National Aeronautics and Space Administration
Washington, DC

NASA ADVISORY COUNCIL

Human Exploration and Operations Committee

Research Subcommittee

September 12, 2014

NASA Headquarters
Washington, DC

MEETING MINUTES

David Longnecker, Chair

Bradley Carpenter, Executive Secretary

NASA ADVISORY COUNCIL
Human Exploration and Operations Committee
Research Subcommittee
NASA Headquarters
Washington, DC
September 12, 2014

MEETING MINUTES
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Meeting Minutes Prepared By
Jim Wilhelm, Consultant
P B Frankel, LLC

NASA ADVISORY COUNCIL
Human Exploration and Operations Committee
Research Subcommittee
NASA Headquarters
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PUBLIC MEETING
September 12, 2014

Call to Order

Dr. Bradley Carpenter, Executive Secretary for the NASA Advisory Council (NAC) Human Exploration and Operations (HEO) Committee's Research Subcommittee, called the Subcommittee to order at 9:00 a.m. He welcomed those in attendance and those on line to the meeting.

Opening Remarks

Dr. Carpenter introduced Dr. David E. Longnecker, HEO Research Subcommittee Chair, who welcomed everyone to the meeting. Dr. Longnecker reviewed the meeting agenda and described how the Subcommittee is focused on research activity conducted on the International Space Station (ISS) and in the national laboratories, as well as other research engaged in by the HEO Mission Directorate's (HEOMD's) Space Life and Physical Sciences Research and Applications Division (SLPSRA). He stated that there would be an opportunity for public comments from 3:00 p.m. to 3:30 p.m., before the Subcommittee conducted its deliberations at the end of the day. He thanked everyone for the work being done and pointed out that a finding had been adopted by the NAC as a result of the Subcommittee's reviewing and commenting on Omics work. The Subcommittee had generated a finding that was approved by its parent HEO Committee with minor modifications and then adopted by the NAC. Dr. Longnecker expressed how this was an important affirmation of the Subcommittee's work. He noted that the NAC is very selective in what it adopts and that the finding was a good endorsement of the Subcommittee's thinking.

NASA Status, Omics and Open Science Status

Dr. Longnecker introduced Dr. Marshall Porterfield, SLPSRA Director, who thanked the Subcommittee members for attending the meeting, for helping to understand the direction of research, and for providing advice. He briefed the Subcommittee on the open sciences initiatives. He began by describing the physical sciences highlights.

The Cold Atom Laboratory (CAL) is in the hardware development stage and is scheduled for launch and installation on the ISS in 2016. The CAL will use the ISS's unique microgravity environment to observe quantum phenomena that would otherwise be undetectable on Earth. It will also serve to develop technologies using laser-cooled

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atoms for future quantum sensors. The laboratory will be available for use by multiple scientific investigators and is designed to be maintained on orbit. The CAL will enable research on how gases are handled using lasers to cool them in microgravity. This enables temperatures 100 times colder than is possible in Earth's gravity. The benefits of this research could be seen in supercomputing using individual atoms per bit as well as in nanotechnology and nanomanufacturing. This research will be able to achieve several orders of magnitude increase in resolution for $60 million (M).

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The Materials Laboratory (Lab) is operating under a new management strategy. A workshop on the Materials Lab was completed recently. The investigation paradigm has been changed to adopt an open science philosophy, with multiple investigator opportunities from both commercial and government agency entities. This has enabled the identification of shared interests and has led to creating new materials in a microgravity environment. A slide was presented to show the diversity of the workshop attendees' organizations. It was attended by academic and commercial entities, including the Department of Defense (DOD), ISS international partners, and representatives from the NASA Institute of Standards and Technology (NIST).

The Cool Flames Experiment (CFE) is now being conducted on the ISS to investigate the structure and dynamics of the cool flame mode of burning during the second stage of a non-premixed droplet flame. Understanding this burning regime can lead to decreased emissions and increased efficiency in advanced low temperature internal combustion engines as well as a better understanding of fire safety in space.

Dr. Stein Sture discussed NIST's cooperation in developing standards for thermal properties when designing new materials.

Dr. Porterfield discussed the goals of the Materials Genome initiative and commented that there is often a ten- to fifteen-year lag until the results from this type of research reach "society" or benefit the public directly. He introduced Dr. Francis Chiaramonte, SLPSRA Combustion, Fluids, Materials, and Biophysics Science Lead, who discussed the cool flames phenomena that is being researched. Dr. Chiaramonte explained that to better study the phenomenon, the cameras are being upgraded to enable better investigation of the "jelly fish flame," where soot creates a flame shape change.

Dr. Porterfield described recent space biology highlights, which included NASA Research Announcement (NRA) selections, the upcoming rodent research (first rodents on a SpaceX Dragon flight), and NASA's Veg-01 experiment, nicknamed "Veggie," which was first brought to the ISS during SpaceX's last resupply mission in April. He presented a NRA timeline slide listing research areas and noted the considerable amount of research in mammalian systems and plant microbial growth. Responses to the proposals are evaluated through a peer review scoring process. In the last call, 92 proposals were received and 49 had a score of 70 or better, which is considered passing. There were many new proposals for space biology, and 65 percent went to new investigators.

He explained that one difficulty with conducting the rodent research is that there is no way to bring the rodents back to Earth for further study. This demonstrates an example of the level of support needed to make these experiments happen. He showed a slide of lettuce growing on the ISS and explained that fine-tuning the lighting systems is an ongoing effort. The next demonstration will be a flowering plant.

Dr. Jeffrey Hoffman asked whether there was any bioreactors research. Dr. Porterfield stated that research in that field had been cancelled and has not been re-established. Regarding tissue growth and tissue engineering, there are logistical difficulties associated with SpaceX, along with the problem of getting immediate access to the samples when they are returned to Earth. Preservation of samples in orbit is also an issue. Dr. Hoffman noted that the Subcommittee should remain cognizant of ISS research limitations and look for solutions to those limits.

Dr. Porterfield discussed the Human Research Program (HRP), the HRP Risk Reduction Model, and the HRP schedule. The Visual Impairment and Intracranial Pressure (VIIP) phenomenon effort is ongoing. The project examined the effect of long-term exposure to microgravity on the structure of the eye along with change in distance and near vision of crewmembers before and after they returned to Earth. Continued research is needed on the ISS.

The Multilateral Human Research Panel for Exploration (MHRPE) is preparing to manage a one-year mission aboard the ISS. This mission involves two crew members, Astronaut Scott Kelly and a Russian, making this a multi-lateral effort. The U.S. crew member offers a unique study opportunity because he has a twin brother, retired Astronaut Mark Kelly. The one-year mission follow-on plans are evolving with ongoing work in operations implementation strategy and with ground studies focusing on psychological and other factors.

Dr. Porterfield described the Human Exploration Research Analog/Institute for Biomedical Problems (HERA/IBMP) chamber campaigns. Some one-week missions that have looked at crew isolation have been completed. To conduct further research, other analog requirements have been identified and locations, such as the South Pole Station and flights on Novespace, are being considered. The HRP Translational Research Institute (HTRI) plan was discussed. There are cooperation agreements in place to increase the throughput, and the focus has changed to emphasize cutting edge research into new opportunities.

Dr. Porterfield discussed the geneLAB status. The field has moved towards an open science NRA and away from traditional experiments. The value of open science for NASA missions is that it opens the field to new communities of researchers. In some areas, there are innovation awards. The National Institutes of Health (NIH) uses the same methodology and relates the studies back to human subject studies using geneLAB informatics. This can lead to commercialization opportunities. He explained that it is not just discovery in space that is important, but the translation of that discovery

into a product, e.g., liquid metal. Bringing in non-traditional space research communities, such as high school science projects, also adds to outreach efforts.

Dr. Hoffman asked who is responsible for the research if there is no Principal Investigator (PI). Dr. Porterfield stated that it is handled by a team with one person serving as the team chairman. He expounded on what the open science philosophy will provide for NASA. With a systems biology approach and high content screening, a large number of people should be able to look at the data. The concept of operations involves getting the data back to Earth to process, model, and validate the experiments. The geneLAB reiterates the benefits of open science and has a PI-multiplier effect. GeneLAB platform components include the bioinformatic system and the research initiatives. GeneLAB users include the Center for the Advancement of Science in Space (CASIS) for data mining. Diverse opinions and ideas from external sources such as the Department of Energy (DOE), NIH, and CASIS are greatly sought after.

In response to a question from Dr. Longnecker about the integration process, Dr. Porterfield explained that space biology and human sciences very frequently overlap. Integration with be accomplished through ongoing processes and coordination between HRP and Science. The breadth of the research is exciting, yet daunting. He noted that later in the afternoon the science leads would discuss how it is organized at NASA.

Dr. Sture commented that the time limitation on experiment return is an important constraint and asked whether the Dream Chaser would be able to land. Dr. Carpenter responded affirmatively. In response to a question from Dr. Longnecker on the expansion of PIs, Dr. Porterfield stated that there has been a renewed outreach effort, in particular for the geneLAB experiments. The large response from university students and postdoctoral researchers was aided by exposure and discussions at numerous symposiums such as the American Physiological Symposium.

Dr. Hoffman noted the importance of having access to the data from experiments in space right away as opposed to having to wait for years. In response to a question from Dr. Kathryn Thornton, Dr. Porterfield replied that SLPSRA would be receptive to suggestions for future studies.

Dr. Longnecker commented on geneLAB analysis. He explained that it is critical to get the information out to others, create a portal, and make the information available. Dr. Terri Lomax agreed and noted that it is important that the data be made available in standardized software that researchers already possess. Dr. Thornton added that NASA's specific needs should not be disregarded. Dr. Sture observed that there is a need for better software systems search capabilities, that the algorithms are lacking, and that even supercomputers are crashing while searching through the data. NASA should not have to develop the analysis tools, search tools, and algorithms to use the data. NIH and DOE have already been engaged in this area.

Dr. Longnecker thanked Dr. Porterfield for his presentation.

ISS National Laboratory Overview

Dr. Longnecker introduced Dr. Carpenter who, in addition to being the Subcommittee's Executive Secretary, also serves as the CASIS liaison. Dr. Carpenter reviewed the major legislative directions relevant to shaping the ISS National Lab and CASIS. The 2005 NASA Authorization designated the U.S. assets of the ISS as a National Lab and directed NASA to seek increased utilization by non-NASA entities. The 2008 NASA Authorization directed NASA to develop a plan for managing research aboard the ISS. The 2010 NASA Authorization directed NASA to establish a cooperative agreement with a non-profit organization to manage non-NASA scientific utilization of he ISS. The 2010 Authorization allocated 50 percent of U.S. research capacity to the ISS National Lab. In 2011, CASIS was selected as the ISS management entity.

Dr. Carpenter described two recurring themes in space policy. One theme has been establishing research institutes. The intention was to broaden the economic impact of NASA to move research expertise from the Agency to institutes. In 2003, an ISS and Space Shuttle utilization effort was initiated, which was intended to operate the ISS like the Hubble Space Telescope to enhance the ISS's productivity. This initiative almost reached the Request for Proposal (RFP) phase; however, the Columbia accident intervened. The other theme has been commercial development. At one point, there were 16 centers for the commercial development of space, based mostly at universities. NASA asked subject matter experts to lead the research; however, the experts were not business-oriented like CASIS has become and is intended to be. Currently, there are the Commercial Crew and Commercial Cargo efforts, success with SpaceX and Orbital Sciences, and the competitors for Commercial Crew Transport. The next chapter in these efforts is space commercialization: providing a market for crew and cargo. As part of that effort, CASIS explores ways to expand funding for space exploration through external sources and venture capital.

Dr. Hoffman commented on the fact that only $3M of the $15M from NASA is spent by CASIS on research. Dr. Carpenter explained that CASIS's focus is on business development and in using the funds from NASA as seed money to generate additional funding.

Dr. Carpenter described CASIS highlights. Six RFPs have been released since June 2012. The first RFP selections were launched on SpaceX-3 in April 2014. Project Good Earth involves training and research on Earth observations in partnership with the United Nations. CASIS will provide technical capabilities and assist with marketing. The CASIS business development team is thinking about ecosystems development and is providing funding to small companies to develop concepts that can turn into viable ISS-use activities. CASIS is stimulating interest in industrial sectors that do not have a heritage of space research, such as textiles and petroleum, and is exposing those industries to the possibilities of ISS research, particularly microgravity research.

Dr. Carpenter described the membership of the CASIS board to give the Subcommittee an idea of the breadth and scope of the board's membership.

Dr. Longnecker thanked Dr. Carpenter for his presentation.

International Cooperation in Space Research

Dr. Longnecker introduced Dr. Steve Davison, SLPSRA HRP Program Executive. Dr. Davison described the Office of International and Interagency Relations (OIIR). It oversees all of the coordination between NASA and other countries' space agencies. He described how international cooperation and interaction has been a cornerstone of NASA since its inception in 1958. NASA has basic guidelines that are followed regarding international cooperation. Generally, efforts are handled government-to-government due to the scale and expense. Each partner funds its respective contributions. There is no exchange of funds. Cooperation must be consistent with U.S. foreign policy objectives. Projects must have scientific and technical merit and demonstrate a specific benefit to NASA. No International Traffic in Arms Regulations (ITAR) issues can be involved. The engagement and cooperation mechanisms are through the use of bilateral and multilateral working groups and nonbinding multilateral expert forums. These include cooperative activities involving education and outreach, conferences, and workshops. International research coordination is particularly beneficial because of the advantages with regards to funding issues. It leverages funding and capabilities, allowing more researchers to conduct experiments at multiple facilities. The agreements are coordinated usually at the bilateral level, during and after the bilateral and multilateral working groups that meet once or twice a year.

The International Space Life Sciences Working Group (ISLSWG) is unique in that it sponsors workshops to share information with the broader community. The workshops occur one to two times a year. The topics rotate at roughly ten-year intervals. This allows for the members to examine what was accomplished in that time frame, what direction should be taken in the future, and what important questions should be answered. There are associated international life science research announcements that carry reviews of the research conducted and the member countries that are involved. Cooperation within the ISLSWG is allowed without further high-level agreements between cooperating agencies and countries.

Another group called the International Microgravity Strategic Planning Group (IMSPG) coordinates the development and use of ISS research among microgravity research programs. The priority areas for international coordination include all the disciplines within the physical sciences.

Dr. Davison introduced Dr. Dave Tomko, SLPSRA Space Biology Science Lead, to discuss the ISLSWG in further detail. ISLSWG was established in 1991. The effort began initially on how to conduct logistics in a coordinated fashion for the ISS. This group has met twice a year since 1991. The initial meetings dealt with each partner negotiating who owned what assets and how to manage and share resources, including

astronaut time. One unique feature of the ISLSWG is the International Life Sciences Research Announcements (ILSRA). There have been seven ILSRAs since 1996. The ILSRA is used for planning, reviewing, and processing what each agency contributes on the ISS. There are a series of international workshops to share information with the broader community. The workshops include peer review panels and are held once or twice yearly. Each ILSRA shares a document that describes all the hardware in place for specific experiments, such as the fruit fly laboratory, and enables the sharing of equipment and capabilities.

Dr. Tomko reviewed slides summarizing the agencies and the proposals that have been reviewed and selected. This information is on a public website. The partners disclose their information and equipment needs so that agreements can be negotiated at the meetings. Currently, 204 proposals are being considered for the next ILSRA meeting.

Dr. Longnecker and Dr. Thornton commented on how other countries had filled the gap when funding from the U.S. was reduced, particularly the European Space Agency's (ESA's) assistance.

Dr. Tomko presented a chart that showed all the completed and proposed workshops, along with the host sites and dates. The Agency-sponsored investigations cover the entire range of life sciences. The outcomes of the experiments usually result in a publication such as the Plant Biology in Space booklet that Mr. Tomko distributed to the Subcommittee members. The next workshop is planned for space microbiology at the annual American Society of Microbiology meeting, May 2015.

Dr. Davison described the Canadian Space Agency (CSA) cardiovascular function experiments to study bone loss and fluid shift and experiments involving muscle loss using the muscle physiology facility. He explained that for ISS investigations, HRP provides overall integration and coordination for all ISS research requiring crewmembers. The HRP shares hardware with the international partners. This group oversees coordinating and obtaining crew consents, since the U.S. leads the medical programs research on the ISS. Crew coordination scheduling is critical due to the busy training schedules of the astronauts. Dr. Davison noted that the ISLSWG also coordinates the analog capabilities on the ground. There is particular interest in bedrest studies, and the U.S. is partnering with the German Aerospace Center (DLR) to use its EnviHab, along with other facilities such as South Pole Station and Novespace. ISLSWG is critical for coordinating and facilitating these studies. A health initiative called "train like an astronaut" has received White House support and is another successful education outreach conducted by the ISLSWG.

A key working group is the US-Russia Executive Space Science Joint Working Group (URESSJWG). Dr. Davison explained that there is a long history, going back to 1971, of working with the Russians in space. The relationship has evolved across four major programs: Apollo/Soyuz, the Shuttle/Mir program, longer duration Shuttle missions, and the ISS. In November 2006, the group was modified into three joint subgroups to

coordinate and develop strategies for cooperation in space. The subgroups meet once a year.

Dr. Tomko discussed U.S./Russia space biology cooperation. There have been 10 to 12 missions studying a variety of specimens. There has been consistent collaboration with the Russians on space biology research. The Russians have flown rodents and rhesus monkeys on some of those missions. The last mission was the Bion-M1 mission conducted in April 2013. A considerable amount of cooperative rodent research has been conducted jointly. In the U.S. science program, mouse tissue has been used to meet primary science goals. Post-flight sample collection and video analysis complements those efforts. Some of the tissues are precursor tissues used for the geneLAB.

Dr. Davison described how the Russians are helping with isolation studies. This is of particular interest with regards to the Mars mission. There are risks and concerns due to the very long exposure times in isolated and confined environments, and that risk needs much improved quantification. The Russian isolation chamber in Antarctica will be a critical facility to study and assess some of those risks.

In response to a query from Dr. Longnecker, Dr. Davison stated that the Hawaii facility is not a NASA facility and that it is not being supported by NASA; it is purely a university facility.

Dr. Davison described the MHRPE. It is focused on long-duration, risk-reduction measures and will help validate Mars-ready capabilities. Due to the small number of test subjects, their efficient use for all the research needed is critical. He showed an HRP risk-reduction schedule chart. These efforts will maximize the use of each subject from each nation. MHRPE is the forum for developing all the guiding documents related to the One Year Mission efforts. Each agency has its own national efforts, and coordination will allow for one set of samples to be used by all agencies. That, with data sharing, will prevent duplication of research, subjects, and hardware. A 2015 biomedical science plan has been developed to prevent duplication of experiments. Lastly, a preflight milestones chart was presented showing the complexity of the issues involved with a year-long mission.

Dr. Chiaramonte discussed the IMSPG. He noted that IMSPG has existed since 1995 with all the international partners represented. It meets annually. The priority areas for its coordination include all disciplines within physical sciences. They share facilities, experiment-specific hardware, and data to save money and time. There is substantial coordination between the different countries and their specific space agencies. The group is writing NRAs to participate with European teams on the atomic clock ensemble. Multiple sharing arrangements allow for the sharing of resources for hardware, software, and launch capabilities that leverages expertise on all sides. Another example of the IMSPG's efforts is the crystal research with the Russians.

Dr. Chiaramonte explained that with the mature configuration of the ISS laboratories, many unique research facilities are provided by each partner. To maximize utilization, the partners pursue cooperative arrangements to perform investigations in each other's facilities and utilize each other's on-orbit and ground resources. The SLPS gravity-dependent physical sciences research covers biophysics, combustion science, fluid physics, complex fluids, fundamental physics and materials science. The ISS facilities for physical sciences research have also been used as a bartering chip for other resources and investigations. He commented that there are language barrier difficulties in working with the Japanese.

Dr. Longnecker thanked Dr. Davison, Dr. Tomko, and Dr. Chiaramonte for their presentations.

Biological and Physical Research (BPS) Overview

Dr. Longnecker introduced Dr. Angel Otero, SLPSRA Deputy Division Director. Dr. Otero described SLPSRA's history. In 2004, the Agency's decision to focus its resources on Exploration directed resources away from traditional microgravity program efforts. The organization responsible for directing, managing, and more importantly, advocating for life and physical science research was ultimately disbanded. Ground and flight grants were terminated in an abrupt manner in 2004, leaving many researchers and students in a dire situation. Life and physical science research was placed in an organization focused mostly on engineering development studies, not research. Funding for space biology and physical science became dependent on annual Congressional earmarks, making long-term planning very difficult. Until 2011, there was no high-level organization responsible for life and physical science research. In 2011, with the merger of the Exploration Systems Mission Directorate (ESMD) and the Space Operations Mission Directorate (SOMD) into the HEOMD, the SLPSRA Division was created to direct, manage, and advocate for life and physical science research across the Agency. He noted that SLPS is poised to move forward into a new and exciting era of growth for research. SLPS is moving forward with the open source, geneLAB, and Microbial Observatory concepts. There are continued efforts to work with the International Space Station Program Office (ISSPO) to maximize available resources to grow the program.

Charts were presented on the tactical and strategic development schedules for BPS/ISSPO. Information on the budget was reviewed. Dr. Longnecker commented that finding new partners is a great way to grow the program, as it also brings in new resources. In response to questions from Dr. Sture and Dr. Longnecker about the future of the ISS after 2024, Dr. Porterfield responded that NASA is waiting for the international partners to commit to ISS life extension.

Dr. Longnecker thanked Dr. Otero for his presentation.

Public Comment

Dr. John Rummel asked about the Mars-ready research and whether the ISS can handle the biomedical research needed at eight psi. Dr. Davison responded that there is a project involved with physiological changes; however, the atmospheric pressure has not yet been set. He noted that NASA has not built an extravehicular activity (EVA) surface suit in a while, and that inter-crew communications could be an issue. Power requirements, a heat study, and engineering work are ongoing to design support structures on the suit.

Dr. Katherine Banks complimented the presenters on an amazing job. She asked where NASA sees the open science concept going. Dr. Porterfield replied that he hopes it will be very successful, that more money is allocated, and that it leads to human exploration beyond low Earth orbit (LEO). The open science concept appears to be gathering great minds, collecting large amounts of data, and presenting itself as a new model for doing collaborative research.

Subcommittee Deliberation

Dr. Longnecker proceeded to ask for comments from the Subcommittee: what were its concerns, whether it wanted to prepare any findings or recommendations, and what topics it wanted to hear about at the next Subcommittee meeting.

Dr. Thornton concurred with Dr. Bank's compliments to the presenters. She expressed concern regarding the ground community and the need for more resources to do ground/analog research. She asked how the relationship with CASIS is and how to optimize that. Dr. Porterfield replied that the Division is working well with CASIS. There is overlap with what the Division does and how the benefits track back to Earth. CASIS is assisting in partnering so that if any research leads to commercialization, it will be in a position to include the ground community early in the process so that they, too, can benefit. This could also assist in funding ground-based research.

Dr. Sture agreed with the previous comments and asked if there was any way to avoid the 7 to 10 year gap in commercialization. Dr. Porterfield noted that development of the liquid metal alloy took almost 20 years and that ground research is critical to the process of commercializing research. Dr. Banks commented that a significant amount of ground research is needed if the open science model is to work. Dr. Longnecker suggested that it would be useful to identify the existing ground research assets and the ground based research that is still needed.

Dr. Hoffman asked whether technology research on the ISS falls under the Subcommittee's purview. Dr. Carpenter responded affirmatively. Dr. Bette Siegel noted that the NAC has a Technology, Innovation, and Engineering (TIE) Committee. Dr. Longnecker suggested holding a joint meeting with that committee. The next TIE Committee meeting is December 2-3, 2014, at NASA Headquarters, and it will be meeting jointly with the NAC's Science Committee.

Dr. Longnecker noted that the NAC's Science Committee thinks that a potential show-stopper for the Mars mission remains radiation. The Science Committee will be meeting jointly with the NAC's HEO Committee. He suggested having the Research Subcommittee, the HEO Committee, and the Science Committee meet together, since the Subcommittee's recommendations flow up through the HEO Committee.

Dr. Robert Altenkirch asked where the Division was going long term, after the ISS. Dr. Porterfield stated that conducting research with open data, using the open sciences model, would remain valuable and could be disconnected from a strict "vehicle," such as the ISS. That would require considerable ground-based work before doing the experiments in space. Dr. Otero agreed with the large level of ground work needed prior to space experimentation.

Dr. Altenkirch stated that one issue is: What does the future of space research look like? What is it? He observed that "the future ain't what it used to be." He added that a significant amount of theory and ground based work is needed to support future space research.

Dr. Longnecker reviewed four important points from the Subcommittee's meeting. First, there needs to be a better understanding about ground-based research programs, including what is being done to fill in the gaps that have been identified and to accelerate the work currently being done. Second, CASIS, due to its role with the ISS National Lab, can help NASA understand the current and future state of space research. Third, several people have asked what the longer term direction and post-ISS efforts should be. Fourth is the potential to meet with the HEO and Science Committees with respect to radiation issues which relate to both life and physical sciences.

Dr. Thornton agreed with Dr. Longnecker's thoughts and suggested a finding that commends NASA on the rapid standup of the ISSPO and in attracting large numbers of new investigators. She also noted that at the last Subcommittee meeting, concerns had been expressed about the lack of flight stowage on Dragon and the inability to return items to Earth rapidly. She also commented that NASA does not want to provide or find funding for people to improve the databases and that NASA might have to find people to analyze the data sooner than expected.

Dr. Altenkirch concurred with the suggestion for a joint meeting to consider the issues surrounding radiation.

Dr. Hoffman inquired about external experiments on ISS and the use of ISS for Earth observation. Dr. Siegel noted that that is not within the Subcommittee's purview. Dr. Carpenter stated that the Subcommittee charter covers research under HEO and that the Subcommittee could look at ISS utilization, but should not comment on the ISS utilization for Earth science.

Dr. Longnecker posed the question of whether the Subcommittee would want to develop a finding related to the apparent engagement of the new cadre of scientists. He noted that some data on that is now available. He recommended holding the joint meeting on December 2-3, 2014, thus allowing deliberations for a finding on that subject in addition to a finding about the long term direction of space research.

Dr. Longnecker thanked the presenters and the Subcommittee members for their participation.

Adjournment

Dr. Carpenter adjourned the meeting at 4:00 p.m.

NASA ADVISORY COUNCIL

RESEARCH SUBCOMMITTEE
MEETING

NASA Headquarters
Room 7H41A
Washington, DC 20546

Friday, September 12, 2014

AGENDA

10:00	Opening Remarks	Dr. Longnecker
10:10	NASA Status	Dr. Porterfield
10:40	Omics and Open Science Status	Dr. Porterfield
11:30	Discussion	
12:00	Lunch	
1:00	ISS National Lab Overview	Dr. Carpenter
1:30	International Cooperation in Space Research	Dr. Davison Dr. Lee Dr. Tomko Dr. Chiaramonte
3:00	Committee Deliberation	Dr. Longnecker
3:30	Public Comment	
4:00	Adjourn	

Human Exploration and Operations Committee
Research Subcommittee Membership
September 2014

Dr. David E. Longnecker, Chair, Association of American Medical Colleges (AAMC) and member of the National Academy of Sciences Institute of Medicine (IOM)

Dr. Robert A. Altenkirch, The University of Alabama in Huntsville

Dr. M. Katherine Banks, Texas A&M University

Dr. Jeffrey A. Hoffman, Massachusetts Institute of Technology

Dr. Terri L. Lomax, North Carolina State University

Dr. Stein Sture, University of Colorado at Boulder

Dr. Kathryn Thornton, University of Virginia

Human Exploration and Operations Committee
Research Subcommittee
NASA Headquarters
Washington, DC

September 12, 2014

MEETING ATTENDEES

Committee Members

David Longnecker, Chair	AAMC and NAS/IOM
Bradley Carpenter, Executive Secretary	NASA Headquarters
M. Katherine Banks	Texas A&M University
Robert Altenkirch	University of Alabama, Huntsville
Jeffrey Hoffman	Massachusetts Institute of Technology
Terri Lomax	North Carolina State University
Stein Sture	University of Colorado, Boulder
Kathryn Thornton	University of Virginia

NASA Attendees

Gale Allen	Deputy Chief Scientist	NASA
Francis Chiaramonte	Science Lead	NASA
Steve Davison	Program Executive	NASA
Angel Otero	Deputy Division Director	NASA
Marshall Porterfield	Division Director	NASA
Bette Siegel	Program Executive	NASA
Dave Tomko	Science Lead	NASA

Other Attendees

James Lochner	Dir University Communications and Engagement	USRA
Jim Wilhelm	PB Frankel, LLC	

WEBEX Participants

James Dean
Marcia Smith
Jeff Foust
Dan Leone
John Rummel
Richard Passmone
Tom O'Mealia
Kathy Banks
Barbara Adde
Stephen Clark

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LIST OF PRESENTATION MATERIAL

1) Space Life and Physical Sciences [Porterfield]
2) ISS National Laboratory – Background and Status [Carpenter]
3) International Cooperation in NASA Physical Sciences Research [Davison, Tomko and Chiaramonte]
4) Biological and Physical Research Overview [Otero]