

Worldwide Satellite Magazine—May 2015

SatMagazine

THE ROLE OF IMAGERY IN... POACHING PREVENTION

Constellations A GoGo
Just What The Client Odered..
CommunicAsia2015
Digital Signage In Education
Creating Room For "New Space"
Use Of Hybrid Delivery Methods
Recognizing Leadership
The Bear Necessities
Perfecting Flight Dynamics
Operating + Growing A Teleport
Taxing New SATCOM Tech

*Cover photo is courtesy of
Air Shepherd*



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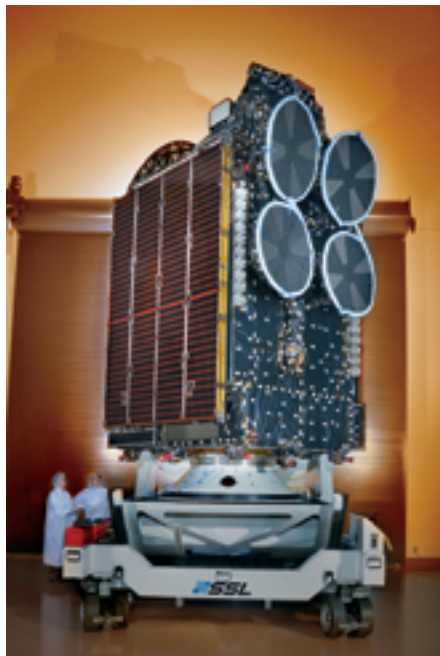
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Smooth Sailing For THOR-7 + SICRAL 2 Satellites



*Telenor's THOR-7 satellite during the build process.
Photo is courtesy of SSL.*

Space Systems/Loral (SSL), a leading provider of commercial satellites, has announced that a satellite designed and built for Telenor Satellite Broadcasting (TSBc), which was successfully launched on April 26th, is successfully performing post-launch maneuvers, all according to plan.

THOR 7 deployed its solar arrays on schedule following its launch aboard an Ariespace Ariane 5 launch vehicle from the European Spaceport in Kourou, French Guiana. The satellite fired its main thruster and entered final, geosynchronous orbit.

"THOR 7 is a very advanced and flexible satellite that will improve the lives of many people," said John Celli, president of SSL. "We would like to extend our gratitude to Telenor, Ariespace, and all of the SSL employees whose skills, hard work, and dedication helped make this satellite launch a success."

THOR 7 is a multi-mission satellite equipped with Telenor's first high performance Ka-band payload, designed to serve the maritime market.

The satellite will also offer high powered coverage over the North Sea, the Norwegian Sea, the Red Sea, the Baltic Sea and the Mediterranean.

The satellite also has a Ku-band payload for broadcast and television services in Central and Eastern Europe. The satellite will be positioned at 1 degree West longitude

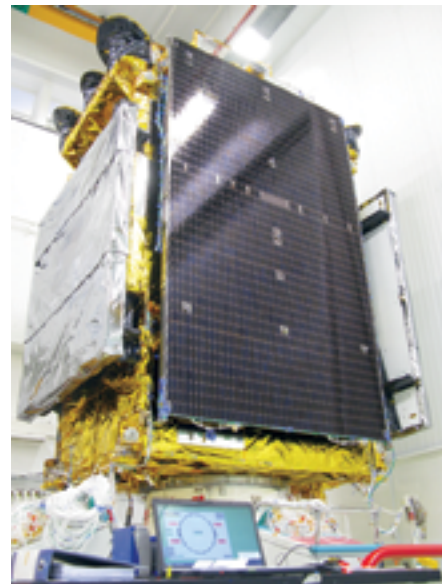
"THOR 7 will help us grow our business in both broadcasting and data communications," said Morten Tengs, Vice President and CEO of Telenor Satellite Broadcasting. "We are very happy that the satellite is now on its way to orbit and would like to thank both SSL and Ariespace for making this satellite a success."

THOR 7 is based on the highly reliable SSL 1300 platform, which provides high-power and the flexibility to support a broad range of applications and technology advances. The satellite is designed to provide service for 15 years or more. With this launch, there are 78 SSL-built GEO satellites currently on orbit.

Joining in the launch was the SICRAL 2 military telecommunications satellite. SICRAL 2 is a joint program between the Ministry of Defense in Italy and DGA (Direction Générale de l'Armement) in France for the benefit of Italian and French armed forces, with respective stakes of 62 and 38 percent.

"The launch of the Sicral 2 satellite marks another major step forward in the successful French-Italian collaboration on space programs," said Jean Loïc Galle, President and CEO of Thales Alenia Space.

The CEO of Telespazio, Luigi Pasquali, said, "As with previous missions of the SICRAL program, the company handled the implementation of the ground segment and managed the satellite's delicate phases of launch and putting into orbit, confirming a long tradition of excellence in the field of space operations."



The SICRAL 2 satellite upon build completion. Photo is courtesy of Thales Alenia Space + Telespazio.

"For SICRAL 2 as well, Telespazio invested directly in the programme, and will therefore have access to part of this satellite's capacity, in order to provide communications services to the armed forces of NATO countries."

Positioned at 37 degrees East in geostationary orbit, SICRAL 2 will have a service life that exceeds 15 years and will enhance the satellite communications capabilities already provided for Italy by SICRAL 1 and SICRAL 1B (launched in 2001 and 2009) and for France by Syracuse 3A and 3B (launched in 2005 and 2006). All of these satellites were designed and developed by Thales Alenia Space and Telespazio.

SICRAL 2 offers unprecedented flexibility and versatility and will ensure interoperability with existing satellite systems, NATO traffic terminals and current national telecommunications networks. The satellite will provide strategic and tactical satellite communications services, supporting military land, sea and air platforms used by Armed Forces to guarantee internal and external security.

Liftoffs For Lockheed Martin-Built Hellasat-4 | Saudi Geo Satellite-1 To Be Managed By Arianespace



Arianespace, Arabsat and King Abdul-Aziz City for Science and Technology (KACST) have signed a launch service contract for the Hellasat-4/Saudi Geo Satellite-1 satellite.

The satellite will be built by Lockheed Martin as part of a turnkey contract with the operator Arabsat and for Saudi Arabia-based KASCT.

HellaSat-4/Saudi Geo Satellite-1 will be launched in 2018 by an Ariane 5 from the Guiana Space Center, Europe's Spaceport in Kourou, French Guiana.

Offering a design life exceeding 15 years, HellaSat-4/ Saudi Geo Satellite-1 will weigh about 6,000 kg. at launch and will provide telecommunications and television broadcasting services from its orbital position at 39 degrees East over Europe, the Middle-East and north Africa. This is the 10th launch contract that Arianespace has signed with Arabsat.

Following the signing of this latest launch contract, Arianespace Chairman and CEO Stéphane Israël said, "Since the launch of Arabsat-1A in 1985, Arianespace had orbited eight others satellites for this operator. Moreover, Arabsat 6B is scheduled in the second part of the year. I would also like to thank King Abdul-Aziz City for Science and Technology for entrusting us with this launch."

Khalid Balkheyour, President & CEO of ARABSAT said, "This year marks the 30th anniversary of our successful partnership with Arianespace. At ARABSAT, we have always admired the seriousness and professionalism that Arianespace carry their business process, always seeking perfection."

(Artistic rendition of the satellites is courtesy of Lockheed Martin.)

Focus On Imagery: Using Satellites To Target Poachers In Africa

By Dr. Thomas Snitch, Distinguished Senior Professor, Institute for Advanced Computer Studies, University of Maryland



The global poaching situation has reached crisis proportions.

In 2014, 1,215 rhinos were killed in South Africa for their horns, which end up in Vietnam as purported cures for cancer and as enhancers of virility. Similarly, the estimated is that more than 30,000 African elephants were slaughtered last year for their ivory—ivory that was turned into bracelets and trinkets in China. To place these numbers in perspective, the world loses three rhinos per day and an elephant every 15 minutes. Simply stated, this is an unsustainable situation.

Our team at the University of Maryland's Institute for Advanced Computer Studies [UMIACS] has teamed with the Lindbergh Foundation's Air Shepherd initiative and we have created a multifaceted approach to combating poaching in Africa and Asia. The Air Shepherd effort was created to expand anti-poaching programs across Southern Africa and satellites are a major component of this effort.

Very high resolution satellite imagery is used to provide extremely detailed maps of the topography of an area. A wide array of data, with many different

variables, is collected and overlaid on the imagery. Through the use of our algorithms, we are able to devise an analytical model of how animals, poachers, and rangers simultaneously move through space and time.

Geospatial Assets Are Essential To Our Work

We begin our modeling with very high resolution satellite imagery of a specific park. For several years, we used .5 meter resolution imagery from GeoEye and now we are in discussions with DigitalGlobe to continue this crucially-needed cooperation.

With this imagery, we are able to study the topography of the region and this is the key to answering one most important question—show us where will we not find animals. This sounds counterintuitive. However, this information is critical to our work.

Africa is an enormous continent and to logistically fly Unmanned Aerial Vehicles [UAVs] to cover these huge expanses of land is quite impossible to





accomplish. With geospatial imagery, we are able to reduce the amount of space that must be covered.

By closely studying the topography of the satellite imagery, we are able to identify areas where there is little or no water, where the hills are too steep or the ravines too deep for animals to venture into, and we can look for areas that do not support the vegetation the animals eat.

Additionally, we can identify features in the landscape that inhibit or make it difficult for the poachers to find or reach their targets. These range from steep hillsides, extremely deep valleys to fast flowing rivers. The bottom line is that we need to know where *not* to look for poachers. The goal is to constantly try to reduce the amount of territory that we must cover with our UAVs.

There is a second major contribution satellites afford to our work and that revolves around the data we received from satellite-enabled animal collars. There are literally hundreds of animals, primarily elephants, which are carrying satcollars that send their geotagged land position to a satellite several times a day. Over time, as we download this data to our computers, we can clearly see how elephants move in an area—this has led us to discover that animals definitely have patterns to their movements.

With the satellites, we know where animals are likely to be during specific times of the year and also where they are highly unlikely to be at any time of the year. We can superimpose movements of poachers on this animal data and identify possible places where these two actors—elephants and poachers—are most likely to meet.

When we add additional variables with everything from the phase of the moon, to locations of nearby roads, geotagged animal snares locations and even the weather, we can mathematically determine where to deploy rangers and fly UAVs for the greatest likelihood of finding the poachers *before* they can reach an animal.

We do not have to find the poachers. We just need to know where the elephants and rhinos are most likely to be at any given time.

The good news is that we have proof of concept and proof on the ground that satellites and UAVS make a tremendous difference in beating the poachers. The bad news is that we are finding the poachers are moving to regions where we are not in operation. This tells us that to really address the challenges of poaching in Africa, all of the south African nations need to be at least willing to test these solutions packages in their most critically endangered poaching areas.

The successful solution to halt poaching rests in the combination of satellites, great math, properly positioned rangers, and UAVS with precise flight paths.

This is why the Air Shepherd effort is so critical. By raising the funds necessary to grow the use of this program across Africa and, in the future in Asia, the Air Shepherd effort can beat the poachers and save animals around the world.

The Lindbergh Foundation aims to raise \$500,000 through IndieGoGo to fully implement the Air Shepherd program for one year in the Ezemvelo KwaZulu-Natal [EKZN] Wildlife area. We have plans to expand into seven additional African countries that have indicated an interest in implementing the program.

There truly is no time to waste.

An informative video regarding Air Shepherd is available for viewing at:
<https://www.youtube.com/watch?v=jDAuv6iVxm4>

Dr. Thomas Snitch has spent 40 years in Washington, DC, working both in and for the U.S. Government, tackling difficult issues and challenges with the appropriate use of new technologies. These projects range from the disposal of old chemical weapon stockpiles to the cleanup of the damaged nuclear reactors in Fukushima, Japan.

Bezos Is Ticked Pink With Blue Origin's Test Launch



Those at Blue Origin are beginning to live their dreams with the successful test flight of their reusable test space vehicle, New Shepard.

Amazon's founder Jeff Bezos made the following statement.

"Today [April 30, 2015], we flew the first developmental test flight of our New Shepard space vehicle. Our 110,000-lbf thrust liquid hydrogen, liquid oxygen BE-3 engine worked flawlessly, powering New Shepard through Mach 3 to its planned test altitude of 307,000 feet. Guidance, navigation and control was nominal throughout max Q and all of ascent. The in-space separation of the crew capsule from the propulsion module was perfect. Any astronauts on board would have had a very nice journey into space and a smooth return.

"In fact, if New Shepard had been a traditional expendable vehicle, this would have been a flawless first test flight. Of course one of our goals is reusability, and unfortunately we didn't get to recover the propulsion module because we lost pressure in our hydraulic system on descent. Fortunately, we've already been in work for some time on an improved hydraulic system. Also, assembly of propulsion module serial numbers 2 and 3 is already underway—we'll be ready to fly again soon.

"We continue to be big fans of the vertical takeoff, vertical landing architecture. We chose VTVL because it's scalable to very large size. We're already designing New Shepard's sibling, her Very Big Brother—an orbital launch vehicle that is many times New Shepard's size and is powered by our 550,000-lbf thrust liquefied natural gas, liquid oxygen BE-4 engine."

Blue Origin's goal is to offer commercial space flights. The capsules and rocket are completely new concepts.

The New Shepard capsule and booster are being designed and tested in a process that is both rigorous and disciplined. Their manufacturing and assembly technicians are experienced in aircraft and spacecraft manufacturing.

The elements of the New Shepard system are being tested extensively, both on the ground and during uncrewed test flights. From vibration tables and thermal chambers to hundreds of engine firings, these tests stress the vehicles and all of their subsystems.

Their flight test program continues to build experience with the New Shepard system in an uncrewed configuration, leading up to the day when they are ready for astronauts to climb on board for launch. Sitting atop a 60-foot-tall rocket in a capsule designed for six people,

the passengers will feel the engine ignite and rumble under them as it climbs through the atmosphere. Accelerating at more than 3 Gs to faster than Mach 3, passengers will count themselves as one of the few who have gone these speeds and crossed into space.

The New Shepard system is a fully reusable vertical takeoff, vertical landing (VTVL) space vehicle and consists of a pressurized capsule atop a booster. The combined vehicles launch vertically, accelerating for approximately two and a half minutes, before the engine cuts off. The capsule then separates from the booster to coast quietly into space. After a few minutes of free fall, the booster performs an autonomously controlled rocket-powered vertical landing, while the capsule lands softly under parachutes, both ready to be used again.

Reusability enabled Blue Origin to fly the system repeatedly. The New Shepard capsule's interior is 530 cubic feet—offering over 10 times the room Alan Shepard had on his Mercury flight. The spacecraft seats six astronauts and is large enough for passengers to float freely and turn weightless somersaults.

Each window is made of multiple layers of fracture-tough transparencies, designed to provide crystal clarity of the incredible views before you. Minimizing distortion and reflection, the windows transmit 92 percent of visible light—as good as glass.

The crew capsule descends under parachutes for a smooth landing, in the same way as the earliest space pioneers. Three independent parachutes provide redundancy, while a retro-thrust system further cushions the passengers' landing. This test is the start of Bezos' dream being fulfilled.

Blue Origin: www.blueorigin.com/

Constellations A GoGo

By Chris Forrester, Senior Contributor



The Washington DC satellite show saw panel after panel talking about the prospects for LEO constellations.

The past month or two has seen this picture become even more complex, with a clutch of highly optimistic plans being unveiled for a series of LEO constellations which their proposers hope will satisfy—and help to create—a growing demand for broadband bandwidth around the planet.

The likes of Greg Wyler and his ambitious OneWeb scheme is designed to emulate and out-perform the O3b series of MEO satellites he helped co-found and he is typical of this new generation of satellite entrepreneurs. Elon Musk, already globally famous for his PayPal success, his Tesla electric car, and quite spectacular SpaceX 'rockets to Mars and everywhere else' aims is yet another. LeoSat is another beast in the making, promising terabytes of capacity and tapping into anticipated demand. Throw in self-seeking publicists such as Virgin Galactic's Sir Richard Branson and you win guaranteed column inches of press coverage.

Northern Sky Research (NSR), in a report published last month, speculated that the combined result—if all of these constellation placements were successful—would mean anything up to 5,000 LEO satellites being launched in the next decade. By any measure, and even if they do not all launch, this still means a true quantum leap of extra satellite bandwidth coming into play. This equates to tens of terabits of capacity and a hoped for reduction in the cost/GB tumbling down, all to the consumers' benefit.

Not yet answered is exactly how all of this hardware is going to get into orbit. Even with today's quite sophisticated orbital injectors, their positioning is still going to require a gigantic thrust of rocketry to achieve a business case.

Then there's the financing—while there's plenty of cash around for well-structured satellite projects, perhaps the extremely deep pockets of a Qualcomm or Google will be required to see if these schemes can actually fly.

However, what if they do all crack the meaningful challenges of mass-producing satellites (at a rate of two-a-day, if Thales Alenia is correct) and actually line up for launch? NSR is blunt in its assessment and I cannot disagree with it. NSR says some serious questions are starting to emerge.

"How does an industry build and launch ~5,000 satellites, even if they are much smaller than the traditional GEO COMSATS? With the same 17 to 20 active launchers, averaging the same 75 to 80 combined launches per year to GEO and LEO, launching all constellations in a two to five year window seems near impossible. NSR estimates that if all constellations do go ahead as planned, we are looking at capacity of the order of 20 to 30 terabits coming online in the next decade, which is orders of magnitude higher than the 2.5 terabits of GEO/MEO HTS capacity that NSR expected by 2023."

Where will all of the demand for this new capacity be derived from, remembering all the while that the telcos and fiber-layers are not exactly idle in expanding their networks and penetration? Will an over-capacity 'bubble' drive some of these schemes into bankruptcy?

NSR added, "Even if the industry remains divided on whether all this capacity constitutes a "bubble," it remains feasible that 20 to 30 terabits of capacity could be launched by 2020. Hypothetically, if all this capacity were available today and sold at rates of \$500/Mbps (equivalent of \$1,500 to \$2,000 per MHz in Ku-band at 1:3 or 1:4 Bits per Hz modulation and coding) it would mean revenues of the order of \$15-\$20 billion, which is 10 percent of the entire satellite industry's revenues as per the 2014 SIA report.

Now one must factor in that only a portion of this capacity can be truly "commercialized" and only 30 to 40 percent of it is over land mass, not to mention unique landing rights in each country that make selling this capacity a rather tough problem to solve. And cost effective antenna technology required on the ground is far from reality anytime soon, which may be a larger problem than launching massive volumes of capacity into orbit."

Do not forget that the established satellite players are also not resting on their laurels. Almost every major operator is aggressively expanding their 'High Throughput' fleets. Inmarsat, Intelsat, SES and Eutelsat are all typical of the breed and continue to add to the amount of capacity on offer.

NSR's Activity List

System	Orbit	Launch Date	Satellites	Services	Bit Rate	Throughput (Gbps)	Band	Latency
Inmarsat	LEO	1998	66+	Telephony, Data	Low		L	
Intelsat IXT	LEO	2015-2017	66+	Telephony, Data	Medium		L	<10ms
Globalstar	LEO	1991	60	Telephony, Data	Low		L	
Orbcomm	LEO	1993	30+	Data	Low		L	
ICO	MEO	1995	15+	Telephony, Data	Low		N/A	
Skybridge	LEO	1995	80	Data	High		Ka	
Teledesic	LEO	1996	288	Data	High		Ka	
O3b	MEO	2007	12-20	Data, Backhaul	High	80-340	Ka	150 msec
OneWeb	LEO	2015-19	640-2400	Data, Backhaul, Aero	High	8000-10000	Ku	20-30 msec
SpaceX	LEO	2015-20	<1000+	Data, Backhaul	High	8000-10000	N/A	20-30 msec
COMMSat	LEO	2017	75+	Data	High	N/A	N/A	
Xonavi	LEO	2017	30+	Data, Maritime, Aero	Medium?	N/A	N/A	
LeoSat	LEO	2018-20	80-140	Energy, Maritime, Backhaul	High	5000-10000	Ka	50 msec
Lower Light	MFO	2018	8-12	Data	High	4000	N/A	

Source: NSR



It would be easy to report on the challenges that these new entrants face. Top of the list has to be financing, especially with the less than stellar performance histories of 14-15 years ago, when planned constellation after constellation failed and cost backers millions.

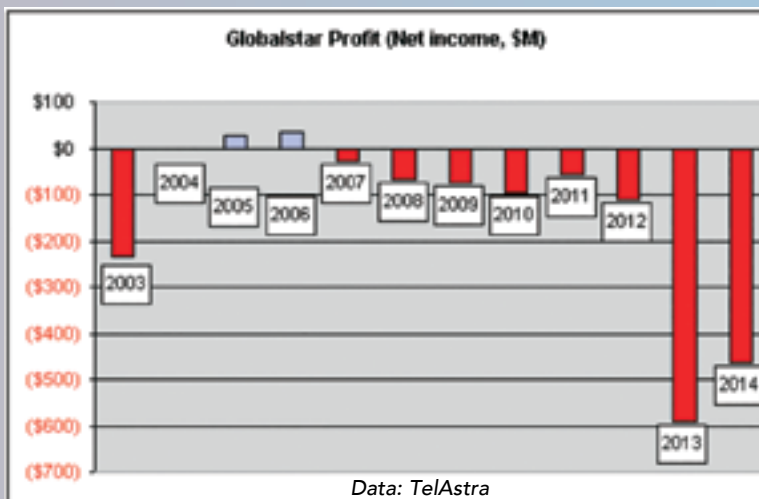
But even assuming the funding can be sourced, then there's the already mentioned 'build and launch' physical challenges to be engineered and achieved. Perhaps Elon Musk can create another revolution in thinking how satellites can be built—and he has a solid record of achieving what he promises. But as many as 4,000 satellites takes a bit of development, and testing, and planning and launching and solving the numerous terrestrial problems and then finding a market!



One highly respected observer calls some of the schemes "preposterous" and funded by organizations and individuals who have "more money than good sense." He reminds the industry that most of the schemes proposed about 20 years ago were also under-funded and over-estimated in terms of the ROI, and he doubts whether even the new SpaceX constellation could see the cost of building and launching drop by 99 percent.

There's another expensive factor to be considered. Today's major satellite operators have generations of expertise in managing their fleets, with skilled engineers and technicians. These skills will need to be generated almost overnight by these new constellations. Ground installations will not be cheap, and even O3b doesn't interface with the public (but stays strictly B2B).

Perhaps Google and the others will create a whole new business sector serving the public and interfacing with the satellites. Perhaps. But this is not going to be an overnight happening. Moreover, the proven history of systems such as Iridium and Globalstar is not good. They've both been through Chapter 11 and have not set the world alight since their rescue and re-launch.



Iridium's constellation is kept afloat by support from the U.S. government, and, despite making regular profits for the past five years (net profits of \$50 to \$70m over the past three years), the company is, nevertheless, obligated to pay back a massive \$384 million each year for the next 10 years and also needed to fund its 'next generation' fleet.

Whether we have another 2000-type 'bubble,' or whether the new breed of satellite entrepreneurs have timed their investment decisions well, only time will tell. This place in space is going to be watched closely!

Wyler's OneWeb Plans Explained

Greg Wyler, the original thinker behind O3b's mission to capture the "other 3 billion," used the Washington show to explain his new mission as head of OneWeb and his plan to serve the other three billion via his OneWorld strategy, with a constellation of 648 active LEO satellites (at 1200 kms), plus another 250 in construction (for replacements/redundancy) and at a cost of about \$400,000 each.



Wyler, in a special presentation, demonstrated how a Rockwell Collins-designed snazzy rooftop all-in-one antenna could serve a village or an even larger community from a central point.

OneWeb has attracted funding and participation from Qualcomm and Sir Richard Branson and currently is talking to five potential suppliers (including three European and two American actors). A decision could emerge shortly as to the successful bidder. Thales said it would build an all-new facility if it won its bid. Wyler wants the first launches to occur in 2017.

Airbus Defence & Space, OHB and Thales Alenia Space are the European trio, while Space System/Loral and Lockheed Martin are the U.S. pair. The pre-bidders will not have to wait too long, as it emerged during the show that a decision could be made quickly.

The intention is to then form a j-v with the winning bidder and build a dedicated factory to build satellites at an unprecedented rate. Thales, for example, said the company would need to manage two a day in order to have an initial working constellation into space by 2017, all in order to secure and 'bring into use' the ITU-authorized frequencies. The bulk of the satellites would launch in 2018.



Thales Alenia's New 'Ready To Fly' Models

Much of the talk at the DC show revolved around new demands on satellite builders, with operators expressing extremely firm views that they needed shorter delivery times, less expensive satellites, more functionality, and a great deal of fresh thinking for the supply side of the industry.

Jean-Loïc Galle, CEO at Thales Alenia Space (TAS), stressed that his company was actively addressing all of these elements, but admitted that the changes could be dramatic over the next few years. "But, we will be at the forefront of these changes."

Indeed, he opened his presentation by revealing that last year's commercial sales totaled five major satellites, and "we would not have won any of those contracts had we not worked hard on our cost structure, trimming about 10 percent from those costs and looking to save a similar amount this year. We have also looked hard at our product lines and also the classic Spacebus platform."

He explained that TAS saw the market for commercial satellites falling into three clearly defined groups: The first was for HTS, where the satellite would be complex but the cost per Gigabit would have to be lower. The second group included what he described as "Low Cost/Short Schedule, low CapEx but being extremely agile for operators."

The third group were global-reach satellites, with very low latency, and a large number of new services. "This means the new constellations," he agreed, and this topic alone was a major focus at the show.

He said the global market for Group 1 and 2 satellites was probably about 20 craft in a year, but also cautioned that many people did not fully appreciate the high degree of complexity of a major HTS satellites. He also stated that TAS was well placed to compete effectively in supplying sub-24 months delivery dates on the supply of (largely) pre-configured craft. He added that TAS would be employing more robots (and co-robots where a human was involved) to trim the time taken on certain tasks, and thereby keep costs down and delivery dates shorter.

"Our customers are pushing us very hard for standardization and we are increasingly looking at these automated processes, as in the car industry, for improvements. And in some cases, we are targeting 18 to 20 months for delivery."

Some of these developments are revolutionary and include using 3D Printing technologies to speed some production processes on complex components. One specific 3D Printing task was 'super accurate' and delivered a 50 percent saving in mass and costs. Another task saw robots inserting the aluminum honeycomb elements on a satellite's bus and achieving super accuracy as well as a reduction of a (human-based) time from around a week of labor to just about six hours.

He added these lessons were being applied to all of its manufacturing units, and while he spoke optimistically of winning business from the new breed of constellation owners and developers, he was under no illusion of the challenges and difficulties ahead. Separately, Greg Wyler had talked about 900 or so satellites at a cost of \$400,000 per unit.

Galle said this was achievable but also meant turning the OneWeb mini-sats out at a rate of two per day. "We have to examine how to do this. How will this affect our own internal supply systems, as well as those of our outside contractors? These are just the first steps."

Galle also spoke extensively about the TAS-developed and patented 'StratoBus' flying drone/balloon, which would 'fly' at 20 kms and stay in a geo-orbit for about a year, despite the craft's low speed. It would weigh some five tons, carry a 200 kg. payload, and be ready for use next year. The StratoBus would then return to Earth, be refueled and be returned to orbit—this craft could be ready to fly in 2020.



The StratoBus, image courtesy of Thales Alenia Space

The 'Big Four' Chat To 9000

The focus was—as ever—on reducing the costs of launch vehicles, and, in particular, in reducing the time of building and assembling satellites. The general consensus was that 30 to 36 months for actual manufacture was far too long a period of time.



The 'Big Four' during their panel discussion.

The Big Four opening session (David McGlade, CEO of Intelsat; Dan Goldberg, CEO of Telesat; Michel de Rosen, CEO of Eutelsat; and, for the first time on the panel, Karim Michel Sabbagh, CEO of SES) spent perhaps more time than was justifiable in discussing the prospects for the raft of new LEO constellations, especially as none are likely to make an impact for some time to come.



The headline grabbing multi-satellite projects coming from SpaceX/Elon Musk, and Google—and with the most recent big-name investor being Richard Branson and Virgin Galactic—were generally welcomed but there was much speculation—and sly

comment—as to which of the many competing blue-sky projects would ever see the light of day.



Karim Michel Sabbagh, CEO of SES

SES' Sabbagh, with his old boss watching from the second row, could hardly deny he was in favor of constellations, given that SES is a 46 percent shareholder in O3b. The expectations are that SES will likely consolidate that ownership in the next year or so. O3b is already raising fresh cash to expand the constellation beyond the existing eight fully working

(plus four less than perfect) orbiting craft.

"The most interesting growth opportunities still lie ahead of us. We're here to truly democratize satellite connectivity. Our satellites cover 99 percent of the world's population, but we don't serve 99 percent of the population—why not?" Sabbagh asked.



David McGlade, CEO of Intelsat.

U.S., Europe and some parts of Asia, but seeing programming proliferate through new devices in all markets more cost effectively." He also cautioned wisely about getting "too overheated" in worrying about the new LEO competition until everyone's plans were a little clearer. McGlade admitted that the satellite industry was in a period of innovation that has accelerated rapidly in the last five years.

De Rosen highlighted that operators have been in a constant innovation cycle, citing the example of Eutelsat's Smart LNB "which will be a great tool for interactive non-linear TV, but also for broadband in emerging markets."

The panel responded to questions about several new important technology developments which could fundamentally revolutionize the way satellites are ordered and built. These technological developments could, depending on the industry's willingness to embrace change, completely transform the way the satellite industry operates.

New software programmable payloads could mean an end to the two- to three-year wait for a satellite to be built following an order from an operator. Satellite manufacturing should become much more of an assembly line, with customization of payloads being done as a pre-launch adjustment of more standardized 'off the shelf' spacecraft. Several industry leaders likened the paradigm change to having satellites become similar to mass produced Fords, rather than each spacecraft being an expensive handcrafted Ferrari, or as a French rocket builder described on the next day, very Haute Couture, when they needed to be 'Ready to Wear' (actually, Prêt à Porter, said in heavily accented French!).



Michel de Rosen, CEO of Eutelsat.

he wanted to see modern business practices start to enter the sector. Fresh from the textbook launch of one of his SatMex (Eutelsat Americas) all-electric

For McGlade, the event was his swan song. He will retire next month, but he was also happy to address the wider market opportunities in 'smart' devices and second screens, saying, "the proliferation of devices that consumers are consuming content on, not just in the

U.S., Europe and some parts of Asia, but seeing programming proliferate through new devices in all markets more cost effectively." He also cautioned wisely about getting "too overheated" in worrying about the new LEO competition until everyone's plans were a little clearer. McGlade admitted that the satellite industry was in a period of innovation that has accelerated rapidly in the last five years.

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Michel De Rosen highlighted the advantage Eutelsat had taken in this area with the announcement of its advanced Quantum satellite. However, and not for the first time, he delivered a very public warning to the industry's big names. While he did not mention Arianespace (or Proton, or any of the satellite builders by name), it was clear

he wanted to see modern business practices start to enter the sector. Fresh from the textbook launch of one of his SatMex (Eutelsat Americas) all-electric

satellites by SpaceX, he told the 9,000 delegates that "SpaceX, their energy, is now shaking the entire launcher industry and forcing the other players to become much more competitive themselves."

The other big development for the satellite industry in the coming years is the emergence of HTS, which promise much more power while delivering dramatically lower cost per bit. The combination of HTS and a totally new way of much more speedily commissioning, building, launching and lighting up satellites all spell good news for broadcasters—lower cost and faster time to market.

The upcoming WRC-15 meeting of spectrum regulators in November, and the threat from cellular operators and some governments to confiscate C-band spectrum, was also much discussed. The big satellite operators have gone to great lengths to demonstrate to the ITU why any kind of spectrum sharing will devastate not only many TV businesses, but also humanitarian aid operations worldwide and will have a deleterious effect on many developing economies.

However, the mobile lobby stands accused by the satellite players as being guilty of a dirty tricks campaign, with de Rosen unhesitatingly alleging that the mobile providers are blatantly lying in order to win the day. The mobile lobby just recently issued a press release, said de Rosen, claiming that Arab states had declared in unison that they do not need to preserve C-band as satellite-only, and have effectively given these frequencies to mobile. "This is simply not true," said de Rosen.

Indeed, when pushed on the whole question of sharing their C-band assets, the CEO's of SES, Intelsat and Eutelsat, all gave a firm 'No' when asked whether sharing was likely. Dan Goldberg, not for the first time on the panel, uttered a logical 'Maybe' as an outcome of WRC-15.

While TV remains a key revenue source for The Big Four—some 70 percent of SES' revenues, for instance—the leading operators offered much optimism in regard to their newer business concentrations in maritime, aviation, oil & gas and other B2B and government communications services, as well as bringing broadband to the underserved masses. Only Dan Goldberg name-checked Ultra-HD as the main reason to be excited about satellites' immediate future.

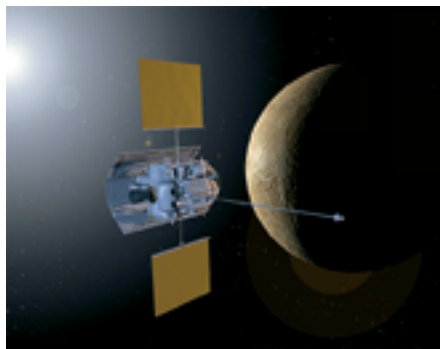
However, there was one over-riding message—the Big Four view the industry as being in a healthy state and firmly rejected the suggestion that there was an over-capacity problem looming.

Senior Contributor Chris Forrester is a well-known broadcasting journalist and industry consultant. He reports on all aspects of broadcasting with special emphasis on content, the business of television and emerging applications. He founded Rapid TV News and has edited Interspace and its successor, Inside Satellite TV since 1996. He also files for Advanced-Television.com. In November of 1998, Chris was appointed an Associate (professor) of the prestigious Adham Center for Television Journalism, part of the American University in Cairo (AUC), in recognition of his extensive coverage of the Arab media market.



Dan Goldberg, CEO, Telesat.

NASA's MESSENGER... A Bittersweet Close To An Eleven Year Journey



Artistic rendition of the MESSENGER spacecraft. Image is courtesy of NASA / Johns Hopkins APL

A NASA planetary exploration mission came to a planned, but nonetheless dramatic, end Thursday when it slammed into Mercury's surface at about 8,750 mph and created a new crater on the planet's surface.

Mission controllers at the Johns Hopkins University Applied Physics Laboratory (APL) in Laurel, Maryland, have confirmed NASA's MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) spacecraft impacted the surface of Mercury, as anticipated, at 3:26 p.m. EDT on April 30, 2015.

Mission control confirmed end of operations just a few minutes later, at 3:40 p.m., when no signal was detected by NASA's Deep Space Network (DSN) station in Goldstone, California, at the time the spacecraft would have emerged from behind the planet. This conclusion was independently confirmed by the DSN's Radio Science team, which also was monitoring for a signal from MESSENGER.

"Going out with a bang as it impacts the surface of Mercury, we are celebrating MESSENGER as more than a successful mission," said John Grunsfeld, associate administrator for NASA's Science Mission Directorate in Washington. "The MESSENGER mission will continue to provide scientists with a bonanza of new results as we begin the next phase of this mission--analyzing the exciting data already in the archives, and unravelling the mysteries of Mercury."

Prior to impact, MESSENGER's mission design team predicted the spacecraft would pass a few miles over a lava-filled basin on the planet before striking the surface and creating a crater estimated to be as wide as 50 feet.

MESSENGER's lonely demise on the small, scorched planet closest to the sun went unobserved because the probe hit the side of the planet facing away from Earth, so ground-based telescopes were not able to capture the moment of impact. Space-based telescopes also were unable to view the impact, as Mercury's proximity to the sun would damage optics.

MESSENGER's last day of real-time flight operations began at 11:15 a.m., with initiation of the final delivery of data and images from Mercury via a 230-foot (70-meter) DSN antenna located in Madrid, Spain. After a planned transition to a 111-foot (34-meter) DSN antenna in California, at 2:40 p.m., mission operators later confirmed the switch to a beacon-only communication signal at 3:04 p.m.

The mood in the Mission Operations Center at APL was both somber and celebratory as team members watched MESSENGER's telemetry drop out for the last time, after more than four years and 4,105 orbits around Mercury.

"We monitored MESSENGER's beacon signal for about 20 additional minutes," said mission operations manager Andy Calloway of APL. "It was strange to think during that time MESSENGER had already impacted, but we could not confirm it immediately due to the vast distance across space between Mercury and Earth."

MESSENGER was launched on August 3, 2004, and began orbiting Mercury on March 17, 2011. Although it completed its primary science objectives by March 2012, the spacecraft's mission was extended two times, allowing it to capture images and information about the planet in unprecedented detail.

During a final extension of the mission in March, referred to as XM2, the team began a hover campaign that allowed the spacecraft to operate within a narrow band of altitudes from

five to 35 kilometers from the planet's surface.

On Tuesday, the team successfully executed the last of seven daring orbit correction maneuvers that kept MESSENGER aloft long enough for the spacecraft's instruments to collect critical information on Mercury's crustal magnetic anomalies and ice-filled polar craters, among other features. After running out of fuel, and with no way to increase its altitude, MESSENGER was finally unable to resist the sun's gravitational pull on its orbit.

"Today we bid a fond farewell to one of the most resilient and accomplished spacecraft to ever explore our neighboring planets," said Sean Solomon, MESSENGER's principal investigator and director of Columbia University's Lamont-Doherty Earth Observatory in Palisades, New York. "A resourceful and committed team of engineers, mission operators, scientists, and managers can be extremely proud that the MESSENGER mission has surpassed all expectations and delivered a stunningly long list of discoveries that have changed our views--not only of one of Earth's sibling planets, but of the entire inner solar system."

Among its many accomplishments, the MESSENGER mission determined Mercury's surface composition, revealed its geological history, discovered its internal magnetic field is offset from the planet's center, and verified its polar deposits are dominantly water ice.

APL built and operated the MESSENGER spacecraft and managed the mission for NASA's Science Mission Directorate in Washington.

Learn more about the accomplishments of NASA's MESSENGER:
www.nasa.gov/mission_pages/messenger/main/index.html

Emerging Markets Communications To Gain MTN Communications

Emerging Markets Communications (EMC) has signed a definitive merger agreement to acquire MTN Communications (MTN), a leading provider of communications and content for remote locations around the world.

The combined entities bring together the most talented and experienced professionals in the remote communications industry, servicing land and maritime-based customers, with a transformative suite of network products and services for businesses and people, connecting in hard to reach places or on the move.

The acquisition will benefit the organizations' combined 1,600 vessels and more than 8,000 land-based customer sites in the most hard to reach places on all continents and in every ocean. Customers will represent multiple verticals, including maritime, energy, cruise lines and ferries, yachts, non-governmental organizations, telecommunications providers, global enterprises and governments.

The combined entity will be one of the largest independent providers of satellite connectivity services for both land-based sites and maritime vessels, worldwide. The company will also be the largest provider of connectivity services, in some of the most strategic verticals within the satellite industry, backed by ABRY Partners, a private equity firm specializing in funding some of the most successful communications companies in North America, with more than \$42 billion of completed transactions.

EMC and MTN have proven track records of delivering a broad range of transformative communications solutions. They bring faster, more efficient Internet, content and cellular services -- including voice, text and 3G Internet access -- for business, personal and critical missions.

The acquisition will leverage patented and patent-pending solutions, including optimization, cloud computing and hybrid networks. This complementary acquisition will expand global footprints, service centers and teleports, and invaluable products.

IRG Insights: The Return of the Tour

By Martin Coleman, Executive Director, the Satellite Interference Reduction Group (IRG)



Last year, we ran a series of Carrier ID Tours at the major events around the world. The result was to some extent mixed, but they were extremely well received by all who participated and particularly well attended at CommunicAsia. This year, we have decided to run the tour again, but this time with a slight twist.

Not Just Carrier Interference Detection (CID)

One of the biggest differences this time around will be the fact that the sessions won't just cover CID. It remains a hot topic, of course, and we need to continue this education portion of the tour in order for users, manufacturers, and operators to understand what is involved in becoming CID ready. I hope the tour will accomplish this task and CID will still be a huge part, once again showing the different stages of the process from transmission, through detection, to resolution.

However, simultaneously, we need to realize that there are so many other pieces of the puzzle, all of which need to be tackled. Having invested so much energy into getting CID established, we can now continue to push for implementation, while also focusing on other solutions to reduce interference.

Engineering Our Way Forward

Thinking about how to start 2015 and our first workshop, which occurred at the Intelsat Headquarters in conjunction with the DC satellite show, I put a great deal of thought into our organization's direction and motivation. One element I keep coming back to is that IRG is an engineering group—we are about technology and innovation to solve interference,

which, in turn, often makes our satellite processes more efficient and cost-effective.

When it comes to solving interference, we definitely need to think back to the premise of engineering. While that in itself isn't going to solve interference alone—we still need the other tools in the arsenal such as training—through better engineering, we can make great strides forward towards mitigation.

Our members truly step up to this challenge. There have been an amazing number of technology advancements made in recent months in that deal with interference. The 2015 Tour will focus on how our member's technology base is a formidable weapon in reducing interference. The use of smart modulation methods, better detection algorithms and reusing old methods with new thinking to really make future satellite products and services robust will be our concentration.

We saw a number of new solutions presented at our workshop, everything from using echo cancellation techniques to an array of training course materials and the various technologies available to the industry to get the point across; new geolocation products and processes; VSAT Installation Tools and the new GSM Demodulation and DVB RCS VSAT Detection Tools.

This is just a sample of what technology and products are now available to mitigate interference.

While we will highlight those CID-related technologies in the 2015 Tour, there is so much more innovation being developed by our members, which will make significant strides in the solving interference challenge.

Educating Users

The tours, as with all our activities, are aimed at the entire industry. Anyone looking to understand the practical steps needed to reduce interference will find solutions for their use. For the most part, the operators are already on board, and the manufacturers are doing their bit but the largest group we need to educate right now are the end-users.

Practical steps need to be brought to light for users as well as demonstrating the tools available to them in offering the support they need to become as interference-free as possible. Ultimately that is



going to lead them into becoming a far better service provider—and everyone's a winner.

Our first IRG webinar will also take place this year, planned for May, with a focus on the practical steps users can take to reduce interference. The details will become available shortly on our website for anyone who would be interested in registering.

On Board With Training

As well as developing new innovative technology solutions, coming up with innovative ways to train the industry and user community is an important aspect. At our recent workshop, we spent some time discussing how we can improve training and those processes and we had some interesting presentations delivered by the Global VSAT Forum (GVF) and Obor Digital.

The tour will definitely cover training, so that participants can understand some of these available programs that are appropriate to their business needs. Of course, as we also like to be informal, this will be an opportunity for participants to tell us what they want to see in a training course and how we can help them make that accessible to all interested parties.

A Joint Approach

Ultimately, when you put all of these tools together you get a force to be reckoned with. If we could get the entire industry and user community on board, I'm certain interference wouldn't stand a chance to continue. It is vital that we maintain the momentum, innovation, and engineering moving forward, as by developing new tools and processes we can ensure we truly minimize interference.

The tours will take place every day at 11:00 a.m., starting at the Meeting Point on Level 3.

For more information or to register for a tour, please visit

satirg.org/communicasia-interference-tour/

Martin Coleman is the Executive Director of the Satellite Interference Reduction Group (IRG) and is responsible for spearheading a number of significant initiatives. He is committed to introducing new technology and processes to mitigate all types of satellite interference: VSAT TDMA Systems, BIG Data; a reference guide to Interference; sorting out those Difficult Cases including new standards and processes within the Geolocation industry; assisting the ITU in dealing with Harmful Interference; and implementing Carrier ID (CID). Martin regularly addresses the industry on the subject of satellite interference, at global industry events, on an individual basis, and at IRG-led conferences and webinars.

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Thuraya's XT-PRO Gorilla® Glass Is Nothing To Monkey Around With...



Thuraya Telecommunications Company, has launched their latest satellite phone, the Thuraya XT-PRO.

Targeted at professional users across a range of market sectors including government, energy, media and NGOs, the Thuraya XT-PRO is the only satellite phone to feature built-in GPS, BeiDou and Glonass for highest accuracy and added security in every region.

The Thuraya XT-PRO offers the longest talk-time, the largest display, and all three major navigation systems. It brings unparalleled flexibility for government, energy, media and NGO users in all regions.

The Thuraya XT-PRO has a talk-time of up to nine hours, which is the longest on any satellite phone. It is jet-water, dust and shock resistant, ensuring it withstands the harshest environments.

The phone's hardened Gorilla® glass display is the largest available on a satellite phone; and the screen is designed for glare resistance, which allows for optimal visibility in bright sunlight.

In case of emergency, the Thuraya XT-PRO also has a dedicated SOS button with advanced navigation and tracking features for added safety.

Samer Halawi, Chief Executive Officer of Thuraya, said, "The Thuraya XT-PRO houses all three major navigation systems, the longest talk-time, and the largest display on the market. Following the success of the SatSleeve and the XT-LITE, we continue to demonstrate our ability to disrupt the mobile satellite industry with ground-breaking products of the highest quality.

"The XT-PRO is ideal for our core customer base of professional satellite phone users who count on us to deliver highly reliable connectivity in some of the world's toughest and most remote places.

"The Thuraya XT-PRO builds on the success of the highly popular Thuraya XT and introduces new features and functionality for an enhanced user experience. This allows Thuraya to strengthen its satellite phone portfolio with the new flagship product, Thuraya XT-PRO, for the professional user, and the Thuraya XT-LITE for the casual user," added Halawi.

"The XT-PRO's feature upgrades and its sleek design reflect our aim to understand and continuously evaluate what users are looking for in a satellite phone."

The Thuraya XT-PRO allows users to enjoy ubiquitous coverage in areas that are not served, or are under-served by terrestrial networks. The device also works as a security backup when natural or man-made disasters disrupt terrestrial communications.

The XT-PRO can be used across the Thuraya network covering two thirds of the globe, including more than 160 countries.

The ability to use the phone either with a Thuraya prepaid or postpaid SIM card, or a SIM card from any of Thuraya's worldwide GSM roaming partners, gives flexibility for users to choose the best option based on their needs.

The Thuraya XT-PRO is available at all Thuraya Service Partners beginning April 30, 2015.

For more information on the Thuraya XT-PRO, including pricing and airtime plans, please check with your local Thuraya Service Partner.

Additional information:
www.thuraya.com/xt-pro

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Globalstar Europe Enables Out Of Range Connections



Globalstar Europe Satellite Services Ltd., a wholly owned subsidiary of Globalstar Inc. (NYSE MKT: GSAT) of satellite messaging and emergency notification technologies, has announced the availability of Sat-Fi in EMEA.

With Sat-Fi, customers can use their existing smartphones and existing phone numbers to send and receive communications over Globalstar's satellite network, offering voice and data connectivity when beyond the range of the mobile phone network.

Using a Sat-Fi satellite hot spot, as many as eight individuals can make and receive voice calls and email using an app that runs on Wi-Fi enabled devices including tablets, smartphones and laptops.

SMS capability will also be added soon. Subscribers maintain constant, reliable connectivity when travelling in and out of mobile network coverage.

Sat-Fi's performance provides the fastest, most affordable, mobile satellite data speeds—four times faster than the competition—and the clearest voice communications in the industry.

Like all Globalstar mobile satellite solutions, Sat-Fi is designed and priced to appeal to a broad market, including enterprise and government customers who see the value of BYOD, as well as consumers.

Examples include:

- **Commercial fishing for crew welfare**

- **Emergency responders supporting natural or man-made disasters, such as forest fires and flooding, where mobile phone coverage becomes unreliable**
- **Recreational sailors as well as commercial boat owners and their passengers**
- **Remote workers in the oil and gas and alternative energy industries**
- **Temporary industrial worksites, particularly for the construction industry**
- **Hotels, campsites and residential buildings in remote locations**
- **Haulage and transportation companies**

Although we live in a connected world, there are still billions of people who work, play and live in remote locations lacking reliable and affordable voice and data communications. With Sat-Fi, they now have the ability to use their own device to stay connected," said Gavan Murphy Director of Marketing EMEA, at Globalstar. "This innovative product opens up new opportunities for business and consumers to rely on Sat-Fi to maintain reliable connectivity and peace of mind even when off the grid."

Sat-Fi features include:

- **Easy initial setup—Sat-Fi can be operational within minutes to make calls and send emails**
- **Affordable airtime plans**
- **Best voice quality in the industry**
- **Simple 10-digit dialling and access to contacts**
- **Connect as many as eight users simultaneously**

More info:

www.globalstar.com/sat-fi/lander.php

Small Islands Need Big Help



Growth is good news, but usually there are elements that need adjusting because of the growth—and so it is with this company.

ABS and Tuvalu Telecommunications Corporation (TTC) have announced that they have signed a five year contract on ABS-6. The capacity agreement will provide high speed Internet connectivity to support TTC's growing infrastructure.

Under the multi-year contract, TTC will use the C-band A beam capacity on ABS-6 to increase the volume of traffic to the Tuvalu islands offering high speed internet to support schools, banks, hospitals and IP backhaul for its mobile network.

TTC is a state-owned enterprise of Tuvalu, which is the sole telecommunications provider to its islands (six atolls and three reef islands). It provides mainly satellite based services for communications and broadband connectivity between atolls and with the rest of the world.

Tom Choi, CEO of ABS., said, "In March 2015, Tuvalu experienced the impact of Cyclone Pam when it passed through the region and disrupted communications for days. This service will offer critical communications to ensure that the necessary infrastructure is readily available to support the needs of Tuvalu."

www.absatellite.net/

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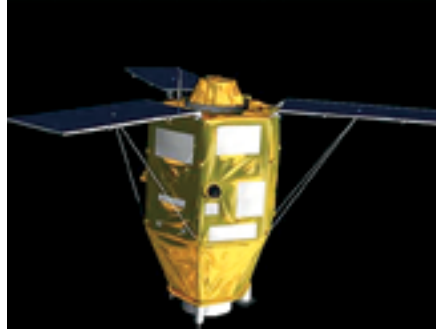
Airbus Defense & Space's Pléiades Puts On Their Overalls For Precision Farming In The U.S.

Airbus Defense and Space and Simplot are launching a project to deliver Pléiades very high-resolution satellite imagery to Simplot customers. In the United States, Simplot will monitor fields distributed over several states during the growing season.

This imagery will be acquired at key crop growth stages, and will be assessed for in-season adjustments.

Satellite imagery provided during the growing season will allow Simplot to collect reliable data on crop conditions, and pinpoint variations that could be related to specific pest, nutrition or water issues.

Thanks to Pléiades acquisition capacity, Simplot will be able to cover its entire geographic footprint to create a precise and detailed database.



This advanced mapping will enable Simplot to provide growers with crop change detection analysis, and estimate the possible impacts this may have on yield.

As a result, it will be possible for Simplot to diagnose crop issues, through field comparisons, allowing Simplot to guide crop production management and optimization decisions in real time.

Factors such as seed density, fertilizer, water and other inputs will be adjusted on a sub-field level with pinpoint accuracy.

"The Pléiades images collected at key crop stages will fully support more sustainable farming practices while saving time and cutting costs," said Allan Feters, Director of Technology for Simplot Grower Solutions.

Airbus Defense and Space relies upon twin satellites, Pléiades 1A and 1B, that operate as a constellation in the same orbit, phased 180 degrees apart and deliver very high-resolution optical data products in record time, offering a daily revisit capability to any point on the globe.

**airbusdefenceandspace.com/
<http://www.simplot.com/>**

Just What The Client Ordered... More Bandwidth

By Tore Morten Olsen, Head of Maritime Satellite Operations, Airbus Defence and Space



The highly technical operations in the offshore arena are driving demand for more bandwidth.

The industry is using new technology developed for monitoring and collaboration, which is changing the way many fields operate. From remote drilling and well sensors, to seismic survey and engineering operations, the industry is reliant on strong, high bandwidth data links over VSAT.

However, the seismic survey industry is one of the biggest consumers of bandwidth within the offshore sector. The potential for cost savings generated by having survey data sent to shore as, or just after it's generated, are significant. However, to move this amount of data over satellite requires significant bandwidth. This demand may be met by temporarily increasing bandwidth to a vessel's existing VSAT services.

One of the first examples of this process in the sector was Marlink's successful delivery of a temporary boost of its Ku-band VSAT services to a 12 Mbit/s dedicated return link for the Atlantic Explorer, a Petroleum Geo Services (PGS) owned seismic survey vessel. The high throughput link was an upgrade to Atlantic Explorer's existing Marlink customized VSAT service.

The service was used during a four week North Sea survey project, enabling seamless transfer of survey data to shore where it could be reviewed and addressed while Atlantic Explorer was still at sea. This enabled survey schedules to be amended based on results as they were generated, saving time, costs and resources for PGS' client as there was no need to wait for data to be delivered on return to port or collected by a helicopter.

Taking into account overheads—packet loss, for instance—the link enabled throughput of approximately 5GB per hour. A link of this scale was necessary in order to facilitate the transfer of survey data. The project was a success, with the link providing massive amounts of bandwidth that enabled PGS and its client to conduct a highly operationally and cost efficient offshore survey.

The connection was enabled on the existing 1.5 m Ku-band antenna on board Atlantic Explorer. A Marlink engineer installed a new 40W BUC (Block Upconverter) prior to the survey, to enable the higher throughput, which was activated while the vessel was out at sea.



The configuration and service provision reflects Marlink's approach to project based VSAT, where it can quickly provide extended capabilities for vessels requesting extra temporary or permanent bandwidth.

Wind Power Bandwidth Boost

This kind of high-level connectivity is not an off-the-shelf product. It supported PGS in providing a very high-end service to its client and, in the competitive seismic survey market, PGS was able to offer not readily available advanced capabilities.

Marlink is receiving more and more requests for similar temporary capability boosts. The Norwegian maritime SATCOM service provider recently concluded a project to significantly increase the Internet speeds aboard the Simon Møkster owned Stril Server Multi-Purpose Support Vessel (MPSV). Simon Møkster runs a fleet of 23 advanced offshore support vessels that are connected to shore and each other using Marlink VSAT services and the Microsoft Lync platform.

The established Norwegian offshore vessel operator has installed Microsoft's standardized business collaboration and communication platform across their organization on land and at sea. This has resulted in operational benefits as well as substantial savings in crew calling costs.

Using Lync via Marlink VSAT enables bridge and engine room teams to access low-cost and reliable telephony, video conferencing, instant messaging as well as data sharing. Marlink ensures high uptime of the VSAT, meeting Simon Møkster's requirements for continuous availability. Custom dynamic allocation of dedicated bandwidth enhances reliability, especially for bandwidth hungry applications.

An example of the customization Simon Møkster has in terms of connectivity is the integration of Lync with the company telephone system, so calls from terrestrial and mobile networks and other Lync users can be made to vessels and received via Lync. A unique VoIP solution has also been implemented for crew members from the Faroe Islands, which reduces their calling costs by at least 50 percent.

With an already highly customized connectivity solution at sea and on land, Simon Møkster was well positioned to engage Marlink to provision

a bandwidth boost for a specific client aboard Stril Server. The extra bandwidth for Stril Server was required by client engineers on a project at the Westernmost Rough offshore wind farm on the UK's east coast, from September 2014 until February 2015.

Marlink increased the available bandwidth on board to 8Mbps downlink and 4Mbps uplink. This enabled the client to operate its own dedicated network aboard Stril Server, facilitating updating and management of documentation using tablet computers. Engineers and managers could read and edit documentation from their tablets, enabling them to work more effectively through greater collaboration and convenience.

A specially installed on-board server would synchronize all data with the client's on board and shore-side network to ensure all documentation was fully up to date. The increased bandwidth facilitated the reliable, fast transfer of all data.

The bandwidth upgrade was deployed using the already installed, above deck equipment that facilitates Marlink's ongoing VSAT services for Stril Server. In order to enable the increased data throughput for the duration of the project, the existing iDirect X5 modem was upgraded to a new generation iDirect X7 modem. Simon Møkster is one of the first ship owners to use the X7 modem on Ku-band coverage.

High satellite capacity and strong relationships with major Satellite Network Operators (SNOs) enable Marlink to meet the needs of customers in the high-end offshore and specialist vessel market who are looking to increase bandwidth at the request of their clients or for short-term projects.

Temporarily increasing bandwidth can be a complex task, but the inherent flexibility in the VSAT services already provided to Stril Server, combined with Marlink's expertise and close co-operation with the SNO, ensured that Simon Møkster could deliver the bandwidth that the company's client needed for this specific project.

Tore Morten Olsen holds a M.Sc in Telecommunications from the Norwegian Technical University and has participated in Executive MBA programs at Wharton Business School in the United States, Insead in France and the Stockholm School of Economics in Sweden. He has more than 20 years of experience in the satellite communications sector, where he began his career as a technical product manager and moved on to hold several, senior management positions with Telenor, Marlink and Astrium Services.



Simon Møkster's Stril Server vessel.

InfoBeam

Inmarsat's IsatPhone 2 — Have Antenna, Will Travel



Inmarsat has launched its first vehicular antenna for the IsatPhone 2.

Designed by AeroAntenna Technologies, the new external, vehicle-mounted, active antenna enables IsatPhone 2 users to enjoy high quality, uninterrupted voice connectivity while on-the-move.

Vehicular antennas provide 'line-of-sight' to a satellite while a user is traveling in a vehicle, enabling them maintain connectivity and continue using their satellite phone.

The new antenna kit will be particularly beneficial for organizations with teams traveling in remote locations, for whom



staying in contact while on the move is essential to their work and their safety.

It is anticipated that the new vehicular antenna kit will be of major benefit to NGOs with teams scattered across some of the most remote regions in the world, as well as for oil and gas, mining, utilities, construction and fleet transportation organisations with personnel in-the-field.

The omni-directional antenna features a sleek design and has an ultraflex cable for easy installation, a suction-mount clip for hands-free communication, and a dual USB charger that allows the antenna to be in use while also charging the IsatPhone 2.

"We have seen a very positive response to the enhanced capabilities of the IsatPhone 2 since it was released last year," said Tim Johnson, Vice President, Enterprise Channel & Portfolio Development, Inmarsat. "The vehicular antenna represents a powerful accessory for the IsatPhone 2 that will even further enhance the phone's capabilities and add significant value for our customers."

www.inmarsat.com/isatphone/

FAA Purchase A Lot Of Weather Program Support Services From Harris

The Federal Aviation Administration (FAA) has selected Harris Corporation for an eight-year, single-award IDIQ contract with a potential value of \$238 million to design and implement a system that will disseminate real-time, comprehensive weather pictures to all aviation users across the National Airspace System (NAS).

The Common Support Services–Weather (CSS-Wx) program will help minimize flight delays and cancellations by providing additional weather data with increased accuracy to more aviation consumers, supporting real-time operational planning and decision-making.

"About 70 percent of flight delays are caused by weather," said Carl D'Alessandro, vice president and general manager, Civil Programs, Harris Government Communications Systems. "The enterprise-wide, data-sharing design of the CSS-Wx solution will reduce these delays, saving the FAA and flying public precious time and money."

The Harris CSS-Wx system is scalable, with Open Geospatial Consortium standards for common weather formats, and highly advanced geospatial- and temporal-based filtering methods to process meteorological data. It applies expertise the company has gained from work on mission-critical weather programs for the FAA, the National Oceanic and Atmospheric Administration and the Department of Defense.

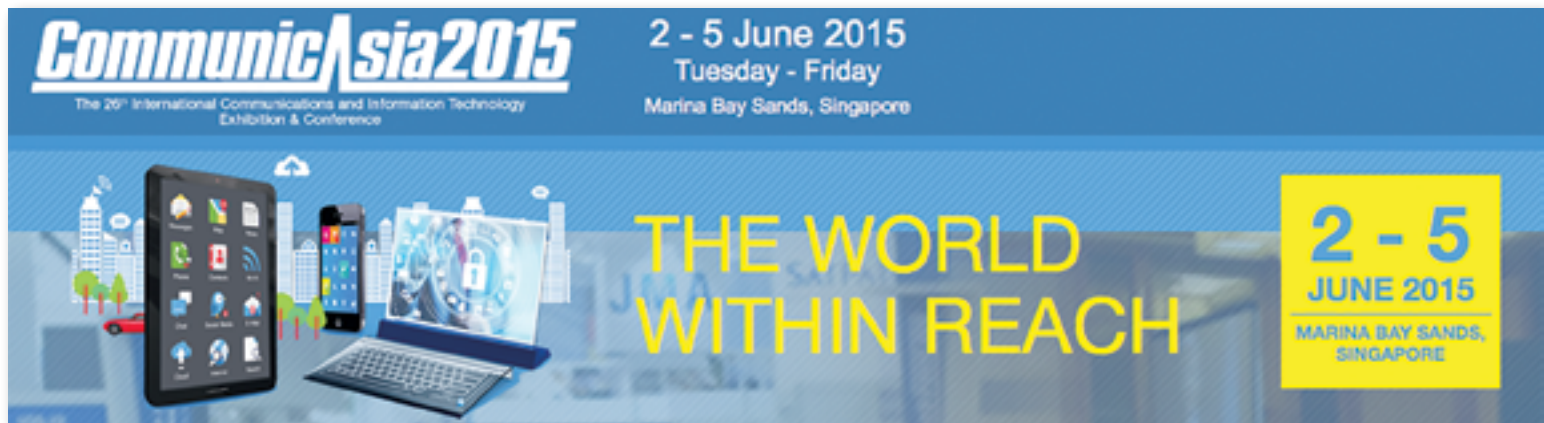
The company is the prime contractor for the FAA Telecommunications Infrastructure (FTI) program, securely connecting more than 4,500 national and international FAA and DOD facilities, manages over 26,000 services, and supports more than 50,000 users. Other FAA programs developed by Harris include:

- **The Weather and Radar Processor, which provides weather processing dissemination and display capabilities to air traffic controllers in the en-route air traffic control environment**

- **Datacomm, which provides air-to-ground digital data link networks to connect FAA air traffic control sites and data communications-equipped aircraft**
- **The NAS Voice System, which provides a secure, IP-based voice network for critical communications between air traffic controllers, pilots and ground personnel nationwide**
- **The Operational and Supportability Implementation System, which serves the General Aviation community in Alaska by providing weather briefing and flight planning services**
- **The National Air Space Enterprise Messaging Service, which will provide the FAA with the network-centric, collaborative information-sharing capabilities afforded by System Wide Information Management**

www.harris.com/

The CommunicAsia2015 Connection



Global mobile connections have passed the seven billion mark—a figure akin to the global population.

Multi-screen consumption of content has thrown control to the hands of the consumer like never before—enterprise mobility has become ingrained in consumers' lives and transformed the workplace where employees not only have choice in devices, but applications, as well.

Once thought to be a thing of the future, driverless cars are to become a reality in everyday lives. The manifestations of megatrends such as IoT, mobility, cloud, social, and big data will be brought to life at CommunicAsia2015, EnterpriseIT2015 and BroadcastAsia2015 from June 2nd through 5th, 2015, at the Marina Bay Sands in Singapore.

Mobile explosion has given rise to dramatic changes in the consumption of technology, data and applications evidenced in the hyper-connected consumer and workforce, and ease of connectivity proliferated possibilities and realities of Internet of Things (IoT). Forecasted to reach US\$59 billion by 2020, Asia Pacific's (APAC) total IoT spending points to the opportunities in the areas of digitized landscape monetization, the capability of wearable technology, big data and analytics and even the IT infrastructures in place for greater agility, flexibility and scalability required for business and national growth.

"The trend of IoT continues to impact ways of life on both consumer and business fronts, bringing about opportunities and challenges for businesses in the areas of mobility management, big data analytics, media consumption and more. Aligned with the global phenomenon, 2015's CommunicAsia, EnterpriseIT and BroadcastAsia will provide international audiences access to insights, latest technologies and solutions ranging from connected devices, smart living, reality of TV-everywhere, satellite applications, enterprise mobility and more," said Mr. Victor Wong, Project Director, from the event's organizer Singapore Exhibition Services.

At CommunicAsia, EnterpriseIT and BroadcastAsia, visitors will experience the latest technologies, obtain insights from business leaders and subject-matter experts, and network with major and emerging industry players from around the world.

CommunicAsia2015 + EnterpriseIT2015

The events provide a deeper look into the entire info-communications ecosystem, with a strong spotlight on state-of-the-art technologies and solutions that can empower a "connected" city, government, enterprise and consumer.

Showcase highlights:

- *Technicolor's IZE (1st in Asia), the 1st Smart Home platform that brings together one's digital lifestyle on TV and other screens*
- *PCCW Global world-class integrated global fiber and satellite network offers solutions such as a global TV network transporting high quality feeds, and cloud-based transcoding for superior multiscreen content*



Speaker presenting Big Data + IoT track during CommunicAsia2014.



Visitors queuing up to enter CommunicAsia2014.

- Temasek Polytechnic Singapore, in collaboration with Toyota Tsusho, will display an Electric Car fitted with Smart Telemetry Solutions GPS and GPS-enabled devices, and a Smart Battery Management System, as well as a compact and lightweight Fuel Cell Bike that runs on hydrogen

Other prominent exhibitors such as Akamai, Dell, CDNetworks, FiberHome, Kaltura, Irdeto, Soliton Systems and many more will also be at the event to display capabilities that are specially designed enable greater connectivity and mobility.

As part of CommunicAsia2015, SatComm2015, the strategic platform for the satellite communication industry, will see the gathering of more than 160 satellite-based companies to address key issues within Asia-Pacific's mobile ecosystem. Specifically, SatComm offers the broadcast, enterprise, government, maritime, military and oil & gas sectors with the necessary network agility and mobility services required for reliable and secure connectivity.

Showcase highlights:

- The *Thuraya IP Voyager* is a high quality vehicular satellite terminal designed for a wide range of mission-critical operations such as border patrol, defense, and disaster response. The terminal enables users to collaborate reliably and efficiently through video, data, and VoIP

- iDirect's *SatHaul* solution enables mobile operators to cost effectively connect remote and rural locations. SatHaul combines the latest in satellite infrastructure with advanced transmission techniques, including mobile specific optimization of signaling, voice and data content.
- KORE Wireless's M2M hybrid satellite and cellular solutions in partnership with ATrack provides a complete coverage solution ideal for wide-area fleet tracking, disaster response, compliance monitoring and mission critical applications.

Other participants include Chengdu Global-way Communication Technology, China Satcomm, Intelsat, Inmarsat, SKY Perfect JSAT, MEASAT, SES, Siemens, ST Electronics, Thaicom, and more from over 20 countries and regions around the world.

CommunicAsia2015 Summit

World business leaders from top tech conglomerates and specialized experts will parcel out valuable insights at this year's CommunicAsia2015 Summit. Defining content that is shaping the future of today's global ICT landscape, more than 200 industry experts including C-level speakers will be sharing the value IoT brings, digitization of the media landscape and how they can bring enterprise mobility to the next level.

Held Concurrently

Enterprise IT2015

Broadcast Asia2015

Incorporating

SatComm2015



A fiery opening ceremony for CommunicAsia2014.

Program highlights:

- Hari Krishnan, LinkedIn's Managing Director for Asia Pacific and Japan, will deliver a visionary address at CommunicAsia2015 Summit and BroadcastAsia2015 International Conference on "How Social Media is Changing the Way People Work and Play".
- Bill Chang, CEO, Enterprise, SingTel, and Barry Lerner PE, Regional Chief Information Officer, Huawei Solutions Marketing South Pacific Region will join a panel discussion on "What Role do We Play in the Age of 'The Internet of Everything' "

Key speakers:

- Steve Leonard, Executive Deputy Chairman, Infocomm Development Authority of Singapore
- Peter Moore, Head – Global Public Sector (APAC), Amazon Web Services
- Jeremy Kung, Executive Vice President – New Media and Chief Executive Officer, Telekom Malaysia
- Barry Lerner PE, Regional Chief Information Officer, Huawei Solutions Marketing South Pacific Region
- Magnus Ewerbring, Chief Technology Officer – APAC, Ericsson ...and many more

What Can Be Expected @ BroadcastAsia2015?

On-demand consumption of media has become the modus operandi for consumers today, bringing about the trend of 'TV Everywhere.' The broadcasting landscape has changed significantly with the advent of social media and increased mobility of consumers brought about by IoT trends today. More than just the delivery of content, with high-definition and 3D now made readily available in the comfort of consumers' homes, the TV experience has become critical for the broadcasting industry.

Highlights:

- **TV Everywhere! Zone (NEW)**
From smartphones, tablets or Smart TVs, media and TV consumption are now everywhere. This year's new TV Everywhere! Zone promises an experiential showcase of solutions from authentication, monetization, network and device management, OTT, security, storage and more.
- **ProfessionalAudioTechnology2015**
The ProfessionalAudioTechnology zone will showcase latest technologies and expertise on pro audio.

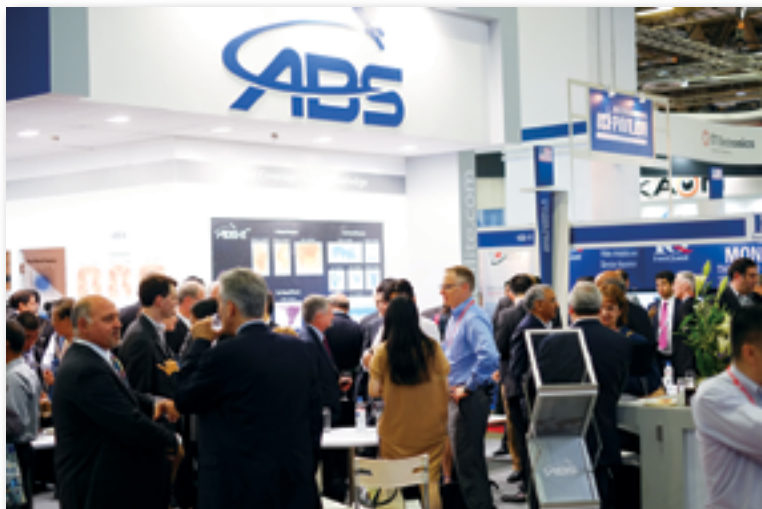
Held Concurrently

Enterprise IT2015

BroadcastAsia2015

Incorporating

SatComm2015



Attendees visit the ABS booth during CommunicAsia 2014.



A busy show floor during CommunicAsia 2014.

- **The Cinematography/Film/Production Zone**

The thrill of a movie can be determined by techniques employed by production teams and houses. To stay ahead and provide audiences with a visual feast and unforgettable experience, latest trends, developments and innovative technologies will be shared.

- **Production Hub**

Well-known and award winning directors, colorists, visual effects experts and more will be sharing their experience and insights on the different equipment and solutions that they are using in the course of their work.

BroadcastAsia2015 International Conference

Recognizing that non-linear viewing options are eclipsing traditional TV viewing habits, broadcasters, channels and networks need to innovate their services in order to secure their foothold in the new broadcasting environment.

With this in mind, BroadcastAsia2015 International Conference is specially designed to tackle the commercial and technical challenges stakeholders have to overcome to achieve a profitable TV everywhere service. Conference topics include OTT expansion into new territories, innovating TV service with intelligent analytics tools, immersive TV technologies, cloud distribution and network virtualization, and digital broadcasting standards and technologies.

The Creative Content Production Conference will host some of industry's most creative minds and emerging content developers. Together they will examine the evolving market landscape and discuss effective strategies to succeed in Asia's film and TV arena. Conference topics include fostering collaborations and co-productions, monetizing a successful transmedia strategy, financing and distribution best practices, and alternative financing options among others.

CommunicAsia2015 / EnterpriseIT2015 Exhibition

Incorporating: SatComm2015

Date: 2-5 June 2015, Tuesday - Friday

Venue: Marina Bay Sands, Singapore, Levels B2, 1 & 3

Opening Hours: June 2-4, 2015: 10:30 a.m. - 6:00 p.m. | June 5, 2015: 10:30 a.m. - 4:00 p.m.

Admission: Business and trade professionals only

Infosite: www.communicasia.com | www.goto-enterpriseit.com

CommunicAsia2015 Summit

Date: June 2-5, 2015, Tuesday - Friday

Venue: Marina Bay Sands, Singapore, Level 3

Admission: Registered delegates only

Infosite: www.communicasia.com/conference/conference-highlights/

BroadcastAsia2015 Exhibition

Incorporating: ProfessionalAudioTechnology2015

Date: June 2-5, 2015, Tuesday - Friday

Venue: Marina Bay Sands, Singapore, Levels 4 & 5

Opening Hours: June 2-4, 2015: 10:30 a.m. - 6:00 p.m. | June 5, 2015: 10:30 a.m. - 4:00 p.m.

Admission: Business and trade professionals only

Infosite: www.broadcast-asia.com/

BroadcastAsia2015 International Conference & Creative Content Production Conference

Venue: Marina Bay Sands, Singapore, Level 3

Date: June 2-5, 2015, Tuesday - Friday

Admission: Registered delegates only

Infosite: www.broadcast-asia.com/conference/conference-highlights/

A Closer Look @... Digital Signage In Education

By Tony Bardo, Senior Contributor + Assistant Vice President, Government Solutions, Hughes



Digital signage is gaining popularity across organizations of all kinds, and especially in government.

From VA Hospitals to major metropolitan police departments to Social Security offices, more government departments and agencies are realizing their value. Making information highly visible, engaging and targeted to audiences with real-time content enhances user experiences and makes the overall operation more efficient. Digital signage platforms also open the way for more challenging distance training and learning systems.

For example, the Government Education Training Network (GETN) delivers interactive audio-visual training programs for thousands of employees over broadband satellite Internet connections across the country. This innovative solution reduces the burdensome costs of employee travel, saving millions of dollars in annual travel and per diem costs at a time when it's needed most. It utilizes high definition screens under control of an interactive learning management system via a secure portal accessible over the Internet.

Many would immediately assume such systems are too expensive for public schools and too "bandwidth hungry" for their existing networks. The reality is there are budget affordable options available from trusted managed service providers who are motivated to expand their enterprise solutions by working with school board administrators and educators.

Best of all, if the solution includes an emergency notification component it becomes grant-eligible, possibly reducing the financial commitment from the school or district. Considering that the price for an enterprise-grade satellite broadband connection can be less than a few hundred dollars per month, and the resulting financial picture is not as severe as one might think.

From a networking perspective, bandwidth limits, reliability, availability and security of student records are just a few of the 'tips of icebergs' that

mean schools and districts should not be going it alone when evaluating a digital signage or learning management system. The prudent direction to take is to partner with a trusted provider with experience in both for enterprise and government, who brings together the know-how as a complete solutions integrator.

Educators know what programs and content should be delivered and results measured in the learning process; the integrator knows how to design the most cost-effective combined network solution, employing terrestrial fixed, mobile and/or satellite platforms. Such combined networks provide fail-safe, path diversity for critical components of an existing primary network should it fail. That means digital signage can still be utilized for instantaneous emergency notifications, even when the terrestrial network is down.

The good news is schools are starting to see the value. A workforce development initiative for high school students recently launched a digital signage network for as many as 30 schools in a mid-western district to help address youth unemployment. The initiative has over 500 screens in the schools managed by a district administrator, but also includes localized content contribution from each school.

One of the most rewarding features is having student groups or clubs generate the content for the screens viewed by their peers. This creates a hands-on approach for students and also helps them develop the technical skills that are imperative in the job market.

The fact remains we're all still learning about learning. And as technology evolves, there will be pioneers testing it for the benefit of everyone else. Digital signage is no different. Some schools have seen the potential and are procuring it now to deliver engaging video, display originally created content, encourage creativity and enhance critical thinking skills in the

HUGHES





Digital signage in the Oklahoma State University's Student Union.

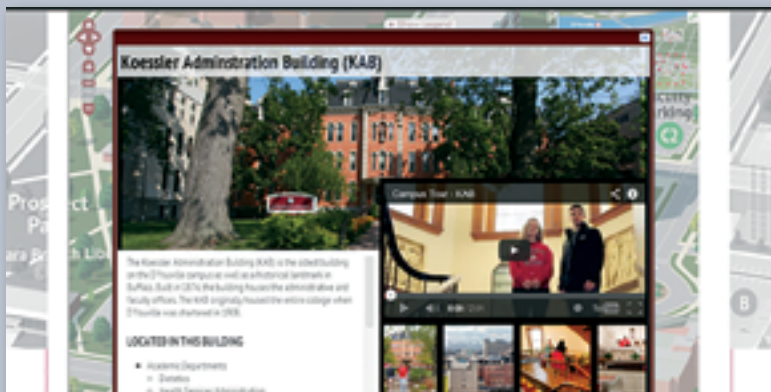
manner that best fits their student's needs. Others are taking the wait-and-see approach.

Though learning systems are still nascent and much remains to be learned in applying them most effectively, no one should doubt their huge potential

value in enhancing our children's' education. Time and results will show the way; indeed through successes and failures alike.

Additional digital signage information:

www.hughes.com/solutions/digital-signage-1



Digital signage being used to guide students around campus.

Anthony "Tony" Bardo has over 30 years' experience with strategic communication technologies that serve the complex needs of government. Since joining Hughes in January 2006, Bardo has served as assistant vice president of Government Solutions, where he is focused on providing Hughes managed network broadband solutions and applications to Federal, State, and Local governments. Bardo also served as Chair of the Networks and Telecommunications Shared Interest Group (SIG) for the Industry Advisory Council, an advisory body to the American Council for Technology (ACT).

Before joining Hughes, Bardo was with Qwest Government Services for nearly five years where he was senior director of U.S. Government Civilian Agencies sales and marketing, senior director of marketing, and senior director of business development. Prior to Qwest, Bardo spent 14 years with the government markets group at MCI where he held the position of executive director for civilian agencies. During his tenure, his teams managed programs for the Federal Aviation Administration's national air traffic control network, the Social Security Administration's toll-free network, the U.S. Postal Service Managed Service Network, and the U.S. General Services Administration's FTS2001.

Mr. Bardo is a 1974 graduate of Virginia Tech where he majored in economics with a minor in public communications.

And Speaking Of SSPI... Creating Room For "New Space"

By Louis Zacharilla, Director of Development, Society of Satellite Professionals International (SSPI)



An interview by Louis Zacharilla with Chris Stott and Randy Segal about the Satellite Industry's Involvement in Silicon Valley.

On May 20th and 21st, SSPI will launch its first chapter in Northern California. The "Silicon Valley chapter" will be one of several SSPI chapters worldwide. This one will have a unique characteristic because it brings together companies and people whose businesses are a part of the tech sector known for high-wire innovation, risk-taking investments and new ways to create and shape mass markets for communications. This is called "New Space."

New Space will meet one that has been characterized by steady, successful growth, and engineering-oriented approach that has helped produce the most enabling and complex infrastructure ever assembled. While the clash of cultures might be assumed, this is a match made in heaven.

The law firm of Hogan Lovells, which has offices in Silicon Valley (Menlo Park) and San Francisco, California, will host SSPI's first chapter event. I will be on hand to discuss the industry's new "Better Satellite World" campaign and to meet with the champions of the new local chapter.

SSPI Chairman Chris Stott, Chairman and CEO of ManSat, will also be there to lend his experience to the new bridge being built between SSPI and Silicon Valley.

I recently had a discussion with Chris and Randy Segal, a partner at Hogan Lovells who co-leads the firm's satellite practice and is a leading transactional lawyer in the firm's Corporate practice group. I asked them what is ahead and why the satellite industry seeks a foothold in Northern California.

Louis Zacharilla

Why is it important for SSPI and the entire satellite industry to have an increased presence in Silicon Valley? Is it because a global industry like ours needs global partners?

Randy Segal

Silicon Valley is the largest global incubator shaping the new face of satellite activity, both in terms of innovative initiatives as well as in the exponential convergence with other communications platforms. This has been going on in earnest since 2014.

Historically, satellite has played a critical role in niche communications delivery services or broadcast mediums. It did well when it was superior to terrestrial alternatives. What Silicon Valley brings to the table is a new way to see and to use satellites.

Silicon Valley sees a satellite solution as integral to the need to connect the world, solve global problems. We have been seeing our clients in Silicon Valley and across the world reaching out to one another, looking to work together in new ways, structuring interesting ventures and acquisitions, and using satellite-based technology as an integrated extension of their existing technical ecosystem. Effectively, these new ventures seek to achieve the "best of both worlds" and is an exciting time to be part of this convergence.

Chris Stott

Is it important? Absolutely. On the one hand, satellite and Silicon Valley already work closely together for service provisioning. It is something that is in our blood. How do you think the Internet gets around the world? It is because of satellites. Satellite is a critical part of this infrastructure.



On the other hand, we have so much that we can learn from each other. Silicon Valley is the beating heart of global innovation. The exponential revolution is happening here and it is driving big changes throughout our industry.

Moore's law is firmly in effect in the Satellite industry: from driving increased demand via digital data through to increasing the capability and reducing the cost of components. The innovations that are applied to satellite construction and data offerings are coming out of companies like Planet Labs and Chandah are stunning and truly game-changing. We have to be here. We are here.

Lou Zacharilla

True. We were the first truly global communication industry and, at the outset, the most innovative. We matured and, as you both seem to suggest, offer a network for companies throughout Northern California who want to build new business models to capture the unique accessibility technologies that we naturally bring.

How will the event that you are hosting at Hogan Lovells tie into our current "Better Satellite World" campaign, Randy? Do you think we will find interest for this campaign among the folks in Northern California? After all, they have only recently been part of SSPI's mission.

Randy Segal

While the styles and legacy of the Silicon Valley innovators may be different than those of the historical satellite participants, they are focused on the same goals: to improve the world through technology, to reach those places affected by natural disasters without warning, and to provide new models for education where education and medical alternatives are limited without e-learning or e-medicine.

Yes, the goal for Silicon Valley innovators is to help contribute to a "Better World" through innovation. They see space-based technology platforms as a means to an end, rather than a stand-alone industry. These entrepreneurs are different in that they exist in a world where angel and VC funding often drives success.

In addition, in the Silicon Valley economy, the business model and pricing for service may be quite different than in the case of a stand-alone space business. Rather, it is more of an extension of other service offerings. Some of these are transformative in terms of a societal benefit or outcome.

Louis Zacharilla

Chris, you have always said that conversation and cooperation are the keys to raising the game of the industry and for accomplishing the goals that you are passionate about to deliver a better world, better education and overall economic improvement. Will this chapter help move that forward?

Chris Stott

Our entire industry needs to be here, learning, watching, and contributing. The establishment of this new SSPI chapter is timed to perfection with huge thanks to Hogan Lovells. We often forget that satellite has always been at the heart of Silicon Valley. It's like coming home.

Where is the largest satellite manufacturer based? In Silicon Valley, in Palo Alto, Space System Loral. Lockheed Martin and many others are also in the Valley. The electronics and aerospace boom after World War II helped to lay the foundation of what Silicon Valley is today. We were there then and are still there today.

This is where we will learn from each other as our worlds again merge. Also, to make a better world you have to know how to navigate through the legal system. Satellite has plowed the proverbial field from Day One. Learn from us, we are here to help and to share knowledge.

We build high tech equipment and launch it into space—and make money from it by providing services to the whole world. Sound familiar? We've figured out the growth stages and pitfalls of financing over the long-term. We've figured out how to navigate the regulatory environment.

Satellites have also built entirely new industries, such as satellite insurance, to facilitate a more connected world. We love what is being done in Silicon Valley and cannot wait to work together to fulfill SSPI's mission, which is to expand the field of people whose lives relate to the satellite option and, yes, to tell the story of how satellites make a better world.

Louis A. Zacharilla is Director Development for the Society of Satellite Professionals International, where he serves as strategist and spokesperson for the international society. He oversees SSPI's corporate development program and serves as liaison between the Society and its underwriters. Mr. Zacharilla also assists with the formation of new partnerships and international events for the Society.

Mr. Zacharilla has written numerous articles for trade and business publications, appears in the media and is a co-author of three books on business, technology and the emergence of cities that thrive by embracing technology infrastructure.

Mr. Zacharilla also serves as a senior manager and the Director of Development for World Teleport Association, another industry trade association and is also one of the founders of the Intelligent Community Forum, an international think tank that studies the role of technologies like satellite on the growth of cities and communities.

Randy Segal co-leads the Hogan Lovells Satellite practice and is a leading transactional lawyer in the Corporate practice group, with a focus on satellite and space system development, deployment, procurement and financing, including international joint ventures, technology development, and wireless, satellite, and technology mergers and acquisitions. In 2014, the Northern Virginia Corporate practice group was recognized as Tier 1 by Legal 500 for US M&A: Large deals (\$1bn-\$5bn). Chambers USA has consistently ranked the Corporate practice group in Tier 1 as well as high rankings by other leading sources such as Bloomberg, Thomson Reuters, and mergemarket.

Prior to joining the firm, Randy served as general counsel and/or a member of the Board of Directors of American Mobile Satellite Corporation, Mobile Satellite Ventures, SkyTerra Communications, Hughes Network Systems, TerreStar Networks, and XM Satellite Radio.

Chris Stott has been a member of SSPI for more than 20 years, a Board member for the past five years and also serves as Chairman of the organization's Isle of Man chapter. Chris was one of the forerunners of the Isle of Man's space industry, setting up ManSat in 1998. Since 2000, the company has carried out satellite filings for the Island under a contract with the Isle of Man Government's Communications Commission.

Chris is a longtime supporter of space and STEM education and serves on the Boards of organizations including the International Space University, Challenger Foundation, Conrad Foundation, the United Space School and the International Institute of Space Commerce. In addition, he serves as Co-Chair of the Manna Energy Foundation and Geeks Without Frontiers and on the faculties of the International Space University and Singularity University.



SatBroadcasting™: Satellite + The Use Of Hybrid Delivery Methods

By Elad Manishviz, Chief Marketing Officer, RR Media



In the age of increasing online content accessed from multiple devices, satellite distribution remains relevant. Satellite distribution networks still efficiently broadcast content to large audiences worldwide—however, TV isn't limited to one box anymore.

Viewers now want to consume media from any device, at any time, and at any location. To meet these desires, providers need a system that offers multiple content delivery services to varied audiences at the same time.

Hybrid systems offer providers the flexibility to deliver content to different audiences in different regions, on multiple devices. Hybrid distribution systems that effectively combine broadcast and broadband capabilities in closely linked networks might provide a long-term solution for broadcasters.

What Is Hybrid Delivery?

Hybrid distribution combines broadcast and broadband networks. The approach delivers media content over satellite, fiber and the Internet. When combined, each method is complemented to create optimized, more connected content delivery mechanisms. Such brings benefits and new opportunities to content providers through providing the most enhanced viewing experiences to audiences.

Watching content becomes non-linear as viewers now are able to interact with content from multiple screens and devices and individualize their viewing with on-demand and other screening services.

The Rise Of Hybrid Delivery

As technology evolves, viewers expect a richer experience overall when consuming video content. Although older generations were once amazed by color TV, today's consumers demand high-definition (HD) programming, and expect the picture quality to continue to improve. Viewers also expect

clearer and more immersive audio as improved technology has improved the sound quality, as well.

In the same way, the widespread adoption and use of tablets, smartphones, and other devices has created the expectation to access interactive content on-demand from any device. With more advancements, consumers will only expect more and more from providers and the content they deliver.

Why Is Hybrid Delivery Needed?

Viewing habits are changing rapidly. Viewers are increasingly consuming content on-the-go from a variety of devices. According to data from January 2014, collected by Pew Research Center, 90 percent of American adults own a cell phone, 42 percent own a tablet, and 32 percent own an e-reader.

Viewers are using these devices to watch video content from anywhere. In a survey of 30,000 people in 60 countries conducted by Nielsen in August and September of 2014, 59 percent of respondents felt that watching video content from their phones is convenient, while 53 percent said a tablet is just as good as a laptop or personal computer. The report also found that viewers prefer to watch content from different devices, depending on where they are and what type of content they're viewing.

What's more, multiple devices allow viewers to watch content from different devices at the same time. More than 58 percent of respondents browse the Internet while watching video programming. The vast amount of available content, and the variety of devices to choose from, make it more difficult to keep the viewers' attention.



Delivering relevant content to the right audiences is a major challenge broadcasters must now overcome in the face of so many viewing options. Hybrid distribution can help providers reach and engage viewers despite this barrier by optimizing content for a variety of regions, devices and consumption options.

Here are some of the top benefits of using a hybrid delivery system:

Optimize content delivery

Using hybrid distribution allows providers to reach diverse audiences who access content on multiple platforms. Broadcast satellite, fiber and the Internet are optimized for the delivery of content on linear channels to large audiences, whereas Internet networks are best suited for interactive content, on-demand services, and niche media services.

Optimizing content can also address the problem of "second screens," or losing viewers' attentions to other devices. Innovative apps allow consumers to browse through content from their tablets and smartphones and watch it from their televisions. Then, viewers can interact with the content from their mobile devices. Other solutions allow viewers to switch seamlessly from TV to mobile devices while viewing content.

It's all about engaging with your viewers to provide the types of content they want to watch, when and how they want to watch it. Getting viewers involved in what they are watching by personalizing their content offering, will have enormous benefits in the long run: ability to better target advertising to specific viewers; new content monetization opportunities like subscriptions and pay-per-view; as well as accumulating business data through measurement tools, you can understand viewing preferences and tailor an engaging offering with rich potential.

Reach more viewers

Hybrid distribution also allows content providers to take existing content to new audiences. As the need to push out

more and more content grows, satellite networks will allow companies to distribute a higher volume of content to a large audience. Providers can then repurpose the existing digital content for online delivery and consumption.

With content repurposed for different screens, content owners also need to think on a global scale with the ability to deliver locally. In order to attract new viewers and drive revenues, it's vital to change standard content into local programming that can watched by audiences in their own language. By providing services like screen size conversions, subtitling, dubbing, tailored local advertising and more, media companies can localize content to further attract new audiences worldwide.

Hybrid distribution of content through multiple networks to various regions can broaden the customer base and create new business opportunities for providers.

Reduce costs

Hybrid solutions for satellite, fiber and online video distribution can also help to reduce content operation and delivery costs. Delivering content to more places on more devices using a converged, single media workflow reduces the content handling and distribution costs.

RR Media's complete ecosystem of digital media services maximize the potential of media and entertainment content, with a smart global content distribution network that optimizes content delivery over satellite, fiber and the Internet.

Elad Manishvitz has served as CMO of RR Media since January 2014. He has over 15 years of experience and business leadership in the digital media, video, entertainment and advertising industries.

Prior to joining RR Media, Mr. Manishvitz served in a broad range of executive positions in global communications, media-related software and Internet companies. He previously served as CEO of Wallstream, VP Products and Strategy at DG-MediaMind and as a VP of Products at NDS (acquired by Cisco).

Mr. Manishvitz has an Executive MBA from the Hebrew University and a Bachelor's degree in Media and Management from the Tel Aviv College of Management.



Careers: The Road To The Future— Recognizing Leadership

By Bert Sadtler, Senior Contributor



As a business consultant, I am in multiple conversations with senior level professionals on a daily basis. Some of my conversations are with the individuals doing the leading; other conversations are with professionals who are being led. I am frequently asked about how to spot leadership.

The success of business today requires a variety of talents. The one that matters the most is leadership. Books on leadership have been published for years, so this is not by any means a new topic.

Is the definition of leadership changing like everything else in today's business world?

Jack Welch, former chairman and CEO of General Electric, is regarded by many as a business leader icon. However, would it be considered great leadership today for a company to formally eliminate the weakest performing 20 percent of the employees each year? Wouldn't today's workers spend a lot of their time fearing the loss of their job instead of focusing on delivering the best effort they could for their employer?

Does the "fear motivator" deliver an employer the best results today? Wouldn't positive reinforcement and a structured, aligned bonus compensation plan serve both employee and employer with a higher degree of performance?

I was in a recent conversation with a senior executive whose team had won several major contracts from a competitor. The companies knew each other well and they had both fought hard for the business. During the transition to take over the contract, the new awardee realized there was a small part of the contract they needed outside resources to perform. The senior executive I was speaking with called his counterpart of the incumbent contract holder and said, "We can't complete this part, I'd like your help with it, would you like to keep it?" The surly reply was, "No, we don't want it, that's your problem."

In a conversation with another senior executive who heard the story, his answer was, "If that call had come to me, I would have said, 'Hell yes!' and then I would have instructed my employees to treat the customer with



the best care we could offer and overwhelm them, hoping they miss our services and we could win it back in the future.”

Obviously, this serves as an example of the lack of leadership in the first conversation and as an example of leadership in the second.

Another of the senior executives I know calls himself out for mistakes he makes. While most traditional business books would not encourage senior executives to make mistakes in front of their team, the reality is that everyone in business gets it wrong sometimes.

However, this executive has used it to his company’s advantage. Businesses are under pressures to always make the right decisions and a really bad decision can put a business in a hole. This executive has been able to foster a culture that says, “I make mistakes. Sometimes, I even laugh at the mistakes. They happen to me and it will happen to all of you in this company. So, do your job as best as you can. Don’t anguish over always getting it right. You can be wrong. It happens. Learn from it and fix it.” As a result of this example of leadership, his company is growing, his organization is aligned, his team is always trying to get better, and little to no time is wasted on being wrong.

Another example of leadership was during a conversation with a CEO who wanted my company to conduct a “Confidential Recruitment.” Generally, a confidential recruitment occurs when the employer wants to hire a replacement before they dismiss the individual currently in that specific role.

I advised the CEO against taking the confidential recruitment path. Some of my points were...

- *In reality, you can’t keep the hiring process a secret and the incumbent will find out*
- *There is a great window of opportunity to demonstrate to your employees that you, the CEO, are listening to their concerns and making changes for the better. All the more reason to do it in the open*

- *Any candidate coming in will want to speak with current employees and walk around the facility. A candidate will not be able to freely do that with a confidential search and, therefore, the best talent may never make themselves available*

The CEO accepted the advice and agreed. The significance is that no one has all the answers. Good leadership recognizes when there is a better idea than theirs and is able to implement the best idea, not necessarily to only implement their ideas.

Is leadership recognized by what the leader actually does or it is recognized by what the leader is able to motivate the team to do?

Once a leader can influence the actions of others, the force multiplier has a significantly larger output than what that leader can deliver as an individual producer. Furthermore, by definition doesn’t it require that to be a “Leader,” that someone or some group is being led?

My litmus test for recognizing leadership is:

Look past the leader and look at the leader’s team. The leader is responsible for every member of that team. The leader should be able to deliver a higher performance output from the team as a unit than from the output if the team members were measured on an individual bases. The leader should have a handle on what motivates each team member. The leader should be motivating each team member as both an individual and also as a team.

Now for the simple reveal: What really happens when the leader is away from the team? Is the team working harder in the leader’s absence because they want to as a result of the leader’s long distance influence. Or, are the team members catching their breath when the leader is absent and just “pushing paper”?

Think about the parameters of this and how much can be learned from a simple observation. As a leader, what is your team doing when you are not present?

Good hunting.



Boxwood is a management, consulting and recruiting firm with a presence in two regions—offices are located in the National Capital region and also in The Greater Tampa Bay Region in Florida.

As a dedicated, consulting resource to employers, Boxwood develops strategies for organizational growth through performance rewards, as well as the evaluation and acquisition of critical talent. Market sectors include: SATCOM, Government Contracting, Communications and Technology.

Bert Sadtler is an invited speaker to discuss the shift in the employer’s performance-based compensation model as well as the shift in the changing paradigm toward acquiring critical senior level talent.

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SatBroadcasting™: The Bear Necessities Of Broadcasting Live From The Tundra

By BJ Kirschhoffer, Director of Field Operations, Polar Bears International



Polar Bears International (PBI) (www.polarbearsinternational.com) is a non-profit organization dedicated to polar bear conservation and educating people on the effects of climate change on the Arctic ecosystem.

For the past six years, we have worked with a team of scientists and educators to produce a unique program called Tundra Connections. Targeted at schools, universities and community organizations, the main objective is to give people experience with polar bears in their natural habitat while learning from climate and animal experts.

The ultimate goal is to get the audience engaged and motivated to take action on behalf of polar bears. Every year, in the late fall, there is a seasonal migration of sorts when polar bears congregate on the shore of Hudson Bay and wait for it to freeze. Once it freezes, they will venture off on the ice to hunt for their primary food source, ringed seals. While they are waiting, our crew has an excellent opportunity to get up close and personal with the bears.

Location Challenges

The challenge of streaming a live show to thousands of classrooms from this remote location next to the bears themselves is a big one, but thanks to state-of-the-art equipment, another successful season has just concluded. The operation centers on the remote town of Churchill, Manitoba, 1,000 miles north of Minneapolis on the shores of Hudson Bay. It's a community of around 900 people and in the late fall there are as many polar bears as there are people roaming around, usually in separate areas, but many of the locals purposefully keep their cars unlocked in case someone needs a quick shelter from a surprise bear encounter!

The town of Churchill is only accessible by plane or rail, and only a few years ago finally received cellular phone service. We make use of a custom designed "Tundra Buggy®," supplied by Frontiers North Adventures, the polar bear tourist vehicle of choice. This vehicle resembles a bus-sized monster truck and, for four weeks at the end of October, we turn it into a high-tech mobile broadcast studio and classroom.





The Tundra Buggy + A New Definition Of Roaming

The Tundra Buggy ventures out each day along the shore of Hudson Bay. Since infrastructure for live streaming is practically non-existent, we have created our own bandwidth to serve our needs. We have a 20Mbit circuit we purchased from the local ISP.

The bandwidth starts and ends in Churchill itself, directly across from the most popular restaurant in town. From there, we maintain 51 miles of wireless Internet that blasts this 20Mbits of bandwidth out to the Tundra

and then to our Tundra Buggy. Essentially, we've created our own cell network that delivers very high quality and high speed Internet to just a couple of targets.

We have deployed a full microwave backhaul network with around 15 nodes to cover the 51-mile area. There are antennas all over the area, including some unusual places, such as a 300 foot tower at an old research facility that at one time launched rockets for Northern Lights study. These multiple links allow seamless coverage, enabling the buggy to select the best signal to obtain the full 20Mb.





Live From The Tundra

Inside the buggy, we have created a sophisticated, but power conscious, broadcast studio. At the center of all this cutting-edge gear is Telestream's Wirecast live streaming production software running on a Mac workstation. Wirecast captures camera feeds, audio, displays and graphics, and creates the finished program stream feed that populates the Tundra Connections web page as well as Explore.org and other sponsors.

There are various video capture devices that grab streams from both internal cameras as well as external cameras on the buggy. All cameras have PTZ (pan, tilt, zoom) with joystick control. Each program lasts about 35 to 45 minutes and includes a panel discussion that is interspersed with live shots of the polar bears outside. For the viewers, there is a chat window in the web interface where participants can send questions, or they can submit their inquiries via email.

We have six people typically rolling around in the buggy, so we don't have a lot of extra room for production personnel. This is, pretty much, a one-man band—I drive the cameras, mix the show, dress the set, do the lighting and the audio.

Last year, the show was still broadcasting in SD with older SD cameras and Firewire connections. We're experimenting with newer Sony PTZ HD cameras and capturing video as IP streams via RTSP directly into Wirecast. Wirecast then re-encodes at 720p HD for the resultant output stream. With shared bandwidth and power restrictions, they try to stay around 2 to 2.5 Mbits for their output streaming bandwidth. One of the discoveries made this year is that using RTSP streams seemed to require a lot of processing cycles on the computer and the audio can lag the video. Next year, we may switch to external HD encoders to try and lighten the load on the computer and re-balance the power consumption.

The Tundra Connections program lasts four weeks in the fall, with a couple broadcasts in the spring as well. Each one of the weeks has a different headline sponsor/partner that helps PBI reach a greater audience. Each organization sends a moderator to participate with panels of scientists, polar bear biologists, climatologists, educators, and so on.

Some of the nodes are in the Wapusk (Cree Indian word for white bear) National Park, about a four hour drive from town by tundra buggy. There's no power, so we use methanol fuel cells and solar power to keep the wireless nodes active and transmitting. In a way, our operation itself is a model for green energy. We're talking about polar bears and climate change with the greatest threat being greenhouse gas emissions—we're at the cutting edge, using some of the identical technology that could potentially help polar bears.

Beyond the challenges of connectivity, power is another concern for our mobile broadcast studio. There is a 1000 amp-hour battery bank stashed under the floor, similar to what one might see in a small camp or an off-the-grid home. A large, high quality inverter is used to convert the 12volt power into clean 120v. The operation needs to stay as quiet as possible, not only for the bears, but for the studio broadcast as well.



On the day of the broadcast, it's 'go time.' We set up a table in the buggy, fire up the LED light panels, and then the moderator introduces our location, how viewers can ask questions, and then we start rolling our content. The on-air personnel include the four panelists and me, with—hopefully—polar bears outside the buggy window.

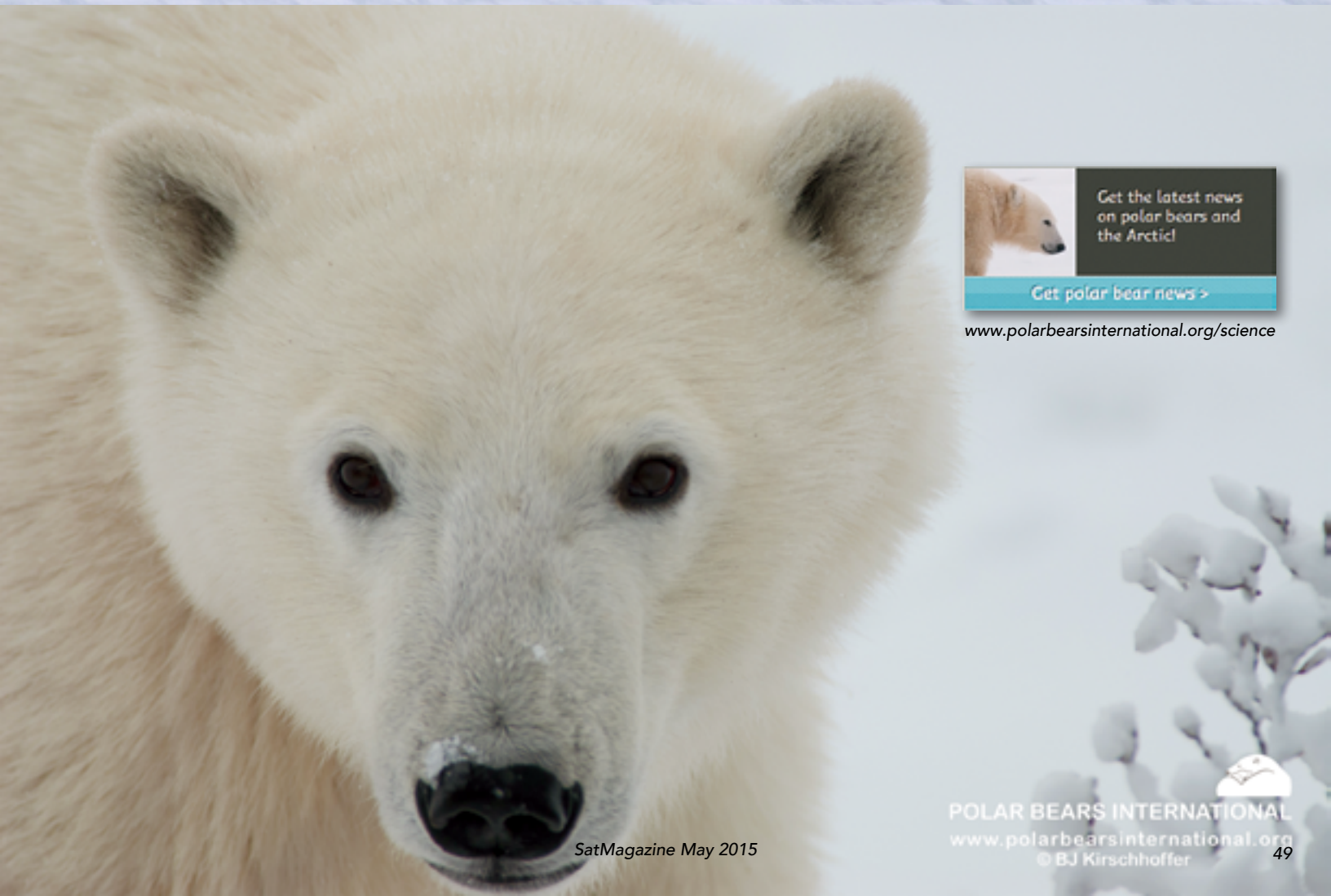
Depending on the age group they're talking to, different topics are covered such as "What do polar bears do?" and "Why do they act the way they do?" At any time, I can switch to the outside cameras using the PIP (picture in picture) feature within Wirecast, or switch to full frame and have the specialists talk about what's happening outside right now with the polar bears, what they are doing, and why. Easily inserting graphics, pictures and footage supplied by the panel on the fly is important to convey information about where the polar bears are, how the ice is changing, and all resultant polar bear behavior.

Some of my favorite features in Wirecast are the ability to grab streams from Teradek devices that let them wander around with a camera if we want to. The "external display out" function is really useful and allows an external monitor to be plugged in for a 'confidence view' so that the panelists can see their graphics and know what the viewers are seeing. The "external display out" feature is also used for video conferencing—this allows Wirecast to mix and send the stream directly into the video conferencing system when they do one-on-one programs with classrooms.

As content delivery networks are expensive for a non-profit, we have experimented with the "virtual camera out and virtual microphone out" feature in Wirecast as we continue to look for ways to get signals out without having to pay content delivery networks extra fees. Using the virtual camera and virtual microphone, streams can be sent to Google Hangout, for instance, or have the streams sent to YouTube. In this manner, a two-way conversation is possible, similar to a video conferencing system with classrooms, but with the world tuning in to the broadcast in through YouTube.

The evolution over the past six years from what started out as a purely point-to-point video conferencing event to these sophisticated webcasts using Telestream Wirecast has exponentially grown viewership. We had a day this year where we almost 17,000 computers were connected to our broadcast. If most of those were classrooms, we estimated one-quarter to one-half million students were watching our program.

Taking this programming project from basic videoconferencing to where we were now has been truly exciting. As the polar ice patterns continue to change and impact these amazing animals, building awareness of the cause and the effects of climate change has never been more important for us.



www.polarbearsinternational.org/science

And Speaking Of The SDA... Perfecting Flight Dynamics

By Erika De Souza Rossetto, Director, Space Data Association



This is the second in a series of columns from the Space Data Association. In the last column, we talked about Radio Frequency Interference, a particularly hot topic in the industry. However, this time I'd like to focus on another, equally important arena—Flight Dynamics and reducing the risk of collision.

Crowded Skies

Naturally, the risk of collision is one of the major concerns for all satellite operators—and for good reason when you realize that, considering debris of any size, the space population is estimated to be greater than 10 million in number. Of course, every rocket launched is cataloged by NORAD (North American Aerospace Defense Command), but it is only possible to

track objects larger than 10 centimeter in LEO (Low Earth Orbit) and 1 meter in GEO.

Although LEO is the most populated region, the geostationary arc is almost completely full. It is also in the GEO region that the problem becomes more serious. This is because the objects are not under atmospheric dragging effect. This means the possibility of re-entrance onto the Earth's surface is practically non-existent and, as a result, the GEO population is continuously growing.

Estimation of the quantity of objects orbiting the Earth. This image was produced to show the number of objects, but the size of each piece is exaggerated. We can see that the LEO is the most populated region, but the GEO is practically all occupied. (Image from NASA).

Protecting GEO

As the industry is witnessing the challenges all are faced with in these crowded skies, the need to perform a de-orbit is becoming more apparent. Increasingly important for all satellite operators is for them recognize the need to take objects out of geostationary orbit and, ideally, put them in a trajectory called the Graveyard orbit. This orbit is computed in terms of the satellite area, mass and solar pressure coefficient. Usually, the altitude of this orbit is around 300 km related to nominal geostationary orbit.

However, the real catalyst for protecting the GEO arc will likely be guidelines from the regulators to ensure such happens. We are already seeing some traction here. For example, in the United States, before satellite operators can receive landing rights, they must present a debris mitigation plan to the FCC (Federal Communications Commission). The debris mitigation plan should include a budget to perform the de-orbit and this regulation is in effect for all satellites launched after March 18, 2002.

The International Telecommunication Union has also presented a recommendation for environmental protection of the geostationary-satellite orbit (Recommendation ITU-R S.1003-2 from 12/2010), which specifies the conditions to perform the de-orbit.

The main challenge remains that, unfortunately, a great many satellites are unable to be de-orbited due to breakup before the end of their life or lack of adequate fuel to execute the maneuvers necessary to elevate the orbit. Around 65 percent of tracked objects are fragments from the breakup of a spacecraft.

Space Surveillance

The most effective, essential way for a satellite operator to keep its fleet safe is by establishing a space surveillance program. The biggest barrier to building an effective space surveillance system is the quality of data available to perform the analysis. The public data for debris, generated by the U.S.A.F.'s Joint Space Operations Center (JSpOpC), is not accurate enough to form the basis for a mitigation maneuver decision. An operator can sign an agreement with JSpOC to receive conjunction reports from them. In this case, the close approaches are computed using a high accuracy orbit determination model. Although it has a more accurate model than the TLE, JSpOC is not able to predict any maneuver during the time span analysis. This means that you may generate a false alert, as the maneuver effects were not taken into account. Given the fact that any amount of fuel is valuable for satellite life, it is crucial to seek a highly reliable analysis before performing a mitigation maneuver.

This was the anchor founding principle of the Space Data Association (SDA), which was established in 2009 by Inmarsat, Intelsat and SES. The goal is to provide high reliable close approaches predictions. With the involvement of the major satellite operators, and a growing number of smaller operators across the globe, SDA is able to gather a vast amount of accurate data.

All operators associated to SDA are committed to sharing orbital and maneuver information. Couple this data and NORAD's TLE database (for those objects for which we cannot obtain better quality data), our organization is able to compute close approaches far more accurately.

Sharing Is Caring

The more data we can gather, the better. Sharing data between the various sources is an obvious and crucial step. Many operators already have an agreement with JSpOC, enabling them to combine the more accurate data for debris from JSpOC and the operator ephemeris.

This has proven to be a highly reliable method for computing close approaches. In fact, we have been discussing how to improve collaboration between SDA and JSpOC. At the end of last year, SDA signed an agreement with the United States Department of Defense (U.S. DoD) to participate in the DoD's Space Situational Awareness Data Sharing Program, the first such agreement with a non-satellite operator. This means that in the near future, SDA will be able to provide an even better space safety service for the satellite community. This is something we are looking to replicate on a global scale, which will be a key focus for us over the coming months.

We are also witnessing several organizations developing systems to increase the debris database. In most cases, telescopes are being used to estimate the orbits for those objects that cannot be tracked by NORAD. The use of telescopes to track geostationary objects has some advantages: one is the possibility of using existing observatories around the world, which increases the number of tracked objects; another is that building a tracking system with telescopes is easier and less expensive than a ground station with radars; also, tracking tiny bodies using telescopes with a large lens is also possible.

Combining all these sources of data means we can build a strong network within the SDA with the ultimate goal of keeping satellite fleets safe. It is vital we continue to work on new developments, as well as engaging with more entities, in order to improve space safety and grow satellite communication capability, all the while remaining free of risks.

Erika Rossetto is leader of flight dynamics for Star One. She coordinates orbital operations of Star One fleet, including space surveillance. She is responsible for specification of flight dynamics and orbital system control for upcoming satellites and follow-up such issues during satellite programs. She is developing research in orbital debris in collaboration with researchers of Brazilian national observatory and federal university of Rio de Janeiro.

On May 19th and 20th, the Centre National D'Etudes Spatiales (CNES), will be holding its first international workshop on Conjunction Assessment, in Paris. SDA will be presenting a paper on what needs to be done to improve Conjunction Assessment.

On May 21st, the Space Data Association will be hosting a Flight Dynamics Meeting in Paris, discussing how SDA services can be improved. For more information or to register to attend, please visit

www.space-data.org/sda/events/sda-flight-dynamics-meeting/

The Business Of Operating... + Growing... An Independent Teleport

By Robert Smibert, Founder, President + Chief Executive Officer, Virgin Technologies

Virgin Technologies Inc., owns and operates its own iDirect teleport which features an 8.1 meter antenna, two 3.8 meter antennas, all with redundant RF, and more than 30 Mbps of data transmission capability.

Along with advanced manufacturing capabilities, the purchase and operation of this teleport has played a major role in the evolution of our business. The cost of a teleport is, obviously, a significant capital expense for any business, new or old—hard lessons have been learned as the teleport evolves from a regional based, independent operation to one with strong North American growth.

Obviously, the recurring fees, upgrades and costly expenses for broadband are monetary challenges that immediately spring to mind for anyone considering entry into the teleport business. Yet, once overcome, the real business tests come into full view, namely, managing the teleport properly to ensure that the operation is a profitable enterprise, while simultaneously and constantly aligning capacity to meet user demands and needs.

One key strategy that has allowed scaling to our customer base has been the modular design of our network infrastructure, permitting the match up of blocks of data with new revenue streams. Moreover, Virgin Technologies unique industry niche is that, while we own and operate the teleport, we also manufacture our own line of Ku- and Ka-band, auto-aiming satellite antennas. A robust international customer base that uses our products and relies on the teleport for their day-to-day operations is also a significant plus for the operation.

The teleport's history has been predominately to serve the oil and gas markets in Western Canada—from drilling rigs, camps, and mobile data vans to pipeline.





What is unique about Virgin Technologies' North American teleport is that a significant portion of the users are direct end-users. In practical operational terms, this means the teleport and network operations center (NOC) receive routine phone calls on everything from a down Internet connection to a broken phone, and often by someone in a highly stressful situation.

Through the management and operations of our sales and operations teams, the NOC team, the company's CTO and network team, and the field technician teams, the quality of management and operations is tested on a daily basis. Operational success is underpinned by a growing footprint in the O&G verticals in North America, coupled with the recent launch of an OEM Global Dealers Network.

In practical terms, real-time reports are produced on teleport operations that are distributed to management every eight hours, 24x7x365. This information drives constant management of our operations and rapid response to customer and market demands is the result.

This growth is not without hiccups—recently, the NOC began to receive complaints from U.S. based customers on Canadian IP addresses while web browsing. This required the company to purchase a new set of American IP addresses to please the customers. This close link between teleport operations, end-users, field technicians and sales can sometimes admittedly be messy—it is not unusual for a sales person to be in the NOC championing a solution for their customer, while NOC personnel simultaneously trouble shoot the issue remotely over the phone with the end user. Ultimately, as a business, the teleport operation embeds accountability across the entire company, as there is no one else to point to for failures, bad service, or mistakes.

Going forward in 2015, Virgin Technologies' goal is to continue to add new users to the teleport operations who directly use our products and the teleport. However, we also foresee forging new, reciprocal relationships with international teleport operators who we can potentially pass along our customers to, and who may also want to leverage our company's unique value proposition as manufacturers of antennas.



For example, to help move this play forward, our products are offered to international buyers in Canadian dollars as an incentive to join our Global Dealer Network. As teleport operators ourselves, we believe our identity and capability will continue to resonate with new customers, as we share their experiences and challenges in working closely with end-users directly. That's been Virgin Technologies' history and, we anticipate, the means to a successful future, as well.

The company's infosite is located at www.virgintechologies.com/

Taxing The New SATCOM Technologies

By Selva Ozelli, Attorney + CPA

Editor's note: In this feature, the author provides a brief review of SATCOM technology and the types of satellites on orbit today. She then presents the pertinent legislation and explains the space and ocean sourcing rule.

We thank **Tax Notes International** (www.taxanalysts.com/) for allowing us to repurpose this feature from their publication, which is copyrighted 2015 Tax Analysts and is reprinted with their permission.

New Technologies

O3b Networks (O3b) is the first communications satellite company to commercialize a non-geostationary, Medium Earth Orbit (MEO) satellite constellation, which began its commercial operations in September of 2014, the same month when the Indian Space and Research Organization successfully placed its first satellite into orbit around Mars¹.

O3b was founded in 2007, backed by SES S.A. (the second largest satellite company), Google, and some banks, to develop a satellite constellation that would serve 3 billion people who live in parts of the world that are

insufficiently connected by fiber optic cable and thus do not have access to the Internet through their cellphones². The company's name, O3b, stands for "other 3 billion."

O3b launched its first set of MEO in June 2013, but there were complications with a two of the four components, which were placed on standby³. O3b successfully launched MEO in two more launches during 2014, which brought the number of its

four satellites to eight more satellites to

operational satellites in its satellite constellation to 10⁴. O3b's successful launches were in contrast to the back-to-back rocket launch explosions that involved private space companies—Orbital Sciences Corporation's unmanned rocket, which was carrying cargo to the International Space Station, including 26 experimental satellite projects; followed by Virgin Galactic's manned SpaceShipTwo rocket⁵. All three private space companies—O3b⁶, Orbital Science⁷, and Virgin Galactic⁸—are in a race that also includes Internet companies and various country space programs to develop reasonably priced communications satellite technologies to meet increased global market demand⁹.

Types of Communications Satellites

In simple terms, a communications satellite serves as a reflector in space. The satellite receives uplink signals sent from an antenna, gateway, or ground station located at one point on Earth and then processes the incoming signal by changing the frequency and amplifies it. The satellite then reflects these signals on a downlink to another antenna, gateway, or ground station located in another point on Earth.

Communications satellites can

be located in a variety of orbits

including geostationary or bits and medium and Low Earth Orbits (LEO).

Geostationary

A geostationary satellite is stationed 22,236 miles above our planet's equator, appearing to hover at a fixed orbital point, while it moves circularly at the same speed as Earth's rotation, in 24-hour orbits. It relies on stationary antennas, since there is no need to track the satellite.

A classic geostationary communications satellite provides a broad single beam (C-band) to cover wide regions or even entire continents on Earth to facilitate intercontinental and global communications. Because of its significant distance from Earth, the signals to and from the geostationary satellite are delayed, making the C-band beams unsuitable for many applications. Therefore, a geostationary communications satellite acts in tandem with fiber optic cable, terrestrial infrastructures, to transmit data more quickly.

There are wireless satellite telephony network (STN) systems, which integrate geostationary satellite and terrestrial radio communication technologies into one system that may be approved for use in the United States by the Federal Communications Commission¹⁰.

The new geostationary satellite technology being highly commercialized is the high-throughput satellite (HTS). HTS can provide more capacity per orbital slot, by handling much larger amounts of data, at higher speeds, through frequency reuse and use of multiple narrowly focused spot beams (Ka-band, Ku-band), as opposed to one wide beam, on areas of high demand and population density, cost efficiently¹¹. Satellite manufacturers are developing new electric HTSs¹², while the largest communications satellite companies are expanding their HTS network coverage area by entering into first-of-its-kind interconnection agreements ("HTS agreement")¹³ and by launching HTS into Geostationary Synchronous Orbit (GEO) as detailed in Table 1¹⁴. Currently, most of the communications satellites in space are located in GEO¹⁵.

Non-Geostationary

A non-geostationary satellite can be located at a MEO anywhere from 1,243 miles to 22,236 miles below a geosynchronous orbit, or it may be located at LEO anywhere from 99 miles to 1,243 miles below a geosynchronous orbit. A non geostationary satellite does not appear to hover at a fixed orbital slot but needs to be continuously tracked by moving ground antennas as it moves eastward in a circular motion around the world in anywhere from 1.5 to 23 hour orbits. Because of a non-geostationary satellite's proximity to the Earth, the signals to and from the satellite can provide fiber-optic-cable-like performance at high speed, which supports video, Internet protocol virtual private network, Voice over Internet Protocol (VoIP), cloud computing, enterprise applications, and interactive gaming in remote locations throughout the world that are insufficiently populated and insufficiently fiber-optic cable connected¹⁶.

However, an MEO or LEO satellite constellation requires many more satellites, satellite launches, gateways, moving antennas, and ground stations to provide the same beam coverage of Earth that can be accomplished with only three geostationary satellites, making these satellite constellations more expensive to commercialize and to operate¹⁷. Other challenges concerning commercializing and operating MEO and LEO satellite constellations include:

- *Space debris*
- *Interference issues with existing communications satellite infrastructure because of increased communication between moving antennas, base stations, and satellites*
- *Obtaining landing rights for gateways in various countries*¹⁸

To alleviate the cost burdens relating to establishing and operating an MEO or LEO satellite constellation, several companies are developing technologies to reduce the moving antenna costs¹⁹ and satellite launch costs by making rockets reusable²⁰. Such initiatives are encouraging companies to continue to develop commercial non-geostationary LEO satellite constellations to provide low-cost satellite communications services to the 3 billion people who live in parts of the world that are insufficiently fiber-optic-cable connected.

In-Earth-Atmosphere Satellite Initiatives

In addition to MEO and LEO satellite companies, there are also U.S. Internet companies that are developing communications satellite technologies to be used within Earth's atmosphere. Google's Project Loon aims to deliver Internet access to Earth's remote areas through fleets of high-altitude balloons²², while Face book's Connectivity Lab project aims to develop a solar powered drone to compete with both satellites and balloons to deliver Internet access cost efficiently²³.

Market Demand and the Orbit Act

The technological innovation and growth in the \$190 billion global communications satellite industry during the past 14 years was spurred by increased commercial demand for up-to-date information in a globalized economy²⁴ as well as by the enactment in the United States of the Open-Market Reorganization for the Betterment of International Telecommunications Act (ORBIT Act)²⁵.

The ORBIT Act encouraged competition in the global satellite services market by ending the monopoly position of the International Telecommunications Satellite Consortium (Intelsat) through privatization²⁶.

Intelsat was a former intergovernmental consortium that was established in 1964 and promoted the development and commercialization of a global satellite system in cooperation with countries throughout the world based on a treaty agreement. Intelsat enjoyed privileges including immunity from competition laws and exemption from taxation²⁷.

From 1964 up to its privatization in 2001, Intelsat operated the largest single fleet of commercial geostationary communications satellites that were a key part of the global communications network, which in 1969 allowed 500 million people from around the world to watch on TV images of astronaut Neil Armstrong's first steps on the moon.

Intelsat's privatization in 2001 coincided with the Internal Revenue Service's issuance of proposed regulations governing space or ocean and communications source rules, under Internal Revenue Code section 863(d) and (e)²⁸. These proposed regulations were withdrawn and replaced on September 19, 2005, with new proposed regulations that were finalized on December 26, 2006²⁹. The space and ocean source rule is used for sourcing income from the commercial activities of privatized space companies, which provide 40 percent of the global communications satellite services³⁰.

The Space and Ocean Sourcing Rule

The space and ocean rule sources income based on the residence of the recipient earning the income and serves different functions for U.S. taxpayers as compared with foreign taxpayers.

A U.S. taxpayer is subject to U.S. taxation on its worldwide income, making the ocean and source rule relevant to the taxpayer's outbound transactions including subpart F³¹, withholding taxes, and foreign tax credits. Under the space and ocean rule, a U.S. person's³² income from space or ocean activity is U.S. source unless the income, based on all the facts and circumstances, is attributable to functions performed, resources employed, or risks assumed in a foreign country or countries³³.

A foreign taxpayer is subject to U.S. taxation on some U.S.-source income or income that is effectively connected with a U.S. trade or business³⁴. A foreign person's³⁵ income from space or ocean activity is foreign source, unless:

- *Space and ocean income derived by a CFC³⁶ is U.S.-source income, except to the extent the income, based on all the facts and circumstances, is attributable to functions performed, resources employed, or risks assumed in a foreign country or countries*
- *Space and ocean income derived by foreign persons (other than CFCs) engaged in a U.S. trade or business is U.S.-source income to the extent that the income, based on all the facts and circumstances, is attributable to functions performed, resources employed, or risks assumed in the United States.³⁷*

Thus, the space and ocean rule defines the boundaries of U.S. taxation of a foreign taxpayer's inbound transactions, allowing them to structure their operations to minimize their U.S. federal income tax liability.

Space and Ocean Activity

Under the space and ocean rule, space and ocean activity includes any activity conducted in space or Antarctica or under water other than that of the United States, its possessions, or a foreign country, to the extent recognized by the United States³⁸. Such activity includes the manufacturing of property³⁹, the performance of services⁴⁰, the leasing of equipment⁴¹, the licensing of technology or other intangibles⁴², the underwriting of insurance risks on activities that produce space income⁴³, sales of property in space⁴⁴, communications activity in international waters⁴⁵, and the lease of a research vessel⁴⁶.

The following examples demonstrate the application of the space and ocean rule to the new communications satellite technologies of private space and Internet companies.

Geostationary Satellite HTS

A U.S. satellite company (USSCo) and a foreign satellite company (FSCo) enter into an agreement as follows: USSCo will lease its HTS satellite and sub-license its orbital slot in geosynchronous orbit to FSCo (note that an orbital slot is applicable in the context of a geostationary satellite, but not in the context of a non-geostationary satellite constellation). FSCo will operate the HTS satellite and gateways or ground stations in the United States because an HTS satellite uses smaller beams, which are connected to a gateway beam or station on the ground with different frequencies used for the forward and return channels.

Part of USSCo's performance as lessor or sub-licensor in this transaction occurs in the United States, but the HTS satellite and the sub-licensed orbital

slot are in space. USSCo's income from leasing the HTS satellite and sub-licensing the orbital slot would be from space activity and foreign sourced to the extent the income, based on all the facts and circumstances, is attributable to functions performed, resources employed, or risks assumed in a foreign country or countries⁴⁷.

FSCo's income from commercializing the HTS satellite, orbital slot, and U.S. ground stations would be from space activity. Assuming FSCo is deemed engaged in a U.S. trade or business for operating the U.S. gateway or ground station, then FSCo's space income would be U.S. source to the extent that the income, based on all the facts and circumstances, is attributable to functions performed, resources employed, or risks assumed within the United States⁴⁸. FSCo may be engaged in a U.S. trade or business when conducting business through an independent or dependent agent⁴⁹ or by being a partner in a partnership engaged in a U.S. trade or business⁵⁰. There is no description in the IRC or Treasury regulations defining when a principal agent relationship exists; the U.S. tax analysis is made based on facts and circumstances that differ from the analysis for attributing profits to a permanent establishment under a tax treaty⁵¹. An FSCo engaged in a U.S. trade or business would be taxed at graduated rates on effectively connected U.S.-source income and some foreign-source income attributed to the U.S. office or fixed place of business that may be offset by deductions and tax credits only if FSCo has filed a U.S. tax return⁵².

Non-Geostationary Satellite Constellation

U.S. Internet Co. (USICo) is developing an MEO satellite constellation, which is operated by a foreign satellite company (FMCo) that is not a CFC. FMCo's satellites are manufactured by a foreign space company (FSCo) and launched into space by a foreign launch company (FLCo). FMCo leases a transponder to USICo but does not provide uplink or downlink services in the United States or in a foreign country on behalf of USICo.

As a service provider, USICo offers a service to personal computer users accessing the Internet. This service permits a customer, C, to make a call, initiated by a modem, routed to a control center, for connection to the World Wide Web. USICo transmits the requested information over a transponder on FMCo's MEO satellite constellation and performs the uplink and downlink functions in the United States and a foreign country. USICo would be providing communications services consisting solely of the delivery by transmission of communications or data that could also constitute a space or ocean activity⁵³. The MEO satellite constellation operates 8,000 kilometers (4,970 miles) above Earth's surface. Space is not a defined term under the code or the regulations or under the Outer Space Treaty, but international law defines the lower boundary of space as the lowest perigee attainable by an orbiting space vehicle at the Karman Line (100 km/62 miles from Earth's surface). Accordingly, the communications activity over a transponder on MEO satellite constellation would be a space/ocean communications activity⁵⁴. If USICo does not derive international communications income, then services performed by USICo would be space activity to the extent the value of the service is attributable to functions performed, resources employed, and risks assumed in space⁵⁵. However, if USICo derived international communications income, the international communications income rule would override the source rules for space or ocean activities, and USICo income would be 50 percent U.S. source and 50 percent foreign source⁵⁶.

In FMCo's MEO satellite constellation, the satellites constantly fly over Earth and do not appear to stay in an orbital slot. From any one place on Earth, the MEO satellite flies by such that a remote station requires tracking antennas to track the satellite as it flies across Earth so that the remote can perform "make before-break" decisions and ensure that connectivity can be established with the next satellite to fly over before the current satellite disappears from view as it continues its flight around Earth.

Since FMCo does not provide uplink or downlink services in the United States or in foreign countries for USICo but only leases a transponder on its MEO satellite constellation located in space, FMCo's income from leasing transponders to USICo would be space activity and foreign sourced, not subject to U.S. tax liability under the space and ocean rule⁵⁷.

FSCo's income from selling satellites to FMCo and FLCo's income from launching FMCo's MEO satellite constellations into space are also space activity since the rights, title, and interest in the MEO satellite pass to FMCo in space⁵⁸. Based on the legislative history, the Treasury Department and the IRS believe that sales of property in space or international water -with the exception of sales of inventory property in space or international water for use, consumption, or disposition outside space, international water, and the United States should be considered space or ocean activity and that the source of income from such sales activity should be determined under section 863(d)⁵⁹. Accordingly, FSCo's and FLCo's income from the space activity would be foreign-source income under the space and ocean rule⁶⁰.

Balloons and Drones

U.S. Internet Co. (USICo) is developing in-Earth atmosphere balloons and drones to serve as communication satellites. As a service provider, USICo offers a service to personal computer users accessing the Internet. This service permits a customer, C, to make a call, initiated by a modem, routed

to a control center, for connection to the World Wide Web. USICo transmits the requested information over a balloon or drone communication satellite and performs the uplink and downlink functions. USICo would be providing communication services consisting solely of the delivery by transmission of communications or data⁶¹ that could also constitute a space or ocean activity⁶². Income derived by a taxpayer for transmitting communications or data between a point in space or international water and another point in space or international water would be income from a space/ocean communications activity⁶³. Since the balloon and drone communications satellites would operate within Earth's atmosphere, below the Karman Line, the balloon and drone communications activity would not meet the definition of space/ocean communications activity.

Accordingly, any communications income relating to balloons and drones could be determined under the international communications source rules, which states that a U.S. person's international communications income is sourced as 50 percent U.S. income and 50 percent foreign income from the transmission of communications or data from the United States to any foreign country (or U.S. possession) or from any foreign country (or U.S. possession) to the United State⁶⁴.

To the extent that USICo's personal service income constitutes international communications income, this would override the personal service income source rules that source personal services performed inside the territorial limits of the United States as U.S.-source income, and personal services performed outside the United States as foreign-source income⁶⁵.

Table 1. HTS Satellites

Satellite Company	Country/Total Number of Geostationary Satellites	HTS	HTS Manufacturer	Country	HTS Launcher	Country	Year
Intelsat	Luxembourg/ 50-plus satellites	Epic	Boeing	U.S.	Arianespace	Kourou Space Center, French Guiana	2015
Inmarsat	U.K./11 satellites	Global Express	Boeing	U.S.	International Launch Services (ILS)	Baikonur Cosmodrome, Kazakhstan	2015
Telesat	Canada/14 satellites	Vantage	Airbus Defence & Space (Astrium)	France	Mitsubishi Heavy Industries (MHI)	Tanegashima Space Center, Japan	2015
Viasat	U.S./2 satellites	Viasat 2	Boeing	U.S.	SpaceX	U.S.	2016
Echostar	U.S./23 satellites	Hughes Net	Space Systems/Loral	U.S.	Arianespace	Kourou Space Center, French Guiana	2016
SES, SA	Luxembourg/ 50-plus satellites	Hybrid HTS	Astrium	France	Not determined		2017

Reusable Rockets

A U.S. space company (USSCo) manufactures unmanned launch rockets, launches satellites into space from a launch facility located in the United States, and also attempts to land rockets on a barge the size of a football field located 200 miles off the U.S. coast in the Atlantic Ocean in an attempt to make rockets reusable, which reduces launch costs.

USSCo unmanned rocket production income would be sourced as follows:

- When production occurs only in space or in inter national water, income attributable to production activity is space or ocean income that is sourced under the space and ocean rule.⁶⁶
- When property is produced both in space or in international water and in other areas, gross income must be allocated to production occurring in space or in international water and other production to the extent the income, based on all the facts and circumstances, is attributable to functions performed, resources employed, or risks assumed under the space and ocean rule⁶⁷. (See the "How To Apportion" section of this article for apportionment.)

The regulations empower the commissioner of the IRS to separate parts of a single transaction into separate transactions or combine separate transactions as parts of a single transaction⁶⁸ so that the space and ocean activity is broadly defined⁶⁹ without disadvantaging a taxpayer⁷⁰. Accordingly, when services occur both in space or in international water and constitute parts of a single transaction such as USSCo's reusable rocket launch activity (the rocket launch activity taking place in space and the rocket landing on an experimental barge placed 200 miles away from the U.S. coast in international waters)⁷¹, the transaction will be characterized as a space or ocean activity in its entirety and sourced under the space and ocean rule⁷².

How To Apportion

When a taxpayer allocates gross income based on all the facts and circumstances⁷³, the taxpayer must allocate or apportion expenses, losses, and other deductions to the class of gross income, which includes the total income so allocated in each case⁷⁴. A taxpayer then applies the allocation or apportionment rules to properly allocate or apportion expenses, losses, and other deductions to gross income from U.S. sources and non-U.S. sources⁷⁵. The taxpayer must prepare and maintain documentation

Table 2. Non-Geostationary Satellite Constellations

Satellite Company	Country	Satellite Constellation/ Total Number of Satellites in Constellation	Manufacturer	Country	Launch	Country	Year
O3b Networks	Channel Island	O3b/up to 120 satellites	Thales Alenia	France	Arianespace	Kourou Space Center, French Guiana	2014
Iridium	U.S.	Next Generation/72 satellites	Thales Alenia	France	SpaceX	U.S.	2015
Orbcomm	U.S.	Next Generation OG2/31 satellites	Sierra Nevada Corp.	U.S.	SpaceX	U.S.	2014-2015
Gonets Satcom	Russia	Gonets DM-1/18 satellites in Northern Hemisphere	Academician Reshetnev Information Satellite Systems (ISS)	Russia	Cyclon rocket	Plesetsk Cosmodrome	2015
Commstellation	Canada	78 micro satellites, 100% global coverage	Microsat Systems Canada Inc.	Canada	Not determined		2016-2018
OneWeb/ WorldVu	U.S.	Ku-band satellite constellation to be developed/ 648 satellites	Not determined		Virgin Galactic, Launcher One	U.K.	2017
SpaceX	U.S.	Optical-laser technology LEO satellite constellation to be developed/ 4,000 satellites	SpaceX	U.S.	SpaceX	U.S.	2019

regarding the allocation of gross income and allocation and apportionment of expenses, losses, and other deductions, the methods used, and the circumstances justifying use of those methods at the time its return is filed and must make this documentation available to the IRS within 30 days upon request⁷⁶.

Conclusion

In our globalized economy, private global communications satellite companies and Internet companies are constantly developing new ways to bring communications services to people who live in parts of the world who cannot access the Internet through their cell phones. These companies do not have immunity from competition laws and are not exempt from worldwide taxation; therefore they should carefully consider the impact of international tax laws, tax treaties, and competition laws on their international tax planning initiatives, as they set out to commercialize their new technologies to bring communications services to parts of the world where their services are most needed⁷⁷.

Footnotes

¹The Federal Communications Commission has authorized 03b to operate a number of Earth stations in the United States to communicate with the 03b system. See Federal Communications Commission DA-14-637; "India successfully sends 'MOM' to Mars," USA Today, Sept. 24, 2014; Madison Park, "India's spacecraft reaches Mars orbit . . . and history," CNN, Sept. 24, 2014.

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⁵Mike Wall, "Private Orbital Sciences Rocket Explodes During Launch, NASA Cargo Lost," Space.com, Oct. 28, 2014; Irene Klotz, "Orbital Sciences' unmanned rocket explodes on liftoff in Virginia : NASA," Reuters, Oct. 28, 2014; Miriam Kramer, "Orbital Sciences to Stop Using Suspect Russian Rocket Engine After Explosion," Space.com, Nov. 5, 2014; Joel Achenbach, Drew Harwell, and Mark Berman, "Virgin Galactic's SpaceShipTwo crashes after 'anomaly' during test, killing one," The Washington Post, Oct. 1, 2014.

⁶Stephen Clark, "03b Networks plans satellite fleet expansion," Spaceflight Now, Dec. 29, 2014.

⁷Orbital pioneered the use of smaller, more affordable space craft used for geosynchronous-Earth orbit (GEO) communications and created the first global communications network to employ a constellation of ORBCOMM LEO satellite-based communications network. See <https://www.orbital.com/SatelliteSpaceSystems/CommunicationsimagingSatellites/>.

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¹⁰SkyTerra, formerly Mobile Satellite Ventures, was a Reston, Virginia, company that developed telecommunications systems that integrated satellite and terrestrial radio communication technologies into one system. In March 2010 the company was acquired by Harbinger Capital Partners and became part of a new company called LightSquared. LightSquared placed its first geostationary satellite, SkyTerra-1, in orbit on November 14, 2010, and is seeking FCC approval to provide a wholesale, nationwide, wireless broadband network

integrated with satellite coverage. LightSquared intends to combine its existing geostationary satellite communications services with a ground-based 4G-LTE network that transmits on the same radio band as its satellites. The L-band is next to the primary GPS frequency and may cause interference with the GPS system. See http://space.skyrocket.de/doc_sat/hs-702.htm; Nick Brown, "LightSquared creditors to vote on latest bankruptcy exit plan," Reuters, Jan. 20, 2015.

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¹⁶In its April 1998 study, the FCC predicted that "[i]n the future, new voice, data and video services authorized by the Commission will be available to consumers via low Earth orbiting, non-geostationary satellite systems." See http://www.faa.gov/about/office_org/headquarters_offices/ast/media/leo-d.pdf.

¹⁷Many LEO satellite constellations were a commercial failure: Iridium in 1999, ORBCOMM in 2000, and Globalstar in 2002 filed for bankruptcy while Skybridge and Teledesic suspended operations; Graeme Philipson, "Battle of the low earth orbit satellites," iTWire, Jan. 21, 2015.

¹⁸See http://www.itu.int/dms_pubrec/itu-r/rec/s/R-REC-S.1527-0-2001016-1!!PDF-E.pdf.

¹⁹Henry, "Kymeta Plans Mass Production, September Demonstration with 03b," Satellite Today, June 11, 2014; Carol Patton, "Innovations in Satellite Antennas Attracting New Markets & Opportunities," Via Satellite, Oct. 31, 2014.

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²³ Christopher Mims, "The Internet's Future Lies Up in the Skies," *Dow Jones Business News*, Dec. 14, 2014.

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²⁷ Under IRC section 883(b) Intelsat's geostationary satellite commercial activities were exempt from U.S. federal income and communications taxation concerning activities authorized by Intelsat agreements. Intelsat was also exempt from customs duties on imports of communications satellite equipment. Also, Intelsat and its property, income, operations, and other transactions were exempt from all taxes imposed by the District of Columbia where it had its headquarters except for those not used for, or related to, the purposes of Intelsat. More over, the wages and salaries of Intelsat employees who were not U.S. nationals or permanent residents were exempt from federal and District income taxes. United States Government Accountability Office, Report to Congressional Requesters, "Tax Policy: Historical Tax Treatment of Intelsat and Current Tax Rules for Satellite Corporations," Sept. 2004, available at <http://www.gao.gov/assets/250/244060.pdf>.

²⁸ REG- 106030-98, 66 Fed. Reg. 3902 (Jan. 17, 2001).

²⁹ REG- 106030-98, 70 Fed. Reg. 54859 (Sept. 19, 2005).

³⁰ Roger Rusch, "The Big Satellite Shakeout," *Space News*, Nov. 10, 2014; Frost & Sullivan, "Space Mega Trends and Beyond," available at <http://www.slideshare.net/FrostandSullivan/space-mega-trends-key-trends-and-implications-to-2030-and-beyond>; <http://www.sia.org/annual-state-of-the-satellite-industry-reports/2014-sia-state-of-satellite-industry-report/>; <http://www.sia.org/wp-content/uploads/2014/09/SSIR-September-2014-Update.pdf>; http://en.wikipedia.org/wiki/List_of_communication_satellite_companies.

³¹ Before its repeal for tax years of CFCs beginning after December 31, 2004, IRC section 954(f) treated IRC section 863(d) space and ocean income as foreign base company shipping in come for subpart F purposes, which was not eligible for deferral. Section 415(a)(2), P.L. 108-357, Oct. 22, 2004.

³² A U.S. person is a U.S. citizen, resident alien individual, domestic corporation, domestic partnership (applied at the partner level Treas. reg. section 1.863-8(e)), or trust or estate that is not a foreign trust or estate; IRC section 7701(a)(30).

³³ IRC section 863(d)(1); Treas. reg. section J.863-8(b)(1).

³⁴ IRC sections 871(a)(1), 881, 882, and 864(c)(4).

³⁵ A foreign person is a nonresident alien individual, foreign corporation, foreign partnership, foreign trust, or foreign estate. IRC section 7701(a)(31).

³⁶ Defined under IRC section 957.

³⁷ IRC section 863(d)(1)(B), Treas. reg. section 1.863-8(b)(2)(i), (ii), and (iii).

³⁸ IRC section 863(d)(2). The United States considered only the areas within the boundaries of its states and territorial waters as U.S.-source and within its primary taxing jurisdiction. Staff of Joint Comm. on Tax'n, General Explanation of the Tax Reform Act of 1986, P.L. 99-512; 99th Congress; H.R. 3838, Pt. 13; JCS-10-87 ("Bluebook"). Consequently, the high seas and space would have been treated as foreign-source income. Under the IRC or the Treasury regulations thereunder, the U.S. sea boundaries are 12 miles from the coast, but the space boundaries are not defined. The Outer Space Treaty also does not define space, while international law defines the lower boundary of space as the lowest perigee attainable by an orbiting space vehicle but does not specify an altitude, which presumably is the Karman Line (100 km/62 miles from the Earth's surface) since the Federation Aeronautique Internationale (FAI), which is an international standard-setting and record-keeping body for aeronautics and astronautics, uses the Karman Line to determine space boundaries as follows:

- Aeronautics: for FAI purposes, aerial activity, including all air sports, within 100 kilometers (62 miles) of the Earth's surface; and,

- Astronautics: for FAI purposes, activity more than 100 kilometers above the Earth's surface.

³⁹ Treas. reg. section 1.863-8(d)(1)(i)(D); Treas. reg. section 1.863-8(d)(2)(i).

⁴⁰ Treas. reg. section 1.863-8(d)(1)(i)(A).

⁴¹ Treas. reg. section 1.863-8(d)(1)(i)(B).

⁴² Treas. reg. section 1.863-8(d)(1)(i)(C).

⁴³ Treas. reg. sections 1.863-8(d)(1)(i)(F) and (ii)(F).

⁴⁴ Treas. reg. sections 1.863-8(d)(1)(i)(G) and (ii)(G).

⁴⁵ Treas. reg. section 1.863-8(d)(1)(i)(E).

⁴⁶ S. Rept. No. 99-313 (P.L. 99-514), p. 341, 359.

⁴⁷ Treas. reg. section 1.863-8(b)(2)(ii); Treas. reg. section 1.863-8(f), Ex. 1, 7.

⁴⁸ Treas. reg. section 1.863-8(b)(2)(iii); Treas. reg. section 1.863-8(f), Ex. 13.

⁴⁹ Treas. reg. section 1.863-8(f), Ex. 14.

⁵⁰ IRC section 875(1); Treas. reg. section 1.875-1; *United States v. Balanovski*, 131 F. Supp. 898 (SDNY 1955), *aff'd in part*, 236 F.2d 298 (2d Cir. 1956), cert. denied, 352 U.S. 968 (1956); *Vitale v. Commissioner*, (1979) 72 TC 386.

⁵¹ Rev. Rul. 70-424, 1970-2 C.B. 150; *Hanfield v. Commissioner*, (1955) 23 TC 633; *Inverworld Inc et al.*, (1996) TC Memo. 1996-301, RIA T.C. Memo. 96301, 71 CCH T.C.M. 3231; Legal Advice Issued by Associate Chief Counsel 2009-2010, Oct. 2, 2009; JRC section 894(a)(1).

⁵² IRC section 874(a).

⁵³ Treas. reg. sections 1.863-8(b)(5), (d)(J)(i), and (ii)(E).

⁵⁴ Treas. reg. section 1.863-8(d)(1)(ii)(E).

⁵⁵ Treas. reg. section 1.863-8(f), Ex. 2.

⁵⁶ IRC section 863(d)(2)(B)(ii).

⁵⁷ Treas. reg. sections 1.863-8(b)(3)(i), (2)(i), and (2)(iii).

⁵⁸ Treas. reg. section J.861-7(c).

⁵⁹ Preamble to the Final Regulations, 2007- 1 C.B. 479.

⁶⁰ Treas. reg. section 1.863-8(f), Ex. 11.

⁶¹ Treas. reg. section 1.863-9(h)(1)(i).

⁶² Treas. reg. sections 1.863-8(b)(5), (d)(1)(i), and (d)(ii)(E).

⁶³ Treas. reg. section 1.863-9(h)(3)(v); Treas. reg. section 1.863-8(b)(5) and -9(e). The source of space and ocean income that constitutes communications income as defined under Treas. reg. section 1.863-9(h)(2) (other than income from a space/ocean communications activity rather than under 863(d) and Treas. reg. section 1.863-8(b)).

⁶⁴ IRC section 863(e).

⁶⁵ IRC section 861(a)(3); IRC section 862(a)(3); Treas. reg. section 1.862-1(a)(1)(iii).

⁶⁶ Treas. reg. section 1.863-8(b)(3)(ii)(B).

⁶⁷ Treas. reg. section 1.863-8(b)(3)(ii)(C).

⁶⁸ Treas. reg. section 1.863-8(d)(1)(i) and (ii).

⁶⁹ See Senate Report, *supra* note 46, at 357.

⁷⁰ Preamble to the Final Regulations, TD. 9305, 2007- J C.B. 479.

⁷¹ Under the IRC section or the Treasury regulations thereunder, the U.S. sea boundary is 12 miles from the coast; LTR 9610015; LTR 9012023; Rev. Rul. 75-483, 1975-2 C.B. 286; Rev. Rul. 77-75, 1977-1 C.B. 344.

⁷² Treas. reg. sections 1.863-8(d)(2)(ii)(A) and (B).

⁷³ Treas. reg. section 1.863-8(b)(1), Treas. reg. section 1.863-8(b)(2), Treas. reg. section 1.863-8(b)(3)(ii)(C), or Treas. reg. section 1.863-8(b)(4).

⁷⁴ Treas. reg. section 1.861-8 through temp. Treas. reg. section J.861-14T.

⁷⁵ Treas. reg. section 1.863-8(c).

⁷⁶ Treas. reg. section 1.863-8(g).

⁷⁷ Simon Bowers, "Amazon EU Sari paid too little tax, EU competition regulator says," *The Guardian*, Jan. 16, 2015.

