

**National Aeronautics and Space Administration**

**Office of Space Science**

**SPACE SCIENCE ADVISORY COMMITTEE**

**July 25-27, 2001  
NASA Headquarters  
Washington, DC**

**MEETING REPORT**

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Marc S. Allen  
Executive Secretary

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Steven W. Squyres  
Chair

**SPACE SCIENCE ADVISORY COMMITTEE (SScAC)  
NASA Headquarters  
July 25-27, 2001**

**MEETING MINUTES  
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**SPACE SCIENCE ADVISORY COMMITTEE (SScAC)**  
**NASA Headquarters**  
**July 25-27, 2001**

*Tuesday, March 20*

Welcome and Chair's Remarks

Dr. Steven Squyres, Chair of the SScAC, called the meeting to order and welcomed members and attendees. He noted that Drs. Isabel Hawkins and Wendy Freedman have rotated off the committee. Drs. Chris Elgin, Rod Heelis, and Paul Knappenberger are the new members. After introductions, Dr. Squyres reviewed the agenda. Some of the major topics at this meeting were the Space Operations Management Office (SOMO), Information Technology (IT) Security, and a report on the Senior Review.

Program Status and Q&A

Dr. Ed Weiler, Associate Administrator, provided a program update on the Office of Space Science (OSS). The FY02 President's budget proposes \$2,453,000 (\$2,786,400 full cost, including civil service salaries) for the Space Science Enterprise. This budget includes a \$500 million increase to the Mars Program from 2002 to 2006. There was significant new funding (\$250 million over five years) to begin an in-space propulsion research program to enable a potential Pluto "sprint" mission. There were funds for critical technology for future decisions on astrophysics missions—Constellation X (CON-X) and the Laser Interferometer Space Antenna (LISA). There were additional funds to correct deficiencies in the Hubble Space Telescope (HST) and the Space Infrared Telescope Facility (SIRTF) budget lines, keeping these missions on schedule. Funds for Solar Probe and Pluto/Kuiper Belt (PKB) were deleted. Dr. Weiler discussed the features of the augmented Mars Program. The funding includes upgrades to the Deep Space Network (DSN). Although funding for PKB was not included in the FY02 budget, Congress directed that the Announcement of Opportunity (AO) activity proceed up to the point of selection. The selection will be on hold until the Congress acts. The House mark-up did not include funds for PKB. The Senate mark-up designated all of the in-space propulsion funding (\$25 million in FY02) for Pluto, but this does not cover the costs needed for the mission (at least \$75 million). With respect to Solar Probe, the National Academy of Sciences (NAS) has been asked define the critical science in the solar and space physics field. In the event that Solar Probe is assigned a high priority, the mission could be funded out of the resources planned for other solar and space physics programs. The Senate Appropriations Committee put \$5 million back into the budget to keep Solar Probe alive.

Dr. Weiler reviewed some of the language from the House Appropriations Committee. Overall, there was a 1 percent reduction to the OSS budget. The Committee recommended a number of "adjustments" (earmarks). Dr. Weiler noted that the budget presented to Congress did not contain any funding for earmarks (per direction from the Administration). One of the earmarks was \$10 million (out of the \$20 million in-space propulsion augmentation) for a propulsion research lab at Marshall Space Flight Center (MSFC). There were directed reductions to the Next Generation Space Telescope (NGST)--\$20 million, the New Millennium Program (NMP)--\$10 million, and the Solar Terrestrial Relations Observatory (STEREO)--\$10 million. The Senate Appropriation Committee took all of the funds from the Outer Planets line (Europa) and put them into the "competed Outer Planets program," which would include Europa. All missions would have to be competed. To date, there has been no interest from industry for a competed Europa mission. An Europa mission would be very difficult technologically. The Senate direction would effectively terminate all of the Europa work at the Jet Propulsion Laboratory (JPL), and this would significantly impact the Laboratory. The good news for Sun-Earth Connection (SEC) was the \$5 million for Solar Probe and the restoration of funds for Living With a Star (LWS). Reductions included \$50 million from the Mars Program. The Senate reacted to the House cut in NGST by calling out that NGST should be fully funded. The Senate has requested a detailed plan on future Mars missions beyond the proposed 2007. It directed NASA to proceed with the selection of Europa science instrumentation as planned. One of the most serious actions was the reduction in SOMO funding, which further exacerbated the SOMO problem. The Senate language also directed NASA to submit a detailed accounting of all TMOD (a major element of the DSN run by JPL) related funds. Dr. Weiler indicated that he intends to work to try to turn this action around.

With respect to the SOMO issue, there have been significant funding shortfalls in Space Operations over the budget runout period due to optimism about savings from consolidating space operations, mission extensions, and high flight rates due to “faster, better, cheaper.” The OSS decision was to reduce the baseline program content to cover the shortfall. The shortfall over the next five years is about \$400 million. There will be no major program/project cancellations, but many baseline missions will be delayed. Also, future Discovery and Explorer AO’s will be delayed. Dr. Weiler indicated that he does not intend to transfer \$400 million to the Office of Space Flight (OSF) without caveat. OSS must have control over its part of operations, particularly the DSN. In response to a question, Dr. Weiler agreed that OSS would still be dealing with the Consolidated Space Operations Contract (CSOC). Dr. Weiler could not discuss the impacts to any specific mission, but indicated some of the boundaries. There will be significant impacts to NGST, the Space Interferometry Mission (SIM), the Mars Exploration Program, CON-X, Europa Orbiter, future Discovery missions, future Explorer missions, the Solar Dynamics Observatory (SDO), the SEC guest investigator program, and New Millennium flight validations. No current Discovery or Explorer missions will be canceled or slowed; delays will only affect future AO’s. Research and Analysis (R&A) and Data Analysis (DA) should not be impacted. All of the Division Directors approved this solution and none felt that any single reduction was unfair. All changes to the program baseline must be approved by OMB and Congress prior to implementation. As soon as the Operating Plan is approved in the fall, it can be shared with the community; however, the FY03 budget cannot be shared until the President presents it to Congress next year.

OSS is now operating under the new, streamlined organization (essentially, the former Fisk organization). The Explorer Program and NMP are in the SEC Division; the Discovery Program is in the Solar System Exploration (SSE) Division. A lot of authority will be delegated to the Division Directors, and they will make the decisions on cancellation of programs. Dr. Weiler briefly discussed the responsibilities of the Executive Directors, the staff Directors reporting to him, and the Division Directors. There will be a science selection board, consisting of himself, the Executive Director for Science and the three science Division Directors. They will make the selections for Explorer, Discovery, and NMP. The themes will continue as a way to focus the science thinking.

Dr. Weiler highlighted some recent space science events. One of the notable successes in OSS education and public outreach was the development of a scheme to put HST images and descriptions into Braille. Genesis is set for launch next week and everything is on schedule. Mars Odyssey was launched in April and all is going well. The Microwave Anisotropy Probe (MAP) was launched in June and had a lot of press interest. This mission will probe conditions in the early universe by measuring the properties of the cosmic wave background. There is good news on Cassini—there is a potential fix to the problem on Huygens to avoid loss of scientific data. Dr. Weiler showed some Mars Global Surveyor (MGS)/MOC images of Cydonia on Mars that have been popular in the press.

Dr. Weiler addressed the prior SScAC recommendations. OSS has complied with the SScAC recommendations on sounding rockets and attached International Space Station (ISS) payloads as Mid-class Explorer (MIDEX) projects. He noted that the SScAC would receive a briefing on the Mars Program and IT Computer Security later in the meeting.

#### Structure and Evolution of the Universe Subcommittee (SEUS) Report

Dr. Bruce Margon reported on the SEUS meeting earlier in the month. The SEUS and the Origins Subcommittee (OS) meetings overlapped, and they had a plenary session on how to work together in the future. Both Subcommittees felt that they should retain their separate identities, especially through the roadmapping process. Separate advisory committees with frequent plenary sessions might be a long-term solution. Dr. Squyres noted that the SScAC accepted the recommendation of the SEUS and OS at the last meeting, i.e., to keep two full Subcommittees going at full strength for at least one year, but still recommends that the SScAC revisit this structure after a couple of meetings. Dr. Margon reviewed the SEUS plan for the roadmap procedure. The Structure and Evolution of the Universe (SEU) theme plans to do two different documents for the roadmap—a short, integrated description of the Cosmic Journeys program, and a detailed, technical discussion of the community’s consensus on problems, missions, and priorities. The SEUS discussed the National Virtual Observatory (NVO)—a concept to make a large

number of huge astronomy datasets interoperable. It was designated as the only high priority small program by the NAS Decadal Survey. Costs are very modest, and should be shared with the National Science Foundation (NSF). The community is unified in its desire to move forward with this project. Although the project is cheap, ready, and low-risk, there are no prospects for significant funds before FY04. Dr. Squyres noted that it is important that the SScAC think about the significance of this. It should be treated like a project. If this project is going to be advocated, it must be assigned a priority relative to the other flight projects. Dr. Squyres noted that there would be a presentation on the NVO later in the meeting. Dr. Margon announced that the Astro-E2 reflight has been approved, and this issue is now closed. The SEUS learned of two new nascent NASA Policy Guidances (NPG's) concerning commercialization of software and technical products. With these NPG's, the potential for serious disruption of relationships with the university and research community appears just as severe as with the IT Security policy.

#### Origins Subcommittee (OS) Report

Dr. Alan Dressler reported on the OS meeting that was held earlier this month. As noted by Dr. Margon, the OS had a joint session with the SEUS. The OS received presentations on the state of the theme, the R&A Program, the NVO, SIM, SIRTF, NGST, the Terrestrial Planet Finder (TPF), the Full-Sky Astrometric Mapping Explorer (FAME), the Stratospheric Observatory for Infrared Astronomy (SOFIA), and education and public outreach. Starlight remains in the Origins Program. With SIM at its new budget cap and the NGST rescoped, the Origins program fits within its budget. The principal concern with having two Subcommittees was contradictory advice to the Division Director. To address this concern, the two Subcommittees will meet jointly on any common topics. The Subcommittees will welcome a SScAC revisit of the arrangement two meetings from now. The OS strongly endorsed the R&A's Senior Review committee's recommendations relative to augmentation of the R&A program. The OS had the same conclusions as the SEUS with respect to the NVO. Dr. Squyres posed a question for later discussion: Is NVO important enough to the community to delay an Explorer AO? Dr. Dressler briefly reviewed the status of SIM. The "shared baseline" configuration fits within the cost cap, and a series of milestones have been established to move from Phase A to Phase B to Phase C/D. The OS recommended staying the course and monitoring technical progress. With respect to NGST, the OS recommended that the Mid-Infrared Instrument (MIRI) Project Scientist should have a vested scientific interest in the instrument and be a full member of the US MIRI science team. It also made recommendations concerning the science oversight management and an interim working group. The OS was concerned about the potential cancellation of AIRES (due to cost and technical problems) from the SOFIA mission. This is a major scientific capability on the mission. If this is done, the OS endorsed the plan to pursue the eventual construction of an instrument through an open AO. Overall, the OS had a very full and satisfying meeting, noting progress on many fronts, including SIRTF, SIM, and NGST.

#### Solar System Exploration Subcommittee (SSES) Report

Dr. Michael Drake reported on the SSES meeting that was held the previous week. The SSES endorsed raising the cost cap on Discovery to at least keep pace with inflation and account for the retirement of the Delta II line and changes in risk management policy. With respect to extended missions, the SSES recommended developing a plan to fund extended missions for the Cassini spacecraft. For all future missions, Mission Operations and Data Analysis (MO&DA) for extended missions should be planned in advance. The SSES discussed the Outer Planets missions. Pluto is still top priority, but only for schedule reasons; science balance was not evaluated. At its next meeting, the SSES will be discussing the RTG problem and will be proposing a reliable technology line for nuclear power sources. In-space propulsion technology is critical to outer planets missions. The SSES was concerned with the runout cost of Europa Orbiter--\$1.2 billion. Currently, this is the only outer planets mission, and the SSES felt that NASA does not have a robust planetary program. The SSES discussed a number of issues related to the Mars Exploration Program—the DSN challenges in 2004 and 2007, the SOMO threat, reliable access to nuclear power sources, the complexity of international partnerships, and the Mars Exploration Rover (MER) schedule for 2003. The SSES spent the second day of its meeting on roadmap planning. The two roadmapping groups will address the outer planets—"Exploring Organic Rich Environments," and the inner planets—"Evolution of a Habitable Planet." SOMO funding issues threaten both the Mars Program and the Discovery Program. The SSES had a long discussion about the "biocentric" theme. It recognized the importance of biology, but considered a program with a much broader context. The SSES emphasized the importance of an intellectually coherent theme. Dr. Drake reviewed some of the Senate actions that

were taken last week that were not discussed by the SSES: the reduction of \$50 million from the Mars Program; the reduction of \$48.6 million from Europa Orbiter/X-2000; restoration of \$43.6 million for an "outer planets program" in which all missions are competed through AO; restoration of \$5 million for Solar Probe; reduction of \$25 million from in-space propulsion and restoration of \$25 million for PKB; and a statement regarding further funding for PKB.

#### Sun-Earth Connection Advisory Subcommittee (SECAS) Report

Dr. David McComas reported on the SECAS meeting that was held the beginning of the week. The major topics were LWS, Space Technology (ST)-5, the SEC roadmap and the impact of the National Research Council (NRC) study, and Dr. Withbroe's replacement. There were two main findings. The first concerned LWS. The Science Architecture Team (SAT) has made excellent progress in defining a coordinated system-wide approach. SECAS supported the formation of two Definition Teams—one for data systems and one for theory and modeling. Cross membership is needed between the SAT and the two study teams. The other main topic was ST-5. The SECAS reiterated its very strong endorsement of ST-5 for the demonstration of mission enabling micro-satellite and constellation-specific technologies that are crucial to the SEC future program. The SECAS felt that it is critical to fly all three spacecraft in order to demonstrate the urgently needed technology. If cost savings are required in the implementation of ST-5, the SECAS recommended that the down scoping be taken in areas other than the constellation aspects. The SECAS requested that the SScAC support its recommendation regarding ST-5. It acknowledged SScAC's support on Solar Probe, low-cost access to space (LCAS), and "boilerplate" attachments (all prior SECAS issues). Dr. McComas expressed concern that the NRC decadal study, in preparation, will be used to assess the importance of Solar Probe versus other SEC missions. He reported that SECAS felt that the importance of this mission was well-established.

#### Strategic Planning Update

Dr. Marc Allen discussed the strategic planning process and schedule. The general approach will be similar to the 1997 and 2000 plans. The new features this year are the SSE and SEC surveys that are being done by the NRC as well as the Turner Committee on the Physics of the Universe. All of these are addressing missions as well as focusing on science objectives. This will mean that the roadmapping activity for three of the themes will be divided into two phases. Dr. Allen noted that each of the themes is in a different situation. Dr. Allen showed the flow of the strategic planning process and discussed the schedule. The NRC science survey results will be available in the April/May 2002 timeframe. Phase 2 of the roadmap activities will start in May 2002. All of the roadmapping results are due to Headquarters in September 2002, and the consensus workshop will be held in November 2002. Following the community strategic planning workshop, there will be an iteration of the draft plan, followed by the review cycle. The SScAC and the Space Studies Board (SSB) will review the first plan draft in February 2003. SSB comments are due in May 2003, and final SScAC review will be in July 2003. The Plan will go into production in August 2003, with a release in September 2003. The December 2001, SScAC meeting will be the latest practical opportunity for SScAC to give direction to the subcommittees on roadmapping. Some of the questions are: Should there be contiguous SScAC Subcommittee meetings? If so, should the Subcommittee sessions precede the SScAC meeting, or follow it? Should the Subcommittees be given more specific guidance on the roadmap products? Dr. Squyres deferred discussion on these questions until later in the meeting.

#### Mars Exploration Program Office: Status and Plans

Mr. Orlando Figueroa briefed the SScAC on the Mars Exploration Program. He discussed three key topics: the restructured program, threats and vulnerabilities, and near term plans. Prior to his present position, Mr. Figueroa was the Deputy Chief Engineer at NASA Headquarters and formerly manager of the Explorer Program at the Goddard Space Flight Center (GSFC). Dr. Firouz Naderi is Director of the Mars Program at JPL as well as the SSE Directorate. To date, this organization is working very well. The Planetary Flight Projects Directorate (under Dr. Chris Jones) has responsibility for implementation of the missions. Mr. Figueroa briefly described the restructured Mars Exploration Program. Mars Global Surveyor (MGS) is in extended mission phase. The 2001 Mars Odyssey mission is going very well. A significant effort is being made to design missions so that they can provide telemetry support to future missions. The phasing is such that throughout the program, the science and technology heritage will be available for subsequent missions. The 2003 MER mission and the 2005 Mars Reconnaissance Orbiter (MRO) are moving along well. The

Science Definition Team (SDT) is focusing on defining the science priorities and objectives for the 2007 mission. A competition for Scout mission concepts has been completed and ten proposals have been selected for 6-month study. NASA is in the process of finalizing a Letter of Agreement with France regarding the CNES Orbiter, a technology demonstration mission in 2007. NASA is also in the process of finalizing a Letter of Agreement with ASI for a telecommunications satellite. The 2009 mission will also be a collaboration with Italy. The 2011 opportunity includes the Mars Sample Return (MSR) mission. All of this represents the baseline program.

There are two threats: SOMO and the international partnerships. The SOMO problem would affect the 2007 opportunity, the Scout missions, and MSR. In the case of a \$50 million Senate adjustment, the Program is left with very few options. The most likely one would affect technology and the 2007 Lander. The priorities have been: preserving the scientific strategy, balancing the resources, and maintaining community engagement. Mr. Figueroa stated that the impacts that Dr. Weiler highlighted earlier in the meeting are very significant. In response to a question, Mr. Figueroa indicated that NASA has solid agreements with CNES and ASI for 2007; commitments beyond that are less definite although some of the elements in 2011 are definite. Dr. Squyres noted that the SScAC has gone on record as strongly supporting the Scout concept. There are significant challenges ahead and the SScAC needs to think about priorities. In addition to the missions, the program includes program management, reserves, advanced studies, technology, education and public outreach (EPO), DSN antenna and other upgrades, the Mars Data Analysis Program (MDAP), and Mars fundamental research and data analysis. In response to a question, Mr. Figueroa noted that there is not enough resiliency in any one year to cover the SOMO impacts. The SScAC was pleased with the creation of the MDAP, but would like to see it increase from 0.5%.

The Program has responded to the SScAC recommendation and has re-chartered the Mars Exploration Payload Analysis Group (MEPAG). Mission SDT's will be assembled for every mission during pre-formulation. The one piece that is still missing is the establishment of a Mars Exploration Standing Review Group. Mr. Figueroa will be chartering this group. It would be worthwhile strengthening the SSES with respect to Mars Exploration. The SScAC felt that these actions were responsive to the recommendation.

Mr. Figueroa noted that the long lead nature of the sample handling facility requires that it be addressed now; this is being done.

#### Sun-Earth Connection Division

Dr. George Withbroe provided an update on SEC. In addition to SEC missions, the Division has responsibility for the Explorer Program, the New Millennium Program (NMP), the Sounding Rocket Program, and Information Systems. Funding has been restored to the Sounding Rocket Program. SEC will review the program and its resource needs and recommend appropriate actions. The MIDEX AO was released this month and proposals are due in October. Six Small Explorers (SMEX) are competing for two SMEX slots. Astro-E2 was selected as a Mission of Opportunity. With respect to the NMP, cost growth is a concern for ST-5. ST-6 is a subsystem validation mission (eight subsystem technologies are in Phase A, with downselect in August) and ST-7 is a system validation mission (four system concepts are in Phase A studies, with downselect around the end of the year). Dr. Withbroe reviewed the four basic science questions in SEC. The next two launches are the Thermosphere-Ionosphere-Mesosphere Energetics and Dynamics (TIMED) mission (September 15, 2001) and the High Energy Solar Spectroscopic Imager (HESSI) mission (targeted for October). SEC is moving along with LWS. Scientific problems are selected based upon relevance to society. The four societal objectives are: solar influences on global change; the space environment "climate" data; nowcasting the space environment; and predictive capabilities. There is a very strong international interest in LWS, particularly by ESA and Canada. The four major Inter-Agency Consultative Group (IACG) space agencies have expressed a desire to establish a task group to study prospects for forming an international LWS program. The first multi-agency ILWS meeting was in May 2001, and the concept of an international program was endorsed by all of the parties.

#### Solar System Exploration Division

Dr. Colleen Hartman provided a status report on SSE. She discussed the recent Senate actions, which mostly affected the SSE Division, and provided a copy of the Appropriations language. One good thing was the House language relative to the International Traffic in Arms (ITAR) regulations—it directs the

Office of Science and Technology Policy (OSTP) to work with NASA, NSF, and the Department of State to resolve the problems. Dr. Hartman summarized the status of current missions. The very successful Near Earth Asteroid Rendezvous (NEAR) Project ends September 30, 2001. The Borrelly encounter by Deep Space (DS)-1 is September 23. There are no issues on Mars Odyssey or Genesis. Deep Impact passed confirmation review in May, and MESSENGER passed confirmation review in June. The Cassini spacecraft is operating nominally. With respect to future missions, the Discovery 9 first phase selections were announced (Kepler, INSIDE Jupiter, Dawn, and Netlander). Two first phase PKB studies were selected in May—Pluto and Outer Solar System Explorer (POSSE) and New Horizons. NASA cannot move on to selection without sufficient funding. Europa Orbiter is currently baselined for a 2008 launch with 2 RTG's. A tiger team is underway to investigate alternate approaches to the Europa mission. This team has two tasks: to consider only mission options that are judged to meet Level 1a objectives (from the SDT report); and to consider mission options addressing a subset of the SDT objectives. A report is due to NASA in September 2001. NASA could select two missions for development in the current Discovery AO and delay one mission for implementation (as well as the next AO), or select one mission and delay the next AO. Budget would be the essential criteria.

#### In Space Propulsion

In-Space Propulsion (ISP) is an agency-wide, new technology initiative for FY02. Its focus is to develop near- to mid-term propulsion technologies that will significantly reduce travel times to outer planet destinations. The evaluation and selection process will be based on comprehensive systems analysis. Competitive procurements will be used extensively. In addition to technologies to reduce trip times to the outer planets, the technologies will support inner solar system science, Earth observation, and human exploration. A team effort is underway to identify technology areas that would be most fruitful. Priorities were achieved by consensus among the Enterprises. Ion propulsion, aerocapture, and nuclear electric are the high priority areas. Dr. Hartman briefly discussed each of these areas. The following technologies are in the next highest level of priority: solar sails, high power electric propulsion for nuclear electric propulsion (NEP), solar electric propulsion (SEP) hall thrusters, and advanced chemical propulsion. The Next Generation Ion Propulsion NASA Research Announcement (NRA) was scheduled to be released in August, but will be on hold pending the budget outcome. The ISP technology NRA was scheduled to be released in October 2001. The non-nuclear part of the ISP (67%) will be competed. MSFC is the project Center for the program, but the NRA's will be open to everyone. NASA will work very closely with the Department of Energy for nuclear electric propulsion. Dr. McComas noted that solar sails is a critical enabling technology for SEC. Dr. Hartman emphasized that the ISP Program is completely independent of any Division. She reports directly to Dr. Weiler for this Program.

#### Committee Discussion

The SScAC discussed the following topics: the approach to the next round of strategic planning; Mars issues; and ISP. Dr. Drake suggested a discussion on a mixed approach to outer planet exploration. Dr. Squyres suggested a discussion on whether a draft paragraph would be appropriate for inclusion in the letter.

#### Mars discussion:

Dr. Squyres noted three topics related to Mars that the SScAC should comment on: (1) the advisory structure; (2) the fundamental Mars research program; and (3) the choices that may lie ahead in 2007 and beyond. The SScAC felt that the proposed advisory structure was completely responsive. Dr. Beichman added that biologists should be represented. The SScAC was very pleased to see a portion of the flight budget (0.5%) allocated to Mars science. This is a step in the right direction towards the SScAC recommendation.

The SScAC had significant discussion on the future Mars program (2007 and beyond) and all of the pressures that may come to bear, e.g., SOMO, international, etc. There will be some tough choices ahead. Mr. Figueroa's priorities are to (1) maintain the science strategy, (2) take care of the international commitments, and (3) to have the Scouts. Slipping the Scouts for two years might be acceptable, as long as the program is not dropped. Dr. Drake observed that the technical and financial contributions cannot be overlooked. The biggest contribution is the French; they wanted sample return in 2005. The Program needs to maintain the implementation with the international partners. Unless there is another way to

provide the launch capability, the French contribution is essential for the implementation of the program. Dr. Papike added that sample return cannot be moved out any further than 2011. He felt that the adjustable parameters would be to do something less in 2007 and 2009. He said it is not clear why the large rover in 2007 is necessary before sample return. Dr. Squyres noted that the strategy appears to be to focus sample return on not just a sample from Mars, but being able to select the sample return location from orbit and get to that spot. This has led to an MRO mission in 2005 and a mission in 2007 that has the capability to travel across the surface to the spot selected from orbital data. That would be a technology demonstration mission. Dr. Farmer, who has been involved with Mars planning for 10 years, agreed with the priority order presented by Mr. Figueroa. The core strategy is the top priority. What is driving the strategy, besides the technology, is the search for life. To be successful, the current program requires international collaboration; that is the next priority. This makes the Scout program the third priority. Dr. Beichman noted that there is another way within SSE to attack the problem—removing the restriction on Discovery with respect to Mars proposals. It should be possible to get a Scout mission or two out of Discovery. Dr. Drake observed that the magnitude of the SOMO problem could affect the 2005 mission. Dr. McComas noted that the Scout program provides contact to a much broader base than the Mars Program does, and losing this aspect would hurt the program. Dr. Dressler observed that the Discovery Program does not offer a solution; if the Mars Program has to go outside of the Program and depend on competition across the board, it is giving up an important element. The engagement in the Mars program could be captured with Discovery, but the possibility of the Scout program downstream should be kept alive.

The SScAC recognized the significant challenges on the horizon and felt that Mr. Figueroa's priorities were right. Sample return is crucial. A science strategy has been carefully thought out and constructed, and it leads in a measured way to sample return. Keeping the strategy intact is the highest priority. Everyone recognized that the international contribution is necessary to do the program. While the SScAC has an extremely high opinion of the Scout program, it is in the right place in terms of priority. There are some significant open issues, e.g., the science in 2007 and what is included in the 2009 mission. The proposed advisory structure is appropriate for dealing with those questions. Discovery cannot "bail out" Scouts. Discovery should cast its net widely and pull in the best ideas across the board, including Mars. Sample return is very challenging and will require international participation. The core science strategy, which is the top priority, is aimed at getting samples back as soon as possible.

#### ISP discussion:

ISP can do a lot for future planetary missions. It can benefit other themes as well. Dr. Mewaldt felt that in-space propulsion is the top priority technology in SSE. Dr. McComas noted that if ISP a program that is supported over OSS, the prioritization appears to be very SSE-centered. It was noted that ISP is at risk because of possible legislative action. Dr. Squyres commented that the SScAC could provide some useful advice. ISP could benefit themes other than SSE. The prioritization should be done in that context, with appropriate balance across OSS. Dr. Richstone noted that ISP opens up a new way of looking at astronomy missions, e.g., the ability to bring missions back to low-Earth orbit (LEO) for repair. Dr. Das noted that there is considerable interest by the Department of Defense in this area, e.g., moving things around from LEO to GEO. There are already some investments in technology. Dr. Akin agreed that the prioritization would be different if one looks across all of space science. He noted that not all of the hardware will work; the ability to repair and upgrade provides a lot of science return. Robotic servicing and upgrade, in-orbit assembly and operations, etc. are critical technologies that are not being addressed.

The SScAC strongly supported the ISP. The ISP should be treated at the OSS level and the prioritization should be done with a clear view to what could be done across OSS. There was a question regarding the extent to which the non-nuclear portion would be competed, and the SScAC asked for clarification on this point.

#### Strategic planning discussion:

Two aspects were discussed: whether there should be more specific guidance on the roadmap products, and whether there should be contiguous subcommittee meetings at the next SScAC meeting.

Dr. Dressler indicated that his Subcommittee was planning a much smaller process than in previous years. Dr. Margon observed that it is very hard to have more specific guidance on roadmap products. All of the

themes have unique boundary conditions. Dr. Mewaldt noted that some work is needed in the SEC to define LWS, but he would approve of moving toward more uniform products. Dr. McComas added that the uniformity aspects would make it easier to integrate the whole program together as one. The roadmaps should be more homogeneous. Dr. Allen stated that a lot of “meat” in the strategic plan comes at the roadmap level. He suggested putting together a strawman “style manual” and circulating it to the Chairs for comment. Dr. Margon suggested more participation in the intermediate step (between the roadmap and the strategic plan). He felt that there was not very good connectivity (within the community) between submission of the roadmap and the resulting strategic plan. Dr. Dressler approved of the idea of getting the roadmaps to look more uniform than they were the last time, but noted that the cultures are very different and the roadmaps should not be overly constrained. Dr. Squyres noted that there was a sense among the SScAC that the community put a lot of time and effort into the roadmaps; if the basic parameters of the process are established ahead of time, it would help everyone to work toward a common goal and the burden on the community would be more appropriate. Dr. Beichman observed that a template for uniformity would be useful and could make the Strategic Plan a more powerful document. Dr. Farmer expressed concern about the role that astrobiology is playing in the planning. There is no real way that the astrobiology input is being provided. The life issues are largely being addressed by non-biologists. He suggested that astrobiology could have its own vision that could be represented across the themes; another way to include astrobiology would be to have astrobiologists on the roadmap working committees.

The SScAC saw the need for a little more structure and uniformity so that each group is working within a common set of confines. There should be a responsibility on the part of the Subcommittee Chairs to see that biology is appropriately represented in the process. Some of the SScAC members felt that there should be some more thought given to the process on how the roadmaps become the strategic plan. People in the community were more annoyed over the process than about the outcome. However, everyone recognized that having a “shoot out” was not the way to go either. Everyone agreed that the strategic plan was very responsive to the roadmaps. Dr. Squyres observed that what the SScAC can do is to clearly communicate to the colleagues in the community what the process is so that they have accurate expectations at the workshop. People need to understand the parameters and the process in advance.

The SScAC discussed the question of whether the Subcommittees should have contiguous meetings with the SScAC meeting in December. The SScAC discussed a range of dates and couldn’t come to a consensus. Dr. McComas recommended that if the set of contiguous dates didn’t work for this meeting, they should be considered for the following SScAC meeting.

#### ***Thursday, July 26***

Dr. Squyres updated the Committee on the status of an education task force. He distributed a draft of the charter for an Education and Public Outreach Task Force.

#### **Astrobiology Task Force**

Dr. Charles Beichman provided an update on the Astrobiology Task Force (ABTF), which had its last meeting on April 30-May 1, 2001. Overall, the ABTF is very satisfied with NASA’s role in forging this new field. The NASA Chief Scientist has agreed to impanel a visiting committee to review the NASA Astrobiology Institute (NAI) on 3-5 year intervals. The ABTF recommended that a strong, internationally recognized biologist should chair the committee. With respect to the Director of the NAI, the ABTF felt that OSS and the Chief Scientist should closely monitor the situation, given the present uncertainty over the top leadership within NASA. In response to a question, Dr. Squyres noted that astrobiology has become such a vibrant field that it would most likely continue as a growing discipline under new leadership in NASA. The ABTF discussed the NASA Specialized Centers on Research and Training (NSCORT’s) and noted that they provide a valuable educational opportunity in astrobiology. The ABTF gave a strong endorsement for research into extreme terrestrial environments as analogs for other planets, and recommended that NASA initiate an Astrobiology Technology for Exploring Planets Program (ASTEP) within OSS and pursue collaborations with NSF and other agencies. Dr. Squyres requested the ABTF to investigate the ASTEP further and report back at the next meeting. In particular, the SScAC was interested in learning how NASA will collaborate with other agencies, and what will happen with the NSF Life in

Extreme Environments (Lenexa) program. The other issues discussed by the ABTF involved more participation of biologists on higher level committees, e.g., OS and SScAC. Dr. Farmer reiterated that the current participation is not sufficient, and the NASA should make an effort to obtain greater representation of biologists on committees and subcommittees. He noted that the SSE and Origins goals have a strong astrobiology focus. In response to a question, Dr. Beichman suggested that the only issue that should be included in the letter to Dr. Weiler should be the recommendation of a strong leader for the NAI.

#### IT Security Follow-Up

Dr. David Nelson, the Deputy Chief Information Officer (CIO) provided an update in IT security. He noted that the internet is not resistant to tampering and hacks. That is changing, but it will be a number of years before the internet is an intrinsically secure computing environment. One of the main problems recently has been hacking into domain server systems. In order to get research done, we have to pay attention to IT security today. Specifically, Dr. Nelson discussed the IT security clause. On July 14, 2000, the original version of clause was published. It was intended to be used in contracts, not grants and cooperative agreements. For contracts, NASA is actually acquiring something, e.g., goods and services. The intent of the clause is to level the playing field so that contractors that are supplying computing do the same things that NASA does for itself, within reason. NASA went through the regular process of putting a regulation on the books. There were not many comments on the clause during the comment period. The regulation was issued on July 14, with implementation on December 31. There were problems with the contractual implementation. It was assumed (in error) that the field Centers would be able to interpret the appropriate applicability. Not all of the field Centers took advantage of knowledge at the respective field Center, e.g., the program/project people, the contracts people, and the field IT CIO's. In order to clarify applicability, examples of tasks that require IT security have been put into the revised clause. Unfortunately, the clause is a necessary evil, and we need to be paying attention to security to a much greater degree than we did ten years ago. It is the job of NASA (the program managers, aided by CIO's), to determine whether the clause applies. As the Enterprise is putting a program together, it is the responsibility of the Enterprise to determine whether the clause applies, and that should be spelled out in the solicitation. The program offices must take this responsibility seriously, including determining when it applies. They must work with the Contracting Officers so that they don't make that decision in isolation. The SScAC felt that the default should be: don't apply the clause unless instructed to by the program office.

Dr. Smith raised the issue of fingerprinting, e.g., the entire Space Telescope Science Institute. Dr. Nelson reviewed the changes that have been made in the clause. He noted that there was a Webcast on July 29 on these changes. The revised clause has the following differences: it defines more clearly where the clause is applicable and gives examples; it is less prescriptive regarding the contractor's security provisions; and although it still requires the contractor to develop a security plan, it gives latitude in the details. NASA will approve the plan. The security features can be tailored to the mission. The revised clause also clarifies and simplifies the requirements for background screening; ordinary users do not require fingerprinting. It is only required for individuals who have privileged access, e.g., system administrators, or limited privileged access, e.g., data base administrators. There are three levels of screening requirements depending on the sensitivity of the function e.g., the degree of potential impact. There are relatively lenient screening requirements in keeping with NASA's research activities. The original clause was suspended March 23. During April through June, the CIO worked with Gen. Armstrong and the university community and rewrote the clause. On June 20, the revised clause was sent to OMB for approval. On July 12, the revised clause was published in the Federal Register. It is effective now as an interim rule, but there is a 60 day comment period before the final rule. Dr. Nelson emphasized that there is a lot of leeway within the clause for good application. NASA would welcome input if it is still not working, and the Agency can issue further instructions regarding implementation.

The SScAC appreciated the responsiveness of NASA to the Committee's concerns. Dr. Squyres noted that comments on the revised clause will be provided in the letter to Dr. Weiler. In response to a question, Dr. Nelson indicated that the clause is silent about the contractor type. He noted that he would be visiting the University of California/Berkeley around August 6 to look at their self-screening program and see if it is "equivalent." Assuming the program is equivalent, that should deal with the concerns regarding HESSI. Questions or comments on the clause can be provided either directly or indirectly to [dnelson@hq.nasa.gov](mailto:dnelson@hq.nasa.gov). Indicate in the subject line that it is regarding the IT security clause. Dr. Beichman noted that publication

in the Federal Register does not seem to reach the IT people at universities. There should be some way to better publicize this. Dr. Nelson noted that there is mandatory training for all NASA managers on how to address IT security. The SScAC felt that NASA had made great progress on this issue. In response to a question, Dr. Nelson noted that the fingerprinting may be a sticking point. For the limited set of people who have to be screened, fingerprinting will be required because it is hard to reliably check background without fingerprinting.

#### Technology Program Update

Dr. Harley Thronson, Director of Technology, discussed technology priorities and initiatives in OSS. He started by describing his role as technology director. His job is to see that long-term technologies will be available when needed. This includes determining long-term technology priorities, developing new budget initiatives, developing the long-term technology strategy, representing OSS technology interests to other Enterprises, and coordinating technology education and public outreach activities. This past winter, a series of assessments were begun to determine priority technologies to enable OSS missions and to justify new initiatives (including “gap” analysis). A number of the reviews are designed to inform the Office of Aerospace Technology (OAT) of OSS priorities. The assessment is not yet complete. Phase 2 is underway now (it will include a LISA-type mission). The results of the evaluations will go to the Division Directors, who have budget authority for implementation. Some activities that are currently funded or planned for the near term are: in-space propulsion; information systems/technology (largely funded by OAT); the MSFC large optics capabilities (not initiated in OSS, but Dr. Thronson is a representative on the evaluation group); analyses of “non-conventional” technologies for power and propulsion; large optical systems; and expanded technology demonstrations or validations. In response to a question, Dr. Thronson indicated that his office funds the assessments, not the technologies themselves. Dr. Thronson showed the power trade space for the various applications. It was developed by the program managers and the theme technologists. There are two NPG’s that request OSS input: external release of NASA software, and the NASA technology commercialization process. These were both initiated by OAT and could have an impact on OSS missions. The first one may not apply to science or data reduction software.

Dr. Thronson presented some questions for the SScAC: What priority technologies does the science community feel need to be subjected to “relevancy assessment?” Is OSS “backing into” responsibility for its own long-term technology program? What are the implications? What kind of input does SScAC want into OSS actions? What kind of input does SScAC want into OSS-led efforts to improve mission cost estimates and constrain costs? Dr. Squyres agreed that Dr. Thronson needs input from the community, but on the timescale that input is needed, the SScAC cannot provide it. There needs to be some kind of advisory process that enables input on the timescale that is needed, e.g., something like the MEPAG. Dr. McComas expressed concern about the “closed” roundtable process, e.g., the power trade space, and how engagement can be obtained across all areas. Dr. Thronson noted that the people who are usually called on are the theme technologists. This raises this job to a high level. In the past, not all of them have been equally vigorous in their roles. With respect to the last question, Dr. Thronson noted that he has an action on how NASA might institute a different partnership with the Centers that is conducive to cost savings in a manner that the current system of “cost-capping” is not. Dr. Richstone suggested that at the next meeting, Dr. Thronson show how the technologies being invested in connect to the long-term plan.

#### Astronomy and Physics Division

Dr. Anne Kinney discussed both the Origins and SEU themes. The draft Near Infrared Camera (NIRCam) AO will be released July 31 for comment. The NIRCam is a U.S. lead with Canadian contribution. NASA is soliciting the U.S. Principal Investigator (PI) to deliver the instrument. Two teams will be selected for Phase A. The Canadian contribution will be firmed up during the 6-month Phase A study. After Phase A, there will be a downselect to one team. The NIR Multiobject Spectrometer will be ESA’s responsibility with U.S. detectors and MOS chips. ESA has agreed to be ready with a back-up design in the event that the micro-devices don’t arrive in time. The MIRI will be U.S.-led with an ESA contribution value at 50% of the MIRI cost. The draft science requirements are being developed by the Mid Infrared Steering Committee. A letter has been sent to GSFC, Ames Research Center (ARC), and JPL soliciting a proposal for management responsibility to build and deliver the instrument and work with ESA. The MIRI Science Lead and four U.S. MIRI team members will be selected via AO. NASA is on a fast track for the AO. The draft will be released on July 31, 2001; selection is targeted for March 2002. Dr. Squyres raised a concern

regarding the absence of firm Canadian commitment when the proposals are selected—specifically, how the review process fairly evaluates a contribution for which there are no team agreements, only tentative arrangements. The strength of the Canadian contribution should be a criterion in the selection process. It is difficult to see how a selection could be made on a criterion that is indefinite. Dr. McComas noted that in most Phase A's where there is international participation, there is a commitment from the research institution, but not the funding agency, until the end of Phase A. Dr. Kinney agreed that this is an unusual arrangement, but noted that there have been close discussions with the Canadian Space Agency (CSA). NASA did not want to freeze the Canadian contribution prematurely.

SIM has been confirmed by OSS to proceed to develop the Shared Baseline concept. It will be cost capped at \$932 million for Phases B/C/D and includes launch vehicle costs. OSS is requiring several technology milestones to be met before the mission makes the transition to Phase B and to Phase C/D. There are two levels of milestones—the major ones are required; the minor ones measure progress. StarLight is working to a June 2006 launch. It is a full mission with all technologies demonstrated at or near the levels needed for TPF. An independent cost review is underway. OSS is seriously pursuing the technologies required to enable Eclipse and Eclipse-like missions. This is an alternative technology path for TPF. Kepler is being evaluated as a Discovery mission. OSS has established the Navigator Program Office at JPL to oversee the suite of missions and elements associated with TPF—TPF, SIM, StarLight, Keck Interferometer, the LBT interferometer, the Interferometry Science Center, and education/public outreach. Dr. Squyres observed that finding a way to draw upon the interconnected strength of all of the elements is something that the Navigator Program Office should emphasize.

In the near term, the Astronomical Search for Origins (ASO) and SEU themes are being kept separate within the Division. Dr. Kinney noted some recent SEU topics. There have been some recent SEUS membership rotations. There has been a mid-term compromise on the subcommittee issue. There will be two subcommittees that meet concurrently, with a joint session with one set of recommendations. Dr. Squyres noted that the SScAC wanted this arrangement to proceed for one year, then revisit it to assess how it is working. MAP was launched successfully on June 30. SEU had its annual theme review in May. There was new money added in the last budget action for CON-X and LISA. Some funding from the technology lines was used for the SOMO hits. GP-B has some budget challenges, which have been accepted by Dr. Weiler as an OSS-wide issue. Launch is scheduled for October 2002. Astro-E2 has received approval. The Galactic Explorer (GALEX) problems are now under control, but there is a 4-month launch delay. After the OS and SEUS meetings, Dr. Kinney indicated that she had some discussions about setting up a joint working group between NASA and NSF on archives and NVO.

The Astronomy and Physics Division has 35 missions, including 8 major missions in development or formulation. Dr. Kinney presented the “fever chart” and reviewed the status of all of the major missions in development or formulation, including HST refurbishment, NGST, SIRTF, SOFIA, StarLight, SIM, TPF, Keck Interferometer, and FAME. Dr. Squyres noted that SIM has been successfully reformulated and has gone from “Red” to “Green” on the fever chart. The SScAC indicated interest in hearing more about the SIM reformulation at the next meeting.

#### Discussion:

The SScAC postponed discussion of the IT Security Clause until the afternoon. The Committee discussed the technology presentation by Dr. Thronson. Dr. Margon felt that the SScAC should reiterate that there is not yet a process in place to keep NPG's from automatically taking effect without comment. Dr. Farmer noted that there seems to be a disconnect from the grass-roots level of the community and what is going on in OSS. With respect to the NPG's, the SScAC raised the issue about getting appropriate input. It was agreed that someone in OSS needs to be a “gatekeeper” on these. With respect to the technology program, it was not clear that SEC was getting the appropriate technologies supported nor good engagement with all elements. Dr. Beichman also observed that there appears to be a disconnect between the technology needs of the different themes and the technology program. The theme technologists need to go into their disciplines and find out what is required, and feed that into Headquarters. Dr. Akin stated that this is a big problem. There doesn't appear to be any pressure across the Agency to maintain the role of theme technologist. Dr. Das observed that the program appears to be very ad hoc; there needs to be a well-defined process on how technology is selected. The long-term approach was also not very clear. There needs to be

dialog among the different Codes. Dr. Squyres observed that the technology situation does not appear to be getting any better—there is still not a clear, coherent description. Dr. Beichman posed a question: What is the relationship between OAT and OSS technology? Dr. Hawkins noted that the OSS Technology Office needs to reach out to the field Centers and OAT. What is needed are good connections and strategy for the future. Dr. Squyres suggested that the Committee address these issues in face-to-face discussions with Dr. Weiler.

#### Science Talk – Recent Submillimeter Wave Astronomy Satellite (SWAS) Results

During lunch, Dr. David Neufeld from Johns Hopkins University gave a science talk on recent results from SWAS, the first space observatory to carry out pointed observations at submillimeter wavelengths. It is dedicated to the spectroscopic study of star formation and interstellar chemistry. One of the key scientific questions concerns the origin of water in our solar system. SWAS was launched in December 1998, and the performance is actually better than expected or required. Targets observed to date include over 80 interstellar gas clouds, 3 evolved stars, 3 planets, and 3 comets. One of the stars appears to be surrounded by an orbiting system of comets. Dr. Neufeld showed some of the results from the interstellar medium (ISM): water abundance in interstellar clouds varies by more than a factor of 100,000; and molecular oxygen remains undetected and its abundance is over 100 times less than pre-launch predictions. The SWAS observations program is largely guided by the desire to understand the astrophysics underlying the large range in water abundance as well as the absence of molecular oxygen in the ISM. Future observations include mapping the outer edges of the dense clouds. There were some interesting results from the solar system. Strong detection of water vapor has been detected in the 3 comets that have been observed. Water vapor has also been detected toward 3 planets (Jupiter, Saturn, and Mars). The water vapor content of the Martian atmosphere has increased during the recent global dust storm. The last topic that Dr. Neufeld discussed was the detection of water vapor around other solar systems (the carbon-rich star CW Leonis). There was evidence for a vaporization of a “Kuiper Belt” around this star. Water detection around this star argues for the presence of an analog to the Sun’s Kuiper Belt. The SWAS observations demonstrate the potential of molecular spectroscopy as a probe of extra-solar planetary systems. The observations obtained to date raise key questions that will be addressed by future SWAS observations. It will lay the groundwork for future investigations of water vapor and oxygen with the Herschel Space Observatory.

#### SOMO

Mr. Robert Spearing from the Space Communications Office (SCO) within OSF briefed the Committee on SOMO. He started with some history and background to bring all of the Committee members up to speed on what SOMO is. It started in the mid 1990’s with the zero-base review and the emphasis on cost reduction. It was felt that efficiencies could be achieved with the consolidation of space operations. SOMO was formed to do a Level 1 function (formerly Code O). The execution of the program and the program management function was moved to Johnson Space Center (JSC). SOMO operates like a Headquarters function, located at a Center. The situation is a field Center that is making programmatic decisions that affect other Enterprises and other Centers. This has created difficulty over the past few years. The SCO at NASA Headquarters has the responsibility for the Agency; SOMO reports to that office. The SCO relies very heavily on the field Centers and other offices at NASA Headquarters. The DSN is part of SOMO’s responsibility; actual conduct of that is delegated to JPL, which manages the DSN. There is a direct link between JPL and SOMO. Between SOMO and each Center there is an agreement that specifies the responsibilities. CSOC is the primary contract that is involved in execution of SOMO responsibilities. Some of the CSOC team are tied into JPL and maintain facilities at the Lab. They have a local manager at JPL and that manager works directly with the JPL Deep Space Mission Systems (DSMS) manager. The contract includes about 2000 FTE’s; it has a five-year base term with a five year option. The base term is over in January 2004. Dr. Spearing explained the relationship between TMOD and CSOC. The TMOD organization has about 1500 FTE’s involved with DSMS. About 490 Caltech people are full-time; on the CSOC side, there are about 350 full-time people. There are about 800 FTE Caltech people. There is a lot of knowledge transfer both ways, and it would be very difficult to pick it up (near-term) and move it somewhere else. Also, there is the issue of personnel capture (JPL/Caltech employee to CSOC employee).

The original objectives of CSOC were to develop an integrated operations approach to spacecraft design, operations, and data processing as well as provide a contract and management structure which enabled

outsourcing, privatization, and commercialization. Lockheed Martin, the selected contractor, proposed an integrated operations architecture. There were significant dependencies on NASA initiatives as well as other anticipated sources of savings—process efficiencies, outsourcing, and multiple contract consolidation. Mr. Spearing showed the budget history of CSOC and noted that the budget numbers were based on a cost proposal in a competition. Dr. Squyres requested the budget versus actual in FY00 and FY01. Dr. Weiler noted that the CSOC did not include full maintenance and a reasonable replacement budget for antennas. Dr. Spearing added there were some costs for the maintenance of antennas at Goldstone. This posed one of the dilemmas in the way the contract was arranged. It is obvious today that there were insufficient funds to deal with the 70-meter antennas. The principal drivers for the CSOC cost changes were: changes to the mission set; the integrated operations architecture; increased sustaining engineering due to new or additional requirements; and new services for existing customers. Operating missions have not rolled off as fast as predicted, and more have been launched than were in the original model. Dr. Drake observed that the initiation of the faster, better, cheaper philosophy was started in the early 1990's; it appears that SOMO did not take this administration policy into account when developing the mission model during the mid to late 1990's. Mr. Spearing indicated that the office now has a mission model that reflects a realistic projection. [Mr. Spearing deferred the rest of his presentation and discussion until after the comments by the NASA Administrator.]

#### Comments by the Administrator

The NASA Administrator, Mr. Daniel Goldin, visited the meeting and addressed the SScAC. He stated that we are still seeing people bidding to win, not bidding to perform. This has to stop. The SScAC is not doing its job. There is a sloppiness on the part of the contractors and the PIs. Some of the discussions must deal with accountability. One of the positive recent examples is what GSFC did on NGST. Before all the money was spent, the Center came back with some economic trades. This is not happening uniformly. There is not enough discussion about having these trades up front, before bringing on the “marching armies.” We are having to cancel too many missions, and this destroys our reputation with the Congress. We must do what we say we are going to do; if we don't, we open the door to earmarks. Mr. Goldin expressed concern about the Mars Program. He observed that the Senate has sent a signal. He stated that he wants to make sure that we know what we are doing on the Mars program and that we have the adequate resources. The SScAC has not done its job to the depth that it should have on Mars, and the Committee needs to ferret the problems out. Dr. Weiler should not have had to cancel 8 missions. There is an unbelievable program ahead of us. Although the NASA budget is flat, the space science portion is going up. However, it will not continue to do so with sloppiness in management, proposals, or evaluation. The SScAC has to be accountable for holding people responsible for what they say they are going to do. Mr. Goldin was not able to stay to take any questions from the Committee.

Dr. Squyres asked for Mr. Figueroa's and Dr. Weiler's reaction. Dr. Weiler stated that Dr. Goldin was very concerned about the Mars Program because JPL said they could do two rovers in 2003, and now we are on the edge of having to cancel one of them. [At this point, Dr. Squyres recused himself from the Mars discussion and asked Mr. Figueroa to talk about the 2003 mission. Dr. Drake chaired the SScAC during Dr. Squyres's recusal.] Mr. Figueroa agreed that NASA loaded the Mars Program with reserve, and JPL said that it could be done. JPL has the best people on the mission. They will probably run out of time before they run out of money, although they are doing miraculous things to stay within schedule. He estimated the chances of completing on schedule and within budget are 80% or better. If the two rovers are getting in the way of each other, JPL is looking at options of proceeding with just one. He stated that he still felt the program is doable, although he expressed concern about the threats. Dr. Papike expressed the same dismay as Mr. Goldin, i.e., that even the restructured plan may be difficult. Dr. Drake noted that none of the advisory committees were ever consulted on having two rovers. However, the problem is probably real. Mr. Figueroa stated that the mission was reviewed by an independent group and many of the recommendations were implemented; there is still adequate reserve. The schedule from the beginning has been tight, but the project has been able to hold all of its slack (within a few days). Dr. Das indicated that the SScAC is a committee of scientists and can give good science advice; however, if program analysis is needed, then the Committee needs program managers and technologists. Dr. Akin indicated that he was on the independent review team that reviewed the program. It is an ambitious project. The review team noted that ATLO was tight on schedule and observed that a lot of time could be saved by only flying one rover. JPL replied that one was not an option; they had to fly two. It was not clear what the SScAC could have

done differently. Dr. Drake asked Mr. Figueroa if there was anything that the SScAC could do to help. Mr. Figueroa noted that when the MER mission was approved, all of the resources were there. He indicated that he would not do anything differently at this point. The Program Office is focusing on watching the project, but staying out of the way.

Dr. Beichman raised the question: how badly do we need two rovers? Dr. Weiler stated that he would not fly anything that was not ready. This Committee could look at how much risk is acceptable in doing two rovers instead of one versus the science that could be gained. Dr. Drake indicated that the science side could be examined so that NASA could have the SScAC input on the implications of the trade. The SScAC should think about charging a group to come up with a plan to provide science input on one versus two. At this point, Dr. Squyres provided the SScAC with some purely factual information on mass, dollars, and schedule. Of the three, schedule is most critical. Four types of mass are managed. The flight system Critical Design Review (CDR) is next week. All types of mass margin are above 10% across the board. The dollar situation is typical of flight projects at this stage in the game—there is not enough margin to feel comfortable, but more than enough margin to get to where we need to be. There is a major challenge in schedule. Phase B began a year ago and the start of ATLO is February. Going from two rovers to one would help alleviate some of the schedule challenges, but not all, e.g., getting to a design to be able to start cutting metal. Availability of test facilities at JPL is the biggest issue. We will not know how big the schedule challenge is until months from now, e.g., until ATLO. Dr. Squyres stated that the project team at JPL is the finest group of engineers he has ever witnessed on any project in the Agency. With respect to a question on people, Dr. Squyres noted that the project is fully staffed. Dr. McComas agreed that there should be science input on the one versus two trade. Mr. Figueroa emphasized that he still believes that the reformulated program is on solid ground. Dr. Weiler stated that the critical issue is whether OSS can get either of these missions ready for a 2003 launch.

Dr. Spearing continued with the SOMO discussion. The contract type is cost plus award fee. For the first year, the award fee was about 70% (the evaluation is 70% technical); the last evaluation was around 80%. The operations area is doing quite well; they are meeting or exceeding all performance elements. Dr. Squyres noted that the SScAC has stressed that there should be mechanisms in place for user feedback. Dr. Spearing stated that there is a user working group as well as a survey process that is used by the contractor. Issues or actions are dispositioned as they come out. Dr. Riegler added that there is user working group input on the award fee process.

Dr. Spearing continued with his SOMO presentation and discussed some changes that are under consideration. One of the issues involves having a Lead center with a Level 1 program responsibility making decisions that affect other Enterprises and field Centers. SCO has decided to collapse that Level 1 function and have it at Headquarters. In the process, some of the functions being done at JSC will be distributed to the participating field Centers. The new organization will have a control board function populated by the customers—OSS, the Office of Earth Science (OES), OSF, and OAT. Supporting the office, within each code, there will be a program executive who has management responsibility (including decision-making and budget authority) for that area of the program. Budgets will be moved into the customer Enterprises. This should start in FY03. There are some adjustments in FY02 to take care of the shortfall within the operating plan.

Dr. Weiler relayed some additional input from Mr. Goldin (whose sudden departure was due to the need to be present at budget discussions on the Hill): He is not asking this group to do engineering analysis. This group could play a stronger role in making the tough trades on science—e.g., are they asking too much, are they “gilding the lily.” He thinks the group could play a role in looking at the trade-off on two rovers versus one. It could assign tasks, e.g., are there descopes in the mission? The SScAC needs to be a group that probes into the mission and asks if the program is trying to do too much. Mr. Goldin challenged the Committee to be more critical and look at the tough trades. It should help set the priorities. Dr. Papike noted that the advisory group reporting to the lead of the Mars program has not been implemented yet. That should be put in place immediately and meet frequently. Dr. Weiler noted that the SScAC could assign more specific actions to the Subcommittees or other groups. He cited the effort of the ABTF, which was a good example of the SScAC doing the kind of job that Mr. Goldin needed it to.

National Virtual Observatory (NVO)

Mr. Joe Bredekamp provided an overview of the NVO concept and how it evolved and discussed the status of activities. The NVO is a new information infrastructure for astronomy and physics. It is a federation of digital sky surveys and archives and a provider of the data and the tools for exploration and science discovery. It was the highest rated, small initiative in the NAS Decadal Survey for Astronomy and astrophysics. It offers a great opportunity for collaborations between astronomers, computer scientists, and statisticians and has enormous potential for education and public outreach. It builds on the foundation pieces of the NASA Astrophysics Data Archives and the advanced IT tools and techniques developed under the Science Information Systems program. A joint NASA/NSF NVO SDT has been formed and has been chartered to recap the science drivers, define the architecture or framework, and recommend roadmap and priorities for proceeding. Its report is expected this fall. There are a number of other activities and funding plans/proposals. The Astro data archive system continues to build and improve services and the Astro SOMO Working Group (SOMOWG) has been reestablished. There are a number of efforts in the Applied Information Systems Research Program (AISRP). These will be folded into the planning process as they evolve. A number of groups have submitted proposals to the NASA Intelligent System Program. NVO-like capabilities are solicited as high priority items for the upcoming AISRP solicitation. There is about \$1.5 million in FY 02 and \$2 million in FY03 for definition and pilot demonstrations. Dr. Margon observed that the programs being funded at a smaller level are a start on the NVO, but these are still separate, rather than an integrated program. Dr. Richstone observed that what is missing is a demonstration of the science that would be empowered by having an NVO. Mr. Bredekamp indicated that this is part of the NVO SDT charter. It is envisioned that the NVO will be conducted in a project-like fashion. This has not yet been defined. Dr. Squyres noted that the Agency has invested a lot of funds in the Earth Observing System Data and Information System (EOSDIS). The objective of EOSDIS is to do for Earth scientists what the NVO proposes to do for space scientists. There may be some lessons learned from that program.

Senior Review Update

Dr. Guenter Riegler discussed the first peer review of the R&A program. The community and the advisory committees had recommended looking at the balance across OSS's R&A Program and the structure of the Program. All of the R&A programs were grouped into nine science clusters and two function clusters (the theory program and information systems). Two of the clusters were broken into "mini-clusters." Astrobiology was not reviewed in this cycle because the NAI was going through a major review of its own this year. However, all clusters will be included in the process the next time. The Senior Review Committee received a report from each of the eleven R&A program clusters in May. The Committee looked at merit and relevance in each science cluster, budget distribution, R&A program structure, and new initiatives or augmentation. All of the panel reports will be available on CD-ROM. Dr. Riegler indicated that he would send this to all of the SScAC members. Overall, the Review Committee was impressed with the high quality of the R&A reports and found that the OSS R&A program is essential to realizing the full potential of flight missions and to defining the imperatives for new flight programs. It found that the individual R&A clusters were oversubscribed by substantial factors and recommended that the R&A program be augmented to provide the proper level of science support. Dr. Riegler noted that there is no current plan for an augmentation, but this could be considered in the next strategic planning cycle. The Review Committee also noted that the current organization of OSS provides an opportunity to streamline the organization of the R&A clusters and to make them consistent across the science divisions. It recommended that the clusters be restructured so that content is uniform amongst them. It also endorsed the concept in the recent Decadal report of including directly-related theory with data analysis in mission line D&A. The Committee recommended that all R&A elements (including Astrobiology and LWS R&A programs) should be included in the next review cycle.

The Committee developed a categorization for the R&A Programs. Dr. Vondrak clarified the distinction between the categories. The categorization was not a science merit classification; it was a way to prioritize clusters for budget redistribution. If there is a general augmentation, the Committee recommended that the clusters in Category I receive additional funds. Dr. Riegler noted that at this time there are no plans for a general increase; OSS will look at a general augmentation in the next budget cycle. Seven clusters were in Category I, three were in Category II, and one was in Category III. In response to a question, Dr. Riegler showed the discipline content in each of the clusters. Three clusters were recommended for special

augmentation: the Astrophysics Theory Program; an instrument definition and development program for Geospace sciences; and an expansion of the ground-based search for extra-solar planets (part of the Origin and Evolution of Solar System Bodies program). Category III (Information Systems) was asked to develop a plan to respond to the three specific issues listed in the R&A review report. Dr. Papike observed that one of the values of this review is that there is now a written document that provides a summary assessment of all of the R&A programs.

The Information Systems program will be reduced by \$1.5 million in FY 2002 and by \$3 million during FY03 and FY04. With respect to the special augmentation/new initiatives, OSS will provide additional funds for the three clusters identified by the Committee. Each will get an additional \$0.5 million in FY02, an additional \$1.0 million in FY03, and an additional \$2.4 million in FY04. The funds will come in part from the diverted Information Systems line. Beginning in FY02, there will be an across-the-board 3 percent increase per year in R&A. Dr. Riegler indicated that in the future (under the new organization) the process will be continued in a cross-cutting fashion. He stated that the Senior Review performed a very worthwhile "scrubbing" function, even though the redistribution of funds was relatively modest. The Division Directors decided to continue with a R&A review every three years.

#### Committee Discussion

With respect to the remarks from the NASA Administrator, Dr. Squyres noted that the SScAC has a record of letters to Dr. Weiler and has been aggressive in pointing out problems on SOMO, the Outer Planets Program, etc. He stated that the SScAC should take the Administrator's remarks to heart and forge ahead.

Dr. Squyres identified other topics for discussion: the IT Security Clause; the NVO; the Senior Review process; the complexities of arrangements for the science payloads for NGST; Mars; and SOMO.

Technology: The SScAC was disappointed with the lack of clarity in the technology presentation that it received and requested a clear, crisp description of the technology plan at the next meeting, including technology briefings from the people in the Divisions who are responsible for the work.

IT Security Clause: Dr. Smith observed that the revised clause is a great improvement. Two things are still missing: whether it will be communicated to the Centers and will be implemented properly; and whether NASA will go back to the contracts where it has been implemented incorrectly and fix the problem. OSS needs a better system to catch the things that need to be caught. Dr. McComas stated that the default should be that it is not applied, and it takes an actual decision on the part of the program manager to invoke it. Dr. Allen noted that NPG's coming to OSS for concurrence are distributed to people in OSS that know the most about the subject. Dr. Akin raised the issue of the manpower at universities to write the required plans. Dr. Macauley was concerned the cost of the IT security requirements.

SOMO: The SScAC felt that it received a good historical briefing and the current situation is clear. The Enterprise must start paying its share of the bill and needs to get its share of control. Dr. McComas felt that anybody who wants to opt out of CSOC should be allowed to do so. This becomes a critical issue for future proposals. The pitfall for the future is that it is still a monopoly; this presents the danger that the bill might balloon again. The SScAC was glad to see some OSS control over the operations. However, it felt that proposers should be able to opt out of CSOC if there is a more cost-effective way of operating their spacecraft.

Senior Review: The SScAC commended Dr. Riegler for his efforts on the Senior Review. There was discussion on whether a 3-year cycle was too frequent. Several of the SScAC members felt that the review should be once every 10 years, others thought that there was value to reviewing the program on a more frequent cycle than that, e.g., every 5 years. The SScAC was struck by the fact that a well-qualified set of senior individuals found that the R&A program was about right. The peer review process appears to be a good forcing function to shift funding to a proper balance. Even though the SScAC originally considered doing a review every 3 years, it now felt that a cycle less frequent would be appropriate. Targeting special areas for augmentation is a good idea that should be continued.

NVO: The SScAC discussed how it could move NASA into a leadership position on this project, given its priority in the Decadal survey. Two of the Subcommittees (OS and SEUS) recommended going forward on this, given the low cost and the high priority that the Academy placed on this project. However, the implementation was not clearly presented at this meeting. The SScAC asked for a briefing on a concise, crisp implementation plan at the next meeting.

Mars: The SScAC revisited its discussion of Mars the previous day. The SScAC was skeptical that the program in 2007 and beyond could be done as presented. The SScAC agreed with the priorities presented by Mr. Figueroa. The SScAC felt that it would not be the right group to do a program review; however, Mr. Figueroa has clearly identified the need for such a group to provide advice to him. Because of the clear stresses in the Mars program, the SScAC felt that this advisory group needs to be formed now and indicated that it would like to hear a report from this group at its next meeting.

NGST payload complexity: NGST is a very important mission to the Agency. The SScAC was still concerned about the complex arrangements for the three payload elements. Dr. Squyres posed the question: Would it be wise to consider simpler management arrangements that would result in cleaner interfaces but might involve less science? The SScAC stressed the importance of having a plan to deal with the potential failure of the international arrangements. This should be a criterion in the AO.

### ***Friday, July 27***

The SScAC discussed its draft findings and recommendations on the following topics: the NVO; the Strategic Plan; the Mars program; the Senior Review; SOMO; and information security.

#### Discussion with the Associate Administrator

Dr. Squyres reviewed the key topics with Dr. Weiler. With respect to Mars, the SScAC heard about the plans for the review and advisory structure, a 0.5% "tax" to pay for some basic Mars R&A, and the status of the program. The plans for the advisory structure are very responsive, but NASA needs to get this implemented very soon. The 0.5% for basic Mars R&A was a good first step, and the Committee hoped that it would grow to 1-2% as recommended. SScAC was concerned that there may be trouble ahead. The Mars Program is extremely rich and aggressive. There is a lot planned in 2007, for example. In light of SOMO, Congressional actions, and technical challenges, the SScAC was concerned that the program may be overly aggressive. There may be some tough choices ahead. The SScAC agreed with Mr. Figueroa's priorities of: (1) maintaining the core science strategy; (2) honoring the international commitments; and (3) preserving the Scout program. These should be the guiding principles for making the tough choices ahead. For the short term, there was discussion on 2003. [The Chair, Dr. Squyres, recused himself and Dr. Drake summarized the findings of the Committee.] It is very important that the 2003 mission fly successfully. The schedule is tight; the SScAC will hear from Chair of the Standing Review Board of the MER Project, the chair of its independent review committee, and the Chair of the new advisory committee at the December SScAC meeting.

Dr. Goldin visited with the Committee again and explained that he had spoken in "shorthand" when he had addressed the Committee the previous day. His concern was that the scientific appetite is not counterbalanced with alternatives on cost. There must be credibility and balance of cost with "off ramps" before Phase B. SIM is a case in point; Europa is another. The Europa program did not have the oversight of the advisory committee. The reality of what it takes to do the science passes the SScAC by. We need skeptics, and the SScAC needs to test the people. Sometimes programs get inserted without the scientific review process. Dr. Squyres noted that at the last meeting, the SScAC had an extensive interaction with NGST. The SScAC was pleased with the result of preserving the core science in a more manageable program. When the SScAC looks at the Mars program, 2007 and beyond looks very aggressive. When looking at the downstream pressures, there are causes for concern. The SScAC posed the priority questions to Mr. Figueroa. The SScAC will have these guiding principles in the letter. He noted that the SScAC took Mr. Goldin's words to heart. Mr. Goldin stated that it was important to be objective and have intellectual tension to make sure that we are doing the right things. TPF should not turn into a "battlestar galactica."

He posed the question: Should there be a competition between SIM and other approaches that lead up to TPF? This committee needs to scrutinize things very rigorously and critically. There must be an intellectual tension. Dr. Squyres indicated that the SScAC felt that it could use its experience as scientists to identify in advance areas where problems could arise, e.g., the complexities of the international arrangements on NGST. It can also help NASA by providing science-based advice on how to make the tough choices. It is difficult for the SScAC to provide the kind of in-depth review needed for projects that might get into technical difficulty. Mr. Goldin agreed with that. The SScAC has to ask for the trades to be made. This wasn't done on SIM. NASA has learned that single-point solutions are unbelievably problematic. There is a tendency to drive to a single point solution. The SScAC must ask for the trade space so that we know where to go when problems develop. We need to spend more money in Phases A and B to retire risk, and there shouldn't be single-point solutions until Phase C/D. There were single-point solutions in Phase A in both SIM and Europa and there have been embarrassments on those programs. Contractors bid to win, but when it comes to performance, NASA doesn't get it. NASA doesn't get the value up front. The contractors want to go to single-point solutions as soon as possible to lock things up. We should not be going to contractor selection until Phase C/D. This Committee needs to be more discriminating in when it allows a program to go to a downselect. Mr. Goldin stated that he does not have confidence that the aerospace contractors can do what they say they can do. Before a problem occurs, he wants SScAC to assume more responsibility and be more demanding and ask the tough questions in the formulation of a program. There must be parity between scientific and engineering leadership at all levels.

After the departure of Mr. Goldin, the SScAC continued its discussion with the Associate Administrator. Dr. Weiler indicated that he is headed towards a cancellation review on FAME. In SIRTf's case, JPL found a way to cut cost and preserve science. There has been progress on SIM, but there are still a lot of concerns. Dr. Weiler stated that OSS is not really locked into SIM; OSS is doing as much as it can do, and is looking at alternative paths to TPF. Dr. Richstone observed that understanding the early warning signs can be difficult. The proposal to hear from the Mars independent review board and the Mars advisory committee is a very good step. One of the questions is: How do we surface problems more effectively? Dr. Weiler indicated that on Mars, he came to the same conclusion as the SScAC and Mr. Goldin. The French mission is an "in-line mission" to MSR, e.g., demonstration of aerocapture, in-orbit rendezvous, etc. Mr. Figueroa and Dr. Garvin have an action to plan some alternate routes to get to the ultimate goal, e.g., an "off ramp." Dr. Weiler emphasized the SScAC ability to help NASA. He agreed with SScAC's concern regarding the complex arrangements on NGST. If it is the best that we can do, it doesn't mean that we have to do it.

Dr. Squyres summarized the SScAC findings on several topics that were discussed at the meeting:

**In-space propulsion:** The SScAC had very strong feelings that this is something that the Enterprise should be investing in. The presentation that the SScAC got was focused on what it could do for SSE; in fact, it can do great things for Astronomy & Physics and SEC. In-space propulsion is enabling to whole groups of missions. The SScAC saw a set of priorities that appeared to be based on what it could do for SSE only. It urged that OSS look again at the priorities in terms of what it could do for all of the OSS programs.

**SOMO:** The SScAC received an informative presentation on SOMO and CSOC. SScAC felt that if OSS is going to pay the bills, it should have the control. Projects should be able to make operational choices that are the most cost effective.

**Senior Review:** The SScAC expressed its thanks to Dr. Riegler and all of the people involved in this activity. They did an exemplary job. The conclusion at the end of this process was that the balance among the clusters was about right. The natural peer review process is leading to a balance among the scientific disciplines. The SScAC felt that continuing to evaluate the balance among disciplines is important. Division Directors will now have the ability to reestablish priorities within their Divisions. It would be appropriate to do another Senior Review of R&A in about 5 years.

**IT Security Clause:** The SScAC saw a big improvement in the revised version. It appreciated the fact that NASA responded to the SScAC; however, the implementation of the clause could present problems.

Specifically, the default position should be that the security clause should not be applied. If the contract is one that involves IT security, then the clause should be applied.

Europa mission: The SScAC had a long discussion on the Europa mission, and it will not comment on the competition issue. Dr. Weiler asked the SScAC to comment on whether it supported his policy, i.e., that JPL and GSFC should each have at least one major project in-house to maintain core competency.

NPG's: The SScAC felt that it would be helpful if there were someone in OSS who had the responsibility to examine these and make sure that the community hears about them before there are written into policy. Dr. Weiler indicated that anything dealing with grants and contracts should be routed through Dr. Riegler, who will have the responsibility to review these before they are signed out of OSS.

With respect to technology, Dr. Weiler indicated that the Technology Director's job is to look at what OAT is doing and focus on low technology readiness level (TRL) aspects and long-term technology needs. Dr. Thronson did not intend to give a comprehensive review of technology programs. Dr. Squyres indicated that he would work this topic into the agenda for the next meeting.

The SScAC discussed the core competency issue. Some of the members supported Dr. Weiler's proposal and felt that core competency is important to NASA; others felt that Centers should not have "entitlement" to projects and that everything should be competed. Dr. Squyres noted that the SScAC did not reach consensus on this issue at this meeting, and would not address this topic in its letter.

Before adjourning, Dr. Squyres invited any final comments from the members:

- Dr. Papike: The string of Mars planned missions is too complicated. We can achieve the objectives with more modest investments. The need for a big rover in 2007 is questionable.
- Dr. Knappenberger: The new members need a list of acronyms. Copies of previous minutes and letters would also be useful. Dr. Allen noted that the final SScAC minutes and letters are posted on the OSS Website. Ms. Frankel indicated that she had a list of acronyms that she would email to all Committee members.
- Dr. Margon: It may be dangerous for the SScAC to drift into the level of detail that the Subcommittees are covering more thoroughly.
- Dr. Farmer: It is very important to have astrobiology representation on the subcommittees that will produce the roadmaps, particularly SSE.
- Dr. Das: The agenda is too Headquarters-centric. Bring in program people (from Centers) to discuss projects and issues with the SScAC. OSS needs to keep the pressure on technology.
- Dr. Beichman: The NGST management approach and interfaces are very complex.
- Dr. Mewaldt: The IT security issue will be a much bigger one when it hits the universities. Some of Mr. Goldin's words should apply to the upcoming roadmap process.
- Dr. Akin: Technology is a concern. A good fraction of the money in OSS goes there, but there doesn't appear to be coordination across themes or across projects.
- Dr. Hathaway: The EPO committee is a welcome addition to the advisory structure.
- Dr. Macauley: If the SScAC charter is to be critical, there should be a different procedure for how the committee works. There is limited time at the meeting. Presentation and informational material should be provided in advance. The SScAC needs to be clear to presenters (in advance) about what it wants to see. If there are particular issues that Dr. Weiler needs help with, the members should know that in advance.
- Dr. McComas: Mr. Goldin's visit and his guidance were appreciated. The SScAC should provide a more critical view. To do that, we need different sorts of presentations. With the limited time, we need for people to explain what they have already reviewed, what trade spaces they have found, and how they are working through those trade spaces. The presenters must clearly list their issues.
- Dr. Richstone: How does OSS want to use the departing committee members for the next cycle of strategic planning? This should be worked out soon. There appears to be a lack of balance in the agenda. For example, more than half the time was spent on Mars. Other programs have been given insufficient time, e.g., LWS and SEU. There are four themes that the SScAC needs to pay attention to.

- Dr. Smith: Mr. Goldin has charged the SScAC with the right thing. A lot of the exploration of trade space and looking at alternatives has to reside at the Subcommittee level.

The SScAC decided to have the four Subcommittees meet concurrently, immediately prior to the SScAC meeting in December. Dates are: Subcommittees meet—December 3-4; Committee meets—December 5-6. The site for all of the meetings will be Cocoa Beach, Florida. Subcommittee members are welcome to stay over and attend the SScAC meeting.

Space Science Advisory Committee  
 July 25-27, 2001  
 NASA Headquarters, Washington, DC  
 Room 6H46  
**AGENDA**

Wednesday, July 25

|       |  |             |
|-------|--|-------------|
| 8:30  | Chair's Introductory Remarks                                   | S. Squyres  |
| 8:45  | Program Status and Q&A   | E. Weiler   |
| 9:45  | <b>Break</b>   |             |
| 10:00 | SEUS Report  | B. Margon   |
| 10:30 | OS Report  | A. Dressler |
| 11:00 | SSES Report  | M. Drake    |
| 11:30 | SECAS Report   | D. McComas  |
| Noon  | <b>Lunch</b>   |             |
| 1:00  | Strategic Planning Update                                      | M. Allen    |
| 1:15  | Mars Exploration Program Office: Status and Plans              | O. Figueroa |
| 1:45  | Sun-Earth Connection Division: Status, New Org., and Plans     | G. Withbroe |
| 2:30  | Solar System Exploration Division: Status, New Org., and Plans | C. Hartman  |
| 3:15  | <b>Break</b>   |             |
| 3:30  | In-Space Propulsion Program Update                             | C. Hartman  |
| 4:00  | Committee Discussion   | S. Squyres  |
| 5:30  | Adjourn  |             |

Thursday, July 26

|       |   |  |
|-------|---|--|
| 8:30  | Astrobiology Task Force Update                            | C. Beichman                              |
| 8:45  | IT Security Follow-Up                                     | D. Nelson, Deputy CIO<br>for IT Security |
| 9:30  | Technology Program Update                                 | H. Thronson                              |
| 10:00 | <b>Break</b>  |  |
| 10:15 | Astronomy & Physics Division: Status, New Org., and Plans | A. Kinney                                |
| 11:00 | Committee Discussion                                      | S. Squyres                               |
| 11:45 | <b>Lunch</b> (Science Talk: "Recent SWAS Results")        | D. Neufeld, Johns<br>Hopkins Univ.       |
| 1:00  | SOMO  | R. Spearing                              |
| 3:00  | <b>Break</b>  |  |
| 3:15  | Committee Discussion                                      | S. Squyres                               |
| 4:00  | National Virtual Observatory                              | J. Bredekamp                             |
| 4:30  | Senior Review Update                                      | G. Riegler                               |
| 5:00  | Committee Discussion and Writing Assignments              | S. Squyres                               |
| 5:30  | Adjourn   |  |

Friday, July 27

|       |   |            |
|-------|---|------------|
| 8:30  | Committee Discussion                    | S. Squyres |
| 10:30 | Chair's Report to the AA and Discussion | S. Squyres |
| 11:30 | <b>Adjourn</b>                          |            |

SPACE SCIENCE ADVISORY COMMITTEE  
Membership List

Steven W. Squyres (Chair)  
Cornell University

David L. Akin  
University of Maryland

Charles A. Beichman  
NASA/Jet Propulsion Laboratory

Alok Das  
AFRL/VSC

Michael J. Drake  
University of Arizona

Alan M. Dressler  
Carnegie Observatories

Jack D. Farmer  
Arizona State University

David H. Hathaway  
NASA/Marshall Space Flight Center

Roderick A. Heelis  
University of Texas at Dallas

Paul H. Knappenberger  
Adler Planetarium and Astronomy Museum

Edward W. Kolb  
Fermi National Accelerator Laboratory

Molly K. Macauley  
Resources for the Future

Bruce H. Margon  
Space Telescope Science Institute

David J. McComas  
Southwest Research Institute

Richard A. Mewaldt  
California Institute of Technology

James J. Papike  
University of New Mexico

Douglas O. Richstone  
University of Michigan

Kristen Sellgren  
Ohio State University

William Smith  
Universities for Research in Astronomy

Maria T. Zuber  
Massachusetts Institute of Technology

Marc S. Allen (Executive Secretary)  
NASA Headquarters

**SPACE SCIENCE ADVISORY COMMITTEE (SScAC)  
NASA Headquarters  
July 25-27, 2001**

**MEETING ATTENDEES**

Committee Members:

|                                      |   |
|--------------------------------------|---|
| Squyres, Steven W. (Chair)           | Cornell University                                    |
| Akin, David L.                       | University of Maryland                                |
| Allen, Marc S. (Executive Secretary) | NASA Headquarters                                     |
| Beichman, Charles A.                 | NASA/JPL  |
| Das, Alok                            | AFRL/VSC  |
| Drake, Michael J.                    | University of Arizona                                 |
| Dressler, Alan M.                    | Carnegie Observatories                                |
| Farmer, Jack D.                      | Arizona State University                              |
| Hathaway, David H.                   | NASA/MSFC   |
| Knappenberger, Paul H.               | Adler Planetarium and Astronomy Museum                |
| Macauley, Molly K.                   | Resources for the Future                              |
| Margon, Bruce                        | Space Telescope Science Institute                     |
| McComas, David J.                    | Southwest Research Institute                          |
| Mewaldt, Richard A.                  | California Institute of Technology                    |
| Papike, James J.                     | University of New Mexico                              |
| Richstone, Douglas O.                | University of Michigan                                |
| Smith, William                       | Association of Universities for Research in Astronomy |
| Zuber, Maria T.                      | Massachusetts Institute of Technology                 |

*NASA Attendees:*

|                    |                   |
|--------------------|-------------------|
| Behr, Alberto      | NASA Headquarters |
| Bergstralh, Jay    | NASA Headquarters |
| Boyce, Joe         | NASA Headquarters |
| Bredenkamp, Joe    | NASA Headquarters |
| Brody, S.          | NASA Headquarters |
| Calabrese, Mike    | NASA/GSFC         |
| Carver, Gary P.    | NASA/JPL          |
| Davidson, Greg     | NASA Headquarters |
| Eastwood, Charles  | NASA Headquarters |
| Figueroa, Orlando  | NASA Headquarters |
| Hartman, Colleen   | NASA Headquarters |
| Hasan, Hashima     | NASA Headquarters |
| Horowitz, Steve    | NASA Headquarters |
| Kinney, Anne       | NASA Headquarters |
| Moore, M.          | NASA Headquarters |
| Nelson, David      | NASA Headquarters |
| Norris, Marian     | NASA Headquarters |
| Ormes, Jonathan    | NASA/GSFC         |
| Ramsey, Becky      | NASA Headquarters |
| Riegler, Guenter   | NASA Headquarters |
| Rosendhal, Jeffrey | NASA Headquarters |
| Rummel, John D.    | NASA Headquarters |
| Sadof, Donna Walls | NASA/GSFC         |
| Salamon, Michael   | NASA Headquarters |
| Six, Frank         | NASA/MSFC         |
| Smith, Eric        | NASA/GSFC         |
| Sorrels, Carrie    | NASA Headquarters |
| Spearing, Bob      | NASA Headquarters |

|                  |                   |
|------------------|-------------------|
| Thronson, Harley | NASA Headquarters |
| Vondrak, Rich    | NASA/GSFC         |
| Weiler, Ed       | NASA Headquarters |
| Withbroe, George | NASA Headquarters |

*Other Attendees:*

|                      |                                   |
|----------------------|-----------------------------------|
| Andreoli, Leo        | TRW                               |
| Appleby, John        | APL                               |
| Borek, Robert        | Boeing                            |
| Burrowbridge, Don    | Winderemere                       |
| Dewhurst, Brian      | NRC/SSB                           |
| DiBiasi, Lamont      | L. DiBiasi Associates             |
| Hopkins, Joanne      | SRI International                 |
| Malay, Jon           | Ball Aerospace                    |
| Neufeld, David       | Johns Hopkins University          |
| Richardson, Larry R. | Boeing-Delta Launch Services      |
| Wallin, Sheryl       | House Science Committee, Minority |

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**SPACE SCIENCE ADVISORY COMMITTEE (SScAC)  
NASA Headquarters  
July 25-27, 2001**

**RECOMMENDATIONS**

[Letter from Dr. Squyres to Dr. Weiler to be inserted here]

**SPACE SCIENCE ADVISORY COMMITTEE (SScAC)  
NASA Headquarters  
July 25-27, 2001**

LIST OF PRESENTATION MATERIAL<sup>1</sup>

- 1) Program Update for Space Science Advisory Committee [Weiler]
- 2) Structure and Evolution of the Universe Subcommittee [Margon]
- 3) Report to the SScAC from the Origins Subcommittee [Dressler]
- 4) SSES Report to SScAC [Drake]
- 5) SECAS Report [McComas]
- 6) Strategic Planning 2003 [Allen]
- 7) The Mars Exploration Program [Figueroa]
- 8) Sun-Earth Connection Division [Withbroe]
- 9) Space Science Advisory Committee Presentation – Solar System Exploration Division [Hartman]
- 10) Astrobiology Task Force Report [Beichman]
- 11) IT Security Clause [Nelson]
- 12) Technology Director's Report [Thronson]
- 13) Recent Results from the Submillimeter Wave Astronomy Satellite (SWAS) [Neufeld]
- 14) Original Objectives of CSOC [Spearing]

Other material presented at the meeting:

- 1) IT Security Clause
- 2) Draft – Charter for the Education and Public Outreach Task Force of the Space Science Advisory Committee

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<sup>1</sup> Presentation and other material distributed at the meeting are on file at NASA Headquarters, Code S, Washington, DC 20546.