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MilsatMagazine

The Warfighter

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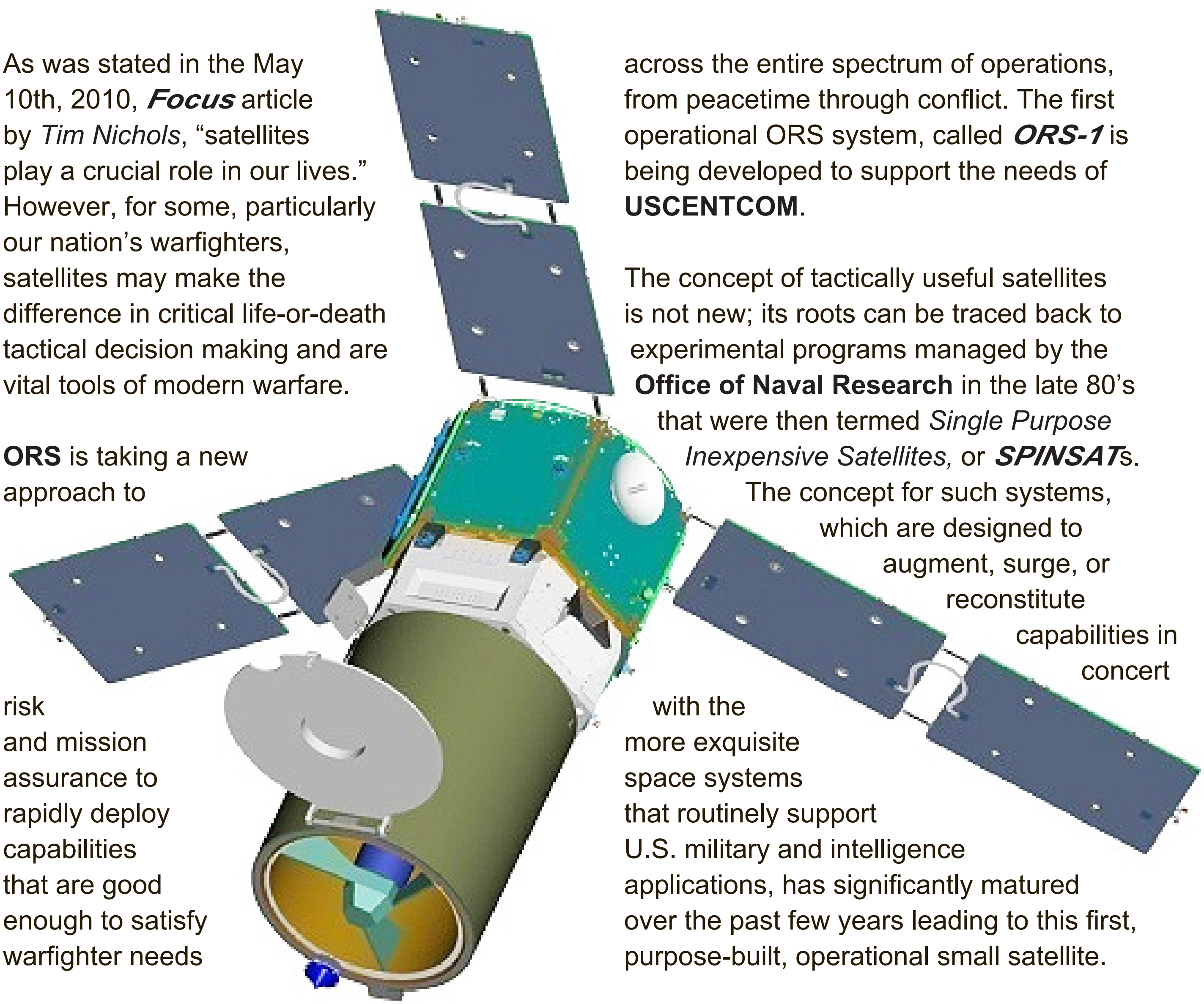
Cover image: U.S. soldiers run to a UH-60 Black Hawk helicopter during extraction from Operation Marathon in Tikrit, Iraq, Oct. 6, 2008. The soldiers are assigned to the 101st Airborne Division's Company B, 1st Special Troops Battalion, 1st Brigade Combat Team. U.S. Army photo by Sgt. 1st Class Kevin Doheny

MAKING SPACE ACCESSIBLE TO THE WARFIGHTER

By Robert Meurer, ATK Space Mission Systems



As was stated in the May 10th, 2010, ***Focus*** article by *Tim Nichols*, "satellites play a crucial role in our lives." However, for some, particularly our nation's warfighters, satellites may make the difference in critical life-or-death tactical decision making and are vital tools of modern warfare.

ORS is taking a new approach to risk and mission assurance to rapidly deploy capabilities that are good enough to satisfy warfighter needs across the entire spectrum of operations, from peacetime through conflict. The first operational ORS system, called ***ORS-1*** is being developed to support the needs of **USCENTCOM**.

The concept of tactically useful satellites is not new; its roots can be traced back to experimental programs managed by the **Office of Naval Research** in the late 80's that were then termed *Single Purpose Inexpensive Satellites,* or ***SPINSAT***s. The concept for such systems, which are designed to augment, surge, or reconstitute capabilities in concert with the more exquisite space systems that routinely support U.S. military and intelligence applications, has significantly matured over the past few years leading to this first, purpose-built, operational small satellite.

The ORS-1 Concept

ORS-1 was born out of a confluence of events that married up a systems concept co-developed by **Goodrich Corporation** in Danbury, Connecticut, (the mission prime contractor), and **ATK**'s **Aerospace Systems Group**, ***Space Mission Systems*** team in Beltsville, Maryland, to answer a mission need for the **U.S. Central Command** (**CENTCOM**).

USCENTCOM, who is in charge of U.S. operations in Afghanistan and Iraq, identified the operational need, which was validated by the **U.S. Strategic Command**. The system technical concept in response to this need is both innovative and purposely designed to maximize reutilization of existing capabilities of the two companies — a payload derived from Goodrich's ***U2—Senior Year Electro-Optical Reconnaissance System*** (SYERS-2), and ATK's flight-proven ***Responsive Space Modular Bus*** (**RSMB**) for the **Air Force Research Laboratory** sponsored ***TacSat-3*** mission.

The 'flight' heritage of the Goodrich SYERS-2 sensor on airborne platforms, coupled with existing interoperable ground systems, enables the seamless integration of the ORS-1 data products into the battlefield picture. This eliminates the need to retrain tactical forces already familiar with U-2 imagery products, or build a whole new ground infrastructure for such satellites. This further minimizes the cost of fielding this new tactical capability.

ATK's Responsive Space Modular Bus was, likewise, a natural choice for such a quick reaction mission. Although ORS-1 was placed on contract before the first launch of ATK's RSMB, the effort was determined to be a low-risk path to meeting the tight mission schedule. RSMB has now completed its first year on orbit as part of the TacSat-3 mission and the overall flight has been so successful, the Air Force is extending the flight of this spacecraft. The Air Force Space Command will determine if there is operational follow-on use upon completion of a *Joint Military Utility Assessment* later this summer.

Minotaur-1

Time Critical Needs

In times of conflict, warfighters need actionable information in timeframes that support the successful execution of the battle — the ORS program office concept fully recognizes this urgency, which is why a three-tiered concept has been developed:

- ***Tier 1: Rapidly exploit or retask existing assets in a matter of hours.***[1]
- ***Tier 2: Rapidly launch small satellites from inventory in a matter of days.***[1]
- ***Tier 3: Rapidly develop and build new satellites within months to one year of an identified need.*** [1]

Achieving these objectives requires fundamental changes in the way such systems are procured, built, tested and launched.

The ORS-1 program is the pathfinder for this new business model. For example, the ORS-1 contract was issued to Goodrich and ATK in a matter of days, in stark contrast to the months, or to as much as a year-long process, typical of traditional space system procurements. The contractor team was given only 24 months to build, integrate, test, and make the spacecraft ready for a planned launch in the 4th quarter of 2010 from **Wallops Island**, Virginia, on a ***Minotaur-1*** rocket. ATK delivered the ORS-1 satellite bus (which is a more sophisticated version of RSMB) in just 16 months, and four days ahead of the contracted delivery date. Unlike the bus for TacSat-3, this system includes upgrades to improve the projected utility of the system.

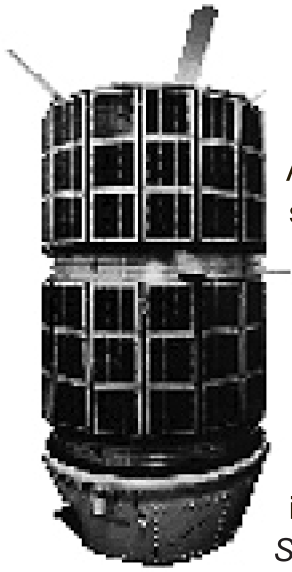
ORS-1, and particularly its predecessor TacSat-3, has broken the space system paradigm providing militarily useful capability on a time frame of less than two years from mission concept to launch. Future versions are expected to reduce this cycle time significantly further. People have noticed, and are looking at, the possible enhancements that small satellites can bring to every space mission application as single-unit or constellation systems. "The key aims for the ORS program are to keep costs low, react swiftly to urgent warfighter needs and reconstitute capability in contested environments, with the ORS-1 being a 'clear example' of these goals." (The ORS office will continue to develop the modular open systems architecture to achieve the enabling infrastructure to meet Tier-2 timelines.)

Notably, the interest in such systems is not limited to defense applications — NASA science teams have evaluated and baselined ATK's RSMB for ***Explorer***-class missions because of the design flexibility and low-cost that this bus offers.

Work-Horse Tasks

Equally important to the rapid potential to field such systems is the ability of these smaller platforms to accomplish "work-horse" tasks that unburden the bigger satellites to perform the exquisite work for which they were optimally designed.

TacSat-3, illustration by Erik Simonsen



DARPA's MacSat

A pair of **DARPA**-sponsored experimental ***Multiple Access Communications Satellites*** (**MacSats**) launched in May of 1990 were pressed into action in *Desert Shield* and *Desert Storm* to deliver vital logistics data stateside for the **U.S. Marine Corp.** Then and now, these small satellite platforms have demonstrated an ability to augment existing space systems constellations with right-sized capabilities.

Just as other air, land and seaborne warfighting systems employ platforms of varying size and capability to perform unique elements of the mission, so too can "small satellites" (<1000 Kg) fulfill mission-critical roles. Moreover, in the event larger systems become unavailable, these smaller systems provide an ability to partially reconstitute lost or "gapped" capabilities in rapid fashion.

Several side benefits also result from the work to develop these smaller missions, among which is they keep the industrial base active, maturing new engineering talent for when larger systems are needed. Similarly, they help sustain a pipeline of experienced government personnel who can work a space program from concept through flight operations.

ORS-1 Spacecraft Bus in Final Integration (Photo Courtesy of ATK)

Just as the U.S. has done with aircraft and other weapons systems, a policy of potentially exporting ORS-class systems is being investigated by the *Secretary of the Air Force* (International Affairs) and *Office of the Secretary of Defense* (Policy). That effort is focused on reaching an approved protocol, consistent with and supportive of U.S. National Space Policy, to further strengthen our alliance/coalition ties and increase the survivability of our space capabilities.

Not only would opening the doors for export of small satellites add further work to the U.S. industrial base, this initiative can have two important strategic benefits.

First, by deploying these satellites in shared constellations with allied forces, we would be changing the calculus of potential adversaries through deterrence.

Second, by allowing coalition partners to procure additional copies of ORS spacecraft, backed by data sharing and tasking agreements, the U.S. and its allies will be able to "buy the capability of a constellation for the price of a single satellite." In lean budgetary times, this is an obvious path to preserving a strong global space capability.

Bottom Line — Saving Lives

Finally, as was recently stated by Mr. *Gary Payton*, Deputy Under Secretary of the Air Force for Space Programs, “The [ORS-1] spacecraft, when delivered to orbit, will save American lives.”

Despite one’s predilection on the utility of small space systems, that is a benefit that cannot be challenged. That is why the ATK/Goodrich team is dedicated to delivering ORS-1 on schedule and on cost.

About the author

Robert Meurer is Vice President, Commercial & International Business Development, and Director for Responsive Space Business Development within ATK’s Space Missions Systems product line of the Spacecraft Systems and Services Division. He has more than 25 years experience in program management and space business development with particular emphasis in small satellite missions. Commander Meurer was ONR’s SPINSAT Program Manager and Military Deputy for Space Programs in the Naval Center for Space Technology prior to joining the industry in 1991. Meurer is Technical Chairman of the AIAA/USU Conference on Small Satellites held each year in August on the Utah State University campus in Logan, Utah.

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The article’s first image is an artistic rendition of the ORS-1 spacecraft in orbit and is courtesy of ATK

ORS: A NEW BUSINESS MODEL IN SPACE

By Tom Wilson, V.P. And General Manager, ATK Spacecraft Systems and Services

The Operationally Responsive Space Office, created in 2007 by the Department of Defense, was charged with providing assured space power focused on timely satisfaction of Joint Force Commanders' needs. The keystone of responsive space capability was envisioned to be smaller, more affordable satellites able to provide time critical images and other information to commanders in the battlefield.

After only three years, a very short time for traditional satellite development process, the vision is real. The office's first true operational satellite, ORS-1 will launch later this year to support US Central Command's (USCENTCOM) warfighters.

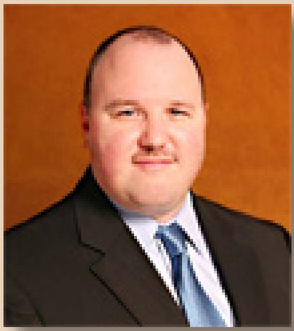
ATK is a major subcontractor to the Goodrich Corporation, the overall spacecraft integrator, and delivered the Responsive Space Modular Bus (RSMB). ATK built the bus in just 16 months at its Beltsville, Maryland facility and is the first provider of an ORS Spacecraft bus.

ATK also designed the spacecraft bus, onboard processor, power source, solar arrays, command and telemetry system for a pioneer of the ORS program, the Air Force Research Laboratory's Tactical Satellite-3. The TacSat-3 spacecraft recently celebrated its one year anniversary in orbit and is currently operated by the Air Force Space Command.

As the benefits of ORS become more apparent, we anticipate building more small satellites tailored for use by the Pentagon, allies and other agencies. This will ensure that going forward, a supply of small and relatively inexpensive "on-demand" satellites are readily available for launch. Highly capable small satellites are fast becoming a crucial element in next generation space constellations. All eyes will be on the launch later this year of ORS-1 as a true test of how well the new model works.

About the author

Tom Wilson is Vice President and General Manager of Spacecraft Systems and Services (SSS) Division for the ATK Aerospace Systems Group, of Alliant Techsystems Inc. (ATK), a premier aerospace and defense company with more than 18,000 employees and $4.8 billion in revenue. As General Manager of SSS, Tom is responsible for leading all aspects of a $160M/yr business with a team of more than 575 employees in California, Maryland, and Virginia. Previously, Tom served as the Vice President of Strategy, Business Development and Advanced Systems for ATK Space Systems Group.



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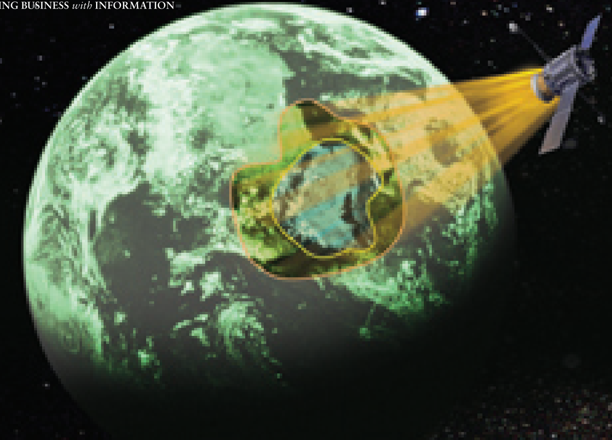

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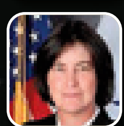

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GROWING GOVERNMENT DEMAND FOR IMAGE INTELLIGENCE LEADS TO SHARED RESOURCES, USE OF COMMERCIAL DATA

By Adam Keith, Director, Earth Observation, Euroconsult

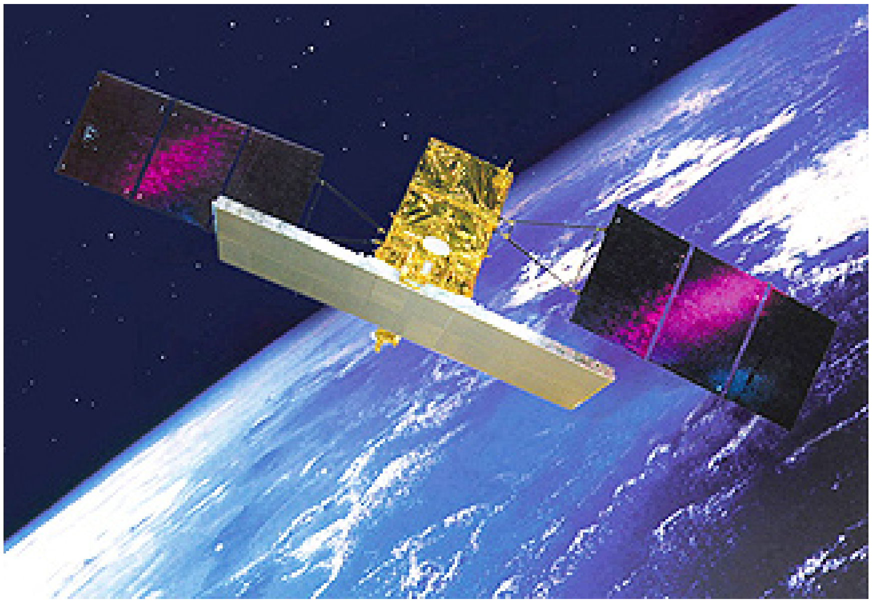
In an era of growing concerns about international terrorism and an uncertain global balance of power, the gathering of intelligence for defense and security purposes is of growing importance to governments worldwide. The development of a wide range of Earth observation (EO) technologies has led intelligence and defense agencies to focus increasingly on Image Intelligence (IMINT) and its derived geospatial information (GEOINT). While manned aerial solutions and proprietary defense systems have been the traditional sources of IMINT, continuing budget constraints on extensive reconnaissance satellite systems have led government defense agencies to explore other mechanisms to meet their IMINT requirements.

From 2000 to 2009, defense agencies in nine countries launched 57 satellites representing overall revenues of **$12.5 billion** for the satellite manufacturing industry globally. Over the coming decade the number of satellites launched for these purposes is set to grow significantly, while the average revenue per satellite is expected to grow slightly, generating $18.3 billion for the manufacturing market.

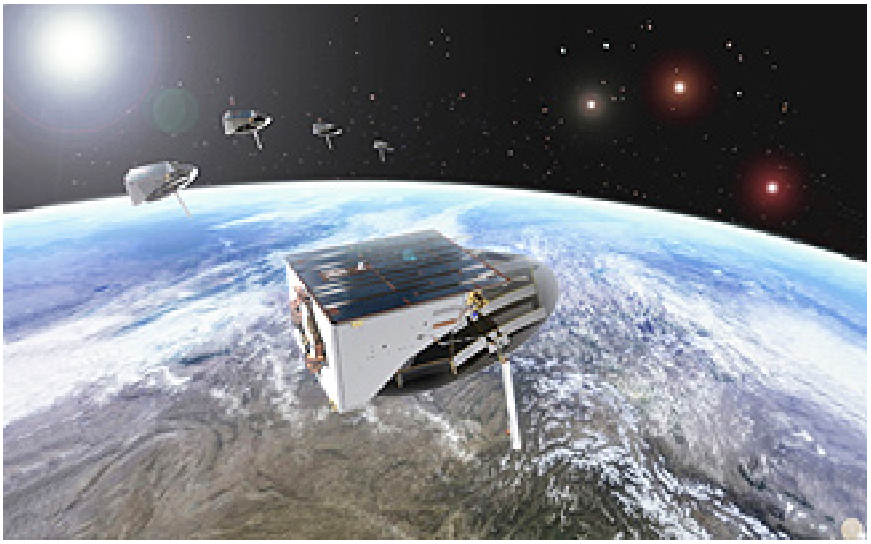
Although new government program announcements are likely, the high barriers to entry associated with launching a constellation of defense reconnaissance satellites will limit the number of countries that are capable of developing such extensive systems. This leaves the question of how a country can fulfill its IMINT requirements in a cost effective manner, without too many trade-offs.

One mechanism used to procure defense satellites is to spread costs and usage across multiple defense and civil government departments, so called "dual-use" systems. Italy's ***COSMO-Skymed*** constellation and the French ***Pleiades*** are examples of such systems. Offering data from these satellites in the commercial market, as is being done through *e-GEOS* (COSMO-Skymed) and will be done with **SPOT Image** (Pleiades), allows the government agencies to earn a return on their investments while still being able to use the imagery themselves.

Another option for government agencies is to develop bilateral and multilateral partnerships with other nations. Such arrangements are expected to increase as countries leverage their own assets in order to negotiate access to third-party systems. This is particularly attractive when a country lacks a specific data capacity and/or wants to add robustness to its data collection capacity. For example, France (which does not operate any defense radar satellites) will be able to access data from the German radar ***SAR-Lupe*** system beginning in 2010. In return, Germany will be able to access the French optical ***Helios*** system



Artistic rendition of COSMO-Skymed, courtesy of Thales Alenia Space



Germany's SAR-Lupe constellation

data under the two countries' respective contractual agreements. France has a similar agreement with Italy to access the radar COSMO-Skymed constellation.

In Europe in particular, where an increasing number of countries have acquired defense/dual-use satellite systems, greater coordination and cooperation is called for.

As a starting point, six nations (Belgium, Germany, Greece, France, Italy and Spain) committed to the development of the ***Multinational Space-based Imaging System*** (**MUSIS**) in 2006. This will incorporate systems developed at a national level and related ground segments. Further missions may emerge through the MUSIS agreement at both a national and multi-national level.

Finally, with increasing technological advances in higher resolution datasets, improved image accuracy and reduced revisit times, commercial EO data is becoming a viable solution for certain defense and military agency IMINT requirements.

France's Helios II satellite, image courtesy of Thales Alenia Space

Prior to 1999, commercial data solutions simply weren't a suitable solution for key defense applications such as routine intelligence gathering and surveillance. This changed with the launch of ***IKONOS*** in that year, the world's first high-resolution commercial system. Since then, two U.S.-based commercial operators have launched satellites capable of high-resolution imaging that enabled them to increase their satellite capacity and service offerings. Through large service-level agreements for satellite data supply and because of a U.S. data policy of "buy commercial first," these companies have emerged as key partners for the ***U.S. National Geospatial-Intelligence Agency*** (**NGA**). Through these agreements, the NGA has emerged as the largest consumer of commercial remote sensing data globally.

In 2009, the market for commercial data for defense and security applications was valued at $735 million, representing 62 percent of the overall commercial data market. Of this amount, more than half was purchased by the U.S. government. The NGA is expected to remain the primary customer for commercial data for the foreseeable future because of both the new EnhancedView procurement contract expected to be agreed upon in 2010, and the establishment of contracts between the NGA and foreign commercial systems for commercial radar data supply over 2009/2010.

For the commercial EO satellite operator, particularly U.S.-based operators, a key challenge is how to expand their data offerings to other countries outside of the U.S. market where adoption has remained more modest. Other markets have been slow to embrace the commercial data solution for defense

IKONOS, image courtesy of GeoEye + European Space Imaging

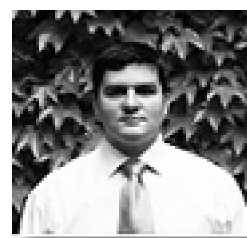
applications primarily because commercial data suitable for defense and security purposes has become available only relatively recently.

However, in the coming decade, the next generation of high-resolution, high-accuracy commercial solutions and development of data-reseller networks around the world will contribute to growing adoption in a number of other markets. As such, **Euroconsult** anticipates that revenues for the commercial data providers will reach $2.6 billion for government defense and security by 2019.

In a new report, "***Earth Observation: Defense & Security, World Prospects to 2019***," Euroconsult has examined government attitudes toward EO procurement, including customer requirements for IMINT/GEOINT; the use of satellites and UAVs to gather data; and the risks and challenges governments face in using commercial data.

An emerging global trend is the establishment of government-centralized procurement bodies to consolidate the needs of defense departments and decide upon the best mechanisms for responding to their IMINT requirements, including building sole-defense proprietary systems; dual-use systems (implying civil and defense government usage); leveraging data through bi/multilateral cooperation agreements; expanding aerial and UAV capacity or purchasing commercial data; or, most likely, a combination of these factors.

About the author



Adam is principal author for the Satellite-Based Earth Observation, Market Prospects report and is a specialist in remote sensing. He contributes to several other Euroconsult reports. Prior to joining Euroconsult, Adam worked at the European Space Agency, within the Directorate of Earth Observation, primarily analyzing market and value chain development.

Opening image is courtesy of GeoEye... Last year, the National Geospatial-Intelligence Agency (NGA), a US Department of Defense combat support agency, awarded GeoEye (formerly Orbimage) in Dulles, VA a $214.2 million firm-fixed-price contract modification to supply satellite imagery to US government customers from the company's satellite constellation.

COTM AND TRANSEC: COMMUNICATIONS FOR THE BATTLEFIELD

By Karl Fuchs, Vice President of Engineering, iDirect Government Technologies (iGT)

A vital component for any military organization is the ability to communicate, share information and provide support for large, mobile groups of personnel anytime, anywhere. Satellite technology is well suited to meet these needs. It provides a flexible, reliable and high-capacity service that can cover a large area. For units deployed around the world, satellite provides a high-speed communications backbone. It connects soldiers to each other and to central operations. And it enables them to stay united with friends and family back home.

Communications on the Move **(COTM)** satellite technology increasingly is helping the military with mission-critical connectivity when they need to be mobile. As the name implies, COTM moves with soldiers to provide communications on the move.

Recent COTM technology advances are bringing even greater advantages to the military. Soldiers can deploy a wireless broadband network on a moving ground vehicle, deep water fleet, military aircraft and even on an Unmanned Aerial Vehicle (UAV). Portable systems that can fit inside a soldier's rucksack are engineered to withstand harsher environments and can be activated at a moment's notice.

Advances in mobility were demonstrated during a recent exercise at *Fort Monmouth*, N.J. The exercise involved a 15-mile route designed to test-drive COTM systems. In the exercise, a designated COTM vehicle maintained a live video teleconference with Fort Monmouth and a joint task force forward operating base.

L-3 Datron Antenna System

Using an **L-3** ***Datron*** Ku-band antenna system, the network sustained connectivity for 35 minutes, passing under overpasses and through heavily wooded areas in the Fort Monmouth vicinity, at speeds as high as 65 miles per hour.

COTM systems traditionally were deployed in larger vehicles; however, significant advancements in satellite communications have brought the technology to the warfighter. New satellite router boards that are half the size of current product standards are now available to fit in soldiers' rucksacks, providing COTM connectivity to on-the-foot warfighters.

At the Fort Monmouth demonstration, a ground task force integrated a small form factor satellite router board into a portable terminal to support mobile X-band connectivity. The compact unit uses a light bi-directional antenna for voice, video and data connectivity. The unit was configured with multiple hubs, allowing troops to accomplish simulated objectives while on the move.

This new development in portable technology delivers several critical advantages. Soldiers can receive battlefield imagery that identifies potential threats, transmit situational video to base, receive command and control information and even transmit X-rays and imagery of a wounded soldier to doctors who can interpret the injury and provide guidance on proper treatment.

With a dynamic COTM solution, a vehicle in the field becomes "broadband-enabled," capable of supporting Internet, voice, data and video services. Satellite routers can fit in the rear of a vehicle. A low-profile antenna installs on top, and inside the cabin, users benefit from wireless connectivity on laptop computers and Voice over Internet Protocol phones.

Mobile communications over satellite is not a new idea, but a number of technological advancements in the past five years have made wide spread deployment more cost effective. Smaller satellite dishes, more effective IP technologies and the efficient use of spread spectrum technology have all fueled the growth of mobile communications over satellite.

COTM helps the warfighter achieve instant access to information in a mobile environment on the ground, at sea or in the air. Perhaps that is why more and more military organizations consider it a "must have" technology.

The Key To Mission Success

Mobile communications are certainly making a difference in mission success, but transmission security of COTM is also important to warfighters. As the ability to monitor satellite transmissions grows increasingly sophisticated, the need to implement increased levels of security becomes even more critical and the need for advanced encryption over satellite is obvious. As a remote moves from location to location and beam to beam, one never knows who may be listening. Satellite service providers need to offer strong encryption.

For the very high security requirements required for most military operations, the industry has developed *Transmission Security* (**TRANSEC**) for *Time Division Multiple Access* (**TDMA**)-based COTM systems.

TRANSEC has a number of security components including the ability to obfuscate any traffic volume or remote terminal activity information which may allow an adversary to infer useful information based on activity levels.

TRANSEC requires a communications channel appear completely full to an adversary even if little or no actual data is flowing. This is contrasted with *Communications Security,* or **COMSEC**, where the actual communications (*e.g.,* voice, video and data stream) is encrypted but certain header information is sent in the clear.

In combat situations, where even a small spike in traffic can be a critical piece of intelligence, the need to mask any communications activity becomes readily apparent. Fortunately, TRANSEC compliance is relatively straightforward. The DoD has outlined the vulnerabilities inherent in an IP-based TDMA transmission that must be addressed in order to provide true TRANSEC.

These include the ability to secure transmission energy to conceal traffic volumes and to protect the traffic source and destination. Another vital requirement for military operations is the need to ensure remote terminals connected to the network are able to validate authorized users.

COTM is one of the fastest growing areas for satellite communications. Having broadband IP connectivity in a mobile environment on the ground, at sea and in the air provides instant access to vital information. When combined with a solid TRANSEC solution to address security concerns, it provides unparalleled benefits.

Advances in COTM and TRANSEC technology are providing critical and secure connectivity to warfighters on the battlefield. Military personnel cannot afford to lose secure connectivity at any moment. Because of this, COTM and TRANSEC are increasingly crucial to a successful mission.

About the author

Karl Fuchs is Vice President of Engineering for iDirect Government Technologies (iGT). He leads iGT's team of federal systems engineers and serves as chief architect for new product integration. Fuchs has more than 15 years of experience in the areas of technology and the federal government.

Evolution iConnex e850mp Series Satellite Router Board

Extremely compact and lightweight boards, the iConnex e850mp and the iConnex e850mp-IND are designed to be easily integrated into a portable VSAT solution. This iConnex series meets the most rigorous demands for mobility and security, delivering always-on broadband capabilities into smaller form factors that support data, voice, and video connectivity in highly mobile military and government applications. The e850mp-IND has been industrialized to MIL Standard requirements for extreme operational conditions.

Offering maximum portability, this router board is approximately 70 percent smaller surface area than iDirect's e8350 router, and half the size of the iConnex e800 board. The e850mp and the e850mp-IND allow for maximum customization into a portable router solution that can be easily transported by a single person or mobile vehicle, making it ideal for Communications-on-the-Move (COTM), emergency response, and for command and control applications in the field.

Combined with leading spread spectrum technology, this iConnex series enables the use of ultra-small and phased-array antennas on aircrafts, ships, and land-based vehicles. The iConnex e850mp series is fully enabled for iDirect's Global Network Management System (GNMS) and automatic beam switching technology allowing for a seamless network with truly global coverage while on the move.

The iConnex e850mp series offers the choice between iNFINITI TDM or DVB-S2/ACM on the outbound, providing even more flexibility for network design and bandwidth optimization. It is also compliant with the highest military security requirements and features embedded AES encryption and TRANSEC with advanced FIPS 140-2 certification. Also, to support Wideband Global Satellite (WGS) frequency ranges, the e850mp series is equipped to cover wider IF ranges, providing flexibility in secure network deployment.*

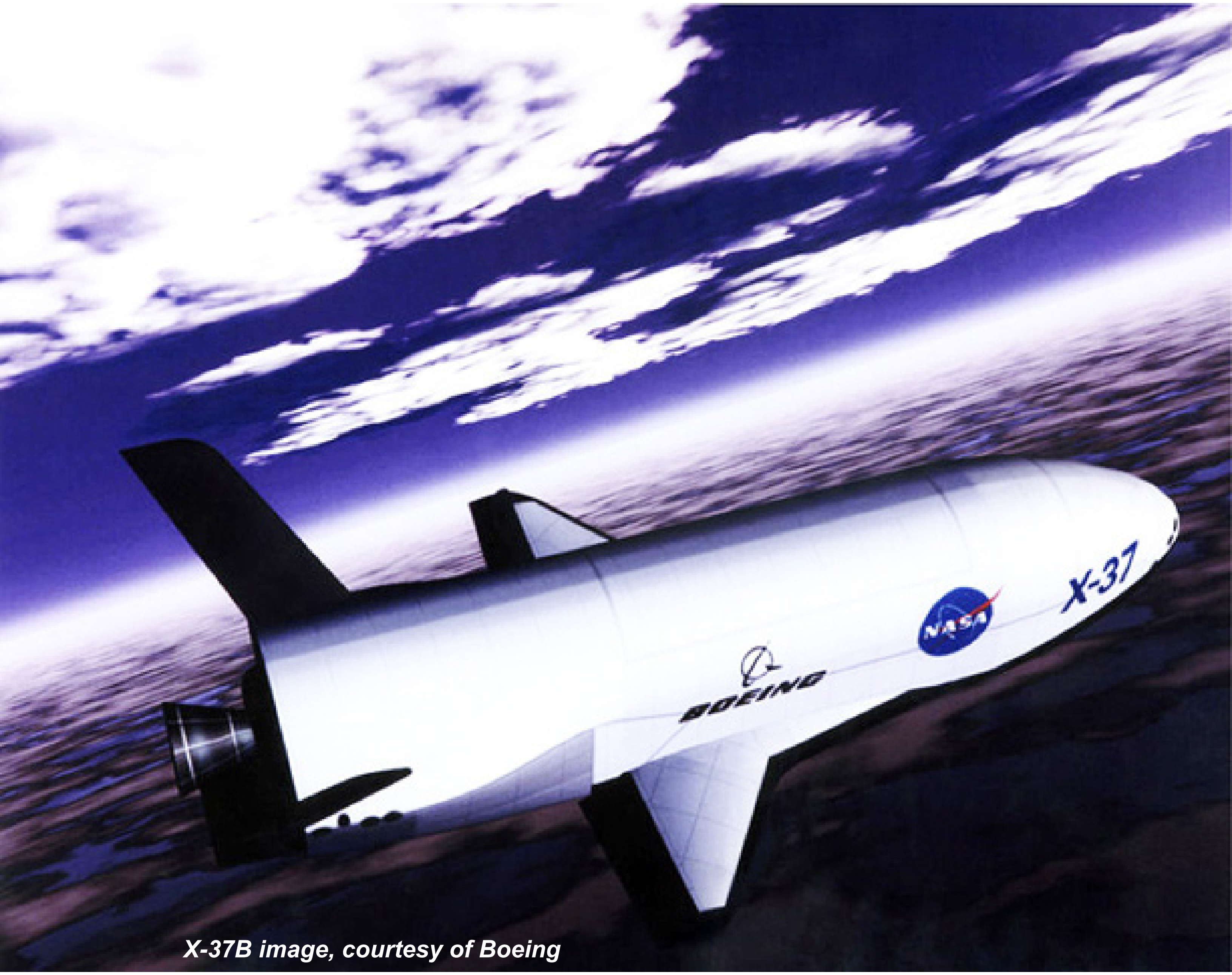
With iDirect's state-of-the-art Group QoS, high-priority traffic designation can be recognized by advanced encryption devices and traffic can be segregated by groups of remotes, multiple sub-networks, and multiple applications, ensuring the highest quality transmissions where needed.

Service providers can easily configure and centrally manage each individual unit though the iVantage™ network management system, a complete suite of software-based tools for configuring, monitoring and controlling networks from one location. More information here...

AN ANALYSIS... THE X-37B ORBITAL TEST VEHICLE

By Brian Weeden, Secure World Foundation

The X-37B OTV is a technology demonstrator and experimental vehicle which is likely to be used for flight testing new reusable space launch vehicle (SLV) technologies (such as guidance and thermal protection), and on-orbit testing of new sensor technologies and satellite hardware primarily for space-based remote sensing. While it does have some capability for orbital inspection, repair, and retrieval, it is unlikely to perform these functions given its limited payload bay and



X-37B image, courtesy of Boeing

altitude range. It has near zero feasibility as an orbital weapons system for attacking targets on the ground.

Background

The **X-37B** is an experimental re-usable spaceplane, very similar to the Shuttle but much smaller and completely robotic, using more advanced technologies. The X-37B is 29 feet long and has a wingspan of just over 14 feet across. It stands just over 9-1/2 feet tall and weighs nearly 11,000 pounds. By comparison, the **Space Shuttle** is 122 feet long, 78 feet across, and 58 feet tall and weighs 172,000 pounds.

The X-37B's payload bay is about the size of a pickup truck bed. The Space Shuttle payload bay is 15 feet by 60 feet, large enough to fit two X-37Bs inside.[1] The X-37B uses its own solar array and lithium ion batteries to generate power, instead of fuel cells like the Shuttle's, which is a major reason why it can stay on orbit for a much longer period of time.

The X-37B is designed to be launched into space on top of a standard space launch vehicle, stay on orbit for as long as 270 days, and then reenter and land like the Shuttle. It has thrusters for on-orbit maneuvering and de-orbit, but no engines for powered flight in the air — it is a glider in the atmosphere.

The X-37B started life as a **NASA** program in 1999, but transferred to **DARPA** in 2004. DARPA transferred it to the **USAF** in 2006 after additional budget issues. The total program costs and budget line are classified.

The eventual number of craft in the X-37 fleet is "unknown", according to USAF, however, construction of a 2nd X-37B is already underway.[2] The first X-37B, **OTV-1**, was launched on 22 April, 2010, into an orbit probably around 430-450 km in altitude and 28 and 40 degrees in inclination.[3] The Center upper stage, which placed it into orbit, performed a fuel depletion burn which placed it in orbit around the Sun.[3]

Secrecy surrounding the actual on-orbit activities and payload is almost certainly due to presence of **NRO** hardware being tested or evaluated on the spacecraft.

Debate + Reasoning

Official objectives of the X-37B program include "space experimentation, risk reduction and concept of operations development for reusable space vehicle technologies."[4] However, none of the potential missions posited by the US military appear to justify the program's existence, especially on a cost basis, and this has led to speculation about what the "real" mission may be.

The X-37B as an on-orbit sensor platform + test bed (Feasibility: high)

Concept

- ***X-37B payload bay would contain various sensors used for intelligence collection of the Earth from space, potentially including radar, optical, infrared, and** signals/electronic intelligence* **(SIGINT/ELINT*) suites to flight-test and evaluate new sensors and hardware*****
- ***Could also be done in response to crises/ warfighter needs for Operationally Responsive Space (ORS)***
- ***USAF: "What it offers that we have seldom had is the ability to bring back payloads and experiments to examine how well the experiments performed on-orbit," said** Gary Payton**, the undersecretary of the Air Force for space programs. "That's one new thing for us."[5]***

Advantages

- ***The ability to flight test and return experimental sensors and satellite hardware would be of significant benefit to the US military.***
- ***This is a mission that has been done in the past using the Shuttle[6] and it is likely that the US military has realized it will need this capability after the Shuttle program is retired.***
- ***Ability to re-configure the payload bay contents for various sensor packages would make it much more flexible than having to procure multiple satellites***
- ***X-37B could be more maneuverable once in orbit than many ORS satellites or existing satellites, allowing for more flexible ground coverage***

Drawbacks

- ***Prompt response is questionable given that it is tied to an EELV booster and associated processing timelines and launch pad availability requirements***
- ***Not very cost effective, given the estimated average cost of close to $100 million per EELV launch (based on the Atlas V version 501 configuration used for the April 20, 2010 launch)[7]***

X-37B as a deployment platform for ORS satellites (Feasibility: medium)

Concept

- *X-37B could be launched into orbit and deploy multiple small satellites on a very timely basis to support time sensitive warfighter needs*
- *USAF: "We could have an X-37 sitting at Vandenberg or at the Cape, and on comparatively short notice, depending on warfighter requirements, we could put a specific payload into the payload bay, launch it up on an Atlas or Delta, and then have it stay in orbit, do the job for the combatant commander, and come back home," Payton said. "And then the next flight, we could have a different payload inside, maybe even for a different combatant commander."*[8]

Advantages

- *Flexibility in payload configuration, as you don't need to integrate each new satellite to the booster. The satellites get integrated to the X-37B, which then gets integrated to the booster*
- *Deployment could be done in a semi-stealthy manner, potentially avoiding tracking by amateurs*

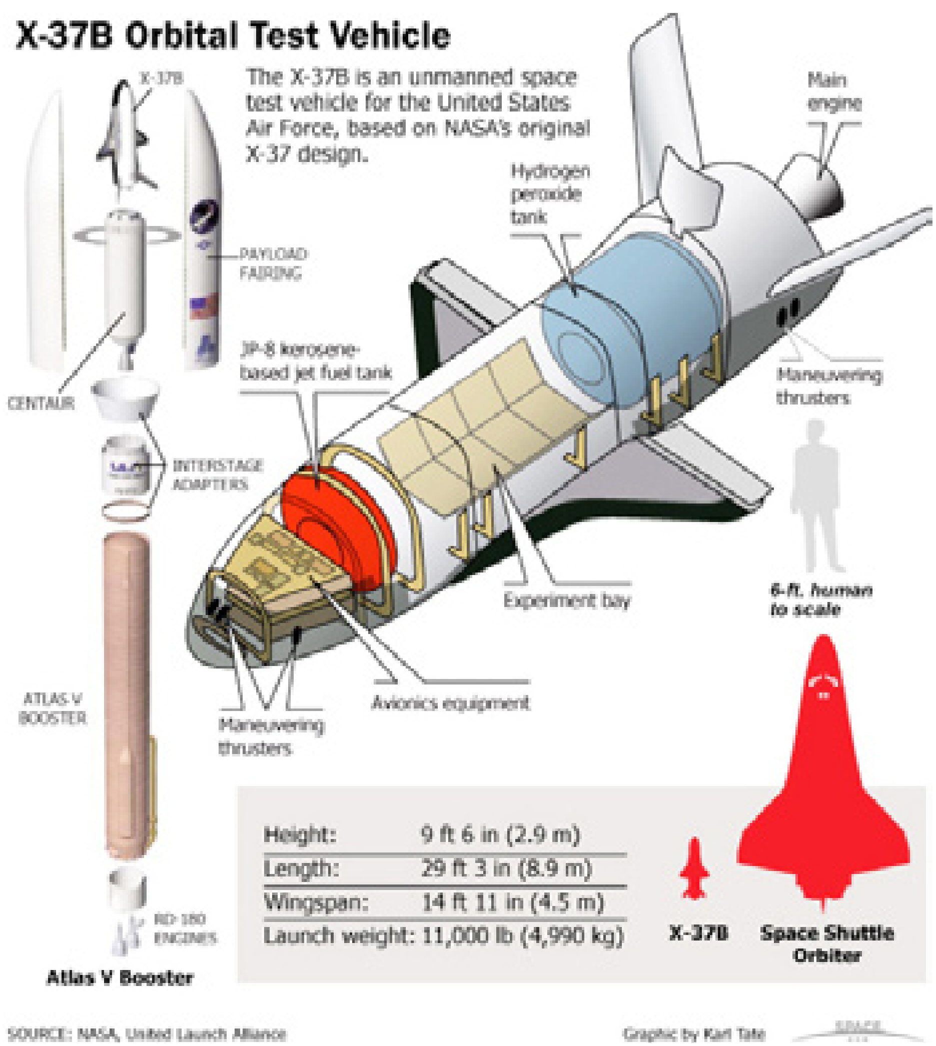
Drawbacks

- *Not very timely as you still are dependent on an EELV time requirements for launch*
- *The costs for a single EELV launch is equal to or more than the entire ORS budget in FY10 and beyond*[9]
- *The payload bay for the X-37B can only carry a couple of small satellites, giving very little "bang for the buck"*
- *It would be much more efficient to just launch several ORS payloads on their own smaller booster*
- *Deployment could be done out of sight of amateur community, but very unlikely to be able to conceal from military space situational awareness capabilities*

X-37B as an on-orbit repair vehicle (Feasibility: low)

Concept

- *X-37 could be used to rendezvous with malfunctioning satellites and repair or refuel them, or in some cases capture and return them to Earth for a post-mortem analysis*



Advantages

- Could help the US military solve the problem of figuring out what went wrong when a satellites dies
- Return of hardware from space could help with research into effects of space weather, debris, and micrometeoroids

Drawbacks

- X-37B is limited in altitude — it has been rumored that it will have a maximum altitude range of 700 or 800 km (about 500 nautical miles), potentially high enough to access most Sun-synchronous satellites, but this is unconfirmed
- Not many existing operational military satellite components will fit in the X-37B cargo bay
- Would almost certainly need human tele-presence link to control on-orbit repairs and activities

X-37B as an on-orbit inspection or ASAT platform (Feasibility: low)

Concept

- X-37 could be used to rendezvous and inspect satellites, either friendly or adversary, and potentially grab and de-orbit satellites.

Advantages

- Existing on-orbit inspection satellites (XSS-11, MiTEx) have a fixed set of sensors, X-37 sensor package could be upgraded or modified as needed on a per-mission basis
- Existing satellites can only access satellites close to their existing inclination and do not have the potential to capture and return
- Could provide the capability to disable adversary satellites on-orbit without creating a large amount of debris

Drawbacks

- Other platforms such as XSS-11 and MiTEx already have this capability and can stay on orbit for much longer
- X-37B is much larger than the XSS-11 or MiTEx, which increases the chances that an adversary would detect an unauthorized rendezvous
- The X-37B cargo bay is much smaller than many operational satellites, and most of that space is likely to be filled by the required robotic arm and other gear

X-37B as a Conventional Prompt Global Strike (CPGS) weapon or delivery system (Feasibility: zero)

Concept

- X-37B could be launched in response to a pending crisis and remain on orbit for a length of time to respond to high value/very time sensitive targets
- X-37B could either drop "rods from god" out of its payload bay or re-enter and become a weapon itself

Advantages

- Would eliminate political issues over using ballistic missiles launched from the ground for CPGS missions

Drawbacks

- Hyperkinetic weapons dropped from bay would need to be equipped with thrusters capable of performing a huge de-orbit burn, very difficult given small bay size [10]
- X-37B itself re-enters like the space shuttle landing at an estimated 200 mph (321 kph)[11] which means it travels in the atmosphere much slower than an RV on a ballistic arc or a hyperkinetic weapon. Thus it would need to carry conventional explosives to do any significant damage

- *X-37B after re-entry would be a slow moving, not-very-maneuverable glide bomb, easy prey for any air defense system along its path to the target*
- *Having only a few X-37Bs would not provide very timely coverage of potential ground targets defense system along its path to the target*[12]

About the author

Brian Weeden is Technical Advisor for Secure World Foundation on space security and sustainability issues. His current research focuses on global space situational awareness, development of the technical architecture for space traffic management, and methods of protecting satellites. Brian spent nine years as an officer in the U.S. Air Force working in space and ICBM operations. He was part of US Strategic Command's Joint Space Operations Center — he directed the orbital analyst training program and developed tactics, techniques and procedures for space situational awareness and space control.

Footnotes

[1]http://en.wikipedia.org/wiki/Space_Shuttle_orbiter

[2]Clark, Stephen, "Air Force spaceplane is an odd bird with a twisted past", Spaceflight Now, 2 April 2010 http://www.spaceflightnow.com/atlas/av012/100402x37update/

[3]McDowell, Jonathan, "Jonathan's Space Report No. 627", 11 May 2010, http://www.planet4589.org/space/jsr/jsr.html

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[10]Wright, David, "The Physics of Space Security", page 57 http://www.ucsusa.org/assets/documents/nwgs/space_security.pdf

[11]Covault, Craig, "USAF to Launch First Spaceplane Demonstrator". Aviation Week Science and Technology, 3 Aug 2008 http://bit.ly/cvnkRA

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OPERATIONAL SITUATIONAL AWARENESS

By Rob Patterson, Integral Systems, Military and Intelligence Group

Increased complexities within the space environment are forcing an evolution from a single static perspective of Space Situational Awareness to a more comprehensive space system operations, segment defined, ***Situational Awareness*** (**SA**); space, ground, and system.

The topic of ***Space Situational Awareness*** (**SSA**) is not new; however, if you ask 10 people to define SSA, you will likely receive many different perspectives. Depending on the presenter, SSA can range from the monitoring of the space environment, to maintaining the *High Accuracy Catalog,* to the monitoring of interference on Military Satcom (**MILSATCOM**) and Commercial Satcom (**COMSATCOM**) links. Of course, there are other examples, but the point is clear.

Integral Systems has more than 25 years of experience within the satellite industry, working with military and commercial satellite operators to help them better understand their operational environments. Over the past 18 to 24 months, the company has seen a sharp increase in requests to provide a broader, albeit focused, operational picture to operators. After discussions with a number of customers and research on the subject, it became clear the concept of SSA was evolving from a very broad perspective into SA segments to analyze all aspects (space, ground, and system) that could affect the operation of a space system.

This space system focused, all-inclusive approach to the segments of SA is what the company refers to as "***Operational Situational Awareness***" (**OSA**). OSA provides the operator with an integrated space, ground, and system overview of the space system environment and delivers the ability to quickly and easily "drill down" into individual segments enabling an operator to take immediate action.

Integral Systems recently announced its ***SATOPS Enterprise Architecture***. Our powerful enterprise architecture provides satellite and space operators with a platform for OSA varying from a single echelon operation up through multi-level echelon operations. The architecture will include the entire enterprise by integrating mission-relevant, multi-source data from Integral Systems best-in-class products and technology, as well as third-party products and data sources.

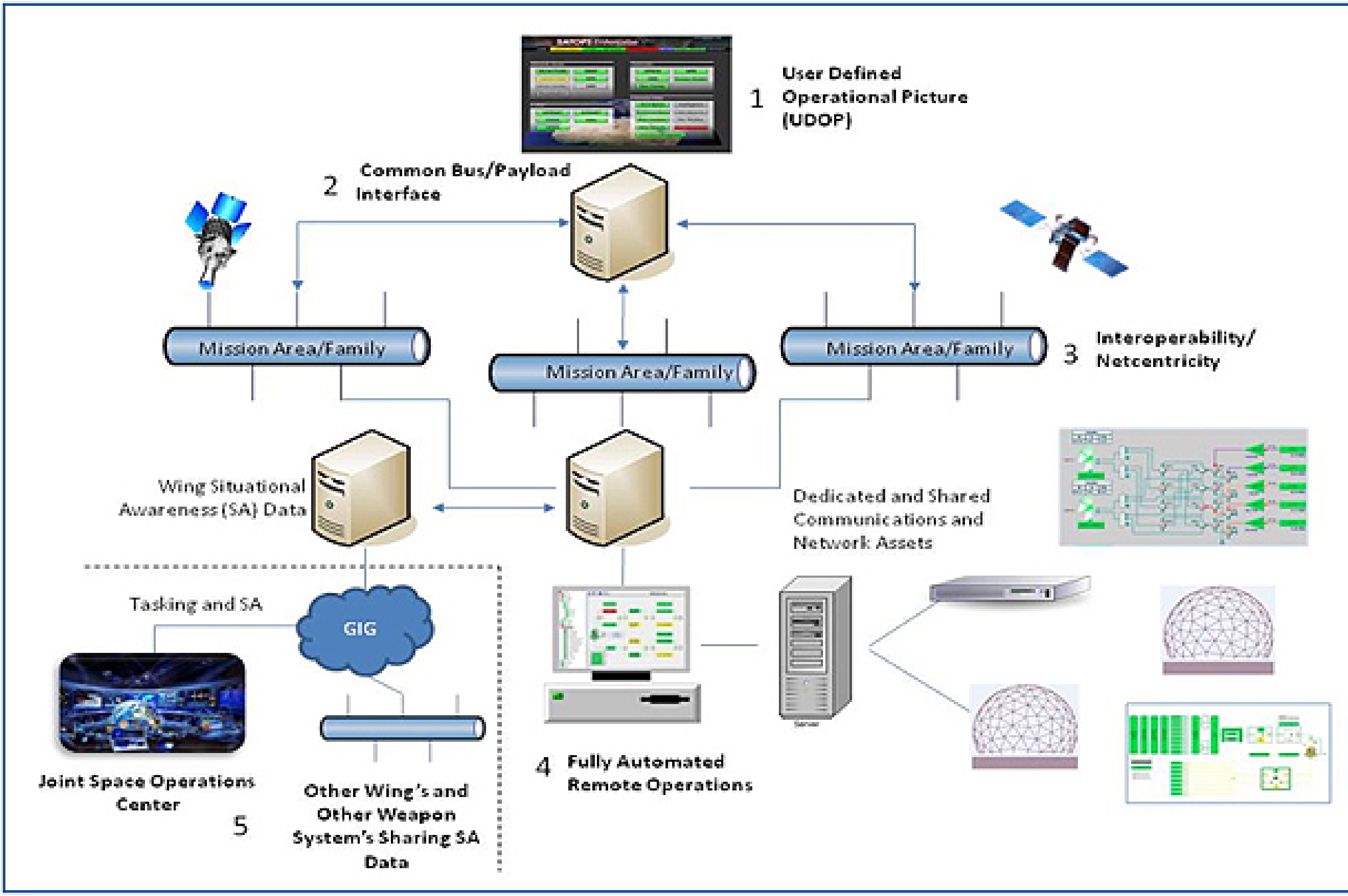


Figure 1. Hypothetical SATOPS Wing Operational View

Components of the architecture include: *User Defined Operational Picture* (**UDOP**); thin client application; common *Telemetry, Tracking*, and *Commanding interface*; underlying Interoperable/Netcentric core architecture; automated monitor and control of all remote antenna systems; and real-time, SA data sharing through the ***Global Information Grid (GIG)***, to and from the **JSpOC**, other **SATOPS Wings**, and adjacent weapon systems. The **50th Space Wing** (SW) is used as a representative example; however the concept is applicable to any operational unit. (***See Figure 1 on the previous page.***)

1) UDOP: The UDOP is the primary access to OSA information. The user can select what data to display and how to arrange it, since the main features are data source independence and web-based access. Figure 2 on the next page is a screen shot from Integral System's Webic thin client that represents a possible UDOP at the 50th Space Wing located at Schriever AFB, CO. The operator has access to all the mission areas under the wing; real-time status of the dedicated and share networks, including commercial networks used by the Space Based Space Surveillance system. A host of external information is available

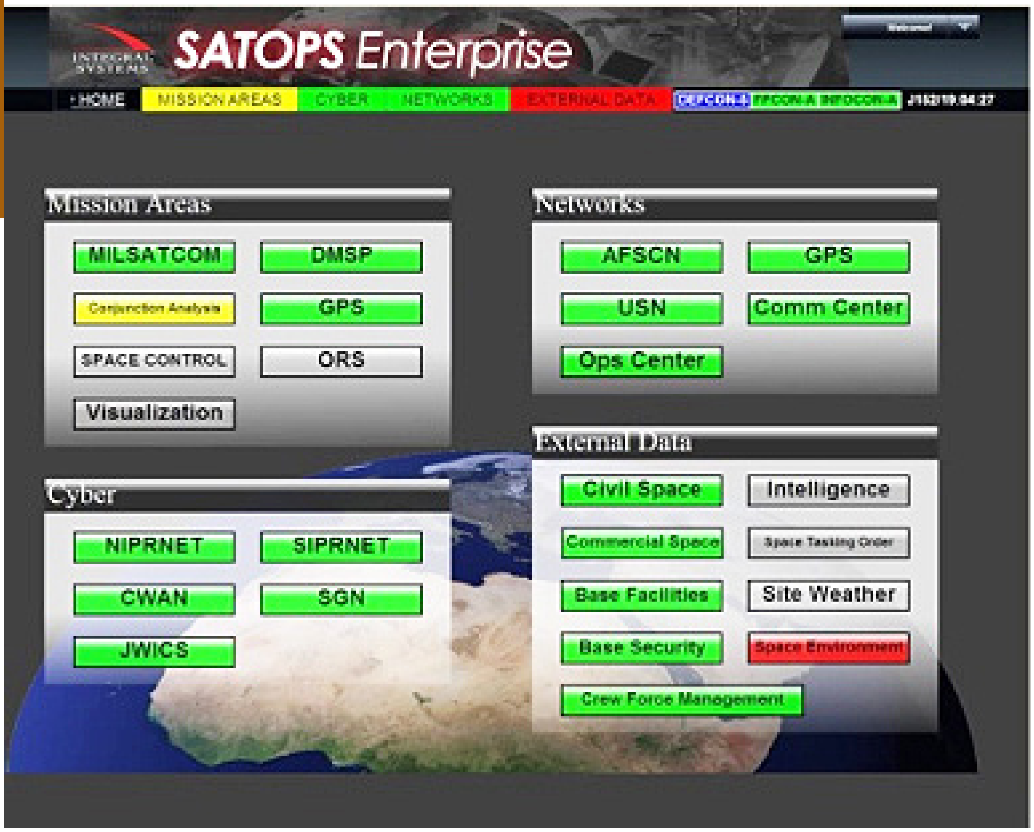
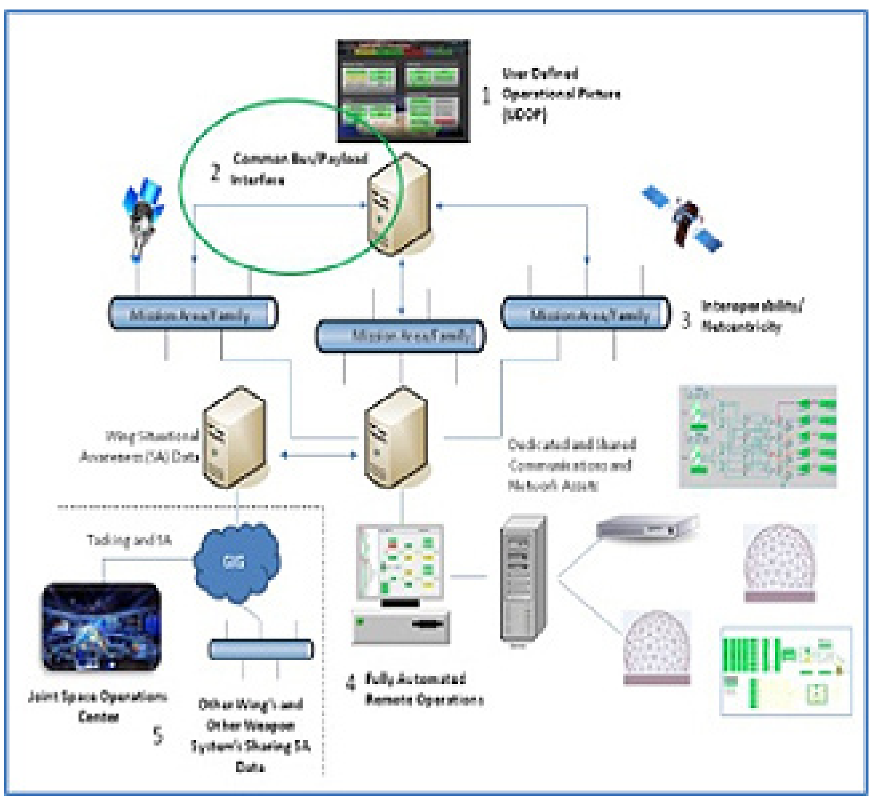


Figure 2. Potential UDOP Homepage

to the operator support decision making, including base readiness, weather, space environment, and information from other space agencies. Additionally, the user can perform administrative functions such as Crew Force management.

*2) **Common TT&C Interface**: Currently, each command and control system deployed throughout AFSPC has a different look and feel from the operator's perspective. **AEP** uses one product, **SBIRS** uses another, **MMSOC** uses yet another, and **MILSATCOM uses Integral Systems' EPOCH**. Leveraging a thin client as described in the previous section, coupled with an automation language, such as Integral System's **Task Automated Operations** (TAO), that executes spacecraft and ground procedures, AFSPC could migrate to a common user interface quite easily. This approach could be used to drive procedures within the legacy systems across AFSPC.*

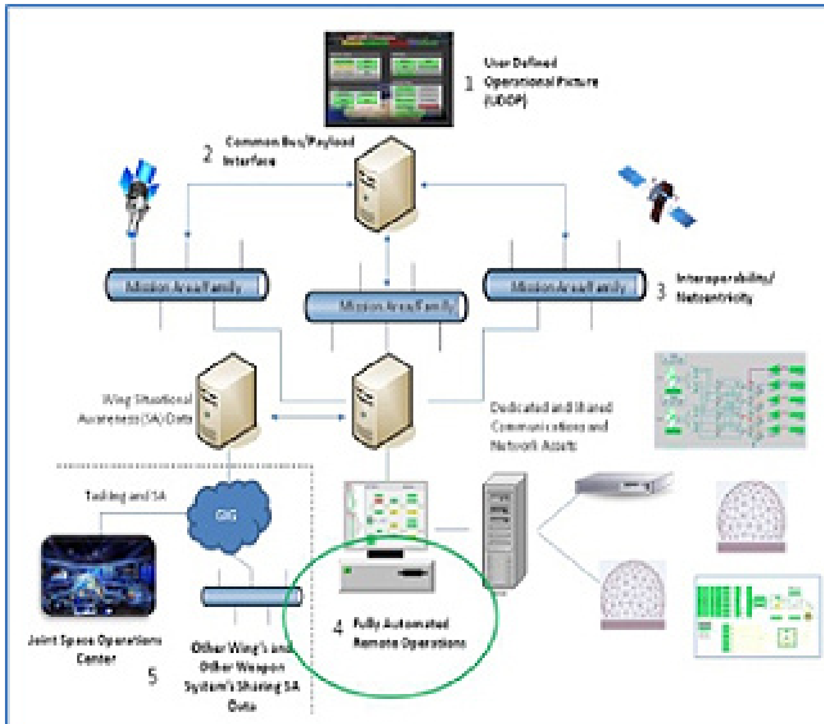
The best approach is to provide "selectable" automation, which lets the operator literally "dial-in" the level of

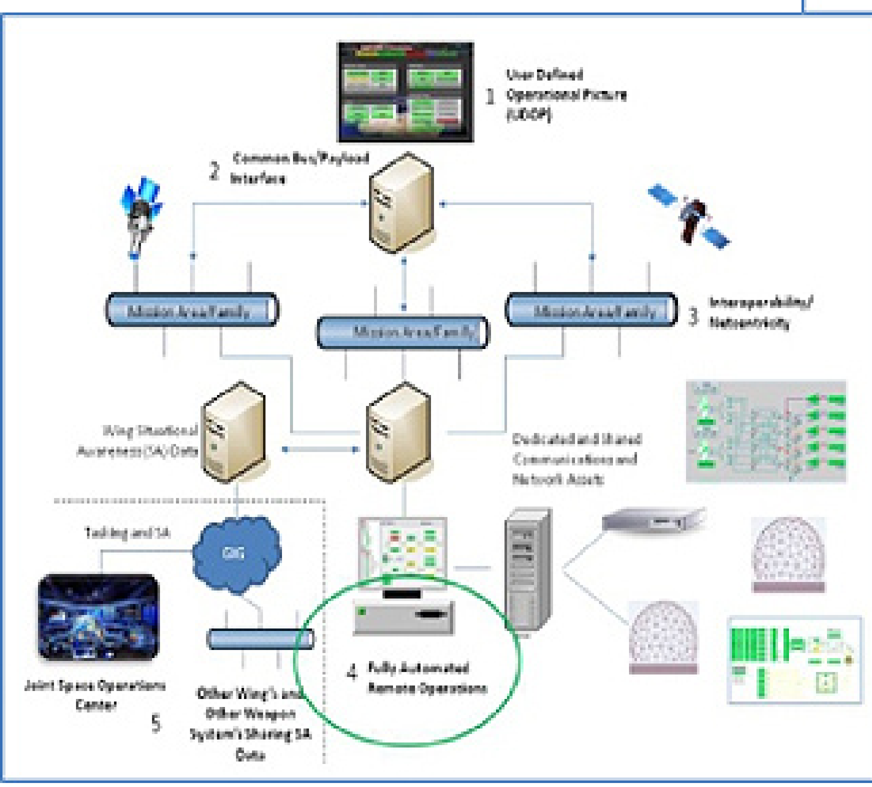


automation for each operation. Ultimately, introducing as much automation as possible will reduce operator workload, freeing up resources to focus on the mission at hand.

3) ***Interoperability/Netcentricity****: The reality of the existing AFSPC architecture is that systems are not only disparate technically, but also are funded from different budgets or program elements. This creates a challenge as OSA is implemented, but there are ways to work through this situation. In the short term, it is not necessary that each mission area operate on the exact same architecture, but it is important that each are interoperable through the use of well-documented Application Programmer Interfaces (API) and perhaps migrating to serviced-based/ enterprise architectures that allow for services from one system to communicate with another, and then communicate with common user interface layer described in item 2.*

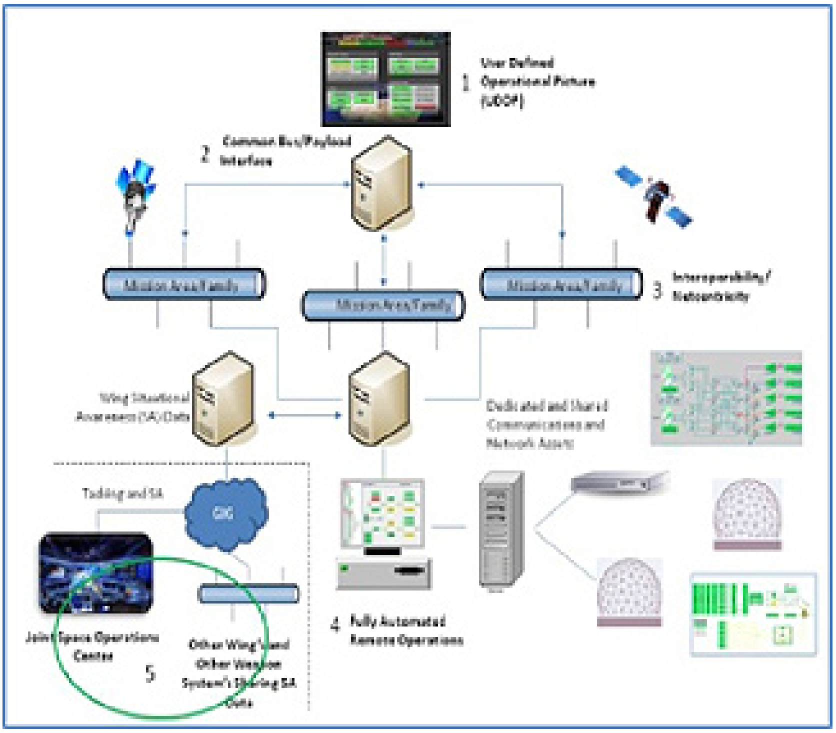
4) ***Automated Remote Antenna Systems****: Within the 50th SW alone, remote networks include the AFSCN, dedicated GPS Ground Antenna, and the GPS L-band Monitor Stations. The GPS sites are fully automated today, and transitioning the AFSCN to fully automated operations is achievable in the short term, coincident with* ***RTS Block Change*** *(RBC) rollout. We define fully automated AFSCN ground system operations as hands free, lights out, with all remote operations centralized within a common SOC. The primary issue in achieving full automation is to allow the satellite operator to update their satellite configurations, which sets up the site for a specific satellite vehicle. Today,*





many satellite configurations still require manual intervention.

5) ***Real-time, Shared SA Data****: The most critical aspect of the SATOPS Enterprise Architecture is the ability for the JSpOC, other Space Operations Wings (50th and 460th), other space agencies (NRO, NASA, and NOAA), launch wings (30th and 45th), and other weapons systems (i.e., Defensive Counter Space) to share all situational awareness information up through various echelons or across agencies, enabling effective, timely decision making at all levels in near real time.*



Each wing, mission area, or even an individual system could be its own "Data Center" connected through the various networks (i.e., SIPRNET) and available on the GIG. Employing a Data Center concept, along with potential Mesh/Cloud architectures, the JSpOC will have access to the right information, at the right time, without hosting all the data at ***Vandenberg AFB****. Conceivably, the JSpOC could have a minimal set of tools for performing various analysis functions, and a thin client for access to wing-level, mission area, or even specific weapon system OSA information. This includes the status of the space effects. As a two-way operation, the JSpOC's Data Center would also publish awareness information for consumption across the AFSPC enterprise and other communities.*

As space systems, from launch to disposal, and their related environments become more complex, operators must have a complete picture of their operation. OSA, as we have presented it, provides operators with the tools needed to easily monitor and manage their space system(s), as well as the ability to quickly respond at all levels when issues arise. This new, expanded capability ensures that the nation's critical satellite infrastructure is running at peak performance.

Image at right:
Integral Systems RaptorX Ultra Small Satellite Terminal (USAT) delivers easy to deploy, manage and operation Satellite on the Move capabilities to the Warfighter.

The Warfighter's Best Friend

By Steve Gizinski, Vice President, Integral Systems SATCOM Solutions

The 21st century Warfighter faces a multitude of challenges that reflect a complex and ever-changing global threat environment. No longer is the U.S. military solely focused on fighting and winning a head-to-head conflict with a well-defined enemy. Today's Warfighter must be prepared to respond to rapidly emerging threats in a short period of time in locations that may or may not have existing terrestrial communications.

The difference between mission success and failure can be the seconds it takes to report on and engage a target based on actionable, real-time intelligence. Critical to winning on today's dynamic, fast-paced battlefield is the information the Warfighter is able to send and receive. Access to reliable deployable satellite communications systems is a must to ensure mission success.

Earlier this year, ***Integral Systems*** *introduced the* ***RaptorX Ultra Small Satellite Terminal*** *(USAT). This communications system represents the next generation in man-portable satellite communications technology. It is designed to operate 24 hours a day, seven days a week and provides assured and reliable mobile communications throughout the world. The high-speed 45cm terminal was developed to provide the U.S. Military with an easy to deploy, ruggedized X-band terminal for battlefield data connectivity to replace existing low data rate systems. The terminal operates using various military and commercial satellites and gives soldiers the ability to communicate using data intense voice, video and data communications.*

*As easy to transport as a piece of carry-on luggage, Integral Systems' RaptorX terminal (****see product photo on the previous page****) is a self-contained system weighing less than 33 pounds and meeting the military's strictest standards for ruggedization including MIL-STD-810F. The system can be unpacked and operational in less than eight minutes. The streamlined terminal interface allows users to select a desired satellite from an easy to navigate on-screen menu assisting with dish alignment. The package also includes a web-based graphic user interface (GUI) that allows remote monitoring from any standard web browser.*

The U.S. military fields the best trained and equipped force the world has ever seen. Providing them with top-of-the-line, reliable mobile communications systems like the RaptorX helps ensure it is responding to global and tactical threats with the best possible intelligence increasing the likelihood of mission success.

GORDON DORWORTH

FOUNDER, CEO, STAMPEDE TECHNOLOGIES

For more than 25 years, Mr. Dorworth has worked on the development of award-winning enterprise software products. Prior to founding Stampede Technologies, Mr. Dorworth was the director of Engineering for 10NET Communications, a division of Digital Communications Associates (DCA), and was a principal design originator of the 10NET peer-to-peer Local Area Network. One of the most successful LAN operating systems to emerge in the 1980s, 10NET was developed and marketed by the highly profitable Fox Research prior to its 1987 acquisition by DCA. Mr. Dorworth joined Fox Research's development team in 1983 and was instrumental in helping 10NET achieve international acceptance. 10NET was recognized as the leading NOS in Europe and was available in over 12 languages with an installed base of more than 650,000 units worldwide. Prior to joining Fox Research, Mr. Dorworth held various advanced development positions at NCR Corporation.

SatMagazine (SM)

Mr. Dorworth, would you please offer our readers some information as to your background and how you came to found Stampede Technologies?

Gordon Dorworth

I began my career at NCR Corporation here in Dayton, Ohio as an engineer, working on transaction processing systems for their mainframe computers. I was also part of the advanced development group that built the first peer-to-peer network called DecisionNet. I left NCR to join a team of five that started a company call 10Net Communications, where we developed the first WAN-based peer-to-peer network. We grew 10Net into a company with $20 million in revenue, with more than 650,000 nodes worldwide, and we became the number one vendor in Europe — over companies such as 3Com, Novell and Microsoft. We sold 10Net to Digital Communication Association (DCA).

After we sold 10Net to DCA, I started Stampede Technologies. This came about after we had such great success in proliferating all of the peer-to-peer networks. I saw how the market was changing with remote and mobile users using laptops to connect into their corporate offices, which led me to see the opportunity to develop Stampede's first products.
We developed a line of remote access (RAS) products called Remote Office. We were able to

leverage our networking expertise to develop dial-in networking software that enabled a user to connect their laptop remotely, and have complete network access to corporate resources on the corporate LAN.

SM

What distinguishes Stampede from other firms in the same market segment?

Gordon Dorworth

Back in the early 1990's, we saw how the Terminal Server vendors were able to address the remote connectivity market by converting their products into remote access servers. The challenge, and what turned out to be the opportunity for Stampede, was with client acceleration technologies and dial-up client capabilities where the Terminal Server vendors lacked expertise.

The problem we addressed and solved was for remote users connecting to their home office over slow network links using a modem; remember, this was in the early 1990's. For example, when using cc:Mail, the screen would take so long to come up, it was excruciating. With Stampede's accelerating technologies, such as caching and protocol optimization, the screen would come up almost instantly.

Back in 1995, Stampede was in an enviable position to OEM our remote access client products to many of the Terminal Server vendors, such as Cisco, DEC, Hayes, US Robotics, Xyplex and many others. The OEM model that we built with our remote access client software is what gave us the tie-in with acceleration technologies that we applied to other applications, such as email. Stampede became the forerunner for accelerating email applications, such as Microsoft Mail, Lotus cc:Mail, Novell GroupWise, etc. A few years later, I believe the year was 2000, we applied our acceleration technologies to Lotus Notes. The problem with Lotus Notes was the application's use of replication, where the user could actually replicate their entire mail database to their laptop to work on offline. Stampede applied our acceleration technologies to the Lotus Notes replication model for both client-to-server and server-to-server products. These enterprise-level applications were used by the largest companies in the world.

Today, Stampede is delivering its fourth-generation of acceleration products. So, as you can see, Stampede has a long history in providing acceleration products that are now allied to application acceleration and WAN optimization. These products are now in a category referred to as WAN Optimization Controllers and Application Delivery Controllers. Today, Stampede is selling our products to military and commercial applications for satellite and terrestrial-based networks.

SM

With many years of experience within the enterprise software worlds, how and why did you key in on the satellite communications arena as a major focus of the company?

Gordon Dorworth

Stampede's first entry into the satellite market was with a very large financial services company that needed our acceleration technologies for Lotus Notes that they used in all of their 1,485 loan offices across the United States. All of their loan offices were connected by a Hughes satellite network. They needed a solution that addressed the satellite link performance that was hampering the delivery of their company-wide email.

Fundamentally, WAN optimization is deployed to make applications run faster. However, what you quickly discover about application performance over the WAN; is that it's not about bandwidth; it's really about latency and "turn reduction". For example, sending a network packet from New York to Los Angeles over a WAN link takes 50 milliseconds. If you have a globally distributed enterprise, and have web applications with chatty protocols, you are immediately in need of an application delivery product to address delivering enterprise applications over latency sensitive links.

For satellite link, latency gets even worse as the typical round trip from a satellite and back down can take 600-700 milliseconds. Reducing latency becomes a key area of importance in satellite environments.

Another critical area of importance is to reduce "turn reduction" and shrink packet payloads, as well as using acceleration technologies such as caching and compression to optimize bandwidth utilization. For chatty protocols, turn reduction can take multiple packets, and deliver them within fewer, larger payloads. This type of acceleration used across a satellite link provides a huge benefit in reducing the effects of latency.

Beyond latency, network congestion plays a major factor. For example, satellite, cellular, wireless, WiFi and WiMAX environments use shared links. If the service provider over-subscribes their network capacity; if one thousand users are on a single link that supports one hundred users, you invariably will have a slow network.

Even today, as new Ka-band satellite communications that offer faster connections are being deployed; this bandwidth will quickly get consumed. It's like the old adage, "give them more, and they will use it". As KA-band satellites get deployed, they will provide more bandwidth capacity for satellite service providers to sell. What you will see is more people being populated on these satellite transponders. However, eventually, these satellite links are going to be out of capacity as well. The convergence of voice, data and video is evolving in the United States. But, in other countries, unified communications is what they are building from the start, because of the demand for more data that is being driven by new applications and devices that enable it.

SM

Where do you see WAN optimization heading in the future, and why is it so important? What makes the Stampede WAN optimization offering so "optimal" for customer consideration?

Gordon Dorworth

Today, there are many factors that impact network performance. Network convergence is becoming the vehicle for a whole host of bandwidth-consuming applications. We used to have a separate TV, stereo, video recorder, camera, CD player and phone — all used independently, with no interconnectivity.

Today, these are all available on a single device, such as smart phone, desktop computer, iPad and notebook computer, all consuming huge amounts of data over limited amounts of bandwidth, at unprecedented rates. And the amount of bandwidth consumed by these devices is only going to grow.

Not only are these new devices consuming huge amounts of data (and therefore, bandwidth), they are enabling new capabilities that were not available before. For example, there are now more opportunities to expand where you get your music. We used to get all of our on-air music over the radio airwaves. However, now we can get it over the Internet, and from sources that we never could before.

Today's new TVs are Internet-enabled. You can get streamed videos, watch YouTube on your TV, we can listen to music, access data, etc. Now all of this information is available not only to enterprise users, but home users, as well. The ramping of the amount of data that is consumed by individual users and enterprises is increasing exponentially.

That is where Stampede's products come in to accelerate data center servers that deliver these applications, and optimize the networks to improve performance, and minimize the amount of bandwidth these applications can consume. Our products are capable of accelerating applications across a wide framework of technologies. They are being used in a wide array of devices and applications, from a stand-alone network appliance located in a data center, to a modem, router, or client devices that are use over satellites, wireless, WiFi, WiMAX and terrestrial networks.

SM

With interests in both the SATCOM and MILSATCOM arenas, is there a sympathetic union of technologies to address solutions of interest to these camps?

Gordon Dorworth

We live in a very fast-changing world, and there is more of a bridge between the commercial and military that creates a union for using WAN optimization and application acceleration products. The military can no longer work based on proprietary standards that take years of development, and by the time they are available, they are obsolete. More than ever before, government entities are using standard off-the-shelf products and services in order to stay ahead of the curve. If they don't do this, their systems will become obsolete, and they will not be able to compete.

SM

Where would you like to see Stampede in one year? Five years?

Gordon Dorworth

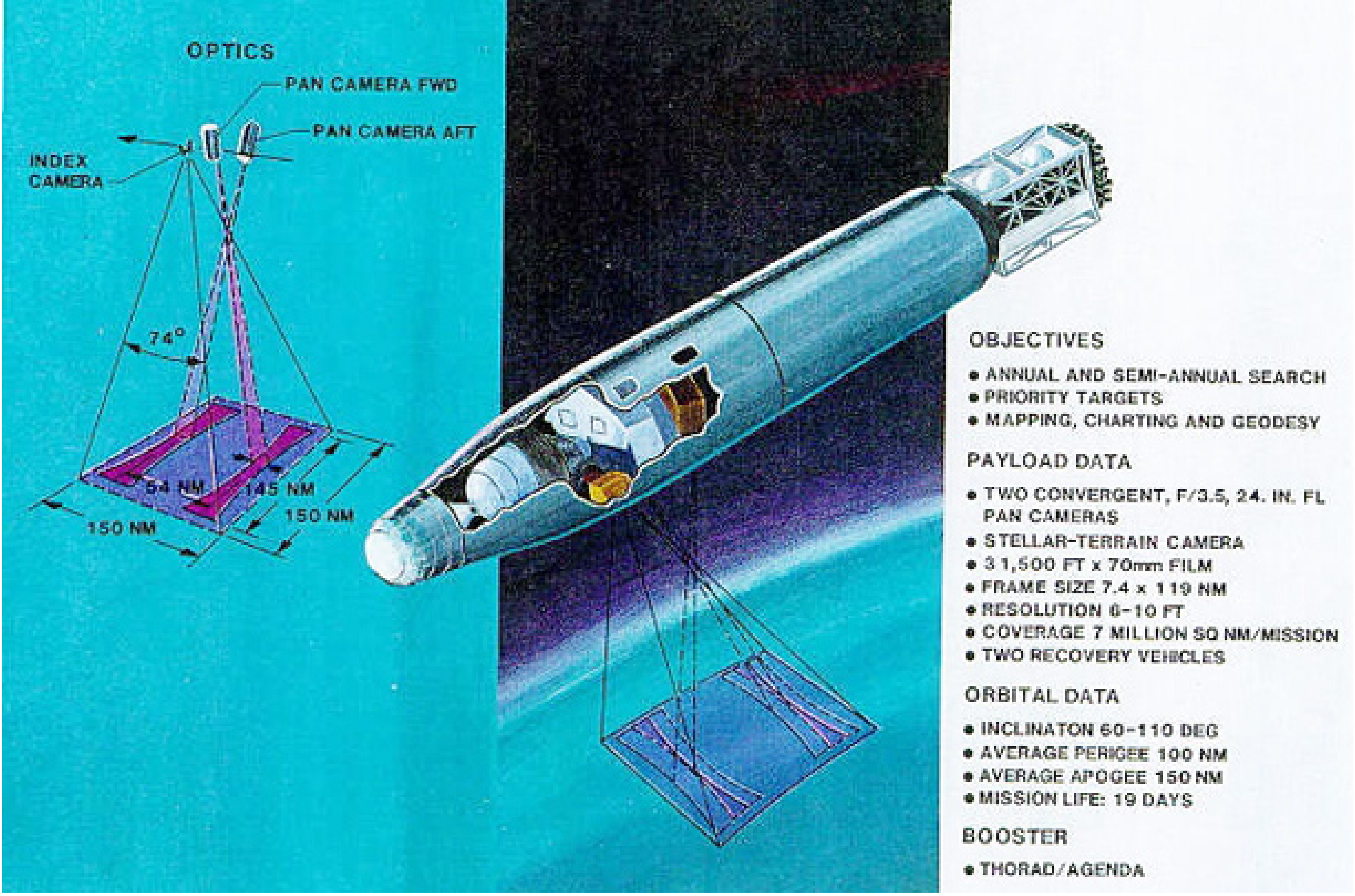
Given the application of Stampede's technologies within the many areas that we've discussed today, we expect very rapid growth over the next five years. Stampede plays in several areas, with technology partnerships that support satellite service providers, and satellite service providers that use our products to be more competitive, by getting greater utilization out of their satellite links, and delivering a better, faster service to their customers. We are also delivering our technologies within embedded systems in a wide variety of business and consumer devices within diverse markets.

NEW HORIZONS... COALITION SPACE OPERATIONS

By Lt. Col. Thomas G. Single, USAF

To provide a current picture of space power in the North Atlantic Treaty Organization (NATO), in January, 2009, the Joint Air Power Competence Centre published NATO Space Operations Assessment, which recommends 23 ways to improve NATO's integration of space into military operations.[1]

The NATO-led ***International Security Assistance Force*** (**ISAF**) in Afghanistan, which faces significant challenges, exemplifies the need to conduct coalition space operations. Performing combined and joint air, land, sea, and special operations, the ISAF finds itself in the early stages of integrating national space capabilities, critical enablers to operations



Corona photo recon satellite specs

that require the leveraging of all available resources. One means of integration involves establishing coalition space support teams (SST), but in order to conduct space operations with these teams, we must address matters of doctrine, presentation of forces, education, training, and equipment. This article offers some thoughts and recommendations for establishing coalition SSTs.

Historical Perspective

Operation Desert Storm is generally accepted as the first space war even though the military developed and used space capabilities long before that conflict.[2] To put these capabilities into historical perspective, we need to go back to Vietnam and the Cold War. For example, ***Corona***, the United States' first photo reconnaissance satellite system, operated from August 1960 to May 1972.[3] Also in 1960, the U.S. Navy tested the five-satellite ***Transit***, the first satellite navigation system, which could generate a navigational fix four to six times a day.[4]

Transit satellite, photo courtesy of Smithsonian Institute

The first ***Missile Defense Alarm System*** satellite, designed to serve as a space-based early warning system for ballistic missile launches from the Soviet Union, became operational in 1963.[5]

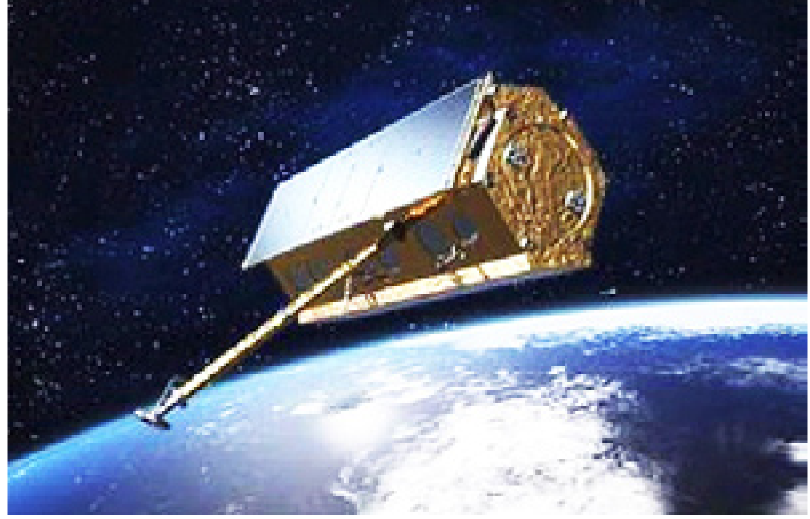
Following that system was the ***Defense Support Program***, developed to detect missile or spacecraft launches and nuclear explosions by picking up infrared emissions. The ***Defense Meteorological Satellite Program*** began providing cloud-cover information in the mid-1960s, allowing more precise planning of air missions in Vietnam.[6] In 1970, the United States launched its first signals intelligence satellite.[7]

The more commonly known global positioning system first launched in 1978, reaching initial operational capability in 1993.[8] Even though the United States has operated these and other satellites for more than 50 years, only recently were their capabilities fully integrated into combat operations.

Allied Space Capabilities

NATO coalition partners can now employ a variety of space assets. France became the third recognized space power, after the Soviet Union and the United States, when it launched its first satellite in 1965.[9] The French now operate satellites for communications, electro-optical, infrared, signals intelligence, and electronic intelligence; they should field an early warning system by 2020.[10]

Italy and Germany have also become players in the space defense sector, Italy launching its first communications satellite in 2001 and the first of four *synthetic aperture radar* (**SAR**) satellites in 2007.[11] Germany launched a constellation of six SAR satellites from 2006 to 2008 and will add another this year; moreover, the nation launched five medium-



TerreSAR-X, an EADS Astrium-built synthetic aperture radar (SAR) satellite

resolution electro-optical satellites in 2008.[12] The Germans have also developed two communications satellites, one on orbit and the other scheduled for launch in 2010.[13]

Other military satellite communications (SATCOM) programs in Europe include the United Kingdom's ***Skynet*** and Spain's ***Hisdesat*** satellites. The European Union's ***Galileo*** program will provide a global *positioning, navigation, and timing* (**PNT**) capability. Clearly, the Europeans have much to offer.

In addition to technology and hardware, NATO coalition partners offer trained space personnel. Many nations have studied our space doctrine and are quickly catching up. The French have set a goal of fostering a military space culture across the European Union. A French *Joint Space Command* will likely stand up in the summer of 2010 — a major step forward.[14]

In 2008, Germany announced it would establish a *Space Situational Awareness Center* in Uedem, Germany.[15] The **Royal Air Force** has a *Space Operations Coordination Centre* in High Wycombe.[16] Spain placed a *European Union Satellite Centre* in Torrejón.*17*

As the space capabilities of European nations continue to grow, the expertise of those countries will develop. Additionally, other states such as Japan, India, and Australia are acquiring their own space capabilities.

Integration of such allied resources could allow the rapid reconstitution of lost capability, add capability, decrease revisit times, and so on. Allied space personnel offer strength through diversity by bringing to the table a different cultural perspective. Experts in their space systems and organizations, they have different understandings of and solutions to the geopolitical environment.

Although the United States would greatly benefit from increased partnerships with the growing number of space personnel, this relationship will demand changes to the way we currently operate.

Why A Coalition Team?

Coalition operations are not new. Nations formed alliances to fight the two world wars, Korea, Vietnam, the Balkans, Iraq, and Afghanistan. War fighters in US Central Command's area of operations conduct joint and combined operations. Nations such as Afghanistan, Australia, Belgium, Canada, Germany, Iraq, Italy, France, the

Netherlands, and the United Kingdom all participate in flying operations with the United States. In addition to providing international political support and sharing risks, resources, and costs, a coalition establishes legitimacy in the international community.

A complex undertaking, modern warfare includes diplomatic, political, social, economic, informational, and military aspects, not to mention staggering costs that few nations can afford for an extended time. Our economies and governments have become inexorably intertwined in the international arena. Most importantly, sending troops afield requires political support both at home and abroad. The benefits of common security concerns, the dialogue and cooperation essential to a coalition, and the shared culture and understanding greatly outweigh any day-to-day challenges. Undoubtedly, nations will continue to organize themselves in coalitions to wage war.

Unfortunately, NATO, the ISAF, and most nations have neither adequately addressed space as a domain nor fully leveraged space capabilities. Coalition forces need space-based *intelligence, surveillance and reconnaissance* (**ISR**), SATCOM, global PNT, tracking of friendly forces, space control, environmental (weather) monitoring, and missile-warning capabilities. Generally speaking, these space capabilities emerged because of their cost-effectiveness or because the high ground of space represented the only feasible place for their employment.

Current coalition operations require vast amounts of communications, imagery, intelligence, and information, which partner nations must share. The NATO-led ISAF in Afghanistan faces challenges because the sharing of intelligence and information cannot always occur at a common classified or unclassified level. Procedures for requesting, tasking, processing, exploiting, and disseminating intelligence are difficult at best. Problems arise with regard to technology as well as policy, data management, and sharing.

We must use all of our available resources optimally because the ISAF can greatly benefit from space capabilities. Informational seams, such as the inability to share a critical piece of intelligence, reduce our operational effectiveness. Arguably our operational paradigm must change in the space community. Because we fight as a coalition team, we must include space. Products and services classified Top Secret just a few years ago are now unclassified and available from commercial companies. Therefore, we should take a critical step towards overcoming these challenges by integrating the space capabilities of our coalition partners.

The evolution of space integration in the United States can serve as a model for developing coalition space operations. As the

United States cultivated space capabilities, it had to address integration, policy, doctrine, and the development of trained personnel.

Doctrine has evolved over the years, training courses have emerged and changed, and a space career field has appeared. The United States now has a space cadre with combat experience in Iraq and Afghanistan — a cadre mature enough to include general officers who have spent most of their careers in space assignments. Presenting forces, which remains a topic of debate between the Air Force and Army, will continue to adapt as America involves itself in coalition operations.

As other nations and organizations, such as NATO, begin to think about space capabilities, they must consider how they can develop space forces and integrate them into coalition operations. Other nations can use the US space-integration construct to build a force structure that can conduct space operations within a coalition.

Training + Doctrine

> ***"The most difficult problem the Air Forces faces in integrating space is how to create an air and space officer to employ an air and space force."***
> ***—Lt Col Mark P. Jelonek,***
> ***Toward an Air and Space Force, 1999***

Having space systems does not necessarily mean that our war fighters are using them; rather, we must integrate system capabilities into the fight. To develop a coalition's space capability, we would do well to learn lessons from the evolution of US space training and doctrine. For many years, the United States struggled to integrate and fully exploit highly classified and compartmented space systems. One solution entailed the establishment of space teams, much like coalition SSTs. US Space Command's joint SSTs, established in the mid-1990s, and their associated component SSTs served theater commanders and joint task forces, making space capabilities understandable and useful for warfare.[18]

In 1995, the Air Force formed the 76th Space Operations Squadron to assist air component commanders' understanding and application of space capabilities in support of air operations.[19] These Air Force SSTs, designed to support the air operations center (AOC) and the tactical level of war, deployed to assist in *Operations Joint Endeavor*, *Deny Flight*, *Desert Fox*, *Desert Thunder*, and *Allied Force*.[20]

The United States possessed significant space capabilities, but *Desert Storm* taught senior leaders that we had not fully leveraged them. This situation led to formation in 1994 of the *Space Tactics School*, which became the ***US Air Force Weapons School***'s *Space Weapons Instructor Course* in 1996.[21]

The course has produced 215 graduates, eight of whom have now reached the rank of colonel.[22] These space weapons officers, who assisted regional combatant commanders and became part of the AOCs, supported the *joint force air component commander* (**JFACC**) by providing space expertise and effects. Their success showed the Air Force the value of such embedded expertise.

By the end of 2000, the Air Force had begun to integrate space personnel throughout the combat air forces and ended the joint and Air Force SSTs. More recently, the service established a position for the director of space forces, who advises the combined force air component commander and coordinates space requirements and effects for the theater.

As part of the commander's staff, the director must rely on the embedded space operators in the various AOC divisions and throughout the area of operations to gather requests for effects and to integrate space into daily operations. This method has proven effective for operations in **US Central Command**; however, the Army has not adopted the director's doctrinal construct and continues to field SSTs. The Navy and Marine Corps have a small number of personnel with specialized expertise in space operations, but neither service fields space teams.

Primarily, the Army integrates space by means of its SST and the *space support element* (**SSE**), the former a deployable team of six soldiers and the latter a smaller cell of typically two or three personnel assigned to a brigade or division headquarters.[23] Army SSTs began deploying in 1995 to make space a part of ground operations.[24]

In 1998, the Army established ***Functional Area 40*** (**FA-40**) (a space operations officer) as a mechanism for training and developing space specialists.[25] Both the Army SST and SSE are responsible for coordinating space activities and synchronizing space mission-area activities throughout the operations and planning processes.

These teams and elements, which have proven successful in Iraq and Afghanistan, continue their high deployment and operations tempo. Embedding such space expertise in the *combined joint task force* (**CJTF**) structure ensures that space capabilities and effects are part of planning and that they support operations.

Unfortunately, very few Air Force personnel have deployed to integrate space into ground operations. The service must do a better job of placing these individuals with units that use space-based services. A more joint approach would allow our forces to understand and make optimal use of space capabilities.

In terms of space, the fundamental doctrinal difference between the Air Force and Army is that the Air Force is primarily a provider of capabilities while the Army is primarily a user. Coalition operations require both providers and users. The Air Force established positions to command, control, and integrate space, whereas the Army fielded teams to exploit and use space-based services.

For example, to improve air-land integration, the Air Force embeds air liaison officers and tactical control parties — experts on employing airpower — with Army forces. They coordinate communications and aircraft for precision air strikes. However, the Air Force has yet to establish space-operations liaison officers for the purpose of integrating its space capabilities into ground operations. As we look to the future of conducting combined space planning and operations, we must examine and modify US space-integration models in order to effectively include not only our other services but also those of our allies.

It is important to understand established space doctrine and to determine if we must adapt it to guide the conduct of coalition space operations. The United States has the most developed space doctrine of any NATO nation, having updated its joint space doctrine in 2009, Air Force doctrine in 2006, and Army doctrine in 2005, as well as having implemented Navy space policy in 2005.[26]

NATO has been active as well, publishing its doctrine document for air and space operations in 2009.[27] The **European Union** published a space policy in 2007.[28] Australia, Great Britain, Holland, France, Germany, and other nations are developing, or have recently established, national space policy and doctrine. Unfortunately, no country has adequately captured the space-related realities of coalition operations in Afghanistan.

An examination of questions about why US doctrine would have to change to support coalition space operations lies beyond the scope of this article, but we should address a few key points to understand what we need for coalition space teams. As other nations produce space capabilities, personnel, and centers, US doctrine will have to address the construct of those relationships and the means of interacting with them.

For example, as the French now field a space team of three personnel to support their rapid-reaction forces and AOCs, we need to think in terms of developing a common framework, definitions, and mission areas.[29] The following discussion addresses concepts for establishing a foundation for coalition space operations.

Current US and NATO space-mission areas include space-force enhancement, space control, space support, and force application.[30] These terms have been in use for some years now and need revising (except for space support, which is still applicable).

No longer simply an enhancement of our operations, space has become a critical joint enabler. Space control is often confused with offensive counteroperations, which aim to dominate enemy airspace and prevent the launch of air threats.

The latter can include destroying the enemy's air and surface-to-air forces, interdicting his air operations, protecting air lines of communications, and establishing local military superiority in air operations.[31]

Joint* Support Space Operations	Counterspace Operations	Space Support Operations
Position, Navigation, and Timing	Space Situational Awareness	Launch and Range Operations
Satellite Communications	Offensive Counterspace	Satellite Operations
Intelligence, Surveillance, and Reconnaissance	Defensive Counterspace	Command and Control of Space Forces
Missile Warning		Operational Test and Evaluation
Environmental Monitoring		Space Professional Development
Integration and Exploitation		

*The NATO term joint equates to the US term combined.

Table 1. Proposed mission areas for space operations

Additionally, other nations consider the term space control much too aggressive and offensive in light of the intended peaceful use of space. No country wants to see US forces controlling space. Similarly, other nations find the term force application, which translates to weaponizing space, too politically sensitive and therefore unnecessary. The force-application mission makes other nations suspect that the United States has secretly placed weapons in space; otherwise, why would we have doctrine for weapons that don't exist? As those countries study our doctrine, we need to be careful about the message it sends.

We need a new construct for US and NATO space-mission areas, including joint support space operations, counterspace operations, and space support operations (*Table 1* on previous page).

This construct would make the space-mission areas easier to understand and more accurately reflect actual operations. For example, joint support space operations would include PNT, SATCOM, ISR, missile warning, and environmental monitoring because they all directly support joint force operations.

We should add one area not currently included in force enhancement — integration and exploitation. Some existing cross-functional programs in the space portfolio do not fit under a specific capability area. Additionally, the absence of integration and exploitation in the doctrine compromises any advocacy for funding or programs that we need most — specifically, those that use space capabilities to support the joint war fighter. As discussed above, coalition space doctrine should not mention space control; counterspace is a better term.

Finally, we need add only space professional development to space support operations and omit force application, as mentioned above.

Drawing on these proposed mission areas, we can envision a notional structure for

Position	Rank
Space Coordination Element	
Senior Space Operations Planner	O-5
Space Operations Planner	O-4
Space Support Team	
Space Team Leader	O-4
Operations Officer	O-3
Counterspace Operations Planner	O-3 or E-6
Space Operations Planner	O-3 or E-6
Intelligence Analyst	E-6
Information Systems Operator	E-5
Space Support Element	
Senior Space Operations Officer	O-4
Space Operations Officer	O-3

Table 2. Composition of a typical space team

a coalition space team (*Table 2*). Sized appropriately for the assigned mission, teams would have expertise in ISR, PNT, SATCOM, missile warning, space situational awareness, offensive counterspace, and defensive counterspace. Army SSTs and SSEs have benefited from training and deploying as integral units. Attempting to make these teams multinational presents certain challenges in terms of organizing, training, and equipping forces.

Presentation Of Forces

Using the proposed mission areas, we have to consider how the United States should present its space forces in-theater. Current US doctrine has Air Force personnel embedded in AOCs. The Army's SSEs are an integral part of its divisions, and Army SSTs deploy to augment CJTFs when needed. NATO doctrine addresses space operations only at a high level and does

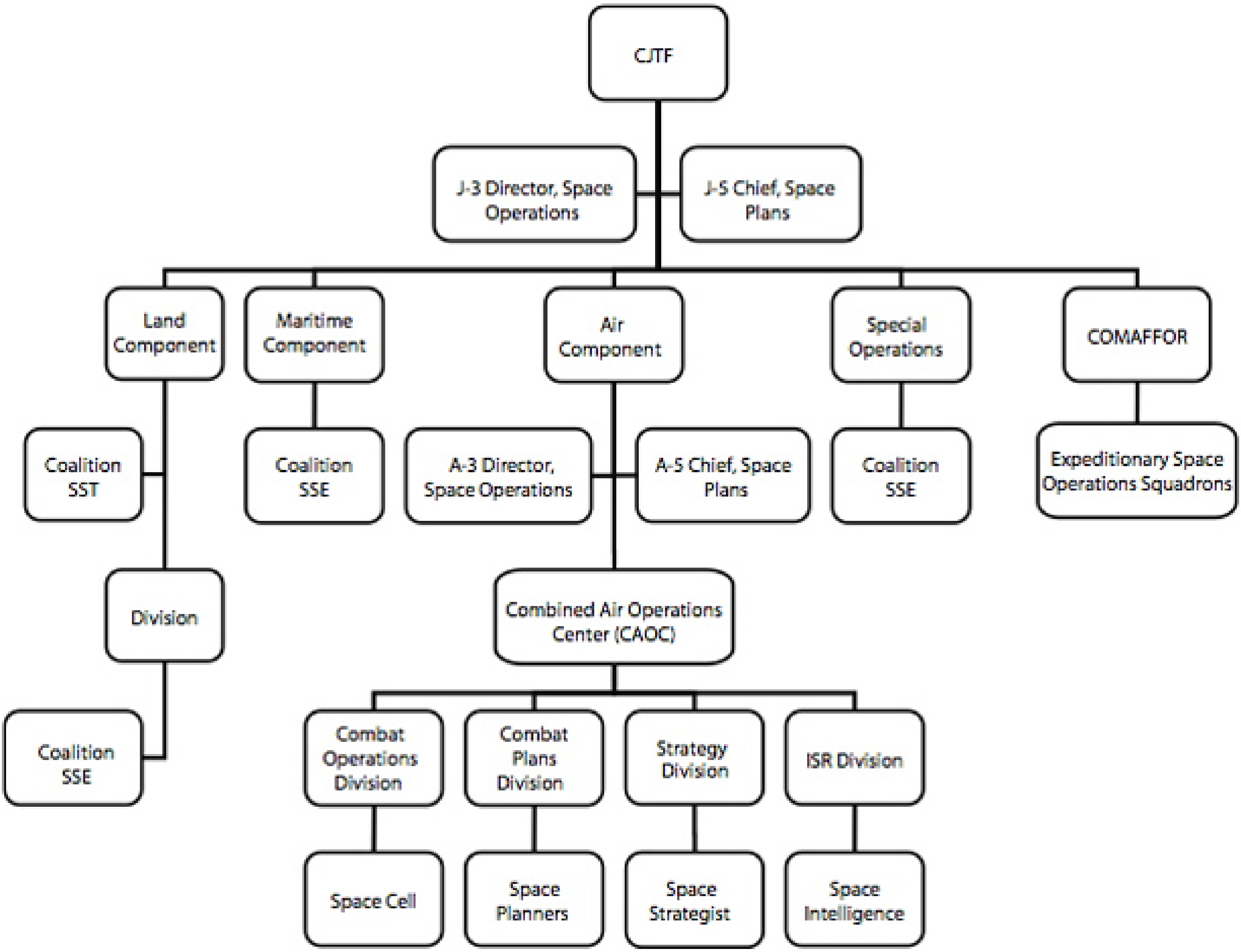


Figure 1. Structure of a notional combined joint task force

not offer guidance on presenting space capabilities or forces.[32]

Furthermore, US joint doctrine only briefly addresses space in multinational operations.[33] Since the beginning of operations in Afghanistan, we have had no strategic plan to integrate space personnel, but the ISAF is developing an architecture to make better use of space capabilities.

At the NATO joint level, two space officers are assigned to the ISAF Joint Command, including the chief of ISAF space operations — the force's senior space officer. At the regional level (which corresponds to the service-component level in US doctrine), Army SSTs are assigned to **ISAF Regional Commands East** and **South** headquarters. US Marines in **Regional Command Southwest** also have an assigned Army SST. Additional space personnel have been requested to support **Regional Commands North** and **West**. Unfortunately, the ad hoc nature of requests for space personnel over the past eight years has resulted in confusing command relationships and, for some, organizations lacking individuals with space expertise.

Our experience in Afghanistan recommends the following two-phased construct for

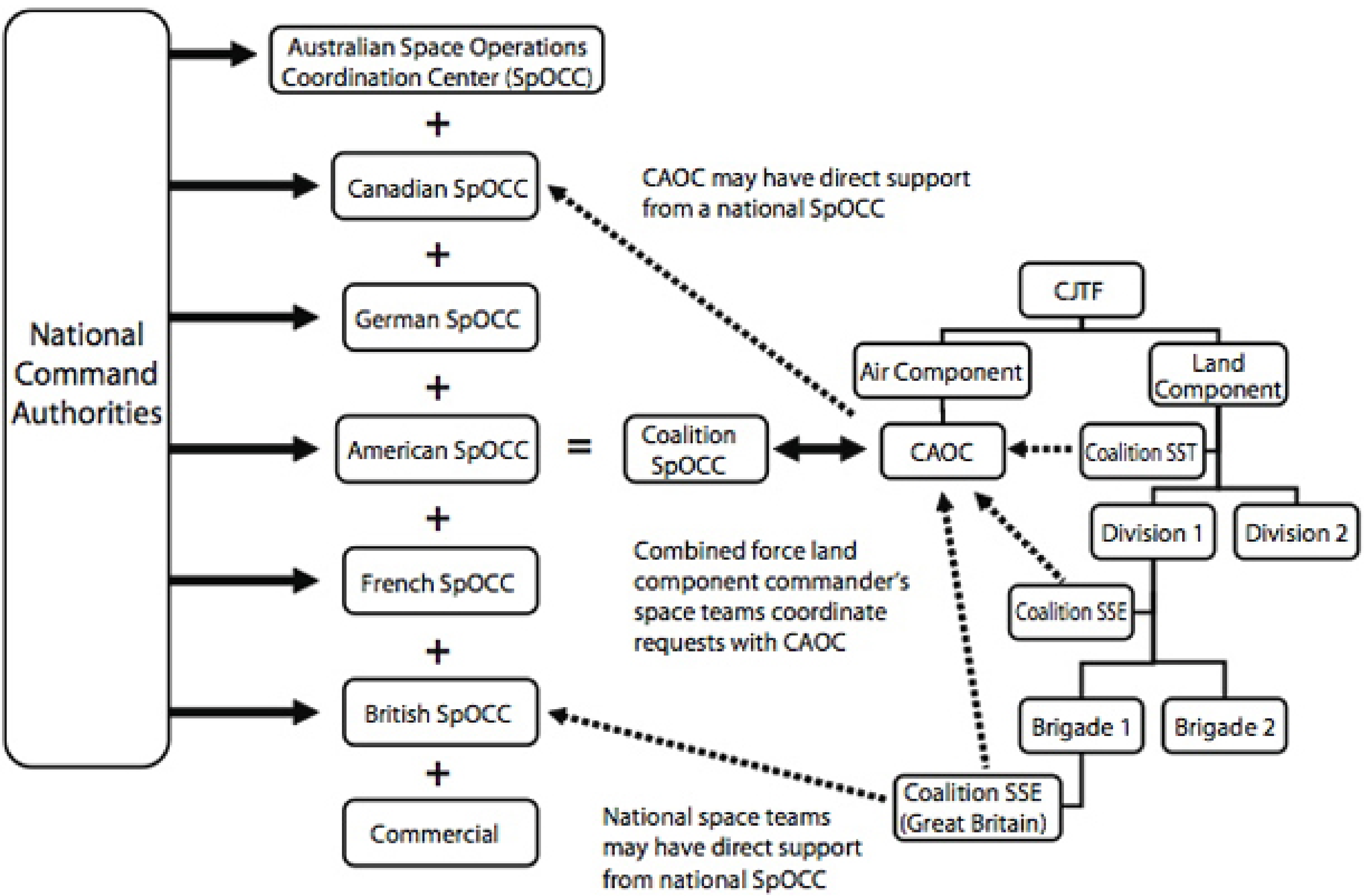


Figure 2. Notional space support architecture

integrating space into a multinational CJTF. Space must first find representation at the US joint level, in **J-3** (*operations*) and **J-5** (*plans*). Additionally, assuming the presence of a JFACC, we must continue to integrate space into the AOC because of the center's status as the command and control, planning, and execution node for air operations. The JFACC, also typically the c*ommander of Air Force forces* (**Comaffor**), should have space officers in **A-3** (*operations*) and **A-5** (*plans*). We can continue the current US Army structure for integrating space teams into land forces.[34] Each component command (and regional command in the ISAF) should have a coalition SSE at headquarters. Subordinate headquarters at the corps level would have a coalition SST. Since each service brings its own expertise and capabilities, the space teams/elements need joint manning. It is important to note that the number of teams and personnel depends on mission requirements and operations tempo. Team size and composition should be scalable to meet operational needs. For example, perhaps only a single space officer, rather than a full space team, would suffice for coordination.

The second phase will call for integrating coalition partners (*Figure 1* on Page 42). Team integrity, training, and access to classified information must become a consideration, and higher headquarters will include multinational personnel. The tactical level is the most difficult place to integrate such personnel because they require detailed operational and system knowledge to perform their mission. Because formation of a multinational SSE or SST would prove difficult, this article recommends assignment of a national SSE to support its country's forces. Some of the teams could be multinational, depending on bilateral or multilateral security arrangements.

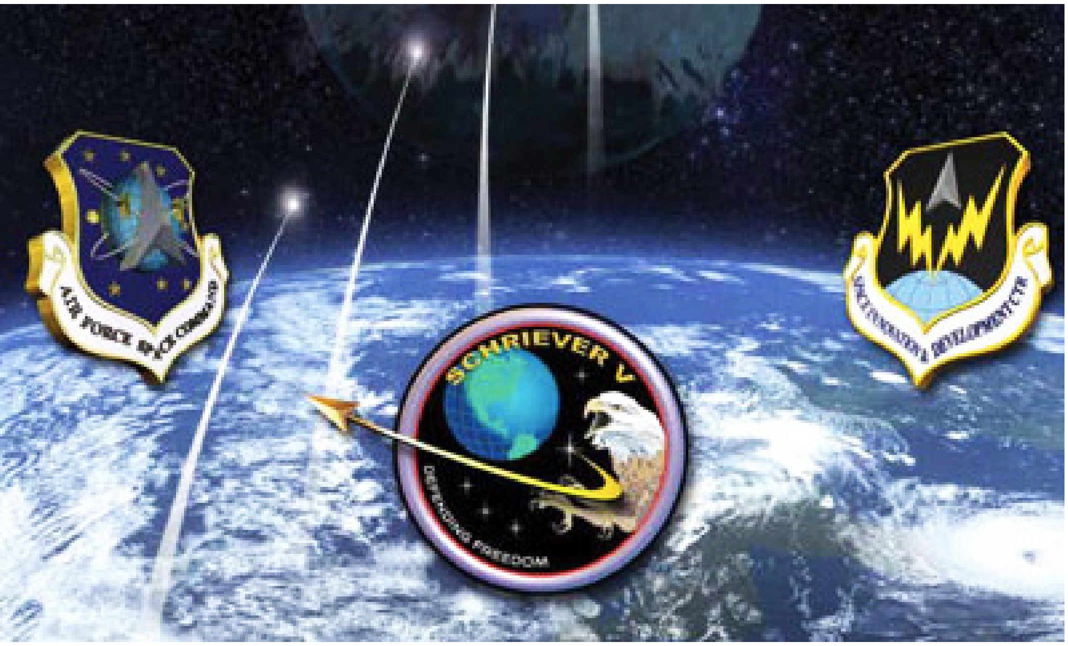
We must also address assigned space units, which fall under the Comaffor as expeditionary space operations squadrons. Even so, they could be assigned to other commanders or components. Due to the political and strategic nature of space assets, these units would most likely have to report directly to their national authorities for guidance regarding rules of engagement. The command relationships would be developed, based on national direction and the mission.

For the most part, we have integrated mature space capabilities into daily operations and have normalized them. Intelligence teams plan and execute the use of space-based ISR assets, and the communications team runs SATCOM. However, we still need some space specialists in strategic- and operational-level positions. Consequently, this example does not require a director of space forces because of the full assimilation of space positions into the command structure.[35]

Space Support + Reachback

Soon after the start of the ***Schriever V*** war game of 2009, it became apparent that an integrated force structure would facilitate coordination for coalition operations.[36] This realization led to establishment of a CJTF-like organization and a combined space operations center construct. Building on this concept, we can think of designing a notional space support architecture for a coalition (See *Figure 2* on Page 43).

CJTF space forces must integrate effects and support the mission, perhaps via reachback to a *space operations coordination center*



(**SpOCC**). Typically, the CJTF commander will designate a single focal point for space—logically, the JFACC and *combat air operations center* (**CAOC**).

As the supported multinational command, the CAOC would enjoy direct support from the coalition SpOCC, which can serve as a virtual coordination center since a designated lead nation's SpOCC would become the coalition center. National SpOCCs can also directly support the coalition SpOCC. It would be wise for the CAOC to have arrangements with national SpOCCs for time-critical support. National space teams would have reachback via national command authorities and support channels. For example, space personnel supporting operations in US Central Command go the CAOC, which can then reach back to US Strategic Command's joint functional component commander for space and the joint space operations center.

Coalition operations require some nations to provide space capability, often both military and commercial satellite services. Consequently, each national SpOCC would have to maintain its own space picture and share some of that data with the coalition SpOCC to generate an integrated picture.

Each SpOCC could serve as a central point of contact to access national space capabilities. National command authorities would maintain control of their national assets while providing an agreed-upon space capability or service to coalition operations.

Doing so requires that we put in place agreements today to begin developing guidance for security classification, interoperable information networks, tasking and dissemination processes, and so on. Because this construct will probably take years to develop, we cannot afford to wait for a crisis to occur.

Education + Training

Often an afterthought, education and training are paramount to success. Too frequently we have sent space operations personnel into combat with inadequate experience and training. It is vital to properly organize, train, and equip our space forces. Although the United States has made improvements to develop space professionals, we need specialists.

During the last decade, space weapons officers have filled this role. Because the position is adapting to focus more on Air Force Space Command units, and because of the limited number of positions, the Air Force needs to develop a track for personnel specializing in the integration and exploitation of space. Either the Army's FA-40 program or the Air Force Space Weapons Instructor Course can serve as models. Most nations have neither military space systems nor military space specialists, so they must develop personnel with space expertise and establish a career specialty. Because coalition space teams require trained personnel, partner nations must establish training programs to develop specialists who can integrate space into ground, air, and sea operations.

Before developing a specialty, we must clearly understand the operational requirements for space capabilities. ***Army Field Manual 3-14***, ***Space Support to Army Operations***, May 2005, clearly defines the roles and tasks of an Army SST and a space operations officer.[37] We have high expectations for deployed space personnel, who must know all of the national space systems, capabilities, limitations, and supporting organizations; understand the CJTF's mission, priorities, and operations; and then figure out how to integrate them into the planning process. They must coordinate with a multitude of intelligence and space organizations, monitor the status of space systems for changes, determine possible effects on the theater, and track vulnerabilities and threats.

Space Based Space Surveillance (SBSS) satellite, image courtesy of Boeing

Theater space officers may also perform other classified duties. In a coalition environment, they will carry out these duties for other nations' space assets and processes. After training and developing senior captains and majors to best support our theater commanders, the Air Force must groom these officers for more advanced positions. Therefore, to meet the above requirements, we should organize a small cadre of US joint and allied space planners and liaison officers.

Several existing training programs can begin to address these needs. As one would suspect, the United States offers the majority of space training. However, Canada, the United Kingdom, France, and NATO also have space courses. Selecting the best aspects of each of them should enable us to develop the requisite courses.

Because joint and allied commanders and operational planners need a basic awareness of space capabilities and limitations, staff colleges and other advanced schools should include space familiarization in their curricula. Similarly, senior political and military leaders would benefit from an executive space course that covers strategic space issues, just as commanders and staffs would profit from a course on military applications of space. NATO members should have access to such courses at a reasonable cost.

Furthermore, at the more advanced level, the NATO school in Germany offers the only operational planning course for space, which attempts to teach staff officers and operational planners with little or no space background how to integrate space into the operational planning process in just five days — simply not enough time. Indeed, the basic and advanced training that students need could take months. Without proper education and training, we will continue to provide only adequate rather than optimal support to our theater commanders.

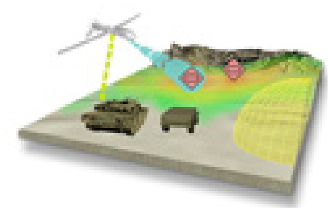
Equipment + Planning Tools

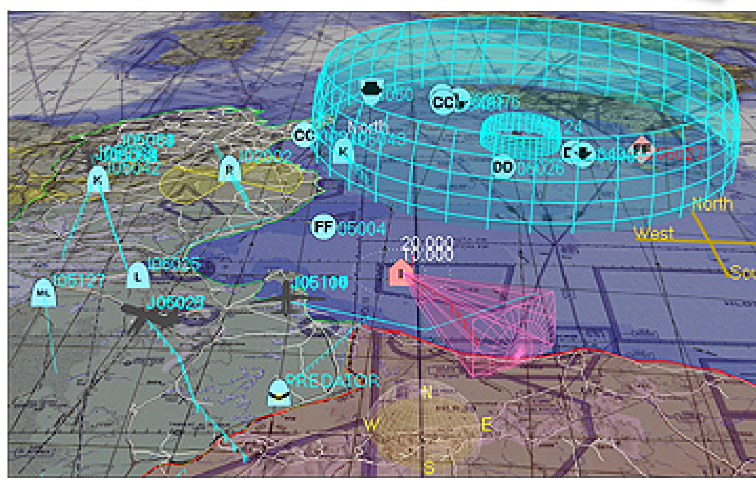
We can't send our space warriors into the fight without tools. For situational awareness, teams must have an integrated space picture — including US, coalition, adversary, and commercial space assets — similar to the information about our land, sea, and air forces. We must monitor and display system and network status and assess effects on the theater.

Teams must have planning and coordination tools so they can share information at a common classification level in a coalition environment. Chat programs, email, and phone networks must be interoperable and allow sharing amongst coalition nations. Computer systems should be capable of handling information up to at least a *Secret* classification. (The removal of sources, means, and methods permits the release of most intelligence information and products.)

In order to move forward, we must produce fused intelligence products, and many nations must contribute to that process. Most importantly, because all coalition forces must be aware of available capabilities and products, the United States should no longer confine itself to national systems but begin operating on coalition network systems.

Space personnel also need certain types of equipment. Army SSTs, for example, have their own deployable SATCOM terminals and computers with which they can obtain or produce space products such as three-dimensional visualizations, satellite-overflight reports, communication-interference reports, and imagery maps. Using satellite connectivity, they can monitor the space environment, operational status of space vehicles, effects of solar weather, and other space events. They also can serve as a





primary missile-warning node. However, these US teams are not ideally enabled for coalition operations because they cannot release many of their products to partner nations. In addition to having an integrated space picture, a coalition SST must be able to produce satellite-overflight predictions, analyze communications links, analyze and manage ISR resources, assess threats, and conduct electronic warfare/countercommunications planning, as well as perform many other tasks. Hence, they need deployable SATCOM capability, not to mention information systems and software to support operations, the latter including such products as the widely used ***Satellite Toolkit*** from **Analytical Graphics**, which can help coalition SSTs do their jobs.[38]

Commanders cannot fight without knowing the location and status of their aircraft, ships, and land forces at any given time; consequently, coalition nations must contribute orbital information, aircraft information, and data to create an integrated picture. Sadly, the current state of a coalition's space situational awareness is minimal at best.

Conclusions

During the past 15 years, the United States has experimented with, developed, and fielded space forces to support theater commanders. Capabilities and personnel have matured and have more jointness than before, but today's coalition operations demand that we better integrate space capabilities into the fight. Recently, some allied nations have developed their own space capability. It is now time for the next step: coalition space operations. Thus, we must address doctrine, organization, command and control, education and training, equipment and tools, as well as our bilateral agreements for space cooperation, which do not suffice for coalition space operations.

Ongoing coalition operations in Kosovo, Iraq, Afghanistan, and elsewhere motivate us to better integrate and use all available space capabilities. Improving the way we organize, train, and equip our forces will enhance the space effects available to joint and coalition war fighters. Space is for everyone, including our adversaries, so we mustn't delay.

About the author

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Editor's Note:

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Notes

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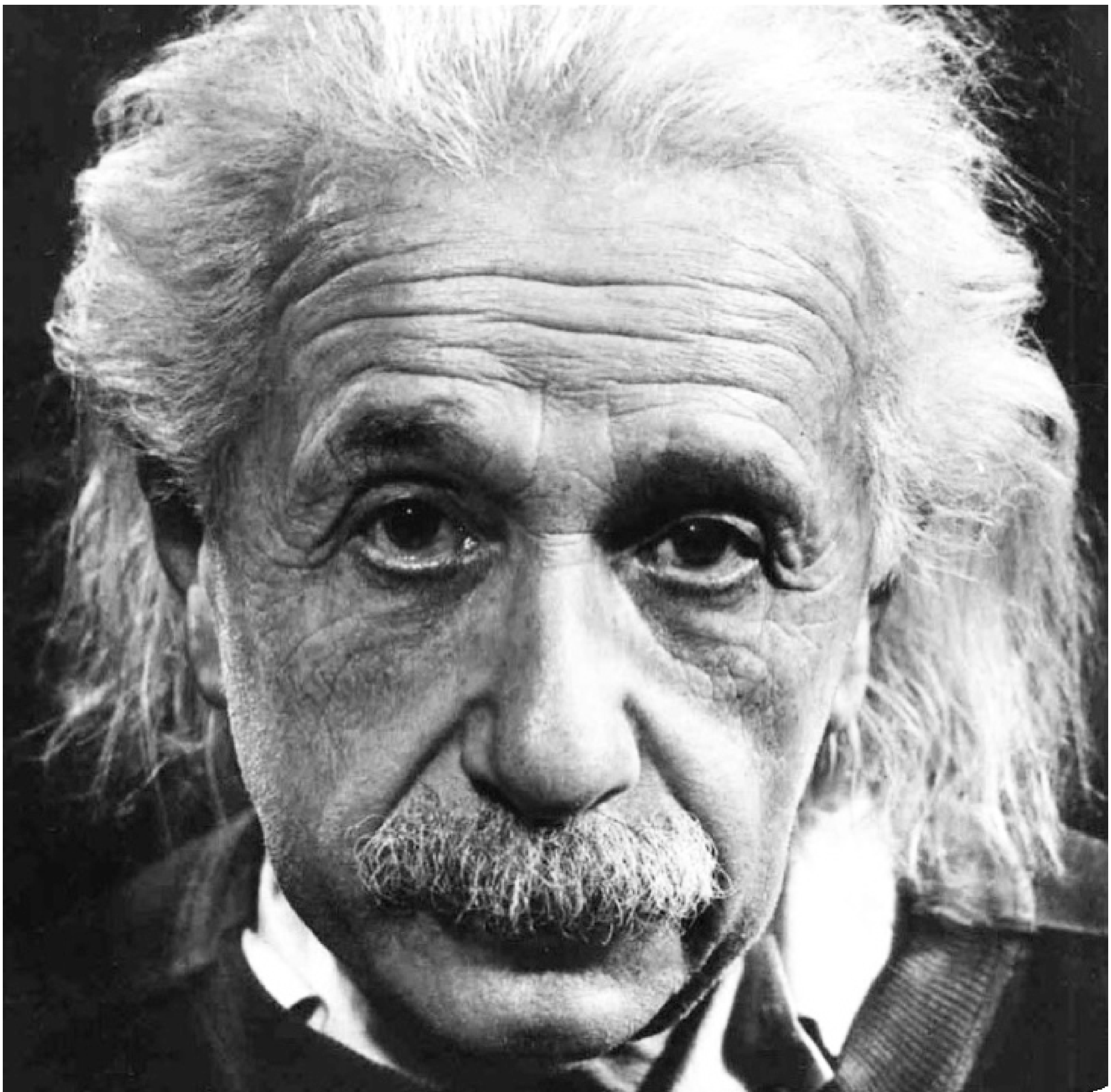
** The conclusions and opinions expressed in this document are those of the author cultivated in the freedom of expression, academic environment of Air University. They do not reflect the official position of the U.S. Government, Department of Defense, the United States Air Force or the Air University.

EINSTEIN'S VIEW OF INSANITY – APPLIED TO OUR NATION'S SPACE ENDEAVORS

By David L. Taylor, president and CEO of Ball Aerospace & Technologies Corp.



Editor's Note:

The following article is excerpted from David L. Taylor's keynote remarks at the ***Washington Space Business Roundtable*** *on May 11, 2010, as published in The Space Foundation's* ***Space Watch*** *newsletter, Vol. 9, No. 6, with full permission.*

Albert Einstein was many things — physicist, Nobel Prize winner, philosopher, humanist, pacifist. His career was notable by the constant quest for knowledge. His theory of insanity, as the act of doing 'the same thing over and over again and expecting different results' is often quoted.

I have to think that if he was still with us, he would either be perplexed or at least bemused by the way in which we manage our nation's space endeavors.

I must confess, Einstein's quote is the reaction I have every time I hear of another major space procurement that has overrun or is behind schedule — or usually both.

Our recent history is littered with acronym-riddled poster children for space-programs-gone-bad, but I'd like to think today's developing trend lines are positive.

Two approaches, if proactively embraced by government space acquisition officials, would alter the course of fulfilling the nation's future in space.

The first, adopting distributed or tiered architectures for a broad set of missions; and second, applying more broadly fixed-price contracting for space programs.

Given today's ever-growing deficits and the multitude of programmatic needs, I believe distributed architectures represent an advantageous path forward.

Recently, major policy shifts and program cancellations have hinted at a coming revolution in our space program. Perhaps the most visible has been on the human spaceflight side of the equation. But there have also been sea-state change decisions in weather and climate as well as some defense mission areas. There are technical, cost and programmatic advantages to formally adopting distributed architectures as one leg of America's space posture.

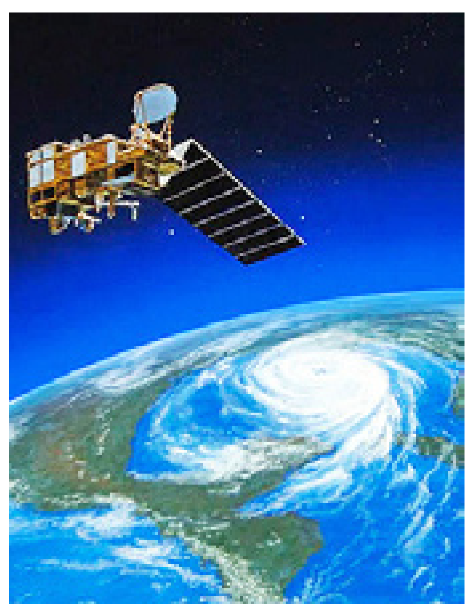
The defense community is reeling from a series of failed large satellite system procurements — **FIA** (*Future Imagery Architecture*), **TSAT** (*Transformational Satellite System*) and **Space Radar**, to name a few. Others such as **SBIRS** (*Space-Based Infrared System*) and **NPOESS** (*National Polar-orbiting Operational Environmental Satellite System*) continue on but have many battle scars.

TSAT, image courtesy of Boeing

Prior to these troubled programs, block satellite buys were the norm — with spares on orbit and in development. **GPS** (*Global Positioning System*) is an example of this and an example of one of the most successful **Department of Defense** space programs ever implemented. About two-and-a-half years ago, with the writing on the wall and the hemorrhaging of cash, government discussions began about our acquisition approach for the overhead imaging collection systems.

This debate centered on the 80 percent solution vs. the exquisite solution, particularly when assessing the nation's overhead imagery collection capability. When 80 percent of the requirement can be met by a significantly less costly system — perhaps on average, 10 to 20 percent of the cost of exquisite systems — do we really need to field the most sophisticated solution for 100 percent of the need?

That's not to say we shouldn't build exquisite systems. There's certainly a time and place for such systems. But what is truly visionary is codifying the role of commercial imagery in the nation's architecture for the first time, and therefore validating the acceptability of distributed architectures for this critical national security mission.



NPOESS

The military is now fully invested in having access to this data. Vice Chairman of the Joint Chiefs of Staff Gen. *James E. Cartwright*, USMC, and battlefield commanders are supportive of this approach for a very practical reason — the acceptance of the product by the warfighter. The imagery is invaluable: its resolution, color, clarity, availability is outstanding; it can be shared with coalition partners; and it's operationalized.

Gen. *Cartwright* stated that he would rather own 'half of four' satellites rather than 'all of two,' as that would increase coverage and reduce vulnerability.

The development of very complex systems that must serve multiple mission requirements and also be relied on to deploy only after they are already desperately needed is a luxury we cannot afford.

Our communications infrastructure benefits from the broad distribution of architectural elements that capitalize on commercial, government, ground-based and space-based nodes. Other potential applications of this model include space situational awareness and space control. One could even argue that NASA's new exploration approach is at its core a distributed architecture. It will utilize commercial providers for access to low Earth orbit, while developing leading edge capability for exploration of the Solar System.

An ancillary benefit of distributed architectures is the maintenance of a robust U.S. aerospace industrial base. They offer industrial base and technical benefits necessary to bolster the aerospace sector as a continued economic and innovation engine of the U.S. economy.

Distributed architectures have been effectively applied in countless non-space domains such as computing, telecommunications, industrial automation and consumer products. Their advantages are obvious. Distributed architectures are already with us. The concept is not revolutionary. They now need to be codified into our space policy.

In aerospace, distributed architectures should be adopted as a national strategy rather than something that happens in small pockets based on single advocates or as an unintended consequence of program cancellations and technology failures. This is a logical progression from where we have come and where we need to go. Distributed architectures represent a realistic and affordable approach to field new capability and recapitalize critical infrastructure. ***The bottom line? More bang for the buck for U.S. taxpayers.***

I would really like to de-mystify fixed-price contracting. Fixed price contracting is not a panacea. It's not applicable to every mission and every challenge. It is also not about cutting quality, cutting testing, or cutting corners to cut costs. Instead, when used correctly, it is a powerful tool in the space acquisition toolbox.

The ***Geosat Follow-on 2***, recently awarded on fixed-price terms by the Navy, is an excellent example. GFO-2 is an operational environmental system that provides critical oceanographic altimetry data. It requires performance improvements, but not new development. Fixed price offers the Navy evolutionary advancements in capability, as well as remarkable cost predictability and value.

Over the past year, we've heard from many top defense and military leaders about fixed price as a cure for the nation's acquisition ills. But, I have to say that while this may be a notional desire at the top levels of government organizations, when you meet with specific customers to tout this capability — from NASA to DoD — not everyone is sold.

There is a perception — across our community — that fixed price means fixed capability. Pick your catch phrase — one-size-fits all... cookie-cutter approach... auto plant assembly line — these are all terms I've heard used to describe fixed-price with respect to space hardware. These descriptions are wrong.

Ball Aerospace has a 20-year heritage of delivering fixed price space systems, so I think I can speak with some expertise on this subject. We've implemented market- and customer-drive upgrades. The keys to fixed-price success are well-defined requirements and contractual terms, consistent expectations, experienced teams on both sides, easily-implemented change clauses and that all-too-uncommon factor, trust. Multiple contractors provide buses and components in this class — without government-funded new development. The competition clearly yields a lower cost and more taxpayer value.

I believe that approaches such as distributed architectures and fixed-price contracting will greatly advance our nation's ability to meet our space requirements within the confines of today's fiscal and programmatic challenges. At the same time, I am by no means advocating these methods for all procurements. There are proven alternatives out there that include alternative architectures, providers, systems and contracting vehicles.

The current administration has shown a willingness to take a different path. This is the right thing to do. It is true that not all the plans are in place, but they have expressed a willingness to stop doing the same things over and over again. We think that's a sign that we're headed in the right direction.

We must ensure that our opportunity costs are spent on the highest priority national interests, and not stick with what we've done just because we've always done it that way. We can field more capability for less, with an appropriate commitment to new strategies in our space policy, practices and doctrine.

We can expect different results if we exhibit different behaviors, and I believe we have the tools to get it done.

About the author

David L. Taylor is the president and CEO of Ball Aerospace & Technologies Corporation and a member of the Space Foundation Board of Directors. His full remarks may be read at *Space News* at... http://www.spacenews.com/commentaries/100601-stopping-insanity-space-endeavors.html.

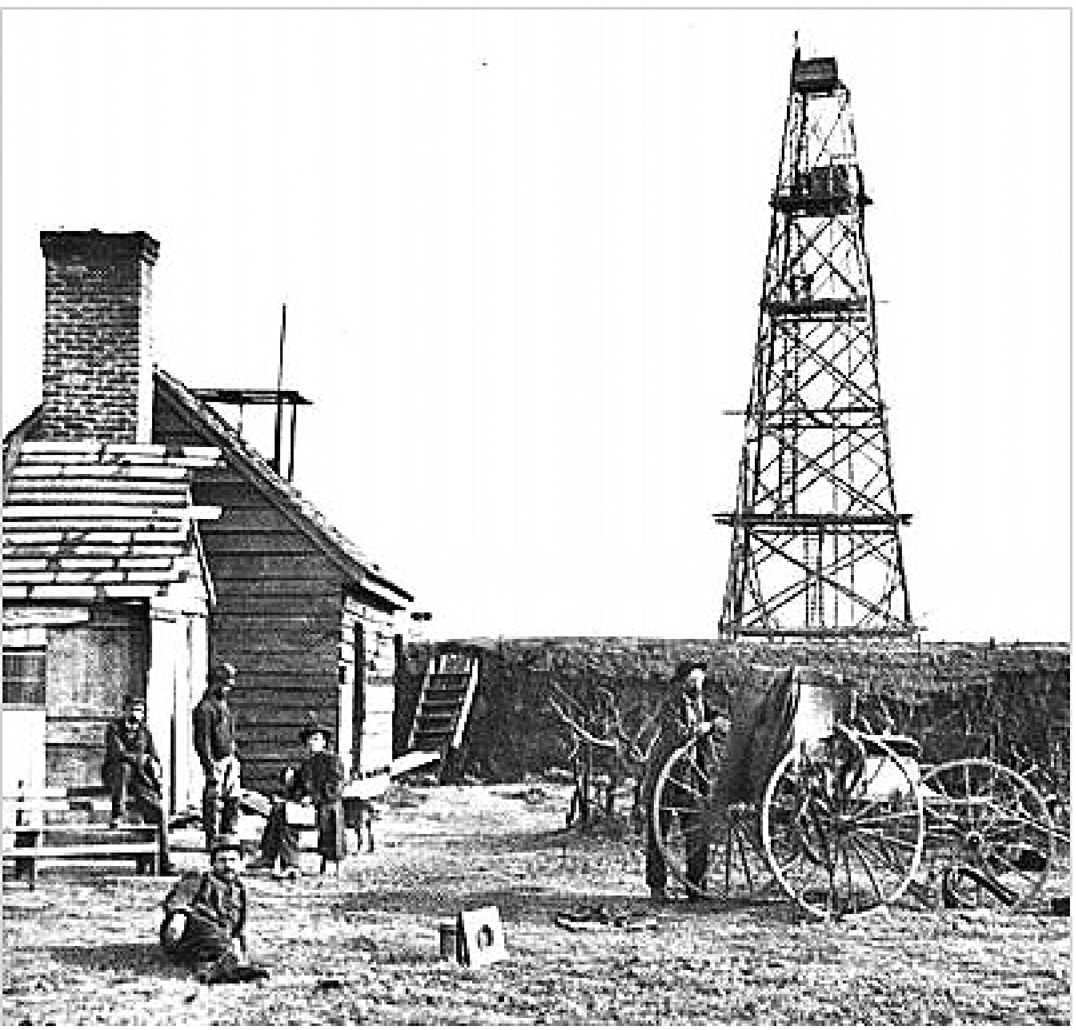
SWIFTLINK — BRINGING BROADBAND TO THE BATTLEFIELD

By Michael Bristol, Sr. VP, Government Solutions Group, TeleCommunication Systems, Inc.

In today's world, having superior satellite communications seamlessly tied to the Internet is vital to sustaining a military force and winning on the modern battlefield. The U.S. military relies heavily on this technology to gain a decisive advantage over our enemies. By bringing "broadband to the battlefield," our soldiers now have better situational awareness about their friends and foes than ever in the history of warfare.

Our military's most recent engagements, especially in South West Asia, have drastically changed the face of traditional communications requirements. The need for rapid dissemination of real-time intelligence and other vital content has transformed the military's communications requirements. Our forces rely on having access to high-speed secure voice, video, and data, anytime and anywhere. Our military leaders understand that data and the effective use of it, is a weapons system unto itself, especially in the highly mobile nature of today's conflicts.

Rapidly growing information requirements and the need to access Web-based enterprise applications in remote locations makes satellite communications systems increasingly more vital.



Signal Tower used during the Civil War (Source: Library of Congress)

Today's warfighters depend on space-based technologies to provide command and control communications, to employ high-tech sensors and data-intensive weapon systems, and to supply instant access to a vast array of real-time information. This capability puts crucial data at the fingertips of the soldier at critical times and in critical locations.

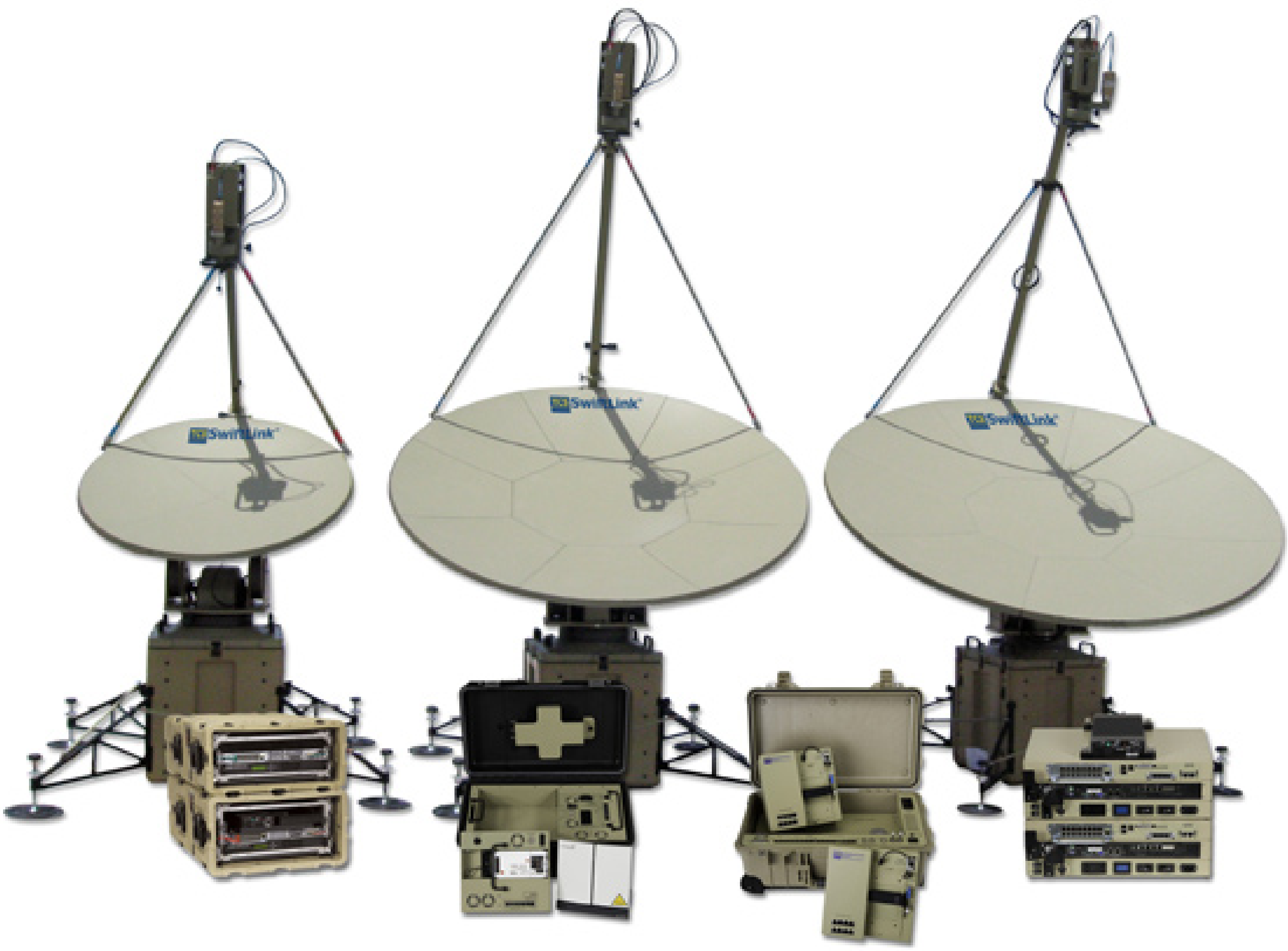
Soldiers today have instant access to live video images from UAVs and other intelligence sources. They can chat with bomb disposal experts on the other side of the world or seek medical advice to treat the wounded from medical experts anywhere around the globe. They are able to submit instant inquiries from biometric data collected in the field to help identify terrorists on the spot, and of course, they now enjoy better command and control when deployed in very remote parts of the battlefield. In fact, deployable satellite communications are even aiding in the health, morale, and welfare of soldiers by providing CNN feeds, VoIP calls home, email and other social networking sites.

For the past 20 years, **TCS** has been supporting the U.S. military by providing thousands of ***SwiftLink® Satellite Communications Systems*** and related support services that bring data up to the edge of the battlefield. Using both commercial and military satellites, SwiftLink systems extend the ***Global Information Grid*** by enabling *Defense Switched Network* (**DSN**) VoIP and Secure VoIP as well as *Secure and Non-Secure Internet Protocol Routing* (**SIPR/NIPR**). SwiftLink deployable communication products provide reliable, battle-tested, satellite-based, secure, and interoperable Internet Protocol (IP) communications.

Among TCS' most recent offerings, which are widely deployed with warfighters, are the ***SIPR/NIPR Access Point*** (**SNAP**) and ***Wireless Point to Point Link*** (**WPPL**) systems. SNAP VSAT systems provide *Beyond-Line-of-Sight* (**BLOS**) transportation of all types of IP data, both secure and non-secure, to include Voice over IP (VOIP), data and video to remote, austere camps with little to no organic support capabilities. SNAP systems provide secure and non-secure Internet Protocol access via either a 1.2-m small VSAT system or a 2.0-m medium VSAT system. The 1.2-m SNAP VSATs provide Ku connectivity, field upgradeable to Ka-band. The 2.0-m SNAP VSAT is a Ku- system, field upgradeable to both Ka- and X-band.

bandwidth in terrain-challenged environments. The "operator-friendly" modem utilizes dynamic bandwidth allocation, minimizing the need for configuration which results in a reduced need for training and troubleshooting in the field.

SNAP VSAT terminals consist of an RF VSAT satellite access sub-system and a baseband



Additional short-distance BLOS capabilities are available via the *SwiftLink Tactical Transportable Tropo* (**3T**). Providing long-haul, high-capacity, and low-latency technology economically, the 3T is a small, lightweight Troposcatter system that can eliminate the need for high-cost, recurring satellite

sub-system. The RF sub-system consists of an RF equipment case and an Uninterrupted Power Supply (UPS) case. Users have the option of using one of four baseband systems: rack-mounted, embedded, Stryper, or micro. All of the RF VSAT sub-systems can be matched with any of the baseband sub-systems to form a complete SNAP system. There are four different modem options, including **iDirect**, **ViaSat**'s ***Linkway S2***, ***Network-Centric Waveform***, and the **DISA JIPM** modem.

All TCS SNAP systems provide integrated, rugged, field-upgradable SATCOM solutions for wideband BLOS communications, therefore increasing the reach of local IP network traffic to distant stations, facilitating uninterrupted, secure communication via *SIPRNet*, *NIPRNet*, and *CENTRIX*. SNAP systems offer interoperability among multiple SATCOM terminals utilizing Ku-, Ka- C-, and X-band frequencies with L-band service available via the ***E500*** BGAN terminal.

The SwiftLink WPPL system enables warfighters to close the gap on the "last digital mile," pushing data services to the network edge using a low-cost alternative to expensive BLOS satellite communications. It enables secure, long-range LAN communications between a hub and deployed personnel.

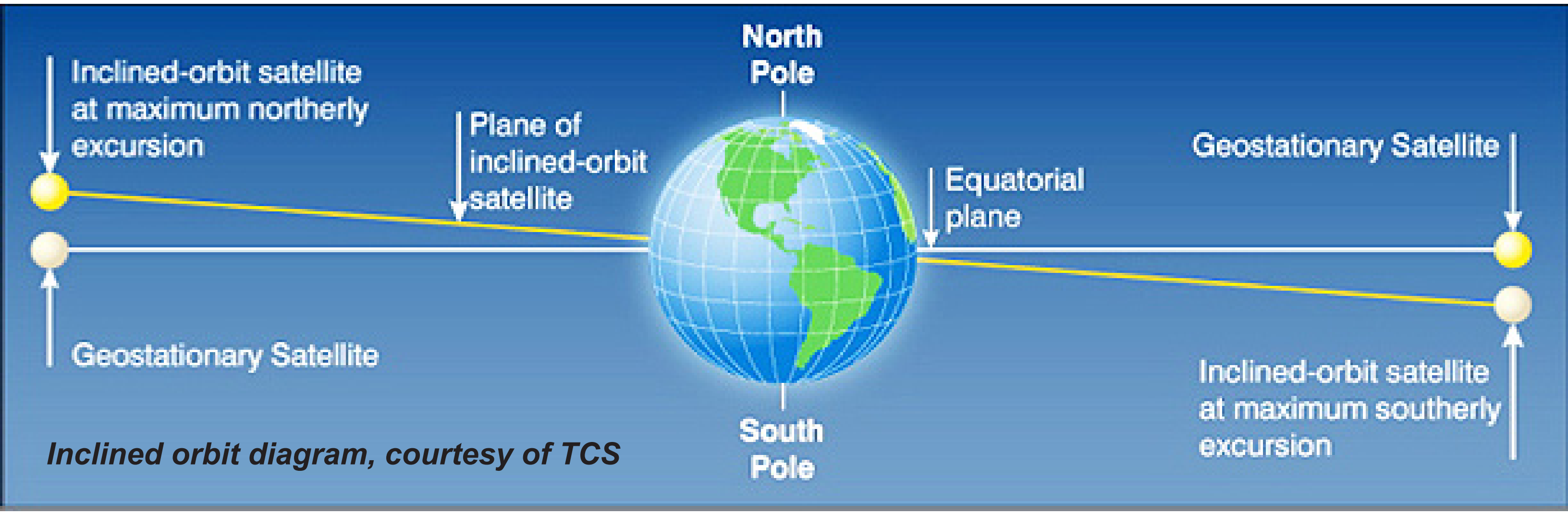
The WPPL system provides voice, video and data network service extension to remote areas, in addition to ground-based observation video backhaul to forward-operating bases. WPPL systems allow users to quickly field a rapidly deployable capability that maximizes ease-of-use, scalability, interoperability, sustainability, and current technology while minimizing operator training, embark footprint, and reoccurring costs. The WPPL system provides two radio frequency ranges through the use of two different radio systems: The **Harris** ***RF-7800W HCLOS*** radio and the **Redline** ***AN/80i*** radio. Both radios offer up to 80Mbps of Ethernet throughput, operating in 4.4-5.0 GHz and 5.470-5.725 GHz spectrums.

SwiftLink solutions, especially the small baseband and executive kits, have been used by non-conventional forces for more than ten years because of the variety of small form factors available. Examples of this include TCS' ***Single User Executive Travel Kit*** and the ***SDN-Lite 2300***, a secure data network kit that can serve a small team. One of the benefits of these kits is that they are designed to be small enough that they can pass through airport security screening with low-visibility, be carried on a commercial airliner, and then easily stored in an overhead compartment.

In some cases, it is common for customers to deploy a single individual or a very small advance party on a moment's notice with a lone user kit that either uses a BGAN or MicroVSAT Terminal (sub-1-m) system, so they have their own secure reach-back when they hit the ground. As the size of these teams grow, they can use one of the medium SwiftLink kits capable of handling a 15 to 20 man operation. Furthermore, as that team grows to include even more users, they can use larger, more robust SwiftLink systems which ultimately are integrated seamlessly into larger theater communications networks.

Most recently, TCS unveiled the ***SwiftLink Inclined Orbit Tracking Terminal***, which tracks inclined satellites as they move away from the boresight of standard antennas and provides capability for tracking the drift, resulting in accessible bandwidth at inexpensive price points. This military-grade, ruggedized solution is ideal for use in harsh, mountainous environments where the absence of bandwidth availability is of critical concern.

The Terminal is the first of its kind and is the latest addition to the SwiftLink VSAT family. The end-to-end solution is completely interoperable with existing SNAP systems and can be retrofitted in the field.



Inclined orbit diagram, courtesy of TCS

SwiftLink solutions are also in wide use by mainstream combat forces such as deployed *Brigade Combat Teams* (**BCT**s) and are a mainstay of their daily communications missions. SwiftLink supports today's common operational scenarios and deployments that reinforce remote *Forward Operating Bases* (**FOBs**) and *Combat Outposts* (**COPs**) where the only transportation in and out is by air.

This is especially the case in Afghanistan where SwiftLink solutions are perfectly suited for use due to their compact size fitting easily into a helicopter storage bay. Often the SwiftLink Flyaway VSAT terminals provide the only secure communications path to higher headquarters for command and control. Currently, a remote mountain top unit relies on SwiftLink solutions to receive situation reports, mission orders, intelligence briefings and data, and other applications such as the current local weather.

With Internet connectivity, these units have the same access to enterprise applications that exists back at home base, such as *Army Knowledge Online* (**AKO**) and the *DoD Personnel System*. Using IP-based connectivity via secure satellite communications provides units at the tip of the spear the same administrative functions that standard terrestrial networks provide back in the garrison.

In the field, SwiftLink solutions are ideal for providing communications in a hostile and highly mobile environment. SwiftLink systems can be set up in a matter of minutes and require very little training to operate. SwiftLink solutions have been used for several years now by *Military Transition Teams* (**MiTT**) to train Iraqi and Afghanistan military and police forces throughout the vast region of these two countries.

These systems are ideal for this kind of mission as they are packed in a few transit cases that can be easily transported by vehicles and helicopters and operated without the need for specialized skills/Military Occupational Specialties (MOS). Another use of these systems is real-time video. *Explosive Ordinance Disposal* (**EOD**) teams use SwiftLink VSAT terminals to transmit images and to download defeat instructions from the

Army EOD specialist, photo courtesy of WWW.ARMY.MIL, photo by Pfc. Kim, Jun Sub, 8th U.S. Army Public Affairs

analysts who remain in communication with the operational teams. Other security forces use SwiftLink systems to access criminal and terrorist databases, exchanging biometric data instantaneously. This is truly using data as a weapon system.

It is no secret that superior communications and instant access to data is a force multiplier. The U.S. military has recognized this fact and has made huge investments in infrastructure and equipment to capitalize on this revolutionary capability. Jumps in satellite technologies, the Internet, and advancements in ground equipment like SwiftLink, have transformed the way our military goes to war. Giving the warfighter the right technology to obtain critical intelligence on friendly forces and the enemy, in real-time, anytime and anywhere, is making all the difference in the world.

About the author

As Senior Vice President and General Manager of the Government Solutions Group, Mr. Bristol oversees TeleCommunication Systems' Government business divisions, including the SwiftLink® suite of products and services, SwiftLink® Global Satellite Services, Teleport Operations, World Wide Logistics Support and IT Professional Services.

OPERATIONAL COMMUNICATIONS

By Craig Harrison, Sales Support + Business Manager, Vizada Networks

Vizada Networks has earned its reputation as a defense communications specialist by being on the ground where its services are most needed, and by developing satellite capacity to ensure availability. Here's a look at a number of Vizada Networks projects. Additionally, the company has now restructured and has opened a new, dedicated, defense division.

In May 2001, **Vizada Networks** was awarded a contract for installation and operation, including manpower, of a satellite communication system connecting **NATO** headquarters in Brussels, with NATO peacekeeping forces in Kosovo, Macedonia and Albania (**KFOR**), and Bosnia Herzegovina (**SFOR**). The network has two hub locations; one located at **NATO HQ, SHAPE** and a second at **JFC Naples —** 18 locations are served with satellite and microwave communication. The network is fully operational and has proven to be highly reliable, while at the same time exceeding all required availability demands.

Vizada Networks' activity within the defense market has grown considerably in the years since the KFOR and SFOR networks were implemented, culminating in the formation of a dedicated, security cleared defense division that went on-line in January 2010. It operates out of Vizada Network's security cleared Oslo, Norway, headquarters as well as other substantial, security cleared location's in Norway, France and Slovakia. With own-staff, partners and personnel in all major theatres and other trouble spots, it offers a very global outlook.

The new division was formed, based on the company's success in the last decade. Vizada

Networks had become recognized as an organization of experienced people committed to serving the integrated telecommunications and satellite communications requirements of defense organizations such as NATO so it was only natural that the company's work in this specialist sector was ring-fenced to continue and strengthen its already strong customer focus.

Norwegian Defense Logistics Organization

It wasn't long before the new division hit an important milestone — the May, 2010, announcement that the company had signed a first of its kind agreement with the ***Norwegian Defense Logistics Organization*** (**NDLO**), which expanded existing co-operation by entering into a *Framework Agreement* for the supply

Norwegian Defence Logistics Organisation

of commercial satellite capacity and additional services. Vizada Networks has been contracted to provide the NDLO with worldwide coverage and support within SATCOM (VSAT) solutions and has become the preferred vendor for the organization's satellite communication requirements.

The framework agreement extends on a strong foundation of previous co-operation and was awarded based on Vizada Networks' wide ranging experience in providing defense communications for NATO and other military organizations in all current operational theatres including Iraq and Afghanistan.

A portfolio of worldwide coverage, strong technical solutions, a position as a turnkey defense communications networks supplier and the ability to meet the NDLO's future requirements for services and solutions in a quick and reliable manner were also attributes cited for the contract award.

Under the agreement, which commenced February 2010, Vizada Networks is to provide the **Norwegian Armed Forces** with on-demand satellite capacity in defined

NORWEGIAN ARMED FORCES

areas. The additional services Vizada Networks will supply include, but are not limited to; capacity on contractors satellite anchor stations, lease of land lines from **NDINI** (*Norwegian Defense Information Network Infrastructure*) to the providers' satellite anchor station, housing agreements for hosting NDLO's own equipment, and training and engineering services.

The Framework Agreement with Vizada Networks is the first of its kind for space capacity that the NDLO has entered and will ensure reliability and availability of communications for Norwegian military units around the world. Vizada Networks is among the top customers of the major satellite operators and is uniquely positioned to provide this service by offering the most appropriate solution of conveniently located and powerful C-, Ku- or X-band satellites available in the market, with particular emphasis on the North Atlantic and the Middle East regions.

NATO Consultation, Command and Control Agency — NATO Response Force

As an integrated SATCOMs and CIS systems specialist for the defense industry, it is vital that Vizada Networks offers reliable, high quality satellite capacity to ensure that all communications from all locations are received and acted on because at times — such really could mean the difference between life and death.

Together with additional operational partners, Vizada Networks represents the strongest satellite consortium available in the market. The consortium's vast combined available satellite capacity in all frequency bands provides NATO, the NDLO, and Vizada Networks' other defense customers, with a great deal of flexibility. This capability increases Vizada Networks ability to accommodate immediate and on-demand requests, and provide the unique northern coverage of the high power Spot1 beam on Intelsat IS-1002. Vizada Networks' position in the consortium also enables it to enter into discussions and develop non standard concepts to meet specific customer requirements if requested.

In addition to agreements and partnerships that provide the ability to ensure delivery of every single communication, Vizada Networks is also committed to deploying the right technology for the people on the ground and because the company is independent and not tied to any one manufacturer, it is capable of providing COTS or highly customized solutions for specialized missions or campaigns using multi vendor hardware and software.

Between 2006 and 2009, Vizada Networks designed and delivered a total of 21 *Deployable Satellite Ground Terminals* (**DSGT**) to ***NATO Consultation, Command and Control Agency*** (**NC3A**) for *NATO Response Force* (**NRF**) projects. The DSGT terminal is an X-band satellite system with a 2.4m motorized antenna system and all HW is installed in a transit case for easy deployment in the field, and fully integrated by Vizada Networks. The system is provided with Vizada Networks monitoring and control software and the company provides additional maintenance and upgrade support for the terminals whilst offering regular training courses for NATO

Pictured above: Mobile communications system and the tent portion of the SATCOM setup. Photos courtesy of Vizada Networks.

staff. The Vizada Networks Satellite Ground terminal is the standard NATO terminal currently used in operational theatres as part of the NRF communications segment.

In 2009 Vizada Networks started delivery of three identical and coherent mobile communications systems providing voice, video, and data services for a military organization. These systems are capable of rapidly providing CIS services in new operational areas, in existing areas of operation with limited CIS support or when there is a lack of network connectivity, following an outage due to an act of war or natural disaster. They are easily transportable by road, rail, sea, and air (C-130 roll-on roll-off) and are capable of rapidly deploying into austere environments on a moments notice and functioning 24 hours per day, 7days per week, for extended durations. Due to these mandatory requirements, Vizada Networks focused on minimizing the size and weight of the systems.

The mobile communications systems provide CIS services anywhere in a conflict zone without the need of external resources. One of the tactical vehicles has a mounted CIS shelter, with the most critical of the CIS equipment pre-wired and preconfigured for rapid deployment and rapid establishment of *Initial Operational Capability* (**IOC**) services upon arrival at the deployed location. Following the initial deployment, the remaining equipment can be transported to the deployed location to provide the *Full Operational Capability* (**FOC**) of the systems and vehicles.

In addition to the transmission, information systems, Voice & VTC, Vizada Networks also supplied the non-CIS segment of the solution, which included mobile redundant diesel generators, inflatable field tent systems to act as the communications control center, and the field power distribution system. All integration, implementation, installation and training was carried out by Vizada Networks.

NATO Virtual Silk Highway (SILK)

Vizada Networks' position as a communications supplier to NATO is also relevant for non-military operations, which is reflected in the company's position as a

Pictured above: SILK Project, Bamyan University, courtesy of Vizada Networks

supplier to the **SILK** project. Named after the *Great Silk Road* trading route linking Asia and Europe, the ***NATO Virtual Silk Highway*** (SILK) project was initiated in 2002 under the ***NATO Science for Peace and Security*** (**SPS**) ***Program*** that NATO's ***Public Diplomacy Division*** (NATO-**PDD**) is managing. Over seven years, it has provided affordable, high-speed Internet access via satellite to the academic communities in the Caucasus and Central Asian countries. The **Kabul University** in Afghanistan was included in 2006. Apart from predictable bandwidth, Vizada Networks delivers tailor-made service management tools, including security in order to protect the network from outside violations.

However, while the Caucasus and Central Asia sites are migrating to terrestrial connectivity with support by the **European Union**, the new NATO project 'SILK-Afghanistan' will initially extend the connectivity to seven provinces of Afghanistan. In early 2009, NATO-PDD tasked the NC3A to prepare an *Invitation for Bids* to the Industry for expanding Internet connectivity for universities and higher education institutes in Afghanistan. On 21 December 2009, the NC3A and NATO-PDD completed the signature process of the Letter of Agreement in support of the SILK-Afghanistan project. This is a significant step towards expanding broadband Internet connectivity for higher education throughout the provinces in Afghanistan and Vizada Networks will continue its prominent role in this next, key phase of SILK.

The signature of the Letter of Agreement between NC3A and NATO-PDD concluded the tender process which took place in spring/summer 2009. NC3A will act as Procurement Agent and manage the new contract with the selected service provider — Vizada Networks — to maximize the potential of the SILK-Afghanistan project for universities in Afghanistan.

Seven universities have been identified as the first beneficiaries of this expansion project in addition to the already serviced Kabul University and the *Government Media and Information Centre* in Kabul, affording them access the public Internet network and the **GEANT** network (*multi-Gigabit Pan-European data communications network*) dedicated to use for research and education purposes. Vizada Networks will ensure connectivity to the nine sites via satellite resources by installing satellite ground terminals at each site. Traffic will be anchored at Vizada Networks' teleport in Bratislava, Slovakia, and will connect from there to the European network.

Iraqi Ministry of Defense

Vizada Networks also has experience working direct with various *Ministry of Defense* customers around the world for internal/local telecommunications projects. A recent example of this approach is the contract announced in June of 2009 with the ***Iraqi Ministry of Defense*** for the supply and operation of a 129 site VSAT network in Iraq, one of the largest contracts of its kind in Iraq.

Among the main objectives of the Iraqi MoD is a consolidation of independent networks delivered by different companies and on different platforms. The consolidated VSAT network will be based on a standardized ***iDirect Evolution*** platform and Vizada Networks' part of the contract in Iraq is to deliver the HUB services, provide bandwidth services and operations and maintenance to the terminals, with the possible expansion of an additional 100 terminals. The space segment is being used to provide a solution consisting of TDMA, Mesh TDMA and SCPC services. The project had a very aggressive roll-out; 90 percent of the network was operational in 30 days.

Dedicated to Defense

The new Vizada Networks dedicated defence division is a result of the company's ongoing commitment to a key market segment where it supplies the largest, most demanding players. To achieve the success in the projects detailed in this article takes specialist knowledge and an ability to operate in high pressure environments in support of defence organizations with solutions and services, in the crisis areas of the world today. The company has a track record as a key supplier of SATCOMs and large system integration projects and has built an extensive understanding of NATO and other defense organization requirements, which ensures competence — regardless of the theatre of operations.

For more information regarding Vizada Networks, select this direct link to the company website.

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