SatCom For Net-Centric Warfare September 2008

# MilsatMagazine

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## + BRIGADIER GENERAL SUSAN K. MASHIKO

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**According to a recent Forecast International (FI) press release, the research firm projects that over the next decade, defense departments worldwide will invest some U.S. $30.6 billion on approximately 95 military satellites. The satellites to be developed and procured with this funding will range in size from large military satcoms, such as the Wideband Global Satcom and Advanced EHF, to the relatively small ELISA electronic intelligence satellite.**


Further information from the Company's latest informative release, ***The Market for Military Satellites,*** finds the U.S. military satellite dominating the market over the next decade, based on the country's vast financial capabililties to meet the requirements anticipated for the transformational process. Plus, high-priority reconnaissance and defense programs are already underway within the United States. FI also expects the ongoing trend of consolidation of European nations' satellite efforts, combined with increased military use of civil remote-sensing systems, will limit production opportunities in that region.

The analysis projects military satellite production in Europe, Japan, and Israel will account for 27 spacecraft, representing approximately 28.4 percent of the market covered in the report. In terms of value, production in those regions is expected to be worth U.S. $5.2 billion, or approximately 17 percent of market share.

Among notable indicators, in the United States, over U.S. $5 billion in military satellite production scheduled for the forecast period has yet to be contracted. Additionally, the massive ***GPS*** and ***Transformational Communications*** programs currently underway in the United States will provide a comparatively cushy fiscal pillow to fall back on during the current commercial downturn for local manufacturers such as **Boeing**, **Lockheed Martin**, and **Northrop Grumman**.

"In terms of unit production within the United States, Lockheed Martin outpaces its competitors as the number one military satellite manufacturer in the world over the next 10 years," said ***John Edwards***, Forecast International senior analyst and author of the study. Lockheed Martin is building the ***Advanced EHF*** constellation ***GPS III***, the Navy's ***Mobile User Objective System***, and the ***SBIRS High*** system.

The United States enjoys an advantage in the military space arena second to none, according to the FI report, and accounts for nearly 90 percent of global military space spending. "This lack of balance in the world military satellite inventory and in military space capabilities as

a whole is driving this dynamic market, and therefore the militarization of space will continue to be a vigorous and lucrative market." ***Edwards*** said. Unlike the market for commercial systems, military markets are less exposed to risk when it comes to the ebb and tide of the consumer, which in this case is the military itself. "Therefore, manufacturers of these systems, especially in the United States, can look forward to a strong military satellite market over the next decade," said Edwards.

The CEO of **Globecomm**, ***David Hershberg***, reveals his firm has succeeded with a U.S. $23 million contract with NATO to supply force tracking equipment. Additionally, Globecomm is one of six contractors selected to participate in the U.S. Army's U.S. $5 billion ***Worldwide Satellite Systems Program*** (**WWSS**). The Defense Communications and Army Transmission Systems and the Warfighter Information Network-Tactical Program jointly manage the WWSS out of offices located in Ft. Monmouth, New Jersey. "Globecomm will bring government agencies turnkey commercial satellite systems and associated support services for satellite terminals, including all hardware, software, field support services and technical information," added David. The company is exploring the possibililty of an acquisition in Europe to increase their European sales.


***Howard Hausman***, the President of **MITEQ**, believes "The military satellite business continues to change, improving capability, reliability, and cost per bit. As an example, in the past few years major changes have occurred in the availability of L-band Modems, which, when employed, alter the configuration of the respective Satellite Earth Station. Interfacing with the L-band modem is a single conversion Block Frequency Converter instead of a dual conversion device. MITEQ produces both types of converters and continues to support our customers using either technology.


**MITEQ's Multiband 1/3 Rack-Mounted Block Converter**

When asked about some of the advances this market segment could experience in the next year or so, Hausman replied, "The ability to adapt to flexible missions is a key necessity for successful military operations. To support these missions, companies such as ours are looking into integrated microwave subsystems and more compact packaging techniques for easier transportability and faster set up of Satellite Communications equipment.

There are the usual challenges to overcome. MITEQ's CEO said, "Bureaucracy, time to deployment, and funding are challenges that must be overcome to meet the communication needs of the military, but the major challenge is sustaining an industrial capability in an increasingly competitive international market. Military forecasting, longer term contracts, and customer support will help our industry maintain a capability to react to changing military requirements." MITEQ has made the commitment to maintain a flexible production capabilities while ensuring close communication with their customers to make their mission easier and more reliable.

**Numerex**' satellite division, **Orbit One**, uses their satellite technologies for mission critical military and commercial applications, entering this market as resellers of commercial technologies. Their initial applications encompassed general field logistics capabilities, which quickly

led to the development of tracking solutions specifically tailored to a variety of industries that ranged from cargo tracking to defense logistics.

***Michael Maret***, the Executive Vice President and Chief Operating Officer of the company, offered some insights into his company's operations and plans.

"We launched the SX1 satellite tracking tag in September 2007 as a direct result of real world perspectives gained during our direct dealings with the emergency response and military industries. Building upon our commercially developed tracking device, we incorporated additional features to meet the highly specialized needs of disaster recovery organizations.

"The resulting device is now the most rugged available, carrying the highest environmental ratings of any satellite tracking device, with the ability to withstand the harshest conditions, whether water, heat or fire — all with the smallest footprint — 7.25 x 3.25 x 1 inch (184 x 83 x 25 mm) and weighing only 13 ounces (369 g)."

Agreeing with Howard Hausman, Michael added, "Time to deployment and funding are two key challenges to any new implementation in government agencies, and were the contributing factors we considered while developing the SX1. This solution can be installed, activated, and operational in less than one minute, with the ability


to track and monitor any asset from continent to continent nearly instantly.

"Education on the need and value of new technologies is a challenge many organizations must overcome within the military and government entities.Decision makers now realize that new technology, processes, and solutions are a positive addition, offering them total visibility of their assets within their supply chain, and adoption rates are improving at a more impressive pace than in the recent past."

**G-RFID's active tag, the SX1, includes a field-replaceable lithium battery, an internal motion sensor and an integrated GPS chipset.**

Continuing along the "challenges that must be faced" theme, Michael adds, "The last major challenge we see is the lack of visibility into the 'last mile'. Many organizations use RFID technology, but are still unable to view their assets through to the last mile of their destination. RFID is only accurate when the shipment/container is within the depot. Once the asset leaves the land-based infrastructure, communication and tracking is lost, presenting a major obstacle for military logisticians, as well as commercial supply chain operators. Satellite tracking tags like the SX1, are not limited by distance from readers like traditional RFID. Orbit One satellite tracking is the 'where it is, not where it was' technology."

In taking a look at Numerex' upcoming plans, Michael told us, "We are developing an upgrade to our satellite tracking solution that will allow our customers to monitor additional components including temperature, disturbance, and even the ability to send alerts if it senses unauthorized activity. And Numerex' acquisition of Orbit One uniquely combined cellular with satellite solutions positioned Numerex as a single source for machine-to-machine (M2M) communication. The 'All-Terrain M2M™' option of cellular and satellite solutions is an increasingly attractive alternative for customers who require the added reliability and dependability of a 'back up' satellite network. This revolutionary shift in the remote monitoring and asset tracking marketplace, which is traditionally limited to cellular networks, improves the reliability, effectiveness and efficiency of all future deployments."

## Intelligence Input

The complexities of the military satellite world can be confusing, due to the heavy reliance on acronyms, procurement policies, and bureaucracy. To make sense of these channels of operation, a number of seminars, sessions, conventions and trade shows specifically orient themselves to parsing this information to those interested in this expanding industry.

One such leading show happens to be the **Global MilSatCom 2008**, described as the European hub for Military Satellite Communications. The show is celebrating its 10th Anniversary this year.

This is a great venue for assembling with leading milsatcom nations to discuss national developments, international cooperation and learn all about current operational challenges. Attend key presentations and determine which of your company's solutions can provide our warfighters with the technological products required to ensure their missions are successful.

You'll also be able to analyze the latest European, U.S., Astralian and UAE national programs to determine how best to supply their needs.

Other key areas include the ability to directly engage with decision makers and leaders from 20 countires... absorb information about the latest technological advances from industry leaders and then benchmark them against military ops experiences... learn about future technologies and how they will impact current ops... delve into policy frameworks and procurement strategies... and learn about Satcom on the Move as well as SatCom on the Halt.

There is a ***MOST*** impressive speaker list for this exposition...

- Rear Admiral *Victor C. See*, Jr., USN Commander, **Space and Naval Warfare Systems Command**, *Space Field Activity* (**SPAWAR**) and Director, *Communications Systems Acquisition and Operations Directorate* (**COMM**), **National Reconnaissance Office** (**NRO**) and Program Executive Officer (PEO) Space System, **Department Of The Navy**
- Lieutenant General *Pietro Finocchio*, General Director, *General Directorate for Telecommunications, IT and Advanced Technologies*, **Ministry of Defence**, Italy

- Brigadier (Ret'd) *Tim Waugh*, *CBE SATCOM and Deployable CIS Team Leader*, **NATOC3 Agency**
- Brigadier General *Ian Fordred*, Director, *Information Communication Technology* (**DICT**) in the *Command and Management Information Systems Division* (**CMIS**), **South African National Defence Force** (**SANDF**)
- Commodore *Eric Fraser* RN, Assistant Chief of Staff J6, **U.K. Permanent JointHeadquarters**
- Colonel *Patrick H. Rayermann*, Chief, *Communications Functional Integration Office*, **National Security Space Office**, Pentagon
- Colonel *Robert Champagne*, Head of *CIS Branch*, **Canada Operational Support Command** (**CANOSCOM**), **Department of Defence**, Canada
- *Peter Kerr*, Head, *Satellite Communications Discipline*, *C3I Division*, *Defence Science and Technology Organisation* (**DSTO**), Australia
- Lieutenant Colonel *Flemming Agerskov*, Head, *CIS Branch*, **Army Operational Command**, Denmark
- *Michael Pascaud*, *Syracuse III Program* Manager, **DGA**, **Ministry of Defence**, France
- Commander *Alexandre Baillot,* Military & Civil SatCom Leader, *Space & Joint Systems Division,* **French Joint Staff**
- Major Dr. Eng. *Mohamed N. Mubarek Alahbabi*, Information Communication Technology (ICT) Advisor, **General Headquarters,** United Arab Emirates
- Armed Forces Commander *Chris Cheesman* RN, Capability Team Leader, *DEC CCII*, **Ministry of Defence**, U.K.
- Dr. *Oystein Olsen*, Principal Scientist, *Communication Information Technology Systems*, **Norwegian Defence Research Establishment.**

**Global MilSatCom** will also be presenting associated events, such as *Understanding Ku- and Ka-band* and *SATCOM-on-the-Move Antenna Systems*. If the success of SMI's 2007 exhibition is any indication, MilSatCom 2008 will be bigger and better! Select this link for further conference and registration details. *Select the graphic on Page 6 for further details.*

I have compiled more information on a number of conferences occuring this year that possess a MilSatCom focus — this content may be read in a later article in this issue of ***MilsatMagazine.***

## *InfoHUD*

A number of news items highly relevant to those in the milsatcom industry appeared in our daily *SatNews* briefings. Offered are the headlines and short inclusions of the items, with a direct link to the story in *SatNews* for your further edification. Simply select the first sentence to travel to the story. News items are presented in alphabetical order...

- **Actel Corporation has added new ProASIC3 and ProASIC3EL FPGAs (field programmable gate arrays) to its military-qualified product offerings.** Verified to operate across the full military temperature range (-55 to +125 degrees Celsius) and ranging in density from 600,000 to 3-million system gates, the new low-power devices are immune to neutron-induced configuration upsets ("firm errors"), saving board space and minimizing complexity in the system, Actel officials say.

- **A new report from ASDReports entitled Military Communications and COTS 2008 describes both the technologies and the relevant markets in detail**, with pertenent data and informed opinions and is valuable to both defense procurement operations and to relevant technology providers.
- **BBN Technologies has been awarded U.S. $8.9 million in funding by the Department of Defense's Defense Advanced Research Projects Agency (DARPA) under the third phase of its Disruption Tolerant Networking (DTN) program.** This latest award follows BBN's successful completion of Phases One and Two, which resulted in a working prototype system.
- **The Boeing Company [NYSE: BA] has completed a U.S. $10 million, 20,500 square-foot satellite Mission Control Center (MCC) in El Segundo, California.** The MCC can manage as many as four commercial or government satellite missions at the same time and replaces another Boeing

facility in El Segundo that was smaller and had limited capacity. The U.S. Air Force is expected to be the first customer of the new center and will use it to manage an element of the military's Wideband Global SATCOM (WGS) mission. Boeing is currently manufacturing satellites for the WGS mission, the Global Positioning System, and the Space-Based Space Surveillance system.

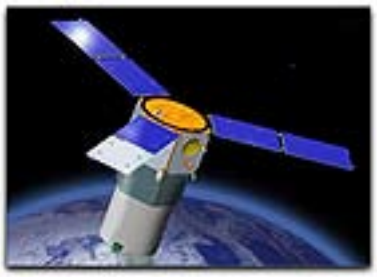
- **CAP Wireless, Inc. has announced the debut of their CHPA0618-1 ultra-broadband power amplifier for broadband military platforms within the defense electronics and homeland security industries.** The unit incorporates gallium arsenide (GaAs) monolithic microwave integrated circuit (MMIC) technology into CAP's patented Spatium™ broadband spatial combining architecture.

- **DataPath, Inc. has been awarded U.S. $1.7 million to provide field services support for the Ramstein Air Base satellite communications teleport operated by the U.S. Air Force.** This funding continues DataPath's support of the Ramstein teleport and is from exercised options on an existing delivery order. The teleport is a vital Defense Information Systems Agency (DISA) hub for military communications and links military X-band networks with commercial Ku-band networks to enhance overall bandwidth capacity and provide network-centric, high-bandwidth capabilities to U.S. forces. DataPath installed the teleport and has supported it for seven years.

- **DataPath, Inc. has been awarded U.S. $1.9 million to continue providing field services for DataPath Deployable Ku Band Earth Terminals (DKETs) at a key communications hub in Iraq.** The DKET systems were built and installed by DataPath and are used by the U.S. military as critical satellite communications (SATCOM) hubs that deliver high-bandwidth capabilities on the battlefield.

- **L-3 Electron Technologies, Inc. (L-3 ETI) has debuted their model 8923H dual-band 300W 30 GHz/175W 45 GHz Traveling Wave Tube (TWT) amplifier.** Designed for military SATCOM uplink applications, the new TWT has a remarkably small footprint and weighs less than four pounds. L-3 ETI's model 8923H TWT operates over the 30 to 45.5 GHz frequency range, including the 33 to 36 GHz radar band, and incorporates focus electrode modulation to allow CW and pulsed operation.

- **Newtec's Tellitec® IP software product TelliNet has been selected by satellite broadband supplier ND SatCom to be integrated with the SkyARCS platform to provide fast and secure Intranet access via satellite to the Bundeswehr (German Federal Armed Forces).** ND SatCom Defence is the main supplier of military satcom solutions to the German Armed Forces.
- **Coming to NASA's Wallops Flight Facility, Wallops Island, Virginia is a first — the Tactical Satellite-3 mission is scheduled to demonstrate rapid data collection and transmission to the combatant commander in the theater of interest.** During this upcoming flight a new capability will be demonstrated and tested; that of employing a hyperspectral imager with a space-based, onboard processor to obtain and send images within minutes to the war fighter on



the ground. Raytheon constructed the Advanced Responsive Tactically Effective Military Imaging Spectrometer, or ARTEMIS, hyperspectral imager.

- **A landmark announcement by the U.S. Air Force and the State of Florida today states that they will fundamentally expand the state's position and prominence in aerospace and the space industry in all three key sectors**: civil, military and commercial, thereby broadening participation in space-related activities. Launch Complex 36 at Cape Canaveral Air Force Station, subject to completion of the environmental impact analysis process, will be re-built as a multi-use vertical launch complex capable of supporting several launch vehicle configurations ranging from light to medium-lift into low-Earth orbit and beyond.


- **ViaSat Inc. received a U.S. $9.3 million award from the Defense Information Systems Agency (DISA) to continue the development of the UHF SATCOM Integrated Waveform Channel Controller.** This second phase of the Integrated Waveform (IW) development enables demand assigned services on UHF SATCOM networks to support new applications that require better performance and higher channel throughput. IW, a requirement of the Department of Defense (DoD) Standardization Program, is designed to prolong the life of the UHF Demand Assigned Multiple Access (DAMA) SATCOM System through a series of network upgrades.

- **iDirect, a subsidiary of VT Systems Inc. (VT Systems), has launched its Series 12200 Universal 4-Slot Industrialized Hub, which allows network operators to implement and manage a mobile satellite network in the field.** The new 4-slot hub will operate using iDirect's enhanced iDS 8.3 software, engineered for use in mobile applications. **Additionally, TigrisNet, a U.K. based global provider of IT solutions and satellite communications, has installed an iDirect Series 15000 Universal Hub and 50 Evolution X3 Satellite Routers to power an enhanced DVB-S2 network with Adaptive Coding and Modulation (ACM) for corporate and government customers in Iraq and the Middle East.** iDirect is a world leader in satellite-based IP communications technology.

My thanks to those who took the time to contribute their insights for INCOMING. Author writings do not necessarily reflect the views or opinions of *SatNews* Publishers—

*Hartley Lesser, Editorial Director*

MSM

*by Jos Heyman*
***Tiros Space Information***

**As of July 1, 2008 the nations of the world had launched a total of 6,040 satellites and spacecraft since the first launch of Sputnik-1 on October 4, 1957. Of these, 2,748 can be considered as having purely military applications. This total excludes crewed missions that were used to undertake, amongst others, military experiments. It also excludes military scientific satellites and satellites that were primarily used for other purposes with military applications as a secondary objective.**

There is no doubt that the concept of satellites would not have existed to the extent that we now know were it not for the military services of the United States and the former Union of Socialist Soviet Republics (USSR). Not only did these military services envisage the advantages of using space for military purposes before the launch of the first satellites, but spaceflight would also have been impossible without the rockets developed for the military for use as ICBM missiles. These rockets, and their derivatives, proved essential for access to space.

It is believed that the engineers and scientists of Nazi-Germany were the first to consider the possibility of placing a (piloted) satellite in orbit for military reconnaissance purposes. Such a satellite was to be launched by their **A-12** launcher, a development of the **A-2** missile. Although no such satellite did materialize, this interest continued after the war when the military services of the United States and the USSR made extensive use of satellite-based surveillance systems to provide an around the clock surveillance

| | U.S.A. | USSR/RUSSIA | FRANCE | GERMANY | JAPAN | U.K. | NATO | Total |
|---|---|---|---|---|---|---|---|---|
| Reconnaissance | 259 | 809 | 3 | 5 | 5 | 0 | 0 | **1081** |
| Elint | 74 | 131 | 0 | 0 | 0 | 0 | 0 | **205** |
| Early warning | 32 | 99 | 0 | 0 | 0 | 0 | 0 | **131** |
| Ocean surveillance | 53 | 85 | 0 | 0 | 0 | 0 | 0 | **138** |
| Radar calibration | 6 | 161 | 0 | 0 | 0 | 0 | 0 | **167** |
| Communications | 79 | 566 | 2 | 0 | 0 | 0 | 8 | **668** |
| Meteorological | 45 | 0 | 0 | 0 | 0 | 0 | 0 | **45** |
| Navigational | 100 | 124 | 0 | 0 | 0 | 0 | 0 | **224** |
| Other | 32 | 57 | 0 | 0 | 0 | 0 | 0 | **89** |
| **TOTAL** | **680** | **2032** | **5** | **5** | **5** | **8** | **13** | **2748** |
| | | | | | | | | |

***Table 1 — Military Satellites ****

of each other's territory during a period we know as the Cold War. Such surveillance was tolerated by both superpowers, if not willingly, by the fact that there was relatively little that could be done about it.

Over time, various types of military application satellites have emerged, with the major applications being:

- Reconnaissance satellites, which provide photographic or electronic images of the surface of the Earth;
- Electronic intelligence gathering systems, which provide information on radio communications;
- Early warning systems, which provide advanced warning of missile attacks through the detection of missile exhaust plumes;
- Ocean surveillance systems, which locate and monitor the movements of naval vessels;
- Radar calibration, which simulate incoming missiles and test the ground based early warning systems;
- Communications, which provide battlefield communications;
- Meteorological, which provide meteorological information;

Navigational, which provide accurate locational information for ground, naval and airborne forces; and Other, such as satellites for anti-satellite testing, the detection of nuclear explosions and other minor military purposes.

As can be expected, details of military satellites, such as their primary objective, their orbits, and their instrumentation, are treated as classified information.

However, as international agreements require the identification of all satellites through an **International Designation** (e.g., 2008 012A, the latest recorded United States military satellite), the existence of military satellites, along with their launch dates, is known.

To cloak these satellites, the United States and the USSR/Russia have resorted to evasive practices.

The USSR/Russia uses the multi-discipline **Kosmos** series to 'hide' its military satellites. These satellites

** The table 1 figures above are based on the author's interpretation of what a satellite/spacecraft is, as well as his interpretation of the primary objective. As such, figures quoted in other reference sources may vary slightly. The USSR military obtained meteorological data from the civilian Meteor system.*

are invariably described as carrying 'scientific instruments, a radio system for precise measurement of orbit elements, and a radio telemetry system'. The Kosmos series, which had reached **Kosmos-2440** by July 1, 2008, was also extensively used to cloak a range of non-military satellites.

Initially, the United States did identify its military satellites by name. However, starting in early 1962, the military authorities halted the assignment of names to military satellites. That was until 1984, when they designated their satellites in a USA series that has now reached **USA-201**.

How, then, do we know the objectives of military satellites and, in some cases, their instrumentation?

A first indication is the vehicle that is used for the launch of a military satellite. Such a vehicle cannot be 'cloaked' — for obvious reasons — and can, therefore, provide a first indication of the objective of the military satellite. Another indicator is the launch site itself. Satellites to be placed in a geostationary orbit, such as military communications satellites, are invariably launched from near-equatorial sites such as **Cape Canaveral** and **Baikonour**, while reconnaissance satellites are, as a rule, launched into a polar orbit from launch sites such as **Vandenberg** and **Plesetsk**.

More information on the satellite's objective can be gathered from the orbit. Although the orbit is not normally announced, **NORAD** publishes the orbital data and has always been quite happy to make known this information for USSR/Russian satellites. Other information sources include visual and radio satellite observations conducted by amateurs.

*Artist's concept illustration of a DSP satellite (USAF)*

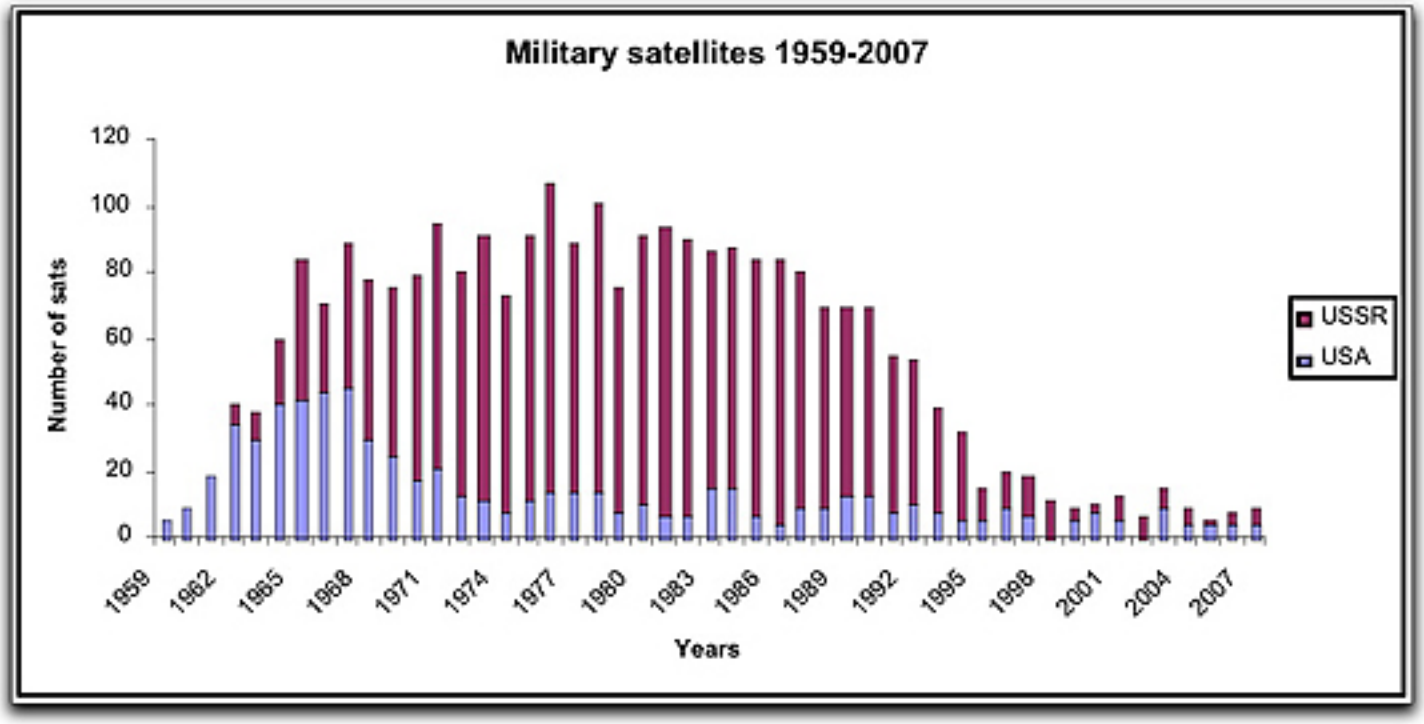



*Table 2 — Military satellites by year*

Finally, there are the occasional snippets of information in press releases, scientific papers, and other references that, in the hands of a gifted space historian, can be used to slowly gain a complete description of a satellite or a satellite series, including the classified code names. Such a process might not be completed until many years after that satellite was launched. Finally, after many years, the information may be declassified as a result of Freedom-of-Information requests.

For reasons to which we are not privileged, some programs are better documented than others, in particular the ***Defence Support Program*** (**DSP**) system of early warning satellites. In fact, the DSP system is unclassified.

In the early days, observing satellites was in fashion. One of the early observers was an English science teacher named *Geoff Perry*. Located in the town of Kettering, England, Geoff and senior chemistry teacher *Derek Slater* used radio receivers to listen to transmissions of satellites. Their first attempt to receive signals was from **Sputnik-4** and, over the period of a week, they made a number of recordings.

Then, one day, they received the satellite's signals later than expected and concluded the satellite must have moved to a higher orbit. Indeed, the spacecraft had, but unintentionally so. The USSR had tried to recover a spherical capsule with a dummy cosmonaut, but the satellite was facing the wrong direction and when the rocket fired, Sputnik-4 went into a higher orbit. Later on, Geoff Perry made extensive use of his students in the observation programs — it was part of their educational program.

On March 17, 1966 the USSR launched **Kosmos-112**. From the observation data obtained by Geoff Perry, it became apparent there was something different about the spacecraft besides the satellite's departure from the standard 65° inclination to 72°. He exam-

ined the ground track and it was obvious it could not have been launched from **Baikonour** or **Kapustin Yar**, the known launch sites. With further observations of **Kosmos-129**, on October 14, 1966, again indicating the launch had initiated from a more northerly launch site, Perry decided to publish his observations, pointing towards a launch site at a location now known as Plesetsk.

There is no doubt that the United States military was aware of the Plesetsk launch site but were not in a position to reveal their knowledge. The independent publication of the findings of Geoff Perry allowed others to become aware of the information. These included Dr. *Charles S. Sheldon II* of the *Congressional Research Service* of the **U.S. Library of Congress,** who included details of this new launch site in his work for the U.S. Congress.

Over time, Perry established a worldwide network of global observers, loosely referred to as the **Kettering Group**. The data generated by these amateurs became an essential part of the identification of the USSR's military satellites.

| System | Objective |
|---|---|
| GOES | Meteorology |
| Globalstar | Communications |
| Ikonos | Earth observation |
| Inmarsat | Maritime communications |
| Iridium | Communications |
| Landsat | Earth observation |
| NOAAO | Meteorology |
| Orbcomm | Communications |
| PanAmSat | Communications |
| Quickbird | Earth observation |
| SPOT | Earth observation |
| Telstar | Communications |
| TDRSS | Tracking and data relay |

*Table 3 — Major civilian satellites in U.S. military use*

These days, visual observations continue to be recorded by a group of about 20 amateurs, or hobbyists, around the world. The spokesman of this informal group is Canadian *Ted Molczan*. Equipped with little more than a pair of binoculars, or a telescope on a tripod, a stop watch, and star charts, he and his fellow satellite-gazers have tracked more than 190 military satellites flying in secret orbits between 2,000 and 40,000 kilometers above the Earth.

U.S. officials prefer hobbyists not publish their findings, suggesting that foreign countries try to hide their activities when they know a spy satellite will be passing overhead. Ted has stated that, "In a democracy, there's a necessary and healthy tug-of-war between people in government who tend to want to make things secret and the public's need and right to know." Ted's informal group began to concentrate on military satellites after the United States ceased publishing the orbits of its military satellites in June 1983. Among their achievements was the identification of the first U.S. stealth satellite that was supposed to be invisible to radar and optical tracking.

Over the years, the number of military applications satellites being launched each year has dramatically decreased. This decrease can be attributed to several unrelated causes.

First of all, improved technology has made the operation of the satellite more sophisticated — this extends their operational life. For instance, early reconnaissance satellites relied on photo return capsules and had an operational life of about one to two

| HOSTILITIES | Killed | Days | Average | Ref |
|---|---|---|---|---|
| World War II (Sep 1, 1939, to Aug 15, 1945) | 1,554,500 | 2,175 | 714.7 | 6 |
| Korean War (May 25, 1950, to Jul 27, 1953) | 285,241 | 1,159 | 246.1 | 7 |
| Vietnam War (Jan 31, 1965, to Apr 30, 1975 | 58,393 | 3,741 | 15.6 | 8 |
| Iraq War (Mar 20, 2003, to Aug 1, 2008) | 4,439 | 1,962 | 2.3 | 9 |

***Table 4 — War casualties***

weeks. These days, with the development of image transmission and radar technology, these satellites can remain operational far longer.

The demise of the USSR, and subsequent thaw of the Cold War as well as the lack of funds in Russia, has resulted in a significant reduction in the number of military satellites launched by Russia.

Under the provisions of the **United Nations**' Outer Space Treaty, which was signed by the United States, the United Kingdom, and the USSR on October 10, 1967, outer space cannot be used to place nuclear weapons or other weapons of mass destruction in orbit. The **1972 Anti-Ballistic Missile Treaty** set further limits on the use of exo-atmospheric interceptor deployments in space. The net effect was to put the brakes on development of space weapons and preserve a relatively tranquil domain.

Despite this, some military experiments have been associated with space warfare, i.e., a space-to-Earth, space-to-space, or Earth-to-space intercept/destroy scenario.

During the period 1966 to 1971, the USSR launched a series of Kosmos satellites to test the so called ***Fractional Orbit Bombardment System*** (**FOBS**), whereby multiple warheads would be deployed. In these tests, a shell representing the nuclear warhead of a ballistic missile was placed in orbit and recovered over the USSR within one orbit to study the effects of re-entry on the dummy warhead. Tests were suspended in 1971, possibly because the techniques were found to be impractical.
In addition, in 1967, the USSR commenced testing of an anti-satellite (ASAT) system. The tests consisted of placing a target vehicle into orbit and having this target overtaken by an interceptor, which could destroy the target by exploding itself. No weapons of any sorts are believed to have been carried in these tests, which had a success rate of 70 percent. A second series of tests commenced in 1976 and possibly included a new guidance system, which was not susceptible to jamming. The success rate of that series was only 57 percent.

Similar to the USSR, the military forces in the United States military forces have experimented with anti-satellite weapons as well. In the late 50s and early 60s, a number of anti-satellite systems were studied under the code names **Saint**, **Insatrac**, **Spad** and **Bambi**. The latter proposal envisaged the placing in orbit of 100,000 satellites to intercept ICBM missiles. Between 1964 and 1968, anti-satellite weapons were tested with sounding rockets. Thirteen such sub-orbital launches were conducted during the period using Thor ballistic missiles.

The first major achievement came on September 13 1985, when an **ASAT** missile fired by an F-15 fighter blew up the scientific **P78-1** satellite, which was launched on February 24, 1979. Another four firings of this missile, developed by **Vought**, were conducted, but against pre-determined points in space rather than physical targets. Further tests were to be held in 1986/87. Two specially instrumented target satellites, known as **ITV-1** and **ITV-2**, were launched on December 13, 1985. The satellites, also known as **USA-13** and **-14**, were to have been destroyed by ASAT missiles, but a moratorium on ASAT weapons prevented these tests from occurring. A further three ITV satellites were scheduled for 1989/1990, but were never launched.

In early 2008, an opportunity occurred that allowed

anti-satellites techniques to be tested in a lawful way. A military reconnaissance satellite known as USA-193 (or NROL-21) had been launched on December 14, 2006. The satellite was probably to have been placed into a higher orbit of 20,000 km but it has been suggested it was abandoned in an orbit of about 350 km altitude due to failure to establish communications with the satellite. By February 11, 2008 the orbit had reduced to about 250 km, with a daily reduction of 1 km. The daily reduction was to increase as the spacecraft descended and it was estimated the spacecraft would decay in mid March of 2008. Concern about the 500 kg of hydrazine on board, which was believed frozen solid, led to the decision to destroy the spacecraft with an SM-3 missile fired from the ***USS Lake Erie*** on February 21, 2008. The missile was fired from a location in the Pacific Ocean west of Hawaii when USA-193 was in a 242 x 257 km orbit. The spacecraft was successfully destroyed and resulted in more than 80 pieces of debris that burned up in the atmosphere over the next few days.

China conducted an anti-satellite test on January 11, 2007 when the **Feng Yun 1-3** meteorological satellite that was launched on May 10, 1999, was destroyed by a medium range missile fitted with a kinetic kill vehicle — this resulted in more than 900 pieces of debris.

There is currently a trend towards the use of unclassified (including commercial) satellites to acquire vital intelligence, surveillance, and reconnaissance data for the military, replacing most of the uses of the highly classified satellites. This trend started during the 1991 Persian Gulf War when commanders on the ground found it difficult to acquire adequate access to data from intelligence satellites.

There will, however, always be a place for dedicated satellites in the field of surveillance and early warning, and the proposed SBIRS system is evidence of that need. The SBIRS satellites will be fitted with scanning sensors that will provide a wide range of information concerning mobile launchers and missile tracking as well as the more humble tasks such as spotting tanks and other ground vehicles.

There is also a trend toward smaller satellites that can be developed and launched at short notice and from mobile locations.

What has been the impact of satellites on war operations? Casualty data of World War II, the Korean War, the Vietnam War, and the current war in Iraq reveals a dramatic reduction in the number of average casualties per day. (***See Table 4 below***).

This reduction cannot be attributed to satellites only; rather, it is the result of an overall advancement in warfare technology. Furthermore, this reduction must be compared against the nature of the conflict, in particular World War II, where the war was conducted on multiple fronts. In particular, in the current Iraq war, it must be recognized the opponents do not have access to space based resources (as well as many other resources).

Nevertheless, we can conclude that the military space applications have had a positive impact on the incidence of war. They have contributed toward a reduction in the number of casualties and also, in the opinion of the author, toward the prevention of turning the Cold War turning into a Hot War. **MSM**

***About the author***

*Jos Heyman is the Managing Director of Tiros Space Information, a Western Australian consultancy specializing in the dissemination of information on the scientific exploration and commercial application of space for use by educational as well as commercial organizations.*

*An accountant by profession, Jos is the editor of the TSI News Bulletin and is also a regular contributor to the British Interplanetary Society's Spaceflight journal. For more information regarding the TSI news bulletin, please select the logo below...*

Tiros Space Information

*by Andrea Maléter and Chad Frappier*
***Futron Corporation***

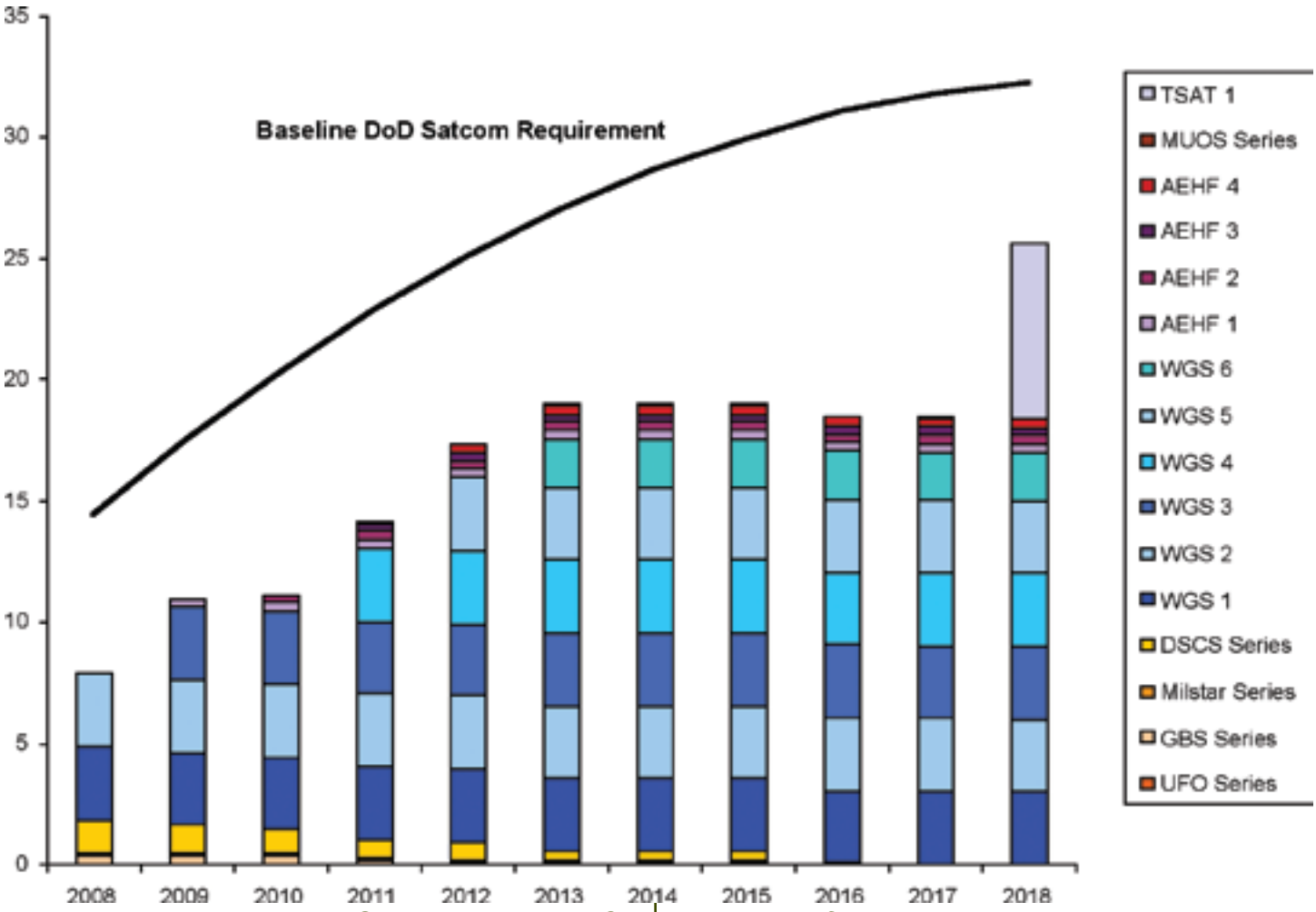
**United States military use of satellite communications has grown exponentially over the past decade through extended utilization of military satellites as well as unprecedented expansion in the use of commercial satellite capacity. Leveraging what was a period of low utilization of commercial systems, the Department of Defense was able to work with commercial operators to reconfigure their systems and make satellites available where needed, to the point that currently some 80 percent of the satellite capacity used by the DoD is leased from commercial systems.**

The uniqueness of this situation has not been lost on U.S. military planners, and despite the arguments that continued reliance on commercial capacity might produce the most efficient and economically sound approach for the future, plans continue to move back to a more internally driven solution.

So what's behind all of this use, and the future growth? And what are the DoD's options to address the emerging needs?

First to DoD's own systems, what's in place now and what's coming on-line.

As shown in the chart on ***Page 22***, the DoD's MilSatCom systems are at a critical stage, with older fleets reaching end-of-life as new programs start to come into service. Over the next 5-10 years, the **DSCS**, first-generation **GBS**, **Milstar** and **UFO** systems will either cease operations entirely (DSCS and first-gen-




*Source — Futron Corp. analysis of DoD data*

eration GBS) or be reduced to one or two spacecraft (Milstar and UFO). In their place the Wideband Global SATCOM (WGS, which includes new GBS capability), Advanced EHF (AEHF) and Mobile User Objective System (MUOS) constellations will be launched, each meeting different types of needs, and with much greater capacity than the predecessor systems. This capacity is important, as the chart also shows, to close the gap between MilSatCom capabilities and the baseline demand forecast from DoD.

## What Are the New MilSatCom Systems?

WGS, built by **Boeing**, is the first of the next generation systems in orbit, providing Ka-Band and X-Band capacity, with each satellite having the capability of carrying 2.1-3.2 Gbps of data, some ten times the capability of the **DSCS III** spacecraft. The first WGS was launched in October 2007, with the second scheduled for launch in 2008 and these, together with the third, will create a global network of two-way interactive communications and broadcasting. The fourth and fifth satellites will incorporate enhanced radio frequency bypass capabilities designed to further support the ultra-high bandwidth and data rates demanded by unmanned aerial vehicles. A sixth satellite has also been ordered by DoD in conjunction with the Australian armed forces.

The next new system to be deployed is the **AEHF**, being built by **Lockheed Martin**, and scheduled for launch starting in 2009 to replace the **Milstar** constellation. Operating in the EHF/SHF bands, enhanced by inter-satellite links, each of the four satellites will be capable of transmitting some 400 Mbps when fully loaded, with link rates of approximately 8 Mbps.

A unique aspect of the AEHF system is that it is a multinational effort with partners from Canada, the U.K., and the Netherlands, each of which will access the AEHF network through their own terminals. While enhancing the value of the constellation, this international partnership means that the capacity of the AEHF system is not entirely available to the DoD.

The third new constellation is **MUOS**, also being primed by Lockheed Martin to provide expanded tactical communications capabilities primarily to the U.S. Navy. Five satellites are currently planned, with launches starting in 2010. Each satellite will carry a legacy UFO payload along with an enhanced MUOS payload, ensuring backward compatibility.

Each of these systems provides a discrete, specialized set of capabilities, with much more capacity than its predecessors, but all are intended to be part of the lead-up to a more integrated defense communications network which is planned through the development of the ***Transformational Satellite*** (**TSAT**) system, a key element for the future DoD global net-centric operations. TSAT, planned to provide some 30 Gbps of capacity, would overcome the gap to the demand line — a gap now filled by commercial systems.

The TSAT space segment would allow for a range of capabilities including protected high-throughput *communications-on-the-move* (**COTM**), plus airborne *Intelligence, Surveillance and Reconnaissance* (**ISR**), and it would meet the strategic force requirements following from Milstar and AEHF. But TSAT has been delayed a number of times, and while now apparently moving forward again, requires extensive new tech-

nology developments both on the satellites and in the user terminals.

## What More Is Needed?

This last issue — availability of the user terminals needed to take advantage of the expanded on orbit capability offered by new systems — is already a concern with the near-term programs described above, in particular MUOS. Somewhat ironically, while terminal developments and deployments appear to be lagging in satellite construction, it is the continuing evolution of technology deployments, including new sensors and receivers requiring massive amounts of bandwidth, that is the biggest driver of new demand for DoD satellite services.

So what is the bottom line? Until the major game-changing TSAT system becomes fully operational, all of the new MilSatCom systems now being launched will not be sufficient to meet the continually growing demand generated by DoD, meaning there is an ongoing, sustained DoD need for high levels of commercial satellite capacity.

There is still debate on the level of effect the new MilSatCom systems will have on the overall DoD demand of commercial satellite capacity, especially including whether TSAT will dry up any significant amount of commercial capacity demand.

DoD demand for satellite communications capacity is forecast to be at least 32GHz by 2016, while MilSatCom system capacity at that time is expected to be 17GHz in the C-, Ku-, Ka-, X- and UHF bands. This estimate assumes delays in TSAT to at least 2018. To fill the gap and meet the remaining requirements, DoD will need to acquire up to 15 GHz per year from commercial operators, primarily in the Ku- and Ka-Bands, although some X- and UHF-Band needs are also foreseen.

In fact, demand in the later years is often presented in DoD forecasts as being as high as 47 Gbps by 2018, based on fielding of large numbers of terminals tied to TSAT capabilities. Key among these capabilities would be the ability to interconnect mobile terminals around the globe, building on what has already proven to be a major driver of DoD satellite capacity demand: the need for mobility and flexibility to provide COTM and ISR including the acquisition/delivery of data from UAVs. If the capabilities of TSAT meet its planners' expectations, and the technology emerges to enable broad-based device-to-device communications, TSAT will, itself, drive the demand curve back up from the baseline shown above.

## What Are The Opportunities?

There is clearly a strong and growing demand for satellite capacity to meet ever-evolving DoD requirements. While TSAT may provide a solution to meeting these requirements, there is a clear opportunity for both commercial satellite operators and ground equipment providers to address this challenge. Taking the latter first, as noted above, the availability of user terminals is a pacing factor in the use of new satellite capacity. Industry and DoD working together need to address both the standards and technology issues key to moving forward with production and fielding of those terminals.

As to the space segment, for at least the next decade DoD will continue to need to acquire on-orbit capacity from commercial providers. Given the length as well as depth of this need, it only makes sense for DoD and the commercial satellite operators to develop a new approach to their partnership.

While DoD needs 5-10 years to get new satellites on-orbit, reflecting the advanced technology developments planned for such satellites, commercial operators have the ability to design and deploy new capacity, even with specialized payloads, in 3-5 years. Without some commitment from DoD to their use of such payloads, however, it is hard (if not impossible) for the operators to convince their management/investors to fund such developments. In some countries, notably the U.K., public/private partnership is a key element of military satellite communications. And in other areas of satellite service — specifically remote sensing — shared investment commitments are proving key to the deployment of new technologies and capabilities that benefit both government and commercial entities. There is every reason to believe that similar partnerships could provide the opportunity to support and enhance growth in DoD's communications technologies and services. MSM

*Vice Commander*
*Space and Missile Systems Center*
*Los Angeles Air Force Base, California*

**A graduate of the U.S. Air Force Academy with a bachelor's degree in aeronautical engineering, General Mashiko's career has encompassed a broad range of space and acquisition assignments. She was the Chief of the Programs Division in the Office of Special Projects, the executive officer to the Department of Defense Space Architect, and Program Manager for the Atlas V Program. She has also served as Director of the Evolved Expendable Launch Vehicle System Program, Vice Commander of Air Armament Center, and the Program Executive Officer for Environmental Satellites.**

These critical assignments have served her well, as the General now assists the base commander with the management of the research, design, development, and acquisition and sustainment of space and missile systems, lauch, command and control, and operational satellite systems... no small task! *Milsat Magazine* was delighted to have the opportunity to speak to General Mashiko regarding her career and Space and Missile Systems Center (SMC).

## MilsatMagazine

*General, as the Vice Commander of the Space and Missile Systems Center, you have an enormous responsibility in helping to command a variety of wings that are responsible for the security of our nation. How do you manage and prioritize your daily tasks?*

## BGEN Mashiko

As the Vice Commander of the Space and Missile Systems Center, I am responsible for supporting the Commander, Lt. Gen. Tom Sheridan, in overseeing a wide variety of areas, both in his Program Executive Officer for Space role and in his Center Commander role.

We both rely on our Wing Commanders and Staff Organization Directors to handle most of the day-to-day program and center staff issues. Items only become elevated to the command level when there are impacts across multiple organizations, or when there is a major item with long-term consequences. When that happens, both Lt. Gen. Sheridan and I have outstanding staffs to help us manage and prioritize our daily tasks.

## MilsatMagazine

*The U.S. Air Force appears to select commanders based on their experience and talents... how were you selected for this important posting?*

## BGEN Mashiko

I am truly honored to have earned the opportunity to be the Vice Commander of the Space and Missile Systems Center. Selections for positions like mine are made by a board of general officers who consider individuals based on their experience and performance. The board looks at your past assignment history to determine if you have relevant experience to lead a particular organization. They also look at your performance evaluations and promotion recommendations to determine if you have the leadership, management, strategic, and other skills necessary for a command position.

I have served in the Air Force for 28 years, almost exclusively as a space professional. I have had a range of assignments in space organizations in Los Angeles and Washington, D.C. Each of these assignments has added another skill to my toolbox and has increased my understanding of space systems and the related acquisition, policy, and operational issues. I think the sum of my experience and career history has prepared me well to help lead the Space and Missile Systems Center.

### MilsatMagazine
*You manage a huge $46 billion budget for Milsatcom. What processes are important for suppliers to realize in order to become leading contenders in support of U.S.A.F. programs?*

### BGEN Mashiko
The Military Communications Systems Wing (MCSW) at the Space and Missile Systems Center manages the $46 billion dollar military satellite communications systems portfolio. Contracts in this capability area are solicited in much the same way contracts are solicited in any of our other materiel wings.

All Air Force contract proposals are evaluated using a structured, thorough, deliberative, and disciplined process that proceeds in accordance with established regulations and processes. All proposals are evaluated for their technical adequacy, cost, risk, and contractor past performance. Each of these criteria is weighted differently for different solicitations. Because each solicitation is different, an essential part of competing successfully during a source selection is simply complying with the directions in the Request for Proposals (RFP).

There are no "secrets" I can offer for how suppliers and vendors can become leading contenders in this process. Each proposal is evaluated individually, following the guidelines established in the solicitation, and every supplier is given equal opportunity to put their best foot forward.

### MilsatMagazine
*What is your connection and interaction with other major commands, as well as the NRO, NASA, and the Secretary of Defense?*

### BGEN Mashiko
The Space and Missile Systems Center is part of Air Force Space Command, a major command. Requirements for the systems we acquire are developed by Air Force Space Command, in conjunction with the operator and warfighter communities in other major commands. We report to Air Force Space Command in our role to organize, train, and equip SMC for mission execution. In addition, Lt. Gen. Sheridan, as the Program Executive Officer for Space, reports to the Secretary of the Air Force for space acquisition program execution. Depending on the size of a program, acquisition decisions will be made either by the Program Executive Officer, the Secretary of the Air Force, or the Undersecretary of Defense for Acquisition, Technology, and Logistics.

SMC's relationships with organizations such as the NRO and NASA generally include cooperation on specific programs or technology development projects and joint participation in space acquisition community forums. For example, all three of these organizations participate in the Mission Assurance Forum, which brings together government and industry participants in space launch. Meetings like the Mission Assurance Forum allow for the sharing of best practices, processes, and standards to strengthen the chances of success for space launch. One example of technology cooperation is the Air Force, NRO, and NASA's cooperation to upgrade the RS-68 rocket engine. This cooperation will provide enhanced performance for the Delta IV and Ares V launch vehicles that use the RS-68 engine.

### MilsatMagazine
*How did you become intrigued and interested in Milsatcom, when there are so many career paths in the U.S. Air Force?*

### BGEN Mashiko
Military satellite communications are a critical part of the command and control infrastructure that our warfighters depend on in the field. When we conduct operations in remote parts of the

***A Boeing Delta IV heavy launch vehicle lifts off from Cape Canaveral Air Force Station.***

***Photo: USAF***

world, often unconnected to terrestrial communications systems, we rely heavily on our military satellite communication systems as part of the Global Information Grid. Almost every piece of information that comes to or goes from the field will, at some point in its journey, pass through a satellite communications system.

As the former Wing Commander of the Military Communications Systems Wing and now Vice Commander of the Space and Missile Systems Center, I support our continued investment in military satellite communications systems, as well as space systems in all of the SMC capability portfolio areas.

### MilsatMagazine

*Your career has seen you posted to a variety of bases. In fact, wasn't your first assignment in June of 1980 your first posting to L.A.F.B. as the Director of ASAT Systems? How have your assignments, from Wright-Patterson to Maxwell to Washington D.C. prepared you for your current command role?*

### BGEN Mashiko

My breadth of experience in the Air Force and inter-agency space community has prepared me for my current role as Vice Commander of the Space and Missile Systems Center. I have a long history of assignments in the space arena. With each assignment, I've learned about the capabilities that Air Force space systems provide and how the Air Force develops, acquires, operates, and budgets for these systems. Only by having a breadth and depth of knowledge about the whole range of issues affecting the space capability area can one assume command of an organization with a portfolio as

wide-ranging as that of the Space and Missile Systems Center.

## MilsatMagazine

*There are several, critical projects underway at SMC. Of those that can be discussed, which one do you feel will have the most impact in aiding our warfighters and protecting our country, and why?*

## BGEN Mashiko

All of the programs at SMC will have an impact in aiding our warfighters and protecting our country. I can't choose any one to say it will have the most impact because each program has its own unique role in supporting the warfighter and the nation.

One of the interesting things about space systems, and in fact most modern military systems in general, is that they are all interconnected. A military aircraft, for instance, receives its mission orders via a communication satellite, plans its operations using information collected by weather and other reconnaissance satellites, and executes its flight path with the help of GPS coordinates. All of those systems are necessary to conduct a successful operation. Every system that SMC develops and acquires has an impact for our warfighters and our nation.

***BGEN Susan Mashiko cuts a birthday cake at the celebration last year for Los Angeles AFB's birthday. Also pictured is Chief Master Sgt. Mark Raffery.***

***Photo: Joe Juarez***

## MilsatMagazine

*You were promoted to Brigadier General in September of 2006. This is a terrific accomplishment. How was this attained, all the while looking after your family and personal life?*

## BGEN Mashiko

I'm very fortunate to be in the Air Force general officer ranks. When an officer is selected for promotion to a general officer it is because of his or her record of accomplishment and potential for leadership. Getting to the point where you are under consideration for such a promotion requires hard work and dedication throughout your career. It is always a challenge to balance career and personal life. Throughout my service, I have maintained a strong commitment to the Air Force and to excellence.

## MilsatMagazine

*The requisition and acquisition cycle can sometimes seem to take forever in order to obtain Congressional approval and financing for projects. Having a great deal of experience in acquisition management, are there any steps that you could recommend to help optimize the process to more quickly move critically needed projects to the front burner?*

## BGEN Mashiko

There will always be acquisition challenges to contend with and, unfortunately, it can take time to acquire space systems. This, after all, is "rocket science"! Anyone involved in the programming and budgeting process must understand Air Force, Department of Defense, and Congressional processes intimately and work within the established laws, policies, and guidelines. Being able to articulate requirements and communicate their warfighter impacts is an essential part of the process because we must justify why a project is in the national interest. Effective communication among all services is vital to our national security and the national security space enterprise.

## MilsatMagazine

*Lastly, General, what do you see as the most important role of Milsatcom over the next few years?*

## *BGEN Mashiko*

Military satellite communications will continue to play a key role in supporting our warfighters and decision-makers around the world. The Air Force and other services rely on both military and commercial communication assets to keep information flowing to and from the battlefield. Military satellite communications systems enable command and control of our ground forces, equipment, and other space systems. They also carry information to warfighters in the field and national decision-makers. Military satellite communications systems play a key role in connecting our warfighters into a global information grid.

At SMC, we play the important role of delivering new military satellite communications systems capabilities in the next few years. As we continue to sustain existing systems such as the Defense Satellite Communications Systems (DSCS), we are fielding new systems such as the Advanced Extremely High Frequency (AEHF) and Wideband Global SATCOM (WGS) systems. With the recent favorable reviews of the Transformational Communications Satellite (TSAT) program, we also look forward to the development of a next generation system that will enhance our capabilities and grow the Global Information Grid. MSM

*To learn more about SMC, select the logo below...*

# Robert Demers

***Senior Vice President***
***Americom Government Services***

**When Robert Demers joined Americom Government Services (AGS), he brought with him decades of experience as; Vice President of government solutions for Inmarsat; general manager of global government services at ICO Global Communications, Inc., a Mobile Satellite Service (MSS) company; 22 years in the U.S. Army, serving in a variety of capacities including service as a combat helicopter pilot, an Aviation Unit Commander, and as Army liaison to the U.S. Senate. During one of his rare moments of availability, we caught up with him to retrieve some information regarding his work with AGC.**


## MilsatMagazine

*Mr. Demers, what key role does your company play within the military and/or government-based satellite industry, and how has that changed over the past, few years?*

## Robert Demers

AMERICOM Government Services (AGS) provides both civilian and defense agencies with the best satellite communications solutions available. From satellite capacity to engineering and integration solutions, Americom Government Services provides comprehensive, global solutions that reflect a thorough understanding of the government market.

Our full range of turnkey satellite solutions ensure secure communications combined with comprehensive global coverage. Offerings include custom network solutions, strategic satellite solutions (hosted and customized payloads) and transponder leases.

2008 has been a pretty remarkable year for AMERICOM Government Services. Earlier in the year, we were awarded the Army TROJAN contract to continue our support of the custom network we designed for U.S. Army Intelligence and Security Command. This award represented the largest dollar value contract win for our company to date. Additionally, we were given the opportunity to host a payload for the U.S. Air Force in the form of an experimental infrared sensor on board one of our spacecraft that is scheduled to launch in 2010. Most recently, we signed an agreement to acquire AOS Inc., a secure telecommunications technology company out of Dallas, Texas — a partnership that will better enable us to provide secure solutions to our U.S. government customers.

## MilsatMagazine

*What advances can we expect in milsatcom technology over the next year or so?*

## Robert Demers

From a commercial perspective, micro technology allows us to do great things with less weight, less mass and less power and increases our ability to create new capabilities. The benefit of working with industry on these advancements is that we continue to test and experiment with new technologies on our satellites not only for our government customers, but our commercial partners as well.

Over the past few years, the demand from the military for commercial satellite use has grown exponentially. Satellite solutions have played an integral roll in war fighting efforts as well intelligence gathering, disaster relief efforts and other missions that require instant communications in areas around the world. With this continued growth the reality is that over the next 5-10 years, the gap between military demand and availability for satellite capacity will continue to grow.

By-and-large, the increase in demand will come from across DoD, however, there are specific mission areas

that we can anticipate will increase more substantially than others as the projected consumption of bandwidth per mission also grows over time. The key drivers behind many of these mission areas are the need for AISR, mobility and flexibility.

The primary requirements served by satellite in most instances include some element of Comms on the Move (COTM) and/or acquisition/delivery of data from UAVs, both of which are satellite-based and heavy bandwidth applications in multiple frequencies

### *MilsatMagazine*

*What are the major challenges facing improving military and governmental agency communications and intelligence needs? Bureaucracy? Time to deployment? Funding and other?*

### *Robert Demers*

The increase in military demand for commercial satellite services over the past few years has caused a higher utilization of capacity across the major fleets. New military satellite communications systems now being launched will not be sufficient to meet this continued demand, meaning there is an ongoing, sustained DoD need for high levels of commercial satellite capacity. The limitation of commercial satellite companies to be able to provide the required capacity can be reduced when our government customers involve their corporate partners early in the mission planning process.

It is our intention to address this gap and make the business case so that we can recommend the appropriate investments in our fleet of 38 global SES satellites, and we are in a strong financial position to begin these discussions and make the investments to

| Satellite | Orbital Slot | Frequency Band | Coverage Area |
|---|---|---|---|
| AMC-1 | 103° W | C/Ku-band | North America, 50-state |
| AMC-2 | 101° W | C/Ku-band | North America, 50-state |
| AMC-3 | 87° W | C/Ku-band | North America, 50-state |
| AMC-4 | 101° W | C/Ku-band | North + South America, 50-state |
| AMC-5 | 79° W | Ku-band | CONUS |
| AMC-6 | 72° W | C/Ku-band | North America |
| AMC-7 | 137° W | C-band | North America, 50-state |
| AMC-8 | 139° W | C-band | North America, 50-state |
| AMC-9 | 83° W | C/Ku-band | North America |
| AMC-10 | 135° W | C-band | North America, 50-state |
| AMC-11 | 131° W | C-band | North America, 50-state |
| AMC-15 | 105° W | Ku/Ka-band | North America, 50-state |
| AMC-16 | 85° W | Ku/Ka-band | North America, 50-state |
| AMC-18 | 105° W | C-band | North America, 50-state |
| AMC-21 | 125° W | Ku-band | North America, 50-state + Caribbean |
| Astra 2B | 28.2° E | Ku-band | West Africa (spot beam) |
| GE-23 | 172° E | C/Ku-band | Pacific Ocean region |
| NSS-5 | 183° E | C/Ku-band | Pacific Ocean region |
| NSS-6 | 95° E | Ku/Ka-band | Indian Ocean region |
| NSS-7 | 338° W | C/Ku-band | Atlantic Ocean region |
| NSS-10 | 37.5° W | C-band | North + South American, Europe, Africa |
| NSS-11 | 108.2° E | Ku-band | China, NE Asia, S Asia |
| NSS-703 | 57° E | C/Ku-band | Indian Ocean region |
| NSS-806 | 319.5° E | C/Ku-band | Atlantic Ocean Region |
| Telstar-14 | 63° W | Ku-band | North + South America |

***AGS' has exclusive access to the entire AMERICOM satellite fleet as well as select satellites through SES' global fleet***

meet the government's demand in the coming years.

Our procurement cycles in the commercial industry (and subsequent capacity in orbit) are not optimally aligned with the process and budget cycles of the government which increases communications difficulty in getting adequate capacity in the proper location in a timely manner.

Another challenge facing the space industry as it pertains to military communications is that at the present time, there is no active executive agent for space as authorized in DoD Directive 5101.2.

**MilsatMagazine**

*How will your company address this market over the next one to two years?*

## Robert Demers

We will continue to work closely with the government to identify capacity needs going forward so that we are able to provide the type of capacity, in the desired locations at the time it is required — just as we do for our commercial customers. We can do this by customizing our spacecraft and hosting full or partial payloads for our U.S. government customers. We are also capable of providing small bespoke satellites to meet specific missions in regions.

Additionally, we will need to work with our government customers to preposition certain kinds of capacity with some level of portability in hot spots such as SW Asia, the Pacific Rim and South America. This capacity should be duel usage and should enable the U.S. government and industry to both make the investment and use the capacity.

## MilsatMagazine

*Thanks for your time, Robert. To assist with their growth, AGS just recently acquired AOS, Inc., engineers of secure telecommunications technologies and global network mobility. AOS, founded and based in Dallas, Texas, will be integrated as a division of AGS. AOS provides highly secure, customized, turnkey network mobility and communications solutions, and engineering, program management, IT consulting and managed network services.*

## SatSavy AGS

An SES AMERICOM company, AGS leverages 38 global satellites to create custom satellite communications solutions to meet the mission requirements of the U.S. Department of Defense, NASA, FAA, and other U.S. government organizations around the world. Please see the list of satellites accessible by AGS on the previous page.

MSM

# Gary Hatch

*CEO and President*
*ATCi*

**Antenna Technology Communications Inc. is best known by all as ACTi and is headed up by one of the true personalities within our industry, Gary Hatch. As the CEO and President of the firm, Gary has also served as an international executive and engineer for Motorola and Telecommunications Inc./Liberty Media, as a board member for World Teleport Association (WTA), Society for Satellite Professionals (SSPI), Near Earth Investment Bankers, and Skyway Connect. We caught up with Gary to check with him on the government and military side of his successful business that's based in Chandler, Arizona.**


## MilsatMagazine

*Gary, ATCi has been in business for a long time — please tell about your history...*

## Gary Hatch

We've been involved with systems integration for uplink systems and of course our proprietary product, Simulsat for over 20 years. We've worked with broadcasters, cable operators, military/government, universities and large corporations customizing our technologies to a variety of applications over that time period. Through Simulsat, our customers are able to see 35 + satellites within a 70 degree view arc, and we have those systems installed thousands of locations worldwide. In the U.S. alone, we reach out to over 50 million cable TV subscribers. It truly is a complete solution, it's one antenna that meets all of our customers' needs.

## MilsatMagazine

*We recently read news of your Warrior system for voice, video, data and RF spectrum monitoring, can you expand on this new system?*

## Gary Hatch

The ability to enable surveillance of 70 satellites utilizing the footprint size of approximately two parking spaces has created an incredible tool for the U.S. Department of Defense and other like agencies worldwide. Through this system we can monitor and triangulate thousands of carriers simultaneously, and with our Sentry technology, we are able to archive, retrieve and catalog voice, data and video with a Google-like search engine.

Moreover, this system is completely integrated to bring (an associated) relationship to satellite, voice, data and video throughout the satellite arc. This automation and storage creates incredible information gathering capability which provides U.S. government, military and foreign applications the knowledge base so vital to the security of our nation.

## MilsatMagazine

*How long have these systems been in place?*

## Gary Hatch

Originally these were solely Broadcast, Cable, Telephone — and involved with pure data applications. However, governments today need the best information to make the best decisions on behalf of their citizens. The Warrior allows for the association and assimilation from hundreds of sites throughout the world into one common relational software database. Ultimately, this vital information can provide unique understanding of any and all activities carried throughout the satellites hovering around the world.

## MilsatMagazine

*It sounds like you're talking about a repurpose technology for military and government applications. What will be the financial impact for your company with this new integrated surveillance system offering?*

## Gary Hatch

We have been involved with several defense programs over many years that has allowed us to intersect our knowledge from Broadcasters, Cable, Telephone, Data and general satellite monitoring into

these critical satellite surveillance programs. This program is contained within the worldwide satellite services program and allows for fast track purchasing at feasible cost levels for these different defense applications. These are exciting projects, meaningful in every way, and we are honored to bring our best technologies to these important entities.

## MilsatMagazine

*The Warrior system has incredible simultaneous monitoring capabilities, what technologies have enhanced the coming forth of this system?*

## Gary Hatch

Number one — the growth of satellites around the world and their efficiencies, low cost storage systems, digital RF chip set systems and relational search devices that allow us to associate virtually limitless bits of information. We feel as though we bring the best of CNN, telephone companies, cable operators and defense to the intersection contained within this Warrior package and overall integration.

## MilsatMagazine

*Thanks, Gary. And, for our readers info, back in July of this year, ATCi completed a full year of GSM satellite operations in Iraq via Zain/Fastlink, a Kuwaiti-based global telecom firm that offers mobile telephony services thoughout MENA. ATCi has been able to complete GSM services from Iraq to anywhere in the world. Plus, ATCi is in the process of implementing additional GSM backhaul systems for implementation throughout MENA and Latin America over the upcoming years.*

*For additional information on ATCi's Warrior system, select this text for a direct connect to their website.*

MSM

*by U.S.A.F.'s Space and Missile Center's History Office*
*Los Angeles Air Force Base*

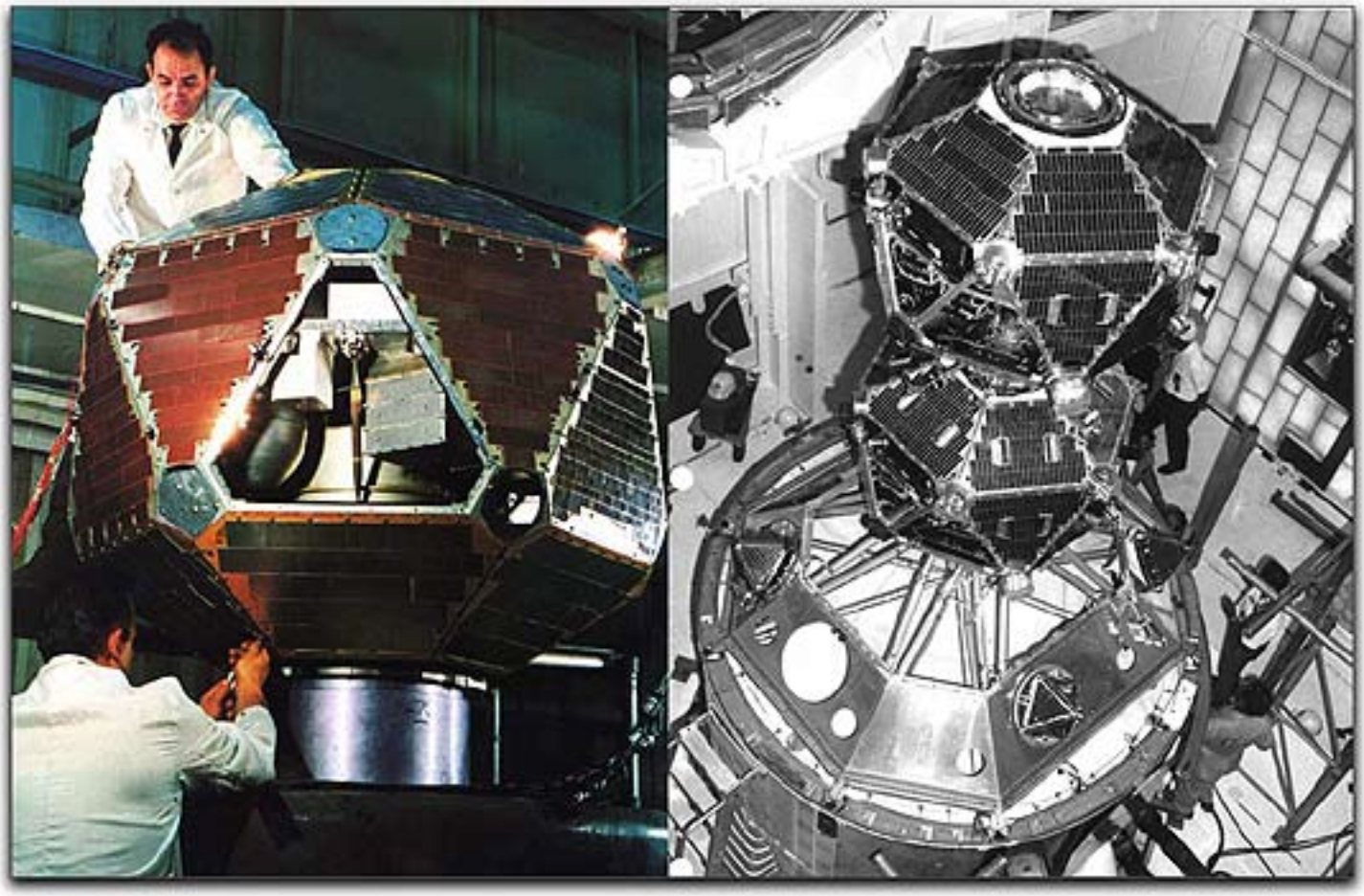
**The Space and Missile Systems Center is the birthplace and cradle of military space and the central hub of military space acquisition excellence. SMC's mission is to deliver unrivaled space and missile systems to the joint warfighter and our nation, producing innovative, affordable, and operationally effective space systems of separate subsystems that could carry out different missions.**

We continue our review of military satellite systems and we examine…

## Nuclear Surveillance

In addition to reconnaissance and missile warning, SMC and its predecessors have developed satellites to serve a number of other purposes, among which are nuclear surveillance, weather observation, navigation, and communication.

The first space system to accomplish nuclear surveillance was called **Vela Hotel**—later, simply **Vela**. Representatives of the *Air Force Ballistic Missile Division* (**AFBMD**), the *Atomic Energy Commission*, and **NASA** met on December 15, 1960 to initiate a joint program to develop a high-altitude satellite system that could detect nuclear explosions. Its primary purpose was to monitor compliance with the *Nuclear Test Ban Treaty* then being negotiated in Geneva. During 1961-1962, the Atomic Energy Commission developed detectors and flew experimental versions on



***Left: A Vela satellite in fabrication at TRW's facility.***
***Right: A pair of Vela satellites (Vela 5A and 5B) mounted on their Titan IIIC launch vehicle before installation of the fairing.***
***They were launched successfully on 23 May 1969.***

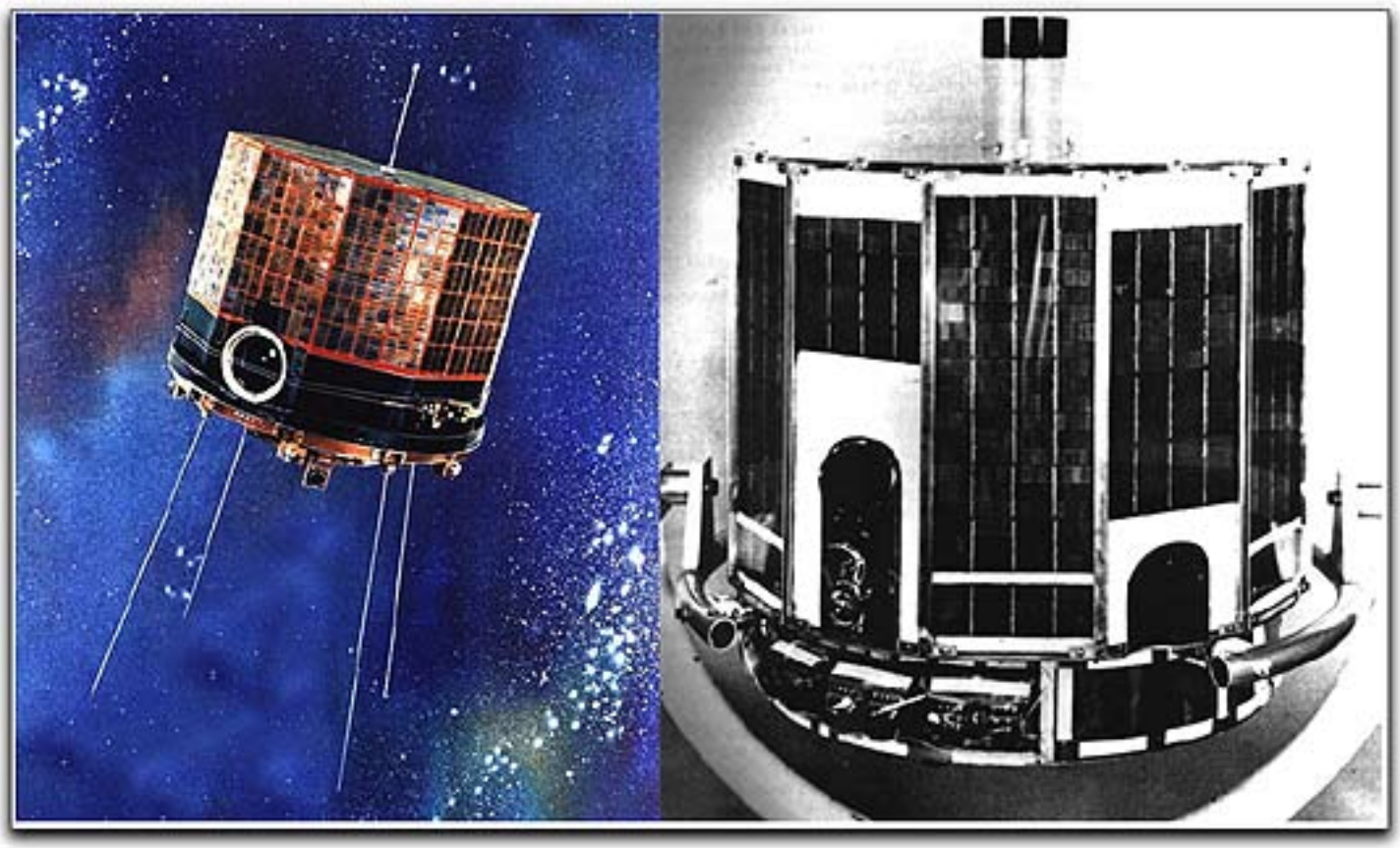
**Space Systems Division's Discoverer** satellites. **SSD** issued a contract for the spacecraft to **Space Technology Laboratories** (later part of **TRW**) on November 24, 1961.

The first pair of satellites was launched using an **Atlas Agena** on October 16, 1963, a few days after the Nuclear Test Ban Treaty went into effect two more pairs were launched on July 16, 1964 and July 17, 1965. Six **Advanced Vela** satellites, containing additional, more sophisticated detectors, were launched in pairs on Titan IIIC vehicles on April 28, 1967, May 23, 1969, and April 8, 1970. (***See photos on preceding page***.)

The Vela satellites successfully monitored compliance with the Nuclear Test Ban Treaty and provided scientific data on natural sources of space radiation for many years. The least successful of the original satellites operated for 10 times its design lifetime of six months. The last of the advanced Vela satellites was deliberately turned off on September 27, 1984, over fifteen years after it had been launched.

## *Meteorological Systems*

Providing the systems with which to conduct military weather observations from space is presently the mission of the ***Defense Meteorological Satellite Program*** (**DMSP**), which maintains a constellation of at least two operational weather satellites in polar orbits about 450 miles above the earth. DMSP satellites now carry primary sensors that provide images of cloud cover over the earth's surface during both day and night, and they also carry other sensors that provide additional types of data on weather and on the space environment.



*Left: A DMSP Block I satellite, launched 1962-1963. Blocks II and III were similar. Right: DMSP Block IV satellites, launched 1966-1969, included the first major improvements in DMSP sensors.*

The first DMSP satellites were developed by a program office physically located with Space Systems Division but reporting to the National Reconnaissance Office (NRO),[27] which needed analyses of cloud cover over Eurasia to plan its photographic reconnaissance.[28] The program office awarded a development contract for weather satellites employing television cameras to RCA in 1961.

**Block I** began with five launch attempts on **Scout** launch vehicles during 1962 and 1963, all but one of which failed.[29] Later Block I launches on **Thor Agena** and **Thor Burner I** vehicles were more successful.

**DMSP Block II** and **Block III** satellites, also launched on Thor Burner I vehicles, provided weather data for tactical applications in Southeast Asia.

Wider military uses for weather data led to an important change in the program's reporting structure when, on July 1, 1965, it became a program office under ***Space Systems Division***. Development of more capable and more complex satellites also came to fruition with **DMSP Block 4** satellites, seven of which were launched during 1966–1969.

Television resolution improved from three to four nautical miles with Blocks I and II to 0.8 to three nautical miles with **Block 4**, along with many other improvements in the sophistication of secondary sensors. **Block 5A** satellites introduced the ***Operational Line Scan*** (**OLS**) sensor, which provided images of clouds in both visual and infrared spectra. Television resolution improved to 0.3 nautical miles in daylight.

[27] See R. Cargill Hall, A History of the Military Polar Orbiting Meteorological Satellite Program, National Reconnaissance Office, September 2001.

[28] Although NASA was developing a National Operational Meteorological Satellite System, the NRO's director, Under Secretary of the Air Force Joseph V. Charyk, did not believe it would adequately support the NRO's missions. See note 27 above.

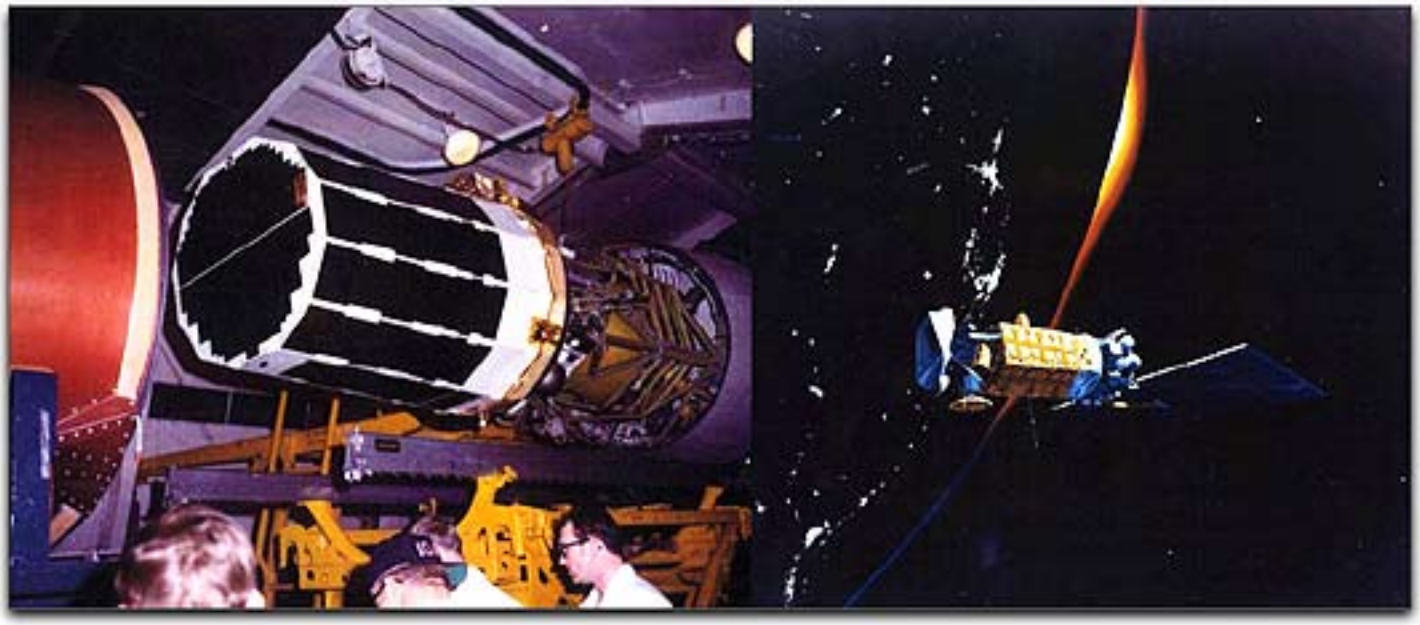
Three **Block 5A**, five **5B**, and three **5C** satellites were launched during 1970–1976 on Thor Burner II launch vehicles. Larger and much more sophisticated **Block 5D-1** satellites were also developed during the 1970s, but only five were built.

In 1980, the fifth 5D-1 satellite was lost in a launch failure, and the operational 5D-1 satellites in orbit prematurely ceased to function. From August 1980 to December 1982, when the first Block **5D-2** satellite was successfully launched, meteorological data was supplied to DoD entirely by civilian satellites.

Nine **Block 5D-2** satellites were launched during 1982–1997 on **Atlas E** and **Titan II** launch vehicles. In 1989, Space Systems Division began the procurement of five **Block 5D-3** satellites from **General Electric** (later acquired by Lockheed Martin). By early 2003, the first of these was scheduled for launch later in the year.

Civilian weather satellites were operated by the **National Oceanic and Atmospheric Administration** (**NOAA**). Proposals to merge the civilian and military meteorological systems had been made from time to time since the early 1970s.[30] On May 5, 1994,

[29] The first launch attempt took place on May 23, 1962, but it failed. The first successful launch was the second attempt on August 23, 1962. Later unsuccessful Scout launches took place on February 19, 1963, April 26, 1963, and September 27, 1963. Successful Thor Agena D launches were carried out on January 19, 1964 and June 17, 1964. Block I launches on Thor Burner I rockets took place on January 18, 1965 (failure) and March 18, 1965 (success). Block II launches on Thor Burner I vehicles were on September 9, 1965 (success), January 7, 1966 (failure), and March 30, 1966 (success). The only Block III satellite was launched successfully on May 20, 1965 using a Thor Burner I launch vehicle. See note 27 .



***Left: The payload fairing is being installed over a DMSP Block 5A satellite mated to a Burner II upper stage on a Thor Burner (LV-2F) launch vehicle about 1970-1971. Right: This artist's concept depicts a DMSP Block 5D-3 satellite in an early-morning orbit. The DMSP constellation consists of two operational satellites and two spares in sun-synchronous polar orbits. One of the operational satellites crosses the equator (northward) early in the morning, and the other does so at noon local time.***

President Clinton issued a presidential decision directive ordering the convergence and eventual merger of the two programs into a new national space-based system for environmental monitoring.

A ***Tri-Agency Integrated Program Office*** (**IPO**) made up of representatives from **NOAA**, **NASA**, and **DoD** would be responsible for carrying out major systems acquisitions, including satellites and launch vehicles. However, NOAA would have overall responsibility for operating the new system, which was soon named the ***National Polar-orbiting Operational Environmental Satellite System*** (**NPOESS**).

A major step in convergence occurred on May 29, 1998, when NOAA's ***Satellite Operations Control Center*** (**SOCC**) took over satellite control authority as well as actual operational control of the existing DMSP system. The IPO issued competitive contracts to **Lockheed Martin** and **TRW** on December 13, 1999 for an early phase of the NPOESS development program called ***Program Definition and Risk Reduction***, and it issued five development contracts for NPOESS sensors during 1997-2001. A flight demonstration satellite known as the ***NPOESS Preparatory Project*** (**NPP**) was scheduled for launch in late 2006. It would be a joint mission involving NASA and the IPO.

## Navigation Systems

The world's first space-based navigation system was called **Transit**. It was developed by scientists at **Johns Hopkins University**'s ***Applied Physics Laboratory*** in 1958. DoD's ***Advanced Research Projects Agency*** (**ARPA**) initiated the development program in September 1958 and assigned it to the Navy a year later. The ***Air Force Ballistic Missile Division*** launched the Navy's first Transit satellite on April 13, 1960. The system achieved initial operational capability in 1964 and full operational capability in October 1968.

Transit used three operational satellites to produce signals whose Doppler effects and known positions allowed receivers — primarily ships and submarines — to calculate their positions in two dimensions.

[30] The Defense Meteorological Satellite Program was declassified in 1973.

***Left: The second Transit satellite (Transit 1B) undergoes checkout at Cape Canaveral before launch on April 13, 1960.***
***Right: This artist's concept depicts the second Navigation Technology Satellite (NTS-2) in orbit. NTS-2 was used as part of the GPS Block 1 test constellation.***

Transit established the principle and much of the technology of navigation by satellite and prepared military users to rely on such a system. However, it was too slow for rapidly moving platforms, such as aircraft. Transit's signals were turned off deliberately in December 1996 because DoD had decided to rely on a newer, faster, and more accurate system.

All of DoD's navigation and position-finding missions are now performed by the ***Global Positioning System*** (**GPS**). The system consists of 24 operational satellites that broadcast navigation signals to the earth, a control segment that maintains the accuracy of the signals, and user equipment that receives and processes the signals. By processing signals from four satellites, a user set is able to derive the location of each satellite and its distance from each one. From that information, it rapidly derives its own location in three dimensions.

In addition to Transit, GPS had two immediate programmatic ancestors: a technology program called **621B**, started by **SAMSO** in the late 1960s, and a parallel program called **Timation**, undertaken by the **Naval Research Laboratory** in the same period. 621B envisioned a constellation of 20 satellites in synchronous inclined orbits, while Timation envisioned a constellation of 21 to 27 satellites in medium altitude orbits. In 1973, elements of the two programs were combined into the GPS concept, which employed the signal structure and frequencies of 621B and medium altitude orbits similar to those proposed for Timation.

Deputy Secretary of Defense *William P. Clements* authorized the start of a program to "test and evaluate the concepts and costs of an advanced navigation system" on April 17, 1973, and he authorized the start of concept validation for the GPS system on December 22, 1973.

*Top: A GPS Block I satellite (left) and a GPS Block II satellite (right) undergo acceptance testing at Arnold Engineering Development Center.*
*Bottom left: An artist's concept depicts a GPS Block IIR satellite in orbit.*
*Bottom right: An artist's concept depicts a GPS Block IIF satellite in orbit.*

GPS was acquired in the classical three phases:

- validation
- development
- production

During the validation phase, Block I navigation satellites and a prototype control segment were built and deployed, and advanced development models of various types of user equipment were built and tested.

During the development phase, additional Block I satellites were launched to maintain the initial satellite constellation, a qualification model Block II satellite was built and tested, and manufacture of additional Block II satellites was initiated.[31] In addition, an operational [31] Block I, Block II, and Block IIA satellites were built by Rockwell International, which sold its aerospace and defense divisions to Boeing in 1997. In addition, an operational control segment was activated, and prototype user equipment was developed and tested. During the production phase, a full constellation of 24 **Block II** and **IIA** (A for advanced) satellites was deployed. User equipment was also

produced and put into operation by issuing it to foot soldiers and installing it in ships, submarines, aircraft, and ground vehicles.

The full constellation was completed on March 9, 1994, allowing the system to attain full operational capability in April 1995. **SMC** began launching the next block of GPS satellites, known as **IIR** (R for replacement), in 1997.[32] The following block of GPS satellites, which incorporated further improvements, was known as **Block IIF** (F for follow-on). SMC awarded a contract for their production on April 22, 1996.[33] By 2003, they were scheduled to be available for launch beginning in 2006.

GPS can support a wide variety of military operations, including aerial rendezvous and refueling, all-weather air drops, instrument landings, mine laying and mine sweeping, anti-submarine warfare, bombing and shelling, photo mapping, range instrumentation, rescue missions, and satellite navigation. GPS is also the focus of a growing civilian market. By 2003, it was widely used commercially, and some of those commercial applications, such as airline navigation, were critical. At one time, the GPS signal available to civil users contained intentional inaccuracies, a condition known as selective availability. At President Clinton's direction, the intentional inaccuracies were set to zero on May 1, 2000, providing significant improvements in the accuracy available to the system's civil users.

MSM

31 Block I, Block II, and Block IIA satellites were built by Rockwell International, which sold its aerospace and defense divisions to Boeing in 1997.

32 The launch of the first IIR satellite on January 15, 1997 failed when the Delta launch vehicle exploded. It was the first failure of a Delta II vehicle and only the second launch failure in the history of the GPS program. The first GPS Block IIR satellite to attain orbit and become operational was launched on July 23, 1997.

33 SMC (then called Space Systems Division) had awarded the contract for Block IIR satellites to General Electric (later part of Lockheed Martin) in 1989. It awarded the contract for Block IIF satellites to Rockwell International (later part of Boeing). See note 31.

**The MILSATCOM Systems Wing (MCSW) plans for, acquires, and sustains, space-enabled global communications to support the President, Secretary of Defense, and combat forces. MCSW is headquartered at Los Angeles Air Force Base (AFB) Space and Missiles System Center. MCSW consists of an integrated system of satellites, terminals and control stations, valued at more than U.S. $46 billion providing communications to aircraft, ships, mobile and fixed sites. It is a jointly manned wing which interfaces with Major Commands, Headquarters, United States Air Force, and Department of Defense agencies.**

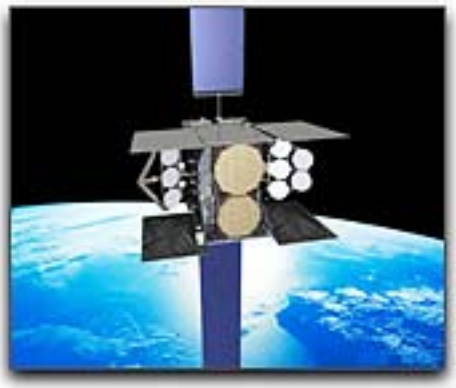
The MCSW is the primary acquirer of satellite communication systems to equip national authority and combat forces of all services with survivable, worldwide, rapid communications for all levels of conflict. MCSW provides program management direction for all phases of system development and acquisition for the current and future MILSATCOM satellite programs from concept development through orbital operations.

MCSW has 12 programs, five of which are ***Acquisition Category*** (**ACAT**) **1** and is divided into three primary ***Satellite Communications*** (**SATCOM**) product lines — wideband, protected and network. These product lines are supported by the ***Command and Control System Consolidated*** (**CCS-C**) and ***Family of Advanced Beyond Line-of-Sight Terminals*** (**FAB-T**) programs.

## The Wideband Product Line

The wideband product line includes the on-orbit legacy system ***Defense Satellite Communications Systems*** (**DSCS**), and the on-orbit and in production, ***Wideband Global SATCOM*** (**WGS**) system.

***DCS satellite***



***WGS satellite***

The goal of wideband communications is to move large amounts of data through high bandwidth pipes between primarily large ground terminals (8 to 60 feet) or, in the future, ***unmanned aerial vehicles*** (**UAVs**) and large ground terminals. WGS provides flexible, high-capacity communications for the Nation's warfighters through operationalization of the WGS and the associated control systems. WGS will provide a quantum leap in communications bandwidth for marines, soldiers, sailors and airmen. WGS is a multi-service program that leverages commercial and technological advances in the satellite industry to design, build, launch and support a constellation of highly capable military communications satellites.

WGS is composed of three principal segments: **Space Segment** (satellites), **Control Segment** (operators) and **Terminal Segment** (users). A constellation of

six satellites will provide service in both the X- and Ka-band frequency spectrums. WGS will supplant X-band communications now provided by DSCS and one-way Ka-band service provided by the ***Global Broadcast Service*** (**GBS**). Additionally, WGS will provide a new two-way Ka-band service.

MCSW terminals, the Family of Advanced Beyond-Line-of-Sight Terminals (FAB-T), ***Ground Multi-band Terminal*** (**GMT**) and ***High Data Rate-Radio Frequency Ground Terminal*** (**HDR-RF**) provide terminal support to this product line. Both the DSCS and WGS systems provide worldwide, high-volume, voice and data communications to the warfighter and are supported by CCS-C.

## GBS

**GBS** provides mission-essential information to the nation's war fighters using space-based, broadband satellite communications links. It provides high-speed, one-way information flow of high volume data to the nation's command centers and joint combat forces in garrison, in transit and deployed within global combat zones. GBS is analogous to DirectTV for the warfighters!

GBS disseminates IP-based real-time video and large data files (up to 4GB in size) over-the-air (30 Mbps per transponder) to garrisoned and deployed combat forces using smart push and user pull-information based on unit mission reception priority profiles. The GBS system consists of broadcast management, space, and terminal segments. It supports existing Commander In Chief (**CINC**) requirements by providing the capability to quickly distribute large information products to deployed user platforms. GBS uses modern digital satellite broadcasting technology to disseminate information products to the war fighter.

## Assistance to Warfighters

WGS will provide essential communications services for Combatant Commanders to command and control their tactical forces. Tactical forces will rely on WGS to provide high-capacity connectivity into the terrestrial portion of the ***Defense Information Systems Network*** (**DISN**).

GBS continues to support the warfighters worldwide and particularly in support of ***Operation Enduring Freedom*** (**OEF**) and ***Operation Iraqi Freedom*** (**OIF**). GBS is currently providing over 1.6 Terabytes of information to more than 700 receive suites with missions ranging from homeland security and disaster relief efforts to supporting counter ***improvised explosive device*** (**IED**) activities in Iraq.

GBS is the primary, multicast dissemination system within the DoD. Most terminals operating in Iraq and Afghanistan at every echelon have continuous real-time access to over 130 megabytes per second (Mbps) of information. GBS is the primary Intelligence ***Surveillance and Reconnaissance*** (**ISR**) support system for the tactical dissemination of ***Predator*** and other national ISR platforms. Demand for ISR Full Motion Video in Iraq and Afghanistan is growing significantly every year. GBS provides key support to ***Task Force Observe, Detect, Identify, and Neutralize*** (**ODIN**) operations, which are credited with more than 148 sensor-to-shooter handoffs supporting counter IED operators and impacting over 500 IED emplacers.

## Highlights

- With its first launch into geosynchronous orbit on October 10, 2007, WGS space vehicle (SV)-1 became the Department of Defense's (DoD) highest capacity communications satellite. One WGS space vehicle will provide more capacity for users than the entire DSCS legacy satellite constellation!
- The option to procure the sixth WGS satellite was exercised in December 2007. Production will start in December of 2008, with a contract launch date of March 2013. The sixth space vehicle will be paid for by Australia and they will share a portion of the bandwidth of the WGS constellation.
- The GBS broadcast went operational on WGS SV-1 in April of 2008, extending and enhancing broadcast coverage, throughput, and reliability in the Pacific Command (PACOM) theater.

## Upcoming Milestones

- WGS SV-2 Launch: October 2008
- WGS SV-3 Launch: 2009
- WGS SV-4 Launch: 2011
- WGS SV-5 Launch: 2012
- WGS SV-6 Launch: 2013
- GBS will provide support for additional WGS satellites as they become available.
- GBS plans to continue enhancing broadcast coverage by activating operational capability with WGS SV-2 by mid-calendar year 2009 and, WGS SV-3 by early calendar year 2010.
- GBS will produce and field Receive Suites through 2013.

## The Protected Product Line

The protected product line includes the on-orbit legacy **Milstar** system, the ***Advanced Extremely High-Frequency*** (**AEHF**) and ***Enhanced Polar*** (**EPS**) systems. Protected communications uses a variety of signal processing techniques and the inherent properties of transmission frequencies to provide the Department of Defense global, secure, protected, jam-resistant communications for high priority military ground, sea and air assets.

***Milstar satellite***

*AEHF satellite*

of detection and interception, allowing users unscheduled access to communications worldwide. AEHF, currently in production, will provide connectivity across the spectrum of mission areas, including land, air and naval warfare. This includes the areas of: special and strategic nuclear operations, strategic and theater missile defense, and space operations and intelligence.

The AEHF System is the follow-on to the Milstar system, augmenting and improving on the capabilities of Milstar, and expanding the MILSATCOM architecture. The system consists of four satellites in geosynchronous earth orbit (GEO) that provide 10 times the capacity of the 1990s-era Milstar satellites. AEHF will provide continuous 24-hour coverage between 65 degrees north and 65 degrees south latitude.

The tactical mission is to provide high-priority users the ability to operate in an environment with a low probability

The AEHF system is composed of three segments: **space** (the satellites), **ground** (mission control and associated communications links) and **terminals** (the users). The segments will provide communications in a specified set of data rates from 75 bits per second (bps) to approximately 8 megabytes per second (Mbps).

The space segment consists of a cross-linked constellation of three satellites. The mission control segment controls satellites on orbit, monitors satellite health and provides communications system planning and monitoring. This segment is highly survivable, with both fixed and mobile control stations. System uplinks and crosslinks will operate in the extremely high frequency (EHF) range and downlinks in the super high frequency (SHF) range.

The terminal segment includes fixed and ground mobile terminals, ship and submarine terminals, and airborne terminals used by all of the Services and international partners (Canada, Netherlands and U.K.). MCSW is responsible for acquisition of the space and ground segments as well as the Air Force terminal segments. The protected product line is supported by the MILSATCOM terminal, Family of Advanced Beyond-Line-of-Sight Terminals (FAB-T) and CCS-C.

## EPS

**EPS** will provide continuous coverage in the polar region for secure, jam-resistant, strategic and tactical communications to support peacetime, contingency, homeland defense, humanitarian assistance, and wartime operations. The system consists of two EHF communications payloads hosted on satellites operating in highly elliptical orbits, modified AEHF communications terminals, a Gateway to provide connectivity into the ***Global Information Grid*** (**GIG**) and other communication systems, and an extension of the ***AEHF Mission Control Segment*** (**MCS**) hardware and software to accommodate EPS.

The EPS will be an interoperable part of the ***Transformational Communications Architecture*** (**TCA**), and will include gateways for connectivity into other communication systems and the GIG. EPS characteristics include protected communications services, communications services without continuous system C2, integrated capability allowing different levels of planners to manage their resources, interconnectivity between Enhanced Polar satellites and mid-latitude users via an EPS Gateway located at a **GIG PoP** (***Point of Presence***), data rates between 75 bps and 1.28 Mbps (threshold) and an AEHF Extended Data Rate (XDR)-interoperable waveform. EPS will be an essential adjunct to the MILSATCOM mid-latitude systems.

## Assistance to Warfighters

Once on orbit, the AEHF satellite system will provide secure, survivable anti-jam, anti-scintillation communications for strategic and tactical users. It will also provide the warfighter continuous 24-hour coverage between 65 degrees north and 65 degrees south latitude.

The EPS system will provide communications for military tactical and strategic forces and other users for operations above **65° N**. Additionally, EPS provides connectivity to ***Combatant Commander Command and Control*** (**C2**) centers below 65° N.

## Highlights

### AEHF SV-1

- Currently in the last stages of environmental testing. Tests are performed to mitigate the risk of launch and on-orbit failure. These determine flight worthiness and help in detecting potential problems of the satellite by subjecting the flight article to flight-like operating conditions.

### AEHF SV-2

- Core and Payload Module Mated

### AEHF SV-3

- Core in Sunnyvale, California
- Major bus and payload components being integrated
- Payload Module delivery estimated in early 2009
- Currently there are cooperative agreements in place with the United Kingdom, Canada, and The Netherlands.

## Upcoming Milestones

### AEHF

- Launch of SV-1 in calendar year 2009

### *EPS*

- The Program Key Decision Point – B (KDP-B) is expected to occur in the spring of 2009

## *The Network Product Line*

The network product line is DoD's future MILSATCOM System that includes the ***Transformational Satellite Communications System*** (**TSAT**). Once on-orbit, TSAT will provide worldwide, secure, survivable satellite communications to U.S. strategic and tactical forces during all levels of conflict. It will sustain the MILSATCOM architecture by providing connectivity across the spectrum of mission areas, to include land, air and naval warfare; special operations; strategic nuclear operations; strategic defense; homeland security; theater operations; and space operations and intelligence. TSAT will be supported by the FAB-T MILSATCOM terminal and also by CCS-C.

On a global scale, TSAT will provide high assurance, automated and dynamic capabilities. In addition to providing a significant increase in capacity over current satellite systems, specific emphasis is placed on providing new capabilities through the use of technologies such as Internet Protocol (IP), onboard routers and large aperture antennas. These technologies provide the potential for enabling ***Communications on the Move*** (**COTM**) to users with small terminals and allow TSAT to collect information from protected ***Airborne and Spaceborne Intelligence, Surveillance and Reconnaissance*** (**AISR**, **SISR**) assets to enhance situational awareness. TSAT delivers these capabilities in a broad integrated information sharing environment thereby enabling interoperability on an unprecedented scale in military communications.

The TSAT program is composed of three segments (TSAT Mission Operations System – TMOS, space and terminal segments, and), and a systems engineering and integration function.

### *TSAT Mission Operations System (TMOS) Segment*

**TMOS** is responsible for network and operational management for the TSAT system, effectively managing TSAT interactions with the GIG. TMOS will incorporate AEHF mission planning capabilities as well. TMOS will provide circuit and packet mission planning, external network coordination, network operations, policy-based network management, cryptographic key management and situational awareness in a secure environment. In addition, the TMOS contractor leads the overall effort to architect and design the TSAT network and its interface with the GIG.

### *Space Segment*

The Space Segment will consist of five satellites in geosynchronous orbits interconnected by high data rate laser crosslinks. The Space Segment is also comprised of the ***TSAT Satellite Operations Element*** (**TSOE**) which includes a primary ***TSAT satellite operations center*** (**TSOC**) for on-orbit satellite control, and the ***CONUS Ground Gateway Element*** to receive high rate data transmitted by a TSAT satellite for linking into the GIG.

In January of 2004, the government awarded ***Risk Reduction and System Definition*** (**RRSD**) contracts to both **Boeing Space Systems** (BSS) and Lockheed Martin (LM). The RRSD phase allowed the program to conduct rigorous risk reduction and system definition activities. An independent team sponsored by **SAF/AQR** performed a ***Technology Readiness Assessment*** (**TRA**) and concurred that each of these technologies was sufficiently mature to warrant proceeding into the development phase. The TSAT Program is currently pursuing a competitive acquisition strategy for the design, development, and production of the Space Segment. The TSAT proposal evaluation is a thorough, deliberative process that is proceeding in accordance with established regulations and processes. Contract award will be made as soon as this process is complete and the selection of an offeror has been approved.

### Terminal Segment

The terminal segment consists of the terminals that will be designed and procured by each of the armed services, based on the requirements allocations from the TSAT program.

### Systems Engineering and Integration (SE&I)

The SE&I contract was awarded in October of 2003 to a team led by **Booz Allen Hamilton**. The contract is for systems definition and assisting the TSAT program office with integration of the Space, TMOS and Terminal Segments, and external programs. The SE&I effort is responsible for integrating Space and TMOS with each other, and with a broad range of external programs including terminal programs, and the other network domains comprising the GIG. There will be a full and open competition for a follow-on SE&I Contract to cover the development and production phase of the program.

## Highlights

- In June 2008, the DoD completed a Military Satellite Communication investment strategy study which assessed alternatives to the TSAT program. The Department decided to continue with the ongoing source selection.

## Upcoming Milestones

- TSAT expects to meet KDP-B Defense Space Acquisition Board (DSAB) in fourth quarter of fiscal year 2008. If the TSAT program office receives approval to proceed into the development phase, the program office will award the space segment development and development and production (D&P) contract as soon as the source selection process is complete and selection of an offeror approved.

## Assistance to the Warfighter

- Once on orbit, TSAT will use Internet-style technology to connect warfighters all over the world in a global information network with unprecedented carrying capacity, accessibility, reliability and protection from jamming, eavesdropping and nuclear effects. TSAT is essential to 21st century net-centric warfare and will revolutionize military communications.

## CCS-C Program

The **CCS-C** program supports the majority of MCSW's product lines, providing satellite control capabilities for DSCS III, Milstar, AEHF, and WGS satellite systems, that are operated at **Schriever Air Force Base** by the **3rd** and **4th Space Operations Squadrons**. The CCS-C program management office currently supports on-orbit operations of DSCS III, Milstar, and WGS satellites and will support launch and early orbit operation and on-orbit operations of AEHF. The system's capabilities include: mission, activity, and maneuver planning; telemetry processing; commanding; orbit management; resource management; space vehicle and ground system simulation; support planning and execution; and interfaces with dedicated ground and payload control systems.

Satellite platform and payload state-of-health operations include launch, early-orbit, on-orbit, anomaly resolution, and disposal operations. The CCS-C system consists of high specification, commercially available computer servers and workstations running commercially available ***Telemetry Tracking and Commanding*** software packages on local area network-based client/server architecture. ***Automation features such as Task Automated Operations*** (**TAO**) has dramatically reduced operator workload thereby enabling the operators in 3rd and 4th Space Operations Squadrons to reduce operator crews while ensuring sufficient Tactical Control of America's most critical communications assets.

CCS-C products are operational at: ***Air Education and Training Command***, ***533rd Training Squadron*** at Vandenberg AFB; ***14th Air Force, 50th Space Wing***, ***3rd*** and ***4th Space Operations Squadrons*** at Schriever AFB, Colorado. A CCS-C ***Backup Satellite Operations Center*** (**BSOC-V**) at Vandenberg AFB is planned to be operational September 2008.

## Highlights

- WGS Ops Transition – January 08

## Upcoming Milestones

- BSOC-V located at Vandenberg AFB, CA is schedule for turnover from the CCS-C Program office to the 50th Space Wing in September 2008.
- CCS-C will support handover from Boeing to 3SOPS of WGS Satellite Vehicles 2 and 3 in February and August 2009.
- CCS-C will be the primary command and control system for AEHF Launch and Early Orbit support for three upcoming launches.
- Full Operational Capability (FOC): CCS-C FOC will occur after the first AEHF launch. At this time CCS-C will be operating at least one satellite from each of the MILSATCOM families.

## Assistance to the Warfighter

CCS-C maintains the satellite platform for DSCS and WGS, so that Army Operators can provide responsive payload communication to the warfighters. CCS-C also resolves major anomalies for the protected satellite communications legacy system Milstar and will provide the same capability to AEHF (once on-orbit) to minimize downtime to the warfighter. The AEHF (protected) system will:

- provide an order of increased capacity than that of the Milstar satellite system
- be more flexible and faster than the legacy EHF systems
- be the joint service satellite communications system that provides survivable, global, secure, protected, and jam-resistant communications

## FAB-T Program

As discussed previously, **FAB-T** supports each of MCSW's product lines. FAB-T develops architecture to support family of satellite communications terminals for airborne, ground-fixed and ground transportable applications. The FAB-T Program is an evolutionary acquisition program providing a family of Beyond Line-of-sight (BLOS) SATCOM terminals with an open architecture developed in Increment 1.

## Highlights

- Successful Preliminary Design Review in June 2008

## Upcoming Milestones

- Modem and processor Risk Reduction Prototype (RRP) contract awarded in 2007; prototype delivered to MIT/LL in July 2008

## Assistance to the Warfighter

With each increment of FAB-T, capabilities will be increased and will provide the warfighter with greater bandwidth and speed! For example, FAB-T Increment 1 will provide EHF/AEHF communications for strategic and tactical operations. FAB-T Increment 2 will provide Ka/Ku band SATCOM for WGS. ***FAB-T Increments 3 and 4*** will also provide increased communications capabilities for the TSAT satellite.

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*Editor's Note*

*Our thanks to the Space and Missile Command's press relations department and their command officers for their contributions to this article.*

**The ability to learn allows mankind to adjust to situations of the most important kind, those of personal and business growth and, yes, even survival! Within the military, governmental, organizational and commercial worlds, the capability to adjust one's ideas based upon absorption of new information enables personal and professional development. Isn't that is what it's all about?**

To assist with your endeavors in this regard, we present a list of upcoming conferences and expositions to help you acquire additional information to support your path toward even further successes...

***September 15th through 17th, 2008***

**Air & Space Conference and Technology Exposition**

**Marriott Wardman Park Hotel, Washington, D.C.**


- The Air Force Association blends Air Force leadership, industry experts, academia, and current event specialists from around the world together to discuss the issues and challenges currently facing the U.S. and aerospace community. Among the invited speakers and attendees are the Secretary of the Air Force, the U.S.A.F. Chief of Staff, and other Air Force, government, and aerospace industry leaders. More than 130 aerospace exhibitors will be in attendance.

***September 22nd through 25th, 2008***

**Asia-Pacific Satellite Communications Council (APSCC) Annual Satellite Conference & Exhibition**

**Hotel Lotte, Jeju, Korea**


- It's a first — Asia-Pacific Satellite Communications Council (APSCC) conducts a Military Satellite Services Workshop. Much history takes place over a decade, and the APSCC 2008 Satellite Conference and Exhibition is no exception. Known as APSCC's flagship contribution to the satellite industry, the conference has been providing a globally integrated platform that covers every sector of the satellite industry as well as a unique briefing and networking opportunity to the participants of the event. This year the APSCC 2008 event, scheduled for September 22-25 in Jeju Island, at the Lotte Hotel, will be launched on a bigger platform covering more issues than ever regarding the Asia-Pacific satellite industry.

***October 6th to 8th, 2008***

**Strategic Space and Defense 2008**

**Qwest Center in Omaha, Nebraska**


- This is the sixth year for this annual global security conference for the space and defense industry and includes the strong support and participation of the U.S. Strategic Command (USSTRATCOM), defense industry, and the Omaha community to present timely and relevant insights into the global missions of this vitally important command. The leaders of USSTRATCOM, as well as component and supported commands, will address a number of panel topics that range from strategic deterrence, cyberspace, and national defense. Attendees will gain awareness about USSTRATCOM's mission, global activities, relationships, international perspectives, as well as developments in national security policy and trends from aerospace leaders.

*October 6th to October 7th, 2008*

**Military Data Links and Situational Awareness**

**Crowne Plaza St. James Hotel, London, U.K.**


- This is the 11th annual conference that examines the latest developments in data links, all designed to help you improve situational awareness for the modern warfighter. Learn about current, salient issues and engage in networking and partnering opportunities. Updates include tactical data links on a platoon level, data link management and planning, cost of ownership, Blueforce tracking and situational awareness, advanced data links, integrating air and ground data links, and using data links to accurately target and engage.

*November 3rd to 5th, 2008*

**Global MilSatCom**

**Millennium Conference Center, London, U.K.**


- This is the 10th year for this SMI featured event where attendees will discuss national developments, international cooperation and current operational changes. The latest programs from Europe, the U.S., Australia and the United Arab Emirates will be revealed. And the speaker list is MOST impressive… see the information regarding this event in the INCOMING editorial notes at the start of this issue of ***Milsat Magazine.***

*November 3rd to 6th, 2008*

**TechNet Asia-Pacific 2008**

**Sheraton Waikiki Hotel, Honolulu, Hawaii**


- TechNet Asia-Pacific is the AFCEA's 23rd Annual Conference and Exposition and presents "Beyond Joint — Connecting Mission Partners". The conference brings attendees up to date on IT developments in the Pacific and offers dynamic panel sessions and key military commands present insider perspectives as well as critical issue discussions.

*November 11th to November 13th, 2008*

**Asia Pacific Defence and Security**

**Adelaide Convention Centre, Adelaide, South Australia**


- Supported by the Government of South Australia, this exhibition encompasses tri-service and security products and services. The event's aim is to results-driven and fully focused on exhibitors and visitors. High-level discussions will occur regarding national, regional, and international defense and security issues. Additionally, a number of global defense firms have selected Adelaide as their base to pursue Australian and regional business opportunities, with more than U.S. $14 billion worth of new defense and security projects coming online.

# BRIEFING

**November 17th to November 19th, 2008**

**MILCOM 2008: "Assuring Mission Success"**

**San Diego Convention Center, San Diego, California**


- For 27 years, MILCOM has been a must-attend event for members of the government, military, scientific, and engineering communities. This year's conference will showcase new products, breakthrough technologies, and exciting industry trends through special exhibits, interactive tutorials, keynote speeches, and panel discussions.

***November 19th to November 20th, 2008***

**Aerospace & Defense Finance Conference**

**Credit Suisse Headquarters, New York, New York**


- This event is for VPs of business development, commercial/military suppliers/contractors, and anyone looking to expand their market share and increase their presence in this community! The conference will offer higher level government representation, increased opportunities to meet with speakers and panelists, and analysis of the impact of the U.S. Presidential election. Attendees will have the opportunity to hear forecasts and get guidance and detail regarding the upcoming financial year.

***January 19th through 21st, 2009***

**GULF C4ISR 2009**

**Armed Forces Club, Abu Dhabi, UAE**


- GULF C4ISR is the only event for the Military Communication C4I/ C4ISR/ NCW community, bringing together more than 200 government, industry, and military leaders, together with leading suppliers and industry experts, across an information packed three days of accurate, timely and cutting-edge military case studies. With speakers and research experts from across the Middle East and the world, you'll be able to meet many senior defense communication experts from the Gulf region. The purpose of the conference is to bring together practitioners, strategic heads of C4i, integrated project leaders, and technology leaders from defense organizations internationally to review the latest developments in this area. The conference will deliver a program with more than 30 case study presentations from GCC MoDs, international defense agencies, and other security organizations, covering all aspects dealing with advanced communications technologies, NCW, advanced SATCOM technologies, network management, and interoperability of systems among coalition forces in a deployed situation.

***January 26th to January 29th, 2009***

**Network Centric Warfare 2009**

**Ronald Reagan Building and International Trade Center, Washington, D.C.**

- NCW 2009 offers the world's largest and most respected event focused on net-centric operations. Institute for Defense and Government Advancement's (IDGA) NCW is the premier forum for an exchange of ideas on network centric innovation, and the most trusted event for information on the latest operational experiences and the most groundbreaking and significant government and industry initiatives to date. Some of the topics to be discussed include network enabled capabilities for improved command, control, and communications; battle command migration and future combat systems integration; interoperability solutions for multi-level security networks training and doctrine establishment of netcentric capabilities; and leveraging architectures for secure service-oriented systems.

***February 10th through February 12th, 2009***

**WEST 2009**

**San Diego Convention Center, San Diego, California**


- Co-sponsored by AFCEA International and the U.S. Naval Institute, West 2009 is the largest event on the West Coast for communications, electronics, intelligence, information systems, imaging, military weapon systems, aviation, shipbuilding, and more. Engage the military and industry leaders, who are designating warfighting strategies and operational platforms. Their theme for this event is "Defense — Reset, Redesign or Reinvent?"

***February 10th to February 12th, 2009***

**National Space Symposium (25th annual)**

**The Broadmoor Hotel, Colorado Springs, Colorado**


- The National Space Symposium is the premier U.S. space policy and program forum, a true opportunity for information and interaction on all sectors of space — civil, commercial, and national security. The push for space continues in all sectors, and "Our Expanding Universe...50 Years of Space Exploration" sets the tone for the event. As we push forward, the many accomplishments in space will also be examined, as 2007 marked the 50th anniversary of space exploration. Also highlighted will be the Orion/Ares program and how it's moving manned space exploration forward through further expeditions to the moon, Mars and other destinations; and how the shuttle program continues to bring the International Space Station closer to completion. The role of entrepreneurs will be included on how they continue to push the edge of the envelope, providing more funding for new and innovative research in the "new space" industry leading to affordable space tourism. National security issues will broach on continuing to understand the central role of space and using the opportunities it has to offer for defense purposes.

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