

SATCOM For Net-Centric Warfare – September 2016

MilsatMagazine

Space Mission Force
Helping The DoD Modernize
Spaceplanes That Never Were...
New Technologies Acquisition
Exceeding Expectations
MILSATCOM 2016
Cross Domain Collaboration

United Launch Alliance's Delta IV launch of the USAF's AFSPC-6 with a payload of two orbital patrol satellites. Photo is courtesy of United Launch Alliance.

MilsatMagazine

September 2016

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DISPATCHES

AFSPC-6 Climbs To Sensitive Orbit

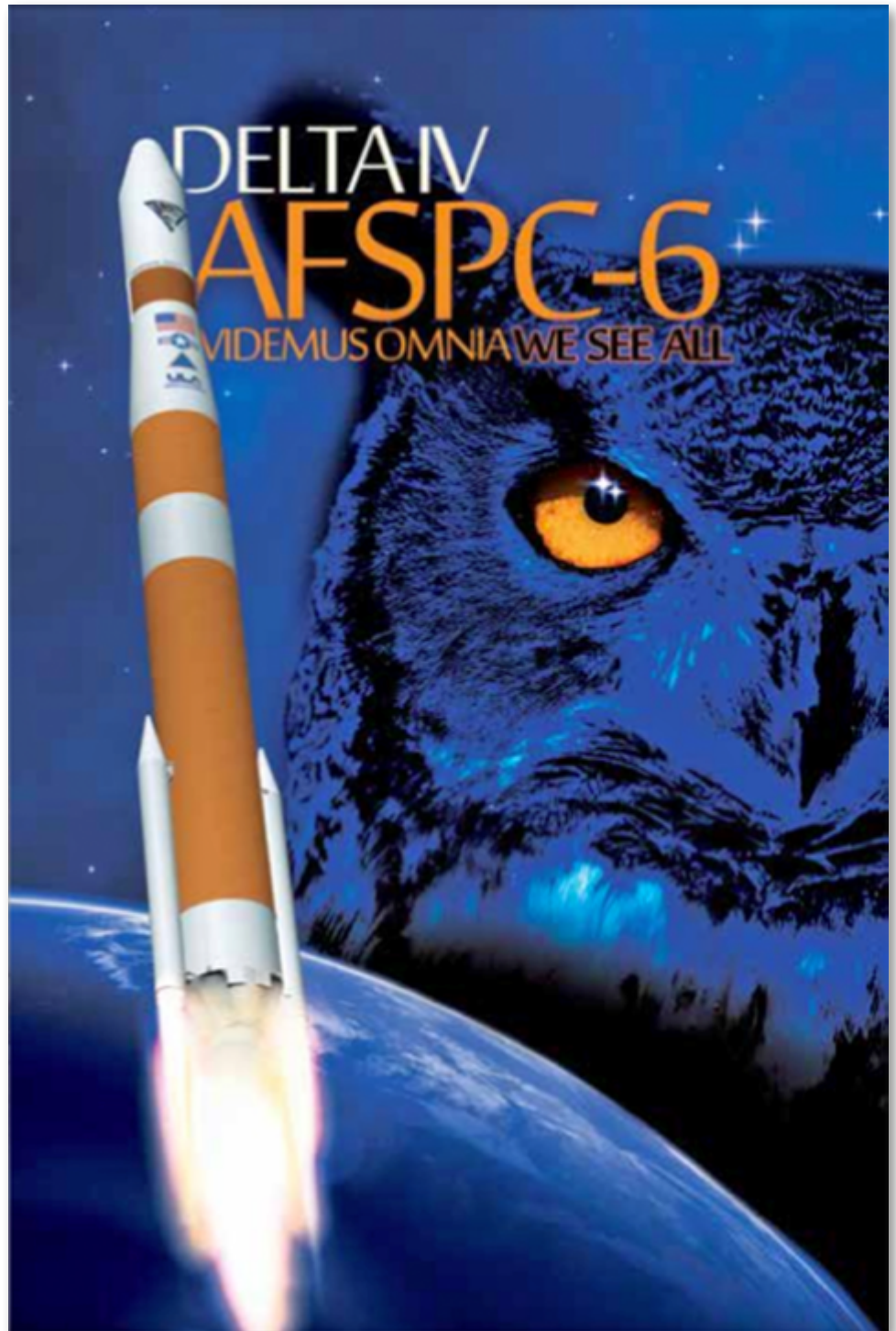
A United Launch Alliance (ULA) Delta IV rocket that carried the AFSPC-6 mission for the United States Air Force lifted off from Space Launch Complex-37 on August 19th at 12:52 a.m. EDT—this was ULA’s seventh launch in 2016 and the 110th successful launch since the company was formed in December of 2006.

“Thank you to the ULA, Air Force and industry partners for the outstanding teamwork and flawless execution that made today’s mission a success,” said Laura Maginnis, ULA vice president of Custom Services. “This morning’s AFSPC-6 launch is a prime example of why our customers continue to place their trust us to launch our nation’s crucial space capabilities.”

This mission was launched aboard a Delta IV Medium+ (4,2) configuration Evolved Expendable Launch Vehicle (EELV) powered by one common booster core. The common booster core was powered by an RS-68A liquid hydrogen/liquid oxygen engine producing 702,000 pounds of thrust. A single RL10B liquid hydrogen/liquid oxygen engine powered the second stage. The booster and upper stage engines are both built by Aerojet Rocketdyne. ULA constructed the Delta IV Medium+ (4,2) launch vehicle in Decatur, Alabama.

The AFSPC-6 mission consists of twin Geosynchronous Space Situational Awareness Program (GSSAP) spacecraft, built by Orbital ATK. The new satellites will join the first two GSSAP spacecraft launched approximately two years ago aboard a Delta IV launch vehicle.

GSSAP is a space-based capability that collects space situational awareness data, allowing for more accurate tracking and characterization of man-made orbiting objects. There is a clear, unobstructed and distinct vantage point for viewing resident space objects orbiting Earth in a near-geosynchronous orbit without the weather or atmosphere disruptions that limit ground-based observations.



The data from GSSAP greatly improves the ability to rapidly detect, warn, characterize and attribute disturbances to space systems in the geosynchronous environment.

The EELV program was established by the US Air Force to provide assured access to space for Department of Defense and other government payloads. The commercially developed EELV program supports the full range of government



A ULA Delta IV rocket awaits the launch command at Cape Canaveral Air Force Station Space Launch Complex 37. Photo is courtesy of United Launch Alliance.

mission requirements, while delivering on schedule and providing significant cost savings over the heritage launch systems.

"Today's successful launch will enhance our capabilities in space situational awareness and our space-based space situational awareness architecture," said Lt. Gen. Samuel Greaves, SMC commander and Air Force program executive officer for space. "We will continue our unwavering focus on mission success and guaranteeing assured access to space for our nation. Congratulations to the AFSPC-6 integrated team and all mission partners on a successful launch."

The satellites join a GSSAP constellation currently supporting US Strategic Command space surveillance operations as a dedicated Space Surveillance Network sensor.

The GSSAP also supports the Joint Functional Component Commander for Space by collecting space situational awareness data, allowing for more accurate tracking and characterization of man-made orbiting objects.

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

portfolio includes the Global Positioning System (GPS), military satellite communications, defense meteorological satellites, space launch and range systems, satellite control networks, space based infrared systems and space situational awareness capabilities.

Additionally, the 45th Space Wing supported this successful launch of the third and fourth Orbital ATK-built Geosynchronous Space Situational Awareness Program satellites for the US Air Force with weather forecasts, launch and range operations, security, safety and public affairs. The wing also provided its vast network of radar, telemetry and communications instrumentation to facilitate a safe launch on the Eastern Range.

www.ulalaunch.com



Photo captured from the AFSPC-6 launch infocast, courtesy of ULA.

DISPATCHES

OnePath Is On The Correct Path

Harris CapRock Communications answered the growing demand for bandwidth in the cruise, energy and commercial maritime industries with the launch of its OnePath long-range wireless radio.



This radio provides a unique mode of complementary connectivity to Very Small Aperture Terminal (VSAT) technology and provides higher throughput and increased redundancy.

The radio enables a fully secure, localized wireless data/voice network

complete with traffic management. OnePath provides first/last mile connection and can close links in excess of 160 km with appropriate heights and the radio is equipped with operating modes for Point-to-Point and Point-to-Multi-Point applications.

Licensed or unlicensed spectrum options are available, with throughputs of up to 400 mbps. OnePath features:

- **Data rates of greater than 400 Mbps**
- **Reaches distances of 160 km or more**
- **Embedded or external device encryption for security**
- **Web-based user interface for configuration & monitoring**
- **Multiple links can be bonded for additional coverage**

Matthew Broida, vice president, marketing, Harris CapRock, said, *"The OnePath radio solution offers best-in-class throughput performance and spectrum efficiency and is lightweight, rugged and easy to deploy. It offers extremely low latency to ensure rapid delivery of high bandwidth applications including VoIP, real-time video, teleconferencing and sensor traffic."*

The OnePath radio offers a robust, always-on communications experience delivered by a secure, optimized network that is supported by a worldwide, redundant infrastructure.

www.harriscaprock.com/onepath-radio/

DISPATCHES

Goodbye GPS SVN-23... Satellite Heads To Higher Orbit



The USAF's 2nd Space Operations Squadron bid goodbye to Global Positioning System Satellite Vehicle Number 23 via final command and disposal at Schriever Air Force Base, Colorado, on August 26, 2016.

Older, less capable satellites, such as SVN-23, are moved into a disposal orbit at end of life to reduce risk to the GPS constellation, and to create space for more satellites.

As GPS satellites do not carry the amount of fuel required for de-orbit maneuvers, they are instead pushed to a higher orbit, roughly 1,000 kilometers above the operational GPS orbit.

SVN-23 has a unique story, as its journey of almost 26 years came with a rough beginning—it severely malfunctioned in its initial orbit. 2 SOPS contractors Bruce Carlson and Mike O'Brine were on the operations floor when the satellite's solar array stopped working.

At the time, the operators realized the design flaw in the vehicle. If they did not correct the malfunction, SVN-23 would have additional failures, which could actually endanger their ability to dispose of it.



Photo: Lt. Col. Peter Norsky, 2 SOPS commander, encourages his team on the operations floor during the final command ceremony of Global Positioning System Satellite Vehicle Number 23 at Schriever Air Force Base, Colorado, Friday, August 26, 2016. Norsky insisted the survival of the "bird" was because of the space operator crews who man their stations 24 hours a day, 365 days a year.

Photo is courtesy of the US Air Force photo and 2nd Lt. Darren Domingo.

In 2005, a decision was made to allow normal operations on the B side of the solar array drive and miraculously it worked for the remaining 11 years of life on the vehicle.

The extra care and diligence with SVN-23, through hundreds of operators and contractors, sustained the 25-year-old satellite's life to the final command Friday, a bit of a marvel, since the design life of the spacecraft was only supposed to be 7.5 years.

The team had to switch the solar array's mode to the second drive motor to save the vehicle's life.

Capt. Aaron Blain, 2 SOPS DOA (analysis) flight commander, said that this is actually a story of the men and women who've been keeping these vehicles alive much longer than expected.

The launch occurred on the 26th of November in 1990 and early orbit operations were completed in the early part of December. The satellite was stabilized and, 12 hours later, the A side of the solar array drive failed.

According to Bruce Carlson, the crew asked, hey, what's up with this, and the reply was "Oh, it looks like the solar array appears to have failed to power off conditions. We'll just power it back on and it will come back on. Oh wait, it didn't." That was a fun day or two when that happened, he added.

O'Brine commented that for the next 14 years, twice per orbit, a technique was run called scissoring, where (during) orbit dawn and orbit dusk, the solar arrays were manually commanded back and forth, all from a ground command.

Lt. Col. Peter Norsky, 2 SOPS commander, said, "This is just an incredible event and I'm really proud that you all have put so much into (SVN-23) and every single one of our birds. Having something last this long is truly a testimony to (our) operations. Every single day that you are all on the ops floor, you're contributing to things like this, so thank you for what you do."

Story by 2nd Lt. Darren Domingo, 50th Space Wing Public Affairs, USAF

DISPATCHES

Russia Jamming Up The Works

In a story posted at *Sputnik News*, Russia has now developed a system that can block enemy electronics.

The report states that an integrated jamming system to screen strategic facilities from cruise missiles, smart bombs and drones using GPS, GLONASS, Galileo and Beidou global positioning systems for homing, has entered service with the Russian armed forces.

This was originally reported in the Russian newspaper *Izvestiya*—they cited a Defense Ministry source in Moscow.

Dubbed as POLE-21, the system consists of jamming modules installed on mobile phone towers that operate as a single whole to cover entire areas, making them impregnable to satellite navigation systems.

In addition to being powered by a tower's circuit, the Pole-21 modules also use their GSM antennas as a backup channel for signal control and transmission.

"The system has already been successfully tested and is now operational," the source told the newspaper.

All of the four global positioning systems whose signals are effectively deflected by Pole-21 work within the 1176.45 and 1575.42 MHz range.

Even a 20 watt transmitter is enough for Pole-21 to jam all signals in this range within a radius of 80 kilometers.

Pole-21 has one downside, however; while generating radio interference against the enemy using the GPS satellite navigation systems, the system also affects the domestic users of GPS and the Russian GLONASS.

DISPATCHES

Real-Time Info Access For DoD End-Users From SES

A satellite beam operating at less than 200 milliseconds per round trip, a full duplex symmetric 155 Mbps link, gateway access, a transportable 2.4 meter AvL terminal, terrestrial backhaul, installation services and 24x7x365 operations and maintenance activities, that's what SES Government Solutions (SES GS) will provide to a US DoD end-user via a new contract.

SES S.A. has revealed that SES Government Solutions (SES GS), a wholly owned subsidiary of SES, has been awarded this contract to provide an O3b Networks high throughput, low latency satellite communications solution for the government customer.

The contract also enables the US Government to order additional O3b services to meet surge requirements.

Operational benefits of the solution include the capability to transfer large files from remote locations in just minutes instead of hours.

Cloud-based applications and information can be used nearly anywhere in the service area. End-users will be able to view simultaneous high definition (HD) videos providing situational awareness to commanders.

This real-time information access may enable better-informed, life-saving decisions in the field.

This is SES GS' second US Government customer to use O3b Networks' services this year.

The National Oceanic and Atmospheric Administration (NOAA) was the first US Government agency

to sign an agreement with SES GS, that one for an O3b high throughput solution at the Pago Pago National Weather Service Office in American Samoa. This service has been delivering critical information since May of 2016.

According to Pete Hoene, the President and CEO of SES GS, with SES's recent acquisition of O3b, the company is uniquely positioned to offer scalable, game-changing Medium Earth Orbit (MEO) high throughput, low latency and global Geosynchronous Earth Orbit (GEO) communications products and solutions. This is a clear differentiator for SES GS and the firm's US Government customers.

www.ses-gs.com/

ViaSat To "Pump Them Up"



ViaSat must have been on the US Navy's 'radar' when the Space and Naval Warfare Systems Command (SPAWAR) recognized ViaSat Inc.'s expertise and awarded them a sole source contract for engineering, technical services and hardware/software products in support of the US Navy's joint Ultra High Frequency (UHF) military satellite communications (satcom) system.

Under this SPAWAR contract, ViaSat will help support the sustainment and modernization of the joint UHF military SATCOM network integrated control system, UHF satcom channel controllers and user terminals.

In addition, ViaSat will provide a path to a modern crypto design for next-generation UHF terminals.

This award highlights the US Government's commitment to maintaining the long-term viability of proven UHF systems; ensuring Navy warfighters have ongoing support and access to proven communications technology when in the battlespace.

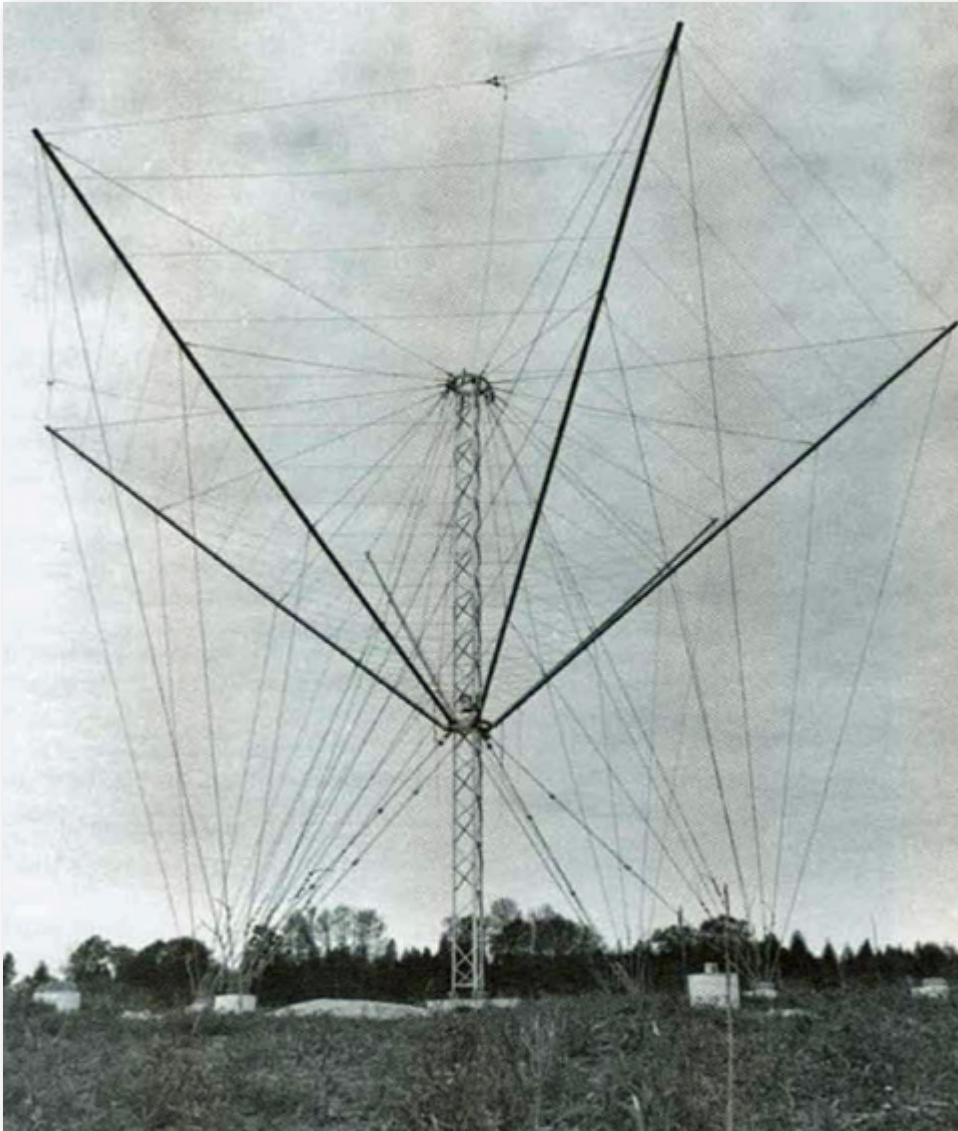
Ken Peterman, Senior Vice President and General Manager, Government Systems Division, ViaSat said in an interview, *"UHF military SATCOM has a long history enabling beyond line-of-sight communication across the battlespace, and provides a solid, 'always available' communications solution."*

"This award reflects the Navy's commitment to using proven UHF radios and channel controllers already deployed worldwide, mitigating risk with non-fielded communications systems in order to ensure continued and enhanced capabilities for the warfighter many years into the future."

www.viasat.com

DISPATCHES

CPI's ASC Signal Division Sees Their Spira-Cone™ Heading To Indonesia



CPI's ASC Signal Division Type 3000 Series GRANGER™ HF Broadband Multi-Mode SPIRA-CONE® antennas.

An antenna that does its job is invaluable and in demand, which has been proven most recently by the ASC Signal Division of Communications & Power Industries LLC's (CPI) with their high-frequency (HF) unit.

ASC Signal has been awarded a contract for four Model 3005 Spira-Cone™ HF antennas in Indonesia by Pratama Wahyu Teknik (PWT), a communications systems integrator headquartered near Jakarta.

Model 3005 HF antenna system was first developed to meet a requirement by the US Navy for a low-profile antenna to replace older, rotatable log-periodic antenna systems. This model includes mode voting technology, which is widely used in non-commercial HF systems, and extends the use of that technology into the commercial sector.

PWT will use the Model 3005 Spira-Cone™ HF antennas for air-to-ground communication and navigation

purposes for the Indonesian National Directorate General of Civil Aviation for RDARA, the Regional and Domestic Air Route Area coverage agency in Makassar and Merauke, Indonesia.

Although this is CPI ASC Signal Division's first project for PWT, the new contract is not its first project in Indonesia nor the region as they have been supplying antenna systems to the Southern Pacific region for approximately 12 years.

Their projects include the provision of state-of-the-art antenna products to Australian aviation authorities and the Indonesian military through large, multi-national original equipment manufacturers.

Keith Buckley, president of CPI ASC Signal Division commented, "*The Southern Pacific region relies heavily on air transportation for a variety of its social and economic needs, and it is vital that it has access to reliable, proven technology for aviation communications and navigation applications.*"

"CPI ASC Signal Division's HF antenna systems are trusted components of aviation systems throughout the region. We are honored that Pratama Wahyu Teknik, a world-class integrator, has recognized our Model 3005 technology as optimal for its system needs in Indonesia, and we look forward to a productive relationship."

www.cpii.com/ascsignal

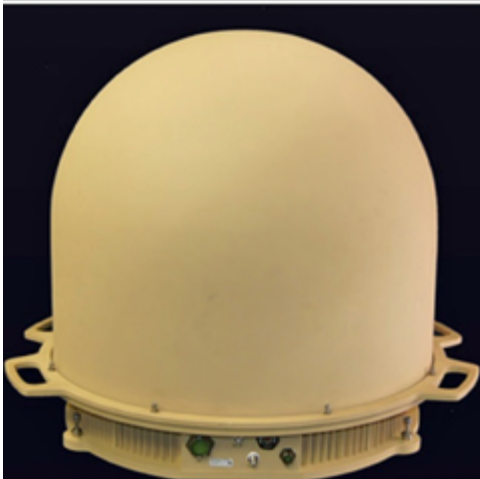
www.pratamateknik.com

DISPATCHES

General Dynamics Gets SOTM'ing



New, fourth generation (4gen) SOTM antennas have debuted from General Dynamics, a system wherein military users were responsible for helping with the design and development of the new product.



General Dynamics' Model 20-24M SOTM Terminal.

The antenna features improved reliability by increasing mean-time between failures (MTBF) and eliminating cooling fans to improve airflow within the antenna terminals. The new model is also 16 percent lighter, giving terminal

operators the opportunity carry additional equipment or increase their agility and efficiency when on-the-move.

The new terminal delivers private, secure voice, video and data satellite communications (SATCOM) for users remotely located or where there is limited access to a satellite network infrastructure. Ruggedized for the most challenging operational environments, General Dynamics SOTM terminals maintain connectivity with satellite networks using the terminal's trusted gyro-stabilization, which provides high-pointing accuracy.

General Dynamics SOTM products come in a variety of sizes and configurations and customers can install the antennas on ground vehicles, maritime vessels and aircraft to establish secure links to forward operating bases.

gdmissionsystems.com

DISPATCHES

POGO Pumps Up USAF Satellite Control Network



The antenna, designated as POGO-Charlie, represents some of the latest telemetry, tracking and command technologies in the Air Force

Photo is courtesy of the US Air Force.

Detachment 1, 23rd Space Operations Squadron, gained operational acceptance of the seventh and final Remote Block Change antenna at Thule Air Base, Greenland, July, 26, 2016.

Known as POGO-Charlie, this seventh and final Remote Tracking Station Block Change antenna has received full operational acceptance for Detachment 1 of the 23rd Space Operations Squadron at Thule Air Base in Greenland.

This is a vital asset to the Air Force Satellite Control Network, which consists of seven ground stations located around the world. These remote tracking stations support space operations by allowing Department of Defense (DoD), national, allied and civilian satellite operators to communicate with more than 175 satellites; the RTS's also support launch, early orbit and end of life operations.

Operational acceptance was the final step in the installation of the antenna at Thule AB. Beforehand, the antenna remained in a testing period to identify and resolve any deficiencies.

A final vote from stakeholders determined whether the antenna would be considered fully operational. The vote was unanimously cast in favor of acceptance of the antenna as a fully operational asset.

Col. William Angerman, 50th Network Operations Group commander, explained the antenna's acceptance is strategically crucial and that the POGO-C antenna is important as its location in Thule, Greenland, is ideal for contacting polar-orbiting satellites.

About four years ago, a legacy antenna failure reduced the number of antennas to only one. That reduction left the station handicapped, forcing the AFSCN to lean on three other antennas at New Boston Air Force Station, New Hampshire, to compensate and support the satellite mission.

According to Lt. Col. Marty Easter, 23 SOPS Commander, RBC antennas are the latest version of the systems used to command and control satellites on orbit. The benefit is that this antenna is a more modern system when compared to the previous generation.

The technology brings a new level of sustainability and operational capability.



Easter added that the final antenna did present some challenges because of Thule AB's remote location—the 50th Space Wing worked closely with the Space and Missiles Systems Center, 21st Space Wing and the 821st Air Base Group to manage the complicated logistics of installation, testing and operational acceptance of the equipment and the personnel required to accomplish all those tasks.

The SMC, Range and Network Division oversaw the engineering, installation and issue resolution of the antenna.

The 22nd Space Operations Squadron oversaw the operational test period and satellite user coordination, observing 691 satellite contacts with a more than 98.7 percent success rate.

23 SOPS oversees three of seven AFSCN sites, including POGO (Detachment. 1, 23 SOPS), which operates the actual antenna. The detachment also provides real-time feedback for satellite user requirements and configuration issues.

Article by 2nd Lt. Darren Domingo, 50th Space Wing Public Affairs, USAF

DISPATCHES

'Neighborhood Watch' Helps Navy Investigate Satellite Out Of Target Orbit

Air Force Space Command's "Neighborhood Watch" satellites, from the Geosynchronous Space Situational Awareness Program, recently responded to the Navy's request for help with a satellite of their own.

The Joint Functional Component Command for Space officially tasked the 1st Space Operations Squadron to support the Navy's ongoing Mobile User Objective System-5 anomaly effort after the satellite failed to reach the target geosynchronous orbit on July 3 of this year.

Anomaly resolution in space is challenging for many reasons, one being it's difficult to see what's going

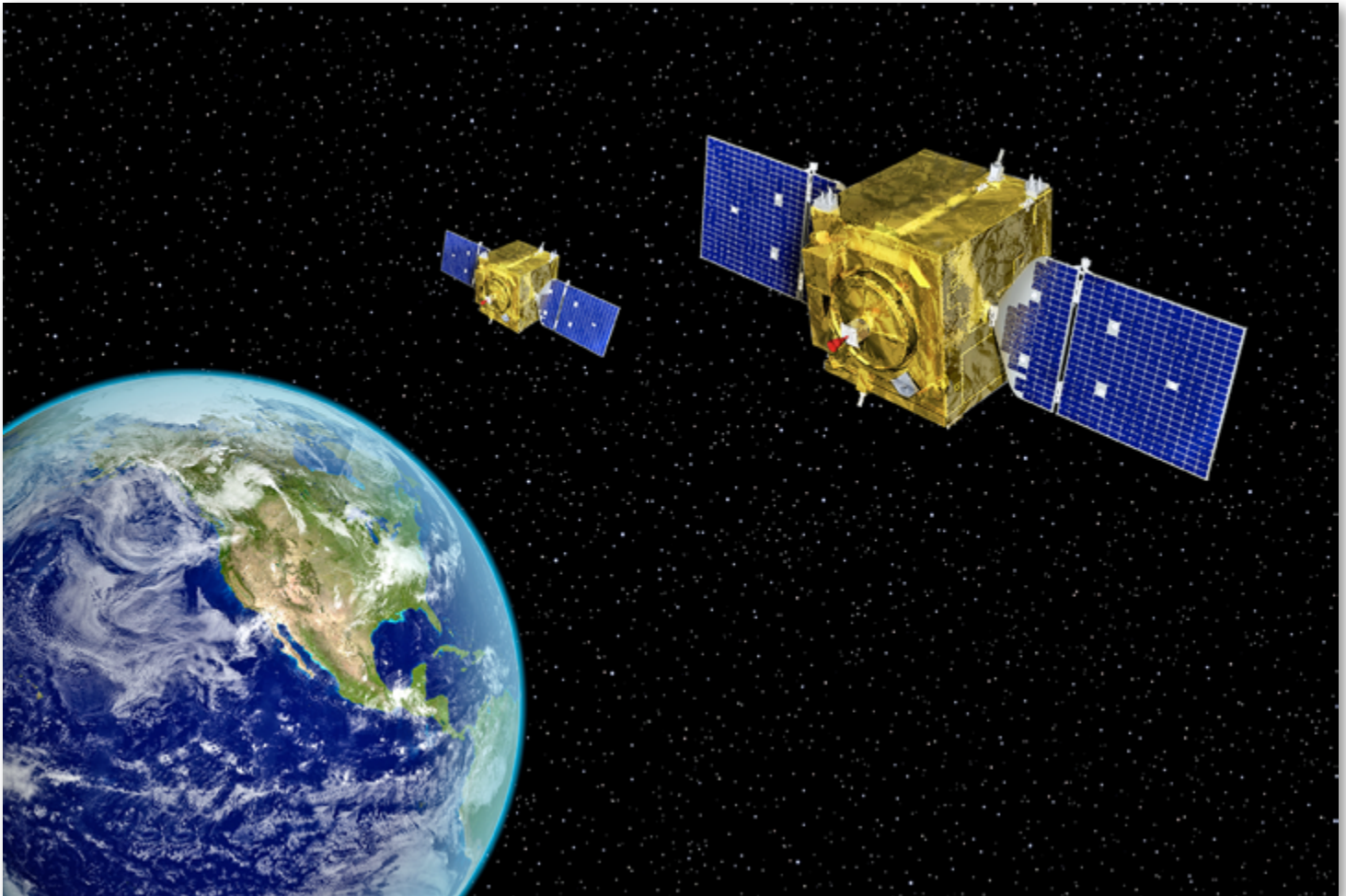
on with the satellite. Traditionally, engineers, analysts and operators comb through telemetry to come up with possible reasons for the anomaly; however, in cases like this, GSSAP is able to provide electro optical space situational awareness on the status of space objects to include location, orbit and size of the space object.

GSSAP crews conduct rendezvous and proximity operations to get the best possible vantage point for collecting SSA data when requested. In this case, the mission was to help rescue MUOS-5.

Once tasked, the 1st SOPS mission planning cell began deliberate, customized mission planning to

determine how to execute the operation and maximize the probability for success. The satellites' differing orbits and the various forces at play, including astrodynamics, reminded crewmembers that success was not inevitable.

Capt. Barbara Dyer, the 1st SOPS mission commander, led the crew that accomplished the command and control operations to collect MUOS-5 imagery on her 10th shift.



Air Force Space Command's "Neighborhood Watch" satellites, from the Geosynchronous Space Situational Awareness Program, recently responded to the Navy's request for help with a satellite of its own. Artistic rendition is courtesy of the US Air Force.

"I knew we were prepared. We had completed the rehearsal of concept for the unique mission," she said. "We recognized the newness of what we're doing will drive new expectations."

Second Lt. Nathan Paddock is the satellite vehicle operator who executed the command and control for the operations.

"There were a lot of different people on the operations floor during the shift," he said. "Senior leadership was there encouraging us and reminding us that this was something very important. I am new to the Air Force and the job, but knowing leadership trusted me and expected excellence is something that's unique to this work."

The audience and mission importance added to the pressure to achieve success, but that didn't deter Paddock.

"I liked it. I thrive under pressure," he said. "The crew engineers gave us a lot of support and helped me stay calm and relaxed. I know they had my back."

The crew conducted SSA missions with other 1st SOPS assets, like the Space Based Space Surveillance system, in preparing for and during the mission.

While planning and operations were conducted at Schriever Air Force Base, another aspect of this unique mission occurred at Point Mugu, California.

"Due to the complexity of the program, we wanted someone on site to provide context to Navy leadership, explain our operations, facilitate information sharing and ensure there was robust coordination during the operations," said Lt. Col. Casey Beard, the 1st SOPS commander.

The squadron's mission planning cell chief, Capt. Brett Kasischke, was just up the road at Vandenberg AFB, California, to participate in an exercise. He capitalized on the opportunity and extended his stay in California.

"I quickly immersed myself into the mission's requirements and served as an intermediary; I ensured data was sent at appropriate times as well as supported the team back at Schriever," Kasischke said.

The mission's full impact is yet to be determined, but there are successes already to be celebrated.

*Story by Jennifer Thibault,
50th Space Wing Public Affairs, USAF*

DISPATCHES

Preparing For The Worst While Working With The Best

What is Pacific Endeavor? Hosted by the Australian Defence Force and US Pacific Command's Multinational Communication Interoperability Program, this year's Pacific Endeavor is the culminating event of a year-long planning effort, which took participants and planners to Papua New Guinea, Hawaii and Mongolia—the exercise wrapped-up September 2.

Based on recent real-world events, Pacific Endeavor 2016 features a scenario based on a Category 5 typhoon striking Brisbane, which requires participants to set up a Multinational Coordination Center and forward deploy to two other locations in the affected area.

Their mission is to validate and document high-frequency voice and data transfer using ordinary field radios. Commonly referred to as Internet protocol over radio frequency, the practice involves transmitting not only voice, but images and e-mail data over the same IPRF signal.

GVF reports that more than 20 APAC militaries plan to strengthen regional disaster preparedness and response through expanded collaboration with GVF—the international association of the satellite communications industry—and its Member companies, which include the world's leading providers of broadband connectivity.

The expansion plan was recently established during "Pacific Endeavor," an annual, joint program of militaries from throughout the region sponsored by the US Pacific Command (PACOM) through the support and coordination of PACOM's MCIP Management team.

This will build upon the previous information sharing and certification by GVF of participants from Asia-Pacific militaries on the use of satellite communications systems to ensure that in a crisis or disaster there are individuals available throughout the region who can assist with relief efforts. In addition to capacity building, collaboration will also be expanded to address Cyber Security and Validation and Benchmarking initiatives.

"With support from leading satellite industry providers of bandwidth, Earth stations, integration, and online interactive content mentored on site, GVF will be working closely in collaboration with the MCIP team at PACOM to facilitate information sharing for those in their organizations who will stand ready to help save lives during any disasters that may strike the Asia-Pacific region," said David Hartshorn, Secretary General of GVF.

During the previous three Pacific Endeavor exercises, 71 candidates successfully completed the online courses and 67 passed Hands On Skills Tests and were Certified.

GVF conducted the Onsite Mentored Certification modules in 2012, 2014 and 2015. Military personnel participating from more than 27 PE member nations achieved GVF Satcom Professional Certifications. This included GVF Basic and Advanced Satcom Professional Certification; several participants also earned GVF's new General Auto-Point Terminal Operator Certification.

Industry support was provided by GVF Members and partners, including AQYR, GATR, Integrasys, Intelsat, Mercantile, SES, Speedcast, Viking Satcom, and other leading companies. Online interactive content was provided by SatProf and Onsite Mentoring of sessions was supported by Mahdi Bagh Computers.

"Our goal is very simple," said Riaz Lamak of Mahdi Bagh Computers and a GVF Point of Contact for Pacific Endeavor. *"The most important thing is that people on the ground are able to ensure that the network can be established rapidly, works properly, the signals don't drop, and communications happen."*



Participants of Pacific Endeavor 2016 transmit voice and data communications over radio frequency at Victoria Barracks during a field training exercise. The workshop involved 250 participants from 22 allied and partner nations. DoD photo by Air Force Master Sgt. Todd Kabalan

www.gvf.org

DISPATCHES

UltiSat Into ISR For Lockheed Martin & US Army

With US and foreign customers, agencies, contractors, NGOs and multi-national enterprise companies under their belt, UltiSat will now also be providing the firm's technology architecture design for a new contract that will support Lockheed Martin Corporation for the Sensor Systems – Aerial Intelligence, Surveillance and Reconnaissance (SS-AISR) task order on the R2-3G indefinite delivery, indefinite quantity (IDIQ) contract vehicle by the US Army Contracting Command – Aberdeen Proving Ground (ACC-APG).

Under this one-year base/two one-year options contract, UltiSat will support the SS-AISR program in AISR data collection, ground-based processing, exploitation,



and dissemination for missions worldwide. UltiSat ISR services team will provide personnel to manage and operate the Aerial Reconnaissance Support Team, Intelligence Analyst, and all Network Communications for the overall program at multiple stateside and overseas locations.

The team is focused on supporting the US ACC-APG in delivering efficiencies and reliability for the missions being supported. The firm also presents a wide range of products and managed network services for the Airborne ISR and COTM markets for manned and

unmanned fixed wing and rotary wing platforms.

Moe Abutaleb, CEO of UltiSat, acknowledged that his firm is rapidly becoming a key player in the airborne ISR/COTM markets due to the unique expertise in the design, optimization, commissioning, and network operations of airborne Beyond Line of Sight (BLoS) solutions they produce.

The company's technology agnostic approach, strategic partnerships and reseller agreements create the industry's largest SATCOM-focused ISR/COTM product portfolio, according to Abutaleb.

ultisat.com/

DISPATCHES

Aerojet Rocketdyne Takes AFSPC-6 To Slots

A successful launch requires the talents of numerous individuals and companies lending their expertise to the common goal... launch that satellite.

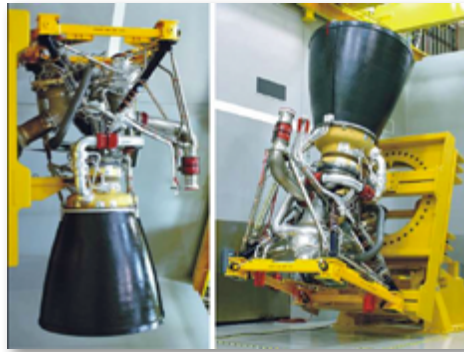
The early morning launch of the Air Force Space Command-6 (AFSPC-6) satellite was made possible with the assistance of Aerojet Rocketdyne, Inc., a subsidiary of Aerojet Rocketdyne Holdings, Inc.

At liftoff, a single RS-68A engine ignited to boost the Delta IV rocket off the pad, providing 702,000 pounds of lift-off thrust. After the upper stage separated from the launch vehicle, a single RL10B-2 engine ignited to provide 24,750 pounds of thrust to power the upper stage, using cryogenic liquid hydrogen and liquid oxygen propellants during its operation. The RS-68A is the world's most powerful liquid-hydrogen/liquid-oxygen engine.

The huge RS-68A engine supported the successful launch of two Geosynchronous Space Situational Awareness Program (GSSAP) satellites into orbit to help detect and track space objects as part of the Air Force Space Command-6 (AFSPC-6) mission. The mission was launched from Cape Canaveral Air Force Station in Florida by a United Launch Alliance Delta IV rocket.

Aerojet Rocketdyne's rocket propulsion systems included:

- » RS-68A booster engine
- » RL10B-2 upper-stage engine
- » 12 helium pressurant tanks
- » 12 reaction control thrusters on the upper stage for roll, pitch, yaw and settling burns



Aerojet Rocketdyne's RS-68A engine.

Aerojet Rocketdyne CEO and President Eileen Drake stated, "In today's world, it's absolutely critical that our nation have the ability to monitor potential threats to military satellites operating in geosynchronous orbit above our planet. We are honored to provide reliable propulsion to make that possible."

Rocketdyne's family of engines has a busy history and the company has now flown 33 commercial and government missions, all with 100 percent mission success.

The RL10B-2 engine is a liquid-fueled cryogenic rocket engine designed and developed from the RL10 family of upper-stage engines, which has accumulated one of the most impressive lists of accomplishments in the history of space propulsion.

More than 470 RL10 engines have supported launches over the last 50 years, helping to place military, government and commercial satellites into orbit, and powering scientific space-probe missions to every planet in our solar system.

Twelve 9-lbf MR-106H Aerojet Rocketdyne monopropellant hydrazine thrusters, packaged in four, 3-engine MRM-106F modules on the Delta IV upper-stage, provided roll, pitch and yaw control, as well as settling

burns for the upper-stage. ARDÉ, a subsidiary of Aerojet Rocketdyne based in New Jersey, provided the pressure vessels on the first and second stages on the launch vehicle.

The twin spacecraft are the third and fourth satellites for the GSSAP. They will support U.S. Strategic Command space surveillance operations as a dedicated Space Surveillance Network sensor.

The GSSAP also supports Joint Functional Component Command for Space tasking to collect space situational awareness data, allowing for more accurate tracking and characterization of man-made orbiting objects.



www.rocket.com

www.AerojetRocketdyne.com

DISPATCHES

Moving On Up... General Raymond To Head Up AFSC



General Raymond has extensive command experience, ranging from the 5th Space Surveillance Squadron at Royal Air Force Feltwell, England to Southwest Asia as Director of Space Forces in support of operations Enduring

Freedom and Iraqi Freedom to Joint Functional Component Command for Space, U.S. Strategic Command, Vandenberg AFB, California

He will succeed General John Hyten in this position.

US Secretary of Defense Ash Carter has announced that the president has nominated Air Force Lt. Gen. John W. Raymond for appointment to the rank of general and for assignment as the commander of Air Force Space Command, Peterson Air Force Base, Colorado.

Gen. Raymond will move into this command position from his current duties as is the Deputy Chief of Staff for Operations, Headquarters U.S. Air Force, Washington, D.C. He is responsible to the Secretary of the Air Force and the Chief of Staff for formulating policy supporting air, space, cyber, irregular warfare, counter-proliferation, homeland security, and weather operations.

As the Air Force operations deputy to the Joint Chiefs of Staff, the general determines operational requirements, capabilities and training necessary to support national security objectives and military strategy.

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SPACE MISSION FORCE: DEVELOPING SPACE WARFIGHTERS FOR TOMORROW

Air Force Space Command recently posted a white paper regarding the Space Mission Force construct that was recently implemented within the command—the white paper has not been approved for public release, so what follows is a brief explanation of this AFSC construct.



The Space Mission Force, akin to the Air Expeditionary Force, is a long-term overarching initiative to prepare and present space forces as a ready force capable of operating in a contested, degraded and operationally-limited environment. This will be the new standard for space operators to increase preparedness to operate their weapon systems and respond to the increasing threats to those same systems.

"The Space Mission Force construct is really quite simple; we are revamping our crews to respond appropriately to threats in a dynamic environment," said General John E. Hyten, commander of Air Force Space Command. *"We are aligning to be more consistent with the Air Force, which will allow us to focus on advanced training to prepare our forces to effectively deal with the threats they have today and in the future. The old way of training was appropriate for a benign environment, but does not ensure we will be able to deliver space effects to the rest of the Joint Force in a contested environment."*



*General Hyten,
Air Force Space
Command Commander.
Photo is courtesy of
Space Foundation.*

Space Mission Force has two primary lines of effort.

First, the SMF construct establishes the Ready Spacecrew Program which enhances training to create a force capable of performing combatant commander-directed missions in the face of dynamic and varied threats. The Ready Spacecrew Program will maintain foundational skills and, more importantly, will build new skills and emphasize innovation,

decision making at the lowest levels and development and use of tactics to counter space threats.

Second, SMF adjusts force presentation and command and control constructs to mirror other Air Force combat units. It provides transparency to combatant commanders regarding available forces and readiness, and creates the dwell time required for an effective training program. This construct is similar to Combat Air Forces, Mobility Air Forces and AF Special Operations Forces, which have operated with incredible effectiveness in the contested air domain for several decades.

Space Mission Force execution will involve space operations crews beginning a rotation cycle where they spend four to six months training together in a robust, challenging, and realistic training environment. They will then spend an equal amount of time applying their skills to real-world operations as part of the Space Mission Task Force, which is the Air Force's space mission force presented to US Strategic Command for operational use.

The primary purpose of the dwell period is to put spacecrew members through a rigorous training cycle consisting of various types of training, advanced courses and exercises. As spacecrew members rotate into the Space Mission Task Force, they will train as crews before a final readiness assessment, where they will apply the lessons learned in advanced training and demonstrate their readiness to perform their warfighting mission.

One of the main goals of the SMF initiative is to have a balance of experienced and inexperienced crew members conducting operations. This balanced crew force will have depth of experience and be better prepared to respond to known and anticipated threats in a contested, degraded and operationally-limited environment, and provide inexperienced crewmembers with more consistent and productive interaction with experience crew members.

The new rotation duty and staffing schedule will also affect Guard and Reserve personnel. There are no anticipated changes in personnel numbers, whether active duty, Guard or Reserve.

The 50th Space Wing was the first wing to implement the Space Mission Force construct and begin rotations, which started on February 1, 2016. The 21st Space Wing implemented SMF on July 1, 2016, and the 460th Space Wing will transition to the SMF construct next year.

www.afspc.af.mil

POV: HOW SATCOM AS A SERVICE CAN HELP THE DOD MODERNIZE EFFECTIVELY AND AFFORDABLY

By Rebecca Cowen-Hirsch, Senior Vice President, Government Policy, Strategy, & Outreach, Inmarsat Government Services, Inc.

The US Department of Defense (DoD) is struggling to address modernization requirements within the spending limits directed by the Budget Control Act (BCA) of 2011.

This is particularly true in the area of recapitalization for space, where new threats are also driving changes in the US operating posture. This is one reason why DoD leadership is closely watching advancements from the commercial sector, as a means of implementing innovation, augmenting satellite communication (SATCOM) capabilities and reducing the strain of an overstretched and essentially flat budget.

In terms of action, the time is now: The Obama Administration released a National Security Strategy (NSS) in February 2015, addressing challenges in meeting the service men and women's needs in a period of fiscal uncertainty.

Meanwhile, the fiscal year (FY) 2017 budget reveals how the decade ahead will require significant modernization of

front-line weapons systems, which have endured the enormous stresses of long-term combat operations.

The DoD will also have to implement new weapons to support a smaller force structure that will meet continuing and emerging threats around the globe. The US Air Force is expected to take a particularly hard hit in this modernization crunch, with current budget funding levels unable to pay for new programs to boost capabilities.

On the space segment side, the satellite systems on orbit are aging, even while the programs of record are completing their deployment schedule.

Fortunately, lawmakers and the DoD recognize the potential for grave risk in space and are beginning to respond accordingly: as laid out in the FY 2016 National Defense Authorization Act, the Secretary of Defense must conduct an Analysis of Alternatives (AoA) for a follow-on, wide-band



satellite communication system to the Wideband Global SATCOM (WGS) system, which includes space, air and ground layer communication capabilities of the DoD.

Military decision makers are increasingly viewing the expansion of use and the intentional integration of commercial satellite communications (COMSATCOM) as they move forward, seeking to adopt an enterprise-level, integrated SATCOM architecture and strategy, which will allow the DoD to manage military satellite communications (MILSATCOM) and COMSATCOM as a holistic capability to best support the full spectrum of military operations.

Central to the success of this integrated architecture is the incorporation of SATCOM as a Service (SaaS), which brings greater efficiencies and responsiveness to meeting DoD requirements, in contrast to broadcast-centric fixed transponder leases.

SATCOM as a Service allows users to leverage COMSATCOM for core functions, while seamlessly integrating with MILSATCOM to address any remaining gaps for optimal redundancy, diversity, protection, scalability and global portability—the ultimate resiliency approach.

This frees military members from the administration of disparate networks and allows them to focus on critical defense operations. Rather, with SaaS, information can flow seamlessly from Point A to Point B using commercial capacity directly with WGS.

In the most innovating and interoperable examples of this unified approach, the military users employ their existing WGS-certified terminals, thereby attaining the ultimate state of efficiency and functionality affordably. When world events trigger usage spikes, increased capacity can be readily accessed. Thus, users benefit from the most flexible and immediate of technologies without the need to invest in additional stove piped or disparate infrastructure.

In other words, SaaS can redefine the way the government employs and acquires satellite communications.

For far too many years, multiple DoD branches have administered multiple parts of the package, turning to private industry generally on an “as needed” basis: The Navy supplies the one element of the “space” part, i.e., the UHF satellite system. The Army provides the many aspects of the “land” part, i.e., both military-owned and commercial terminals for units.

The Air Force is in charge of global, protected wideband—the Defense Information Systems Agency (DISA) leases commercial capacity. This new integrated architectural approach, supported through use of SATCOM as a Service, allows for the provisioning of an end-to-end capability to meet operational requirements rather than simply having individual pieces of the puzzle asynchronously acquired

and thus putting the burden on the military user to cobble together the end solution.

In August 2014, the DoD indicated in its *Satellite Communications Strategy Report* that a five year SATCOM plan should include a stronger commercial presence within a more cohesive, integrated architecture.

“(A) decentralized approach impedes centralized, multi-year acquisition and hinders the DoD’s ability to manage MILSATCOM and commercial SATCOM as a holistic capability to best support the warfighter,” according to the report.

The DoD continues to note that the agency “may have to move toward a ‘shared resource’ model of usage, versus the current ‘my demand/my capacity’ separatist philosophy. This will require a centralized management strategy with resource monitoring and management instantiated on an ‘enterprise-level’ instead of the current method that allows users to implement (and pay for) resource monitoring and usage management at their own discretion.” SaaS as a Service supports the implementation of such an enterprise approach.

More recently, in July 2015, the Government Accountability Office (GAO) issued its “*Defense Satellite Communications*” report, indicating that space programs experienced large cost growth, schedule delays and unanticipated technical problems throughout the 1990s and early 2000s. Because satellites were not delivered on schedule to replace aging legacy systems, concerns have been raised about possible operational gaps in critical space functions. Today’s highly diverse operational environment and increased variety of risk demands that history not repeat itself.

In further complicating the issue, agencies are under mounting pressure to conform to Lowest Priced Technically Acceptable (LPTA) policies for purchases. Under LPTA, decision makers select vendors who offer a technically acceptable proposal at the lowest evaluated price.

LPTA does have its place, even in the military community, though only for commodity purchases. Mission-critical SATCOM, however, does not warrant a commoditized, “least common denominator” approach.

Every operational environment presents an array of scenarios and potential threats. These may include a variety of security requirements (such as encryption differentiators), geographic challenges and functionality requirements such as video distribution, Intelligence, Surveillance and Reconnaissance (ISR) support as well as mission unique, capability-focused considerations. These must be addressed through a more discerned acquisition approach.

"We need to get our heads around the fact that space might not always be a peaceful sanctuary," Secretary of the Air Force Deborah Lee James said at this year's Space Symposium in Colorado Springs, Colorado. She further stated, "We need to ensure that our mission can get done despite what could be a very challenging environment in space to include challenges of one day having warfare effects in space. We must not let potential adversaries ever deny us the use of space."

The current budget stands in the way of such intent, funding for strictly the minimum required for America's space systems, as driven often by the business-as-usual acquisition approaches. With the DoD now seriously considering revamping the way it conducts future military space acquisitions, it is clear that innovation-supporting recapitalization is critical for our nation to keep pace with evolving threats, while taking advantage of the incredible innovations and diversity provided by the commercial satellite industry.

A shift to SaaS would inspire a profound change of mindsets. No longer would agencies think in terms of "buying" more and more government-owned and operated satellite communications simply because "that is the way we have always done it." Instead, they would primarily consider leveraging the immense breadth and scope of COMSATCOM offerings enriched capabilities—while still benefiting in terms of affordability and focusing the smaller amount of investment resources towards the proper amount of purpose-built exquisite and government-unique assets.

To underscore the urgency here, consider this testimony from the Air Force before the Senate Armed Services Committee this past March. *"We view our national security as inextricably dependent on space-enabled capabilities. At the same time, space has become contested, congested and competitive. Our space capabilities today are facing advanced, demonstrated and evolving threats, which require fundamental changes in the way we organize, train and equip our forces... Legacy space acquisitions relied on packing as much capability as possible into a few systems creating critical vulnerabilities. Current budget realities drive us to rely on legacy systems, while warfighter demands have driven the need for more capable systems."*

"We must provide space capabilities that assure performance of military space functions, regardless of the hostile action or adverse condition. We must invest smartly in the highest payoff capabilities that enhance space domain mission assurance to include resilience, defense operations and reconstitution of our space systems and architectures to ensure US and Allied use of space through all phases of conflict. We seek to balance military and commercial systems and leverage international partner capabilities to allow the US to share the cost of space power; provide additional coverage in areas the US requires assistance in; and create a coalition structure that can promote deterrence."

In addition, DoD leaders such as General John Hyten, Commander of US Air Force Space Command, have urged for an overhaul in how COMSATCOM is acquired.

"We have purchased the commercial product in the most inefficient way possible," Hyten has said. "You're never going to get the best price you can when you buy something on a spot market one year at a time."

General Hyten is driving a two-way engagement with industry leaders—leaders with valued expertise about new strategies. While a formal commitment to change will most likely not be established until completion of the aforementioned AoA, the potential remains for a seismic shift in how industry works with the military community.

The pursuit of innovation across the space portfolio can reduce acquisition burdens, as commercial advances are more rapid and commonplace. The Congress and internal DoD advocates are pushing for reform and adoption of advanced approaches in the space enterprise—exemplified by SATCOM as a Service.

Eliminating organizational hurdles toward this goal will pay dividends and address funding shortfalls. The sooner COMSATCOM is actively integrated into the core DoD architecture, the greater the possibility of savings in enabling service men and women to safely—and successfully—perform their missions.

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THE HEYMAN REPORT: SPACEPLANES THAT NEVER WERE...

By Jos Heyman, Senior Contributor

Throughout the space age, there have been many proposals for single-stage-to-orbit (SSTO) horizontal-takeoff-horizontal-landing launch vehicles that would make spaceflight similar to aircraft flights.

Such a capability was closely linked to the desire to have short notice access to space, specifically for military purposes. The realization arrived that the power requirements for take-off and orbit insertion associated with this ideal mode of operation were unobtainable. This led to proposals that relied on the brute force of rockets for the first stages of operations, thereby limiting the 'short notice' aspect.

The argument was made that these efforts eventually resulted in the Space Shuttle; however, whether the record of 135 flights over a period of 30 years met this desire to have 'short notice access' or not is questionable. Instead, the Space Shuttle, with all of the spacecraft's incredible achievements, was a cumbersome way to access space.

This article discusses some of the many proposals for spaceplanes that have been advanced over the years but have never seen the light of day.



UNITED STATES

X-20 MOCK-UP

Records claim that the United States commenced the Dyna Soar project on October 14, 1957, a mere 10 days after the launch of Sputnik-1.

On that day, the United States Air Force (USAF) issued what must be seen as preliminary directives for a maneuverable spaceplane. The concept was to a certain extent a follow-on from earlier studies undertaken for the USAF as well as for NASA under a variety of project names that included Hywards, 118P, Brass Ball and Bomi.

The project, with the military designation X-20, was an attempt to combine the best features of two approaches: high speed flight in space and the capability to return to Earth with airplane-like control.

In March of 1958, eight aerospace companies submitted proposals and in June of that year, Boeing, as well as a Bell/Martin consortium, were awarded contracts for further studies into the project. By December 9, 1959, it was obvious that the Bell/Martin proposals relied heavily on unproven technology and Boeing was awarded a development contract for their Model 844.

The craft that was then under development by the company was a delta-winged glider and was to be rocketed into space by a powerful booster. Once in orbit, the pilot would be able to fly to any point on the globe at speeds of more than 27,000 km/h. When the pilot would have completed the mission, the craft would be flown back into the atmosphere and then land at an appropriate airfield of the pilot's choice.

The term Dyna Soar is derived from 'dynamic' and 'soaring,' meaning that the vehicle was to use centrifugal force and aerodynamic lift. Centrifugal force was to sustain the craft at orbital speeds when flying just fast enough to off-set the pull of the Earth's gravity. The aerodynamic lift would be given by the wings and would be used for flight in the atmosphere.

By 1961, the design was frozen and the Air Force formally ordered 10 production vehicles. The craft had a span of 6.17 meters a length of 10.77 meters, a height of 2.44 meters and an empty weight of 4912 kg—there was no propulsion system.

At that point of time, the plan was to fly seven scale models of the X-20 on top of Scout rockets into sub-orbital trajectories to test high speed flight as well as thermal protection. Further plans were for air drop tests that would commence in 1963 using a B-52 mothership. These flights, which would be unmanned as well as manned, would occur over Edwards Air Force Base in California.

In 1964, the first unmanned, sub-orbital flight was to take place while the first unmanned orbital flight was to occur in late 1965. After two such flights, the first manned orbital flight was scheduled for early 1966 after which flights at three months' intervals were planned. At that point in time, funds would then be made available for a total of 12 flights. All orbital flights were to be launched by a modified Martin Titan launch vehicle.

Further developments included the X-20A, to demonstrate reconnaissance and satellite inspection; X-20B, for anti-satellite missions and X-20X; and a larger version to test satellite interception and destruction.

In mid-1961, the government, in the embodiment of the Secretary for Defense McNamara, began to question the project and delays crept into the program, leaving only the pure space flight aspect. When it appeared that this project was adequately being met by the other crewed space projects of the US, on December 10, 1963, the entire Dyna Soar project was canceled.

By that time Boeing had built a full scale mock-up of the Dyna Soar and some material for production had been cut, although no construction had been started. Additionally, the Air Force had selected a number of potential pilots for the project's initial phase and subsequent 'operational' phase. This selection had taken place in three groups on March 15, April 20, and October 22, 1962. Once the program was officially canceled, most of these pilots went back to other duties, although some eventually became astronauts.

USSR

MIKOYAN SPIRAL

The USSR undertook studies not dissimilar to the US Dyna Soar and the Mikoyan design bureau developed a proposal for a winged spaceplane that would be launched on top of a Soyuz launch vehicle.

Identified as Spiral, the program was canceled but was resurrected in 1974 as a development program associated with the Buran Shuttle vehicle. As part of this project, MiG built the MiG 105-11 vehicle, with a length of 8.5 meters and a span of 6.4 meters with accommodation for a single crew member. The vehicle was fitted with a Koliesov RD-36 jet engine and made a first flight on October 11, 1976. The eighth and final flight was in September of 1978. The plan was to have the craft fitted with an orbital rocket engine.

FRANCE & ESA

In the 1980s, the European Space Agency started planning for a re-usable spaceplane to provide independent crewed access to space. The plan envisaged a spacecraft that could take three astronauts on missions of from 30 to 90 days duration in space.



USSR's Mikoyan Spiral.

Hermes commenced as a pure French project but, with increasing costs, the development became a European effort, with substantial funding added by Germany in November 1987.

In 1984, Hermes was seen as a small mini-space shuttle that would consist of two modules: a spaceplane that could carry four to six astronauts plus a 4500 kg payload in the cargo bay as well as a cone shaped Resource Module at the rear of the spacecraft that would be abandoned before re-entry. The spaceplane was anticipated to be able to conduct at least 30 flights without requiring major servicing.

Payloads to be returned to Earth could be contained in a small payload bay, but most experiments were included in an expendable pressurized supply module, equipped with a docking port that was mounted to the base of the glider. As the Hermes was too heavy to be launched by the existing Ariane 4 launcher, the Ariane 5 vehicle was developed to launch this vehicle from Kourou. Hermes would also land at Kourou, with alternative landing sites at Fort de France Island, Bermuda, or Istres in southern France.

The mission envisioned flights to the proposed European remote sensing Polar Platform (PPF), flights to ESA's Man-Tenden Free Flyer (MTFF) Station and flights to the proposed Columbus module for the Freedom Space Station.

The original Ariane 5 proposal envisaged mating the Ariane booster stage with a new upper stage burning liquid oxygen and hydrogen, which would have boosted the payload capability to more than 15 tons. Eventually, Ariane 5 became, however, a totally new vehicle with an even larger capability.

Over the same time period, the Hermes was reduced in size to a crew of three and a 3,000 kg pressurized payload with a length of 15.51 meters and a span of 10.57 meters. The cargo bay had a diameter of 2.70 and a length of 7.70 meters.

In April 1985, Dassault-Breguet and Aerospatiale submitted designs for Hermes to the French national space agency CNES and, in October of 1985, CNES awarded a contract to Aerospatiale with some assistance required from Dassault-Breguet. The cost was expected to be about \$1.9 billion, including \$1.1 billion for development and construction of two vehicles.

By the time ESA took over the project in November 1987, the cost was expected to be \$4.25 million, including two qualifications flights, as well as \$3.36 million for the development of the Ariane 5 launch vehicle. France was to absorb 45 percent of the cost while Germany was to fund 30 percent of the program.

But by the time the first phase of the Hermes development was completed in November of 1991, ESA decided to



The European Hermes vehicle.

have a year long "reflection" period in order to review and reconsider their plans to build its own space shuttle and space station or, if new partners could be found to share the cost and development of the craft.

In the new European political arena, ESA and Russia agreed to cooperate on future launchers as well as a replacement for the Mir space station. Both Russia and ESA then joined NASA in the International Space Station program and the need for a European crew transport system disappeared, as both Russia and the US had existing capabilities that did not require expansion. Accordingly, ESA decided to cancel the Hermes development in November of 1992.

A 'reduced' Hermes X-2000 unmanned technology demonstrator was briefly considered but was canceled at the same time—\$2 billion had been spent on the Hermes project.

Had the Hermes program continued, the first unmanned mission would have occurred in 2002 with the first crewed mission taking place in 2003. The program would have been managed by an industrial company named Euro Hermesspace, with the French companies Aerospatiale and Dassault-Breguet controlling 51.6 percent, Germany's DASA 33.4 percent and Italy's Aeritalia 15 percent.

JAPAN

HOPE

In 1986, Japan initiated the development of the H2 Orbiting Plane (HOPE), a re-usable spaceplane that would carry as many as four astronauts to the Freedom Space Station

in which Japan had agreed to take part. This was one of Japan's two contributions to the Freedom Space Station operations, the other being the Japanese Experiment Module (JEM) which eventually evolved into the Kibo module of the International Space Station (ISS).

HOPE was to be used to ferry astronauts and supplies to the space station and was to be developed in piloted and automatic versions that would have a span of 12.00 meters and a length of 16.50 meters, which would carry a 2,000 kg payload. Operations were envisaged to start in 2000. The spaceplane was to be launched via the H2 launch vehicle that was still under development at this time. The returning spaceplane was to land on the Aeon air field on Christmas Island in the Pacific Ocean.

As a first step in the development, the intention was to build a sub-scale prototype identified as the H-2 Orbiting Plane. Experimental (HOPE-X) was to be used for flight testing and systems validation before the larger HOPE spaceplane was constructed. The HOPE-X was to have a span of 9.75 meters and a length of 15.24 meters and, like HOPE, was to be launched by the H2 rocket.

As part of the development of the HOPE-X, Japan's space agency (JAXA) undertook several test sub-projects.

The experimental Orbital Re-Entry EXperiment (OREX) ballistic re-entry vehicle, also known as Ryusei, tested various communications systems, heating profiles and heat shielding components. The vehicle had a mass of 870 kg and was launched on February 3, 1994, with the first H2 launch vehicle and was placed in an orbit of about 6,830 km. After



Japan's HOPE vehicle.

one orbit, the vehicle re-entered Earth's atmosphere and collected data during that re-entry that was transmitted prior to a central Pacific splashdown.

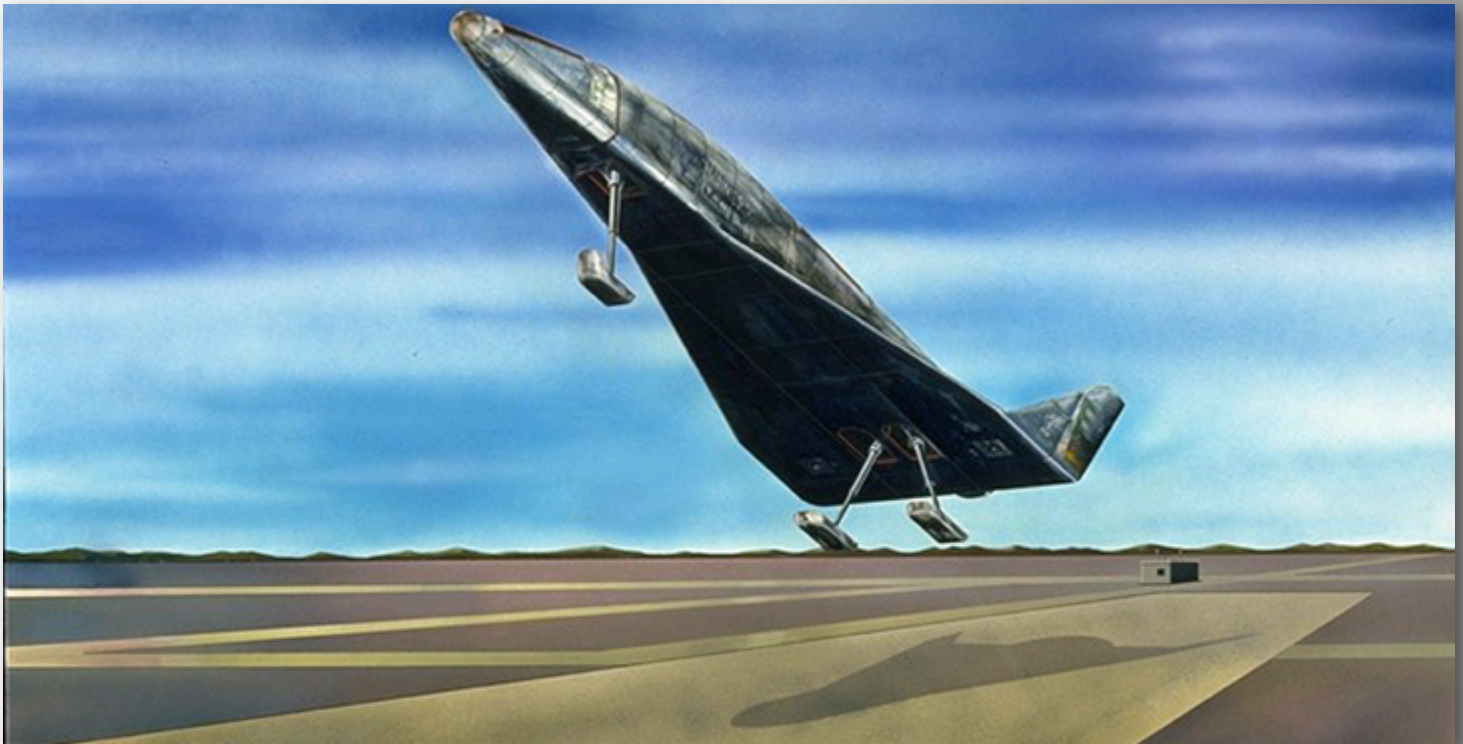
The second test vehicle was the Hypersonic Flight Experiment (Hyflex), which was placed into a sub-orbital trajectory with a J-1 launch vehicle on February 12, 1996. The 1,050 kg lifting body vehicle tested the reentry technology. Hyflex reached an altitude of 110 km and then executed a glide back into the Earth's atmosphere. The craft's parachutes deployed successfully; however, the craft broke away from the retaining harness and dropped into the sea approximately 250 km northeast of Ogasawana Island.

The Automatic Landing Flight Experiment (Alflex) tests demonstrated low-speed aerodynamic and landing systems. The vehicle, with a span of 3.78 meters and a length of 6.10 meters, was dropped from a helicopter flying at high altitude.

Thirteen flights were conducted at Woomera, Australia, from July 6 to August 15, 1996, and each test was successful.

By 1997, HOPE-X had developed into an unscrewed cargo spacecraft with an automatic approach and landing system and able to deliver 3,000 kg of cargo to what by then was the International Space Station (ISS). HOPE-X would have made the operations of the ISS independent of the Russian Progress cargo transfer spacecraft and the first flight was envisaged in 2004.

But by 1999, the H2 launch vehicle, after encountering many difficulties, was canceled by Japan. After a first flight on February 3, 1994, with Orex, another six flights were completed, with the seventh, and last one, failing on November 15, 1999. After this experience, the further development concentrated on the simplified and lighter H2A. As a consequence, HOPE-X was canceled in 2000 and had never flown.



Development of the HOPE spaceplane continued and by 2003 consideration was given to air-launching the vehicle with an aircraft. But Japan's economic conditions, as well as the urgency given to establishing a series of observation satellites to track the North Korean nuclear efforts, led to the cancellation of HOPE in 2003.

GERMANY

During the 1930s and 1940s, German-Austrian Eugen Sänger conceived and developed the design of a spaceplane that would fly at a speed of Mach 10 and at an altitude of 160 km. This eventually led to his 1944 design of an antipodal bomber that could be launched to suborbital velocity, skip off the upper atmosphere to deliver a bomb load on target and then return back to the launch site.

After the war, Sänger worked in France before returning to Germany for further research on winged shuttle designs as a professor at the Technical University of Berlin—he died in 1964. Sänger's final design was the Raumtransporter (RT)-8-01. The RT-1 to RT-7 designs represented a range of alternative lifting-body and winged configurations advanced by Sänger, but these were never built except for the air-dropped models.

In 1961, the German Messerschmidt-Bölkow-Blöhm (MBB) started further development of the RT-8 as a crewed spaceplane

RT-8

The RT-8 configuration involved a sled that was powered by a steam rocket. This sled would propel the first and second stages of the spaceplane on a 3 km track to a release velocity of 900 km/h. The first and second stages were fitted with liquid oxygen/hydrogen fueled rocket engines.

After release from the sled, the first stage would take the vehicle to an altitude of 60 km, where separation would occur, after which a glide back to the launch site would transpire.

The second stage would then fly to an altitude of 300 km. The first stage had a shoulder mounted delta wing, providing the necessary lift at those high speeds and allowing the vehicle to fly back toward a landing. The vehicle had a span of 31 meters and a length of 31 meters and would have carried a crew of two and capable carrying a 500 kg payload.

By 1965, MBB had abandoned the concept of a sled and, after briefly considering a subsonic air release from a large aircraft, gave consideration to a vertical take-off, two stage concept vehicle identified as RT-8-02. By 1969, MBB abandoned further development.

To date, there has been no spaceplane developed that meets the 'single-stage-to-orbit' (SSTO) and horizontal-takeoff-horizontal-landing launch requirements. However, there can be little doubt that designers will continue to research this ideal means to access space.

Jos Heyman, a retired accountant, specializes in the dissemination of information on the scientific exploration and commercial application of space for use by educational as well as commercial organizations. Jos has more than 40 years of experience in the historical aspects of astronautics.



NEW TECHNOLOGIES & BETTER METHODS TO ACQUIRE THEM

By Ryan Schradin, Executive Editor, GovSat Report (Sponsor: SES Government Solutions)

In July of this year, the Association of the United States Army (AUSA) sponsored a "Hot Topic" event that was focused on Army networks and the next generation technologies that are a priority for the Army's senior IT leaders and decision makers.

The event, which featured the theme "Network Readiness in a Complex World," brought together senior ranking members of the Army and other branches of the military responsible for identifying and implementing military IT strategies and industry leaders that work directly with the military to deliver the technologies and services necessary to empower America's warfighter.

The panel discussions and side sessions at the event were a veritable "who's who" of military IT leaders—both active duty and retired—including the CIO of the Army, LTG Robert S. Ferrell.

With a theme that encompassed network readiness, it's no surprise that much of the discussion centered around cybersecurity and the new IT solutions and technologies that are helping to make IT services more agile, mobile and secure, while enabling advanced capabilities and services to the warfighter in the field.

Technologies of focus for all of the senior IT decision makers in attendance included those that could make their networks more secure against cyberattacks, cloud solutions that deliver more resiliency, flexibility and scalability to networks and even Unified Communications solutions that can better connect warfighters and civilian employees regardless of their location.

Another necessary technology when it comes to network readiness and ensuring that IT capabilities are available to the warfighter in any location and at any time is COMSATCOM.

Although it wasn't mentioned extensively during the day, SATCOM—particularly commercial SATCOM—is the bridge that extends Army and other DoD networks from CONUS and other locations to the very tip of the spear. It carries the data and information—whether that is video from UAVs, HD telemedicine or distance learning content, or any other type of IT network data—to the places where terrestrial networks don't extend.

THE SPEED OF INNOVATION

There was one conversation during the event where COMSATCOM featured prominently—the discussion about the acquisition of necessary IT products and services.

Acquisition was the topic of conversation for an entire panel discussion, entitled, "Readiness across the acquisition and industry communities," and featured:

- Retired Army LTG William Phillips (moderator)
- Army LTG Michael Williamson, the Principal Military Deputy to the Assistant Secretary of the Army for Acquisition, Logistics and Technology and Director of Acquisition Career Management
- Douglas Wiltsie, the Executive Director of the System of Systems Engineering and Integration Directorate at the Office of the Assistant Secretary of the Army
- Henry Muller, a Director at the Communications-Electronics Research Development & Engineering Center
- Retired COL Randy Bland, the Senior Director for Integrated Development at SES Government Solutions
- Jack White, the Director of the Infrastructure Development Directorate at the Development and Business Center at DISA

One common theme during this panel discussion was the pace of technology and the speed of innovation. According to LTG Michael Williamson, "The pace of innovation in information technology is increasing. The pace of our combat operations and our adversary's ability to influence our operating environment is increasing. Keeping up with this rapid evolution and exploiting it is creating challenges for the Army procurement system."



The pace of innovation doesn't just effect IT and consumer electronics, however. This need to keep up with innovation is one of many reasons why the DoD is looking to increase their use of COMSATCOM in the future.

That sentiment was echoed by Doug Loverro, the Deputy Assistant Secretary of Defense for Space Policy at the Department of Defense (DoD), during a recent trade event, where he was quoted as saying, *"In order to keep pace with the ever-expanding user need. And the users are incorporating new technologies—video, Internet, streaming services and more we haven't thought of yet—as fast as the commercial world produces them on the ground. We can't go ahead and maintain that pace of change in space. The only people that can maintain that rate of change in space is the commercial world."*

But there are challenges keeping the military from more rapid and widespread adoption of COMSATCOM.

OVERCOMING THE CONUNDRUM

One of the major obstacles facing increased use of COMSATCOM across the military is the process and system for acquiring COMSATCOM services. As we've discussed in previous posts, the military has a history of purchasing COMSATCOM services on the "spot market," when and where they're needed.

This makes it impossible to take advantage of efficiencies of scale and ultimately results in the military paying more for these services.

Unfortunately, this is an issue that is caused partly by the acquisition process, but predominantly by how we fund military programs. This was echoed by LTG Michael Williamson, who said, *"We are very quick to attack the acquisition process and ask why we can't acquire with speed. But you really have to take a whole government approach that includes how we fund for these programs."*

These acquisition and funding challenges are ultimately why programs like the Air Force's Pathfinder program are so essential, they help identify ways around acquisition and funding issues that plague the COMSATCOM purchasing process. But they're not the only problems with the acquisition process that came to light during the event—the protest process.

The COMSATCOM industry is quite unique in that providers pay a significant amount of money to develop, launch and manage satellites on orbit. In the time that the satellite is on orbit and operational, these providers need to maximize the amount of transponder capacity they sell to recoup their investment.

This means that the protest process can cause a unique amount of issues and trouble for COMSATCOM companies.

As Mr. Bland stated, *"Protest is not good and we have to find a way to hold people accountable and require them to have skin in the game for protests...if it's frivolous, it has to stop. They cost our industry a great deal of money. Let's say we have five transponders reserved for [a military customer]...and someone protests frivolously, those five transponders cost us millions of dollars a month as they sit idle, or they are reclaimed and when they re-release the solicitation, we don't compete..."*

The **Army Networks Hot Topic** event sponsored by the AUSA was an incredible window into the IT priorities and challenges facing the Army and wider military community today. COMSATCOM is essential for addressing one of the major challenges exposed at this event—the need to keep up with the speed and pace of innovation. However, to accomplish that, the military needs to reevaluate the way it acquires COMSATCOM, and eliminate some of the challenges facing the COMSATCOM industry.

This article is 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 event and conference coverage, providing in-depth reporting from leading satellite shows.



The GovSat Report is sponsored by SES Government Solutions (ses-gs.com/govsat).

PORTABLE PRODUCTS MUST EXCEED THE WEIGHT OF EXPECTATION: A SPECTRA PERSPECTIVE

By Simon Davies, CEO, Spectra Group (UK) Ltd.



When discussions come to the subject of communications—especially tactical communications—the compatibility of new products with existing systems—size, weight and power and, of course, security—all have to be the key objectives within a highly competitive marketplace.

When Spectra Group (UK) embarked on a development path three years ago with the ground-breaking SlingShot® product—a small, external adapter that converts existing tactical radios to SATCOM—the company realized from the outset that success would result only if all kept in mind the needs of the user community. The highest priority for Spectra was to develop a system—in our case, available in a manpack, vehicle, maritime and aviation versions—that was complementary and transparent to in-service equipment.

As stated earlier, high on the list of mandatory requirements were size, weight and power. Real estate on mounted platforms is limited and dismounted troops face a real challenge if technology reduces the amount of ammunition, food and water that can be carried.

For that reason, the company worked hard to minimize the unit's footprint. The manpack system, which weighs under 2 kg in order for the unit to acquire power from in-service radio batteries, frees the operator from carrying various battery types as well as the need to support other charging systems.

Spectra also recently introduced a battery cassette as a further lightweight power option, making use of the ubiquitous AA battery.

Already in deployment with several NATO countries, the SlingShot system can deliver secure BLOS (Beyond Line of Sight) COTM (Comms-On-The-Move) over tactical, theater and strategic distances. SlingShot's appliqué connects to a power supply, which can be a standard AA batteries or a transport 12/24 DC radio battery, vehicle or AC,





any available bearer and is ideal for small and medium-sized teams that require 24/7 availability, plug-and-play set-up and remote management.

SHADE offers secure and straight-forward connectivity to the Internet, ISDN, PSTN, or dedicated private networks. All equipment is packaged in ruggedized, portable and air-checkable containers.

A range of SHADE™ nodes gives the system flexibility and scalability and, no matter how hostile the environment, if there is access to a bearer of some kind, be such leased line, ADSL, 3G or 4G, SHADE™ can create a secure global network of voice and data services within minutes. With no available terrestrial bearer, VSAT or BGAN can be used, depending on bandwidth requirements and how fast and often the user has to move.

Options include SHADE™ Lite, which at 22.4 kg can be powered by 12V DC (vehicle), 110V AC or 240V AC to allow for maximum deployment flexibility, and μ Shade™, which weighs only 1.6 kg μ Shade™ makes use of any available communications bearer but is predominantly designed to use BGAN, Wi-Fi, 3G, 4G, ADSL and leased line.

μ Shade can be deployed globally, on short notice, by small teams or a single user traveling into any area, confident in the knowledge they will be able to securely access the Internet and private networks.

Both of these products benefit from all the security, resilience and technical support offered by SHADE, with Networks Operations Center (NOC) staff on hand to provide technical support and remote configuration to the deployed equipment.

As the nature of conflict changes around the globe and high-tempo, short duration, deployments become the norm, Spectra has pulled out all of the stops to ensure these systems are designed for ease of use and reliability—this eases the burdens present in the modern battlefield.

The days of large forces moving into an area and setting up bases and communications infrastructure are now largely over and tactical communications technologies must adjust to the new battlefield paradigms to save lives and shorten missions.

www.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 Defence, Governmental and Non-Governmental sectors.

Upon leaving the military in 2004, Simon set up Spectra which has achieved steady growth over the past twelve years through these 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 a few.

depending on which SlingShot system is in use. Power is supplied to the appliqué as well as the omni-directional antenna and, under standard operational conditions, the manpack system, using a radio battery, will run for as many as 24 hours on a single charge.

Each SlingShot appliqué has slightly different physical characteristics, depending on which frequency is being converted, which power supply is being used, or if there is additional cooling required (the manpack appliqué may be carried in a pouch or bag and therefore requires heat dissipation). Nevertheless, the weight varies between 489 g and 605 g and the dimensions for the manpack appliqué are 170x75x mm for UHF and 204x75x30 mm for VHF.

The antennas that form the final part of the SlingShot system are all omni-directional, with robust BLOS and COTM capabilities. This gives the system several advantages over traditional UHF TacSat units.

On foot, there is no need to stop and orientate toward the satellite and the system can be used prone, kneeling, walking, jogging or running. As long as there is sight of the satellite, there will be service.

The vehicle antenna can be mounted with a magnetic plate or a pole and is small and unobtrusive at 146x72 mm. SlingShot has been tested at speeds in excess of 80 mph (130 kph) without loss of voice or data communications. Similarly, the maritime antenna has been tested up to 40 knots with high-speed turns on fast military RHIBs (Rigid-Hulled Inflatable Boat).

The ground-breaking combination of secure BLOS and COTM that SlingShot delivers to tactical radios has been described as a battle-winning capability.

Another Spectra product with an emphasis on portability is SHADE™ (Spectra Hostile Area Deployment Environment). This is a rapidly deployable communications hub that delivers secure voice and data services across

A SATCOM FRONTIER PERSPECTIVE: SPREADING CRITICAL DOD SPACE CAPABILITIES OVER MORE SATELLITES

By Intelsat General's SatCom Frontier Editorial Team

For decades, the most secure and protected U.S. military satellite network has served both a strategic and a tactical purpose.

But now, with space becoming a more contested and militarized theater, there is an ongoing conversation within the DoD to separate—or disaggregate—the strategic and tactical functions of the Advanced Extremely High Frequency (AEHF) satellite constellation.

So far, three of the planned six AEHF satellites have been launched to replace the aging Milstar constellation. Both constellations have the strategic role of maintaining command and control communications in the event of a catastrophe such as nuclear war and a tactical role of transmitting communications and data to and from areas of military operations.

The disaggregation of these functions would better protect the DoD's capabilities in space. A recent *Space News* article explained:

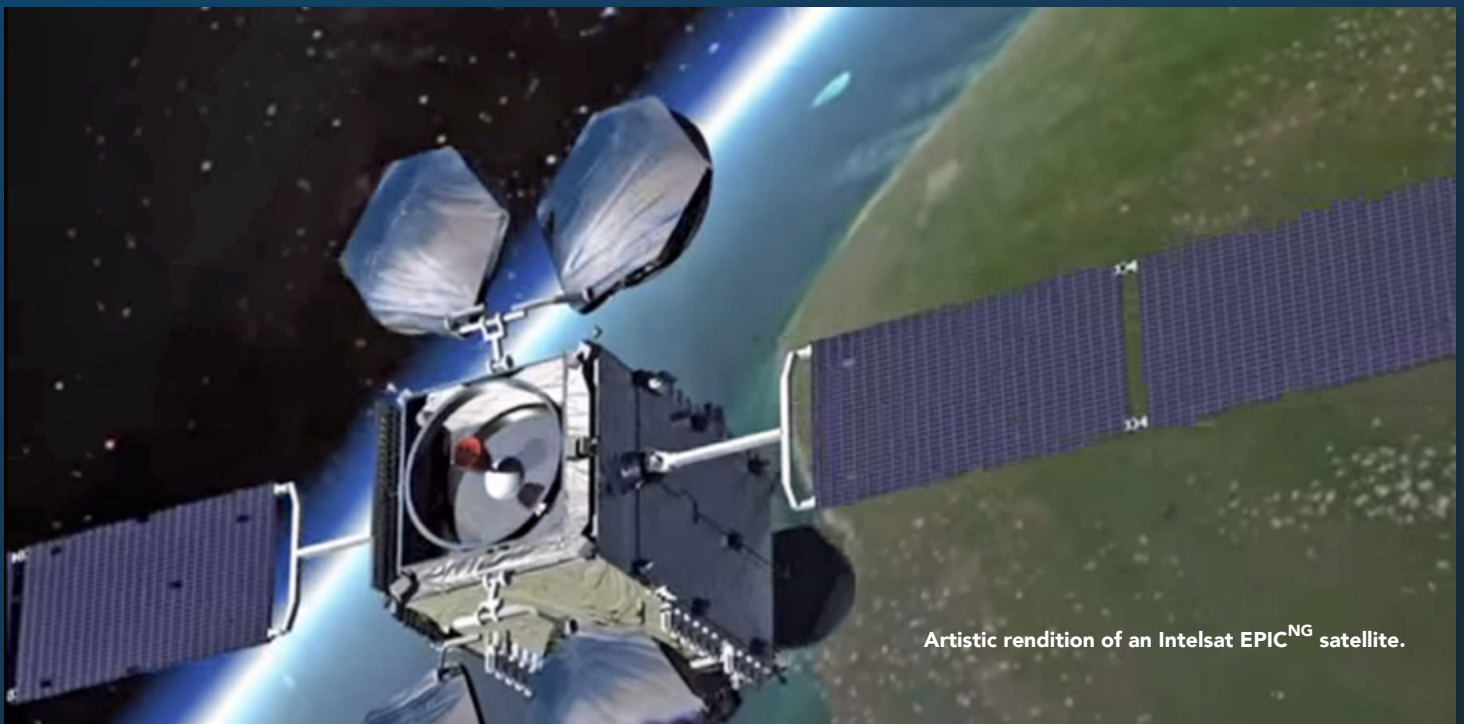
"During that [study period], the Air Force and the broader national security space community it serves have been debating the value of disaggregation: spreading critical space capabilities among batches of smaller, highly specialized satellites instead

of building a handful of super-expensive "exquisite" satellites jam-packed with top-shelf features. Proponents argue that presenting an enemy with numerous lower-value targets instead of a much smaller number of high-value targets would make it harder to degrade the U.S. military's space-enabled battlefield advantages."

There are other important benefits to separating the strategic and tactical roles of AEHF. Moving the tactical function to different satellite payloads would enable the DoD to take advantage of technological advances in commercial SATCOM capability. Separating the two functions also makes sense because the strategic role of AEHF is more difficult and expensive to perform.

For example, the strategic function of AEHF still relies in part on the aging Milstar satellites, first launched in 1994. Those satellites were designed in the 1980s, and don't begin to approach the performance of modern SATCOM networks. Putting the tactical function on other satellites would also give the DoD an opportunity to encourage collaboration with both the commercial industry and allied nations.

These points were made by Douglas Loverro, U.S. deputy assistant secretary of defense for space policy in an article from *Aviation Week* from statements he made during the



Artistic rendition of an Intelsat EPIC^{NG} satellite.

MilSatCom USA conference in Arlington, Virginia, organized by the SMi Group of London, earlier this year:

"Interoperability is most easily achieved when established as a requirement in a program's early stages, says Douglas Loverro... With the U.S. and its closest allies preparing to spend more on their respective military satellite communications fleets in the next decade, there is an opportunity to cultivate greater compatibility across these systems. That is going to provide a much better capability than anything we could do individually, or if we share after the fact."

There is certainly precedent for taking a collaborative and innovative approach to tactical SATCOM. The Australian Defense Force (ADF) turned to Intelsat General for a UHF hosted payload aboard IS-22 launched in 2012.

The IS-22 hosted payload delivered substantial reductions in cost and time to capability for the Australian military. Leasing the UHF bandwidth would have cost the Australians 180 percent more than the hosted solution, and procuring a new satellite would have cost them twice as much.

There is funding in place that could potentially be used for separating AEHF. The Air Force's Pathfinder program is an effort to purchase commercial SATCOM capacity in more efficient ways. While future Pathfinders are not yet fully

defined, they are fully funded: \$30 million in fiscal year 2017; \$41 million in FY2018; and \$50 million in FY2019.

The decision on whether to separate these two functions on separate satellite payloads is expected by year's end. There are elements of space communications that should be entirely in the hands of the DoD.

The strategic function of AEHF certainly belongs in that category. Yet there are others elements of SATCOM where the DoD could do a much better job embracing the superior flexibility and performance of commercial technology.

As is often the case when it comes to change, the challenge is cultural more than technical. Loverro admitted as much in the *Aviation Week* article:

"It's not a matter of, 'Can it work?' it's a matter of, 'Do we want it to work?' Loverro said. "If we want to make it work, it will."

Editor's note: This article is courtesy of Intelsat General Corporation's SatCom Frontier infosite, located at:

www.intelsatgeneral.com/management-team/satcom-frontier/

MILCOM 2016 — OFFERING 35 YEARS OF MILSATCOM KNOWLEDGE



When discussing future MILSATCOM needs to protect nations and their citizens, one of the most important considerations is to be aware of what may be coming to harm or interfere with a national process and to know what tools are available to immediately offset such incursions.

As far as intelligence gathering regarding the acquisition of technologies that can be employed by MILSATCOM professionals against opposition infiltration, events that gather the companies and the personnel who have the subject-matter expertise to present viable solutions are truly worth their consideration for attendance.

One such event is MILCOM 2016, which this year will run from November 1st through 3rd at the Baltimore Convention Center in Baltimore, Maryland, USA.

Operating with the tagline "*Secure Communications At The Speed Of Cyber*," MILCOM 2016 provides the convenience of assembling a plethora of information at a single venue as well as providing attendees with the knowledge they are seeking direct from those who are "in the know."

That valuable knowledge is offered by various military/agency/government agencies and organizations to dozens of commercial companies, all of whom are involved in producing the numerous products and the technologies able to counter hostile actions through the application of assured and reliable communications.

From the start of the event to the closing day, command, control and communication challenges are presented, from the ongoing research and development of yet-to-be announced offerings to the application of existing solutions to the presentation of future needs, products and assessments.

The breadth of the requirements, the pace of change as well as the state of play of the C4I markets that serve the Department of Defense (DoD), federal agencies, multinational entities are explored by the leaders in government, industry and academia.

With a Cyber domain that is rapidly expanding, the issues and solutions to the challenges presented to those within the MILSATCOM world are without peer at MILCOM 2016.

This event brings technical presentations, discussions, tutorials and nearly 30,000 square feet of industry exhibits under the Baltimore Convention Center's roof.

This year, there is also an expansion of government organizations and exhibits in attendance. Additionally, there will be presented more than 300 unclassified and restricted technical presentations, tutorials and panel discussions, all led by experts in *Command, Control, Communications, Computers and Intelligence (C4I)*, with a broad array of continuing education credits are also offered to attendees.





A look at the programs available on the first day, as of this writing, offers an overture of the expertise attendees can expect at MILCOM 2016.

DAY 1: November 1, 2016

**Restricted Technical Panel
System Perspectives and Integrated
Electronic Warfare (EW) and Communications**

Tuesday, November 01, 2016
9:00 AM - 10:30 AM

Organizer/Moderator: *Captain Kenneth Park*,
USN (Ret.), Senior Manager, **Harris Corporation**

Synopsis: The Pentagon continues to look for areas of investment and strategic advantage in this era where technology is defining modern warfare. Ensuring dominance over the electromagnetic spectrum is an imperative that cannot be overlooked with the increasing capabilities of traditional and emerging adversaries fast developing technologies.

Today, links between electronic warfare and cyber systems are nearly as inextricable as those between data/communications and the operations that depend on them. This panel will examine the growing importance of information assurance on the battlefield through the lenses of electronic warfare and cyber warfare to highlight the next phase of operational threats and technologies to address them. This panel will seek to answer some fundamental questions such as:

- *How are electronic warfare (EW) and cyber related? What can be achieved by combining these capabilities (i.e., w/ sensors, communications and networks)?*
- *How are adversaries deploying EW and cyber solutions on the battlefield? What's their next step?*
- *What is the current state of affairs in pairing EW and cyber capabilities for the field and operationalizing?*

- *What types of systems and investments are needed to overcome adversaries in the near-, long-term?*

Technical Panel
**Confronting the Ever-Evolving
Threat Landscape**

Tuesday, November 01, 2016
9:00 AM - 10:30 AM

Approved for 1 CompTIA CEU: Security+ and CASP

Organizer: *Lance Dubsy*, Chief Security Strategist, **FireEye**

Synopsis: How does threat intelligence improve an organizations or a nation's security posture? This panel will discuss threat intelligence quality, security operations maturity, review threat intelligence in offensive and defensive applications, discuss how threat intelligence sharing will work in theory and in practice, the viability of STIX as a threat sharing structure, and highlight cases where intelligence findings led to read-world security gains.

Lance Dubsy, FireEye Chief Security Strategist will navigate the panel through the threat intelligence paradox to help leaders understand how to apply it and reduce organizational risk.

Technical Panel
Tactical Data Link (TDL) Developments

Tuesday, November 01, 2016
9:00 AM - 10:30 AM

Organizer: *Delbert Jones*, CSRA

Synopsis: The panel will address Tactical Data Link (TDL) interoperability issues in the Joint, Allied, and Coalition Forces environments. Panel members will provide multiple perspectives, including strategic policy influences, data link and waveform specifications and standards, and warfighter requirements.

Focus includes the following: status on the Joint TDL Migration Plan and its formal release to foreign partners; status of the services' programs related to the Joint Aerial Layer Network (JALN); the benefits of the Interoperability Enhancement Process (IEP) and it's supporting tools; and COCOM priorities driving TDL investments.

Technical Panel
**Cyber Risk: Challenges, Mitigation,
and Modeling**

Tuesday, November 01, 2016
2:00 PM - 3:30 PM

Approved for 1 CompTIA CEU: A+, Network+,

Security+, and CASP
Organizer: *Bharat Doshi*, Senior Research Scientist (Cyber Security), ST, Communications-Electronics Research Development and Engineering Center (CERDEC), U.S. Army

Synopsis: Cyberspace has permeated all aspects of personal and business life, critical infrastructures, and national security apparatus. The advent of Internet of Things, Cyber Physical Systems, system-on-a-chip, man-machine systems, heavily connected platforms, and autonomous systems promise that the role of the cyberspace will continue to expand and our reliance on timely and secure delivery of accurate information to humans and machines will continue to grow.

The spread of cyberspace will enlarge the attack surface and increasing reliance could lead to severe consequences of successful cyber-attacks. Connectively, Cyber Risk (likelihood of a successful attack x consequence of the attack) could continue to grow unless technologies and operational guidelines are designed to control the likelihood and consequence to minimize the Cyber Risk.

This panel will discuss current and future Cyber Risk from various categories of adversaries, approaches to modeling and quantifying this risk, and novel approaches to mitigating the risk.

Technical Panel

Distributed Terminals and Architecture for Tactical SATCOM On the Move

Tuesday, November 01, 2016

2:00 PM - 3:30 PM

Organizer: *Tat Fung*, Electronics Engineer, Communications-Electronics Research Development and Engineering Center (CERDEC), U.S. Army

Synopsis: A SATCOM on the move (SOTM) capability is needed on Army tactical vehicles. Integration of these systems has become the primary challenge as the vehicles are increasingly crowded with many other combat and communications systems.

The concept of a Distributed SOTM Terminal (DST) in an Open Standard Architecture (OSA) is being developed to mitigate the platform integration challenges, reduce cost and speed procurement and fielding. It is envisioned that Distributed SOTM Terminals will allow the additional integration flexibility needed bring a SATCOM capability to these tactical vehicles.

The intent of the Open Standard Architecture is to reduce procurement cost and schedule in the engineering and development of this capability across multiple types of platforms. This panel session will discuss the challenging requirements that lead to the development of Distributed SOTM Terminals, the partition of the terminal into various components and open standard interfaces being developed between each component.

The panelists will provide perspectives from the military and industry on: the cost and benefit to the military, the challenges and lessons learned in realizing a design based on an OSA, and the future of Distributed SOTM systems.

Technical Panel

Tactical Data Links—A Way Forward

Tuesday, November 01, 2016

2:00 PM - 3:30 PM

Organizer: *Marius Vassiliou*, Project Leader and Analyst, **Institute for Defense Analyses**

Synopsis: Tactical data links must operate in increasingly contested and degraded environments, but current TDLs provide limited protections from advanced electronic attack and surveillance systems. Platforms' data link transmissions are susceptible to detection and receivers are vulnerable to jamming. Data link waveforms and networks also have limited adaptability to changing user demands, channel conditions, and topology changes due to mobility.

Link capacity and network throughput are limited, both due to system design limitations and channel degradations in con-tested environments. Improved architectures are needed to minimize platform detectability, increase system jam resilience, increase user and network capacity in contested and degraded environments, and achieve scalable connectivity.

Such advances will require improvements in existing systems and development of new waveform and systems technologies. These include directional antennas, adaptive beam forming and nulling, novel modulation and coding, frequency agility, and others.

The panel will discuss emerging architectures and technologies for tactical data link evolution.

Tutorial

Wireless Cyber Operations: The Anatomy of an Attack

Tuesday, November 01, 2016

2:00 PM - 4:30 PM

Approved for 1 CompTIA CEU: A+, Network+, Security+, and CASP; 1 GIAC CPE
Instructor (s): *Jack Burbank* and *Elizabeth Alonzi*

Synopsis: This tutorial aims to provide attendees with practical knowledge of how to both secure and attack several key commercial wireless networking technologies. The tutorial will first provide attendees with a theoretical treatment of wireless network security and information operations.

The tutorial will then provide an overview of many of the key security software tools available to a network security professional and numerous examples of attack methods utilizing these tools. This tutorial will provide several in class demonstrations so that attendees will gain an understanding of how to use these tools, with a focus on the Kali Linux security suite and Cobalt Strike.

The proposed tutorial will utilize several computer systems and wireless technology devices, provided by the instructors, that will provided attendees with demonstrations of several classical wireless vulnerabilities with a limited number of interactive hands-on activities.

The instructors will provide attendees with USB thumb drives loaded with Virtual Machines (VMs) that has preloaded and configured all required software tools for the course.

Attendees can bring their own laptop computer equipped with a VM player (available as a free download from VMWare) if they wish to participate in the hands-on activities (not required).

The exhibit hours for this event are:

- **Tuesday, November 1st, from 1:30 PM to 6:30 PM**
- **Wednesday, November 2nd, from 10:30 AM to 4:00 PM**
- **Thursday, November 3rd, from 8:00 AM to 12:30 PM**

MILCOM 2016 is co-sponsored by AFCEA International and the IEEE Communications Society, MILCOM is a unique collaboration. MILCOM is the one conference where command, control, and communication challenges are presented and discussed end to end—from research and development through existing solutions to future needs.

This event offers industry the opportunity to understand the breadth of requirements, the pace of change, and the state of play in a variety of C4I markets serving DoD as well as federal agencies, and multinational entities. Leaders across government, industry, and academia address their needs, issues, and solutions.

In the MILCOM tradition, the technical program features numerous continuing education opportunities, paper presentations, panels, and tutorials. The technology engagement hall serves as the central hub for collaboration and innovation. Attend to discover hundreds of technologies and solutions.

Those who produce MILCOM 2016 include...

AFCEA International, which was established in 1946, is a non-profit organization serving its members by providing a forum for the ethical exchange of information. AFCEA is dedicated to increasing knowledge through the exploration of issues relevant to its members in information technology, communications and electronics for the defense, homeland security and intelligence communities.

AFCEA supports local chapters, sponsors events, publishes the award-winning SIGNAL Magazine, promotes education through the AFCEA Educational Foundation, and provides member benefits—all with the purpose of equipping its members to meet government's challenges and to further their careers. AFCEA and its chapters provide a common ground for learning that is unquestioned in its integrity and unequaled in the reach of its relationships. More than 32,000 members participate through their 150 chapters and student chapters across the globe.

The **IEEE** (Institute of Electrical and Electronics Engineers, Inc.) is the world's largest technical professional society. Through its more than 400,000 members in 150 countries, the organization is a leading authority on a wide variety of areas ranging from aerospace systems, computers and telecommunications to biomedical engineering, electric power and consumer electronics.

Dedicated to the advancement of technology, the IEEE publishes 30 percent of the world's literature in the electrical and electronics engineering and computer science fields, and has developed nearly 900 active industry standards. The organization annually sponsors more than 850 conferences worldwide.

The **IEEE Communications Society** founded in 1952 and has over 30,000 members. It is the second largest of IEEE's 38 technical societies. It has become the major international forum for the exchange of ideas on communications and information networking.

To register for MILCOM 2016, please access
**[http://events.afcea.org/milcom16/
Public/Content.aspx?ID=62537](http://events.afcea.org/milcom16/Public/Content.aspx?ID=62537)**



A TRIDENT SYSTEMS FOCUS: CROSS DOMAIN COLLABORATION WITH RADIOS

“A bobcat growls over the speaker, and Airmen from the 71st Expeditionary Air Control Squadron spring into action within the darkened confines of the Battlespace Command and Control (C2) Center, better known as 'Pyramid Control.' ”

This single audio cue alerts the Weapons Director that an unplanned engagement with hostile forces—referred to as Troops in Contact, or TIC—has occurred somewhere in Afghanistan. On the Weapons Director's computer monitor a chat room window flashes to distinguish itself from the dozens of rooms he monitors continuously.

More than a thousand kilometers away, a Joint Terminal Attack Controller on the ground has called for a Close Air Support (CAS) aircraft to assist the friendly forces now under assault. The Weapons Director has minutes to move remotely piloted vehicles away from the CAS aircraft's flight path, to de-conflict the air support and ground fire from other aircraft, and to provide an update on hostile activity to all concerned.

The Weapons Director has numerous communication methods at his disposal, including VoIP and tactical radio to quickly get the critical information to operators throughout southwest Asia and across the world, including communicating across differently classified networks. This enables key participants to assess the situation and to commence their portions of the mission in parallel.

Another alert appears in the chat room window and the VoIP softphone pops up. The Weapons Director gets an inflight report from the pilot of one of the UAVs...

(Talon 21): "Identified on station TBM launch site. PID launcher with missile; personnel activity. Be advised, mosque IVO target."

In the background the tactical radio communications from the UAV pilot is sent over a coalition network to the Trident Systems Mini-SCC device and converted to VoIP. The VoIP traffic is then securely transmitted via the Trident Systems V2-CDS, which filters the media, and forwards to the Weapons Director desktop softphone on SIPRNET.



(WD): "Copy that. Please state weapons on board and fuel."

(Talon21): "Have plenty of gas, but we've only got GBU-24s."

(WD): "Copy that Talon. How far is the mosque from target?"

(Talon21): "Mosque is approximately 500 feet from launcher."

(WD): "Copy Talon. Thanks for the info."

The Weapons Director then relays the information to the local Target Duty Officer for the go/no-go decision.

The scenario described above and similar scenarios are not isolated events but occur daily in the global war on terror. Large, distributed multi-disciplinary teams work around the clock executing missions and responding to threats and opportunities.

Theatre operations centers (and lower echelons, as well) work best when they are "fighting off the same map" with interoperability among C4ISR systems being the most critical feature in satisfying this requirement. Commands often find operators supplementing key global command and control systems, such as the Networked Interoperable Real-time Information Service (NIRIS), the Global Command and Control System—Joint (GCCS-J), and the Joint Automated Deep Operations Coordination System (JADOCS), by collaborating with voice calls on command network VoIP phones and tactical radios.

Given the rising uncertainty and unpredictability of the nature and scope of future military operations, the use of SATCOM, VoIP, tactical radio and commercial cell calls going forward is likely to increase. The inherent flexibility and tailor ability of being able to compose a collaboration environment tuned to mission needs is crucial and adaption to the environment must occur on the fly.

Tactical radio and VoIP systems lack the ability to collaborate with users across networks of differing security classification levels (*i.e.*, cross-domain) requiring each participant to have multiple phones at a single station, effectively limiting communication within across enclaves. These requirements have driven the integration of two proven technologies, described below, which can be combined to provide a cross-domain tactical radio capability.

MINI-SECURE COMMS CONTROLLER

Trident Systems' Mini-Secure Communications Controller (Mini-SCC) is a man-portable device for cross-connection of disparate communications links, including Tactical Radios and Land Mobile Radios that incorporate High Frequency (HF), Very High Frequency (VHF), Ultra High Frequency (UHF), SATCOM, public safety radios, coalition and partner nation radios, Voice-over-Internet- Protocol (VoIP), and cellular networks.

Completely hopset (*a list of frequencies the spectrum manager authorizes a particular unit to use*) and encryption

Trident Mini-SCC.



key independent, the Mini-SCC achieves communication cross-connect regardless of the radio type, communication medium or security key.

For expeditionary and handheld use, the Mini-SCC is contained in a small form factor (1.73" x 4.38" x 7.43"), weighing only 18 ounces without the internal battery, and can be outfitted with a rechargeable internal battery for 12 hours of continuous runtime. Setup and configuration are completed through a web-based interface (WBI), allowing an operator with any web browser to access, configure and store settings in the Mini-SCC.

If desired, the WBI can even be accessed over Wireless IP or from a cell phone browser. Once set up, the Mini-SCC holds the settings until they are changed; the WBI is not necessary to operate this device. The WBI supports administrator and operator logins and has been tailored to meet IA requirements for security and performance.

The Mini-SCC has been tested with a wide variety of US and partner nation radios, include the majority of typically deployed US tactical radios by companies such as General Dynamics, Harris, Raytheon and Thales. Additionally, the Mini-SCC has been used with a variety of coalition radios manufactured and deployed by various partner nations.

The Mini-SCC has been employed in a number of exercises for coalition inter-communications with nations such as Korea and Japan; most notably the Ssang Yong Event in Pohang Korea in 2014 and 2016, where it was used to cross-link US Marine Corps and Republic of Korea tactical radios for seamless communications.

VOICE & VIDEO CROSS DOMAIN SOLUTION

The balance between protecting and sharing critical information has never been more crucial than in today's Joint and Coalition military environment. Voice over IP audio and point-to-point video are common tools for operational information-sharing networks throughout the DoD and Intelligence Community (IC).

However, the current collaborative infrastructure creates communities of users who frequently are unable to communicate outside of their network or security domains quickly and effectively. Voice and Video Cross Domain Solution (V2-CDS) provides a complementary capability allowing Voice over IP (VoIP) audio and video phone calls across network security boundaries using existing Cisco (and compatible) or Asterisk VoIP call managers and phones, including those connected through Trident's Mini-SCC (described above) when used together.

V2-CDS has been certified at the Secret and Below Information (SABI) level and is on the Unified Cross Domain Services Management Office (UCDSMO) Baseline List as the first and only VoIP CDS (Cross Domain Solution) available for deployment within the DoD & IC.

Additionally, V2-CDS has been deployed and accredited for operational use at EUCOM, connecting the EUCOM J6 SIPRNET and the US BICES (Battlefield Info Collection and Exploitation Systems) networks. Phones on EUCOM J6 SIPR and US-BICES can now call each other directly using both voice and video phones, eliminating the cost and footprint of installing and maintaining separate phones and networks to each end user's desk.

Trident Systems' Voice and Video Cross-Domain Solution delivers VoIP audio and video telecommunications across network security boundaries using existing call managers and videophones in a user-friendly and timely manner. V2-CDS authenticates users and reduces covert channels to an acceptable risk, while simultaneously maintaining point-to-point video capability.

- *Instantly and securely relays vital video and real-time voice across different security domains*
- *Provides face-to-face communication to reduce uncertainty, strengthen trust and expedite collaboration*



- *Supports cross-domain, point-to-point videophone calls and point-to-point and multi-party audio calls*
- *Cross domain calls are as easy as placing a long distance call*
- *Supports existing Voice over IP (VoIP) infrastructures, including popular Private Branch Exchange (PBX) servers and SIP-compatible IP phones, with minimal hardware required*
- *Provides Recording for Playback and Analysis*
- *Designed to meet rigorous Department of Defense (DoD) and National Security Agency (NSA) standards*
- *Assured Pipeline Architecture protects sensitive conversations and minimizes covert channels*
- *Supports star and cascading network connections with multiple V2-CDS systems*

Based on government testing, V2-CDS can simultaneously support at least 1000 Audio and 120 Video Conversations across two security domains. A high capacity/density version with double the number of video calls, as well as a compact version with less video throughput, are also available. V2-CDS works with Trident's Secure Communications Controller (SCC) product to enable secure cross domain tactical radio and commercial cellular communications.

V2-CDS implements requisite NIST 800.53 and CNSS 1253 security controls. V2-CDS is a guard evaluated for operation at Protection Level 4 (PL4) to instantly and securely relay vital video and real-time voice across different security domains, providing face-to-face communication to reduce uncertainty, strengthen trust & expedite collaboration.

In Joint, Coalition, and rapidly formed ad-hoc disaster response teams, the need to share information quickly is impeded by each organization's well-protected network boundaries.

In cases where special coalition networks are created (e.g., AMN), users often find themselves with multiple computer terminals and VoIP phones, one for each network and still unable to combine users from multiple networks in one chat room. The solution to stove-piped security enclaves is a set of emerging cross-domain capabilities supporting tactical radio cross-connect and a VoIP solution tailored to ops center requirements.

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Trident Systems is a veteran-owned small business that delivers innovative and affordable technology solutions for critical government and commercial needs. Founded in 1985, Trident continues to harness technology and provide leading-edge solutions to every Military Service, the Intelligence Community, and a broad spectrum of government and industry partners.

Trident develops products in three primary focus areas: Integrated C4I systems, Radar Systems, and Assured Collaboration Systems. Trident also provides an array of services from Complex Systems Engineering services for complex system development as well as Collaboration Services, providing a full range of design / build services for state-of-the-art facilities including supporting of the Integrated Air Defense System in the National Capital Region. Trident's headquarters is located in Fairfax, Virginia.

