Space Science Advisory Committee

of the

NASA Advisory Council

Resolution on the Global Geospace Science Program

March 23, 1994

The Space Science Advisory Committee (SScAC) strongly concurs with the Space Physics Subcommittee (SPS) in reasserting the importance of the Global Geospace Science (GGS) program. WIND and POLAR are the primary NASA components of the International Solar-Terrestrial Physics (ISTP) mission. These two GGS spacecraft are essential for the success of this international space physics mission. We are encouraged by the intensity of NASA's efforts to ensure that identified problems with WIND and POLAR are repaired prior to launch. Such effort is entirely consistent with the SScAC view that the highest strategic priority be given to realizing the greatest and most cost-effective return on prior investments that achieve high priority science objectives. Demonstrating such constancy of purpose also maintains US credibility as a reliable international partner. In our view, cancellation or prolonged delay of these missions so close to completion would be a loss and embarrassment to the NASA program only slightly less serious than a failure in orbit. We urge NASA to accomplish the earliest possible launches of both WIND and POLAR, consistent with prudent risk.

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Statement on the 1995 Strategic Plan for Space Science

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OVERVIEW AND SUMMARY

The Space Science Advisory Committee endorses the 1995 Strategic Planning Process followed by the Office of Space Science and concludes that it can result in a viable strategy shaped in the context of an austere fiscal climate. As expectations for the future have been brought into line with the reality of the Nation's economy, many exceedingly difficult choices have been made. The OSS plan, presented in its near-final form during our March 1994 meeting, represents a balanced distillation of the very highest priority science programs. It achieves balance between the present and the future, between the several scientific disciplines, and between more frequent, smaller missions and occasional moderate class missions. It is a responsive and austere program that can be accommodated within a level budget.

This statement describes SScAC's role in the planning process, defines the characteristics of a viable space science program with the actions necessary to achieve them, specifies the highest strategic priorities for 1996-2000, and enumerates other high priorities that have been deferred, deleted or descoped.

THE 1995 STRATEGIC PLANNING PROCESS

The 1995 strategic planning exercise for Space Science differs significantly from that of earlier years. In prior Strategic Plans of the Office of Space Science and Applications, the challenge was to define the highest priority new initiatives that could be accommodated within budgetary "wedges" created in part by assumed increases in the total OSSA funding level. Therefore, the "Woods Hole" exercises of Space Science & Applications Advisory Committee focused on establishing queues of flagship missions, moderate missions and research base enhancements. The existence of a healthy "base program" within each discipline was taken as a tacit assumption.

Now the new Office of Space Science and Space Science Advisory Committee are faced with a much greater challenge: creating a balanced, vigorous and world-class space science program that fits within a level budget. Rather than assuming the existence of a base program, we have constructed one: first, by identifying the essential elements of a space science program; second, by retaining only activities of the very highest scientific priority within each element; and third, by assembling those into a balanced program that is both fiscally and scientifically viable. By necessity, many excellent scientific missions and programs that had received very high priority in earlier plans have been eliminated or deferred beyond the year 2000, and virtually every one that remains has been significantly reduced in scope (see Table).

In this activity, as in the earlier ones, it is essential that the scientific priorities flow from the high level scientific strategies defined by the research community working through the National Academy of Sciences and National Research Council. When necessary, NASA has requested review by the appropriate NAS/NRC body to assure that revised mission concepts are consistent with the previously defined scientific imperatives. This practice should continue as needed.

The process of creating this new "bottom-up" input to the strategic plan proceeded in several stages:

- First, each of the three SScAC discipline subcommittees was directed to work closely with its respective Division Director to define a meaningful but highly cost-constrained program for that discipline within budgetary guidelines set by the Associate Administrator.
- Second, at our meeting in January 1994, SScAC reviewed the plans-in-progress of each Division/Subcommittee, discussed both general and specific aspects of the overall plan, and provided formal and informal recommendations.
- Third, we also defined the characteristics necessary for a <u>viable</u> space science program: *Quality, Vitality, Community and Efficiency.*
- Fourth, the Subcommittees and Divisions continued working to refine their programs, making additional prioritizations and retaining only the highest priority missions and programs that fit within the budgetary guidelines.
- Fifth, SScAC met in March 1994 to review the overall OSS strategic plan assembled from the divisional programs and to assess this combined program for space science.

CHARACTERISTICS OF A VIABLE SPACE SCIENCE PROGRAM

A viable space science program is defined as one that can successfully and responsibly deliver its **products**, *new discoveries* and *new understanding* to its **customers**, *the science and education communities, technology innovators, and ultimately the American public* . We identify four essential characteristics of a viable program, each of which requires a set of actions for implementation:

- QUALITY: A viable program must be one of excellence, one that remains at the forefront of the key space science disciplines. The Clinton administration has stated one of its three goals for Science and Technology to be: "maintain world leadership in mathematics, science and engineering." The US may no longer be preeminent across all of space science, as it once was, but we are convinced that the American public demands and deserves a space science program with the highest standards of excellence.

  Actions: Choices must be made among activities on the basis of scientific priority in such a way that no key discipline area is abandoned. Programs and missions must address the highest priority science. Similarly, missions that make major advances of the scientific frontiers, while necessarily limited by budgetary constraints, should not be abandoned.

- VITALITY: A viable program must advance the frontiers of knowledge and exploration at a sufficient rate to maintain momentum and progress. In short, the products of space science must be returned to its customers, including the American public, at a reasonably regular rate.

  Actions: The plan must provide for sufficiently frequent opportunities to make steady advances in space science. This requires an appropriate combination of ground-based, suborbital and flight programs together with adequate levels of the necessary research and analysis.

- COMMUNITY: A viable program must attend to the human resources required to carry it out. NASA cannot achieve its goals in space science without a highly skilled, talented and motivated research community within NASA, in industry, and in educational institutions. This community is also an effective producer of technical and scientific talent for other national needs and is a significant contributor to education, technical innovation and public information.

  Actions: Adequate attention must be given to training programs, recruitment of underrepresented minorities, and assurance that key capabilities needed for the future are not allowed to atrophy. Frequent scientific opportunities are the main promoters of a productive and diverse community.

- EFFICIENCY: A viable program must make the most cost-effective use of resources. This includes getting the best return from past investments in flight hardware, taking advantage of opportunities for international and interagency collaborations (which requires good faith attempts to honor past commitments), and being as efficient as possible in all phases of mission definition, development and operations.

  Actions: Efforts to extract maximum efficiency from all programs and missions must be continued as an ongoing part of the space science program. Scientific objectives need to be sharply focused, appropriate investments need to be made to enable future missions with minimal technical risk and, above all, effective use must be made of prior investments in space science assets.

HIGHEST STRATEGIC PRIORITIES for 1996-2000

SScAC endorses the following Strategic Priorities as essential elements of a coherent space science plan for the next five year period.

CURRENT PROGRAM: First and foremost, attention must be given to achieving optimum potential for discovery and new knowledge using existing assets. This means obtaining the most cost-effective scientific return on the very substantial investment in operating missions and in approved missions already under development. The scientific objectives of the major missions under development, GGS, Cassini and AXAF, remain of the highest priority. Substantial restructuring and descoping have occurred to achieve the highest possible science return at significantly reduced cost. Similarly, mission operations for spacecraft already in orbit or under development have been scrutinized to increase efficiency, and some missions have or will soon be terminated. SScAC recommends that the ongoing program be reviewed periodically to ensure that all missions are carried out in the most cost-effective manner and that resources are allocated according to scientific priority.

Special consideration should be given to Mars Surveyor I and II which are included in the President's budget for FY 1995, but which have not yet been approved by Congress. These missions together provide for a responsible, and affordable recovery of the Mars Observer science and should be considered part of the Current Program.

FUTURE PROGRAM: To avoid stagnation, the space science plan must allow for initiation of the highest priority missions and must also lay the groundwork for investigations in the more distant future. The following elements of the program are essential:

- Provide frequent opportunities for continual advances in space science. More frequent flight opportunities involving smaller missions with shorter development times are essential to provide steady advances in space science.

  The highest priority in this area is to continue the Explorer and Discovery programs, initiate Solar-Terrestrial Probes, and begin SOFIA. Planning and approval of these missions should include explicit recognition of the necessary ATD and MO&DA resources. The plan should also include appropriate funding levels for R&A and suborbital programs.

- Initiate selected moderate programs to make major advances of the frontiers of space science. Answers to many fundamental scientific questions can only be made with larger missions. The laws of nature dictate that the ability to detect faint signals from the distant Universe or to explore the inner and outer solar system requires larger, more capable spacecraft.

  The highest priority initiatives in this category are SIRTF, Pluto Fast Flyby and Solar Probe.

- Leverage the US investment in space science through international cooperation. NASA should take advantage of opportunities for interagency and international collaboration and cooperation to improve the scientific return of both NASA-led missions and missions led by other agencies or other countries. NASA has a successful history of cooperation with ESA, the European states, and Japan, and a growing body of cooperative efforts with Russia. These kinds of efforts should be encouraged where they can effectively accomplish the mutual goals of the two partners by pooling their resources and combining their complementary strengths.

- Prepare for the future. It is essential that appropriate investments in research programs, technology development, and mission concept studies be made. These investments provide the engine for generating new approaches to answering the fundamental questions, formulate new questions based on recent discoveries, provide new technologies with potential impact beyond NASA, and enable future increases in the productivity of the space science program.

DEFERRED, DELETED AND DESCOPED PRIORITIES FOR 1996-2000

The strategic priorities enumerated above resulted from a very difficult process of elimination in which numerous programs and missions of nearly comparable scientific merit were deleted from active consideration, very significantly reduced in scope, or postponed beyond the current planning horizon. In every case, the affected program addressed scientific questions of high priority in earlier rankings by NAS/NRC and NASA advisory bodies and had successfully survived previous priority setting exercises. Although in some cases, the questions may be addressed by an international mission, others must simply remain unanswered for the foreseeable future.

When compared with the draft 1992 Strategic Plan for OSSA, the present plan eliminates all "flagship" missions and most moderate missions. Some of these actions were taken in recent years by NASA and the science community and occasionally by Congress as budgets have consistently fallen below prior expectations. Some missions have been replaced with much smaller, more focused and less costly moderate or small missions. Others were deleted entirely, or postponed beyond the year 2000. A detailed listing is given in the accompanying Table. In addition to these actions regarding future missions, each discipline will continue to make painful choices between new initiatives and further operations of existing missions that continue to return very valuable data.

SETTING PRIORITIES:
RESPONSES TO A CHANGING ENVIRONMENT IN SPACE SCIENCE FUNDING IN THE 1990s

Flagship/Moderate Missions Deleted

CRAF Detailed, close-up studies of a comet and asteroids; primitive solar system material.
GAMMA RAY SPECTROSCOPY MISSION US role in ESA study of nuclear emission from interstellar medium & supernovae
ORBITING SOLAR LABORATORY Fundamental processes in the solar atmosphere & corona, solar flares
SUBMILLIMETER INTERMEDIATE MISSION Interstellar molecules, star formation in diffuse interstellar clouds

Missions Deferred beyond year 2000

ASTROMETRIC INTERFEROMETRY MISSION Ultra-high angular resolution studies of stars & quasars
ASEPS-1 Comprehensive exploration and study of other planetary systems
ASTROMAG Properties and origins of cosmic ray elements, isotopes and anti-particles
GRAND TOUR CLUSTER Multi-point measurements of space plasma environment of Earth
MESUR JUPITER Detailed study of largest planet in the solar system
SATURN PROBE In situ measurements of the composition and structure of Saturn's atmosphere

Missions Retained but Significantly Descoped

AXAF Reduced instrumentation, lifetime; AXAF-S deleted; reduced capability to study properties and chemical composition of celestial objects
CASSINI Deleted instrument scan platform; reduced flexibility for icy satellite observations; reduced instrument coverage and sensitivity
HESP Reduced capability with HESI to study impulsive energy release in solar flares
IMI Reduced capability with MI to study Earth's global magnetosphere; in situ measurements deleted;
MESUR NETWORK Reduced capability on Mars Surveyor to study Martian atmosphere, rocks & soil
SIRTF Reduced instrumentation and lifetime; reduced capability to study cool objects, interstellar gas and outer solar system
TIMED Reduced instrumentation and orbital coverage with MTI to study unexplored upper reaches of Earth's atmosphere