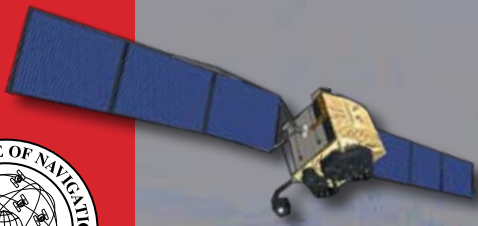




**THURSDAY**  
September 23, 2010



**ION GNSS 2010**

# Show Daily

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Written in Cooperation With:



## GNSS System Updates Panel

# GNSS Providers Chart Progress of Programs

**C**ol. Bernard Gruber, the new GPS Wing commander in his first ION GNSS appearance, led off Wednesday's GNSS program updates panel discussion with optimism fused with caveats about the prospects for GPS in an era of budgetary constraints.

He was joined in the panel by representatives of GNSS programs in Russia, Europe, and Japan.

Gruber noted the recent progress with a variety of Wing-led initiatives, including the on-orbit performance of the new-generation Block IIF satellites and the recent critical design review (CDR) for the next-generation Block IIIA spacecraft — in which the commander participated within weeks of assuming his post at Los Angeles Air Force Base, California. The successful CDR puts the GPS III program two months ahead of schedule.

Looking forward to the near future, Gruber said that a GPS enterprise review will take place in November, a preliminary design review in April 2011 for the next-generation GPS ground control segment (OCX), and a request for proposal for Phase B of the modernized GPS user equipment (MGUE) program.

Having recently spent five days at the Pentagon, Gruber said that his "take away" was that the GPS program draws strong interest and "positive support," but that the defense budget overall is under intense scrutiny. The result is that proposed expenditures for accelerating any program have a tough road to transit.

For example, the anticipated schedule for completion of a 24-satellite constellation transmitting the new L5 civil signal recently slipped to 2019, in part as a function of the "launch on need" approach to constellation sustainment that uses new generations of satellites with longer design lives.

### GLONASS

Sergey Revnivkyh from the Russian Federal Space Agency reported on the world's second oldest GNSS system nearing full operational capability (FOC) once again after a nine-year rebuilding effort.

With its most recent satellite launch of three modernized GLONASS (GLONASS-M) satellites on September 2, the Russian constellation will have more than enough spacecraft for an FOC declaration in the not-too-distant future.

Currently, the system provides 98 percent global coverage with dilution of precision (DOP) of less than 6, assuming a five-degree masking angle. Moreover, system accuracy continues to improve with the modernized space vehicles (SVs) — now producing a 1.8



Col. Bernard Gruber, GPS Wing commander

meter user range error, Revnivkyh said.

The constellation has 26 SVs now in orbit, with 20 satellites broadcasting healthy signals, 2 spares, and the most recent trio in the process of being commissioned. Another triple launch of GLONASS-Ms is planned in late November/early December, with the first demonstration flight of the next-generation GLONASS-K expected before the end of the year. The latter spacecraft will transmit the first CDMA signals in addition to the system's traditional FDMA.

The latter spacecraft will be launched on a Soyuz rocket from Plesetsk, Russia, rather than on Proton launchers from Baikonur, Kazakhstan.

Russia's government recently approved extension of the GLONASS program through 2020.

### Galileo

An update on the European Union's GNSS program, Galileo, was presented by Rene Oosterlinck, who heads the navigation directorate of the European Space Agency (ESA).

Launch of four in-orbit validation (IOV) satellites, which are in most respects identical to the planned FOC Galileo satellites, is now expected to be completed in the course of 2011, beginning with a mid-year launch. A new facility has been established in Korou (French Guiana) from where the IOV SVs will be lifted by a modified Soyuz rocket.

Provision of initial FOC Galileo services is expected by 2014, Oosterlinck said, including the civil Open Service, encrypted Public Regulated Service, and a Search and

*GNSS SYSTEM UPDATES PANEL, continued on page 3*

## Civil Interface Committee

# CGSIC Urged to Revive More Active Role

**A** well-attended meeting of the Civil GPS Service Interface Committee (CGSIC), which preceded the ION GNSS 2010 on Monday and Tuesday, underscored the interest of key stakeholders in re-forging closer ties with the U.S. Air Force stewards of the Global Positioning System.

Jim Doherty, a CGSIC founder and former co-chair now with the Institute for Defense Analysis, led off the Tuesday plenary session with a recap of the origins of the group, which first met in 1986. He challenged session attendees to re-assert the early interactive engagement that enable the civil community to make its needs and wishes known to the Air Force operators.

"Remember, you're a committee, not an audience," Doherty said.

There followed a familiar (for CGSIC) agenda of presentations, although perhaps with a bit more vigorous interrogation of some speakers.

Col. Rob Hessin, deputy director of the National Coordination Office (NCO) for Space-Based Positioning, Navigation, and Timing (PNT), reported on the work of the board that facilitates interagency GPS policy efforts. For the first time since the NCO's formation nearly six years ago, the office is fully staffed with repre-

sentatives from every member agency of the PNT Executive Committee.

"That strengthens the NCO's effectiveness across the interagency space," Hessin said.

Lt. Col. Stephen Steiner, the new chief engineer for the GPS Wing, described progress on that organization's activities, while Lt. Col. Mike Manor, deputy commander for the GPS Operations Center at Schriever Air Force Base, Colorado, briefed the committee on the status of the constellation. This included description of the satellite repositioning effort that comprises development of an "expandable 24" configuration, which will provide increased availability and accuracy for military and civil users in mountainous terrain and urban areas.

Rick Hamilton, U.S. Coast Guard, briefed CGSIC members on GPS interference detection and mitigation (IDM) initiatives mandated under the 2004 national security directive on PNT.

He described the first document case of a portable GNSS jammer in the United States — a motorist driving in the New York City area, whose jamming device was located and confiscated by local law enforcement. Hamilton also discussed the Patriot Watch program designed to lead to a "system of systems" in which data collected



Lt. Col. Rob Hessin, deputy director, National Coordination Office for PNT

from a variety of sensors will be fused to provide a shield around key resources and critical infrastructure.

So-called "command post" exercises that simulate jammer events are planned in the near future.

Hamilton also discussed restrictions under the Federal Communications Commission regulations that outlaw the

importation or operation of unlicensed radio devices, which covers GNSS jammers.

"The United States is not going to stand by as these devices are imported into the country," he said. ♦



## Exhibitor News

### KVH Highlights FOG-based Inertial Systems

KVH Industries, Inc. (Booth 204) will demonstrate its fiber optic gyro (FOG)-based inertial measurement units and navigation systems, designed to offer cost-effective solutions for applications such as dynamic surveying and mapping, autonomous vehicle guidance and tracking, unmanned aerial vehicles, underwater remotely operated vehicles and more.

Included will be demonstrations of the following: CNS-5000, featuring IMU/

GNSS technology, incorporating KVH's precision FOGs and NovAtel's precision OEMV-3 GPS receiver; CG-5100 incorporating KVH FOGs coupled with MEMS accelerometers; precision FOGs, designed to deliver high performance in bias stability, low noise and high bandwidth for precision pointing, stabilization and navigation in optical equipment, cameras, antennas, unmanned vehicles and remote weapons.

### JAVAD Awarded \$3.9 Million USGS Contract

Javad GNSS (Island Booth I) has received a contract for various configurations of GPS/GNSS receivers and antennas from the Department of Interior, U.S. Geo-

logical Survey. The indefinite-delivery, indefinite-quantity contract was competitively awarded and has a five-year ordering period with a \$3.9 million ceiling.

### Receiver Manufacturer Picks IFEN's GNSS RF Constellation Simulator

IFEN GmbH (Island Booth H) has announced that Ashtech (Booth 721/723) has selected IFEN's NavX-NCS Professional, a multi-constellation and multifrequency GNSS RF navigation constellation simulator as the new GPS, Galileo, and GLONASS reference simulator for its professional receiver development and testing of high-precision professional receivers. "IFEN's product offering is a perfect match for our highly demanding testing needs, as the NavX-NCS Professional simulator has proven to be very

flexible in its use, extremely accurate and can be upgraded when necessary," says Igor Grechkin, head of engineering at Ashtech. IFEN offers two types of GNSS RF constellation signal simulators. The NavX-NCS has up to 108 signal channels and 9 L-band frequencies, GPS, Galileo, GLONASS, and QZSS can be simulated simultaneously.



### USAF Awards Locata Contract for Terrestrial Positioning System

The U.S. Air Force 746th test squadron (Island Booth M) recently awarded a contract to Locata Corporation to upgrade the Locata high-accuracy terrestrial positioning system to cover almost 2,500 square miles (6,500 square kilometers) of the White Sands Missile Range (WSMR) in New Mexico. The upgrade is designed to help the 746 TS to provide sub-meter accurate positioning on the WSMR when GPS is jammed.

The contract focuses on the redesign and upgrade of the USAF's current Locata Non-GPS Based Positioning System

(NGBPS), which Locata sells commercially under the "LocataNet" trademark. The NGBPS will provide the 746 TS's Ultra High Accuracy Reference System (UHARS) with sub-meter position accuracies in a GPS-denied environment. The 746 TS requires UHARS to evaluate performance accuracies of next-generation weapon and aircraft navigation systems. The 746 TS leads the U.S. Department of Defense tri-service GPS Test Center of Expertise and has operated a Locata NGBPS at Holloman Air Force Base for more than three years.

### DW International Debuts as Exhibitor

DW International (Booth 218) makes its debut appearance at the ION GNSS show this year, demonstrating its GNSS RAIM/RNP (receiver autonomous integrity monitoring/required navigation performance) Prediction Service and the GNSS Performance Monitoring System. DW CEO

John Wilde, chair of the international information committee for the Civil GPS Service Interface committee, will be on hand to demonstrate the company's range of GNSS solutions.



### Galileo Last Chance to Win a Navigation Receiver!

Visit our Booth 206 and drop off your business card and join us for the lottery

drawing on Thursday during the Afternoon Coffee Break. *Good Luck Folks!*

## ION SATELLITE DIVISION

# ION GNSS 2010 STUDENT PAPER AWARDS

### Students Sponsored to Attend GNSS Meeting

As part of the ION GNSS 2010 technical program, the Satellite Division awarded eight students ION GNSS STUDENT PAPER AWARDS. These award recipients, who will be recognized during the Friday Awards Luncheon, were selected by recognized industry and academic experts in their field. Only those papers of superior technical quality for acceptance as a primary paper in the session were included in the program.

To qualify, students must have been full-time undergraduate or graduate students in engineering, science, mathematics, or other related fields at the time their papers were written. Groups of student authors were accepted, but the submitted paper could not be co-authored by a working professional or a faculty member. Only the primary author making the presentation was eligible for the award.

Student award winners received a full complimentary conference registration and a travel stipend.

The following students received an ION GNSS Student Paper Award this year:

**Simon Banville,**  
*The University of New Brunswick, Canada:*  
Antenna Rotation and Its Effects on Kinematic Precise Point Positioning

**Wei Chen,**  
*The University of Science and Technology of China, China:* A Novel EMG-based Stride Length Estimation Method for Pedestrian Dead Reckoning

**Gabriele Giorgi,**  
*Delft University of Technology, The Netherlands:*  
The Multivariate Constrained LAMBDA Method for Single-Epoch, Single-Frequency GNSS-Based Full Attitude Determination

**Philip Jales,**  
*Surrey Space Centre, University of Surrey, U.K.:* GNSS-Reflectometry: Techniques for Scatterometric Remote Sensing

**Yu-Hua Li,**  
*National Cheng Kung University, China:*  
The Calibration Methodology of a Low Cost Land Vehicle Mobile Mapping System

**Ahmed Mohsen Mohamed Kamal Saeed,**  
*University of Calgary, Canada:*  
Design and Testing of an Intelligent GPS Tracking Loop for Noise Reduction and High Dynamics Applications

**Shashank Satyanarayana,**  
*University of Calgary, Canada:*  
Stationary, Cyclostationary and Nonstationary Analysis of GNSS Signal Propagation Channel

**Yong Khing Tan,**  
*University of New South Wales, Australia:*  
Positioning Techniques with Two GNSS Satellites Over Time



ION GNSS 2010 Program Committee: L to R: Dr. John Betz, *The MITRE Corporation*; Dr. Alexander Mitelman, *Cambridge Silicon Radio, Sweden*; Dr. Anthea Coster, *MIT Haystack Observatory*; Prof. Naser El-Sheimy, *University of Calgary, Canada*; Patricia Doherty, *Boston College*; Deborah Lawrence, *Federal Aviation Administration*; Dr. Didier Flament, *European Space Agency, France*; Martin Lopez, *Overlook Systems Technologies*. Not pictured: Dr. Mark Petovello, *The University of Calgary, Canada*.



## Autonomous Weapons Summit and GNC Challenges for Miniature Autonomous Systems Workshop

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**SESSION TOPICS**

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- GNC Challenges for Miniature Autonomous Systems (multiple sessions)
- Combatant Command Perspective
- Processing and Algorithms
- Navigation
- Networking
- Seeker Sensors
- DoD & Service Perspective
- Dynamics and Controls
- Simulation and Test Technology

**PUBLIC ACCESS SESSIONS**

- Alternatives to GPS
- Avionics and Control
- Precision Navigation in Challenging Environments
- Operator Interfaces
- GNC Test Technology
- Networking
- Seeker Concepts and Technologies
- Small Weapons and Systems Concepts

See [www.ion.org/aws](http://www.ion.org/aws) for Program Updates

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## NEW PRODUCT ANNOUNCEMENTS



### NovAtel Introduces Next-Generation OEM6 GNSS Receiver Platform

On Wednesday NovAtel Inc., (Island Booth C) launched its next-generation OEM6 GNSS receiver platform at ION GNSS 2010 on Wednesday. According to the Calgary, Canada-based company, the powerful OEM6 platform offers comprehensive support for all current and upcoming GNSS constellations and satellite signals including GPS, GLONASS, Galileo, and Compass. The OEM628 board, the first in the new receiver line, expands positioning capabilities with the inclusion of such features as RAIM (Receiver Autonomous Integrity Monitoring) for safety critical applications, integrated LAN Ethernet port with NTRIP Client, and server capabilities designed for seamless integration into reference network applications, and 100 Hertz measurements for high dynamic positioning. The OEM628 board is form, fit and function compatible with NovAtel's OEMV-2TM receiver and supports all NovAtel OEM firmware options, including AdVance RTK for centimeter-level positioning accuracy, ALIGN for precise heading determination, GLIDE for consistent pass-to-pass accuracy, and L-band positioning for autonomous decimeter level positioning. The OEM628 will be available to order in November 2010, with first shipments occurring in December 2010.

### Discover Averna's 3x50 MHz Record and Playback

Visit Averna (Booth 318) to see the company's line of Universal Receiver Tester (URT) solutions, designed to empower RF device manufacturers to generate, record and play back all common radio, video, and navigation signals in use today. Averna representatives will demonstrate the Best-in-Test award-winning URT RF test platform, including the URT Record and Playback 3200 to validate, test and verify Professional GNSS devices.

### Hemisphere GPS Introduces miniEclipse Dual-Frequency GPS OEM

On Wednesday, Hemisphere GPS (Booth 617/619) announced the release of the miniEclipse – a compact dual-frequency, high-performance, low-power GPS OEM board that incorporates the same digital and analog ASIC design as the recently released Eclipse II OEM board. According to the company, the miniEclipse is the smallest precision dual-frequency (L1/L2) OEM module available in the market today and is available in two form factors, P200 and P201. The miniEclipse P200 is a drop-in board replacement for Hemisphere GPS' Crescent board, while miniEclipse P201 is configured as a drop-in replacement for another industry standard interface. The miniEclipse is scalable, functioning in L1-only SBAS and RTK modes that can be upgraded to dual-frequency RTK solutions. Also, raw data is available for post-processing in any configuration. P200 and P201 also feature Hemisphere's patented SureTrack and COAST technology. The P200 and P201 OEM boards will be available in the fourth quarter of 2010 through the company's global network of Hemisphere GPS dealers.



### Spirent 7-element Controlled Reception Pattern Antenna (CRPA) Test System

The Spirent 7-element Controlled Reception Pattern Antenna (CRPA) Test System enables the user to conduct comprehensive wavefront testing. Spirent CRPA test systems simulate GPS L1 and L2 signals simultaneously with coherent L1 and L2 interference at each element of a CRPA array, providing customers the control and repeatability desired for testing CRPA systems. Spirent's CRPA test system supports Y-code, SAASM, and M-code simulation capabilities, which are available to authorized users. The flexibility of Spirent's CRPA test system architecture easily supports any CRPA element configuration. For non-CRPA requirements, the multi-chassis system outputs can be configured to represent individual antennas on separate simulated vehicles. This flexibility allows testing on a broad range of applications. To learn more about CRPA and wavefront testing, visit Spirent Federal, www.spirentfederal.com, at Island Booth E.

### Septentrio Announces PolaRxS GNSS Receiver for Scintillation Monitoring

Septentrio (Booth 516/518) has introduced the PolaRxS, an ultra low noise multi-frequency multi-constellation receiver dedicated to ionosphere monitoring and space weather applications. The receiver offers 136 channels capable of tracking simultaneously GPS, GLONASS, Galileo and SBAS signals in L1, L2, L5 and E5ab/AltBOC bands. Coupled with an oven-controlled crystal oscillator (OCXO), the PolaRxS provides an extensive set of specific measurements for ionosphere monitoring, including signal phase and intensity at up to 100 Hz, with a phase noise standard deviation ( $\phi_{60}$ ) as low as 0.03 rad. Proprietary LOCK+ tracking technology is designed to provide robust tracking of rapid signal dynamics such as are encountered during high scintillation events, while the integrated interference analysis and mitigation module enables installation in difficult radio environments. A graphical user interface – RxControl – is provided for data logging and remote control and is extended for continuous TEC and scintillation indices, specifically for space weather and ionosphere monitoring applications. Septentrio will start shipping PolaRxS in the last quarter of 2010.

### CSR/SiRF Launches SiRFAtlasV Aimed at Consumer Devices

CSR (SiRF Technology, Booth 319) has introduced the SiRFAtlasV multifunction GPS system processor, a system-on-chip (SoC) device designed for integration into high-volume consumer navigation and location-aware products. Available now in production quantities, the SiRFAtlasV processor combines on a single chip a 500- or 664-MHz ARM11 processor core with vector floating point unit; advanced, autonomous GPS/Galileo baseband DSP core with available SiRFAlwaysFix technology, DDR2, Mobile DDR, SD/MMC/MMC+ and NAND flash memory controllers; audio DAC; LCD touch panel controller; video post processing accelerator; USB 2.0 and other connectivity interfaces and a complete power management unit. CSR is working with Microsoft Corporation to optimize the SiRFAtlasV's integration with Windows Embedded CE 6.0 real-time operating system on a wide range of small footprint consumer and enterprise devices.

### GNSS SYSTEM UPDATES PANEL, continued from page 1

Rescue Service. It will include 14 SVs now being built by OHB and Surrey Satellite Technology Ltd. in addition to the 4 IOVs.

Meanwhile, the European Geostationary Navigation Overlay Service (EGNOS), a satellite-based augmentation system similar to the U.S. Wide Area Augmentation System (WAAS), will be certified for use by civil aviation before the end of this year.

### QZSS

Hiroaki Maeda, lead system engineer for Japan's Quasi-Zenith Satellite System (QZSS), brought the audience up to date on the program, which on September 11 successfully launched its first satellite — nicknamed Michibiki.

Developed by the Japan Aerospace Exploration Agency (JAXA), QZSS will provide a regional augmentation service to the western Pacific/east Asia area. It will broadcast six signals: GPS L1C/A, L1C, L2C and L5; an L1-SAIF (L1-Submeter-class Augmentation with Integrity Function), and LEX, an experimental signal with a higher data rate message (2Kbps) that is designed to be compatible and interoperable with the Galileo E6 signal.

Designed to provide a satellite at near zenith in the region, QZSS will increase coverage and availability of PNT services even in urban canyons and mountainous areas.

It can also enhance GPS performance by transmitting error correction and integrity information.

The first satellite is undergoing a three-month On-Orbit-Checkout (OOC) period, following which JAXA will carry out a technical demonstration phase and then an application demonstration in which 101 companies will participate. ♦

8:30 a.m.  
**MORNING SESSIONS BEGIN**  
**PANEL DISCUSSIONS — DEEP INDOOR NAVIGATION – WHICH TECHNOLOGIES WILL PREVAIL?**  
Room C123-124

9:00 a.m.  
**EXHIBIT HALL OPENS**

12:15 p.m. – 1:15 p.m.  
**INFORMAL LUNCHEON**  
Exhibit Hall

This event is included with any type of registration. Enjoy lunch with colleagues and new acquaintances.

1:15 p.m. – 1:45 p.m.  
**FREE TIME IN EXHIBIT HALL**

1:45 p.m.  
**AFTERNOON SESSIONS BEGIN**

**PANEL DISCUSSIONS — 50TH ANNIVERSARY OF KALMAN FILTERING**  
Room C123-124

5:00 p.m.  
**EXHIBIT HALL CLOSES**

### PROGRAM CHANGES

**Session B3:** Paper #3 by Thommesen, cancelled. Replaced with alternate #1 by Ruegamer.

**Session D4a:** Paper #4 by Woodward cancelled. Replaced with alternate #2 by De Voy. Alternate #1 by Brzezinska, cancelled.

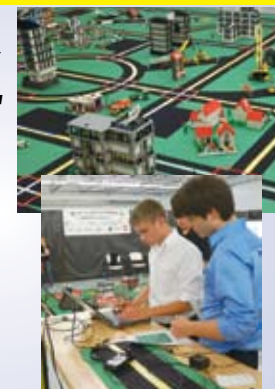
**Session E4:** Paper #8 by Zheng, cancelled. Replaced with alternate #1 by O'Hanlon.

**EXHIBITORS — Information for the Show Daily:** You may drop off press releases, new product announcements and other information for the Show Daily at the **ION Membership Booth 820** in the Exhibit Hall or at the **Registration Desk** in the foyer.

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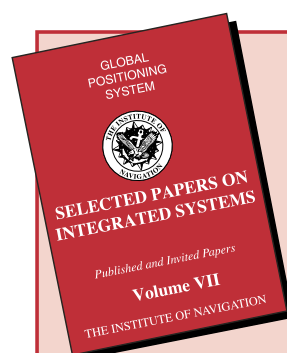


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