

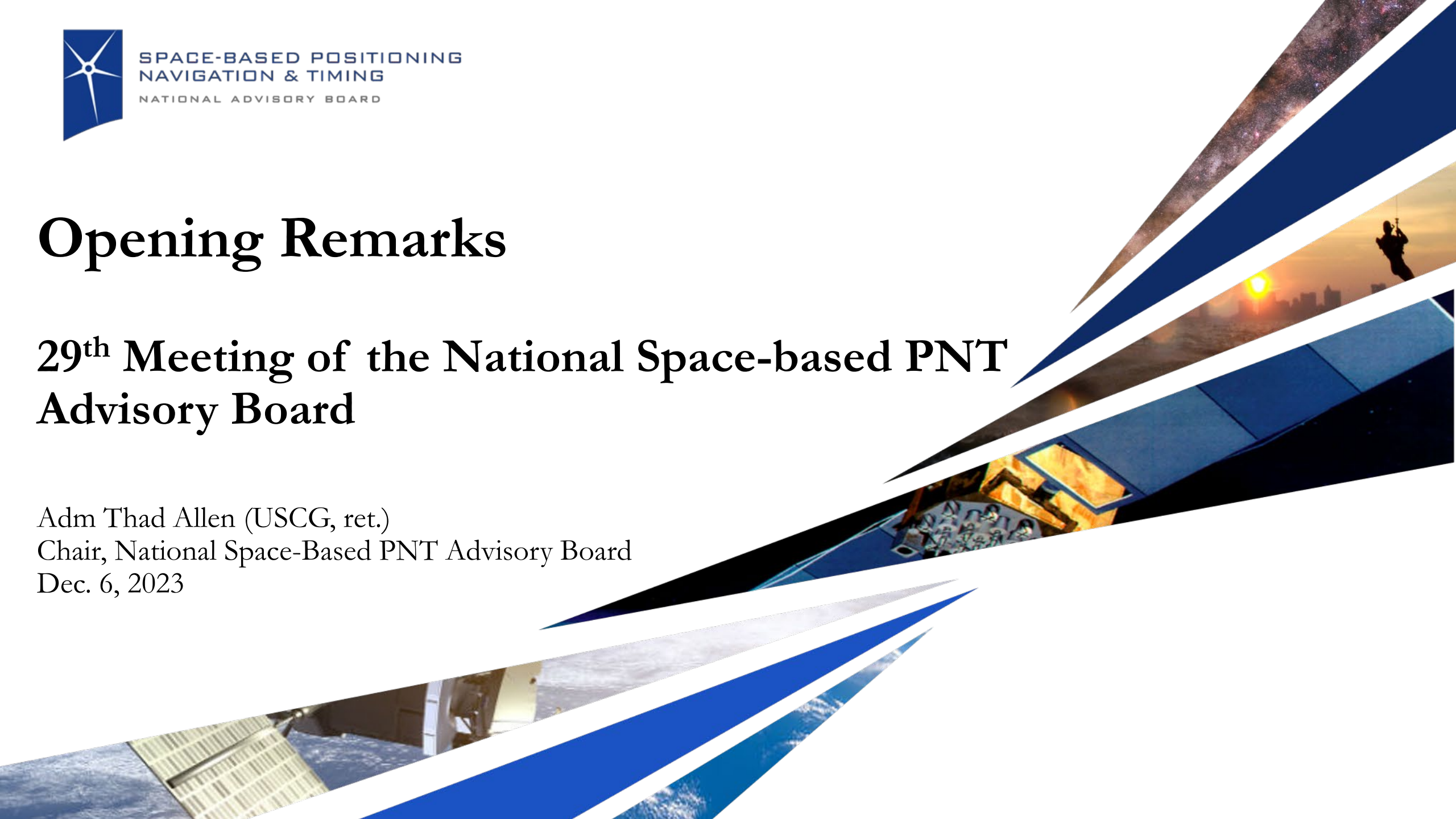


SPACE-BASED POSITIONING
NAVIGATION & TIMING
NATIONAL ADVISORY BOARD

Opening Remarks

29th Meeting of the National Space-based PNT Advisory Board

Adm Thad Allen (USCG, ret.)
Chair, National Space-Based PNT Advisory Board
Dec. 6, 2023



GPS 50th Anniversary

- This year marks the 50th anniversary of the start of the Global Positioning System (GPS) program.
- In December 1973, the Defense Systems Acquisition Review Council (DSARC) gave the USAF approval to proceed with the development of the Navstar GPS.
- GPS has provided America and the world innumerable and incalculable benefits. It has also been a symbol of America's strength and global leadership for decades.
- Recommitting to U.S. positioning, navigation, and timing (PNT) leadership must be a key public policy objective in an era of great power competition.
- Per a Jan. 27, 2023, recommendation to the PNT Executive Committee, celebrations of the 50th Anniversary of GPS are being held to remind Americans and the world what GPS has done for humankind and must serve as the catalyst to elevate global PNT leadership to its proper place in our national policy agenda.

(Left) First Director of the GPS Joint Program Office, Dr. (Col, USAF) Bradford Parkinson, in discussions with his deputies (1973)



(Right) Launch of the first GPS satellite (1978)

In Memoriam

Martin “Marty” C. Faga

June 11, 1941 – October 19, 2023

Marty was born on June 11, 1941, in Bethlehem, PA. He received Bachelor’s and Master’s degrees in Electrical Engineering from Lehigh University and received a commission as a Second Lieutenant in the United States Air Force. He spent six years as a Research and Development officer in the Air Force, after which he worked for the CIA for several years. In 1976 he joined the staff of the House Permanent Select Committee on Intelligence, rising to become the Staff Director. In 1989 he was appointed by President George H W Bush as Assistant Secretary of the Air Force and Director of the National Reconnaissance Office he served in that role until 1993. During this time, he led the NRO through the First Gulf War and the de classification of the existence of the NRO. Following retirement from government service in 1993 he joined MITRE Corporation as a Vice President, rising to be the President and CEO He retired from MITRE in 2006. He remained on MITRE’s Board of Directors and served on numerous other boards and commissions.



New Board Members (1)

Mr. Bryan Chan

Co-Founder, Vice President of Business Development and Strategy,
XonaSpace Systems Inc.

Bryan Chan is co-founder and VP of Business Development and Strategy at Xona Space Systems. He has over 12 years experience in the aerospace industry, spanning technical roles in government organizations to executive leadership positions at start-up companies. Prior to Xona, Bryan worked at Maxar Technologies managing GEO communications satellite programs. He also served as the CEO of Night Crew Labs, conducting research on GPS radio occultation methods on aerial platforms for NASA and NOAA.

Mr. Chan previously held engineering roles at the NASA Jet Propulsion Laboratory, NASA Ames, and SpaceX. He received his B.S. in aerospace engineering at Georgia Institute of Technology, and his M.S. degree in aerospace engineering at Stanford University



New Board Members (2)

Dr. Logan Scott

Owner, Logan Scott Consulting.

Logan Scott has over 40 years of military and civil GPS systems engineering experience. He is a consultant specializing in radio frequency signal processing and waveform design. At Texas Instruments, he pioneered approaches for building high-performance, jamming-resistant digital receivers and adaptive arrays. At Omnipoint (now T-Mobile), he developed spectrum sharing techniques that led to a Pioneer's preference award from the FCC.

Logan has been an active advocate for improved civil GPS location assurance for over 20 years and was the first to describe how civil navigation signals could be authenticated using delayed key concepts central to the Chimera signal. For the past 6 years he has been developing advanced signal concepts for NTS-3, AFRL, and the University of Colorado. He has also been active in developing LEO system architectures. Logan is a Fellow of the Institute of Navigation and a Senior Member of IEEE. In 2018 he received the GPS World Signals award. He is the author of "Interference: Origins, Effects, and Mitigation" in PNT21 and holds 46 US patents.



New Board Members (3)

Gen. William L. Shelton, USAF (Ret.)

Independent Consultant, Shelton Consulting Inc.

William “Willie” Shelton retired as Commander, Air Force Space Command, in Sep. 2014. During his career, he commanded space operations units at every level and held staff positions in a wide range of Air Force and DoD organizations. In his final assignment, he led a team of over 40,000 at AFSPC to provide space and cyberspace operational forces, as well as acquisition of space systems.

During his Air Force career, Gen Shelton was a Space Shuttle controller for the first 18 missions, commander of GPS operations during the initial deployment of the constellation, and commander of the Air Force’s largest ballistic missile wing. He also commanded all DoD space operations during internationally significant events such as the Chinese anti-satellite test in 2007 and a North Korean Taepo Dong missile launch initially thought to be threatening Hawaii. He served as the CIO of the Air Force and the director of the Air Force HQ staff during one of the most turbulent periods in the Air Force’s history. While leading AFSPC, he drove the development of new satellite architectural concepts to address growing space threats amid significant fiscal challenges. Finally, he led the rapid maturation of cyberspace forces to enhance both the defensive and offensive cyber capabilities of the Air Force.

General Shelton earned a Bachelor of Science degree in astronautical engineering from the U.S. Air Force Academy in 1976, a Master of Science degree in astronautical engineering from the Air Force Institute of Technology in 1980, and a Master of Science degree in national security studies from the National War College in 1995.



PNTAB Organization (Dec. 2023)

PNTAB Leadership Committee

Thad Allen (Chair) James J. Miller (Executive Director & DFO)
Brad Parkinson (1st Vice-Chair) Barbara Adde (Deputy Director & DFO)
Jim Geringer (2nd Vice Chair)

Communications & External Relations (CER) Subcommittee

Dana Goward (Chair)

Joe Burns (1st Vice-Chair)
Eileen Reilly (2nd Vice-Chair)
John Betz
Pat Diamond
David Grossman
Vahid Madani
Jeffrey Shane
Greg Winfree

Barbara Adde (DFO)

Education & Science Innovation (ESI) Subcommittee

Jade Morton (Chair)

Terry Moore (1st Vice-Chair)
Dorota Greiner-Brzezinska (2nd Vice-Chair)
Penny Axelrad*
Renato Filjar
James Geringer
Russ Shields

Barbara Adde (DFO)

*Departing member

Emerging Capabilities, Applications & Sectors (ECAS) Subcommittee

Frank van Diggelen (Chair)

Penny Axelrad (1st Vice-Chair)
Scott Burgett (2nd Vice-Chair)
Renato Filjar
Dorota Greiner-Brzezinska
Renato Filjar
Matt Higgins
Vahid Madani
Tim Murphy
Tom Powell
Eileen Reilly
Russ Shields
Todd Walter

Cody Kelly (DFO)

International Engagement (IE) Subcommittee

Matt Higgins (Chair)

Renato Filjar (1st Vice-Chair)
Terry Moore (2nd Vice-Chair)
Jade Morton
Jeffrey Shane
Russ Shields

Joel J.K. Parker (DFO)

Protect, Toughen, Augment (PTA) Subcommittee

John Betz (Chair)

Tim Murphy (1st Vice-Chair)
Tom Powell (2nd Vice-Chair)
Scott Burgett
Pat Diamond
Renato Filjar
Michael Hamel
Larry James
Vahid Madani
Todd Walter

Misty Finical (DFO) & R.J. Balanga (DFO)

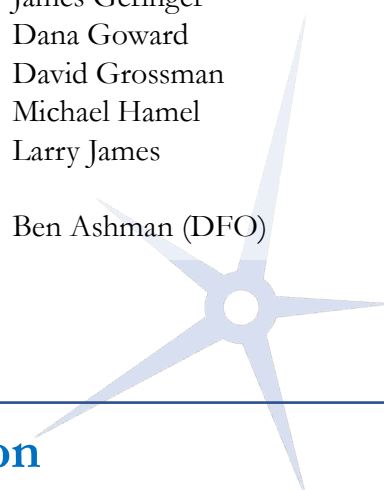
Strategy, Policy & Governance (SPG) Subcommittee

Jeff Shane (Chair)

Gary Thompson (1st Vice-Chair)
Greg Winfree (2nd Vice-Chair)
James Geringer
Dana Goward
David Grossman
Michael Hamel
Larry James

Ben Ashman (DFO)

The three new PNTAB members are invited to choose which subcommittees to serve on



Protecting GPS Users: National PNT Advisory Board Recommendations to PNT EXCOM (1)

Protect, Toughen, and Augment (PTA) Program

- The primary objective of board is assured PNT for all users, and to encourage/exploit system improvements and new techniques to advance PNT for all applications
- To accomplish this, the board's strategy is its PTA Program:
 - **Protect** the radio spectrum + identify + shut down interferers
 - **Toughen** GPS receivers against natural and human interference (jamming and spoofing) and to other system threats
 - **Augment** with additional GNSS/PNT sources and techniques
- Following deliberations at the PNTAB 27th session on Nov. 16-17, 2022, the board approved nine recommendations to the National PNT EXCOM (next slide)

Nov. 16-17, 2022, PNTAB Meeting



Protecting GPS Users: National PNT Advisory Board Recommendations to PNT EXCOM (2)

Theme 1: GPS monitoring, disruption, public warning, and risk assessment

EXCOM is urged to develop a compelling, quantitative way to accurately express the economic damages to the nation attributable to extended disruptions to GPS services.

DOT is urged to issue public warnings to GPS users as soon as possible after the beginning of significant disruption events.

USG should rapidly prototype a National GNSS Interference Detection and Reporting system based on mobile wireless technology. Such a system would have been very beneficial in responding to multiple interference events at major U.S. airports in 2022.

Theme 2: Full integration of threats to and protection of PNT technology within existing cyber security measures

PNT security should be made a prominent part of the National Cyber Director's responsibilities. Departments and agencies should include PNT security in their cyber portfolios.

Theme 3: Need for greater role for USG and revision of existing response doctrine, plans, and policies

USG should develop & implement a GPS High Accuracy and Robustness Service (HARS) delivered to users via the Internet, with performance initially comparable to that provided by other GNSS.

USG should invest in the future of U.S. PNT education and training. There is a definitive shortage of geodesy experts being trained in relation to competitor nations.

USG should establish, publish, and maintain estimates of likelihood GPS will not provide sufficient useful civil signals, due to failures of the GPS infrastructure from any cause.

USG should convene a White House summit to recognize and celebrate U.S. achievements with GPS and to launch an initiative to regain U.S. PNT leadership because GPS capabilities are now substantially inferior to those of China's BeiDou.

The Executive Office of the President should undertake an Administration-wide review of domestic radio spectrum regulation processes.