



WEDNESDAY
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ION GPS 2001 Show Daily

Published By: The Satellite Division of the Institute of Navigation 14th International Technical Meeting

Written in Cooperation With:



Plenary Session

Panel Projects GNSS Marketplace

The marketplace for GPS and other Global Navigation Satellite System (GNSS) technologies, products, services, and applications highlighted a panel discussion at the opening session of The Institute of Navigation Satellite Division's 14th International Technical Meeting titled "GNSS Market Projections and Trends." The panel took place against the backdrop of stuttering economies worldwide and significant mergers and acquisitions within the GPS manufacturing and services community. Panel members included Mike Swiek, executive director of the U.S. GPS Industry Council; Professor Vidal Ashkenazi, CEO of Nottingham Scientific Ltd.; Lyn Dutton, business development manager, Thales UK (formerly Thomson-CSF); and John Shewfelt, with SiRF Technology. Dutton and Shewfelt were replacing Alain Bories, corporate vice president for space systems, the Thales Group, and Dr. Jackson Hu, CEO of SiRF Technology, both of whom had to cancel at the last minute due to the emergency closing of all U.S. airports. Glen Gibbons, editor of *GPS World*, introduced and moderated the discussion.

GNSS Focus

Despite the event's GPS-centric name, conference organizers couched the plenary panel and numerous technical sessions in GNSS terminology so as to embrace

not only GPS and Russia's Glonass systems, but also the proposed European satellite navigation system, Galileo. Gibbons introduced the subject by describing the difficulty of finding reliable and comparable GNSS market research, due to differences in study terms of reference and a "top-down" approach to the subject. He framed the issue of trends and projections in terms of "old" and "new" sectors within contemporary economies, illustrating their varying fortunes in terms of the performance of public stock markets.

For the GNSS marketplace, Gibbons said, "old economy" segments include such things as surveying, civil engineering, construction, air/land/sea transportation, mapping & geographic information systems, especially in natural resources, extractive industries, and utilities. "New economy" segments included are those associated with the dot.com community, built around Internet products and services, mobile computing, wireless communications, and portable devices.

Swiek continued the line of inquiry by



Plenary panelists, pictured from left to right: Glen Gibbons, panel moderator, *GPS World*; John Shewfelt, with SiRF Technology; Mike Swiek, executive director of the U.S. GPS Industry Council; Lyn Dutton, business development manager, Thales UK (formerly Thomson-CSF); and Professor Vidal Ashkenazi, CEO of Nottingham Scientific Ltd..

raising the fundamental question of whether there is a GPS market in and of itself, or whether GPS plays a critical role in many other markets, and hence becomes difficult to measure as a distinct category of products and services. He reflected on some of the amazing and amusing applications that have emerged for GNSS, and underlined the need for coordination and cooperation with other technologies and markets such as wireless communications.

Following on with the discussion, Ashkenazi pointed out that, over the past 25 years, GPS has moved from a purely military satellite navigation system to "an indispensable positioning and timing tool," for hundreds of civilian scientific, engineer-

Plenary, continued on page 3

ION GPS 2001 SPECIAL ANNOUNCEMENT

The ION GPS meeting in Salt Lake City, Utah, will proceed as scheduled for the full three-day program. Program modifications will be made as necessary. A revised program will be published each day and will be available at registration.

If you are an author and have arrived in Salt Lake City, you will present your paper on the day you were originally scheduled. **All authors should check in at the ION Business Center, in the ION Exhibit Hall, immediately upon arrival.**

If you are an author and arrive **after your scheduled presentation time**, you should report to the Speakers' Breakfast the next morning. All authors who arrive in Salt Lake City will be given the opportunity to present.

Please pass this information along to your colleagues. **Authors who know they will be unable to attend**, are requested to please notify the ION Business Center as soon as possible by faxing a message to (801) 534-4732.

Messages. If you need to get a message to a conference attendee, please fax your message to (801) 534-4732.

The ION Satellite Division appreciates your patience and cooperation during this difficult time.

See Program Changes on page 3



Satellite Division Officers, pictured from left to right: SLDR Robert Bunton, International Technical Advisor; Mr. Lyn Dutton, International Technical Advisor; Dr. Penina Axelrad, Chair; Mr. John Lavrakas, Vice Chair; and Mr. Ron Hatch, ION President and Immediate Past Chair

Honored to be Your Hosts

Satellite Division Vows to Carry On

The Institute of Navigation's Satellite Division would like to express its grief over the tragic loss of life that occurred yesterday in this great nation. Our hearts go out to those families whose lives have been shattered. To those who remain here in Salt Lake city, we share your anguish and resolve to weather this storm together. We're proud to share this time with you as we host the largest single GNSS and positioning conference in the world here in Salt Lake City.

Past is Prologue

The Satellite Division was formed in 1987 by a group of ION members who, anticipating GPS's immense potential, wished to both focus attention on this emerging technology and provide a forum for exchange of technical information. The first ION meeting was held that year in Colorado Springs, Colorado.

Since then, worldwide interest in the group's activities has made the Satellite Division ION's most active. The division's ION GPS meetings have received worldwide recognition as the world's largest and most prestigious gathering of those involved in positioning technologies. No other gathering so adeptly illustrates the breadth and depth of GNSS technology or the marketplace.

Division Officers

Activities surrounding this year's meeting have been spearheaded by a prestigious panel of Satellite Division and Institute of Navigation Officers and chairs. These include Satellite Division Chair Dr. Penina Axelrad, Associate Professor of Aerospace Engineering Sciences at the University of Colorado; Vice-Chair John Lavrakas, currently senior staff

Carrying On, continued on page 3



StarFire Heats Up

NavCom Technology, Inc. (booth C) has been in the spotlight lately and the company plans to continue that trend at ION GPS 2001. This morning, NavCom will demonstrate its StarFire Network as well as other products from 10-12 in room 254B. This will be the first such demonstration since NavCom finalized its technology partnership agreement with NASA's JPL earlier this year. The network is a global system for the distribution of differential GPS corrections and two-way messaging with a reported accuracy of better than 1 foot.

Just last month, House Minority Leader Richard A. (Dick) Gephardt (D-MO) received a personal introduction to the StarFire™ network and its agricultural uses, as well as the company's GreenStar® user equipment, when he visited NavCom at its Redondo Beach, California facility. NavCom representatives gave Gephardt an overview of how and why John Deere company (NavCom's parent company) and farmers around the world use GPS. They also explained to him how important it is to provide such technologies to other countries/industries and why the company



Pictured above from left to right: J. Christopher Litto, NCT Sales Manager; Peter Williams, NCT; Bob Abernathy, Redondo Beach Technology Center; and Congressman Richard Gephardt (D-MO).

believes it is important to approve the Fast Track Trade Authority bill now before the House.

In other news, NavCom recently announced a commercial agreement with C&C Technologies, Inc., an international survey company, for the supply of StarFire™ differential GPS receivers and signals worldwide. The agreement is exclusive to offshore operations pertaining to satellite navigation positioning on projects for surveying, mapping, geophysics, mining, cable laying and offshore construction, installation, inspection, and maintenance operations.

A member of the John Deere Special Technologies Group, NavCom specializes in developing and manufacturing equipment for precise positioning and wireless communications. ♦

Navtech Seminars—Attendees Intrigued With Galileo, Indoor GPS



Navtech Seminars & GPS Supply continued its 15-year tradition of offering leading-edge tutorials in conjunction with the annual ION GPS series of meetings. More than 300 people chose among 35 short courses that were presented Monday and Tuesday at the Salt Palace.

Twenty-four internationally recognized GPS experts taught the courses, which are designed to help attendees better comprehend the ION GPS 2001 conference presentations. The curriculum included new tracks such as a full day Galileo focus, a session addressing the use of GPS indoors, and a presentation on propagation environment effects.

Indoor GPS, or more precisely, high-sensitivity GPS, is of particular interest this year. Because of increasing demand for the ability to locate cell phones, high-sensitivity GPS devices are coming to market in the form of chips embedded by the device manufacturer.

Because Europe has now completed the definition phase for the Global Nav-

igation Satellite System of the Second Generation (GNSS-2), called Galileo, this track was especially intriguing. In an April 5, 2001 meeting, the European Transport Council decided to build up the satellite navigation system and to continue with the development phase. A half-day Navtech course educated attendees about specific decisions regarding Galileo development as well as about the proposed services and requirements that led to Galileo's current design.

The new propagation environment effects course dealt with solar and geomagnetic conditions that can cause data problems as well as techniques for avoiding, modeling, or correcting for these effects. For future courses offered by navtech, see www.navtechgps.com.

Navtech Seminars & GPS Supply presents its tutorials as a contractor to the ION's Satellite Division, paying a fee and commission to participate. Navtech provided its tutorials free of charge to all ION GPS-sponsored students. ♦

Random Fixes

IEC's SAASM-Based Receiver, New President

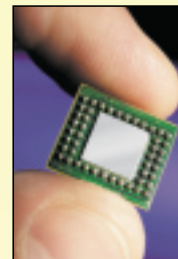
Interstate Electronics Corporation (IEC, booth 208-214), a wholly owned subsidiary of L-3 Communications Corporation, recently rolled out the next generation of military GPS receivers and announced a change of leadership.

IEC's TruTrak is a 12-channel, SAASM-based GPS receiver, available in any form factor in 120 days or less. It reportedly meets the size, accuracy and performance requirements for high-G platform applications but is easily and cost-effectively configurable for range, avionics or handheld navigation platforms. The TruTrak receivers feature IEC's compact Xfactor™ SAASM module, a 40 x 40 x 3.2 millimeter, highly integrated package that receives, provides, and manages the GPS satellite signals, requiring only antenna/pre-amplifier and navigation functions externally. TruTrak will track up to 12 satellites at a time while providing fast (less than 3 seconds) C/A and P(Y)-code signal acquisition. This module has been recently approved by the NAVSTAR GPS Joint Program Office.

In other IEC news, L-3 Communications announced last month that Robert Huffman has succeeded Richard Tierney—who is retiring—as president of IEC. Tierney will continue in a consulting role for IEC in order to ensure a smooth transition process. Huffman has more than 17 years of experience in aerospace management, marketing, and engineering.

SyChip's Award-Winning Module

The SyChip (Booth 124) GPS2020 module continues to gain industry-wide attention, winning the Editor's choice award in Electronic Products for Outstanding Product.



Headquartered in Warren, New Jersey, SyChip is a January 2000 spinout of Lucent Technologies. Its SyChip solution targets semiconductor segments that are complex or expensive to integrate monolithically. The company's technical approach is to build a Chip Scale Module (CSM) that closely replicates the electrical environment of each single chip. Performance is enhanced through the reduction of parasitics associated with the package structure and also the reduction of the electrical distance between the ICs (memory, logic, mixed signal, and so forth). A proprietary low loss silicon substrate is used to enable high-quality embedded passive components as well as high-density interconnects.

Designed for wireless Internet applications, the GPS2020 receiver module measures just 13 x 15 x 3.75 mm. It is designed with a stacked architecture containing BB, RF and FLASH. Only the RTC clock and antenna need to be added to complete the design. The module is currently being prepared for volume production, with fully qualified products expected to be available in Q301.

Pacific Crest in Modem Mode

Pacific Crest Corporation (booth 632) recently introduced the Positioning Data Link (PDL) Low Powered Base (LPB) kits. PDL LPB modems comply with European standards offering reliable commu-



nication for GPS RTK (Global Positioning System Real Time Kinematic) surveying. The kits are available in frequency ranges between 430MHz and 470MHz and include a tripod mount system, carrying cases, battery, cables, antenna and a CD-ROM User's Guide.

Pacific Crest Corporation kits are designed to maximize the operation of GPS RTK equipment. To obtain the optimum radio range, a tripod mount system can be used to elevate the unit. In addition, the antenna can directly attach to the unit minimizing dB loss. All the company's cables are customized to fit with the surveyor's GPS manufacturer's equipment and radio modems feature an enhanced user interface so user's can see what channel they are on, and change it instantly if necessary.

Headquartered in Santa Clara, California, Pacific Crest Corporation manufactures wireless technology for positioning applications.

Valence Unveils Pure CMOS Receiver

Valence Semiconductor—a global provider of integrated



system on silicon solutions for broadband and mobile communications markets—will demonstrate its newly unveiled VS7001 integrated circuit for GPS applications today in booth 801. The VS7001 is a fully integrated, pure CMOS receiver aimed at enabling a single chip GPS product. Valence has already provided prototype units to more than 50 companies who are evaluating use of this design within mobile and wireless devices.

The VS7001 features low power consumption at only 27 MWatts at 2.2 V, enabling the receiver to be placed in battery-operated devices. The company expects its GPS chip solution may be used in cell phones to comply to the new FCC Enhanced 911 standard, in vehicles for navigation, and in PDAs equipped with real-time maps. The device is offered in a 48 pin TQFP package. Its intended input signal is the L1 GPS signal at 1.57542 GHz.

Founded in 1999, Valence Semiconductor Specializes has engineering design centers in Irvine and Calabasas (California), Toronto (Canada) and Dubai (UAE). Valence's team includes a technical staff of about 220 people with more than 50 Ph.D.s.

CHECK IT OUT

Business Center: Advance copies of technical papers will be available for purchase for \$3 each. This is not a profit source for the meeting or the Institute. Only papers submitted by the author will be available. The CD-ROM version of the proceedings will be mailed 12 weeks following the conference.

Faxed Messages: If your office needs to contact you, they can fax a message to the ION Business Center at (801) 534-4732.

Job Board: A self-service styled job board will be available outside the Business Center. Feel free to post any openings your organization may have.

Internet Access Center: Computer stations are located in the registration area with Internet connections for your convenience.

PROGRAM CHANGES SEPTEMBER 12, 2001

ATTENDEES: Since many speakers had to cancel or delay their arrival, a revised daily program will be published each night and will be available in the registration area each morning.

We will continue to run the sessions on a synchronized schedule that will allow you to move freely between them.

AUTHORS: Please reference the daily published program the morning of your presentation to ascertain your presentation time and session.

Speakers should attend the Speakers' Breakfast at 7:30 a.m. on the morning of their scheduled presentation.

The ION Satellite Division appreciates your patience and cooperation.

TODAY'S SPECIAL EVENTS

SPOUSES PROGRAM
9:30 a.m.–3:30 p.m. **Cancelled**
Tour M Area. Cost: \$0, includes box lunch.

SPEAKER LUNCHEON
noon–2 p.m., Exhibit Hall D
We regret that Joe Portney will not be able to make this luncheon. However, even though Joe will not be available, **the luncheon will be held as scheduled.** Join your colleagues for a delightful meal and take this time to unwind. *This event is included in the price of a full registration. Tickets for partial registrants and guests can be purchased at the registration desk. Cost: \$35*

BOOK SIGNING, 7–9 p.m.
A limited number of complimentary copies of **Cancelled** by Joe Portney's *Portney's Portney's*, will be distributed by Northrup Grumman at exhibit booth #229 during the Exhibitor Hosted Reception.

EXHIBITOR HOSTED RECEPTION
7–9 p.m., ION Exhibit Hall
This event is included with any type of registration. Spouses are welcome. Join this year's exhibitors as they host a social evening of information and cuisine. All the exhibit booths will be open.

TODAY'S PRODUCT DEMONSTRATIONS
(See On-Site Program for more information)



Navcom Technologies, Inc., Product Demo
10 a.m.–noon,
Rm. 254B



Leica Canceled
Rm. 245B

Plenary, continued from page 1

ing, navigation, and positioning applications. He said GPS is now poised to play a leading role in the emerging "info-mobility" society, by combining its location and timing information with mobile communications and information technology. The new emerging services will range widely, from emergency 911 and network synchronization, to M-commerce and mass-market location-based services (LBS).

"Galileo will be a success if we, users, equipment manufacturers, and service providers are in the loop from the beginning."

—Lyn Dutton, Thales UK

"In this context, the addition of the Galileo system, which will be fully interoperable with GPS, will provide GNSS not only with an enhanced capability, but also help meet the tight requirements of certifiable safety-critical applications," Ashkenazi said. Recent estimates of potential users in both the specialist and professional markets, as well as in the much larger mass markets, justify the European investment in a second global satellite navigation system, which must be both compatible and interoperable with GPS, and yet independent of it, he continued.

Dutton, the other European panelist, also dwelled on the prospects for Galileo. Noting Thales' existing presence in the GPS marketplace through its acquisitions

of Magellan, DSNP, Racal, and Wilcox GPS-related businesses, Dutton said, "Our largest future challenge is Galileo. We consider Galileo as a huge opportunity for industry to develop new applications and new services, because it will enhance performance and availability through the use of both constellations, GPS and Galileo—and hopefully Glonass if our Russian colleagues succeed in refurbishing the constellation." Dutton estimated that, in Europe alone, Galileo will boost the GNSS market to more than \$60 billion between 2010 and 2020.

"Galileo will be a success if we, users, equipment manufacturers, and service providers are in the loop from the beginning, in order to have proper specifications and constraints taken into account in the design," Dutton said. He added that Galileo should be market-focused, user driven, and managed by organizations with proven track records and technological expertise.

In remarks prepared in advance, Dr. Jackson Hu described his company's focus on GPS technology and market development for high-volume consumer and commercial applications. "SiRF has a vision that one day GPS can be incorporated in every mobile device to bring us convenience, safety and security and to facilitate information access based on our locations," Hu said.

In the past five years, Hu said, the industry has made tremendous progress in reducing power consumption, cost structure, and the form factor for GPS receivers, thanks largely to the advances in silicon process technologies. However, silicon alone cannot solve all the problems, he continued. For example, location determination in obstructed environments for location-based services and E911 emergency response require the development of high-sensitivity receiving software. High-volume markets such as wireless handsets also require a new business model to address the stringent cost objectives, he noted, as well as new approaches in addressing product development, quality, and customer support. ♦

Carrying On, continued from page 1

engineer at Overlook Systems Technologies, Inc. in Colorado Springs; Satellite Division Secretary Boris Pervan, Assistant Professor of Mechanical and Aerospace Engineering at the Illinois Institute of Technology in Chicago; and Treasurer John Clark, Associate Principal Director for System Engineering at The Aerospace Corporation.

Helping to guide planning activities was Institute of Navigation President Mr. Ron Hatch, who is immediate past Division Satellite Division Chair. Hatch is currently the director of navigation systems at NavCom Technologies. Further assistance was provided by ION General Chair Larry Hothem, a senior physical scientist with the U.S. Geological Survey in Reston, Virginia. Dr. Gerard Lachapelle, head of the department of Geomatics at University of Calgary, provided his invaluable input as program chair.

Though these credentials are impressive, the qualifications and intellectual property here at the ION go well

beyond our esteemed panel of officers.

The Best and the Brightest
You'll find plenty of colleagues here at the conference with whom to discuss and debate the GNSS industry, and a lot of opportunity to learn and share.

This year's conference aims to have a global perspective, with more than 50 percent of the authors coming from outside the United States. Of particular interest on the international front are stepped up activities surrounding Europe's proposed Galileo constellation.

Not only the technical participants are positioning themselves for this conference, though. Attendees can get a quick fix on the state of GNSS markets and technologies by visiting the exhibit hall where more than 100 manufacturers and service providers are showing their wares. Look for this year's newcomers and, if you've been around for a while, now's your chance to be an ambassador by introducing the new members of the expanding GNSS community to those who blazed the trail. ♦



Larry Hothem



Gérard Lachapelle

2002 CONFERENCE DATES AND CHAIRS

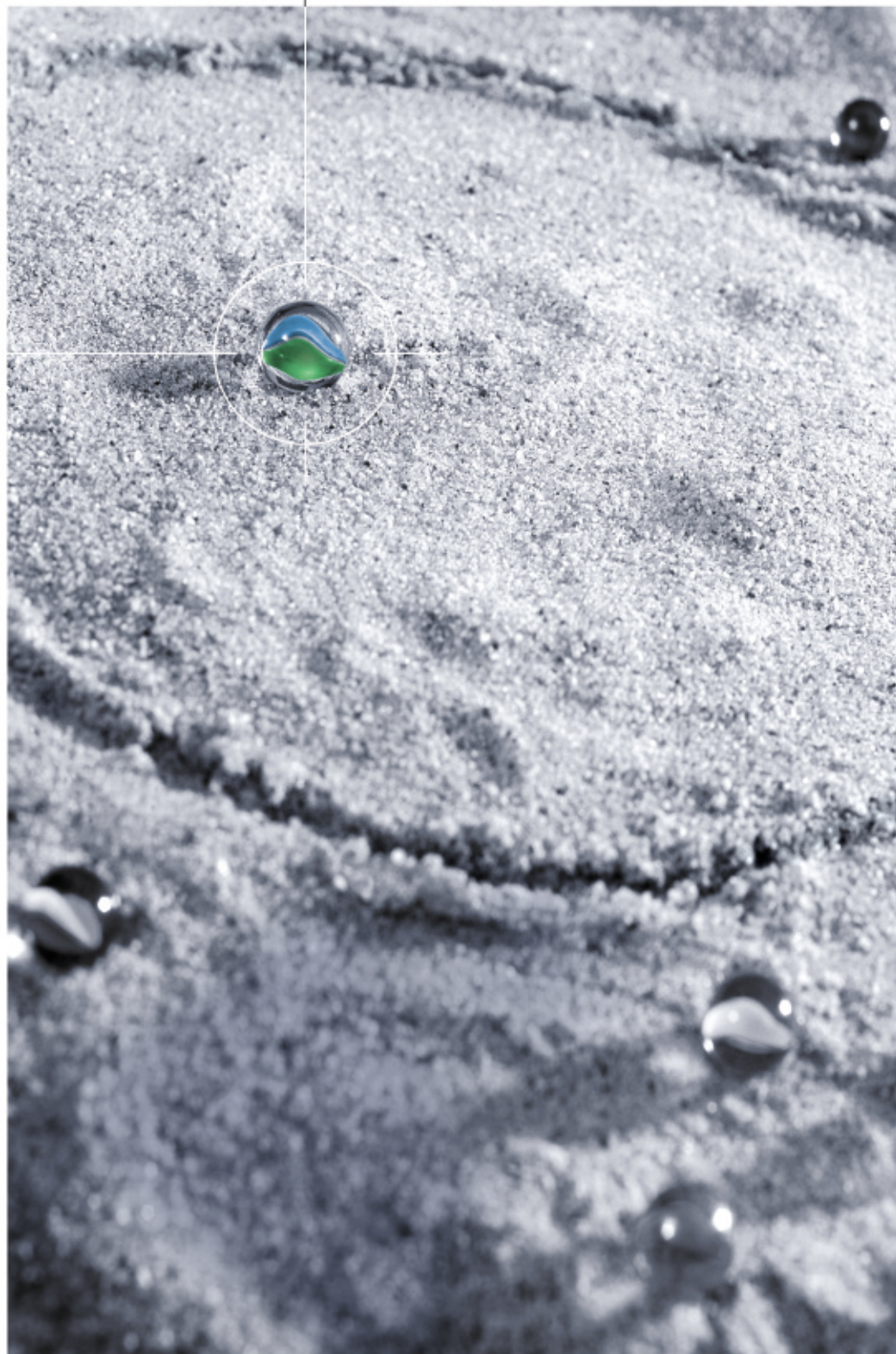
National Technical Meeting
January 28–30, 2002
Catamaran Hotel/San Diego, CA
General Chair:
Dr. Pratap Misra
Program Chair:
Mr. Jay Spalding

58th Annual Meeting
June 24–26, 2002
Hyatt Regency/Albuquerque, NM
General Chair:
Dr. Chris Bartone
Program Chair:
Mr. Boyd Holsapple
CIGTF Program Chair:
Mr. Fred Schreiber

ION GPS 2002
September 24–27, 2002
Portland, Oregon
General Chair:
Dr. Gerard Lachapelle
Program Chair:
Dr. A.J. Van Dierendonck



Accuracy is the name of the game.



OEM4 with Pulse Aperture Correlation Technology

The OEM4 GPSCard incorporates NovAtel's patented Pulse Aperture Correlation (PACT™) technology to virtually eliminate the effects of multipath. With WADGPS corrections, the OEM4 can achieve 0.7 meter CEP accuracies. The OEM4 is available in both passport size (85 x 125mm) and Eurocard size (176 x 100mm).



DL-4 Data Logger

NovAtel's DL-4 Data Logger is tough, flexible and WADGPS-enabled. Powered by the OEM4 GPSCard, it features an LCD interface and removable compact flash card. In addition to WADGPS corrections, the DL-4 can use RT-20® and RT-2® corrections from your own base station.



GPS-600 with Pinwheel™ Technology

The GPS-600 Antenna Series uses NovAtel's patent-pending Pinwheel™ aperture coupled slot array technology. It is the industry's first GPS dual-frequency antenna to achieve less than 1-millimeter offset between L1 and L2 phase center without the aid of a choke ring.



Black Diamond System

NovAtel's Black Diamond System (BDS) combines an Inertial Measuring Unit (IMU) with leading-edge GPS technology. It updates positioning even when the sky is obscured and the GPS signal is temporarily unavailable. BDS is a major advancement for applications that require greater precision under challenging conditions.

Visit Booth A and learn more about NovAtel's advancements in GPS. You can believe anything is possible again.

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Now, what's tomorrow's challenge?