehicles and satellite kits. After 20+ years of engine and rocket systems development, prototyping, hot-firings, and test-flights, IOS could well become the poster-child for 'Space 3.0'

IOS explores rather unconventional methods of conducting launches and the gamble pays off through the avoidance of established spaceports and by offering nimble and totally mobile launch–on-demand services through the firm's self-contained, ocean-based spaceport and "Floating Launch" concept of operations. The company creates disposable, deeply discounted and radically simplified 'smart' rocket systems that win in the price-war arena.

Due to IOS' minimum cost design and modular mass-production manufacturing philosophy and methodology, the company is experiencing a launch booking upswing that has six of their NEPTUNE N3 and one N8 launch vehicles fully manifested for the 2017to 2018 time period.

The scalability of all of the rocket systems and the firm's Concept of Operations (ConOps) are proving to be attractive to a number of Department of Defense (DoD) interests that are seeking to increase their testing and operational capabilities, chiefly in the realm of smallsat communications and ad hoc, rapid–response constellation node deployment from any ocean-based location on the planet. IOS additionally possess the ability to conduct mobile land-based launches with the same dexterity, reach, and mobility the firm envisions for all ocean-based orbital launch operations.

LEO AND LUNAR MISSIONS

IOS, in collaboration with world-renowned interplanetary trajectory and orbit designer, Ed Belbruno, is developing a lunar-impact mission that will be attempted in 2017.

Dr. Belbruno, the founder and CEO of Innovative Orbital Design, Inc. (IOD), is calculating a lunar trajectory that has a minimum reaction-mass requirement. The payload will be based on IOS' TubeSat and CubeSat technology.

The mission, designated the "Lunar Bullet," will feature a lunar-direct trajectory that ends with a hard impact on the Moon's surface. During the lunar approach phase of the mission, HD video will be continuously transmitted to Earth until impact.

The project will be similar to the NASA Ranger mission from the 1960s. The Lunar Bullet be the first payload launched by a commercial rocket company to the surface of the

A single Common Propulsion Module (CPM) sounding rocket on its mobile launcher. Bundling three of the CPMs produces the Neptune (N3) orbital rocket.

moon. The IOS/IOD mission will also serve as a precursor to Interorbital's launch of Team SYNERGY MOON's Google Lunar X PRIZE mission, with that attempt slated for the end of 2017. The Lunar Bullet Mission will verify IOS' launch and interplanetary navigation technology.

The launch vehicle for the "Lunar Bullet" mission will be the bipropellant liquid IOS NEPTUNE 3 (N3) rocket, which will include an updated version of the company's Common Propulsion Module, the CPM 2.0.

Each CPM 2.0 is assembled from an array of four carbon-filament-wound tanks, a single gimballed engine, a valve and controller unit, and a fairing. The CPM 2.0's four-tank array includes three propellant tanks and a single pressurant tank to provide regulated pressurant flow during the operation of the rocket engine.

CPM 2.0 has been shown to have substantially improved engine performance. The N3 is a four-stage launch vehicle that is constructed by bundling three CPM 2.0s. The third- and fourth-stages are composed of a series of IOS Minerva I solid rocket motors.

The N3, which has a payload capacity of 23 kg to 310 km, and the N5, which has a payload capacity of 60 kg to 310 km, will be used for the upcoming launches of IOS' 137 manifested satellites.

IOS has completed the design of their Google Lunar XPRIZE (GLXP) launch vehicle for Team SYNERGY MOON, which will be assembled from eight CPM 2.0s and will include enhanced-performance rocket engines that will each deliver 20,000 pounds (88,960-newtons) of thrust. The launch vehicle has been designated the N8 LUNA and is capable of launching 500 kg (1,102 lb) into LEO or a 12 kg (26.5 lb) payload to the surface of the Moon.

CURRENTLY IN BUILD

Two CPMs are currently in build mode: one is designed for a low-altitude guidance system flight test and the other for a full-performance, space-altitude suborbital (up-and-down) flight to test all communication and control systems as well as the satellite deployment unit for in-flight and in-space performance evaluation.

Also in-build are modules for two NEPTUNE 3 (N3) orbital launch vehicles—one for IOS' first orbital launch of 12 smallsats set for mid-2017 (the date is launch-license dependent) and the other for the Lunar Bullet mission.

Prior to December 31, 2017, Interorbital will make an attempt at winning the Google Lunar X PRIZE using a NEPTUNE 8 (N8) enhanced rocket to send a lander and rover for Interorbital's GLXP Team SYNERGY MOON for a soft landing on the Moon.

SATELLITE KIT AND LAUNCH PROGRAM

IOS offers Personal Satellite Kits: a TubeSat which is circular in form factor, and a CubeSat, which is cubic. These kits have all of the components and instructions needed to build a working satellite that is small enough to fit in the palm of one's hand.

The price includes launch of the smallsat on a NEPTUNE rocket in a ride-share arrangement. The number of satellites carried depends upon the number and mass of the satellites, the altitude, type of orbit to be used as well as the configuration of the NEPTUNE launcher employed—N3, N5, or N8.

Kits for complete smallsats are readily available for less than the price of a car and they may be acquired by any interested party, from military and government organizations to students to those whose interests are purely commercial in nature. There are a few countries to which kit export cannot occur, due to US regulations.

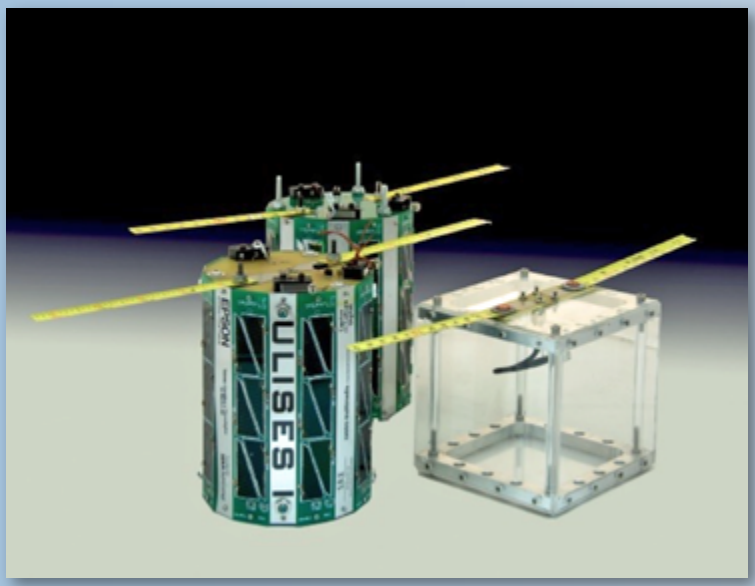
Orbital smallsat launches are projected to start in mid-2017. IOS currently launches clients' test satellites to low-altitude for testing in preparation for their orbital missions. These suborbital launches inform the satellite owners how well their spacecraft can handle the rigors of flight, G-forces, vibration, and so on, before they are placed into orbit.

IOS now has a total of 137 satellite units booked for orbital launches, with many clients having multiple satellites on the company's launch manifest. For a complete list of current customers, please see ***http://interorbital.com/interorbital_06222015_014.htm***.

Wes Faler, from NASA CubeQuest Challenge Team MILES, said, "The launch slot I've secured with Interorbital is instrumental in the 7 digit funding of a new company and suborbital flights are the critical path to proving our technology."

THE IOS APPROACH

IOS notes well the 'market pain' that drives Space 3.0 chiefly as encompassing a vast field of potential customers who possess no low-cost space-access and/or infrequent launch opportunities with only a secondary payload status available to them.



IOS TubeSat and CubeSat kits.

The current industry solution to these problems is RideShare, which is far better than no-ride. However, this temporary fix may still not be affordable for smallsat start-ups and independents and is not always ideal. As a secondary-payload, usually the client has no control and must consent to be dragged along for the expensive ride to the primary-payload's possibly undesirable orbit.

Interorbital's solution to this situation is to provide abundant Launch-on-Demand using the firm's NEPTUNE Modular Rockets for dedicated smallsat launches, and employing its private, completely mobile land- and sea-based spaceports as the operation bases.

All payloads are treated as primary, not secondary concerns. These ultra-flexible launch services, combined with IOS' satellite kits, are the catalyst that can take the customer from a PowerPoint abstraction and transforms the possibilities to one of performance, from the self-empowering construction and launch of a personal satellite, to designing, launching, and operating a 60 satellite constellation.

The estimated size/value of Interorbital's niche market runs well into the billions of dollars; 137 CubeSat and TubeSat payloads; seven sold-out space launches; pending orders that include two CubeSat constellations of 60 and 80+ smallsats; eight planned lunar missions; two 6-U escape velocity missions; and pending military orders—these bookings into 2020 speaks well about the company's viability and ability to meet market demand.

Interorbital's 2017 technology objective is to conduct an LEO launch for under $1 million when the firm's modular, dedicated smallsat rocket system is operational. All components of the rocket system are made in the US and Stage-II of the IOS NEPTUNE rocket has already successfully flown.

CLOSING 2016

IOS milestones for 2016 include completing the refinements to guidance system software and hardware in preparation for hot-fire field-test of the gimbal system, which is to be followed by testing the guidance system in flight. A CPM 2.0 is currently in-build for that next flight.

To implement low-cost mass-production techniques, IOS is nearing the completion of the development and testing of an innovative, carbon-composite, filament-winding machine, developed in-house. This unit is expandable and capable of winding tanks with a maximum diameter of 30 inches (76 cm) and a maximum length of 30 feet (9 meters).

Interorbital is largely self-funded through the sales of satellite kits and launches. The 137th satellite kit and launch was sold in the first week of November.

The company's presence at the Mojave Air and Space Port in California has recently been expanded to four buildings. One is to be expressly used for the mass-production of carbon composite, filament–wound, rocket tanks and for CPM manufacture. The company is now hiring additional technicians for the production ramp-up demanded by IOS' 2017 launch commitments.

interorbital.com/