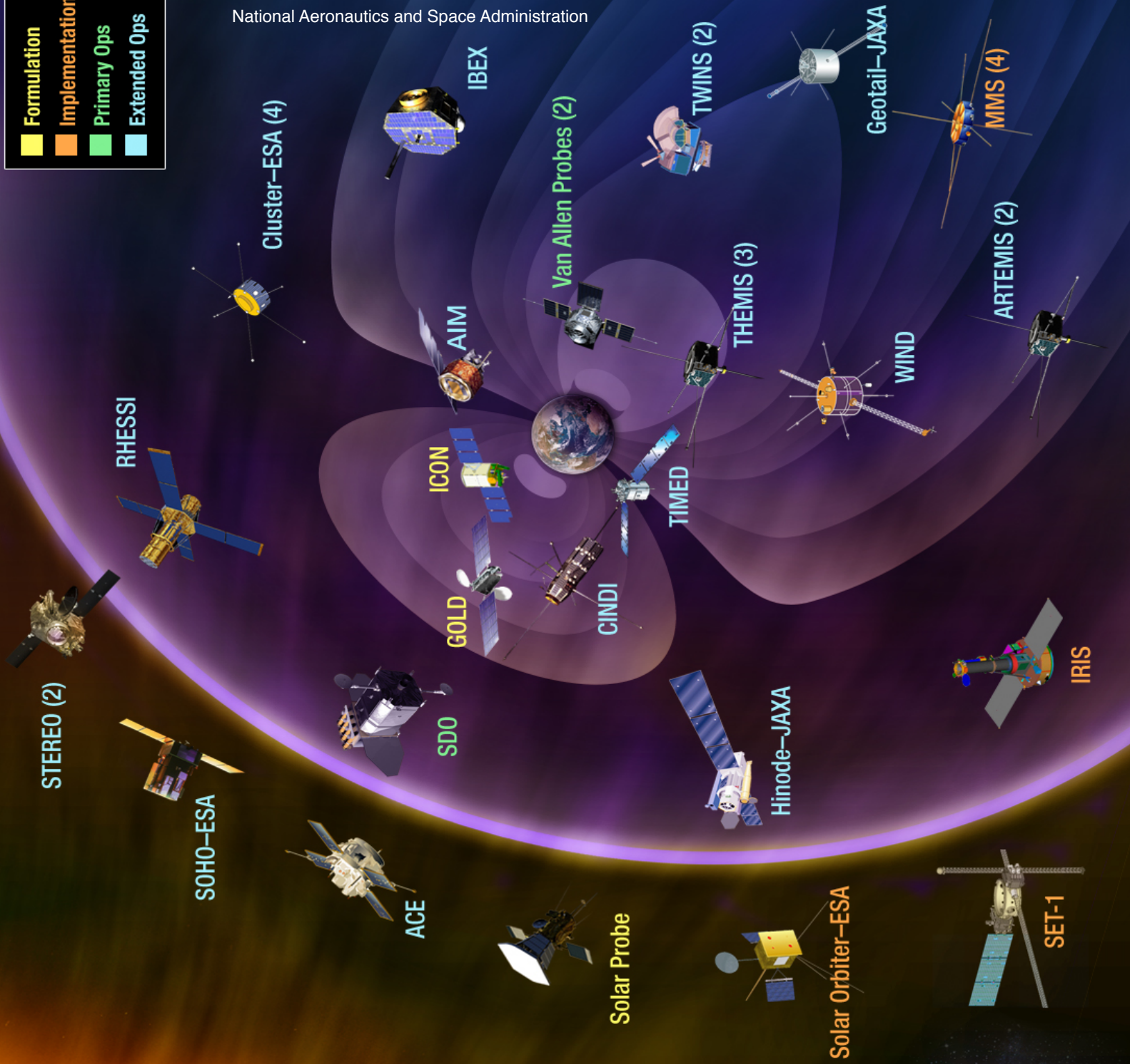


Formulation
Implementation
Primary Ops
Extended Ops



# PI-Team Masters Forum 8

Presented February 12, 2020 by

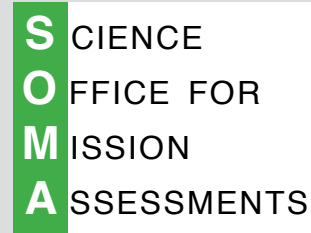
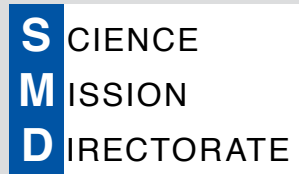


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*The NASA Research and Education Support Services,  
in partnership with NASA's Science Mission Directorate and NASA's Science Office for Mission Assessments, presents*



## PI-Team Masters Forum 8

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February 12, 2020

The Hotel at the University of Maryland

7777 Baltimore Avenue

College Park, MD 20740

Phone: 301.277.777

**W**elcome to the **Principal Investigator (PI)–Team Masters Forum 8**, a collaboration between NASA’s Science Mission Directorate (SMD), Science Office for Mission Assessments (SOMA), and NASA Research and Education Support Services (NRESS). This is the eighth of our PI Team knowledge-sharing events, which are held following major science mission announcement of opportunity (AO) Phase A selections as established by SMD Policy Directive 13B (SPD-13B). The purpose of this Forum is to enable you to engage, share with, and learn from colleagues in relevant science missions through their stories, shared experiences, and lessons learned as a means to enhance the probability of executing a mission successfully.

Your participation in this Forum is in recognition of your selection in the 2018 Heliophysics Stand Alone Missions Opportunity process, and we wish to congratulate your team on these outstanding accomplishments. The Forum reflects the importance that NASA places on providing a context for knowledge that can contribute to a successful mission. We are delighted to have you participate.

Among the many benefits of your participation, this Forum is meant to help you gain an understanding of program/project management, systems engineering, and science mission design best practices and lessons learned; to cultivate reflective practitioners within your team; and to help solidify cross-organizational relationships in support of your project.

In addition to thought-provoking presentations and dynamic group discussions, the Forum offers you the chance to build relationships with peers and meet face-to-face with key leaders in this community. Former Forum participants have stated that the opportunity to network with colleagues from across NASA, other government agencies, universities, and private industry is one of the Forum’s most valuable features.

We hope that this Forum will provide you with an enhanced perspective and be useful in helping you conduct your studies, investigations, and missions.

Sincerely,

Sandra Connelly, Acting SMD Deputy Associate Administrator

Cindy Daniels, SOMA Director

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# **Agenda**

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PI Masters Forum #8 – Agenda

February 12, 2020

The Hotel at University of Maryland, College Park, MD

	Session Title	Time	Speaker / Panelists
2 0 1 8  H E L I O P H Y S I C S  S C I E N C E  M O  &  T E C H   D E M O	<b>Formal Welcome &amp; Opening Remarks</b> - Welcome, Agenda Review - Attendee Introductions	9:00-9:15	<i>Geoff Yoder, Moderator</i>
	<b>SMD Introduction/Overview</b> - How Explorer Program fits within SMD mission set	9:15-9:30	<i>Sandra Connelly, SMD DAA(A)</i>
	<b>SMD Management of PI-Led Missions: Guidance and Expectations (PANEL)</b> - Introduction of Panelists (5 min) - Guidance and Expectations: Heliophysics Div. (10 min) Program Scientist Role (10 min) Program Executive Role (10 min) - Discussion / Q&A (25 min)	9:30-10:30	<i>Panel Host: Geoff Yoder Nicola Fox / Heliophysics Div Dir Dan Moses, Roshanak Hakimzadeh, Simon Plunkett / PS Bill Stabnow, Alan Zide, Willis Jenkins / PE</i>
	<b>Break</b>	10:30-10:45	
	<b>Lessons from Previous Explorer Missions – PI PANEL</b> - Introduction of Panelists (5 min) - GUSTO (15 min) - GOLD (15 min) - NICER (15 min) - Level 1 and Level 2 Requirements (15 min) - Discussion / Q&A (40 min)	10:45-12:30	<i>Panel Host: Geoff Yoder Chris Walker / PI Richard Eastes / PI Keith Gendreau / PI Jared Leisner / PS</i>
	<b>Lunch</b>	12:30-1:15	
	<b>Lessons from Previous Missions – PM PANEL</b> - Introduction of Panelists (5 min) - AIM/GOLD (15 min) - CYGNSS (15 min) - IRIS (15 min) - LightSail (15 min) - Discussion / Q&A (40 min)	1:15-3:00	<i>Panel Host: Geoff Yoder Susan Westfall / PSE William Wells / PSE Gary Kushner / PM David Spencer / PM</i>
	<b>Program Office Role</b> - Program Office Role - Assistance vs. Oversight (25 min) - Discussion / Q&A (15 min)	3:00-3:40	<i>Panel Host: Geoff Yoder Nick Chrissotimos / AD-EHPD Michael Delmont / DPM-STP Gregory Frazier / DPM-Explorers Pietro Campanella / BM-STP Christine Hinkle / BM-Explorers</i>
	<b>Break</b>	3:40-3:55	
	<b>ESPA Ring Presentation (10 min)</b> Discussion / Q&A (20 min)	4:00-4:30	<i>Mandy Self Melody Martinez</i>
	<b>Dealing with Resource Challenges (PANEL)</b> - Managing Partners, Managing Contingency, Descope Philosophy (15 min) - Discussion / Q&A (15 min)	4:30-5:00	<i>Introduction: Geoff Yoder Jim Russell / AIM PI</i>
	<b>SOMA Analysis of Previous PI Missions Performance</b>	5:00-5:30	<i>Victor Lucas / NASA SOMA</i>
	<b>Closing Remarks</b>	5:30-5:40	<i>Geoff Yoder, Moderator</i>

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**Welcome**

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## About the Presenters

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### **Science Mission Directorate (SMD) Acting Deputy Associate Administrator: Sandra E. Connelly**



Sandra Connelly is the Acting Deputy Associate Administrator in the NASA Science Mission Directorate (SMD). She is responsible for assessing a portfolio of over 100 missions in formulation, development, and operations, for technical and cost effectiveness, quality, and performance. She coordinates program and project content with NASA's other mission directorates and federal agencies with whom SMD partners.

Ms. Connelly served as the Director of the Joint Agency Satellite Division (JASD) in SMD at NASA Headquarters from 2015 - 2018. She was responsible for managing reimbursable satellite, instrument and ground system development activities performed by NASA for partner agencies. JASD also partners to develop future architectures and strategically plan future work. From 2014 - 2015, Ms. Connelly served as the Deputy Director for the Heliophysics Division in SMD, whereby she provided executive leadership, strategic direction, and executive management for a portfolio of 24 projects in formulation, development and operations. Prior to joining SMD, she served from 2008 – 2014 as the NASA Director for Engineering, Program and project management, in the Office of the Chief Engineer, during which she established, revised and implemented NASA's acquisition, engineering, and program/project management policy and requirements for NASA's Human Space Flight, Robotics, Aeronautics, Information Technology (IT), Institutional and Infrastructure, and Research and Technology portfolios. Ms. Connelly co-authored several program and project management standards and practice guides for international standards organizations, including the Project Management Institute (PMI) and the International Organization for Standardization (ISO).

Early in her career, Ms. Connelly served as the Program Manager for the US Navy's Expert Systems Program and implemented the first information technology system at the Naval Sea Support Center Atlantic. She joined NASA Langley Research Center in 1992.

She earned her Masters degree in Electrical Engineering from Old Dominion University and a Bachelor of Science in Physics from the College of Charleston.

### **Moderator: Geoffrey L. Yoder, Retired.**



Mr. Yoder retired from NASA November 2016 after a distinguished career in both the private sector and within the government. Prior to retiring from NASA in November 2016, Mr. Yoder served as both the Associate Administrator (Acting) and the Deputy Associate Administrator in the NASA Science Mission Directorate responsible for overseeing the safe and successful execution of the directorate's \$5.6B annual budget and portfolio of 114 missions in formulation and development, as well as the operating science missions.

Mr. Yoder joined NASA in 2000 formulating the Flight Hardware Development Branch within the Engineering Directorate at the Johnson Space Center, Houston Texas. In 2005, Mr. Yoder joined the Exploration Systems Mission Directorate (ESMD) at NASA Headquarters serving in various roles including Director for the Directorate Integration Office where he was responsible for a broad range of ESMD integration activities. Mr. Yoder served as the Director of the Constellation Systems Division within the Exploration Missions Directorate NASA Headquarters where he was responsible for Division management of the Constellation Systems Program and Commercial Crew and Cargo Program.

Mr. Yoder joined the Astrophysics Division in the Science Mission Directorate May 2010 as the Astrophysics Division Deputy Director working with the Director leading one of the world's largest space astrophysics programs. In January 2012, Mr. Yoder was selected as the Director of the Office of Evaluation at NASA HQ. In June 2012, Mr. Yoder was assigned the role of Program Director for NASA's \$8B James Webb Space Telescope. Prior to joining NASA in 2000, Mr. Yoder working for Litton Systems Inc., from 1986 -2000 responsible for reliability assurance of various avionics suites directing reliability and qualification test and verification activities.



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# **SMD Management Panel**

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## SMD Management of PI-Led Missions: Guidance and Expectations Panel

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**Panel Host:** Geoffrey Yoder

**Heliophysics Division Director:** Nicola Fox

**Heliophysics Explorers Program Scientists:** Dan Moses, Simon Plunkett, Roshanak Hakimzadeh

**Heliophysics Explorers Program Executive:** Willis Jenkins, Jr., Bill Stabnow, Alan Zide



Dr. Nicola Fox is the Heliophysics Division Director in the Science Mission Directorate at NASA Headquarters in Washington, DC. Heliophysics is not only vital to understanding Earth's most important and life-sustaining star, but the study of key space phenomena and processes supports situational awareness to better protect astronauts, satellites, and robotic missions exploring the solar system and beyond.

Until August 2018, Dr. Fox worked at the Applied Physics Lab at the Johns Hopkins University in Laurel, Maryland, where she was the chief scientist for Heliophysics and the project scientist for NASA's Parker Solar Probe – humanity's first mission to a star. Dr. Fox is a proven leader with extensive project, program and supervisory experience, having served as the deputy project scientist for the Van Allen Probes, and the operations scientist for the International Solar Terrestrial Physics program. She has authored numerous scientific articles and papers in addition to delivering science presentations worldwide. In addition to her research, she is also keenly involved with science education and outreach activities.

Dr. Fox was born in Hitchin, Hertfordshire in England. She graduated from The Imperial College of Science, Technology and Medicine in London with a Bachelors of Science in Physics. She received an Masters of Science in Telematics and Satellite Communications from the University of Surrey. She then returned to Imperial College to complete a PhD in Space and Atmospheric Physics. She has also previously worked at NASA's Goddard Space Flight Center in Greenbelt, Maryland, receiving a number of agency awards for outstanding performance.

### NASA HQ SMD Program Scientist Role

**Dr. Dan Moses** - Dr. Moses joined the NASA HQ Heliophysics Division (HPD) in 2017 as a Program Scientist. In addition to his role as Heliophysics Explorers Program Scientist, he is PS for the Heliophysics Technology and Instruments Development for Science, the HPD Lead Technologist and the PS for the SMD Cubesat Initiative Panel. Dr. Moses spent most of his professional career as an Astrophysicist in the Space Science Division of the Naval Research Laboratory, investigating the experimental space science of the Sun, the interplanetary medium, magnetospheres and the Earth's ionosphere. He led development and utilization of new detector and sensor techniques, including the first use of a soft-X-ray CCD in space and the first wide-bandgap (diamond) UV detector, as well as conducting complete science investigations by developing, as PI, 3 new payloads that were flown in 8 successful NASA sounding rocket missions. He made substantial instrumentation development and science contributions to the LASCO and EIT SOHO investigations (Co-I) and the SECCHI STEREO investigation (Project Scientist). Dr. Moses received a Bachelors of Science in physics at Duke University and a PhD in Physics at the University of Chicago.

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## SMD Management of PI-Led Missions: Guidance and Expectations Panel, cont.

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### NASA HQ SMD Program Scientist Role, cont.

**Roshanak Hakimzadeh** - Dr. Hakimzadeh is a Program Scientist and Deputy Chief Technologist in the Heliophysics Division at NASA Headquarters. She is responsible for soliciting, nurturing, incubating, and advancing technologies for enabling heliophysics missions in the next decade and beyond. In her previous position, Dr. Hakimzadeh was the Senior Technical Advisor to NASA Glenn's Center Director and the Project Manager of the Advanced Energy Conversion (AEC) project. Prior to this, she was the Chief Technologist and the Deputy Chief Technologist at Glenn Research Center. In these positions she provided technical leadership within Glenn for the planning, management, and evaluation of a comprehensive advanced Center-wide technology development program to meet Glenn's future mission responsibilities. Dr. Hakimzadeh's over 20 years of experience at NASA include design of power systems for the International Space Station, design and development of experiments which flew successfully on the space shuttle and the Russian Mir space station and leading and directing research and technology in power technologies with applications to space, aeronautics and commercial energy systems. Prior to becoming the Deputy Chief Technologist, she was the Chief of the Photovoltaic and Power Technologies Branch for over a decade. In that position she led the development of advanced photovoltaic cells and arrays for future space missions, as well as entered into numerous new partnerships with universities, for-profit and non-profit organizations. Dr. Hakimzadeh earned her bachelor's degree in Physics and Astronomy/Astrophysics (double major) from the University of St. Andrews in Scotland, her Masters degree in Electrical Engineering from Cleveland State University, and her Doctor of Philosophy degree in Electrical Engineering from Case Western Reserve University. She is an Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA). Dr. Hakimzadeh completed the NASA Senior Executive Service Candidate Development Program and was certified by the Office of Personnel Management. She has received numerous awards including the 2004 Glenn Federal Women's Program Supervisor's Award for Excellence and the Distinguished Alumni Award from Cleveland State University.

**Simon Plunkett** - Dr. Simon Plunkett is a heliophysicist who has worked on multiple NASA missions over the course of his career. Prior to joining the Heliophysics Division at NASA HQ as a Program Scientist in September 2018, he spent 14 years in the Space Science Division at the US Naval Research Laboratory. His areas of expertise include solar and heliospheric physics, with an emphasis on understanding the physics of coronal mass ejections and their implications for space weather. He was the Lead Operations Scientist for the LASCO coronagraphs on the ESA/NASA SOHO mission, and for the SECCHI suite of coronagraphs and heliospheric imagers on the STEREO mission. More recently, he was the Project Manager for the development of the WISPR instrument that NRL built for Parker Solar Probe, and he was a Co-Investigator on the SoloHI instrument for the ESA/NASA Solar Orbiter mission. He currently serves as the NASA Program Scientist for Solar Orbiter and for the recently selected PUNCH SMEX mission, and is the lead Program Scientist for the Explorers component of the Heliophysics Science Missions of Opportunity Phase A down-selection. He is also the Science Lead for the Living With a Star program in the Heliophysics Division. Dr. Plunkett earned a Bachelors of Science and Ph.D. in Physics from University College Dublin, Ireland, and an Masters of Science in Technical Management from Johns Hopkins University.

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## SMD Management of PI-Led Missions: Guidance and Expectations Panel, cont.

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### NASA HQ SMD Program Executive Role

**Willis S. Jenkins, Jr.** – Mr. Jenkins is the Senior Program Executive for NASA's Explorer Program in the Science Mission Directorate/ Heliophysics Division at NASA Headquarters. He is responsible for projects from definition and formulation through funding and accomplishment of objectives for the oldest cost effective program at NASA dedicated to exploration within the heliophysics and astrophysics science areas. The Explorer Program is the only program at NASA for which the scientist received a Noble Prize and the first HBCU, Hampton University, to develop, launch and operate a major mission. Mr. Jenkins was responsible for managing the first and only NASA mission to launch five spacecraft on a single rocket.

Jenkins began his NASA career as an electrical engineer at the Goddard Space Flight Center in Greenbelt, Maryland, in 1994. He came to NASA headquarters as a Program Executive detailee for the Explorer Program in 2000 and later permanent in 2003.

Jenkins has been awarded two of NASA's highest honors, NASA Equal Employment Opportunity Medal (2008) and the Medal for Exceptional Service (1999). He has also garnered accolades for his work performance within and external to the agency, including several outstanding team efforts in Earth and Space science. He was nominated Black Engineer of the Year in 2001. He also received the outstanding Professional Excellence in Federal Career Award, signed by Senator Barbara Mikulski of Maryland. At Headquarters, Jenkins also assists the Office of Diversity and Equal Opportunity (ODEO), the Office of Education, the NASA Speaker's Bureau and the Science Mission Directorate by participating in outreach events, at which he addresses space flight, career development and the value of science, technology, engineering and mathematics.

Prior to NASA, Jenkins enjoyed a successful career in the private sector. As an electrical systems manager at McDonnell Douglass, Seabrook, Maryland, he managed the electrical systems for all NASA Pegasus launch vehicle missions and supported the orbital launch service managers on launch vehicles (Scout, Delta and Atlas) and the International Space Station robotic arm. In other positions in industry, he trained military personnel, provided expertise in the integration and testing of flight and ground communication instruments, developed software for mainframe computers, managed programs and projects and supervised engineers and technicians.

**William R. Stabnow** - Mr. Stabnow is the Program Executive (PE) for the Solar Terrestrial Probes Program in the Heliophysics Division. Additionally he is the responsible PE for the Heliophysics Science Missions of Opportunity that are currently in their Phase A Concept Study Report.

Preceding the above set of missions, Mr. Stabnow's time at NASA headquarters he has participated in successful missions such as; the Magnetospheric Multiscale and the Global-scale Observations of Limb and Disk. He is actively participating in two missions, which are currently in formulation, the Atmospheric Waves Experiment mission and the Escape, Plasma Acceleration and Dynamics Explorers mission. Mr. Stabnow is also serving as the Heliophysics Division PE for our Heliophysics System Observatory missions in prime Phase E as well as in their extended mission phase.

Mr. Stabnow has forty-four years of federal service experience, which includes three federal agencies prior to entering NASA, via the Goddard Space Flight Center during the COBE era.

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## **SMD Management of PI-Led Missions: Guidance and Expectations Panel, cont.**

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### **NASA HQ SMD Program Executive Role, cont.**

**Alan Zide** – Mr. Zide is the Program Executive and Senior Technologist for NASA’s Solar Orbiter Collaboration and TechPort, respectively, at NASA Headquarters. He is responsible for ensuring mission success by managing all programmatic activities including initiation and execution according to approved processes. In prior roles, he served as the Technical Integration Manager for NASA’s Kennedy Space Center (KSC), working within the Center Planning and Development directorate. He also served as a Constellation Projects Office electrical engineering representative for Launch Vehicles (Area I) associated Flight Test Vehicles (FTV), and the Cargo Launch Vehicle (Ares V).

During Mr. Zide’s career he has received the NASA Silver Snoopy Award in 2015 for his direct contribution to increasing KSC’s business base, while taking full advantage of KSC’s underutilized capabilities through technical leadership. This led to center creating critical partnerships between commercial organizations and other government agencies.

He attended the International Space University and received a certification in Exoplanets and Human Performance in Space. Mr. Zide received a Bachelors of Science in Electrical Engineering at Missouri University of Science and Technology.

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# PI Panel

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## Lessons from Previous Missions – PI Panel

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**Panel Host:** Geoff Yoder  
**GUSTO PI:** Chris Walker  
**GOLD PI:** Richard Eastes  
**NICER PI:** Keith Gendreau  
**LWS GDC PS:** Jared Leisner

### **GUSTO**

The Gal/Xgal Ultra-Long Duration Balloon-borne Spectroscopic THz Observatory (GUSTO) will dramatically improve our understanding of the Universe by probing the topology and ecology of interstellar gas throughout the Milky Way and nearby galaxies. GUSTO is a cryogenic balloon-borne, 0.9 m Cassegrain telescope designed to stay aloft for 100 days or more. During this time GUSTO will survey 124 square degrees of the Milky Way and all of the Large Magellanic Cloud (LMC) in three important interstellar lines: [CII], [OI], and [NII] at 158, 63, and 205  $\mu\text{m}$ , respectively. GUSTO will map the structure, dynamics, energy balance, pressure, and evolution of the Interstellar Medium within the Milky Way and LMC.

### **GOLD**

The Global-scale Observations of the Limb and Disk (GOLD) mission of opportunity, scheduled to launch in February 2017, will perform unprecedented imaging of the Earth's thermosphere and ionosphere from geostationary orbit. GOLD's imager will fly as a hosted payload on a commercial communications satellite provided by ESE Government Solutions, one of the world's leading comsat companies. This hosted payload approach is a pathfinder for cost-effective NASA science missions. GOLD will answer fundamental scientific questions about how the thermosphere-ionosphere (T-I) system responds to geomagnetic storms, solar radiation, and upward propagating tides. GOLD will conduct simultaneous measurements of temperature and composition in the T-I system on a global scale, in the same way that weather satellites provide comprehensive measurements of the troposphere. GOLD's synoptic images of temperature and composition at a half-hour cadence will enable unambiguous separation of temporal and spatial variability. GOLD's far-ultraviolet imaging spectrograph will perform breakthrough measurements needed to address compelling questions about the global response of the T-I system to external and internal influences and their ties to space weather, comparative planetary atmospheres, and Earth sciences. GOLD is led by the Principal Investigator, Dr. Richard Eastes of University of Central Florida (UCF). GOLD is a collaboration between UCF, University of Colorado/LASP, SES-GS, NCAR, University of California/Berkeley, NOAA, and others.

### **NICER**

The Neutron star Interior Composition ExploreR (NICER) is an approved NASA Explorer Mission of Opportunity dedicated to the study of the extraordinary gravitational, electromagnetic, and nuclear-physics environments embodied by neutron stars. NICER will explore the exotic states of matter inside these stars, where density and pressure are higher than in atomic nuclei, confronting theory with unique observational constraints. NICER will enable rotation-resolved spectroscopy of the thermal and non-thermal emissions of neutron stars in the soft (0.2-12 keV) X-ray band with unprecedented sensitivity, probing interior structure, the origins of dynamic phenomena, and the mechanisms that underlie the most powerful cosmic particle accelerators known. NICER achieves these goals by deploying, following launch in August 2016, an X-ray timing and spectroscopy instrument as an attached payload aboard the International Space Station (ISS). Grazing-incidence optics coupled with silicon drift detectors, actively pointed for a full hemisphere of sky coverage, will provide photon-counting spectroscopy and timing registered to GPS time and position, with high throughput and relatively low background.

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## About the Presenters

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### **Dr. Chris Walker, GUSTO PI**

Professor Christopher Walker has over 30 years of experience designing, building, and using state-of-the-art receiver systems for terahertz astronomy. Prof. Walker has published numerous papers on star formation and protostellar evolution. He has served as dissertation director for thirteen Ph.D. students and been a Topical Editor for IEEE Transactions on TeraHertz Science and Technology. Prof. Walker has worked in industry (TRW Aerospace and JPL) as well as academia. As a Millikan Fellow in Physics at Caltech, he worked on the development of low-noise, SIS waveguide receivers above 400 GHz and explored techniques for etching waveguide out of silicon. On joining the UofA faculty in 1991, he began the Steward Observatory Radio Astronomy Lab (SORAL), which has become a world leader in developing THz receiver systems for astronomy and other remote sensing applications. Instruments developed by Prof. Walker's team have served as primary facility instruments at the Heinrich Hertz Telescope on Mt. Graham, AZ and the AST/RO telescope at the South Pole. Prof. Walker led the effort to design and build the world's largest (64 pixels) submillimeter-wave heterodyne array receiver. He was PI of the NASA long duration balloon project "The Stratospheric THz Observatory (STO)", which flew in Antarctica in 2012 and 2016. He is now PI of GUSTO, a balloon-borne mission under the auspices of the NASA Explorer Program. He was also PI of the "10 meter Suborbital Large Balloon Reflector (LBR)" project, which was selected by the NASA Innovative Advanced Concepts (NIAC) program for both a Phase I and II study. He recently authored *Terahertz Astronomy*, the first textbook in his field of study.

### **Dr. Richard Eastes, GOLD PI**

Dr. Richard Eastes is a research scientist at the University of Colorado's Laboratory for Atmospheric and Space Physics (LASP) and the PI for NASA's Global-scale Observations of the Limb and Disk (GOLD) mission. The GOLD imager began operations in October, 2018; imaging the Earth's ultraviolet (UV) emissions from geostationary orbit. The mission is the first to image temperatures of the Earth's thermosphere (the neutral atmosphere in the Earth's space environment); it simultaneously images the composition (O/N<sub>2</sub> ratio) also. The mission is the first NASA mission to be hosted on a commercial communications satellite in geostationary orbit.

Richard Eastes received his Ph.D. in Physics from The Johns Hopkins University in 1985. He was a postdoc at The University of Michigan's Space Physics Research Laboratory for two years before going to the Air Force Geophysics Laboratory, which became part of the Air Force Research Laboratory. There he worked with the ionospheric physics group until 2001 when he joined the Florida Space Institute at the University of Central Florida. Since 2018 he has worked at LASP. He specializes in space based remote sensing of the Earth's thermosphere-ionosphere system - developing instrumentation for remote sensing from spacecraft; new remote sensing approaches; and modeling and analysis of observations.

### **Dr. Keith Gendreau, NICER PI**

Dr. Keith Gendreau is the principal investigator of the Station Explorer for X-ray Timing and Navigation Technology (SEXTANT) and the Neutron Star Interior Composition Explorer (NICER) mission. He has been at Goddard Space Flight Center since 1995 and was the calibration lead on the X-ray spectrometer instrument on the ASTRO-E mission. Dr. Gendreau was the NASA scientist on the joint NASA--DARPA X-ray pulsar source--based navigation and timing study. Keith Gendreau received his PhD in astrophysics at the Massachusetts Institute of Technology in 1995, working on X-ray charge-coupled devices and the cosmic X-ray background with the Advanced Satellite for Cosmology and Astrophysics (ASCA) mission.

### **Dr. Jared Leisner, LWS GDC PS**

Dr. Jared Leisner joined NASA HQ in 2014, as a Program Scientist in the Planetary Sciences Division. In that role, he managed the Cassini Data Analysis Program, co-managed the Solar System Workings program, served as the Program Scientist for the MESSENGER extended missions, and served as the Deputy to the Program Scientist for the 2014 Discovery mission evaluation. In 2017, he joined the Heliophysics Division as a Program Scientist. He serves as the Program Scientist for the Solar-Terrestrial Probes Program and for the Geospace Dynamics Constellation mission. Before his arrival at NASA HQ, his research focused on planetary magnetospheres, particularly the interactions between magnetospheric plasma and the moons of Saturn. Dr. Leisner received his BS from the University of Wisconsin, Oshkosh, and his PhD from the University of California, Los Angeles.



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# **PM/PSE Panel**

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## Lessons from Previous Missions – PM Panel

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**Panel Host:** Geoff Yoder  
**GOLD/AIM PSE:** Susan Westfall  
**CYGNSS SWRI MSE:** William Wells  
**IRIS Lockheed Martin PM:** Gary Kushner  
**LightSail 2 PM:** David Spencer

### **CYGNSS**

Cyclone Global Navigation Satellite System (CYGNSS) is the first NASA Earth Science System Pathfinder (ESSP) Earth Venture mission. The CYGNSS science goal is to understand the coupling between ocean surface properties, moist atmospheric thermodynamics, radiation, and convective dynamics in the inner core of a tropical cyclone. The CYGNSS primary objectives are to 1) measure ocean surface wind speeds in all precipitating conditions, including those experienced in the tropical cyclone eye wall, and 2) measure ocean surface wind speed in the tropical cyclone inner core with sufficient frequency to resolve genesis and rapid intensification of the cyclone. CYGNSS meets the science goal and objectives by the use of 8 low earth orbiting micro-satellites released from a single deployment module using GPS bi-static scatterometry to measure ocean surface winds at all speeds and under all levels of precipitation. The University of Michigan (UM) leads a team that includes the Southwest Research Institute (SwRI) as the CYGNSS implementing organization, Surrey Satellite Technology (SST) as the payload provider, Sierra Nevada Corporation (SNC) as the provider of the CYGNSS deployment module (DM) and several Co-Investigators from various institutions. CYGNSS was launched in Dec. 2016 on an Orbital-ATK Pegasus-XL, completed commissioning in March 2017, and is now in Phase E.

### **IRIS**

The Interface Region Imaging Spectrograph (IRIS) is a NASA Small Explorer Mission to observe how solar material moves, gathers energy, and heats up as it travels through a little-understood region in the sun's lower atmosphere. Tracking how material and energy move through this region is a crucial part of understanding the dynamics of the sun. Such information can help explain what causes the ejection of solar material -- from the steady stream of the solar wind to larger, explosive eruptions such as coronal mass ejections (CMEs) -- that travels toward Earth and causes space weather that can disrupt human technology. IRIS was launched in June 2013 and has been extended through September 2018, with further extensions possible. IRIS collects data on the temperature and movement of solar material throughout this region to determine how it helps drive the constant changes we see on our sun. This data is crucial for answering outstanding questions about our sun, such as why its million-degree upper atmosphere, the corona, is several hundred times hotter than the fiery surface below. The interface region feeds solar material into the corona and the solar wind, the constant stream of charged particles flowing from the sun. This particular region is also responsible for generating most of the ultraviolet emission that reaches Earth. Our space weather and environment are continuously influenced by both these emissions and the solar wind.

### **LightSail 2**

The LightSail 2 mission provides the first demonstration of controlled solar sailing in Earth orbit. Following launch as a Space Test Program-2 payload and deployment from the Prox-1 satellite, LightSail 2 deployed its solar sail on July 23, 2019. By performing two 90 degree attitude slews each orbit using a momentum wheel and torque rods, the solar sail orientation is controlled to result in an increase in orbit apogee due to thrust from solar radiation pressure. The effects of the sail control strategy are apparent in the evolution of the orbital state based upon two-line elements. Orbit apogee increased steadily following sail deployment and the initiation of sail control, and perigee altitude decreased as the orbit became more eccentric. Sail control performance is reconstructed from the on-board attitude quaternions that are derived from magnetometer and Sun sensor measurements. LightSail 2 has achieved the goals established for the decade-long LightSail program. Through demonstrating controlled solar sailing, LightSail 2 has made a key contribution to the advancement of solar sailing technology, demonstrating the potential of solar sailing spacecraft for future space science missions. Funded entirely by private donations with nearly 50,000 individual donors, the LightSail program has been a pathfinder for public funding of engaging, high risk technology/science missions.

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## About the Presenters

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### **Susan Westfall, GOLD PSE**

Dr. Susan Westfall (formerly Susan Batiste) is a Systems Engineer with the Laboratory for Atmospheric and Space Physics at the University of Colorado Boulder where she began as a graduate student in 1995 and continued on as a professional in 2001. She is currently the Mission Systems Engineer on Global-Scale Observations of the Limb and Disk (GOLD) an Explorers' Mission of Opportunity. She has been Systems Engineer for the Imaging Ultraviolet Spectrometer (IUVS) for the Mars Atmosphere and Volatile Evolution (MAVEN) mission, Relativistic Electron-Proton Telescope (REPT) for the Radiation Belt Storm Probes (RBSP), Electric Fields of Waves (EFW) for RBSP, Cloud Imaging and Particle Size (CIPS) instrument for the Aeronomy of Ice in the Mesosphere (AIM) mission, the Cosmic Dust Experiment (CDE) for AIM, and the Student Dust Counter (SDC) for New Horizons. She participated as both a science investigator and a technical manager for the Mechanics of Granular Materials (MGM) Space Shuttle experiment (3 missions in 1996, 1998, 2003). She has also been active as a geotechnical engineer assisting in NASA's development and testing of new lunar regolith simulants. She has a Bachelor's degree in Civil Engineering, and a Masters and Ph.D. in Geotechnical Engineering from the University of Colorado Boulder.

### **William Wells, CYGNSS Industry MSE**

Mr. Wells has over 12 years of experience across payload, spacecraft, and mission systems engineering. He is presently the Operations Phase Systems Engineering Lead for the Cyclone Global Navigation Satellite System (CYGNSS) mission, an 8-spacecraft constellation launched December 2016. He has supported CYGNSS since the mission was proposed in 2011. During CYGNSS development phases Mr. Wells contributed to many systems engineering and AI&T efforts including requirements management and verification planning at all levels (Mr. Wells architected and administrated the mission requirements database in DOORS), mission level analyses (particularly in the realm of mission design and orbital mechanics), functional/environmental test planning and execution, and Launch Vehicle performance and spacecraft separation analyses. Over the past 3 years he has supported all aspects of CYGNSS operations spanning routine day-to-day planning, development and testing of updated FSW capabilities, anomaly resolution, and trending of engineering data across the constellation.

Prior to CYGNSS, Mr. Wells was part of the instrument suite systems engineering team for the highly successful Magnetospheric MultiScale (MMS) mission launched March 2015. During the design and development phases of MMS Mr. Wells led several and contributed to a wide variety of systems engineering tasks. Primary duties included mechanical interface control for the instrument-spacecraft interfaces (22 unique interfaces), payload materials and processes control, and requirements management including co-architecture and administration of the MMS DOORS database.

Most recently, Mr. Wells is the Observatory Systems Engineer for the Polarimeter to UNify the Corona and Heliosphere (PUNCH) Heliophysics SMEX mission set to launch in 2023. PUNCH was selected through a competitive phase A and is presently working toward mission SRR/MDR in late March 2020. Mr. Wells' is busy developing PUNCH observatory and subsystem requirements, fleshing out interfaces and conops, and, working aggressively toward an early engineering model spacecraft build.

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## About the Presenters, cont.

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### **Gary Kushner, IRIS Industry PM**

Gary Kushner is currently the Program Manager for the Interface Region Imaging Spectrograph (IRIS) and the Geostationary Carbon Cycle Observatory (GeoCarb). The IRIS mission includes the instrument, spacecraft, mission operations, ground data system, and science data pipeline. IRIS is a NASA Small Explorer (SMEX) designed to study how energy is generated and transmitted from the chromosphere to the corona and is managed by the Explorers Office at the NASA Goddard Space Flight Center. The mission is operated out of the SSC Advanced Technology Center (ATC) where the scientific payload was also developed. The observatory was successfully launched and placed in low earth orbit on June 27, 2013.

Prior to his current position, Mr. Kushner was the program manager for the Atmospheric Imaging Assembly (AIA) instrument suite that is part of the NASA Solar Dynamics Observatory (SDO), which has been on orbit for more than seven years producing over 100 million images of the sun in multiple wavelengths. Mr. Kushner was also responsible for the Helioseismic and Magnetic Imager during integration on the SDO.

Before becoming program manager, Mr. Kushner was the systems engineer for the Focal Plane Package (FPP) on the Hinode mission, currently operating on orbit. He was also an optical engineer and a member of the integration and launch team for the NASA Far Ultraviolet Spectroscopic Explorer (FUSE) mission.

Mr. Kushner received his Bachelors in Physics from the University of Colorado, Boulder.

### **David Spencer, LightSail 2 PM**

Dr. David Spencer is an Associate Professor of Aeronautics and Astronautics and Director of the Space Flight Project Laboratory at Purdue University. He leads an active research program related to mission design, automated proximity operations, and aeroassist technologies. During seventeen years with the Jet Propulsion Laboratory, Dr. Spencer held positions as the Deputy Project Manager for the Phoenix Mars Lander, Mission Manager for Deep Impact and Mars Odyssey, and mission designer for Mars Pathfinder. He is currently the Project Manager for the LightSail 2 project in support of The Planetary Society.

He received Bachelors of Science and Masters of Science degrees in Aeronautical and Astronautical Engineering from Purdue University, and a Ph.D. in Aerospace Engineering from the Georgia Institute of Technology.

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# **Program Office Panel**

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## Program Office Role – Assistance vs. Oversight

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**Host:** Geoff Yoder

**NASA Explorers Associate Director of Flight Projects:** Nick Chrissotimos

**NASA Explorers Deputy Program Manager:** Greg Frazier

**NASA Explorers Business Manager:** Christine Hinkle

**NASA LWS and STP Deputy Program Manager:** Michael Delmont

**NASA LWS and STP Business Manager:** Pietro Campanella

### **Nick Chrissotimos, Associate Director of Flight Projects**

Mr. Chrissotimos has 32 years of project/program management experience at the Goddard Space Flight Center (GSFC). He is currently the Associate Director of Flight Projects for Heliophysics where he is the Program Manager for Explorers, Living with a Star and Solar Terrestrial Probes.

He is responsible for directing the implementation of the Solar Orbiter, Solar Probe Plus, Astro-H, ICON, TESS, GOLD and NICER missions. He has been in this position since 2008 and has successfully launched SDO, RBSP, MMS, IBEX, WISE, NuSTAR and IRIS. In addition, under his responsibility EHPD successfully developed and delivered the MSL SAM instrument and the LADEE payloads. He is currently serving as an SRB Chair for the GRACE FO mission and is serving or has served on a number of NASA SRB's as a review board member.

Mr. Chrissotimos also served as the Associate Director of Flight Projects for the Exploration and Space Communications Projects Division. There he was responsible for the Lunar Reconnaissance Orbiter (LRO) Project, TDRS Project, Space Network and Ground Network Projects and GSFC Constellation Program support.

In 2003 Mr. Chrissotimos was appointed as the STEREO Project Manager where he led the project to a successful launch in October 2006.

Mr. Chrissotimos earned his bachelor's degree in EE from Pratt Institute, Brooklyn New York, in 1974, and his master's degree in EE from the University of Maryland, College Park MD, in 1981. Mr. Chrissotimos is a recipient of the Meritorious Presidential Rank Award, the NASA Medal for Outstanding Leadership, and Goddard's Exceptional Achievement Award.

### **Gregory Frazier, Explorers Program DPM**

Gregory Frazier has worked at the NASA for over 30 years. He has worked on numerous flight projects currently performing Earth and Space Science Observations and a mission to Mars.

Mr. Frazier started as a cooperative education student while attending the University of Maryland at College Park. He completed his Bachelor of Sciences in Aerospace Engineering in 1985 and became a member of the Mechanical Engineering Branch. Mr. Frazier designed numerous mechanical systems on flight projects such as the Cosmic Background Explorer, the X-ray Timing Explorer and Gamma-Ray Observatory. He also helped manage missions for the Earth Science Systems Pathfinder Project. He went on to manage the main instrument on the Swift Project, the Burst Alert Telescope.

Following the successful launch of Swift in 2004, Mr. Frazier became a member of the Flight Projects Directorate where he served as the Interstellar Boundary Explorer Mission Manager, which was successfully launched in 2008. Following that, he became the Project Manager for the Sample Analysis at Mars instrument suite on the Mars Sample Laboratory rover Curiosity, which is currently operating on the red planet.

### **Christine Hinkle, Explorers Program Business Manager**

Ms. Christine Hinkle is the Explorers Program Business Manager in the Explorers and Heliophysics Projects Division (EHPD). Christine joined the EHPD in December of 2009, as the Deputy Program Business Manager for Explorers, supporting the IRIS, NuSTAR, SAM, and GEMS missions. In March of 2011, she moved to the position of Program Business Manager, currently supporting GOLD, TESS, ICON, IXPE, XARM, and GUSTO missions.

Before joining the EHPD, Christine supported the Exploration and Space Communications Division, for over 20 years in various business leadership roles in several projects and offices, including the Near Earth Network Project, Space Network Project, Technology and Standards, the Guam Remote Ground Terminal Project, and the Second TDRSS Ground Terminal Project.

Christine has a Bachelor of Science degree from University of Maryland, University College.

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# **ESPA Presentation**

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## **Program Office Role – Assistance vs. Oversight, cont.**

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### **Michael Delmont, Living With a Star (LWS) and Solar Terrestrial Probes (STP) Deputy Program Manager**

Mr. Delmont has over 20 years supporting GFSC Missions. He most recently served as the Chief of the Mission Support Division, which provides direct support to the GSFC projects in the areas of System Safety, Reliability and Quality Assurance from design through flight operations with the objective of assuring and measuring the reliability of the system.

In 2001, Mr. Delmont was appointed as the Deputy Project Manager for the STEREO mission at GSFC. His primary duties included managing the instrument development, and leading the risk management process and launch site processing.

Mr. Delmont supported various in-house missions at GSFC including: Diffuse X-Ray Spectrometer, Extreme Ultraviolet Explorer, Rossi X-ray Timing Explorer and Wilkinson Microwave Anisotropy Probe. He also served as the Agency Program Manager for Workmanship.

### **Pietro Campanella, LWS and STP Business Manager**

Mr. Pietro Campanella joined the Goddard Space Flight Center (GSFC) in 1985 as a cooperative education student. He began full time in 1987 after receiving a Bachelor of Science degree from Towson State University. He subsequently earned a Master of Business Administration degree from Loyola College in Maryland. Pietro has many years of GSFC experience, including over 20 years in project/program business management. Over the course of his career, Mr. Campanella has received numerous internal GSFC awards as well as the NASA Exceptional Service Medal. He is currently the Program Business Manager (PBM) for the Living With a Star (LWS) and Solar Terrestrial Probes (STP) Programs in the Explorers & Heliophysics Projects Division (EHPD).

Pietro has worked on numerous flight projects over the years, gaining varied (in house and out of house) flight project experiences and increased responsibilities along the way. His experience includes projects/missions such as International Solar Terrestrial Physics (ISTP), Television InfraRed Observation Satellite (TIROS), Gravity Recovery and Climate Experiment (GRACE), Solar TERrestrial RELations Observatory (STEREO), and Lunar Reconnaissance Orbiter (LRO). His management experience includes serving as the Deputy Project Manager for Resources for the Earth System Science Pathfinder (ESSP), STEREO, and LRO projects and as the PBM for the Earth Explores Program, the Robotic Lunar Exploration Program, the Exploration and Space Communication Projects Division, and currently for the LWS and STP Programs.



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## ESPA Ring Presentation

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### **EAGLE**

EAGLE is a triple-nested acronym that when broken out is: Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA) Augmented Geosynchronous Laboratory Experiment.

ESPA is an innovative technology that increases the number of satellites that can be put into space on a single launch.

The EAGLE program is led by the AFRL Space Vehicles Directorate located at Kirtland Air Force Base, New Mexico, with key team members from the Air Force Space and Missile Systems Center headquartered at Los Angeles AFB, California. Industry partners include Orbital ATK of Dulles, Virginia; ATA-Aerospace, of Albuquerque, New Mexico; and Tempe, Arizona based Moog-Broadreach Engineering. The one-year, on-orbit experiment, flown in partnership with the DOD Space Test Program, enlists numerous military, civilian, and contractor scientists and engineers to analyze the data. The EAGLE program will transition technology and knowledge of future space capabilities in support of Air Force Space Command Space Warfighting Construct.

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### **About the Presenters**

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#### **Ms. Amanda Self, EAGLE Lead Mission Planner, Air Force Research Laboratory**

Ms. Self is an aerospace and systems engineer, who has been part of the AFRL Space Vehicles Directorate for nine years, both as an on-site contractor and now a federal employee. Ms. Self is the Chief Engineer for the SSPIDR program, in which AFRL is investigating beaming power from space to the ground. In addition to her work on SSPIDR, Ms. Self is also the Lead Mission Planner for the EAGLE spacecraft (launched in Apr. 2018). Ms. Self executed the first successful deployment of an ESPA-class satellite from a propulsive ESPA bus as well as coordinated the execution of mission objectives for EAGLE's nine different payloads during experimental and high-tempo on-orbit operations.

Ms. Self holds a Bachelors of Science and Masters of Science in Aerospace Engineering from the Georgia Institute of Technology, as well as a graduate certificate in Systems Engineering from the Air Force Institute of Technology.

#### **Ms. Melody Martinez, EAGLE Systems Engineer, Air Force Research Laboratory**

Ms. Martinez is an astronautical and systems engineer, who has been part of the AFRL Space Vehicles Directorate for ten years as a federal employee. Ms. Martinez is the Deputy Program Manager for the SSPIDR program, in which AFRL is investigating beaming power from space to the ground. Performing as the systems engineer on the EAGLE Program, Ms. Martinez was involved with the design, development, and implementation of the EAGLE Platform which enabled the transport and on-orbit operations of 12 disparate payloads at geosynchronous earth orbit (GEO), which launched in April of 2018. She also performed as an EAGLE Mission Planner under the guidance of Ms. Self, which includes the first successful deployment of an ESPA-class satellite from a propulsive ESPA bus.

Ms. Martinez holds a Bachelors of Science in Astronautical Engineering from Capitol College, now known as Capitol Technology University, located in Laurel, Maryland.

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# **Dealing with Resource Challenges**

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## Dealing with Resource Challenges on Explorer Missions

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### AIM

The Aeronomy of Ice in the Mesosphere (AIM) satellite mission is exploring Polar Mesospheric Clouds (PMCs), also called noctilucent clouds (NLCs), to find out why they form and why they are changing. The mission goal has been expanded in recent years to include study of atmospheric dynamics.

The AIM mission was launched in 2007 and has been extended by NASA through the end of FY17. During this time, the instruments have been monitoring noctilucent clouds to better understand their variability and possible connection to climate change. During the course of the investigation it became clear that PMCs at 80km altitude and Rayleigh scattered light measured by AIM at ~ 52 km are also providing valuable atmospheric dynamics information. Individual instrument data collection status, as well as spacecraft and instrument health, will be monitored throughout the life of the mission and reported periodically on the AIM website.

The primary goal of the AIM mission is to help scientists understand whether the clouds' ephemeral nature, and their variation over time, is signaling high altitude climate change - and to investigate why they form in the first place. By measuring the thermal, chemical and other properties of the environment in which NLCs form, the AIM mission will provide researchers with a foundation for the study of long-term variations in the mesosphere and its relationship to global climate change. In addition to measuring environmental conditions, the AIM mission is collecting data on cloud abundance, how the clouds are distributed, and the size of particles within them. Dynamics, or gravity wave, data are also being measured globally, opening the way for study of vertical coupling between atmospheric regions.

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### About the Presenters

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#### Dr. James Russell III, AIM PI

James M. Russell III's research has focused on atmospheric science, remote sensing, and satellite data analysis to study properties and processes in Earth's atmosphere. He began his career in electrical engineering at the NASA Langley Research Center, developing instrumentation and performing ground and rocket reentry tests of heat shield material used on the Gemini and Apollo capsules. He also worked on instrumentation for characterizing the Martian atmosphere during entry.

Dr. Russell served as Co-PI on the Nimbus-7 LIMS experiment to study odd nitrogen effects on Earth's ozone layer and PI for the HALOE experiment on the UARS satellite to study odd chlorine and odd nitrogen effects on ozone. He currently serves as PI for the SABER experiment on the TIMED satellite to study the chemistry, dynamics, and energetics of the thermosphere and mesosphere; and PI on the AIM mission to study noctilucent clouds and atmospheric dynamics. He also served as co-investigator on the JPL ATMOS experiment launched on the Space Shuttle and the Oxford University ISAMS experiment launched on the UARS satellite, to study the chemistry and dynamics of the stratospheric ozone layer.

Dr. Russell served as head of the Chemistry and Dynamics Branch and the Theoretical Studies Branch in the Langley Atmospheric Sciences Division and currently is an endowed professor of atmospheric and planetary sciences and co-director of the Center for Atmospheric Sciences at Hampton University in Hampton, Virginia. He received a Bachelors of Science degree in Electrical Engineering from Virginia Tech, an Masters of Science degree in Electrical Engineering from the University of Virginia, and a PhD in Aeronomy from the University of Michigan. He is author or co-author of more than 400 papers in the scientific literature, including first authorship of the most cited paper in all of geosciences during the period 1991–2001. He is a Fellow of the American Geophysical Union and has received the NASA Exceptional Scientific Achievement Medal; the NASA Outstanding Leadership Medal; the Virginia 2008 Outstanding Scientist Award; and the University of Michigan, College of Engineering, Alumni Merit Award.

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# **SOMA Presentation**

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## **SOMA Analysis of Previous PI Missions Performance**

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To encourage the submission of the highest-quality mission proposals and concept-study reports, the Science Office for Mission Assessments maintains an ongoing effort to identify and analyze common areas of major weaknesses resulting from the technical, management, and cost-review process. The results of this effort will be described, including appropriate lessons learned that can provide valuable guidance to future mission proposal and concept-study teams.

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## **About the Presenter**

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### **Victor Lucas, Acquisition Manager (AM), SOMA, NASA Langley Research Center**

Victor Lucas is currently a Heliophysics Technology Demonstration and Science Missions of Opportunity Acquisition Manager, preparing for the Technical, Management, and Cost evaluation of the upcoming Step 2 Concept Study Reports (CSRs). Mr. Lucas has been a member of SOMA since 2010 and has led or been an alternate Acquisition Manager on several instrument and mission evaluations, including Mars 2020 and Europa instrument evaluations and Astrophysics, Discovery, and New Frontiers mission evaluations. Before joining SOMA, Mr. Lucas performed systems analysis for the Space Mission Analysis Branch and was the Ground Segment Manager for the CALIPSO mission, both at the Langley Research Center. He started his career in the Mission Operations Directorate at the Johnson Space Center as a Space Shuttle flight controller and as a systems engineer developing ground systems for the Space Shuttle and ISS programs. Mr. Lucas received a Bachelors of Science in Electrical Engineering from Texas A&M University and a Masters in Business Administration from the University of Houston – Clear Lake.