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Richard Dutchik, Contributing Editor
Bert Sadtler, Contributing Editor

Authors + Contributors

Jan Einar Bringedal
Patrick Decool
Chris Forrester
Martin Jarrold
Jos Heyman
Hartley Lesser
Reinhold Luppen
Bert Sadtler
Pattie Waldt

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hartley@satnews.com 530.448.6049


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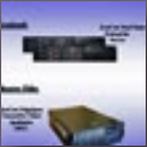


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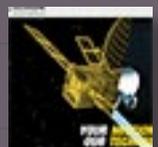


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Terry Neumann is part of the market development team within iDirect. He focuses his time and resources on promoting and expanding the use of VSAT.



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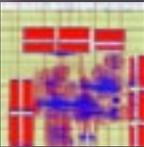
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Kim Gram has held the position of Vice President of the Aeronautical Business Unit at Cobham SATCOM (previously Thrane & Thrane A/S) since 2009.



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Similar to home computers, the sophisticated capabilities of today's space missions are made possible by the power of their processor chips.



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Satellite communications usage at sea typically reflects trends on land and, today, more than ever... *By Jan Einar Bringedal, Marlink*

Adding Two To The Books

International Launch Services (ILS) and Intelsat S.A. have signed a contract for two, firm ILS Proton launch missions.

“Intelsat enjoyed another steady year in 2012, which included five successful satellite launches and the completion of the world’s first global broadband mobility platform, which will enable increased bandwidth to support our customers’ growth plans. We look forward to building on our momentum, as we select ILS for two future satellite launches, enabling us to reach even further into developing regions to meet the growing demand for highly efficient and reliable connectivity,” said Intelsat EVP and Chief Technology Officer Thierry Guillemin.

“ILS is honored to be selected by Intelsat for these future missions. We are pleased to have Intelsat’s confidence and commitment to support their plans for growth and expansion of their business,” said ILS President Phil Slack.

ILS recently conducted its successful ILS Proton return to flight mission on March 27 from the Baikonur Cosmodrome in Kazakhstan, with the Satmex 8 satellite for Satélites Mexicanos S.A. de C.V. (Satmex) of Mexico City, Mexico. #

Hybrid Help

Intelsat S.A. has signed a multi-year agreement with Digital Networks, a provider of business-class satellite solutions to the energy sector.

Intelsat will provide capacity via its satellite fleet and IntelsatOne terrestrial network, enabling Digital Networks to more effectively support very small aperture terminal (VSAT) communications networks in North America.

Digital Networks will leverage Intelsat’s teleport services and capacity on the Galaxy 3C satellite to expand its network in the United States and Canada. #

Satellites’ Study Set Up

Space Systems/Loral (SSL) has been selected to study the feasibility of accommodating next-generation U.S. military weather systems on commercial polar orbiting satellites.

SSL will examine options for the U.S. Air Force Space and Missile Systems Center to lower its cost to replace the legacy Defense Meteorological Satellite Program, through the use of alternative architectures such as equipping commercial satellites with advanced meteorological sensors.

The six-month study contract was awarded under a broad agency announcement issued in June 2012. SSL will study the technical feasibility of hosting a third generation meteorological instrument on an SSL commercial bus platform; identify commercial business opportunities that the Air Force can leverage to achieve weather sensing from a Highly Inclined Elliptical Orbit (HIEO); and quantify the value proposition for performing the mission in this non-traditional fashion.

As a satellite manufacturer that works with most of the world’s leading satellite operators, SSL is well-positioned to find suitable

opportunities for placing government payloads on commercial spacecraft.

SSL also has experience building dedicated HIEO satellites, which can provide a persistent view of arctic latitudes for the next generation weather program.

The company’s experience includes the first constellation of three satellites designed and built for Sirius XM Radio, which were launched into 24 hour Tundra orbits in 2000. This fleet of HIEO satellites continues to provide service today.

The company’s extensive hosted payload experience includes SES-5, a commercial telecommunications satellite, which was launched in 2012 and hosts a navigation payload for the European Union. SSL also built Intelsat-14, which hosted the first commercial Internet Router in Space (IRIS) and was successfully launched in 2009.

SSL’s experience with hosted payloads also includes Optus-C1, built for SingTel Optus, which was launched in 2003. Optus-C1 provides commercial communications services in Australia and also hosts several milsatcom payloads for the Australian Defence Forces. #



Artistic rendition of DMSP, courtesy of U.S. Air Force.

R&D Courtesy Of SADI

Norsat International Inc. has been awarded a \$13.3 million (CAD) repayable contribution from the Strategic Aerospace and Defence Initiative (SADI).

The contribution will enhance Norsat's strategic research and development program and enable the Company to maintain a leadership position in the development of innovative new or improved communications products, services and processes.

Norsat's research and development program is focused on communications technologies that provide militaries, governments, and commercial customers around the world with connectivity in locations or applications in which infrastructure is unreliable, damaged, insufficient or non-existent. These solutions are ideally suited for use in challenging environmental or technological conditions on a temporary, extended or permanent basis.

Overall, the contribution will enable Norsat to develop new communications technologies, expand existing lines of microwave products, satellite terminals, and antennas and filters, and maintain competitiveness in existing markets.

These development projects will also assist the Company in becoming more competitive for entry into other growing markets.

The contribution provides spin-off benefits with opportunities for Norsat to work collaboratively with university researchers and develop stronger channel relationships with the local suppliers of components used in new technologies. The contribution from SADI will further six major projects, including the development of:

- » *Microwave products with improved technical specifications and performance. Norsat's microwave components are used worldwide for satellite signal transmission and reception*
- » *Fly-away satellite terminals with improved ease-of use and technical performance*
- » *Communications-on-the-Move (COTM) technologies that provide connectivity throughout moving deployments*
- » *Wireless communications technologies for Land Mobile Radio (LMR).*
- » *Novel antennas that deliver high performance, reliability, and durability*
- » *Complementary Communications solutions, providing end to end solutions for applications such as monitoring, surveillance and emergency communications*



Spanish Digital Movie Distribution Calls For Many Talents

For the first time in Spain, leading companies from the telecommunications sector and the movie industry have come together with the aim of making an innovative and ambitious project a true reality, in order to modernise the cinematographic contents distribution.

It is estimated that, at the outset, they will be able to distribute 20,000 film copies and 30,000 trailers per year to 2,000 movie theatres all over the country, using the Hispasat 1E satellite and with no need for hardware supports.

The technological advances that make up the new distribution system offer significant advantages as compared to those currently used, as they streamline the process and considerably reduce the time spent to receive the films in the theatre, by simultaneously transmitting them to cinemas in just three hours.

In addition, security and efficiency increases and logistics are simplified, avoiding the material becoming lost or damaged risks, and deliveries delayed.

The power, flexibility and functionality of the satellite makes it possible for this type of distribution to be used for all types of content, from HD and 3D to the future Ultra High Definition, that is currently being developed.

Similarly, the extensive Hispasat satellites coverage enables to extend the solution to Europe and to the American continent.

The Madrid Callao cinema, one of the oldest theatres in Spain, will be a pioneer in this new cinematographic distribution system that will revolutionise the dissemination process in cinemas, in this way combining cultural tradition and technological state-of-the-art.

Hispasat will supply its satellite fleet's space segment; Ericsson has designed the technological platform (contents broadcasting server and digital reception equipment); Ericsson's MoMe will provide the overall system integration and its deployment (broadcasting antennas and receivers, operation and system maintenance) and it will be the service provider; Deluxe Spain, an audio visual service provider responsible for the most of the cinematographic material distribution in Spain, it will exclusively include this solution to its services, so content can reach cinemas via satellite.

Theaters are moving from celluloid to a smaller digital format, the DCP (Digital Cinema Package). There is a single film transmission from the Deluxe premises to all of the cinemas simultaneously. The Hispasat 1E satellite will transmit the signal sent out by Deluxe, amplify it and send it back to Earth, where it can be received by the antenna installed in the cinemas. The theatres will receive a digital password by electronic mail that will enable them to decode the film.



Hispasat 1E Global Coverage

All of the cinemas will be able to download a medium-sized film—approximately 200 GBytes—in a secure way onto their projectors in three hours, and a trailer in just a few minutes.

A central server controls and transfer all of the multimedia contents (distributions) to cinemas, and a receiving server at the movie theatres receives the files and sends them to the projectors.

Ericsson CMS-D provides full control of the transfers to the cinemas from a central console located at the Deluxe facilities.

Callao City Lights is an innovative project that represents a unique communication model, capable of offering interactivity in three different scenarios at the same time: the square, the screens and Internet.

With this project, Callao City Lights maintains itself at the forefront of the technology and cinematographic industry evolution. #

Active Within Minutes

C-COM Satellite Systems Inc. has revealed its new, rugged, lightweight, iNetVu® line of Ka- and Ku-Band auto-pointing antenna systems, which can be deployed within minutes at the touch of a button.

For the SNG market, the iNetVu® is an advanced solution as well as the most reliable and cost-effective. The iNetVu® FLY-75V Flyaway Antenna is the most recent innovation by C-COM's acclaimed antenna designers. This 75cm Flyaway product is a highly portable, self-pointing, motorized and fully auto-acquire unit, configurable with the iNetVu® 7710 Controller, and can provide fast satellite acquisition within minutes. Designed to operate on Ka-band, this antenna system can be assembled in 10 minutes by one person, and is priced very effectively for any user.

The iNetVu® Ka-75V Drive-Away Antenna is a 75cm auto-acquire satellite antenna system which can be mounted on the roof of a vehicle for direct broadband access over any configured satellite. The system works seamlessly with the iNetVu® 7024C Controller and with the world's emerging commercial VIASAT / KA-SAT satellite Surfbeam II/PRO Nomadic modems.

The iNetVu® 981 Drive-Away Antenna is a 98cm Ku-band auto-acquire satellite antenna system which can be mounted on the roof of a vehicle for direct broadband access over any configured satellite. The system works seamlessly with the iNetVu® 7024C Controller and with the world's most popular commercially available Ku modems and services. With an optional pod for added aerodynamic flair, this antenna is ideal for bigger vehicles and SNG applications. Most importantly, this system is field upgradeable to Ka-band. #

Spot-On Comms

On Call Communications is developing the second generation of its QuickSPOT™ on demand satellite network.

The second generation network will expand the network capabilities with higher upload speeds, dual feeds, and new flexibility in choosing between on-demand and scheduled service access while maintaining the completely automated operation it is known for.

On Call has selected the Romantis Universal Hardware Platform (UHP) for the next generation network. Romantis also has developed an advanced network management system which enables high bandwidth satellite links and precision management tools on which On Call layers a smart scheduling system.

The new network will allow broadcast news and sports organizations to access higher upload speeds than the existing QuickSPOT™ network and allow for dual HD video feeds. Additional multi-casting options will be available as well.

A unique scheduling system will let clients schedule satellite and fiber network reservations online, direct feeds to their selected destinations and then access capacity using the same convenient, fully automated functionality of the current QuickSPOT™ on demand network.

"Our mission is to provide our client's with easy and efficient satellite network access," said Jim Gilbert, On Call's CEO. On the new network it should take just moments to book satellite space online and then access it by the same non-technical operator using our auto-deploy QuickSPOT™ system.

The Romantis UHP technology really enables the next generation developments. The high upload speeds, the ability to create MESH networks and the compact design make it ideal for a mobile, automated network suited to broadcasters.

On Call has purchased two of the management systems. One for the domestic U.S. market and the second will provide service in Europe.

Initial trials have been successful for domestic, disaster response clients and for broadcast use on the European network last fall. #



Second Stage In Final Stage

ATK successfully tested its newly developed CASTOR® 30XL upper stage solid rocket motor at the U.S. Air Force's Arnold Engineering Development Complex (AEDC) in Tennessee.

The test was the final qualification for the ATK commercial motor, which was jointly developed by ATK and Orbital Sciences Corporation in just 20 months from concept to completion.

The CASTOR 30XL is designed to ignite at altitudes in excess of 100,000 feet. In order to accurately test the motor performance, the static fire was conducted at AEDC using a vacuum chamber specially designed to simulate upper atmospheric conditions. Initial data indicate the motor performed as designed, and ATK will now analyze the results against its performance models.

The motor is intended for use by Orbital as an enhanced second stage of the Antares™ launch vehicle. Antares is slated to perform commercial cargo re-supply missions to the International Space Station (ISS) for NASA, to be demonstrated under the Commercial Orbital Transportation Services program for later delivery missions to the ISS under the Commercial Resupply Services contract.

The CASTOR 30XL solid rocket motor is 92 inches in diameter, 236 inches in length and weighs approximately 58,000 lbs. The nozzle is eight feet long with a submerged design with a high-performance expansion ratio (56:1) and a dual density exit cone well-suited for high altitude operation.

The CASTOR 30XL is a high-performing upper stage motor in ATK's commercial product line of solid rocket

motors. The company's flight-proven rocket motors are used for military and commercial customer missions. A basic version of the CASTOR 30 motor was tested at AEDC in December 2009 and will fly the initial Antares missions. The CASTOR 30XL is an upgraded version that will fly later

operational missions requiring greater payload capacity.

The CASTOR 30XL motor was tested at AEDC due to their unique capability of being able to simulate second stage flight conditions.

A key partner supporting ATK through development and production of the CASTOR 30XL motor is Moog

Inc. in East Aurora, New York, which produced the Thrust Vector Control (VTC) System. This system was developed by the C30 program to have common hardware for future use on other ATK motors. #

Making A Messier Of Things

The NASA/ESA Hubble Space Telescope has captured this vivid image of spiral galaxy Messier 77, one of the most famous and well-studied galaxies in the sky.

The patches of red across this image highlight pockets of star formation along the pinwheeling arms, with dark dust lanes stretching across the galaxy's energetic center. Messier 77 is a galaxy in the constellation of Cetus, some 45 million light-years away from us.

Also known as NGC 1068, it is one of the most famous and well-studied galaxies. It is a real star among galaxies, with more papers written about it than many other galaxies put together!

Despite its current fame and striking swirling appearance, the galaxy has been a victim of mistaken identity a couple of

times; when it was initially discovered in 1780, the distinction between gas clouds and galaxies was not known, causing finder Pierre Méchain to miss its true nature and label it as a nebula. It was misclassified again when it was subsequently listed in the Messier Catalogue as a star cluster. Now, however, it is firmly categorized as a barred spiral galaxy, with loosely wound arms and a relatively small central bulge.

It is the closest and brightest example of a particular class of galaxies known as Seyfert galaxies—galaxies that are full of hot, highly ionised gas that glows brightly, emitting intense radiation.

Strong radiation like this is known to come from the heart of Messier 77—caused by a very active black hole that is around 15 million times the mass of our Sun.

Material is dragged towards this black hole and circles around it, heating up and glowing strongly.

This region of a galaxy alone, although comparatively small, can be tens of thousands of times brighter than a typical galaxy.

Although no competition for the intense center, Messier 77's spiral arms are also very bright regions. Dotted along each arm are knotty red clumps—a signal that new stars are forming. These baby stars shine strongly, ionizing nearby gas which then glows a deep red colour as seen in the image above.

The dust lanes stretching across this image appear as a rusty, brown-red colour due to a phenomenon known as reddening; the dust absorbs more blue light than red light, enhancing its apparent redness. #

Helping This Sapphire To Glean

Canada has received part of the ground segment of its military's first dedicated operational military satellite from Denmark's Terma A/S.

Terma delivered its compact robust data processor for the Sapphire satellite system's ground station, which implements the algorithms for processing downloaded Sapphire imagery, establishes the precise attitude of stars and resident space objects in the images, and creates RSO tracking data products. The processor was produced under a subcontract from MDA Systems Ltd.

"In recent years, many states have experienced problems with space junk, as it poses a danger to commercial and military space assets in case of collision," Terma said. "In order to support avoidance of such collisions in the future, the Sapphire satellite's space-based electro-optical sensor will track man-made objects in Earth orbits between... as part of Canada's continued support of space situational awareness."

Canada's Sapphire satellite was launched into low Earth orbit last month.

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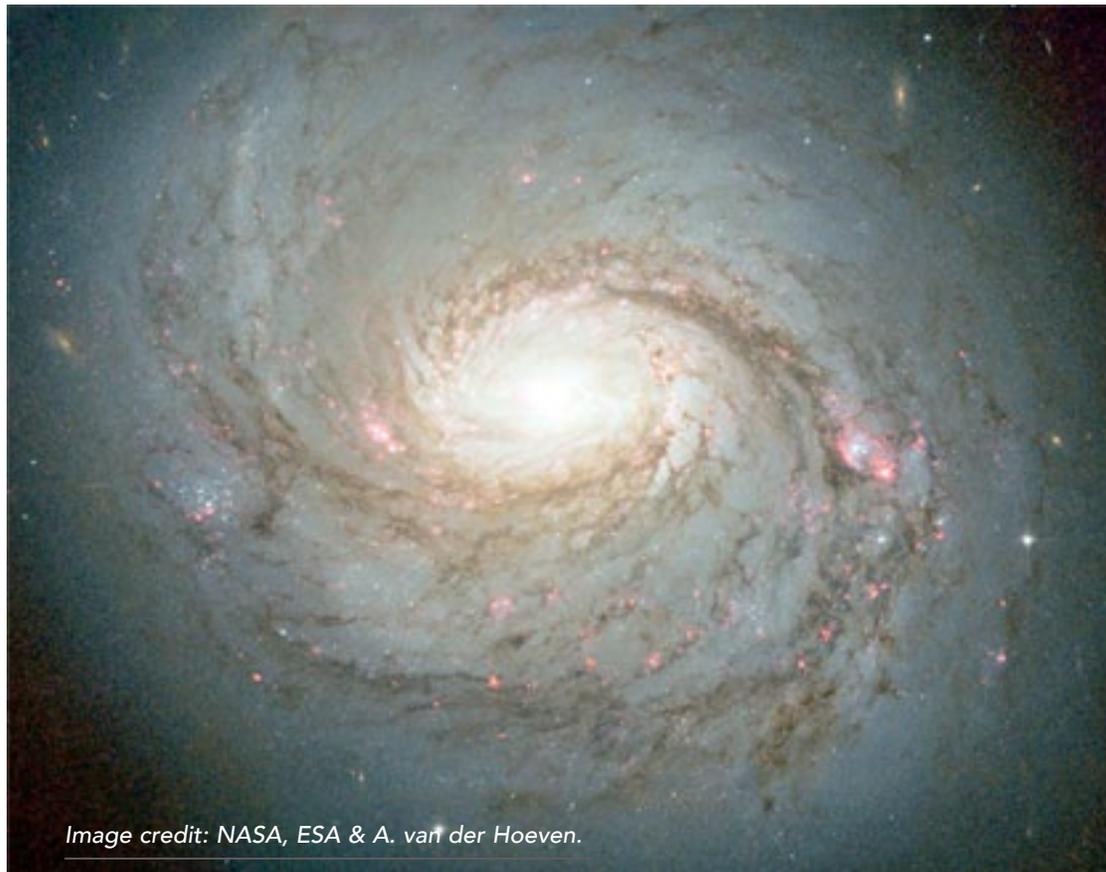


Image credit: NASA, ESA & A. van der Hoven.



New Controller + On The Skids.

Winegard has designed a new controller package that incorporates an iDirect Evolution® X5 or iDirect iNFINITI® 3000 modem inside the controller housing.

Other popular VSAT platforms also are compatible with the new controller, including HughesNet™, Spacenet®, Comtech® and 2, minus the integrated feature of storing the modem inside the IDU casing.

The new Integrated Controller is completely universal and backward compatible with all other Winegard VSAT antenna systems. It comes equipped with built-in DVB (digital video broadcasting) receivers and GPS. The Integrated controller holds CE certification for international use.

Winegard VSAT antenna systems and controllers are operational worldwide, including the countries of United Arab Emirates, South Africa, Russia, Iraq, Pakistan, Saudi Arabia, Scotland and Columbia.

Additionally, Winegard has started delivering a new customized skid for its WX series VSAT auto-deploy antennas based on the growth and demand from the shale drilling community.

The portable skid is designed for rapid deployment without the need for a technician, saving time and money.

The skid helps prevent damage to the antenna and electronic components inside and makes the package more portable and maneuverable.

A host of unique features, including a cable reel that holds three 150-foot long cables (for transmit, receive, power), built-in bubble levels and a Pelican Case for secure controller storage during shipping, allow quicker antenna deployment and minimize setup time.

Inside the skid, the antenna sits atop a specially designed isolation frame to absorb shock and protect the antenna from typical vertical and lateral movements during transit.

A critical advantage of this new skid is that skilled technicians are not required to set up, take down or move the antenna, thus lowering deployment costs. All the operator needs to do is position the skid in a desired location, open the bi-fold lid doors, plug in the three

operational cables at the control center, connect the controller and push a button.

The antenna system automatically deploys, finds the appropriate satellite and stays locked onto the satellite signal. Similar skids already are available and in use for the company's SPA and SF VSAT antenna systems.

All Winegard WX series antennas hold CE, GOST-R and Peru Homologation certifications for international use. #

A Most Important 30 Year Anniversary For SAR

Thirty years ago the premier launch of the Advanced TIROS-N satellite series carried a very special hosted payload aboard—the first Search and Rescue (SAR) payload on a U.S. satellite.

The satellite, NOAA-E, was designed and built at the Lockheed Martin (NYSE: LMT) (then RCA AstroSpace Division) facility in East Windsor, New Jersey.

To date, more than 33,000 lives have been saved as a direct result of the Search and Rescue Satellite Aided Tracking (SARSAT) capability, and more than 325,000 emergency beacons have been registered in the National Oceanic and Atmospheric Administration (NOAA) database.

As of 2012, 26 countries were providers of ground segments for the Cospas-Sarsat system, while 11 countries were user states.

In the midst of the Cold War, SAR hosted payloads were sent into space as the result of an agreement signed in 1979 by Canada, France, the United States, and the former Soviet Union that established the International Cospas-Sarsat Programme—a satellite-based SAR distress alert detection, location, and information distribution system designed to save lives.

Cospas-Sarsat provides the alerts to search and rescue authorities worldwide. It was a Russian navigation satellite launched nine months earlier—on June 29, 1982—that carried the first Cospas SAR payload into space.

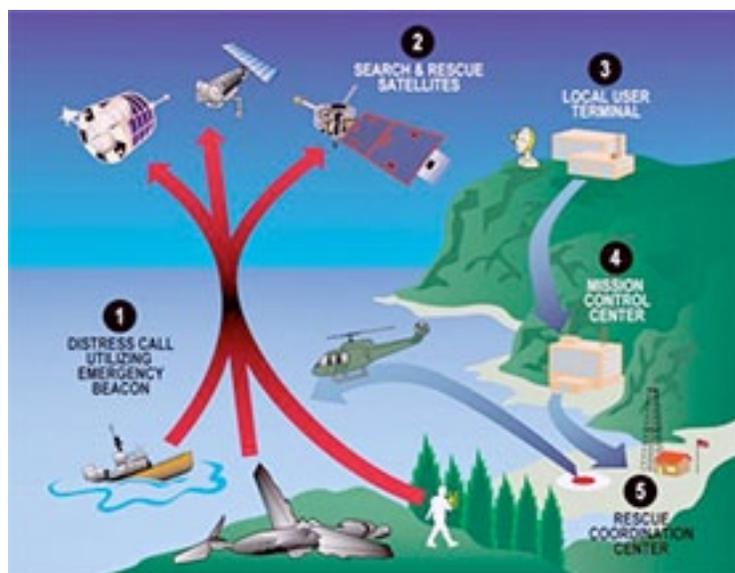
“While NOAA’s weather satellites have indirectly been saving lives for over 50 years by making possible timely forecasts of dangerous weather, the initiation of

the Cospas-Sarsat Program originated the use of satellite technology that enabled direct intervention in the rescue of people in distress,” said Mark Valerio, vice president and general manager of Military Space at Lockheed Martin Space Systems Company (LMSSC) in Sunnyvale, California, who also served as the SAR mechanical integration lead at East Windsor during the Cospas-Sarsat program.

“It was NASA’s vision decades ago, with its ‘missions of opportunity’ that underscored the value of hosted payloads, and the SARSAT program was an early pioneer,” Valerio continued. “Using available space on satellites for small additional payloads added enormous new capabilities, and fostered innovation in satellite missions. Some believe that the notion of hosted payloads is still in its infancy, but our company has been building and integrating them for nearly three decades now and we’ve come to appreciate the



Artist conception of NOAA-N Prime in orbit. Credit: Lockheed Martin.



SARSAT diagram, courtesy of NOAA.

benefits, and understand well the challenges and the risks.”

Under the Cospas-Sarsat 1979 agreement, France provided the Search and Rescue Processor, developed by the Center for National D’Etudes Spatiales (CNES). Canada’s Department of National Defence developed the Search and Rescue Repeater.

The United States provided the Search and

Rescue Receive Antenna—designed and built by the East Windsor team, which also performed the integration, test and fielding of the system that also needed to work in conjunction with the Soviet Union’s Cospas satellites.

In the U.S. the SARSAT system was developed by NASA. Once it became fully functional, its operation was turned over to NOAA where it remains today.

The Cospas-Sarsat system swings into action when a distress beacon is activated in a life-threatening emergency. The beacon is picked up by the satellites equipped with the SARSAT hardware.

Satellites downlink the distress data to ground stations and mission control centers that distribute it to rescue coordination centers that dispatch personnel to effect a rescue.

Typical rescue beacon radios transmit a strong 5-watt signal once every 50 seconds. Most beacons also include a GPS receiver so they can report a precise latitude/longitude location.

Aircraft Emergency Locator Transmitters (ELTs) are automatically activated by g-force switches that detect sudden deceleration during a crash, while maritime Emergency Position Indicating Radio Beacons (EPIRBs) are normally activated by contact with seawater. Personal Locator Beacons (PLBs) are activated manually.

Initially, SARSAT hardware was installed only on low Earth orbit polar-orbiting satellites, such as the Advanced TIROS-N series. These orbit at about 500 miles in altitude, making a single revolution each 100 minutes, with sensors viewing a different swath of the planet on each pass as the Earth turns beneath them. When a distress beacon is detected, its location can be computed based on the Doppler shift

of the beacon signal as the satellite passes overhead. Satellites in polar orbit provide emergency beacon users with global coverage (including the polar regions).

Starting in 1998, SARSAT hardware was also installed on geostationary satellites that reside 22,300 miles in altitude above the equator, orbiting the Earth at the same rate at which it turns beneath them. Because of this, they appear to remain over a fixed point on the Earth's surface. This high perch is ideal for making uninterrupted observations of the weather or environmental conditions over an enormous area, and enables the immediate detection, in their field of view, of distress beacons. However, unlike polar-orbiting satellites, those in geostationary orbit cannot view the Earth's polar regions.

The current constellation of operational SARSAT-equipped polar-orbiting satellites include NOAA-15, -16, -18 and -19 - all Advanced TIROS-N satellites, built by Lockheed Martin Space Systems. The European METOP-A weather satellite completes that constellation.

The six operational geostationary satellites hosting SARSAT payloads are NOAA's GOES East (GOES-13) and GOES West (GOES-15) with two satellites in stand by (GOES-12, GOES-14), India's INSAT-A satellite, the European Meteosat Second Generation satellites MSG-2 and MSG-3, and Russia's Electro-L No. 1.

When the GOES-R series of satellites—being built by Lockheed Martin—begin to enter service in 2015, all will host the SARSAT payload.

In addition, it is likely that the USAF GPS III satellites, currently under development at Lockheed Martin, will host the payload as that system evolves.

LMSSC, a major operating unit of Lockheed Martin Corporation, designs and develops, tests, manufactures and operates a full spectrum of advanced-technology systems for national security and military, civil government and commercial customers. Chief products include human space flight systems; a full range of remote sensing, navigation, meteorological and communications satellites and instruments; space observatories and interplanetary spacecraft; laser radar; ballistic missiles; missile defense systems; and nanotechnology research and development. #

“Must Have” Report Now Available From Space Foundation

The global space economy grew to \$304.31 billion in commercial revenue and government budgets in 2012, reflecting growth of 6.7 percent from the 2011 total of \$285.33 billion.

Commercial activity—space products and services and commercial infrastructure—drove much of this increase. From 2007 through 2012, the total has grown by 37 percent.

Commercial space products and services revenue increased 6.5 percent since 2011, and commercial infrastructure and support industries increased by 11 percent.

Government spending increased by 1.3 percent in 2012, although changes varied significantly from country to country, with India, Russia and Brazil increasing budgets by more than 20 percent, while other nations, including several in Europe, experienced declines of 25 percent or more.

These new global space economic numbers come from the Space Foundation’s publication, *The Space Report 2013: The Authoritative Guide to Global Space Activity*, which was just released. Data was compiled from original research and a wide variety of public and private sources, and analyzed by Space Foundation researchers.

The Space Report Key Findings—The 160-page book contains worldwide space facts and figures and is illustrated with photographs, charts and graphs. Within are myriad examples of the benefits of space exploration and utilization, the challenges facing the space sector, the opportunities for future growth and the major factors that shape the industry. In addition, *The Space Report*

includes an overview of each sector, easy-to-understand definitions and up-to-date information on space infrastructure, facilities, launches and programs. Following are just some of the many interesting facts and analyses found in *The Space Report 2013: The Authoritative Guide to Global Space Activity*:

Launches

» 78 launch attempts took place in 2012, a drop of 7.1 percent from the 84 launches in 2011 (but higher than the 2010 total of 74)

» Russia led with 24 launches, China had 19 launches and the United States totaled 13 launches. For the second year running, the Chinese launch rate was greater than that of the United States

» The United States led in terms of launch vehicle diversity, however, with ten types of orbital rockets launched in 2012.

Workforce

» According to U.S. Bureau of Labor Statistics (BLS) data, the size of the U.S. space workforce declined for the fifth year in a row, dropping 3.8 percent, from 252,315 in 2010 to 242,724 in 2011 (the most recent full year for which data is available) - a decrease of about 9,500 workers. However, the changes varied by sector, with some portions of the space industry growing while others contracted

» The United States’ National Aeronautics and Space Administration (NASA)’s civil servant workforce decreased from 18,709 in fiscal year (FY) 2012 to 18,167 in FY 2013, a drop of 2.9 percent. However, there is evidence that the

employment situation in areas with significant Space Shuttle-related layoffs, including Florida, is beginning to improve

» Both Europe and Japan saw increases in space workforces; the European industry workforce showed very modest growth in 2011; in Japan, the overall workforce grew by 7.5 percent, while employment at the Japan Aerospace Exploration Agency (JAXA), Japan’s government space agency, dropped

Space Products and Services

This year, *The Space Report* features an overview of how space agencies around the world move technology from space programs to commercial use. This includes a section about technology transfer mechanisms and patterns of innovation and technological development, including quantitative metrics. *The Space Report* also includes information about emerging technologies.

The Space Foundation Index As of December 2012, the Space Foundation Index was 40.95 percent above its value at inception in June 2005. The Space Foundation Index and Space Foundation Services Index both outperformed the S&P 500 and the NASDAQ during 2012, while the Space Foundation Infrastructure Index did not perform as well as the NASDAQ, but slightly better than the S&P 500. These indexes, which are updated daily on the Space Foundation website, are easy-to-understand mechanisms for gauging the financial performance of space industry companies listed on U.S. stock exchanges.

The Space Report is published annually by the Space Foundation, which works with a leading aerospace consulting firm, Futron Corporation. The stock market analysis is provided by ISDR Consulting, LLC, a management consulting firm specializing in the space, satellite and technology sectors.

Bringing Apple iOS Into The Mix

Satcom Direct has released a new mobile application called GetORT+ that will allow users of the Satcom Direct Unity product kit to interface with their SATCOM equipment using Apple devices.

The GetORT+ mobile app supports and operates on the latest Apple iOS and allows customers to use their iPhone, iPod Touch, iPad or iPad Mini to interface with their SATCOM equipment.

Along with a Unity product kit, the GetORT+ app allows operators and aircraft maintenance personnel with Honeywell Satcom Terminal (MCS 3000, 6000, 4000, 7000, 7200) and AIS-2000 SAT TV to perform Owner Requirements Table (ORT) loading and channel list updates to the

AIS-2000 Multi-Region Module.

This release of the GetORT+ iPhone/iPad app supports upload of ORT files to the Honeywell MCS-3000, 6000, 4000, 7000, and 7200; supports upload of channel list and RIC file updates to AIS-2000 Multi-Region Modules; and supports upload of both preloaded ORT files and e-mailed files.

Unity is Satcom Direct's latest mobile SATCOM support product that allows avionics technicians to connect to multiple satcom systems for troubleshooting, diagnostic and configuration management.

The Unity product kit is comprised of a selection of terminal adapters and a suite of mobile applications which access data from the aircraft's satcom systems. The GetORT+ mobile app is available from the App Store for \$9.99 USD and can be found by searching for "Satcom Direct".

A Unity Kit (Unity II, Unity III, Unity Honeywell or Unity Dealer) is required to use this app. #

Feeding The Screen

KenCast now has a deal with DCDC (Digital Cinema Distribution Coalition), the joint venture satellite distribution operation between Warner Bros, NBC Universal, Lionsgate, The Walt Disney Company, Paramount Pictures and DCIP (Digital Cinema Implementation Partners).

KenCast will provide large cinema movie file delivery and live-event streaming into theaters with their EdgeSpan CinemaPro appliance and the EdgeSpan Enterprise server.

The installation covers 1500 CinemaPro appliances to theaters nationwide, and includes all AMC, Regal, Cinemark movie theatres as well as other theatre chains.

The EdgeSpan CinemaPro meets the needs of every cinema content distributor, and comes in 2, 3, and 4-rack unit configurations. Accepting multiple satellite feeds, or fiber delivered

content, it can handle content at entertainment speeds (exceeding 400Mbps).

The CinemaPro may be configured to provide internal storage of up to 16 TBytes, interfacing with the theater management system via Ethernet LAN. External storage can provide additional capacity.

KenCast's EdgeSpan CinemaPro is currently used by top-grossing movie houses in North America and South America, choosing to upgrade to state-of-the-art content distribution capability for optimal delivery of Hollywood movies to theatres.

The CinemaPro enables delivery of very large movie files and live events, and includes simultaneous recording for "time-shifting" with its DVR features, allowing delivery to multiple screens, as well as recording of the event for later play out. #

Becoming PALs With Connectivity

Philippine Airlines (PAL) has become OnAir's 50th connectivity customer.

PAL is the first airline from the Philippines to offer its passengers GSM and Wi-Fi Internet, giving them the choice to call, text, tweet, email and surf the Internet as they fly across Philippine Airlines' extensive network in Asia Pacific, Australasia and U.S.

PAL is expanding quickly, growing its route network as well as building up and renewing its fleet. A major pillar of its state-of-the-art passenger experience is inflight connectivity. After a thorough market evaluation,

PAL selected OnAir's joint GSM and Wi-Fi service, the first combined service flying since 2010.

Ramon Ang, President of Philippine Airlines. "The two most important criteria to us and for our passengers are to have a service that is global and of high quality wherever we fly, and a flexibility to suit the needs of all passengers."

Mobile OnAir and Internet OnAir will be retrofitted on Philippine Airlines' Airbus A330-343 and Boeing B777-300ERs, starting next month, and the global GSM and Wi-Fi service is expected to be launched from mid-year.

"Passengers use of the inflight GSM and Wi-Fi networks mirrors behaviour on the ground, which is why having both is so important," said Ian Dawkins, OnAir CEO. "When both GSM and Wi-Fi are available, over 80 percent of passengers use GSM. Simply turn on your phone or tablet and use it for calls, text messages, emails, updating Facebook and Twitter, as well as the Internet. No need to enter your credit card details because the costs are included in your mobile phone bill, as with international roaming."

OnAir uses Inmarsat's SwiftBroadband network, the only one designed specifically to provide worldwide satellite coverage. #

Ultra Reliable with Strong Redundant Features

Headend: KenCast Dual Node Enterprise Server



Theatre Side: KenCast EdgeSpan CinemaPro Client Appliance (4RU)




GSM or Wi-Fi, we've got you covered. Find out more >



What does OnAir provide?
Inflight GSM and Wi-Fi across the globe. Find out more >



How does it work?
Communications go between the aircraft and the ground via satellite. Find out more >

Your one-stop shop
Everything you need for connectivity, on any aircraft, anywhere in the world. Find out more >



Who flies with OnAir?
Commercial airlines and business jet users throughout the world. Find out more >

Much Ado About Manufacturing + Launch Services

NSR's 3rd edition Satellite Manufacturing & Launch Services (SMLS3) report is the definitive guide for opportunities within the sector over the next 10-15 years.

Through extensive primary research with all satellite manufacturers and launch providers, SMLS3 is the result of a rigorous bottom-up analysis segmented by 9 satellite manufacturing verticals and all geographic regions.

Beyond units ordered and launched, this report provides a transparent forecast of their mass and power categories as well as the market sizes.

This accurate & actionable information is regularly used as a core component of strategic business plans across the globe.

In parallel, this study features a meticulous and thorough analysis of the satellite manufacturing and launch services industries' strategic environments.

It delivers a comprehensive and detailed assessment of the current situation and trends, drivers and restraints in the industry and in each vertical market.

Finally, NSR contributes to strategic decision-making in this ever-changing environment by assessing key success factors required to thrive in the satellite manufacturing and launch services industries.

The report also features a platform assessment and a Launch Services Providers competitiveness index, an objective presentation and ranking of each provider, to enhance the current & future satellite operators' business case analysis.

This report answers many fundamental questions facing the Satellite Manufacturing & Launch Markets.

Included with every NSR Report Purchase is a complimentary one-half day of consulting time with the NSR analyst who authored the report to review report findings and interpret market.

Additionally, all NSR reports come with comprehensive Excel spreadsheets providing a better understanding of the raw data. #

SatBroadcasting™: Talk Of The Show + Getting Tough On Broadband

By Chris Forrester, Senior Contributing Editor

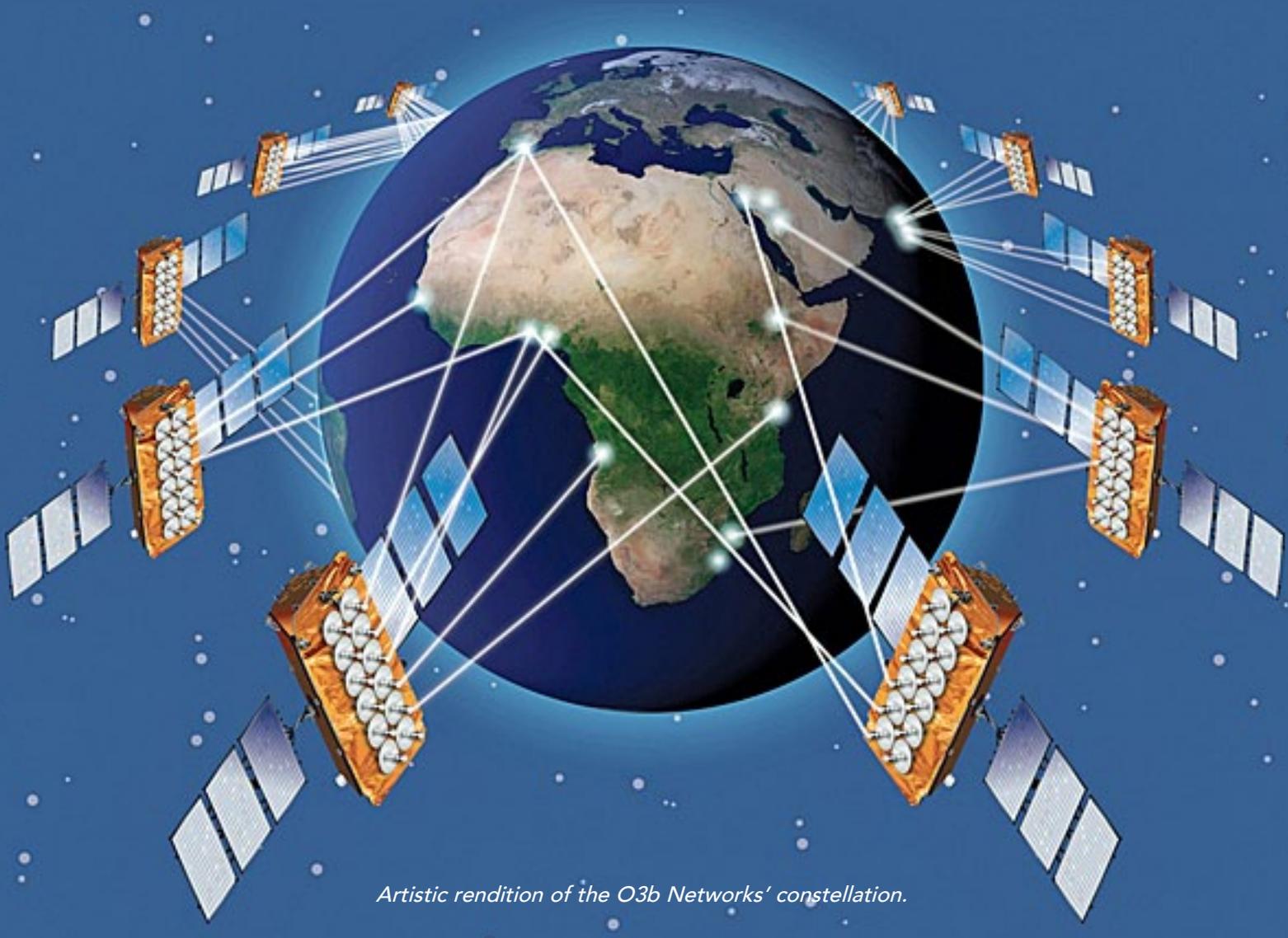
There was, without doubt, a spring in the step of SES' Romain Bausch as well as other senior staff at the recent Satellite 2013 event in Washington DC. The reason revolved around O3b, which sees the first four satellites emerge from their *Thales Alenia* manufacturing facility in Cannes over the next few days, prior to their transfer to *Arianespace's* Guiana spaceport with a *Soyuz* launch vehicle scheduled for the end of May.

Bausch mentioned, and mentioned, and mentioned O3b during his 'off the record' press briefing and repeated his O3b mantra to thousands of delegates at the annual 'Big Four' session at the show. One fact did emerge concerned another \$150 million of forward contracts, taking the project's backlog to more than \$750m. Steve Collar, O3b's CEO, was also upbeat during his panel session at Sat 2013.

Indeed, when you examine the general state of readiness of the O3b project, with ground segment installations having been built and completed on time, and hard orders coming in from telcos around the world, it is clear there are grounds for optimism. However, a joking request to 'visit Fiji and see how the local clients will be tapping into O3b's constellation' was met with only a polite smile!

Perhaps the "strong fundamentals" of SES also boosted his optimism, given the impressive launch schedule (for O3b and conventional GEOs) which will add "some 1000 Ku-equivalents" to SES' existing 1400-transponder inventory.

"Add in O3b's remaining contracted MEO craft, and we will end up having doubled our transponders in the fleet," he



Artistic rendition of the O3b Networks' constellation.

SES Spring launch schedule

End May.....Four O3b MEO's, on Soyuz
Early June SES-6 on ILS/Proton
June SES-8 on Falcon 9
Late June Astra 2E on Proton

said. O3b's team is busy pitching for contracts, and is winning more than its fair share. While services will not kick in before Q4 (when the first constellation is ready for work), Bausch was happy to predict quite large expansion plans for O3b.

Additionally, SES enthusiasm is perhaps rubbing off on the financial community. Sarah Simon from **Berenberg Bank** released a note to clients on March 18th ("HOLD" SES, "SELL Eutelsat") and, while expressing the view that both SES and Eutelsat would continue to "deliver organic growth that is well above the sector average," she added that the next six months was likely to see significant developments for both of Europe's satellite operators.

She also re-valued O3b in terms of SES' current stake from a cautious 481m euros to a much more interesting 700m euros. She also pointed out that with annual contracted revenues on O3b already well over the 100m/year euros range (she suggests 175m euros a year), it is more than exceeding Eutelsat's own 100m euros a year that **KA-SAT** targeted for 2014.

"Regarding Eutelsat," she said, "the most important will be the outcome of the arbitration with SES concerning the 28.5 degree orbital position. If Eutelsat is successful, our estimates will likely be maintained. However, if the judgement goes against Eutelsat, we estimate a PBT downgrade for fiscal 2014 of around 5 percent. The second key issue is

**"For SES, without doubt, the most important event will be the launch of the O3B satellites."
— Sarah Simon, Berenberg Bank.**

what impact, if any, sequestration will have on Eutelsat's U.S. government business. The third is progress with KA-SAT, which, having had a slow start, now appears to be gaining traction with various new services emerging."

"For SES, without doubt, the most important event will be the launch of the O3B satellites. The first four satellites launch on May 28, 2013. The backlog continues to grow, and we expect acceleration in demand once proof of concept has been delivered. A second issue for SES will be decisions regarding whether or not to order more satellites (for Latin America and/or Asia). A third will be decisions that the company makes regarding the use of cash at the end of 2013. We estimate that the company will end the year with net debt/EBITDA of 2.7x, well below the 3.3x limit. Even allowing for the purchase of control of O3B, SES looks likely to "need" to return cash to shareholders in 2014, we think."

"For SES, we look for a successful launch of the three wholly-owned satellites due to launch in June, as well as for the eight O3B satellites which are due to go into orbit in Q2 and Q3. Regarding the latter, this could trigger an increase in the market's appreciation for this asset which, being



During the "Big 4" presentation, Intelsat's Dave McGlade (r) jokes, "My EPIC is bigger than your O3b."

below the line at present, does not appear to have been fully factored into SES's fair value by the market."

Overall, Simon gives a fresh valuation for SES, boosting its price target from 22.50 to 28.60 euros per share.

Eutelsat Gets Tough On European Broadband

Speaking of **Eutelsat**, the company is starting to make demonstrable progress with its giant KA-SAT broadband satellite. Eutelsat says it now has 72,000 'active' **Tooway** terminals as of December 31st—that's up from 52,450 in June of last year.

Eutelsat significantly modified and simplified its pricing structure for Tooway last month. The increased subscriber levels on broadband means that Eutelsat's Value-Added Services division grew 37.6 percent to 31.2m euros. Eutelsat says it is now launching Tooway services in Turkey and Russia.

Challenged on the pricing strategy for Tooway, Eutelsat's Deputy CEO **Michael Azibert** says it is possible to reduce prices because of the increased throughput of the satellite and the price reflected the competitive environment. Sales growth should follow, he added, speaking at the Eutelsat half-year results announcement on February 8th. Azibert said none of the spot-

Eutelsat Vs. SES

Eutelsat and SES are arguing over access to the 28.2/28.5 degrees East orbital positions. Questioned on the current status of the arbitration, Michel de Rosen said the two arbitration initiatives were running (one with Deutsche Telekom, the other with SES). "We believe our rights are solid. Therefore we do not need to create any [financial] provision. This is still what we believe, and have no further comment."



Michel De Rosen,
CEO, Eutelsat

beams are full and there's plenty of capacity available. "We are also hopeful to sell complete beams to [sub-contractors]. We are also creating with our partners a telemarketing campaign [for KA-SAT/Tooway]."

In other Eutelsat half-year numbers (to December 31st), which were released late on February 7th, overall revenues grew 5.2 percent at 633.6m euros, while EBITDA grew 4.9 percent to 501.9m euros, helping deliver its operating margin of 79.2 percent. Net income was up 14 percent.

Overall group revenues were helped by the strong performance of Hispasat (meaning a 20 percent increase in Hispasat's revenues to Eutelsat). Mr. De Rosen also said Eutelsat's increase in Hispasat's shareholding was not yet finalised, having to go through various Spanish approval processes. "We have yet to pay over the cheque," he joked, "but we have no idea as to the future intention of Spain's government shareholding. Our investment in Hispasat is a long-term one."

"Ultra-HDTV is just around the corner"

Other key metrics include a record contract backlog for Eutelsat of 5.4B euros (up 0.5 percent) and a useful increase on the 4.9B euros in place two years ago.

At December 31, 2012, the total number of TV channels broadcast by Eutelsat's satellites was 4,485, up 7.5 percent (+312) year-on-year. The channel count includes 398 HDTV

channels, up 40.6 percent, implying an overall HD penetration rate of 8.9 percent compared to 6.8 percent a year earlier. The strongest channel growth was recorded at the 7 degrees/8 degrees West video neighbourhood (+25 percent). The largest increase in HDTV channels (+97 percent) showed 36 degrees East, with coverage of Russia and sub-Saharan Africa. HDTV adoption is "very encouraging" says Azibert, with the number of HD channels doubling over the past two years. Eutelsat's 'Hot Bird' neighborhood at 13 degrees East (covering Europe), 7 degrees/8 degrees West, 16 degrees East and 7 degrees East (covering Turkey) all reported growth in HD channels at rates higher than 30 percent.

Eutelsat says the professional business on KA-SAT is also developing; in October, for example, 12,600 professional terminals were deployed via distributor **Datagroup** in the Ukraine during national parliamentary elections. Eutelsat's **Air Access** division will become active in the next few months, starting with the **Air Lingus** aircraft fleet out of Dublin.

However, Eutelsat's Data Services segment fell back by 1.5 percent to 93.7m euros. "This reflects the full year impact of factors identified in 2011-2012, notably competitive pressure in the African market which remains, however, one of the strongest in terms of potential growth for fixed satellite service operators, as well as the end of a contract with a late-paying customer whose capacity has since been resold," says the company.

CEO *Michel de Rosen* explained the "strategic partnership" with Russia's RSCC covering 36 degrees East and 140 degrees East, with 36 degrees East will see added Ka-band capacity on its replacement satellite, for example, while 140 degrees will have its current capacity doubled.

He added that Eutelsat now has sales offices in Washington, Tampa, Rio, Johannesburg, Dubai, Madeira, Singapore and Beijing. These were additional to locations in Paris, London, and other European offices. However, he stressed that MENA, Russia and Africa and the video market generally still represented plenty of upside revenues for the operator "and Ultra-HDTV is just around the corner".

He quoted industry forecasts that suggested significant growth in Africa from VSAT demand which would lead to considerable increase in transponders although Africa represented a highly-competitive environment not only from industry rivals but also from services such as fibre.

Mr. De Rosen confirmed guidance for the period to 2015, and anticipating 5 to 6 percent growth for this year, and 6 to 7 percent CAGR growth for the following two years to June 2015, with EBITDA margins of around 77 percent in the period to June 2015.

Eutelsat's numbers

Six months ended December 31	2011	2012	Change
Revenues	602.4	633.6	+5.2%
Operating expenses	(123.9)	(131.8)	+6.4%
EBITDA	478.5	501.9	+4.9%
Depreciation and amortisation	(153.0)	(163.3)	+6.8%
Operating income	325.5	338.6	+4.0%
Financial result	(66.9)	(54.4)	-18.7%
Income tax expense	(99.3)	(104.0)	+4.7%
Income from associates	5.2	6.2	+19.9%
Group share of net income	156.8	178.5	+13.9%

Data: Eutelsat

No plans for Sea Launch.

Michel de Rosen said the options for using Sea Launch were duplicated with other options with Arianespace and that currently Eutelsat had no plans to use Sea Launch.

Simultaneously with the results announcement came news that Eutelsat had signed a fresh multi-year, multi-launch agreement with Arianespace covering up to four launches in the 2016-2017 time-frame. This fresh contract is additional to the one in place and signed last year covering one launch and one extra option.

Eutelsat on HellasSat

"We are fiscally conservative. As we demonstrated when we bought GE-23/E-172A there was a price we were happy to go to, but no further. Our main priority is organic growth. We do not need and are not looking at any major transformational transactions, although we will look at single deals that are highly targeted. But we have nothing in the oven just at the moment, but if an opportunity comes our way we are ready to grab.

Eutelsat pricing compared

July 2012	Feb 1 2013	
Flat 2 €19.90	Tooway S	£19.99/€19.90
Flat 8 €29.90	Tooway M	£29.99/€29.90
	Tooway L	£39.99/€39.90
Flat 50 €89.90	Tooway XL	£49.99/€49.90
	Tooway	£74.99/€74.90
	Absolute	

Data: Eutelsat

Operator Eutelsat is re-introducing what it describes as the fastest satellite-based broadband available in the U.K.—and at lower-than-ever prices for a satellite-based system. The new package offers potentially unlimited overnight data download and cheaper home consumer receiver units. Eutelsat says that the new pricing should appeal to the U.K.'s 3.3m "digitally deprived" homes.

Eutelsat says it has 72,000 Tooway numbers, up from 52,450 broadband subscribers at the end of June 2012. Tooway was launched in 2007 in a simpler form, offering 3.6 Mb/s downstream and just 384 kb/s upstream. KA-SAT was designed to give much faster speeds and as a High Throughput Satellite (HTS) is capable of working much harder thanks to its spot-beam technology. KA-SAT was launched in 2010, and its service went live in May 2011. Last July 30th, Eutelsat said that the pre-KA-SAT Tooway user base was just one quarter of the 52,400 total.

The new recommended monthly retail prices for the new U.K. Tooway satellite broadband services start from less than £20 (\$31) a month including VAT for the entry level Tooway S service, rising to just under £50 (\$75) a month for the Tooway XL service, which offers a monthly data allowance of 30GB and unlimited data use overnight (11:00 p.m.-7:00 a.m.). However, to tap into a fully uncapped/unlimited (day and night) service will cost £74.99 (\$114) per month or 74.90 euros in mainland Europe.

Some of these new prices (in particular Large, Xtra-Large and Absolute) are lower than those announced last summer. Although the names were then tagged a little differently, the new prices seem to more aggressively priced. Comparing and contrasting the old vs new rates is something of a challenge given the €/£ differences, and new download limits, but here's the end result.

"Whatever their location, the benefits of high speed broadband, including applications such as film downloads, heavy file uploads and video chat that are now standard user expectations. Research shows that there are 3.3m U.K. premises that cannot receive broadband or receive a service of less than 2 Mbps," said Eutelsat. Eutelsat has suggested that its European potential market is in the region of 30 million under-served (or non-served) and about 3.3m in the U.K.

Steve Petrie, Eutelsat's U.K. commercial manager for Tooway, says that support is going to be given to its local retailers. "We have listened to them and our customers and potential users. We think we are now delivering what the market needs to take it to the next level." Petrie declined to supply existing subs numbers.

"The new packages, called Tooway S, M, L, XL and Absolute, will be available through service providers from February 1st and will offer across the board download speeds of up to 20Mbps and upload speeds of up to 6Mbps." Eutelsat says the enhanced Tooway system is the fastest satellite broadband service in Europe. The services are delivered by KA-SAT.

Executive Spotlight: Malcolm McMaster, President, Globecom Maritime

Mr. McMaster possesses many years of experience with a number of companies, where he exercised full P&L responsibility for operations in the U.K., U.S.A., and Canada. He has held senior director level positions in telecom, marine equipment, plastics manufacture as well as industrial engineering with extensive international experience and has a track record of successfully turning around under-performing companies. In example, he turned a U.K. Industrial Engineering business from loss to profit in nine months and then facilitated a successful sale, with a similar experience in turning a U.S. marine services company from loss to profit in one year with increased profits recorded every year thereafter.

Mr. McMaster played a leading role in the launch of Fortune 100 company's operations in New Jersey and he directed cross functional teams through the launch

of wireless handsets, with projected revenues in excess of \$1B. Another success was the initiation of customer trials with European wireless operators for a multimedia start-up company. He joined Telaurus as the company's President in 2007 and oversaw the sale of Telaurus to Globecom in 2009. He then created and launched Globecom Maritime in March 2011, where he drives the creation of an expanded product line that includes global VSAT products with an increased focus on VARS.



SatMagazine (SM)

Good day, Mr. McMaster. Would you please tell our readers how you came to become involved in the maritime communications industry? What positions in your career have held you in good stead for your current executive position with the Company?

Malcolm McMaster

While my previous background was not in maritime communications, it sometimes feels that getting into this business was almost inevitable. I was born in Newcastle upon Tyne, England, traditionally a major shipbuilding area, and I spent almost 20 years working in the maritime industry, both with ship-owners and shipyards. I was involved in capital goods, manufacturing, and after sales support sectors. From day one, the international aspect of shipping held tremendous appeal for me. Subsequent to my 'first' career in maritime, I became involved in telecommunications and worked with companies such as **Lucent, Philips** and **Motorola**.

When I joined **Telaurus** as President in 2007, it seemed the most natural fusion of my previous maritime and telecoms experience. In 2009, I oversaw the sale of Telaurus to **Globecomm** and the subsequent creation and launch of **Globecomm Maritime** in March 2011.

A large part of my focus has been (and still is) on maximizing the synergy between the different component organizations that, to varying degrees, provide the product and service offerings of Globecomm Maritime: Telaurus, Globecomm Europe, and Globecomm South Africa. Most recently, as an organization, we have been driving an expanded product line, including a global hybrid VSAT/L-band offering, an increased focus on crew welfare related value-added services, and *Machine to Machine (M2M)* services.

SM

How does Globecomm Maritime work with the parent Company and is there any independence in operations and service decisions for your market segment? How does Globecomm support Globecomm Maritime?

Malcolm McMaster

As a company, Globecomm is organized by market verticals, and Globecomm Maritime is effectively the brand name of the maritime market vertical.

The willingness of Globecomm corporate to allow us to operate independently, and to provide support whenever it is needed, is a tremendous benefit to us and our customers. The Globecomm approach is "you are the maritime experts, so you run the business—just let us know how we can help and what you need in the way of support".

The actual support we get takes a number of forms, but includes 24/7 state-of-the-art Network Operations Center, one of the largest Ku-band networks in the world, access to Globecomm's global high capacity managed fibre network of 13 Teleports and, of course, the financial strength that results from a company that has produced 35 consecutive profitable quarters.

SM

What are the key needs and demands from maritime customers that you have identified as focus elements for Company revenue generation?

Malcolm McMaster

These are very interesting times for maritime communications, both for our customers and for us as a provider of airtime and value-added services.

There is increasing demand for the land-based experience at sea, both for business communications and for crew welfare services, and the choice of communications platforms and solutions has never been broader. But that doesn't necessarily make the buying decision easier for customers.

Our role is to help shipowners, managers and operators to select packages of hardware, software, and airtime that truly reflect their needs, rather than simply recommending they fit the biggest 'pipe' available. We think this sort of partnership approach is the key to continuing revenue growth in the future.

Another area where we are seeing demand grow strongly is for real-time data systems that are used to remotely manage hardware devices and processes onboard. This kind of M2M communications has long been common in the energy market but ship and cargo owners are now embracing it to improve visibility on their supply chain.

Executive Spotlight: Malcolm McMaster, Globecomm Maritime (Cont.)

SM

How does Globecomm Maritime satisfy those needs? Why should customers decide on your solutions rather than other companies' offerings?

Malcolm McMaster

Globecomm Maritime is able to meet these needs because we provide solutions that are focused on flexibility and adaptability. We pride ourselves on being 'technology agnostic', which means that we are able to focus on what is the best solution for the customer, and this, of course, varies from customer to customer.

For the majority of ships 'broadband' is not going to be what we experience in our homes and businesses. So we spend a lot of time helping users get the most out of limited bandwidth at sea. As the demand increases so does the idea that ships can simply adopt mainstream applications and use them over satellite. The truth is this is rarely efficient in terms of bandwidth or cost.

Our heritage is in developing value-added solutions that are optimised for maritime, such as real-time email, remote IT access, crew Wi-Fi and message pre-billing, and we will continue to help owners get the best out of their connections.

For higher value shipping sectors—tankers and LNG for example—there is scope for higher bandwidth services, such as VSAT. On top of our maritime experience, which comes from providing service to 3,500 ships globally, our expertise with land-based applications positions us very well to accommodate the higher end services which can take advantage of the increasing bandwidth available to these users.

Another significant benefit we bring to ship-owners and managers is in hybrid solutions. As well as providing hybrid Ku/L-Band solutions, we also provide combined VSAT/GSM solutions used to provide end-to-end, 24/7 automated monitoring and real-time information control for vessels trading worldwide.

SM

Given the somewhat sluggish business environment currently surrounding maritime, what seems to be of most importance to the customer—the provision of maximum possible bandwidth or tailor-made, budgeted solutions?

Malcolm McMaster

The reality is that there is no simple answer to this question, just as there is not a 'one size fits all' solution to communication needs. Some customers see the advances in technologies as a great opportunity to do a lot more without driving up their costs, while others are more cost conscious and want to use the newer technologies to do what they have always done, but at a much lower cost.

Many more traditional, and perhaps conservative, owners are still not focused on the opportunities that the new generation of maritime communications presents. What has happened over the last decade is that technology providers, rather than the owners, have been driving the market forward. The tail has been wagging the dog.



Photo of a LNG carrier. Courtesy of Azbil Corporation.

The message that we need to get across to change-resistant owners/managers is that this newer technology can add real value to their businesses. The benefits extend far beyond the IT department, and the sales message has to be heard at board level and has to demonstrate the real value and benefits that can accrue from the use of advance communications. In effect, we need to demonstrate better ROI that can be achieved.

When you can demonstrate how such applications as weather routing and vessel tracking can save fuel, how crew comms can retain valuable human capital, and how online training or videoconferencing can improve competence and increase agility, the decision process should become much easier.

Equally important is the need for predictability in both performance and pricing. We are agnostic about the technology services we provide, but whichever it is, owners need the solution to work as reliably as possible. For most owners that means global, seamless services from providers with a reputation for maximum uptime. And shipping is no different to any other business in the sense that owners and managers like to budget and plan. That makes fixed price services such as VSAT packages or L-Band bundles increasingly popular so there are as few surprises as possible.

SM

Pricing for products and services is a ticklish issue within the maritime communications environs... how does Globecomm Maritime maneuver within the pricing field? Is there much leeway in customized pricing plans for company ranging from small up to large maritime companies?

Malcolm McMaster

In terms of our L-band services, Globecomm, like other distribution partners, is a price taker. We have to work with the business decisions of the airtime providers. While some prices have risen in the last couple of years, it's worth remembering that in comparative terms airtime has never been cheaper to end users. The trend is definitely towards pricing plans and we work to provide packages that are tailored as far

as possible towards what a client really needs. In the longer term, though, our focus will be as much about the value added services touched on earlier as in selling airtime. The barriers to entry in re-selling bandwidth are comparatively low. Having the experience to help a shipmanager gain value from their communications and save fuel through trim optimisation or engine monitoring is not, however, knowledge that can be gained overnight.

SM

Globecomm has certainly been one of the innovators in crew calling services, providing Wi-Fi and dedicated crew networks. How do you see this market's growth possibilities for your firm and for the industry in general?

Malcolm McMaster

The potential for growth in providing crew services is very strong. In fact, if you look in detail at the traffic that moves over some maritime VSAT installations, you can see that crew communications makes up a large portion of the demand.

When you think that Smartphones have only really been in the mass market for less than a decade, the generation who began using these as teenagers is just beginning to come into the workforce. In the next five years, we expect to see a huge increase in demand from crew wanting access not just to email but to the web and social media applications too.

Shipowners are coming under increasing pressure to provide that access, with some reporting that they struggle to retain good quality crew unless they provide these services. We have been hearing about crew retention issues for several years, but it is only now with the advance of broadband,

coupled with lower airtime pricing, that owners and managers are beginning to embrace the idea. This creates a strong opportunity for Globecomm to build on its innovative approach to crew communications. An additional important driver is that the senior officers are very busy people – they don't want to have to manage the crew access. We realised that it would be comparatively simple to enable a ship for Wi-Fi and separate ship's business from crew business. This separation is very helpful, and leaves the crew to manage the connections themselves.

SM

Are nexgen HTS services a true game changer? Will there continue to be a place for L-band in the future?

Malcolm McMaster

High Throughput Satellite (HTS) services will be a game changer for some, but not for everyone. At the higher value end of the market, we can expect to see more oil and gas, tanker and offshore and military users consider HTS as a way to improve their operations.

However, the market for L-band is not going away, and for mainstream merchant shipping I would expect that it will continue to provide the backbone of connectivity - even after services such as Global Xpress and EPIC NG become operational. We may see the ARPU and total revenue decrease for L-band as the higher end customers move to VSAT and HTS, but in five years there will still be tens of thousands of ships using L-band.

Globecomm will continue to support those users and help them gain the best possible value out of L-band airtime,



Executive Spotlight: Malcolm McMaster, Globecomm Maritime (Cont.)

even while they are considering which next generation solution could be right for them.

SM

Please offer your views on the future of value-added and new services—will there be new technologies, such as the ever-expanding cloud, making an impact on SATCOM over the next few years?

Malcolm McMaster

Value added services are already an extremely important component of our offering as bandwidth and hardware have tended to become more commoditized. Just as with a consumer offering, the key differentiator as a service provider is what you enable your customers to do with the available technology, and how well you can support those capabilities.

For Globecomm that means embracing the potential of the cloud and optimising it for the specific requirements of the maritime industry. We are already seeing the cloud making inroads into maritime, and the opportunities for virtualisation and replication of databases, and for M2M applications mean that this will not only continue, but will accelerate. With the support of Globecomm, and the Globecomm Cloud, we are in a very strong position to help our customers to adapt to and take advantage of these changes.

SM

Are there any new products or services we might see from Globecomm Maritime during 2013?

Malcolm McMaster

Globecomm Maritime is continuously refreshing and improving its product portfolio. Examples include a new and improved anti-virus solution, and our **se@REMOTE** software for remote management of a ship's IT network. However we do have some more significant and exciting developments which we will be announcing very shortly.

Our next launch will be a big one for crew communications, and will give seafarers a very cost-effective chat solution with video capabilities. The most well known product in this space is great when you're ashore, but it was not designed for use over satellite. Our solution will give ships the same functionality, but it has been purpose-designed for maritime and so keeps bandwidth usage and costs under control. We're very excited about the potential and the early feedback from customers has been very encouraging.

SM

Please tell us about the most satisfying product(s) or project(s) you have been involved with during your career that truly bring a smile to your face.

Malcolm McMaster

That's a very tough question as there have been many events during my career that have brought me tremendous feelings of satisfaction.

However, I think I would have to say that helping bring about the sale of Telaurus to Globecomm, thereby helping to bring Globecomm into the maritime business, ranks right up there. In the same vein, I am extremely proud of the

achievements of our team over the past few years.

In a time of great difficulty for shipping and tremendous change in satellite communications, we have been able to double both our revenues and the size of the fleet served since Globecomm made its initial foray into maritime in 2009.

#



Sadtler On Careers: And A Good Divorce To You...

By Bert Sadtler, Contributing Editor and President of Boxwood Search



No, you did not mistakenly pick up a legal journal with an article written for attorneys about the dissolution of married couples. However, we will discuss some similarities between marriage and employment within the context of leadership and best practices recruiting.

Nothing is static. Things are in constant motion. Employees change and companies change ... sometimes destroying the employee-employer relationship.

- *When it is determined that critical talent is holding the company back, a change must be made.*
- *When changing critical talent out, does it always have to be an uncomfortable event that results in a broken relationship?*
- *This event is inevitable. What are you doing about it?*

Professionals have goals, ambitions and a personal life to juggle. The challenges and rewards, which attracted the professional to originally join your company, may no longer apply as the employee's career has developed. Companies have goals, objectives and the responsibility to deliver value to their stakeholders.

When the employer hired the professional, enough of the employee's goals and the employer's goals intersected to make for the foundation of a good employer/employee relationship.

As time has gone on, the employee has developed more experience and has redefined career objectives. The company's growth objective may be through existing market penetration, the penetration of new markets, acquisitions or something else.

Are the goals of employee and employer still intersecting?

Has the employer reached a point where the company must keep growing in order to remain relevant and remain in business? What direction will deliver needed growth? Once the employer has determined a direction for growth, what changes are needed?

What got the company to this point may not be what the company needs to get to the next level. From the perspective of critical talent, what got the company to this point may have included the efforts of some extremely dedicated employees who have earned the employer's loyalty. While the loyalty is well deserved, it can cause the employer to evaluate the employee's future abilities and contributions through "clouded lenses." The evaluation should be based upon the critical employee's potential and not based on the critical employee's list of past accomplishments. Can this person get you where you need to go?

Intellectually, employers find the answer to be easy. They know when a critical employee has maximized their ability to contribute. Sometimes, it is a matter of additional training or an adjustment in responsibilities. In other cases, no amount of training or different responsibilities will resolve the issue. Clearly, the employee no longer fits the company. With that revelation comes the difficulty of an emotional conclusion: "How can we possibly move them out after all of the loyalty they have given us".

It is a challenging dilemma.

- *What is the likely result of a critical employee remaining under a "mis-fitting" scenario?*
- *Unhappy critical employee*
- *Critical talent who is not challenged and unable to pursue career development*
- *An employer who is less competitive and less productive*
- *An employer with a critical employee viewed by peers as under-performing*



- *Possibility that the departing employee could some day return to the employer in a more advanced role and delivering renewed value*

On a personal note, I have observed “good employment divorces” only a few times and wish it were more common. It is impressive when both parties openly speak well of the other with genuine respect. Both parties have moved forward and find they are in a better place through growth and related changes in the marketplace.

As was mentioned at the top of this discussion, “nothing is static”. With the embracing of change comes the anticipation that talent will change, as well. Accepting that a transition is a part of growth, there comes a time when the employer must acquire talent that better fits the next step and the employee is better suited to take on a new role for a new employer. With communication and professionalism, the event can be a win-win. It makes you ask, “Why doesn’t this happen more often?”

You can get there from here. “Good divorces” can be a very productive solution to an employment relationship that is no longer delivering the value.

Many employers find their growth to be stunted at this point. It can become a most difficult barrier for companies to overcome. Employers who have successfully faced this have decisively made a change. Whether the change takes the form of a brutal termination or some type of amicable separation, they all fall under the general classification of *employment divorce*.

Webster’s Dictionary defines divorce as “to end a marriage” and “to make separate”. This definition does not include or suggest that a failure has occurred. It does not point blame. It does not involve alimony. There is no mention of children or mothers-in-law. Nothing needs to be split-up.

If we agree that businesses and people must both continually develop, then we must also agree that both wont necessarily develop in the same direction. Bad employment divorces leave deep emotional scars with no one as the winner.

What is the likely result of a “good employment” divorce?

- *New opportunity for the talent to take on new challenges and career development*
- *Lasting appreciation by the talent toward the previous employer for professional treatment and care during the employment divorce*
- *Opportunity for the employer to solely focus on acquiring new critical talent without needing to address any “untidy departing employee issues”*
- *Likelihood that the departing talent could become an ally working within the industry*

About *Boxwood Search*

There is a battle for senior level talent. A great hire can make a long term positive impact and a failed hire can prove to be very expensive. How does a company recruit and hire the right talent? It is more than just networking within the community of friends and business associates. It requires focusing on results through a process oriented approach. We are committed to reaching a successful outcome. Our recruitment method has repeatedly proven to deliver very qualified senior talent.

We exclusively represent employers in the marketplace as a dedicated resource and discrete trusted advisor. Through original research and industry contacts, we will target qualified candidates and motivate them to consider the opportunity.

We will screen candidates against key criteria, analyze technical fit along with cultural fit, interview, contact references and present our recommendations. Upon making the offer, we are the employer’s advocate and an active participant in communicating with the candidate until offer acceptance has been secured. Results are guaranteed.

#

Consumerization Of IT @ Sea—A Challenge Or An Opportunity?

By Reinhold Lüppen and Patrick Decool, Astrium Services Business Communications

When it comes to smartphones and tablets, we only have to sit down in a café or in an airport departure lounge to realize how indispensable these devices have become in our everyday lives.

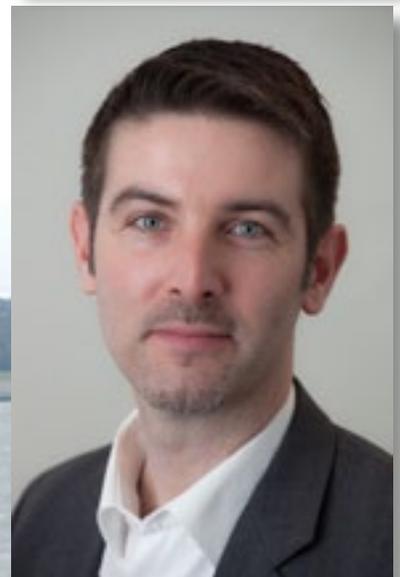
Many column inches have been devoted to the unbridled rise of these consumer tech devices, not the least through the current dual between Apple and Samsung for global domination in this highly lucrative market.

Five years ago, consumers' access and use of the latest hardware and software were driven by the PCs and laptops provided by their companies. Users made the most of their hardware primarily in a corporate context, using the same or similar hardware at home.

However the relentless quest by consumers for always-on connectivity and mobility, and the ability of innovators to cater for these needs in well-marketed and user-friendly devices, has led to a significant shift in terms of user behavior and expectations.

The phenomenon known as "consumerization of IT" has since emerged as a direct result, essentially denoting the increasing use by consumers of personal technology and communications devices in a professional environment.

These changes are happening quickly and are set to continue. According to market analysts **Frost & Sullivan**¹, the iPhone became mainstream within 80 percent of Fortune 500 companies in only three years following the product's launch—Android devices reached three million business users in less than two years.



Authors: top, Reinhold Lüppen; bottom, Patrick Decool





Analysts *IDC*² also conducted research into people who use a mobile device for professional reasons and found that, in Western Europe, the population of mobile workers is due to reach 129.5 million in 2013. The most significant increase in mobile workers is due to occur in Asia-Pacific, where 838.7 million people are expected to use a mobile device by 2015.

Unsurprisingly, this has had a significant effect on the way in which companies manage their IT systems. Such introduces a number of additional challenges for IT departments in terms of security, confidentiality, cost, infrastructure access, and so on.

The shipping industry is certainly no exception. Crew members are, after all, consumers themselves. They have the same desire to stay in contact with friends and family and keep abreast of the latest news as non-maritime users. Being on board a vessel for several weeks or months, the demand for private communications becomes even higher. Crew increasingly demand access to the tools which will enable them to do satisfy their needs. Their thirst for data is expected to become a competitive differentiator for many shipping companies, conscious that qualified crew members

will be attracted by easy access to personal communications (*Skype*, instant messaging, chat functions, *Facebook*, etc.).

In the shipping community, it is estimated that 60 to 70 percent of crew use their own personal laptops while away at sea, and 30 percent have smartphones³, with growth set to continue. Current trends show that crew are likely to keep their laptops to store personal files, films and music, as well as use a smartphone or a tablet for phone calls, social media, games and multimedia, mirroring the trends among 'land-based consumers'.

While there are similarities between maritime and land-based consumers in the nature of adoption, the major difference is *how* IT managers deal with the issues linked to the use of consumer devices on board ship.

Clearly, when it comes to communications at sea, a satellite link is never far from the equation, and this has a fundamental impact on the way that an IT manager provides access to those devices.



Consumerization Of IT @ Sea (Cont.)

What is currently being seen, through the phenomenon of consumerization of IT, is an even stronger emphasis on the issues which have always existed when providing crew with access to private communications, notably budget, potentially disrupted business functions, and network security.

For example, an important factor for IT managers is keeping crew comms completely separate from business functions to ensure avoiding congestion of lines and potential 'corruption' of business-critical data through malware. Certain satellite comms providers have developed systems which enable IT managers to dedicate a local area network (LAN) to the crew members, and install a Wi-Fi connection to which they can establish an Internet connection from their smartphones and tablets.

Crew members' behavior with personal devices also has a major impact, in the sense that these encourage bandwidth-hungry activities such as downloading and streaming, and to a lesser extent, browsing. The burning question for IT managers is how to avoid overrunning the comms budget, bearing in mind that crew are capable of generating ten times more traffic than corporate functions if their access to data apps is unrestricted.

A major factor is the choice of satellite service. For example, flat-rate VSAT packages starting around \$2,000 per month cover many ships' corporate and crew needs. Such services from **Astrium** typically provide a connection up to 1.5Mbps, with the possibility to upgrade to 2 or 3Mbps at a higher cost, but with guaranteed throughput speeds.

Shipping companies who invest in VSAT for corporate or business purposes are now understanding the benefits of supplying crew communications with the same equipment, with priority on the ship's business. Ku systems currently available are ideal for this type of package. The launch of a Ka services in 2013 will provide even more scope, with higher data speeds and all-in-one, flat rate packaging.

Contrary to VSAT, **Mobile Satellite Services (MSS)** offer a pricing scheme based on the amount of data consumed, so it is most important that IT managers set limits and alerts

for business and crew in order to avoid receiving unexpected high data costs. Again, a number of solutions running over MSS systems enable IT managers to do this.

Another major issue for IT managers when it comes to crew is additional, time-consuming administration. Given the increasing use of personal devices at sea, the trendsetting satellite communications providers have developed software and solutions to enable crew to administrate private comms themselves, directly from their tablet computer or their smartphone. Once the separate LAN has been set up, crew are free to create their own account and configure settings linked to the amount of data they wish to consume and the subsequent cost.

What is clear from these examples is that the phenomenon that is the consumerization of IT, or the increasing use of personal devices by crew on board, need not present such a challenge for IT managers. Clearly it requires them to deal with a host of dramatically different cost, security and technical issues which previously were not part of their remit. However, recent developments have shown that the forward-thinking SATCOM providers are stepping up to the challenge and working on solutions to help them tackle these head-on.

The thirst for data and related apps and platforms will continue to grow among shipping company staff as it will on land among the rest of the consumer population. With this as a backdrop, the best ships systems will be run by IT managers who simplify the management of satellite communications and, even better, place the responsibility for crew comms with the crew themselves.

For further information...

<http://astriumservices.com/business-communications-maritime/>

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- ² Source: *Worldwide Mobile Worker Population 2009-2013 Forecast*, IDC, 2010
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About the authors

Reinhold Lüppen is Director Solutions, Astrium Services Business Communications. He defines the strategy and is responsible for the development of the company's value-added IT & communications tools and applications. Reinhold has more than 10 years experience in the mobile satellite sector, beginning his career with DeTeSat, the former satellite arm of German national operator Deutsche Telecom.

Patrick Decool is Director New Products, Astrium Services Business Communications, responsible for the strategy and development of new innovations. Patrick has thirteen years' experience in the GSM and satcom communications industry, specifically managing innovation projects.

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Spotlight On Maritime With Terry Neumann, Director, Market Strategy, iDirect

Terry Neumann is part of the market development team within iDirect. He focuses his time and resources on promoting and expanding the use of VSAT and iDirect technology in specific vertical markets. He has been supporting the maritime market for the past 5 years and evangelizes the benefits of VSAT for maritime connectivity. He works closely with a number of the top maritime satellite service providers in the industry that rely on iDirect as their primary platform for delivering differentiated services.

SatMagazine (SM)

Good day, Mr. Neuman. Could you say that the Maritime SATCOM market segment is a booming market?

Terry Neuman

VSAT has clearly become the standard for onboard communications. The latest **COMSYS** market report confirms that there were nearly 12,500 vessels equipped with VSAT by the end of 2011, driven by a five-year compound annual growth rate of 19 percent. COMSYS also projects that VSAT adoption will double by 2016, expanding to more than 26,000 vessels with market revenues exceeding \$1.2 billion.

SM

How are different segments of the market embracing VSAT?

Terry Neuman

As the market expands, different segments are embracing VSAT at various paces. We're seeing two general camps: Those who have adopted VSAT and want to run more bandwidth-intensive applications on their networks, and those who are waiting for better economics to install VSAT on their vessels.

This first group includes major shipping companies, cruise lines, oil and gas operators, mega-yachts, and military organizations. Shipping companies are moving beyond basic voice and data connectivity for crew. Increasingly, they want to leverage VSAT for route planning, engine diagnostics, weather applications—all to improve productivity and lower operational costs.



Photo courtesy of International Satellite Services, Inc.



Cruise ships are expanding in size and taking on more passengers, who now want to stay connected to social media. Oil and gas companies are turning to VSAT to send large data files such as seismic images, to operate ROVs, and to support greater use of video for multiple applications. All these scenarios are testing the data throughput limits of current VSAT networks.

Other segments of the maritime market—including mid-sized shipping companies, ferries, fishing vessels, yachts, and other specialized vessels—are holding out on VSAT until they see more favorable economics. For this segment, *High Throughput Satellites (HTS)* will likely encourage them to move forward.

SM

How will HTS make a difference?

Terry Neuman

HTS delivers higher throughput rates at a lower cost per Mb. As a result, it's projected that HTS will substantially lower the price of satellite capacity. HTS services will run on smaller terminals that are less costly and easier to install than



standard options today, which reduces capex and installation costs. This is all welcome news for end users waiting on VSAT prices to come down. Plus, it will open untapped segments of the maritime market for service providers.

HTS will also benefit the core market segments that have embraced VSAT. Faster, more affordable capacity will enable them to run more traffic across their networks. They will also be able to expand their network to more of their fleet and into new geographic locations. For these segments, VSAT will become more integral to their daily operations and deliver a strategic business advantage.

SM

Ku versus Ka?

Terry Neuman

We are seeing HTS come to the market in different ways. These include Ka- and Ku-band, global and regional satellites, as well as open and closed systems. However, there's one key question that's dominating industry conversations right now—will there be a major difference between Ka- and Ku-band HTS services in the maritime market?

There are certainly technical differences between the two frequency bands that need to be taken into consideration. However, to the end customer, all they care about is a consistent, reliable service. It's not the satellite bands that make the difference—it's the business models linked to them. Essentially, service providers need to look at HTS offerings on both bands and then decide what's the correct go-to-market strategy for them.

Do they want a closed HTS system that enables them to quickly acquire capacity without the cost of owning infrastructure and the time commitment involved to deploy a new network? Is it an open system where service providers bear the cost and management of ground infrastructure, but have the opportunity to bring added value to their customers through SLA design, network monitoring and other offerings?

Longer term, we believe service providers will find benefits across both bands and acquire capacity from multiple satellite operators in multiple regions. They'll need to manage a blended portfolio because end users will want one network, and one master service plan that covers all their vessels, applications and geographies. The more flexible the ground infrastructure platform, the easier it will be for service providers to manage customer expectations and grow their business.

SM

What should the market be focused on today?

Terry Neuman

HTS is coming, but there is also a lot to act on right now. For example, VSAT ground infrastructure providers are addressing the need for higher throughput rates by building faster remotes. **iDirect's** new **X7** remote can support 100Mbps of combined throughput. That's exponentially faster than any TDMA remote being used in the maritime market today. In addition, the X7 is HTS ready. Making an investment now is also making an investment in the future.

Spotlight On Maritime With Terry Neumann, iDirect (Cont.)

Maritime service providers also need to focus on the value of VSAT for business applications. COMSYS notes that while crew welfare continues to consume the largest proportion of any VSAT connection, purchase decisions are now primarily driven by the need to support corporate and operational applications.

Greater access to communications can deliver a significant return on investment through increased productivity. Vessels are becoming highly functional remote offices. They enable crew to maintain greater contact with headquarters to share business and operational data. In this context, VSAT enables corporate network applications such as VoIP and ERP systems. It will also support shipping industry application such as data exchange on cargo, or with port authorities to speed up pre- and post-arrival reporting for customs.

VSAT can also power vessel management applications. Whether it's the **ECDIS** (*Electronic Chart Display and Information System*) initiative for electronic navigation, or engine management, more and more systems on board a vessel are starting to transmit real-time data information for improved performance and safety. These systems can enable fuel savings, or enable system monitoring and trouble shooting from personnel on shore, which centralizes knowledge management.

SM

How can providers best plan for the future?

Terry Neuman

There's a lot of change and growth coming to the maritime VSAT market. Service providers need to find the right strategy to meet escalating bandwidth demands and prepare for HTS. At the same time, they need an integrated platform that can support global growth and an increasing range of applications from core and emerging markets.

#

iDirect's new high performance X7 remote offers faster throughput for bandwidth-intensive maritime applications

Higher data rates are not only maintaining revenue growth, they are pushing VSAT vendors to develop and introduce new product models able to support the services that end users are demanding. iDirect's new X7 modem significantly raises the performance of its Evolution system and positions TDMA over SCPC as the solution of choice for bandwidth intense applications.

The X7 is the first in a family of next-generation remotes that are optimized to deliver best-in-class Adaptive TDMA throughput performance and operate with high-throughput satellites.

Four key features of the X7:

- » *Faster throughput. Built on an entirely new multi-core hardware system, the X7 is able to reach new levels of combined outbound and inbound throughput. This remote will work on C, Ku and Ka band beams. This enables service providers to deliver the data rates needed for high-end maritime services for segments like cruise and oil and gas, supporting bandwidth-heavy business applications and multicast services like IP TV, remote training, HD broadcast and video.*
- » *Dual DVB-S2 demodulators with fully independent RF chains. With this unique feature, service providers can support voice and data services while receiving up to 12 shared, high-definition multicast channels over a transponder or satellite. The dual demodulator will also make it very easy to transition from traditional broad beam to high-throughput spot beam satellites.*
- » *VLAN-aware 8-port switch and embedded Group QoS. Service providers can physically segregate multiple end user traffic groups based on VLAN tags and customize SLAs for each unique user group. This is a great feature in markets where you may have a multi-tenant environment like in the offshore oil and gas segment.*
- » *Embedded AC/DC power supply. The X7 remote comes with multiple choices of embedded Power Supply Unit configurations to support higher wattage Block Up Converters.*

Expanding Horizons For Satellite Broadband @ Sea

By Martin Jarrold, Chairman, GVF Maritime SATCOM Forum

There is no doubt that the maritime industry is increasingly vital for a plethora of resources for industry, commerce, and leisure. Indeed, 70 percent of the Earth is covered by oceans and we rely heavily on the maritime industry to transport globalized trade goods, supply food and energy, as well as providing us with entertainment. With increasing importance, however, comes the need to communicate effectively while at sea.

A Challenging Environment

Maritime is one of the most challenging environments for effective communications, while at the same time being one for which communication is vitally important—often, quite literally, a lifeline. Indeed, satellite is at times the only way to effectively communicate when at sea, reaching where other communication methods simply cannot provide the needed services.

The challenge is that by its very nature maritime satellite installations use comms-on-the-move (COTM) solutions and often use auto-deploy technology. For manufacturers to produce these products so as not to cause satellite

interference, especially as they will be moving during operation, is by no means a simple task. With more and more products on the marketplace and manufacturers facing stiff competition, that challenge is becoming all the more apparent.

In 2010, the Global VSAT Forum (GVF) established the GVF Maritime Satcom Forum (MSF) to facilitate more productive satellite-sector engagement with shipping companies. GVF has focused on building strong relationships with the international association of shipping managers, InterManager, as well as running a number of practical initiatives to address the challenges of satellite communications at sea.



Understanding Who Wants What, Where, + For Whom

The maritime marketplace is like no other, meaning that satellite operators need to fully understand the wide-ranging requirements that vary by type of vessel, type of owner / operating company, data volume, and crew requirements. Only by fully understanding these requirements and how they differ for each customer can the satellite operator offer a truly targeted offering to address these to each individual user.

This very subject was recently the focus of a meeting at Satellite 2013 in Washington. Delegates learned how to better recognize and address those individual needs.

At The Helm + At The Desk.

The technology of communications and the exchange of information it facilitates have undergone highly-accelerated development. With such advanced communications, the maritime communications service environment has now progressed fully into the broadband age. Ships' captains in the 21st Century have to wear two hats: Vessel commanders and office managers who run a complex remote business. For captains' access to mission critical satellite communications solutions, supporting complex maritime applications and business applications is essential for a successful voyage and for a successful enterprise.



At Satellite 2013 in another GVF-led session, the question was put as to whether the current fixed and mobile satellite environment is providing all the answers and, if not, "What is missing?" The session addressed a number of key issues, including the following:

GMDSS in the Fixed & Mobile Satellite Environment

No maritime SATCOMs discussion is complete without addressing GMDSS in the Fixed & Mobile Satellite Environment—more so with the advent of maritime piracy on commercially strategic sea lanes. The fixed satellite service (VSAT) environment can serve to meet GMDSS requirements, supplementing the position of the established mobile satellite service in performing this function.

Maritime Comms For A New Arctic Horizon

Climate Change is here, bringing forth new opportunities for the maritime sector. With

the Northwest and Northeast passages open to navigation for a longer period of time every year, and commercial activity in the Arctic region increasing dramatically, new challenges for the delivery of satellite-based broadband communications solutions to the higher northern latitudes present themselves for analysis.

Test Procedures

Satellite interference is a huge problem facing our industry today. As mentioned above, the challenge specifically in the maritime satellite communications sector is that the systems are mainly auto-deploy or comms-on-the-move, which are potentially prone to errors if not built correctly. Therefore testing auto-deploy and comms-on-the-move products is one way of reducing errors and potential interference from these systems. GVF has recently finalized a test procedure for auto deploy systems, and is currently working with the industry to finalize a test procedure for comms-on-the-move equipment. Those products, which pass muster, are then considered compliant with a range of industry requirements, which make them less prone to error and less likely to cause satellite interference.

The key factor with those test procedures in place, will be ensuring that VSAT service providers and other satellite operators encourage their customers to use earth station equipment that has been tested and shown to be compliant with industry performance specifications.

Meeting The Challenges

There is no doubt that the maritime satellite communications sector has a number of unique challenges, however these are being overcome through more effective collaboration between the satellite and maritime industries. There are a number of practical initiatives to help resolve those challenges further and ensure the maritime industry has the efficient and reliable provision of satellite communication upon which it relies.

About the author

Martin Jarrold has worked for GVF for more than 10 years, having been appointed GVF Chief of International Programme Development in June 2001. His particular responsibilities include outreach to the member organisations of the GVF and for the further development of the profile of the Forum within the satellite communications industry, and across the global telecommunications policy and regulatory community. This extends to the development and delivery of programmes focused on extending the understanding of, and promoting the use of, satellite-based communications in various key end-user vertical markets. Mr. Jarrold is Chairman of the GVF Oil & Gas Communications Conference Series, and of the GVF Broadband Maritime Conference Series, which combined have produced 17 conferences in Europe, the Middle East, South East Asia, and South America (as of 1st July 2011). The Oil & Gas Communications Series is expanding into the Angola market in 2012. Mr. Jarrold is also Co-Chairman of the GVF Maritime Satcom Forum.

Executive Spotlight: Kim Gram, Vice President, Cobham SATCOM

Kim Gram has held the position of Vice President of the Aeronautical Business Unit at Cobham SATCOM (previously Thrane & Thrane A/S) since 2009. Kim has commercial responsibility for the global aeronautical business of Cobham SATCOM. He has been an integral part of the company for more than 12 years, having joined Thrane & Thrane A/S in 2001 as Sales Director, Global Maritime Sales. He held this post for two years, during which time he oversaw the introduction of the first data product of the company.

From 2003 until 2009, Gram was responsible for the development of a regional presence in Asia for the total business within Mobile Satellite Services (land and marine) as Director of Sales Asia Pacific and Global OEM Accounts.



His position involved the recruitment of management as well as commercial and technical staff and the establishment of office and training facilities in Shanghai and Singapore. In parallel with his regional responsibilities in Asia, he was appointed Vice President Maritime BU in 2008.

SatMagazine (SM)

Good day, Kim. First, let's introduce you to our readers—how did you become involved in the satellite communications industry?

Kim Gram

After graduating with a master's degree in business sciences, I have worked with technology companies for most of my career. I have found it very challenging and exciting to apply the methodologies of strategy development, sales and marketing in a broad sense to the international development of technology firms. When **Thrane & Thrane** [now part of **Cobham SATCOM**] approached me and asked if I was interested in heading up their global maritime business within satellite communication, it was a very easy decision to say yes.

SM

What training did you receive in order to participate in this dynamic environment? What would you advise students to study today in order to acquire a satisfying career in SATCOM?

Kim Gram

It is a good question. It depends very much on which area of the business they want to engage in—whether it is in a commercial role, a product development role or in the manufacturing of the equipment. It is quite clear that the industry can always use excellent engineers within the fields of SW, Radio Frequency Electronics and mechanical design. However, looking at my own 11-year history in the business, arriving as a business graduate into the industry has been great fun. It is really all about passion for the technology. Thinking about it, I have seen colleagues with very different backgrounds, and not necessarily with master's degrees in anything, have very impactful roles in the industry.

SM

Would you tell us about your move from maritime into the aeronautical side of the business?

Kim Gram

First of all, I like changing roles in two to five year intervals. Variety is the spice of life. In Thrane & Thrane, and now Cobham SATCOM following the acquisition, I have really had three different jobs. My first role was the global commercial responsibility for the maritime business. Then I had the responsibility for our Asia organisation across our land mobile and maritime businesses, involving establishing our local organisation in the region while also running the day-to-day business. My trade is international business development and, in that way, I apply the same methods independently of which technology or market I am in. When I was asked if I would take over the Aero business, I was very excited to

take on the challenge because there is a huge opportunity to make a difference in aircraft SATCOM.

SM

What differences do you see between your original firm, Thrane and Thrane A/S, and its acquisition by Cobham? Do you retain the independence necessary for a successful business unit?

Kim Gram

In terms of the aero business, Cobham SATCOM in Cape Town and Thrane & Thrane A/S have always been competitors and business partners at the same time. The opportunity to join these two businesses creates the engineering platform to really make a leap in the kind of satellite systems available to the airline industry.

SM

What does the Global Aeronautical Satellite Communications business encompass for Cobham?

Kim Gram

As well as the push for broadband in the cabin, the flight deck is increasingly looking at its use of streaming data for tasks such as air traffic control and aircraft operation. We are actively engaged in the **ARINC** committees working on future SATCOM systems that will provide the connectivity to make aircraft a business domain where people can be connected with the rest of the organization. While doing this, we need to be sensitive to the security issues and need for versatility of the future SATCOM communication systems.

SM

What is Cobham's vision for aircraft SATCOM moving forward and what is the parent company's role in these technologies as far as support and implementation are concerned?

Kim Gram

To me, it is an opportunity to change the airline industry from an environment where an aircraft to a large extent remains the only workplace without an IP data link for professional communications. Aircraft are the only remaining workplace where the people working there are not connected with the



Executive Spotlight: Kim Gram, Cobham SATCOM (Cont.)

rest of the organisation, be it maintenance, operation or flight planning with an IP Pipe.

Being the largest provider of mobile satellite systems, I believe that Cobham has an obligation to contribute to changing this situation. Our aim is to provide technologies and systems that, in a cost effective way, will ensure that the operation and maintenance department of the airlines will have the option of being connected to the aircraft continuously for all aspects of the work. That is what we have achieved in the maritime industry during the last decade.

We are talking about developing a new generation of technologies that will handle the specific requirements in the airline industry. I have felt a strong encouragement from Cobham to pursue this vision.

SM

What are your thoughts regarding aircraft SATCOM for the commercial, and the MAG, side of the industry? How fierce will the competition become and what advantages will your business offer to potential customers?

Kim Gram

The demand for connectivity will continue to grow and we can really tap into this potentially huge market thanks to the integration of Cobham and Thrane & Thrane's broad-based portfolio antenna systems. Our **AVIATOR** portfolio offers wireless communications to a very broad range of aircraft, including turboprops, light jets, air transport aircraft, military aircraft and unmanned aircraft vehicles. There are a range of systems which are compact and lightweight, offering simple and cost-effective installation.

SM

For the growing demands of militaries and governments within the airborne SATCOM environs, how will you create the paths necessary to inform acquisition agencies regarding your products and services?

Kim Gram

Cobham has a huge presence in defence and armed forces for land, sea and air applications, with our radar products, specialist antennas and microwave subsystems playing vital roles throughout the world, so the platform is already in place for the SATCOM channel.

SM

What is your experience in approaching the commercial airline and related industries?

Kim Gram

We have lots of commercial customers using Cobham antenna systems and with almost every segment, from high end to low cost airlines, planning to add the capability of supporting Internet connectivity—there are lots of opportunities for us. We will be at the forefront of crucial issues such as differentiating passenger connectivity from the in-flight connectivity for EFBs.

SM

Where do you see airborne SATCOM and MILSATCOM extending itself over the next few years?

Kim Gram

The **SwiftBroadband** service that our AVIATOR terminals are made for has already proven popular in the business aviation market, supporting an extensive range of communications applications for passengers in the cabin by offering built-in Wi-Fi, enabling entertainment services and 'office in the sky' applications such as voice and email. Wireless connectivity can support a host of applications in the cockpit, from enabling on-line use of modern EFBs to accessing real-time weather reports, flight planning and chart information.

The AVIATOR systems and connectivity will continue to support current and future advances in cockpit technology. We are also committed to providing a new, smaller, less expensive terminal that will provide the capability for forthcoming safety services, which will be a very big focus in the coming years.

SM

Given your experiences in this industry over a broad array of business units, what project or projects truly brings a smile to your face?

Kim Gram

Well, it was always satisfying to ensure that *Lars Thrane*, the co-founder of Thrane & Thrane, had the best communication systems on his private jet, made by the company he started in 1984. However, we are now into the next phase of the story and as Cobham SATCOM, I'm sure that there will be many successful projects that will put a smile on my face. Using our skills and experience to develop new technology and provide reliable, cost-effective communication systems for the broadest range of aircraft will definitely keep me smiling.

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A Look At... Early Maritime Satellites

By Jos Heyman, Senior Contributing Editor

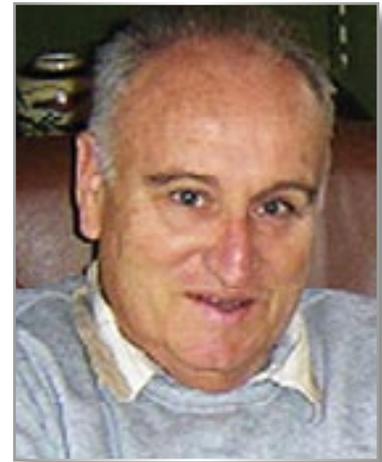
Traditionally, communications with ships on the high seas was conducted by morse code or via radio communications when ships were within range of a receiving station. The start of the space age in 1957 saw the gradual introduction of communications satellites, although initially, large receiving antennas were required.

However, despite its slow pace, smaller receiving equipment was developed and by the late 1970s, it was evident that satellite communications could be used for maritime purposes. In this article, the heritage systems that opened the way for current maritime communications systems will be reviewed.

Marisat

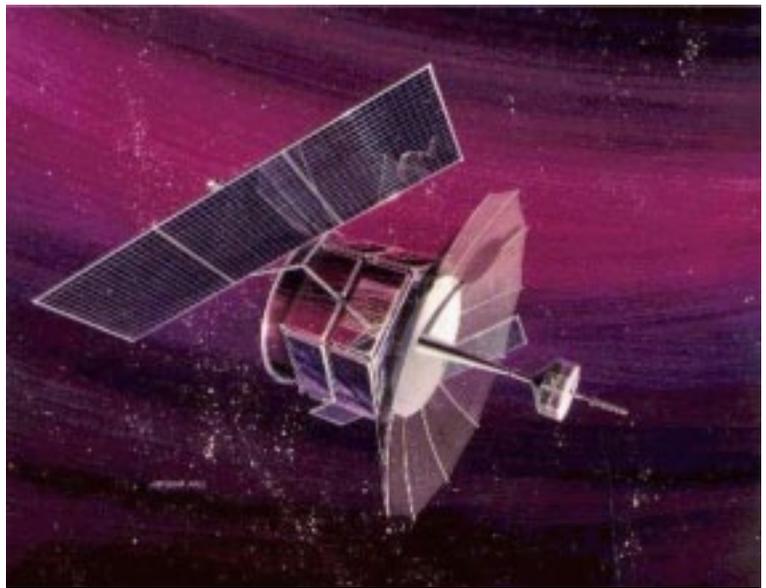
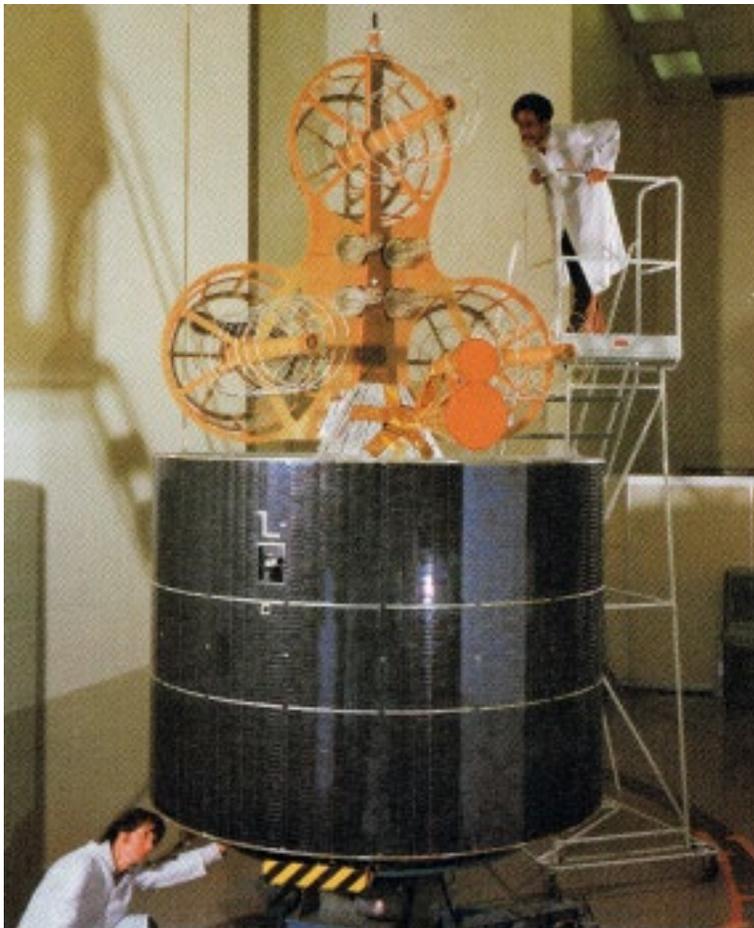
The first maritime communications system was the **Marisat** system owned by **Comsat General Corporation** and leased to the U.S. Navy and then, on February 19, 1976, the **Marisat-1** satellite was launched.

Built by **Hughes**, using the type **HS-356** platform, the 655kg. satellite carried five transponders that operated in the C-band, 1.6/1.5GHz and 300/200MHz bands, to provide telephone, telex and data communications between naval ships and shore stations. The satellite was followed by two more satellites to complete a global system.



With the introduction of the **Fltsatcom** series of satellites, **Marisat-1** and **-3** were eventually handed over to **Inmarsat**, where they were repurposed for civilian communications.

Marisat-2 had a more interesting career. In 1991, the satellite was relocated to 178 degrees West where it stayed until 1996. The satellite's orbit had a slight inclination of 3 degrees, which gradually increased to 13 degrees.



Name	Launch	Geo orbit
Marisat-1	19-Feb-1976	15°W
Marisat-2	10-Jun-1976	176°E, 178°W
Marisat-3	14-Oct-1976	73°E

Name	Launch	Geo orbit
Fltsatcom-1	9-Feb-1978	110°W
Fltsatcom-2	4-May-1979	23°W, 75°E
Fltsatcom-3	18-Jan-1980	23°W
Fltsatcom-4	31-Oct-1980	172°E
Fltsatcom-5	6-Aug-1981	73°W
Fltsatcom-6	26-Mar-1987	Failed to orbit
Fltsatcom-7	5-Dec-1986	105°W
Fltsatcom-8	25-Sep-1989	23°W

This made it ideal for communication services for the **Amundsen-Scott South Pole Station** was out of reach from geostationary satellites. The inclined orbit provided about 6 hours of communications each day. To provide a direct link to the U.S., the location of the satellite was changed from over the Indian Ocean to the Atlantic Ocean at 33.9 degrees West.

On October 29, 2008, after 32 years of service, the longest for any commercial satellite to date, it was retired from active service and boosted into an orbit about 200km higher than its operational slot.

Marecs

In 1973, the **European Space Agency (ESA)** initiated the development of a maritime satellite system named **MAROTS**, based on the experimental **OTS** communications satellite. Following design changes, the program was later renamed **Marecs** and two satellites were launched into a geostationary orbit on December 20, 1981, as **Marecs-1**, and **Marecs-B2** on November 10, 1984. The latter was a replacement for the original **Marecs-B** satellite, which failed to orbit on September 10, 1982.

The satellites, which had been built by **British Aerospace** and had a mass of 497kg., were equipped with two transponders which operated in the C- and 1.6/1.5GHz bands. They provided communication facilities between ship and shore based stations as well as between ships themselves.



Name	Launch	Geo orbit
Marecs-1	20-Dec-1981	26°W, 22°E
Marecs-B	10-Sep-1982	Failed to orbit
Marecs-B2	10-Nov-1984	177°E, 26°W

The Marecs-B satellite incorporated some design improvements to make the circuitry less susceptible to electrostatic interference.

A Look At... Early Maritime Satellites (Cont.)

The Marecs-1 satellite was handed over to Inmarsat on May 1, 1982, after initial problems that had been experienced due to the electrostatic discharges on the satellite's external surface during geomagnetic storms were overcome. In 1991, Marecs-1 was moved to 22 degrees East. Marecs-B2 was later shifted to 26 degrees West and then to 55 degrees West.

Inmarsat

In 1979, the **United Nation's International Maritime Organization (IMO)** established the *International Maritime Satellite Organization (Inmarsat)*, for the purpose of establishing a satellite based communications network for maritime use. It was a not-for-profit and self-funding international organization and 79 countries eventually joined.

From the start, it used the designation Inmarsat and it began full operations in 1982. Over time, the organization also began to provide services to aircraft and global portable users and, to reflect that, its name was changed into **International Mobile Satellite Organization**.

In 1999, the organisation was converted into a private company registered in the United Kingdom. The conversion created the commercial Inmarsat plc company as well as a regulatory body that retained the name of International Mobile Satellite Organization.

Inmarsat plc continues to provide communications services to the maritime sector but has now diversified into providing telephony and data services to users worldwide, via portable or mobile terminals which communicate to ground stations through a number of geostationary telecommunications satellites. It also provides communications services to a range of governments, aid agencies, media outlets and businesses with a need to communicate in remote regions or where there is no reliable terrestrial network.

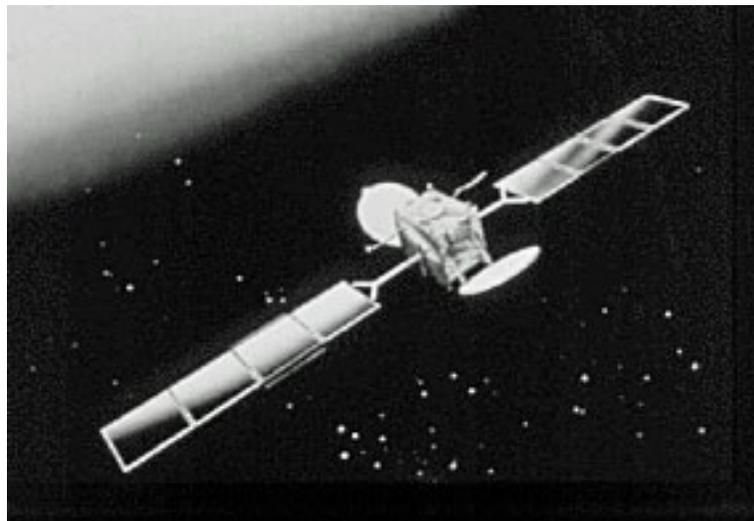
With the transfer of the Marisat and Marecs satellites to Inmarsat, there was never an Inmarsat 1 series of satellite.

150 voice channels that were serviced by four transponders.

The **Inmarsat-3** series of maritime communications satellite were built by **Astro Space** using the **AS4000** platform. The 2064kg. satellites were fitted with two transponders operating in the C-band and the L bands as well as a GPS navigational instrument.

Inmarsat currently owns three Inmarsat 4 series satellites, while three Inmarsat 5 series satellites will be launched starting in 2014.

About the author



Name	Launch	Geo orbit
Inmarsat 3-1	3-Apr-1996	64°E
Inmarsat 3-2	6-Sep-1996	15°W
Inmarsat 3-3	18-Dec-1996	22°W
Inmarsat 3-4	3-Jun-1997	54°W
Inmarsat 3-5	4-Feb-1998	25°E



Name	Launch	Geo orbit
Inmarsat 2-1	30-Oct-1990	65°E
Inmarsat 2-2	8-Mar-1991	15°W
Inmarsat 2-3	16-Dec-1991	179°E
Inmarsat 2-4	15-Apr-1992	55°W

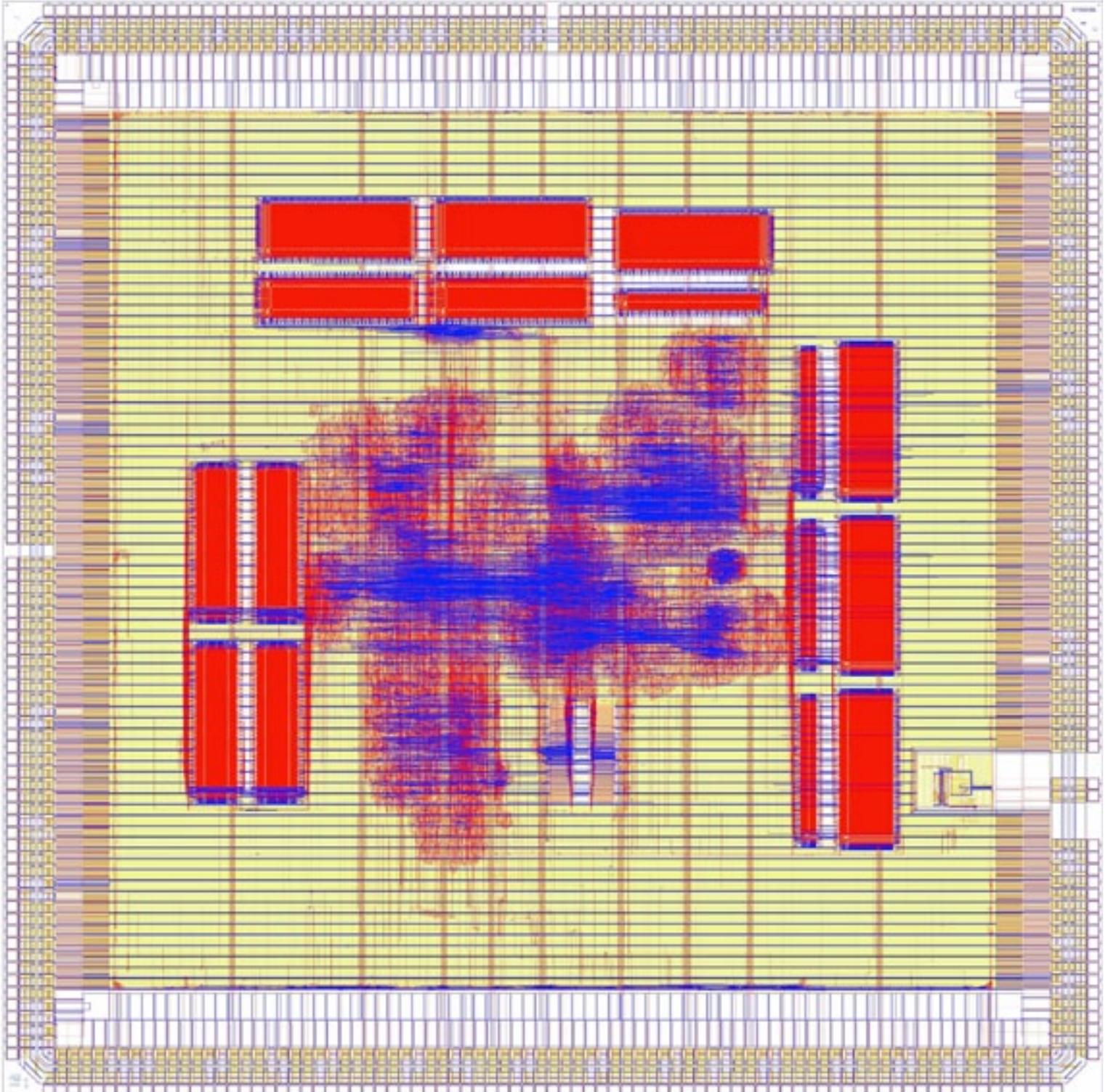
The **Inmarsat 2** series of satellites had been built by British Aerospace and were based on the **Eurostar 1000** platform. They had a mass of 690kg. and operated in the C-band for satellite/shore communications and the 1.6/1.5GHz band for satellite/ship transmissions. The capacity was for

Jos Heyman is the Managing Director of Tiros Space Information, a Western Australian consultancy specializing in the dissemination of information on the scientific exploration and commercial application of space for use by educational as well as commercial organisations. An accountant by profession, Jos is the editor of the TSI News Bulletin (<http://tiros.zarya.info/>) and is also a regular contributor to the British Interplanetary Society's Spaceflight journal as well as to SatMagazine as a Senior Contributing Editor.

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LEON: The Space Chip That Europe Built

Similar to home computers, the sophisticated capabilities of today's space missions are made possible by the power of their processor chips. ESA's coming *Alphasat* telecom satellite, the *Proba-V* microsatellite, the Earth-monitoring *Sentinel* family, and the *BepiColombo* mission to Mercury, are among the first missions to use an advanced 32-bit microprocessor—engineered and built in Europe. All of them incorporate the new LEON2-FT chip, commercially known as the AT697. Engineered to operate within spacecraft computers, this microprocessor is manufactured by Atmel in France but originally designed by ESA.

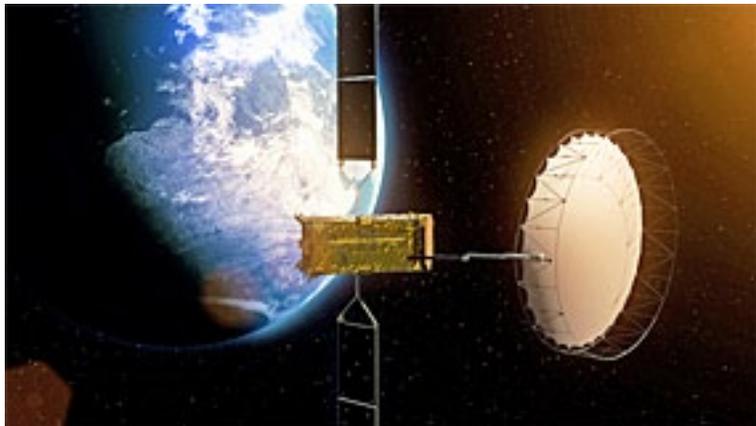


Layout of the LEON2-FT chip, alias AT697. Image courtesy of Atmel.

To give an idea of the kind of complex factors involved in its design, the 'FT' in its name stands for *fault tolerant*, meaning microprocessor can withstand the random memory bit flips due to space radiation.

This year's **Proba-V** microsatellite—surveying daily vegetation growth on a daily basis for a community of scientists previously served by the Spot satellites—will use the **AT697** processor in its main flight computer.

While **Alphasat** employs an older **ERC32** chip in its main flight computer, **LEON2-FT** will be operating an experimental star tracker aboard the satellite as well as the payload computer.



Alphasat I-XL, launching in 2013: This new class of 6-ton telecommunications satellite is the result of a public-private partnership between ESA and Inmarsat, providing high data rate services to mobile users around the globe as well as carrying experimental technology payloads. Its large size gives it 12 kilowatts of power and signal processing capacity and a longer lifetime, attractive to the telecom market.

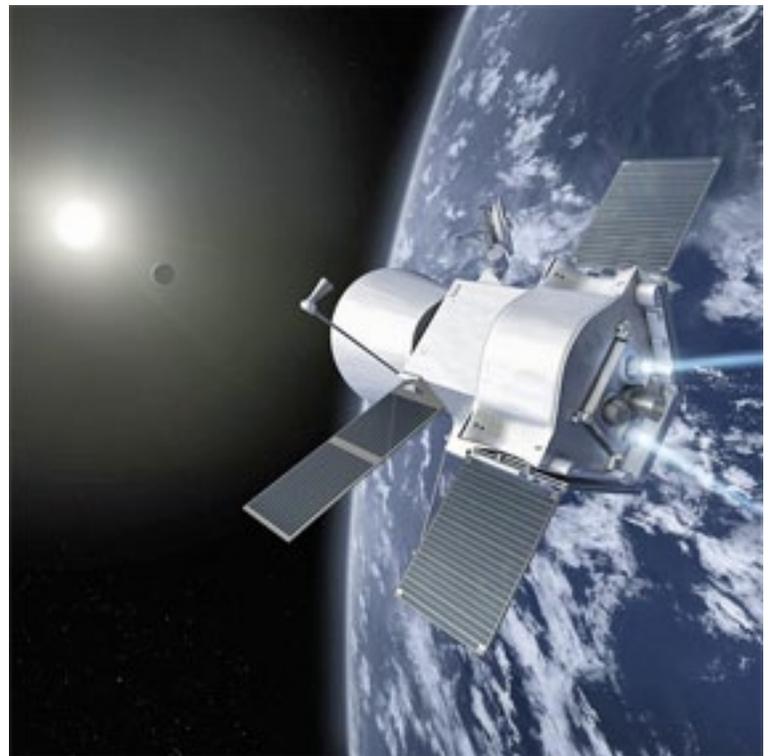
Also with ERC32-based flight computers, ESA's **Sentinels**, the first of which will also be launched in the coming year, will similarly harness LEON2-FT chips in their GPS receivers and startrackers for navigation.

ESA's 2014 **IXV Intermediate eXperimental Vehicle** for testing atmospheric reentry will control its avionics with a LEON2-FT chip. 2015's **BepiColombo** mission to Mercury and 2018's **Gaia** star-mapper are using the same design.

The underlying LEON design has also been made available to Europe's space industry as the basis for company-owned 'system-on-chip' microprocessors optimized for dedicated tasks. For instance, **Astrium** is using it to create a space-based **GPS/Galileo** satnav receiver.

Innovating For Independence

How did ESA end up designing computer chips in the first place? As one of the only worldwide bodies to deal with the entire range of space activities, the Agency is as concerned with the internal components used to put together missions as well as the design of the missions themselves.

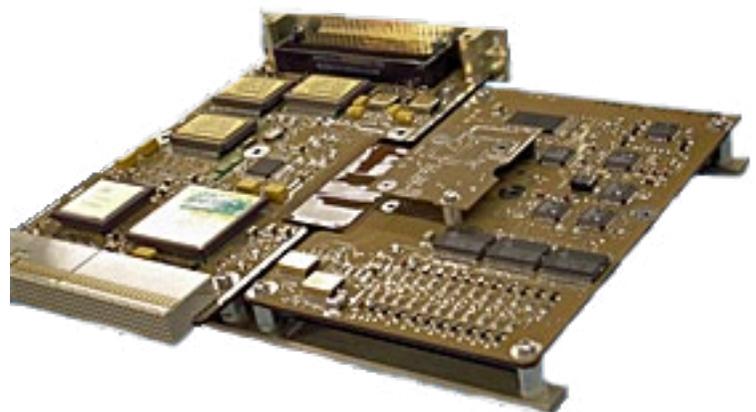


After launch in 2014, the BepiColombo composite spacecraft will start its six-year interplanetary journey to Mercury.

A mission to the inner Solar System is extremely challenging from the technical point of view: not only will the spacecraft have to survive and operate in the very hot environment around a planet so close to the Sun, but it will also require a large amount of energy to brake against the Sun's gravity and enter into orbit around Mercury.

Image courtesy of ESA-AOES Medialab

"One of the main reasons for ESA to exist is to ensure the independence of Europe's space industry," said Roland Weigand of ESA's microelectronics section.



The processor board for Qinetiq Space Belgium's Advanced Data & Power Management System (ADPMS) is designed to run small satellites or payloads and was first flown on ESA's Proba-2 mission in 2009. The ADPMS runs on an ESA-developed LEON2-FT chip, seen towards bottom left.

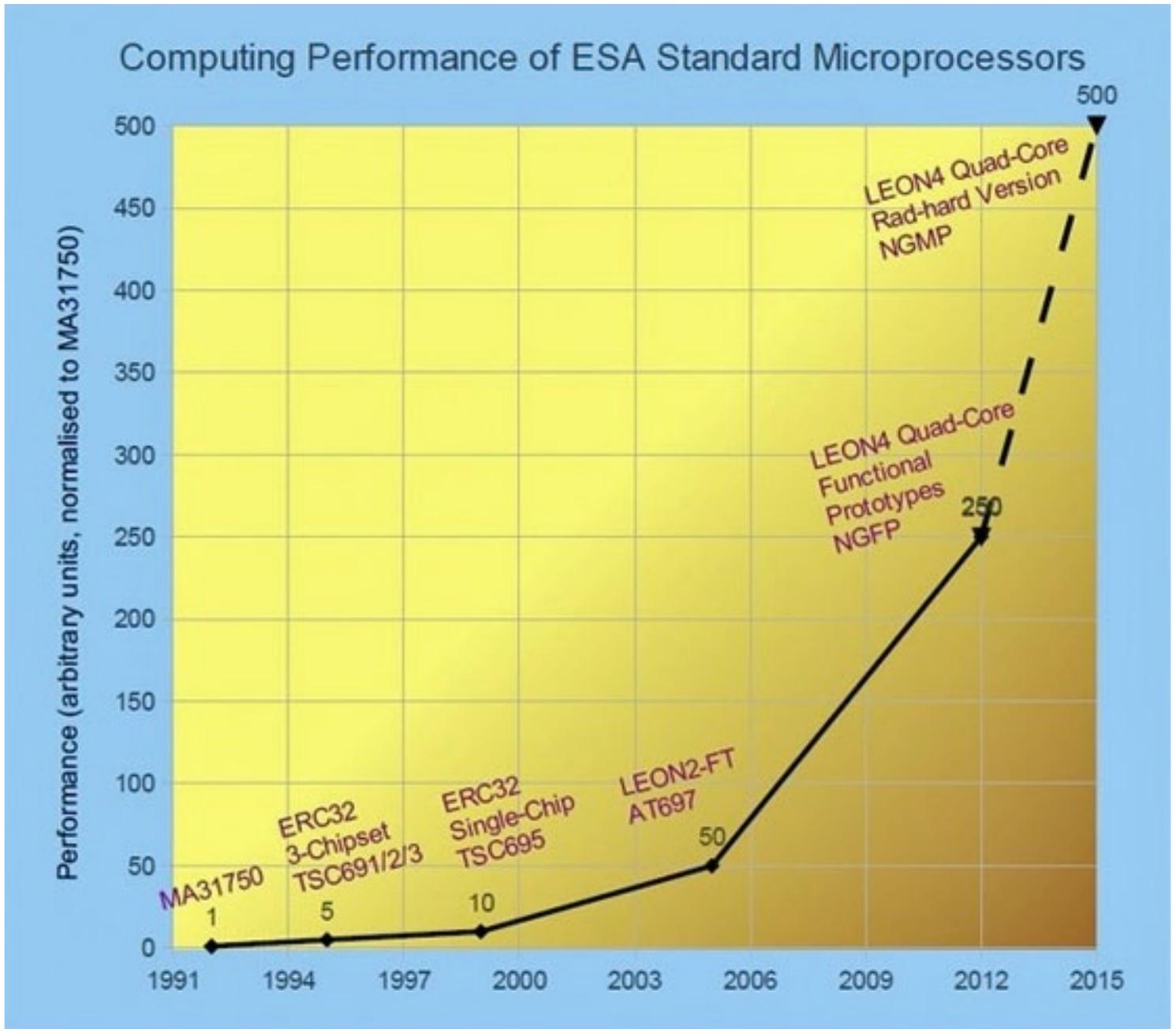
Photo courtesy of Qinetiq Space Belgium

LEON: The Space Chip That Europe Built (Cont.)

"If we are too dependent on parts from outside Europe whose supply could be restricted at any time then the competitiveness, even the long-term viability, of our space sector comes into question. That's become a real concern with foreign export controls and related regulations.

"ESA first became motivated to get involved with microprocessor development back in the 1990s as they became more central to the performance of space missions.

"Independence from non-European parts is also a driver of our European Components Initiative, in place for the last decade, which is working with European industry to bring new components to market."



Computing Performance Of ESA's Standard Microprocessors

ESA's history of microprocessor development in terms of millions of instructions per second (MIPS), from the MA31750 developed in 1992 to the ERC32 three-chipset version in 1995, followed by the single-chip ERC32 four years later, then the LEON-2 FT (commercially known as the AT697) in 2005, with the Next Generation Microprocessor (NGMP) LEON-4 due out in 2015. Chart courtesy of ESA.



An artist's rear view of Proba-2 as it looks toward the sun and a rear side as it looks towards the Sun. The two complete DSLP (Dual Segmented Langmuir Probe) antennas can be seen on the back of the solar panels, as well as the back solar array. Also visible is the top side of the satellite, with two large star trackers and a pair of cylindrical S-band antennas on opposite corners which are used for communication with ground control.

Proba stands for PProject for OnBoard Autonomy. The Proba satellites are among the smallest spacecraft ever to be flown by ESA, but they are making a big impact in the field of space technology. Proba-2 is the second of the series, building on nearly eight years of successful Proba-1 experience. Proba-2 is the result of ESA's commitment to technological innovation. Altogether, 17 new technological developments and four scientific experiments are being flown on Proba-2. Image is courtesy of ESA—P. Carril, 2009

Leading Up To LEON: ESA's First Microprocessors

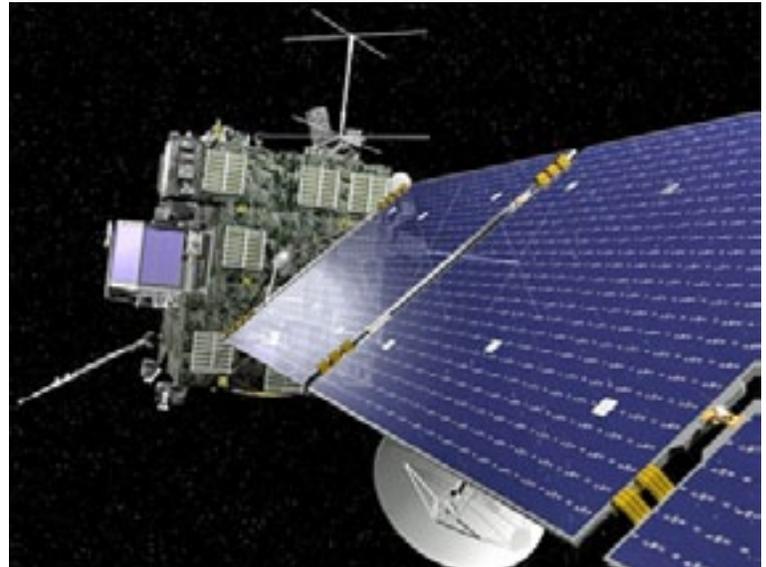
ESA engineers began by taking existing designs and adapting them for use in space. This process began with the Agency's **MA31750** 16-bit microprocessor, designed in the early 1990s.

Manufactured in the United Kingdom (U.K.), this microprocessor is sold internationally and is still in widespread use in the satellite telecommunications sector as well as serving ESA missions, including comet-chaser **Rosetta**.

For its next attempt, the Agency adopted the **SPARC** (Scalable Processor Architecture) open industry standard, resulting in the **ERC32** design.

The initial three-chip set (each chip containing part of the microprocessor) was developed in the mid-1990s. Commercialized by **Atmel** as the **TSC691/692/693**, it was employed by several International Space Station computers, by the **Automated Transfer Vehicle (ATV)** supply truck, and by ESA's highly automated **Proba-1** Earth observation microsatellite.

The microprocessor's second generation, developed in the late 1990s, merged these three chips into a single chip—the **ERC32 'single chip'**, subsequently commercialized by Atmel as the **TSC695**. This product has been at the heart of European space systems for more than a decade.



Rosetta, Running On ESA's MA31750 Chip

An artist's view of ESA's Rosetta cometary probe. The spacecraft is covered with dark thermal insulation in order to retain its warmth while venturing into the coldness of the outer Solar System, beyond Mars orbit. It relies on specially-engineered 'low intensity low temperature' (LILT) solar panels for its power.

Selected in November 1993 as a cornerstone mission of ESA's long-term science programme, the Rosetta probe was launched by an Ariane 5 on 2 March 2004, on an 11-year journey to the comet 67P/Churyumov-Gerasimenko.

Built by EADS Astrium, the Rosetta probe consists of a 3,065-kg spacecraft (1,578-kg dry mass) designed to enter orbit around the comet's nucleus in August 2014 after a series of gravity assist manoeuvres to gain enough orbital energy, with three swing-bys at Earth (March 2005, November 2007 and November 2009) and one at Mars (February 2007). En route to the comet, the probe will flyby the asteroids 2867 Steins (September 2008) and 21 Lutetia (July 2010).

The spacecraft carries 11 science instruments to probe the comet's nucleus and map its surface in fine detail. It will also land a package of instruments (the Philae Lander) to study some of the most primitive, unprocessed material in the Solar System. The mission will provide clues to the physical and chemical processes at work during the formation of planets, beginning 4.6 billion years ago.

Image is courtesy of ESA—J. Huart.

Notable adopters include the inertial units guiding the flight of **Ariane 5** launchers and the **Herschel** and **Planck** space observatories, among other ESA science missions.

"About 3,500 ERC32 single-chip flight units have been sold, and it remains on sale to this day, valued in the space industry as a mature, reliable product," Roland added.

Starting Over

Then, for ERC32's follow-on microprocessor came the concept of starting over from scratch.

"The idea in the second half of the 1990s was not just to rely on this existing SPARC open architecture but to take full control of the functionality, which meant making our own design," explained Roland.

LEON: The Space Chip That Europe Built (Cont.)



ERC32-Based ISS Flight Computer

The DMS-R flight computer for the Russian segment of the International Space Station, designed around the three-chip version of ESA's ERC32 microprocessor (single computer shown). Image courtesy of ESA.

Development of the **LEON** microprocessor was initiated by two, then ESA staff, *André Pouponnot* and *Jiri Gaisler*, in coordination with their division head, *Richard Creasey*.

Not that the small ESA team did everything themselves: By initially releasing a reduced version of the LEON design as open source code to a worldwide community of users, including many universities, they crowdsourced valuable debugging feedback ahead of manufacturing.

Boasting a five-fold performance improvement on the ERC-32, ESA's **LEON2-FT** is once more manufactured by Atmel. Features are etched onto its underlying semiconductor at 180 nanometre (nm) scale, compared to the single-chip ERC32's 500nm scale. The smaller the scale, of course, the more computing power can be crammed onto an individual chip.

To give an idea of scale, an individual atom measures a few nanometres across, while a typical human hair is about 60,000 to 100,000nm wide. Manufacturing at such a scale sounds impressive, but the commercial semiconductor industry is typically operating several generations ahead of the space industry.

LEON's First Flights

The **AT697 (LEON2-FT)** flew for the first time in 2008, launched to ESA's **Columbus** module on the Space Station within a prototype computer payload called the **ERNObox**.

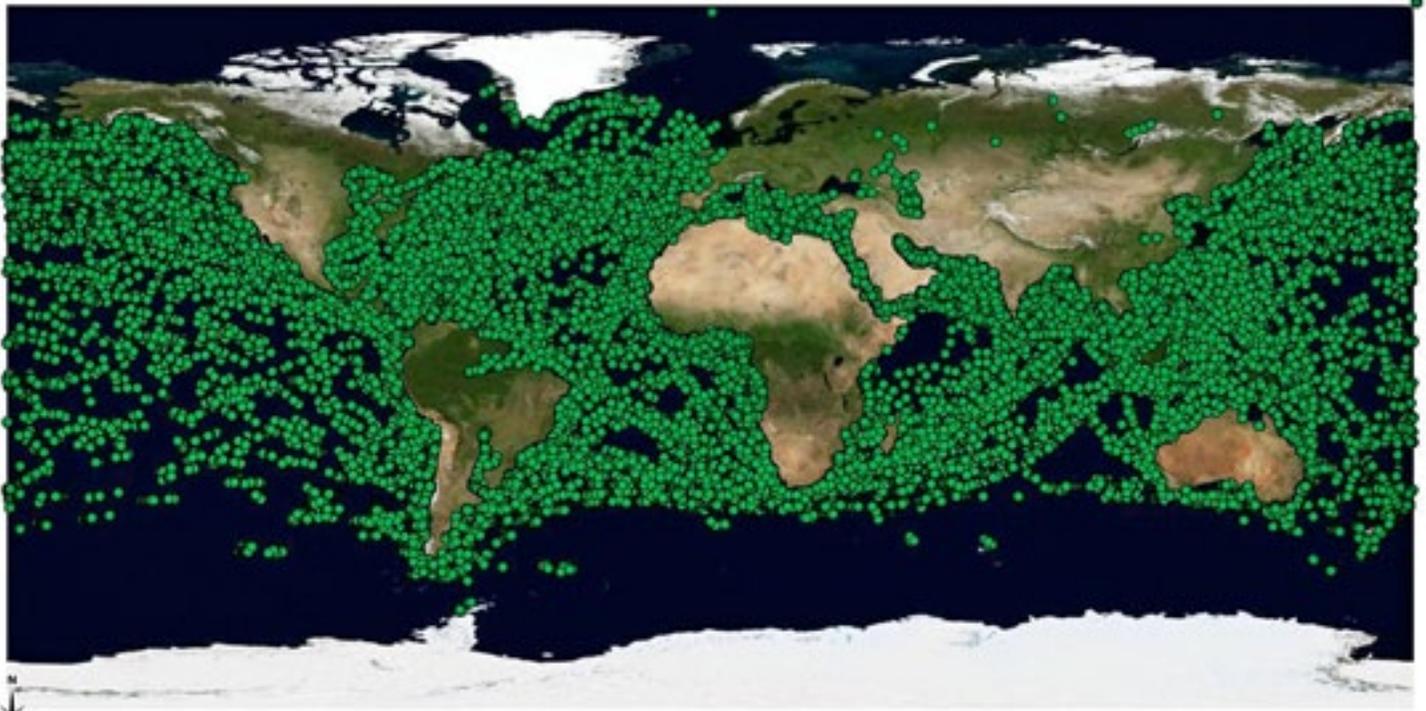


Ariane 5 runs on single version ERC32 chip

On November 10, 2012, an Ariane 5 launcher lifted off from Europe's Spaceport in French Guiana on its mission to place two telecommunications satellites, Eutelsat 21B and Star One C3, into their planned transfer orbits. Flight VA210 was Ariane 5's 52nd successful launch in a row since December 2002.

Photo courtesy of ESA/CNES/Arianespace—Photo Optique Video CSG.

0 30
Degrees



Global Ship traffic detection from ISS based on AIS signals

The COLAIS experiment with NORAIS receiver was switched on 1 June 2010. More than 90,000 Class A AIS messages were gathered between 1900 GMT on June 2nd and 0900 GMT on June 3rd. Image courtesy of FFI.

This served to gather data on the internal Station environment before being converted into an experimental



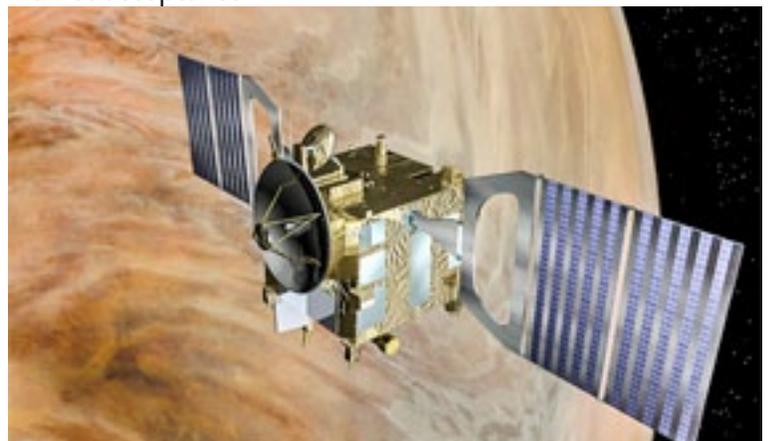
LEON2-FT-based ERNObox

The ERNObox has been designed for operation in the Columbus module of the ISS. Built by Astrium Space Transportation in Bremen, Germany, it is a prototype computer based around a new generation of ESA-developed LEON2-FT processor chips, its name coming from the German for 'modular computer in low Earth orbit'. Photo courtesy of Astrium.

system detecting Automatic Identification System (AIS) signals from orbit—the maritime equivalent of air traffic control signals—to build up a global picture of oceangoing traffic.

The following year, a second LEON2-FT chip ran the flight computer of ESA's Proba-2 microsatellite, a technology demonstration mission focused on solar and space weather monitoring.

Both chips remain fully functional to this day, achieving the all-important flight heritage essential for broader market acceptance.



Artistic rendition of the Venus Express

LEON: The Space Chip That Europe Built (Cont.)

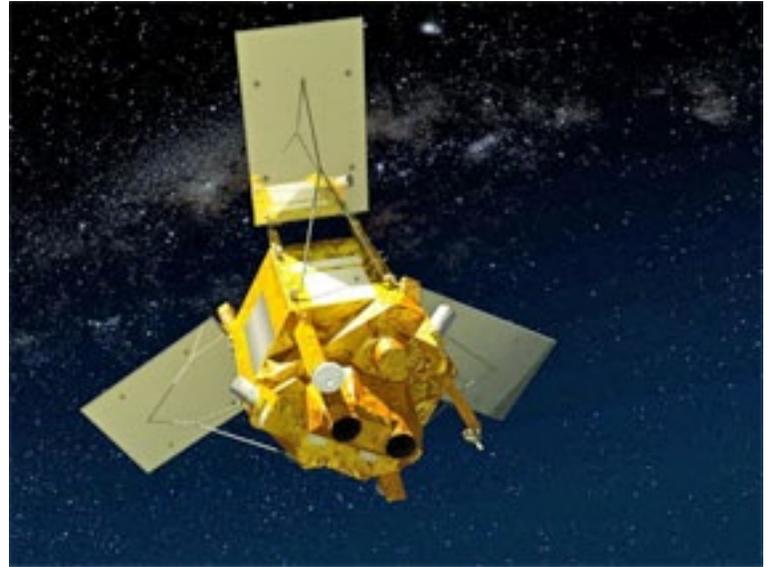
"About 400 flight units have been sold in the almost four years that the LEON has been on sale," Roland said. "It is a general-purpose microprocessor, so it can serve in a main computer to run the satellite platform, but can also be used for payload computers to oversee particular experiments."

An Intangible Asset

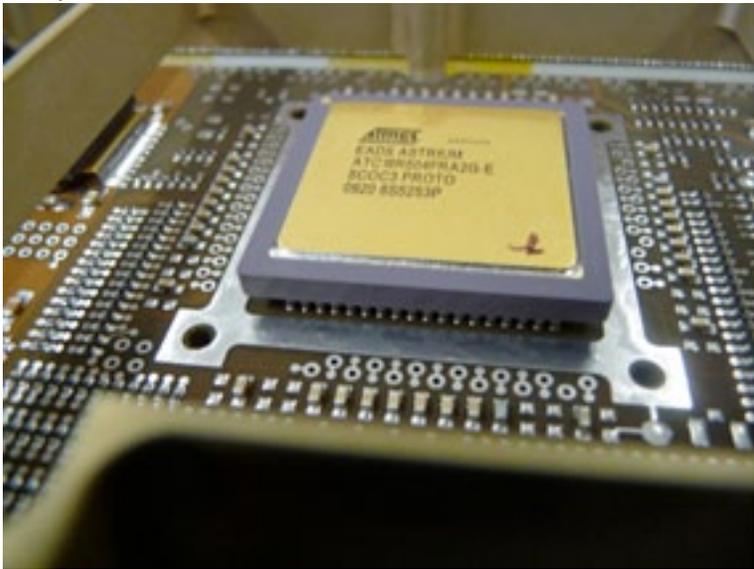
The LEON's versatility extends beyond the physical microprocessor itself. ESA also has full rights to reuse its **IP core (Intellectual Property core)**, meaning the underlying code that describes the circuit, the key input needed, after several design steps, to embed the circuit onto a real chip.

Existing separately from the manufactured circuit, this LEON source code can be applied to various different platforms, such as becoming part of a dedicated system on a chip with specialized peripheral functions, such as data compression or encoding and decoding.

"In fact, a LEON IP core actually was launched even before the AT697 into space," said Roland. "A programmable chip based on a radiation-tolerant version of this IP core has been controlling a visual monitoring camera on ESA's Venus Express mission since 2005."



France's Spot-6 Earth observation satellite launched in September 2012. Image courtesy of Astrium.



LEON3 spacecraft controller on a chip - SOC3. Photo courtesy of Astrium.

LEON's Next Steps

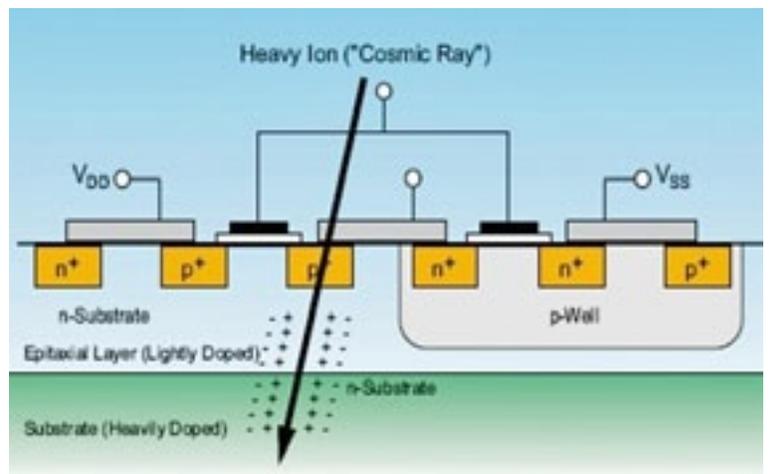
Not that the LEON story ends with the LEON2-FT. **Alphasat** and Europe's **Galileo** navigation satellites use next-generation **LEON3**-based reprogrammable chips within payload elements, embedding a new IP core evolved from the previous LEON design by Swedish company **Aeroflex Gaisler**.

Aeroflex Gaisler's LEON3 has also become the basis of the **SCOC3 spacecraft-computer-on-a-chip**. Developed by **Astrium** with ESA support, for manufacture by **Atmel**, this single component has sufficient functionality to operate an entire satellite platform or payload in space.

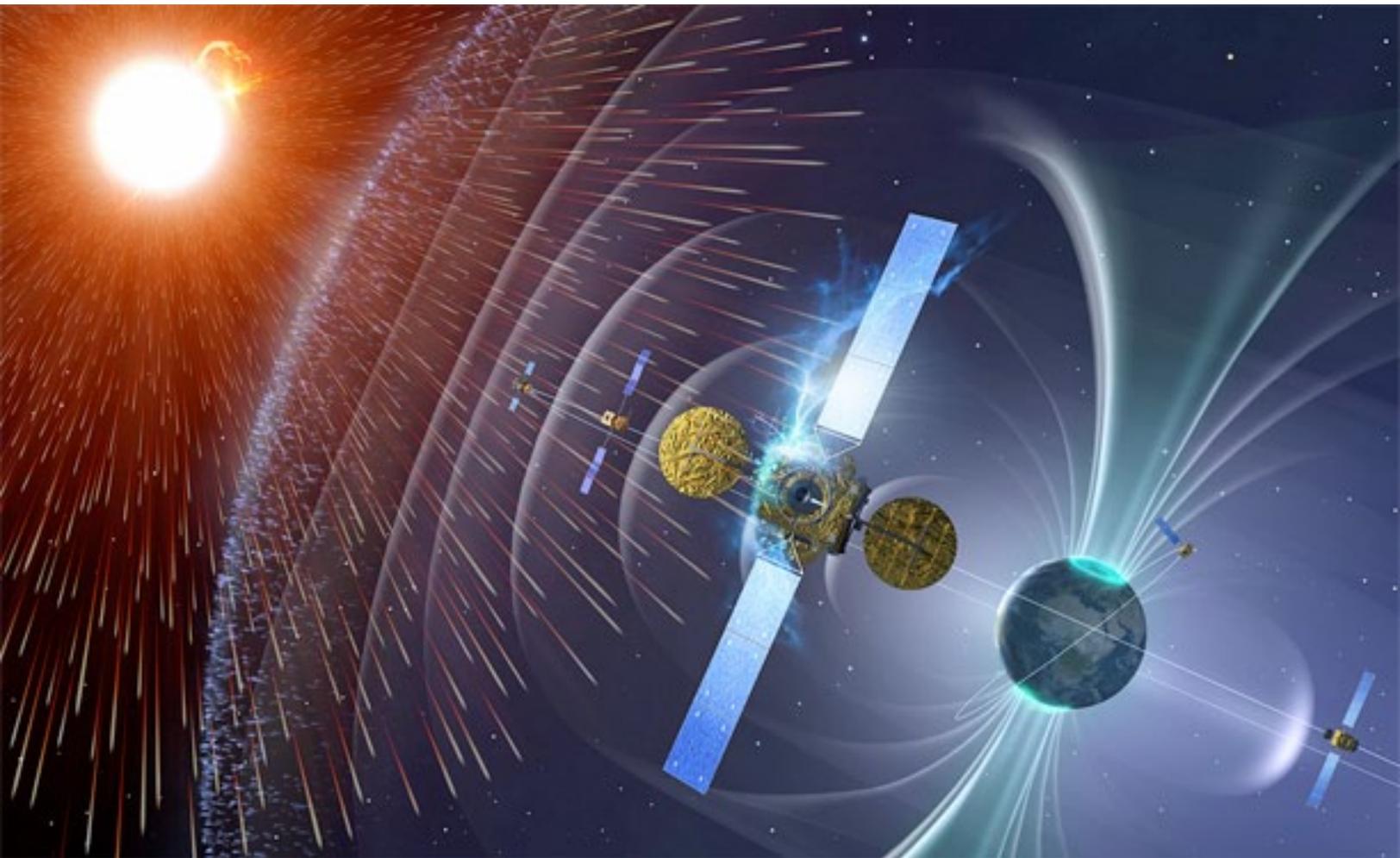
The SCOC3 is already flying in orbit as an integral part of missions that include France's **Spot-6** Earth observation satellite that was launched in September 2012.

ESA has contracted with Göteborg-based Aeroflex Gaisler to develop the **Next Generation Microprocessor (NGMP)** for the decade to come, which will be based on the **LEON4** microprocessor: Four CPUs will serve a comprehensive set of peripherals to provide a further boost in processing performance, reflecting a similar move to multicore processors in terrestrial markets.

The chances are that whatever hardware you are reading this article on would not cope well with space. Assuming its mechanical structure survived the launch acceleration and vibration, it would then face sustained hard vacuum and temperature extremes. Within a matter of months or even weeks, its central microprocessor would doubtless be fried by radiation exposure.



Radiation-driven 'Single Event Effect'
Charged particles in space can randomly flip memory bits as they pass through microprocessors. Computer chips have to be specially designed to minimize the impact of such 'Single Event Effects'. Image courtesy of NASA.



Space radiation affects satellites

The space beyond Earth is awash with radiation. Charged particles emitted from the Sun, confined within Earth's magnetosphere or originating from the wider Universe are a major cause of satellite anomalies and malfunctions. Image courtesy of SSA.

Space is awash with charged particles of various energy levels, either emitted directly from the Sun or the wider Cosmos beyond the Solar System, or else confined within Earth's magnetic field to help form the radiation belts.

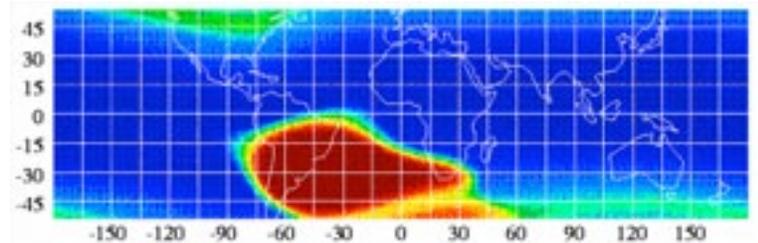
When a high-energy particle strikes a computer chip, the consequences can include the random *flipping* of microprocessor memory cells—known as a *Single Event Upset*—through to transistor gate ruptures up to a complete burn-out, called a *latch-up*.

Sustained radiation exposure can also weaken the underlying quality and electrical conductivity of the chip's semiconductor material, potentially leading to degraded performance or excessive power consumption.

"As microprocessor gates become smaller and the absolute levels of power go down, our circuits are becoming more vulnerable to Single Event Upsets," said Weigand.

"Even terrestrial chip manufacturers are growing more concerned about hardening against radiation—especially for products like network routers or medical applications where reliability needs are absolute.

"For the radiation-heavy space environment the problem is, of course, many orders of magnitudes worse."

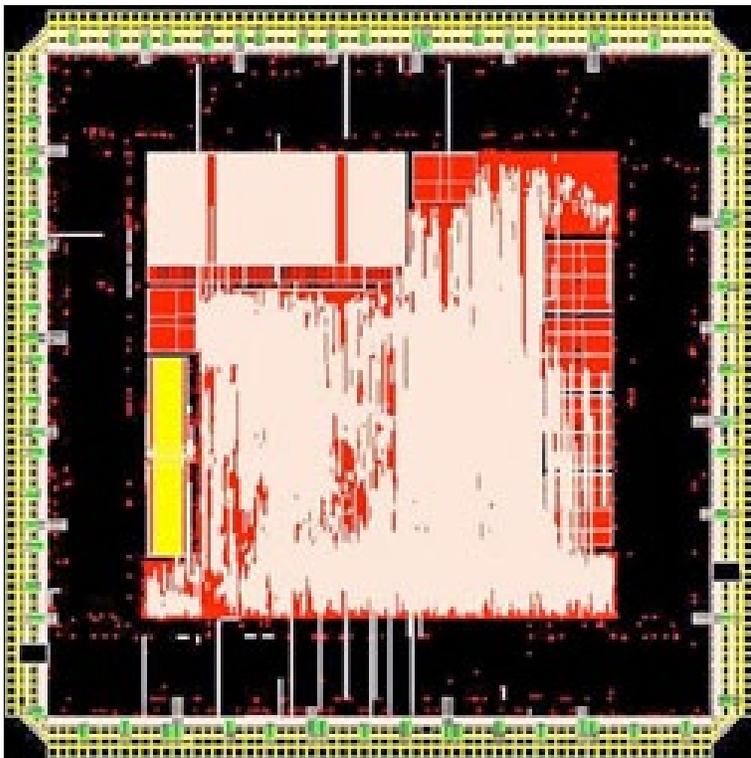


South Atlantic Anomaly

Heightened radiation in Earth orbit

The South Atlantic Anomaly is a region of higher radiation exposure within Earth's magnetic field. Many satellites tend to be affected in some way as their orbit takes them through this area.

LEON: The Space Chip That Europe Built (Cont.)



LEON2-FT-UMC

The LEON family of processors are ESA's equivalent of 'Intel Inside': high-performance 32-bit microprocessors that have been optimised to operate satellites' onboard computers. 'FT' stands for 'fault tolerant: its design is proofed against 'Single Event Upsets' caused by space radiation and incorporates triple modular redundancy to guard against software flips, with its memory protected by 'error detection and checking' and 'parity bits'—adding extra bits per memory item so any disruption can be identified. The LEON2-FT is available commercially as the AT-697 processor, sold by ESA's development partner Atmel Corporation. Two further LEON generations have since been unveiled—the LEON4-FT is the latest. Photo courtesy of ESA.

Robustness Through Redundancy

Dedicated microprocessors such as ESA's LEON family are essential for space missions—radiation-hardening is one of the main factors driving their design.

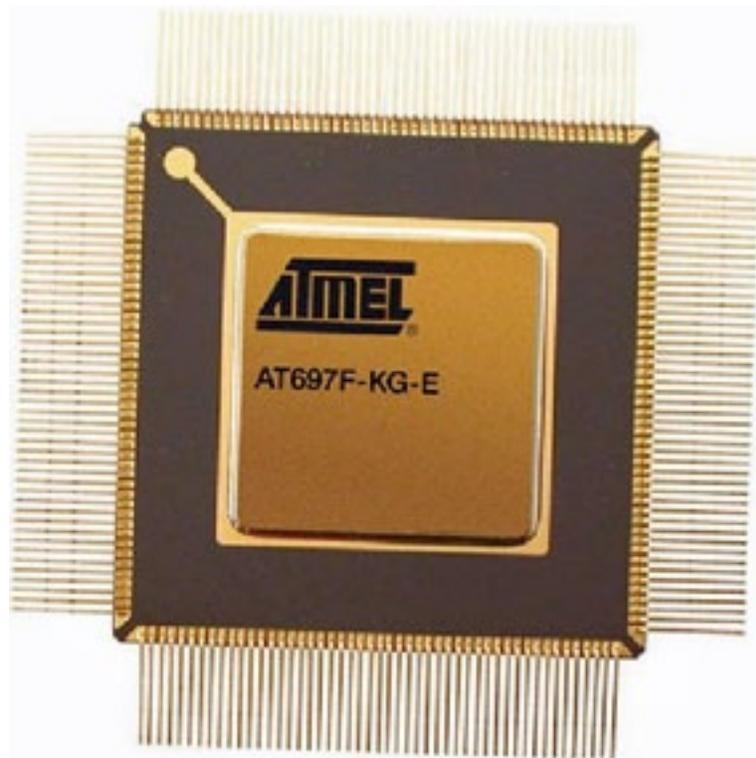
Physical shielding has a role to play, but can only extend so far. Heavy ions can still pass through an aluminium box, or else interact with it to produce a shower of secondary particles that could be almost as harmful.

"The key to designing for rad-hardening is really redundancy," Roland added. "You might duplicate your bits at different sites around the microprocessor or use *parity coding* to add on extra bits that help with detecting errors.

"Or you can triplicate your bits and then use a voting system to detect and correct errors: The result that comes up the most is likely to be right.

"Alternatively you can perform the same calculation multiple times—temporal instead of spatial redundancy.

"Whatever mode of fault tolerance is used, there is a price to pay for that redundancy. Your chip will be larger, run slower and consume more power—in return for its increased reliability.



LEON2-FT within its container

Boasting a fivefold performance improvement on the ERC-32, ESA's LEON2-FT is once more manufactured by Atmel, commercialised as the AT697. Features are etched onto its underlying semiconductor at 180 nanometre scale, compared to the single-chip ERC32's 500 nm. The smaller the scale of course, the more computing power can be crammed onto an individual chip. Photo courtesy of Atmel.

"To limit these penalties requires a careful optimization of the design, striving for compromises with the expected processor timing performance.

"Before introducing radiation tolerance features, the chip designers should ideally have in-depth knowledge of how the processor works. This is a real problem with commercial processors—based on proprietary information—and it is difficult to add in such features after cores have already been designed.

"Instead, for the LEON, we decided to start from scratch, adding redundancy from the beginning."

LEON: A New Recipe For Chips

How to go about designing a microprocessor? The first step is to think about what it needs to do. In this case, serve as a general purpose processor for space-based computer systems.

The next step, having selected the SPARC open standard to work within, was to code the instruction set defined by this standard into a text-based description suitable for translation into an electronic circuit.

"Coding is performed using a hardware description language called **VHDL** which resembles a software programming language, but has specific features to describe an electronic circuit," Roland explained.



Clean room for chip fabrication.

Microprocessor manufacturing is an extremely costly process, so all errors have to have been designed out in advance of batch production.

Photo courtesy of STMicroelectronics.

The resulting description contained several thousand lines of code: The **LEON2-FT VHDL IP core**. This VHDL code could then be simulated on computers to validate it was operating as intended in advance of producing any hardware. A reduced version of the LEON IP core was distributed to the user community to obtain crowdsourced debugging tips.

"The next stage was then to physically translate that code to create a test board hosting a programmable chip called a *field programmable gate array (FPGA)* where the LEON design could be put to work and tested."

The reprogrammable nature of the FPGA allowed different design configurations to be evaluated before deciding on a definitive version for the final (and expensive) chip manufacturing, when the microprocessor design is etched onto semiconductor chips.

Into the Nanoworld

Conservative space technology tends to lag behind its faster-moving terrestrial equivalent: The LEON2-FT is etched to a resolution of 180nm, while the forthcoming Next Generation Microprocessor will go down to 90nm or even 65nm. For comparison, **Intel's** latest CPU is around 32nm. These 90 and 65nm technologies, while available in the commercial world for many years, are currently being validated for use in space through a pair of ESA activities called the *Design Against Radiation Effects (DARE)* and *Deep Sub Micron (DSM)* initiatives.

This descent into the nanoworld throws up fresh design challenges—such smaller technology is more sensitive to Single Event Upsets, for example—but success would mean that spacecraft designers can go on assuming enhanced processing performance for future missions for many years to come.

For additional information on ESA Space Engineering activities, please visit

http://www.esa.int/Our_Activities/Space_Engineering

Integrating Carriers For Cost-Effective Passenger + Crew Connectivity

By Jan Einar Bringedal, Head of Sales, Marlink

Satellite communications usage at sea typically reflects trends on land and, today, more than ever, the maritime community is relying upon connectivity to increase operational efficiency as well as to support passenger and crew welfare. However, in order to offer a similar connectivity experience as those experienced in the home or office—enabling access to social media, email & Internet as well as free or low-cost contact with family and friends while at sea—service providers must offer an efficient balance between cost, coverage and performance.

In the last decade, maritime SATCOMs services have become more widely available. Technology has evolved to support high quality bandwidth and connection speeds that previously could not be achieved. The introductions of link optimization, filtering and security tools have all contributed to the increased accessibility of maritime

connectivity, while the availability of more bandwidth has enabled customers to benefit from increasingly advanced applications and to support multiple, simultaneous, network users.

These developments have seen usage increase and costs to be reduced. Yet, by the very nature of the maritime environment, it is still less affordable to connect to the Internet at sea than it is to logon from home or the office.



Expanding Coverage

An on-going challenge for providing connectivity at sea is coverage and obtaining enough bandwidth. However, near global coverage is now available. **Marlink** parent company **Astrium Services** has been a key player in improving the availability of SATCOMs at sea and has made a number of coverage extension deals in the past 12 months. In November of last year, Astrium Services renewed capacity on the **SES-4** satellite to provide Marlink and other Service Provider customers with advanced services for maritime business communications, tracking equipment and engine performance, as well as ensuring crew and passengers experience high levels of availability.

Located at 338 degrees East, SES-4 is among several **SES** satellites providing capacity to Astrium Services, enabling the company to fashion services to satisfy the specific needs of various customers. In September, **Astrium Services Business Communications** leveraged capacity on the **Intelsat 22** satellite to enhance its maritime VSAT services, such as **WaveCall™** and **Pharostar™**, with Indian Ocean coverage. Astrium Services is also using the **Intelsat 21** satellite, which is designed to provide Ku-band coverage in the southern Atlantic Ocean, to expand the maritime VSAT service capacity in specific regions that demand more coverage.

The most recent coverage extension was in February of 2013, when Astrium Services announced a deal with Intelsat for C-band capacity to be used by maritime customers in the Mediterranean, Atlantic Ocean, North Sea and Gulf of Mexico. The agreement was made to meet the high bandwidth requirements of C-band customized VSAT users, and supports broadband and expanded capabilities in the cruise, ferry and offshore sectors. Marlink will use C-band capacity on the **Intelsat 907** at 332.5 degrees East to provide fast, reliable data connectivity and voice communication for passengers and operational purposes through its Sealink service.

Hybrid Networks

With VSAT and global L-band coverage from **Iridium** and **Inmarsat**, there is now satellite communications coverage for all of this planet's oceans. Many vessels operate closer to land, which means 3G/4G connectivity is a possibility. In ports, Wi-Fi is already well established.

All of these carriers are different. WiMax is also available and even TVRO can be used for communication, where inbound data can be channelled through a vessel's satellite TV antenna. All these channels have positives and negatives. For the majority of vessels, a single service (usually L-band or VSAT) may be selected but some vessels, with hundreds or thousands of passengers, have higher bandwidth requirements. In order to provide them with connectivity services that are on par with what a customer may have at home, a single carrier may not be the best solution.

Hybrid networks, which integrate different services, can offer all of the bandwidth that's needed, while also offering more reasonable costs. Such is achieved by automatically selecting the least cost carrier, depending on where a vessel is at any one time. If a vessel is within 3G or 4G range, there

would be an automatic switch from VSAT or L-band to the ship's on-board Wi-Fi.

Rather than simply installing a range of disparate services and equipment, the critical aspect that delivers true hybrid, onboard networking is a central operations center that can manage and automatically select the best carrier for the job. Although this technology is in its relative infancy, Marlink has completed a number of custom projects for passenger vessels using the **XChange** solution from Astrium Services to provide the switch between VSAT and L-band. This has assisted the operator in offering free or low-cost vessel-wide Wi-Fi, the charged amount based on the savings the operator can accrue through least-cost routing.

XChange is an integrated solutions platform, providing a single solution for voice, VoIP, data and Internet access—all independent of the satellite network in use. This technology helps to turn ships into mobile offices and provides reliable voice, data and VoIP communications to seafarers and crew—while IT managers on shore can maintain full control over the shipboard network infrastructure. Satellite services automatically switch, based on available coverage in any given area.



Integrating Carriers For Cost-Effective Passenger + Crew Connectivity (Cont.)

Passenger Connectivity

An established ferry operator in northwest Europe is using a customer-specific solution from Marlink to provide improved, free, Internet connectivity for passengers on seven ferries serving Scandinavian routes. The solution, called **CoastalRoam**, is only available as a custom project, installed by specific request, but it does reflect the future possibilities for custom hybrid networks as a mainstream service. It is a specially developed addition to the **Sealink** customized VSAT services already in use aboard the customers' vessels and was deployed following a user trial aboard a single ferry on its route between Sweden and Denmark.

The customer operates 20 routes with a modern fleet of 38 vessels, including fast ferries, traditional combi-ferries, RoPax ferries for freight and passengers, and RoRo ferries purely for freight in Scandinavia, the North Sea and the Irish Sea. The passenger vessel market is competitive—this demands a high level of services on board that include value-adds such as free Internet connectivity for passengers. The operator's goal is to make any voyage as comfortable and convenient for the passengers as possible. The company understood that Internet connectivity is crucial toward achieving this goal,—however, the offer of free Wi-Fi on board for hundreds of users was difficult to achieve in a cost effective manner. The ferry company asked Marlink to help them overcome this challenge, to enable them to confidently offer the service and balance the Wi-Fi costs versus the expected high levels of customer satisfaction free Internet would generate.

CoastalRoam is specifically designed for this customer and was made possible through the company's existing use of the Sealink service. The solution integrates satellite with 3G and 4G for vessels sailing around Norway, Sweden, Poland, Germany and Denmark. Whenever the vessels are within range, the public Internet on board the vessel switches automatically to the fastest service available, using a lower cost carrier for free passenger connectivity.

The combination of 3G antennas and the Sealink customized VSAT services on board these seven ferries now ensures seamless free connectivity for passengers. As CoastalRoam enables automatic switching, the system is able to locate the fastest and least-cost connectivity available at any given time. This makes the service cost and time effective for the ferry operator and helps them to remain competitive in the market. Free Internet for passengers is readily available via 3G and 4G when in range and on VSAT at other times, while the Sealink customized VSAT service is used to provide highly reliable and cost-effective connectivity for critical vessel business operations, in addition to supporting additional businesses on board the ferry.

The adoption of hybrid solutions at sea will not be an overnight sensation—it will likely be led by passenger vessel operators, who understand the value customers place on Internet access. The first CoastalRoam project was unique—the seed has been planted and hybrid connectivity will continue to garner attention.

4G is already being implemented using a similar solution for another Marlink customer in Norway. The focus here was not to offer free passenger connectivity. Instead, this ferry operator is using the potential of faster, more available, and lower-cost connectivity to improve the Internet services it offers as part of its business conference portfolio. By being able to show conference organizers that their guests will experience high levels of connectivity while on board, this customer is able to enhance its offering and grow its unique approach by offering business conference facilities on board its vessels.

The hybrid system is also enabled for other carrier technologies, such as Wi-Fi and WiMAX. The first CoastalRoam customer aims to expand its use to other operational locations and is actively seeking telecom providers with good 3G and 4G coverage and competitive prices as partners to replicate the ground-breaking solution already enjoyed on the operator's Scandinavian ferries.

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