



Global Positioning System Constellation Update Modernization and Policy

5th GNSS Vulnerabilities & Solutions Conference
Baska, Krk Island, Croatia
24 May 2011

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U.S. Department of Transportation

BOEING



GPS Constellation Status

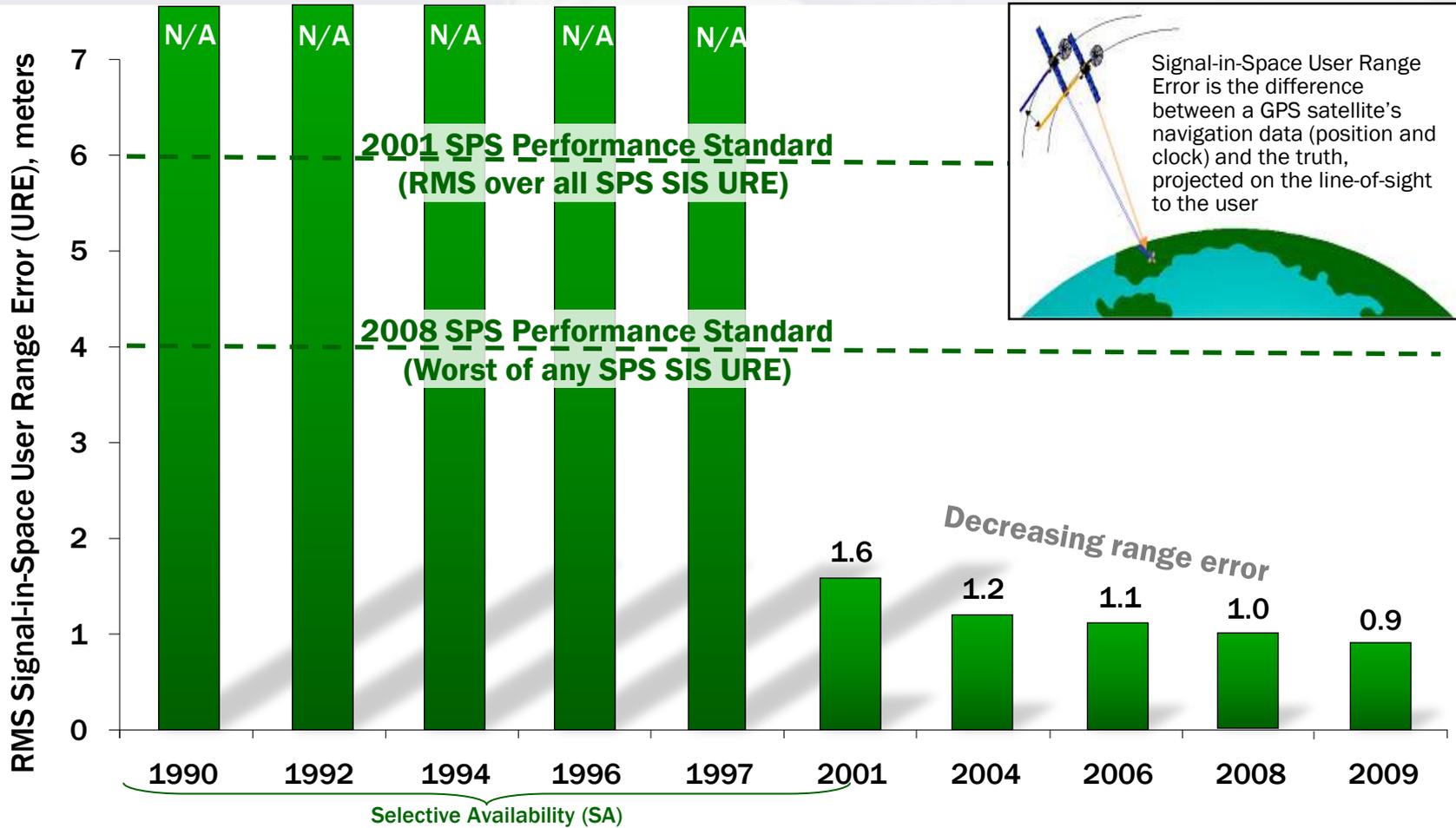
Baseline Constellation = "24 Expandable"

- **Very robust constellation; exceeds user requirements**
 - **31 satellites** currently in operation
 - 11 GPS IIA
 - 12 GPS IIR
 - 7 GPS IIR-M
 - 1 GPS IIF
 - 4 additional satellites in residual status
 - IIF SV-2 scheduled to launch by July 2011
 - IIIA SV-1 scheduled launch 2014
- **Global GPS civil service performance commitment met continuously since December 1993**





Current GPS Accuracy

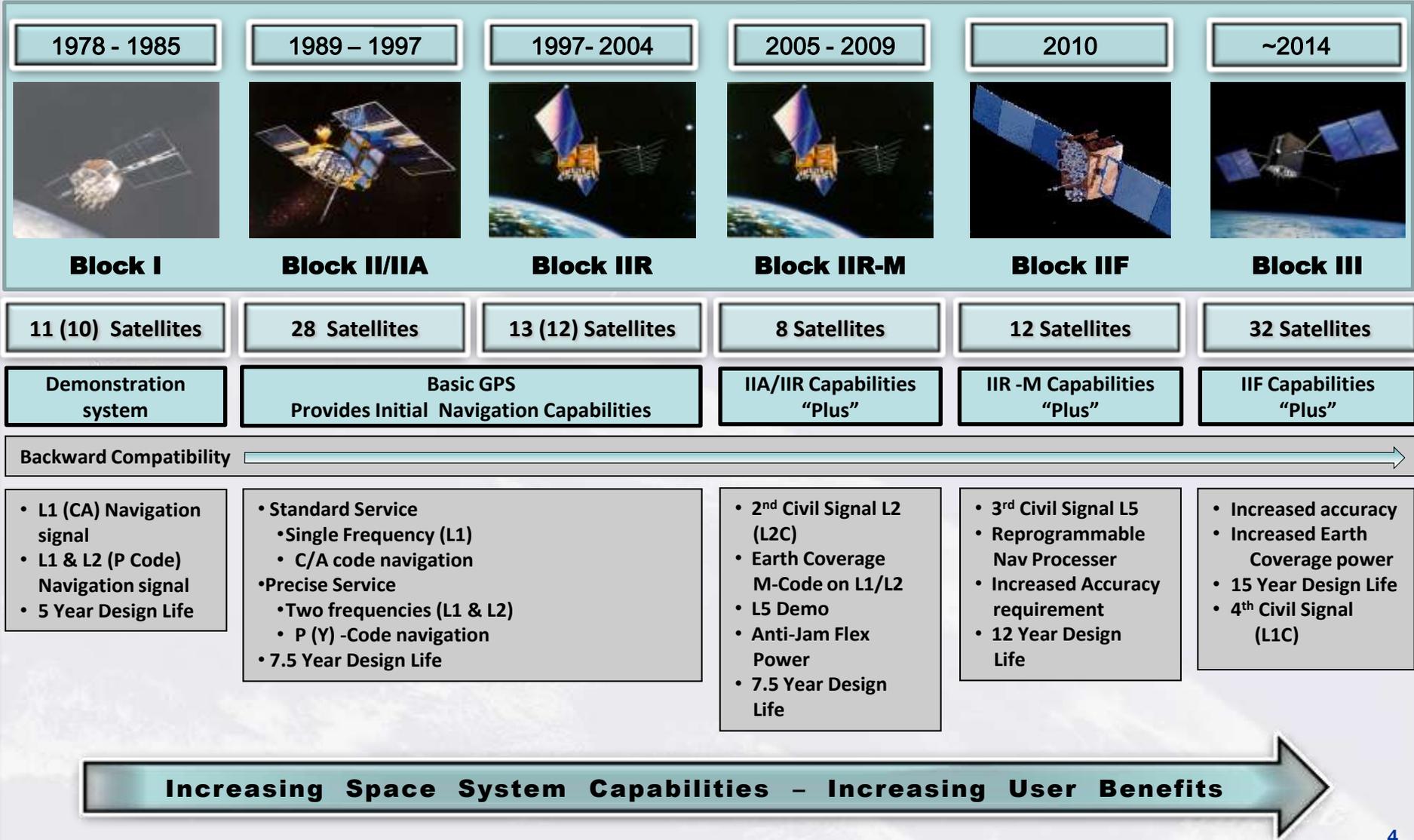


System accuracy exceeds published standard



GPS Modernization

Space Segment





GPS Modernization

Control Segment

- **Architecture Evolution Plan (AEP)**

- Transitioned in 2007
- Increased worldwide commanding capability
- Increased capacity for monitoring of GPS signals
- Modern distributed system replaced 1970s mainframes



- **Next Generation Control Segment (OCX)**

- Controls more capable constellation, and monitors all GPS signals
- \$1.5B contract awarded 25 February 2010
- Capability delivered incrementally to reduce risk
- On track for Preliminary Design Review in June 2011
- Full Capability by ~2016



GPS Improvements

"Expandable 24" Constellation

- **Optimize GPS constellation assets to improve operational effectiveness for global users & terrain challenged environments**
 - Increases the number of satellites in view for better global coverage
- **Consistent with the current Standard Positioning Service Performance Standard**
 - Adjust position of satellites in 3 of 6 orbital planes
 - Provides better Global coverage
 - Coordinated with international community
- **Estimated completion date: [June 2011](#)**

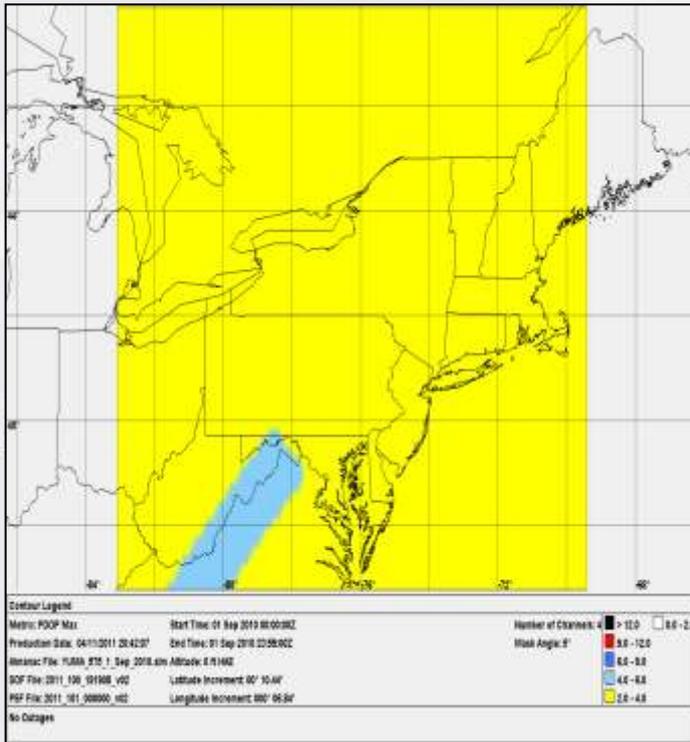




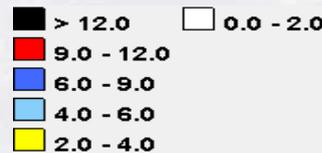
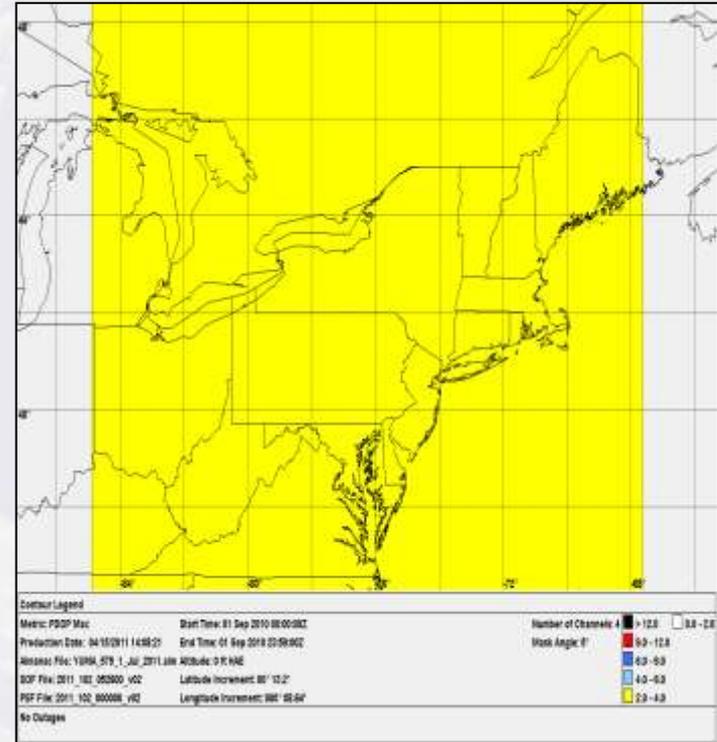
GPS Improvements

"Expandable 24" Constellation

Current Operations



Expandable 24 Constellation



Lighter Colors = Less Positional Error



GPS User Support Improvements

Keeping you informed "GPS.GOV"

The screenshot shows the GPS.gov website interface. Red boxes highlight several key areas:

- Language Selection:** A box at the top right highlights the language menu with options for English, Español, Français, and 中文 | العربية.
- Navigation Menu:** A box highlights the main navigation bar with links for HOME, WHATS NEW, SYSTEMS, APPLICATIONS, POLICY & FUNDING, MULTIMEDIA, and SUPPORT.
- Left Sidebar:** A box highlights a vertical menu with links for "For General Public", "For News Media", "For Congress", "For Internationals", and "For Professionals".
- Main Content Area:** A large box highlights the main content area, which includes a featured article titled "Lost Satellite Reception" with a map, a "Did You Know? GPS Jamming is Illegal" section, and a "U.S. Policy Overview" sidebar with links to Federal Agencies, International Cooperation, Interference Mitigation, Legislation, Program Funding, and Congressional Homepage.
- Video Player:** A box highlights a video player showing a NASA/Air Force video titled "On Target With GPS" from the Goddard Space Flight Center.
- Right Sidebar:** A box highlights a sidebar with three sections: "GPS User Support", "What is GPS?", and "Frequently Asked Questions".



GPS User Support Improvements

Keeping you informed "GPS.GOV"

The screenshot shows the GPS.gov website with the following elements:

- Header:** "GPS.gov Beta" logo, "Official U.S. Government information about the Global Positioning System (GPS) and related topics", and a search bar.
- Navigation:** HOME, WHAT'S NEW, SYSTEMS, APPLICATIONS, POLICY & FUNDING, MULTIMEDIA, SUPPORT.
- Left Sidebar:** Links for "For General Public", "For News Media", "For Congress", "For Internationals", and "For Professionals".
- Main Content:** "Welcome GPS Experts, Developers, and Professional Users".
- Right Column:** Text stating "This page is designed to help you find the latest technical data and other detailed" and "This is still a work in progress, and we welcome your ideas on how to make it more useful." with a "SEND COMMENTS..." button.
- Bottom Left:** "Get Involved!" section with a "Next ICWG Meeting" (April 28, 2011, SAIC Facility, El Segundo, California) and "Documentation" (Interface Specifications: IS-GPS-200, IS-GPS-705, IS-GPS-800, IS-GPS-870; Performance Standards: SPS, PPS).
- Bottom Right:** Three highlighted boxes: "GPS User Support", "President's GPS Budget Request for FY 2012", and "U.S. Policy on GPS".



GPS User Support Improvements

Keeping you informed "GPS.GOV"

The screenshot shows a web browser window with the URL www.gps.gov/technical/icwg/meetings/2011/04/28/. The page header features the GPS.GOV logo and the tagline "Official U.S. Government information about the Global Positioning System (GPS) and related topics". A navigation menu includes links for HOME, WHAT'S NEW, SYSTEMS, APPLICATIONS, POLICY & FUNDING, MULTIMEDIA, and SUPPORT. The main content area displays a breadcrumb trail: Home » Technical Documentation » Interface Control Documents » Public ICWG Meetings » April 28, 2011. On the left, a list of "ICWG MEETINGS:" shows dates from 2008 to 2011, with "April 28, 2011" highlighted. The main heading is "Public ICWG Meeting" with the date "April 28, 2011". Below this is a "Meeting Announcement" section titled "Documents Distributed Prior to Meeting:" which lists four draft documents: DRAFT ICD-GPS-870A, DRAFT ICD-GPS-870A Redline, DRAFT ICD-GPS-870A "Was/Is" Matrix, and DRAFT ICD-GPS-870A Comment Form. A note states: "Some links on this page lead to content in the Portable Document Format (PDF) and may require you to install PDF software. GET SOFTWARE...". The footer contains a "SPACE-BASED POSITIONING NAVIGATION & TIMING" logo, a disclaimer, and a small circular seal.

GPS.gov Official U.S. Government information about the Global Positioning System (GPS) and related topics

HOME WHAT'S NEW SYSTEMS APPLICATIONS POLICY & FUNDING MULTIMEDIA SUPPORT

Home » Technical Documentation » Interface Control Documents » Public ICWG Meetings » April 28, 2011

ICWG MEETINGS:

- April 28, 2011
- March 10, 2010
- February 12, 2010
- October 5, 2009
- October 1, 2009
- September 29, 2009
- November 19, 2008
- November 18, 2008

ACTIONS:

- Share this page via Facebook, Twitter, etc.
- Comment on this page
- Get help and support

Public ICWG Meeting

April 28, 2011

Meeting Announcement

Documents Distributed Prior to Meeting:

- DRAFT ICD-GPS-870A
- DRAFT ICD-GPS-870A Redline
- DRAFT ICD-GPS-870A "Was/Is" Matrix
- DRAFT ICD-GPS-870A Comment Form

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This page was updated on March 14, 2011. This U.S. government website has been developed by the National Coordination Office for Space-Based Positioning, Navigation, and Timing and the Civil GPS Service Interface Committee. It is hosted by the Coast Guard Navigation Center. [Disclaimer](#) & [privacy policy](#). [Contact webmaster](#).



GPS User Support Improvements

Keeping you informed "GPS.GOV"

The screenshot shows the GPS.gov website interface. At the top, there is a navigation bar with links for HOME, WHAT'S NEW, SYSTEMS, APPLICATIONS, POLICY & FUNDING, MULTIMEDIA, and SUPPORT. The main content area is titled "Technical Documentation" and contains several sections: "INTERFACE CONTROL DOCUMENTS", "PERFORMANCE STANDARDS & SPECIFICATIONS", "FEDERAL RADIONAVIGATION PLAN", and "SEMI-CODELESS/CODELESS GPS ACCESS COMMITMENTS". A sidebar on the left lists various support topics and actions.

GPS.gov: Technical Docum... x
www.gps.gov/technical/

GPS.gov Official U.S. Government information about the Global Positioning System (GPS) and related topics

HOME WHAT'S NEW SYSTEMS APPLICATIONS POLICY & FUNDING MULTIMEDIA **SUPPORT**

Home » Technical Documentation

SUPPORT:

- GPS User Support
- Frequently Asked Questions
- Civil GPS Service Interface Committee
- Technical Documentation**
- Interface Control Documents
- Performance Standards & Specifications
- Federal Radionavigation Plan
- Semi-Codeless/Codeless GPS Access Commitments
- Website Feedback

Technical Documentation

It is the official policy of the U.S. government to provide open, free access to the information necessary to develop and build equipment to use the civil services of GPS and its augmentations. [LEARN MORE...](#)

This section of the website provides easy access to all of the relevant technical documentation. Some links on this page lead to content in the Portable Document Format (PDF) and may require you to install PDF software. [GET SOFTWARE...](#)

INTERFACE CONTROL DOCUMENTS

These documents provide detailed information on the civil GPS signals and codes broadcast at the L1, L2, and L5 frequencies. Enter to access current versions of the GPS Interface Specifications, as well as information about ongoing efforts to update the documents through the Interface Control Working Group (ICWG). [VIEW...](#)

PERFORMANCE STANDARDS & SPECIFICATIONS

These documents specify the levels of technical performance that users can expect from GPS and related systems. Enter to access current and past versions of the performance standards for the civil GPS service (SPS), military GPS service (PPS), Wide Area Augmentation System (WAAS), and U.S. GPS monitoring capabilities. [VIEW...](#)

FEDERAL RADIONAVIGATION PLAN

The Federal Radionavigation Plan (FRP) is the official source of radionavigation policy and planning for the federal government. It covers

SEMI-CODELESS/CODELESS GPS ACCESS COMMITMENTS

These documents describe U.S. government commitments to support semi-

ACTIONS:

- Share this page via Facebook, Twitter, etc.



GPS User Support Improvements

Keeping you informed "GPS.GOV"

Welcome to GPS.gov

www.gps.gov/internationals/

English Español Français 中文 عربي

GPS.gov

Official U.S. Government information about the Global Positioning System (GPS) and related topics

HOME WHAT'S NEW SYSTEMS APPLICATIONS POLICY & FUNDING MULTIMEDIA SUPPORT

For General Public
For News Media
For Congress
For Internationals
For Professionals

Bienvenidos
Welcome
أهلاً وسهلاً
歡迎光臨
Bienvenue

To Improve global understanding about GPS, we are pleased to offer key portions of this website in multiple languages.

Please note that some pages may link back to English-language content.

Multilingual Content

Español

- Página Principal
- El Sistema de Posicionamiento Global
- Ampliaciones al SPG
- Aplicaciones del SPG

Français

- Accueil
- Le Système de Positionnement Mondial
- Compléments GPS
- Applications du GPS

中文

- 首页
- 全球定位系统
- GPS的增强系统
- GPS的应用

عربي

- الصفحة الرئيسية
- نظام التموضع العالمي
- إضافات إلى نظام التموضع العالمي
- تطبيقات النظام

GPS Cooperation with Other Nations

- Australia
- China
- Europe
- India
- Japan
- Russia
- International Committee on GNSS
- Other International Organizations

U.S. Policy on Global GPS Access



GPS User Support Improvements

Keeping you informed "GPS.GOV"

GPS.gov: GPS User Support

www.gps.gov/support/user/

GPS.gov Official U.S. Government information about the Global Positioning System (GPS) and related topics

HOME WHAT'S NEW SYSTEMS APPLICATIONS POLICY & FUNDING MULTIMEDIA SUPPORT

Home » Support » GPS User Support

SUPPORT:

- GPS User Support
- GPS Status and Outage Reports
- Report a Problem
- Fixing Map Errors
- Frequently Asked Questions
- Civil GPS Service Interface Committee
- Technical Documentation
- About This Website
- Website Feedback

ACTIONS:

- Share this page via Facebook, Twitter, etc.
- Comment on this page
- Get help and support

GPS User Support

For Civilian Users

Civilian GPS user support comes in a variety of forms. Please select the type of support you are seeking from the list below. Most of these links lead to the U.S. Coast Guard Navigation Center (NAVCEN), the designated point of contact within the U.S. government for civilian GPS user support. **GO THERE...** ➔

- Global Positioning System (GPS)
 - Find out the operational status of the GPS satellites
 - Find out about known GPS service outages
 - Look up Notices to Airmen (NOTAMS) about GPS service disruptions
 - Report a GPS service problem
 - Fix a map error on your GPS device
 - Sign up for GPS email notices
 - Join the Civil GPS Service Interface Committee (CGSIC)
- Nationwide Differential GPS (NDGPS)
 - Find out the operational status of NDGPS sites
 - Find out about known NDGPS service outages
 - Report an NDGPS service problem
- Wide Area Augmentation System (WAAS)
 - Find out the operational status of the WAAS satellites and service
- Other
 - Find answers to common questions about GPS



U.S. National Space Policy

Space-Based PNT Guideline: Maintain leadership in the service, provision, and use of GNSS

- **Provide civil GPS services, free of direct user charges**
 - Available on a continuous, worldwide basis
 - Maintain constellation consistent with published performance standards and interface specifications
 - Foreign PNT services may be used to complement services from GPS
- **Encourage global *compatibility* and *interoperability* with GPS**
- **Promote transparency in civil service provision**
- **Enable market access to industry**
- **Support international activities to detect and mitigate harmful interference**



Summary

- **GPS performance is better than ever and will continue to improve**
 - GPS continues to meet or exceed U.S. performance commitments to worldwide users
 - New civil GPS signal available now
 - Many additional upgrades scheduled
- **U.S. policy encourages worldwide use of civil GPS and augmentations**
- **International cooperation is a priority**
 - **Compatibility** and **Interoperability** are critical



Contact Information

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