HOLD FOR RELEASE AT 3 P.M. EST, February 4, 2002

Office of Space Science (Code S)
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The total Fiscal Year 2003 budget request for the Space Science Enterprise is $3,414.3 million; this is comprised of $3,044.5 million in direct program funding and $369.8 million for institutional support. This represents an increase of 19 percent from FY 2002. There are an estimated 1,572 direct Full Time Equivalent employees included within the Space Science Enterprise in Fiscal Year 2003.

SPACE SCIENCE OVERVIEW

Thousands of years ago, on a small rocky planet orbiting a modest star in an ordinary spiral galaxy, our remote ancestors looked up and wondered about their place between Earth and sky. At the outset of the 21st century, we ask the same profound questions:

- How did the Universe begin and evolve?
- How did we get here?
- Where are we going?
- Are we alone?

Answers to these questions will not be extracted from narrow inquiries, but will be built up by combining innumerable individual clues over the years to come. The broad outlines of much of the puzzle are discernible now, but a clear picture of the whole awaits years of varied research that will undoubtedly produce many surprises along the way. In the last 40 years, space probes and space observatories have played a central role in this fascinating process, and NASA's Space Science Enterprise will continue to be at the forefront of the search for the answers to these major questions.

A summary of Space Science highlights and discoveries during calendar year 2001 is available on the Internet at:

http://spacescience.nasa.gov/

New Initiatives and Other Major Features in the 2003 Budget

A new research program announced by NASA and the Department of Energy, the Nuclear Systems Initiative, paves the way for an unprecedented capability in the next decade and beyond, to explore the far reaches of the solar system in the search for answers to some of the greatest questions in human history.

Safe and proven electrical generating technologies provided by radioisotope power systems will enable sophisticated mobile laboratories to travel over the surface of Mars, drilling deep underground at promising sites where signs of life

can be sought, and conduct a large variety of other experiments day and night, around the clock.

Other missions will be able to speed throughout the outer reaches of the solar system faster than is possible even with the most sophisticated space probes available today**.** Such speed, coupled with numerous powerful scientific instruments, will allow NASA to consider more ambitious possibilities involving missions that could travel from one interesting planet, moon or comet to another for a close-up, in-depth study. The fiscal year 2003 request for this Initiative is $46.5 million for nuclear electric propulsion and $79 million for nuclear electrical power-generation systems.

The New Frontiers Program is a new planetary exploration program, structured and managed along the lines of NASA's highly successful, Discovery program, under which missions are selected through open peer-reviewed competitions. Designed to allow frequent access to space for mid-size planetary missions that will perform high-quality science investigations, New Frontiers will take advantage of advances in propulsion and power systems in the nuclear initiative. Missions will be cost-capped at $650 million in fiscal 2003 dollars with a launch scheduled 48 months from the start of development. $15 million is requested for fiscal 2003.

There is no funding for the New Horizons Pluto-Kuiper Belt mission in fiscal 2003 and subsequent years. However, preliminary design studies on New Horizons are continuing through fiscal 2002. Funding for the Europa Orbiter mission was deleted due to significant cost growth in the mission’s life cycle.

Major Ongoing Programs

As of the end of December 2001, there are 26 operating Space Science missions, in addition to the Enterprise's participation in seven foreign missions. By the end of 2003 Space Science will have 28 operating missions, in addition to participation in eight foreign missions.

- The Mars Exploration Program (MEP) is a sustained series of missions to Mars, each of which will provide long-term, focused scientific return. The primary objective is to characterize and understand Mars as a dynamic system, including its present and past environment, climate cycles, geology and whether life ever arose there. The strategy includes a natural responsiveness to scientific discoveries that will emerge as new observations are made. The fiscal 2003 budget features some alterations in the strategy for the missions that will be launched after 2005. The fiscal 2003 request for the Mars Exploration program is $453.6 million.

    - The 2001 Mars Odyssey orbiter, launched April 7, 2001, is now in its science orbit around Mars, having just recently completed its aerobraking maneuvers to achieve its final orbit.

- The twin Mars Exploration Rovers are being prepared for launch in the summer of 2003, and will arrive at their landing sites on the surface of the Red Planet about seven months later. The mission of the MER rovers is to find conclusive evidence of water-affected materials on the surface. They are designed to effectively serve as robotic field geologists, and they will provide the first microscopic study of rocks and soils on Mars.
- The 2005 Mars Reconnaissance Orbiter mission is now in the formulation stage. The MRO will use its new observational tools, some of which could resolve beach ball-sized objects and their mineralogies, to search for clues within the Martian landscape of telltale layers and materials associated with action of liquid water.
- In 2007, NASA will launch a Mars Scout mission, which will be fully competed and competitively selected. In addition, NASA will provide programmatic and technical support to international Mars missions. These missions are the NASA-Italian Space Agency (ASI) telecommunications orbiter and the French Space Agency's Orbiter including NetLanders.
- The next major step will be NASA's 2009 Mars Smart Lander (MSL)/Mobile Laboratory, a long-duration roving science lab intended to confirm the surface presence of water-related minerals and carbonates and their formational histories. The MSL will be a pathfinder to those sites that offer the highest probability of harboring Martian "fossils" or other forms of indicators of past life. It will serve as both a scientific and technological pathfinder for future missions, including sample return. The 2009 Smart Lander/Mobile Laboratory will take advantage of the advances in nuclear power technology. By incorporating improved nuclear power systems, NASA can extend the operability of the rover from months to years, greatly increasing the scientific return of this mission.

- NASA's currently operating Great Observatories -- the Hubble Space Telescope and the Chandra X-ray Observatory -- are on the forefront of astronomical research. Hubble is the first scientific mission of any kind that is specifically designed for routine servicing by spacewalking astronauts. In February 2002, NASA will launch the second part of the Third Servicing Mission (SM-3B) to the Hubble Space Telescope. During this mission, astronauts will replace the failed attitude control gyros, install a new science instrument -- the Advanced Camera for Surveys, replace the flexible solar arrays, restore the near-infrared imaging instrument's cooling capability, and undertake the complex and difficult replacement of the power control unit. The fiscal 2003 request for Hubble development is $138.9 million.

- NASA's next Great Observatory, the Space Infrared Telescope Facility, or SIRTF, will explore the nature of the cosmos through the unique windows available in the infrared portion of the electromagnetic spectrum. The launch of SIRTF has had to be delayed to afford time to resolve software and other

technical problems. The July 2002 launch date has been delayed to no earlier than December 2002. The fiscal 2003 request is $47.4 million.

- HESSI, the High Energy Solar Spectroscopic Imager, will study the dynamics of solar flares, the tremendous explosions in the atmosphere of the Sun. HESSI will be able to produce high-resolution spectrographic movies of solar flares, allowing scientists to study the life cycle of a flare. HESSI is scheduled for launch in February 2002.

- Albert Einstein's theory of general relativity is the most accepted theory of gravitation and the large-scale structure of the Universe. NASA's Gravity Probe B mission is designed to verify Einstein's theory, which up to now has only been tested through astronomical observation and Earth-based experiments. Whether the experiment confirms or contradicts Einstein's theory, its results will be of the highest scientific importance. The fiscal 2003 request of $19.7 million supports an October 2002 launch.

- The Galaxy Evolution Explorer (GALEX), scheduled for launch in May 2002, is a Small Explorer mission that will map the global history and probe the causes of star formation over most of the life of the Universe. GALEX will investigate the period over which galaxies have evolved dramatically, and the time that most stars, elements and galaxy disks had their origins.

- The Comet Nucleus Tour (Contour), scheduled for launch in July 2002, will fly past two comets and take images of the comets' nuclei, as well as collect and analyze comet dust.

- The Space Science Research Program develops the theoretical tools and laboratory data needed to analyze flight data, and supplies the resources for future mission needs and the analysis of data returned from operating spacecraft in hopes to answer the fundamental questions governing the role of the Space Science Enterprise. The fiscal 2003 request for this program is $709.6 million.

Beginning in fiscal 2003, the budget for the Deep Space Network (DSN) is included in Space Science, consistent with "full cost" budgeting and management. The transfer of management responsibility for the DSN to the Office of Space Science has already begun. NASA's Jet Propulsion Laboratory is working with its industry contract partners to transform the DSN and associated mission operations system architecture into a service-provision system known as the Deep Space Mission System (DSMS). The DSMS will provide a customer-oriented, turnkey service that seamlessly integrates the facilities of the DSN and the Advanced Multi-Mission Operations System (AMMOS). This system will enable more efficient provision of currently available services as well as the creation of new services. The fiscal 2003 request is $385.2 million.

Programs Under Development or Study

The Space Science Enterprise has a number of other programs under development, or under study for possible future development. More information on these programs can be found on the Internet at

http://spacescience.nasa.gov/

February 2002
(Updated Feb. 13, 2002)