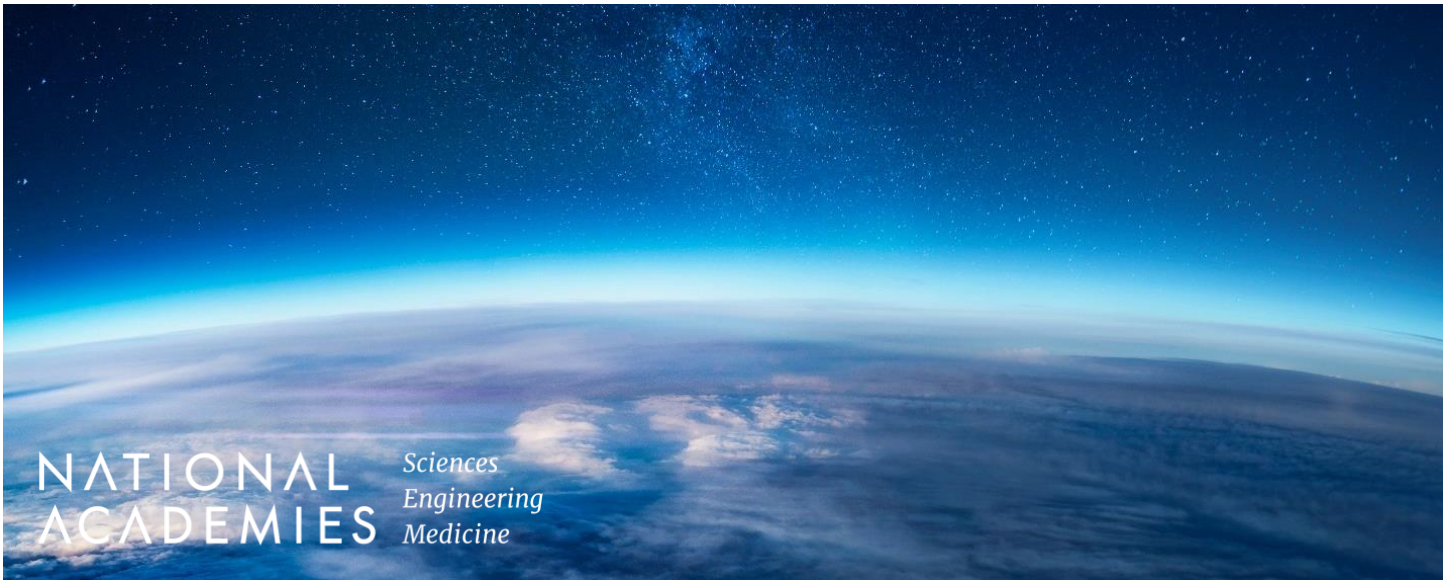

Workshop Session on Transformative S&T for the Department of Defense: Operationalizing very Low Earth Orbit

NAS Lecture Room, 2101 Constitution Ave. NW, Washington, DC
AUGUST 20, 2025

Purpose

The National Academies' Standing Committee on Transformative Science and Technology for the Department of Defense, sponsored by OUSD(R&E), is organizing a series of workshop sessions each of which explores potentially transformative science and technology topics of relevance to the Department of Defense.

This workshop session will bring together experts and stakeholders to share knowledge, discuss challenges, identify solutions, and chart a path forward for the innovative utilization of very Low Earth Orbit. This discussion includes developing common understanding of the benefits, risks, and opportunities presented by vLEO.

Participants will explore the unique environmental conditions of vLEO and the implications for mission design, highlighting opportunities for enhanced Earth observation, telecommunications, and emerging applications. The session will also examine key technical challenges, such as propulsion, aerodynamics, materials, systems design, situational awareness, ground infrastructure, and modeling, and identify areas where cross-sector collaboration between academia, industry, and the Department of Defense can drive innovation and enable sustained, effective operations in this dynamic orbital environment.

Workshop Session on Transformative S&T for the Department of Defense: Operationalizing very Low Earth Orbit

About the Workshop

This public, on-the-record workshop session is part of an ongoing series highlighting emerging trends in science and technology that could transform how the Department of Defense approaches research and engineering, and is aimed at a non-expert audience. An online proceedings-in-brief will feature video highlights and summarize insights from the discussions.

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AGENDA

WEDNESDAY, AUGUST 20, 2025

OPEN SESSION

8:30 AM	BREAKFAST
8:50 AM	**Workshop Introduction** • Ivett Leyva and Bobby Braun, *workshop organizers*
9:00 AM	**Define and Explore the Potential of vLEO** (15 minute presentations followed by panel discussion) • Seth Lacy, Senior Scientist for Space Mobility and Precision Maneuver, Air Force Research Lab • Michael McDonald, Aerospace Engineer, Naval Research Laboratory • Spence Wise, Senior Vice President for Space Missions, Redwire Space
10:15 AM	BREAK
10:30 AM	**Technical Challenges and Opportunities for Advancement** (15 minute remarks followed by panel discussion) • Felipe Guzman, Jack Lee Jewell Endowed Chair in Optical Sciences, Professor of Optical Sciences and Physics, University of Arizona • Iain Boyd, Director of the Center for National Security Initiatives; H.T. Sears Memorial Professor of Aerospace Engineering Sciences, University of Colorado Boulder • Mitchell Walker, William R.T. Oakes Jr. School Chair, Daniel Guggenheim School of Aerospace Engineering, Professor of Aerospace Engineering, Georgia Institute of Technology • Michael Keidar, A. James Clark Professor of Engineering, George Washington University
12:10 PM	**Wrap-up Discussion**
12:30 PM	LUNCH

SPEAKER BIOGRAPHIES

Iain Boyd is the H.T. Sears Memorial Professor of Aerospace Engineering Sciences and the Director of the Center for National Security Initiatives at the University of Colorado. He is an author of over 600 technical publications and has given over 500 technical presentations on a variety of topics dealing with aerospace engineering and defense sciences. His research involves computational modeling of complex gas and plasma systems with applications that include hypersonics and space propulsion. Dr. Boyd is the Director of a NASA-funded Space Technology Research Institute focused on hypersonic entry systems. He is a Fellow of the American Institute of Aeronautics and Astronautics (AIAA) and a Fellow of the American Physical Society (APS). He served with the U.S. Air Force Scientific Advisory Board (SAB) and received the Chief of Staff of the Air Force Award for Exceptional Public Service.

Felipe Guzmán is the Jack Lee Jewel Endowed Chair in Optical Sciences and Professor of Optical Sciences and Physics at the University of Arizona. His research focuses on the development of novel optomechanical inertial sensors, precision laser interferometry, and optical technologies for ground and space applications in gravitational-wave astrophysics, geosciences, navigation, and precision metrology. He is the Director and Principal Investigator for the Laboratory of Space Systems and Optomechanics (LASSO), which focuses on designing and developing inertial sensors with application in distinct fields such as gravitational-wave astronomy and space geodesy. Upon receiving his Ph.D. in Physics from the Max Planck Institute for Gravitational Physics in Hannover, Germany, he was awarded a NASA Postdoctoral Program (NPP) fellowship at NASA Goddard Space Flight Center with the Gravitational Astrophysics Laboratory. Later, he became a Senior Research Associate at the Joint Quantum Institute (NIST and University of Maryland) and Research Group Leader at the German Space Agency (DLR) in collaboration with the University of Bremen

Michael Keidar is A. James Clark Professor of Engineering. His research concerns advanced spacecraft propulsion, plasma-based nanotechnology, and plasma medicine. He has authored over 200 journal articles and author of textbook “Plasma Engineering: from Aerospace and Nano and Bio technology” (Elsevier, March 2013). In 2016, he was elected AIAA National Capital Section Engineer of the Year and in 2017 he received AIAA Engineer of the Year award for his work on micropropulsion which resulted in the successful launch of a nanosatellite with thrusters developed by his laboratory. He is one of pioneers of plasma medicine. His research led to development of the cold plasma scalpel, which is used to treat cancer. Many of his papers have been featured on the cover of high impact journals and his research has been covered by various media outlets. Prof Keidar serves as an AIP Advances academic editor, Associate Editor of IEEE Transactions in Radiation and Plasma Medical Sciences and member of editorial board of a half-dozen of journals. He is Fellow of APS and Associate Fellow of AIAA.

Seth Lacy, a member of the U.S. Air Force's cadre of scientific and technical senior executives, is the Senior Scientist for Space Mobility and Precision Maneuver, Air Force Research Laboratory, Air Force Material Command, Kirtland Air Force Base, New Mexico. He serves as the Department's principal scientific authority and independent researcher for the development of new technologies in support of space mobility and precision maneuver. Dr. Lacy joined the AFRL, Space Vehicles Directorate in 2002. He has led teams to develop technologies in control theory, estimation, uncertainty management, large optical apertures, laser communications, rendezvous and proximity operations, communications and space sensing as well as championing rapid development and test of space technologies.

Michael McDonald is an aerospace engineer in the Spacecraft Engineering Division at the U.S. Naval Research Laboratory, where he has worked since 2012. At the Naval Research Laboratory he founded the Space Technology and Applications Research Lab (STARLab).He earned his Ph.D. in Applied Physics from the University of Michigan in 2011 and specializes in spacecraft propulsion, with a focus on plasma physics and electric propulsion systems such as Hall thrusters, hollow cathodes, and electron emission. His research has advanced understanding of thruster behavior and diagnostics, including rotating spoke instabilities and emissive probe techniques, and he has published extensively in these areas. Widely cited and recognized in his field, Dr. McDonald continues to contribute to the development of advanced propulsion technologies critical to future naval and space missions.

Mitchell Walker directs the High-Power Electric Propulsion Laboratory, and his primary research interests include experimental and theoretical studies of advanced plasma propulsion concepts for spacecraft. He received his Ph.D. in Aerospace Engineering from the University of Michigan. Dr. Walker has authored more than 160 journal articles and conference papers in the fields of electric propulsion and plasma physics. As a Fellow of the American Institute of Aeronautics and Astronautics (AIAA), Dr. Walker serves as an Associate Editor of the AIAA Journal of Spacecraft and Rockets, and on the Editorial Board of Frontiers in Physics and Astronomy and Space Sciences – Plasma Physics. He is a member of the Department of Energy Fusion Energy Sciences Advisory Committee and a member of the NASA Advisory Council – Technology, Innovation, and Engineering Committee.

Spence Wise is the Senior Vice President of Platforms and Missions at Redwire. In this role, he is responsible for Very Low Earth Orbit (VLEO) missions, modeling and simulation services, and lunar Infrastructure as part of the Space Missions business segment at Redwire. He transitioned to this role in 2024 after serving three years as a Vice President of National Security Space Business development. Prior to joining Redwire, Mr. Wise spent 13 years at L3Harris in a variety of leadership roles supporting Department of Defense missions.

TRANSFORMATIVE S&T STANDING COMMITTEE

The Standing Committee on Transformative Science and Technology for the Department of Defense (DoD) will organize a seminar series, designed for a non-expert audience, on emerging trends in science and technology (S&T) that could transform the Department's approach to research and engineering (R&E). The seminar series will aim to (1) foster scientific awareness within the DoD leadership of emerging trends in S&T; (2) generate robust discussion on the applications of these most recent scientific discoveries; and (3) explore opportunities to transform and disrupt traditional R&E strategies and adopt innovative solutions that enable the United States to maintain a scientific and military advantage.

Members

Richard M. Murray, NAE
Chair
Thomas E. and Doris Everhart Professor, Control and Dynamical Systems and Bioengineering
Caltech

Darlene Solomon, NAE
Vice Chair
Former CTO and Senior Vice President
Agilent Technologies

Samuel Achilefu, NAM
Inagural Chair and Professor, Biomedical Engineering
University of Texas Southwestern

Cecilia Bitz
Professor, Atmospheric Sciences
University of Washington

Nadya T. Bliss
Executive Director, Global Security Initiative
Arizona State University

Robert Braun, NAE
Head, Space Exploration Sector
Johns Hopkins Applied Physics Laboratory

William J. Dally, NAE
Chief Scientist
NVIDIA

Deepakraj M Divan, NAE
John E. Pippin Chair Professor, Georgia Research Alliance Eminent Scholar
Georgia Institute of Technology

Markita P. Landry
Assistant Professor, Chemical and Biomolecular Engineering
University of California, Berkeley

Robert H. Latiff
Private Consultant

Ivett A. Leyva
Department Head and Arthur McFarland Professor, Aerospace Engineering
Texas A&M University

Laura A. McNamara
Research and Development Manager
Sandia National Laboratory

Jill C. Pipher
Vice President for Research and Elisha Benjamin Andrews Professor, Mathematics
Brown University

Amina A. Qutub
Burzik Professor, Engineering Design
University of Texas at San Antonio

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