

# 2024 Current Fiscal Year Report: National Space-Based Positioning, Navigation, and Timing Advisory Board

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<b>1. Department or Agency</b>		<b>2. Fiscal Year</b>	
National Aeronautics and Space Administration		2024	
<b>3. Committee or Subcommittee</b>		<b>3b. GSA Committee No.</b>	
National Space-Based Positioning, Navigation, and Timing Advisory Board		29124	
<b>4. Is this New During Fiscal Year?</b>	<b>5. Current Charter</b>	<b>6. Expected Renewal Date</b>	<b>7. Expected Term Date</b>
No	04/25/2023	04/25/2025	
<b>8a. Was Terminated During Fiscal Year?</b>	<b>8b. Specific Termination Authority</b>		<b>8c. Actual Term Date</b>
No			
<b>9. Agency Recommendation for Next Fiscal Year</b>	<b>10a. Legislation Req to Terminate?</b>	<b>10b. Legislation Pending?</b>	
Continue	Not Applicable	Not Applicable	
<b>11. Establishment Authority</b>	Presidential		
<b>12. Specific Establishment Authority</b>	<b>13. Effective Date</b>	<b>14. Committee Type</b>	<b>14c. Presidential?</b>
Space Policy Directive-7 , "The United States Space-Based Positioning, Navigation, and Timing Policy (January 15, 2021).	12/08/2004	Continuing	Yes
<b>15. Description of Committee</b> Scientific Technical Program Advisory Board			
<b>16a. Total Number of Reports</b>	No Reports for this Fiscal Year		

17a. 0 17b. Closed0 17c. Partially Closed0 Other Activities0 17d. Total0  
Open

### Meetings and Dates

No Meetings

	Current Next FY FY	
18a(1). Personnel Pmts to Non-Federal Members	\$0.00	\$0.00
18a(2). Personnel Pmts to Federal Members	\$0.00	\$0.00
18a(3). Personnel Pmts to Federal Staff	\$0.00	\$0.00
18a(4). Personnel Pmts to Non-Member Consultants	\$0.00	\$0.00
18b(1). Travel and Per Diem to Non-Federal Members	\$0.00	\$0.00
18b(2). Travel and Per Diem to Federal Members	\$0.00	\$0.00
18b(3). Travel and Per Diem to Federal Staff	\$0.00	\$0.00
18b(4). Travel and Per Diem to Non-member Consultants	\$0.00	\$0.00
18c. Other(rents,user charges, graphics, printing, mail, etc.)	\$0.00	\$0.00
18d. Total	\$0.00	\$0.00
19. Federal Staff Support Years (FTE)	0.00	0.00

### 20a. How does the Committee accomplish its purpose?

The National Space-Based Positioning, Navigation and Timing (PNT) Advisory Board provides advice, as directed by the PNT Executive Committee (EXCOM) through NASA, on U.S. space-based PNT policy, planning, program management and funding profiles in relation to the current state of national and international

space-based PNT services. The PNT Board Chair and Vice-Chair regularly report progress directly to the Deputy Secretaries of the nine Federal Agencies, and White House offices, that convene at the PNT EXCOM and Assistant Secretary level PNT Executive Steering Group (ESG) 2-4 times per year.

**20b. How does the Committee balance its membership?**

The PNT Advisory Board membership is balanced by sector and expertise to ensure comprehensive representation for diverse points of view to address the complex national issues to be examined and functions to be performed. The actual Board member nominations come from the nine Federal agencies that comprise the PNT EXCOM to ensure this balanced representation and diverse skillset. The Board is comprised of both U.S. and international members, in recognition of the fact that the U.S. Global Positioning System (GPS) is a global navigation satellite system with a worldwide user community. Membership is augmented by rotating on six new members with expertise in different unique sectors at periodic intervals, to ensure new expertise is brought on even as institutional memory is maintained with a core group.

**20c. How frequent and relevant are the Committee Meetings?**

The PNT Advisory Board usually meets twice each fiscal year. It remains relevant by responding to current issues and taskings as assigned by consensus through active PNT EXCOM discussion topics, as well as independent assessments brought forward by active PNT Board members representing the various sectors.

**20d. Why can't the advice or information this committee provides be obtained elsewhere?**

A national Presidential policy was announced on December 8, 2004 that establishes guidance and implementation actions for space-based positioning, navigation, and timing programs, augmentations, and activities for U.S. national and homeland security, civil, scientific, and commercial purposes. This policy superseded Presidential Decision Directive/National Science and Technology Council-6, U.S. Global Positioning System Policy, dated March 28, 1996. National Security Presidential Directive-39 (NSPD-39) was most recently continued by Executive Order 14048 on September 30, 2021. On January 15, 2021, Space Policy Directive 7 (SPD-7), "The United States Space-Based Positioning, Navigation, and Timing Policy," superseded NSPD-39. The National Space-Based Positioning Navigation and Timing Advisory Board is a unique Federal advisory committee in that it is Presidential authority, represents the interests of multiple U.S. Government agencies, and has international participation as well.

**20e. Why is it necessary to close and/or partially closed committee meetings?**

N/A. All PNT Advisory Board deliberative meetings were open and accessible to the public.

**21. Remarks**

NASA is managing the operations of this FACA advisory committee as part of its governmental contribution to the implementation of the 2021 Space Policy Directive-7 (SPD-7), which supercedes the 2004 National Security Presidential Directive (NSPD-39), now in effect through four Presidential Administrations. The PNT Advisory Board reports to the Deputy

Secretary level PNT Executive Committee (EXCOM), now comprised of thirteen (13) Federal agencies: Department of Defense, Department of Transportation, Department of Commerce, Department of State, Department of Homeland Security, Department of Interior, Department of Agriculture, Joint Chiefs of Staff, Justice, Treasury, Energy, Office of the Director of National Intelligence (ODNI) and NASA. The PNT EXCOM is co-chaired by the Deputy Secretary of Defense and Deputy Secretary of Transportation, with the NASA Deputy Administrator or designee as the ranking member. Recommendations and advice are conveyed by the PNT Advisory Board Chair to meetings of the PNT EXCOM, and are formally documented in the PNT Advisory Board meeting minutes.

### Designated Federal Officer

James J. Miller DFO/Executive Director

Committee Members	Start	End	Occupation	Member Designation
Allen (USCG, Ret.), Thad	05/08/2015	10/05/2025	Booz-Allen Hamilton	Special Government Employee (SGE) Member
Axelrad, Penina	05/08/2015	10/05/2025	University of Colorado, Boulder	Special Government Employee (SGE) Member
Betz, John	05/08/2015	10/05/2025	MITRE	Special Government Employee (SGE) Member
Burgett, Scott	05/08/2015	10/05/2025	Consultant	Special Government Employee (SGE) Member
Chan, Bryan	10/06/2023	10/05/2025	Consultant	Special Government Employee (SGE) Member
Diamond, Patrick	06/04/2019	10/05/2025	Consultant	Special Government Employee (SGE) Member

Geringer, James	05/08/2015	10/05/2025	Environmental Special Systems Research Institute	Government Employee (SGE) Member
Goward, Dana	05/08/2015	10/05/2025	Resilient Navigation and Timing Foundation	Representative Member
Greiner-Brzezinska, Dorota	06/04/2019	10/05/2025	Ohio State University	Special Government Employee (SGE) Member
Higgins, Matt	05/08/2015	10/05/2025	International Global Navigation Satellite Systems Society of Australia Nottingham Geospatial Institute, University of Nottingham	Representative Member
Moore, Terry	06/04/2019	10/05/2025	The Boeing Company	Special Government Employee (SGE) Member
Parkinson, Bradford	05/08/2015	10/05/2025	Stanford University	Special Government Employee (SGE) Member
Scott, Hugh	10/06/2023	10/05/2025	Consultant	Special Government Employee (SGE) Member
Shane, Jeffrey	06/04/2019	10/05/2025	International Air Transport Association	Representative Member
Shelton, William	10/06/2023	10/05/2025	Consultant	Special Government Employee (SGE) Member
Shields, T. Russell	05/08/2015	10/05/2025	Ygomi, Founder	Special Government Employee (SGE) Member
Thompson, Gary	06/04/2019	10/05/2025	North Carolina Department of Public Safety, North Carolina Geodetic Survey	Special Government Employee (SGE) Member

**Number of Committee Members Listed: 19**

### **Narrative Description**

The PNT Advisory Board is NASA's contribution to implementation of the U.S. National PNT Policy, where the NASA Administrator, in cooperation with the Secretary of Commerce, shall develop and provide to the Secretary of Transportation requirements for the use of the Global Positioning System and its augmentations to support civil space systems. The PNT Board has therefore provided NASA, and the twelve other Federal agencies of the PNT EXCOM, with expert technical and policy advice to ensure that national and international GPS/PNT needs can continue to be met as the constellation is modernized and the spectrum environment becomes more challenged from radio frequency interference. Specific analysis is conducted to develop actionable recommendations for the PNT EXCOM to consider implementing in support of meeting Space Policy Directive (SPD) -7 goals and objectives.

### **What are the most significant program outcomes associated with this committee?**

	Checked if Applies
Improvements to health or safety	<input checked="" type="checkbox"/>
Trust in government	<input checked="" type="checkbox"/>
Major policy changes	<input checked="" type="checkbox"/>
Advance in scientific research	<input checked="" type="checkbox"/>
Effective grant making	<input type="checkbox"/>
Improved service delivery	<input checked="" type="checkbox"/>
Increased customer satisfaction	<input checked="" type="checkbox"/>
Implementation of laws or regulatory requirements	<input checked="" type="checkbox"/>
Other	<input checked="" type="checkbox"/>

### **Outcome Comments**

While the PNT Advisory Board cannot assume full direct credit for causing the PNT EXCOM and associated Federal agencies to act on specific recommendations, there is most definitely a correlation between what the PNT Board advises and what the PNT EXCOM has actually been implementing and planning to ensure GPS services are protected and made more accessible on a less expensive basis to the world user communities. In this regard the work of the PNT Board has positively assisted NASA and the Federal government in accomplishing its objectives, with some specific examples cited in the comment sections below. Although these Recommendations were developed over a lengthy period due to COVID, most are still in the process of being implemented and thus are reported to monitor progress. Two FACA meetings were held in FY23. The 27th FACA meeting was held on November 16-17, 2022, in Redondo Beach, CA, and the 28th FACA meeting was held on May 3-4, 2023 in Annapolis, MD. Both meetings were also broadcast on webcast. At the first meeting, key discussions included: (1) Updates from the National Coordination Office & DOT on the development of a Strategic Plan for Protection of Interference [from Ligado], or SPPI; (2) International Traffic in Arms Regulations (ITAR) constraints on export of GPS receivers with more than three antenna elements and the adverse impact on U.S. GPS technology innovation and protecting users from interference; (3) Academia & industry presentations on proposed technologies to Protect, Toughen, and Augment (PTA) GPS for user worldwide; (4) Updates from PNTAB international members and industry representatives; (5) deliberation and approval of formal recommendations from the PNTAB to the DoD & DOT dep secs co-chairing the National PNT Executive Committee per SPD-7. A fact-finding prep. meeting was held on November 15, 2023, which included fact-finding briefings on: (1) DHS update on the implementation of Executive Order 13905, "Strengthening National Resilience Through Responsible Use of PNT Services;" (2) JPL briefing on the potential for using the Global Differential GPS (GDGPS) System to support a GPS-based High Accuracy Service (HAS). The presentations and deliberations are described in detail in the Meeting Minutes, which are available at the following link:

<https://www.gps.gov/governance/advisory/meetings/2022-11/>. Following this meeting, the PNTAB Chair submitted a recommendation memorandum to the chairs of the PNT Executive Committee, which is available at the following link:

<https://www.gps.gov/governance/advisory/recommendations/2023-01-PNTAB-27-chair-memo.pdf>

At the second meeting, key discussions included: (1) Discussion on U.S. PNT governance by the Executive Steering Group (ESG) DoD and DOT co-chair; (2) PNTAB subcommittee findings from fact-finding meetings since Nov. 16-17, 2022, PNTAB session; (3) Briefings on emerging GNSS capabilities & alternative PNT; (4) Briefings on Protect, Toughen, and Augment topics; (5) Updates from PNTAB international members & industry representatives; and (6) Deliberations on proposed recommendations to the PNT Executive Committee co-chairs. In addition, the board approved for public release two



White Papers supporting the board recommendations to the PNT Executive Committee:

(1) GPS High Accuracy and Resilience Service (available at:

<https://www.gps.gov/governance/advisory/recommendations/2023-05-white-paper-GPS-HARS.p>

and (2) Celebrating the GPS 50th Anniversary: Recommitting to U.S. Leadership in PNT

(available at:

<https://www.gps.gov/governance/advisory/recommendations/2023-05-white-paper-GPS-50.pdf>).

The presentations and deliberations are described in detail in the Meeting Minutes, which are available at the following link:

<https://www.gps.gov/governance/advisory/meetings/2023-05/>.

### **What are the cost savings associated with this committee?**

Checked if Applies

None	<input type="checkbox"/>
Unable to Determine	<input type="checkbox"/>
Under \$100,000	<input type="checkbox"/>
\$100,000 - \$500,000	<input type="checkbox"/>
\$500,001 - \$1,000,000	<input type="checkbox"/>
\$1,000,001 - \$5,000,000	<input type="checkbox"/>
\$5,000,001 - \$10,000,000	<input type="checkbox"/>
Over \$10,000,000	<input checked="" type="checkbox"/>
Cost Savings Other	<input type="checkbox"/>

### **Cost Savings Comments**

A key recommendation that is still being implemented and has direct value measurable in the tens of millions of dollars is adoption of an enhanced GPS Space Service Volume (SSV) for emerging civil space users (NASA, NOAA, commercial space, etc.). The SSV is a volume of space where GPS broadcasts that ranges from 3,000 Km to 36,000 Km, an altitude where Geosynchronous communications satellites operate. The PNT Board recommended that the Air Force adopt the use of existing GPS signal side lobes to enable more civil space users to access PNT information in the challenging space domain. This capability would enable new missions such as the GOES series of weather satellites, formation flyers, and even satellite servicing missions. However, the Air Force quoted NASA a price of enabling this capability as a new requirement -- for a price range from \$226M to \$1.2B. After much technical debate by PNT Board members, this excessive cost was dramatically reduced by the Air Force in an effort to capture capabilities already available and measured by NASA, rather than forcing a potentially unneeded hardware modification to new GPS satellite vehicles being built. The end result is that the Air Force is now working with NASA to minimize costs and hardware changes for this enhanced capability, and has allowed for a NASA representative to participate on

the GPS IIIF procurement team.

**What is the approximate Number of recommendations produced by this committee for the life of the committee?**

25

**Number of Recommendations Comments**

To support U.S. Positioning, Navigation, and Timing (PNT) policy goals, and the economic benefits of the Global Positioning System (GPS), the U.S. National Space-Based PNT Advisory Board has developed topic papers for the following sectors: (1) Agriculture; (2) Aviation and Aerospace; (3) Critical Infrastructure and Timing; (4) Military; (5) Policy and Governance; (6) Science; (7) Spectrum; and (8) Transportation (Non-Aviation). Of all the recommendations developed for each sector, those summarized below are of the utmost importance to maintain U.S. leadership in core sectors. The continued and successful execution of the GPS Enterprise will require PNT EXCOM vigilance and committed governance:

1. Continue the support of on-going GPS modernization, including space, control and user segments. The U.S. must maintain its leading edge among world satellite-based navigation and timing systems.
2. Ensure that complementary and back-up capabilities for GPS-derived PNT are available and used to protect the nation's critical infrastructure and public-safety applications. Implement Enhanced Loran (eLoran) as a back-up for GPS timing in the continental U.S., subject to verification of cost and performance. Further, U.S. agencies should continue the development of additional capabilities that reinforce PNT resiliency.
3. Protect GPS signals from interference. The potential for more powerful radio signals in adjacent bands and on-going deliberate disruption by malicious actors remain real and present dangers that will continue to grow.
4. Encourage the use of toughened GPS receivers which can resist interference such as jamming and spoofing, especially in critical applications. The technology is available, but it is not being used.
5. Permit users in the U.S. to access other nations' properly vetted GNSS signals. This will increase resilience, receiver performance, and legitimize many receivers already in service.
6. Demonstrate the utility of backup/augmentation of allied GNSS signals in military receivers: This could allow improved resilience, assurance, and GPS back-up capabilities to military operations in increasingly contested environments.
7. The PNT Board recognizes the need for efficient spectrum management. At the same time, it believes it is imperative that we follow the PNT EXCOM stricture to not adversely affect current and future GPS uses. Following recommendations from the PNT Board, and the a Department of Transportation (DOT) Adjacent Band Compatibility (ABC) study, Section 1663 of the Fiscal Year (FY) 2021 National Defense Authorization Act called on the Department of Defense (DoD) to enter into an agreement with the National Academies of Sciences, Engineering, and Medicine to carry out "an independent technical review of

the order and authorization adopted by the Federal Communications Commission on April 19, 2020 (FCC 20-48), to the extent that such Order and Authorization affects the devices, operations, or activities of the Department of Defense.” The Office of the Secretary of Defense, Chief Information Officer, with the assistance of the Air Force Research Laboratory, entered into a contract with the National Academies, and the National Academies appointed the Committee to Review FCC Order 20-48 Authorizing Operation of a Terrestrial Radio Network Near the GPS Frequency Bands to carry out this study. The report findings were presented on September 9, 2022, and following this presentation the National Telecommunications and Information Administration (NTIA) issues a statement that, “issued the following statement: “The Report from the National Academies indicates that Ligado’s terrestrial operations would cause harmful interference to GPS devices and that a number of the FCC’s mitigations would be practically unworkable. NTIA will review this detailed Report more carefully, but we believe this offers the Commission an important opportunity to reconsider Ligado’s authorization.

**What is the approximate Percentage of these recommendations that have been or will be Fully implemented by the agency?**

75%

**% of Recommendations Fully Implemented Comments**

The PNT Advisory Board has developed an integrated set of actions to protect, toughen, and augment (PTA) GPS, which have become guidelines for PNT service providers and GPS/GNSS users alike. These recommendations still being refined and adopted, are as follows: (1) the continued support of ongoing modernization of the GPS space, ground, and user segments to ensure the U.S. maintains leading edge capabilities around the world; (2) cost-effective back-ups and complementary technologies for GPS-derived timing, to help ensure the health of the nation’s critical infrastructures; (3) the PNT Board endorses the U.S. Government’s studies and decisions to implement a terrestrial eLoran (Enhanced Loran) system as part of this effort, especially with respect to timing for critical networks; protect the ubiquitous use and great economic benefits of GPS from the encroachment of more powerful radio communications signals in adjacent bands. Navigation signals are fundamentally different from communications signals in terms of how they are processed, which requires careful regulatory consideration; (4) existing international and national regulations governing radiofrequency use have enabled GPS to become globally pre-eminent. Committed spectrum leadership and effective national regulations can protect the GPS utility while enabling new communications services where feasible. Continuing with prudent spectrum management will enable continued realization of the benefits of GPS PNT innovation for the nation and society at large; and (5) use of foreign GNSS is recommended to complement GPS and improve resiliency.

However, before including its use in critical infrastructure services, we will establish that these services meet standards of accuracy and integrity that will enhance user performance. A key development was the release of a National Academies Report addressing the issue of protecting GPS users from harmful interference. Following recommendations from the PNT Board, and the a Department of Transportation (DOT) Adjacent Band Compatibility (ABC) study, Section 1663 of the Fiscal Year (FY) 2021 National Defense Authorization Act called on the Department of Defense (DoD) to enter into an agreement with the National Academies of Sciences, Engineering, and Medicine to carry out “an independent technical review of the order and authorization adopted by the Federal Communications Commission on April 19, 2020 (FCC 20-48), to the extent that such Order and Authorization affects the devices, operations, or activities of the Department of Defense.” The Office of the Secretary of Defense, Chief Information Officer, with the assistance of the Air Force Research Laboratory, entered into a contract with the National Academies, and the National Academies appointed the Committee to Review FCC Order 20-48 Authorizing Operation of a Terrestrial Radio Network Near the GPS Frequency Bands to carry out this study. The report findings were presented on September 9, and following this presentation the National Telecommunications and Information Administration (NTIA) issued a statement indicating that this report indicated that proposed terrestrial broadband operations would cause harmful interference to GPS devices and that a number of the FCC’s mitigations would be practically unworkable.

**What is the approximate Percentage of these recommendations that have been or will be Partially implemented by the agency?**

25%

**% of Recommendations Partially Implemented Comments**

Several recommendations are still being worked as the PNT EXCOM and the GPS program are multi-year efforts with multiple initiatives. However, another productive deliverable from the PNT Board based on testing, analyses, and results discussion is the development of agency positions on radio frequency interference (RFI) to GPS Federal infrastructure, from such sources as the newly proposed terrestrial networks to transportable GPS jammers. Several agencies are now taking a more proactive role on PNT Board recommendations based on the need to protect such critical infrastructure for key agency missions. The PNT Board Chair and two Vice Chairs report directly to the Deputy Secretary-level PNT EXCOM. As such, they receive periodic feedback in real time from NASA and their other associated sponsors. The NASA Deputy Administrator participates directly as a member of the PNT EXCOM in all discussions revolving around the taskings and deliverables of the PNT Board. The PNT Advisory Board is NASA's contribution to implementation of the U.S. National PNT Policy, where the NASA

Administrator, in cooperation with the Secretary of Commerce, shall develop and provide to the Secretary of Transportation requirements for the use of the Global Positioning System and its augmentations to support civil space systems. The PNT Board has therefore provided NASA, and the eight other Federal agencies of the PNT EXCOM, with expert technical and policy advice to ensure that national and international GPS/PNT needs can continue to be met as the constellation is modernized and the spectrum environment becomes more challenged from radio frequency interference. Specific analysis is conducted to develop actionable recommendations for the PNT EXCOM to consider implementing in support of meeting SPD-7 goals and objectives.

**Does the agency provide the committee with feedback regarding actions taken to implement recommendations or advice offered?**

Yes ☒ No ☐ Not Applicable ☐

**Agency Feedback Comments**

The recommendations from the PNT Advisory Board are presented by the Chair, ADM Thad Allen, to the Deputy Secretary level PNT Executive Committee, which consists of 13 Federal departments. NASA is one of these agencies at the Deputy Administrator level, and provides real-time feedback during discussions that address Recommendation adoption & implementation.

**What other actions has the agency taken as a result of the committee's advice or recommendation?**

Checked if Applies

Reorganized Priorities	<input checked="" type="checkbox"/>
Reallocated resources	<input checked="" type="checkbox"/>
Issued new regulation	<input checked="" type="checkbox"/>
Proposed legislation	<input checked="" type="checkbox"/>
Approved grants or other payments	<input type="checkbox"/>
Other	<input checked="" type="checkbox"/>

**Action Comments**

The priorities of both the PNT EXCOM, and the PNT Board, were modified to address immediate interference threats to GPS such as the proposed terrestrial networks operating in Mobile Satellite Services (MSS) radio bands. Many resources were thus rechanneled to assist in developing mitigation strategies and techniques, which were developed into the above spectrum testing criteria. Although the threat of some of these proposals is still immediate, the expertise of the PNT Board has enabled the GPS community to proactively prepare for more expected FCC spectrum sharing proposals.

Also, a more aggressive Protect, Toughen, Augment (PTA) approach to preventing GPS RFI events has been adopted by all PNT EXCOM agencies. The work has led to proposals to improve regulations and statutes such that spectrum interferers are penalized more severely while safe and effective use of spectrum is rewarded.

**Is the Committee engaged in the review of applications for grants?**

No

**Grant Review Comments**

Not Applicable

**How is access provided to the information for the Committee's documentation?**

Checked if Applies

Contact DFO	<input checked="" type="checkbox"/>
Online Agency Web Site	<input checked="" type="checkbox"/>
Online Committee Web Site	<input checked="" type="checkbox"/>
Online GSA FACA Web Site	<input checked="" type="checkbox"/>
Publications	<input checked="" type="checkbox"/>
Other	<input checked="" type="checkbox"/>

**Access Comments**

All PNT EXCOM agencies assist with getting information out to the general public on the PNT Advisory Board's activities to maximize the usefulness of the information that is generated. More information can be found at: <http://www.gps.gov/governance/advisory/>