



# The ISS National Laboratory – Background and Status

## Briefing to NASA Advisory Council/HEO Committee/ Research Subcommittee

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September 12, 2014

## **A brief summary of:**

- Major legislative direction relevant to the formation of the ISS National Laboratory management entity
- Some of the recurring ideas that helped shape the ISS National Laboratory
- Where CASIS is today

# ISS National Laboratory timeline

2005 NASA Authorization designates US segment of the ISS a national laboratory

2008 Authorization Act provides guidance on National Lab management

2010 Authorization Act directs NASA to establish a management entity to manage the activities of the ISS national laboratory, allocates 50% of “United States research capacity” to ISS national laboratory-managed experiments.

2011 – Center for the Advancement of Science in Space selected as the ISS management entity

# 2005 NASA Authorization

- **Designates the US assets of the ISS a national laboratory**
- **Directs NASA to seek increased utilization by non-NASA entities**

## **SEC. 507. NATIONAL LABORATORY DESIGNATION.**

(a) DESIGNATION.—To further the policy described in section 501(a), the United States segment of the ISS is hereby designated a national laboratory.

(b) MANAGEMENT.—

(1) PARTNERSHIPS.—The Administrator shall seek to increase the utilization of the ISS by other Federal entities and the private sector through partnerships, cost-sharing agreements, and other arrangements that would supplement NASA funding of the ISS.

(2) CONTRACTING.—The Administrator may enter into a contract with a nongovernmental entity to operate the ISS national laboratory, subject to all applicable Federal laws and regulations.

(c) PLAN.—Not later than 1 year after the date of enactment of this Act, the Administrator shall transmit to the Committee on Science of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a plan describing how the national laboratory will be operated. At a minimum, the plan shall describe—

(1) any changes in the research plan transmitted under section 506(3) and any other changes in the operation of the ISS resulting from the designation;

(2) any ground-based NASA operations or buildings that will be considered part of the national laboratory;

(3) the management structure for the laboratory, including the rationale for contracting or not contracting with a non- governmental entity to operate the ISS national laboratory;

(4) the workforce that will be considered employees of the national laboratory;

(5) how NASA will seek the participation of other parties described in subsection (b)(1); and

(6) a schedule for implementing any changes in ISS operations, utilization, or management described in the plan.

(d) UNITED STATES SEGMENT DEFINED.—In this section the term “United States segment of the ISS” means those elements of the ISS manufactured—

(1) by the United States; or

(2) for the United States by other nations in exchange for funds or launch services.

# 2008 NASA Authorization

- **Directs NASA to develop a plan for managing research aboard the ISS**

## **SEC. 601. PLAN TO SUPPORT OPERATION AND UTILIZATION OF THE ISS BEYOND FISCAL YEAR 2015**

[...]

(B) ISS NATIONAL LABORATORY RESEARCH MANAGEMENT PLAN.—As part of the plan required in paragraph (1), the Administrator shall develop a Research Management Plan for the International Space Station. Such Plan shall include a process for selecting and prioritizing research activities (including fundamental, applied, commercial, and other research) for flight on the International Space Station. Such Plan shall be used to prioritize resources such as crew time, racks and equipment, and United States access to international research facilities and equipment. Such Plan shall also identify the organization to be responsible for managing United States research on the International Space Station, including a description of the relationship of the management institution with NASA (e.g., internal NASA office, contract, cooperative agreement, or grant), the estimated length of time for the arrangement, and the budget required to support the management institution. Such Plan shall be developed in consultation with other Federal agencies, academia, industry, and other relevant stakeholders. The Administrator may request the support of the National Academy of Sciences or other appropriate independent entity, including an external consultant, in developing the Plan.

(C) ESTABLISHMENT OF PROCESS FOR ACCESS TO NATIONAL LABORATORY.—As part of the plan required in paragraph (1), the Administrator shall—

- (i) establish a process by which to support International Space Station National Laboratory users in identifying their requirements for transportation of research supplies to and from the International Space Station, and for communicating those requirements to NASA and International Space Station transportation services providers; and
- (ii) develop an estimate of the transportation Plan requirements needed to support users of the International Space Station National Laboratory and develop a plan for satisfying those requirements by dedicating a portion of volume on NASA supply missions to the International Space Station.

# 2010 NASA Authorization

- **Directs NASA to establish a cooperative agreement with a non-profit organization to manage non-NASA scientific utilization of the ISS**

## **SEC. 504. MANAGEMENT OF THE ISS NATIONAL LABORATORY**

(a) COOPERATIVE AGREEMENT WITH NOT-FOR PROFIT ENTITY FOR MANAGEMENT OF NATIONAL LABORATORY.—

(1) IN GENERAL.—The Administrator shall provide initial financial assistance and enter into a cooperative agreement with an appropriate organization that is exempt from taxation under section 501(c)(3) of the Internal Revenue Code of 1986 to manage the activities of the ISS national laboratory in accordance with this section.

(2) QUALIFICATIONS.—The organization with which the Administrator enters into the cooperative agreement shall develop the capabilities to implement research and development projects utilizing the ISS national laboratory and to otherwise manage the activities of the ISS national laboratory.

(3) PROHIBITION ON OTHER ACTIVITIES.—The cooperative agreement shall require the organization entering into the agreement to engage exclusively in activities relating to the management of the ISS national laboratory and activities that promote its long term research and development mission as required by this section, without any other organizational objectives or responsibilities on behalf of the organization or any parent organization or other entity.

(b) NASA LIAISON.—

(1) DESIGNATION.—The Administrator shall designate an official or employee of the Space Operations Mission Directorate of NASA to act as liaison between NASA and the organization with which the Administrator enters into a cooperative agreement under subsection (a) with regard to the management of the ISS national laboratory.

(2) CONSULTATION WITH LIAISON.—The cooperative agreement shall require the organization entering into the agreement to carry out its responsibilities under the agreement in cooperation and consultation with the official or employee designated under paragraph (1).

(c) PLANNING AND COORDINATION OF ISS NATIONAL LABORATORY

RESEARCH ACTIVITIES.—The Administrator shall provide initial financial assistance to the organization with which the Administrator enters into a cooperative agreement under subsection (a), in order for the organization to initiate the following:

(1) Planning and coordination of the ISS national laboratory research activities.

(2) Development and implementation of guidelines, selection criteria, and flight support requirements for non-NASA scientific utilization of ISS research capabilities and facilities available in United States-owned modules of the ISS or in partner-owned facilities of the ISS allocated to United States utilization by international agreement.

(3) Interaction with and integration of the International Space Station National Laboratory Advisory Committee established under section 602 of the National Aeronautics and Space Administration Authorization Act of 2008 (42 U.S.C. 17752) with the governance of the organization, and review recommendations provided by that Committee regarding agreements with non-NASA departments and agencies of the United States Government, academic institutions and consortia, and commercial entities leading to the utilization of the ISS national laboratory facilities.

**PL 111-267 SEC. 504. MANAGEMENT OF THE ISS NATIONAL LABORATORY – CONTINUED**

(4) Coordination of transportation requirements in support of the ISS national laboratory research and development objectives, including provision for delivery of instruments, logistics support, and related experiment materials, and provision for return to Earth of collected samples, materials, and scientific instruments in need of replacement or upgrade.

(5) Cooperation with NASA, other departments and agencies of the United States Government, the States, and commercial entities in ensuring the enhancement and sustained operations of non-exploration-related research payload ground support facilities for the ISS, including the Space Life Sciences Laboratory, the Space Station Processing Facility and Payload Operations Integration Center.

(6) Development and implementation of scientific outreach and education activities designed to ensure effective utilization of ISS research capabilities including the conduct of scientific assemblies, conferences, and other fora for the presentation of research findings, methods, and mechanisms for the dissemination of non-restricted research findings and the development of educational programs, course supplements, interaction with educational programs at all grade levels, including student- focused research opportunities for conduct of research in the ISS national laboratory facilities.

(7) Such other matters relating to the utilization of the ISS national laboratory facilities for research and development as the Administrator may consider appropriate.

**d) RESEARCH CAPACITY ALLOCATION AND INTEGRATION OF RESEARCH PAYLOADS.—**

(1) **ALLOCATION OF ISS RESEARCH CAPACITY.—**As soon as practicable after the date of the enactment of this Act, but not later than October 1, 2011, ISS national laboratory managed experiments shall be guaranteed access to, and utilization of, not less than 50 percent of the United States research capacity allocation, including power, cold stowage, and requisite crew time onboard the ISS through September 30, 2020. Access to the ISS research capacity includes provision for the adequate upmass and downmass capabilities to utilize the ISS research capacity, as available. The Administrator may allocate additional capacity to the ISS national laboratory should such capacity be in excess of NASA research requirements.

(2) **ADDITIONAL RESEARCH CAPABILITIES.—**If any NASA research plan is determined to require research capacity onboard the ISS beyond the percentage allocated under paragraph (1), such research plan shall be prepared in the form of a requested research opportunity to be submitted to the process established under this section for the consideration of proposed research within the capacity allocated to the ISS national laboratory. A proposal for such a research plan may include the establishment of partnerships with non-NASA institutions eligible to propose research to be conducted within the ISS national laboratory capacity. Until September 30, 2020, the official or employee designated under subsection (b) may grant an exception to this requirement in the case of a proposed experiment considered essential for purposes of preparing for exploration beyond low-Earth orbit, as determined by joint agreement between the organization with which the Administrator enters into a cooperative agreement under subsection (a) and the official or employee designated under subsection (b).

(3) **RESEARCH PRIORITIES AND ENHANCED CAPACITY.—**The organization with which the Administrator enters into the cooperative agreement shall consider recommendations of the National Academies Decadal Survey on Biological and Physical Sciences in Space in establishing research priorities and in developing proposed enhancements of research capacity and opportunities for the ISS national laboratory.

(4) **RESPONSIBILITY FOR RESEARCH PAYLOAD.—**NASA shall retain its roles and responsibilities in providing research payload physical, analytical, and operations integration during pre- flight, post-flight, transportation, and orbital phases essential to ensure safe and effective flight readiness and vehicle integration of research activities approved and prioritized by the organization with which the Administrator enters into the cooperative agreement and the official or employee designated under subsection (b).

# Background – Two recurring themes in space policy

## Institutes

NASA Technology Research Institutes, 1993

Science Institute Initiative, 1995

Station and Shuttle Utilization Reinvention, 2003

ISS National Laboratory Management Entity CAN, 2011

## Space Commercialization

Centers for the Commercial Development of Space, 1985-2004

Industrial Space Facility/Commercially Developed Space Facility, 1988

Commercial Crew and Cargo, 2005

Space Commercialization RFI, 2014

# CASIS Highlights

Six Requests for Proposals released since June 2012

First RFP selections launched on SpX-3, April 2014

Project Good Earth – Earth Observations partnership with the UN

Research ecosystem development approach underway in Boston, Houston, Denver, San Diego, Santa Clara Valley. Working with MassChallenge, Texas Emerging Technology Fund, Angelus Fund

CASIS is stimulating interest in industrial sectors without a heritage of space research, like textiles and petroleum

# CASIS Board

The first seven members of current CASIS Board were appointed in November, 2012. Five additional members were appointed in January, 2014. Dr. France Cordova, President Emerita of Purdue University, served as the chair of the Board from December, 2012, until she resigned in 2014 upon her confirmation as the Director of the National Science Foundation. The current interim chair is Dr. Lewis Duncan, President of Rollins College. Under Florida state law, the Board is self-perpetuating – the Board is responsible for selecting its successors.

Lt. General James A. Abrahamson (USAF Retired) served as a fighter pilot in Vietnam and later as an Air Force Test Pilot. He was selected to be an Astronaut on the Air Force Manned Orbiting Laboratory program. He directed several Air Force programs, including the development, international production, and deployment of the F-16. He served as NASA Associate Administrator for Space Flight, running the early space shuttle program, and was the first Director for the Strategic Defense Initiative. Following his retirement from the Air Force, Lt. General Abrahamson has held a variety of positions within the aerospace and defense industries. These have included President of Hughes Aircraft Transportation Sector, Chairman of the Board of Oracle Corporation and Chairman of GeoEye Corporation. (appointed 2014)

Dr. Bess Dawson-Hughes, M.D., serves as a Professor of Medicine at Tufts University, and as the Director of the Bone Metabolism Laboratory at Tufts. She is a member of the national medical honor society, Alpha Omega Alpha. She has served on the Advisory Council of the National Institute of Arthritis, Musculoskeletal, and Skin Diseases, was President of the National Osteoporosis Foundation, and is currently Vice President of the International Osteoporosis Foundation. (appointed 2012)

Dr. Lewis Duncan currently serves as the President of Rollins College. Previous positions include Dean of the Thayer School of Engineering at Dartmouth University and Head of Earth and Space Sciences at Los Alamos National Laboratory. Dr. Duncan is recognized for his work in space plasma physics and radar studies of the upper atmosphere. He is the interim Chair of the CASIS Board. (appointed 2012)

# CASIS Board

Mr. Joseph Formichelli began his career at IBM Corporation, where he held positions including Vice President of Worldwide Systems Operations, and Vice President/General Manager of the ThinkPad line of notebooks. After his departure from IBM, Formichelli held positions within companies including Toshiba, Gateway and Radio Shack. He currently serves as Director/Supervisor, Celsia Technologies Taiwan, a US technology start-up company focused on next-generation cooling solutions for microelectronics and he is also an adjunct professor at California State University – Fullerton. (appointed 2014)

Dr. Leroy M. Hood, M.D., is a pioneer in the systems approach to biology and medicine. His professional career began at Caltech, where he and his colleagues developed the DNA sequencer and synthesizer and protein synthesizer and sequencer. He has played a role in founding over 14 companies, including Amgen and Applied Biosystems. He is a member of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. In 2012 he was awarded the National Medal of Science. (appointed 2012)

Dr. Ioannis (Yannis) Miaoulis has served as the President and Director, Museum of Science, Boston since 2003. The Museum of Science introduces about 1.5 million visitors each year to science, technology, engineering and math (STEM) concepts and programs and has been a nationally ranked museum by multiple publications over the years. Prior to his position with the Museum of Science, Miaoulis served at Tufts University as its Dean of the School of Engineering, Associate Provost and Interim Dean of the University's Graduate School of Arts and Sciences. (appointed 2014)

Dr. Andrei Ruckenstein is a professor of physics at Boston University. He has held faculty positions at UC San Diego and Rutgers University, and has served as President of the Aspen Center for Physics. He was the co-founder of the Aspen Science Center. (appointed 2012)

Philip Schein, M.D., has held several positions within the field of medical oncology, including Head of the Clinical Pharmacology section of the National Cancer Institute, Scientific Director of the Lombardi Cancer Research Center, and was the founder and CEO of US Bioscience, a publicly traded biotechnology company focused on cancer and HIV. Recent positions include President of the American Society of Clinical Oncology and Chair of the Food and Drug Administration's Oncological Drugs Advisory Committee. Currently, Dr. Schein is the President of the Schein Group, which provides consultative services in the areas of product development and regulatory submission, and he also serves as a visiting professor in Cancer Pharmacology at the University of Oxford. (appointed 2014)

# CASIS Board

Ms. Carolyn Ticknor is the former President of Hewlett-Packard Imaging & Printing. Prior to that, she was the President of LaserJets at Hewlett-Packard. Since then, she has worked extensively as a consultant to various inventors and entrepreneurs, while simultaneously serving on several public and private boards of directors. (appointed 2014)

Dr. Gordana Vunjak-Novakovic serves as the Mikati Foundation Professor of Biomedical Engineering and Medical Sciences at Columbia University, and is the director of the Laboratory for Stem Cells and Tissue Engineering at Columbia. She is a fellow of the American Institute for Medical and Biological Engineering and of the Biomedical Engineering Society, and a member of the National Academy of Engineering. (appointed 2012)

Dr. Howard Zucker serves as Professor of Clinical Anesthesiology at Albert Einstein College of Medicine, as Adjunct Professor of Law at Georgetown University, and as a senior advisor in the Division of Global Health and Human Rights at Massachusetts General Hospital. He has served as Assistant Director-General of the World Health Organization, and U.S. Deputy Assistant Secretary of Health focused on science, technology, and medicine. (appointed 2012)

