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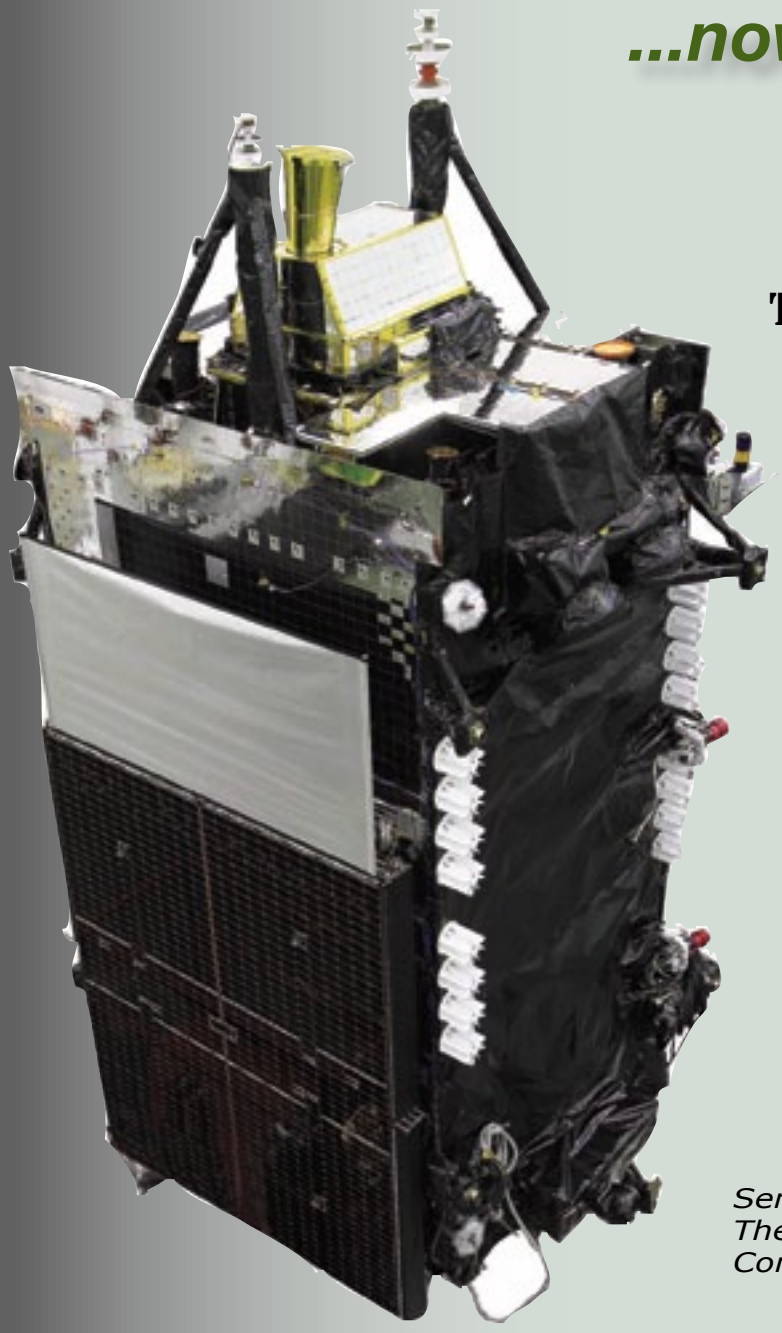

MAKING HISTORY...

THE HOSTED PAYLOAD ALLIANCE

Sensor technology trailblazing...
The SES-2 satellite with the U.S.A.F.'s
Commercially Hosted Infrared Payload (CHIRP).

About the cover image

The SES-2 satellite is shown with the solar array panels collapsed down by its side. This is necessary for the satellite in order for SES-2 to fit within the fairing of the Arianespace rocket for launch.

On top of SES-2, the mirrored appearing box with a cone shaped piece that stands upright... that's the Commercially Hosted Infrared Payload (CHIRP), which includes the wide field-of-view infrared staring sensor. The U.S. Air Force contracted with SES UGS to host CHIRP on a commercial satellite in order to test a proof-of-concept in orbit. For this experiment, the U.S.A.F. will test this technology from a GEO orbit for the first time in history — true trailblazing for sensor technology.

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May 2011

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To Fly Or Not To Fly

A pilot sits in his UH-60 Black Hawk on the airfield at Joint Base Balad and calls in for a preflight weather check. The Staff Weather Officer tells him there is a dust storm in route and there will be zero visibility at Camp Taji and that flying there is not recommended.

The pilot heeds the SWO's warning and goes into a holding area until the weather clears; possibly saving not only his own life, but the lives of his crew and passengers.

Several Airmen from the **California Air National Guard** are deployed to Iraq to support the **40th Combat Aviation Brigade** and other air and ground assets in the country.

Master Sgt. Hilario Flores gives a weather update to a UH-60 Black Hawk pilot prior to take off at Joint Base Balad, Iraq. Pilots receive up-to-date weather reports before flying anywhere in Iraq.

"The Army needs to know what's going on with the weather throughout its area of operations," said Master Sgt. *Hilario Flores*, SWO for the **22nd Expeditionary Weather Squadron, Detachment Two, 163rd Reconnaissance Wing/210th Weather Flight** out of **March Air Reserve Base**,

Maj. Jeffery Johnson checks a TMQ-53 Weather Observation Station on top of a building at Camp Taji, Iraq. The TMQ-53 records the temperature, air quality and clairity, wind speed and direction, cloud presence and atmospheric pressure.

California, which is currently deployed to Camp Taji and Joint Base Balad in support of Operation New Dawn. "If something pops up, we have to let them know immediately so they can adjust fire accordingly and go from there."

The weather plays a big factor in all military operations, both in the air and on the ground. From when a mission starts to when it is finished, the weather may change two or more times. A change in the weather can make a smooth operation grind to a screeching halt in a matter of seconds.

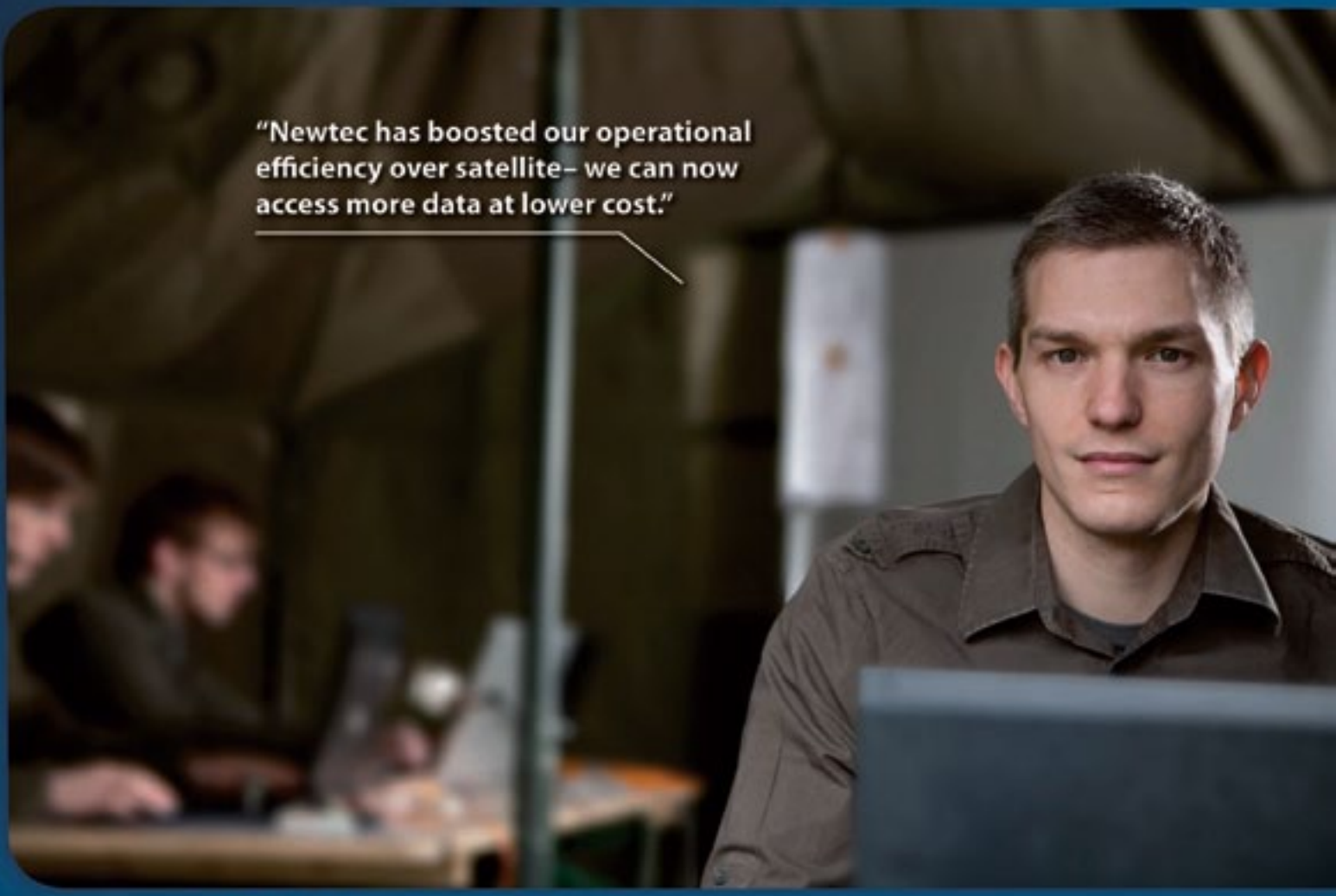
"The weather here in Iraq can change drastically in an instant," said *Flores*. "We always have to stay vigilant when we're at our post and we're always on our toes looking to ensure our forecasts stay accurate."

The 22nd EWXS uses a vast array of ways to gather its information to be able to accurately forecast the weather.

"We use satellite imagery and live feeds, we have automated sensors out at different locations that gather information, we send people up to the roof every hour to physically look at and feel the weather; plus, we use intel that we get from soldiers out in the field, among other ways to gather our information to accurately forecast the weather," said Maj. *Jeffery Johnson*, SWO officer in charge for the 22nd EWXS. "We by no means have a lack of intel to forecast the weather accurately up to four to seven days in advance."

In addition to accurate forecasting, the 22nd EWXS is efficient in letting the troops know what to expect and when to expect it when it comes to the weather.

"We brief the pilots before takeoff, during takeoff, when they're in route, and before they land, on the most current, up-to-date weather conditions in their area," said Master Sgt. *Carlos Coronado*, SWO non-commissioned officer



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in charge, 22nd EWXS. "We also brief the command on what is going on and what's about to happen so they can disseminate it to the troops."

Master Sgt. Carlos Coronado monitors weather updates to accurately forecast the weather at Joint Base Balad, Iraq. Coronado is tasked with providing timely and accurate weather reports to pilots that call in prior to take-off.

The airmen of 22nd EWXS said they take pride in their mission: to provide accurate weather forecasts, visibility reports and temperature predictions to the pilots, commanders and to the everyday soldier on a daily and sometimes hourly basis.

Story and photos by Spc. Darriel Swatts

Operation Tomodachi Support

***Exercise Key Resolve 2011* ended March 10, and 1st Marine Aircraft Wing, III Marine Expeditionary Force, assets used for the exercise are being sent to mainland Japan to support humanitarian assistance and disaster relief efforts there.**

According to Sgt. *Kevin Medina,* a system administrator with **Marine Tactical Air Command Squadron 18, Marine Air Control Group 18, 1st MAW**, Key Resolve was an excellent way to train with the Air Force and use database exchanges between the services.

"The coordination between the system administrator, the interface control officer and the Hardened Tactical Air Control Center kept the commanding general's satellite picture up and operational at all times," said Gunnery Sgt. *Columbus Wilson*, an interface control officer with MTACS-18.

The data links between the Marine Tactical Air Communication Center and the **Air Force HTACC** worked with no connection problems throughout the exercise, according to Staff Sgt. *Michael Selden*, a crew chief with MTACS-18.

Due to current relief efforts in Japan, 1st MAW communication assets that would have been deployed back to Okinawa are being sent to mainland Japan instead.

"We are sending a Lamda antenna, a Lightweight Multiband Satellite Terminal and a Support Wide Area Network to help aid the disaster relief in Japan," said Lance Cpl. *Annalynn Delvalle*, an embarkation specialist with Marine Wing Communication Squadron 18, MACG-18. In all, Marines from MWCS-18 sent five pallets of communication gear to **Naval Air Facility Atsugi**, Japan.

A tactical forklift hauls pallets of communication gear used during Exercise Key Resolve in the Republic of Korea March 15. The gear was flown to mainland Japan to help with the humanitarian assistance and disaster relief efforts there.

"The gear is being sent to Atsugi to support the Air Combat Element Command Operational Center and Sendai to support the Forward Air Refuel Point," said 1st Lt. *Mike Parrott*, a detachment executive officer with MWCS-18.

The FARP was established by 1st MAW Marines at Sendai's **Yamagata Airport** to increase military airlift capabilities.

According to Delvalle, the squadron loaded about 25,000 pounds of gear to help support III MEF Marines already deployed to aid Japan.

Story and photos by
Lance Cpl. Michael Iams

Addtionally, Marines assigned to Marine Wing Communications Squadron 18, Marine Aircraft Group 36, 1st Marine Aircraft Wing, III Marine Expeditionary Force, provided much-needed communication support to Marines and sailors, as well as their Japanese counterparts in Sendai, March 23.

Sgt. Eerrik Byrd and Spc. Eric Martinez, from U.S. Army Japan's Logistics Task Force 35, set up a Satellite dish at Sendai Airport. This communications equipment will allow for the establishment of a Humanitarian Assistance/Disaster Relief supply hub that assist in providing supplies to the Japan Ground Self Defense Force to be distributed to evacuation facilities in the Tohoku area as part of Operation Tomodachi. (U.S. Army Japan photo by Jose Sanchez)

In the wake of the earthquake and tsunami that devastated the coastal city of Sendai in northeastern Japan on March 11, Marines and sailors assigned to **III MEF** have been working steadily in support of the disaster relief efforts known as Operation Tomodachi with poor communication assets.

Although many different components are involved in the relief efforts, Marines in charge of restoring communication feel their mission is a top priority.

"We are here to support any communication-related needs during Operation Tomodachi," said Sgt. *Giovanie Maldonado*, a wireman with MWCS-18.

The squadron has spent the past week providing constant support to those in need, whether fellow Marines assisting the relief efforts or Japanese counterparts focused on rebuilding the damaged areas of their country.

"We are providing communication to our satellite sites of operation that are unable to communicate properly with the outside world," said *Maldonado*. The squadron is operating as they would on a deployment, handling the need for communication with an unprecedented sense of urgency.

Yarian added, "We go to the next disaster site and provide crucial communications support to both U.S. and Japanese forces so they can coordinate the relief efforts."

"We leave when the mission is complete," Yarian said. Unsure as to when their mission will end, the Marines remain focused on providing communication support to the relief efforts.

As a part of *Operation Tomodachi*, the Marine Corps continues to work closely with the government of Japan to provide any requested assistance.

Bundeswehr Bundling (Comms)

Thanks to this new order, the Harris Corporation now supplies six countries with their tactical radios…

The Company has received a $1.6 million order from the Bundeswehr, the **Armed Forces of the Federal Republic of Germany**, for ***Falcon III*® *AN/PRC-117G*** multiband manpack radio systems. This order brings to six the number of countries that have adopted the AN/PRC-117G to provide defense personnel with nexgen tactical communications

capabilities such as wideband networking. In connection with the order, Harris is supplying German forces with AN/PRC-117G radios and related accessories. Germany will deploy the AN/PRC-117G in support of national and NATO peacekeeping missions. The AN/PRC-117G radio provides

warfighters with unprecedented situational awareness of the battlefield by enabling applications such as streaming video, simultaneous voice and data feeds, collaborative chat, and connectivity to secure networks. The wideband networking capabilities of the AN/PRC-117G give warfighters critical real-time information through a man-portable radio that is significantly smaller and lighter than previous manpack radios.

Product information at this link...
http://www.rfcomm.harris.com/capabilities/tactical-radios-networking/an-prc-117g/default.asp

Warrior Welfare

Afghanistan-based troops will soon have access to far more welfare comm services.

NewSat Limited has won a new contract to provide MILSATCOM services to U.S. Military troops in

Direct lik to Jabiru information...
http://www.newsat.com/Satellites/jabiru-satellite-program.html

Afghanistan. The contract is worth $4.4 million of additional revenue per annum, commencing in June 2011. The contract will see NewSat providing welfare communications for military personnel in over 15 locations throughout Afghanistan. The contract also has the option for NewSat to extend for a further year. This latest contract takes NewSat's year-to-date contract wins to more than $10 million in new revenue, in addition to NewSat's current contract base and high retention rate. For reference, NewSat's revenue in the year to June 30, 2010, was $25 million.

MILSATCOM Testing Prior To Deployment

Soldiers with the Arkansas National Guard's 39th Infantry Brigade are now testing a new satellite-based communications system as they prepare for their latest combat deployment.

A tent city housing computer terminals and satellite links that sprouted last week among the rows of World War II era barracks at Fort Chaffee took Arkansas' largest National Guard brigade one step closer to being ready for its pending Afghanistan deployment.

The *Arkansas Democrat-Gazette* reported Sunday that tents housing computer terminals and satellite links went up last week at **Fort Chaffee**, allowing soldiers to test the ***Warrior Information Network-Tactical*** system for the first time in a virtual war scenario.

Sometime next year, soldiers from the brigade will head to Afghanistan for the unit's third combat deployment in a decade. The new network gives soldiers at all levels access to one another's

intelligence, data and procedures, said the brigade's commander, Col. *Kirk VanPelt.*
"It can be too much information, so the challenge is, how do you manage it," *VanPelt* said. "We have a ways to go."

Brigade officials expect to receive this spring their formal alert, signifying a one-year countdown to deployment, but they wanted to be proactive and start preparing now. Brigade leaders attended a leadership workshop earlier this month at **Fort Irwin**, Calif., and in six weeks, the whole brigade will leave for a three-week exercise at the *National Training Center* at the same California post.

VanPelt said the brigade remains about 300 soldiers short of its goal of 3,400 soldiers. Soldiers from the **Alabama National Guard's 1st Battalion, 167th Infantry Regiment**, have been told they will join the Arkansas unit for the deployment.

Although the brigade does not yet know what its mission will be when deployed, soldiers know know will be using the new communications system. Capt. *Marcus Pierce*, the 39th's signal officer, said the system will allow units spread across a region to share intelligence. He said last week's exercise proved helpful but "we're somewhere between a crawl and walk phase" in using the system.

"The real challenge beyond the initial training is how do we keep training up from month to month and how do we make sure we get software updates," *Pierce* said. "That can cripple us."

Story from the
Arkansas Democrat-Gazette
by Amy Schlesing
http://www.arkansasonline.com

Gearing Up

The U.S. Army continues to move forward on Low Rate Initial Production of Increment 2 of the Warfighter Information Network-Tactical, or WIN-T. WIN-T is a mobile satellite communication and terrestrial network able to move voice, video and data across long distances for forces on-the-move in combat, Army officials said. WIN-T includes network management tools, radios, routers and small, vehicle-mounted satellite dishes able to transmit signals via terrestrial and satellite from the company level up to division echelons. It will also support communications connectivity to vehicles on-the-move, to other command posts, and higher headquarters, said Lt. Col. *Robert Collins*, product manager for WIN-T Increment 2.

The ***WIN-T Increment 2*** contract, which was awarded to **General Dynamics** and finalized on Dec. 30, will support procurement and fielding of 20 brigade-sized maneuver units and includes two years of LRIP with an option for one additional year of Full Rate Production. The initial Low Rate contract Delivery Order calls for delivery of eight brigades and one division headquarters worth of WIN-T gear, Collins said. The WIN-T network is designed to be self-healing and self forming. It is managed and configured via custom and commercial-based Network Operations software to ensure the most efficient and effective path is available to transmit valuable, combat-relevant information.

The Tactical Communication Node for the Warfighter Information Network - Tactical, or WIN-T, allows for on-the-move functionality. Photo credit Courtesy PM WIN-T

"The network components are designed with redundant paths in and out, so WIN-T has routing capability. If you are maneuvering through the desert and you hit some kind of blocking terrain where you don't have a terrestrial line-of-sight connection, the network can automatically re-route information to the next available path, such as a satellite," said Collins. The NetOps software allows the signal officer to monitor activity and prioritize information flows across the network. "There are protocols and policies that we use to make sure the network is constantly making decisions and pushing information out through the most efficient route possible. Additionally, the WIN-T Inc 2 system allows network resources to be weighted much like combat forces are in support of operational missions. The network can allocate bandwidth and prioritize traffic so that that critical messages get precedence on the network," *Collins* said.

WIN-T Increment 2 has a key Initial Operations test coming up in early 2012 with the **2nd Brigade, 1st Armored Division** at **Fort Bliss**, Texas, he said. The WIN-T program is also continuing development on Increment 3 - that includes additional capability such as an "aerial tier"- in which the network will be extended to leverage the use of aerial "nodes" on Unmanned Aerial Systems such as the ***Gray Eagle*** to enhance overall connectivity and reliability, *Collins* said.

Nanosatellite's 3U CubeSat Success

The multiple payloads aboard this spacecraft have science operations under control and completed…

Dynetics announced during the recent ***NSS*** event in Colorado Springs that **FASTSAT-HSV01** has successfully completed scheduled science operations for multiple payloads. Mission operations are managed and

controlled at **NASA**'s *Huntsville Operations Support Center* in Huntsville, Ala. FASTSAT is a commercial satellite developed by Dynetics in partnership with the *Von Braun Center for Science & Innovation* (**VCSI**) and NASA's *Marshall Space Flight Center* in Huntsville for the ***Department of Defense Space Test Program*** (**DoD STP**). The spacecraft launched on Nov. 19, 2010, carrying six payload experiments to low-Earth orbit. NASA's ***Mini-Me*** and ***PISA*** instruments onboard the satellite are successfully performing science observations as the TTI instrument continues sensor optimization. FASTSAT demonstrated the deployment of a 3U CubeSat from a microsatellite on Jan. 20. The ***NanoSail-D*** nanosatellite deployed its 100-square-foot polymer sail in low-Earth orbit and is operating as planned. Additional payload operations are planned.

Atlas V Ascends

Lift off was successful for this NRO payload…

On Thursday evening of April 15, 2011 , the **United Launch Alliance** (**ULA**) ***Atlas V*** with the **NRO**'s ***L-34*** payload stood ready to launch at **Vandenberg AFB**'s *Space Launch Complex-3*. The weather forecast earlier stood at a 30 percent chance of acceptable weather due to ground level winds. This launch marks the 25th launch of the Atlas V vehicle since its first launch in August 2002. This mission is in support of national security. Lots of intrigue occurred as weather reports made the event sound tenuous, but at last the launch took place.

The Atlas 5 rocket takes an unconventional shape that provides just the right amount of

A United Launch Alliance Atlas V rocket blasts off from Space Launch Complex-3 at 9:24 p.m. PDT with the National Reconnaissance Office's L-34 payload. Photo by Pat Corkery, United Launch Alliance.

power for its payload. The Atlas 5-411 vehicle's single solid-fuel booster is mounted to the first stage making this configuration unique because rockets typically fly with either no strap-on boosters or multiple motors. The concept of the Atlas 5 was that is was designed from its initial concept with the thought of each launch being tailored to the payload. If a cargo's weight needs the power of only one booster, then that's how the rocket will be built. Additional photos are available at the ULA's website, http://www.ulalaunch.com/

Go Atlas V! Go Centaur! Go NROL-34! And it did!

Lofted Comm Used In Libya Air Strikes

As 26th Marine Expeditionary Unit AV-8B Harriers conducted air strikes on Libya as part of Joint Task Force Odyssey Dawn, the new Lofted Communications System was operationally deployed for the first time aboard ship, March 20.

The helium-balloon transmission system was used to bridge the gap in communications from ship to Harriers conducting air strikes against the Libyan Leader Muammar al-Qadhafi's ground forces and air defenses, as part of an international effort to halt an offensive against the Libyan populace. Normally, Airborne Warning and Control System aircraft would be used to relay and ensure command and control from the ship. The system, which was first tested in Kuwait in January 2009 during the MEU's sustainment training for its 2008/2009 deployment, costs a fraction of the expense to put additional aircraft in the air and doesn't risk additional lives.

"Being able to loft one of these balloons saves the MEU money, manpower and limits the risk that is associated with flying aircraft," said Capt. *Kevin Soeder*, the MEU assistant communications officer.

The system, which increases the range of line of sight radio communications, can also relay encrypted and non-encrypted data hundreds of miles for about six hours.

"It is exciting to see this capability utilized in support of MEU operations," said *Soeder*, "especially with all of the training and standard operating procedure certification that has taken place."

The MEU has both tethered and non-tethered variants. For the strike missions, the non-tethered version is required so that the balloon can reach the appropriate altitude. The tethered version is currently supporting **Company I, Battalion Landing Team 3/8**, which is conducting counter-insurgency operations in Helmand province, Afghanistan.

"Pushing the technological envelope to support a wide variety of operations throughout the (Marine Air Ground Task Force) is what the MEU is known for," *Soeder* said.

"We are setting the standards for MEUs to come," said Staff Sgt. *Juan Padilla*, the MEU radio chief. "We are the tip of the spear – 26th MEU is leading the way."

Story by Staff Sgt. Danielle M. Bacon, 26th MEU

Cooling Off

A new method by which military satellite payloads can be cooled will be tested at the ISS…

Northrop Grumman Corporation will use an experiment on the *International Space Station* (**ISS**) to test a new way to cool military satellite payloads. The payload, the *Massive Heat Transfer Experiment* (**MHTEX**), was taken to the ISS on board the space shuttle *Endeavour*. This shuttle mission is one of two final flights planned by NASA. "In space, it's difficult to cool electronic systems and today's methods have been stretched to their limits," said *Cecilia Penera,* Northrop Grumman's project manager and principal investigator for MHTEX. "The new method we are testing uses an advanced capillary pump loop that moves heat generated by electronic systems so it can be safely expelled from the spacecraft."

MHTEX is a collaborative effort of Northrop Grumman, the U.S. Air Force Research Laboratory's Space Vehicles Directorate and the U.S. Department of Defense Space Test Program. The experiment will demonstrate how satellite systems can be cooled eight times more efficiently than today's systems. This will allow new cooling systems to be developed that support more complex hardware on military spacecraft.

The Massive Heat Transfer Experiment (MHTEX) — Photo courtesy of Air Force Research Laboratory

New Wideband Satellite Operations Center Dedicated

The U.S. Army Space and Missile Defense Command / Army Forces Strategic Command (USASMDC/ ARSTRAT) dedicated its new Wideband Satellite Communications Operations Center (WSOC) during a ceremony at the Joint Base Pearl Harbor-Hickam (JBHH), Wahiawa Annex in Hawaii.

"This dedication culminates years of planning and teamwork by a number of people, from all services," said Lt. Gen. *Richard Formica*, USASMDC/ ARSTRAT commanding general, in his remarks. "We are particularly grateful to the U.S. Navy's Naval Computer and Telecommunications Area Master Station (NCTAMS) - Pacific for partnering with us as important tenants on this installation. We will be responsible and cooperative tenants and we look forward to a long partnership here at Wahiawa Annex.

Lt. General Richard Formica opens the dedication ceremony.

"Today represents an important milestone in our command's core task to provide trained and ready space and missile defense forces and capabilities to our Combatant Commanders and Warfighters. We replaced the 1980s-era satellite control capability located at Camp Roberts, Calif., with this state-of-the-art $25.3 million facility here at Wahiawa. This enables the best support and coverage for PACOM Theater Wideband SATCOM requirements. Wahiawa is the first of four new Wideband Satellite

Communications Operations Center Control facilities. Based on this center's design, we will be replacing our remaining three legacy Wideband Operations Centers over the next three years."

The facility is a prototype for three other WSOC locations slated for worldwide operations. This center serves as the new home for Army space Soldiers of **Delta Company, 53rd Signal Battalion, 1st Space Brigade**. These Soldiers serve as controllers of the ***Defense Satellite Communications System*** (**DSCS**) and ***Wideband Global Satellite-Communication*** (**WGS**) satellite constellations. This means they command communications payload on these satellites and provide user control.

The purpose of this new facility is to provide Delta Company controllers with increased capabilities to control the communications payload and communications transmissions of the DSCS and WGS constellations. The system is composed of satellites, users, controllers, planners, and managers. Three WGS satellites are currently on orbit. A single WGS spacecraft has as much bandwidth as the entire DSCS constellation.

Formica added that the center is important in his organization because of its ability to meet its responsibility in "providing military communications to troops deployed at forward stations throughout the Geographic Combatant Commands ... ."

He described the operations center role as "managing the payloads and providing critical communications, navigation, and other space based capabilities to the Warfighter. This is no small task, and our Soldiers and civilians take pride in their ability to maintain the lifeline that secure communications bring to those serving in harm's way."

"The capabilities provided by the WGS constellation of satellites and this WSOC here at Wahiawa provide high speed satellite communications support and improved communications control services to USPACOM," *Formica* said. "Satellite capacity that's used to support U.S. combat forces in Iraq and Afghanistan, our fleet afloat and Soldiers, Sailors, Airmen and Marines stationed around the world who work daily to defend our great nation. With this new Ops Center, we'll work alongside 11 Australian servicemembers who will be integrated into our team as part of our bi-national partnership in the Wideband Global Satellite program." The 28,244 square-foot, state-of-the-art building was completed under contract by the **Naval Facilities Engineering Command** (**NAVFAC**).

RAIDRS Ramp Up

A new contract will provide direct SATCOM for combatant commanders...

The **United States Air Force** (USAF) has awarded **Integral Systems, Inc**., a contract valued at $6.99 million for construction of the first two deployment sites for the *Rapid Attack Identification, Detection and Reporting System* (**RAIDRS**) *Block 10* (**RB-10**) program. The contract also includes funding to design a third deployment site.

"The new contract is a significant milestone for the program as we now begin site construction as a prelude to site deployment of RAIDRS," said *David Conway*, Integral Systems' RAIDRS Program Manager. "The close teaming relationship between the Space and Missile Systems Center and the Integral Systems' RAIDRS team was essential to meeting the USAF's stringent requirements." Integral Systems is the RAIDRS RB-10 program prime contractor. RAIDRS is a ground-based defensive counterspace program. The system will provide near real-time event detection,

characterization, geolocation and *Electromagnetic Interference* (**EMI**) reporting for critical satellite communications systems, directly supporting combatant commanders.

RB-10 uses proven, *Commercial Off-the-Shelf* (**COTS**) hardware and software components from Integral Systems, as well as products from its family of companies, including RT Logic, SAT Corporation and Newpoint Technologies. **RT Logic** is providing its ***Telemetrix***® ***Sentinel*** products for signal processing, **SAT Corporation** is providing its ***Monics***® *Satellite Carrier Monitoring and Interference Detection and Geolocation* system and **Newpoint Technologies** is providing its ***COMPASS Network Management System*** (**NMS**).

A Refreshing Risk Reduction Solution

ITT Corporation has been awarded a $2.2 million contract to develop a new generation of satellite remote sensor technologies for the Air Force Research Laboratory located in Kirtland Air Force Base, N.M.

During this phase of the *Space Situational Awareness Environmental Monitoring Sensor Risk Reduction Program*, **ITT** will develop a cost-effective technology refresh solution that replaces decade-old communications and navigation outage sensors. The sensors will be used to measure atmospheric disturbances that cause signal dropouts from satellites, disrupting communications and navigation.

"With this strategic award, ITT will bring upgraded technology that is critical to navigation and communications data with satellites," said *Rich Sorelle*, vice president and general manager of ITT's integrated electronic warfare systems business. "The new sensor will help the Air Force identify conditions that could hamper warfighter communications."

The system, when deployed, will be placed on multiple platforms to provide complete geographical coverage of the Earth. The risk reduction effort will be performed by a team of **ITT Electronic Systems**, **Ball Aerospace Technologies Company** and **Northwest Research Associates** in cooperation with the **Air Force Research Laboratory.**

The James Webb Space Telescope pathfinder backplane during the manufacturing process

A Foremost Backplane

The *James Webb Space Telescope* reached another key milestone with the delivery of the pathfinder backplane to Northrop Grumman, prime contractor on the program.

Like so much of the hardware on this unique spacecraft, the backplane, built by **Alliant Techsystems** (**ATK**) is being manufactured to demanding specifications that will allow the telescope to perform its mission in the harsh environment 1 million miles from Earth. The backplane must support the weight of the telescope's beryllium mirrors, instruments, and other elements during launch and hold the 18-segment, 21-foot-diameter primary mirror nearly motionless while the telescope is peering into deep space.

The backplane meets exacting thermal stability requirements. For example, it must not deform more than 38 nanometers (about 1/10,000 the diameter of a human hair) while the telescope is operating, even though it will experience temperatures colder than -400 degrees Fahrenheit.

The pathfinder backplane is a full-scale engineering model of the flight backplane and will be used to demonstrate integration and test procedures prior to implementing them on the flight telescope. Consisting of 2,540 parts, the backplane is built with advanced, lightweight graphite composite material attached to metallic fittings.

The pathfinder is a high-fidelity model of the *Optical Telescope Element*, which is the eye of the observatory. A full-size structure, it consists of 12 of the 18 hexagonal cells (the center section) of the telescope and contains a subset of two primary mirror segment assemblies, the secondary mirror and aft optics subsystem. The pathfinder is made of the same material with the same tolerances

as the flight backplane, which measures 24 by 21 by 9 feet to accommodate interfaces at the top and bottom.

Used by **NASA** and the entire ***Webb*** telescope team, the pathfinder supports numerous engineering models and flight optics. In addition to demonstrating integration and alignment techniques, it will be subjected to optical performance measurements at cryogenic temperatures and will verify all ground support equipment and test procedures.

The ***James Webb Space Telescope*** is the world's next-generation space observatory and successor to the ***Hubble Space Telescope***. The most powerful space telescope ever built, Webb will observe the most distant objects in the universe, provide images of the very first galaxies ever formed and see unexplored planets around distant stars. The Webb telescope is a joint project of NASA, the European Space Agency and the Canadian Space Agency.

A Perigree Passing

The first Advanced Extremely High Frequency satellite crossed the half-way mark to geosynchronous orbit March 22, with its perigee climbing above 17,893 km. altitude.

As of this writing, ***AEHF-1*** has crossed the 20,000 km. perigee mark. Orbit-raising for AEHF-1 is successfully continuing as planned, according to *Dave Madden*, director of the ***Military Satellite Communications Systems Directorate***. Shortly after the launch Aug. 14, 2010, the

orbit-raising plan was modified as a result of an anomaly with the bi-propellant propulsion system, which was intended to place the spacecraft near its operational orbit. The new plan entails two phases: one phase using hydrazine thrusters, which is now complete; the other using AEHF's *Hall Current Thruster* electric propulsion system. The HCT electric propulsion system has achieved more than 2,100 hours of successful operation.

The satellite is safe, continues to operate as planned and is expected to reach geosynchronous orbit in late summer 2011. "Throughout the anomaly recovery, re-planning, and orbit-raising operations, a government and contractor team has demonstrated incredible technical expertise and innovation to work around the anomaly and create the opportunity to achieve mission success for this critical national asset," said *Madden*.

Upon reaching its planned orbit, AEHF-1 will provide a significant enhancement to our nation's survivable communications infrastructure by allowing operators to communicate in a wide range of environmental conditions, providing tactical and strategic satellite communications to Army, Navy, Air Force and Marine users, as well as a host of other agencies. AEHF will extend the capabilities of the operational ***Milstar*** satellite constellation with an order of magnitude increase in protected communications capability.

AEHF is developed by the ***MILSATCOM Systems Directorate***, which develops, acquires and sustains space-based global communications in support of the President, Secretary of Defense and combat forces. The MILSATCOM enterprise consists of satellites, terminals and control stations and provides communications for more than 16,000 air, land and sea platforms.

Morale Satellite Connections

Soldiers from the 525th Battlefield Surveillance Brigade working at the Operational Coordination Center District in Spin Boldak, Afghanistan, can communicate with loved ones in the United States at no cost—thanks to the newly installed morale satellite program.

The satellite, known as the ***Cheetah*** system, is an auto-acquiring portable satellite receiver that provides high-speed data communications for internet and phone connections for soldiers at remote operating bases.

The system is meant to support troops with no other means of morale, welfare and recreation connectivity, said Master Sgt. *Glynn Honts*, non-commissioned officer in charge of the *Combined Joint Communications* office at *Regional Command-South,* Kandahar Airfield, Afghanistan.

Honts said the system is being used at small combat outposts that have less than 100 U.S. service members.

There are more than 100 systems already in place throughout Afghanistan. *Honts* has distributed 17 additional systems and will deliver seven more this summer as new units set up locations.

Personnel from 1st Squadron, 38th Cavalry Regiment, 525th Battlefield Surveillance Brigade, talk to family members using the Cheetah system, a new morale satellite at Operational Coordination Center District, Spin Boldak, Afghanistan, March 5, 2011. The satellite allows soldiers working at remote locations to call the United States for free and have high-speed internet connectivity keeping them connected with family and friends.

The telephone calls home are free and the Internet connection is fast, said *Honts*, the 22-year veteran. He added that the portable system is user friendly; it can be installed within 30 minutes, and it runs off of a generator or a humvee battery.

"Its best feature is that it self-acquires," said *Honts*. "To be able to find a satellite 22,236 miles out in space is no easy task, manually. This system is able to find that one specific satellite by itself. It takes a burden off of the operator as well as speeding up the process of getting connected. It is also a lot faster than any government computer."

With six new laptops and two telephones installed at the OCCD providing faster links to the homefront, soldiers can maintain emotional connections with family and friends through video teleconferencing, social networking sites and conversations.

Honts, a Dayton, Ohio, native, said maintaining the bond back home lifts soldiers' spirits and provides a twofold benefit while they carry out their missions. "When morale is high, soldiers do their jobs with a sense of ease and the qualities of their efforts are better," he said. "These happy soldiers continually surprise and exceed their leadership's expectations. Communication amongst the team is enhanced."

While there may only be a couple dozen soldiers working from the OCCD at one time, the days and nights spent there has improved, according to one soldier who called home after returning to the center. "It's a great way to call home to the states," said Staff Sgt. *Jeremiah Berger*, Operations NCO, **Alpha Troop, 1st Squadron, 38th Cavalry Regiment, 525th BfSB**. "I don't have to spend money like I do when I have to use my cell phone, and it makes being out here better."

Story and photo by Senior Airman Jessica Lockoski, 16th Mobile Public Affairs Detachment

The Cheetah™ auto-acquire flyaway VSAT system, pictured below, is a product of L-3 Communications GCS and provides secure high-speed data communications for Internet/VPN connectivity, live videoconferencing, surveillance or reconnaissance. The unit is available with an iDirect iConnex™ e800 Evolution modem, which is capable of DVB-S2.

RET. U.S. AIR FORCE GENERAL JOHN. H. CAMPBELL EXECUTIVE VICE PRESIDENT, GOVERNMENT PROGRAMS IRIDIUM COMMUNICATIONS

A DISCUSSION: THE HOSTED PAYLOAD ALLIANCE

General Campbell joined Iridium from Applied Research Associates (ARA), where he served as Principal, Defense and Intelligence, since 2004. General Campbell joined ARA following his retirement from the U.S. Air Force after a 32-year career. In the U.S. Air Force, General Campbell served in a variety of operational and staff assignments worldwide.

From 1998 to 2000, he was Vice Director of the *Defense Information Systems Agency* (DISA) and was the first commander of the *Joint Task Force - Computer Network Defense*. From 1997 to 1998, he served on the Joint Staff as *Deputy Director for Operations*.

Between 1971 and 1997, General Campbell served around the world in a variety of operational assignments as an F-15 and F-16 fighter pilot and commander.

General Campbell is the recipient of numerous military and intelligence community awards, including the *Defense Distinguished Service Medal*, the *Legion of Merit*, the *Air Medal*, the *National Imagery and Mapping Agency Award*, the *National Reconnaissance Distinguished Medal*, and the *National Security Agency Award*. He is a graduate of the University of Kentucky with a degree in Computer Science and a Masters of Business Administration.

General Campbell is responsible for all aspects of Iridium's relationship with its U.S. government customers.

MILSATMAGAZINE (MSM)
Iridium is one of the companies involved in the newly formed Hosted Payload Alliance (HPA). Can you give us a description of this organization and why it was founded?

JOHN CAMPBELL
The **HPA** is a satellite industry alliance formed to increase awareness of the benefits of hosted payloads on commercial satellites. The U.S. National Space Policy, published in 2010, calls for an increasing role for commercial space to meet government requirements. It also explicitly directs the use of non-traditional options for the acquisition of space goods and services, and cites hosted payloads as one of these non-traditional options. The policy notes that public-private partnerships with the commercial space industry can offer timely, cost-effective options to fill government requirements.

MSM
When was the group formed?

JOHN CAMPBELL
The Steering Committee held its first meeting at the Satellite 2011 conference in Washington, D.C., March 17, 2011.

MSM
Who are the members of the Steering Committee for the organization?

JOHN CAMPBELL
HPA Steering Committee members are **Boeing Space and Intelligence Systems**, **Intelsat General Corporation**, **Iridium Communications Inc.**, **Lockheed Martin Space Systems**, **Orbital Sciences Corporation**, **SES WORLD SKIES U.S. Government Solutions**, and **Space Systems/Loral**.

Membership in the HPA is open to satellite operators, satellite manufacturers, system integrators and other interested parties.

MSM
John, what are the goals of the Alliance?

JOHN CAMPBELL
The goals of the HPA are to:

1. *Serve as a bridge between government and private industry to foster open communication between potential users and providers of hosted payload capabilities.*
2. *Build awareness of the benefits to be realized from hosted payloads on commercial satellites.*
3. *Provide a forum for discussions, ranging from policy to specific missions, related to acquisition and operation of hosted payloads.*
4. *Act as a source of subject-matter expertise to educate stakeholders in industry and government.*

MSM
Why is the subject of hosted payloads so timely for our industry?

JOHN CAMPBELL

Budgets of the DoD and most other agencies and departments are being reduced and access to space is expensive: NASA estimates a price tag of $450 million for a space shuttle mission, and unmanned missions are also costly. Less expensive access to space is important to the future of the U.S. space program.

Consider, for example, space-based data collection missions to build a comprehensive picture of the effects of climate change. Many organizations involved in global warming research — such as **NASA**, the ***National Oceanic and Atmospheric Administration*** (**NOAA**), the ***National Science Foundation*** (**NSF**) and various international space agencies — may require continuity and even expansion of space-based data collection.

Hosted payloads present an opportunity for the U.S. Government to leverage commercial investments to provide access to space at significant savings over the cost of traditional dedicated missions. It is far less expensive for the government to get into space with a partner than it is to go it alone. Hosted missions are estimated to cost about one-quarter of dedicated missions, according to Bethesda, Maryland-based **Futron**, a leading aerospace consulting firm.

The private sector is offering affordable access to space — and the pace is accelerating as a result of President Obama's space policy recommendations. Further, by sharing launch costs with the private sector, the policy initiatives may help free up funds for NASA to focus on a myriad of other space projects, such as going to Mars.

It is important to understand, however, that decisions on scientific missions such as these need to be made in commercial time frames, which are typically shorter than government acquisition and development cycles. While government schedules often slip, and requirements and budgets sometimes grow, commercial business imperatives can help ensure on-time and on-budget access to space.

Iridium NEXT, artistic rendition

For example, we're finalizing the design of ***Iridium NEXT*** satellites between now and late 2012, at which time the design — and our hosted payloads — will be frozen and satellite construction starts in earnest. No doubt other companies planning to launch new satellites are under similar time constraints. Rather than a constraint, commercial cost and schedule discipline can be an advantage.

MSM

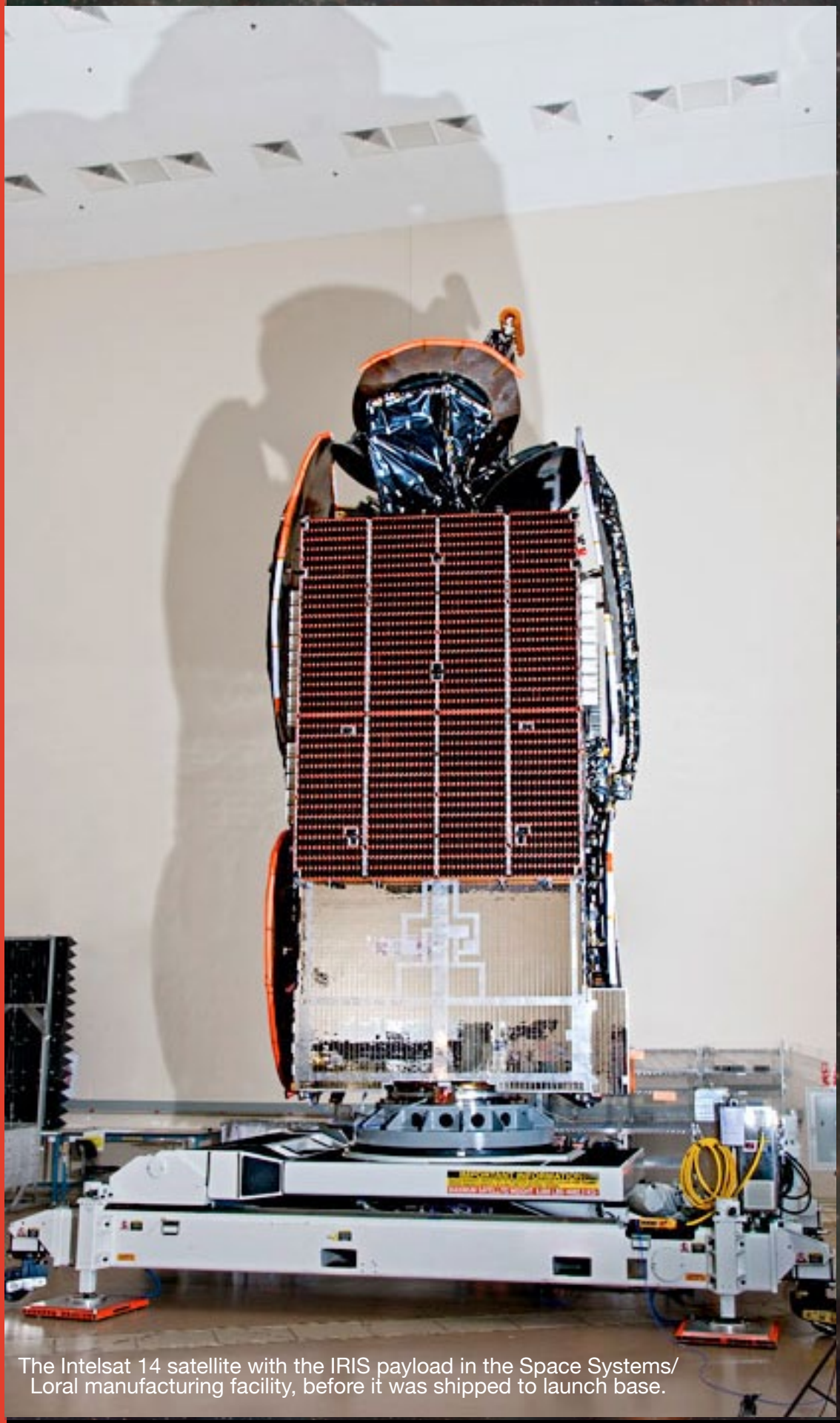
Would it then, be fair to describe the HPA as a lobbying group?

JOHN CAMPBELL

HPA is definitely not a lobbying organization. It is strictly an industry organization made up of companies with an interest in hosted payloads. Its primary mission is to serve as a forum connecting representatives from government and industry to further the goals set forth in the National Space Policy. It also has a strong educational focus, providing a source of industry expertise to provide information on issues relating to hosted payloads for stakeholders in the public and private sectors.

MSM

Can you give us a few examples of some of the potential payloads that might be hosted on commercial satellites in the future?



The Intelsat 14 satellite with the IRIS payload in the Space Systems/ Loral manufacturing facility, before it was shipped to launch base.

JOHN CAMPBELL

Hosted payload applications include air traffic safety, communications, Earth observation, remote sensing, research and development, space situational awareness and forecasting electromagnetic solar storms in space.

MSM

Then what's holding up progress on the wider use of hosted payloads?

JOHN CAMPBELL

Any new idea takes time to percolate down from policy to program level in the government, and, although there are numerous examples of government payloads hosted on commercial satellites, they've all been one-offs, which came to fruition as a result of inspired leadership and heroic efforts. There's no process in place to consider hosted payloads as a regular way of doing business, to evaluate them as an alternative to traditional ways of doing business.

MSM

But the concept of hosted payloads is not something new, is it? There are precedents, correct?

JOHN CAMPBELL

There are a number of examples of how government has made use of commercial satellites for hosted payloads. A classic use of a government hosted payload, for instance, is the ***Federal Aviation Administration***'s (**FAA**) ***Wide Area Augmentation System*** (**WAAS**) used for air navigation.

Let me offer some more examples...

The ***Commercially Hosted Infrared Payload*** (**CHIRP**) flight demonstration program represents an arrangement between the **U.S. Air Force Space and Missile Systems Center** and **SES WORLD SKIES U.S. Government Solutions**, to host a wide field-of-view, infrared starring sensor, on board the ***SES-2*** spacecraft scheduled for launch in August of 2011. The SES-2 spacecraft has been built by **Orbital Sciences Corporation** and the sensor was designed and built by **SAIC**.

The ***Internet Router in Space*** (**IRIS**) program is a *Defense Department Joint Capability Technology Demonstration* (**JCTD**) managed by **Cisco** and **Intelsat General Corp**. The IRIS hosted payload was launched aboard the ***IS-14*** satellite, which was built by **Space Systems/Loral**, in November 2009, and is the first IP router in space.

The ***Active Magnetosphere and Planetary Electrodynamics Response Experiment*** (**AMPERE**) is a combined effort of the **NSF**, **Johns Hopkins Applied Physics Lab**, **Iridium** and **Boeing**. AMPERE uses sensors aboard Iridium satellites to continuously monitor space weather data in real-time, enabling high-quality forecasting of space-based solar storms, which can disrupt aviation and terrestrial telecom and satellite systems. All these initiatives promise new capabilities at significant savings.

Let me add that the U.S. government is not the only customer for hosted payloads. For instance, **Space Systems/Loral** is building a satellite for **SES** that has a WAAS-like payload for the *European Union*, and the A**ustralian Defence Force** is purchasing a UHF payload on the ***Intelsat IS-22*** communications satellite, which has a launch date in 2012.

Despite these precedents, there is a lingering perception that hosted payloads are a new and an unproven concept. They're not, but they do require a new way of thinking.

Artistic rendition of the Intelsat 14 satellite with the IRIS payload.

MSM

What's next for the Hosted Payload Alliance?

JOHN CAMPBELL

We just conducted our first organizational meeting at the **National Space Symposium** in April, which included presentations from senior government officials from the DoD as well as by civilian agencies of the federal government. The meeting furthered our goal of fostering an open dialogue between the public and private sectors to facilitate and streamline wider deployment of hosted payloads to meet commercial launch schedules in the coming years.

IET Events

The Institution of Engineering and Technology

Milsatcoms

The IET Seminar on Military Satellite Communications

Wednesday, 15 June 2011. IET London: Savoy Place

Attend this seminar to:

- hear firsthand from the MoD about how they are balancing their Milsatcoms requirements in financially challenging times
- gain an in-depth analysis of industry developments, including current operations, trends, technologies and solutions
- discuss spectrum, integration and interoperability issues with leading industry players operating in UK and international markets

Speakers include

Colonel Duncan Warne, Deputy Head Enabling Networks (Command, Control and Information Infrastructure Capability), **Ministry of Defence**

Commander Andy Rayner, RN, Ministry of Defence, SO1**,** Core Networks, CAP CC&II**, Ministry of Defence**

David Lascelles, Deputy Head of DCNS T3**,** ISS DE&S**, Ministry of Defence**

Plus **DSTL** and industry players from **Paradigm, EADS Astrium, SES Astra, Avanti, Inmarsat Global, Cobham** and **Thales.**

Sponsors ASTRIUM, paradigm

Exhibitors avanti, CST

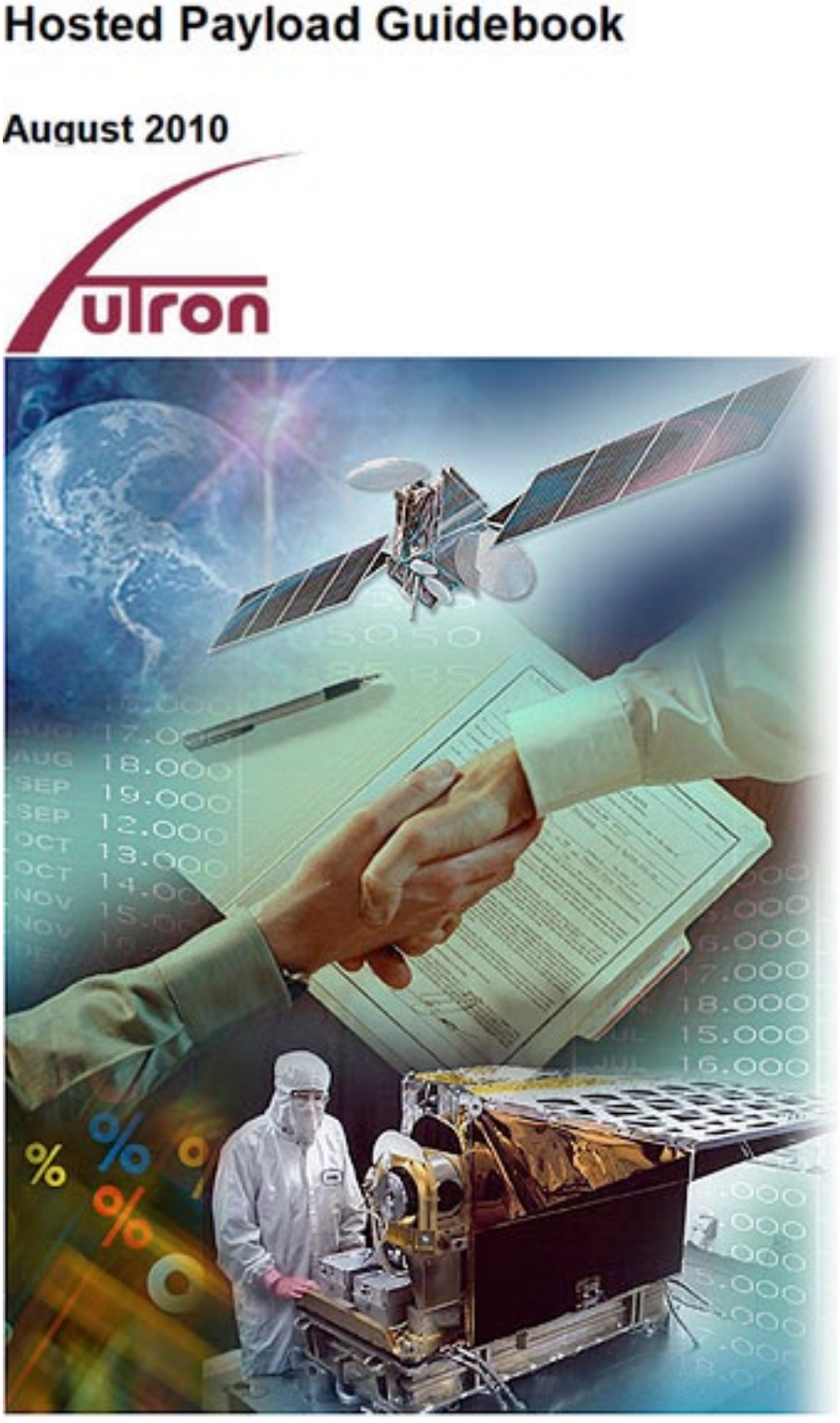
Supported by Satcoms UK, SPACE Calling, sspi Broadcasting & Satellite Network, Space Newsfeed

Media Partners E&T, satnews publishers

For further information and to register visit www.**theiet**.org/milsatcoms

HELP WITH HOSTED PAYLOADS

As DoD, NASA, and other U.S. government agencies increasingly consider alternative means of getting payloads to orbit in order to save time and money, greater consideration is being given to having those payloads hosted on commercial satellites. While the use of commercial satellites to host government payloads has proven effective, it is an approach that has a range of risks as well as rewards. Successfully launching a payload on a host satellite requires an understanding of the nature of commercial satellite business and technical operations. Futron Corporation has developed a guidebook that is intended to clarify those operational issues and help government customers plan to use the process to their best advantage. The following is excerpted from their highly informative HPA startup treatise.



RATIONALES FOR FLYING HOSTED PAYLOADS ON COMMERCIAL SATELLITES

The two principal advantages for a hosted payload owner of flying on a commercial mission versus a government-sponsored mission are: (1) *the faster tempo of commercial programs, and* (2) *the lower cost*.

Typical schedules for commercial satellite deployments from concept definition to operations are around 32 months. Comparable government schedules can be five to seven years, and sometimes longer if the primary government mission is complex. And while many science missions have been limited to *low earth orbit* (**LEO**), given the expense of getting to *geostationary orbit* (**GEO**), the use of hosted payloads on commercial GEO satellites provides a relatively low cost opportunity for access to higher orbit.

Other advantages include: a reliable and predictable launch schedule, with a large choice of launch vehicles (commercial operators usually are on the manifest of several launchers, in order to be better prepared for contingencies); the use of existing mission support facilities; and the fact that, once on-orbit, the primary payload operator will take care of all operations and maintenance of the host spacecraft as well as (if requested) data downlink and processing. In addition, since commercial spacecraft are insured, the hosted payloads on those spacecraft can also be insured, helping defray the costs of a replacement mission in the event of a launch failure.

Disadvantages include the inevitable limitations on mass, volume, and power consumption that the status of "secondary" payload often entails (while some hosted payloads may effectively hold primary status, this is not typically the case). In addition, there is the requirement to adhere to the strict procurement, construction, and launch schedules for commercial satellites, which are typically much less flexible and more driven by time constraints than their government counterparts.

Another disadvantage, often overlooked but important for Earth observation missions, in particular, is that although the number of commercial geostationary spacecraft launched in a particular year is quite large, each of them will occupy a fixed orbital slot with limited views of the Earth. This allows for multiple observations a day, but not a global view. The amount the hosted payload owner would have to pay to the primary payload operator is difficult to assess, and is likely to vary considerably. Key variables include the size and mass of the payload, what ancillary services are desired to support payload operation, whether payment is up-front or over the satellite lifetime, opportunity cost to the host, whether it enhances the host system's business case, choice of launch vehicle, insured or not insured, and so on.

A further area to be considered is the fact that the primary commercial payloads typically have a lifetime of 15 years and often more. Many hosted payloads, by contrast, have a projected life of five years or less. This mismatch is less of an issue for communications payloads, which may be designed to operate for as long as the primary spacecraft. On the other hand, this long host platform life may present an opportunity for enhanced data continuity that has not typically been available to past payload missions.

BACKGROUND + EXPERIENCE

All of the major commercial GEO fixed satellite operators (**Eutelsat**, **Intelsat**, **SES**, and **Telesat**) have publicly declared themselves receptive to the idea of hosting payloads, as have non-GEO users such as **Iridium** and **ORBCOMM**, and a number of these operators have hosted government payloads. Outside of the global operators, **INSAT** has hosted several **ISRO** payloads, all of them either scientific or technology demonstrators in nature.

Among the first major U.S. government payloads hosted on commercial GEO satellites were the two L-band *Wide Area Augmentation System* (**WAAS**) *Packages* operated by subcontractors **Telesat** and **Intelsat** for the prime, **Lockheed Martin**, under contract to the **FAA**. One WAAS payload is carried on Telesat's ***Anik F1R***, built by **Astrium** and launched in September 2005. The other WAAS payload is on Intelsat's ***Galaxy 15***, a satellite Telesat's ***Anik F1R***, built by **Astrium** and launched in September 2005. The other WAAS payload is on Intelsat's ***Galaxy 15***, a satellite

Artistic rendition of Telesat's Anik F1R satellite

built by **Orbital Sciences** and launched in October 2005 (the satellite was part of the **PanAmSat** fleet when launched).

More recently, two demonstration payloads have been completed. The first of these is

Intelsat's Galaxy-15 satellite, imager courtesy of Orbital Sciences

the *Internet Router in Space* (**IRIS**) hosted on **Intelsat**'s **Space Systems/Loral**-built ***Intelsat 14*** satellite, launched in November 2009; the second is the *Commercially Hosted Infrared Payload* (**CHIRP**) sensor which will be integrated on the **SES WORLDSKIES**' ***SES-2*** satellite under construction by **Orbital Sciences** for launch in late 2011.

Also in the construction stage is an operational UHF package which the ***Australian Defence Force*** (**ADF**) contracted for launch on ***Intelsat 22,*** a **Boeing**-built ***702B*** bus, in mid-2012. Most recently, the DoD has contracted for a UHF payload to be hosted on the ***Intelsat-27*** spacecraft, to provide capability to complement the existing *UHF Follow-On* (**UFO**) and future *Multi-User Objective System* (**MUOS**) satellites.

While each of these programs has provided insights that are incorporated in this guidebook, the primary lesson, noted in interviews and workshops among operators and manufacturers, is the need for adequate planning and realistic expectations on the part of the hosted payload owner. The earlier the hosted payload's requirements are incorporated in the planning process for satellite procurement, the greater the likelihood that they will be accommodated.

To provide some context for understanding the potential opportunities for putting a hosted payload on a commercial GEO satellite, *Table 1* on the following page lists known planned satellites by **Eutelsat**, **Intelsat**, **SES**, and **Telesat** for the period 2011–2016, including their launch year and their planned orbital locations. Although all of the major operators have indicated they would be willing to host payloads, practical constraints indicate that the larger the bus and the longer the lead time, the better the chances are that the hosted payload's requirements will be accommodated. Those satellites marked **HR** are hypothetical replacements anticipated to be ordered to replace existing spacecraft, but have not been contracted.

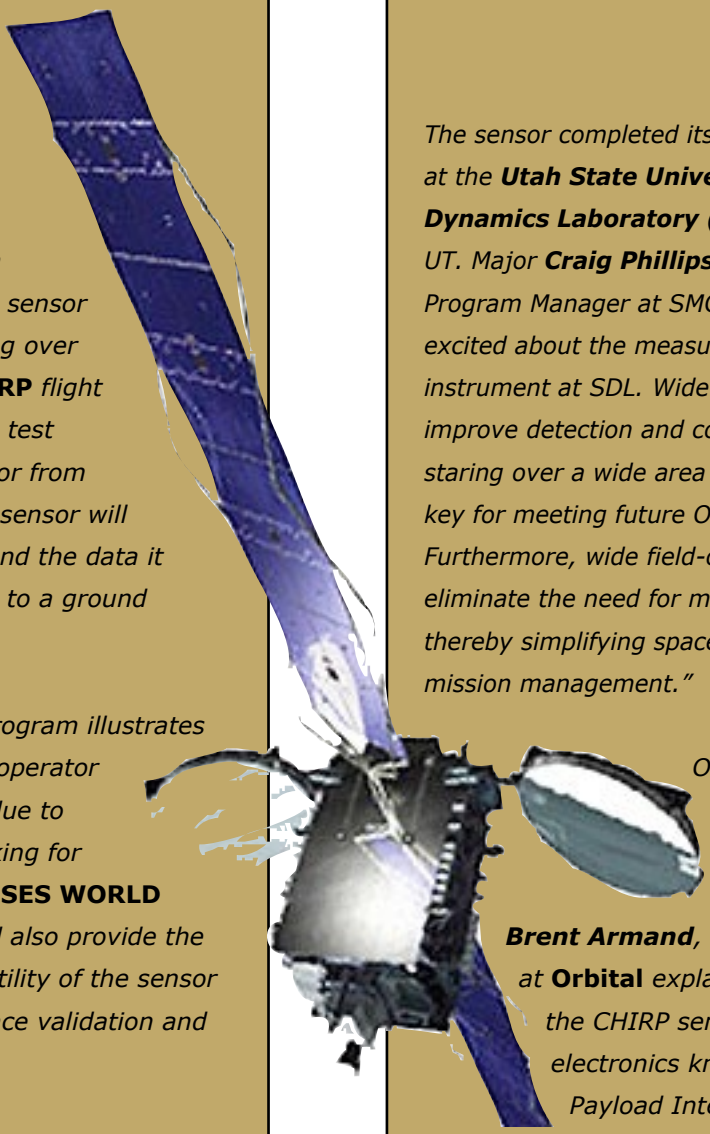
In addition to these spacecraft, **Iridium** is now building a new LEO constellation, and had stated its interest in hosting payloads on some or all of these spacecraft, planned for a series of eight launches between the first quarter of 2015 and the first quarter of 2017.

About the guidebook
Futron Corporation's development of the guidebook was sponsored by NASA Langley Research Center under contract NNL07AA00C. Download the guidebook at...
http://science.larc.nasa.gov/hostedpayload/HostedPayloadGuidebook_final_with_acknowledgment.pdf

For further information regarding Futron...
http://www.futron.com/

Satellite Name	Owner/Operator	Launch Year	Location (°E)
Eutelsat W3C	Eutelsat	2011	7
Atlantic Bird 7	Eutelsat	2011	7.2
Intelsat 17	Intelsat	2011	66
Intelsat 18	Intelsat	2011	180
Intelsat 19	Intelsat	2011	166
Intelsat 23	Intelsat	2011	307
SES-5/Sirius 5	SES	2011	4.8
SES-2	SES	2011	273
Astra 1N	SES	2011	19.2
SES-4	SES	2011	338
SES-3	SES	2011	257
Telstar 14R	Telesat	2011	297
Eutelsat W6A	Eutelsat	2012	21.6
Intelsat 22	Intelsat	2012	72
Intelsat 20	Intelsat	2012	68.5
Intelsat 21	Intelsat	2012	302
Astra 2F	SES	2012	28.2
Anik G1	Telesat	2012	252.7
Nimiq 6	Telesat	2012	269
Eutelsat W5A	Eutelsat	2012	70.5
Eshail	Eutelsat/ICT Qatar	2012	25.5
SES-6	SES	2013	319.5
Astra 2E	SES	2013	28.2
Eurobird 3-HR	Eutelsat	2014	33
EUROBIRD 1-HR	Eutelsat	2014	28.5
Astra 1H-HR	SES	2014	19.2
Astra 2G	SES	2014	28.2
Astra 5B	SES	2014	31.5
Intelsat 12-HR	Intelsat	2015	45
Intelsat 1R-HR	Intelsat	2015	310
NSS 11-HR	SES	2015	108.2
AMC 6-HR	SES	2015	288
TELSTAR 12-HR	Telesat	2015	345
ATLANTIC BIRD 2-HR	Eutelsat	2016	352
Eutelsat W3A-HR	Eutelsat	2016	7
Intelsat 10-HR	Intelsat	2016	TBD
Intelsat 805-HR	Intelsat	2016	304.5

Hosted Payloads Updates



SES WORLD SKIES, USG Solutions *will host an experimental U.S. Air Force sensor on an SES satellite operating over the United States. The* **CHIRP** *flight demonstration program will test a new type of infrared sensor from geosynchronous orbit. This sensor will be integrated onto* ***SES-2*** *and the data it receives will be transmitted to a ground station for analysis.*

This flight demonstration program illustrates how a commercial satellite operator can provide tremendous value to government customers looking for affordable access to space. **SES WORLD SKIES, USG Solutions** *will also provide the services to determine the utility of the sensor in terms of data, performance validation and interoperability.*

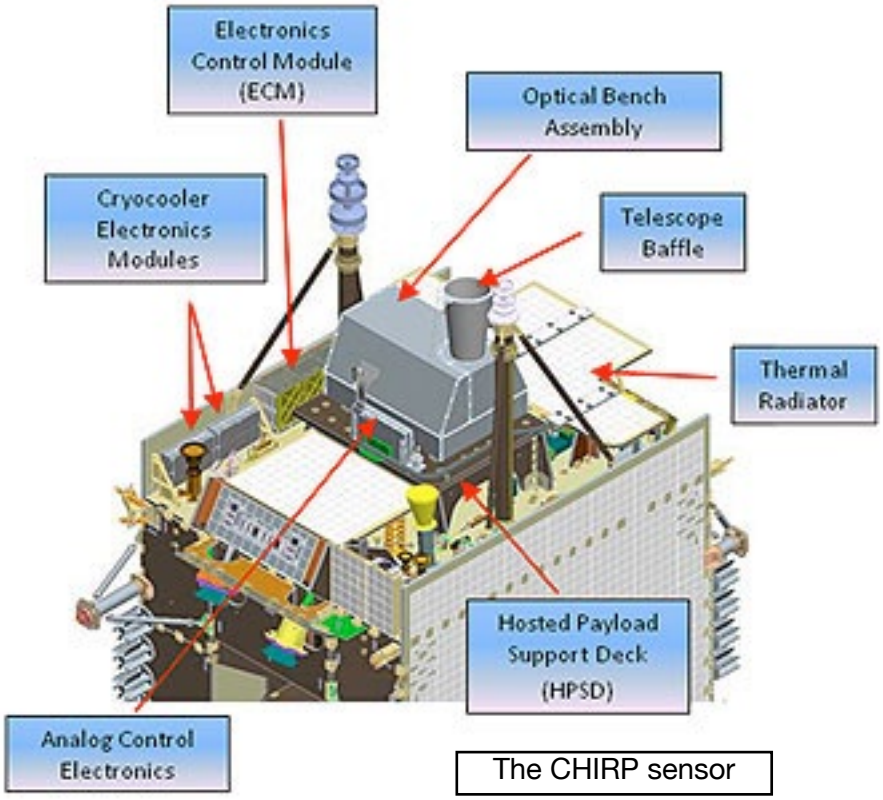
The CHIRP sensor, developed by ***Science Applications International Corporation*** *(***SAIC***), represents an important milestone for* ***Air Force Space and Missile Systems Center*** *(***SMC***) in their objective to test the potential of wide field-of-view, staring infrared sensors for a range of* ***Overhead Persistent Infrared*** *(***OPIR***) missions.*

Michael Felix*, Program Manager at SAIC, explained that the CHIRP sensor features a telescope that can view a quarter of the earth from geosynchronous orbit. The CHIRP sensor is equipped with a four megapixel focal plane array manufactured by Teledyne that is sensitive in both short wave and medium wave infrared.*

The sensor completed its calibration campaign at the ***Utah State University Space Dynamics Laboratory*** *(***SDL***) in Logan, UT. Major* ***Craig Phillips****, the former CHIRP Program Manager at SMC, said, "We are excited about the measured sensitivity of the instrument at SDL. Wide field-of-view sensors improve detection and collection by continuously staring over a wide area of interest which is key for meeting future OPIR requirements. Furthermore, wide field-of-view staring sensors eliminate the need for mechanical gimbals, thereby simplifying spacecraft installation and mission management."*

One of the steps for the CHIRP sensor is a series of electrical interface tests. ***Brent Armand****, Program Manager at* **Orbital** *explained, "We will test the CHIRP sensor with a set of electronics known as the Secondary Payload Interface (SPI). The SPI is a key enabler for hosting military payloads because it provides a secure, two-way communication channel to the government payload through a standard commercial telecommunication transponder. After checking the electrical interfaces, Orbital and SAIC technicians will mount the sensor to the earth-facing panel of the satellite for full-up spacecraft mechanical and thermal testing."*

Timothy Deaver*, Vice President of Hosted Payloads at SES WORLD SKIES, U.S. Government Solutions, said that the launch window for this mission is expected to open in the second half of 2011. "We look forward to demonstrating in space how hosting government payloads on commercial satellites can provide cost effective means for experimenting with new technologies.*



The CHIRP sensor

Down the road, we envision a variety of operational military missions can be served by special purpose payloads hosted on commercial spacecraft."

*For hosting on the upcoming **SES-5/Sirius 5** satellite, which will launch in the second half of 2011 to **5 degrees East**, will be the **European Geostationary Navigation Overlay Service** (**EGNOS**). This satellite will provide navigation services to Europe and will supplement the American **GPS** and the Russian-led **GLONASS** navigation systems. It verifies, improves and reports on the reliability and accuracy of positioning signals in the European states area. In the future, it will also support the European **GALILEO** navigation system.*

***ASTRA** has been awarded two contracts for **EGNOS** following two completely separate tenders by the **European Commission**, which manages the program on behalf of the **European Union**. Two tailor-made payloads and the related ground infrastructure, including fully redundant ground network hosting and two redundant uplink chains, will be supplied by ASTRA. EGNOS is the first government payload on a commercial satellite. The hosting satellites provide the capability to extend the coverage of the service from Europe to Africa and other neighboring countries of the EU.*

*The first EGNOS payload hosted by ASTRA will operate in L-band and ASTRA will start operations of the payload by the end of the 2011. The second payload will also operate in L-band and will be hosted on the **SES 5/Astra 4B** satellite. The satellite is scheduled for launch in 2013 and will be positioned at **31.5 degrees East**.*

***EGNOS** is a satellite-based system that complements the GPS system by sending integrity signals in real-time. EGNOS provides multiple redundant signals to enable safe aircraft landings and other critical navigation decisions. EGNOS provides enhancements for accuracy, availability, continuity and integrity. These parameters relate to the trust which can be placed in the information, including timely warnings for the user when navigation systems (or data provided by the systems) should not be used for navigation. This is particularly important to ensure safe aircraft landings in bad weather conditions and for marine vessels to safely navigate through narrow or congested waters during times of bad visibility. Correction data improves the accuracy of current GPS services from about 10m to about 2m.*

The payloads hosted by **ASTRA** *on* ***ASTRA 4B*** *and* ***ASTRA 5B*** *form part of the EGNOS space segment, which is composed of several geostationary satellites that distribute the EGNOS signals. On the user side, multiple types of EGNOS receiver terminals are being developed for various types of users. The ground segment is composed of stations/ centers which are mainly distributed in Europe and are interconnected through a terrestrial network.*

- ***34 Ranging and Integrity Monitoring Stations (RIMS): receive the original navigation system satellite signals and send this information to the control and processing centers. The EGNOS extension program envisages the deployment of 7 additional RIMS.***

- ***4 control and processing centers (MCCs) receive the information from the RIMS and generate correction messages to improve satellite signal accuracy and information messages on the status of the satellites. The MCC acts as the EGNOS system 'brain.'***

- ***6 stations that access the geostationary satellites: they receive the correction messages, upload the data stream to the geostationary satellites and generate the GPS-like signal. This data is then distributed to European users via the geostationary satellite.***

In addition, the system has support installations on the ground that perform system operations planning and performance assessment.

EGNOS is Europe's first venture into satellite navigation and a major stepping-stone towards Galileo, Europe's own future global satellite navigation system. It was developed by the European Space Agency (ESA) under an agreement between the European Commission (EC), the European Organization for the Safety of Air Navigation (Eurocontrol) and ESA. In 2009, the ownership of the EGNOS assets were transferred from the European Space Agency to the European Commission, which now manages and finances the entry of EGNOS into the service provision phase.

THE NEXT BROADBAND FRONTIER: AIRBORNE SATELLITE PLATFORMS

AUTHORS
DANIEL LOSADA AND DR. RAJEEV GOPAL, SENIOR DIRECTORS,
HUGHES DEFENSE AND INTELLIGENCE SYSTEMS DIVISION

The requirement for real-time sharing of *intelligence, surveillance and reconnaissance* (ISR) information continues to grow in the military and homeland defense communities – making airborne video surveillance crucial to operational success, no matter where. Deployed troops in Afghanistan need to be able to determine if mountainous or urban areas are safe for transport. Homeland security agents responsible for monitoring thousands of border miles need to be able to communicate information regarding illegal crossings and drug enforcement, to name just a few examples. In these and many other scenarios, airborne video surveillance has become essential to help keep troops and public servants safe, while improving the efficiency and effectiveness of communications from the air…and ensuring mission success.

WHY SATELLITE COMMUNICATIONS IN THE AIR?

Domestic and international agencies are increasingly deploying airborne video surveillance applications to aid in a variety of missions, such as national disaster assessment, homeland defense and military ISR, including using unmanned aerial vehicles (UAVs). In all cases, only satellite networks can provide unconstrained coverage over land and water, eclipsing limitations of ground-based communication systems – a key requirement for airborne systems operating anywhere. Additionally, airborne satellite platforms can operate at any altitude, an important consideration for airline carriers avoiding weather systems or military aircraft evading detection.

Yet, despite these advantages, past implementations of airborne satellite platforms at L-band frequencies suffered from low-data rates, overcrowding, and high costs. Enter today's latest Ku- and Ka-band *commercial-off-the-shelf* (**COTS**) satellite solutions—which eliminate these issues.

As a case in point, the ***Hughes HX Airborne*** platform delivers high-speed data capabilities for commercial and military applications in a standards-based, cost-effective package available now. Some of the key challenges the authors encountered in designing this platform are now detailed...

600 MPH (1000 KM/HR) TRACKING ANTENNA

One of the main challenges that must be overcome in any airborne implementation is the fact that the antenna is in constant motion, upwards of 600 miles per hour (1000 km/hr). This requires dynamic re-pointing to track the satellite. In the commercially available Hughes HX System, a high-performance, *very small aperture terminal* (**VSAT**) is deployed onboard. Comprising a compact router and sub-meter size antenna, the first problem faced was the mechanical limitation as to how low, in relation to the horizon, could the satellite be tracked. Current satellite coverage footprints are calculated based on the abilities of ground-based terminals, which can readily be pointed to a specific satellite. A single pointing isn't sufficient on an aircraft which can move across multiple satellite footprints. During a given flight over the continental United States, for example, a Ku-band VSAT terminal needs to seamlessly switch between three different satellites without breaking connectivity and thus not disrupting critical applications. As illustrated in *Figure 1*, a compact antenna

Figure 1

tracking platform and radome cover was developed and is currently deployed by a commercial customer on **Boeing 737** aircraft.

FROM SATELLITE TO SATELLITE

Coverage of geostationary satellites can span thousands of miles, and ground-based satellite terminals only require configuration with a single satellite. This is not the case for airborne platforms, which can move in and out of as many as three satellite footprints in a single flight. In the onboard Hughes HX terminal, mobility support information is received from five separate satellite gateways, each enabling service on a different satellite. By backhauling the management of traffic on the system, a single platform was able to be designed which tracks the position of an aircraft as it switches from one gateway's coverage area into another, and dynamically establishes new connections.

AN UNBROKEN LINK

There is nothing more frustrating to a user and more potentially disruptive to a mission than losing connectivity — even temporarily, let alone being kicked offline. As we worked on the switching capability in the Hughes HX terminal, a key issue was to eliminate the downtime while the terminal switches from one satellite to the next. This was resolved by employing *Performance Enhancing Proxy* (**PEP**) technology. During a gateway switch, the underlying transmission channel is dynamically torn down and then reestablished through a new gateway without disrupting the TCP connection to the Internet. The net effect is to preserve the end-user's connection and minimize impact on system operation.

THE "JUST WORK" STANDARD

At a recent technology conference, a high-ranking military official said that the new generation of IT leaders expects technology to "just work." Configuring and reconfiguring, or updating and re-installing, whether it comes to software or hardware, is becoming a thing of the past. Not only does technology need to "just work," it also needs to "just work together." That's the standard we applied in building the Hughes HX Airborne solution; because interoperability is not just an issue when it comes to upgrades, it's also an issue when it comes to initial adoption and continued adaptation in an ever-changing technology ecosystem. The video and audio encoders employed are able to produce standard IP data packets over an Ethernet interface, and the HX satellite router itself is IP compatible. What's more, the commercially available HX platform provides a common solution for land-mobile, maritime, fixed, and airborne terminals, which can all participate seamlessly in the same operational network — a capability uniquely positioned for national defense operations.

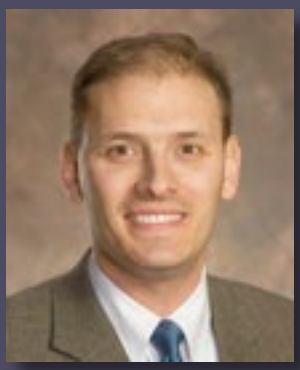
AIRBORNE DEMONSTRATION

In recent airborne testing, the Hughes HX solution delivered peak data rates of 2 Mbps, allowing real-time video imagery to be streamed while the aircraft performed at various bank angles, in loops and figure-eights over both land and sea. The platform provided 98 percent availability at level flight and 95 percent availability at banking angles up to 15 degrees. These positive results demonstrate that airborne COTS technology can meet the demands of both commercial and government needs, providing a high-speed broadband solution for any airborne deployment.

Welcome to the world of airborne broadband.

About the authors

Dr. Rajeev Gopal leads commercial satellite communications and cyber initiatives within the Hughes Defense and Intelligences Systems Division (DISD). He is the Hughes principal investigator of Hughes/DISA CRADA (Cooperative Research and Development Agreement) on net-centric evaluation of the RSM-A regenerative satellite mesh technology. He earlier served as the network system engineering lead for a USAF TSAT space segment alliance and was on the SPACEWAY® 3 system architecture and Mobile Satellite systems (Thuraya, ICO) development teams. He also served as the chief architect and software manager for development of the SPACEWAY Network Operations Control Center. Dr. Gopal is a member of the Cyber Security best practices working group of the FCC's Communications Security, Reliability and Interoperability Council (CSRIC). As a member of the US President's NSTAC Satellite Task Force, he participated in the development of the NSTAC STF 2009 report on commercial satellite communications security. He serves on several program committees, including IEEE Globecom SAC, SPIE, and IEEE SIMA and has been on panels organized by Satellite Industry Association and National Institutes of Health.



Dan Losada is a Senior Director of the Defense and Intelligence Division at Hughes. He is responsible for Department of Defense programs, covering all their product lines. Recently, he has been working on C4 programs in support of all branches of the Military during their transition to IP based broadband systems with a Net-Centric vision.

STEVE GIZINKSI
GENERAL MANAGER, INTEGRAL SYSTEMS, SATCOM SOLUTIONS DIVISION

Steve Gizinski is responsible for leading the division's operations, strategy and planning. He brings to this role more than 20 years of in-depth expertise in overseeing mission-critical technology efforts for commercial, federal, intelligence and homeland security customers. Prior to joining Integral Systems, he served in management positions at Northrop Grumman and Boeing. At the latter, he founded and led Boeing's Satellite Applications Center in Herndon, Virgina, where the principal focus was on implementing and maintaining regional and global communications solutions based on satellite and terrestrial technologies. Mr. Gizinski holds a BS in Electrical Engineering from the University of Central Florida and a MS in Systems Management from the University of Southern California.

MILSATMAGAZINE (MSM)

Good day, Mr. Gizinski. Would you describe your responsibilities at Integral Systems to our readers?

STEVE GIZINKSI

I am the General Manager for Integral Systems' SATCOM Solutions division. In this role I am responsible for the oversight and management of the development and manufacturing of a range of SATCOM terminals, RF products, High Speed Modems, Access Gateways, and Satellite Ground Systems equipment, as well as a Professional Services Division. Our Division is comprised of approximately 100 highly-technical, innovative and creative people who work closely as a team. My most important job though, is to work closely with our military, commercial and civil government customers to ensure we are providing them with products, systems and solutions that meet their most complex challenges.

MSM

What product lines does the SATCOM Solutions Division manage and develop?

STEVE GIZINKSI

SATCOM Solutions has products targeted for users end-to-end along the data transmission chain from teleports and network operations centers to those in the field. For network and ground systems operators, we offer High Data Rate Modems (HDRMs), multiplexers and telemetry processors. For field users, we have a variety of maritime and terrestrial USAT/ VSAT systems and flyaway communications kits. In the VSAT area, our Raptor manpackable, airline carry-on size deployable communications line of 45 cm and 60 cm X, Ku-, and Ka-band kits are used by the military to make it easier to communicate in the field.

Also, a recent acquisition has allowed us to move into the RF products arena. Our new Solid State Power Amplifiers (SSPAs) and Block Upconverters (BUCs) are a major leap forward in terms of size, weight and power efficiency. In addition, our new line of SSPAs are the ideal choice for customers looking to replace, or retrofit, Traveling Wave Tube Amplifiers (TWTAs) nearing the end of operating life.

MSM

What do you most enjoy about your job?

STEVE GIZINKSI

I am excited to have an opportunity to lead a group of tremendously talented and motivated technologists. The ability of our team to create innovative products that address market needs is impressive. As a General Manager, there is no better feeling than to have this sort of talent

Integral Raptor Kit

Integral's Ku-band 100W Solid State Power Amplifier

as part of your team and, because of their professionalism and dedication, the satisfaction I get when customers call me to praise our team and technology.

MSM

Why did you select the satellite industry as your chosen career field?

STEVE GIZINKSI

As far back as six-years old, I was enthralled with the idea of rocketry and space travel. As a matter of fact, I still have a Crayola drawing of an Apollo splashdown in a trunk in my basement that I drew while in kindergarten. As time progressed, maybe around the sixth grade, I realized I wanted a career in the space business and determined that I was going to work towards being an engineer. The opportunity to work on advanced technology in such a unique environment was exciting to me.

I received my engineering degree and started my professional career building launching satellites for the Hughes Aircraft Company and all Space Shuttle launches. I also spent time at Martin Marietta (now Lockheed Martin) working the launch side on the "Commercial Titan" program. For the past 15 years, I have been focused on the ground segment of space communications. I really enjoy that I have had a chance to work on various phases of satellite communications and truly love what I am able to do for a living!

MSM

Are you concerned over the lack of interest in technical training of our younger students as they engage in their educational pursuits? How can the industry further the cause of STEM training to ensure a competent work force in the future?

STEVE GIZINKSI

The critical need is to get today's students excited about space and the SATCOM industry. Integral Systems is committed to helping through our support of programs like the CanSat Competition where more than 20 university teams build, test, launch and operate can-sized satellites. While it is setup to

AN/USC-69 (v)1 Maritime Antenna System

be a fun, educational activity, the competition is structured to be as similar to a real-world satellite program as possible with a full slate of industry-standard reviews, such as PDR, CDR and pre- and post-flight reviews.

We are also active with the AIAA educational activities, including STEM, through involvement with the AIAA Space Operations and Support Technical Committee (SOSTC) Education Subcommittee. A career in the space and SATCOM industry is exciting and incredibly rewarding, especially as the country and the world increasingly relies on space for global communications. Integral Systems will continue to do its part to foster enthusiasm in STEM programs, and we look forward to working with our partners in the industry on this critical initiative.

MSM

You have a great deal on your plate that involves technological oversight for military/government and commercial sectors. Where do you see SATCOM heading over the next year or two, especially as such applies to your Company?

STEVE GIZINKSI

We see end-user SATCOM technology in general heading in the direction of a more commercial-based approach, a reduction in the size, weight, and power of components (as we have implemented in our SSPA product line) and from the government, an ever growing emphasis on multiple award orders that are based off of ID/IQ procurements so that

ioPLEX™: IP Access Gateway

industry competes for "lowest price technically acceptable" and "best value" solutions.

MSM

One of the areas of concern within MILSATCOM and SATCOM is the quest for capacity... how is Integral assisting in developing technologies to ease the flow of information?

STEVE GIZINKSI

The latest maritime terminals that we supply to both the United States Navy and Coast Guard have served to upgrade the capacity of their communications nodes within a worldwide network. These Ku-band terminals also have optional bands that can be added on the same physical platform to further increase capacity by combining multiple bands for multiple uses on the same hardware footprint.

MSM

Is the melding of terrestrial and satellite technologies becoming more efficient? How do you answer those who are concerned about comms security, especially for "boots on ground" and the command operations?

STEVE GIZINKSI

Terrestrial and satellite both continue to benefit from technological advancements in circuit design, capacity and size, weight and power (SWAP) improvements. Both segments benefit from industry advances. Comms security and the assurance of information across deployed systems continues to have the highest priority. Communications systems need to be capable, flexible and secure to meet the needs of the warfighter. Like many in the industry Integral Systems tests its solutions to ensure compliance for security in a package that is designed for high MTBF for the critical "boots on the ground" personnel.

MSM

The Company has a new and smaller SSPA offering — can you generally discuss some of the other new products that are in your development pipeline?

STEVE GIZINKSI

Our Raptor line of terminals continues to evolve. Using the initial 45 cm units as a baseline, we are working on a 60 cm terminal that will offer increased performance, including the option for autopointing. Upcoming Raptors will also benefit from our new SSPA and BUC technology, which will help keep the system weight down and increase efficiency. Another area we are working on is an evolution of our existing HDRM. The new product will be a software defined radio that supports two-way data rates from 50 kbps to 900 Mbps. Waveforms supported include DVBS2 at up to 300 MSymbols/S and all ground and air Standard Common Data Link (CDL) waveforms and rates (200 kbps to 274 Mbps). It will also support Direct Sequence Spread Spectrum (DSSS) technology, and will be configurable to accommodate multiple modulation schemes, data rates, coding algorithms and data formats.

MSM

Being responsible for military/government and commercial product lines must be challenging — could you explain the differences in approaching clients within both fields of endeavor and how you handle contract issues within each category?

STEVE GIZINKSI

Both military/government and commercial users expect a high quality product that is a best value solution for the application. This expectation is not exclusive to either group and, as such, allows us to standardize on a common set of processes and procedures to efficiently run our ISO-9001 certified company. We find that a customer-centric approach that emphasizes on time, on budget, requirements to compliant solutions serves both of these communities and the unique products and services that are required. Additionally, working with both communities allows us to develop and maintain a best practices environment that draws from the best that both of these worlds offer.

MSM

There is enormous interest in airborne and maritime antenna systems — as well as a great deal of competition. How do you present Integral Systems products to offset competitor challenges?

STEVE GIZINKSI

The competition is definitely intense. Generally we try to leverage the breadth of knowledge within our engineering staff to produce innovate and affordable solutions, as well as our experience in production. SATCOM Solutions has implemented a consistent repeatable systems engineering approach to produce our products and services. We approach each customer and each contract using this set of systems engineering principals

to consistently perform from the development of the solution through to the implementation, testing and O&M stages. Combining this approach with systematic trade analyses during the design phase regularly results in the best value solution to the government and commercial marketplace.

Our customers are the benefactors of this strict adherence to process, and as a result are inclined to give us repeat business. A recent example of this philosophy has been implemented on our SDM-M contract where we have delivered 935 baseband kits since 2006 — every one on, or ahead of schedule, and requirements compliant and within budget.

MSM

Security concerns for MILSATCOM and SATCOM continue to garner a great deal of attention — what is Integral Systems undertaking to assuage such concerns?

STEVE GIZINKSI

Both cyber and physical security of our networks, our facilities and our system deployments are always of the utmost importance and priority. We regularly work with fully accredited independent third parties to review and assess our networks, validate and certify our equipment and test and implement our products in the field. We regularly implement recommendations from the consistent feedback of our government and commercial customers. Each deployed solution is on a spiral path to address security risks and threats, update hardware and software to assuage these threats and regularly reviewed to assess and mitigate new threats as they arise.

HDRM High Data Rate Modem

MSM

With the increasing use of FMV in the field of military operations, does Integral have any plans to implement new technologies to assist with real-time delivery via compression to assist warfighters and NGO projects?

STEVE GIZINKSI

We have several innovative products that support delivery of full motion video. In the SATCOM arena, our HDRM provides support for the Digital Video Broadcast – Satellite – Second Generation (DVB S2) at the industry's fastest data rates – 900Mbps. The tremendous benefits of DVB-S2 are highly relevant to many areas including UAV operations. This waveform is a leading contender for use with programs such as HDR-AT.

On the ground network side, our ioPLEX provides for the adaptation of FMV over an Ethernet or ATM network using JPEG-2000 CODEC to perform compression of live video streams. This approach has a unique advantage in that it is robust over error prone networks. This approach essentially eliminates the negative effect of Ethernet frame loss that is seen when using MPEG encoding.

BLUE FORCE TRACKING-2 FROM VIASAT

Selected to upgrade the U.S. Army and Marine Corps *Blue Force Tracking* network, ViaSat brings real-time situational awareness and better networking capabilities to the warfighter with BFT-2. ViaSat's next-generation Blue Force Tracking transceivers provide dramatic improvements in situational awareness through faster *Position Location Information* (PLI) refresh rates and greater information throughput features. This BFT-2 system delivers improved network efficiency and reduces the Department of Defense's total operational expenditure for the specified capability.

With ***BFT-2***, network users can achieve real time position accuracy by operating through a *Ground Vehicular Transceiver,* or *Aviation Transceiver,* to one of up to 10 satellite channels back to a *Satellite Ground Station* (**SGS**). The average round-trip message latency through the network has been demonstrated and proven to be less than two seconds.

ViaSat's antenna element design offers more predictable performance and improved system reliability on both the vehicular and aviation systems. The Ground Vehicular Transceiver is a single *Line Replaceable Unit* (**LRU**) that measures 8.75" square (excluding connectors), is less than 5" tall, and is compatible with mounts designed for the **MT-2011**. The Aviation Transceiver is a two-LRU design that separates the RF assembly from the modem assembly to offer better aerodynamic performance.

The next-generation network also adds **FIPS 140-2 Level 2** data link security to protect warfighters from adversarial traffic analysis and data probing. The BFT-2 system delivers trusted, high-performance operation, even in the harshest MIL-STD environments. ViaSat's transceivers have successfully completed **MIL-STD-461**, **464** and **810** testing.

Future capabilities may include vehicular wireless extensions and non-vehicular (man-packable) configurations for the dismounted warfighter or paratrooper. Integration of wireless technologies in either the ground mobile or man-packable configuration will enable vehicle-to-vehicle communications, or the use of secure Smartphone technologies, providing direct interaction between the wireless-enabled warfighter and the lower tactical Internet.

BFT-2 AT-A-GLANCE

- Download situational awareness information and other IP-based data up to 100 times faster and upload data up to 60 times faster than the BFT-1 system
- Refresh situational awareness PLI in as little as 2 seconds every 30 seconds or 50 meters of travel (configurable time and movement parameters)
- Employ more than eight times the number of remote users with the same space segment of the BFT-1 system
- Operate more efficiently with legacy or new-generation commercial L-band satellites
- Optimize network performance for varied satellite link conditions using hundreds of symbol rate, chip rate, and FEC rate combinations
- With an embedded, NIST-Certified, FIPS-140-2 Level 2 AES-256-bit based transmission security (TRANSEC) module, the system ensures secure connectivity and protects sensitive communications.
- Provision, manage, and control up to 200,000 transceivers operating worldwide on leased SATCOM channels over 8 Satellite Ground Stations 24 hours a day, 7 days a week (24x7)
- Based on ViaSat's battlefield-proven ArcLight® technology, the enhanced COTM waveform provides improvements in capabilities specific to situational awareness users
- Technology enables future enhancements without needing to replace hardware

left: ground vehicle system
right: aviation system

TO PROTECT + SERVE... LAPD + SATCOM

AUTHOR: JON DOUGLAS, MARKETING + COMMUNICATIONS DIRECTOR, SPACENET

With its large population, diverse environment and unique geography, Los Angeles is a one-of-a-kind place that is not easily comparable to other cities. Yet just like other cities, it has its share of strengths and challenges — Los Angeles is the second most populous city in the U.S., with a population of more than 4 million. If you include the urban area of L.A. beyond the city limits, the population increases to more than 15 million, making it one of the largest urban areas in the world. To support its large population, L.A. is intertwined by a large road infrastructure of highways and freeways. The Texas Transportation Institute ranked its road traffic as the most congested in the U.S. in 2005.

In addition to its traffic, L.A. is well known for its entertainment, including the development of movies, television, and music. It also boasts an impressive business environment, serving as a major economic force for the country. Then there are the earthquakes. L.A. is also well known for being a victim of this natural disaster, due to its location on the *Pacific Ring of Fire*. Unfortunately, the city also deals with other environmental issues that range from mud slides to forest fires, the latter having been highly publicized, including the recent *Station Fire* of 2009 that destroyed 209 structures. Needless to say, L.A. has a lot to offer, but like any place, it requires a strong force to keep the city safe and to protect its large population. One group that knows — first-hand — how to face this challenge is the ***Los Angeles Police Department*** (**LAPD**).

The LAPD has an important mission to safeguard the lives and property of the people it serves, to reduce the incidence and fear of crime, and to enhance public safety while working with the diverse communities to improve their quality of life. It is the third largest local law enforcement agency in the U.S. With just over 10,000 officers and more than 3,000 civilian staff, the LAPD covers an area of 498 square miles.

The LAPD has to be ready for virtually any situation as it deals with a myriad of incidents every day that range from traffic violations, to crowd control at world-class sporting events, to ensuring the safety of VIP personnel, to major emergency situations and disasters. A critical component to enable the agency to fulfill its mission and support its daily activities is ensuring access to reliable communications

for its officers across the city. Without voice and data communications, a police department would be virtually paralyzed, unable to verify subject information while processing arrests, conducting routine traffic stops, responding to domestic disputes, or serving warrants.

To help it fulfill its mission, the LAPD sought to expand its mobile and emergency communications network through its transportable *Incident Command Posts*. LAPD determined that it needed a communications solution that could support its full range of requirements. The solution had to be comprehensive, reliable and cost-effective while ensuring access to converged data, voice fax, video and land mobile radio integration. The system needed to be mobile, independent of terrestrial networks and provide interoperability between state agencies during emergency situations — and it needed to be available all the time.

After researching its options, LAPD concluded that satellite would provide an ideal solution for its core network solution. Unlike other technologies, satellite networks completely bypass the local terrestrial infrastructure and provide a completely independent, wireless last-mile solution. In addition, satellite technology offers the benefit of mobility as well as ease and speed of deployment to provide instant communications and support for affected communities. Satellite networks are also easily maintained on an ongoing basis, and can be deployed for days or weeks at a time depending on the emergency situation.

To meet its full range of requirements, LAPD chose **Spacenet**'s satellite communications system. The system is integrated with **Raytheon**'s ***ACU-2000 IP*** interoperability system, which provides an SIP-based gateway to digitally converge existing radio systems with SIP telephones, networks, and devices, and with solutions from **Rivada Networks**, a provider of wireless, interoperable public safety communications networks. The system joins disparate communications systems that can be connected, monitored and controlled over an

FOCUS

two-way radio users access to features that have traditionally been available only to telephone users. In addition, the distributed network design is intended to provide continuity of local operations in the event of network failure. LAPD started implementing its satellite network for its command posts in 2009 with the goal of providing a reliable communications outlet for big events and emergency situations across the city. LAPD worked with Spacenet, Raytheon and Rivada Networks to implement the comprehensive communications network, including satellite services and equipment, and support for Wi-Fi, WiMAX and full LMR integration.

The solution is based on Spacenet's *Emergency Communications Service* (**ECS**) via satellite, which provides a cost-efficient pay-as-you-use service plan option, and

"The LAPD's focus is to enhance public safety and safeguard the lives of the people we serve. Spacenet's full-time and part-time satellite services that support broadband data, voice and LMR for Radio over IP, in addition to its 24 X 7 customer service, gives us an advantage by providing a reliable communications network for emergency situations. It is accessible where and when we need it most so that we can focus on our mission of protecting the city."
— *James MacDonald,* LAPD Sgt.

Spacenet's ***Connexstar S2*** satellite service, which is based on the ***SkyEdge II*** VSAT platform. ECS is provided on a usage based model, enabling users to pay a low monthly standby fee and then only pay for the service when they actually need it during emergency

> ***"Our emergency communications service was designed to help the LAPD and other similar agencies meet their public safety initiatives by providing a flexible, reliable and transportable solution for emergency communications. By integrating with broadband data, voice and LMR, our satellite technology provides a comprehensive solution to enable access to communications in any emergency situation. We look forward to supporting the communications needs of the LAPD and to working with other agencies that have similar mission-critical requirements."***
> ***— Glenn Katz, Spacenet President & COO***

situations. It provides dedicated bandwidth and service level agreements for a high-quality and reliable solution.

Key to the innovative on-demand and always available service is the ability to support *Land Mobile Radio* and voice and fax lines connected to the PSTN. Also, the satellite service is used to connect the Wi-Fi (which is used to support smart phones) and WiMAX services for multiple command posts. WiMAX antennas are meshed with the Incident Command Posts enabling the LAPD to share its resources across the satellite network, providing improved efficiencies.

In addition to its Command Posts, the LAPD is using the satellite service to provide connectivity for multiple Chevy Suburban vehicles that are used as mobile communications centers across the city. The vehicles can share resources with the Command Posts, providing an extremely efficient communications network that saves the LAPD money. The comprehensive communications solution integrates a mixture of different technologies to support all of the LAPD's network requirements for its Command Posts and mobile communications vehicles.

Since the implementation of this system, LAPD's Command Posts and Suburban vehicles have been used to support multiple events across the city for real-time deployments and have served as the main communications network to support data, voice and fax. Most significantly, it was used to support a visit from President Obama to the Los Angeles area in 2010. The LAPD's Suburban vehicles were deployed to support interagency communications with the **Department of Homeland Security** and surrounding police and fire departments, providing complete interoperability and effective security during this critical event.

The vehicles are used to support multiple events and activities every month, from high profile major sporting events to every day DUI arrests. It was recently used to support communications during a triathlon event, and also used during a *Los Angeles Lakers* basketball game to provide a remote booking station for arrests. The communications network enabled police personnel to complete booking info using the satellite system to transmit data.

In addition, the Command Posts are set up to support emergency response for disasters that occur by providing the infrastructure to build a large mobile network on-demand utilizing satellite, Wi-Fi and WiMAX. Ongoing testing is conducted on a regular basis, including at Los Angeles' *Griffith Park*. Testing has shown that even in traditional communication dead zones, LAPD is able to keep its communications working by using LMR, WiMax and Wi-Fi integrated with the satellite network.

Overall, the satellite network has proven to be an extremely valuable resource during many events in Los Angeles and offers a reliable solution for communications across the city. It provides numerous

benefits to LAPD including an easy to deploy, versatile, and comprehensive system to support its transportable communications requirements.

The network can be up and running in a matter of minutes, even in areas that are traditionally hard to reach. Previous technologies would require hours to connect and simply wouldn't work in some areas. The solution is a major tool for public safety, providing a high reliability communications system to those that must ensure security at various events across the city as well as emergency communications in the case of a crisis or disaster.

The LAPD has leveraged satellite to prepare for virtually any event it may face across the city. Although not every city faces the same challenges as L.A., every city has a department in place that is responsible for ensuring the safety of the public, no matter how big or small the event. For these agencies, having a reliable communications system in place helps ensure the safety of personnel and the public, and helps them promote domestic security. With today's latest technologies, public security agencies have relatively easy and generally cost-effective ways to procure and implement satellite systems for emergency communications, whether in California, or anywhere across the U.S.

About the author
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Emergency Communications Service (ECS) Via Satellite

Public safety organizations require reliable emergency communications to support any situation in any location. However, paying for an emergency communications service when there are no emergencies seems counterintuitive, and is not cost efficient. Spacenet is here to help by offering its Emergency Communications Service (ECS). With ECS, organizations have access to an affordable and flexible emergency communications solution that provides readily available communications via satellite to virtually any U.S. location. ECS is designed to provide a more cost-effective and flexible satellite solution, leveraging an always-on pay-as-you-use service plan with dedicated satellite bandwidth for readily available and reliable emergency communications*. It is ideal for public safety and first responder agencies such as police, fire departments, and medical emergency teams as well as federal agencies such as FEMA and the Department of Homeland Security who require network continuity for disaster planning, but also face the reality of budget limitations.

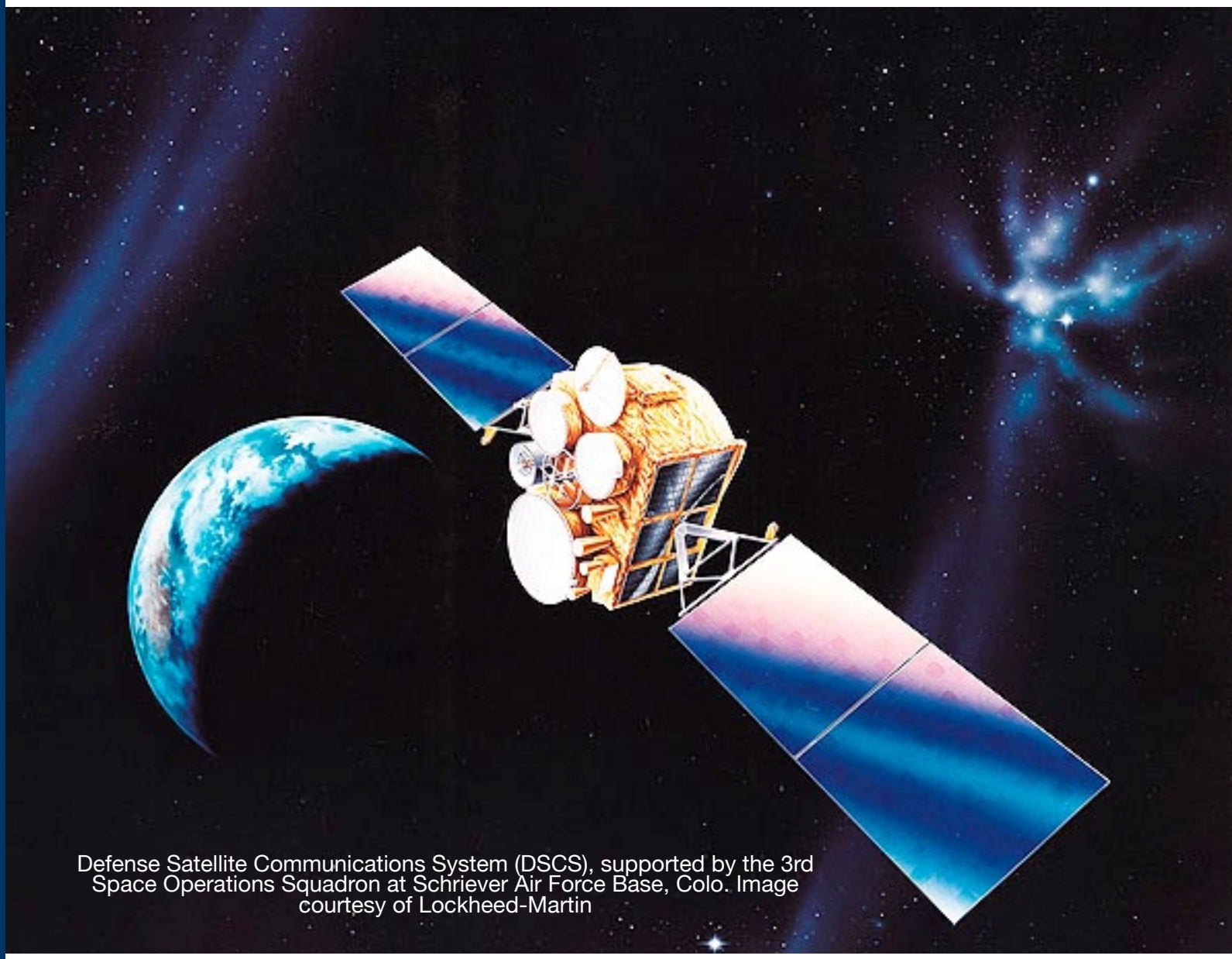
Features include:

- *Range of packages with multi-megabit inbound and outbound speeds*
- *Guaranteed dedicated bandwidth during deployment*
- *Daily or weekly usage service plans*
- *Full support for converged data, voice and video applications*
- *Deployed on mobile command vehicles, trailers and other fixed and transportable configurations*
- *24 x 7 U.S. based premium customer support*

THE 21ST CENTURY BATTLEFIELD IS FOUGHT ON THE TACTICAL EDGE

AUTHOR: KARL FUCHS, VICE PRESIDENT, TECHNOLOGY, IDIRECT GOVERNMENT TECHNOLOGIES

The quicker soldiers can receive updated and accurate information, the more effective they become. Airborne satellite communications is playing its part in this new paradigm, allowing our military to communicate in the air with troops at sea, on land, and deployed in remote locations, where terrain and range can interfere with communications signals.



Defense Satellite Communications System (DSCS), supported by the 3rd Space Operations Squadron at Schriever Air Force Base, Colo. Image courtesy of Lockheed-Martin


Photo of the Deepwater Horizon catastrophe

Advances in the speed and throughput of SATCOM signals have made high-definition (HD) video a reality for airborne applications. With the ability to upload full-motion video while in flight, high-speed airborne SATCOM can be used for intelligence, surveillance and reconnaissance missions as well as voice, video and data applications for the military and to fortify disaster response efforts. Using SATCOM technologies, the military and emergency responder communities can make command assignments and target imagery of natural and man-made disasters.

Today, many airborne applications are coming to fruition, thanks to innovations in technology and a push from the Department of Defense to move in this direction. Smaller satellite dishes, more effective compression technologies, and the efficient use of *Time Division Multiple Access* (**TDMA**) based spread spectrum technology have all fueled the growth of mobile communications over satellite. Spread spectrum technology lowers the power spectral density of a carrier to mitigate adjacent satellite interference problems inherent when ultra small antennas are used. The cost of this mitigation strategy is increased bandwidth utilization. TDMA based spread spectrum systems minimize the required spread factor to meet the *Adjacent Satellite Interference* (**ASI**) power spectral density limitations.

During flyovers of the Gulf Coast last summer, high-tech planes equipped with auto-tracking antennas and state-of-the-art infrared cameras shot high-definition video images of the 3,300 square-mile *Deepwater Horizon* oil spill and tracked where the oil was spreading in the Gulf of Mexico. The images were transmitted to the U.S. Coast Guard and cleanup workers over a secure satellite communications backbone developed by **iDirect Government Technologies** (**iGT**). *Internet Protocol* (**IP**) connectivity was provided via satellite from iGT, with bandwidth provided by **Intelsat**.

The system was vital for up-to-date situational awareness and gave the Coast Guard and cleanup workers a view they could not have had otherwise. The infrared cameras and auto-tracking antennas enabled the collection of video and IP applications, which was critical for the airborne SATCOM application. With this high-powered equipment, officials in charge of the oil spill cleanup mission could see the full extent of the oil slicks and were even able to pick up the plumes that were beneath the water's surface. This technology

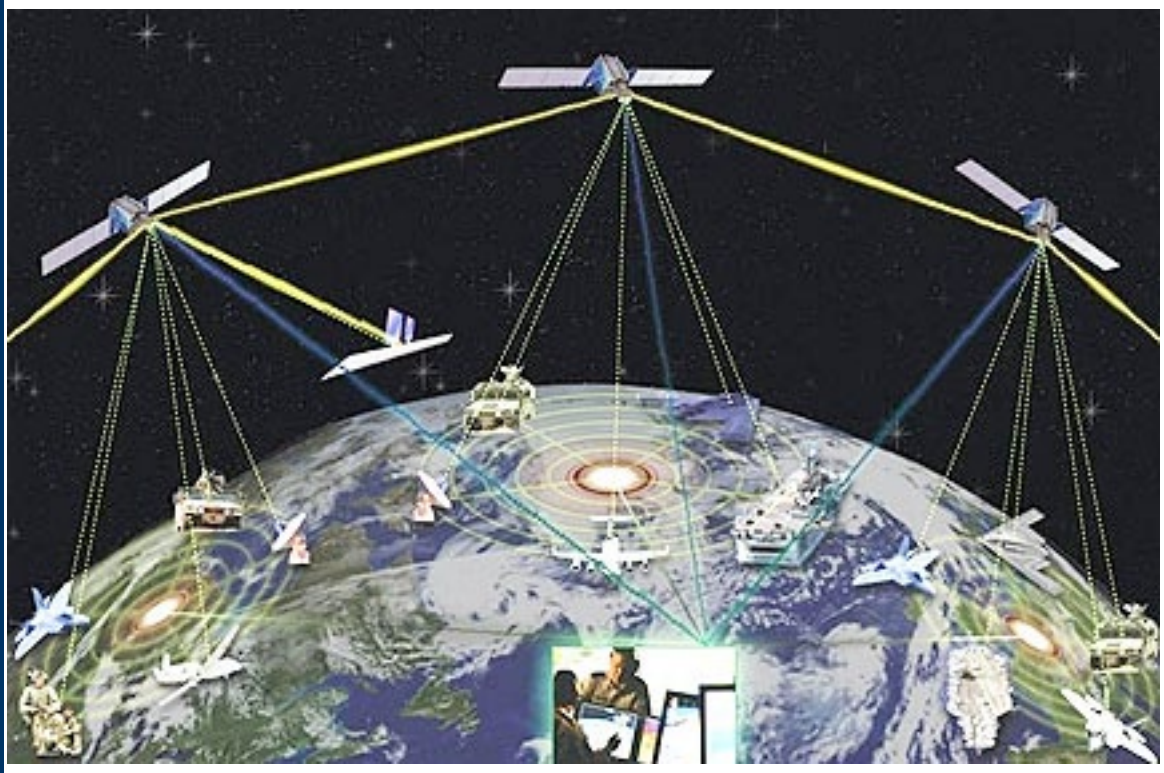
is extensible to fighting wildfires and search and rescue missions.

iGT's high-bandwidth satellite technology was integrated into the aircraft so that the modem, the antenna and the aircraft navigation system all worked in concert. The result of the integrated pieces was a solution that substantially increased the data rates, anticipated the transit between satellite footprints, accommodated the rapid Doppler Effect shifts that occur during flight, thus allowing the antenna to react more quickly to aircraft movement and integrate into many of the ISR systems being used today. The Doppler Effect refers to the high speeds, turbulence and rapid shifts in altitude that can create problems in receiving satellite signals. Additionally, the architecture deployed was able to accommodate hundreds of aircraft in one network and track their movements dynamically if required.

This is among the recent advances made in the field of airborne communications. The key to effectively communicating in the air, similar to other forms of *communications-on-the-move* (**COTM**) platforms, is integration of all of the parts. Although mobile communications is not a new concept, a growing number of technological advancements in recent years have made widespread deployment more cost effective and achievable for military and emergency responder communities.

The greatest developments in COTM technology are taking place with airborne communications. Airborne COTM can be just as reliable as ground-based COTM with the use of specialized demodulators that support increased vehicle speeds.

By using automatic beam switching and persistent IP addressing for airborne communications, an aircraft can be flown from the United States to Europe and on to a final destination in Southwest Asia and maintain a seamless global network of advanced communications while switching satellites throughout its journey.



The Transformational Satellite Communications System (TSAT)
Image courtesy of TSAT Program Office
MILSATCOM Systems Wing, Los Angeles Air Force Base

This network even extends to soldiers departing the aircraft with communications-equipped manpacks that include mobile satellite router boards. Paratroopers

can quickly and easily set up communications on the ground to suit any mission.

iGT's technology includes built-in **FIPS 140-2** certified AES encryption combined with *Transmission Security* (**TRANSEC**) solution, which guarantees a high level of security for data communication. This technology is managed by **iVantage** and includes a global NMS providing roaming remote management along with automatic beam switching and geographical mapping.

Another critical component is that the airborne system has the ability to transmit in real-time large amounts of data with varying prioritization. This data has to transmit accurately and quickly to military analysts, soldiers on the ground and first responders. The satellite router software must also possess the ability to allow users to quickly and efficiently process the information that is being received, giving those at the command level a better situational view of what is transpiring, in real-time, and with interfaces that make it easier to quickly understand the data.
In recent years, the Department of Defense has shown significant movement in the direction of airborne communications. It is important that military systems can communicate with one another and that information is delivered across a variety of platforms supporting the Joint Forces.

However, the technology is not without its pain points. Without adequate integration between the antenna and modem, airborne communications is inefficient. The need for high-definition video from mobile military aircraft communications is an ISR requirement that has been difficult to achieve in the past due to the requirement for very high in-bound data rates through ultra-small antennas. The speed of the aircraft and abrupt maneuvering can further complicate the puzzle. Recent developments in antenna tracking capabilities are making airborne COTM a reality.

In a mobile satellite network, military security requirements include **IA STIG** and **TRANSEC**. These TRANSEC features enable the Department of Defense to obfuscate any SATCOM traffic volume or remote terminal acquisition activity, which either on its own, or when coupled with other intelligence information, may prove useful to an adversary. The information assurance mitigates malicious hacking or denial of service attacks potentially perpetrated by an adversary.

Even with its challenges, airborne COTM continues to evolve and be tested to meet the most stringent military standards. It is where the military is headed to further evolve the airborne technology as a viable COTM platform. It suits the 21st Century warfighter and expands the information reach hundreds, even thousands, of miles away from troops on the ground, giving them an enhanced view of the battlefield.

About the author

Mr. Fuchs is the Vice President of Technology of iDirect Government Technologies (iGT), a satellite-based IP communications company that transforms the way the Department of Defense (DoD) and civilian government agencies get and stay connected. He joined iGT in 2004 as the company was expanding their presence in the VSAT market into new International IP networking opportunities and the federal government.

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