National Aeronautics and Space Administration

Technology & Innovation Committee
of the
NASA Advisory Council

NASA Headquarters
Washington, DC

November 18, 2011

MEETING MINUTES

G. M. Green, Executive Secretary

William F. Ballhaus, Jr., Chair

NAC Technology and Innovation Committee
NASA Headquarters
Washington, DC
November 18, 2011

MEETING MINUTES
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Meeting Report prepared by
David J. Frankel, consultant
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NAC Technology and Innovation Committee Meeting
NASA Headquarters
Washington, D.C.
November 18, 2011

Welcome and Overview of Agenda/Logistics (FACA Session)

The NASA Advisory Council (NAC) Technology and Innovation (T&I) Committee meeting was convened by Mr. G. M. (Mike) Green, Executive Secretary. Mr. Green announced that the meeting was a Federal Advisory Committee Act (FACA) meeting open to the public. He distributed a press release announcing that Cornell University Professor Mason Peck will be the Agency's Chief Technologist, effective in January. Mr. Green announced that it is time for the Committee members to prepare SF 450 forms.

Opening Remarks and Thoughts

Mr. Green introduced Dr. William Ballhaus. Dr. Ballhaus is the new Committee Chair and has been appointed to the NAC. Dr. Ballhaus welcomed everyone and reviewed the agenda for the meeting. He noted that he had spent two days with Dr. Bobby Braun, NASA's former Chief Technologist. Dr. Ballhaus appraised recent budget activity for technology development in the Agency as favorable.

Office of Chief Technologist (OCT) Update

Dr. Ballhaus introduced Mr. Joseph Parrish, NASA Deputy Chief Technologist. Mr. Parrish described plans for reorganizing OCT. The Chief Technologist will serve NASA's Administrator as the principal NASA advisor on matters concerning Agency-wide technology policy and programs. He will also advocate externally for NASA's research and technology programs. The Deputy Chief Technologist will be delegated responsibility to integrate, coordinate, and track technology investments across the Agency and work to infuse technologies into future NASA missions. He will facilitate Agency technology governance in matters such as risk acceptance and reporting. He will also document, demonstrate, and communicate the societal impact from NASA technology investments. The Space Technology (ST) Program will become a quasi-independent organization within OCT, and the ST Program Director will have budgetary authority and management responsibility for the Program.

Mr. Parrish presented a chart describing 13 Space Technology Grand Challenges for expanding human presence in space, managing in-space resources, and enabling transformational space exploration and scientific discovery. He discussed NASA's 14 ST roadmaps. These were drafted by NASA and are being reviewed by the National Research Council (NRC). An interim report has been released by the NRC and a final report is expected in January 2012. The roadmaps will serve NASA as a decadal-like survey to provide sustained technology investment goals. The NRC's interim report indicates that NASA's technology base is largely depleted, that current technology is insufficient to accomplish many intended space missions, and that future U.S. leadership in space requires a foundation for sustained technology advances. More information on the roadmaps can be found at www.NASA.gov/offices/OCT/home/roadmaps/index.html.

Mr. Parrish described how NASA develops its technology portfolio. It begins with the NASA Strategic Plan and is driven by requirements from NASA's Mission Directorates and the OCT organizations for Early-Stage Innovation, Game Changing Technology, and Crosscutting Capability Demonstrations. He discussed a pie chart showing FY 2011 basic and applied research funding at NASA for the following: science research and development ($200 million); fundamental aeronautics ($225 million); ST ($350 million); and Human Exploration ($340 million). In FY 2012, it is expected that ST will expand, and Human Exploration will contract. Dr. Ballhaus observed that often, technology investment provides options, not all of which are used. It is important to connect with program users of technology to enhance the yield of technologies that get baselined into systems. Mr. Parrish described the high-level emphasis areas and initiatives for FY 2012. There are 10 ST programs covering over 1000 projects, including the "Big Nine" projects. OCT will increase engagement with external entities for collaborative technology

10 ST programs covering over 1000 projects, including the "Big Nine" projects. OCT will increase engagement with external entities for collaborative technology development. He noted that there has not been much multi-national technology development in the past. In response to a question from Dr. Susan Ying, he explained that a federal law prohibits NASA from collaborating with China. Dr. Matt Mountain noted that there is multi-national cooperation in space science that can serve as a model. Mr. Parrish described a new approach, "co-development," which will be used to simultaneously develop technologies to meet NASA mission objectives and provide broader societal benefits. This involves identifying key requirements and partnerships at a project's outset in parallel development, which is expected to result in faster, less expensive development than if done serially. Mr. Parrish reviewed OCT's FY 2011 highlights and accomplishments. There were 1257 new inventions, 129 new patent applications filed, 221 new copyright licenses executed, 34 new invention licenses executed, and 44 new technology transfer successes. He acknowledged the Committee's assistance in causing NASA to redefine Small Business Innovation Research (SBIR) contracts to be non-severable. Fewer SBIR contracts will be issued this year to accommodate the larger contract values. In FY 2012, a primary Agency-level goal will be to increase technology transfer activities. A public online portal will be released to improve public access to federally-owned inventions. Agency procedures for Cooperative Research and Development Agreements will be revised and streamlined. Mr. Gordon Eichhorst emphasized that it is important to identify and catalog NASA'S intellectual property assets. He asserted that the greatest opportunity for productively disseminating new technology is two or three degrees of freedom away from parties that traditionally work with NASA. Mr. Parrish responded that a technology tracking tool is being developed, and he suggested briefing the Committee about the new tool in six months.

Dr. Ballhaus thanked Mr. Parrish for his presentation.

Update and Discussion of NASA Space Technology Program

Dr. Ballhaus introduced Dr. Michael Gazarik, Director, NASA ST Program. Dr. Gazarik described the ST Program's status. He explained that ST invests in high-payoff, disruptive technology that industry cannot currently tackle. ST does this to mature the technology required for NASA's future missions while proving the capabilities and lowering the costs for commercial and other government agencies' space activities. ST is the central NASA contribution to federal investments in research, technology, and innovation across the Nation. There are 10 ST programs that are currently divided into three organizations: Early-Stage Innovation, Game Changing Technology, and Crosscutting Capability Demonstration. The FY 2011 highlights were described. ST was included in the NASA Authorization Act of 2010. NASA's 2011 Operating Plan funds ST at approximately $350 million. In addition, Exploration Technology is funded at $185 million. Dr. Gazarik explained that advance planning enabled ST to issue solicitations and make FY 2011 competitive award announcements for Research Fellowships, Flight Opportunities, NASA Innovative Advanced Concepts, Game Changing Development, and Technology Demonstration Missions. FY 2012 solicitations are being developed. NASA Innovative Advanced Concepts (NIAC) selected 30 advanced concept proposals from several hundred submittals. The NASA ST Research Fellows program selected an inaugural class of 80 highly-qualified and talented graduate students from 37 universities and colleges. Game Changing Development's initial selections include a proposal by the Boeing Company to develop a lightweight composite cryogenic propellant tank and a proposal by Amprius, Inc., to develop an ultra-high energy density silicon nanowire lithium ion battery. Seven companies were selected to integrate in-flight technology payloads on commercial suborbital reusable platforms: Armadillo Aerospace; Near Space Corp.; Masten Space Systems; Up Aerospace; Virgin Galactic; Whittinghill Aerospace; and XCOR. Technology Demonstration Mission proposals have been selected for Solar Sail (L'Garde Inc.), Deep Space Atomic Clock (Jet Propulsion Laboratory), and Laser Communications Relay Demo (Goddard Space Flight Center). Dr. Gazarik presented a chart showing awards made in FY 2011 by the SBIR and Small Business Technology Transfer (STTR) programs. These programs foster the development of innovative ideas by small companies across the Nation. Successful SBIR and STTR technologies will be infused into NASA missions at each stage from solicitation to selection through technology maturation. The next solicitation cycle will increase the emphasis on the Agency's ST Roadmaps. Charts were presented showing the technology priorities for the Human Exploration Operations Mission Directorate (HEOMD), the Science Mission Directorate (SMD), the Aeronautics Research Mission Directorate (ARMD), the Office of the Chief Engineer, and the Office of the Chief Health and Medical Officer.

Dr. Gazarik described "The Big Nine," which are small, ongoing, high-priority/high visibility, broadly-applicable activities with major testing milestones in FY 2012 and FY 2013. These projects are: Laser Communications Relay Demonstration; Low Density Supersonic Decelerators; Cryogenic Propellant Storage and Transfer; Deep Space Atomic Clock; Hypersonic Inflatable Aerodynamic Decelerator (HIAD); Composite Cryotanks; Robotic Satellite Servicing; Solar Sail; and Human-Robotic Systems. Charts were presented showing highlights and milestones for The Big Nine. In FY 2012, ST will include many Exploration Technology Development and Demonstration activities from the former Exploration Systems Mission Directorate, as well as the crosscutting technology development activities that were included in the President's FY 2011 Budget Request. As part of the FY 2012 human spaceflight workforce transition strategy, ST will engage an additional 276 full-time equivalents (FTE) from the human spaceflight program. The Exploration Technology Development (ETD) was described. Its objective is to develop and demonstrate critical technologies that provide the basis for a broad set of human exploration capabilities to enable future human missions beyond low Earth orbit (LEO). These technologies will be based on the prioritized needs of NASA's human spaceflight enterprise. A chart was presented showing ST's ETD projects for FY 2012: In-Space Propulsion; Space Power Generation and Storage; Nuclear Systems; Lightweight Materials and Structures; Human-Robotic Systems; Autonomous Systems; Next Generation Life Support; Deployable Aeroshell Concepts and Flexible Thermal Protection Shield (TPS); In-Situ Resource Utilization; Composite Cryogenic Propellant Tank; Advanced Radiation Protection; Hypersonic Inflatable Aerodynamic Decelerator; Human Exploration Telerobotics; Mars Science Laboratory (MSL) Entry, Descent and Landing Instrumentation; Autonomous Landing and Hazard Avoidance Technology; Cryogenic Propellant Transfer and Storage; Solar Electric Propulsion; and Satellite Servicing. Dr. Ballhaus described the Air Force Space and Missile Systems Center (SMC) process called the Program Executive Officer (PEO)/ Technology Executive Officer (TEO) engagement, where the PEO and the TEO meet with their combined staffs to review technology requirements. He recommended that NASA seek to sit in on those meetings to become familiar with the SMC's needs and determine where there is overlap and where there might be a basis for a partnership. Dr. Gazarik will follow-up on the recommendation.

Crosscutting Space Technology Development (CSTD) projects in FY 2012 were described. The objective is to span from early-stage conceptual studies to flight demonstration in order to create a steady pipeline of broadly-applicable technologies enabling NASA's future Science, Space Operations, and Exploration missions. The projects with milestones in FY 2012 are: Nanotechnology; Space Synthetic Biology; Low Density Supersonic Decelerators; Materials International Space Station (ISS) Experiment (MISSE-X) Demonstrations; Laser Communications Relay Demonstration; Atomic Clock; and Solar Sails. In response to a question from Dr. Ballhaus, Dr. Gazarik explained that the Atomic Clock technology is being developed by Jet Propulsion Laboratory (JPL) and will enable GPS to be more accurate. Dr. Gazarik noted that the $575 million FY 2012 appropriation for NASA's ST program will allow the Agency to continue developing American technologies and innovations that will enable NASA's future missions. He explained that there are two types of demonstration failures. The first is a project that does not work, which is an acceptable failure. The second is a project demonstration that works but is not infused anywhere and just sits on the shelf. That is not acceptable and is something that they are working hard to avoid.

Dr. Ballhaus thanked Dr. Gazarik for his presentation.

NASA Technology Roadmap Review and Update

Dr. Ballhaus introduced Dr. Raymond Colladay, NRC Aeronautics and Space Engineering Board Steering Committee Chair, who participated telephonically. At Dr. Ballhaus' request, everyone in attendance at the T&I Committee meeting introduced themselves. Dr. Ballhaus noted that T&I Committee member Dr. Dava Newman is also a member on the Steering Committee. Dr. Colladay briefed the T&I Committee on the NRC's Interim Report on NASA's 14 Technology Roadmaps. The NRC's task is to solicit external inputs on the draft roadmaps, evaluate them, and identify and prioritize key technologies. The technologies to be considered include NASA's exploration systems, Earth and space science, and space operations mission areas, as well as those technologies that contribute to critical national and commercial needs in space technology. Two reports are to be prepared. The first is a brief interim report that addresses high-level issues associated with the roadmaps. The second is a comprehensive final report that summarizes findings

and recommendations for each roadmap and prioritizes, by group, the highest priority technologies from all 14 roadmaps. Dr. Colladay presented charts showing the membership for the Steering Committee and its six panels, the roadmaps assigned to each panel, and the schedule for the work. They expect to deliver the final report to NASA on January 24, 2012. Public workshops were held for each roadmap and public input was solicited over the Internet. The data from the public input can be found online at: www8.nationalacademies.org/asebsurvey/tabs/publicview.aspx. He noted that work is similar to a NRC decadal study by the Space Studies Board. The study covered 320 technologies contained in the 14 roadmaps. The interim report has been released, and Dr. Colladay summarized its findings on the roadmaps and NASA's technology base. Success in executing future NASA space missions will depend on advanced technology developments that should already be underway. NASA's technology base is largely depleted. Currently available technology is insufficient to accomplish many intended space missions and Earth orbit, and to the Moon, Mars, and beyond. Future U.S. leadership in space requires a foundation of sustained technology advances. A robust space technology base is urgently needed. Technology roadmaps that set forth the time sequence and interdependencies for high-priority advanced space technology research and development (R&D) over the next 5 to 30 years will enhance the effectiveness of efforts to reinvigorate the technology base.

Dr. Colladay briefed the T&I Committee on findings regarding general management practices. Program stability is important to avoid disrupting individual programs and to ensure that other federal agencies, industry, academia, and foreign organizations recognize NASA as a reliable partner. Pursuing evolutionary improvements and setting intermediate goals lead to time-phased applications, promote sustainable facilities and workforce within industry, and improve NASA's ability to manage its resources and provide effective oversight. Balance is needed between support for focused technological approaches, and support for technologies that accommodate a wide range of destination and schedule options. Flight opportunities to test and demonstrate the performance of new technologies under realistic flight conditions are necessary for many of the technologies in the roadmaps. Facility issues are of concern for some key technologies covered by the draft NASA roadmaps, although this is largely outside OCT's scope and responsibility. The roadmaps would be more valuable and actionable if they provided more detail about how goals may be accomplished through partnerships with outside organizations. The NRC made recommendations for the following technology areas: an integrated approach to technology development; precision landing systems; guidance, navigation and control; launching from locations other than Earth; and radiation protection. It was also observed that technology developers could better understand human factors considerations if crew comments from past programs were consolidated and integrated into an existing electronic database made accessible to all U.S. exploration technology developers. The interim report identified gaps in the draft roadmaps and recommended revisions to the roadmaps' Technical Area Breakdown Structure (TABS). The roadmaps should identify how the commercial space sector could benefit from advanced technology. Pre-competitive technology relevant to the commercial space sector should be supported, similar to the support NASA gives to the aeronautics industry. Advanced technologies should be transferred to U.S. industry. NASA should support the development of avionics technologies that are uniquely driven by NASA mission requirements. The technology roadmaps do not adequately address the broad impacts from space weather. The TABS was modified for some technology areas, primarily to fill technology gaps within a particular roadmap. The revised TABS will be used for the final report. New technologies that have been added include the following: electric and magnetic field storage; thermal storage; food production; processing and preservation; smart habitats; integrated flight operations systems; integrated risk assessment tools; space atomic interferometry; high contrast imaging and spectroscopy technologies; and wireless spacecraft technologies.

Dr. Ballhaus asked whether the Board discussed the loss to sustained capabilities when teams are disbanded. Dr. Colladay responded that this will be covered in the final report. Dr. Mountain questioned whether there have been any stable technology programs at NASA without a sustained mission. Dr. Colladay observed that many people would agree; however, he noted that Aeronautics is an example where technology effort has been sustained without a mission. It is important for NASA to sustain technology development, yet that may be futile in a mission-oriented agency. Dr. Ballhaus counseled that a technology base is needed before the mission is known, and that there is a precedent for this. Mr. Parrish noted that there is a new line in the budget for space technology, which will be receiving five percent of the Agency's FTEs. In response to a question from Mr. Gordon Eichhorst, Dr. Colladay advised that the depletion in

NASA's technology base is not hopeless and that NASA has already taken steps that can turn it around in a significant way—through cooperative development and partnerships with the Department of Defense, laboratories, industry, and universities. Dr. Alain Rappaport advised that keeping technology development independent from missions is very important and should be maintained. Dr. Ballhaus concurred and asserted that this would be a challenge for Mr. Parrish and Dr. Gazarik. Dr. Colladay noted that the changes recommended in the interim report had been provided to NASA to let NASA know where the NRC was heading and enable NASA to get a head start before the final report is released. The final report on the study will be issued early in 2012, and will provide specific guidance on how the technology development program managed by NASA's OCT can be enhanced in the face of scarce resources by focusing on the highest priority technologies.

Dr. Ballhaus thanked Dr. Colladay for his presentation.

Hypersonic Inflatable Aerodynamic Decelerator (HIAD) Program Update

Dr. Ballhaus introduced Dr. Neil Cheatwood, NASA Langley Research Center (LaRC). Dr. Cheatwood is the Principal Investigator for NASA's HIAD project. Dr. Cheatwood explained the motivation for HIAD. The thin atmosphere on Mars makes it difficult to decelerate large masses and limits accessible surface altitudes. Science payload size and site altitude are limited by Viking-derived entry, descent, and landing (EDL) systems. The aeroshell size is limited by the launch vehicle fairing. After inflation, HIAD behaves much like a rigid device, the aerodynamics are scalable, and HIAD are lighter, increasing delivered payload. A lower ballistic coefficient from increased drag area allows higher altitude deceleration, providing access to higher surface elevations, increase in landed mass, and longer EDL timelines. He discussed a slide depicting the first fully successful reentry HIAD flight demonstration, the Inflatable Reentry Vehicle Experiment (IRVE)-II mission. The mission achieved three objectives: it demonstrated inflation and survival; it verified predictive thermal and tank performance; and it validated design and performance predictions. A graph was presented showing IRVE-II's predicted and actual trajectory. Dr. Cheatwood discussed a chart on various EDL Mars exploration architectures. Slides were presented showing an IRVE-3 mission concept and design overview, the inflatable structure development, and its flight test instrumentation. Dr. Cheatwood described the vision for HIAD mission infusion for robotic missions to Mars, Venus, Titan and Neptune, for robotic or crewed Earth return, for Defense Department applications, and for technology development and risk reduction for human Mars missions. He presented a chart showing the HIAD organization structure and a slide showing flexible TPS development. He discussed NextGen subsystems that use trim tabs and presented a chart showing the progression of HIAD development flights. High-Energy Atmospheric Re-Entry Tests (HEART) will integrate all aspects of the HIAD Development Project to demonstrate the performance and survivability of an integrated, low ballistic-coefficient entry vehicle in a relevant environment. Charts were presented showing the HEART reference concept description, the concept of operations, and the HIAD project implementation schedule. In response to questions from Committee members, Dr. Cheatwood explained that the project is testing in the LaRC Aerodynamics Laboratory, which is a closure-threatened facility, and also plans to conduct tests in the Ames Research Center Unitary Plan Wind Tunnel, which is scheduled to be closed next year. Dr. Cheatwood described the project's ongoing education and public outreach efforts and discussed the project's milestones for FY 2012.

Dr. Ballhaus thanked Dr. Cheatwood for his presentation.

Space Technology Research Fellow (STRF) Update

Dr. Ballhaus introduced Ms. Claudia Meyer, NASA Space Technology Research Grants Program Executive. Ms. Meyer briefed the Committee on NASA's Space Technology Research Fellowships (NSTRF). The core values for the program are that NASA Space Technology Fellows will perform innovative space technology research while building the skills necessary to become future technology leaders. Fiscal year 2011 was the inaugural year for the NSTRF program. Four hundred applications were received and 80 students were selected from 37 universities in 22 states and territories. Geographical location and diversity were not used as selection criteria. Dr. Mountain cautioned that faculty recommendations are notorious for demonstrating unconscious bias, and that it is important to demonstrate

how unconscious bias has been fought. Charts were presented showing awards by university, state, and technology area. All NSTRF11 awarded proposals with abstracts are available on the NASA OCT website at www.NASA.gov/offices/OCT/early_stage_innovation/grants/2011_inaugural_class.html. A solicitation for FY 2012 fellowships has been released and applications are due on January 11, 2012. The solicitation is available at http://nspiers.nasaprs.com. Candidates must be U.S. citizens or permanent residents who are pursuing or seeking to pursue advanced degrees in science, technology, engineering or mathematics (STEM). A chart showing the components for the application was presented. Ms. Meyer explained how applicants will be evaluated and selected. A key factor will be the proposed research's relevance to NASA's ST Roadmaps and the TABS. Fellowship awards will be issued as a training grant to the student's host university. In addition, resources separate from the awards have been allocated to cover mentor time and costs associated with hosting and interacting with the Fellow. Ms. Meyer presented a sample NSTRF Research Training Plan. The plan will be used by the program for reporting and advocacy, both internal and external to NASA.

Dr. Ballhaus thanked Ms. Meyer for her presentation.

Cryogenic Propellant Storage and Transfer (CPST) Update

Dr. Ballhaus introduced Ms. Susan Motil, CPST Technology Demonstration Mission Project Manager, NASA Glenn Research Center. Ms. Motil described the present challenges for in-space cryogenic systems. There is no demonstrated capability to store liquid cryogenic propellants in space for more than a few hours. There is no demonstrated, flight-proven method to gauge cryogenic propellant quantities accurately in microgravity. There is no proven way to guarantee that gas-free liquid cryogens can be moved from a tank in microgravity. Gas-free liquid is required to safely operate a cryo propulsion system. The only known experience is the single Russian Buran flight using liquid oxygen. There is no demonstrated ability to move cryogenic liquids from one tank or vehicle to another in space. Ms. Motil noted that a flight demonstration with cryogenic propellant storage, expulsion, and transfer can remedy these problems. A chart was presented showing the Human Exploration Architecture Team (HAT) requirements for CPST technologies. Almost all HAT missions beyond LEO require CPST's storage and expulsion technologies. CPST offers cross-cutting benefits for power generation and energy storage, advanced thermal management systems, better ground processing, nuclear thermal missions to Mars, extended commercial upper stage capabilities, in-situ resource utilization (ISRU), and high-performance chemical propulsion beyond LEO. Ms. Motil explained the reasons microgravity is required for CPST. Passive and active thermal control performance is unknown due to the effects of acceleration level and propellant orientation. Liquid Acquisition Devices (LADs) will be required and only work when surface tension forces are greater than gravity and acceleration forces. In microgravity, surface tension becomes the dominant force acting on fluids. LADs use surface attenuation to draw gas-free liquid to the tank outlet. Propellant Mass Gauging must be demonstrated in microgravity in an actual tank across various propellant orientation scenarios and fill levels. Microgravity storage tests are needed. Probe-type gauges are not sufficient, because they require liquid to be settled.

Ms. Motil discussed how CPST technology is being matured. One technology development goal is to demonstrate high-performance cryogenic insulation for Passive Thermal Control (PTC) to minimize heat leaking through large areas of tanks and lines. Spray-On Foam Insulation (SOFI) for this purpose is at Technology Readiness Level (TRL) 9. SOFI will not reach the boil-off rate needed for a long-duration flight. Thick Multi-Layer Insulation is at TRL 4. Another technology development goal is to develop active thermal and pressure control systems to achieve long-duration reduced or zero boil-off (ZBO) for a cryogenic propellant. Ninety-K cryocoolers to achieve reduced boil-off for CPS are at TRL 6. Twenty-K cryocoolers to achieve ZBO for CPS are at TRL 2. The technology development goal for gauging is to develop propellant quantity (mass) gauges that work in zero-g, and/or under low settling thrust. The TRLs for these developing technologies range from TRL 4 to TRL 5. A screen-type LAD to transfer vapor free liquid cryogenic propellant is at TRL 4 and a vane-type LAD is at TRL 5. Ms. Motil presented a chart on the project's process for concept definition. The approach enables infusing the best ideas from industry and government. She presented charts on the concept option for this technology development and a 6-month CPST demonstration and mission architecture. The focus in FY 2012 will be on maturing technology to TRL 5, developing a mission concept, and preparing for Mission Concept Review. She noted that a flight

demonstration is the only way to close Cryogenic Fluid Management (CFM) technology gaps and ready the Cryogenic Propulsion System for future in-space applications. In response to a question from Dr. Mountain, it was explained that while CPST is primarily mission driven. Dr. Gazarik noted that CPST is the number one technology that NASA needs to acquire for deep space exploration.

Dr. Ballhaus thanked Ms. Motil for her presentation.

Discussion on Potential Intellectual Property (IP) Finding/Recommendation

An article entitled "A Structure for Capturing Quantitative Benefits from the Transfer of Space and Aeronautics Technology," from the Innovative Partnerships Office, OCT, was circulated by Mr. Green.

Mr. Ballhaus introduced Ms. Courtney B. Graham, Associate General Counsel, Commercial and (IP), NASA Office of General Counsel. Ms. Graham reported that technology transfer personnel from across the Agency had met to identify areas where IP opportunities could be improved. Technology development reports are not being submitted because they had not been included in either acquisition policy or performance plans. Reporting needs to be identified as an important job criteria; accordingly, there will be a new focus on improving the civil service reporting. There is an action now to include reporting in acquisition policy and to emphasize it in performance plans. Mr. Eichhorst expressed encouragement over the efforts to develop a tracking tool. He asserted it would not be worthwhile to implement it in a piecemeal fashion, and that a cross-Agency commitment is necessary. If individual Centers do not find it worthwhile, the tracking tool will not make a difference. Ms. Courtney observed that managers do not see tracking and reporting as included in their job description and do not want to charge technology and innovation to their bottom line; therefore, there is no management support. "Incentivization" takes place at the Centers and is a cultural value. NASA is undergoing a change from large operations to research. She reported that half the awards from NASA's awards programs go to people at JPL. Mr. Eichhorst asserted that incentives work at JPL because it is subordinate to and supported by the California Institute of Technology, a private entity that has staff and resources to capitalize on new technology. Mr. Eichhorst asserted that small businesses have difficulty identifying who to work with at NASA in order to develop technology, and he suggested that the website maintained by the National Institutes of Health (NIH) provides a good model for NASA to consider. In response to a comment from Dr. Rappaport, Ms. Graham advised that NASA is permitted to retain royalty income, although the purposes for which it can be used are restricted. Dr. Rappaport recommended that NASA use the NIH model and disseminate patent information through the Internet. He described a Department of Defense program called America's Top Innovators, which establishes an easy way for small companies to license technology. In response to a question from Dr. Ballhaus, Ms. Graham reported that the maximum award that NASA employees may receive for inventions ranges from $100,000 to $125,000. Dr. Rappaport recommended giving rewards for provisional patent filings. Ms. Graham responded that it is amazing what people will do for a limited edition T-shirt. She cautioned against stigmatizing employees who do not have an opportunity to participate in the IP award process.

Dr. Ballhaus thanked Ms. Graham for her presentation.

General Discussion and Recommendations

Mr. Green indicated that the Committee would receive the following for its next meeting: updates on FY 2013 Budget request; the final NRC report on the technology roadmaps; and information about retaining NASA's laboratory facilities. Dr. Ballhaus recalled that the NRC had performed a laboratory assessment several years previously, and he expressed an interest in learning about NASA's response. Mr. Green informed the Committee that the number of meetings for the Committee and the NAC would be reduced from four to three per fiscal year. Dr. Ballhaus indicated that milestones should be established for reviewing OCT's performance in the 2013 fiscal year. Dr. Ying explained that a high level should be expected, considering the $575 million funding level. The Committee discussed the location for its next meeting without making a decision at this time. Mr. Eichhorst and Ms. Graham will bring back proposed recommendations on identifying and protecting NASA's IP.

Adjournment

Dr. Ballhaus thanked the committee members for their participation and adjourned the meeting.

Agenda

NAC Technology and Innovation Committee Meeting
November 18, 2011
NASA Headquarters
Washington, D.C.
MIC 6A – 6H65

November 18, 2011 –

8:00 a.m.	Welcome and overview of agenda/logistics (FACA Session) Mike Green, Executive Secretary
8:05 a.m.	Opening Remarks and Thoughts Dr. William Ballhaus, Chair
8:15 a.m.	Office of Chief Technologist Update Mr. Joseph Parrish, NASA Deputy Chief Technologist
8:45 a.m.	Update and Discussion of NASA Space Technology Program Dr. Michael Gazarik, Director, NASA Space Technology Program
9:30 a.m.	Break
9:45 a.m.	NASA Technology Roadmap Review Update Dr. Raymond Colladay, NRC and Dr. Dava Newman, Professor, MIT
10:30 a.m.	Hypersonic Inflatable Aerodynamic Decelerator Program Update Dr. Neil Cheatwood, NASA Langley Research Center
11:30 a.m.	Space Technology Research Fellow Update Ms. Claudia Meyer, NASA Space Technology Research Grants Program Executive
12:15 p.m.	Lunch (On own)
1:00 p.m.	Cryogenic Propellant Storage and Transfer (CPST) Update Ms. Susan Motil, CPST Project Manager, NASA Glenn Research Center
2:00 p.m.	Discussion on Potential IP Finding/Recommendation
2:30 p.m.	General Discussion and Recommendations
3:15 p.m.	Adjournment

NAC Technology and Innovation Committee Membership
October 2011

Dr. William (Bill) F. Ballhaus, Jr., Chair	[retired]
Mr. G.M. (Mike) Green, Executive Secretary	NASA Headquarters
Mr. Gordon Eichhorst	Aperios Partners LLP
Dr. Charles (Matt) Mountain	Space Telescope Science Institute
Dr. Dava Newman	Massachusetts Institute of Technology
Dr. Alain T. Rappaport	[consultant]
Dr. Susan X. Ying	The Boeing Company

NAC Technology and Innovation Committee
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MEETING ATTENDEES

Committee Members:

Ballhaus, William (Bill) – Chair
Green, G.M. (Mike) – Executive Secretary
Eichhorst, Gordon
Mountain, Charles (Matt)
Newman, Dava
Rappaport, Alain
Ying, Susan X.

NASA Attendees:

Cheatwood, Neil	NASA/LaRC
Comstock, Douglas	NASA Headquarters
Gazarik, Mike	NASA Headquarters
Graham, Courtney	NASA Headquarters
Harrington, Tammy	NASA/GRC
Jarst, Marcia	NASA Headquarters
Kortes, Trudy	NASA/GRC
McGowan, David	NASA Headquarters
Meyer, Claudis	NASA Headquarters
Motil, Susan	NASA/GRC
Parrish, Joe	NASA Headquarters
Rakanjee, Kina	NASA Headquarters
Smith, Brian K.	NASA/GRC
Tischer, Peter	NASA/GRC
Turner, Janelle	NASA Headquarters

Other Attendees:

Bardos, Russ	Aerojet
Beavin, Michael	House Science Committee
Chell, Kaitlin	California Institute of Technology
Frankel, David	P B Frankel LLC

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LIST OF PRESENTATION MATERIAL

1) A Structure for Capturing Quantitative Benefits from the Transfer of Space and Aeronautics Technology [Comstock & Lockney]
2) Office of the Chief Technology Update [Parrish]
3) Space Technology Program [Gazarik]
4) NASA Technology Roadmap [NRC]
5) Hypersonic Inflatable Aerodynamic Decelerator (HIAD) Project [Cheatwood]
6) Space Technology Research Fellowships [Meyer]
7) Cryogenic Propellant Storage & Transfer (CPST) Technology Demonstration Mission [Motil]
8) NASA Release 11-374 – "NASA Administrator Names Peck Agency's Chief Technology"