

29TH NATIONAL SPACE-BASED POSITIONING, NAVIGATION, & TIMING ADVISORY BOARD MEETING

CELEBRATING 50 YEARS OF THE GPS PROGRAM

December 6-7, 2023
South Shore Harbour Resort & Conference Center
2500 South Shore Blvd
League City, TX 77573



In Memory of Martin “Marty” C. Faga

June 11, 1941 – October 19, 2023



Martin C. Faga of Falls Church, VA passed away on Oct. 19, 2023 due to heart failure, surrounded by his loving family. He was 82 years old.

Marty was born on June 11, 1941 in Bethlehem, PA, the son of the late Carolyn and Edgar Faga. He was raised in Bethlehem, along with his sister Betsy. 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.

Marty married Barbara Macklin in 1966, and they embarked on a life-long love affair. They settled in the Washington, D.C. area and raised their sons, Jeff and Scott, there.

Marty loved to sail and spent many happy hours over many years sailing the waters around Washington and Annapolis. He also enjoyed travelling with his family and shared wonderful family vacations at many locations. Marty was extraordinarily generous with his time and exceptional talents, volunteering and donating to his parish church and other organizations. He also enjoyed mentoring many young professionals in their careers.

Marty is survived by his wife, Barbara; his sister, Betsy; and his sons, Jeff and his wife Kelly and Scott and his wife Martine. He is also survived by his loving grandchildren Courtney, Patrick, Matthew, Rachel, Brian and his wife Gloriana, and Stella. His family will greatly miss his loving heart and exceptional wisdom.

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New Advisory Board Members



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

Independent Consultant, Shelton Consulting Inc.

William “Willie” Shelton is an independent consultant. He also serves on several corporate boards and advisory boards and is Chairman of the Board of Trustees for a non-profit organization in Colorado.

General Shelton retired as Commander, Air Force Space Command, in September 2014. During his career, he commanded space operations units at every level and held staff positions in a wide range of Air Force and Department of Defense organizations. In his final assignment, he led a team of over 40,000 at Air Force Space Command to provide space and cyberspace operational forces, as well as acquisition of space systems. In this role, he was responsible for an annual budget of over \$10 billion.

During his Air Force career, General Shelton was a Space Shuttle controller for the first 18 missions, commander of Global Positioning System operations during the initial deployment of the constellation, and commander of the Air Force’s largest ballistic missile wing. He also commanded all Department of Defense 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 Chief Information Officer of the Air Force and the director of the Air Force Headquarters staff during one of the most turbulent periods in the Air Force’s history. While leading Air Force Space Command, 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 aeronautical engineering from the United States Air Force Academy in 1976, a Master of Science degree in aeronautical 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.

New Advisory Board Members



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.



Mr. Bryan Chan

Co-Founder, Vice President of Business Development and Strategy,
Xona Space 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.



29th Meeting Agenda – Day 1

Marina Plaza Ballroom
South Shore Harbour Resort and Conference Center
2500 South Shore Blvd, League City, TX 77573

(Presentations Available at: <https://www.gps.gov/governance/advisory/>)
(Day 1 Livestream: <https://www.youtube.com/@nationalpntboardmeetings822/streams>)

Wednesday, December 6, 2023

9:00-9:05 (5 min)	BOARD CONVENES <i>Call to Order, Logistics, & Announcements</i>	Mr. James J. Miller, <i>Executive Director, National Space-Based PNT Advisory Board, NASA HQ</i>
9:05-9:30 (25 min)	Welcome & Introductions – In Memoriam: Martin (Marty) Faga – Introduction of New Members – Meeting Goals & Objectives	ADM Thad Allen (USCG, ret.), <i>Chair</i> ; Dr. Brad Parkinson, <i>1st Vice Chair</i> ; Hon. Jim Geringer, <i>2nd Vice Chair</i>
9:30-10:30 (1 hr)	Subcommittee Priority Highlights: (10 min each) – Communications & External Relations (CER) – Education & Science Innovation (ESI) – Emerging Capabilities, Applications, & Sectors (ECAS) – International Engagement (IE) – Protect, Toughen, & Augment (PTA) – Strategy, Policy, & Governance (SPG)	Subcommittee Chairs – Mr. Dana Goward – Dr. Jade Morton – Dr. Frank van Diggelen – Mr. Matt Higgins – Dr. John Betz – Hon. Jeff Shane
10:30-10:45 (15 min)	BREAK	
Theme 1: U.S. Government & Institutional PNT Updates		
10:45-11:00 (15 min)	National Coordination Office Update & Status on PNT ESG Response to 2023 PNTAB Recommendations	Mr. Harold (Stormy) Martin III, <i>Director, National Coordination Office for Space-Based PNT</i>
11:00-11:30 (30 min)	DOT PNT Research Priorities, Complementary PNT, and GPS Interference Detection & Mitigation (IDM)	Ms. Karen Van Dyke, <i>Director, PNT & Spectrum Management, Dept. of Transportation (DOT)</i>
11:30-12:00 (30 min)	U.S. Space Force (USSF) Update: <i>GPS Modernization (virtual)</i>	Col. Andrew S. Menschner, <i>Commander, PNT Delta (Prov.), Space Operations Command, USSF (virtual participant)</i>
12:00-12:30 (30 min)	Results & Outcomes from the International Committee on GNSS (ICG) 17 th Plenary Meeting	Ms. Sharafat Gadimova, <i>Executive Secretariat of the ICG, United Nations Office for Outer Space Affairs</i>
12:30-1:30 (1 hr)	LUNCH (Paradise Reef)	
Theme 2: Protect, Toughen, and Augment GNSS for all Users		
1:30-2:00 (30 min)	Critical Infrastructure Augmentation Framework	Dr. John Betz, <i>Member, PNTAB</i>
2:00-2:30 (30 min)	Global Differential GPS System (GDGPS) & Galileo High Accuracy Service (HAS) Comparison	Dr. Attila Komjathy, <i>Supervisor, Near Earth Tracking Systems Group, JPL</i> ; and Dr. Frank van Diggelen, <i>Member, PNTAB</i>
2:30-3:00 (30 min)	Low Earth Orbit PNT Landscape – Overview (15 min) Mr. Jeff Auerbach – Technical Discussion (15 min) Mr. Bryan Chan	Mr. Jeff Auerbach, <i>Senior Foreign Affairs Officer, Office of Space Affairs, Dept. of State</i> ; and Mr. Bryan Chan, <i>Member, PNTAB</i>
3:00-3:15 (15 min)	BREAK	
Theme 3: PNT Education & Science		
3:15-3:45 (30 min)	Space Weather: Weak Solar Events can be more Harmful to GNSS Signals than Strong Ones (<i>virtual</i>)	Dr. Nigel Meredith, <i>Space Weather Research Scientist, British Antarctic Survey (virtual participant)</i>
3:45-4:00 (15 min)	Space Weather Advisory Group (SWAG): <i>White House Space Weather Survey for GNSS Users (virtual)</i>	Dr. Rebecca Bishop, <i>Member, SWAG, National Weather Service, National Oceanic and Atmospheric Administration (virtual participant)</i>
4:00-4:30 (30 min)	Challenges in Hiring Geospatial Intelligence Professionals (<i>virtual</i>)	Dr. J.N. (Nikki) Markiel, <i>National Geospatial-Intelligence Agency (virtual participant)</i>
4:30-6:00 (1 hr 30 min)	Member Deliberations, Key Highlights, and Closing Thoughts from Day 1: <i>Findings & Recommendations?</i>	All members, led by Chair (<i>Session completion at Chair's discretion</i>)
6:00	ADJOURNMENT	



29th Meeting Agenda – Day 2

Marina Plaza Ballroom
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2500 South Shore Blvd, League City, TX 77573

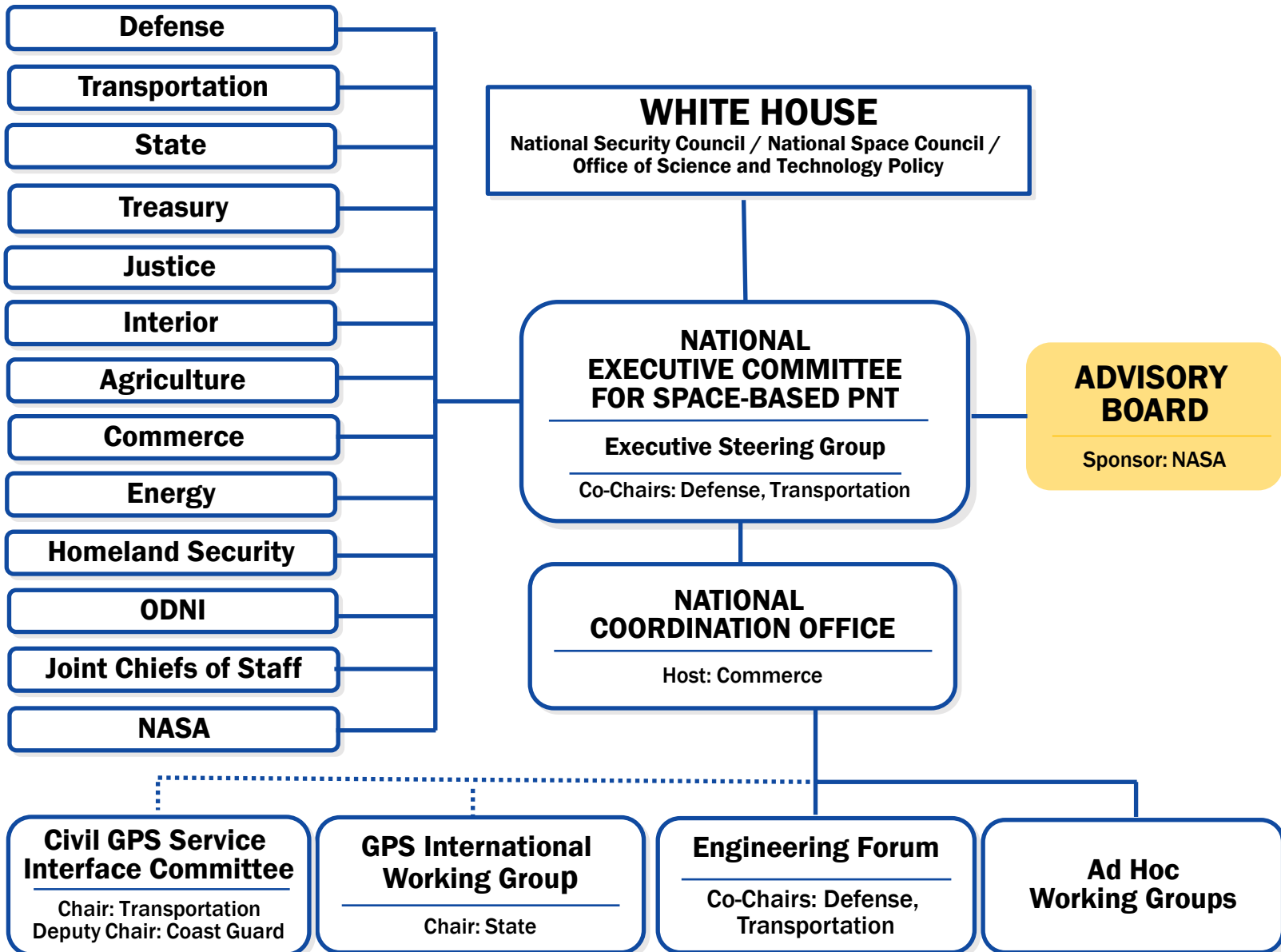
(Presentations Available at: <https://www.gps.gov/governance/advisory/>)
(Day 2 Livestream: <https://www.youtube.com/@nationalpntboardmeetings822/streams>)

Thursday, December 7, 2023

9:00-9:05 (5 min)	BOARD CONVENES <i>Call to Order</i>	Mr. James J. Miller, <i>Executive Director, National Space-Based PNT Advisory Board, NASA HQ</i>
9:05-9:15 (10 min)	PNTAB Leadership Observations from Day 1	ADM Thad Allen (USCG, ret.), <i>Chair</i> ; Dr. Brad Parkinson, <i>1st Vice Chair</i> ; Hon. Jim Geringer, <i>2nd Vice Chair</i>
Theme 4: Updates from International Members & Representatives		
9:15-10:45 (1 hr 30 min)	Countries/Associations – Croatia – Australia – United Kingdom (UK Ten-Point PNT Framework) – Resilient Navigation and Timing (RNT) Foundation – Consumer Technology Association (CTA) – International Air Transport Association (IATA)	Representatives (15 min each) – Dr. Renato Filjar – Mr. Matt Higgins – Prof. Terry Moore – Mr. Dana Goward – Mr. David J. Grossman – Hon. Jeff Shane
10:45-10:55 (10 min)	BREAK	
10:55-11:55 (1 hr)	Roundtable Discussion & Next Steps	All members, led by Chair
11:55-12:00 (5 min)	Wrap-Up – Determine date & venue for next meeting	ADM Thad Allen (USCG, ret.), <i>Chair</i> ; Dr. Brad Parkinson, <i>1st Vice Chair</i> ; Hon. Jim Geringer, <i>2nd Vice Chair</i>
12:00-1:00 (1 hr)	LUNCH – Working as needed (<i>Paradise Reef</i>)	
1:00	ADJOURNMENT	

Organizational Structure

The National Space-Based Positioning, Navigation, and Timing (PNT) Advisory Board provides independent advice to the U.S. government on [GPS-related policy, planning, program management, and funding profiles](#) in relation to the current state of national and international satellite navigation services.



Speakers and VIP Guests



Mr. Jefferey Auerbach

Senior Foreign Affairs Officer, Office of Space Affairs, U.S. Department of State

Mr. Jeffrey Auerbach currently serves as the acting deputy director for the Office of Space Affairs at the Department of State, where he supports U.S. efforts to promote responsible and sustainable use of outer space. In this capacity, he plays an active role in bilateral engagement with partners and allies, and leads U.S. participation in multilateral fora, such as the International Committee on GNSS (ICG). He also represents the U.S. at various satellite navigation venues, discussing policy and status of the civil use of GPS. Mr. Auerbach previously worked at the U.S. Federal Aviation Administration (FAA) where he supported international operations and technical programs, and the international expansion of the Wide Area Augmentation System (WAAS).



Dr. Rebecca L. Bishop

Member, Space Weather Advisory Group (SWAG), National Weather Service, National Oceanic and Atmospheric Administration (NOAA)

Rebecca Bishop received a B.S. in Physics and Mathematics from the University of Idaho in 1996 and a M.S. and Ph.D. in Physics from University of Texas at Dallas in 2001. She is currently a Principal Scientist in the Space Sciences Applications Laboratory at The Aerospace Corporation. At Aerospace, she has focused on understanding the fundamental physics of the Earth's ionosphere and thermosphere and how those regions' dynamics and structures affect various applications and technologies. She led the design, building, and testing of a CubeSat capable GPS Radio Occultation (RO) sensor to measure ionospheric density and scintillation and she is currently the Principal Investigator of a NASA-funded CubeSat mission to understand the coupling between features in the nighttime ionosphere/thermosphere. Dr. Bishop has been a member to the Space Weather Advisory Group since 2021

Speakers and VIP Guests



Ms. Sarafat Gadimova

Executive Secretariat, International Committee on Global Navigation Satellite Systems (ICG), United Nations Office for Outer Space Affairs

Sharafat Gadimova has been with the United Nations Office for Outer Space Affairs since 2004. She is involved in the United Nations Programme on Space Applications activities related to global navigation satellite systems (GNSS), including space weather. She coordinates the work of an International Committee on GNSS (ICG) and its Providers' Forum. She is a chair of the ICG's Working Group on Capacity Building and Information Dissemination. She is leading the organization of the training programmes on GNSS at the United Nations-affiliated Regional Centres for Space Science and Technology Education.



Dr. Attila Komjathy

Supervisor, Near Earth Tracking Systems Group, JPL

Attila Komjathy is Supervisor of the Near Earth Tracking Systems Group of the Tracking Systems and Applications Section at NASA Jet Propulsion Laboratory. He received his Ph.D. from the Department of Geodesy and Geomatics Engineering of the University of New Brunswick, Canada and worked as post-doctoral research associate at the Colorado Center for Astrodynamics Research of the University of Colorado at Boulder in 1997-2001. Attila joined the Ionospheric and Atmospheric Remote Sensing Group at JPL in 2001 where he has led R&D efforts for customers including NASA, the Navy, the US Air Force, DARPA and the French Space Agency delivering GNSS-derived real-time and post-processed products for over 15 years. In 2016 he assumed the role of Group Leader and became a JPL Principal in 2019 and Supervisor in 2020. Attila has initiated new research activities expanding research focus beyond GNSS-related remote sensing techniques, targeting novel terrestrial and planetary applications.

Attila has published over 80 peer-reviewed papers, co-authored three book chapters and received three U.S. Patents. He served as group lead on NASA Group Achievement awards including one in 2018 for innovation in conducting the first successful balloon-based infrasound experiment using an artificial seismic source, with planned applications to planetary seismology. His contributions were recognized by JPL Voyager and Mariner, NASA Space Act and NASA Exceptional Board Awards. He was elected by the GPS World Magazine as "50+ Leaders to Watch" in 2008 and was the recipient of a GPS World Leadership Award in 2013. He is a 2015 Fellow of the US Institute of Navigation and appointed by the National Academy of Sciences as chair of Commission G in USNC-URSI for 2017-2021. He served an associate editor for AGU's Radio Science and GPS Solutions

Speakers and VIP Guests



Dr. J.N. (Nikki) Markiel

Senior GEOINT Authority for Geomatics, Source,
Directorate, National Geospatial-Intelligence Agency

Dr. J.N. (Nikki) Markiel serves as the Senior GEOINT Authority for Geomatics (SGA), Source Directorate, National Geospatial-Intelligence Agency (NGA). The SGA for Geomatics serves as the National System for Geospatial Intelligences (NSG) principal advisor and GEOINT Functional Manager's personal advisor on all aspects of geomatics, a discipline that integrates acquisition, modeling, analysis, and management of spatially referenced data. Geomatics is based on the scientific framework of multiple scientific disciplines, and uses terrestrial, marine, airborne, and satellite-based sensors to acquire spatial and other data, including the process of transforming spatially referenced data from different sources into common information systems with well-defined accuracy characteristics. Dr. Markiel is responsible for Geomatics tradecraft and developing/maintaining national & international relationships; both being necessary to facilitate the creation, collecting, brokering, and delivery of authoritative GEOINT content and services supporting national security priorities and NGA's role as a DoD Combat Support Agency. A primary focus is modernizing the tradecraft, data, models, and systems related to providing Assured Positioning, Navigation, and Timing (PNT), which provides the Foundational basis for all GEOINT and enable the Joint Force to operate in a unified global environment.

Prior to her appointment to the Defense Intelligence Senior Level (DISL), Dr. Markiel served as NGA's Senior GEOINT Officer for the Global Navigation Satellite Systems division where she was a catalyst for modernizing efforts related to the WGS 84 Reference Frame, and in the Gravity division, developing specialized gravity products for a variety of DoD missions, including the nuclear triad. She has engaged on a wide variety of special programs across the Geomatics disciplines, including elevation, bathymetry, surveying, and LIDAR imagery. Prior to entering Federal service, she had an extensive career in the private sector, primarily focused on applied science & engineering.

Dr. Markiel began her career as a tool & die maker, designing and building sophisticated tooling for automotive and consumer electronic markets. She has undergraduate degrees in both Industrial Engineering and Mechanical Engineering, a Master's in Business Administration from Franklin University (Columbus, Ohio), and a Master's & Doctorate in Geodetic Science from The Ohio State University (Columbus, Ohio). Her research work for the Doctorate developed algorithms exploiting three-dimensional ranging datasets to enable navigation in GPS denied environments for the United States Air Force.

Dr. Markiel resides in St. Louis with her partner Victoria

Speakers and VIP Guests



Mr. Harold “Stormy” Martin III

Director, National Coordination Office for Space-Based PNT

Harold W. Martin III, a member of the Senior Executive Service from the Department of Transportation, is the Director of the National Coordination Office for Space-Based Positioning, Navigation, and Timing (PNT). He functionally supports the Deputy Secretaries of Defense and Transportation in their roles as the Co-Chairs of the National Executive Committee for Space-Based PNT (EXCOM). He is responsible for information sharing, coordination, and issue resolution on space-based PNT programs, requirements, budgets, and policies across the federal government. Additionally, he represents the EXCOM on such matters to governmental, public sector, and international organizations.

Mr. Martin is a retired U.S. Air Force Colonel. His past assignments included command and leadership positions from squadron level to the Pentagon and he served as the Director of Operations for GPS during the wars in Afghanistan and Iraq.

Mr. Martin has over 28 years of experience in GPS, its augmentations, space-based systems conducting communications and intelligence missions, and other aerospace systems. He holds a Bachelor's degree in mathematics from Purdue University, a Master's degree in space operations from Webster University, a Master's degree in military operational art and science from Air University, and is a graduate of the Federal Executive Institute.

Speakers and VIP Guests



Col. Andrew S. Menschner (USSF)

Commander, PNT Delta (Provisional), Space Operations Command, Peterson Space Force Base, Colorado

Colonel Andrew S. Menschner is the Commander, Position, Navigation and Timing Delta (Provisional), Space Operations Command, Peterson Space Force Base, Colorado. The PNT Delta (Provisional) is a ground-breaking blend of operations, sustainment and acquisitions units designed to increase unified mission readiness and resiliency of the GPS Constellation. In this role, Colonel Menschner is responsible for around-the-clock operations of 37 GPS satellites; providing warfighters and four billion worldwide users with position, navigation and timing capabilities; oversight of a \$11 billion portfolio focused on development of advanced command and control capabilities; and production and launch of GPS satellites.

Colonel Menschner received his commission from Drake University in 2001. He has served in a variety of program management and staff duties within Space Systems Command, Space Development Agency and the Office of the Assistant Secretary of the Air Force for Acquisition, Technology and Logistics.

Prior to his current assignment, Colonel Menschner was a student at Air War College, Maxwell AFB, AL.

EDUCATION

- 2001 Bachelor of Arts in Chemistry, Drake University, IA
- 2003 Master of Science in Biology, University of Texas-San Antonio, TX
- 2006 Squadron Officer School, Maxwell AFB, AL
- 2010 Master of Business Administration, Colorado State University, CO
- 2011 Air Command and Staff College (correspondence)
- 2015 Master of Science in Military Operational Arts and Sciences, Air University, AL
- 2016 Air War College (correspondence)
- 2017 Senior Program Manager's Course, Defense Acquisition University, Naval Base Point Loma, CA
- 2023 Master of Science in Strategic Studies, Air University, AL

MAJOR AWARDS AND DECORATIONS

- Defense Meritorious Service Medal with one oak leaf cluster
- Meritorious Service Medal with two oak leaf clusters
- Joint Commendation Medal with one oak leaf cluster
- Air Force Commendation Medal
- Air Force Achievement Medal
- Air and Space Recognition Ribbon
- National Defense Service Medal
- Afghanistan Campaign Medal with service star
- Global War on Terrorism Service Medal
- Nuclear Deterrence Operations Service Medal with one oak leaf cluster
- Non-Article 5 NATO Medal

EFFECTIVE DATES OF PROMOTION

- Second Lieutenant May 30, 2001
- First Lieutenant May 30, 2003
- Captain May 30, 2005
- Major Jan1, 2011
- Lieutenant Colonel Apr1,2016
- Colonel Jul 1, 2022

Speakers and VIP Guests



Dr. Nigel Meredith

Space Weather Research Scientist, British Antarctic Survey

Dr Nigel P. Meredith is a space weather research scientist at the British Antarctic Survey. He investigates fundamental problems in radiation belt physics with relevance to space weather hazards. He develops global plasma wave models, essential for the operation of radiation belt models and forecasts. He is interested in extreme space weather and has determined the one-in-100 year event levels for low, medium, geosynchronous and high Earth orbit to help assess the impact of extreme events on the satellite fleet. He enjoys exploring the use of scientific data as art and is the science-lead in a multi-disciplinary art-science collaboration inspired by the 'sounds of space'.



Ms. Karen Van Dyke

Director for PNT and Spectrum Management, U.S. Department of Transportation

Karen Van Dyke serves as the Director for Positioning, Navigation, and Timing (PNT) and Spectrum Management in the U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology (OST-R). Karen has been involved in navigation-related programs at the Volpe National Transportation Systems Center for over 25 years and currently is responsible for overseeing the navigation program and development of policy positions on PNT and spectrum in coordination within the Office of the Secretary of Transportation. Karen received her BS and MS degrees in Electrical Engineering from the University of Massachusetts at Lowell. She served as the President of the Institute of Navigation (ION) and is a recipient of the Award for Meritorious Achievement (Silver Medal) from the Secretary of Transportation and is a Fellow of the ION. Karen was a collaborator on the book, *Understanding GPS: Principles and Applications* (first and second editions).

Advisory Board Members & Subject Matter Experts



Admiral Thad W. Allen, USCG, Retired

Chairman, PNT Advisory Board

Admiral Thad Allen retired from the Coast Guard in 2010 as the 23rd Commandant. He is a Senior Executive Advisor at Hudson Analytix where he supports government and commercial clients in cyber security, maritime security, navigation systems, emergency response, and crisis leadership. He is a nationally recognized expert in disaster response and an advisor to government leaders on creating unity of effort and governing structures to address complex problems. He serves on the boards of the Council for Foreign Relations, National Intelligence University and the U.S. Naval Institute. He is a Fellow in the National Academy of Public Administration.

Admiral Allen was the lead federal official for the responses to Hurricanes Katrina and Rita and served as National Incident Commander for the Deepwater Horizon oil spill. He also directed Coast Guard operations in the wake of the 9/11 attacks and the Haitian Earthquake. His experience in Positioning, Navigation, and Timing dates to his service as Commanding Officer of a LORAN C transmitting station in Northern Thailand during the Vietnam conflict.

A 1971 graduate of the Coast Guard Academy, Admiral Allen also holds Master Degrees from The George Washington University and MIT Sloan School. He has been awarded honorary doctorate degrees from The George Washington University, George Mason University, Georgetown University, Massachusetts Maritime Academy, the National Defense University, and the National Graduate School.



Dr. Bradford Parkinson

1st Vice-Chair, PNT Advisory Board

Dr. Bradford Parkinson was the Chief Architect for GPS and led the original advocacy for the system in 1973 as an Air Force Colonel. Gaining approval, he became the first Director of the GPS Joint Program Office and led the original development of spacecraft, Master Control Station and 8 types of User Equipment. He continued leadership of the Program through the extensive test validation Program, including being the Launch Commander for the first GPS satellite launches. This original deployment of GPS demonstrated comfortable margins against all PNT (Positioning, Navigation, and Timing) requirements.

Earlier in his career, he was a key developer of a modernized AC-130 Gunship, introduction of which included 160 hours of combat missions. He was an instructor at the USAF Test Pilot School. In addition, he led the Department of Astronautics and Computer Science at the US Air Force Academy. He retired from the US Air Force as a Colonel. He was appointed a Professor at Stanford University in 1984, after six years of experience in industry. At Stanford University, he led the development of many innovative applications of GPS, including:

1. First Commercial aircraft (Boeing 737) blind landing using GPS alone,
2. First fully automatic GPS control of Farm Tractors on a rough field to an accuracy of 2 inches,
3. Pioneering the augmentation to GPS (WAAS) that allows any user to achieve accuracies of 2 feet and very high levels of integrity assurance.

He has been the CEO of two companies and serves on many boards. He is the editor/author of the AIAA Award winning 2 Volumes: "GPS Theory and Applications" and is author or coauthor of over 50 technical papers. Among his many awards are the IEEE Medal of Honor and the Draper Prize of the National Academy of Engineering, considered by some to be the "Engineering Nobel."



The Honorable Governor Jim Geringer

2nd Vice Chair, PNT Advisory Board

The Honorable James Geringer, a former governor of the State of Wyoming, is now Director of Policy and Public Sector Strategies for Environmental Systems Research Institute (ESRI). He has held this position since 2003, working with senior elected and corporate officials on how to use geospatial technology for place-based decisions in business and government. Gov. Geringer is fond of saying that he is an engineer by education, farmer by choice and governor by accident. He has a B.S. in Mechanical Engineering from Kansas State University that enabled 10 years active and 12 years reserve service in the U.S. Air Force working with unmanned space programs of Air Force and NASA. He worked on GPS, remote-sensing early detection/warning systems, Interim Upper Stage for the Space Shuttle, Mars Viking Lander, activation of the Peacekeeper missile system and disaster recovery from nuclear, biological and chemical warfare.

Upon leaving active duty, he signed on as contract administrator for the construction of a 1700 megawatt coal-fired electric power generation plant near Wheatland, Wyoming, then took up agricultural pursuits along with serving in the Wyoming Legislature from 1983 to 1994, including six years each in the House and the Senate. Gov. Geringer served two terms as Wyoming Governor during which he focused on improving education through standards, accountability and technology, modernizing Wyoming's economic base to extensively include technology, changing how natural resource agencies among state, federal and local governments worked together, establishing community-based health and family services programs and implementing strategic planning and information systems.

Gov. Geringer is a member of the Committee on America's Climate Choices under the National Academies, served on the Mapping Sciences Committee under the National Research Council; Western Interstate Energy Board; Association of Governing Boards for higher education; Operation Public Education; the Board of Governors of the Park City Center for Public Policy; Board member of NatureServe and, co-chair of the Policy Consensus Initiative. He is the current Chair of the Board of Trustees, Western Governors University.

Advisory Board Members & Subject Matter Experts



Dr. Penina Axelrad

Professor, Department of Aerospace Engineering Sciences, University of Colorado Boulder

Dr. Penny Axelrad is a Distinguished Professor in Aerospace Engineering Sciences (AES) at the University of Colorado Boulder, where she has been a faculty member since 1992 and served as Department Chair from 2012-2017.

Her research interests include space domain awareness, technology and algorithms for GPS-based position, navigation, and timing in space, airborne, marine, and land environments, multipath characterization and correction, and remote sensing using Global Navigation Satellite System (GNSS)-based reflectometry and radio occultation measurements. She has authored 63 journal papers, 142 conference papers, and served as Principal Investigator (PI) or Co-Investigator on research grants and contracts totaling \$12.5 M.

Dr. Axelrad is a member of the National Academy of Engineering (NAE), a Fellow of the Institute of Navigation (ION), and a Fellow of the AIAA. Additional honors include the Lawrence Sperry Award (1996) from the AIAA, Samuel Burka Award (2011) and Johannes Kepler Award (2009) from the ION, Women In Aerospace Educator Award (2015), and University of Colorado Excellence in Leadership Award (2017). She holds bachelor's and master's degrees from M.I.T. and a PhD from Stanford University.



Dr. John Betz

Fellow Emeritus, MITRE Corporation

Dr. John W. Betz is MITRE Fellow Emeritus at The MITRE Corporation. He has been with MITRE since 1989, and before that worked at The Analytical Sciences Corporation and RCA Corporation. He has also been adjunct professor at Northeastern University. Since 1997 he has primarily worked on PNT.

Dr. Betz was a member of the U.S. Air Force Scientific Advisory Board from 2004 to 2012, serving as its chairman from 2008 to 2011, leading 52 accomplished engineers and scientists who advise the Air Force senior leadership. He has also served on the Defense Science Board.

Dr. Betz has contributed to the design of modernized GPS signals, especially the spreading modulation and other aspects of the new military signal, the M-signal, and the newest civil signal known as L1C. He also was a lead technical contributor to the U.S. delegation in negotiations with the European Community concerning GPS and Galileo, leading to the 2004 Agreement between the U.S. and European Community. He also has been a key member of technical working groups between the U.S. and Europe, Japan, the Russian Federation, China, and India, leading to other nations' adoption of civil signals compatible and interoperable with GPS. His recent work focuses on making navigation and timing more robust and resilient for military and critical infrastructure applications.

Dr. Betz received a B.S. in Electrical Engineering from the University of Rochester in 1976, and a M.S. (1979) and Ph.D. (1984), both in Electrical Engineering from Northeastern University. He is co-inventor on four patents or patent applications, and authored Engineering Satellite-Based Navigation and Timing: GNSS, Signals, and Receivers (Wiley-IEEE Press, 2015), along with more than 60 other technical publications. He has received national and international awards, including Fellow of the Institute of Navigation, Fellow of the Royal Institute of Navigation, Life Fellow of the IEEE, and has been inducted into the GPS Hall of Fame.

Advisory Board Members & Subject Matter Experts



Mr. Scott Burgett

Director of Global Navigation Satellite Systems, Garmin International

Mr. Burgett is the Director of Global Navigation Satellite Systems for Garmin International. He has been a principal architect in the integration of GPS technology into Garmin's consumer and aviation products.

Burgett conducted early research into wearable GPS technology. He was instrumental in the creation of turn-by-turn automotive navigation systems combining GPS and dead reckoning technology. He also contributed to the development of TSO-C129a and N8110 certified aviation equipment.

Burgett's involvement in GPS dates to 1991, when he worked at Sandia National Laboratories on the integration of GPS with inertial navigation systems, precision guidance, and motion measurement for imaging radars.

Burgett holds a B.S. in Electrical Engineering from Kansas State University and a M.S. in Electrical Engineering from the University of New Mexico. He is a named inventor on 17 patents related to the integration of GPS technology with sensors and the use of GPS in portable navigation devices.



Captain Joseph D. Burns

CEO, The Airo Group

Captain Joe Burns is a thirty-year veteran of Aviation, Technology, and Communications industries. He is currently the CEO at The Airo Group – an Electric Air Logistics systems manufacturer and operator. He was most recently the CEO at Sensurion Aerospace – an Unmanned Systems manufacturer and technology operations firm. He was also the Managing Director of Technology and Flight Test at United Airlines responsible for over \$250M in annual NextGen programs. At United Airlines, Joe held positions as Managing Director – Flight Standards, FAA Certificate Director of Operations, Director Flight Standards, Chief Pilot Federal Flight Deck Officer Program, Manager Automation Systems, and Pilot Instructor. A 15,000 hour pilot, and type-rated on many large jet transports, he currently flies as International Captain on the Boeing 767.

His engineering and management experience also includes CEO positions at Xcelar, Agile Defense, Inertia Technology, Chief Pilot and systems engineer for Coffeen Associates, Chief Systems Engineer for Ericsson, and Engineering Manager for Sprint.

He is currently on the Position, Navigation, and Time Advisory Board; Board Member for Aspen Avionics; Board Member for Airo Group Holdings.; Member of the NextGen Advisory Council Subcommittee; Board Member Emeritus for EMS Technologies (NASDAQ:ELMG); Board Member and CEO Emeritus of ATN Systems, Inc.; Former Advisory Board Member for the National Center for Atmospheric Research (NCAR/UCAR); Chairman Emeritus for the ATA Air Traffic Control Council and Operations Committees.

Captain Burns holds an M.B.A. in Management from the Miami University distinguished Farmer School of Business and a B.S. in Aeronautics/Aeronautical Engineering from Miami University. Joe has over a dozen patents in aeronautics, security, and communications technology applications.

Advisory Board Members & Subject Matter Experts



Dr. Patrick Diamond

Principal, Diamond Consulting

Dr. Diamond has been at the forefront of development of timing and synchronization technologies for over 20 years. His activities include leading the development of the first monolithic silicon device for synchronization in SONET/SDH networks, and as the original evangelist for creating a version of IEEE 1588 for use in packet wide area networks and leading the development of the only fully integrated 1588v2 system on a chip currently deployed in over 2 million base stations.

Dr. Diamond is and has been active in the International Telecommunication Union - Telecommunication Standardization Sector (ITU-T), IEEE and Internet Engineering Task Force (IETF) standards development. He has worked at NASA, McDonnell Douglas, Data General and Semtech in senior and executive engineering and business development roles. He has been awarded BSEE, BSCS and Ph.D. degrees.



Dr. Frank van Diggelen

Distinguished Engineer, Google

Dr. Frank van Diggelen is a Distinguished Engineer at Google, where he works on high accuracy GNSS for phones, watches, and cars. He also teaches GPS: he and Prof. Per Enge created an on-line GPS course, offered through Stanford University and Coursera and available on YouTube.

Van Diggelen is a pioneer in Assisted GNSS, the technique that allows GPS to work in cell phones. He is the inventor of coarse-time GNSS navigation, co-inventor of Long Term Orbits for A-GNSS, and holds over 100 issued US patents on GNSS. He is the author of "A-GPS" the first textbook on Assisted GNSS, and Co-editor of "PNT in the 21st Century" (Morton, van Diggelen, Spilker, and Parkinson), the latest book on GNSS and Navigation. He was the President of the Institute of Navigation (ION) 2021 through 2023. He has received the Thurlow and Kepler awards of the ION, and the Harold Spencer Jones Gold Medal from the RIN. He is a Fellow of the IEEE, ION, and the Royal Institute of Navigation.

Previously, he was a Navigation Officer in the South African Navy. He obtained his bachelor's degree from the University of the Witwatersrand, South Africa, and Ph.D. in electrical engineering from Cambridge University, England.



Dr. Renato Filjar

Honorary Professor of Electronics Engineering, University of Rijeka
Professor of Electronics Engineering, Krapina University of Applied
Sciences, Croatia

Renato Filjar is a Titular Professor of Electronics Engineering (Tenure) with the Faculty of Engineering, University of Rijeka, Croatia, and a Professor, Head of Laboratory for Spatial Intelligence, and Vice-Dean for science and international cooperation at the University of Applied Sciences Hrvatsko Zagorje Krapina, Croatia. He established and organized the traditional Baška GNSS conference, and Baška SIF (Spatial Information Fusion) Forum, held annually in Baška, Krk Island, Croatia.

His professional interests include: Global Navigation Satellite System (GNSS) resilience development against adverse space weather, geomagnetic, ionospheric, multipath, and spoofing effects; statistical, mathematical and computer science framework for the environment-aware GNSS position estimation; statistics, statistical learning and predictive modeling; spatial and sensor information fusion; application-scaled GNSS positioning performance; GNSS Software-Defined Radio, and nature-inspired navigation methods.

Professor Filjar is involved in international science, research, development, commercialization, and education activities and initiatives related to satellite navigation, through his expert cooperation with the United Nations International Committee on GNSS, International Space Weather Initiative, the European Union Agency for Space Programmes, European Telecommunications Standardisation Institute, and universities across the world.

Professor Filjar is a Fellow of The Royal Institute of Navigation (RIN), London, United Kingdom (UK), a Member of the Institute of Navigation (ION), and a Member of the International Society of Information Fusion. Professor Filjar was presented with the RIN J. E. D. Williams (Silver) Medal in 2010 and was elected an Honorary Fellow of the International TransNav Conference (Maritime University of Gdynia, Gdynia, Poland) in 2021. He holds BSc (1987), MSc (1994) and Ph.D. (2007) degrees in electrical engineering, respectively, from the Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia.



Mr. Dana A. Goward

President, Resilient Navigation and Timing Foundation

Mr. Dana Goward is the founder and President of the Resilient Navigation and Timing Foundation, a 501(c)3 scientific and educational charity. The foundation is dedicated to protecting, toughening, and augmenting GPS signals. Foundation efforts include supporting GPS spectrum protection, stronger laws, and better enforcement against jamming and spoofing, and making GPS services nearly "bullet proof" by augmenting them with terrestrial systems and signals.

He retired in 2013 from the U.S. federal Senior Executive Service as the nation's maritime navigation authority, with 12 business lines budgeted at over \$1.3B/yr. Mr. Goward has represented the United States at IMO, IALA, the UN anti-piracy working group, and other international forums.

A career Coast Guard officer, among his many assignments were command of the Coast Guard's Air Station in New Orleans and leadership of the service's nationwide boat operations as the first Chief, Office of Boat Forces. He retired from uniformed service as a Captain in 2003. Mr. Goward is Chairman Emeritus for the Association for Rescue at Sea, is the proprietor at Maritime Governance, LLC, and is a senior advisor to Space Command's Purposeful Interference Response Team.

Mr. Goward is Chairman Emeritus of the Board for the Association for Rescue at Sea, and the proprietor at Maritime Governance, LLC, and the recipient of the Institute of Navigation's Hays award for inspirational leadership.



Dr. Dorota A. Grejner-Brzezinska

Associate Dean for Research, Ohio State University

Dr. Dorota A. Grejner-Brzezinska is the University Distinguished Professor, Lowber B. Strange Endowed Chair and Professor in the Department of Civil, Environmental and Geodetic Engineering. She is the Vice President for Knowledge Enterprise at The Ohio State University Enterprise for Research, Innovation and Knowledge. Her research interests cover GPS/GNSS algorithms, GNSS/inertial and other sensor integration for navigation in GNSS-challenged environments, sensors and algorithms for indoor and personal navigation, image-based navigation using artificial intelligence (AI) methods, and mobile mapping. She published over 350 peer reviewed journal and proceedings papers, numerous technical reports and five book chapters on GPS and navigation, and led nearly 60 sponsored research projects with the total budget of over \$32 million.

Dr. Brzezinska is a member of the National Academy of Engineering (NAE), Fellow of the Institute of Navigation (ION), Fellow of the Royal Institute of Navigation (RIN), and Fellow of the American Association for the Advancement of Science (AAAS), and the recipient of the 2016 ION Johannes Kepler Award, the 2005 ION Thomas Thurlow Award, the 2005 and 2015 United States Geospatial Information Foundation (USGIF) Academic Research Award, and the 2018 International Association of the Institutes of Navigation (IAIN) John Harrison Award. She has served as President of the Institute of Navigation (2015-2017), and the International Association of Geodesy (IAG) Commission 4, Positioning and Applications (2011-2015), and is an IAG Fellow. Dr. Brzezinska currently serves as Principal Investigator for the NSF Engineering Research Visioning Alliance (ERVA) and served on the U.S. President's Council of Advisors on Science and Technology (PCAST).

Dr. Brzezinska holds an M.S. and a Ph.D. in Geodetic Science from The Ohio State University, and an M.S. in Surveying Engineering and Land Management Systems from the University of Warmia and Mazury, Poland.

Advisory Board Members & Subject Matter Experts



Mr. J. David Grossman

Vice President of Regulatory Affairs,
Consumer Technology Association

J. David Grossman serves as Vice President of Regulatory Affairs for the Consumer Technology Association (CTA), the U.S. trade association representing approximately 1,500 consumer technology companies. In this role, J. David is responsible for representing the association before Federal agencies and the Administration by advocating for policies to encourage the growth of innovative consumer technologies. J. David returned to CTA in 2021, after serving as a member of the organization's government affairs team earlier in his career.

From 2018-2021, J. David served as Executive Director of the GPS Innovation Alliance, an organization dedicated to protecting, promoting and enhancing the use of the Global Positioning System (GPS). In that role, J. David tripled the association's membership, advanced the industry's policy priorities on Capitol Hill and before Federal agencies and the Administration, and expanded the association's educational outreach efforts.

Previously, J. David spent nearly a decade in public service, including serving as Chief of Staff to FCC Commissioner Mignon Clyburn. While at the FCC, Mr. Grossman was responsible for managing the policy agenda, strategy and messaging for the Commissioner, including the development of a 13-city "Connecting Communities" listening tour.

Prior to the FCC, J. David served as Legislative Director and Senior Advisor for Technology Policy to Rep. Anna Eshoo of Silicon Valley. In this role, he served as chief advisor to the Ranking Member of the Subcommittee on Communications and Technology, managing a portfolio of issues ranging from broadband access and privacy to public safety and Internet governance. J. David began his time on Capitol Hill as Technology Counsel to the U.S. House Small Business Committee under the leadership of Rep. Nydia Velázquez. During this time, he served as the Committee's lead advisor on technology and telecommunications policy.

Mr. Grossman began his career as a research analyst at Kellogg, Huber, Hansen, Todd, Evans & Figel, P.L.L.C., where he supported the firm's telecommunications practice. Mr. Grossman holds a Master's Degree in Public Policy from George Mason University and a B.A. in Political Communication from George Washington University's School of Media and Public Affairs.



Lt. Gen. Michael A. Hamel, USAF (Ret.)

Former Commander, Space and Missile Systems Center

General Hamel is the former Commander of the Space and Missile Systems Center. In that capacity, he managed the research, development, acquisition, and sustainment of space, missile, launch, command and control, and operational satellite systems. He was responsible for 6,500 employees nationwide and an annual total budget in excess of \$10 billion. General Hamel was the Air Force Program Executive Officer for Space and has direct responsibility for execution of major Air Force space acquisition programs to include: the Space-Based Infrared System Program; Military Satellite Communication programs; the Global Positioning System; Space Launch and Range programs, Intercontinental Ballistic Missile Modernization, the space superiority system programs, and other advanced space technology programs

General Hamel was commissioned a second lieutenant through the U.S. Air Force Academy in June 1972. His career included assignments in a variety of command, acquisition, operations, and policy positions involving space, system development, intelligence, space operations, and launch. The general has served in senior staff positions at Headquarters U.S. Air Force and Air Force Space Command, and was the Vice President's military adviser on defense, nonproliferation and space policy. General Hamel commanded the 14th Air Force "Flying Tigers," and was responsible for all U.S. Air Force operational space forces and execution of assigned U.S. Strategic Command space operations.

Advisory Board Members & Subject Matter Experts



Mr. Matt Higgins

President, IGNSS Association, Australia

Matt Higgins, PSM, is President of the International Global Navigation Satellite Systems (IGNSS) Association, a not-for-profit association based in Australia. He is also an Assistant Director Space Technology in the Australian Space Agency's Office of the CTO as the subject matter expert on Positioning, Navigation, and Timing.

From 2007 to 2010, Higgins was a Vice President of the International Federation of Surveyors (FIG) and its representative on the International Committee on GNSS, where he co-chaired Working Group D on Reference Frame, Timing and Applications. Matt is also an Honorary Fellow of the Geospatial Council of Australia.

In the 2023 King's Birthday Honours List, Matt was awarded the Public Service Medal within the Australian honours system for "outstanding public service to Queensland with international impact in the fields of surveying, geodesy and spatial sciences."

Higgins holds Bachelor and Master Degrees in Surveying.



Lt. Gen. Larry James, USAF (Ret.)

Deputy Director, Jet Propulsion Laboratory

Lieutenant General Larry D. James, USAF, Ret., was appointed Deputy Director of the Jet Propulsion Laboratory (JPL) in August 2013. At JPL he is the Laboratory's Chief Operating Officer responsible to the Director for the day-to-day management of JPL's resources and activities. This includes managing the Laboratory's solar system exploration, Mars, astronomy, physics, Earth science, interplanetary network programs, and all business operations. These activities employ 6200 scientists, engineers, technicians, and business support personnel, generating \$2.6 billion in annual revenues.

Prior to his retirement from the Air Force and his appointment as JPL Deputy Director, Lt. Gen. James was the Air Force Deputy Chief of Staff for Intelligence, Surveillance and Reconnaissance (ISR) at the Pentagon. He was responsible to the Secretary and Chief of Staff of the Air Force for policy formulation, planning, evaluation, oversight, and leadership of Air Force intelligence, surveillance and reconnaissance capabilities and led more than 20,000 Intelligence, Surveillance and Reconnaissance officers, enlisted and civilians across the Air Force ISR Enterprise.

Lt. Gen. James received his Bachelor of Science in Astronautical Engineering (1978) from the U.S. Air Force Academy (Distinguished Graduate) and his Master of Science in Aeronautics and Astronautics (1983) from the Massachusetts Institute of Technology, Cambridge MA. He was also a Draper Fellow at the Charles Stark Draper Laboratory in Cambridge MA and is a Fellow of the AIAA.

His 35 year military career included assignments as a Space Shuttle Payload Specialist, GPS Program Manager, Titan IV Launch Director and Commander of the 50th Space Wing at Schriever AFB, CO. Lt. Gen. James has also served on the staffs of U.S. Space Command, Air Force Space Command, and HQ Air Force. He was commander of the 14th Air Force at Vandenberg AFB, responsible for all military satellite, launch and C2 operations, and was Director, Signals Intelligence Systems Acquisition and Operations Directorate, National Reconnaissance Office, Washington, D.C. He was the Director, Space Forces for Operation Iraqi Freedom at the Combined Air Operations Center, Prince Sultan Air Base, Saudi Arabia.

Advisory Board Members & Subject Matter Experts



Dr. Vahid Madani

Executive Engineer, GridTology

Dr. Madani is a Fellow of Institute of Electrical and Electronics Engineers (IEEE) and IEEE Distinguished Lecturer, adjunct faculty in accredited U.S. and abroad universities, and a Board Certified practicing Electrical Engineer in California, and holds U.S. and international patents. Dr. Madani's experience spans across system planning, operation, protection, and control engineering at Pacific Gas and Electric Co. (PG&E). For a decade, he served as the chair of the reliability committee of the western interconnected power system. He has also served as Industry Advisor to the National Science Foundation (NSF). Madani's collaborations with the National Institute of Standards and Technology applied engineering metrology group in testing of synchrophasor systems has led to many national and international wide-area monitoring and control system deployment. He is a recipient of the lifetime achievement award from the North American Synchrophasor Initiative.



Professor Terry Moore

University of Nottingham, United Kingdom

Professor Terry Moore is an Emeritus Professor of the University of Nottingham. He was formerly the Director of the Nottingham Geospatial Institute (NGI) at the University, where he was the Professor of Satellite Navigation. He has many years of research experience in surveying, positioning and navigation technologies and remains a consultant and adviser to U.S., European and the United Kingdom government organizations and industry.

He supervised numerous research projects funded by industry, research councils, the European Space Agency and the European Commission, and supervised around 40 successful PhD students. He is regularly involved in the activities of both national and international professional and scientific bodies and has taken a leading role in national and European initiatives aimed at integrating academic research, and teaching, in PNT with industry. He has worked with the UK Government on various initiatives related to PNT developments and policy. He is a past member of the GNSS Science Advisory Committee of the European Space Agency. He is also a Member of the Editorial Advisory Councils of the *Journal of Navigation* and of *GPS World*. He is a Chartered Engineer and he is also a Fellow of the Chartered Institution of Civil Engineering Surveyors, a Fellow of the Royal Astronomical Society, and an Associate Fellow of the Remote Sensing and Photogrammetry Society.

He is a Fellow and the Immediate Past President of the Royal Institute of Navigation (RIN) and is also a Fellow and a Member of Council of the U.S. Institute of Navigation (ION). In 2013, he was awarded the RIN Harold Spencer-Jones Gold Medal, and in 2017 the ION Johannes Kepler Award. At the end of 2021 he was awarded the International Association of Institutes of Navigation (IAIN) John Harrison Award for Outstanding Contributions to Navigation. In the New Year Honours of 2023 he was made an Officer of the Most Excellent Order of the British Empire (OBE).

Advisory Board Members & Subject Matter Experts



Dr. Jade Morton

Helen and Hubert Croft Professor, University of Colorado Boulder
Director for Colorado Center for Astrodynamics Research
Head of the Satellite Navigation and Sensing Lab

Dr. Jade Morton is the Helen and Hubert Croft Professor, Director for Colorado Center for Astrodynamics Research (CCAR), and Head of the Satellite Navigation and Sensing Lab in the Ann and HJ Smead Aerospace Engineering Sciences Department at the University of Colorado, Boulder. She received her PhD in Electrical Engineering from Penn State. Dr. Morton's research interests lie at the intersection of satellite navigation technologies and remote sensing of the Earth's space environment, atmosphere, and surface. She is an author/co-author of over 300 technical publications and the lead editor of a two-volume set of books titled Position, Navigation, and Timing Technologies in the 21st Century (PNT21) published by Wiley-IEEE Press. She was a President of the ION, a distinguished lecturer of the IEEE Aerospace and Electronics Systems Society, a recipient of the ION Burka, Thurlow, and Kepler award, and the IEEE PLANS Richard Kershner award. Dr. Morton is a fellow of IEEE, ION, and the Royal Institute of Navigation (RIN).



Mr. Timothy A. Murphy

Senior Technical Fellow, Boeing

Mr. Murphy is a Boeing Senior Technical Fellow in the Boeing Commercial Airplanes Group where he is a member of the Airplane Systems organization. Tim has more than 37 years of experience in the field of radio navigation and communications systems for civil aviation. The current focus of his work is avionics for new airplane product development, and next generation CNS technologies to support air traffic management. Tim's primary expertise is in navigation systems including satellite navigation systems (GPS, GPS augmentations, GPS modernization, GPS Landing Systems) as well as conventional navigation systems (VOR, distance measuring equipment, ILS, etc.). Tim also has extensive experience and expertise in communications systems including satellite and ground-based communications systems.

Tim is very active in the development of domestic and international standards for use of satellite navigation, communications, and surveillance by commercial aviation. He is the panel member nominated by the International Coordinating Council of Aerospace Industries Association (ICCAIA) to the ICAO Navigation Systems Panel. He is the vice-chairman of the CNS/ATM subcommittee of ICCAIA, which coordinates all industry work within ICAO, a branch of the United Nations which deals with Standards and Recommended Practices to support safety and regularity civil aviation operations. Within ICAO in addition to the Navigation Systems Panel, he represents industry on the Global Aeronautical Distress and Safety System Advisory Group and the Integrated Communications, Navigation, Surveillance, and Spectrum Task Force.

He has been an active participant within RTCA Inc. (an aeronautical standards body), serving on five different special committees in the areas of Satellite Navigation, Satellite Communications, Radio Altimeter, Autonomous Air Vehicles and Automatic Flight Guidance and Control Systems. He is active in the Institute of Navigation (ION) where he is currently on the Executive Council as Western Vice President. He has published more than 50 papers and holds more than 20 patents with several more pending. He received a Bachelor's and a Master's in Electrical Engineering from Ohio University where he was a Stocker fellow and graduate research intern associate at the Ohio University Avionics Engineering Center.

Advisory Board Members & Subject Matter Experts



Dr. Scott Pace

Subject Matter Expert

Director, Space Policy Institute, Professor of the Practice of International Affairs, George Washington University Elliott School of International Affairs

Dr. Scott Pace is the Director of the Space Policy Institute and Professor of the Practice of International Affairs at the George Washington University's Elliott School of International Affairs. He is also a member of the faculty of the Trachtenberg School of Public Policy and Public Administration. His research interests include civil, commercial, and national security space policy, and the management of technical innovation.

Dr. Pace rejoined the faculty of the Elliott School of International Affairs in 2021 after serving as Deputy Assistant to the President and Executive Secretary of the National Space Council from 2017-2020. He previously served as the Associate Administrator for Program Analysis and Evaluation at NASA from 2005-2008 and Deputy Chief of Staff for the NASA Administrator from 2002-2003. Prior to NASA, he was the Assistant Director for Space and Aeronautics in the White House Office of Science and Technology Policy. From 1993-2000, he worked for the RAND Corporation's Science and Technology Policy Institute, and from 1990-1993, he served as the Deputy Director and Acting Director of the Office of Space Commerce, in the Office of the Deputy Secretary of the Department of Commerce. He received a Bachelor of Science degree in Physics from Harvey Mudd College in 1980; Masters degrees in Aeronautics & Astronautics and Technology & Policy from the Massachusetts Institute of Technology in 1982; and a Doctorate in Policy Analysis from the RAND Graduate School in 1989.

Dr. Pace received the NASA Outstanding Leadership Medal in 2008, the US Department of State's Group Superior Honor Award, GPS Interagency Team, in 2005, and the NASA Group Achievement Award, Columbia Accident Rapid Reaction Team, in 2004. He has been a member of the US Delegation to the World Radiocommunication Conferences in 1997, 2000, 2003, and 2007. He was also a member of the US Delegation to the Asia-Pacific Economic Cooperation Telecommunications Working Group, 1997-2000. He has served as a member of the U.S. Delegation to the UN Committee on the Peaceful Uses of Outer Space in 2009, and 2011-15. Dr. Pace has been a member of the NOAA Advisory Committee on Commercial Remote Sensing (ACCRES), a member of the Board of Trustees, Universities Space Research Association, a member of the International Academy of Astronautics, an Associate Fellow of the American Institute of Aeronautics and Astronautics, and a member of the Board of Governors of the National Space Society.



Dr. Tom Powell

Technical Fellow, The Aerospace Corporation

Dr. Powell is a Technical Fellow at The Aerospace Corporation, where he focuses on current and future concepts for resilient Positioning, Navigation, and Timing (PNT). He has supported GPS acquisition programs for over 20 years for Space Systems Center (SSC) in Los Angeles for the office of the Undersecretary of the Air Force for Space Acquisition in Washington D.C.

Dr. Powell has developed orbit determination and estimation approaches and participated in launch and early orbit operations for multiple satellite programs. He led an Aerospace technical team to process signals from the Air Force Falcon Gold experiment, one of the first demonstrations of receiving GPS signals on a spacecraft above the GPS constellation.

As Chief Engineer of the Defense Advanced GPS Receiver (DAGR) program for the GPS Joint Program Office, Dr. Powell led a multi-organizational technical team that developed requirements, evaluated proposals, and conducted early field trials with Army and U.S. Marine Corps users.

In support of GPS and Global Navigation Satellite System (GNSS) Systems Engineering, Dr. Powell led the Aerospace team responsible for GPS constellation management, satellite reliability, Functional Availability, and Atomic Clock Modernization programs. In addition to advising multiple US Government agencies on domestic spectrum and regulatory matters, Dr. Powell participated as a technical advisor to the US delegation in multiple bilateral and multilateral International Telecommunications Union (ITU) sponsored spectrum coordination meetings with all current global and regional GNSS providers.

Prior to joining Aerospace, he worked at NASA Johnson Space Center on advanced space station and lunar base concepts, and in Space Shuttle mission operations.

Dr. Powell holds a BSc degree in Aeronautical and Astronautical engineering from Purdue University, an MSc in Aerospace Engineering from the University of Texas at Austin, and a Ph.D. in Aerospace Engineering from the University of California, Los Angeles.

Advisory Board Members & Subject Matter Experts



Ms. Eileen Reilly

CEO, Global Train Services, LLC

Ms. Reilly began her railroad career as an IBM contractor for the Alaska Railroad (AKRR), a full-service passenger and freight railroad, where she made an immediate impact to the technological advancement of the company. In 1996, after a stint as an independent contractor for information technology, she officially joined the AKRR where she rose through the ranks to become the Vice President (VP) of Projects, Engineering, Technology, & Signal. Ms. Reilly was a VP at AKRR until her retirement from AKRR in 2018.

In her time at AKRR, she procured and oversaw \$500 million of grant funding with no cost overruns, was the leader of the Capital Program which included the following departments: Grant Administration, Project Management, Information Services, Signal & Telecom, Engineering Services, and Advanced Train Control which included the federally mandated Positive Train Control (PTC) System which relies heavily on a resilient and robust position, navigation, and timing solution. The AKRR was an early adopter of using a PTC system since it had both freight and passenger service sharing a single track with passing track periodically spaced, that was operated on AKRR. This led her to volunteering and being accepted to be a member of the Railroad Safety Advisory Committee for 49 Code of Federal Regulations 236 Subpart H and Subpart I that assisted in generating the regulations that PTC systems must comply with. After her retirement from AKRR, she founded Global Train Services LLC (GTS) to assist railroads with implementing and adding resiliency for their PTC systems that includes testing, defining and supporting additional GNSS radio-frequency bands for a spaced-based PNT high-precision and high-reliable solution, procuring grants, and complying with federal regulations. As CEO, she has grown the company each year, expanded the scope of GTS's capabilities, and earned a solid relationship with clients throughout the industry.

Ms. Reilly has been a board member for the Commuter Rail Coalition for the two years and supports a strong commuter railroad presence. Ms. Reilly is a member of American Railway Engineering and Maintenance-of-Way Association (AREMA) Committee 37 – Signal Systems and Committee 39 – Positive Train Control, American Short Line and Regional Railroad Association (ASLRRA) and League of Railway Women (LRW). Ms. Reilly attended the U.S. Merchant Marine Academy and is a graduate of Rutgers University. Ms. Reilly was one Railway Age Women in Rail 2020 Honoree's.



The Honorable Jeffrey N. Shane

Former General Counsel, International Air Transport Association

Jeff Shane joined the International Air Transport Association as General Counsel in April 2013. In that role, he was responsible for managing IATA's Legal Services group, the delivery of legal support to IATA's operational units around the world, and for working with IATA's member airlines to address legal issues of importance to the industry at large. He retired from IATA in 2020, but continues to represent the organization on the Advisory Board. Immediately prior to joining IATA, Jeff was a partner at Hogan Lovells LLP in its Washington, DC office. In addition to his 14 years in private law practice, Jeff had a long career in the U.S. Government. He held three Presidential appointments, including Under Secretary of Transportation for Policy between 2003 and 2008. In addition to other senior positions at the U.S. Department of Transportation, he was Deputy Assistant Secretary of State for Transportation Affairs for four years, where he served as chief U.S. aviation negotiator.

Recognized for his role in establishing an Open Skies aviation policy for the United States, he was also a principal architect of USDOT's approach to international aviation alliances and antitrust immunity. He was an early champion of the "NextGen" transformation of the U.S. air traffic control system, the acceleration of GPS modernization, and other technology initiatives to enhance the safety, security, and efficiency of aviation and other modes of transportation.

Jeff was appointed a member of the Federal Aviation Administration's Management Advisory Council in September 2017. He has served as President of the triennial Assembly of the International Civil Aviation Organization, Chairman of the Commission on Air Transport of the Paris-based International Chamber of Commerce, Chairman of the Military Airlift Committee of the National Defense Transportation Association, and Chair of the American Bar Association's Forum on Air and Space Law. He taught for four years as an Adjunct Professor of Law at Georgetown University. The recipient of a number of professional recognitions, Jeff is a graduate of Princeton and Columbia Law School. He is a member of the District of Columbia Bar. He lives with his wife and two daughters in Founex, Switzerland, near Geneva.



Mr. T. Russell Shields

President and CEO, RoadDB

Mr. Shields is former CEO of Navigation Technologies (later Navteq, now HERE), former Chair of Ygomi, and current President and CEO of RoadDB. Businesses that Mr. Shields has founded or led over the last five decades include Shields Enterprises International, Cellular Business Systems (later Convergys), Navigation Technologies (later Navteq, now HERE), ArrayComm, and RoadDB.

Shields Enterprises International built many pioneering data management and transaction processing systems, including fundamental systems for the Veterans Administration, Social Security Administration, and Central Intelligence Agency. Cellular Business Systems, Inc. was the first company to provide billing services to the U.S. cell phone industry.

Navigation Technologies pioneered the development of comprehensive, navigable map database and routing tools. Mr. Shields served as CEO until 2000, as a board member until 2004, and as an adviser to the CEO until 2008. Under his leadership, Navteq grew to more than an 80 percent market share in Europe and the U.S.

ArrayComm leads the global wireless voice and data communications industry in Long-Term Evolution physical layer software and system integration/testing services for manufacturers of base stations and client devices.

RoadDB offers a full in-vehicle software solution for road database and localization to be used in automated driving in series production vehicles.

Mr. Shields has been involved in communications standards bodies for nearly 40 years. He was a founder of the organization that became the Cellular Telecommunications and Internet Association and served as the President of the Automotive Multimedia Interface Collaboration. He served two terms as Chair of the Committee on Communications of the Transportation Research Board (National Research Council). Mr. Shields was Convenor of the international working group developing standards for vehicle-vehicle and vehicle-infrastructure communications (ISO/TC204/WG16). He is now Chair of the Collaboration on ITS Communication Standards of the ITU, the UN specialized agency for information and communications technology, as well as ITU representative to the United Nations Economic Commission for Europe World Forum for Harmonization of Vehicle Regulations (WP.29).

Mr. Shields was also a founding officer and director of the Intelligent Transportation Society of America (ITS America). He was a founder of the ITS World Congress and is a member of its board of directors. Mr. Shields served on or chaired multiple committees of the Society of Automotive Engineers (SAE). He received the 1998 SAE Delco Electronics Intelligent Transportation Systems Award for distinguished service to the ITS industry, and was named an SAE Fellow in 2007. Mr. Shields was inducted into the inaugural class of ITS America's ITS Hall of Fame in 2008, and was named the inaugural U.S. member of the ITS World Congress Hall of Fame in 2010. In 2019, he was named an inaugural member of the International Federation of Automotive Engineering Societies (FISITA) Academy of Technical Leadership.

Mr. Shields holds a BA in mathematics from Wichita State University and two degrees (an MA in history and an MBA) from the University of Chicago. In 2008, the University of Chicago Booth School of Business awarded Mr. Shields the Distinguished Alumni Award in the category of Entrepreneurship. In 2013, the Hotchkiss School awarded Mr. Shields its Alumni Award.



Mr. Gary W. Thompson

Chief, North Carolina Geodetic Survey

Mr. Thompson has worked for the North Carolina Geodetic Survey (NCGS), which is the agency responsible for developing and maintaining North Carolina's official survey base, since 1977. As Chief since 1994, he has been continually modernizing the agency to keep up with advances and spatial data needs in the engineering, surveying, mapping, and scientific fields. In 1994 NCGS installed three (3) Continuously Operating Reference Stations (CORS). From the three original CORS the North Carolina CORS network has grown to eight-four (84) CORS. In 2004 NCGS started the operation of a statewide Real Time Network that supports multiple professions and industries in North Carolina. In addition to serving as Chief of NCGS he also serves as the Deputy Risk Management Chief (NC Emergency Management). He put the agency's modernized technologies, expertise, and quality control to the test while on the research team that conducted Light Detection and Ranging (LiDAR) aerial mapping research projects with NASA. He incorporated the results of those projects into practice while on the program management team that completed the engineering and surveying project that produced a statewide set of Digital Flood Insurance Rate Maps (DFIRMs) for North Carolina. He served on the program management team that collected statewide elevation data utilizing LiDAR in 2001-2005 and 2014-2017 and the team that is collecting statewide aerial imagery in five phases in 2019-2023.

Mr. Thompson's Global Navigation Satellite System (GNSS) activities include:

- Responsible for the planning, observing, processing and submittal of 500+ Global Positioning System (GPS) geodetic projects to the National Geodetic Survey for the inclusion into the National Spatial Reference System (NSRS).
- Continuing education workshop presenter (50+ workshops since 1994) on GPS related topics
- Team lead for the update of North Carolina Board of Examiners for Engineers and Surveyors board rules (21NCAC 56.1608) related to GPS.
- Team lead for the development of the North Carolina Guidelines for GNSS Data Collection (Statewide Global Navigation Satellite System Data Collection and Documentation Standards)
- North Carolina Geodetic Coordinator for the National Geodetic Survey

Mr. Thompson holds a Bachelor in Engineering Technology from the University of North Carolina at Charlotte, and is a Professional Land Surveyor (PLS) in North Carolina.

Advisory Board Members & Subject Matter Experts



Dr. Todd Walter

Director, Wide-Area Differential GNSS Lab, Stanford University

Dr. Todd Walter is a research professor in the department of aeronautics and astronautics at Stanford University, where he has been a member since 1993. His research focuses on implementing high-integrity air navigation systems. He is one of the principal architects of the Federal Aviation Administration's (FAA) Wide Area Augmentation System (WAAS) safety processing algorithms, including development of the ionospheric estimation and confidence bounding algorithm, as well as the WAAS integrity monitors. He has performed a similar role on the equivalent systems deployed in Japan and India. He also advises the FAA on alternate means to exploit satellite navigation signals to provide safety-of-life services more efficiently. He has authored 51 journal papers and 236 conference papers.

Dr. Walter is an active member of the Institute of Navigation (ION), having served in numerous positions including president of the institute and associate editor of the ION journal, *Navigation*. He is a Fellow of the ION. Additional honors include the Early Achievement Award (2000), Thurlow Award (2008) and Johannes Kepler Award (2010) from the ION. He holds a bachelor's degree from Rensselaer Polytechnic Institute and master's and Ph.D. degrees from Stanford University.



The Honorable Gregory D. Winfree

Agency Director, Texas A&M Transportation Institute

Mr. Winfree was appointed Agency Director of the Texas A&M Transportation Institute (TTI) on December 15, 2016. TTI is a state agency and the largest and most comprehensive higher education-affiliated transportation research institute in the U.S. He is also an Adjunct Professor at the Texas A&M University School of Law. In 2019, he was appointed to the Texas Connected and Automated Vehicle Task Force established by Texas Governor Greg Abbott.

Mr. Winfree joined the U.S. Department of Transportation's Office of the Assistant Secretary for Research and Technology in March 2010 as Chief Counsel and was later sworn in as the Assistant Secretary in January 2014. During his tenure, he also served as Deputy Administrator and Administrator of a predecessor agency, the Research and Innovative Technology Administration.

As Assistant Secretary, he was the senior executive responsible for a \$450 million budget and oversaw more than 1,000 scientific, data analysis, and administrative staff members who support U.S. Department of Transportation's (USDOT) multi-modal transportation initiatives. The program offices under his purview included: the John A. Volpe National Transportation Systems Center; the Research, Development and Technology Coordination Office; the Bureau of Transportation Statistics; the Positioning, Navigation, Timing and Spectrum Management Office; the Intelligent Transportation Systems Joint Program Office; and the Transportation Safety Institute.

Prior to his USDOT appointments, Mr. Winfree served as Corporate Counsel for several Fortune 500 corporations for 17 years that operated in a number of technical industries, including:

- Natural resources and metals (Freeport-McMoran Copper & Gold, Phoenix, AZ);
- Pharmaceuticals (Wyeth Pharmaceuticals, Collegeville, PA); and
- Chemicals and polymers (Union Carbide Corporation, Danbury CT).

Education

- J.D., Georgetown University, Washington, D.C., 1989
- Sc.B., St. John's University, Jamaica, NY, 1986

Advisory Board Designated Federal Officers



Mr. James Joseph Miller

Executive Director, PNT Advisory Board, NASA

James J. Miller is Deputy Director of the Policy & Strategic Communications Division with the Space Communications and Navigation (SCaN) Program at NASA. He is responsible for advising NASA leadership on U.S. and international PNT/GNSS policy and technology issues, and heads the NASA Delegation to the International Committee on GNSS (ICG). James is appointed by the NASA Administrator as the Executive Director of the National Space-based PNT Advisory Board, and is a recipient of multiple NASA Honor Awards, as well as being the 2019 recipient of the prestigious Norman P. Hays award granted by the Institute of Navigation (ION).

Mr. Miller also serves as the Executive Secretary of the National Space Council (NSpC) Users' Advisory Group (UAG), reporting to the Office of the Vice President (OVP). Prior to his NASA assignment, James served as the Deputy Director of the Office of Navigation and Spectrum Policy at the U.S. Department of Transportation, where he received the 2004 Bronze Award from the Under Secretary of Transportation for his work on the President's Spectrum Policy Initiative for the 21st Century.

Preceding his government service, Mr. Miller was a Program Manager for the Flight Standards & Technology Department at United Airlines, where he assisted in determining airline industry policy on emerging communications, navigation, surveillance (CNS) technologies and applications. He was a founding member of the International Air Transport Association (IATA) Spectrum Protection Steering Group, elected as Vice-Chairman of the ARINC Aeronautical Frequency Committee (AFC), and a key flight operations representative on the Air Transport Association (ATA) Flight Systems Integration Committee. In this role, he led airline industry efforts at two World Radiocommunication Conferences (WRCs), eventually serving as the IATA spokesperson to the US Ambassador. In 2000, industry and government leaders recognized James for accomplishments on behalf of the airline industry, including the CEO of United Airlines, the President and CEO of ATA, and US Vice-President Al Gore.

Prior to working in the corporate sector, James was an academic researcher at Curtin University of Technology (CUT) in Perth, Western Australia in 1989, and returned "Down Under" in 1995 to conduct his thesis research in Brisbane at the Queensland University of Technology (QUT), Space Center for Satellite Navigation. Mr. Miller is a commercial airplane pilot with degrees in Aviation Flight, Aviation Management, Master of Public Administration (MPA) degree from Southern Illinois University, and a Master of International Policy and Practice (MIPP) from The George Washington University. More recently, James was selected by the NASA leadership team to serve as a Senior Executive Fellow (SEF) at the Harvard Kennedy School, completing the world-renown program in April, 2023.

Advisory Board Designated Federal Officers



Ms. Barbara Adde

Deputy Executive Director, PNT Advisory Board, NASA

Director of Policy and Strategic Communications, SCA
NASA Headquarters

Barbara Adde serves as a GS-15 civil servant, in the role of Policy & Strategic Communications (PSC) Director for Space Communications and Navigation (SCaN), within the Human Exploration and Operations Mission Directorate at NASA Headquarters. In this role since 2008, Ms. Adde is responsible for SCaN's outreach to SCaN's key stakeholders, including its customers, the general public, academia, and communities connected to the SCaN Program, such as the tracking stations for SCaN's networks – the Deep Space Network and the Near Space Network. Her outreach program includes a wide variety of activities, including the SCaN public website, social media, exhibits, traveling exhibits, and the SCaN Intern Project. She also serves as the Executive Secretariat for the Interoperability Plenary and the Interagency Operations Advisory Group, consisting of 15 international space agencies. In 2020, Ms. Adde was named as Designated Federal Official to the Education & Outreach Subcommittee of the National Space Council's Users' Advisory Group. As PSC Director, she works closely with NASA's national and international policy for Positioning, Navigation and Timing, the services of the Global Positioning System (GPS), which is managed by the PSC Deputy Director, James Miller.

Ms. Adde began her career at NASA in 1997 as a political appointee in the Office of Legislative Affairs, providing legislative support to the Space Operations Mission Directorate, which included NASA's human spaceflight programs, the Space Shuttle and International Space Station, and spectrum management, as well as the Office of International and Interagency Relations. Converting to civil service in 2001, she served as Legislative Specialist and Outreach Specialist in the Space Operations Mission Directorate until 2008.

Prior to NASA, Ms. Adde served as Confidential Assistant to the Associate Director for Technology in the White House Office of Science and Technology Policy, as a political appointee, from 1993-1997.

Ms. Adde graduated from the University of Delaware in 1981 with a Bachelor of Arts in Communication. She was appointed to the Space Generation Advisory Council's Honorary Board in August 2010.

Advisory Board Designated Federal Officers



Dr. Benjamin Ashman

**Aerospace Engineer
Navigation and Mission Design, NASA's Goddard
Space Flight Center**

Benjamin Ashman is an aerospace engineer in the Navigation and Mission Design Branch at NASA's Goddard Space Flight Center in Greenbelt, Maryland. His research is focused on space applications of Global Navigation Satellite Systems (GNSS). Dr. Ashman has supported numerous space communication and navigation efforts within the agency, including TDRS-M, OSIRIS-REx, and the Lunar GNSS Receiver Experiment (LuGRE). He was the 2021-2022 Institute of Navigation congressional fellow and spent the year in the office of Senator Sherrod Brown. Dr. Ashman is from Dayton, Ohio and received his Ph.D. in Electrical Engineering from Purdue University in 2016 and his B.S. in Electrical Engineering from Ohio University in 2010.



Ms. Misty Finical

**Deputy Principal Advisor, Enterprise Protection
NASA Headquarters**

Ms. Misty Finical is currently serving as the Deputy Principal Advisor for Enterprise Protection for NASA providing advice and recommendations regarding the protection of the NASA enterprise. Specifically, and especially, for cross-Agency and complex threats to flight systems, ground systems, and infrastructure. Currently she is leading a team to create space and ground controls to address potential mission security vulnerabilities across current and future NASA architectures and missions.

Ms. Finical began her Federal Government career as a Space Weather Forecaster for the Department of Commerce with a focus on solar flare phenomenology. During Ms. Finical's spare time she pursued impacts to spacecraft systems research. This focus on space weather's operational impact led Ms. Finical to join the Air Force Research Laboratory (AFRL). There, she led the charge for modeling the community could use to better predict solar and geomagnetic impacts into the forecaster's hands. Her drive for the operational community and knowledge of spacecraft hardware eventually led Ms. Finical to become the Deputy Program Manager for Advanced GPS Technologies, thereby leading the development of several technologies vital for the future security of the Global Positioning System (GPS)/Positioning, Navigation, and Timing (PNT) architecture and signals. GPS and PNT expertise took her to Air Force Headquarters as the GPS Integration Planning Engineer for the SAF/AQS (now, SAF/SQS) Global Space Power Projection Division. There, Ms. Finical was responsible for international spectrum as well as system planning and integration into the current GPS system and future space and ground based PNT architectures.

Ms. Finical holds a Bachelors in Earth Science with a focus in Astronomy and Geophysics from the University of Northern Colorado. Ms. Finical also holds a Masters in Aeronautical Science from Embry Riddle Aeronautical University with a focus on spacecraft hardware impacts due to solar cycle variability. Additionally, she holds Defense Acquisition University Certifications in Systems Engineering (Level III), Science and Technology Management (Level III), and Program Management (Level I).

Ms. Finical has been awarded the Air Force Meritorious Civilian Service Award, Director's Cup Junior Force Award, Dr. Harold Gardiner Director's Cup Team Award, multiple exceptional service awards, and the Isaac M. Cline Award for Service Excellence.

Advisory Board Designated Federal Officers



Mr. Cody Kelly

National Affairs Mission Manager
Search and Rescue Mission Office, NASA's Goddard Space Flight Center

Cody Kelly currently serves as the National Affairs Mission Manager within NASA's Search and Rescue Mission Office at the Goddard Spaceflight Center. His role includes the coordination and leadership of NASA's work in research and development of search and rescue technologies for use by those in distress anywhere in the world. He is the current lead for all Human Spaceflight SAR activities and supports ongoing missions with dedicated search and rescue data for locating crew capsules and astronauts following landing. For future exploration missions, Cody is leading the development of Lunar Search and Rescue (LunaSAR) requirements and systems for human exploration of the lunar south pole and sustained lunar surface presence. Cody is NASA's representative to the US Government's National Search and Rescue Committee, helping shape post-disaster response policy and coordination of SAR capabilities to save lives.

Cody was honored by Popular Mechanics Magazine as one of 2017's Breakthrough Award winners for his work in the civilian and military satellite-aided search and rescue community, as well as NASA's prestigious Early Career Achievement Medal for enabling joint NASA and military rescue operations. Cody was awarded NASA's Silver Snoopy Award in 2020 for his work on astronaut rescue equipment and testing.

Cody graduated from Texas A&M in 2012 with a Bachelor's of Science in Aerospace Engineering and Certificate in Advanced International Affairs.

Outside of NASA, Cody is a Lieutenant in the League City Fire Department specializing in hazardous materials response, as well as serving as a Planning Team support member on the Texas A&M Task Force One, combining professional passions in search and rescue with opportunities to help others.



Mr. Joel Parker

Position, Navigation, and Timing Lead
NASA's Goddard Space Flight Center

Joel J. K. Parker is the PNT Policy Lead at NASA Goddard Space Flight Center where he is involved in national and international projects related to GNSS and space-based PNT services. He co-chairs the Space Use Subgroup of the International Committee on GNSS and is the PI for the Lunar GNSS Receiver Experiment (LuGRE) payload on the Firefly Blue Ghost Mission 1, landing on the lunar surface in 2024.

Advisory Board Recommendations to
PNT EXCOM



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.

Charter of the National Space-Based Positioning, Navigation, and Timing Advisory Board



1. Official Designation: National Space-Based Positioning, Navigation, and Timing Advisory Board (“PNT Advisory Board”).

2. Authority: The National Space-Based Positioning, Navigation, and Timing Advisory Board was established pursuant to the National Security Presidential Directive-39 (NSPD-39) of December 15, 2004, and most recently continued by Executive Order 14048 of 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 of December 15, 2004. The PNT Advisory Board operates in accordance with the provisions of the Federal Advisory Committee Act (FACA), 5 U.S. Code 10.

3. Objectives and Scope of Activities: SPD-7 establishes implementation actions and guidance for United States (U.S.) space-based positioning, navigation, and timing (PNT) programs and activities for U.S. national and homeland security, civil, commercial, and scientific purposes. This policy complements the guidance set forth in Executive Order 13905 of February 12, 2020 (Strengthening National Resilience through Responsible Use of Positioning, Navigation, and Timing Services), and the inter sector guidance for Global Navigation Satellite Systems (GNSS) included in the December 9, 2020, National Space Policy. SPD-7 reaffirms the role of the National Space-Based Positioning, Navigation, and Timing Executive Committee (“PNT EXCOM”) as the interagency body responsible for guiding and preserving whole-of-Government interests in the provision of space-based PNT services, augmentations, and space-based alternatives. SPD-7 also directs the PNT EXCOM to maintain and receive advice from the National Space-Based Positioning, Navigation, and Timing Advisory Board (“PNT Advisory Board”), established by NSPD-39 and continued by the Executive Order 14048, “Continuance or Reestablishment of Certain Federal Advisory Committees and Amendments to Other Executive Orders.” The National Aeronautics and Space Administration (NASA), in close coordination with the PNT EXCOM, will task the PNT Advisory Board and define the full scope of activities and schedules required to accomplish such tasks based on emerging national and international PNT developments. The PNT Advisory Board will operate solely in an advisory capacity as directed by the U.S. PNT Policy and in accordance with FACA, 5 U.S. Code 10.

4. Description of Duties: The PNT Advisory Board shall be composed of experts from outside the U.S. Government and shall be chartered as a Federal Advisory Committee. The Advisory Board shall seek input from state and local governments, industry, and academia on developments in the application of space-based PNT technologies and advise the PNT EXCOM Committee on policy and service impacts. At the request of the EXCOM, NASA sponsors the PNT Advisory Board as part of NASA’s contribution towards PNT Policy implementation. The PNT Advisory Board will provide advice, as requested by the PNT EXCOM and through NASA, on U.S. PNT Policy, planning, program management, and funding profiles in relation to the current state of national and international space-based PNT services. This advice will consist of assessments and recommendations to facilitate the accomplishment of the goals and objectives of the U.S. PNT Policy on behalf of the PNT EXCOM. The PNT Advisory Board will evaluate national and international needs for changes in space-based PNT capabilities, assess possible trade-offs among options, and provide independent advice and recommendations to the PNT EXCOM on requirements and program needs. The U.S. reserves the right to hold “U.S. members-only” meetings of the PNT Advisory Board, as required, in full compliance with the FACA and related U.S. statutes and regulations.

5. Official to Whom the Committee Reports: The PNT Advisory Board will report findings, recommendations, and tasking progress to the PNT EXCOM, of which NASA is a member.

6. Support: The NASA Space Operations Mission Directorate shall provide staff support and operating funds for the PNT Advisory Board and is responsible for fulfilling the reporting requirements of section 7(b) of FACA.

7. Estimated Annual Operating Costs and Staff Years: The estimated annual operating costs are \$150,000, which includes the approximate costs for meeting logistics, travel, report generation, subordinate meetings, and NASA staff support. NASA staff support is expected to require 0.3 work years of effort.

8. Designated Federal Officer: The Executive Director of the PNT Advisory Board shall be appointed by the NASA Administrator and will serve as the Designated Federal Officer (DFO). The DFO will be a full-time employee, who will: call, attend, and adjourn committee and subcommittee meetings; approve agendas; maintain required records on costs and membership; ensure efficient operations; maintain records for availability to the public; and provide copies of committee reports to the NASA Committee Management Officer for forwarding to the Library of Congress. The DFO will also coordinate with the PNT Advisory Board members and NASA’s Office of General Counsel (OGC) to ensure that all legal/ethical requirements are met. With regard to Special Government Employees (SGEs), these requirements include, though are not limited to, timely filing of financial disclosure reports and ethics training by a representative of NASA’s OGC and seeking advice from the NASA OGC Ethics Team for any questions concerning Government ethics requirements that may arise.

9. Estimated Number and Frequency of Meetings: The PNT Advisory Board will meet approximately one to two times each fiscal year. Meetings will be open to the public unless it is determined that the meeting, or a portion of the meeting, will be closed in accordance with the Government in the Sunshine Act, 5 U.S. Code 552b(c).

Charter of the National Space-Based Positioning, Navigation, and Timing Advisory Board



10. Duration: The duration of the PNT Advisory Board is continuing, subject to the Termination section below.

11. Termination: The PNT Advisory Board shall terminate on September 30, 2023, unless continued by the President.

12. Membership and Designation:

1. The PNT Advisory Board shall consist of not more than 30 members from critical industry sectors, academia, international organizations, or space-based PNT user application areas. Members will serve as SGEs or Representatives.

2. The PNT Advisory Board will consist of constituent experts from outside of the U.S. Government nominated by the PNT EXCOM Federal agencies approved by the PNT EXCOM Co-Chairs and appointed by the NASA Administrator.

3. PNT Advisory Board members shall be appointed so as to ensure a balanced representation in terms of the points of view represented and the functions to be performed. Diversity and sector representation will be considered as well.

4. PNT Advisory Board members will be appointed for a two-year term, renewable at the discretion of the NASA Administrator.

5. PNT Advisory Board members will not be compensated for their services, but will be reimbursed for travel and per diem expenses as allowed by 5 U.S.C. 5701 et seq. and the FACA as amended.

6. The PNT EXCOM may maintain a list of approved PNT Advisory Board nominees to fill vacancies and to enable rotation of new members onto the PNT Advisory Board at the discretion of the PNT EXCOM Co-Chairs and NASA Administrator.

7. Any PNT Advisory Board member rotations shall not exceed six members in any one year period to ensure a core institutional membership is maintained so as to ensure ongoing PNT Advisory Board work is not adversely affected.

8. The NASA Administrator, in consultation with the PNT EXCOM Co-Chairs, will designate the PNT Advisory Board Chair and Vice-Chair.

13. Subcommittees, and Task Forces: As authorized by the DFO, the PNT Advisory Board work may be organized and supported by subcommittees, and/or task forces, to ensure taskings are appropriately completed in a timely manner in consultation with the PNT Board Chair or Vice Chair. Subcommittees must report back to the parent committee and must not provide advice or work products directly to the Agency. In addition, NASA may authorize consultants with special expertise to support such subordinate groups on an ad hoc basis. Such subcommittees, and/or task forces, will be comprised of appointed PNT Advisory Board members and will report their findings and recommendations to the PNT Advisory Board Chair or Vice-Chair. Information classified for national security reasons may be provided to appropriately cleared members of the PNT Advisory Board to support the mission of the PNT EXCOM.

14. Recordkeeping: The records of the PNT Advisory Board, its subcommittees, and/or task forces, shall be handled in accordance with the General Record Schedule 6.2, or other approved Agency records disposition schedule. These records shall be available for public inspection and copying, subject to the Freedom of Information Act, 5 U.S.C. 552.

15. Filing Date: Since the PNT Advisory Board is a Presidential authority advisory committee, this Charter shall be effective on the date of its filing with the Committee Management Secretariat of the U.S. General Services Administration and the U.S. Congressional committees of jurisdiction.

Bill Nelson
Administrator
National Aeronautics and Space Administration

04/25/2023
Signature Date

Space Policy Directive 7 (SPD-7) for Space-Based PNT



Sec. 5. Management of Space-Based PNT Services.

(d) The Executive Committee shall make recommendations on sustainment, modernization, and policy matters regarding United States space-based PNT services to its member agencies, and to the President, through the Assistant to the President for National Security Affairs, or the Executive Secretary of the National Space Council, as appropriate. In addition, the Executive Committee will advise and coordinate with and among the agencies responsible for the strategic decisions regarding policies to maintain and improve United States leadership in the provision of space-based PNT infrastructures and services, including GPS, its augmentations and United States Government owned and operated space-based PNT systems and applications, security for these services, and their relationships with foreign space-based PNT services. Specifically, the Executive Committee shall:

(vii) Maintain and receive advice from the National Space-Based Positioning, Navigation, and Timing Advisory Board (Advisory Board). The Advisory Board shall be composed of experts from outside the United States Government, and shall be chartered as a Federal Advisory Committee. The Advisory Board shall seek input from state and local governments, industry, and academia on developments in the application of space-based PNT technologies and advise the Executive Committee on policy and service impacts

Sec. 7. Agency Roles and Responsibilities, Agencies shall allocate the resources required to fulfill the objectives of this policy, subject to the availability of funds appropriated for that purpose.

Highlights:

Dep. of State: Promote the use of GPS and its augmentation services and standards with foreign governments and other international organizations, and encourage the development of foreign civil PNT services and systems based on GPS.

Dept. of Defense: Development, acquisition, operation, security, and continued modernization of GPS, while facilitating appropriate civil and homeland security representation and participation in these activities and any decisions that affect civil and homeland security equities.

Dept. of Commerce: Promote United States industry access to foreign markets for space-based PNT goods and services while adopting a risk management approach to United States national security concerns.

Dept. of Transportation: Development of requirements for civil applications from all United States Government civil agencies.

Dept of Homeland Security: Identify space-based PNT requirements for homeland security purposes to the Secretary of Transportation.

NASA: Develop technical requirements for the use of GPS and its augmentations to support civil and commercial space systems; develop requirements for GPS support of space operations and science in the Space Service Volume and beyond into Cislunar space; and sustain and modernize search and rescue and distress alert and location capabilities.

Advisory Board Support




Thanks to the following individuals for their ongoing expert support of the PNT Advisory Board activities:

Ms. Sarah Coates
Ms. Nicole Desrochers
Dr. A.J. Oria

Ms. Sarah Salem
Ms. Julie Wang
Ms. Lesha Zvosec

Website




National Space-Based Positioning, Navigation, and Timing Advisory Board

The National Space-Based Positioning, Navigation, and Timing (PNT) Advisory Board provides independent advice to the U.S. government on GPS-related policy, planning, program management, and funding profiles in relation to the current state of national and international satellite navigation services.

Membership

The Advisory Board consists of GPS experts from outside the U.S. government.



Currently, there are 27 members representing U.S. industry, academia, and international organizations.
[VIEW MEMBERSHIP](#) ➔

The Chairman of the Advisory Board is Admiral Thad W. Allen, USCG, Ret.

Next Meeting:
Dec 6-7, 2023

Houston, Texas

[View Federal Register announcement](#)

Last Meeting:
May 3-4, 2023

Crowne Plaza Annapolis
Annapolis, Maryland

[VIEW AGENDA & LIVESTREAM LINKS](#) ➔
[VIEW MINUTES \(PDF\)](#) ➔

Meetings

The Advisory Board meets twice a year. Meetings are open to the public.
[VIEW PREVIOUS MEETING INFORMATION](#) ➔

Establishment & Sponsorship

The Advisory Board is one of three national

<https://www.gps.gov/governance/advisory/>