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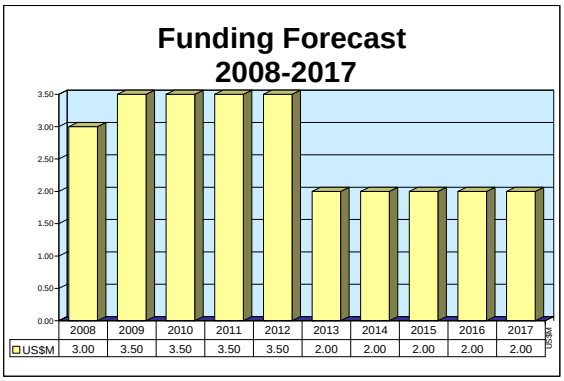
Near-Earth Asteroid Tracking (NEAT) - Archived 4/2009

Outlook

- Despite renewed calls for increased funding, next few years likely to see only modest levels to meet established goals
- Based on current budget for parent Maui Space Surveillance Site, some $36.1 million could be spent over next 10 years on operating costs



Orientation

Description. The Near-Earth Asteroid Tracking (NEAT) program is a U.S. effort to track Earth-crossing asteroids, fast-moving comets, and other space objects.

Sponsor

National Aeronautics and Space Administration (NASA)
Office of Space Science
Washington, DC
USA
Web site: http://www.nasa.gov

U.S. Air Force
Air Force Maui Optical Station
AMOS AFS
Maui, HI
USA

Status. Operational/ongoing.

Total Produced. Not applicable.

Application. NEAT's main objective is tracking and charting near-Earth asteroids, comets, and other space objects that could pose a threat to Earth.

Price Range. Not applicable.

Contractors

Prime

Boeing	http://www.boeing.com, 100 N Riverside, Chicago, IL 60606 United States, Tel: + 1 (312) 544-2000, Fax: + 1 (312) 544-2082, Email: wwwmail.boeing2@boeing.com,

	Prime

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Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

Design Features. The Near-Earth Asteroid Tracking (NEAT) system is an electro-optical sensor camera, installed on a 1-meter (39-in) telescope, operated at the summit of Mt. Haleakala by the U.S. Air Force at the Air Force Maui Optical Station (AMOS). With its short exposure time and quick electronics, the camera is able to achieve wide-sky coverage and detect objects much fainter than is possible using the original photographic Schmidt telescope at Palomar Observatory in Southern California, as was done in the past.

U.S. Air Force/NASA Maui Space Surveillance Telescope

Source: USAF

Variants/Upgrades

A 1996 upgrade added a large 4,096 x 4,096 pixel charge-coupled device (CCD), in conjunction with an autonomous imaging system and a computer controller that allows astronomers to detect four times the number of objects previously observed.

Another upgrade, made in 1998, nearly doubled resources for near-Earth-object research. A new real-time analysis system, which serves as a fully automated CCD camera and telescope, was purchased. It features four 300-megahertz processors that will focus only on incoming data from the NEAT telescope, on a nightly basis. The new system has the capacity to analyze 40 gigabytes of data each night, or the equivalent of 70 CD-ROMs. This allows the amount of sky space viewed to double to 1,000 square degrees.

The Oschin telescope, located in California, was updated in 1999 for use in the search for larger near-Earth asteroids.

Program Review

Background. Outside the realms of science fiction novels and movies, the prospect of an asteroid colliding with Earth did not become a practical concern until the 1970s, when astronomers and geologists began seriously scanning the skies and studying giant impact craters. In 1980, the scientific community began to pay attention when Nobel laureate Luis Alvarez proposed that the extinction of the dinosaurs was caused by a 6-mile-wide asteroid hitting the Earth 65 million years ago. On the basis of this theory, federal agencies began pumping small amounts of funding into private asteroid threat research. The most notable study was conducted in the 1980s by planetary astronomer Dr. Tom Gehrels at the University of Arizona, who in the course of his investigations spotted swarms of asteroids passing the Earth at uncomfortably close distances (at least in astronomical terms), with some even passing between the Earth and the Moon.

In 1990, the U.S. Congress asked NASA to investigate and study the possibility and danger of asteroids striking Earth, and the consequences of such an event. Two years later, NASA released two reports calling for additional monitoring. The issue was put on the back burner until 1994, when 21 fragments of a fractured comet bombarded the planet Jupiter, igniting flashes that outshone the planet and producing startling images of Earth-sized fireballs. Plans were immediately drawn up for a $50 million network of NASA telescopes to watch for and alert the Earth of any such dangers. Political interest quickly waned with the approach of the November 1994 elections, however, and any thought of expanding NEAT fell victim to government budget cuts, leaving the present-day program with a minimal operating budget.

New Technology Makes Task a Little Easier

In 1996, a new electronic sensor/camera was integrated; in 1998, a new computer system was incorporated to upgrade the old one. The new real-time analysis system significantly sped up the processing time of data and substantially increased the amount of data processed. The new system also serves a fully automated CCD camera and telescope located at Mt. Haleakala, Maui, Hawaii. It includes, among other devices, four 300-megahertz processors.

NEAT was reported in March 1999 to have discovered a supernova (an exploding star) located 650 million light years away in a galaxy named CGCG 060-009. In June 1999, it was announced that the NEAT project would be upgrading its 1.2-meter-diameter Oschin telescope, located at Palomar Mountain in California. The enhanced telescope has 10 times telescopic capability of the previous telescope, increasing the viewable depth into space by 20 percent. NASA funded the upgrade to the telescope at $300,000 to $500,000; it is run by the California Institute of Technology.

In January 2000, the Jet Propulsion Laboratory announced that scientists involved with NEAT had re-examined the number of large asteroids in the solar system, and concluded that only about half the previously estimated number actually exist. Prior to the re-evaluation, between 1,000 and 2,000 large near-Earth asteroids were thought to exist. The estimate has now fallen to between 500 and 1,000. These large near-Earth asteroids are approximately 0.6 miles in diameter. The goal set forth at the beginning of NEAT, to find 90 percent of all large near-Earth asteroids by 2010, appeared to be reasonable with the new estimate.

Attention Is Paid

A strong indication that interest in NEAT was growing was the May 2000 award of a support contract from the U.S. Air Force Research Laboratory to Boeing. The contract, which was worth $86.5 million over five years, covered research and development activities conducted at the research laboratory at Maui. Under terms of the contract, the contractor was also to operate and maintain the facilities at the site, including the Advanced Electro-Optical System (AEOS).

In April 2001, the NEAT effort received a major boost with the acquisition of a vastly improved camera installed on the Oschin telescope at the Palomar Observatory in California. The new camera can reportedly provide three times more data than the camera currently installed at the Maui Space Surveillance Site (MSSS). The California system was also upgraded for computer control, allowing the camera to point to different positions 1,000 times a night.

Perhaps helping NEAT's legitimacy in the U.S., the need for international cooperation in the larger effort of planetary defense began to be addressed in the summer of 2001. Drawing on the findings of a large group of experts evaluating the very real threat of asteroids or comets impacting the Earth, a report was released entitled "International Space Cooperation: Addressing Challenges of the New Millennium." The group recommended the formation of an executive body operating under the auspices of the United Nations to oversee an international effort to study the threat.

In January 2002, an asteroid large enough to wipe out an entire country passed by Earth at a distance of only 510,000 miles (less than three times the distance to the Moon). And this happened only one month after the

asteroid was first discovered. The asteroid, identified as YB5, was discovered by the NEAT installation in California and declared "potentially hazardous," meaning that on its next orbit it could strike Earth.

Funding for the Maui Space Surveillance Site project dropped from $19.4 million in FY01 to less than $6.5 million in FY02. Of this amount, only a fraction was dedicated to the NEAT effort. This follows a troubling trend in which, despite the evident need to survey all possible threats, adequate funding is seldom available to researchers. Of the total funding awarded to MSSS in FY01, a mere $2.3 million was for support of the NEAT program.

Buddy, Can You Spare a Million?

Convincing Washington decision-makers of the seriousness of the asteroid threat was difficult enough for the scientific community before the terrorist attacks of September 2001. A boost in funding for the NEAT effort appeared even less likely in light of the efforts directed at the war on terrorism.

Nevertheless, in 2002 the asteroid threat took on yet another pressing dimension. With the installation of vastly more powerful telescopes and computer-controlled cameras, it became evident to astronomers that their early estimates of the total number of objects of all sizes in space may have been dramatically underestimated. Seeing deeper and more clearly into space only served to amplify the vast number of asteroids remaining to be identified and tracked.

With a new estimate of many thousands of space rocks in well-established orbits, astronomers had to face the possibility that they might not be able to keep up with their information. While closing in on the identification of large asteroids was still possible, the ample number of smaller objects discovered only put more strain on the project.

Work Continues; Gap Between Known and Unknown Grows Smaller

In FY02, $3.9 million was dedicated to the demonstration of AEOS/MSSS upgrades and enhancements. Also, $2 million was spent on lost satellite search and non-imaging space object identification to detect and characterize smaller/fainter objects. Significantly, in FY02 $17.4 million was added by Congress to the MSSS budget – most of which went to providing technical support to those involved in research and development, to operational users of the Maui surveillance site, and to visiting scientists.

In FY03, $42 million was added to the MSSS budget. This funding was broken out as follows: $27 million for technical support, $2 million for the High Accuracy Network Determination System (HANDS), and $13 million for the Panoramic Survey Telescope and Rapid Response System (Pan-STARRS).

It was reported in 2004 that 700 of a newly determined 1,100 large asteroids had been identified. Representatives from NASA stated that this put them well on their way to meeting a 2008 objective of having this phase of the effort completed.

In April 2005, Astronomers at the Massachusetts Institute of Technology (MIT) came up with a new scale for identifying the level of threat posed by individual asteroids. The new scale would rate near-Earth objects from 0, or "no chance of collision," to 10, meaning "certain global catastrophe."

A proposed spending bill was introduced to Congress in May 2005 that sought to establish a new NASA program (presumably to augment the NEAT effort) to detect, track, and catalogue near-Earth objects equal to or greater than 100 meters in size. Under the bill, a total of $20 million was allocated for each of FY06 and FY07.

Congress added some $22 million in FY06 for the MSSS, plus $10 million for the High Accuracy Network Determination System (HANDS) and $10 million for the Panoramic Survey Telescope and Rapid Response System (Pan-STARRS).

Related News

Longtime Advocate Calls for Renewed Support – In June 2007, former House Space and Aeronautics Subcommittee Chairman, Dana Rohrabacher (R-Calif), called for a new hearing on the program. "At this time, our ability to track (near-earth objects) is woefully inadequate," he stated. (*Aerospace Daily*, 6/07)

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Funding

Possible sources of funding are NASA and the U.S. Air Force, most likely under that service's PE#0603605F Advanced Weapons Technology and PE#0305910F Spacetrack (Space), which specifically allocates minor funding amounts to the Maui Space Surveillance Site (MSSS) project. Funding for MSSS is indicated below.

U.S. FUNDING

	FY07 QTY	FY07 AMT	FY08 QTY	FY08 AMT	FY09 QTY	FY09 AMT
RDT&E (U.S. Air Force)						
PE#0603444F Maui Space Surveillance System Project 634868	-	50.3	-	5.2	-	5.3

	FY10 QTY	FY10 AMT	FY11 QTY	FY11 AMT	FY12 QTY	FY12 AMT
PE#0603444F Maui Space Surveillance System Project 634868	-	6.7	-	6.8	-	6.0

All $ are in millions.

Source: U.S. Department of Defense FY08/09 RDT&E Descriptive Summary

Contracts/Orders & Options

Contractor	Award ($ millions)	Date/Description
The Boeing Company	86.5	May 2000 – Indefinite-delivery/indefinite-quantity contract for MSSS operation, maintenance, and research/development services through September 2005 at Mt. Haleakala, Maui, Hawaii. Work was completed September 30, 2005. U.S. Air Force Research Laboratory, Kirkland AFB, New Mexico, was the contracting agency. (F29601-00-D-0204)

Timetable

Month	Year	Major Development
	FY90	U.S. Congress orders NASA study on asteroids
	FY92	NASA issues two reports calling for more detailed studies
	FY94	Comet hits Jupiter, renews interest in near-Earth asteroids
	FY96	New electronic sensor/camera fully operational

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Month	Year	Major Development
	FY98	New computer system integrated into NEAT; two large asteroids found within Earth's orbital path
	FY99	NEAT finds a supernova in CGCG 060-009; Oschin telescope upgraded
Jan	2000	Estimated number of large near-Earth asteroids reduced by half
May	2000	Award of contract to Boeing for $86.5 million
Apr	2001	NEAT acquires advanced camera for California site
	2002	Congress adds $17.4 million to MSSS
Early	2002	Estimated number of asteroids to be evaluated vastly increased
Jan	2002	Large and close asteroid, YB5, identified by NEAT
	2002	$2.3 million in funding for NEAT program
	2008	All large asteroids to be identified
	2008-2017	Possible extension of plan to include more research into nature of threat

Worldwide Distribution/Inventories

NEAT is a cooperative effort supported by **NASA** and the **U.S. Air Force**.

Forecast Rationale

The past few years have seen an increase in calls for a renewed effort to further track dangers from deep space, which can take the form of potentially earth-shattering meteors. Officials from NASA and at least one member of Congress have advocated increased funding levels for the nearly dormant Near-Earth Asteroid Tracking (NEAT) program. This may lead to real gains in the years ahead. For now, however, only modest sums of funding seem likely through the next 10 years.

The NEAT program operates within NASA's somewhat larger Maui Space Surveillance Site (MSSS) program and tracks Earth-crossing asteroids, fast-moving comets, and various other space objects that could pose a threat to the planet. The main focus is the identification and tracking of asteroids 0.6 miles or larger in diameter, using a recently upgraded, fully automated charge-coupled device (CCD) camera mounted on a 1-meter-diameter telescope operated by the U.S. Air Force.

NEAT has reportedly found over 800 near-Earth objects since the early 1990s and the original mission is now all but complete. Future research into large, near-Earth objects is likely to be focused on gaining a more detailed knowledge of the threat and actually investigating a way to counter a potential disaster.

The next 10 years could likely see annual outlays of $2 million to $3.5 million to pay mostly for ongoing operating costs. If Congress should agree to add more significant sums, this report will be updated accordingly.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR RDT&E FUNDING (in millions $)												
Designation or Program		**High Confidence**				**Good Confidence**			**Speculative**			
	Thru 2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Jet Propulsion Laboratory												
NEAT <> United States <> Air Force												
	38.60	3.00	3.50	3.50	3.50	3.50	2.00	2.00	2.00	2.00	2.00	27.00
Total	38.60	3.00	3.50	3.50	3.50	3.50	2.00	2.00	2.00	2.00	2.00	27.00