



## **Executive Summary**

### **Workshop on a Near-Earth Object Information, Warning, and Analysis Network Mexico City, 18-20 February 10**

In January 2010, the Association of Space Explorers (ASE), Secure World Foundation (SWF) and the Regional Center for Education in Space Science and Technology in Latin America and the Caribbean (CRECTEALC) held a workshop to examine and analyze the needed makeup of a near-Earth-object (NEO) Information, Warning and Analysis Network (IAWN). The workshop, which was hosted by the Ministry of Foreign Affairs of Mexico, was held in direct support of the work of Action Team 14 of the UN Committee on the Peaceful Uses of Outer Space (COPUOS). It included experts in the science of near Earth objects, disaster management and communications, and space policy. Workshop members included three astronauts from ASE.

The need for an IAWN had been identified in *Asteroid Threats: A Call for a Global Response*, a report prepared by an expert panel convened by ASE to assist the work of the United Nations Committee on the Peaceful Uses of Outer Space Action Team on Near-Earth Objects (AT-14), which was established in 2001..Recognizing that Near-Earth Object impacts represent a global, long-term threat to our collective welfare, the ASE report stated that international preparations under the endorsement of the United Nations are the best way for our society to identify a NEO impact threat and decide on effective prevention or disaster response measures.

Action Team 14 is developing draft international procedures for handling the near-Earth object threat for consideration by the Working Group on Near-Earth Objects of the Scientific and Technical Subcommittee in accordance with the multi-year workplan agreed by the Committee for the agenda item on near-Earth objects. The Mexico City workshop began the process of clarifying the role, responsibilities, and composition of an Information, Analysis, and Warning network (IAWN) under AT-14 Terms of Reference.

The 2008 ASE report stated that:

An Information, Analysis, and Warning Network should be established. This network would operate a global system of ground- and/or space-based telescopes to detect and track potentially hazardous NEOs. The network, using existing or new research institutions, should analyze NEO orbits to identify potential impacts...

Information, analysis, and warning encompass a logical flow of information beginning with basic telescopic observations of NEOs, both new and known, and progressing through orbit analyses enabling, in rare but critical cases, a hierarchy of warnings of an impending NEO threat.

## **A. IAWN Functions and Responsibilities**

A.1.1. To perform these functions, workshop participants agreed that an IAWN should first continue the well-executed work of the institutions currently engaged in NEO detection, tracking, cataloging, and impact prediction. These include NASA's Jet Propulsion Laboratory "Spaceguard" and "Sentry" programs, the University of Pisa's NEODyS group, and the NASA-funded Minor Planet Center. Other aspects of IAWN functions and responsibilities follow.

### *Capability Review*

A.2.1. These institutions and the agencies which support them should review the NEO data products currently distributed and suggest improvements or additional output needed for the astronomical community, policy makers, and the other NEO decision-making functions dealing with mission planning, operations, mission authorization, and oversight.

A.2.2. The workshop concluded that an effective IAWN will need additional capability to fulfill its mission. Among other things, its expertise should include analysis of the physical effects caused by a NEO impact, including study and modeling of tsunami effects. Such analysis and modeling will enable IAWN to be more effective in providing appropriate warning to potentially affected communities.

### *Communications*

A.3.1. Workshop participants quickly recognized the need to develop a strong communications element. The current network institutions should study the existing communications methods used for distribution of NEO detection, orbit analysis, impact prediction, and notification protocols, and recommend improvements. The network should also examine protocols used by similar warning nets and institutions dealing with natural disasters, such as tsunami warning, to improve its communication to governments, policy-makers,

international institutions, and the public and to mesh appropriately with existing disaster watch and warning protocols.

A.3.2. To be more effective, the IAWN should develop a communications strategy, using well-defined communication plans and protocols. NEO information should be distributed in “normalized” fashion (e.g. using words easily understood by the public and policy makers). News from the IAWN should be accurate, timely, and aimed at responding promptly and directly to misinformation, rumors, and media errors. This strategy should be grounded in the science of risk communications and psychology.

A.3.3. The IAWN should investigate the communication channels and contacts used today by other disaster warning networks to communicate with the disaster management (DM) community. For example, a comprehensive list of designated DM contacts used by the International Strategy for Disaster Reduction can serve IAWN purposes as well.

### *Education*

A.4.1. The workshop recognized that education about the NEO threat is needed to give accurate and timely information to the public about the possible effects of a potentially hazardous NEO. It concluded that the NEO IAWN should develop an outreach and education plan, leveraging outlets maintained by existing scientific and disaster response institutions. The IAWN should also identify the major NEO risk facts to communicate to the public, and coordinate a NEO outreach plan using entities such as the IAU, AGU, space agencies, amateur observer organizations.

A.4.2. Three major elements that a NEO outreach plan might address include:

- What is the NEO risk to the public?
- What should the public expect of future impact events, warnings?
- What should the public do to prepare for and respond to an impact warning?

A.4.3. The workshop recognized that an effective education plan on the NEO hazard will cause a major shift in humanity's perception of the nature of the heavens, adding an element of "risk from above" to our long-held wonder of the heavens above. This change in perception will likely have cultural and psychological consequences.

### *Risk Management*

A.5.1. The IAWN can benefit from a large body of knowledge detailing the human response to other natural disasters. The NEO IAWN should include among its members risk analysis expertise familiar with the behavioral and psychological elements of disaster management.

## *Interfaces*

A.6.1. To speed response, the IAWN should develop a schematic of its functions and organization, along with interfaces to other NEO decision-making functions and bodies outlined in the 2008 ASE report..Such a functional diagram will serve as a useful coordination tool and in explaining IAWN operations to the public and coordinating entities.

## *Research*

A.7.1 The IAWN should identify and call for necessary NEO–related research, addressing gaps in our knowledge of impact prediction or effects, or other areas necessary to the IAWN missions. A particular need the IAWN can address is the development of software-based impact response tools to aid decision-makers in assessing the human, infrastructure and financial consequences of a potential NEO impact.

A.7.2 The workshop revealed a large body of scientific literature of use to the IAWN in intelligently responding to and communicating about the risk and effects of an asteroid impact. The IAWN should perform a literature search, then compile and maintain a bibliography of relevant work on risk, communication, impact effects, NEO detection, etc. This NEO hazard bibliography should be accessible to the public, the NEO community, and the DM community.

## *Legal Counsel*

A.8.1 Because an impact and the response to it may produce or fail to prevent property damage, mass casualties, and questions of authority and liability, the IAWN should include legal counsel, well-versed in space law, international law and NEO issues.

## **B. Establishment and Implementation of IAWN**

B.1.1. Proposals for establishing an Information, Analysis, and Warning network should incorporate the lessons learned from other institutions conducting similar functions in the field of disaster management and response. Many of these lessons learned were captured in the United Kingdom Hazards Working Group, which included experiences gained by the World Health Organization, the World Meteorological Organization, the Center for Disease Control, the Tsunami Warning System, and other risk management institutions. Broad experience in communications, analysis, and hazard warning already exists, and establishment of the IAWN should benefit from the experience and expertise of these related institutions.

### *Search for an Appropriate Institutional Model*

B.2.1. In establishing the formal IAWN network, there should be a critical examination of existing institutions to formulate a model based on previous success. The NEO Action Team 14 could discuss applicable models for the IAWN structure during its intercessional work. Workshop attendees were unanimous in recommending against proposing any large bureaucracy or creating a United Nations entity to carry out IAWN functions.

### *IAWN Implementation*

B.3.1. The AT14 should immediately create a steering group to propose and manage the long-term development of the IAWN. Such a group would then be in an ideal position to integrate the IAWN with the functions to be carried out by the Mission Authorization Working group and the Mission Planning and Operations group.

B.3.2. The steering group should not wait until all issues are resolved, but should take a phased approach to implementation, first describing the current flow of NEO information and analysis through existing network elements, then build added capability. When adding additional capability, the implementers should do nothing to encumber the current NEO information channels, or delay the flow of NEO discovery, orbit analysis, and impact prediction products.

B.3.3. Therefore, the IAWN members should first include current institutions like JPL's NEO Program and Sentry system, the University of Pisa's NEODyS system, and the Minor Planet Center. COPUOS and AT14 can then recommend and solicit additional participation to add functional capability, looking especially for broader geographic participation to enhance the network's utility.

B.3.4. AT14 should also study the question of what information from the IAWN would be needed by other NEO decision-making functions, such as those to be carried out by the Mission Planning and Operations Group (MPOG). The members should identify functional interfaces to the MPOG and Mission Authorization and Oversight Group (MAOG). Finally, the workshop attendees recommended that the IAWN establish a formal feedback and assessment process to assess the effectiveness of its information flow process and communications procedures.

### **C. Future Questions and Issues for AT14, COPUOS, and NEO Decision-Makers**

The workshop discussion identified several questions that still require discussion and answers:

1. *Financing*: The attendees recommended that there be no exchange of funds between member states in implementing the IAWN. Given this, how can member states best support the IAWN and put it on a more permanent financial foundation?
2. *Structure*: Which IAWN elements should be in the standing “center,” and which should be comprised of external resources at other institutions, connected virtually to the IAWN?
3. *Institutional model*: While keeping resourcing and central authority at a minimum, what model best enables an IAWN to assume effective responsibility for global NEO information release?
4. *Designating authority*: Which institution (COPUOS, General Assembly) can officially “designate” the IAWN as the authoritative body on NEO information issues? Is such formal designation appropriate? Could the IAWN be recognized as a credible authority simply through performing the mission, even without official blessing?
5. *Long term institutional footing*: How can the IAWN be placed on a long-term footing after establishment?
6. *Future workshops*: AT14 might consider proposing the timing and agenda for future workshops or discussions that identify the functions of the MPOG and MAOG (e.g. creating thresholds of impact probability requiring a decision to respond to a hazardous NEO).