



Course 228:

Merging GPS and Communications

Providing E911, other position info using GPS, mobile phone, etc.

**On-site
only**

	Day 1	Day 2
8:30	Merging Navigation and Communications Enhanced 911 applications; FCC rules, options Integrated in-vehicle navigation and tracking systems with data links Asset tracking and monitoring Automatic Dependent Surveillance-Broadcast (ADS-B) for aviation Dr. Stephen Heppe <i>Telerenergy</i>	Determining DL Needs - Requirements Analysis System requirements for reliable GPS/DL operations GPS and DL capacity and access consid's; tradeoffs Spectrum Issues: Selecting Best DL Frequency Frequency band allocations; current signal classes FCC and NTIA roles; obtaining approvals; avoiding delays and pitfalls, examples
9:45	Parts of the Puzzle - Systems and Protocols for Voice and Data What does the user need? System alternatives for voice and circuit-switched data techniques System alternatives employing packet data Case Study: the IS-801 standard for CDMA cellular networks	Case Study I: Automatic Dependent Surveillance for Civil Aviation International standards for ADS data link broadcast ADS-B with VHF Data Link Mode 4 Historical position reporting versus intent Navigating on the communications signal Other data link applications
11:00	Interference Considerations for Navigation and Communications RF interference environment and concerns The expected and the unexpected; RFI and jamming Shadowing, blockage and multipath effects on navigation and communications Interference mitigation techniques and applicability	Case Study II: Techniques for Solving Tough Problems in Poor Conditions Techniques for indoor GPS In-car applications Vector tracking and IDN receivers Ranging on the mobile comm signal for position Other techniques Use environments
12:00	<i>Lunch is on your own</i>	<i>Course ends at 12:00</i>
1:30	Fundamentals of Data Link Design with GPS Examples <i>(A quick tour of comm theory/engineering and technology; key elements of importance)</i> Probability and queuing theory and their applications to Data Link (DL) and comm Modulating information and detecting it at the receiver; Current modulation methods and performance differences	
2:45	Correcting errors in transmission; GPS and comm Compressing information for efficient transmission; reducing capacity needs Data and Comm Link Budget Analysis Impact of waveform, coding, diversity and error sources Link budget examples - How well does the link actually perform? Improvement techniques	
4:00	Single and repeatered links; satcom; DGPS and other links Paradigms, Integrity and Practical Examples Key insights to modern data links and paradigms Authentication Data integrity DL design examples: • VHF • UHF • Line-of-Sight • Urban	
5:00		

About This Course

Navigation and communications are increasingly intertwined in today's emerging applications. For many difficult areas, a combination of available (partial) GPS info and mobile communications data is necessary to operate successfully. However, these systems can not only support, but at times interfere with one another. To communicate or determine your position successfully, you need the proper wireless data link system... and you've got *lots* of choices! This three-day course will (1) give you an understanding of comm & nav system interrelationships, (2) discuss design considerations for individual system elements for position determination and data links, and (3) tell you how to effectively use them in the field. It also provides a survey of terrestrial wireless data systems and identifies future enhancements that can enable new navigation applications. For anyone needing to improve or communicate position and/or other data from the field, this course is for you!

Instructor: Dr. Stephen Heppe



Who Should Attend

This course is a must for anyone attempting to develop an integrated nav/comm application, or anyone attempting to choose between an off-the-shelf versus a "home-grown" DGPS system. It's also useful for engineers new to nav, comm, and/or differential systems; program managers trying to "ride herd on those crazy engineers"; and analysts trying to understand the current trends shaping tomorrow's applications.

Prerequisites

- A basic knowledge of GPS system operation is assumed.
- Familiarity with communications and engineering terms and analysis methods.
- Understanding of GPS principles, as in *Course 135, 111, 122 or 356*.

Materials You Will Keep

- A notebook containing copies of all vugraphs presented

To register, or for more information, call Navtech at 1-800-NAV-0885 or 703-256-8900, or fax to 703-256-8988, or e-mail to courses@navtechgps.com. For updated information, look on our home page: www.navtechgps.com

