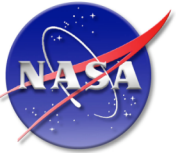


Development of the NASA Science Plan

**NASA Advisory Council
Science Subcommittees
July 7, 2006**

**Greg Williams
Science Mission Directorate**



Congressional Req't for a Science Plan

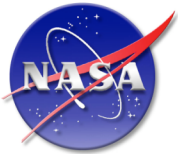
NASA Authorization Act for 2005 (S.1281)

Title I Section 101

(d) SCIENCE.— (1) IN GENERAL.—The Administrator shall develop a plan to guide the science programs of NASA through 2016.

(2) CONTENT.—At a minimum, the plan developed under paragraph (1) shall be designed to ensure that NASA has a rich and vigorous set of science activities, and shall describe— **(A) the missions NASA will initiate, design, develop, launch, or operate in space science and earth science through fiscal year 2016, including launch dates; (B) a priority ranking of all of the missions listed under subparagraph (A), and the rationale for the ranking;** and (C) the budget assumptions on which the policy is based, which for fiscal years 2007 and 2008 shall be consistent with the authorizations provided in title II of this Act.

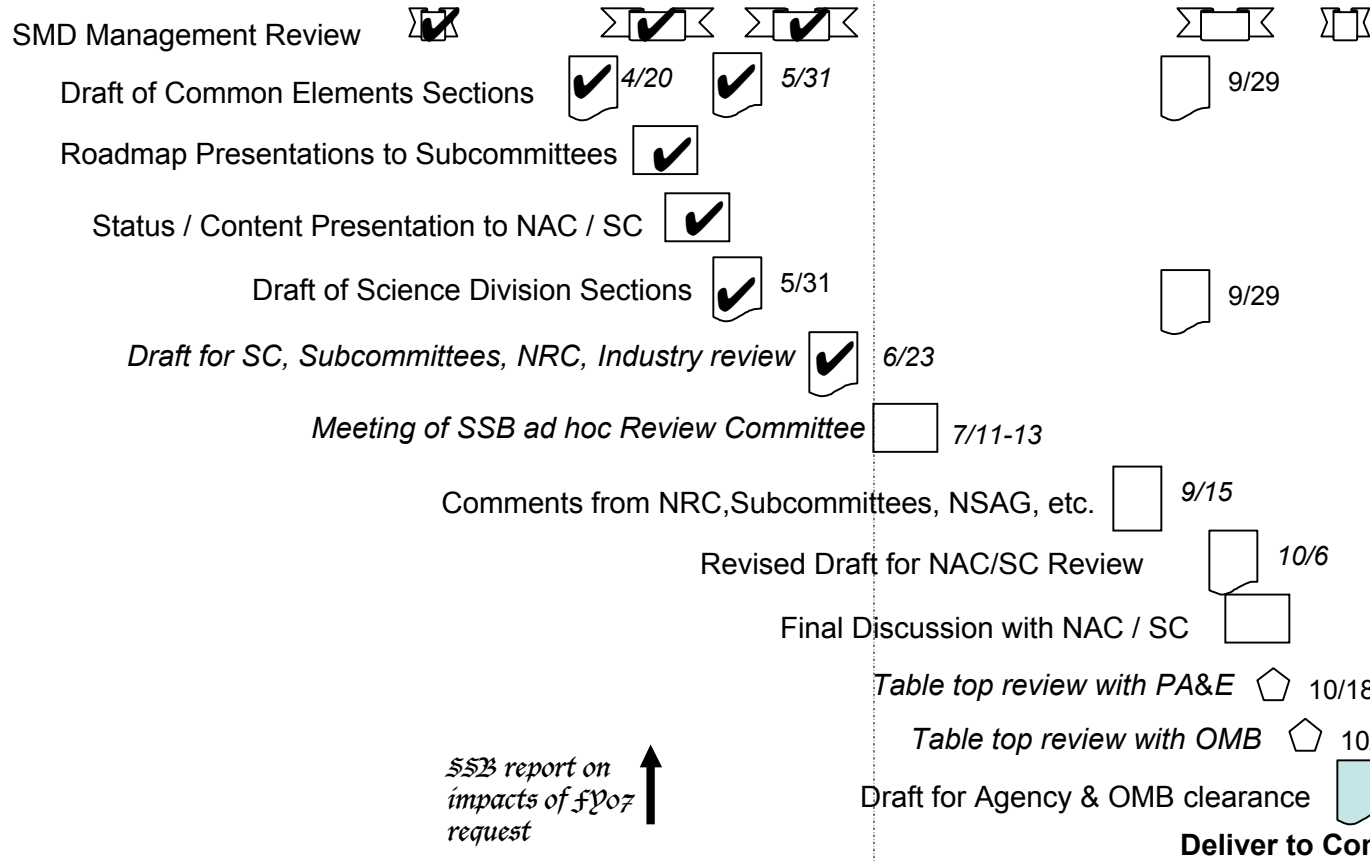
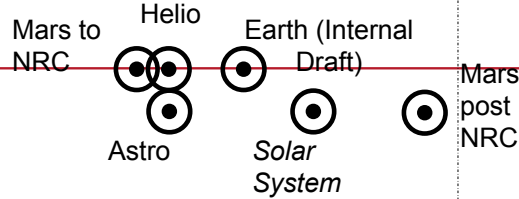
(6) SCHEDULE.—The Administrator shall transmit the plan developed under this subsection to the Committee on Science of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate **not later than 1 year after the date of enactment** of this Act.



JAN 06 FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

SMD Science Plan Schedule
7/7/06

Roadmaps

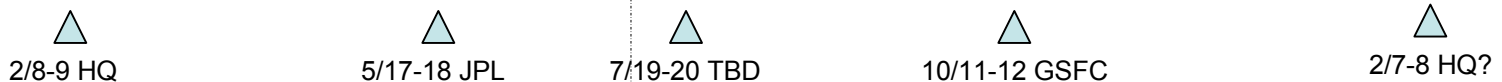


Key

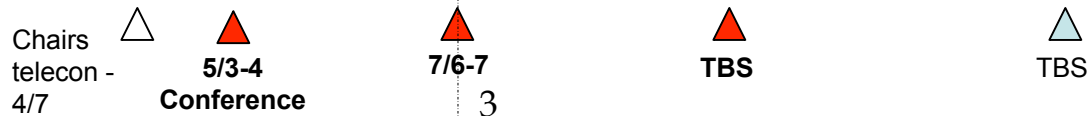
- Roadmap
- SMD Review
- Draft
- Presentation
- Table Top Review
- Meetings
- Delivery

Italics = change from prior version of the schedule

NAC Science Committee



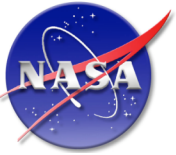
Science Subcommittees



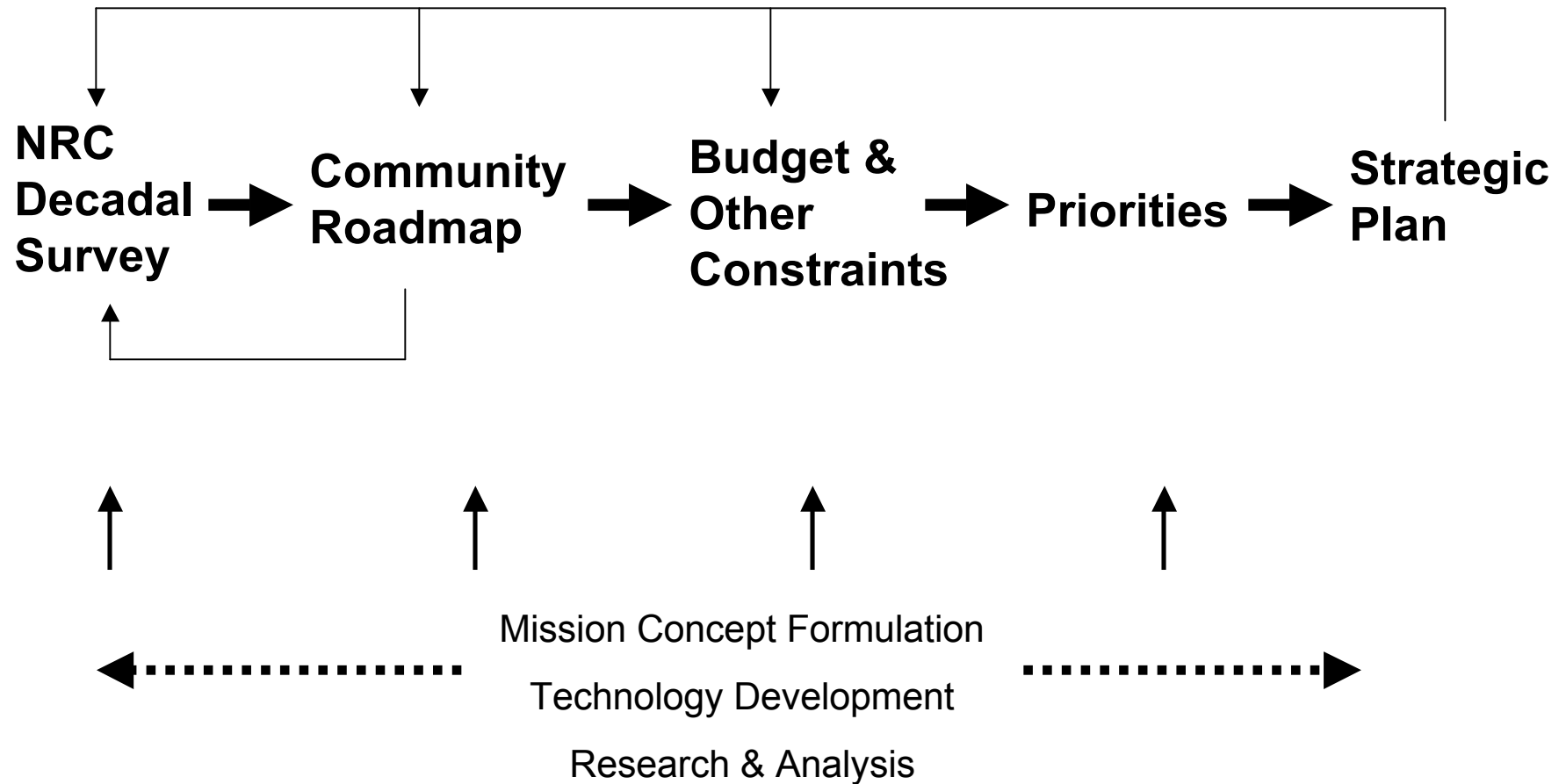


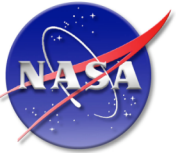
FYI - NRC's Review Team

- **A. Thomas Young – Chair** (Program management)
- **Spiro K. Antiochus – NRL** (Solar & space physics)
- **Ana P. Barros – Duke U** (Earth science)
- **James L. Burch – SRI** (Solar & space physics)
- **Antonio J. Busalacchi – U Md** (Earth science)
- **Jack D. Farmer – Arizona State** (Astrobiology)
- **Margaret G. Finarelli – GMU** (Space & Int'l policy)
- **John P. Huchra – Harvard- SCA** (Galactic evolution)
- **Ralph Lorenz – Univ of Arizona** (Planetary science)
- **Daniel McCammon – UW-Madison** (X-ray astronomy)
- **Anneila I. Sargent – CIT** (Radio astronomy)
- **Jessica Sunshine – U Md** (Planetary science)
- **Carl Wunsch – MIT** (Earth science)



Generic Science Strategic Planning Flow

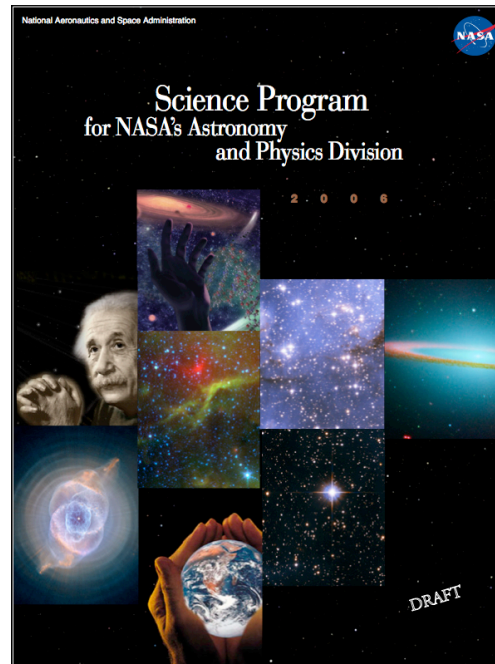




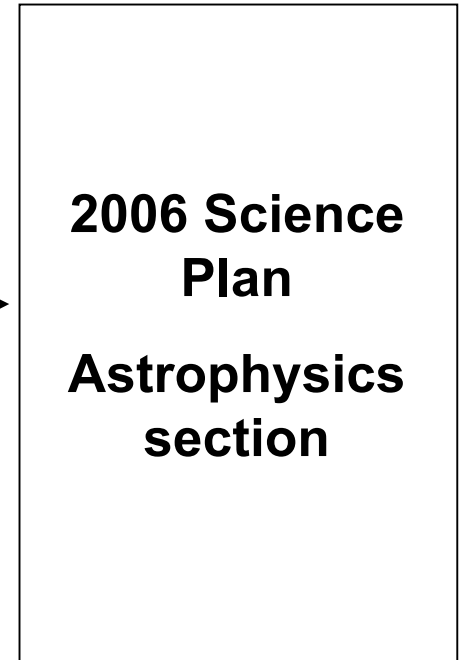
Astrophysics



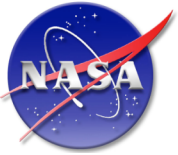
2001
**NRC
Decadal
Survey**



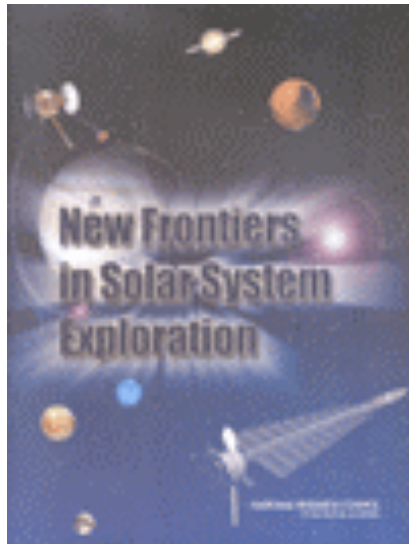
2006
**Community
Roadmap**



**2006 Science
Plan
Astrophysics
section**

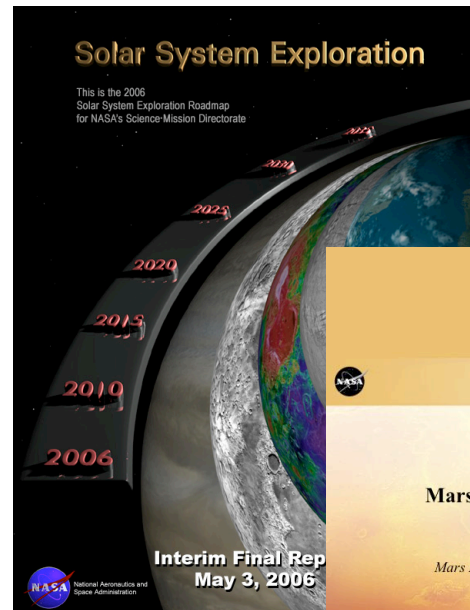


Planetary Science

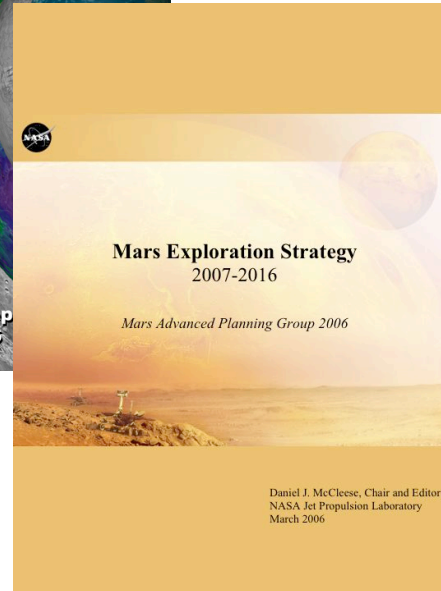


2003

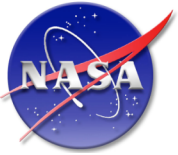
**NRC
Decadal
Survey**



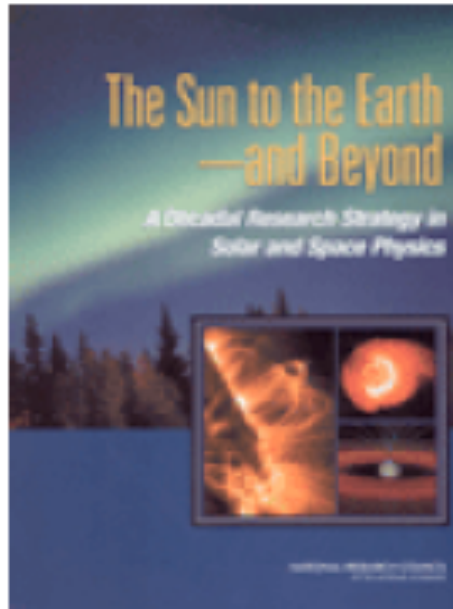
**2006
Community
Roadmaps**



**2006
Science
Plan
Planetary
Science
section**

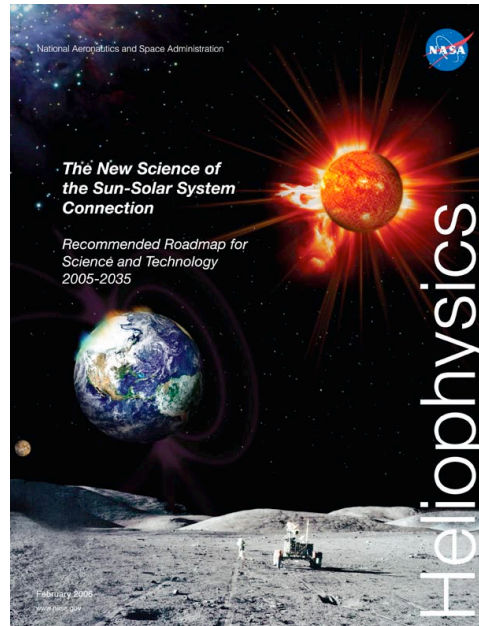


Heliophysics

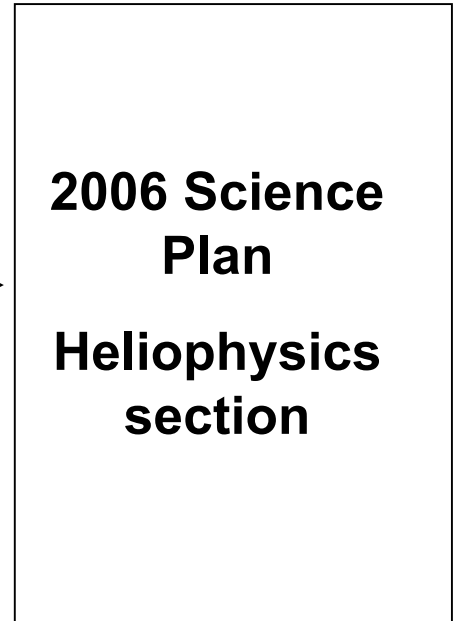


2002

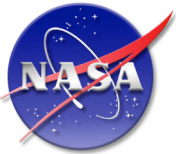
**NRC
Decadal
Survey**



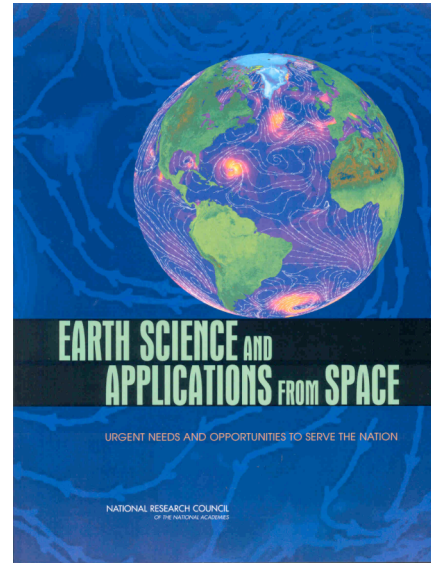
2006
**Community
Roadmap**



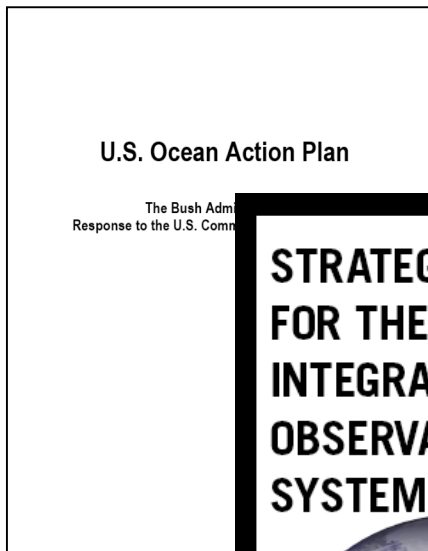
**2006 Science
Plan
Heliophysics
section**



Earth Science



(Interim Report)



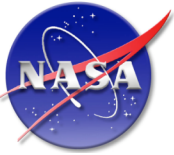
**2006
Science
Plan

Earth
Science
section**



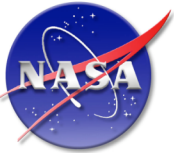
**6 Science
Focus Area
roadmaps; yet
to be
integrated into
a single Earth
Science
roadmap**

2005



Mission Prioritization: Degrees of Freedom Presumed

- **Prioritizing by Division; not attempting a single prioritized list of all SMD missions**
 - Language in report accompanying the Act called for a single list, but we've already told the Committee staff that is not possible
- **Not including missions already in orbit**
 - Describing in the draft Plan how we use the Senior Review Process to prioritize missions in extended operations phase
- **Prioritization of Mars separately from the rest of SSE**



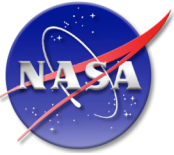
Creating Lists of Prioritized Missions

- **Prioritized competed missions / opportunities and strategic / core missions in same list**
 - Decadal surveys bin them separately, but...
 - The budget process forces us to make trades
- **The top priorities in each list have heritage in the NRC Decadal Survey in each area**
 - For Earth Science, the top priorities for current missions reflect Congressional or Executive mandates; future representative mission concepts listed alphabetically
- **Capture the logic that previously the launch order of missions currently in development**
- **Identify branch points where decisions on ultimate priority depends on future science findings, e.g., Beyond Einstein; Mars missions beyond MSL**



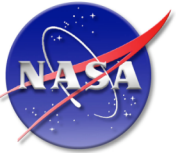
Science Plan Draft Outline

- **Preamble: NASA's Vision for Science**
- **Purpose & Progress**
- **Summary of Science Questions and Prioritized Missions**
 - Principle requirement in the NASA Authorization Act
- **Common Elements of Strategy**
- **Research Areas**
 - Bulk of the Plan; a section for each of the four science areas
- **Science Enabling and Enabled by Human Exploration**
- **Summary: On the Brink of Understanding**
- **Appendices**



NAC Science Committee & Subcommittee Review of the Draft Science Plan

- **Draft 3.0 for External Review sent to the NAC Science Committee, Subcommittees, NRC/SSB, and the NASA Science Associates Group on June 23**
- **SMD Division representatives will be present in the Subcommittee breakouts to aid in Subcommittee discussion of the draft Plan**
 - For Chapter 2, NASA is principally interested the Subcommittees' comments on the rationale employed to create the prioritized lists of missions; is it sound and reflective of community roadmaps? If a Subcommittee wishes to comment on the priority order of specific missions, the Executive Secretary should call upon members to recuse themselves where conflicts of interest exist, as required by the governing ethics rules.
- **Per NAC protocols, Subcommittee comments should be addressed to the NAC Science Committee chair with a copy to the Science Committee Executive Secretary (Gregory.J.Williams@nasa.gov)**
 - The NAC Science Committee will discuss these in its upcoming meeting(s)
- **Detailed comments from individuals and groups will be accepted through September 15**

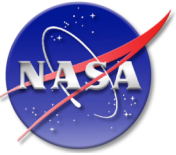


Science Plan Plenary / Next Steps

- **The Science Plan Plenary in today's agenda is an opportunity for each Subcommittee to capture its first order comments and share them with the other Subcommittees**
- **Each Subcommittee will have 15 min; consider summarizing your discussions on:**
 - Overall content of the Plan
 - Rationale for mission prioritization
 - Key comments on the science section of interest
- **Over the next two months, NASA will be addressing open work items and identifying figures and graphics**
- **NASA will report on comments received and actions taken at the Fall NAC meetings**

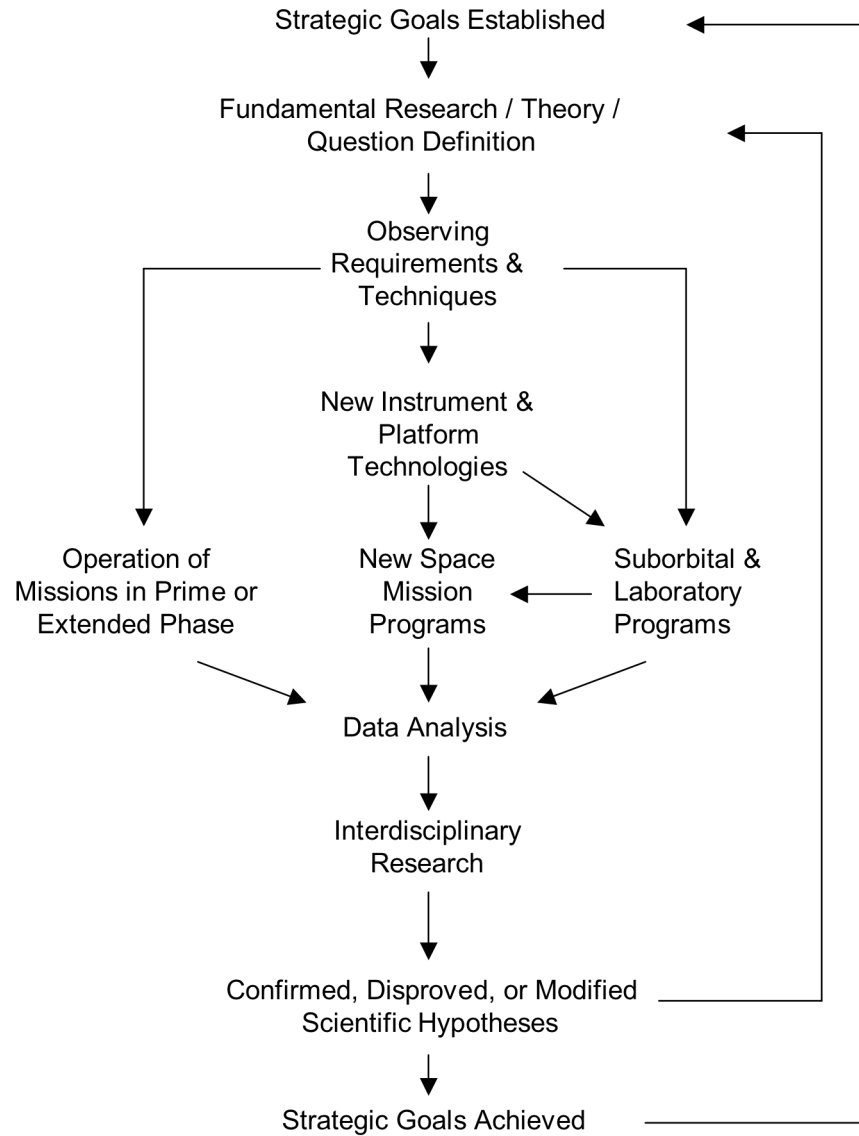


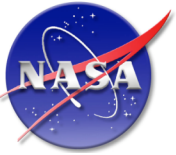
Back-up



Role of R&A in NASA

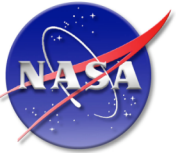
Figure 2.1: Doing Science at NASA





“The committee recommends that successful aspects of the robotic science program -- especially its emphasis on having a clear strategic plan that is executed so as to build on incremental successes to sustain momentum, use resources efficiently, enforce priorities, and enable future breakthroughs -- should be applied in the human space flight program.”

***Science in NASA’s Vision for
Space Exploration -- NRC 2005***



Conference Report Accompanying 2005 Authorization Act

Section 101(d) directs the Administrator to develop a plan to guide the space science and earth science programs of NASA through 2016. The priority ranking required by this subsection is a single ranking of all the missions that NASA lists pursuant to paragraph (2)(A), not a ranking categorized by theme or any other category...

The conferees are aware that the National Academy of Sciences is continuing to work on an Earth Science and Applications from Space Decadal Survey which is due to be completed in 2006. In preparing the science plan, NASA should, to the greatest extent possible, take into consideration information available from the Decadal Survey. The conferees expect NASA to notify the authorizing committees if the completed Decadal Survey would change any of the information provided in the science plan.



Astrophysics Advisors

Board Physics and Astronomy

Burton Richter, *Chair*, Stanford University
Anneila I. Sargent, *Vice Chair*, California Institute of Technology
Elihu Abrahams, Rutgers State University
Jonathan Bagger, Johns Hopkins University
Ronald C. Davidson, Princeton University
Raymond Fonck, University of Wisconsin
Andrea M. Ghez, University of California at Los Angeles
Peter Green, University of Michigan
Laura H. Greene, University of Illinois
Wick Haxton, University of Washington
Frances Hellman, University of California at Berkeley
Erich P. Ippen, Massachusetts Institute of Technology
Marc A. Kastner, Massachusetts Institute of Technology
Christopher F. McKee, University of California at Berkeley
Jose Onuchic, University of California at San Diego
Julia M. Phillips, Sandia National Laboratory
William Phillips, National Institute of Standards and Technology
Thomas N. Theis, IBM T.J. Watson Research Center
C. Megan Urry, Yale University

Space Studies Board

Lennard A. Fisk, *chair*, University of Michigan,
George A. Paulikas, *vice-chair*, The Aerospace Corporation (ret.),
Spiro K. Antiochos, Naval Research Laboratory
Daniel Baker, University of Colorado
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Jack Farmer, Arizona State University
Jacqueline N. Hewitt, Massachusetts Institute of Technology
Donald Ingber, Harvard Medical School
Ralph H. Jacobson, Charles Stark Draper Laboratory
Tamara E. Jernigan, Lawrence Livermore National Laboratory
Klaus Keil, University of Hawaii
Debra S. Knopman, RAND Corporation
Calvin W. Lowe, Bowie State University
Berrien Moore III, University of New Hampshire
Norman P. Neureiter, American Association for the Advancement of Science
Suzanne Oparil, University of Alabama
Ronald Probstein, Massachusetts Institute of Technology (emeritus),
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Harvey D. Tananbaum, Harvard-Smithsonian Astrophysical Observatory
Richard H. Truly, National Renewable Energy Laboratory (ret.),
J. Craig Wheeler, University of Texas
Thomas Young, Lockheed Martin Corporation (ret.)
Gary P. Zank, University of California, Riverside



Committee on Astronomy and Astrophysics

Roger D. Blandford, *Co-Chair*, Stanford University
C. Megan Urry, *Co-Chair*, Yale University
Donald Backer, University of California at Berkeley
Mitchell Begelman, University of Colorado
Charles Bennett, Johns Hopkins University
Thomas Bogdan, National Center for Atmospheric Research
Adam Burrows, University of Arizona
Alexei Filippenko, University of California at Berkeley
Timothy M. Heckman, Johns Hopkins University
Lynne Hillenbrand, California Institute of Technology
Stephan Meyer, University of Chicago
Eve Ostriker, University of Maryland
Mark J. Reid, Harvard-Smithsonian Center for Astrophysics
Scott Tremaine, Princeton University
Jean L. Turner, University of California at Los Angeles

AAAC

Garth D. Illingworth, *Chair*, University of California Santa Cruz
John Carlstrom, *Vice-Chair*, University of Chicago
Neta Bahcall, Princeton University
Bruce Carney, University of North Carolina at Chapel Hill
Wendy Freedman, Carnegie Observatories
Katherine Freese, University of Michigan
Robert P. Kirshner, Harvard-Smithsonian Center for Astrophysics
Daniel Lester, University of Texas at Austin
Angela V. Olinto, University of Chicago
Rene A. Ong, University of California at Los Angeles
E. Sterl Phinney, California Institute of Technology
Catherine A. Pilachowsky, Indiana University
Abhijit Saha, National Optical Astronomy Observatories

Other groups unique names only:
 Universe Working Group (16)
 Decadal “rolling review team” (~10)

Blue font indicates AAS membership (~85 total)
 More than 120 individuals involved in the process

NAC Science Committee

Charles Kennel, *chair*, Scripps Institute
Wes Huntress, Carnegie Inst. Of Washington
Mark Robinson, Northwestern University
Eugene Levy, Rice Univ.
Neil Tyson, Hayden Planetarium
Brad Jolliff, Washington Univ., St. Louis
Len Fisk, *ex-officio*, University of Michigan



Astrophysics Subcommittee

David Spergel, *chair*, Princeton University
Michael Brown, Caltech
Michael Cherry, Louisiana State University
Neil Cornish, Montana State University
Robert Clayton, University of Chicago
Brenda Dingus, LANL
Alan Dressler, OCIW
Debra Fischer, San Francisco State University
Kathryn Flanagan, MIT
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