

National Aeronautics and Space Administration

**Technology & Innovation Committee
of the
NASA Advisory Council**

**Kennedy Space Center Visitor Complex
Debus Conference Center
Cape Canaveral, Florida**

January 12, 2011

DRAFT MEETING MINUTES



G. M. Green, Executive Secretary



Esther Dyson, Chair

Technology and Innovation Committee

Kennedy Space Center Visitor Complex

Debus Conference Center

Cape Canaveral, Florida

January 12, 2011

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*Meeting Report Prepared By
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Wednesday, January 12, 2011

Opening Remarks

The NASA Advisory Council (NAC) Technology and Innovation (T&I) Committee meeting was convened by Mr. G. M. (Mike) Green, Executive Secretary. He announced that the meeting was a Federal Advisory Committee Act (FACA) meeting open to the public. He thanked the Kennedy Space Center (KSC) for hosting the meeting and for allowing the Committee members to tour the facilities. He then introduced Ms. Esther Dyson, Chair, who reviewed the planned agenda for the meeting.

Office of Chief Technologist Update

Ms. Dyson introduced Dr. James Reuther, Director for Strategic Integration, Office of Chief Technologist (OCT), who briefed the Committee on the Office's status. Dr. Michael J. Gazarik has been appointed as the Agency's Deputy Chief Technologist. The OCT is operating with limited funding under the current Congressional continuing budget resolution. Any existing project or program that had been funded in the previous year is authorized to continue to operate under the continuing resolution at last year's level. The OCT had planning funds in last year's budget and, therefore, its road mapping activity is continuing. Ms. Dyson noted that non-OCT funding for research and development is in danger under the current budget stress. Dr. Reuther explained that a significant portion of technology funding is in the Science Mission Directorate's (SMD) budget. Small Business Innovative Research (SBIR) will continue at a Congressionally mandated level. The overall technology budget, however, is well below the amount that had been proposed in the President's budget for FY 11.

Ms. Dyson thanked Dr. Reuther for his presentation.

NASA Technology Transfer and Commercialization Update

Mr. Green introduced Mr. Douglas A. Comstock, Director of Partnerships, Innovation, and Commercial Space (PICS), within OCT. Mr. Comstock briefed the Committee on the OCT's programs for technology transfer and commercialization. A chart was presented showing the statutory authority for these programs. He described the benefits that the OCT offers to potential partners. These benefits include access to NASA's technical expertise, facilities, and flight opportunities. NASA commercialized technology is featured in NASA's annual *Spinoff* publication. Each edition highlights 40 to 50 successful NASA technology transfers. It is available online at <http://spinoff.nasa.gov>. A searchable benefits database containing 1,700 *Spinoff* stories is available at <http://www.sti.nasa.gov/spinoff/database>. Mr. Comstock presented a chart showing statistics on the number of spinoffs that are derived from various transfer mechanisms. Ms. Dyson observed that the statistics did not reflect the financial value of the spinoffs. Mr. Comstock explained that NASA does not have a way to measure their value and that not everything is quantitative in dollars, particularly when lives are saved. They are considering how measurements can be better implemented in the future. NASA has several hundred active licenses from its patent portfolio from which the total income annually is three to four million dollars. Ms. Dyson noted that NASA could leverage the value of its patents in addition to protecting them, not just for its own financial returns, but as a way of ensuring that their latent value is realized by third parties.

Mr. Comstock described the OCT's commercialization efforts. NASA is pursuing economic growth through research parks. One example is the NASA Research Park at the Ames Research Center. He presented highlights from recent Centennial Challenges and from the Commercial Reusable Suborbital Research (CRuSR) program. NASA has sponsored 28 TecFusion™ Summits since 2004. At these summits, large companies have reviewed over 3,700 Phase II technologies and 335 SBIR companies have presented over 400 technologies. He noted that the 2005 NASA Authorization Act designated a portion of the International Space Station (ISS) as a National Laboratory. Accordingly, NASA provides an opportunity for non-governmental entities to use the ISS to conduct research. Ms. Shannon Skinn, KSC National Lab Project lead, added that Congress has allocated half of the ISS research facilities for non-NASA research. Mr. Comstock presented slides showing how NASA-derived technologies have assisted developing

countries, supported environmental cleanup, advanced the use of green technologies, provided disaster warnings, and contributed to security. He described the NASA Technology Transfer System (NTTS). NASA technologies are searchable at <http://technology.nasa.gov>. NASA has established an RSS feed for technologies at http://www.sbipp.com/technologyportfolios/technology_list.asp. Information on partnering with NASA is available online at <http://octpartneringtool.nasa.gov/oct>.

Ms. Dyson thanked Mr. Comstock for his presentation.

NASA and Intellectual Property

Mr. Comstock briefed the Committee on how NASA handles its intellectual property. He described the statutory framework. The 1958 National Aeronautics and Space Act required NASA to transfer valuable technology to benefit U.S. industry and authorized NASA to protect inventions to which it has title. Large businesses contracting for NASA must report inventions to the Agency. The government owns inventions developed under those contracts, although the Administrator may waive NASA's rights. Large businesses must commercialize the inventions. The 1980 Bayh-Dole Act required all government agencies to use the patent system to promote the transfer and public availability of federally funded inventions. The 1980 Stevenson-Wydler Technology Innovation Act and the 1988 Federal Technology Transfer Act continued to define and promote technology transfer. Federal agencies that have federal laboratories were required to have a formal technology transfer program.

The OCT manages NASA's intellectual property via PICS and Technology Partnership offices located at each NASA Center. Patents and copyright licenses are used to transfer technology to the private sector. Royalties collected by the Centers are reinvested back into research and technology programs. Dr. Reuther clarified that only royalties from patents are reinvested; royalties from copyrights revert to the general treasury. Mr. Comstock emphasized that the objective is to benefit the public, not to maximize NASA's revenue from intellectual property. Those revenues are three to four million dollars per year. Ms. Dyson expressed concern that those revenues seem inadequate. She encouraged Mr. Comstock to think more commercially. She explained that getting the technology into the hands of small companies for a small percentage to be paid in the future would help them to grow into large companies. Mr. Gordon Eichhorst advised that it is important to encourage the best people to come to work at NASA, and that the ability to be rewarded and recognized can attract them. Mr. Comstock presented charts summarizing statistical data on NASA's intellectual property. He noted that NASA has more potential patents than it can process and that NASA has too few attorneys to handle these matters due to resource constraints. In FY 2009, there were 1,373 New Technology Reports (NTRs), 114 patents issued, and 67 new patent licenses executed. There are 504 active patent licenses. At KSC, there is one patent attorney and about 12 patent applications are filed each year. Other Centers are staffed similarly. Outside contractors are used to help assess what should be patented. A Licensing Best Practices Group has been formed. NASA is continually exploring mechanisms to help license NASA technology. The Department of Energy, for example, has provided NASA access to its Technology Portal, a website that allows users to browse energy-related patents or licensing opportunities at <http://techportal.eere.energy.gov>.

Ms. Dyson thanked Mr. Comstock for his presentation.

Status of NASA Space Technology Roadmaps

Ms. Dyson introduced Dr. Reuther, who briefed the Committee on the OCT's planning strategy. He explained that over the last decade NASA had focused on developing technologies needed for a specific purpose. There was no innovation culture, and NASA was becoming irrelevant for technology for the country as a whole. It was necessary to think about technology more broadly than just NASA's missions. The OCT wants to establish a well-justified motivation for technology development. Without that basis, Congress will cut the budget. The strategy for technology will be guided by NASA's Strategic Plan, by Grand Challenges, and by Technology Roadmaps. An infusion path will be used to advance innovation. Technology development will be "projectized," with defined start and end dates. Project Managers will have full authority and responsibility. Projects will be focused in clearly defined capability areas. Failures

should “fail fast.” NASA will seek disruptive innovation such that with success, the future will no longer be a straight line. NASA will foster an emerging commercial space industry.

Dr. Reuther described how NASA will manage its Space Technology Programs. The final authority will be the NASA Chief Technologist, Dr. Robert Braun. Dr. William Ballhaus asked whether the Center Directors would be accountable for the execution of a project. Dr. Reuther responded that that would not be the case. A chart was presented showing the OCT organization. Dr. Reuther’s Strategic Integration Office reports directly to Dr. Braun. The OCT has six main goals and responsibilities, which were reviewed by Dr. Reuther. He described NASA’s technology integration governance. There is a NASA Technology Executive Council (NTEC), organized and chaired by the OCT. The NTEC performs Agency-level technology integration, coordination, and strategic planning. Its membership includes Mission Directorate Associate Administrators and the NASA Chief Engineer. There is also a Center Technology Council (CTC), organized and chaired by the OCT. Its membership includes the Center Chief Technologist (CCT) appointed by each NASA Center Director. There are 12 Space Technology Grand Challenges. The challenges are grouped into three areas: Expand Human Presence in Space; Manage In-Space Resources; and Enable Transformational Space Exploration and Scientific Discovery.

Dr. Reuther described NASA’s Space Technology Roadmap (STR). It is available at www.nasa.gov/OCT. The STR performs a “decadal” survey that creates 14 cross-cutting Technology Area (TA) roadmaps and links them to an integrated strategic roadmap. A chart listing the 14 TAs was presented and the process for creating the roadmaps was explained. The roadmaps are intended to capture the phased technology needed to support future NASA missions and national needs. The context is twofold. “Mission Pull” uses Mission Directorate strategic plans to identify specific future missions requiring technology development. “Mission Push” identifies emerging innovations and technologies that would enable missions to meet NASA strategic goals in ways currently not considered within the Mission Directorate plans. Internal and external stakeholders participate in roadmap development. The National Research Council (NRC) will participate in the external review process, and funding for that review has been secured. Draft roadmaps are now available for NRC review and may be viewed on the OCT’s website. Dr. Reuther explained that the SMD has been very successful in securing funding from Congress after working with the NRC in this manner, and the OCT wants to follow that model.

There was a discussion on NASA’s stipend program for graduate students. Dr. Reuther explained that the stipends provide tuition and research costs for approximately 500 graduate students. Dr. Ballhaus noted that the stipends do not cover room and board. He expressed concern that the students might need to find part-time employment to cover those expenses. Dr. Reuther explained that some universities include those expenses in the research costs.

Ms. Dyson presented a proposal to require something new to be flown on each mission. Dr. Reuther noted that the SMD always has new things on its vehicles because every mission is unique in some sense. He explained that cost overruns typically arise because expected technologies did not develop as planned, and that mission costs are related to how long it takes to go from Phase A to flight. A requirement for something new to be flown could work, he opined, if it is not on the critical path. Ms. Dyson observed that there is a backlog of items that are not critical path that can be tested. Dr. Ballhaus asked whether the OCT supported technology off the main line of projects that could benefit project in cost, performance schedule, and risk if it meets established criteria at milestone points. Dr. Reuther responded that the OCT is interested in doing that, subject to funding constraints.

Ms. Dyson thanked Mr. Reuther for his presentation.

Experimental Program to Stimulate Competitive Research (EPSCoR) Presentation

Ms. Dyson introduced Dr. Lesley Fletcher, Deputy Director, KSC Office of Education. Dr. Fletcher briefed the Committee on EPSCoR, a program that provides seed funding to enable state jurisdictions to develop academic research capabilities in aerospace and aerospace-related research. The NASA Authorization Act of 2010 states that the program strengthens the research capabilities of jurisdictions that historically have not participated equally in competitive aerospace and aerospace-related research activities. Dr. Fletcher

presented charts showing the jurisdictions that have received research awards and the number of awards that have been issued per Mission Directorate. Each award can be up to \$750,000, and there have been 88 awards to date. She provided examples of projects that have benefited from the awards.

Ms. Dyson thanked Ms. Fletcher for her presentation.

KSC Research and Technology Capability Areas

Ms. Dyson introduced Karen Thompson, KSC Chief Technologist. Ms. Thompson described eight technology areas that will continue to be emphasized at KSC. Other areas will no longer be focused on due to budget constraints. The eight areas are: Storage, Distribution and Conservation of Fluids (Cryogenics, Liquids, Gases); Materials for Life Cycle Optimization; Life Sciences & Habitation Systems; Remediation and Ecosystem Sciences; In-Situ Resource Utilization and Surface Systems; Life Cycle Optimization of Products, Projects, and Programs; Space Launch and Suborbital Technologies; and Tracking, Timing, Communications (TT&C) and Navigation Technologies. Ms. Thompson presented charts showing examples from each area. She described the KSC Planning and Development Office, which is the “front door” for partnership and development with KSC. Its website is <http://kscpartnerships.ksc.nasa.gov>.

Ms. Dyson thanked Ms. Thompson for her presentation.

Public Input

Ms. Dyson gave the public an opportunity to comment. There were no comments.

Discussion and Recommendations

Dr. Ballhaus suggested four subjects on which the Committee might consider making recommendations to the NAC: overcoming resistance to innovation; promoting the use of advanced technology, which could be advanced by exchanging people at the Centers to promote infusion of technology; the lack of discretionary funds for research and development (R&D), which he believes is partly attributable to full cost accounting; and the need to distinguish innovations and technologies that are critically needed.

Ms. Dyson offered two additional subjects for the Committee’s consideration: the need for the OCT to be fully funded; and a requirement for each mission to include something new. Ms. Thompson noted that not all technologies have to be flown.

Dr. Ballhaus stated that there is a need for NASA to identify the capabilities and technical expertise that must be maintained. Dr. Reuther advised that the Mission Support Directorate (MSD) has that charter. He suggested asking the MSD to brief the Committee on its strategy for maintaining capabilities. He also suggested that the Committee request a briefing on this subject from NASA’s Office of Chief Engineer.

Mr. Alain Rappaport observed that there is a need to increase collaboration at the Centers, and he offered the suggestion that this could be improved by integrating collaboration earlier in the proposal process. Mr. Eichhorst suggested that the proposal process include asking who at NASA has been contacted by the proposer. Ms. Dyson suggested penalizing proposals where there is no indication that some investigation into collaboration has been conducted.

Mr. Rappaport expressed an interest in seeing larger contracts, awarded for longer periods.

Mr. Eichhorst expressed concern over a lack of capability in knowledge management. He believes that there is a need for an accounting of the existing technology. This should be captured from all the Centers. There should be an annual technology review that values the technology in a uniform and quantifiable manner. Dr. Reuther noted that portfolio capture and management is in the OCT’s charter and that all the missions perform activity capture and management. It is a difficult task and the hardest part is keeping it current. It is particularly difficult to do so without adequate funding. The OCT plans on performing that activity and needs to do it carefully so that it becomes a value added project. Ms. Dyson advised that

commercial products are available for this purpose. Dr. Reuther stated that the OCT is working on how to manage a technology portfolio across the Agency. Progress should be seen in the next quarter. Ms. Dyson suggested a Finding that the Committee encourages the efforts by the OCT's Strategic Integration Office to assemble and develop processes for a flexible, unified knowledge data base on NASA's technology and the individual experts involved, for users within and outside the Agency. Mr. Eichhorst suggested that, in order to ensure validity of the data base, there should be an annual technology review that shows growth or decline. There was a consensus by the Committee for both suggestions.

The Committee discussed how to motivate people to populate the data base. Dr. Reuther suggested using social media. He believes that would serve as an advertisement for the participants, rather than just a database for Headquarters. Mr. Eichhorst suggested making changes to the punishment and reward system to encourage people to take risk. He explained that it is a question of economics and that people have to be rewarded for taking risks.

In response to another question, Dr. Reuther noted that there are many missions on the Atlas V where an extra solid booster is all that would be needed for a secondary mission. He asserted that the primary mission should be required to at least consider a secondary mission. Dr. Ballhaus observed that the Chief Technologist is authorized to propose secondary missions and asked whether a negative decision on such a proposal could be appealed by the Chief Technologist to the Administrator. Dr. Reuther answered affirmatively, but noted that it is easy at this time to ignore the OCT, and that appeals would be rare. Dr. Reuther added that flight opportunities are the hardest part in getting technologies over the finish line. Mr. Eichhorst suggested requiring the primary mission to identify reasons why a secondary mission should not be allowed. Mr. Comstock suggested looking at commercial launches that have excess capacity. Dr. Ballhaus proposed requesting Dr. Braun to review the issue of including secondary payloads on NASA and commercial missions and to brief the Committee at its next meeting. The Committee agreed to the following recommendation to the full Council:

The Committee recommends that NASA Administrator encourage the use of secondary payloads (where feasible) on future NASA and commercial missions as an important capability for testing, validating and demonstrating new technologies and scientific payloads in the coming years.

The Committee discussed a time and location for its next meeting, but there was no definitive decision.

The meeting was adjourned.

Public Agenda

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January 12, 2011 –

- 10:00 a.m. Opening Remarks and Thoughts (FACA session begins)
Mike Green, Executive Secretary; and Esther Dyson, Chair
- 10:15 a.m. Office of Chief Technologist Update
James Reuther and Mike Green, NASA Office of Chief Technologist
- 10:30 a.m. NASA Technology Transfer and Commercialization Update
Doug Comstock, Director for Partnerships, Innovation, and Commercial Space, NASA Office of Chief Technologist
- 11:15 a.m. NASA and Intellectual Property
Doug Comstock
- 12:00 p.m. Lunch (On own)
- 12:45 p.m. Status of NASA Space Technology Roadmaps
James Reuther, Director for Strategic Integration, NASA Office of Chief Technologist
- 1:45 p.m. Break
- 2:00 p.m. EPSCoR Presentation and TBD KSC Technology Presentation
Karen Thompson, KSC Chief Technologist
- 2:30 p.m. Discussion and Recommendations – All
- 3:30 p.m. Adjournment

**NAC COMMITTEE ON TECHNOLOGY AND INNOVATION
Membership
January 4, 2011**

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TECHNOLOGY & INNOVATION COMMITTEE MEETING
NASA/Kennedy Space Center Visitor Complex
Debus Conference Center
Cape Canaveral, FL
January 12, 2011

MEETING ATTENDEES

Committee Members:

Dyson, Esther – Chair	EDventure Holdings
Ballhaus, William (Bill), Jr.	[Retired]
Green, G.M. (Mike) – Executive Secretary	NASA Headquarters
Eichhorst, Gordon	Aperios Partners LLP
Rappaport, Alain	[consultant]

NASA Attendees:

Comstock, Doug	NASA Headquarters
Fletcher, Lesley	NASA/KSC
Howe, A. Scott	NASA/JPL
Nichols, Jim	NASA Headquarters
Reuther, James	NASA Headquarters
Scarpa, Phil	NASA/KSC
Schallhorn, Paul	NASA Headquarters
Skinn, Shannon	NASA/KSC
Thompson, Karen	NASA/KSC

Other Attendees:

Atchford, Brian E.	SAS
Frankel, David	[consultant]
Ketcham, Dale	SRTI/UCF
Kohler, Jeff	ASRC Aerospace
Li, Hai	Lockheed Martin
Miller, Larry	Lockheed Martin
Stanley, James	Qinetiq – NA

TECHNOLOGY & INNOVATION COMMITTEE MEETING
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LIST OF PRESENTATION MATERIAL

- 1) NASA Technology Transfer and Commercialization Update [Comstock]
- 2) NASA and Intellectual Property [Comstock]
- 3) Office of the Chief Technologist [Reuther]
- 4) The NASA Experimental Program to Stimulate Competitive Research [Fletcher]
- 5) NASA KSC Research and Technology Capability Areas [Thompson]