



SPACE-BASED POSITIONING  
NAVIGATION & TIMING  
NATIONAL COORDINATION OFFICE

# GPS Constellation, Modernization Plans and Policy

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United States of America

## USTTI Seminar

Washington, D.C.  
October 23, 2012



# Overview



- **Introduction**
- **Global Positioning System**
- **Modernization Plans**
- **U.S. Policy**

# GPS enables a diverse array of applications



**Satellite Operation**



**Surveying & Mapping**



**Power Grids**



**Precision Agriculture**



**Transit Operations**



**NextGen**



**Disease Control**



**Intelligent Vehicles**



**TeleComm**



**Trucking & Shipping**



**Personal Navigation**



**Oil Exploration**



**Fishing & Boating**



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# GPS IIF-3 Launch



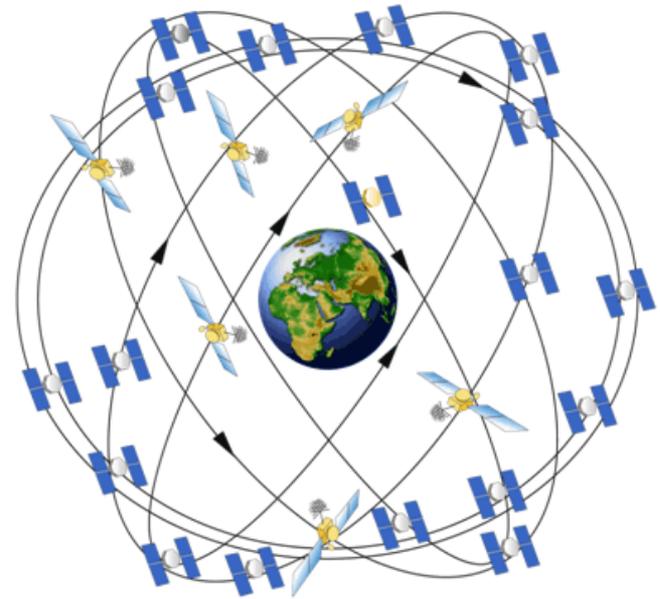
**SVN-65 , October 4, 2012**



# The Global Positioning System



- **Baseline 24+3 satellite constellation in medium earth orbit**
- **Global coverage, 24 hours a day, all weather conditions**
- **Satellites broadcast precise time and orbit information on L-band radio frequencies**
- **Two types of signals:**
  - Standard (free of direct user fees)
  - Precise (U.S. and Allied military)
- **Three segments:**
  - Space
  - Ground control
  - User equipment





# GPS Constellation Status



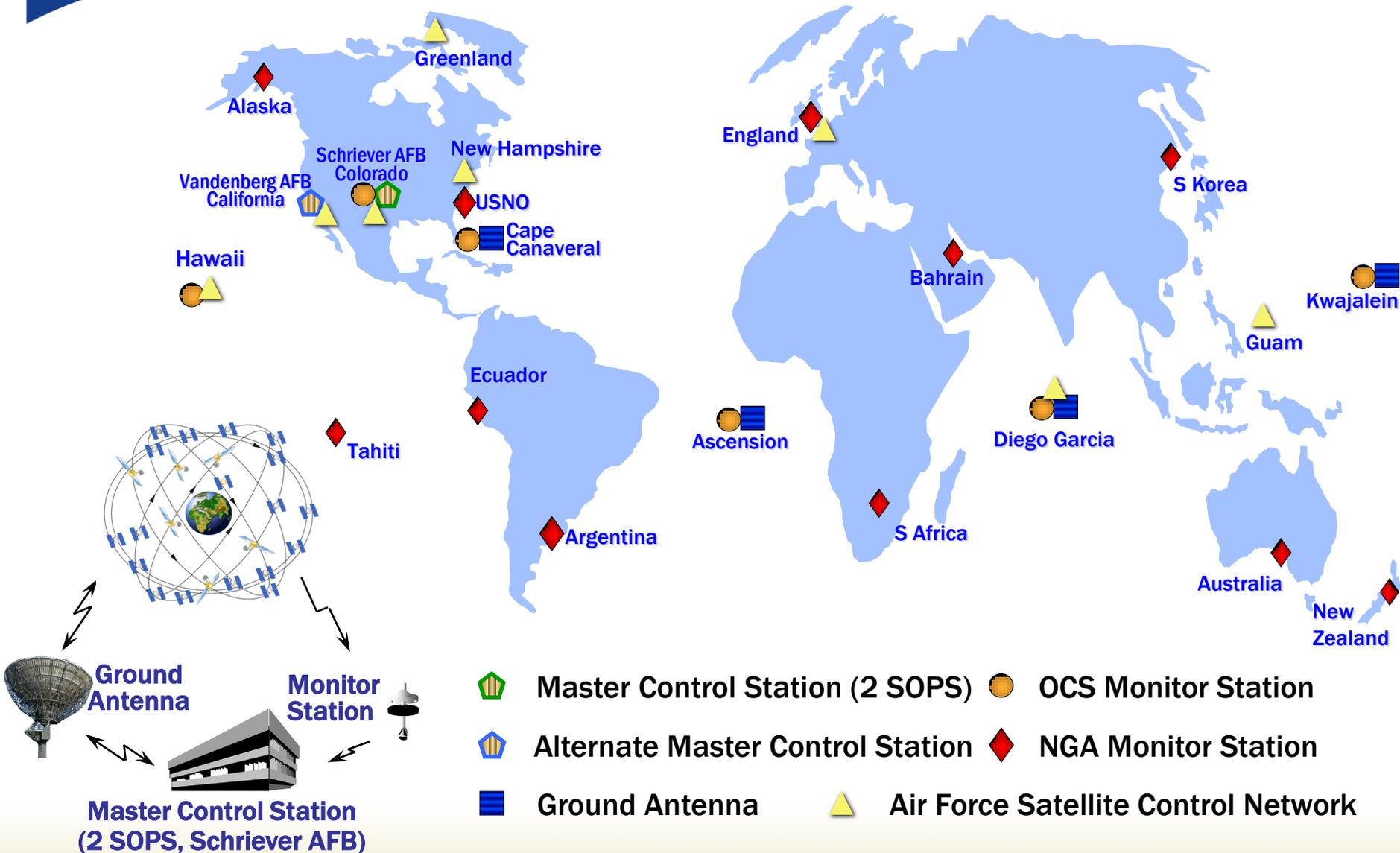
**35 Satellites (30 Operational)  
(Baseline Constellation: 24+3)**

- **12 Block IIA**
  - 3 on-orbit in residual status
- **12 Block IIR**
- **8 Block IIR-M**
  - Transmitting new second civil signal
  - 1 GPS IIR-M in on-orbit testing
- **3 Block IIF**
  - SVN-65 operational late 2012
- **Global GPS civil service performance commitment met continuously since December 1993**



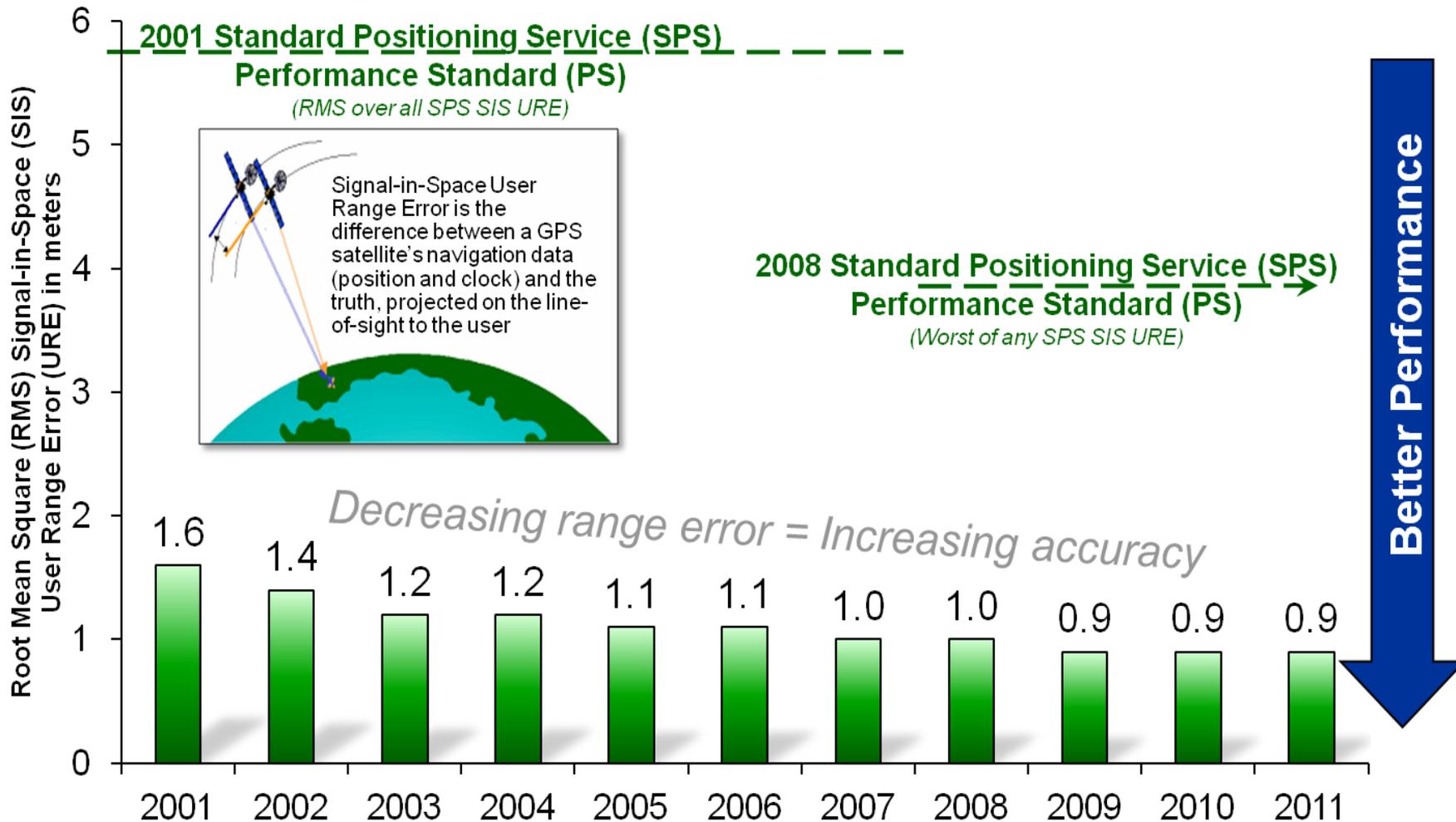


# GPS Operational Control Segment (OCS)





# Standard Positioning Service (SPS) Signal-in-Space Performance



**System accuracy exceeds published standard**



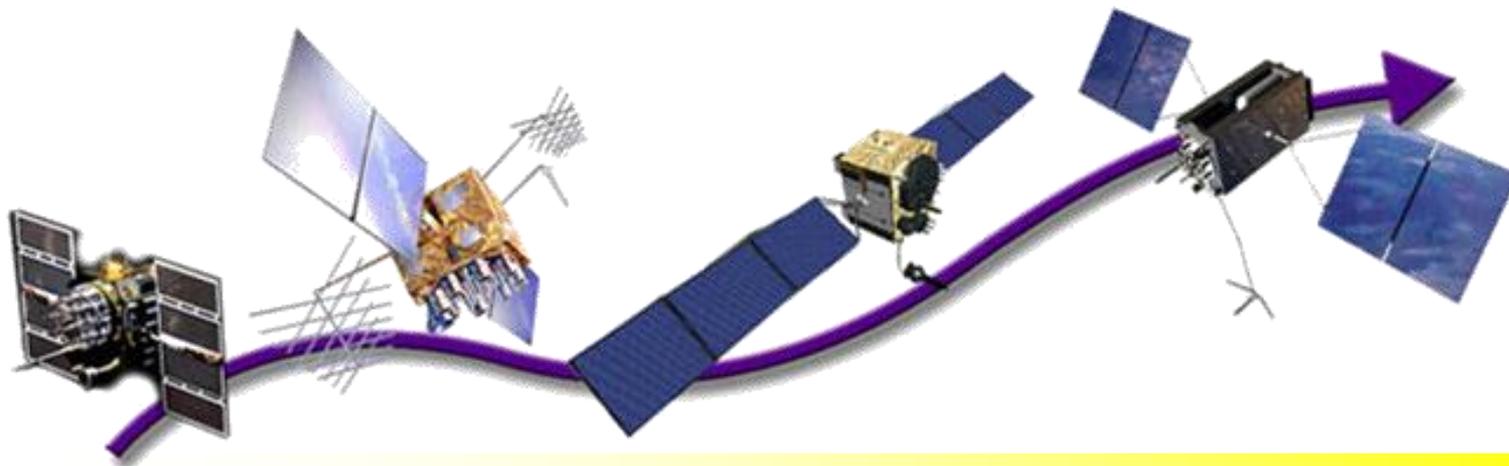
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# GPS Modernization Program



*Increasing System Capabilities ♦ Increasing User Benefit*

## Block IIA/IIR

### Basic GPS

- Standard Service
  - Single frequency (L1)
  - Coarse acquisition (C/A) code navigation
- Precise Service
  - Y-Code (L1Y & L2Y)
  - Y-Code navigation

## Block IIR-M, IIF

### IIR-M – Basic GPS capability plus

- 2nd civil signal (L2C)
- M-Code (L1M & L2M)

### IIF – IIR-M capability plus

- 3rd civil signal (L5)
- 2 Rb + 1 Cs Clocks
- 12 year design life

## Block III

- Backward compatibility
- 4th civil signal (L1C)
- 4x better User Range Error than IIF
- Increased availability
- Increased integrity
- 15 year design life



# GPS Modernization – New Civil Signals



- Second civil signal “L2C”
  - Designed to meet commercial needs
  - Available since 2005 without data message
  - Currently broadcasts from 9 satellites
  - Full capability: 24 satellites and full CNAV approximately 2018



- Third civil signal “L5”
  - Designed to meet transportation safety-of-life requirements
  - Currently broadcasts from 2 satellites
  - 24 satellites and full CNAV approximately 2021

- Fourth civil signal “L1C”
  - Designed for GNSS interoperability
  - Specification developed in cooperation with industry
  - Fully designed and in testing
  - Will be broadcast by GPS III
  - Available on 24 satellites approximately 2026



Improved performance in challenged environments



# Ground Segment Status



Monitor Station



Master Control Stations at  
Schriever AFB, Colorado



Ground Antenna

- Current system Operational Control Segment (OCS)
  - Currently flying expanded 24+3 constellation of GPS Block II satellites
  - Provides worldwide ground antenna and monitor station with redundant coverage
- Next Generation Operational Control System (OCX) development continues
  - Will provide ability to fly GPS III and operate modernized GPS signals
  - OCX Block I deployment planned for 2016



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# U.S. Policy History



- **1978:** First GPS satellite launches
- **1983:** President announces civilian access to GPS following KAL 007
- **1991:** U.S. offers free civil GPS service to the International Community
- **1996:** First U.S. GPS Policy establishes joint civil/military management
- **1997:** U.S. law provides civil GPS access free of direct user fees
- **2000:** President ends use of Selective Availability
- **2004:** President issues U.S. Policy on Space-Based PNT
- **2004:** Agreement signed on GPS-Galileo Cooperation
- **2007:** Selective Availability eliminated from GPS III satellites
- **2010:** National Space Policy provides high-level PNT guidance



# National Space Policy, 2010



***The U.S. must maintain its leadership in the service, provision and use of Global Navigation Satellite Systems (GNSS)***

- **Provide continuous worldwide access to GPS for peaceful uses, free of direct user charges**
- **Encourage compatibility and interoperability with foreign GNSS services**
- **Operate and maintain constellation to satisfy civil and national security needs**
  - **Foreign PNT may be used to strengthen resiliency**
- **Invest in domestic capabilities and support international activities to detect, mitigate and increase resiliency to harmful interference**

# U.S. Objectives in Working with Other GNSS Service Providers

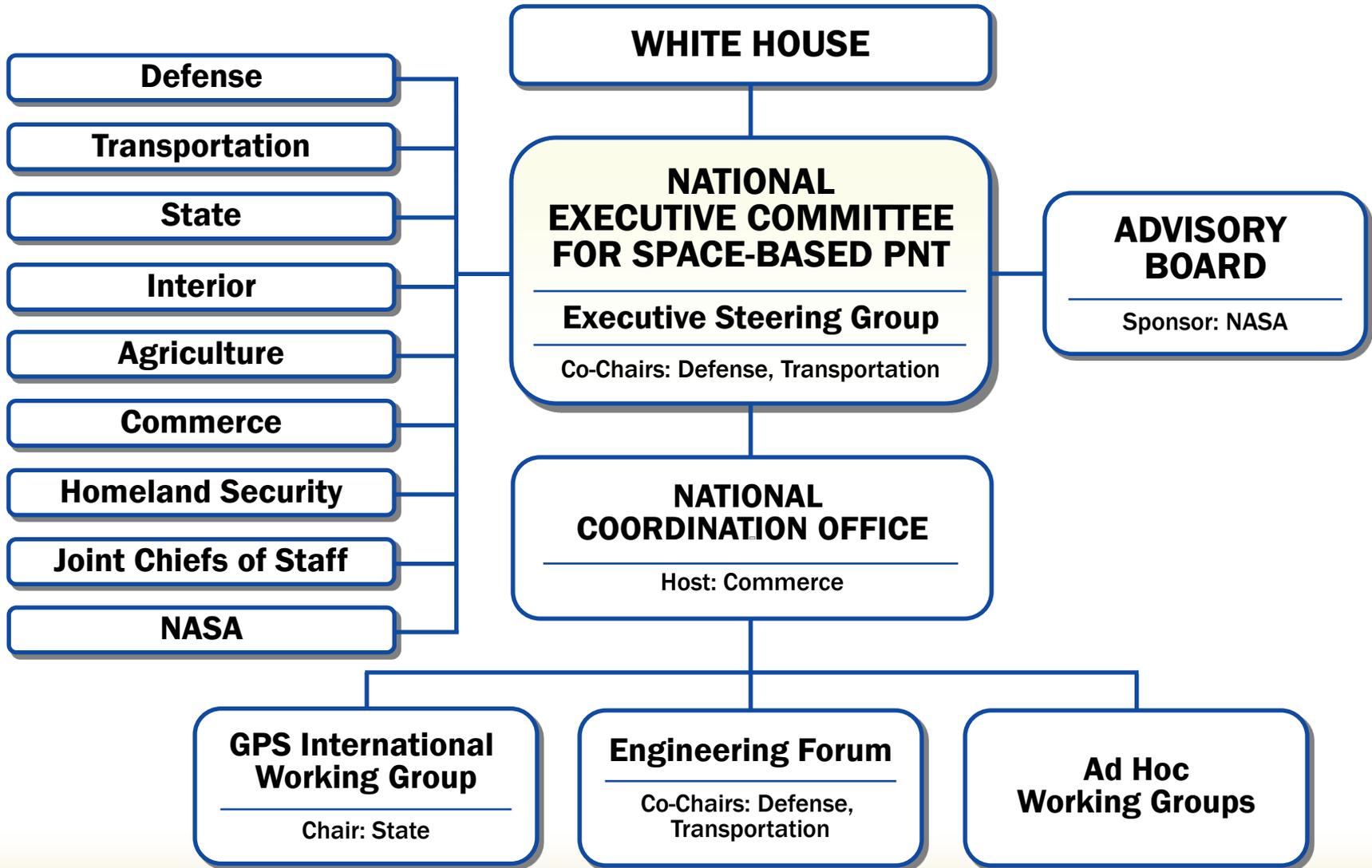


- Ensure **compatibility** — ability of U.S. and non-U.S. space-based PNT services to be used separately or together without interfering with each individual service or signal
  - Radio frequency compatibility
  - Spectral separation between M-code and other signals
- Achieve **interoperability** – ability of civil U.S. and non-U.S. space-based PNT services to be used together to provide the user better capabilities than would be achieved by relying solely on one service or signal
  - Primary focus on the common L1C and L5 signals

*Pursue through Bilateral and Multilateral Cooperation*



# National Space-Based PNT Organization





# Summary



- **GPS continues to meet or exceed our performance commitments to worldwide users**
- **Modernization of all GPS segments on track**
- **Striving to continually improve navigation and timing services while maintaining backward compatibility with legacy equipment.**
- **GPS is committed to open and transparent cooperation with the international GNSS community**



# For Additional Information

- NCO maintains GPS.gov as a central public resource for official USG information about GPS and related topics

NOTICE: We are currently migrating many pages from PNT.gov to GPS.gov. During the transition, many links on this site may lead to the other. We apologize for any confusion this causes.

## SPACE-BASED POSITIONING NAVIGATION & TIMING NATIONAL EXECUTIVE COMMITTEE

Information About LightSquared Interference to GPS Users

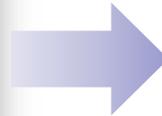
The National Executive Committee for Space-Based Positioning, Navigation, and Timing (PNT) is a U.S. Government organization established by Presidential directive to advise and coordinate federal departments and agencies on matters concerning the Global Positioning System (GPS) and related systems.

The National Executive Committee is chaired jointly by the Deputy Secretaries of Defense and Transportation. Its membership includes equivalent-level officials from the Departments of State, the Interior, Agriculture, Commerce, and Homeland Security, as well as the Joint Chiefs of Staff and NASA. Components of the Executive Office of the President participate as observers to the National Executive Committee, and the FCC Chairman participates as a liaison.

A National Coordination Office located in Washington, D.C., provides day-to-day staff support to the National Executive Committee. It consists of an interagency staff headed by Director Anthony Russo. The National Coordination Office is a point of contact for inquiries regarding PNT policy.

An Advisory Board provides independent advice to the National Executive Committee through its sponsor agency, NASA.

Several working groups support the National Executive Committee through staff-level.



This page has permanently moved from PNT.gov to GPS.gov. Please update your bookmarks and links.

# GPS.gov

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

HOME WHAT'S NEW SYSTEMS APPLICATIONS GOVERNANCE MULTIMEDIA SUPPORT

Home » Governance » Organization » National Executive Committee

## GOVERNANCE:

Policy & Law  
Organization  
National Executive Committee  
Federal Agencies  
National Coordination Office  
Advisory Board  
Civil GPS Service Interface Committee  
Program Funding  
Congress  
International Cooperation  
Spectrum & Interference

## Purpose

Established by presidential directive, the National Executive Committee for Space-Based Positioning, Navigation, and Timing (PNT) receives national-level attention and guidance from a joint civil/military body called the National Executive Committee for Space-Based Positioning, Navigation, and Timing (PNT). The term "space-based PNT" refers to GPS, GPS augmentations, and other global navigation satellite systems.

## Organizational Structure

The organizational structure shows the following hierarchy:

- WHITE HOUSE
  - NATIONAL EXECUTIVE COMMITTEE FOR SPACE-BASED PNT (Executive Steering Group, Co-Chairs: Defense, Transportation)
    - ADVISORY BOARD (Sponsor: NASA)
    - NATIONAL COORDINATION OFFICE (Head: Anthony Russo)
      - GPS International Working Group (Chair: State)
      - Engineering Forum (Co-Chairs: Defense, Transportation)
      - Ad Hoc Working Groups



# Contact Information



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This presentation and other GPS information:  
**[www.gps.gov](http://www.gps.gov)**

**Thank You!**