



The Global Positioning System and Navigation Systems Division



*SPAWAR
Systems Center
San Diego*

SSC San Diego
San Diego, CA 92152-5001

Global Positioning System (GPS) and Navigation Systems Division

Leader in the Research, Development, Test and Evaluation (RDT&E) of Government and Commercial Global Positioning System and Navigation Technologies



The Space and Naval Warfare Systems Center, San Diego (SSC San Diego) is the Navy's leading navigation research and development activity. At SSC San Diego, the GPS and Navigation Systems Division provides a unique and innovative research, development, test and evaluation environment for state-of-the-art navigation systems, GPS receiver systems, and subsystems.

SSC San Diego's navigation laboratories evaluate proposed navigation system changes, support the development of new receivers and systems, perform bid sample and production

performance characterization testing, and assist manufacturers and users with incorporating receiver and navigation system modifications and enhancements in support of fleet needs. Navigation efforts encompass airborne, shipboard, and subsurface vehicles as well as hand-held and ground-based applications for the Department of Defense (DoD) and non-DoD communities.

The SSC San Diego GPS and Navigation Systems Division has supported the GPS Program continuously since its inception in 1973 and has functioned as the lead Navy navigation technology activity for well over 50 years. In 1984, a department of the Naval Air Development Center (now part of SSC San Diego) was designated as the Central Engineering Activity (CEA) to provide technical management and engineering support for GPS receiver development and integration into more than 120 Navy, Marine, and Coast Guard platforms and to manage the GPS CEA Laboratory for evaluating GPS receivers. Due to base realignment and mission consolidation actions, this part of SSC San Diego was relocated from Warminster, PA, in 1996 to the SSC San Diego Point Loma campus. With our re-establishment in San Diego and our consolidation with the in-service GPS and inertial navigation activities already present in San Diego, SSC San Diego now provides cradle-to-grave navigation system support for DoD, non-DoD, and foreign military customers.

GPS and Navigation Systems Division Facilities

The GPS Central Engineering Activity (CEA) leads DoD's GPS testing with this premier facility for support of acquisition, development, integration, and testing of GPS user equipment and its applications.

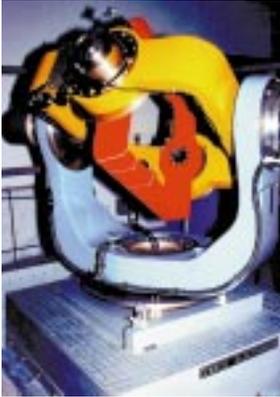


The GPS CEA is the premier Navy GPS laboratory. Through real-time simulation of both GPS satellite signals and host vehicle sensors and communications, the facility exercises GPS receiver hardware and software dynamically under precise and repeatable laboratory conditions. The CEA facility supports multiple simultaneous Satellite Signal Simulator (SSS) control for all-in-view, attitude determination testing, differential testing, etc. Laboratory accuracy under dynamic conditions has been certified to be fewer than 2 centimeters. The CEA includes a development laboratory used for

developing new concepts before introduction to the tightly configuration-controlled CEA laboratory. In addition, the CEA laboratory is continuously undergoing enhancements to meet the future test needs of the navigation community, including modernization / navigation warfare (NAVWAR) and other research and development areas.

The CEA facilities provide fiber-optic RF links to related laboratories including the Strapdown Navigation System Evaluation Laboratory (SNSEL), the GPS Receiver Application Module (GRAM) Test Fixture Development laboratory, the Control Display Navigation Unit (CDNU) laboratory, and the Navigation Sensor System Interface (NAVSSI) laboratory.

GPS and Navigation Systems Division Facilities (continued)



Strapdown Navigation Systems Development Laboratory

This fully automated simulator provides a dynamic-motion environment for testing and evaluating aircraft inertial navigation systems. The simulator consists of a three-axis test platform, electronics to operate systems under test, a control computer, and a data plotter. Using totally programmable flight profiles, high aircraft dynamic rates are applied in all three axes (roll, pitch, and heading) to the navigation system under test.



GPS Receiver Application Module (GRAM) Test Fixture Development Laboratory

This laboratory supports the verification of the functional testing and performance testing of the GRAM and GRAM-SAASM (GRAASM) devices.



Control Display Navigation Unit (CDNU) Laboratory

This unique laboratory serves to develop, test, and maintain Control Display Navigation Unit (CDNU) Operational Flight Program (OFP) software. Through the use of platform hardware and simulation software, the CDNU laboratory supports comprehensive system integration testing prior to actual installation on an operational platform.

GPS and Navigation Systems Division Services

The GPS and Navigation Systems Division provides cradle-to-grave support of navigation systems from concept development through acquisition engineering, system engineering, modeling and simulation, integration, test and evaluation, fleet installation, and in-service engineering. The GPS and Navigation Systems Division's services include:

- Advanced Research
- Antenna Technology
- GPS Modeling and Simulation
- GPS Receiver Architecture
- Hardware and Software Solutions
- Inertial Navigation Integration
- In-Service Engineering
- Integrated Logistics Management
- Interference Detection/Location
- Knowledge-Based Systems Development
- Modeling and Simulation
- Navigation Applications
- Platform Systems Integration
- Receiver Development/Test
- Reliability, Maintainability, and Availability Analyses
- Software Development and Maintenance
- Source Selection and Acquisition Support
- Test Tool Development
- Transition Planning

SSC San Diego maintains highly regarded independent R&D facilities and an expert staff skilled in emerging navigation technologies.

Current Programs and Areas of Investigation

- Advanced GPS Electronic Navigation Tool (AGENT)
- Combat Survivor Evader Locator (CSEL) Logistics
- Control Display Navigation Unit (CDNU) Software Development
- Conventional Navigation
- Digital Receiver Development and Assessment
- Doppler Sonar Velocity Log (DSVL) AN/WQN-2
- GPS Antenna System (GAS-1N)
- GPS Augmented Mission Enhancement (GAME)
- GPS In-Service Engineering
- GPS Modernization
- GPS Security
- GPS Trainers
- Integrated Navigation Tactical Plotting System (INTPS)
- AN/WSN-6
- Joint Tactical Information Distribution System (JTIDS)/GPS
- Location of GPS Interferers (LOCO GPSI)
- Low Elevation Antenna Nuller (LEAN)
- Navigation Sensor System Interface (NAVSSI) Field Support
- Navy Navigation Warfare (NAVWAR)
- Tight vs. Loose GPS/INS Coupling

Test Services

Our state-of-the-art GPS CEA and inertial navigation facilities are used in government and commercial navigation research and development and in fleet support programs. SSC San Diego is an active member of the GPS Joint Program Office (JPO) Test Center of Expertise (COE). Our test services include:

Performance Characterization

- Acquisition/Reacquisition
- GPS Antenna Reception Evaluation
- Jamming and Spoofing Characterization
- Kalman Filter Integration Characteristics
- Minimum Signal Power
- Navigation Accuracy

Bid Sample Testing

Brassboard Testing

Demonstration Feasibility

- GPS/Inertial Pseudo and Delta-Range Tests
- GPS Multipath Sensitivity Evaluation
- Gravity and Magnetic Navigation Evaluations
- Integrity Monitoring
- Navigation Warfare—Prevention Testing
- Non-Precision Landing Approach
- Pseudolites

Special Studies

- Carrier Aiding
- GPS Boundary Testing
- Interference Studies
- JTIDS/GPS/INS Integrated Systems
- Modernization Impacts on User Equipment (UE)
- Precise Time Transfer
- Small Anti-Jam Antennas

Research and Development (R&D)

- Advanced GPS Simulation
- Atmospheric Scintillation
- Test Tool Development

Test Programs

- Advanced Commercial Receiver Evaluation Program (ACREP)
- AN/ASN-128G Embedded GPS / Doppler System
- AN/ASN-217(V5) Embedded GPS / Doppler System
- Cargo Utility GPS Receiver (CUGR)
- Commercial Receiver Test Program (CRTP)
- E-6A GPS Navigation Tests
- Electrically Suspended Gyro Navigator (ESGN)
- Embedded GPS Inertial (EGI)
- Enhanced Miniature Airborne GPS Receiver (EMAGR)
- Enhanced Precision Lightweight GPS Receiver (EPLGR)
- FPS 117 Radar
- GPS Antenna System (GAS-1N)
- GPS Augmented Mission Enhancement (GAME) / Pseudolites
- GPS Inertial Navigation Assembly (GINA)
- GPS Receiver Application Module (GRAM)
- GPS VME Receiver Card (GVRC)
- L_m Backwards Compatibility
- Miniature Airborne GPS Receiver (MAGR)
- Miniature Airborne GPS Receiver (MAGR 2000)
- Miniature Airborne GPS Receiver Upgrade (MAGRU)
- Miniature Underwater GPS Receiver (MUGR)
- Mobile Satellite System (MSS) / Global Navigation Satellite System (GLONASS)
- Navigation Sensor System Interface (NAVSSI) EDM Evaluation
- Precision Lightweight GPS Receiver (PLGR)
- Selective Availability Anti-Spoofing Module (SAASM)
- Special Operations Lightweight GPS Receiver (SOLGR)
- Standard Airborne GPS Receiver (Receiver 3A)
- Standard Shipboard GPS Receiver (Receiver 3S)
- Stellar Tracker
- Tomahawk Land Attack Missile (TLAM) GPS Software
- Tracking and Imaging Systems Carrier Aiding Studies
- U.S. Coast Guard Reference Station / Integrity Monitoring (RS/IM)
- Wide-Area Augmentation System (WAAS) Reference Receiver Testing
- WSN-5 Inertial Navigation System (INS)
- Year 2000 Test Programs

SSC San Diego GPS and Navigation Systems Division...
Responding Today to Tomorrow's Navigation Challenges

Reviewed and approved by

**E. L. Valdes, CAPT, USN
Commanding Officer**



**SD 048, Rev. 2
September 1999**

**SSC San Diego
San Diego, CA 92152-5001**

Approved for public release; distribution is unlimited.

A Product of the Technical Information Division (TID)

***SSC San Diego's state-of-the-art facilities
are staffed by experts dedicated to ensure your
research, development, testing and evaluation
needs are met and surpassed.***