



Viewpoint

Words matter: A call for responsible communication about asteroid impact hazards and plans for planetary defense



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ABSTRACT

The global community of scientists involved in finding and tracking near-Earth asteroids (NEOs), identifying potentially hazardous NEOs, and characterizing the possible effects of asteroid impacts with Earth is developing an awareness of the need to improve and expand efforts to communicate with policy and decision makers about the work they do.

This paper addresses the criticality of clear, concise, correct communications about asteroid impact risks and hazards, as well as proper distinctions among risks, hazards, and actual threats. It reviews recent progress in communication about NEO hazards and impact risks, including new recommendations from expert groups, guidelines for responsible communication about hazards and risks, communication issues raised in collaborations with disaster planners, and other relevant developments.

The next significant asteroid impact with Earth could be 500 years from now, or next week. The need to be prepared for such an event is clear. Policy and decision makers will depend on the community of experts involved in NEO observations and planning for planetary defense for information on the risks and hazards of asteroid impacts with Earth.

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1. Introduction

While solar system exploration and planetary science have advanced by leaps and bounds over the past 50 years, the science of finding, tracking, and characterizing near-Earth asteroids is still relatively new, with NASA creating a near-Earth observation program only in 1998, responding to direction from the U.S. Congress. Finding, tracking, and characterizing asteroids has grown increasingly sophisticated since then, yet a great deal of uncertainty remains embedded in knowledge of the near-Earth asteroid population and the orbital paths and physical characteristics of individual objects.

Over the past five years, developments in space policy and space cooperation coupled with natural events have focused public attention on near-Earth asteroid detection and tracking, the risk of asteroid impacts with Earth, and planning for planetary defense. Consequently, the global community of scientists involved in finding and tracking near-Earth asteroids (NEAs), identifying potentially hazardous asteroids (PHAs), and characterizing the possible effects of asteroid impacts with Earth is developing an

awareness of the need to improve and expand efforts to communicate with policy and decision makers about the work they do.

By far the largest funded program in the field, NASA's Near-Earth Object (NEO) Observations Program,¹ managed in the Planetary Science Division of the Science Mission Directorate at NASA Headquarters in Washington, D.C., is responsible for finding, tracking, and characterizing near-Earth objects – asteroids and comets whose orbits periodically bring them close to Earth.

NASA officially established a NEO Observations Program in 1998 in response to congressional direction. The Program has multiple mandates, including:

- A 1994 request from House Committee on Science, Space, and Technology to develop a plan to discover, characterize and

¹ NASA's program is called the Near Earth Object Observations Program. Near-Earth objects, or NEOs, include asteroids and comets that come within a certain distance of Earth in their orbits around the Sun. Near-Earth encounters with comets are far rarer than near-Earth encounters with asteroids. Hence, the science community is focused on assessing the risk of asteroid impacts with Earth. For the sake of simplicity, I am using the terms "asteroid" and "near-Earth asteroid" rather than the scientific term "near-Earth object."

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catalog within ten years (to the extent practicable), the potentially threatening comets and asteroids larger than 1 km in diameter.

- A 1998 congressional directive to conduct a program to discover at least 90% of 1-km-diameter or larger NEOs within ten years. (This mandate has been met).
- A directive in NASA's fiscal year 2005 authorization act to develop a program by December 28, 2006, to survey 90% of the potentially hazardous objects measuring at least 140 m in diameter by the end of 2020. In addition, this legislation directed the agency to submit an analysis of alternatives it could employ to divert an object on a likely collision course with Earth. (NASA is in the process of complying with these directives.)
- A directive in U.S. National Space Policy of June 28, 2010, to pursue capabilities, in cooperation with other departments, agencies, and commercial partners, to detect, track, catalog, and characterize near-Earth objects to reduce the risk of harm to humans from an unexpected impact on our planet and to identify potentially resource-rich planetary objects. (NASA is in the process of complying with this directive.)

All NEO search and tracking projects supported by the Program are required to make their data permanently available in a timely manner to the scientific community. The internationally recognized archive for these data is the International Astronomical Union's (IAU's) Minor Planet Center, located at the Harvard Smithsonian Astrophysical Observatory and supported by the NEO Observation Program.

In conducting its work, the NEO Observations Program collaborates with other U.S. government agencies, other national and international agencies, and professional and amateur astronomers around the world. For example, NASA works closely with the Federal Emergency Management Agency and the Department of State on NEO impact warning, mitigation and response planning. The Program is responsible for facilitating communications between the science community and the public should any potentially hazardous NEO be discovered. The Program also works closely with the United Nations Office of Outer Space Affairs and its Committee on the Peaceful Uses of Outer Space. The NEO Observations Program participates in an International Spaceguard Survey, initiated in 1996 and managed by the Spaceguard Foundation, based in Europe. To date, NASA-sponsored NEO surveys have provided 99% of NEO detections. The NASA program is a member of the International Asteroid Warning Network (IAWN) and the Space Missions Planning Advisory Group (SMPAG), multinational projects recommended by and operating independently of the U.N.²

The European Space Agency's Space Situational Awareness Program has a NEO Segment, and NASA's and ESA's NEO programs are closely linked. Other national agencies with an interest in NEO observations and planetary defense are represented in the IAWN and SMPAG.

2. U.S. developments in science and policy, 2010–2015

In January 2010, the National Research Council issued a report, *Defending Planet Earth: Near-Earth Object Surveys and Hazard Mitigation Strategies* [1], which concluded that NASA could not fulfill the 2005 congressional directive for asteroid detection by the 2020 deadline, primarily due to lack of funding.

In April 2010, President Obama announced that he was tasking NASA with the development of a human mission to an asteroid. U.S.

national space policy of June 28, 2010, called for NASA to “pursue capabilities, in cooperation with other departments, agencies, and commercial partners, to detect, track, catalog, and characterize near-Earth objects to reduce the risk of harm to humans from an unexpected impact on our planet and to identify potentially resource-rich planetary objects.”³

Consequently NASA created an Asteroid Initiative. NASA's NEO Observations Program was assigned a role in this initiative: identifying human-accessible asteroids. In October 2010, a NASA Advisory Council Ad Hoc Task Force on Planetary Defense reported back to NASA,⁴ and the White House Office of Science and Technology Policy reported to Congress on NASA's progress in NEO observations and U.S. government plans for planetary defense.⁵

The NEO Observations Program had operated on a budget of a few million dollars per year from fiscal year 1998 through fiscal year 2011, at which point the program budget was about \$4 million. The President's 2012 budget request included, and Congress provided, \$20.4 million for an expanded NASA NEO Observations Program. In 2014, the NEO Observations Program budget rose to \$40 million. The President's 2016 budget request included \$50 million for the program.

3. Growing consensus: a need to focus on communications

In recent years, various expert groups have offered advice to the science community on communicating about asteroid impact hazards. In 2010, the National Research Council's Committee to Review Near Earth Object Surveys and Hazard Mitigation Strategies reported:

The statistical risk to human life and property associated with impacts of [asteroids] is real, but it falls outside the everyday experience of most of humanity. This risk must therefore be communicated effectively to the community at large in the context of other natural disasters, particularly those that the local community is likely to encounter. Scientists must carefully assess and explain the hazard so that appropriate public policy measures, commensurate with the level of risk, can be put into action. There must be an assessment of the statistical risk from [asteroids] that is reasonable and acceptable to the general public [1].

In 2011, the Secure World Foundation and the Association of Space Explorers convened a working group on asteroid impact risk communication,⁶ for the purpose of providing advice to a U.N. Action Team on NEOs (AT-14) on how to set up and operate an International Asteroid Warning Network (IAWN). This group offered the following recommendations, among others:

- “Make use of the findings of experts in risk communication in designing its communication strategy.”
- From the beginning, the network should include “skilled communicators supported by risk analysts, planners, scientists, psychologists, emergency management experts and other functional experts.” [2].

³ http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf.

⁴ http://www.nasa.gov/pdf/490945main_10-10_TFPD.pdf.

⁵ <http://www.whitehouse.gov/sites/default/files/microsites/ostp/ostp-letter-neo-senate.pdf>.

⁶ The author was invited to participate in this working group and contributed to recommendations.

² See <http://www.minorplanetcenter.net/IAWN/> and <http://www.cosmos.esa.int/web/smpag>.

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