SPACE-BASED POSITIONING
NAVIGATION & TIMING

NATIONAL COORDINATION OFFICE

Policy and GPS Update

National Coordination Office
for Space Based
Positioning Navigation and Timing

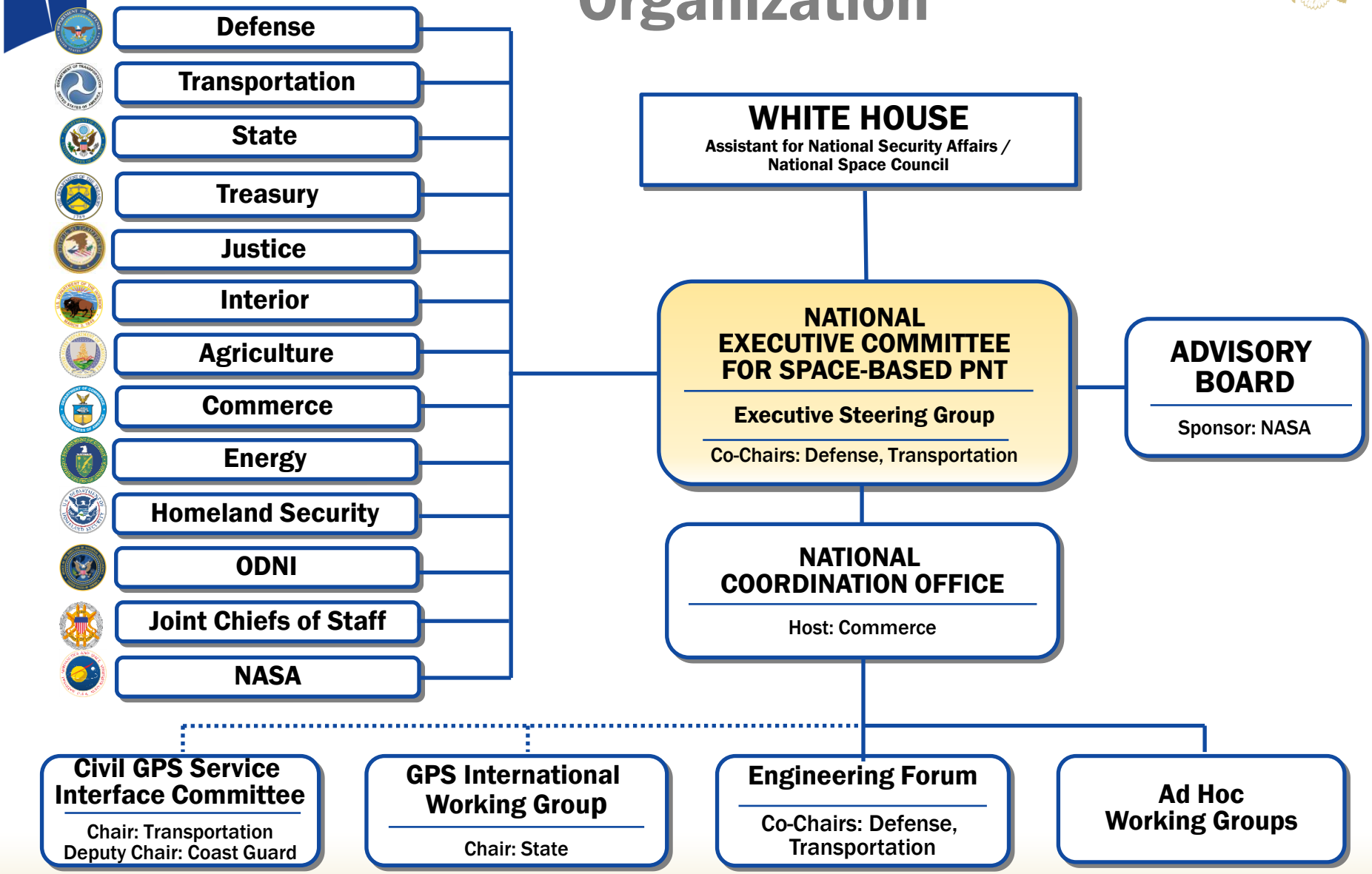
March 2021

Space Policy Directive 7 (SPD-7)
of 15 January 2021

"The goal of this policy is to maintain United States leadership in the service provision, and responsible use of global navigation satellite systems"

- Updates and replaces U.S. Space-Based PNT Policy of 2004
- Increased focus on protecting GPS and denying hostile use
- Incorporated principles of Responsible Use of GPS
- New direction on adding cybersecurity protections for GPS and federal user equipment
- Expanded EXCOM Membership
- New direction to protect the GPS spectrum environment
- Complements the National Space Policy of 2020 and Executive Order 13905 on the Responsible use of PNT

National Space-Based PNT Organization



GPS Constellation Status

36 Satellites • 31 Set Healthy
Baseline Constellation: 24 Satellites

Satellite Block	Quantity	Average Age (yrs)	Oldest
GPS IIR	8 (4*)	19.1	23.5
GPS IIR-M	7 (1*)	13.3	15.3
GPS IIF	12	7.0	10.7
GPS III	4	1.4	2.1

*Ops capable; not set healthy

As of 23 Jan 21

GPS Signal in Space (SIS) Performance

From 22 Jan 20 to 23 Jan 21

Average URE*	Best Day URE	Worst Day URE
51.9 cm	37.3 cm (23 Nov 20)	68.5 cm (27 Feb 20)

*All User Range Errors (UREs) are Root Mean Square values

GPS Modernization

Space Segment

SV families provide L-Band broadcast to User Segment

GPS IIA/IIR
- Basic GPS
- Nuclear Detonation Detection System (NDS)

GPS IIR-M
- 2nd Civil Signal (L2C)
- New Military Signal
- Increased Anti-Jam Power

GPS IIF
- 3rd Civil Signal (L5)
- Longer Life
- Better Clocks

GPS III (SV01-10)
- Accuracy & Power
- Increased Anti-Jam Power
- Inherent Signal Integrity
- 4th Civil Signal (L1C)
- Longer Life
- Better Clocks

GPS IIIF (SV11-32)
- Unified S-Band Telemetry, Tracking & Commanding
- Search & Rescue (SAR) Payload
- Laser Retroreflector Array
- Redesigned NDS Payload

Control Segment

TT&C of Space Segment assets & distribution of data to user interfaces

Legacy (OCS)
- Mainframe System
- Command & Control
- Signal Monitoring

Architecture Evolution Plan (AEP)
- Distributed Architecture
- Increased Signal Monitoring Coverage
- Security
- Accuracy

OCX Block 0
- GPS III Launch & Checkout System

GPS III Contingency Ops (COps)
- GPS III Mission on AEP

M-Code Early Use (MCEU)
- Update OCS to operationalize Core M-Code

OCX Block 1/2
- Fly Constellation & GPS III
- Begin New Signal Control
- Upgraded Information Assurance

OCX Block 2+
- Control all signals
- Capability On-Ramps
- GPS IIIF Evolution

User Segment

Applies Space and Control Segment data for PNT applications

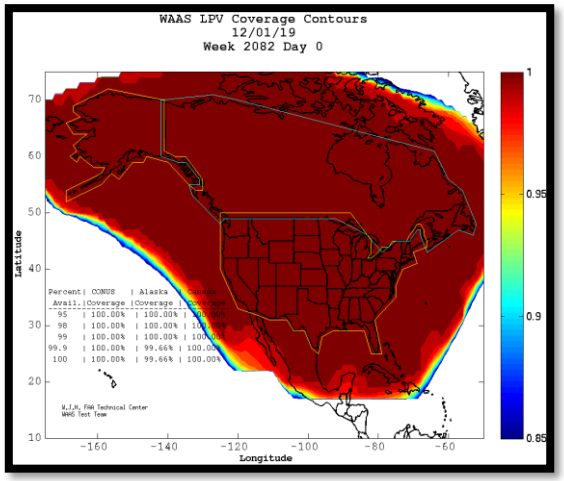
Continued support to an ever-growing number of applications
- Annual Public Interface Control Working Group (ICWG)
- Standard Positioning Service (SPS) Performance Standard Updates
- Precise Positioning Service (PPS) Enhancements
- Sustained commitment to transparency
- Visit GPS.gov for more info

Modernized Civil Signals
- L2C (Various commercial applications)
- L5 (Safety-of-life, frequency band protected)
- L1C (Multi-GNSS interoperability)

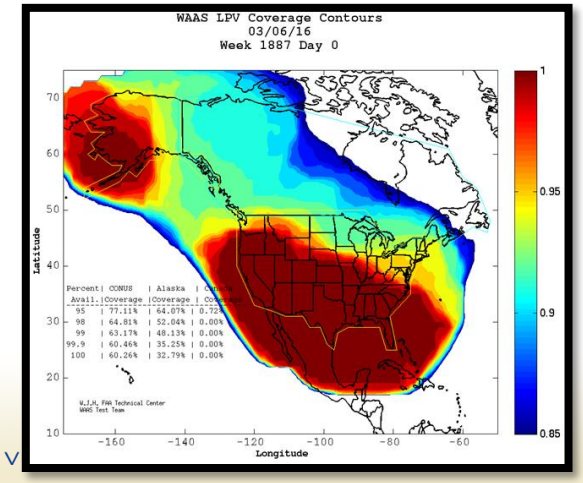
WAAS Current Status

- **Current WAAS provides high availability service to aviation user in North America**
  - 4700+ Localizer Performance with Vertical Guidance (LPV) approaches in the NAS
    - Over 1000 LPVs are LPV-200's which provides CAT I equivalent instrument approach performance
- **Preparing WAAS to take advantage of Dual Frequency service that will be provided by GPS**
  - To continue high availability of WAAS vertical service during ionospheric disturbances
- **GEO Sustainability**
  - Currently maintaining 3 GEO's (Anik F1R [CRE], Eutelsat 117 WB [GEO 5], SES-15 [GEO 6])
  - Developing future GEO's 7/8/9 to replace legacy GEO's upon lease expiration
    - GEO 7 (Intelsat) is expected to be operational in 2022
- **WAAS Modernization Efforts**
  - Dual Frequency Multi-Constellation (DFMC)
  - Advanced Receiver Integrity Monitoring (ARAIM)

Current WAAS LPV Coverage



WAAS LPV Coverage March 6, 2016 Iono event



WAAS Avionics Equipage Status

- **Over 131,000 WAAS equipped aircraft in the NAS**
  - WAAS receivers provided by companies such as:
    - Garmin, Universal, Rockwell Collins, Honeywell, Avidyne, Innovative Solutions & Support (IS&S), Thales and Genesys Aerosystem (Chelton)
- **Since 2006, aircraft equipage rates have increased each year**
- **All classes of aircraft are served in all phases of flight**
  - Recent STC for Boeing 737 600/700/800 avionics
- **Enabling technology for NextGen programs**
  - Automatic Dependent Surveillance Broadcast (ADS-B)
  - Performance Based Navigation (PBN)

Thank You

Stay in touch: www.gps.gov

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GPS: Accessible, Accurate, Interoperable