National Aeronautics and Space Administration
Washington, DC

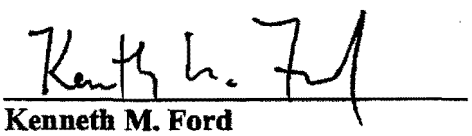
NASA ADVISORY COUNCIL

October 6-7, 2010

The AERO Institute
Palmdale, California

MEETING MINUTES

P. Diane Rausch
Executive Director



Kenneth M. Ford
Chair

NASA ADVISORY COUNCIL
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Meeting Report

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Wednesday, October 6, 2010

Call to Order, Announcements

Ms. Diane Rausch, Executive Director, NASA Advisory Council (NAC or Council), called the meeting to order and welcomed the NAC members and attendees to the AERO Institute in Palmdale, California. She stated that the NAC is a Federal Advisory Committee established under the Federal Advisory Committee Act. The meeting is open to the public. Meeting minutes will be taken by Mr. David Frankel, and will be posted to the NAC web site, *www.nasa.gov/offices/nac,* soon after the meeting. Each NAC member has been appointed by the NASA Administrator, Mr. Charles Bolden, based on the member's expertise. Each member is a Special Government Employee, subject to ethics regulations, and must recuse him or herself from discussions on any topic in which there could be a potential conflict of interest. Ms. Rausch introduced Dr. Susan Miller, Executive Director of The AERO Institute, who briefed the Council on safety measures for the meeting location.

Remarks by Council Chair

Ms. Rausch introduced Dr. Kenneth Ford, Council Chair. Dr. Ford welcomed everyone to the public meeting of the NAC. He reminded everyone that the Council is a Federal advisory committee reporting directly to the NASA Administrator, providing advice and recommendations across the full-breadth of the U.S. civil space program. This is the fifth meeting since the Council was restructured . He noted that one year ago the Council met in northern California at NASA's Ames Research Center (ARC) near San Francisco, and today they are meeting in southern California in the Mojave Desert near NASA's Dryden Flight Research Center (DFRC). Two months ago, they met at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, California. This demonstrates that there is a very large aerospace industry presence in California. Wherever the Council has been in California, it has been impressed by the state-of-the-art research facilities, highly skilled personnel, and sheer enthusiasm for the U.S. civil space program. It is gratifying to see cutting-edge technologies and world-class research and development. At Dryden, the Council can see our nation's aeronautics flight research and operations at its very best. Dr. Ford reported that yesterday the Council had an outstanding tour at two key facilities: the Dryden Aircraft Operations Facility located here in Palmdale, and the DFRC facilities that are co-located with Edwards Air Force Base.

The Council members introduced themselves. Three Council members: Ms. Marion Blakey, Mr. Richard Kohrs, and Dr. Wesley Huntress—were not in attendance and were represented by Dr. Ilan Kroo, Dr. Bohdan Bejmuk, and Dr. Byron Tapley, respectively.

Welcome to NASA Dryden Flight Research Center

Dr. Ford expressed the Council's appreciation to the DFRC for hosting the NAC meeting and introduced Dryden's Director, Mr. David D. McBride. Mr. McBride welcomed everyone to the Center and made some brief remarks.

Remarks by NASA Deputy Administrator

Dr. Ford introduced the Honorable Lori Garver, the NASA Deputy Administrator. He noted that Ms. Garver once was a NAC member and had also served as the Council's Executive Director. This enables her to be intimately familiar with the Council's work and the important role that the Council plays in providing independent external advice and recommendations.

Ms. Garver stated that the NASA administrator, Mr. Charles Bolden sent his best wishes. He is currently in Nepal opening a new facility, the SERVIR (Spanish for "to serve") Himala, a state-of-the-art environmental monitoring system. She described how the NAC has evolved over time. She had previously been selected by former NASA Administrator, Mr. Daniel Golden, as an "under 35" member to bring that age group's perspective to the Council. Mr. Bolden has recently added three committees to the NAC: the Innovation and Technology Committee, the Commercial Space Committee, and the Education and Public Outreach Committee. The addition of these committees shows where NASA is heading. There is a need to better communicate with the public to make sure that they understand the work that NASA is doing. NASA represents an investment by the nation in research and development. About 85 percent of NASA's funds go directly to the private sector. Ms. Garver observed that no one wants to be in a situation where Congress changes NASA's direction every two years. Allowing the private sector to have a greater participation will help alleviate that problem, since they are not at the whim of every new Congress. As the civil space agency, NASA provides an incredible value to the public and needs the Council members' assistance to help NASA do more of that. The NAC members should serve as outside eyes and ears; they should be frank and direct, and they should ask questions.

Ms. Garver observed that NASA has an incredible Space Shuttle team and is coming to the end of an era with the last Shuttle flights. In her view, the public sees NASA as being almost synonymous with the Space Shuttle. It is important to keep NASA's messages positive on what the Space Shuttle has brought to the nation. The Space Shuttle has opened up the world—it has launched probes to the outer planets, it has opened up communications that helped end the Cold War, and it has led to a peaceful relationship with the former Soviet Union. Now, we need to transition the public knowledge base from the Space Shuttle to the International Space Station (ISS). The Space Shuttle has enabled us to build that amazing facility in space. We also need to help transition the public's view from the astronauts flying the Space Shuttle to the astronauts working with U.S. private industry to develop a new industry that flies people to and from the ISS in a way that will be efficient, safe, and cost-effective for the nation, so that we can do even more in space. Those are the messages that we need to develop in the coming year at this really critical transition time for NASA.

Ms. Garver explained that there has been amazing support for NASA from the nation's leaders. The President and Congress have decided that a $19 billion budget for NASA is something that the country needed to invest in. Extending the ISS from 2015 to 2020 and supporting increases in Aeronautics were not controversial. The Commercial Crew program will now be authorized.

The technology funding will be less than the Administration requested, and that is something that will require further effort. The word from the Hill regarding the technology funding request is that NASA did not weave a good message on how those investments would feed into the Exploration programs in the future. NASA has an incredible story to tell. The Exploration Systems Mission Directorate (ESMD) at NASA and NASA's new Chief Technologist, Dr. Bobby Braun, did an excellent job planning a program that would lower the operations costs so that our future exploration efforts have a better chance to be sustainable and succeed. A key to that success is to invest properly at the beginning in programs so that the operations costs will enable us to spend more money on science and the actual work that we do in space. NASA needs to do a better job explaining how the investment in technology will shift the paradigm and be helpful. Dr. Braun has prepared a wonderful chart showing 12 technologies that require investment. Without those investments, NASA does not have a long-term future. There is a view that the President's proposed budget was ending human space flight and turning back the clock. This is a strange turn of events and shows how important communications are. The President's budget was an increase for NASA; it was all about leading human spaceflight into the future and having a stronger, more robust program that can last for decades. Ms. Garver noted that Secretary of Defense, Robert Gates, speaks about the need to be ready to fight the next war, not the last war. In the same vein, NASA needs to work on the future space program, not on the past space program. We need to help people see that they have a bright future at NASA. She explained that people have not been arguing against NASA; there is just disagreement over the best way to carry out a robust space exploration program. The nation's leadership recognizes NASA's value, and it is important to retain that recognition. NASA needs to provide the best programs so that the public and leadership support for NASA continues.

Col. Eileen Collins thanked Ms. Garver for coming to the Council meeting and asked about the timing in the Appropriations Bill for the development of a heavy lift launch vehicle. Ms. Garver responded that it is a challenge for NASA, and that historically more time would be allowed for its delivery. The people who put it into the Bill heard from the aerospace community that it could be done. We have to exert our best efforts to implement that. The

heavy lift launch vehicle is the most important thing for NASA to work through on the Bill now. Congress feels strongly that we need to actually have a vehicle soon, but that was not the Administration's plan. The Administration's plan was to invest in new technologies so that the next launch vehicle could have a lower operations cost and longer service life.

Ms. Esther Dyson asked whether there was a way to eliminate the bureaucracy, and opined that it slows things down and creates morale problems. Ms. Garver replied that many things must be fixed and the Administrator is interested in hearing new ideas. One way to accomplish what is required in the Bill is to use commercial, fixed price contracts rather than cost plus contracts. People are trying to determine what the figures-of-merit for the new vehicles are.

Dr. Raymond Colladay described his views on the advanced technology program. He stated that the roadmaps will help connect the dots from what NASA needs to invest in now and what the payoff will be. It is hoped that the National Research Council (NRC) will help bring the external community in to work with NASA on this. There is a lack of urgency in the sense that the country has not invested in the technology it should have invested in over the last 10 to 20 years. One voice speaking against technology investment seems to carry more weight than 100 advocates, and there is a need to develop a uniform message across NASA. Ms. Garver agreed that there is a need to have the whole team on board. Mr. Robert Hanisee asked whether the Agency was thinking about going with fixed price acquisitions for launch vehicles. Ms. Garver stated that the acquisition strategy is being evaluated.

Dr. Ford thanked Ms. Garver for sharing her insights with the Council.

Ad-Hoc Task Force on Planetary Defense

Dr. Ford introduced Mr. Rusty Schweickart (participating by telephone) and Dr. Thomas Jones (in person), Co-Chairs, Ad-Hoc Task Force on Planetary Defense. Dr. Jones presented the Final Report of the Task Force. Near Earth objects (NEOs) are frequently in the news these days and NASA is the premier agency on the planet for studying them. The White House will soon designate which Federal agency should have the lead role in Planetary Defense. (Note: In mid-October the OSTP assigned NASA a research and technology development role, but did not choose a lead agency for actual asteroid deflection). The NEO discovery rate is increasing rapidly. NASA is doing a good job finding the large objects and is also finding many small ones. Dr. Jones presented a chart showing a sharp increase in the number of small near Earth asteroids that have been discovered since 2000. Some small objects to be discovered in coming years will have a "worrisome probability of impact." The threshold for concern about those objects and at what impact probability we should take action, remain to be determined. The deflection decision frequency will be considerably higher than the actual impact frequency. This is due to the fact that the information regarding orbits and impact probability available at the time a deflection decision is needed will be imperfect. Because these objects strike across the planet and because risk shifting among human populations due to deflection is inevitable, international collaboration, decision-making, and leadership is necessary. He described possible synergies between the Exploration Mission, the Science Mission, and Planetary Defense and asserted that a minor incremental cost to other space missions could yield a large increase in planetary defense knowledge.

Dr. Jones described the five recommendations contained in the Task Force's final report.

Recommendation 1: NASA should establish an organizational element to focus on the issues, activities and budget necessary for effective Planetary Defense planning; to acquire the required capabilities, to include development of identification and mitigation processes and technologies; and to prepare for leadership of the U.S. and international response to the impact hazard. This recommendation calls for the establishment of a Planetary Defense Coordination Office (PDCO) that would be responsible directly to the NASA Administrator. It would require a near-term effort to accomplish the George E. Brown NEO Survey Act of 2005 requirement to discover 90 percent of the NEOs larger than 140 meters in diameter. The budget would be $250-$300 million annually for a decade.

Recommendation 2: NASA should significantly improve the nation's discovery and tracking capabilities for early detection of potential NEO impactors, and for tracking them with the precision required for high confidence in potential impact assessments. In order to implement this, the Task Force recommends that NASA immediately initiate a space-based infrared telescopic NEO search project as the primary means to meet the survey goal, and that NASA should investigate developing low-cost, short-term impact warning systems.

Recommendation 3: To guide the development of effective impact mitigation techniques, NASA should acquire a better understanding of NEO characteristics by using existing and new science and exploration research capabilities, including ground-based observations, impact experiments, computer simulations, and in situ asteroid investigation.

Recommendation 4: To prepare an adequate response to the range of potential impact scenarios, NASA should conduct a focused range of activities, from in-space testing of innovative NEO deflection technologies to providing assistance to those agencies responsible for civil defense and disaster response measures. In order to implement this, the Task Force recommends that NASA should work with the Department of Homeland Security to formulate plans, such as evacuation, should NEO deflection prove impractical. The Task Force advises that it would be prudent for NASA to collaborate with the Department of Energy and the Department of Defense to develop an analytic research program on nuclear explosion technology for NEO deflection.

Recommendation 5: NASA should provide leadership for the U.S. Government to address Planetary Defense issues in interagency, public education, media, and international forums, including conduct of necessary impact research, informing the public of impact threats, working toward an internationally coordinated response, and understanding the societal effects of a potential NEO impact. The Task Force advises that NASA should develop the legal basis for potential actions related to planetary defense, including liability for impact warning or failure to warn, orbit alteration, and using a nuclear option.

Dr. Jones summarized the conclusions in the Ad Hoc Task Force's report. NASA has a strong foundation for understanding the NEO hazard and building a long-term capability to counter a NEO threat. NASA has two of three elements needed to prevent future damaging impacts: (1) search, track, and warning; and (2) deep space operations capability. The missing third element is international readiness, an area that NASA is well-positioned to lead, provided it moves to develop the practical means for actually changing a threatening asteroid's orbit. NASA should begin working now on forging its warning, technology, and leadership capacities into a global example of how to effectively shield society from a future impact.

In response to a question from Ms. Garver, Dr. Jones explained that the PDCO should be at the same level as NASA's Chief Technologist, but without the same budget. In response to a question from Mr. Hanisee about developing a decision tree on the levels of authority to make decisions on deflecting an object, Dr. Jones stated that the U.S. can make its own decision to protect its homeland and that NASA should think about how that decision should be made, perhaps in consultation with the President's Office of Science and Technology Policy (OSTP). At the international level, there have been discussions at the United Nations about making decisions through delegated approval by the Security Council. In response to a question from Gen. Albert Edmonds, Lt. Col. (Ret.) Lindley Johnson explained that the Task Force has been in contact with the Department of Defense (DoD) and that the PDCO would be needed to coordinate with all the relevant U.S. agencies. He added that while the DoD has good capabilities in low Earth orbit (LEO), it does not have the same capability as NASA for deep space missions.

Mr. Brett Alexander stated that the Task Force's report was well thought-out and well organized. He asked whether there was real concern and motivation to push forward with this program, noting that $250 million-$300 million per year is a lot to budget. Dr. Jones responded that Congress has directed the OSTP to nominate a lead agency. Col. Johnson added that when the day comes, we need to be able to respond and emphasized that it is not a question of "if," but a question of "when." Dr. Jones noted that a 10-meter object, which would not penetrate the Earth's atmosphere, comes within the Moon's orbit once a day. Ms. Garver stated that the issues involving planetary defense tie in well with current plans on sending humans to an asteroid, which the President has identified as the next destination. She would be interested in learning the National Research Council's view on going forward, which she explained could be a driver for focusing technological effort in this area. Dr. Ford agreed that this could be coupled with the President's desire to have humans visit a NEO and that the timing is excellent. Mr. Alexander cautioned against overselling the program and consequently the public expecting to see major results on a regular basis. Ms. Dyson agreed with Mr. Alexander and stated that we do not need the threat of the Earth being annihilated every day. We need to get Congress to start thinking about what could happen after their terms are over. Dr. Colladay opined that NASA would best serve the lead role and asked whether the Agency has been passive or active in advocating that assignment. Ms. Garver responded that NASA has been passive, and that one issue is whether the necessary resources would be made available. Mr. Tapley added that the capabilities are inherently within NASA. Col. Collins

getting the resources. NASA's civil servants need a place to go and NASA should begin to look at matching their skills to what is needed in the Planetary Defense Program. Gen. Edmonds stated that DoD would not want this mission. Dr. Bejmuk asserted that it is difficult to conceive any agency other than NASA performing this mission.

The Council approved and endorsed the Final Report of the Ad-Hoc Task Force on Planetary Defense. Dr. Ford thanked Dr. Jones for his presentation and expressed the Council's appreciation to the Task Force for its efforts.

Aeronautics Committee Report

Dr. Ford introduced Dr. Ilan Kroo (representing the Chair, Aeronautics Committee, The Honorable Marion Blakey), who briefed the Council on the recent activities of the Aeronautics Committee. The Committee recently met at NASA Ames Research Center, where NASA is expanding it focus on air traffic management. Dr. Kroo presented a chart describing Ames' involvement in aeronautics and aviation. One particular success has been in air traffic management and control. He described the Traffic Management Advisor, which has had a significant positive impact on the National Airspace System and has saved airlines an estimated $400 million per year. Other projects in this category are the NextGen Concept and Technology Development Project and the NextGen Systems Analysis, Integration, and Evaluation Project. Dr. Kroo described the work being performed at Ames on mitigating adverse impacts caused by contrails. The Federal Aviation Administration (FAA) is the U.S. agency responsible for air traffic management, and it is important to transfer technology from NASA to the FAA. To accomplish this, NASA and the FAA have formed four research transition teams. Dr. Kroo presented a chart summarizing research on Verification and Validation of Flight Critical Systems (VVFCS) and a chart describing the VVFCS technical challenge. He presented a chart illustrating the costs that are attributable to software errors. He described how Southwest Airlines has benefited from NASA's decision to open-source key data mining algorithms to analyze data from flight data recorders. The Aeronautics Research Mission Directorate (ARMD) is developing a task for the NRC to perform a study to assess and make recommendations on how to integrate flight research into ARMD's fundamental research activities and integrated research activities. The study is intended to look at new ways to perform flight research.

Dr. Kroo presented for the Council's consideration three Observations:

1) *The Council believes that within the Verification & Validation (V&V) project planning, the scope is very broad and would benefit from a more focused approach. The Council suggests ARMD continue to engage the external V&V community to obtain suggestions for paring down the current research scope.*

2) *The Council strongly endorses continued research in data mining concepts for aviation research. In particular, the Council recognizes the difficulty and importance of human factors research in collaboration with industry and other government agencies.*

3) *The Council strongly endorses planned National Research Council flight research study that NASA is initiating with the NRC. The Aeronautics Committee should receive regular updates of the study's progress in order to provide continued advice on ARMD planning in regards to flight research.*

The Council approved the three Observations. Dr. Ford thanked Dr. Kroo for his presentation.

Commercial Space Committee Report

Dr. Ford introduced Mr. Brett Alexander, Chair, Commercial Space Committee. Mr. Alexander explained that the Committee is focused on the proposed Commercial Crew program and that the Committee generally meets two to three times between NAC meetings. He presented several slides reviewing the Committee's past Observations, Findings, and Recommendations. Dr. Bejmuk questioned the wisdom behind having the FAA provide the regulatory framework for commercial space flights. Mr. Alexander explained that FAA regulation is required by law, and that there is also a primary role for NASA on the safety side. Dr. Bejmuk asked whether it was envisioned that the FAA would license launches and asserted that the FAA does not care enough about mission success, just that nobody is injured. Mr. Alexander responded that it is not clear whether the FAA would license human space flight missions

performed for NASA by private companies. FAA regulation will be required by law when private companies perform these missions without NASA's involvement. It is important from a commercial perspective, for raising money, that the differences between operating a commercial mission and a NASA mission be known and minimized. The FAA traditionally deals with third-party safety, financial requirements, and insurance/liability, which is different from NASA's role in overseeing the flight safety for the astronauts. Those are complementary, not conflicting roles, and NASA should clarify the interfaces where there might be issues and propose how to move forward. This should be worked out now, rather than keeping uncertainty in the system by deferring the issue. The uncertainty creates a business risk, which increases the cost for financing. The more that NASA can minimize those risks, the more likely that the program will succeed. Mr. Alexander explained that it is more efficient for the company to develop the same systems, regardless of whether the person on the rocket is an astronaut or a third party. It is better from both an operational and financial standpoint.

Dr. Tapley asked who should have the final say if there is a conflict. Mr. Alexander responded that the two roles are complementary and not competitive. Col. Collins stated that the responsibilities have to be clear, that people need to understand what is meant by licensing, and that the Air Force Range also should be involved. Mr. Alexander stated it is important to get clear on this before a Request for Proposal (RFP) is issued. Col. Collins stated it is important for people to understand what licensing really is. Dr. Ford explained that the biggest challenge is clarity, and that there is value in knowing the answer; therefore, there is value in the recommendation. In response to a question from Dr. Bejmuk, Mr. Alexander stated that the FAA would not be certifying space capsules, but eventually would move into licensing for the safety of people on board.

Ms. Esther Dyson, addressing the approach for contracting and acquisition, opined it would be great if NASA moved away from cost-plus contracting when dealing with its commercial partners. Mr. Alexander explained that cost-plus contracting is appropriate when NASA is engaged in a program involving new technology and wants control over the end product. Where the end product will be owned and operated by the private sector, then firm-fixed-price contracting is appropriate. A firm-fixed-price contract would not work where NASA gives direction. Ms. Dyson stated that she would like the Technology and Innovation Committee to have a joint meeting with the Commercial Space Committee on the procurement topic. Mr. Alexander presented a slide comparing the FY 2011 NASA Authorization Bill to the President's proposed budget. The President had proposed $500 million for the Commercial Crew Development Program and the Bill authorizes $312 million. The President's budget proposed $312 million for Commercial Orbital Transportation Service (COTS) and the Bill authorizes $300 million. The Authorization Bill establishes Commercial Crew as the "primary means" for transporting NASA astronauts to and from the ISS. It also requires NASA to publish human rating requirements within 60 days.

Ms. Garver stated that it would be helpful for the Commercial Space Committee to work with the Science Mission Directorate and the Space Station Program. There is a focus in the new National Space Policy to do things differently and NASA needs advice on how to do that. There is flexibility for NASA under the Space Act. She observed that the NAC's recommendation for NASA to define its own market is clear and should be followed. The Authorization Bill also requires NASA to define the private market, and NASA would appreciate assistance from the Commercial Space Committee on how to do that. Mr. Alexander stated that this is an opportunity for NASA to clarify what other market opportunities might be. Ms. Garver also asked for the Committee's advice on the human rating requirements for Commercial Crew. That area, Mr. Alexander advised, is within the jurisdiction of the Space Operations Committee. Mr. Bejmuk observed that whether NASA would be the only commercial customer or whether NASA would be one of several commercial customers depends on the recurring cost to operate the system. Mr. Alexander agreed with that observation. Mr. Bejmuk suggested that industry be required to address the operations cost preliminarily in the design phase. If operations are too expensive, he asserted, NASA will be the only customer. Mr. Alexander explained that the program cannot be accomplished by combining commercial with cost-plus in the traditional oversight contracting style. For companies to put together successful business plans, they will need business beyond NASA, and to do that will require low recurring costs. They also will need rigorous safety requirements, and they are well incentivized to do this. Ms. Garver agreed that commercial companies have those incentives and explained that they would otherwise go bankrupt. Government does not have the same incentive and, therefore, does not make the necessary trade-offs. The whole point is to move to commercial companies, which have a natural incentive to make the choices needed to lower costs to develop a customer base.

Col. Collins noted that the Space Station Program requirements are to transport four ISS crewmembers safely every 180 days, return four every 180 days, and provide a crew rescue function. Dr. Ford explained that to plan for success

and imagine that there would be a successful Commercial Crew operation, you might do things differently and could have different options that you do not have now. To only plan from duplicating what we have now probably is not the best way to proceed.

Dr. Ford thanked Mr. Alexander for his presentation.

Technology and Innovation Committee Report

Dr. Ford introduced Ms. Esther Dyson, Chair, Technology and Innovation Committee. Ms. Dyson reported that the Committee had not met since the last NAC meeting. They plan to meet at the NASA Langley Research Center in two weeks. Dr. Ford informed her that the recommendations made by the Committee at the last NAC meeting were starting to make their way through the process. Ms. Dyson discussed innovation. She explained that innovation's flip side is to tolerate failure, and that failure is what people learn from. It is important to move people from place to place, to work with outsiders, and for culture and points of view to be exchanged. Building ties between industry and NASA and other Government agencies would be very helpful. She has begun to realize that the Committee does not have its own content and, instead, would be most effective working with the other NAC committees. Ms. Dyson stated that she would like to have someone from NASA Human Resources meet with her Committee, and Dr. Ford encouraged that to happen.

Dr. Ford thanked Ms. Dyson for her report.

Space Operations Committee Report

Dr. Ford introduced Col. Eileen Collins, Chair, Space Operations Committee. Col. Collins summarized the Committee's activities since the last NAC meeting. Sites visits at NASA Johnson Space Center included the Orion simulator, the Advanced Suit Laboratory, the Robonaut 2 Facility, and the Astronaut Post-Flight Rehabilitation Facility. The Committee met with the NASA Johnson Space Center (JSC) Director, the Associate Administrator for Space Operations, the Chief of the Astronaut Office, the ISS Program Manager, and the Space Shuttle Associate Program Manager. The Space Operations Committee also enjoyed a joint meeting with the Commercial Space Committee. The Space Operations Committee received briefings on Commercial Crew to ISS, the commercial vehicle crew design, the ISS as a future Exploration testbed, and an update on the the Shuttle program, Shuttle workforce, and the ISS program. A top issue for the Committee is the workforce at NASA Kennedy Space Center (KSC) and JSC, where there has been much turbulence due to impending layoffs. Another top issue is Commercial Crew, specifically the verification and certification, reliability, the Government role, FAA licensing, and transferring experience from NASA to commercial firms. The Committee will be following the FAA licensing issue for its impact on operations. Col. Collins presented slides comparing the Space Shuttle manifest as flown to the planned manifest through the end of the Space Shuttle Program. Atlantis is manifested for June 2011. Although the original plan had been to use Atlantis only if needed for rescue (STS-335), the NASA Authorization Bill directs that Atlantis be flown in 2011 (STS-135), but funding remains to be found. It will be a logistics flight.

Col. Collins discussed the impact on morale resulting from the end of the Space Shuttle Program. She reported on a survey that has been conducted over the last few years with both supervisors and employees. It shows an increase over time in the support that each group expected to give through the end of the Space Shuttle Program. She presented a slide summarizing the status of the Space Shuttle Program. The number one goal is to fly the remaining missions safely and successfully. Retaining critical skills is a major program emphasis. She presented a chart showing planned crew utilization and port rotation on the ISS through 2012. Dr. Bejmuk noted that when smaller flights are used, it would take more departures to keep the same number of crew on the Space Station and asked whether that would be a concern. Col. Collins responded that it would be a concern because there would be more exposure and risk to manage; as well as crew time taken away from utilization, however it is under control. Col. Collins described the research plans for Expedition 24. There will be 127 integrated experiments in biology and technology, Earth and space science, educational activities, human research, and physical and materials science and technology. The experiments will support the work of more than 400 scientists. She described the status of operational issues on the ISS. A cooling pump module that failed on August 1, 2010, was removed and replaced during three extravehicular activities (EVAs). Micrometeroid and orbital debris strikes are the top program risks. At

the suggestion of the Exploration Committee, the Space Operations Committee received a briefing on using the ISS as an exploration testbed. The ISS is being used to help prepare for future deep space exploration. There are several challenges for the Commercial Crew Program. It is not clear how the vehicle will be certified or the requirements will be verified. The Government role in development remains to be determined. Further study by the Committee is needed before it can comment on FAA licensing. In addition, there are questions on redundancy and the Air Force Range involvement.

Col. Collins presented for the Council's consideration a proposed Recommendation for verifying and certifying commercial crew spacecraft. The Committee wants the commercial plan to succeed and wants it to be done safely. In response to a question from Dr. Bejmuk, she explained that the Committee prefers the "rental car" approach over the "taxi" approach because it saves on logistics, since additional supplies would not be needed for drivers. In response to a question from Mr. Hanisee, Col. Collins stated that training should be a joint effort between NASA and the commercial provider. Mr. Alexander explained that this is not yet defined and that the commercial companies believe it would need to be done by the provider. Col. Collins noted that early training would be accomplished through involvement in development. After further discussion, the Council approved the Recommendation as follows:

NASA should expedite development of a strategy, plan and a team for defining and obtaining objective data which would indicate that a commercial vehicle is adequately verified, certified and tested to meet requirements. This strategy and plan should be part of the solicitation package. The plan should identify the analytical and test data, including flight test required, and NASA's involvement in the development activity to enable informed participation in reviews to ascertain that the requirements have been met. The NAC also suggests that part of the strategy should be a small technical team(s) with representatives from all critical disciplines, including flight crew personnel, to following the development of the vehicle and operations development. These teams should be limited in size and operate under guidelines defined in "the plan.". These team(s) should cover all the bases, and should be staffed with specific named participants.

Col. Collins presented for the Council's consideration a proposed Recommendation on sharing NASA "know-how" with commercial developers. After discussion, the Council approved the Recommendation as follows:

The NAC recommends that the impressive NASA capabilities and background available at the Human Spaceflight Centers be offered to the bidders of the commercial crew vehicle. A mechanism can be set up to share this know-how in the most efficient and useful way, to expedite development and safe operation of commercial spacecraft.

Col. Collins discussed the operational impact from adding additional visiting vehicles to the ISS beyond what is required to support the research mission. High reliability is needed to ensure uninterrupted ISS mission operations and to prevent de-crewing the U.S. segment. She described several astronaut preferences that are not currently in human rating requirements: there should be no "black zones" on ascent or aborts; pressure suits should be worn on ascent; and crew collaboration should be included in the design process.

Col. Collins presented for the Council's consideration a proposed Observation/Finding expressing concern over operational challenges with the commercial approach to ISS crew launch and return. There are many programmatic and safety-related uncertainties with relying solely on the commercial crew concept. The foremost concern is a potentially extended period during which the U.S. does not have indigenous access to low Earth orbit. After discussion, it was determined that the proposed Observation/Finding was similar to a previous Observation and, therefore, was not necessary.

Dr. Ford thanked Col. Collins for her presentation.

Science Committee Report

Dr. Ford introduced Dr. Byron Tapley, Vice Chair, Science Committee (representing the Chair, Dr. Wesley Huntress) Dr. Tapley described some recent science results. He presented a satellite image showing the seasonal change in the Chukchi Sea ice cover and noted that NASA has embarked on a marine mission to sample the waters shown in the image. He presented a slide illustrating that the Solar Dynamics Observer is operational. He presented

slides with images from the Interstellar Boundary Explorer, the Wide-field Infrared Survey Explorer, and the Spitzer Space Telescope. The September issue of *Icarus* is devoted to the first two flybys of Mercury by the Mercury Surface, Space Environment, Geochemistry, and Ranging (MESSENGER) mission. He described how students at the Green Middle School in Cottonwood, California, participating in the Mars Student Imaging Project that is part of NASA's Mars Public Engagement Program, had discovered a cave on Mars.

Dr. Tapley briefed the Council on the Science Program status and reported that the Astro2010 Decadal Survey had been released on August 13, 2010. He presented a chart comparing the Decadal Survey budget recommendation with the FY 2011 President's budget. He presented charts showing NASA's current operating missions and future orbital flight missions. Dr. Tapley discussed the need for domestically producing Plutonium-238 (Pu-238). The Pu-238 inventory available for NASA missions will be depleted by the end of this decade without a new Pu-238 production capability.

Dr. Tapley presented for the Council's consideration a proposed Observation on modeling and computational capabilities. The Council approved the Observation as follows:

The Council has become aware of concerns in the space-science community that modeling and computational capabilities across space science disciplines within the Science Mission Directorate (SMD) may not be adequate to fully analyze data from NASA missions or carry out modeling and other computations, and advance scientific understanding, at a level and pace commensurate with the quality and quantity of returned data. The Science Committee plans to explore this potential issue in future meetings.

Dr. Tapley presented for the Council's consideration a proposed Observation on the cost containment of SMD missions. The Council approved the Observation as follows:

The Council continues to receive information about SMD cost containment activities and independent reviews of various cost containment strategies. The Science Committee will continue to study this issue, having received a briefing from the Chair of the NRC's Study on "Controlling Cost Growth of NASA Earth and Space Science Missions" at its July 2010 meeting, and from the Executive Secretary of the NASA Chief Engineer's Management Operations Working Group (MOWG) at its September telecon. NASA is working to complete its SMD mission cost study with The Aerospace Corporation at the end of 2010 or early 2011. The Science Committee is planning to review the results of that and other studies at future meetings.

Dr. Tapley presented for the Council's consideration a proposed Finding on the NRC Cost Containment Study. The Council approved the Finding as follows:

The Council fully supports the excellent work reported in the NRC Study on Cost-Growth in NASA Earth and Space Science and notes that NASA is working diligently to consider its findings and recommendations.

Dr. Tapley presented for the Council's consideration a proposed three-part Recommendation for NASA's response to the Astro2010 Decadal Survey. At Dr. Ford's request, Dr. Tapley analyzed the difference between flying Euclid and Wide-Field InfraRed Survey Telescope (WFIRST) in a single combined mission and flying them separately from the perspective of the U.S. dark energy community. In response to a question from Ms. Dyson, Dr. Tapley explained that the NRC recommended against participating in the PLAnetary Transits and Oscillations of stars (PLATO) mission due to the measurement technique that is to be used in the mission. Ms. Dyson stated it was a good way to save money. After further discussion, the Council approved the Recommendation as follows:

A. NASA's Implementation of Wide Field InfraRed Survey Telescope (WFIRST) mission

- *NASA should proceed with implementation of WFIRST as the top priority large space mission of Astro2010.*
- *NASA should solicit nominations for the WFIRST Science Definition Team (SDT) as soon as possible, including representatives of all three of WFIRST's science areas and members of ESA's Dark Energy Mission, Euclid. By Summer 2011, the SDT should complete a conceptual mission design that is mature enough to support NASA negotiations with ESA on a collaborative mission.*

B. NASA's role in ESA's Euclid Mission

- *NASA should keep open the option of a possible partnership with ESA on the Euclid mission.*

- *If Euclid is selected by ESA, NASA's goal should be the negotiation of a joint ESA/NASA program that meets the science goals of both the Euclid and WFIRST missions and is comprised of either a single combined mission or two complementary missions.*

C. *NASA's role in ESA's PLAnetary Transits and Oscillations of stars (PLATO), Mission*
- *NASA should inform ESA that NASA will not seek a strategic partnership on PLATO, since its science investigation was not recommended in the Decadal Survey.*

Dr. Ford thanked Dr. Tapley for his presentation.

Information Technology Infrastructure Committee Report

Dr. Ford introduced Gen. Albert Edmonds, Chair, Information Technology Infrastructure Committee. Gen. Edmonds briefed the Council on the Committee's recent activities. The Committee met recently at NASA Ames Research Center and visited the NASA Astrobiology Institute, the NASA Advanced Supercomputing Facility, the Nebula facility, and the Security Operating Center. Nebula is an open-source, cloud computing project and service developed to provide an alternative to constructing additional data centers whenever NASA scientists or engineers require additional data processing. All the software is open-source. There has been a 700 percent increase in supercomputer use over the last 18 months. The Committee received a classified briefing on risk mitigation. They visited Lockheed-Martin's Cyber Lab to learn about best industry practices. The Committee examined the role of the Office of the Chief Information Officer (OCIO), its strategic plans and projected resources, and IT governance across NASA. They visited NASA Headquarters and met with the Deputy CIO and the Goddard Space Flight Center (GSFC) CIO. Gen. Edmonds presented a slide describing the OCIO purpose, vision, mission, and principles. The new CIO is still forming a team and trying to attract new talent. He described the CIO's recent IT Summit held near Washington, DC, which was a tremendous success attended by over 900 people. Gen. Edmonds reviewed the Committee's projected work plan for 2011. They will examine best practices, investigate the state of NASA's software, explore areas of disruptive technology, investigate NASA's high-performance networks, examine NASA's data and communications environment for its aerospace operations, and continue to examine the role of the OCIO. Gen. Edmonds noted that he feels very encouraged by the Committee's progress during its first year. There is a need to find a way to incentivize people to use technology that has already been developed. Dr. Bejmuk asked whether there was any way to extend NASA's IT infrastructure and standards to include NASA's contractors, which have enormous amounts of data. Gen. Edmonds responded that it would be ideal to do so, and that he did this in the DoD, where they developed commercial best practices. He explained that it is important to change when technology changes, and that there is a better opportunity to do this if commercial practices are used, rather than Government standards.

Dr. Ford thanked Gen. Edmonds for his presentation.

Education & Public Outreach Committee Report

Dr. Ford introduced Mr. Miles O'Brien, Chair, Education & Public Outreach Committee. Mr. O'Brien described the Committee's membership and reported that the Committee had held an excellent meeting recently at JSC, and that NASA Deputy Administrator Lori Garver had attended it. He noted that Committee member Mr. Michael Bostick is creating a Hollywood movie boot camp at NASA's Jet Propulsion Laboratory (JPL) in November 2010, noting that "JPL is Disneyland for nerds." In addition, Committee member Ms. Debbie Myers of the Discovery Channel is working on a three-hour documentary focused on the end of the Shuttle era and what lies ahead. He showed a video from NASA eClips (*http://www.nasa.gov/audience/foreducators/nasaeclips/index.html*) and observed that it is engaging material aimed at middle-schoolers. The Committee is concerned that educational outreach is not included as a mission requirement for the ISS. The Committee learned about new developments in robotics and the FIRST robotics competition that NASA helps to sponsor. He remarked that during the FIRST competitions "the nerds are out there with cheerleaders in the stands." The Committee would like to see even more NASA involvement in that program. Mr. O'Brien described the High School Aerospace Scholars program in Texas, Virginia, Washington, and Idaho, and opined that it needed to be expanded to other states. The Committee was briefed by the Education Design Team, which has a discretionary budget of only $10 million. A subcommittee has been formed to work with the

team. The Committee saw the galleys from a beautiful new book, *Wings in Orbit*, which is a technical definitive history about the Space Shuttle. Mr. O'Brien noted that the profits from the book will go to the Government Printing Office, and he opined it might be nice to use the funds to help the families from the Challenger disaster. He observed that Astronaut Mark Kelly has 1.26 million Twitter followers. Mr. O'Brien suggested that the NASA Astronaut contract should perhaps require Astronauts to participate in public outreach.

The Committee had a meeting with Mr. David Weaver, NASA's Associate Administrator for the Office of Communications, where they received a primer on marketing and learned that NASA marketing is not explicitly precluded, although it is not expressly authorized, either. The National Aeronautics and Space Act of 1958 provides that NASA may engage in the "widest practicable and appropriate dissemination." An earlier 1913 Federal law, on the other hand, provides that "Appropriated funds may not be used to pay a publicity expert unless specifically appropriated for that purpose." Mr. O'Brien suggested that a conflict could be avoided by having NASA partner with a non-profit marketing entity. The Committee met with Ms. Garver, who Mr. O'Brien reported was passionate on the need to turn around the story for the FY 2011 budget. He discussed the need to have the commercial COTS contracts include a requirement to provide media access for launches. Col. Collins opined that coverage would be great. Mr. O'Brien acknowledged that there are good reasons why commercial business would not want the media to be looking over their shoulders all the time. He asserted, however, that we should be "showing it live, warts and all." Dr. Bejmuk opined that it would be useful for Mr. O'Brien to visit and broadcast from the ISS for several weeks. Mr. O'Brien quickly agreed.

Dr. Ford thanked Mr. O'Brien for his presentation. He then gave the public an opportunity to comment. No comments were offered, and the meeting was adjourned for the day.

Thursday, October 7, 2010

Call to Order

Ms. Rausch called the meeting to order.

Dr. Ford welcomed the Council Members back for the second day of the NAC meeting. He described the agenda for the day and briefly reviewed the presentations from the previous day.

Exploration Committee Report

Dr. Ford introduced Mr. Bohdan Bejmuk, Vice-Chair, Exploration Committee (representing the Chair, Mr. Richard Kohrs). Dr. Bejmuk described the Committee's recent fact-finding session, where they discussed the Human Exploration Framework Team (HEFT) and the budget for the Exploration Systems Mission Directorate. There is concern that the transition from the Continuing Resolution to the final FY 2011 budget may not allow time to award contracts. Dr. Bejmuk presented a chart showing the systems extension and evolution for various destinations. He explained that if you want to develop a new launch vehicle by 2016, then you must go with existing technology; if you want to achieve greater efficiency, then you won't be able to develop it by 2016. If you want to get there soon, it must be Shuttle-derived. If you want to get there later, it could use new engine development based on liquid oxygen (LOX)/kerosene fuel, which will lower the cost of operations. He described a briefing that the Committee received from the Human Research Program on human system risk in exploration. He presented charts describing the human risks in Exploration missions and the requirements for research on those risks. He reminded the Council that no human has been in space further than 385 miles since the last lunar landing. Dr. Bejmuk described a briefing that the Committee received from the ESMD Integration Office on the exploration of NEOs. The briefing identified gaps in the primary technologies and capabilities that are needed for a human mission to a NEO. He presented a chart on the operations concepts for a human mission to a NEO. The operations for a NEO mission include human spacecraft, extra-vehicular activity, science, and robotics. Dr. Bejmuk presented a chart showing NASA partnerships for enabling the Exploration Program and a chart describing the international and inter-agency partnership strategy. Perhaps heavy lift launch vehicle could be built affordably if the internationals could be included on the critical path. This would take a willingness to make sure that national interests are protected. Life cycle costs can be reduced if

international partners are brought in when their hardware or technology is more cost effective. Ms. Dyson stated that this sounds nice in principle, but in practice she would not find it to be very credible when you bring in the political, human, and coordination challenges. It would make more sense to proceed on a commercial modular basis than try to create an international cooperative effort. Dr. Bejmuk agreed that international cooperation is difficult to achieve and that "you are doomed" if you have a committee of internationals. He asserted, however, that international resources are necessary, and that international cooperation could be accomplished with strong leadership from NASA.

Dr. Bejmuk described in detail a briefing that the Committee received from the ESMD Commercial Crew Planning Lead on the status of the Commercial Crew initiative. The FY 2011 budget request invests $6 billion over five years to spur development of U.S. commercial human spaceflight vehicles. NASA plans to competitively allocate Commercial Crew funds to support higher and lower risk systems and systems components. NASA will ensure that all commercial systems meet stringent human-rating and safety requirements before allowing any NASA crew member to travel aboard a commercial vehicle. The objective of the proposed Commercial Crew initiative is to facilitate the development of a U.S. commercial crew space transportation capability with the goal of achieving safe, reliable, and cost-effective access to and from LEO and the ISS. The insight/oversight approach envisioned will require a change in the way government and industry interact for human spaceflight missions. NASA will have in-depth insight into the vehicle design through NASA personnel who are embedded in the contractor's facility. Requirements and standards will be a key facet in certifying the vehicle system. The insight approach should be more efficient and provide a more reliable system than an approach based on requirements accounting and reviewing contract deliverables. Dr. Bejmuk described additional information that the Committee has requested from EMSD in the form of charts. One chart should map required critical research and technologies against four destinations: LEO, the moon, Mars, and NEOs. Another chart should overlay innovative technologies that may be required or be viable for those destinations.

Dr. Bejmuk presented for the Council's consideration a proposed Recommendation for NASA to seek opportunities to collaborate on technology development with other agencies. He noted that things do not happen in international or large U.S. agencies unless the dialogue is elevated to a leadership level. Dr. Kroo observed that the Recommendation seemed very DoD-centric. Dr. Bette Siegel noted that the Department of Energy had developed useful technologies that could also be considered. After further discussion, the Council approved the following Recommendation:

NASA should seek opportunities to collaborate on technology development with the Space leaders at DoD, the Air Force, and other agencies. In particular, the Administrator should brief the DoD "Partnership Council" [Secretary of the Air Force; Commander of Air Force Space Command; Commander of Strategic Command; and Director of the National Reconnaissance Office] on NASA's technology needs for space exploration and discuss opportunities to co-invest in complementary technology developments that can satisfy the common goals of reliable, affordable access to and thru space.

Dr. Bejmuk presented for the Council's consideration a proposed Recommendation for NASA to invite international partners to contribute to all aspects of the exploration architecture. He explained that this recommendation would help implement the June 28, 2010, National Space Policy, which calls for promoting "appropriate cost- and risk-sharing among participating nations in international partnerships" and augmenting U.S. capabilities "by leveraging existing and planned space capabilities of allies and space partners." After extensive discussion on whether international partners should be encouraged or even permitted to contribute to the "critical path" in the transportation system required for a NEO mission, the Council approved the following Recommendation:

The NAC recommends that NASA pursue a policy that, considering the U.S. space industrial base and broad national security interests, invites potential partners to contribute to all aspects of the exploration architecture. In the exceptional case, where appropriate, partnerships on the critical path elements of the deep space transportation system should be considered.

Dr. Bejmuk presented for the Council's consideration a proposed Recommendation for human health risks to be further classified. The proposal was determined to be at the wrong level of detail for the Administrator and it was withdrawn.

Dr. Bejmuk presented for the Council's consideration a proposed Recommendation on developing operability incentives when acquiring commercial crew capabilities. Ms. Dyson explained that she had a potential conflict of interest and recused herself from participating in discussing this item. Dr. Bejmuk asserted that this is a stage where NASA can affect the cost of operations. After discussion, the Council approved the following Recommendation:

NASA should develop operability incentives for the acquisition of commercial crew capabilities. These incentives should drive commercial partner design to include features resulting in recurring cost of operations low enough to attract other customers in addition to NASA.

Dr. Ford thanked Dr. Bejmuk for his presentation.

Audit, Finance, and Analysis Committee Report

Dr. Ford introduced Mr. Robert Hanisee, Chair, Audit, Finance, and Analysis Committee. Mr. Hanisee reported that the Committee met the previous week at NASA Headquarters. Central in everyone's mind was the end of the fiscal year and the meeting with NASA's auditors, Ernst and Young (EY). In 2009, EY had disclaimed giving an opinion for the seventh consecutive year. There were three reasons for the disclaimer: valuing legacy property, specifically the ISS and the Space Shuttle; estimating environmental liabilities; and financial management system compliance with the Federal Financial Management Improvement Act. A little over a year ago, the Financial Standards Accounting Board issued a new rule, financial standard number 35 (SFFAS 35) that NASA believed would help provide a way to get a clean opinion from EY.

Mr. Hanisee presented slides showing asset classes reviewed in FY 2010 and NASA's assets on September 30, 2009. He discussed the results of NASA's review and described how the Office of Chief Financial Officer (OCFO), with the Office of Inspector General and EY would apply SFFAS 35 to the ISS. He reported on how NASA was treating operating material and supplies (OM&S) for accounting purposes. The Space Shuttle Program OM&S accounted for over 67 percent of NASA's total OM&S as of August 31, 2010. NASA has decided to discontinue using the consumption method for reporting OM&S and, instead, will adjust its financial statements to reflect the purchases method. Accordingly, OM&S purchases will now be expensed in the purchase period. At the last minute, EY has raised a new issue over accounting for Barter Agreements; traditionally such arrangements are not placed on the NASA books when NASA takes possession of foreign equipment. NASA now will be required to place a value on equipment turned over to NASA by its international partners. NASA has reviewed the institutional equipment asset class and has determined that adequate documentation is available to support over 99 percent of the recorded costs. Mr. Hanisee discussed a chart showing the impact on NASA's asset balance from application of the new accounting rule and explained that applying the new rule has not resulted in significant changes to the existing balances. Col. Collins asked how equipment is disposed. Mr. Hanisee replied that it is sold by the General Services Administration (GSA), which returns the proceeds to NASA after deducting a commission.

Mr. Hanisee discussed the current financial statement audit. The planning and documentation for internal control phases have been completed. The substantive test procedure and reporting phases are near completion. He explained that property valuation is an area of focus and discussed key property issues. He reviewed slides on the components of property, plant and equipment. It had not previously been clear whether EY would agree to write off all assets relating to the Space Shuttle. Now it is clear that they will. Mr. Hanisee discussed the unfunded environmental liabilities. He explained that NASA had been using Navy "Ideal" software. EY does not like that software and NASA is switching to using user-defined estimates instead. It appears that the unfunded liability issue is being resolved and should not be a problem. Mr. Hanisee discussed the OCFO workforce demographics. The OCFO scored well on several surveys as a place to work. There are four open positions and the turnover rate is 8.7 percent. The CFO is now hiring more entry level people, who tend to remain with the organization longer. The average is 18.3 years of service. Mr. Hanisee described the Constellation plan for FY 2011. They hope to reduce spending levels from $250 million-$300 million per month down to $200 million per month without terminating any contractors.

Mr. Hanisee believes that NASA has made tremendous progress and has solved most of the accounting issues that existed five years ago. The new Inspector General, Mr. Paul Martin, has been reasonable and cooperative. There is a 50 percent chance to get an unqualified opinion from EY this year. This is important because seven years ago, the

General Services Administration (GSA) issued a financial report criticizing NASA. That has put NASA on the defensive whenever it goes before Congress. Mr. Hanisee stated that he is frustrated with EY because issues that EY has recently raised, such as barter agreements on ISS and OM&S (operating materials and supplies) accounting should have been brought to NASA's attention two or three years ago.

Dr. Ford thanked Mr. Hanisee for his presentation.

NAC General Discussion

Dr. Ford stated that it was time for each Council committee to review its work plan for the next year. This is part of the annual cycle. Each committee should determine what needs to be removed from its existing work plan and what needs to be added, and should notify him by email. Work plans should be developed in close consultation with the appropriate NASA Associate Administrator. The Exploration Committee will now be able to develop a work plan because there is now a budget in place for Exploration. When Dr. Ford receives a new topic from Mr. Bolden or Ms. Garver, he will refer it to the appropriate committee. In response to a question from Col. Collins, Dr. Ford explained that work plans could include joint committee meetings.

Dr. Ford reminded everyone to use the template that Ms. Rausch has prepared for presenting Recommendations. He asked that each committee have a Vice-Chair, who would attend Council meetings in the Chair's absence, and to notify him by email of the name of each Vice Chair. He also stated that Committee Chairs should be encouraging their respective NASA Executive Secretaries to come to the NAC meetings in addition to the committee-level meetings to provide support as needed. The next NAC meeting will be in Washington, D.C. February 9-11, 2011. That meeting will be followed by a meeting in Cleveland, Ohio, May 4-6, 2011, at NASA Glenn Research Center.

Public Input

Dr. Ford gave the public an opportunity to comment. There were no comments.

Adjournment

Dr. Ford thanked the Council Members for their participation in the meeting. He thanked the Council's Executive Director, Ms. Diane Rausch, and the Council's support staff for their assistance. He also thanked Dr. Susan Miller of The AERO Institute, and the NASA Dryden Flight Research Center for hosting the meeting.

The meeting was adjourned.

NASA ADVISORY COUNCIL

The AERO Institute
38256 Sierra Highway
Palmdale, CA

PUBLIC MEETING

October 6-7, 2010
Operations Conference Room 400

Agenda

Wednesday, October 6, 2010

8:00 – 8:02 am	Call to Order, Announcements	Ms. Diane Rausch, Executive Director NASA Advisory Council, NASA HQ
8:02 – 8:10 am	Remarks by Council Chair	Dr. Kenneth Ford, Chair NASA Advisory Council
8:10 – 8:30 am	Welcome to NASA Dryden Flight Research Center	Mr. David D. McBride, Director NASA Dryden Flight Research Center
8:30 – 8:55 am	Remarks by NASA Deputy Administrator	Ms. Lori Garver NASA Deputy Administrator
8:55 – 10:10 am	Ad-Hoc Task Force on Planetary Defense: Final Report	Dr. Thomas Jones/Mr. Rusty Schweickart Co-Chairs
10:10– 10:30 am	Break	
10:30 – 11:15 am	Aeronautics Committee Report	Dr. Ilan Kroo, Member, Aeronautics Committee
11:15 am – 12:00 pm	Commercial Space Committee Report	Mr. Brett Alexander, Chair
12:00 – 12:45 pm	Lunch *(Council only)*	
12:45 – 1:30 pm	Technology & Innovation Committee Report	Ms. Esther Dyson, Chair
1:30 – 2:15 pm	Space Operations Committee Report	Col. Eileen Collins (Ret.), Chair
2:15 – 3:00 pm	Science Committee Report	Dr. Byron Tapley, Vice-Chair
3:00 – 3:15 pm	Break	
3:15 – 4:00 pm	IT Infrastructure Committee Report	Gen. Albert Edmonds, Chair
4:00 – 4:45 pm	Education & Public Outreach Committee Report	Mr. Miles O'Brien, Chair
4:45 – 5:00 pm	Public Input	
5:00 pm	Adjourn	

Thursday, October 7, 2010

8:00 am	Call to Order	Ms. Diane Rausch, Executive Director NASA Advisory Council
8:00 – 8:02 am	Announcements	Dr. Kenneth Ford, Chair NASA Advisory Council
8:02 – 9:00 am	Exploration Committee Report	Mr. Bohdan Bejmuk, Vice-Chair
9:00 – 10:00 am	Audit, Finance, and Analysis Committee Report	Mr. Robert Hanisee, Chair
10:00 – 10:30 am	Break	
10:30 – 11:30 am	NAC General Discussion	All
11:30 am – 12:00 pm	Public Input	All
12:00 pm	Adjourn	

NASA ADVISORY COUNCIL MEMBERS
October 2010

Dr. Kenneth M. Ford Council Chair *Founder and Director, Florida Institute for Human and Machine Cognition (IHMC)*	**Mr. Richard Kohrs** Chair, Exploration Committee *NASA (Ret.)*
Ms. P. Diane Rausch Executive Director *Designated Federal Official* *NASA Headquarters*	**Dr. Wesley T. Huntress, Jr.** Chair, Science Committee *Director Emeritus, Geophysical Laboratory, Carnegie Institute of Washington*
Ms. Marion Blakey Chair, Aeronautics Committee *Chief Executive Officer, Aerospace Industries Association*	**Colonel Eileen M. Collins** Chair, Space Operations Committee *USAF (Ret.), NASA Shuttle Pilot and Commander (Ret.), Aerospace Consultant, President of Space Presentations, LLC*
Mr. Robert M. Hanisee Chair, Audit, Finance and Analysis Committee *Managing Director, Trust Company of the West*	**Ms. Esther Dyson** Chair, Technology and Innovation Committee *EDventure Holdings*
Mr. Brett Alexander Chair, Commercial Space Committee *Executive Director, Commercial Spaceflight Federation*	**Dr. Raymond S. Colladay** Ex-Officio *Chair, Aeronautics and Space Engineering Board, National Academies*
Mr. Miles O'Brien Chair, Education and Public Outreach Committee *Miles O'Brien Productions*	**Dr. Charles F. Kennel** Ex-Officio *Chair, Space Studies Board, National Academies*

NASA Advisory Council
The AERO Institute
Palmdale, CA
October 6-7, 2010

MEETING ATTENDEES

NASA Advisory Council:

Ford, Kenneth, Chair	Director, IHMC
Rausch, P. Diane	NASA Headquarters
Alexander, Brett	Commercial Spaceflight Federation
Bejmuk, Bohdan	NAC/Exploration Committee
Colladay, Raymond, Ex-officio	ASEB, National Academies
Collins, Eileen	Space Presentations, LLC
Dyson, Esther	EDventure Holdings
Edmonds, Albert	Edmonds Enterprises Services
Hanisee, Robert	Trust Company of the West
Jones, Thomas	NAC/Planetary Defense Task Force
Kroo, Ilan	NAC/Aeronautics Committee
O'Brien, Miles	Miles O'Brien Productions
Schweickhart, Rusty (via telecom)	NAC/Planetary Defense Task Force
Tapley, Byron	NAC/Science Committee

NASA Attendees:

Alexander, David	NASA HQ
Arevalo, Carmen	NASA DFRC
Billings, Russ	NASA Education
Emery, Katrina	NASA DFRC
Emond, John	NASA HQ/NAC Commercial Space Committee
Garver, Lori	NASA HQ
Gills, John	NASA HQ
Hernandez, Jose	NASA/The AERO Institute
Johnson, Lindley	NASA HQ
Keaton, Jacob	NASA HQ/NAC Space Operations Committee
King, Marla	NASA HQ
Martin, Cam	NASA DFRC
McBride, David	NASA DFRC
Miller, Susan	NASA HQ/NAC Aeronautics Committee
Richards, Lance	NASA HQ
Siegel, Bette	NASA HQ/NAC Exploration Committee, NAC Ad-Hoc Task Force on Planetary Defense
Smith, Shaun	NASA/The AERO Institute
Tschida, Tom	NASA DFRC
Vick, Erika	NASA HQ/NAC EPO Committee

Other Attendees:

Currier, Craig	*Palmdale News*
Floyd, Mary	Zantech IT Services
Ford, Nancy	
Jaffey, Raphael	*Aerotech News & Review*
Ledford, Jim	City of Palmdale
Siddle, Ron	Antelope Valley Press

NASA ADVISORY COUNCIL
The AERO Institute
Palmdale, CA
October 6-7, 2010

LIST OF PRESENTATION MATERIAL

1) Final Report of the Ad-Hoc Task Force on Planetary Defense
2) Aeronautics Committee Report
3) Commercial Space Committee Report
4) Space Operations Committee Report
5) Science Committee Report
6) Information Technology Infrastructure Committee Report
7) Education and Public Outreach Committee Report
8) Exploration Committee Report
9) Audit, Finance & Analysis Committee Report