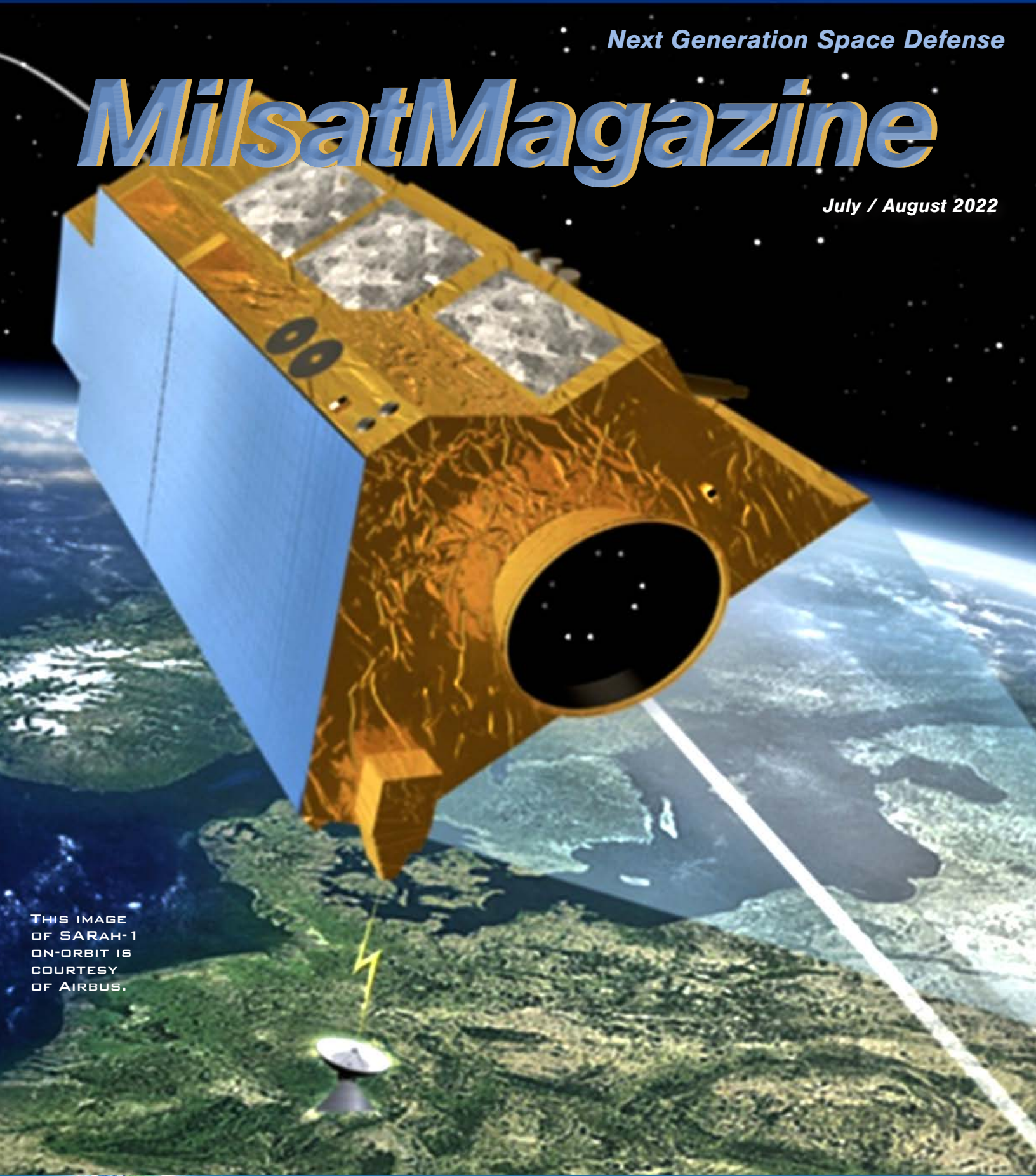
Next Generation Space Defense

MilsatMagazine

July / August 2022



This image of SARah-1 on-orbit is courtesy of Airbus.

PUBLISHING OPERATIONS

Silvano Payne, Publisher + Executive Writer
Simon Payne, Chief Technical Officer
Hartley G. Lesser, Editorial Director
Pattie Lesser, Executive Editor
Donald McGee, Production Manager
Teresa Sanderson, Operations Director
Sean Payne, Business Development Manager
Dan Makinster, Technical Advisor

COLUMNISTS + CONTRIBUTORS

Chris Forrester, Broadgate Publications
Karl Fuchs, iDirect Government
Bob Gough, Goonhilly Earth Station
Rebecca M. Cowen-Hirsch, Inmarsat
Giles Peeters, Track24 Defense
Koen Willems, ST Engineering
Mike Young, Envistacom

AUTHORS

Eric Bernardini
Lou Dubin
Karen Emery
Paul Morris
Etienne Muselier
David Pesgraves

ADVERTISERS

DISPATCHES

Rocket Lab launches the 1st of two Responsive Space Missions for NRO

Rocket Lab USA, Inc **(Nasdaq: RKLB) ("Rocket Lab" or "the Company") has successfully launched the first of two responsive space missions for the *National Reconnaissance Office (NRO)*.**

Following lift-off of NROL-162 ("Wise One Looks Ahead") from Pad A at Rocket Lab Launch Complex 1 at 06:30, UTC, July 13, 2022, Electron successfully delivered the NRO's national security payloadto space.

In partnership with the Australian Department of Defence, NROL-162 will provide critical information to the United States Government's agencies and allies and national security decision makers monitoring and responding to world events and humanitarian issues.

"Wise One Looks Ahead" is the first of a pair of back-to-back responsive space missions commissioned by the NRO for dedicated launch on Electron. NROL-199 ("Antipodean Adventure"), the follow-up mission to NROL-162, is scheduled to launch in just nine days' time from Pad B at Rocket Lab Launch Complex 1 on July 22, 2022.

NROL-162 and NROL-199 are the latest pair of missions awarded by the NRO under the Rapid Acquisition of a Small Rocket (RASR) contract. Rocket Lab previously successfully delivered a pair of national security missions to space for the NRO on Electron in January and June 2020.

www.rocketlabusa.com

FEATURES

MilsatMagazine is published 11 times per year by SatNews Publishers,
800 Siesta Way, Sonoma, California - 94576 - USA
Phone: (707) 939-9306 / Fax: (707) 939-9235

General Dynamics Mission Systems receives National Security Agency (NSA) contract for high assurance ethernet encryptor

General Dynamics Mission Systems was recently awarded a contract from the National Security Agency (NSA) to design, develop, test and deliver a certifiable, 400Gbps, high-assurance encryption solution that is compliant with the Ethernet Data Encryption Cryptographic Interoperability Specification (EDE-CIS).

The winning solution includes the modular TACLANE® E-Series Adaptable Security Platform (ASP) and the TACLANE-ES400 Cryptographic Module. Each module supports throughput ranging from 20Gbps to 400Gbps. When the TACLANE-ASP is fully populated with two ES400 modules, the solution supports aggregate speeds of 1.6 Tbps, more than eight times faster than any other certified encryptor today.

The high-speed, fault tolerant solution is engineered to efficiently scale power needs while maintaining performance. Its modular architecture allows customers to right-size their encryption solution to meet specific needs through the application of user-swappable hardware components, crypto modules, and software upgrades.

The design of the TACLANE E-Series ASP reduces the equipment footprint while balancing power and cooling needs. Its redundant design for power and failover eases maintenance and sustainability requirements, increasing operational availability and reducing downtime to keep mission critical networks working. When bandwidth and security needs grow, the design of the TACLANE E-Series ASP allows for end-users to add functionality and capability without infrastructure changes.

As with all TACLANE products, the TACLANE ASP and the ES400 Crypto Module are supported by the GEM® One Encryptor Manager with the new Key Management Infrastructure Delivery Only Client feature to simplify operations and facilitate easier management and configuration. In addition to this feature, GEM One provides the ability to rapidly assess overall network health and to quickly isolate and recover from failures, eliminating downtime.

"*General Dynamics Mission Systems is known for providing the most widely deployed high assurance encryptors in the world. With the development of the ASP and TACLANE-ES400 cryptographic modules, we are continuing to advance our encryption portfolio to address our customers' need for high performance processing and speed with uncompromised data security and efficient power consumption*," said ***Brian Morrison***, vice president for the Cyber Systems line of business with General Dynamics Mission Systems. "*This win demonstrates our commitment to our customers who require the highest of speeds. It also validates our unique modular approach, fully aligned with NSA's vision of Crypto as IT (CIT). We will deliver a future-proof TACLANE E-Series portfolio, which will ensure that our customer's investments can be re-used as speeds increase.*"

SMARTER COMMS FOR A MODERN MILITARY

FACING AN ADVERSARIAL WORLD

Author: Lou Dubin, Senior Vice President, Product Management and Marketing, Comtech Satellite Network Technologies

AHEAD OF THE CURVE

The need for the fastest, most rugged and resilient communication systems has intensified amid an increasingly adversarial global environment in recent years.

As government and defense markets are constantly changing at a rapid pace, ***Comtech*** is innovating and collaborating to ensure government agencies and military forces are ahead of the relentless communications curve.

The development of ultra-flexible software-defined modems capable of hosting multiple waveforms and operating over multiple orbits and frequencies is vital in fending off intentional jamming, cyberattacks, kinetic attacks, interference and outages.

Comtech has provided modems and amplifiers to the ***Department of Defense*** **(DoD)** community for years and we consistently deliver nextgen platforms to meet current and future demands.

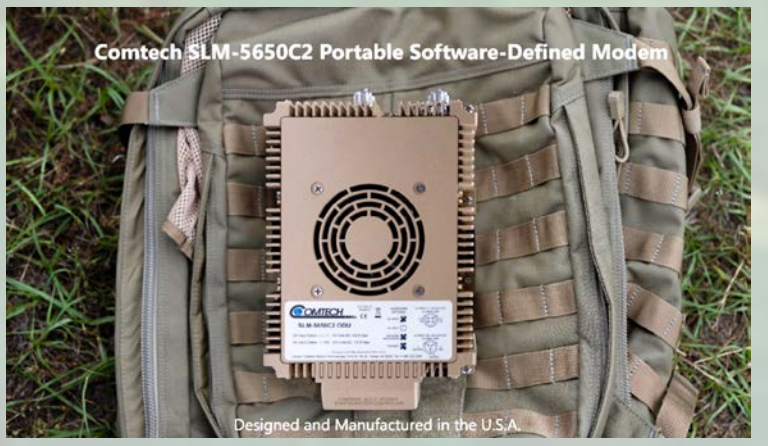
The DoD's focus on ***Joint All Domain Command and Control*** (**JADC2**) is driving open architectures and interoperability and our commercial solutions are supporting many of these modernization goals and objectives. Much of our work supporting satellite operators and constellations in LEO, MEO and GEO is being leveraged to keep armed forces equipped with advanced multi-orbit, multi-frequency, connectivity solutions.

That kind of flexibility across a comms network supporting armed forces offers a life-saving advantage. A military unit that delivers its data, voice and video over a single network can be targeted, disrupted and taken out by enemy forces.

Comtech's ***SLM-5650*** modem has been deployed globally for 20 years, providing both hub-based and portable military-grade communications that can be carried in a backpack instead of the back of a truck.

ON THE EDGE

The SLM-5650C2 is the latest in Comtech's portable software-defined modem series designed for government and military applications and small commercial SATCOM terminals. These portable and powerful modems can be carried and operational in manpacks and offer a future-proof platform to support requirements years ahead on the horizon.



The mobile modem, smaller than a laptop computer, supports multi-orbit comms links — that opens the door to a new level of resiliency and security — making it extremely difficult for adversaries to jam communications links and identify the user's location.

Equally important on the battlespace, the modem is easy to use and reconfigure on the fly. In essence, the small and proven SLM-5650C2 platform extends powerful backbone-like connectivity to the frontline warfighter and enables them to configure network capabilities with the push of a few buttons, eliminating the need to carry cables, a computer and navigate web pages in an already tense environment.

Comtech's new workhorse ***CDM-780*** gateway and trunking modem is a workhorse backbone modem that offers an unprecedented 2.4 gigabits per second of simplex and nearly 5 gigabits per second of duplex communications in a single platform.

The CDM-780 is the world's fastest modem, and the successor to the workhorse ***CDM-760*** platform, which is currently deployed over LEO, MEO and GEO constellations.

A multi-orbit platform, like the CDM-760 and the new CDM-780 trunking backbone modems and the portable SLM-5650 series, enables multiple communications streams over multiple satellites in multiple orbits, making it inherently more difficult for adversarial forces to identify and attack vital comms links.

Comtech also offers a broad range of amplifiers across X-, Ku-, Ka-, Q- and V-bands to provide unmatched flexibility to develop adaptable terminals.

The company continues to integrate successful commercial platforms, innovations and ideas into new and advanced solutions and concepts for government and military use. A great example is Comtech's new ***ELEVATE*** next-gen VSAT platform, which allows networks operators to seamlessly and simultaneously bounce between ***HDNA*** waveforms and ***MF-TDMA*** technology to support small and large networks applications.

We are already working closely with military and government customers to tailor that level of flexibility in the ELEVATE solution to meet specific demands and needs across the military and government sectors.

SUPPLY CHAIN READY

Comtech has had its share of supply chain challenges, like many within the SATCOM industry; however, our mature processes and solid demand forecasting has allowed us to deliver our products and solutions without significant disruptions.

The company's **Made-in-America** focus and mission has been a big part of that success, while other companies have offshored operations. Comtech will be transitioning our division headquarters to a new state-of-the-art 150,000 square foot manufacturing and engineering facility in Chandler, Arizona.

Comtech is convinced a dedication to building products and solutions in the USA lines up well with the U.S. military's objectives to re-shore and do all it can to secure the supply chain going forward. The bottom line is an absolute commitment to the design, development and timely delivery of cutting-edge solutions that offer a transformational edge to government and warfighter comms operations anywhere in the world.

www.comtech.com

COMTECH

DISPATCHES

The initial contracts for the DIU's HSA program have been awarded to four companies

The Defense Innovation Unit's (DIU's) Hybrid Space Architecture (HSA) program seeks to provide global, ubiquitous and secure internet connectivity throughout the space domain for commercial, civil and military users, including international allies and partners.

DIU is collaborating with the ***United States Space Force*** (**USSF**) ***Space Warfighting Analysis Center*** (**SWAC**) and the ***Air Force Research Laboratory*** (**AFRL**) ***Space Vehicles Directorate*** on this prototype effort.

The HSA aims to demo a network architecture that leverages commercial and government space assets across diverse orbits to provide secure, assured and low-latency data communications anywhere on or off Earth. To accomplish this, DIU awarded ***Other Transaction*** (**OT**) contracts to companies **Aalyria**, **Anduril**, **Atlas**, and **Enveil**. Additional awards from the same solicitation are anticipated.

Hybrid space communications is the next great leap forward, representing the convergence of the information age and the space age. Cloud providers are already partnering with teleports—or centers that connect ground-satellite communications—to establish cloud capability in orbiting vessels in space. To fully leverage the capabilities of these networks the ***Department of Defense*** (**DoD**) needs to ensure network interoperability and homogeneity as well as compatibility with existing DoD assets.

A fully networked battlespace has been the dream of commanders for decades, but is now finally within reach. While being a critical enabler of concepts, such as ***Joint All Domain Command and Control*** (**JADC2**) and ***Battlefield Management Command, Control, and Communication*** (**BMC3**), the vast benefits to warfighters vary from on-demand or near-real-time satellite imagery and theater-wide tracking to reliable broadband internet at remote forward operating bases for improved morale and family welfare.

The HSA consists of four identified domains: Multi-path communications, Multi-source data fusion, Cloud-based analytics and Variable trust protocol. On-orbit demonstrations are planned within 24 months.

"*It's time for the internet to move off-planet*," said Dr. **Rogan Shimmin**, DIU program manager for HSA. "*The scope of the HSA is immense and revolutionary. The initial goals are on-demand collection and exploitation of overhead imagery and beyond line-of-sight tactical situational awareness. Hosting IoT sensors and edge processing on every satellite further enables breakthrough civil applications, including comprehensive space domain awareness and high-fidelity mapping of the space radiation environment.*"

A REVOLUTION IN MODEM DESIGN BRINGS NEW POSSIBILITIES

Author: Karen Emery, Vice President of Product Management, iDirect Government

For many years, the design and integration of modems has followed a tried and true path. A collection of dedicated elements were assembled and integrated into a set package.

Each of the elements had a very specific function and the roles were clearly defined:

- *Analog filters*
- *Analog to digital / digital to analog converters*
- *Modulators*
- *Decoders*
- *Security*
- *Power amplification and frequency conversion through Block Upconverter (BUC) and Low-noise Block Downconverter (LNB)*

Frequency converters were essential to go from whatever the desired frequency to L-Band (*used as an intermediate frequency to make supporting multiple satellite bands easier*), adding complexity. The entire system was extremely inefficient and power hungry.

Advancements in **SWaP** (***Size, Weight and Power***) were made along the way, with each new generation of modems improving upon the previous version — but only incrementally. The modems tended to be either "*sandwiches*" made up of circuits on either side of a carrier board, or "*pizzas*" with all components laid out side by side on top of the carrier board. Pizzas were typically used for rack-mounted solutions and sandwiches were placed into terminals. (*Paradoxically, the sandwiches tended to be hotter than the pizzas*!) In many cases, the terminals had to be designed to accommodate the modems. That time is over.

The latest design of modems has broken many of the previous concepts of what constitutes a modem. To better appreciate the latest innovations, it is helpful to start by considering the key building blocks of a modem:

- *The modem radio is traditionally responsible for amplifying, filtering, and converting the Radio Frequency (RF) signal from analog to digital for demodulation in the FPGA of the digital portion of the modem. The transmit side essentially follows the same process but in reverse*
- *The radio section also includes a multiplexer (MUX) that couples DC power for the BUC/LNB together with reference clocks to create the interfacility link (IFL).*
- *The FPGA performs demodulation and decoding and is responsible for security and management*

All of these components are brought together by the carrier board, which routes signals between the components and external input and output (*e.g., Ethernet*). The board also provides a physical mounting structure for the components. Historically, there was a tight coupling between analog and digital, and from a practical perspective, these components could not be separated because the components were designed to work in tandem.

However, with the latest in standardized interfaces, it is now possible to decouple the analog and digital design and that is a major steppingstone in providing a true, software-defined modem and making possible significant advancements in terminal design.

The first major change is using digital interfaces between components. Currently, the most popular standard in use is ***VITA 49.2*** — this is a standardized format for delivering digitized, ***intermediate frequency*** (**IF**) radio signals. This open standard expands the versatility of ***software-defined radios*** (**SDRs**) and is a critical element in the ***Sensor Open System Architecture*** (**SOSA**) ***Consortium*** which focuses on ***Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance*** (**C4ISR**), ***Radar***, ***Electronic Warfare*** (**EW**), ***electro-optical fusion***, and ***communications systems***. VITA 49.2 is also part of the U.S. Army's ***C4ISR/EW Modular Open Suite of Standards*** (**CMOSS**) initiative. Leveraging this digital interface dramatically reduces SWaP and complexity by eliminating the need for L-band.

In this new paradigm, there will no longer be a BUC or LNB construct. The industry is still using these terms, but the function is evolving to leverage these new digital interfaces. Next-generation BUCs and LNBs will likely consist of ***RF Digitizers*** and a ***switch fabric*** in between the antenna and the modem, all making use of VITA-49.2.

There won't really be a traditional radio in these new modems. The modems will exist purely in the digital domain. Having an SDR means the modems won't be limited to a single waveform. Instead, it will be possible for a single, physical form factor to support a range of different waveforms from ***Time Division Multiple Access*** (**TDMA**) and ***Single Channel Per Carrier*** (**SCPC**) to ***Direct Sequence Spread Spectrum*** (**DSSS**) and many others.

In addition to interfaces, new digital technology is further reducing SWaP through innovations in security. In previous generations of modems, ***Transmission Security*** (**TRANSEC**) required a separate module on the modem. This standalone module enabled separation of secure and non-secure processes while enabling software upgrades independent of the secure portion of the modem.

SPACEBRIDGE

CONNECTING OUR MILITARY TO ITS MISSIONS

ASAT II™
Tactical , BLoS
HTS System

For over 30 years, SpaceBridge has striven to provide C4I over SATCOM connectivity by being an innovator, leader, and trusted provider of bold tactical solutions in the military ground segment Satellite technologies.

We live on the cutting edge of what's possible, challenging ourselves to provide products and services that rise to the occasion. In a world of mounting unconventional threats, there is no room for failure or compromise.

We are dedicated to the exploration and implementation of new communication technologies that provide our armed forces with ultra high-performance satellite connectivity products that boast the best security, and highest availability.

Recognized by major players such DISA, SpaceBridge will continue to offer high-throughput solutions at exceptional value.

Contact us today to learn how we can connect you to your beyond line of sight missions.

SpaceBridge.com | info@SpaceBridge.com | +1.514.420.0045
USA | CANADA | LATAM | BRAZIL | EMEA | APAC

TRANSEC continues to be an essential capability in tactical comms, but with the advancements in FPGA technology, it is no longer necessary to have this as a separate module. Instead, it is possible to create a crypto boundary within the FPGA to contain what formerly required entirely distinct circuitry. This development significantly reduces the modem SWAP, while simultaneously increasing the flexibility of modem design.

Integrators will be able to customize components to ensure superior, multi-constellation operation by selecting the appropriate configuration, which might consist of multiple, digital modules and a single RF module. Supporting multi-constellation and multi-orbit operation ensures maximum resilience, which is a key requirement for modern military communications. It will also be possible to leverage the VITA 49.2 interface and eliminate the RF module completely, assuming the RF portion is addressed in an alternative fashion by the integrator.

In this new generation, the generic carrier board will be optional. Instead, terminal integrators or antenna manufacturers will be able to create their own carrier boards to fit their requirements. Instead of terminals being built around modems, modem building blocks can be built into terminal form factors.

Key benefits of designing a terminal-specific carrier board include:

- ***Form factor: changing the carrier board enables integrators to modify the size and shape of the modem to be more suitable for specific use cases.***
- ***Feature customization: the ability to customize the feature list enables the modem to align with the requirements of specific use cases more closely.***
- ***Terminal integration/consolidation: the modem architecture can be integrated at the board level with other terminal components (e.g., antenna control unit in an Electronically Steered Antenna).***

The ability to design a terminal-specific carrier board means the overall size and shape of a terminal can be optimized. What was once extra space that couldn't be used now has the potential to fit another modem. Instead of the traditional sandwich or pizza configuration, integrators can branch out into T or V shapes, whatever works best.

While all of this digitization has opened new avenues of innovation, the best current modem design provides the flexibility to support analog as well as digital. Digital BUC/LNB options are not yet widely available, so having a modem that will support current equipment and infrastructure as well as be "*future-proofed*" for upcoming all-digital environments ensures today's investment is protected while evolving capabilities are possible. ***The revolution in modem design is here***.

Karen Emery serves as vice president of product management for iDirect Government (iDirectGov), a U.S. corporation that is a trusted partner of the U.S. government. Emery leads and drives the firm's technology product strategy, development and launch of specialized Defense satellite communications (SATCOM) products that help our military meet mission success with secure, reliable, MILSATCOM. Emery ensures security features remain top priority on solutions and that the technology developments stay ahead of bad actors who try to interfere with government and civilian agencies critical communications through SATCOM used for voice, video, Internet, imagery and data. She ensures that the company's recent advancements are battle-ready and will meet strict standards for military and government users as they work to keep America safe.

Emery's latest work includes advancing the new Defense-in-Depth approach that creates layers of protection for secure MILSATCOM. She also considers solutions with a reduced size, weight and power (SWaP) footprint, given space limitations of some Defense installations.

Emery is instrumental in understanding the market and customers' needs –moving the company forward with innovative MILSATCOM technology. She cares deeply about the company's customer base and its mission to support the U.S. military.

She has more than 20 years in product engineering, design and management, as well as operations experience. She is a speaker at leading trade conferences and a contributor to industry publications.

www.idirectgov.com

iDirect **GOVERNMENT**

DISPATCHES

Elbit Systems Ltd. (NASDAQ:ESLT and TASE: ESLT) ("Elbit Systems" or "the Company") was awarded a $80 million contract to supply Direct Infrared Counter Measures ("DIRCM") and airborne Electronic Warfare ("EW") systems for a country in Asia-Pacific.

The contract will be performed over a two-year period.

Under the contract, Elbit Systems will provide C-MUSIC™ DIRCM systems together with the Company's Infra-Red-based Passive Airborne Warning Systems (IR-PAWS), for several aircraft types, providing high levels of protection and redundancy.

These systems have accumulated hundreds of thousands of flight hours to date, and have been selected by numerous customers to equip more than 25 types of aircraft.

Customers include Israel, Germany, NATO's multinational fleet and others.

Oren Sabag, General Manager of Elbit Systems ISTAR & EW, said, "*The rising threat that aircraft face from shoulder fired anti-aircraft missiles increases the demand for certified and operationally proven self-protection systems. Our capability to provide a complete and tested solution well positions us to address this growing need.*"

Elbit Systems has also unveiled an innovative, technological vision suite for military helicopters (*a fifth generation aircraft technology*). The new suite integrates a sophisticated sensor array, an ***Artificial Intelligence*** (**AI**) powered mission computer and a unique ***Helmet Mounted Display*** (**HMD**) system.

The new suite enables helicopter pilots to see through the body of the aircraft and provides them with a real-time, clear, colored wide field of view, during day and night, in challenging weather and visibility condition. These capabilities address one of the toughest operational challenges of military helicopters — conducting low-altitude flights during degraded visibility conditions, significantly expanding the operational envelop of military helicopters, transforming extreme weather and other degraded visibility conditions into an operational advantage.

elbitsystems.com

Elbit Systems™

Raytheon Technologies awarded next phase for U.S. Army's TITAN program

***Raytheon Technologies** has been awarded a competitive, prototype phase through an Other Transaction Agreement (**OTA**) with **Consortium Management Group, Inc.** (CMG) on behalf of **Consortium for Command, Control and Communications in Cyberspace** (C5) to continue development of the U.S. Army's Tactical Intelligence Targeting Access Node, or **TITAN**, program. TITAN is a tactical ground station that finds and tracks threats to support long-range precision targeting.*

The Raytheon Technologies team, led by ***Raytheon Intelligence & Space***, is designing TITAN to serve as the Army's underpinning solution to enable multi-domain operations.

TITAN will ingest data from space and high-altitude, aerial and terrestrial sensors to provide targetable data to defense systems. The Raytheon-developed solution will also provide multi-source intelligence support to targeting, and situational awareness and understanding for commanders. Leveraging capabilities that support pattern-of-life sensemaking and automated target recognition, the TITAN solution will also help operators make sense of the massive amounts of data and prosecute a target with the appropriate solution.

The ***Department of Defense***'s vision for a command-and-control network will connect the battlespace across every domain – sea, air, land, space, cyber and the electromagnetic spectrum. RI&S, in collaboration with the Raytheon Technologies business units, is contributing a multi-domain footprint of capabilities in secure communications, advanced sensors, software solutions and smart effectors to enable ***DoD's JADC2 architecture***.

A recent demo used data from five different sensor types in a real-time processing chain with machine-learning models to generate quality data output.

The contract term for the competitive prototype phase is 14 months and will bring additional capabilities to the solution, including software and hardware components. As part of their development, the Raytheon Technologies team will combine modern development tools and processes with cutting-edge production and design practices to increase the quality of the capabilities while meeting aggressive delivery timelines to stay ahead of the threat.

"*Our team is prepared to deliver a mature solution on time to help Army commanders make decisions faster and, ultimately, operationalize joint warfighting capabilities to support the JADC2 vision*," said ***Scott McGleish***, executive director with Space & C2 Systems at Raytheon Intelligence & Space.

TITAN subsumes the functionality of the Army's legacy ground stations, including the ***Advanced Miniaturized Data Acquisition System*** (**AMDAS**) ***Dissemination Vehicle*** (*ADV*), ***Advanced Remote Ground Terminal*** (**RGT**), and ***Tactical Intelligence Ground Station*** (**TGS**).

TITAN's most significant contribution to ISR is its modular open system architecture and data management. The increase in sensor data during competition and conflict require a solution that can receive, process, and store massive volumes of data. The baseline software enables this data integration and processing, and its ability to ***Task, Collect, Process, Exploit, and Disseminate*** (**TCPED**) through Collection management and fusion across domains ensures any sensor can support the correct shooter.

Mission Microwave Titan and MOAB offerings. Photo is courtesy of the company.

Mission Microwave announces a million$ follow-on contract for SATCOM terminal upgrades

***Mission Microwave** has teamed with an industry leading, system integrator that is supporting a U.S. Government (**USG**) requirement and has won a significant terminal upgrade program contract that replaces Traveling Wave Tube Amplifiers (TWTA) with High Performance, Lightweight, Solid State Power Amplifiers (**SSPA**) in Ku- and Ka-band.*

Mission Microwave engineers worked with their customer to create an upgrade path for the USG to replace legacy TWTA based BUCs with state-of-the-art, Solid State BUCs, based on ***Gallium Nitride*** (**GaN**) technology, for the customer's fleet of widely deployed, transportable terminals. The initial upgrades started in late 2019 and, prior to this recent award, more than 100 sets of Ku- and Ka-band BUCs have been delivered to Mission Microwave's customer on the program.

Mission Microwave is providing **200 Watt Ka-Band** and **400 Watt Ku-band** BUCs to replace legacy TWTA based Upconverters. Mission Microwave's industry leading competency in designing compact and highly efficient amplifiers has enabled their customer to offer an upgrade path that will extend the life and improve the utility of this tactical SATCOM terminal fleet.

"*The end-users of our products rely on SATCOM system providers to bring the benefits of Solid State designs to the tactical edge. We worked with our customers' engineering team to navigate the complexities of the upgrade and certification process for these terminals. We expect the established trend of replacing high power TWTA's with SSPA's to be a significant market for the foreseeable future, led by our recent additions of 400 watt Ka-band and 800 watt X-band BUCs to our product line,*" said ***Steve Richeson***, Vice President of Sales & Marketing for Mission Microwave.

missionmicrowave.com

***GMV** is leading automated collision avoidance operations and coordination in Europe*

Space is getting congested and today active collision avoidance has become a routine task in space operations and relies on validated, accurate and timely space surveillance data. For a typical satellite in LEO, hundreds of conjunction alerts can be expected every week. Processing and filtering these still leaves about two actionable alerts per spacecraft and week requiring detailed follow-up by an analyst.

In this context, and as part of the Space Safety Program (S2P), the European Space Agency (ESA) defined in 2019 a technological cornerstone for ***Collision Risk Estimation and Automated Mitigation*** (CREAM).

The aim of the CREAM cornerstone is the development of technology for automated collision avoidance to reduce man-power efforts (experts on 24/7, extra efforts at ground stations), reduce the time between maneuver decision and close approach, and thereby reduce the number of false alerts, i.e., cases where control teams start an avoidance maneuver preparation which, in the end, turns out to be unnecessary, as updated data indicate a low collision probability.

Optimized maneuver plans can be uploaded to the spacecraft and allow late decision taking, which is further enabled with activities for the development and testing of emergency command paths. With the launch of large constellations, conjunctions between operated spacecraft will occur more frequently. The cornerstone therefore also encompasses activities to coordinate maneuverer planning.

Three activities have been started by ESA in the frame of the CREAM cornerstone….

The first one aims at the definition of "*Automated avoidance maneuver decisions and design*." In the frame of this activity, a prototype software is to be implemented, tested, and validated with historic conjunction data from existing collision avoidance processes.

This software shall provide the means for autonomous decision making based on the use of machine learning and propose an optimum collision avoidance maneuver. ***GMV in Romania*** is leading this activity with a relevant involvement by *GMV NSL Ltd*. in the UK and ***Neuraspace*** from Portugal. The development is based on GMV's **autoca autonomous** collision avoidance system, developed for ESA in the frame of the ***ARTES*** program and finally accepted in March 2022.

The second activity is devoted to the "***Development and Testing of Late Commanding Paths and Operations Concepts***." The aim of this activity is to develop and test concepts for late commanding paths which allow for late decisions in collision avoidance processes. Such a mechanism should be considered as part of the nominal concept of collision avoidance operations as well as a tool for emergency response. ***Astroscale Ltd.*** in the UK is leading this activity with relevant support from GMV (from *Portugal* Romania and UK) and from ***OneWeb*** in the UK.

The third and final activity entitled "*Means for coordination of operators and catalogue providers*" will develop a coordination platform providing an information exchange architecture allowing for automated coordination and resolution of a prospected collision event between spacecraft operators and space object catalogue maintainers or collision avoidance service providers as well as a simulation environment for performance evaluation. GMV in Romania is leading this activity counting on ***UPB*** from Romania, ***Solenix*** from Switzerland, and ***Iguassu*** from the Czech Republic as subcontractors.

As a summary, GMV is present in all these three CREAM activities from ESA, in two of them as prime contractor. This confirms the GMV's leading role in collision avoidance operations automation and coordination in Europe.

More than 70 GMV engineers currently work at GMV on SSA/SST activities in seven European countries, making it the largest SSA/SST industry and team in Europe. GMV works intensively in this field for ESA (in Spain, France, Germany, the UK, Romania, Portugal and Poland), for the EU SST (in Spain, France, Germany, Romania, and Poland), as well as in the commercial sector (providing collision avoidance services to more than 10 operators and more than 80 satellites) and in the military domain (including this new activity).

www.gmv.com

Eclipse Global Connectivity partners with Thales to equip French Defense's Airbus MRTT aircraft with a secure SATCOM solution

***Eclipse Global Connectivity** (Eclipse) has partnered with Thales on a 17 year contract to develop and provide a SATCOM solution for French Defense Airbus MRTT aircraft. The project is part of the French Government's program called Marché d'Elaboration d'Intégration et de soutien des Stations Satcom Aéronautiques (MELISSA).*

Based on existing technologies already used in the commercial aviation market, the solution, planned for delivery in early 2027, offers:

Airbus A330 MRTT refueling aircraft. Photo is courtesy of the company.

- *High-bandwidth connectivity on military and civilian Ka-band networks (up to 50 Mbps)*
- *Persistent, highly reliable connection to maintain connectivity in signal-jammed environments and severely degraded weather and flight conditions*
- *Flexibility to ensure compatibility with France's SYRACUSE IV Sovereign satellite system, along with allied military and commercial satellites*
- *Military-grade security for high-level protection against cyber threats*

Eclipse will be responsible for designing and manufacturing the Inmarsat antenna baseplate, certifying the antenna, and the provisioning the Ka-band modem.

Eclipse Technics, the company's Design and Production (DOA / POA) division, is fundamental to the project, having 20+ years of aircraft modification experience.

"*The French Armed Forces will gain a secure, customized, ultra-high-performance connectivity solution to address their unique operational needs and goals*," said ***Marc Pinault***, CEO of Eclipse. "*This is an incredibly gratifying long-term project for us and a testament to our lengthy history providing superior SATCOM solutions to defense aircraft operators.*"

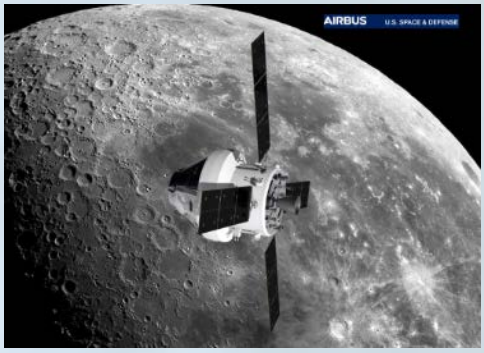
www.eclipseglobalconnectivity.com

Northrop Grumman's T1TL mesh satellite constellation will provide resilient, low-latency, high-volume data transport supporting U.S. military missions around the world and serve as a critical element for Joint-All Domain Command Control. Image is courtesy of the company.

Northrop Grumman selects Airbus U.S. Space — Defense Inc. to supply 42 satellite bus platforms

***Northrop Grumman Corporation** (NGC) (NYSE: NOC) has selected Airbus U.S. Space & Defense Inc. as the commercial provider of satellite platforms for NGC's proliferated-LEO constellation. Under the terms of the contract, Airbus U.S. will supply 42 satellite "bus" platforms, as well as support vehicle assembly, integration and testing.*

Northrop Grumman's T1TL mesh satellite constellation will provide resilient, low-latency, high-volume data transport supporting U.S. military missions around the world and serve as a critical element for Joint-All Domain Command Control.



In May, Northrop Grumman announced the selection of ***Mynaric*** and ***Innoflight*** as its suppliers for laser communications and encryption, decryption capabilities.

The ***Space Development Agency*** (**SDA**) selected Northrop Grumman in February to develop and field a portion of its ***Tranche 1 Transport Layer*** (**T1TL**) constellation. The T1TL network will deliver persistent, secure connectivity for the U.S. military and serve as a critical element for **Joint All-Domain Command and Control**.

Derived from the flight-proven ***ARROW*** platform, the Airbus U.S. solution expands on its commoditized satellite bus design providing more power and a larger payload accommodation. This modular solution offers a scalable 300 – 500 kg. bus for the Northrop Grumman payload and future U.S. Government missions.

Airbus U.S. has designed a highly adaptable spacecraft platform and will use Airbus ***OneWeb Satellites*** (AOS), the Airbus U.S. and OneWeb joint venture in Merritt Island, Florida, to assemble it using their state-of-the-art production line.

This line is currently delivering up to two satellites per day to OneWeb. AOS achieves this industry-leading result through its mature supply chain and manufacturing approach. To date, this facility has already produced over 400 of the 648 satellites on order for OneWeb.

"*The addition of Airbus U.S. as one of our key commercial suppliers complements our end-to-end satellite system integration and heritage communication mission expertise*," said ***Blake Bullock***, vice president, communication systems, strategic space systems, Northrop Grumman.

"*The SDA Tranche 1 Transport Layer is a critical national security program, and we are honored to support Northrop Grumman and the Space Development Agency*," said ***Rob Geckle***, President and CEO of Airbus U.S. Space and Defense. "*This award underscores Airbus U.S.'s mission to develop and deliver, in the U.S., technology critical to the U.S. warfighter.*"

NORTHROP GRUMMAN

SPACE SYSTEMS COMMAND: FIRST YEAR

Space Systems Command celebrates Their First Year as a USSF Field Command

Author: Space Systems Command

SSC'S FIRST YEAR

On August 13, 2021, Space Systems Command was stood up as a U.S. Space Force (USSF) Field Command. Several leaders took time to reflect on what SSC has accomplished in its first year:

Frank Calvelli

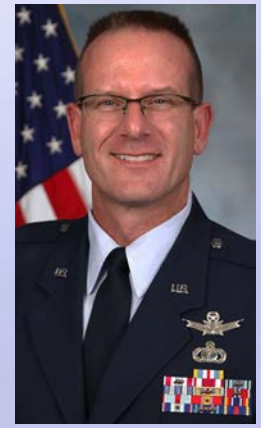
*"I've been impressed with what SSC has been able to accomplish with regard to changing the face of government space acquisition. By creating a unity of effort, building partnerships and delivering space capabilities on time and within budget, our warfighters have what they need to stay ahead of our adversaries and our nation's assured access to space remains intact. It is time to bring fresh energy to acquisitions and SSC is a critical part of that effort." — **Frank Calvelli**, **Assistant Secretary of the Air Force for Space Acquisition and Integration***

Lt. Gen. Michael Guetlein

"I could not be more proud of all that SSC has achieved in its first year. SSC is a nearly 15,000 strong team spanning 18 sites across the U.S, including two Space Launch Deltas ensuring crucial assured access to space. SSC was purpose built to get after the threat by taking the best of breed organizational designs from MDA, NRO, and the RCOs. Never before has our collaboration and communication been stronger between our space acquisition partners. We have opened the door even more to our critical partners, big and small, making it quicker to collaborate and deliver advanced technology to the warfighters. Combined with dedicated teams who manage International Affairs, Warfighter Integration, Commercial Services, the SSC Front Door, and Space Systems Integration, we are laser focused on ensuring the U.S. stays ahead of the threat. We have accomplished a tremendous amount in our first year ensuring our American and allied space superiority." — Lt. Gen. ***Michael Guetlein**, **Commander, SSC***

Brig. Gen. Jason Cothern

"Through the first year of SSC, what has impressed me most is the men and women of this Command and their steadfast commitment to the mission while remaining flexible to the changes we've implemented. In the past twelve months, we've set out to transform how we acquire, build, and deliver robust space capabilities for our nation and its allies, and our people have stepped up to the plate and helped make that transformation *a reality. We've been bolstering our partnerships to improve integration and make our combined architectures more resilient. The Guardians and Airmen of SSC continue to amaze me with their flexibility and dedication to the mission. I am excited to see what the future holds for us." —*Brig. Gen. ***Jason Cothern**, **Deputy Commander, SSC***



Brig. Gen. Timothy Sejba

"Space Domain Awareness and Combat Power (SDACP) is the premier USSF leader in developing and fielding space domain- and combat power-related capabilities in support of National Security requirements. Battle Management Command, Control, and Communications delivers the resilient integrated Space C3 systems to enable timely multi-domain warfighting. Our performance and continued achievements in these areas has increased our nation's ability to rapidly detect, warn, characterize and attribute both potential and real threats to national, allied and commercial space systems in, from and to space." — Brig. Gen. ***Timothy Sejba**, **Program Executive Officer, Space Domain Awareness and Combat Power, and Battle Management Command, Control, and Communications, SSC***

Joy White

"What I'm impressed about SSC in the first year: the resilience of our workforce. Standing up a new Command in the midst of a pandemic takes incredible fortitude and determination...our people, with laser focus on the threat, delivered. What's next? SSC is embracing the changing space landscape in order to drive a resilient architecture by leveraging the ever-expanding commercial space industry and innovation. We're optimizing acquisition for an entirely new space ecosystem." — ***Joy White*, Executive Director, SSC**

Chief M/Sgt Willie Frazier, II

"SSC's first year as a Field Command has been highly rewarding as well as challenging. We successfully moved through some significant changes to correctly align our organizational structure. Our people at every level have really stepped up to embrace this critical responsibility to look at our mission and our operations in new ways. SSC's Guardians, Airmen and all our personnel support the U.S. Space Force, our sister services and allies by performing as a lean, agile, mission-focused Command. I'm especially excited about the future as we continue our digital transformation -- shifting from what has long-been a peacetime architecture - not envisioned for defensive operations - to a new resilient architecture able to survive kinetic and cyberattacks and more." — Chief Master Sgt. ***Willie Frazier,*** II, ***Senior Enlisted Leader, SSC***

Dr. Claire Leon

"This is an exciting time for the Space Force and Space Systems Command. The Space Systems Integration Office is focused on the transition to resilient systems integrated across mission areas, to address the threat. We are also developing strategies to incorporate the tremendous innovation in the space industry and leverage commercial services and international partners." — Dr. ***Claire Leon*, Director, Space Systems Integration Office, SSC**

Brig. Gen. Stephen Purdy

"I am most proud of the fact that we have achieved a record-breaking launch schedule and stood up a new PEO headquarters in the middle of a global pandemic. I'm excited about going faster! Increasing our launch rates to 100+ annually, onboarding 10 new rocket companies, and building flexible warfighter-focused acquisition strategies for future launch and on-orbit services." — Brig. Gen. ***Stephen Purdy*, Program Executive Officer, Assured Access to Space; Commander, Space Launch Delta 45; Director of Launch and Range Operations, SSC and Director of the Eastern Range, Patrick Space Force Base**

Col. Robert Long

"What's most exciting about the past year is the pace of success we've set while managing through significant change including our own reorganization into Space Launch Delta 30 and the transition to Space Systems Command. Despite such dynamics, the team set records for operational agility, achieved a number of innovative firsts and crossed a significant milestone with our 2000th launch from Vandenberg. Space Launch Delta 30 is excited to keep pushing our transformation into a 21st century spaceport and test range while ensuring we remain a world-class, strategic platform for all of our mission partners. We look to build on our success over the past year as we strive to provide flawless, agile and innovative spaceport and range services for a diverse set of customers." — Col. ***Robert Long*, Commander, Space Launch Delta 30, SSC and Western Launch and Test Range, Vandenberg Space Force Base**

Col. Jennifer Krolikowski

"I'm reflecting on how far we've come over the last six months and what we've done to set us up for the efforts in the next six months. Things like pushing to fix our current IT and moving towards Project Enigma (the digital backbone for SSC and the USSF), deploying collaboration tools like Google Workspace/Atlassian products/etc., setting up environments like ARCUS and Digital Engineering clouds, and automating cyber insights by integrating Warp Core and eMASS - all these go towards setting up our customers for their success!" — Col. ***Jennifer Krolikowski*, SSC Chief Information Officer**

Col. Bradley Walker

"Since the Warfighting Integration Office was established in January of 2022, we have aggressively pursued collaboration opportunities with our space warfighting counterparts around the world. We are excited to announce that formal partnerships with our space counterparts at USINDOPACOM and USCENTCOM are already established, and agreements with many more Combatant Commands are in work. We look forward to utilizing these partnerships to continuously close the gap between the acquisitions and operations communities. In addition, look for us to bring acquisition-informed expertise to a wargame, exercise, or problem-solving venue near you!" — Col. ***Bradley Walker*, Chief, Warfighting Integration Office, SSC**

Cordell DeLaPena

"The August 2021 stand-up of Space Systems Command, and the subsequent March 2022 establishment of the Military Communications and Positioning, Navigation and Timing (MilComm & PNT) directorate fundamentally changes the business of Military Satellite Communications (SATCOM) and Global Positioning Systems (GPS). The consolidation of SATCOM & PNT communities, inclusive of acquisition and mission sustainment, enables tight coordination across the DoD and commercial communities and streamlines the transition of capabilities from acquisition to operations. Today the energy must be different. I'm very proud of our professionals who are building resiliency into our future and current systems so we are ready to exceed the capabilities of our adversaries." — ***Cordell DeLaPena*, Program Executive Officer, Military Communications & Positioning, Navigation and Timing, SSC**

Col. Brian Denaro

"The threat is evolving at an unprecedented pace… we're proud of the talented Guardians and Airmen and our industry partners who are ensuring we stay ahead of that threat. We're leading end-to-end Missile Warning, Tracking, and Defense mission integration and spearheading the Space Force's pivot to a more resilient architecture. With our partners, we're rapidly demonstrating and delivering new missile warning and missile tracking capabilities with the GEO Wide Field of View Testbed just launched on July 1st followed shortly by SBIRS GEO-6 in August."— Col. ***Brian Denaro*, Program Executive Officer, Space Sensing, SSC**

Space Systems Command is the U.S. Space Force field command responsible for rapidly developing, acquiring, equipping, fielding and sustaining lethal and resilient space capabilities. SSC mission capability areas include launch acquisition and operations, communications and positioning, navigation and timing (PNT), space sensing, battle management command, control and communications (BMC3), and space domain awareness & combat power. SSC is headquartered at Los Angeles Air Force Base in El Segundo, California.

Contact Space Systems Command at ***SSC@spaceforce.mil*** or follow on ***LinkedIn***.

SSC INTERNATIONAL AFFAIRS: ALLIED BY DESIGN

The United States may be the dominant country when it comes to space, but it isn't going forward into the future alone.

Deanna L. Ryals

Deanna L. Ryals, director of International Affairs (IA) for the ***U.S. Space Force's Space Systems Command***, said there has been a growing recognition in recent years of the need for a major expansion of international space cooperation and to increase partnership with allies.

"*I think the reason we're seeing such an uptick is the recognition that we have to build a resilient space architecture to defeat future threats, and in order to be truly resilient, we can't do it alone: we need our allies and partners to be a part of the enterprise architecture that we're building*," ***Ryals*** said.

Priorities include ***Space Domain Awareness***, ***SATCOM***, ***Space C2 (Command and Control)***, and **Data/Data Transport**. The IA directorate seeks opportunities to match allied needs, capacity and capabilities with U.S. space architecture to build a coalition architecture that is resilient and diverse.

Strong partnerships with international allies are important for a number of reasons, ***Ryals*** said. It allows the United States to prioritize funding, can create cost-savings for taxpayers due to economies of scale, and gives the USSF access to cutting-edge technology developed around the globe.

"*If we look at Lt. Gen. Michael Guetlein's mantra of 'Exploit what we have; buy what we can; and only build what I must,' when we buy collectively together with our allies and partners, we have better buying power when we're buying and pooling our requirements. Or, if our allies and partners are buying or building something that we can leverage, we don't have to spend dollars to buy or build it ourselves*," ***Ryals*** said. "*We can leverage what our partners are bringing to the fight.*"

"*It is essential that partners and allies collaborate to achieve success in the space domain and we have been working closely with Space Systems Command as they lead on 'allied by design,'* said Air Vice-Marshall ***Paul Godfrey***, ***Commander, United Kingdom Space Command***.

"*Here in the UK, much like Lt. Gen. Guetlein's mantra, we have an 'own, collaborate, and access' approach which defines what must be retained as a sovereign capability, where we can collaborate with partners, and what we can simply access through commercial space industry*," ***Godfrey*** said. "*It really is an exciting time as we work together to make space safe, secure, and sustainable for future generations.*"

Forming these partnerships can be complex, Ryals said. As with any U.S. military branch, many USSF details are classified, and there are numerous national security regulations – such as **ITAR** (*International Traffic in Arms Regulations*) – that have to be balanced with the need to share information and technology with allies. The policies that govern the reliability of information were written half a century ago, when the space and terrestrial governmental environment was completely different.

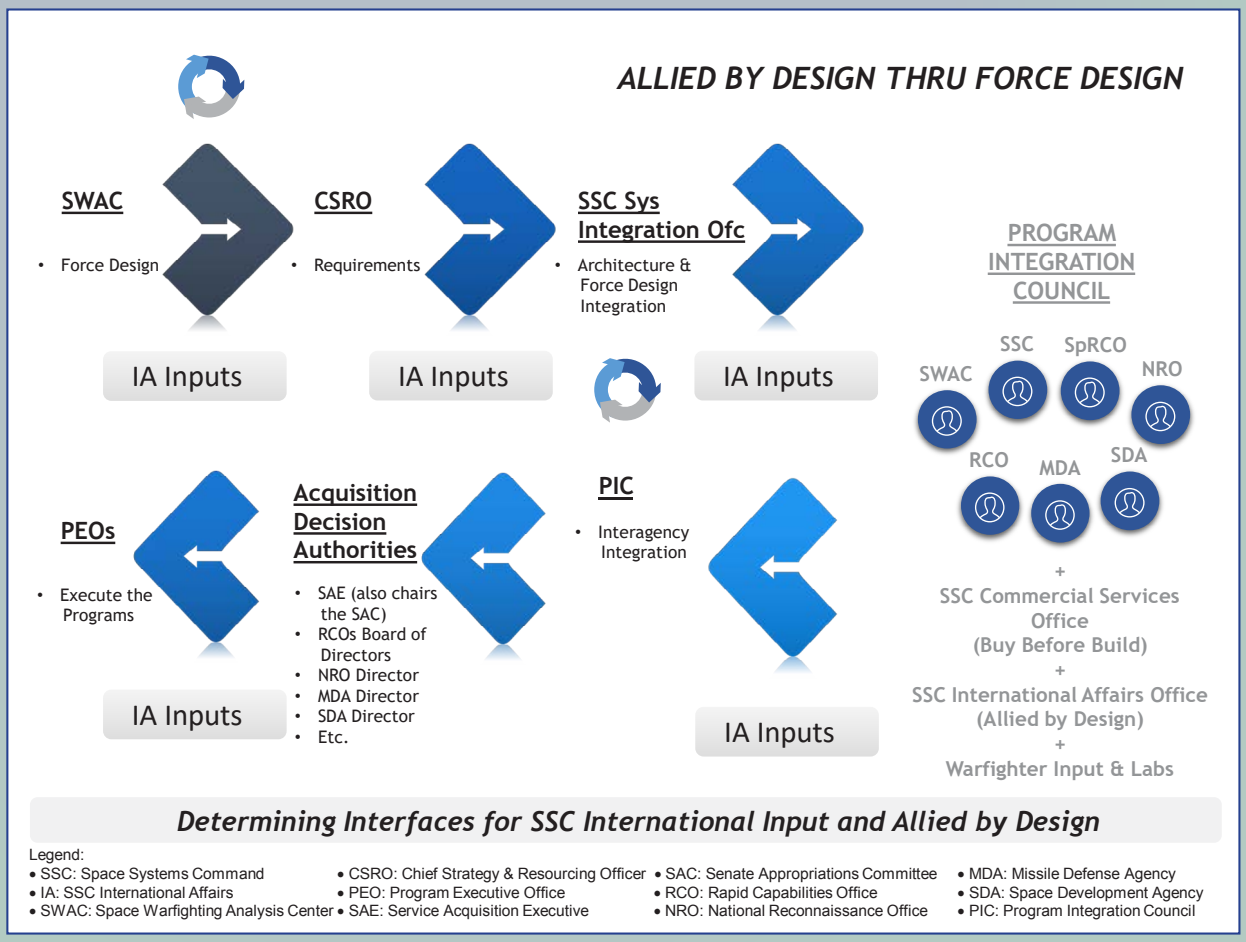
How does SSC handle this? By making sure allied partnerships are factored in decisions from the very beginning, ***Ryals*** said.

"*As we're developing the future space architecture, we're ensuring that the architecture is 'Allied by Design.'*" ***Ryals*** said. "*That's a rallying cry and a mindset that has both policy and technical implications.*"

She continued, "*On the policy side, it's the awareness that the need and benefits from partnerships outweigh the risk that's created by sharing information and capabilities with our allies. By understanding both the policy and technology hurdles we're going to have to get through, we'll be better postured to prioritize allied engagements and work together to develop integrated architectures. By doing so, we're driving a more robust enterprise solution at a lower cost point and while also allowing partners to on-ramp capabilities when the time is right.*"

"***Allied by Design***" also means taking into consideration what allies are buying or building from the very beginning, starting with U.S. force design, ***Ryals*** said. The ***Space Warfighting Analysis Center*** is actively considering what allies are buying/building and where partners might bring capabilities to augment U.S. force design.

That force design then goes to the ***Chief of Strategy and Requirements Office.*** "*At this point the USSF is looking at how we might also factor in our allies requirements for space and space capabilities at the same time we're developing our requirements, so we're really thinking about the integrated architecture and the systems we're going to build, buy or borrow based on inputs of what our allies are also doing*," Ryals said.



Those requirements are then handed over to SSC's ***Space Systems Integration Office*** to look at the force design, architecture and requirements and convenes the ***Program Integration Council***, made up of space acquiring organizations, to determine who is best suited to acquire the capabilities. SSC/IA gets a voice in the council to ensure allied capabilities and partnership opportunities are considered in the discussions.

"*Through every step of this process, we're looking at what the allies are building, what they could bring, where they want to partner, and that will be part of the decision trade-space before we make any choices on what we're going to buy or what we're going to build*," Ryals said.

Allied partnerships also help USSF stay ahead of the threat by allowing it to access the best and newest technology and ideas from around the world, Ryals said.

"*Sometimes our international partners have more agile acquisition processes, so they can bring capability to bear faster than we can, as their acquisition timelines and tools are on a faster scale than ours*," she said. "*Secondly, our international partners are building up their own space industrial bases. A lot of space tech and space innovation is happening outside the United States," Ryals said. "Allies and partners may be able to bring technologies and capabilities in that we traditionally wouldn't have access to, or they may be looking at applying a technology or capability in a different way that could be very beneficial to us.*"

For instance, ***USSF*** is working with the ***Luxemburg Ministry of Defense*** on a partnership to bring international partners together to purchase commercial SATCOM, in order to deliver capability faster and at lower cost points and field common ground infrastructure that could be shared if nations chose to do so. In similar veins, future projects may include teaming up with allies to tackle orbital debris mitigation and on-orbit servicing of space vehicles, particularly with the growing international interest in cislunar operations, and tactical and responsive launch.

Many international partners also are leveraging both the civilian and the military sides of their industrial base, Ryals said: "They may have companies that are building dual use capabilities that can be used on both the civil and the military side."

"*There's a lot of innovation, and venture capital investment that is going into space industries all around the world and we want to be able to capitalize on the best of the best innovation and technology*." Ryals said.

Partnering with allies also can help improve the resiliency of the global supply chain, Ryals added.

"*Our closest allies and partners are developing for their own national sovereign needs with requirements and capabilities that are comparable to the United States*," Ryals said. "*Our closest allies are some of the most capable allies in the space domain.*"

Developing common tools with U.S. partners and allies is another priority, Ryals said. For example, The USSF's ***Unified Data Library*** is being developed as the single data repository for the U.S. Space Force, a key component for ***Space Domain Awareness*** (**SDA**).

"*We're looking how our allies can leverage the Unified Data Library or develop their own UDLs that are interoperable and integrated with our libraries, and that all comes down to building common interfaces and standards*," Ryals said. "*For the peaceful use of space, for situational awareness in space, for collision avoidance, for identification and tracking, we all need to be aware of what's going on overhead. That's why it's so important for us to collect data together, to share information with our allies and partners, to gather the information that they're collecting and put it in a common repository so we can all use that information.*"

SSC's Unified Data Library collects SDA data from a variety of sources, from USSF satellites to commercial satellites, so space operators can distill it and senior leaders can make critical decisions, Ryals said. SSC also is working on common and integrated ***Space C2*** tools so the U.S. and allies together can operate with common and trusted data.

"*If we're looking across a swath of the sky and it looks like there's a satellite that may be tumbling, or something is moving in a way we wouldn't expect, that data is used to identify the object, track it and make determinations on why it's moving in an unnatural way*," Ryals said. "*If we're all collecting and sharing information, then decision makers will have greater tools at their disposal to take action.*"

"*When we talk about partnering with our allies, simply put, the capabilities of individual countries are greater than the sum when partnered as part of a wider coalition*," Ryals said.

Note: Space Systems Command has established a permanent capability to directly ingest observation data from the Space Fence radar system into the U.S. Space Force Unified Data Library (UDL). Space Systems Command's Cross-Mission Data Branch within Space C2 in partnership with Space Fence within the Strategic Warning and Surveillance Systems (HBQ) Division at the Air Force Life Cycle Management Center, successfully completed testing on April 15, 2022.

SPACE SYSTEMS COMMAND

> "I could not be more proud of all that SSC has achieved in its first year. SSC is a nearly 15,000 strong team spanning 18 sites across the U.S, including two Space Launch Deltas ensuring crucial assured access to space. SSC was purpose built to get after the threat by taking the best of breed organizational designs from MDA, NRO, and the RCOs. Never before has our collaboration and communication been stronger between our space acquisition partners. We have opened the door even more to our critical partners, big and small, making it quicker to collaborate and deliver advanced technology to the warfighters. Combined with dedicated teams who manage International Affairs, Warfighter Integration, Commercial Services, the SSC Front Door, and Space Systems Integration, we are laser focused on ensuring the U.S. stays ahead of the threat. We have accomplished a tremendous amount in our first year ensuring our American and allied space superiority."
>
> ***— Lt. Gen. Michael Guetlein***

UKRAINE'S WAKE-UP CALL TO NATO

Now is the time for action in the European defense industry

Authors: Eric Bernardini, Global Lead Aerospace, Defense and Aviation, and Etienne Muselier, Director, Alix Partners

Russia's invasion of Ukraine has served as a catalyst to potentially strengthen the NATO alliance[1] and help meet the demands for which it was established, which is "to unite efforts for collective defense and for the preservation of peace and security."[2]

As such, the crisis is a wake-up call for European NATO members who have signaled they can no longer afford to invest less than 2% of their GDP in their armed forces. Following the Ukraine invasion, most of these countries promptly increased defense budgets to 2% of GDP.

As the crisis continues, we believe a broader increase is likely. During the Cold War, for instance, Germany spent 2.8% of GDP (1980-1990 average) on defense; France 3.1%; and UK 4.9%.[3]

In our view, recent budget increases serve as a bailout of these countries' armed forces after decades of crippling underinvestment.

Over the long term, however, higher spending will likely position the region on a more sustainable trajectory. By allocating 2% of GDP, Germany's budget would equal 75.5 billion euros in 2022, and rise to €85.6 billion by 2026.[4] Russia's defense budget in 2021 was 63 billion euros by comparison.

IMMEDIATE IMPERATIVES

NATO members should focus on four priorities in the short term:

Replenish. Inventories will likely need to be replenished following the transfer of weapons and ammunition to Ukraine and the backstopping of Eastern European countries such as Poland, Slovakia, Czech Republic, or the Baltics. For example, the French army will likely need to replace 10 to 12 self-propelled Caesar howitzers, while the U.K. agreed to backfill the Polish T-72 tanks transferred to Ukraine by supplying Challenger 2 battle tanks.

Resize. Military capabilities in Europe have shrunk since the Cold War ended. The past two decades have focused on counter-terrorism type conflicts. As a result, European forces do not seem to be appropriately sized to sustain a high intensity conflict with high attrition of equipment and personnel. Consider that after slightly more than two months of conflict, Russia lost 603 main battle tanks (including 315 destroyed), according to Oryx. As of now, Germany has only 289 main battle tanks (Leopard 2) in stock, with 183 operational. Of 51 Tiger attack helicopters, only nine are operational.[5]

Restore. Strategic gaps in capabilities of European armed forces also need to be addressed. Prior to the Ukraine invasion, French and German armed forces were leasing the Antonov from Russian and Ukrainian companies to send their forces abroad. This is no longer sustainable. Several European countries still rely on Soviet-era systems for air and missile defense, -- such as Slovakia's S300.

Rethink. Russia's invasion of Ukraine has triggered a shift in war doctrine. The following questions need to be considered amid a reevaluation of how armed forces should operate to sustain a high-intensity conflict:

What is the required depth and mass of armed forces needed to ensure their ability to limit impact on operations amid high attrition of equipment and personnel?

How to arbitrate between high-tech and low-tech equipment ("High-Low mix") and decide on future allocation of investments and resources? For example, do you invest in developing high-tech hypersonic missiles? Or, do you invest in a swarm of low-cost drones capable of saturating enemy forces?

What is required to conduct multi-domain military operations? This includes figuring out how to coordinate and integrate all available forces (i.e., land, air, sea, space, cyber) to leverage the entirety of firepower and regain superiority on the battlefield. Given Russia's tactics in Ukraine, cybersecurity capabilities (both offensive and defensive) are becoming increasingly important for European armed forces to develop and demonstrate.

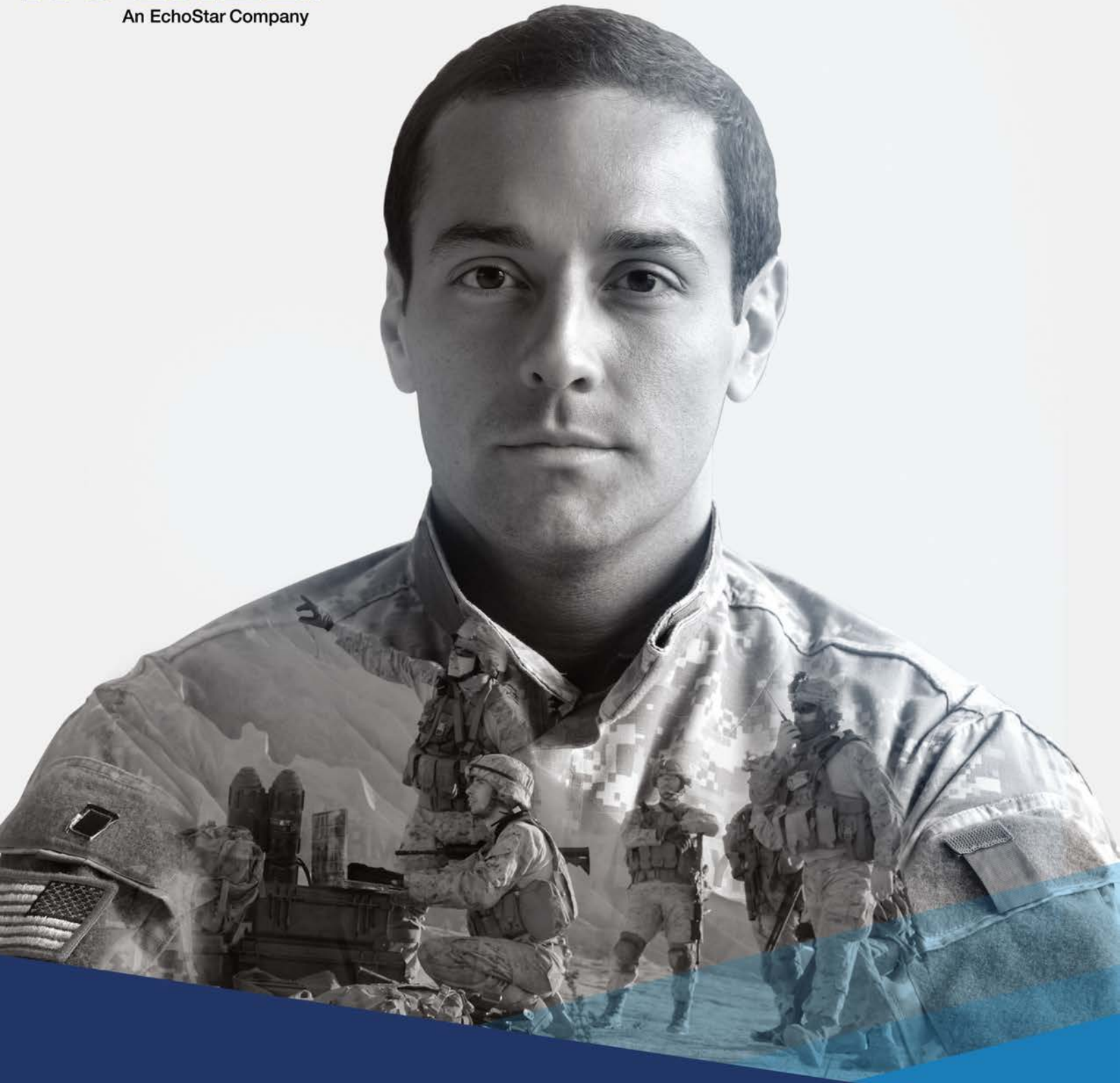
How will information operations capabilities be established or improved? This requires analysis of the spectrum of capabilities needed to conduct strategic, operational, and tactical level operations to counter adversary information warfare across each domain, both on and off the battlefield.

ASSESSING UPCOMING DEMAND

Demand on defense systems will primarily cover three domains: spare parts; existing programs; and new developmental programs. All segments —- aircraft, land systems, missiles, ammunitions, naval systems, C4ISR, and space — are poised for growth.

A look at specific budgets and recent announcements helps clarify needs. In Germany, projections on how to allocate the announced €100 billion

HUGHES®
An EchoStar Company



POWERING THE NETWORKS THAT CONNECT PEOPLE EVERYWHERE

LEARN MORE AT HUGHES.COM

for defense provide a view of priorities for its armed forces, starting with ammunition (20 billion euros), fighter aircraft (*F-35, Eurofighter*), and missile defense systems.

A non-exhaustive list of additional efforts needed in France include 3.5 billion euros to increase ammunition stock, and 2.5 billion euros to double equipment running hours; an increase in number of Meteor missiles; and recommitment to the ambition of reaching a force of 300 combat aircraft.

ENABLERS TO SUCCESS

To fulfill this upcoming demand, the following enablers are required:

Clear objectives — Without guidance from leadership, the defense industry will likely be unable to support armed forces. Clearly expressed demand is critical, with detailed requirements (*i.e.*, capabilities, quantities, locations, etc.) and acceptable delivery timelines.

Production capacity — Production capacity already exists. However, for some programs that have not been in demand for a long time (e.g., Stinger missiles), capacity needs to be rebuilt and obsolescence addressed. Some capex may be required to create new production capacity and support demand. Some solutions already exist and can be used, including: "shadow" production lines; repurposing of existing production units or assembly lines to defense usage; and contracting industrial players to secure fast ramp-up on defense equipment.

Planning and scheduling — NATO's defense industry relies on visible, predictable, and stable requirements from armed forces. However, recent events have changed the industry operating philosophy, with speed and adaptability to a fast-changing environment as key criteria for success. As of now, many weapon systems are facing long production lead times: production of an artillery projectile -- from ordering the raw material to completion -- is estimated to vary between two and three years. The production of a cannon from the French Caesar howitzer requires 18 months in total. Moving forward, central planning and coordination of the production ramp-up is required.

Supply chain readiness — Industrial defense players have recently highlighted existing limitations within the supply chain to support production ramp-up of defense systems. As highlighted by ***Raytheon Technologies*** in its recent earnings call, supply chain constraints continue to be an issue, especially on electronics with longer lead times (from 3 to more than 12 months) and for ***Raytheon Missiles & Defense*** with rocket motors supply delays. In parallel, delivery lead times on some raw materials have increased.

Financing — Until the Ukraine invasion, many investors were intentionally excluding defense related assets from their investment policies. Russia's invasion of Ukraine has clearly reminded everyone that investments in defense and security are essential to the resilience and sustainability of Western democracies. But investors' exclusionary policies have yet to be revised, particularly among international investors.

Workforce — Europe's defense industry employs 600,000 people, with a ~45-year-old median age. A massive recruitment plan has been launched by all major defense companies with four challenges: scarce competencies; attractiveness of the sector with a negative image as an arms producer; higher turnover since beginning of the COVID crisis; and long learning curve requiring loyalty of employees when training

If these enablers are not met by European NATO members, solutions proposed by the U.S. defense industry can help fill immediate needs. The recent German acquisition of 35 F-35 and 60 CH-47F Chinook heavy-lift military helicopters represents that direction.

Nevertheless, while this trend may secure involvement of the U.S. Armed Forces in case of an attack on one of the European NATO members, it is ultimately a step back for the European defense industry.

COLLABORATION WILL DRIVE EUROPEAN DEFENSE INTEGRATION

The ability of Europe to invest in its defense industry and restore deterrence will likely define the long-term mission and viability of the NATO alliance. A sizable risk is posed by a potential lack of coordination among all stakeholders involved in this effort. And, if each country focuses on its own industry, this historical opportunity to build and strengthen a European defense industry could be lost.

If done correctly, this moment presents an opportunity for European NATO members to leverage the alliance and the European Union on multiple fronts:

Share capabilities across Europe (i.e., purchase of raw material, stock of ammunitions and missiles or spare parts)

Jointly invest in defense and security capabilities, such as information warfare capabilities or air and missile defense on the Eastern flank of the EU

Improve coordination or centralize definition of specifications and acquisition of equipment to reduce number of European defense platforms

Support the emergence of efficient, low-tech defense and security solutions in Europe

Ensure competitiveness and exportability of European defense and security solutions

References

[1] www.npr.org/2022/05/18/1099679338/finland-and-sweden-formally-submit nato membership-applications

[2] The North Atlantic Treaty Washington, D.C., April 4, 1949

[3] Our World in data

[4] SIPRI "Explainer: The proposed hike in German military spending", March 25th, 2022

[5] Bundeswehr: Keine großen Fortschritte in der materiellen Einsatzbereitschaft (esut.de), January 2022

[6] French National Assembly: information report from the National Defense and Armed Forces Commission, February 17th, 2022

[7] French National Assembly: information report from the National Defense and Armed Forces Commission, February 17th, 2022

[8] Raytheon Technologies Q1 2022 Earnings Call

[9] AlixPartners analysis, Bruegel

[10] AlixPartners analysis

Authors: *Ben Brooks, Director (wbrooks@alixpartners.com — Aaron Edwards, Vice President (aedwards@alixpartners.com) — Aymeric Gobilliard, Director (agobilliard@alixpartners.com — Lindsey Gyngell, Senior Vice President (lgyngell@alixpartners.com) — Christian Leber, Director (cleber@alixpartners.com)*

About Alix Partners

For more than 40 years, AlixPartners has helped businesses around the world respond quickly and decisively to their most critical challenges — we work in small, highly qualified teams with specific industry and functional expertise, and we operate at pace, moving quickly from analysis to implementation. We stand shoulder to shoulder with our clients until the job is done, and only measure our success in terms of the results we deliver. Our approach enables us to help our clients confront and overcome truly future-defining challenges. We partner with you to make the right decisions and take the right actions. And we are right by your side. When it really matters.

www.alixpartners.com

Image is courtesy of Northrop Grumman.

Northrop Grumman successfully completes PDR for a 300-kilowatt class high energy laser

Northrop Grumman Corporation (NYSE: NOC) recently completed the preliminary design review for a high-energy laser prototype that will feature an architecture scalable to more than a megawatt for the **U.S. Department of Defense**.

The review establishes the company's technical approach for precise, low-cost, speed-of-light technology for military operations.

"*This is an important step in the ability to combine high-power laser beams into a single beam that can be scaled for maximum power,*" said ***Robert Fleming***, vice president and general manager, strategic space systems, Northrop Grumman. "*We're on track to demonstrate the technology, leveraging our decades of experience in the field.*"

In March of 2021, the U.S. Department of Defense awarded Northrop Grumman a $72 million contract under the ***High Energy Laser Scaling Initiative (HELSI)*** to demonstrate a high-energy laser prototype using Northrop Grumman's coherent beam combining technology.

The company will test the prototype at progressively higher powers later this year to prove the coherent beam combining design.

The company was also awarded a firm fixed price Other Transaction (OT) Agreement modification to exercise options by the Missile Defense Agency (MDA) to continue the development of the Glide Phase Interceptor (GPI) supporting the MDA's regional hypersonic missile defense program to deter and defeat hypersonic missile threats.

This modification is a follow-on to the initial 2021 award under MDA's OT Agreement which entailed an accelerated concept design for a GPI prototype.

Artistic rendition of the Glide Phase Interceptor aimed at hypersonic threats. Image is courtesy of Northrop Grumman)

Northrop Grumman is developing its GPI design through a successful ***Systems Requirements Review - Prototype*** under this modification.

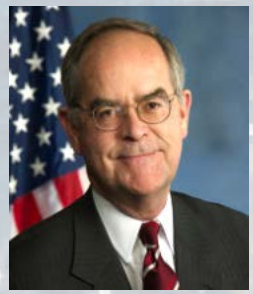
"*GPI will play a central role in ensuring the United States maintains the most reliable and advanced missile defense systems in the world that are capable of outpacing and defeating evolving missile threats,*" said ***Rich Straka***, vice president, launch vehicles, Northrop Grumman.

GOVERNMENT SATELLITE REPORT

Establishing deterrence capabilities in the space domain

Author: David Pesgraves, Government Satellite Report (GSR)

As U.S. adversaries continue to signal their intent to achieve superiority in the space domain, the American government and military must continue to invest and build out a resilient space architecture that not only has the capability to protect U.S. critical assets in-orbit, but also deter near-peer competitors from threatening moves in space in general.



Representative Jim Cooper

In may of 2022, at a special ***Schriever Spacepower Forum,*** ***Congressman Jim Cooper***, *U.S. Representative* for *Tennessee's 5th congressional district*, sat down with Gen. ***Kevin P. Chilton*** (Ret.) to discuss the growing adversarial threat in space, how the U.S. needs to reestablish its deterrence capability in the domain as well as the role commercial industry should play in the process.

U.S. SPACE FORCE AS A DETERRENT FORCE

To open the forum, Gen. Chilton asked Rep. Cooper about his thoughts on the Biden administration's release of its U.S. space priorities framework and if he agreed with its positioning of the U.S. Space Force as a "*support force*" rather than a "*deterrence and warfighting force.*"

According to Rep. Cooper, he is on the side of deterrence. He stated that the U.S. should be able to have warfighting capabilities to defend its assets in space, while simultaneously projecting a strong deterrent presence that would prevent U.S. adversaries from making aggressive moves in the domain.

"*Just few years ago, we'd let our deterrence capability in space go almost to zero,*" said Rep. ***Cooper***. "*Which is pretty sad.*" In his eyes, the space domain is the ultimate "*infrastructure of infrastructure,*" which the U.S. must be prepared to secure and defend.

He went on to explain that the country's near-peer rivals have not delayed their technological innovations in the space arena. In areas where the U.S. military has been languishing, U.S. adversaries have made strides in their advancements. "*We largely squandered that advantage,*" said Rep. Cooper. "*We've got a lot of catch-up work to do to reestablish deterrence.*"

REESTABLISHING SPACE DOMINANCE + DETERRENCE

Rep. Cooper pointed to the ever-shrinking number of American STEM graduates as one of the main contributing factors to the country's authoritative decline in space. "*We gave up on much of big science,*" he said. "*Without a technological lead, our nation is doomed.*"

He did acknowledge that there are signs that STEM is making a comeback in the workforce, and has hope that will give the nation a boost in reestablishing its technological lead. "*We're still head-and-shoulders above other militaries,*" said Rep. ***Cooper***. "*But we've got to make sure that we're always challenging ourselves to be the best. And sometimes I worry that we get distracted, or we rest on our laurels.*"

As for the actual domain itself, one area that he believes could be a starting point to projecting a deterrent dominance in space is by rethinking the assets and satellites that the U.S. puts in on-orbit, explaining that they have to be more survivable and durable and must have extremely robust capabilities.

"*We got to do whatever it takes to have a severe capability,*" said Rep. ***Cooper***. "*And that includes not only extraordinary defense, but also an offensive capability.*"

COMMERCIAL SECTOR CAN BRIDGE THE TECHNOLOGICAL GAP

Rep. ***Cooper*** noted that because threats in space are becoming more ubiquitous, the U.S. needs to prioritize the protection and security of its in-orbit critical systems. "*We got to have a resilient, survivable architecture that can meet all our needs,*" he explained.

He expressed concern around the speed of acquisition within the government and military, as well as emphasizing his concerns on the "*quality*" of acquisition. "*We need to think about what really works, and what really can give us that 10-to-20-year leap…that our Pentagon needs to really meet and beat any other threat and establish deterrence.*"

Rep. ***Cooper*** applauded the innovative technologies that are coming out of the commercial sector and expressed how he wishes that the U.S. government would match that level of innovation. "*The first step is for the military to catch up with the private sector, because so much of the innovation has come from innovative small companies.*"

"*It's incredible innovation that's currently underway*," he said. "*It's innovation that we could currently be using with our Space Force and Air Force and other branches of the military.*"

This sentiment of leveraging the commercial sector in order to advance the capabilities and solutions that are being employed by the U.S. military has lately been echoed by top military officials at the Pentagon.

Last January, the ***U.S. Space Force***'s Chief of Space Operations, Gen. ***John W. "Jay" Raymond***, spoke at a ***Mitchell Spacepower Forum*** where he emphasized the importance of establishing resiliency throughout critical systems in space and how the commercial sector has to play a role in making it happen.

"*We have got to shift the space architecture from a handful of exquisite capabilities that are very hard to defend to a more robust, more resilient architecture by design*," said Gen. ***Raymond***.

"**But it's not just about innovation. Integrating COMSATCOM services into an integrated MILSATCOM and COMSATCOM satellite architecture will have the added bonus of baking resiliency into the military's networks**."

At another forum held last November, the U.S. Space Force's Lt. Gen. ***B. Chance Saltzman*** also agreed that the satellite architecture currently in space is unprepared for combat capability and capacity,. He pointed to the commercial industry as a major player in not only providing the technologies, but also creating a resilient space architecture for the U.S. military.

"*With the technology that's being employed, I think we're going to be able to leverage commercial capabilities to accomplish a subset of our missions*," said Lt. Gen ***Saltzman***. "And as we distribute those up, not only does it free up resources for *us, but it creates a more resilient architecture because of the number of different places and pathways where we can get the information we need.*"

It's clear that the U.S. military needs to begin to source these commercial technologies as soon as possible in order to regain dominance in the space domain, as well as play a deterrent role against aggressive near-peer competitors. As Rep. ***Cooper*** put it, "*We need the capability now. We needed it yesterday. And I'm worried that we're not there yet.*"

*The post Rep. Jim Cooper on reestablishing deterrence capabilities in the space domain appeared first on **GovSat** and is republished in SatMagazine with permission from SES GS and GSR.*

Author David Presgraves is a Staff Writer for GovSat Report, in addition to several other online publications dedicated to defense, military, and federal government agency technologies.

Kongsberg acquires NanoAvionics which combines their smallsat technology and manufacturing

Kongsberg Defence & Aerospace (Kongsberg) has entered into an agreement to acquire Lithuanian smallsat mission integrator and bus manufacturer NanoAvionics. The planned acquisition expands Kongsberg's space offering to also have products and technology for manufacturing small satellites.

NanoAvionics is a smallsat mission integrator and bus manufacturer with significant global growth in recent years, including expansions into the United Kingdom and the United States. With more than 150 employees the company has contributed to 120 missions and commercial satellite projects, with customers ranging from national space agencies to universities such as ***UNSW Sydney*** and companies such as ***Thales Alenia Space***, ***Aurora Insigh***t, the ***Dubai Electricity & Water Authority,*** **SEN** and others.

KONGSBERG will acquire in total 77 per cent of the company. Current majority owner ***AST & Science*** will divest all its shares, while the management of NanoAvionics will retain 23 percent of the company. The parties have agreed upon an enterprise value of 65 million euros (100 percent basis).

Management and leadership structure of NanoAvionics under CEO ***Vytenis Buzas*** and CCO ***Linas Sargautis***, both founders of the company, will remain unchanged. KONGSBERG and NanoAvionics plan to close the transaction following the conclusion of customary closing conditions including any required regulatory reviews.

The two companies have complementary technology and positions in the space value chain. NanoAvionics is a leader in the smallsat segment as a mission integrator and bus manufacturer, while Kongsberg is an established provider of spacecraft subsystems.

NanoAvionics has customers in more than 40 countries across Asia, Europe and the Americas, complementing Kongsberg's global positions in both the traditional space segment and new space.

"*The agreement to acquire NanoAvionics represents a game changer for KONGSBERG's space ambitions. By acquiring NanoAvionics KONGSBERG expands its portfolio to also have products and technology for designing and manufacturing small satellites. KONGSBERG is the Nordic region's largest industrial space company and a global leader in maritime surveillance. We have clear ambitions to grow further and with this acquisition we are taking the next step both for us and for Norwegian space industry,*" said ***Geir Håøy***, CEO of Kongsberg.

"*Joining forces with Kongsberg, one of the most respected names in the defense, maritime and space domain, further strengthens and broadens our position in the NewSpace sector and provides us access to new markets. It is the right timing and a perfect match for our companies to consolidate our expertise and create a world class space company which will be a leading prime contractor for small satellite missions,*" said ***Vytenis J. Buzas,*** founder and CEO of NanoAvionics.

"*By joining forces NanoAvionics and Kongsberg will be able to provide cost efficient solutions and services for customers, from manufacturing, payload production and integration, to launch services, and mission control and data processing. The market for small satellite constellations will increase going forward, within commercial, security and defense segments. NanoAvionics has a strong proven track record, and we look forward to working closely with this talented team,*" said ***Eirik Lie,*** President of Kongsberg Defence & Aerospace.

The planned acquisition is in line with Kongsberg's strategic priorities to grow in the space technology sector and Norway's space ambitions. In April, Kongsberg announced the procurement of three smallsats from NanoAvionics as a first step of establishing Norway's first satellite constellation with unique and world-leading capabilities. On July 5 of this year, Kongsberg will open a new, 6,000 square meter building, with specialized facilities for the development and production of products to be launched into space.

"*Norway is a leader in the domain of maritime surveillance in the high north. The planned acquisition incorporates world class small satellite technology into our portfolio enabling further advances in surveillance and other key strategic capacities. NanoAvionics, along with our existing space portfolio and the development of the Andøya space port means Norway now has leading positions across the entire value chain,*" said Lie.

KONGSBERG

COMMS ON THE MOVE

Resilient SATCOM for today's evolving battlespace.

Field configurable Ku-, Ka- & X-bands

Linear gain at all elevation angles

Open & closed loop tracking

Platforms for land & sea

Multi-orbit GEO & MEO

OpenAMIP enabled

High throughput

Simple interface

Easy to maintain

AvL TECHNOLOGIES

avltech.com

See our new COTM terminal at IBC ✦ Stand 1.C64

SEVEN RULES TO GET SATELLITE SPECS CORRECT THE 1ST TIME

The incorrect component can prove quite costly...

Author:: Paul Morris, Vice President, RF and Comms BU, EnSilica

In any industry — especially in the military/agency/government (MAG) market segments — an incorrect component can, and does, prove costly. In space, this cost can be several orders of magnitude higher. Chip development for satellites and their specifications will assist developers in being correct at the first time around.

The consequences of being late to market can be devastating to a an organization or company, especially when the costs for many products are measured in millions of dollars, whether tax payer or commercial entity supported.

A delayed launch due to late breaking changes could significantly delay services revenue and also prove disastrous to warfighters. Once a satellite is on-orbit, it's extremely difficult and, sometimes, impossible to service.

Getting it wrong can be even more catastrophic.

The maiden flight of ***Ariane 5*** lasted one minute before the rocket — along with its $500 million payload — was destroyed. The cause of this was the specification of the software used, which suffered from a poor definition of detailed requirements and functionality. That ultimately led to software performing 64-bit operations with 16-bit precision and failing to correctly detect overflow conditions.

It's not just the software — much of the electronics used in satellites are ***ASIC***s (*custom-designed chips*), which deliver the bespoke functionality needed while meeting, for example, the power limitations required when operating only on solar and battery power.

As an example, the company recently worked with ESA as a partner to develop a satellite communications system for a spacecraft and this required a Ka-band (***26.5 – 40 GHz***) transceiver in order to communicate with vehicles anywhere on the planet.

Again, the design for this began with the specification.

To quote five IC design experts* … "T*ell me what you want. What you really, really want*."

PURPOSE OF THE SPECIFICATION

The specification defines the behaviour and operation of the product. Functionality and behaviour which is required to be present in the product must be clearly defined. Similarly, functionality that is explicitly not required should also be clearly stated.

Typically, the specification is generated by the engineering team in consultation with the end customer and based on a requirements document provided by the customer.

One key mistake that is frequently seen is the assumption that the specification can function as a datasheet and/or user manual — let's stress that the specification ***is not*** this document.

Instead, the specification is there to confirm customer requirements. Every requirement must be addressed directly or indirectly by the functionality defined within the specification.

There is a one to one (or one to many) mapping between each customer requirement and functionality defined by the specification.

Therefore, it is essential to review and approve the specification only when it adequately responds to each requirement. The compliance report that is prepared by the development team should be closely reviewed and then approved by the customer.

WHO IS THE SPECIFICATION FOR?

There are two audiences.

> *1)* ***The system developer*** *(the ASIC vendor's customer). If the customer does not understand or agree with the definition of the product, the chances that a development team is able to deliver what's needed tends to zero.*

*2) **The development team**. While this sounds obvious, it is all too common for individual members of a development team to only read the sections of the specification focused on their tasks. For the development team, the specification document allows the team to be structured correctly to bring together the right skillsets.*

While the specification cannot magically resolve poor communication between the customer and the supplier, or between people within the suppliers product development team, it will act as the communication channel that will help the information to flow to the correct parties.

THE SEVEN RULES TO WRITING REQUIREMENTS?

1) Use precise language
The choice of words used to express each requirement is crucial. As an example: shall expresses a requirement; will makes a statement of fact; should expresses an aspiration.

2) Be concise
Each requirement should be as concise as possible, with requirements reduced into individual items, giving maximum clarity when reporting compliance during the development. For example, it is preferable to say, "*The product must do X*" and "*The product should do Y*" rather than "*The product must do X and should do Y.*"

3) Be complete
The requirements must be complete. If an aspect of the necessary product functionality is not described in the requirements, it will not be described in the specification and, as a result ,will not be in the product.

4) Include rationales, but only where essential
Where appropriate, each requirement may be accompanied by a rationale. The rationale is not an extension of the requirement. Compliance is determined against the requirement, not the rationale. Do not fall into the trap of using the rationale in an attempt to broaden the scope.

5) Focus on the what, not the how
The requirements must describe the intended functionality but equally must not describe the preferred implementation. The requirements describe what the product must do rather than how it must provide that functionality.

6) Ignore non-essential functionality
Is each requirement necessary for the product? If something is not essential for the intended product functionality then it is not a requirement.

7) Make requirements specific and measurable
For reporting compliance there must be a way to uniquely identify each requirement. This enables compliance reports to make clear statements such as "*Specification S.17 addresses requirement R.49*". Writing clear, unambiguous requirements means the avoidance of any terminology or expression that is not verifiable. As a basic example, saying "*The product must be low power*" is subjective — instead, it should be defined as "*The product must consume less than X.*"

Getting a specification wrong can be catastrophic for MAG and/or commercial projects. By following these seven tips, developers should be well placed to '***get it right first time***.'

Paul Morris is VP of the RF and Comms Business Unit at ASIC development company EnSilica. The company works with a number of SATCOM and automotive system developers, including the European Space Agency.

www.ensilica.com

DISPATCHES

L3Harris infrared space tech will enhance battlefield imagery + missile defense detection

An L3Harris Technologies (NYSE:LHX) infrared instrument will significantly improve the ability to capture high-resolution imagery and other important battlefield information from space — a critical capability for the nation's future missile defense efforts.

L3Harris is providing the instrument as part of a wide-field-of-view satellite that also will help inform future space-based missile defense missions and architectures. The satellite will be positioned 22,000 miles from Earth, enabling the infrared system to see a wide swath and patrol a large area for potential missile launches.

"*The L3Harris instrument can stare continuously at a theater of interest to provide ongoing information about the battlespace, which is an improvement over legacy systems*," said ***Ed Zoiss***, President, Space & Airborne Systems, L3Harris. "*It also provides better resolution, sensitivity and target discrimination at a lower cost*."

The instrument was built for ***Space Systems Command*** and is integrated into a ***Millennium Space Systems*** satellite, scheduled to launch from Cape Canaveral, Florida. The payload, which is more than six feet tall and weighs more than 365 pounds, was developed in *Wilmington*, *Massachusetts*.

L3Harris is prioritizing investments in space-based missile defense programs and has accelerated the development of resilient, end-to-end satellite solutions in spacecraft, payloads and ground software, and advanced algorithms.

In a related effort, the ***Missile Defense Agency*** awarded L3Harris a missile-tracking study contract in 2019 and the prototype demonstration in January 2021. In December 2020, the Space Development Agency selected L3Harris to build and launch four space vehicles to demonstrate the capability to detect and track ballistic and hypersonic missiles.

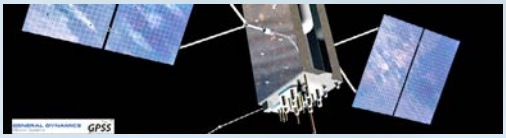
L3Harris Technologies is an agile global aerospace and defense technology innovator, delivering end-to-end solutions that meet customers' mission-critical needs. The company provides advanced defense and commercial technologies across space, air, land, sea and cyber domains. L3Harris has more than $17 billion in annual revenue and 47,000 employees, with customers in more than 100 countries.

www.l3harris.com

L3HARRIS™
FAST. FORWARD.

SDA Awards Million$$$ For Ground Control + Ops To General Dynamics Mission Systems + Iridium

General Dynamics Mission Systems (NYSE: GD), and Iridium Communications Inc. (NASDAQ: IRDM) have been awarded a contract by the Space Development Agency in the amount of $324,516,613, including a base amount of $162,954,122 and $161,562,491 in options, to establish the ground Operations and Integration (O&I) segment for Tranche 1 of the National Defense Space Architecture (NDSA).



Together, General Dynamics Mission Systems and Iridium will build ground entry points and operations centers for the NDSA as well as provide network operations and systems integration services for the SDA's next tranche of proliferated LEO satellites.

The core operations and integration functions include enterprise management, network management, mission management, payload data management, and constellation monitoring that spans the ground, link, space, and user segments of the architecture.

Working with partners at KSAT USA (KSAT Inc.), Raytheon and EMERGENT, the General Dynamics Mission Systems-Iridium team will develop, equip, staff, operate and maintain state-of-the-art, commercial-like operations centers, acquire and operate ground entry points, and lead ground-to-space integration efforts.

"*We are incredibly proud to bring our long heritage of mission-critical space and ground communications and networking expertise to the Space Development Agency*," said ***Chris Brady***, president, General Dynamics Mission Systems. "*Together with our partners, we're excited to build the foundation for the SDA's initial warfighting capability and backbone of Joint All-Domain Command and Control.*"

Photo of the Iridium ground Station, courtesy of Ivar Stakvik.

"*Iridium, General Dynamics Mission Systems and the U.S. government have a long and successful history of working together and partnering on this project is a natural evolution of our relationship*," said ***Matt Desch***, CEO, Iridium. "*Iridium's 25 years of experience operating in LEO makes us uniquely qualified for this opportunity, and we're honored to take on this tremendous responsibility in support of this next generation network.*"

Department of Defense (DoD) releases JADC2 implementation plan

Deputy Secretary of Defense (DSD) Dr. Kathleen Hicks recently signed the Department of Defense Joint All-Domain Command and Control (JADC2) Implementation Plan on March 15, 2022.

JADC2 is a warfighting necessity to keep pace with the volume and complexity of data in modern warfare and to defeat adversaries decisively.

JADC2 enables the Joint Force to "*sense*," "*make sense*," and "*act*" on information across the battle-space quickly using automation, ***artificial intelligence*** (**AI**), predictive analytics, and ***machine learning*** (**ML**) to deliver informed solutions via a resilient and robust network environment.

"***We must maintain continued focus and momentum on these initiatives and programs which enhance Department capabilities to face current and future threats***," said Deputy Secretary ***Hicks***. "*Command and Control in an increasingly information-focused warfighting environment have never been more critical. JADC2 will enable the DoD to act at the speed of relevance to improve U.S. national security. JADC2 is delivering capabilities beginning now, and it will continue to be funded in the coming years.*"

The DSD chartered ***JADC2 Cross-Functional Team*** (**CFT**) will oversee the execution of the JADC2 Strategy, initially announced in June 2021, and the Implementation Plan.

While the JADC2 Strategy provides a vision and an approach for identifying, organizing, and delivering improved Joint Force C2 capabilities — the Implementation Plan outlines how the Department will accomplish this. An unclassified summary of the JADC2 Strategy is available ***at this direct link...***

"*This step represents irreversible momentum toward implementing the JADC2 Strategy and concepts the Department announced earlier this year*," said Gen. ***Mark Milley***, Chairman of the Joint Chiefs of Staff. "*This is about dramatically increasing the speed of information sharing and decision making in a contested environment to ensure we can quickly bring to bear all our capabilities to address specific threats.*"

JADC2 is the Department's way ahead. The JADC2 Implementation Plan, while classified, can be described as the document which details the plans of actions, milestones, and resourcing requirements. It identifies the organizations responsible for delivering JADC2 capabilities. The plan drives the Department's investment in accelerating the decision cycle, closing operational gaps, and improving the resiliency of C2 systems.

ADVANTECH
WIRELESS
A Baylin Technologies Company

Summit versus Summit II

Though the features between Summit and Summit II are similar, Summit II incorporates the latest in RF and control technologies.

The Summit II systems are comprised of modules that are housed in our Taurus SSPA package. As a result, Summit II is approximately 30% smaller and lighter – the perfect solution for antenna-platform mounting.

Taurus provides optimized thermal management and high-efficiency waveguide combining that includes transistor isolation.

Advantech's latest CANBus operating system provides fast inter-component communications as well as the ability to perform device-level diagnostics.

SpiderOak Creates New Space Advisory Board, Appoints Highly Decorated Veterans and Industry Experts to Address Cybersecurity Threats

***SpiderOak**, recently created a new **Space Advisory Board** that included the appointment of **General Ellen M. Pawlikowski** (U.S. Air Force, retired) and **Frederick J. Doyle, Jr., along with the reappointment of Admiral James A. "Sandy" Winnefeld** (U.S. Navy, retired), **Lieutenant General Ken Tovo** (U.S. Army, retired), **and Phil Eichensehr**, veteran industry leader serving the intelligence community.*

SpiderOak's new advisory board members will be tasked with addressing the ***cybersecurity vulnerability of commercial and national security space systems***, which is widely considered the gravest threat to space resiliency. The board will help guide the company in fielding zero-trust products and services to ensure the confidentiality, integrity, and availability of the most sensitive data in space networks.

General Ellen Pawlikowski — Before retiring in 2018, General Pawlikowski was the four-star commander of ***Air Force Material Command***, leading more than 80,000 people and managing $60 billion annually, executing critical warfighter support through leading-edge research and development technology. With a Ph.D. in engineering from UC Berkeley, she served 36 years on active duty and is a key technology leader in areas as diverse as airborne lasers and space communications. Gen. Pawlikowski is also widely credited with restoring technical rigor to the systems acquisition workforce as the Commander of the ***Space and Missile Systems Center***. Prior to that position, Gen. Pawlikowski was the Commander of the ***Air Force Research Lab***, the Deputy Director of the ***National Reconnaissance Office,*** and held various senior positions in the ***Office of the Secretary of Defense***.

"Rethinking our nation's space resilience is now a top priority of the Pentagon, and SpiderOak's blockchain-based products for securing satellites and their networks are a crucial part of building that resiliency," said ***Gen. Pawlikowski***. *"I am pleased to join this new advisory board and believe that SpiderOak's technology will usher in a new and enhanced way to secure America's space infrastructure."*

Fred Doyle
Mr. Doyle is president of ***ISBF, LLC***, an aerospace and defense consulting company. Previously, he was VP Defense & Intelligence at ***Ball Aerospace & Technologies Corp***. Mr. Doyle held various executive-level positions at ***Space Imaging, Corp***. from 1998 to 2005, including the company's first commercial. high-resolution. imaging satellite launch: ***IKONOS***. Prior to joining the private sector, Doyle served more than 20 years in the ***Defense Mapping Agency***, the ***National Reconnaissance Office*** and other branches of the intelligence community.

Admiral James A. "Sandy" Winnefeld
With a degree in Aerospace Engineering, ***Admiral Winnefeld*** began his naval service as a fighter pilot, flying the ***F-14 Tomcat***. He continued his career as an instructor at the ***Navy Fighter Weapons School*** (***also known as Top Gun***) and served as senior aide-de-camp to ***General Colin L. Powell***. Admiral Winnefeld commanded a fighter squadron, the amphibious ship ***USS Cleveland*** and the aircraft carrier ***USS Enterprise***. As a flag officer, he commanded a carrier strike group, two NATO commands, the ***United States 6th Fleet***, ***United States Northern Command***, and the ***North American Aerospace Defense Command (NORAD)***. His final tour of duty was as the ***Vice Chairman of the Joint Chiefs of Staff*** and ***Chairman of the Joint Requirements Oversight Committee***, ensuring the integrity of warfighter requirements remain at the forefront of decision-making within the Pentagon and Capitol Hill. He is a director for several public and private corporations and chairs the ***President's Intelligence Advisory Board***.

Lieutenant General Ken Tovo
Current chairman of the **Green Beret Foundation**, ***Lieutenant General Tovo*** was ***Commanding General of the U.S. Army Special Operations Command***. Previously, he served as ***Deputy Commander, Southern Command***; ***Commanding General, Combined Security Transition Command-Afghanistan and NATO Training Mission-Afghanistan***; ***Commander, Special Operations Command Central***; ***Deputy Commanding General, 1st Armored Division***; and ***Deputy Commanding General, Special Operations Command Europe***. A combat veteran with multiple deployments to *Sierra Leone*, *Bosnia*, *Iraq*, and *Afghanistan*, General Tovo is a thought leader in **Irregular Warfare and Special Operations**.

SpiderOak's new Space Advisory Board reconfirms the company's latest commitment to providing space operators the same levels of assurance in the authority, integrity, and confidentiality of space architectures that other industries have come to expect from SpiderOak's secure communication and collaboration offerings.

In March, SpiderOak announced ***Charles Beames*** was elected Executive Chairman, advancing the company's shift to focus on the new space economy, particularly in the defense sector. SpiderOak recently announced the company is testing ***OrbitSecure***, the company's zero-trust, cybersecurity platform to secure data across the space data supply chain with ***Lockheed Martin Space***'s ***Mission Solutions***.

spideroak.com

Follow-on orders received by Gilat to expand an Asian nation's defense force SATCOM network

Gilat Satellite Networks Ltd. (Nasdaq: GILT, TASE: GILT) was awarded follow-on orders for the expansion of a defense force satellite communication (SATCOM) network in an Asian nation.

Gilat's SkyEdge II-c hubs and Capricorn VSATs are being deployed to serve the specialized needs of the customer.

This additional equipment, which will be used to expand tactical SATCOM solutions for mobile platforms, will increase the availability of communication channels for emergency and disaster response, as well as address mission-critical C4I needs.

"The improved performance of the customer network, with the successful deployment of Gilat's state-of-the-art system, resulted in the requirement for additional network expansion," said ***Michal Aharonov***, Chief Commercial Officer at Gilat. *"We're proud to be recognized as a reliable partner, providing superior technology and highly secure SATCOM solutions that address the specialized needs of this nation's defense forces."*

www.gilat.com

Virgin Orbit Heads Straight Up with Space Systems Command's STP-S28A + six DoD rideshare partners aboard LauncherOne

***Space Systems Command** and Long Beach-based **Virgin Orbit National Systems**, a US-incorporated, wholly-owned subsidiary of Virgin Orbit, successfully air-launched seven **Department of Defense Research and Development** satellites for the **U.S. Space Force** on the company's LauncherOne rocket, after taking off on July 1st from **Mojave Air and Space Port**, California.*

The nighttime mission, designated ***STP-S28A***, demonstrated commercially available solutions to place Space Force satellite capabilities on-orbit, providing flexibility and resiliency for the Space Force and warfighter requirements in an increasingly contested environment.

"*Congratulations to the STP team and our mission partners on today's successful launch,*" said Brig. Gen. ***Timothy Sejba***, program executive officer for Space Domain and Combat Power, which manages the DoD Space Test Program. "*The STP team continues to demonstrate how agile access to space enables us to quickly and affordably prove out new R&D technology on-orbit, accelerating the development of our future, more resilient, space architecture.*"

"*I'm thrilled with [this] successful launch,*" said Lt. Col. ***Jonathan Shea***, director of the DoD Space Test Program. "*Cost effective space access is key to the U.S. Space Force's pivot to a more resilient space architecture. This launch with Virgin Orbit exemplifies SSC's commitment to expanding partnerships with innovative companies and accelerating the delivery of future capabilities for the Warfighter.*"

According to Shea, these new space vehicles will contribute to the nation's defense and gain ground against any adversaries operating in the highly contested space domain.

Space Systems Command, headquartered at Los Angeles Air Force Base in El Segundo, California, is the U.S. Space Force field command responsible for rapidly developing, acquiring, equipping, fielding and sustaining lethal and resilient space capabilities. SSC mission capability areas include launch acquisition and operations, communications and positioning, navigation and timing (PNT), space sensing, battle management command, control and communications (BMC3), and space domain awareness & combat power.

Virgin Orbit (Nasdaq: VORB) confirmed the success of the company's fourth, consecutive, satellite launch mission named Straight Up which carried seven satellites to LEO for the United States Space Force (USSF), who procured this launch for the Rocket Systems Launch Program, with payloads provided by the Department of Defense Space Test Program (STP). In support of its mission partners, Virgin Orbit has now delivered a total of thirty-three satellites to orbit with 100% mission success.

Virgin Orbit's fully mobile LauncherOne system conducted its first ever evening flight from a bare concrete pad and a runway at the Mojave Air and Space Port in California. The launch began at 10:50 p.m. local time, Friday, July 1, and concluded with the successful deployment of all seven payloads at approximately 12:55 a.m. Pacific on the morning of July 2, completing the company's first nighttime demonstration of the company's responsive space launch capabilities.

The launch reached an orbit approximately 500 km. above the Earth's surface at 45 degrees inclination. This was Virgin Orbit's second time reaching that inclination — an orbit that no other system has ever reached from the West Coast.

The seven satellites deployed by the result of the Straight Up launch are from multiple government agencies and will facilitate experiments intended to demonstrate innovative spacecraft technologies, new approaches for satellite applications, and Earth atmospheric science.

The contract to launch this mission, also dubbed STP-S28, was awarded to Virgin Orbit National Systems in April of 2020 by the United States Space Force as a three-launch mission. STP-S28A is the first of those launches.

The Straight Up launch marked the company's fourth successful commercial flight. The U.S. Space Force Rocket Systems Launch Program is a first-time customer for Virgin Orbit. The U.S. Department of Defense Space Test Program is a three-time repeat customer of Virgin Orbit. Photo Credit: Virgin Orbit / Daniel Jarvis, Mark Waker

"The LauncherOne rocket and Virgin Orbit team have made me immensely proud with today's Straight Up mission," said Virgin Orbit founder, Richard Branson. "There is so much potential benefit for everyone from space if we just manage it well together. We are delighted for the opportunity to work with the US government to help make space a safe and fruitful environment for all."

"We are honored to be supporting and delivering for the U.S. Space Force and the U.S. Department of Defense at such a critical juncture for national security space, our nation, and our world. An incredibly talented Virgin Orbit team and our LauncherOne system continue to demonstrate a track record of success for our spacecraft customers and that was confirmed again today," said Virgin Orbit CEO, Dan Hart.

"I'm proud to be part of this incredible team, both on our side and the government team, in driving this mission to success," said Mark Baird, President of Virgin Orbit National System, the subsidiary that interfaces with the National Security customers. "It was incredible to see the Straight Up mission wheels up, and satellites successfully deployed to support the mission of our customers. We are intensely focused on ensuring we are a key mission partner as we continue to accelerate the operationalization of the LauncherOne system."

Following the success of this launch, the Virgin Orbit team is preparing for its first international launch later this year in collaboration with the United Kingdom Space Agency, the Royal Air Force, and Space Port Cornwall. This will be the first orbital launch from UK soil.

Virgin Orbit (Nasdaq: VORB) operates one of the most flexible and responsive space launch systems ever built. Founded by Sir Richard Branson in 2017, the company began commercial service in 2021, and has already delivered commercial, civil, national security, and international satellites into orbit. Virgin Orbit's LauncherOne rockets are designed and manufactured in Long Beach, California, and are air-launched from a modified 747-400 carrier aircraft that allows Virgin Orbit to operate from locations all over the world in order to best serve each customer's needs. Learn more at www.virginorbit.com and visit us on LinkedIn, on Twitter @virginorbit, and on Instagram @ virgin.orbit.


Information & Communication Technology (ICT) Solutions
Sensor: 100 Mbits/s (Fiber Optic) (365 days)
Firewalls and Data Line Infrastructure / Firewall 1
Daily Host Alerts Trend (Last 5 Days)
Reliable.
Resilient.
Secure.
Own the edge.
For over 20 years, Leonardo DRS has supported custom end-to-end satellite-based ICT solutions for maritime, airborne, and ground-mobile operations. As the top SATCOM integrator for the U.S. Federal Government,* we consistently deliver optimal levels of availability, integrity, and confidentiality. This unwavering security makes Leonardo DRS the only choice when success is critical – so you can own the edge.
*Source: GovWin IQ Total Federal Market Overview – Top Contractors 2016-2020 – NAICS 517410 Satellite Telecommunications
Learn about best-value ICT Solutions at LeonardoDRS.com/ICT
LeonardoDRS.com/ICT
LEONARDO DRS

United Launch Alliance advances the USSF-12 mission to GEO + Northrop Grumman's ESPAStar™ satellite

A *United Launch Alliance* (ULA) Atlas V 541 rocket has accomplished the launch of the USSF-12 mission for the *U.S. Space Force's Space Systems Command (SSC)*.

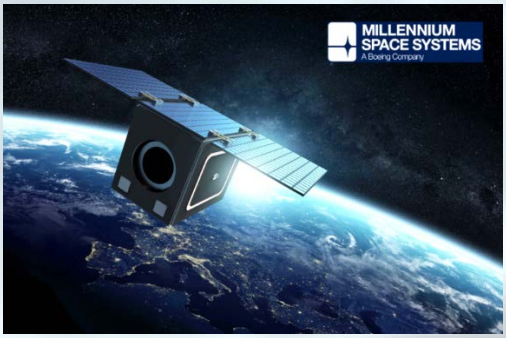
The USSF-12 features two satellite payloads: the ***Wide Field of View (WFOV) Testbed*** for SSC's ***Space Sensing Directorate*** and the ***USSF-12 Ring*** spacecraft for the ***Defense Department's Space Test Program***.

Atlas V will deliver both spacecraft directly to GEO approximately 22,000 miles (35,500 km.) above the equator, approximately 6 hours after liftoff.

The forward payload, WFOV, is a testbed spacecraft that informs the ***Next Gen Overhead Persistent Infrared*** (**OPIR**) program.

The Next Gen OPIR program will succeed the ***Space Based Infrared Systems*** program and is designed to provide a resilient, space-based, global missile warning capability against emerging missile and counter-space threats.

Sponsored by Space Systems Command and managed by the NASA Ames Research Center, the mid-sized WFOV spacecraft is based on *Millennium*'s ***AQUILA M8*** affordable platform series and hosts a transformational OPIR six-degree staring sensor developed under a separate contract by *L3Harris Technologies*.



The WFOV testbed is designed for a 3- to 5-year life with a total mass up to 6,613 lbs. (3,000 kg.) and a payload accommodation of over 771 lbs. (350 kg.). WFOV's primary mission in orbit is to explore future missile warning algorithms with data collected in space.

The aft payload is a propulsive ESPA named the USSF-12 Ring. The Ring is a classified mission to demonstrate future technology for the Department of Defense.

A direct-insertion GEO launch is one of the most challenging types of missions required by national security spaceflight.

The launch vehicle performs three firings of its upper stage to deliver the payload to an altitude more than 22,000 miles over the equator without the satellites themselves needing to perform any large-scale orbit-raising maneuvers.

Geosynchronous orbit is the location where satellites match the Earth's rotation and remain in lockstep above the same spot of the globe as they orbit.

Powering the ***Centaur*** upper stage for this launch is the 514th production engine from the RL10 family.

For more than 50 years, ***Aerojet Rocketdyne's RL10 engine*** has played a vital role in placing hundreds of military, government and commercial satellites into Earth orbit and has helped send spacecraft to explore every planet in our solar system.

In addition to Centaur, ULA uses RL10 on the ***Delta Cryogenic Second Stage*** for the ***Delta IV*** and in the next-generation ***Vulcan Centaur*** rocket. This was the 93rd security mission in 150 flights for ULA

Northrop Grumman Corporation (NYSE: NOC) played a vital role in the successful launch and deployment of the U.S. Space Force (USSF)-12 mission that launched from ***Cape Canaveral Space Force Station***.

As part of this mission, a Northrop Grumman-built ***ESPAStar satellite***™ and a ***Wide Field of View*** testbed missile detection satellite launched on a United Launch Alliance (ULA) Atlas V rocket, powered by Northrop Grumman-provided solid rocket boosters and other critical components.

The ESPAStar platform supports a wide range of missions by utilizing the ESPA standard. ESPAStar is equipped with multiple payload ports that can accommodate hosted and free-flying payloads.

Four of the company's 63-inch-diameter ***Graphite Epoxy Motors*** (**GEM 63**) solid rocket boosters provided approximately 1.5 million pounds of thrust at launch to help lift the rocket and payload from the pad.

Earlier this month, the company finalized a contract for its GEM solid rocket boosters to fly on ULA's next-generation ***Vulcan*** rocket, one of the largest commercial solid rocket motor contracts in history.

Northrop Grumman also provided numerous subsystems for the ESPAStar bus, including the solar arrays, propellant tanks, satellite and star tracker structures.

Using advanced fiber placement manufacturing and automated inspection techniques, Northrop Grumman produced the composite first-stage heat shield, the Centaur Interstage Adapter that houses the second-stage engine and the broadtail that adapts from the core vehicle to the five-meter diameter fairing.

The company also manufactured hydrazine propellant tanks, which feed the Centaur Upper Stage reaction control system to provide guidance and control.

"*ESPAStar provides rapid access to space*," said ***Troy Brashear***, vice president, national security systems, Northrop Grumman. "*As the ESPAStar mission owner, we combined critical technology into a single cohesive mission, including hardware integration and test, ground software, command and control development and integration, mission execution planning, and on-orbit operations*."

www.ulalaunch.com

www.northropgrumman.com

www.spaceforce.mil

Space Development Agency contracts for 28 satellite for the Tranche 1 Tracking Layer: L3Harris statement + Northrop Grumman to complete the spacecraft builds

The Space Development Agency (SDA) has awarded two prototype agreements with a total potential value over $1.3 billion for the establishment of the Tranche 1 (T1) Tracking Layer, providing the initial missile warning/ missile tracking warfighting capability of the National Defense Space Architecture (NDSA) — these satellites will start to launch in April of 2025.

The agreements are awarded to teams led by ***L3Harris Technologies, Inc***. of *Melbourne*, Florida, and ***Northrop Grumman Strategic Space Systems*** of *Redondo Beach*, *California*, to each build a space segment consisting of two planes with seven space vehicles per plane — 14 satellites from each performer for a total of 28 satellites in four planes — to collect infrared data and provide network communications.

Each agreement includes a launch services segment for launch preparation and a ground segment for operations and sustainment.

These prototypes will provide global and persistent indications, detection, warning, tracking, and identification of conventional and advanced missile threats, including hypersonic missile systems.

The ***Tranche 1 Tracking Layer*** will build upon the Tranche 0 Tracking Layer capabilities with targeted technology enhancements, expanded coverage, increased integration, established calibration processes, and greater production efficiencies.

The Tracking Layer is focused on developing a global constellation of infrared missile warning and missile tracking satellites that integrate with the Transport Layer's low-latency meshed communication network, enabling conventional and advanced missile tracking from proliferated LEO.

The Tranche 1 Tracking Layer satellites will be flown out of SDA's ***Operations and Integration Centers*** at ***Grand Forks Air Force Base,*** North Dakota, and ***Redstone Arsenal***, Alabama.

In fiscal year 2022, Congress provided SDA $550 million in additional funding to accelerate deployment of the Tracking Layer, with specific direction to demonstrate a space-based missile warning, tracking, and targeting capability in support of ***U.S. Indo-Pacific Command***.

The vision for the NDSA includes fielding a system that provides a resilient global capability to all combatant commands as rapidly and affordably as possible.

SDA published the Tranche 1 Tracking Layer solicitation on March 17, two days after the President signed the fiscal year 2022 appropriations bill into law.

Leveraging ***Other Transaction Authority***, SDA completed a competitive source selection and finalized the agreements within four months of the published solicitation.

L3 Harris is awarded a prototype agreement with a potential value of approximately $700 million and ***Northrop Grumman Strategic Space Systems***' award has a potential value of approximately $617 million.

The proposal was received and evaluated under Other Transaction Authorities solicitation **SDA-PS-22-02**. The Space Development Agency of Washington, DC is the contracting activity (HQ08502290003).

"*The T1 Tracking Layer effort is a critical step toward building the National Defense Space Architecture*," said **Derek Tournear**, SDA director. "*SDA is confident that selection of the L3 Harris and Northrop Grumman teams provides the best overall solution to accelerate delivery of a low-Earth orbit constellation with wide-field-of-view infrared sensors for a global missile warning and missile tracking capability in Tranche 1, on schedule. I'm pleased to see our industry partners building the marketplace necessary to quickly deliver new space capabilities to the warfighter*."

"*The speed with which SDA pursued this effort is commendable, given the severity of the hypersonic missile threat*," said **Christopher E. Kubasik**, L3Harris Chair and Chief Executive Officer. "*This prime contract is a testament to our growing impact in the space community, and affirms our strategy of being a Trusted Disruptor is gaining traction*."

"*Northrop Grumman brings decades of proven experience in missile detection, identification, tracking and communication systems*," said **Robert Fleming**, Northrop's Vice President and General Manager of the Strategic Space Systems Division. "*We look forward to working with the Space Development Agency and our industry partners on the nation's most pressing challenges in missile defense*."

Recognized as DoD's constructive disruptor for space acquisition, SDA will accelerate delivery of needed space-based capabilities to the joint warfighter to support terrestrial missions through development, fielding, and operation of the National Defense Space Architecture.

For more information on SDA, contact OSD.SDA.Outreach@mail.mil or visit www.sda.mil.

L3Harris Technologies (NYSE:LHX) has been awarded a contract to build the Space Development Agency's (SDA) Tranche 1 Tracking Layer satellite program to serve as "eyes in the sky" detecting, identifying and tracking advanced missile threats — the contract has a potential total value of $700 million.

L3Harris will build a 14-vehicle satellite constellation that will include optical communications terminals, infrared mission payloads, Ka-band communications payloads and multiple pointing modes – advanced technology specifically designed to identify and track the fastest missiles known to exist. The program also includes related ground, operations and sustainment support.

L3Harris developed four prototype satellites under the SDA's Tracking Layer Tranche 0 award in 2020. The four space vehicles produced under the $193 million firm fixed-price contract will launch in 2023.

"*Investing in resilient space assets and acting as a Trusted Disruptor in this market are core to our long-term strategy*," said **Christopher E. Kubasik**, Chair and Chief Executive Officer. "*Our customers have been clear; missile defense technology and space domain awareness architecture must be diversified, and our teams are positioned to deliver those cutting edge solutions*."

"*Flowing from our values as an organization prioritizing schedule, then cost, the Tranche 1 Tracking Layer went from solicitation to award in approximately 120 days and continues to demonstrate the Space Development Agency's ability to acquire capabilities at speed*," said SDA director, **Derek Tournear**.

He continued, "*We look forward to collaborating with our industry partners to quickly deliver missile warning/missile tracking capabilities as part of the Department of Defense hybrid architecture that will provide critical and timely information to the joint warfighter in the very near future*."

"*L3Harris is successfully executing SDA's foundational Tracking Layer Tranche 0 program, which set their strategic way forward for rapidly deploying relevant mission capabilities to our nation's warfighters*," said **Kelle Wendling**, President, Space Systems, L3Harris.

Wendling continued, "*This Tranche 1 win demonstrates our ability to nimbly scale from initial demonstration to proliferation with enhanced mission capability, resilience, global coverage, and speed to deployment as threats continue to evolve*."

Northrop Grumman Corporation (NYSE: NOC) has won a competition to build and deploy a proliferated low-Earth orbit constellation of 14 satellites with infrared sensors for the Space Development Agency's (SDA) Tranche 1 Tracking Layer (T1TRK).

T1TRK will detect, identify and track hypersonic weapons and other advanced missiles from their earliest stages of launch through interception.

T1TRK will detect, identify and track hypersonic weapons and other advanced missiles from their earliest stages of launch through interception.

Northrop Grumman will leverage its experience with the Tranche 1 Transport Layer (T1TL), to provide a resilient, low-latency, high-volume network in space to support U.S. military missions around the world.

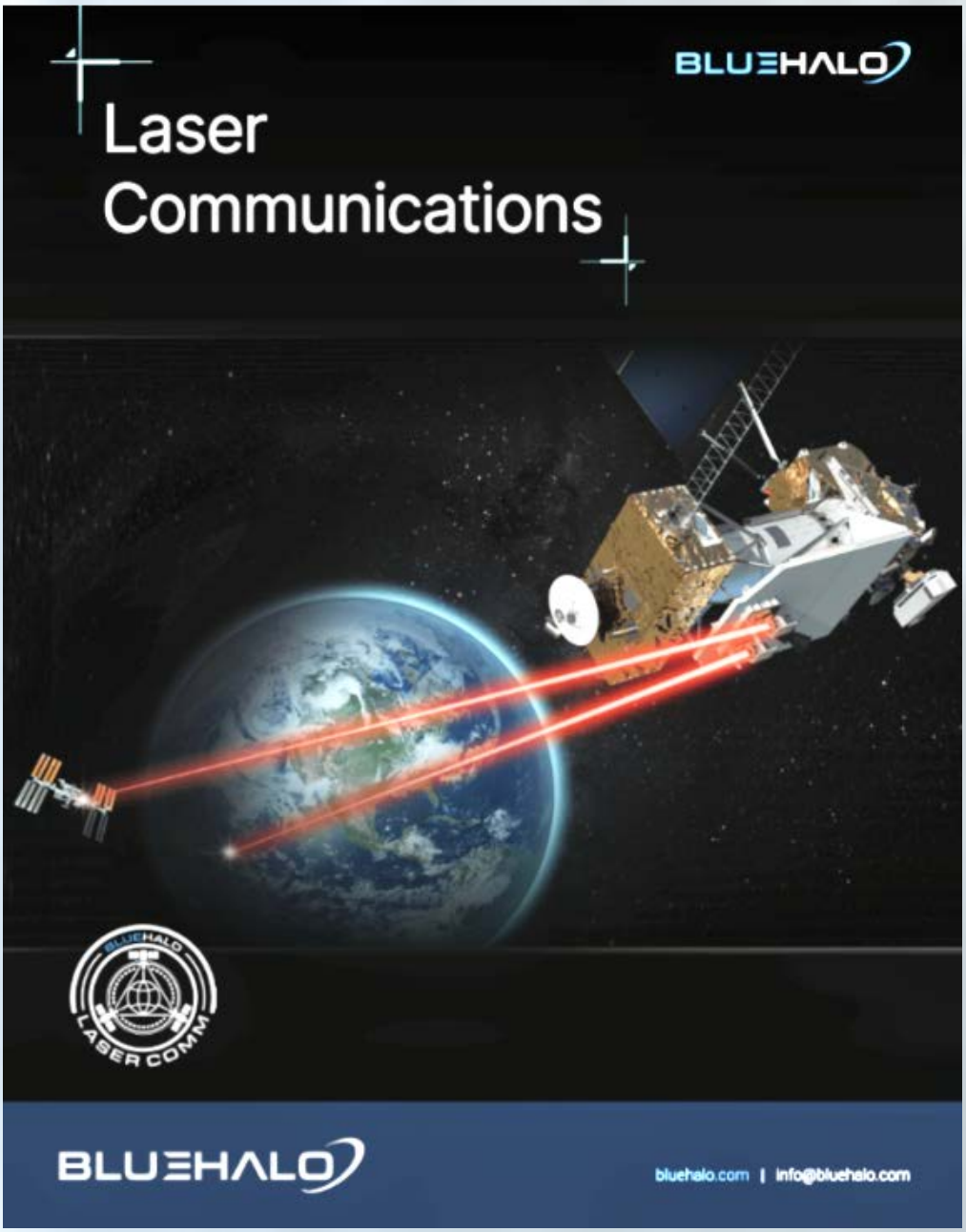
In May, Northrop Grumman successfully completed a System Requirements Review for T1TL – another element of SDA's National Defense Space Architecture.

Once deployed in 2025, the T1TRK satellites will operate in up to four, LEO planes, interconnected with T1TL satellites. Each will feature a wide field-of-view infrared sensor, three optical communications terminals, and a Ka-band payload for communications.

"*Northrop Grumman will provide an integrated space vehicle that will accelerate our nation's ability to defend against the most pressing challenges in missile defense*," said **Robert Fleming**, Northrop's Vice President and General Manager of the Strategic Space Systems Division. "*T1TRK builds upon Northrop Grumman's experience with T1TL and will demonstrate a capability to track advanced missile threats*."

IBC2022

BACK AT THE
RAI AMSTERDAM | **9-12 SEPTEMBER 2022**



BlueHalo awarded million$$ AFRL contract for Optical Laser Communications Flight Terminals + Ground Station

BlueHalo has been awarded a contract to deliver a pair of optical laser communications proto-flight terminals and a ground station to demonstrate on-orbit processing of satellite positioning and timing for the Air Force Research Laboratory (AFRL) at Kirtland Air Force Base.

Work will be performed in *Albuquerque, New Mexico*, and is expected to be completed by February of 2025.

The contract will support the development and demonstration of key technologies: GEO-to-LEO Optical Uplinks and Downlinks, Space-to-Ground Links, Positioning and Timing Accuracies over Optical Communication Links, and interoperability with multiple optical communications standards.

BlueHalo's **Laser Communications Systems Division** is dedicated to developing next-generation optical terminals and key enabling solutions.

The firm specializes in high data rate communications, ranging and timing services with ***low probability of intercept or detection*** (**LPI/LPD**) due to extremely narrow beam widths.

"*As a core area of technological focus at BlueHalo, our Laser Communications Systems Division is rapidly expanding capabilities based on robust internal research and development programs*," said ***Vikram Manikonda***, BlueHalo's Chief Technology Officer (CTO). "*This cutting-edge contract will allow us to apply the Company's extensive experience developing and fielding optical communications systems to continue advancing innovations in laser communications.*"

"*BlueHalo is excited for this opportunity to partner with the Air Force Research Laboratory to continue pushing optical communications technology forward*," said ***Dan Gillings***, BlueHalo Sector President. "*A demonstration like this leverages our previous successes in the field and builds on our expertise in optical jitter control and precision pointing to achieve technological breakthroughs.*"

BlueHalo is purpose-built to provide industry-leading capabilities in the domains of Space Superiority, Space Technology, Directed Energy/Counter-Unmanned Aircraft Systems (c-UAS), Autonomy, Advanced Radio Frequency (RF), Cyber, and Signals Intelligence (SIGINT). BlueHalo focuses on inspired engineering to develop, transition, and field next-generation capabilities to solve the most complex challenges of our customers' critical missions and reestablish our national security posture in the near-peer contested arena.

bluehalo.com

2022 MILSAT SYMPOSIUM

NEXT-GENERATION SPACE DEFENSE

Join the Community Protecting and Expanding Critical Space Assets

OCTOBER 13 – 14, 2022

MILSATSHOW.COM