THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

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Aeronautics and Space Engineering Board News

Welcome to the latest installment of the ASEB News! This newsletter will update you on ASEB events and activities, as well as policy items of interest to the aerospace community.

Inside this issue:

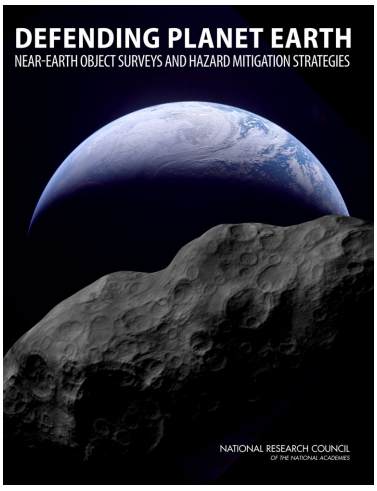
Near-Earth Objects Report	1
From the Chair	2
Director's Corner	5
NAOMS Report	6
NASA Budget Released	7
Committee News	8
ASEB Calendar	9

New Report Examines Near-Earth Object Surveys and Hazard Mitigation Strategies

The Committee to Review Near-Earth Object (NEO) Surveys and Hazard Mitigation Strategies released its final report, *Defending Planet Earth: Near-Earth Object Surveys and Hazard Mitigation Strategies*, on January 23, 2010. The study was requested by Congress and funded by NASA.

Near-Earth Objects (NEOs) have a precise technical meaning, but can be thought of as an asteroid or comet whose orbit approaches Earth's orbit to within about one-third the average distance of Earth from the Sun. In 2005, Congress mandated that NASA discover 90 percent of NEOs whose diameter is 140 meters or greater by 2020. In its interim report, released last year, the committee concluded that it was impossible for NASA to meet that goal, since Congress had not appropriated new funds for the survey, nor had the Administration asked for them.

The committee's final report lays out options NASA could follow to complete the Congressional mandate, albeit with a later completion date, based on the priorities of policy-makers. If completion of the survey as close to the original 2020 deadline as possible is considered most important, a space mission conducted in concert with observations using a suitable ground-based telescope and selected by peer-reviewed competition is the best approach. This combination could complete the survey well before 2030, perhaps as early as 2022, if funding were appropriated quickly. If cost conservation is deemed most important, the use of a large ground-based telescope is the best approach. Under this option, the survey could not be completed by the original 2020 deadline, but could be completed before 2030. To achieve the intended cost-effectiveness, the funding to construct the telescope must come largely on the basis of non-NEO programs. The report also notes that smaller objects—possibly as small as only 30 to 50 meters in diameter—are capable of causing significant damage to Earth, and surveys should attempt to detect as many of these small objects as possible, insomuch as this does not interfere with detecting the larger objects of 140 meters or more diameter.



A copy of the NEOs report can be purchased, or downloaded as a PDF document for free, from <http://www.nap.edu/catalog.php?record_id=12842>.

Additionally, the report recommends that immediate action be taken to ensure the continued operation of the Arecibo Observatory in Puerto Rico. NASA and NSF should support a vigorous program of NEO observations at Arecibo, and NASA should also support

(Continued on page 9)

From the Chair: Strengthening NASA's Technology Development Programs

Raymond S. Colladay

[The following is testimony and Q&A from Dr. Colladay at a hearing of the Subcommittee on Space and Aeronautics of the House Committee on Science and Technology, October 22, 2009.]

Aerospace is one of the few sectors where the US remains preeminent, but our future leadership depends on continued investment in long-term advanced technology R&D.

In our NRC report on *America's Future In Space*, we describe the many reasons why space is important to the country, including the recognition that space generates high-end jobs in science, engineering, and math supplying the workforce for the aerospace sector of our economy that is the envy of the world. Beyond that, it inspires an interest in technical fields of study that is and will continue to be of importance to our economic competitiveness.

Sustaining U.S. leadership in space depends on having a sufficiently broad and deep technology base that pushes the frontiers of our knowledge, leads to innovation and new systems, and challenges conventional wisdom with transformational technology.

When it comes to truly game-changing technical breakthroughs, a long-term view is particularly important and such a perspective is almost exclusively the domain of the government. Long-term advanced technology R&D does not happen in industry because the return on investment is years away and it does not happen in academia without sustained, stable government funding.

With that perspective in mind, I would like to make a few observations.

To fulfill its broad mandate in civil and commercial space, NASA should revitalize its advanced technology development program as a priority mission area.

Its technology R&D mission should be independent of the major development programs and report to the administrator or some equivalent management structure or governance model to give it the stature equal to the agency's other mission areas. In the report, we refer to a DARPA-like organization in NASA to convey this thought.

It should engage the best science and engineering talent in the country wherever it resides—in universities, industry, NASA centers, or other government laboratories.

It should be relieved, at least to first order, of institutional requirements to maintain core competencies at the 10 centers to insure that the research is drawing on the best ideas and talent wherever it resides.

It should serve all civil space customers including commercial space and other government agencies or departments.

A comprehensive assessment of the current state-of-the-art of advanced space technology would be helpful to insure that any new investment in technology R&D would be building on the most advanced, technology base currently available.

Whatever governance model NASA chooses for managing a technology enterprise, it needs to address technology relevance and transition. The ultimate user community determines that the products of technology R&D remain relevant and technology transition is a process that must be managed with all the stakeholders involved.

In summary, the country expects NASA to be a leader pushing the frontiers of air and space applications and missions as called for in the Space Act. But to do so, NASA needs to replenish the underpinning technology that makes it possible.

Questions for the Record

1. Your committee's report states that "Space activities provide economic opportunities, stimulate innovation and support services that improve the quality of life. US. economic competitiveness is directly affected by our ability to perform in this sector and the many sectors enabled and supported by space activities." The report also says that "The United States is now living on the innovation funded in the past".

(Continued on page 3)

From the Chair: Strengthening NASA's Technology Development Programs

(Continued from page 2)

a. Is your report suggesting that NASA is no longer in a position of enabling significant technological innovation?

Nothing that a commitment to fund advanced technology research and development would not solve. NASA has the people with the skills and a clear charter in the Space Act to conduct technology research and development that can lead to the kind of innovation envisioned in the report. It takes a commitment to invest the resources to sustain such research over the long haul—something that has been missing lately.

b. In today's environment where near term challenges command our attention and resources, how do we convince the rest of the Congress that the "seed corn" of technology development is a critical top priority?

The best rationale for investment in technology research and development is based on making the case for the importance of maintaining our technological competitiveness. NASA's mission and U.S. prestige that comes with the space program rests on technological excellence—excellence which cannot be sustained without up-front investment in technology. Unfortunately, the case is easier to make now, because the consequences of not making the necessary investments are evident today in cost overruns, less capable missions, fewer good technical options to meet requirements, and a lack of true game-changing opportunities.

2. Your report discusses the broad customer base that would benefit from the multi-use technologies including NASA, NOAA, industry, and military space programs. Some multi-use technologies might be of more interest and pertinence to certain users.

a. How would the selection process ensure balance among the users?

If NASA is truly conducting and sponsoring technology research and development at the cutting edge boundaries of science and engineering for space applications, balance among ultimate users of the resulting technology is best addressed later in the process during transition to application. DOD and/or industry will adapt whatever technological breakthroughs appear to be in their best interests and they should pay for it when it reaches that stage. NASA can be a catalyst for innovation by investing in very advanced concepts where balance is based on competition of the best ideas from the most talented people with the greatest potential payoff.

b. How would a DARPA-like entity balance technologies that address long-term user needs and in supporting highly visionary technology concepts for which uses are not yet known or defined?

If a DARPA-like entity is created to address technology research and development, then its mission should be weighted primarily towards the highly visionary technology concepts. That is the part of the R&D spectrum that is most in need of emphasis in NASA right now.

c. Who should provide the funding for such multi-use technology efforts?

NASA should. It is explicit in their charter and the ultimate user is, as you say, not yet defined. It will always require orders-of-magnitude more money to transition products of technology research and development to application, which is when others (e.g. DOD or industry) should expect to carry the funding load.

3. Your report notes that one of the goals of the civil space program should be "To provide technological, economic, and societal benefits that contribute to the nation 's most pressing problems."

a. How would the DARPA-like entity discussed in your report address broader, national

(Continued on page 4)

"NASA's mission and U.S. prestige that comes with the space program rests on technological excellence—excellence which cannot be sustained without up-front investment in technology."

The report *America's Future in Space* can be purchased, or downloaded as a PDF document for free, from <http://www.nap.edu/catalog.php?record_id=12701>.

ASEB Staff

Richard Rowberg
Acting Director

Alan Angleman
Senior Program Officer

Paul Jackson
Program Officer

Maureen Mellody
Program Officer

Celeste Naylor*
Senior Program Assistant

Tanja Pilzak*
Manager, Program Operations

Andrea Rebholz
Program Associate

Robert Riemer*
Senior Program Officer

Christina Shipman*
Financial Officer

John Wendt
Senior Program Officer

*Staff of other NRC Boards who are shared with ASEB

From the Chair: Strengthening NASA's Technology Development Programs

(Continued from page 3)

needs?

NASA should stay closely bound to their space and aeronautics mission. It is a very stressing mission that pushes the boundaries of engineering disciplines that benefit broader national needs when considering potential applications beyond aviation and space. As such, space and aeronautics is an engine for technological innovation, but the ultimate application of the technology may be in fields far from aerospace. DARPA has been most effective when it stays focused on its military mission, but the technology breakthroughs it has enabled have led to advances far beyond just the military. Clearly, however, NASA should partner and collaborate with their research counterparts in DOD, industry, and other government agencies and departments in a culture of cooperation in technology R&D.

b. How would technology areas be prioritized, especially if the goal of the DARPA-like organization is to "support preeminent civil, national security..., and commercial space programs" as your committee recommends?

Priorities should be established through a competition of ideas—the best research, by the best people, with the best ideas. There will always be limited funding, so the competition should be intense.

4. DARPA is often characterized as having a risk-taking culture, one that conducts long-term, high-risk, high payoff research, is tolerant of failure, and is open to learning. Is it realistic to expect such risk-taking to succeed in NASA in light of fiscal constraints that emphasize near-term mission success?

You raise one the strongest arguments in my opinion to separate an organization within NASA to undertake this very advanced, game-changing technology research and development. As a whole, NASA must and should be risk averse, particularly with human space flight. Mission success is paramount in human space flight and also in many of the grand space science missions. If the charter for innovative technology research and development is dispersed throughout the agency in all the mission areas, it can be very confusing to the culture and the workforce to say safety and mission success is paramount and at the same time parse the message that there needs to be a high tolerance for risk and failure is acceptable if reaching for an aggressive goal. It seems to me that the leadership can encourage a DARPA-like organization with NASA to take that high-risk path if it is understood that the rest of the organization, particularly human space flight, stays focused on safety and mission success where failure cannot be an option. Advanced technology research and development is precisely where risk should be taken and in so doing, the risk is wrung out before the technology is applied to an operational mission.

5. You note in your prepared statement that a DARPA-like organization adapted for NASA should be "relieved of NASA institutional requirements". Could you elaborate on what requirements you would target?

If technology R&D is to promote a competition of the best ideas by the best people wherever they reside—NASA Centers, universities, other government labs, or industry—then resources should not be preferred to the particular NASA Centers in need of institutional support such as building a center's core competency. It may happen that it accomplishes exactly that, but it should be because the people or the ideas from that center are best in class.

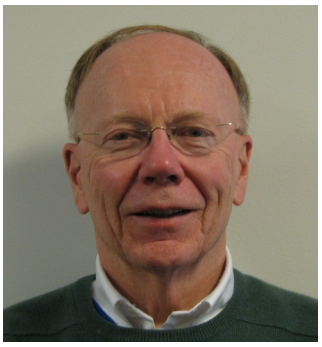
6. Regarding your panel's recommendation that NASA revitalize its advanced technology development program by establishing a DARPA-like organization within NASA, can you clarify what would happen to the advanced aeronautics research currently conducted in ARMD under your approach?

There are many organizational models and most have been tried in one form or another. Aeronautics could be part of it, like it once was, and there are arguments both for and against. Either way, aeronautics in NASA is a vitally important mission area and needs to be supported either as part of a DARPA-like organization whose charter is broadly "aerospace", or separate.

Raymond S. Colladay
Chair, ASEB
rcspace@wispertel.net

Director's Corner

Richard Rowberg



This will be my last report as acting director of the ASEB. Michael Moloney will be taking over most of the responsibilities on April 1 and assume the job completely some time in the late summer as he completes the ASTRO2010 study. Michael has been sitting in on various staff meetings so far, and we are consulting with him on those decisions that are likely to affect his tenure. This transition is going smoothly and should make for a nearly seamless transfer of management.

Michael has a great deal of experience at the NRC on a wide variety of projects. While most of his time has been spent with the Board on Physics and Astronomy, he directed several projects for our Materials Board including one for the Treasury Department on technologies for combating evolving counterfeiting threats. He also worked on a joint project with the Division of Behavioral and Social Sciences and Education on national content of imports and exports. In addition to his project experience with BPA, he served as deputy director of the Board for the last two years.

Michael's current project, the ASTRO2010 decadal survey, is one of the largest projects ever carried out at the NRC. It involves over 100 volunteers on the various science and priority panels and the overarching survey panel. Management of this enterprise is a substantial undertaking and the experience will serve him well as he assumes directorship of the ASEB and SSB with their numerous ongoing studies. I am confident that Michael will be able to carry on in the tradition of Marc Allen, Joe Alexander, George Levin, and Marcia Smith and build on their accomplishments to continue the outstanding record of the Boards.

I will be returning to my job as DEPS Deputy Executive Director gradually over the next several months. Part of that assignment will involve working on a couple of projects outside the space and aeronautics areas. In addition, I will be continuing to work with ASEB. There are a number of potential projects in the works, and I will continue to work with Ray in discussions with NASA and helping to get these projects started.

This past year has been most interesting and very full as we launched a large number of projects. Many of those have been completed, and, as noted, we are in the process of starting a number of new projects. The FY2011 NASA budget request shows that our work has had substantial influence on the new space policy directions taken by the Administration. Of particular interest to ASEB is the dramatic increase in funding and visibility at NASA for advanced technology development including the appointment of Bobby Braun as Chief Technologist, a new position created by Charlie Bolden to help implement that activity. The recommendations included in the ASEB report, *Fostering Visions for the Future: A Review of the NASA Institute of Advanced Concepts,* and the joint ASEB/SSB report, *America's Future in Space: Aligning the Space Program with National Needs*, appear to have played an important role in stimulating this enhanced effort on technology development.

I have enjoyed very much working with the ASEB staff and the members of the Board this past year. I will be leaving with mixed feelings—relieved from the management pressures but missing them at the same time. I know that my e-mail traffic will drop substantially, and maybe I can finally clear up the large back log. Finally, I offer my sincere thanks to the staff, the Board, the standing committees, NASA, the volunteers, and everyone else who has helped me with this assignment.

Richard Rowberg
Acting Director, ASEB
rrowberg@nas.edu

Where's the executive summary?

Looking for a more extended summary of one of our reports? On the report's page on the National Academies Press website (such as <http://www.nap.edu/catalog.php?record_id=12202>), scroll down a little bit to a section called "Free Resources." There, in a box titled "Download Free," you will see a link called "PDF Summary." Click the link to download the full executive summary in PDF format.

Where's the report?

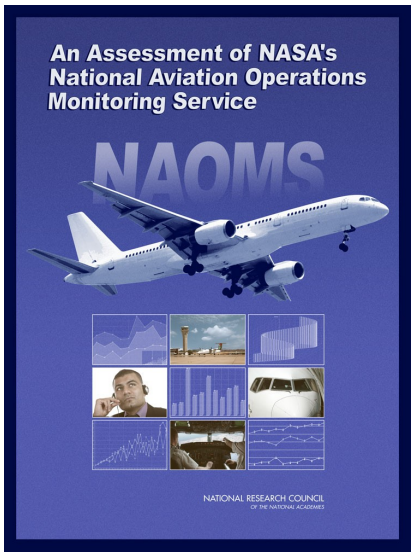
Each of our reports is also available in its entirety in PDF format from the National Academies Press website. Each report highlighted in this newsletter has its corresponding NAP website listed (such as <http://www.nap.edu/catalog.php?record_id=12202>). On the report's page, click on the button that says "Sign in to download free PDFs" and follow the instructions to download the full report.

You can browse or search the NAP website at <http://www.nap.edu> for other ASEB titles.

New Report Provides Advice on the National Aviation Operations Monitoring Service (NAOMS)

NASA's National Aviation Operations Monitoring Service (NAOMS) project was a survey administered to air carrier (AC) and general aviation (GA) pilots from April 2001 through December 2004. At the end of 2008, amid increased public awareness of the project, NASA contracted with the NRC to conduct an independent assessment of the project and an analysis of the publicly available survey data. To conduct the assessment, the NRC formed a committee consisting of experts from the fields of aviation safety, aviation operations (including several pilots), survey methodology, and statistics. On October 28, 2009, the committee publicly released its report, *An Assessment of NASA's National Aviation Operations Monitoring Service*.

The report *An Assessment of NASA's National Aviation Operations Monitoring Service* can be purchased, or downloaded as a PDF document for free, from <http://www.nap.edu/catalog.php?record_id=12795>.



The committee found that several aspects of the NAOMS survey design were consistent with generally accepted practices and principles in survey design. These include the choice of a cross-sectional design, the computer-assisted telephone interview (CATI) method, and the use of professionally trained interviewers. However, evidence suggested that the NAOMS survey did not take full advantage of CATI features. The NAOMS team also faced challenges in the choice of the sampling frame and had to make compromises at several stages. Unfortunately, the use of the publicly available Airmen Certification Database for the sampling frame and the criteria used to draw the sample of pilots in the AC survey led to biases in the sample, with an over-representation of wide-body aircraft and an under-representation of small aircraft.

The committee also identified deficiencies in the structure and wording of the questions used in the survey. Some of the questions asked pilots for information that they would not have had without a post-flight analysis. Other questions had complex structure or multiple parts or used vague phrases to describe the events that the survey was attempting to measure.

The committee's limited analysis of the publicly available data revealed serious problems with data quality: substantial fractions of the non-zero counts of events had implausibly large values, and respondents often rounded their answers to convenient numbers. The extent and magnitude of these problems raise serious concerns about the accuracy and reliability of the data. The committee does note that many of the biases that are relevant for estimating event rates would be mitigated for trend analysis to the extent that the biases remain relatively constant over time. However, the degree of mitigation might vary substantially across event types.

The committee did not find any evidence that the NAOMS team had developed or documented data analysis plans or conducted preliminary analyses as initial data became available in order to identify early problems and refine the survey methodology. These activities should be part of a well-designed survey, especially a research study to assess the feasibility of survey methodology in aviation safety.

Given the deficiencies identified, and despite some methodological strengths of the NAOMS project, the committee ultimately recommended that the publicly available NAOMS data should not be used for generating rates or trends in rates of safety-related events in the National Airspace System. The data could, however, be useful in developing a set of lessons learned from the project.

President Obama Releases a New Budget—and a New Direction—for NASA

Lewis Groswald

On February 1, 2010, President Barack Obama released his Fiscal Year (FY) 2011 budget for the federal government. NASA would represent approximately half of a percent of the $3.8 trillion FY2011 budget, even though its overall budget profile increases from $18.724 billion in FY2010 to $19 billion in FY2011, a 1.5% increase.

In the past, debating a forthcoming NASA budget is an exercise for policy wonks and those "in the know," so the fact that this budget proposal is attracting the attention of the national press and general public is a new development.

The main reason for this attention is the cancellation of the Constellation Program, which is NASA's current successor program to the Space Shuttle program, with a system of two rockets for crew and cargo (Ares I and V, respectively), and the Altair Lunar Lander. Despite the cancellation, NASA is sticking with the plan outlined in President George W. Bush's Vision for Space Exploration (circa 2004) that calls for the retirement of the Space Shuttle in 2010. This will leave the United States with a gap in indigenous human access to space, forcing the nation to rely on the Russians and their venerable *Soyuz* to launch its astronauts to the space station.

The most notable budgetary figure to come from the proposal is $6 billion to be allocated over the next five years to help the private rocket industry develop human-rated rockets to deliver American astronauts and cargo to the International Space Station or other low-Earth orbit destinations. This new tack to achieve access to orbit post-Shuttle has drawn the ire of much of Congress, who are not convinced that the commercial space industry is capable of such a feat.

Dr. John Holdren, Director of the Office of Science and Technology policy and chief science adviser to the President, and Gen. Charles Bolden, Administrator of NASA, said in a joint release that based on the findings of the 2009 Review of Human Space Flight Plans, "the current program [Constellation] is over budget, behind schedule, and suffers from decades of under-investment in space technology development."

The emphasis on technology development is clear throughout the President's budget proposal for NASA, which directs NASA to pursue high-risk "transformative" technologies. According to Holdren and Bolden, in order to go beyond low Earth orbit, "the President has directed a vigorous new technology development and test program that will … re-engage our greatest minds." The budget proposal also alludes to a restructuring of NASA, but what this entails is not yet clear or detailed whatsoever.

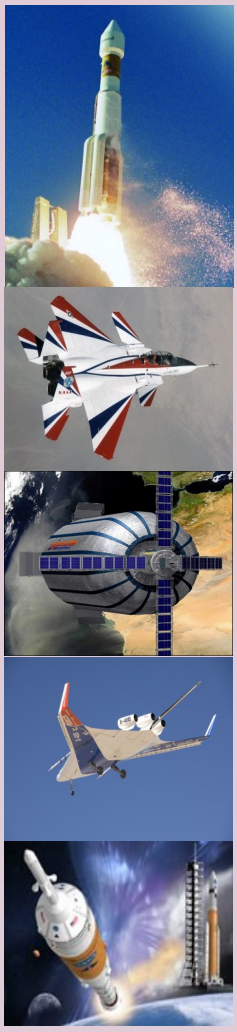
Missing from the budget proposal are anything in the way of milestones or timelines for human space exploration, save for the 2010 retirement of the Space Shuttle, which will cover any launch slippage into 2011. This has prompted some, like Senator Bill Nelson (D-FL), to prod President Obama to "articulate a vision" for the human space flight program.

Although the President has not spoken publicly on his plans for NASA, Mr. Obama talked to the crew aboard the International Space Station in a live webcast February 17th, mentioning his "unwavering commitment to NASA" and new initiatives to develop "transformational technology."

The aeronautics budget would be more than doubled if the President has his way, focusing on new technologies for green aviation and the NextGen national airspace system. Also receiving a boost is the Earth sciences program, which fits into the President's climate change agenda since his candidacy. This includes $150 million to "accelerate the development of new satellites for Earth Science priorities," and $170 million to build and fly a replacement of the Orbiting Carbon Observatory, which failed to separate from its Taurus XL launcher on February 24, 2009, crashing into the waters off of Antarctica.

Lewis Groswald is a Research Associate with ASEB's sister board, the Space Studies Board.

[See the next page of the newsletter for a breakdown of the proposed budget for NASA.]



Committee News

Committee for the Review of NASA's Aviation Safety Related Programs. The purpose of this study is to advise NASA and Congress on the status of NASA's aviation safety-related research programs. The committee will assess a variety of factors about the research programs, including whether they have well-defined, prioritized, and appropriate objectives; whether the programs are properly coordinated with the safety research programs of other relevant agencies (such as FAA); whether the programs have allocated appropriate resources to each of their objectives; and the presence and suitability of mechanisms to transfer research results into operational technology and procedures. The committee held its final meeting on February 22-23 at the National Academies' Beckman Center in Irvine, CA. The committee is now readying its report for review and expects to release its final report in May.

Committee to Review Proposals to Ohio's Third Frontier Program's 2010 Wright Projects Program (WPP). Continuing the previous work of the National Academies for the State of Ohio, a committee was formed in January to review applications to the Wright Projects competition of the Ohio Third Frontier Program for Fiscal Year 2010 to identify proposals that best meet the scientific, technical, and commercialization criteria of the award program. The WPP focuses on capital improvement and research and development at universities (which have teamed up with businesses) for near-term commercialization of new products. The committee held its first meeting on February 12 at the National Academies' Beckman Center in Irvine, CA, and will hold its second and final meeting March 12-13 in Columbus, OH. The committee expects to transmit its recommendations to Ohio and release its final report in mid-May.

Decadal Survey on Biological and Physical Sciences in Space. This Congressionally-mandated study will establish priorities and provide recommendations for life and physical sciences research in microgravity and partial gravity for the 2010-2020 decade. A steering committee and seven topical panels were formed to address this task. The seven study panels have each met three times to gather and review data (including invited presentations, white papers, and community input from town hall meetings) and to draft panel chapter reports. The steering committee will be holding its fifth meeting on March 31-April 2, 2010 in Irvine, CA. A final report is expected to be released in the fall of 2010. This study is being conducted jointly with the Space Studies Board.

National Aeronautics and Space Administration
(In millions of dollars)

	Actual 2009	Estimate 2010	Estimate 2011
Spending			
Discretionary Budget Authority:			
Science	4,503	4,469	5,006
Exploration	3,505	3,746	4,263
Aeronautics and Space Research and Technology	500	501	1,152
Space Operations	5,765	6,147	4,888
Education	169	183	146
Cross Agency Support	3,306	3,194	3,111
Construction and Environmental Compliance and Restoration	—	448	397
Inspector General	34	36	37
Total, Discretionary budget authority	17,782	18,724	19,000

From "Budget of the U.S. Government Fiscal Year 2011", released February 1, 2010

Near-Earth Objects Report

(Continued from page 1)

such a program at the Goldstone Deep Space Communications Complex. Although these facilities cannot discover NEOs, they play an important role in accurately determining the orbits and characterizing the properties of NEOs within radar range.

The report also examines what is known about methods to defend against NEOs. These methods are new and still immature. No single approach is effective for the full range of near-Earth objects, but, with sufficient warning, a suite of four types of mitigation is adequate to meet the threat from all NEOs except the most energetic ones:

1. Civil defense (evacuation, sheltering in place, providing emergency infrastructure) is a cost-effective mitigation measure for saving lives from the smallest NEO impact events and is a necessary part of mitigation for larger events.

2. "Slow push" or "slow pull" methods use a spacecraft to exert force on the target object to gradually change its orbit to avoid collision with the Earth. This technique is practical only for small NEOs (tens of meters to roughly 100 meters in diameter) or possibly for medium-sized objects (hundreds of meters), but would likely require decades of warning. Of the slow push/pull techniques, the gravity tractor appears to be by far the closest to technological readiness.

3. Kinetic methods, which fly a spacecraft into the NEO to change its orbit, could defend against moderately sized objects (many hundreds of meters to 1 kilometer in diameter), but also may require decades of warning time.

4. Nuclear explosions are the only current, practical means for dealing with large NEOs (diameters greater than 1 kilometer) or as a backup for smaller ones if other methods were to fail.

Since the release of the report, the President's budget request has become public and included increased funding for NEO detection and characterization. The study was organized under auspices of the ASEB and the Space Studies Board; the committee was chaired by Irwin Shapiro of the Harvard-Smithsonian Center for Astrophysics.

ASEB Calendar—Spring 2010

March 8-9, 2010	ASEB Meeting (joint with Space Studies Board). Washington, DC.
March 12-13, 2010	Committee to Review Proposals to Ohio's Third Frontier Program's 2010 Wright Projects Program Meeting 2. Columbus, OH.
March 31-April 2, 2010	Microgravity Decadal Survey: Steering Committee Meeting 5. Irvine, CA.

For updates to the ASEB calendar, please see http://www.national-academies.org/aseb

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

Aeronautics and Space Engineering Board

The National Academies
Keck Center
500 Fifth St. NW
Washington, DC 20001

202-334-2858 (phone)
202-334-2482 (fax)
http://www.national-academies.org/aseb
aseb@nas.edu

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About Us...

The Aeronautics and Space Engineering Board (ASEB) was established in 1967 "to focus talents and energies of the engineering community on significant aerospace policies and programs." In undertaking its responsibility, the ASEB oversees ad hoc committees that recommend priorities and procedures for achieving aerospace engineering objectives and offers a way to bring engineering and other related expertise to bear on aerospace issues of national importance.

The majority of ASEB studies originate with the National Aeronautics and Space Administration (NASA), particularly the Aeronautics Research Mission Directorate and the Exploration Systems Mission Directorate. Some of these studies are requested by Congress in related legislation. ASEB also conducts proposal reviews for the State of Ohio's Third Millennium Program through the Ohio Department of Development (ODOD), and identifies experts to assist the Government Accountability Office (GAO) in conducting its studies. The ASEB also has performed technical and policy studies for the Nuclear Regulatory Commission, the Defense Nuclear Agency, the Federal Aviation Administration, the National Science Foundation, the Defense Threat Reduction Agency, Air Force Space Command, the Air Force Office of Scientific Research, the National Oceanic and Atmospheric Administration, and others.