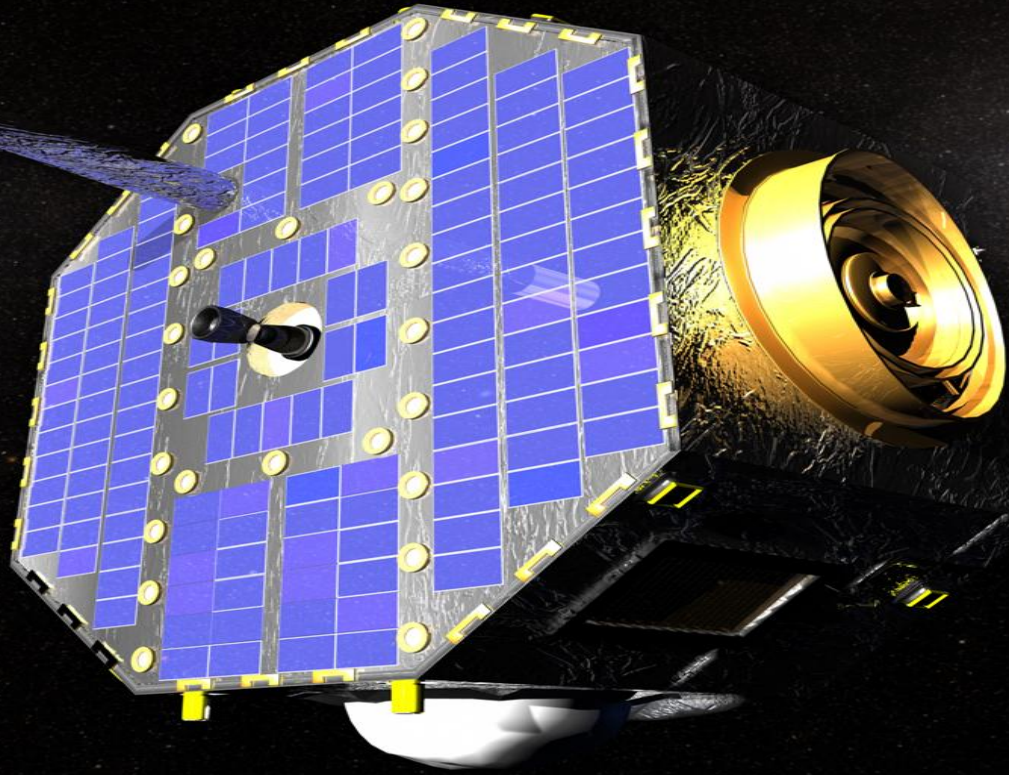


National Aeronautics and Space Administration

PI-Team Masters Forum 7



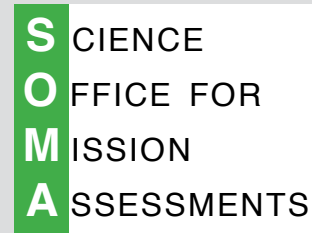
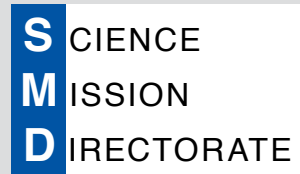
Presented September 20, 2017 by



S SCIENCE
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M MISSION
A ASSESSMENTS

*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 7

September 20, 2017
Hilton Crystal City
2399 Jefferson Davis Highway
Arlington, VA
Phone: 703-418-6800

Welcome to the **Principal Investigator (PI)–Team Masters Forum 7**, a collaboration between NASA’s Science Mission Directorate (SMD), Science Office of Mission Assessments (SOMA), and NASA Research and Education Support Services (NRESS). This is the seventh 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 2016 Astrophysics and Heliophysics Explorers Announcement of 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,

Dennis Andrucyk, SMD Deputy Associate Administrator

Cindy Daniels, SOMA Director

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Agenda

PI Masters Forum #7 - Agenda

September 20, 2017

Hilton Crystal City, 2399 Jefferson Davis Highway, Crystal City, VA

	Session Title	Time	Speakers / Panelists
ASTRO MIX & HELIO SME X / MO	Formal Welcome & Opening Remarks - Welcome, Agenda Review - Attendee Introductions	8:00-8:15	<i>Ed Weiler, Moderator</i>
	SMD Introduction/Overview - How Explorer Program fits within SMD mission set	8:15-8:30	<i>Dennis Andrucyk / SMD DAA</i>
	SMD Management of PI-Led Missions: Guidance and Expectations (PANEL) - Introduction of Panelists (5 min) - Guidance and Expectations: Astrophysics Div (10 min) Heliophysics Div (10 min) Program Scientist Role (10 min) Program Executive Role (10 min) - Discussion / Q&A (25 min)	8:30-9:40	<i>Panel Host: Ed Weiler</i> <i>Andrea Razzaghi/Astro Dep Div Dir</i> <i>Peg Luce/Heliophysics Div Dir (act)</i> <i>Linda Sparke, Dan Moses / PS</i> <i>Willis Jenkins, Mark Sistilli / PE</i>
	Break	9:40-9:55	
	Lessons from Previous Explorer Missions - PI PANEL - Introduction of Panelists (5 min) - ICON (15 min) - NICER (15 min) - WISE (15 min) - NuSTAR (15 min) - Level 1 and Level 2 Requirements (20 min) - Discussion / Q&A (40 min)	9:55-12:00	<i>Panel Host: Ed Weiler</i> <i>Thomas Immel / PI</i> <i>Keith Gendreau / PI</i> <i>Ned Wright / PI</i> <i>Fiona Harrison / PI</i> <i>Fiona Harrison / PI</i>
	Lunch	12:00-1:00	
	Lessons from Previous Explorer Missions - PM PANEL - Introduction of Panelists (5 min) - ASTRO-H (15 min) - CYGNSS (15 min) - NICER (15 min) - IRIS (15 min) - Discussion / Q&A (35 min)	1:00-2:40	<i>Panel Host: Ed Weiler</i> <i>Cynthia Simmons / PM</i> <i>John Scherrer / PM</i> <i>Sridhar Manthipragada / PM</i> <i>Gary Kushner / PM</i>
	Explorers Program Office Role (PANEL) - Program Office Role - Assistance vs Oversight - Discussion / Q&A (15 min)	2:40-3:20	<i>Panel Host: Ed Weiler</i> <i>Nick Chrissotimos / Explorer PM</i> <i>Greg Frazier / Explorer DPM</i> <i>Christine Hinkle / Explorer Bus Mgr</i>
	Break (Feedback Form)	3:20-3:35	
	Dealing with Resource Challenges (PANEL) - Managing Partners, Managing Contingency, Descope Philosophy - Discussion / Q&A (15 min)	3:35-4:20	<i>Panel Host: Ed Weiler</i> <i>Jim Russell / AIM PI</i> <i>Charlie Sobeck / Kepler PM</i>
	SOMA Analysis of Previous PI Missions Performance	4:20-4:50	<i>Carlos Liceaga / NASA SOMA</i>
	Closing Remarks	4:50-5:00	<i>Ed Weiler, Moderator</i>

Presentations

About the Presenters

Moderator: Dr. Edward J. Weiler

Dr. Weiler retired from NASA, effective Sept. 30, 2011. Dr. Weiler and his spouse, Dr. Barbara Thorne, now reside in Vero Beach, Fl. Although retired from NASA, he continues active in Space Science through several advisory and consulting positions including Adjunct Senior Scientist, University of Colorado, member of the LASP (U. of COLO.) Advisory Board, Executive Science Advisor to SGT, Inc., member of the board of directors of USRA, member of the board of advisors to JPL (CalTech) and some science and technical consulting for Lockheed and Boeing.

Dr. Edward J. Weiler was named Associate Administrator of the Science Mission Directorate at NASA Headquarters in Washington, D.C. in May 2008. He was previously Center Director of NASA's Goddard Space Flight Center in Greenbelt, Md., a position he held since August 2004. Prior to that, he served as the Associate Administrator for NASA's Space Science Enterprise since 1998. Under his leadership, the Enterprise had numerous successes, including the Chandra Observatory, NEAR, MAP, FUSE, Spitzer, Mars Odyssey, and Mars Exploration Rover missions. He was responsible for a new Mars Exploration Program architecture in 1999 that has subsequently led to 7 successes in a row over the past 14 years including the incredibly prolific rovers, Spirit, Opportunity and Curiosity, the nuclear-powered Mars Rover (Curiosity) which landed in August 2012. The successes realized under Dr. Weiler's leadership have earned consistent support from the Administration and Congress and have secured an unprecedented level of funding to continue such important space science missions.

Dr. Weiler received his Ph.D. in astrophysics from Northwestern University in 1976. He has published numerous papers in scientific journals. In his role as the Hubble Space Telescope Chief Scientist, he acted as the prime scientific spokesperson for the program and has appeared on a number of National TV programs including NIGHTLINE, TODAY, GOOD MORNING AMERICA, 60 MINUTES, etc. He is also routinely requested as a keynote speaker for a variety of professional and public events.

Space Mission Directorate (SMD) Deputy Associate Administrator: Mr. Dennis Andrucyk

Dennis Andrucyk is the deputy associate administrator for NASA's Science Mission Directorate (SMD).

Prior to joining SMD, Andrucyk served as NASA's acting chief technologist and as deputy associate administrator for the Space Technology Mission Directorate and held many positions at NASA's Goddard Space Flight Center. At Goddard, he was Director of the Applied Engineering & Technology Directorate, serving as Director of Engineering, Deputy Director of Engineering, Chief of the Software Engineering Division, and Chief of the Mission Engineering and Systems Analysis Division. He also served as Goddard's Chief Technologist and as the Associate Chief of the Electrical Engineering Division. While enrolled in the Senior Executive Service Candidate Development Program, he spent a short time at NASA Headquarters as a Division Chief where he was the Director of the Mission & Science Measurement (MSM) Theme/Division. In 2000, he was selected as a Goddard Senior Fellow.

Andrucyk has served on several national and international space partnership teams including the U.S.-based Space Technology Alliance as one of three voting members on the North Atlantic Treaty Organization's (NATO) Sensors & Electronics Technology (SET) panel.

Before joining NASA in 1988, Andrucyk served at the Department of Defense as both a contractor and a civil servant. He has worked at the National Security Agency, the Naval Research Laboratory, Westinghouse Electric, General Electric, and the Northrop Grumman Corporation.

Andrucyk has earned the Senior Executive Service Meritorious Presidential Rank Award, the NASA Medal for Outstanding Leadership, the NASA Exceptional Service Medal, the Goddard Outstanding Leadership Honor Award, and the Goddard Exceptional Achievement Award in Diversity and Equal Employment Opportunity.

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

Panel Host: Ed Weiler

Astrophysics Division Deputy Director: Andrea Razzaghi

Heliophysics Division Director (Acting): Peg Luce

Astrophysics Explorers Program Scientist: Linda Sparke

Heliophysics Explorers Program Scientist: Dan Moses

Heliophysics Explorers Program Executive: Willis Jenkins, Jr.

Working within NASA Policy and Directives

Andrea Razzaghi - Andrea Razzaghi was selected as the Deputy Director of Astrophysics in September 2012. She provides executive leadership, strategic direction, and overall management of the programs and projects in the Astrophysics Division of the NASA Science Mission Directorate. She oversees the Agency's research programs and missions necessary to discover how the Universe works, explore how the Universe began and developed into its present form, and search for Earth-size planets outside of our Solar System. Ms. Razzaghi manages a portfolio of over 20 NASA missions, including Hubble, Chandra, Spitzer, and Kepler.

Ms. Razzaghi joined NASA Headquarters in 2010 to serve as the Assistant Director for Planetary Science, where she oversaw and played a significant role in many exciting mission milestones, including Juno, GRAIL, the Mars Science Laboratory, MESSENGER, Dawn, and the successful landing of the Curiosity rover on the surface of Mars. Prior to coming to NASA Headquarters, Ms. Razzaghi held a number of positions at the Goddard Space Flight Center, including the Mission Manager for WISE and NuStar in the Explorers' Program Office, the Observatory Manager for the Aura mission and the Instrument Manager for the Microwave Imager on the Tropical Rainfall Measuring Mission.

From 1996 to 1997, Ms. Razzaghi served as a Senior Policy Analyst in the White House Office of Science and Technology Policy, where she coordinated the activities of the National Science and Technology Council. Ms. Razzaghi also worked with the President's Council of Advisors on Science and Technology, an advisory group of the nation's leading scientists and engineers who directly advise the President and the Executive Office of the President.

Ms. Razzaghi began her engineering career at a consulting firm working on airborne mine countermeasures for the U.S. Navy and, in 1985, started her NASA career at Goddard as an electromechanical engineer on the COBE mission. Ms. Razzaghi grew up in Washington, D.C. and graduated from the Sidwell Friends School. She earned a B.S. degree in Mechanical Engineering from Brown University, and an M.S. degree from the Catholic University of America in Mechanical Engineering Design. She won many awards for her service to NASA and our nation; and was the 2014 recipient of the Brown University Engineering Alumni Medal.

Peg Luce – Margaret (Peg) Luce is the acting Heliophysics Division Director in the Science Mission Directorate at NASA. Previously, she was the Earth Sciences Division Deputy Director where she provided oversight and advice on a portfolio of mission that advances technologies, flight, research, and Earth applications to increase the World understanding of the Earth as a system.

Peg joined NASA's Goddard Space Flight Center in 1987 following 6 years of engineering experience in the private sector. She managed the structural-mechanical subsystems on the Tracking and Data Relay Satellite. In 1992, Ms. Luce became the Project Formulation Manager of the Earth Observing System (EOS) Aura Mission at GSFC. In this position, she worked with a team of scientific and engineering experts to optimize the instrument suite, assess multiple mission architectures, and study multiple variation on mission funding and profile. Ultimately, she was selected as the Project Manager for the \$900 million EOS Aura Project and managed it until 2 years prior to its launch in 2004.

In 2002, Ms. Luce became the Associate Director of Flight Projects for Project Formulation at GSFC and served as a senior member of the Flight Projects Directorate staff. In this role, she participated in top-level decisions related to the assignment of leaders for flight projects in implementation as well as understudy. In 2006, she became the Chief of a new start-up office, the Advanced Concepts and Formulation Office, which she established to serve as the central organization within the Flight Projects Directorate for the formulation of new missions. In 2008, she moved to NASA Headquarters as the Earth Sciences Division Deputy Director. Ms. Luce holds a Bachelor's Degree in Engineering Mechanics from the University of Wisconsin, Madison.

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

Guidance and Expectations

Dr. Linda Sparke – Dr. Sparke has been at NASA HQ since 2009, when she joined the Astrophysics Division as Research Program Manager. In 2014-5 she was detailed to Marshall Space Flight Center as PI for the Gamma-Ray Burst Monitor (GBM) instrument on Fermi. Along with her role as Astrophysics Explorers PS, she is now PE for the Astrophysics Data Archives, and deputy PS for the Astrophysics Theory Program, for the WFIRST mission, and for NASA's participation in ESA's Euclid mission. Dr. Sparke spent most of her scientific life as a professor of Astronomy at the University of Wisconsin-Madison, studying the many ways that gravity can act to produce the observed patterns of stars and gas in galaxies. She co-wrote the advanced undergraduate textbook “Galaxies in the Universe: an Introduction”, which won the American Astronomical Society’s 2008 Chambliss Award for Astronomical Writing. Dr. Sparke received a BA degree in mathematics from Cambridge University, UK and a PhD in Astronomy from the University of California at Berkeley; she is a Fellow of the American Physical Society.

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 BS in physics at Duke University and a PhD in Physics at the University of Chicago.

NASA HQ SMD 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, Md., 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 assist 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 Douglas, Seabrook, MD, 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.

Lessons from Previous Missions – PI Panel

Panel Host: Ed Weiler

ICON PI: Tom Immel

NICER PI: Keith Gendreau

WISE PI: Ned Wright

NUSTAR PI: Fiona Harrison

ICON

The Ionospheric Connection Explorer (ICON) will explore the boundary between Earth and space, to understand the physical connection between our world and the immediate space environment around us. The anticipated launch date is June 2017. This boundary region is where ionized plasma (the ionosphere) and neutral gas (our atmosphere) collide and react, causing dramatic variability that affects space-based technological systems like GPS. The ionosphere has long been known to respond to “space weather” drivers from the sun, but NASA missions, such as TIMED and IMAGE, have surprised us in showing this variability often occurs in concert with weather on our planet. ICON will compare the impacts of these two drivers as they exert change on the space environment that surrounds us. ICON's science objectives are to understand: the sources of strong ionospheric variability; the transfer of energy and momentum from our atmosphere into space; and how solar wind and magnetospheric effects modify the internally-driven atmosphere-space system.

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.

WISE

WISE is an unmanned satellite carrying an infrared-sensitive telescope. WISE launched into the morning skies above Vandenberg Air Force Base in central California on Dec. 14, 2009. By early 2011, it had finished scanning the entire sky twice in infrared light, snapping pictures of three-quarters of a billion objects, including remote galaxies, stars and asteroids. Today, astronomers continue to mine a cosmic quarry of data provided by WISE.

Upon completing its surveys in 2011, WISE was put to sleep. But in Sept. 2013, NASA reactivated the mission with the primary goal of scanning for near-Earth objects, or NEOs. Though the WISE mission had been doing asteroid searches before it entered hibernation, through a project called NEOWISE, that had not been its main purpose until now. For its new chapter in life, the mission is officially renamed NEOWISE.

NuSTAR

The NuSTAR (Nuclear Spectroscopic Telescope Array) mission is the first mission on orbit to focus in the high energy X-ray region of the electromagnetic spectrum. A NASA Small Explorer (SMEX) mission, NuSTAR launched on June 13, 2012. The NuSTAR instrument consists of two co-aligned grazing incidence telescopes with specially coated optics and newly developed detectors that extend sensitivity to higher energies compared to previous missions such as Chandra and XMM. After launching into orbit on a small rocket, the NuSTAR telescope extended a deployable structure to achieve a 10-meter focal length. The observatory has provided a combination of sensitivity, spatial, and spectral resolution factors of 10 to 100 improved over previous missions that have operated at these X-ray energies. Due to this dramatic sensitivity improvement NuSTAR has made numerous important discoveries and with almost 400 refereed papers is highly successful and is continuing its mission with a guest investigator program.

About the Presenters

Dr. Tom Immel, ICON PI

Dr. Immel is a physicist and Senior Fellow at the Space Sciences Laboratory at UC Berkeley. There he is the Principal Investigator of the Ionospheric Connection Explorer, or ICON, NASA's next Explorer mission. He was a steering committee member on the National Academy of Science 2013 Decadal Survey for Solar and Space Physics, and currently serves on that discipline committee. His scientific work has reached to understanding Earth's auroral and magnetospheric processes and coupling of atmospheric energy to the ionosphere and space. He earned a BA in Physics from Knox College in 1990 and a PhD in Physics from the University of Alaska in 1998. He and his wife Laura have two boys, living in the East San Francisco Bay.

Dr. Keith Gendreau, NICER PI

Dr. Keith Gendreau is the principal investigator of the 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. Edward (Ned) Wright, WISE PI

Edward L. Wright is a Research Professor of Physics and Astronomy at UCLA. He is the PI on the WISE [Wide-field Infrared Survey Explorer] project, which is a MidEx. Prior to the WISE project, Wright worked on the Cosmic Background Explorer [COBE], and on the Wilkinson Microwave Anisotropy Probe [WMAP] which selected in the first MidEx competition. Before coming to UCLA, he taught in the MIT Physics Department, where he first became involved with COBE and with the Spitzer Space Telescope, then known as the Shuttle InfraRed Telescope Facility [SIRTF].

For COBE, Wright was the data team leader. He led the team that chose the COBE pixelization scheme, and he developed techniques for evaluating systematic errors in the differential microwave radiometer data, such as magnetic susceptibility, and removing them from the final maps. In addition, he developed a technique that used star sightings in the scanning infrared radiometer to determine the COBE aspect to arc-minute accuracy.

Wright was an Interdisciplinary scientist on the Spitzer science working group. He led a committee that greatly simplified the instrument complement that led to a much less complicated mission.

For WMAP, Wright invented a technique for solving for the three million pixels in the map without ever inverting, or indeed even constructing, the 9 trillion element correlation matrix.

Wright received a bachelor's degree (ABscI) in Physics from Harvard, and then spent a year working on underwater sound for the Naval Research Laboratory before returning to Harvard to get a PhD in Astronomy.

Wright is a member of the National Academy of Sciences. He is a fellow of the American Academy of Arts and Sciences, and a fellow of the American Association for the Advancement of Science. He has received the NASA Exceptional Scientific Achievement Medal and the NASA Exceptional Public Service Medal.

Dr. Fiona Harrison, NuSTAR PI

Dr. Fiona Harrison is the California Institute of Technology (Caltech) Benjamin M. Rosen Professor of Physics, and the Kent and Joyce Kresa Leadership Chair of the Division of Physics, Mathematics and Astronomy. Dr. Harrison's research is focused on the study of energetic phenomena ranging from gamma-ray bursts, black holes on all mass scales, to neutron stars and supernovae. Currently she is principal investigator for NASA's Nuclear Spectroscopic Telescope Array (NuSTAR). She received her Ph.D. in physics from the University of California, Berkeley, and went to Caltech in 1993 as a Robert A. Millikan Prize Fellow in Experimental Physics.

Lessons from Previous Missions – PM Panel

Panel Host: Ed Weiler

ASTRO-H PM: Cynthia Simmons

CYGNSS SWRI PM: John Scherrer

NICER PM: Sridhar Manthripragada

IRIS Lockheed Martin PM: Gary Kushner

Hitomi (formerly known as ASTRO-H)

Astro-H is a powerful orbiting observatory that was developed as a collaboration between NASA and the Japan Aerospace Exploration Agency (JAXA) for studying extremely energetic processes in the universe. NASA and the JAXA/Institute of Space and Astronautical Science teamed up to develop a high resolution “Soft X-Ray Spectrometer” (SXS) for Astro-H. The NASA contribution to Astro-H was built at the NASA/Goddard Spaceflight Center in collaboration with the University of Wisconsin. The Principal Investigator was Richard Kelley from the NASA Goddard Space Flight Center in Greenbelt, Maryland. Astro-H (now Hitomi) was successfully launched 17 February 2016. A few weeks after launch, a catastrophic on-orbit anomaly on the JAXA spacecraft caused an abrupt and untimely end to the mission. Prior to the anomaly, the SXS instrument successfully gathered data indicating capability to demonstrate unprecedented sensitivity for high-resolution x-ray spectroscopy to provide a wide variety of breakthrough science investigations directly aligned with NASA goals. SXS was designed to test theories of structure formation by measuring the velocity field of x-ray-emitting gas in clusters of galaxies and the energy output from the jets and winds of active galaxies with accurate measurement of metal abundances in the oldest galaxies providing unique information about the origin of the elements. The SXS science objectives were to observe matter in extreme gravitational fields obtaining time-resolved spectra from material approaching the event horizon of a black hole; and determine the chemical abundances and velocity structure in Galactic Type Ia supernova remnants to provide insight into the explosion mechanism. The initial on-orbit SXS data provided sufficient justification for NASA to approve funding for another NASA/JAXA collaboration, XARM/RESOLVE, which is currently in Phase B. The NASA contribution to RESOLVE (SXS rebuild) will be built at NASA/Goddard in collaboration with the University of Wisconsin.

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.

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.

Lessons from Previous Missions – PM Panel, cont.

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.

About the Presenters

Cynthia Simmons, ASTRO-H PM

Cynthia Simmons is the Chief of the Instrument Systems & Technology Division in the Applied Engineering & Technology Directorate and Senior Fellow at Goddard Space Flight Center where she leads ~220 Civil Servants and Contractor engineers and technicians. She has had a diverse career since joining NASA as a support service contractor (2000) where she was Director of Engineering for Edge Space Systems. In 2010, she was recruited into civil service as Goddard Instrument Project Manager, and has earned the Federal Acquisition Program/Project Manager certification. She has led small and large in-house instrument teams for Earth Science and Astrophysics missions including an instrument team comprising 250 members with a budget of ~\$450 million. Throughout her career, Ms. Simmons has worked several instrument and spacecraft projects at Goddard (ST-5, SAM, LRO, GOES O & P, GPM, Messenger, EO-1, SECCHI, TDRSS, Shuttle Hitchhiker and EVA Return-to-Flight), as well as for NTSpace (Japan), classified DoD and DARPA spacecraft programs. She has supported 21 launches for NASA, DoD, and commercial spaceflight missions. Ms. Simmons has been distinguished with several awards and honors for her contributions to spaceflight missions including the NASA Exceptional Achievement Award for the successful programmatic recovery of the NASA Astro-H/SXS Instrument Project, Special Act Award for leadership as ATLAS Instrument Project Manager, and Robert H. Goddard Leadership Honor Award for her leadership of instrument projects. She has a Bachelor of Science from the U.S. Air Force Academy and a Master of Engineering from the University of Maryland, College Park.

John Scherrer, CYGNSS Industry PM

John Scherrer is Program Director at Southwest Research Institute (SwRI) with over 34 years' experience in the design, development, management and delivery of complex instruments for scientific missions, spacecraft and payload management, and mission management. Mr. Scherrer's career at SwRI has encompassed the roles of research engineer, instrument developer and project manager. Mr. Scherrer served as the Deputy Project Manager/Spacecraft Manager for NASA's first MIDEX mission, IMAGE, where he oversaw the development of the SwRI-subcontracted IMAGE spacecraft and directed the IMAGE payload integration onto the spacecraft and launch vehicle. IMAGE launched ahead of schedule and below program cost with no science descopes. He has been IBEX's Project Manager from its Step 1 proposal inception. Under his leadership, IBEX was selected, confirmed and then delivered on time and under budget and launched in 2008. In January 2011, IBEX fully completed its baseline mission and is now in its third extended mission. Following IBEX, Mr. Scherrer served as Project Manager of the HPCA instrument for the MMS mission. Mr. Scherrer served as mission Project Manager of the NASA ESSP's first Earth Venture mission, CYGNSS, where SwRI is responsible for the development, launch and operation of eight microsatellites. CYGNSS launched in December 2016, completed commissioning in March 2017 and has had a very busy 2017 Atlantic hurricane season. Mr. Scherrer now serves as the PUNCH PM. Mr. Scherrer received a B.S. in Mechanical Engineering from Texas A&M University in 1982 and a M.B.A. from the University of Texas at San Antonio in 1986.

About the Presenters, cont.

Sridhar Manthripragada, NICER PM

Sridhar Manthripragada is currently working as the Project Manager for the Neutron Star Interior Composition Explorer (NICER), an Astrophysics mission of opportunity that delivered a science payload to the International Space Station. Sridhar also serves as the Mars Organics Molecular Analyzer (MOMA-MS) Instrument Project Manager in support of the Exo-Mars mission, an international collaboration with the European Space Agency to look for signs of life on Mars. Sridhar began his career at Goddard Space Flight Center in 1990 in the detector systems branch, participating in a broad range of activities including detector development, digital electronics development, and supporting instrument field test campaigns. During this time, Sridhar supported the development and delivery of a flight focal plane assembly for the CIRS/Cassini mission to Saturn. Sridhar has over 17 years of experience developing instruments for flight missions including the LEISA instrument for the New Horizons Mission to Pluto, the Near Infrared Spectrograph (NIRSpec) Instrument for the James Webb Space Telescope, and the Visible and Infrared Spectrometer (OVIRS) instrument for the OSIRIS-REx Mission. Mr. Manthripragada has received awards for Exceptional achievement and leadership. He received a B.S. in Electrical Engineering from the University of Maryland in 1989 and a Masters in Electrical Engineering from George Washington University in 1992.

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.

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Program Office Role – Assistance vs. Oversight

Host: Ed Weiler

NASA Explorers Program Manager: Nick Chrissotimos

NASA Explorers Deputy Program Manager: Greg Frazier

NASA Explorers Business Manager: Christine Hinkle

Nick Chrissotimos, Explorers PM

Mr. Chrissotimos has over 30 years of project/program management experience at the Goddard Space Flight Center (GSFC). He is currently the Associate Director of Flight Projects for Explorers and Heliophysics Projects Division (EHPD) 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. He has also served as the STEREO Project Manager where he led the project to a successful launch in October 2006.

In addition, he has held various program/project management positions on the Earth Explorers Program, ESSP, EOS Aura, and the TDRS projects.

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. He has received numerous individual and group achievement awards throughout his career, and he has been awarded the NASA Medal for Outstanding Leadership, and the Presidential Meritorious Rank 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.

Program Office Role – Assistance vs. Oversight, cont.

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, supporting Astro-H, NICER, ICON, TESS, GOLD, 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.

Dealing with Resource Challenges on Explorer Missions

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.

Kepler

The *Kepler* Mission was designed to perform a census of 100,000 dwarf stars to detect and characterize the planets in these systems. In particular, the mission would be capable of detecting terrestrial planets (0.8-2.2 R_E) in or near the habitable zone (HZ), where liquid water might exist. To perform this task, the mission included a 0.9 meter aperture high-precision photometer. Through continuous monitoring of each target, the mission was able to detect minute changes in the brightness of the target, revealing orbiting planets through the periodic dimming that results from a planet transiting the stellar disk, as viewed from the spacecraft.

With its final catalog, the *Kepler* mission has identified 4,034 planet candidates in addition to thousands of eclipsing binaries. Through the measurements of intrinsic stellar oscillations *Kepler* has enabled improved determinations of stellar radii, ages and internal dynamics for thousands of stars.

Launched from NASA's Kennedy Space Center on March 7, 2009, *Kepler* began science operations on May 12 2009 and continued operating until May 13 2013, when the second of four reaction wheels failed, preventing the continued observation of the *Kepler* field. Since May 2014, the spacecraft has been collecting photometric measurements of targets near the ecliptic in a dubbed "K2" using the remaining two reaction wheels and balanced against solar pressure. Fuel is expected to run out some time next year.

About the Presenters

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 BSEE degree from Virginia Tech, an MSEE degree 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.

Charlie Sobeck, Kepler/K2 Project Systems Engineer and Deputy Project Manager

Charlie Sobeck currently serves as the Project Systems Engineer (PSE) for the continuing K2 mission using the repurposed Kepler spacecraft to observe targets near the ecliptic. He also serves as Deputy Project Manager for the mission. In this role, Mr. Sobeck provides oversight of mission activities to ensure all mission elements are working properly together. In particular, he is responsible for identifying and resolving mission anomalies.

Mr. Sobeck previously served as the Kepler/K2 Project Manager from 2014 through June 2017, shepherding in the K2 mission. Mr. Sobeck has been a member of the Kepler management Team since the beginning of its concept study in 2001, with specific duties that included the conceptual design of the ground segment, the photometer development, and contracting officer's representative for all mission contracts from Ames Research Center. Mr. Sobeck has worked closely with all members of the mission team, and is now working to ensure a graceful end to the mission and the retention of all appropriate mission records.

With a bachelor's degree in electrical engineering from UC Berkeley, Mr. Sobeck worked in several capacities on the Galileo mission to Jupiter from 1980 through 1996, ending up as the Galileo Probe Engineering Manager. He has worked on several proposals, and on the development of several other missions, including the Space Station Biological Research Project, the Aeroassist Flight Experiment and an infrared spectrometer for the SOFIA observatory. Mr. Sobeck has twice won the NASA Outstanding Leadership Medal.

SOMA Analysis of Previous PI Missions Performance

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.

About the Presenter

Carlos Liceaga, Acquisition Manager (AM), SOMA, NASA Langley Research Center

Carlos Liceaga is currently the backup Astrophysics Explorer AM. He is preparing for the Technical, Management, and Cost (TMC) evaluation of the upcoming Step 2 Concept Study Reports (CSRs). This a continuation of his role on the Step 1 Proposal Evaluation as the Missions of Opportunity AM. Dr. Liceaga has been a member of SOMA since 2001. He has led 24 TMC evaluations of mission and instrument proposals, CSRs, and extended Phase A reports. Dr. Liceaga finalized the first Stand Alone Missions of Opportunity Notice (SALMON) Announcement of Opportunity.

Dr. Liceaga's 38-year career at NASA has encompassed the roles of research engineer, software developer, project manager, mission manager, and review manager.

As the review manager for the Radiation Dosimetry Experiment (RaD-X) balloon project he managed all of the life cycle reviews. As the project manager for the Color Printer Subsystem (CPS) he defined the requirements for operation aboard the International Space Station (ISS) and Space Shuttle. Conducted a market survey and selected the Epson 800 as a basis. Negotiated a Space Act Agreement with Epson for their collaboration in modifications. Developed a schedule and budget, and led preliminary and critical design reviews. Tested the modifications on the KC-135 reduced-gravity aircraft and the Space Shuttle. Assisted in preparing and delivering astronaut training. The CPS is now in operation aboard the ISS and was in operation aboard each Space Shuttle.

Dr. Liceaga received a B.S. in Electrical Engineering from the University of Puerto Rico at Mayagüez in 1981, an M.S. in Computer Science from the College of William and Mary in 1984, and a Ph.D. in Electrical and Computer Engineering from Carnegie Mellon University in 1992. He is Professional Engineer registered in Virginia.