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Committee on the Peaceful Uses of Outer Space

Information on research in the field of near-Earth objects carried out by member States, international organizations and other entities

Note by the Secretariat

I. Introduction

1. At its forty-sixth session, in 2009, the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space endorsed the amended multi-year workplan for the period 2009-2011 (A/AC.105/911, annex III, para. 11). In accordance with the workplan, the Subcommittee will, at its forty-eighth session, in 2011, consider reports submitted in response to the annual request for information from member States, international organizations and other entities on their near-Earth object (NEO) activities.

2. The present document contains information received from Canada, Germany, Japan, Slovakia, Spain and the United Kingdom of Great Britain and Northern Ireland and from the Committee on Space Research, the International Astronomical Union (IAU), the Space Generation Advisory Council (SGAC) and the Planetary Society. Information provided by Finland, entitled "National research on space debris, near-Earth objects and the Space Weather Initiative: list of national assets potentially available for the European Space Situational Awareness programme", which includes a list of national assets related to NEOs, will be made available in English only on the website of the Office for Outer Space Affairs (www.unoosa.org) and as a conference room paper at the forty-eighth session of the Scientific and Technical Subcommittee.

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II. Replies received from member States

Canada

[Original: English]
[9 November 2010]

Near-Earth Object Surveillance Satellite

Canada recognizes that the near-Earth space environment is an important natural resource that must be better observed in order to be better understood. The Near-Earth Object Surveillance Satellite (NEOSSat) is a project that is jointly managed and funded by the Canadian Space Agency (CSA) and Defence Research and Development Canada. NEOSSat will be used to perform two critical observation tasks that will provide data for the first time about potentially hazardous situations and will contribute to enhancing the state of alert, while extending the response lead times.

In addition to conducting a survey to discover and monitor NEOs, near-Earth asteroids (NEAs) and comets approaching close to Earth, the NEOSSat spacecraft will also be used to increase awareness of man-made objects in orbit around the Earth, such as spacecraft and large pieces of space debris.

Apart from identifying potentially hazardous NEOs, NEOSSat data will be used by scientists to investigate:

(a) NEOs containing well-preserved evidence of conditions during the creation of our solar system, these being one of the best sources of information on its formation;

(b) NEO data contributing to a comprehensive model of the physical and dynamical properties of the minor bodies in our solar system and of the specific differences and similarities between asteroid populations, and to an exploration of their relationships to each other;

(c) Data needed to evaluate NEO populations for potential future investigations, sample return or in situ resource extraction missions enabled by their proximity to Earth.

NEOSSat is the first space telescope dedicated to searching for NEAs and complements other international efforts by searching areas of the sky close to the sun. As a microsatellite with a 15-centimetre aperture telescope and a highly optimized baffle, NEOSSat will be able to search down to 45 degrees of solar elongation and plus or minus 40 degrees or more from the ecliptic. The observation strategy will be optimized, on the basis of recent models of the NEA population. Searching the sky close to the sun is challenging for ground-based telescopes, whose observational efficiency decreases as air mass increases at low altitudes, where only brief windows of opportunity for observation exist (either shortly after sunset or before sunrise). With these limitations, it is difficult to follow up efforts to confirm NEA finds using ground-based telescopes; therefore, a space platform is much better suited for optimizing opportunities to search for NEAs.

NEOSSat spacecraft development progress

Since the award of the NEOSSat Phase B/C/D development contract in July 2007, significant progress has been achieved in spacecraft design and development. Preliminary and detailed design reviews have been successfully completed, and the project is currently in phase D, as part of which manufacturing, integration and testing of the spacecraft are well under way. In autumn 2010, the telescope, camera and baffle sub-assemblies were fabricated and checked as they were brought together with their associated read-out electronics modules to form the instrument payload. Further integration and testing will be conducted during the second quarter of 2011.

The NEOSSat launch should take place in mid-2011. It will be a dawn-dusk launch into an 800-kilometre sun-synchronous orbit onboard a Polar Satellite Launch Vehicle. The Indian Space Research Organisation has classed it as a secondary payload on flight C20. Once initial operation and commissioning have been completed, NEOSSat will commence data acquisition in autumn 2011.

Science team and ground segment preparations

The science team has developed several methods to efficiently detect inner-Earth orbit asteroids from NEOSSat imagery. The principal investigator at the University of Calgary will be responsible for data management for the NEOSSat science team. Detecting asteroids with NEOSSat imagery involves significant technological resources in order to process the raw data in a timely manner for positive identification and follow-ups, taking into account observation parallax effects, Earth and spacecraft orbital motion, and image resolution and artefact adjustments. With these detection resources, it is expected that NEOSSat will be able to confirm discoveries of about 230 new NEO asteroids after two years of asteroid search activity. During the same period, NEOSSat should detect an additional 170 potential NEO asteroids that would be subject to confirmation by other means.

Support activities for NEOSSat operations are currently nearing completion. The mission operations centre and real-time spacecraft simulator will be located at CSA headquarters in Quebec, and the mission planning system will be located in Ontario. In addition to tracking, telemetry and control communications, CSA can operate NEOSSat from Saskatchewan. Additional ground downlink capacity for NEOSSat is expected to include reception agreements with the National Aeronautics and Space Administration (NASA) and, potentially, other international ground stations. All received data will be archived at CSA headquarters. The investigators will send data request orders and will receive NEOSSat raw data over a secure Internet link using the mission planning system.

Germany

[Original: English]
[28 October 2010]

German Aerospace Center, Institute of Planetary Research, Berlin

Scientists at the Institute of Planetary Research of the German Aerospace Center (DLR) in Berlin-Adlershof have been engaged in international research on NEOs for many years. The work includes the planning, development and use of space missions for NEO research and observation campaigns for the physical characterization of NEOs using astronomical telescopes of various sizes and types. In some cases, observations can be carried out away from DLR using remote observing facilities established by DLR staff and through theoretical impact simulations and hazard mitigation strategies, activities within the European Fireball Network and international activities on NEO risk management.

Space missions relating to near-Earth objects

AsteroidFinder

In 2008, the Institute of Planetary Research was selected to contribute the first payload for the DLR compact satellite programme, which will consist of a series of small Earth-orbiting spacecraft. The AsteroidFinder will search for inner-Earth objects using a 25-centimetre telescope with a 2 × 2 square-degree field of view and the novel Electron Multiplying Charge Coupled Device camera. This mission will be an ideal complement to ground-based NEO search programmes and should become operational in 2014, extending the search into regions of the sky that are difficult to observe or unobservable from the ground. The AsteroidFinder is expected to detect about 10 previously unknown inner-Earth objects during its operating time of one year. The project is currently in phase B (see www.dlr.de/pf/en/desktopdefault.aspx/tabid-174/319_read-18911/).

Spitzer Telescope of the National Aeronautics and Space Administration of the United States

The Institute is using the NASA Spitzer Space Telescope to carry out a unique infrared survey of the physical properties of some 750 NEOs. Despite their scientific importance and impact risk potential, key characteristics of the NEO population, such as the size distribution, mix of albedos and mineralogies and contributions from dead or dormant comets, remain largely unexplored. Among the major results of this work will be determining the size and albedo distribution of the NEO population.

The Spitzer survey has already obtained data for about 300 objects. The Institute has published the initial results, which demonstrate the validity of its observational strategy and analysis techniques. Initial findings highlight the diverse composition of NEOs in this first sample, which is reflected in the very broad distribution of albedos. A major contribution by the Institute to this project is the development of the asteroid thermal models on which the data analysis depends.

Complementary ground-based observations of near-Earth objects

Calar Alto Observatory

In cooperation with the Calar Alto Observatory in Spain, the Institute signed a contract to operate the remotely controlled 1.2-metre telescope for optical photometric and astrometric observations of NEOs and other asteroids and comets for 100 nights per year for three years. The first observing run started in April 2009. As of September 2010, remote observations have been performed from the Institute in Berlin on 135 nights.

Near-Earth objects database

In addition to the above-mentioned research activities, the Institute maintains an online database of the physical properties of all known NEOs. The database, which is available at http://earn.dlr.de/nea, is updated on a daily basis. As of September 2010, the database contains entries for more than 7,000 NEAs, derived from data on the physical properties of NEOs published in some 1,000 research papers and online publications. References to these papers and publications are given. There are plans to further enhance and update this database and incorporate it into the Space Situational Awareness programme of the European Space Agency (ESA).

Theoretical studies and simulations

The formation of craters and the associated effects of asteroid and comet impacts on planets, such as the distribution of ejecta, chemical processes in the impact vapour plume and the evolution of the impact blast cloud, are currently being analysed in a theoretical study entitled “Planetary Evolution and Life”, involving advanced computer modelling and simulations. By using an improved multimaterial hydrocode, impacts on oceans and continents can be assessed. This development has reached the stage where high-resolution impact simulations of objects of between 50 and 120 kilometres on a spherical target overlaid by a stratified atmosphere are possible. This project is part of a research alliance funded by the Helmholtz Association of German Research Centres.

European Fireball Network

The Institute is involved in the operation of the European Fireball Network, a network of all-sky cameras that records the tracks of large meteoroids colliding with the Earth. The European Fireball Network provides fundamental data for the computation of the mass flux near Earth and the probability of collisions with larger bodies.

European Fireball Network cameras routinely monitor the night sky over Central Europe. The network comprises 10 camera stations in the Czech Republic, 2 in Slovakia and 15 in Austria, France and Germany that are deployed approximately 100 kilometres apart to cover a total area of 10^6 square kilometres.

In 2009, the Network detected 29 fireballs, which is slightly below average (see www.dlr.de/pf/desktopdefault.aspx/tabid-623/). Institute personnel were also involved in several meteorite search campaigns in 2009, which resulted in the recovery of meteorites in Lolland, Denmark, and Jesenice, Slovenia.

International activities on risk management of near-Earth objects

Institute staff members are involved in the activities of the Committee on the Peaceful Uses of Outer Space and its Action Team on Near-Earth Objects (Ekkehard Kührt and Alan W. Harris); in the ESA Space Situational Awareness Programme, in particular the NEO database (Gerhard Hahn); and in the work of the International Astronautical Federation, in particular its Near-Earth Objects Technical Committee (Alan W. Harris, Chair).

Japan

[Original: English]
[29 October 2010]

Near-Earth Objects project

Japanese NEO activities started with the establishment of the Japan Spaceguard Association (JSGA) in 1996. JSGA constructed a 1-metre-wide field telescope for NEO detection, which became operational in 2002 and was used mainly for follow-up observations. JSGA improved the telescope in 2006, and it is now able to detect NEOs down to a magnitude of 20.5, which is comparable to detections by the Catalina Sky Survey and the Spacewatch programme in the United States of America. A list of NEO follow-up observations is shown in the table.

JSGA has performed various educational activities over the past 10 years. For public outreach, it has produced an educational package on NEO detection in English, Japanese and Spanish and has published two books and a number of articles in journals and newspapers. In 2010, JSGA organized lectures on the theme “Spaceguard 2010” in four different locations in Japan and published the third issue of its bulletin, *Spaceguard Research*.

Near-Earth object observations by the Japan Spaceguard Association (as of September 2010)

	Near-Earth asteroids			*Comets*	
Year	*Number observed*	*Number of position measurements*	*Sum of position measurements*	*Number observed*	*Number of position measurements*
2000	23	205	4 240	20	113
2001	29	560	5 907	16	275
2002	24	243	2 018	13	339
2003	54	567	4 938	18	165
2004	23	233	2 908	4	20
2005	8	42	2 431	0	0
2006	25	297	3 224	5	66
2007	34	408	7 219	15	108
2008	31	162	4 534	14	110
2009	26	138	5 796	7	37
2010	41	216	2 623	4	17
Total	**318**	**3 071**	**45 838**	**116**	**1 250**

Hayabusa mission

Another important NEO activity is the Hayabusa mission to the NEO Itokawa. The purpose of the mission is to gain information on the mysteries behind the genesis of the solar system and on possible evidence of life; to achieve this, technology to bring back samples of asteroids is essential. Hayabusa reached Itokawa in 2005 and collected many images and other scientific data; it also attempted to touch down and collect surface material.

On 13 June 2010, the asteroid-sample capsule of the Hayabusa spacecraft returned to Earth, and the material inside the capsule is currently being analysed. The results of the mission are important not only for science but also for Spaceguard, as Itokawa is an asteroid of the type that may come close to the Earth and this mission is the first to have studied such an asteroid. The Japan Aerospace Exploration Agency is now considering another NEO sample return mission, Hayabusa-2, which, if successful, would provide information about another type of NEO.

Slovakia

[Original: English]
[22 October 2010]

The Faculty of Mathematics, Physics and Informatics of Comenius University in Bratislava is currently working on the project “Genetic relations between meteoroid streams and NEO objects”. This involves studying the genetic relations of small bodies within the solar system that consist of meteoroid streams, asteroids and cometary nuclei. The main goal of the project is to search for parent bodies of meteoroid streams among NEOs by analysing their orbital evolution and the

physical properties of individual members in order to explain their structural peculiarities.

The Astronomical Institute of the Slovak Academy of Sciences is currently working on five projects related to NEOs, focusing on the physical study of asteroids. The IAU Meteor Data Centre operates at the Institute, under the auspices of IAU Division III. For more information, visit www.ta3.sk/IAUC22DB/MDC2007.

Spain

[Original: Spanish]
[8 November 2010]

The ESA Space Situational Awareness Programme involves guaranteeing the safe operation of European space assets. This initiative includes activities such as the detection, monitoring and study of NEOs.

The numerous facilities that Spain has contributed to the Programme include several astronomical observatories specializing in the detection of asteroids near the Earth. Also of great importance is the Near-Earth Objects Dynamic Site at the University of Valladolid, which carries out systematic monitoring of the risks of an asteroid colliding with the Earth. It is also a centre for data related to NEOs, offering services to users such as the provision of orbital data on NEOs and estimates regarding the approach of such objects to the Earth and other bodies in the solar system.

The Astronomical Observatory of La Sagra, which is operated by the Astronomical Observatory of Mallorca and currently holds survey status at the Minor Planet Centre (La Sagra Sky Survey), is capable of detecting more than 400 asteroids each month and obtaining more than 50,000 astrometric measurements, which makes it one of the most important observatories in the world.

United Kingdom of Great Britain and Northern Ireland

[Original: English]
[1 December 2010]

The UK Space Agency maintains an active role in addressing the NEO problem by encouraging coordination at the national, European, and international levels to reach agreement on understanding and development of effective measures to address the threat posed by NEOs. This leadership role has been demonstrated by, among other things, the United Kingdom's past chairing of the Action Team on Near-Earth Objects and the Working Group on Near-Earth Objects of the Committee on the Peaceful Uses of Outer Space.

The United Kingdom has strong NEO research capabilities in addition to its astronomy, planetary science and space surveillance capabilities, which the UK Space Agency regularly calls upon for impartial technical support and advice. During the past year, United Kingdom organizations have conducted a wide range of activities, a number of which are summarized below.

Remote observation and measurement of the near-Earth object population

Astronomers at Queen's University Belfast continue to obtain astrometry of NEOs that have been identified as presenting a small risk of hitting the Earth in the next 100 years, with the aim of improving their orbits.

The Open University continues to be engaged in research related to light curves of slowly rotating (mostly main belt) asteroids, using data from the Super-Wide Angle Search for Planets sky cameras, and continues to publish NEO observation results (thermal modelling and infrared spectroscopy).

In situ observation and measurement of the near-Earth object population

At the Open University, in addition to theoretical studies aimed at understanding the formation of smaller bodies in the solar system, a number of experimental programmes are also under way. Among them is the development of a penetrometry rig to simulate a high-mass, low-speed impact of a penetrometer fixed to a landing spacecraft. Penetrometers will be key to enabling in situ measurements of an NEO surface, which is likely to be delicate, in order to give the structural and mechanical information necessary for successful mitigation and negation of the body. More broadly, the Open University has an interest in instrumentation for the in situ physical and geochemical investigation of NEOs and other smaller solar system bodies. Open University research on NEOs continues in the field of meteoritics and extraterrestrial sample analysis, using its world-class suite of geochemical laboratories, which forms part of the United Kingdom Cosmochemical Analysis Network.

Risk assessment

The Astronautics Research Group at the University of Southampton is conducting a significant amount of research into the effects of NEO impacts on the Earth. The NEO research programme at Southampton is aimed at assessing the global threat to Earth posed by small NEOs with a diameter of less than 1 kilometre. An NEO impact can affect the Earth's ecosystem and have serious consequences for the human population. The primary challenge of the research is accounting for each impact-generated effect and developing an adequate model to simulate it. To this end, the computer simulation tool under development has the capability of modelling small NEO impacts. This tool tackles the hazard on both a local and a global scale, tracking the consequences of an impact on the human population. Each of the impact-generated effects will affect the human population and infrastructure to varying degrees. Therefore, the analysis of mortality rates and infrastructure cost is the key feature of the simulation. Overall hazard assessment of an NEO impact event will be rated by the casualty figures and level of infrastructure damage. This work is complemented by research within the Department of Earth Science and Engineering at Imperial College London on characterization of the direct effects of NEO impacts. This research is partly supported by the Natural Environment Research Council.

Mitigation

The objective of work conducted by the University of Glasgow is to develop fundamental optimal control theory and to apply it to the interception of hazardous

NEOs. Different parameters — time, mass, orbital corrections, maximum deviation, and so forth — are optimized. A study of the robustness of the methods is also performed to take into account the uncertainties of both NEO dynamics and boundary conditions. A variety of propulsion methods, ranging from solar sails to nuclear propulsion, are considered, and the advantages and disadvantages of each are assessed. Numerical simulations in a realistic scenario are developed in order to investigate the performance of such methods, and, in order to evaluate the optimal trajectories and deviation methodologies, the simulation data are animated. This programme was funded by the Engineering and Physical Sciences Research Council.

Information dissemination

The United Kingdom continues to be home to two centres providing information on NEOs to the public and media.

One is the Spaceguard Centre, located at the former Powys Observatory, near Knighton, Wales. It represents the Spaceguard Foundation as the International Spaceguard Information Centre. It has set up the nationwide Comet and Asteroid Information Network and has a well-established outreach programme. It currently liaises with Spaceguard organizations in other countries and encourages the establishment of new ones. The Centre is also the primary science adviser for the Faulkes Telescope Asteroid Project and is developing a robotic NEO astrometry system (Spaceguard NEO Astrometry Project), deployed in Kenya and the United Kingdom.

The other is the United Kingdom Near-Earth Object Information Centre, which was established in response to recommendations 13 and 14 of the report of the United Kingdom Government's Task Force on Potentially Hazardous Near-Earth Objects. The Information Centre is operated by a consortium led by the National Space Centre, under contract to the UK Space Agency. The main centre is based at the National Space Science Centre in Leicester, which houses an NEO exhibition and provides a primary contact point for public and media enquiries. The Centre is advised by a network of academic institutions active in the field of NEOs: Queen's University Belfast, the United Kingdom Astronomy Technology Centre in Edinburgh, the Natural History Museum in London, Queen Mary University of London, Imperial College London and the University of Leicester. In addition, there are three regional centres with linked exhibits and access to the Information Centre facilities. These are based in W5 in Belfast, the Natural History Museum in London and the Royal Observatory in Edinburgh. The website of the Information Centre (www.spacecentre.co.uk) provides a virtual exhibition, a resources section (for educators and the media) and the latest NEO news, including answers to frequently asked questions. The site also allows access to the Task Force report.

Policy approach

The underlying policy approach to NEOs in the United Kingdom is recognition that the threat they pose is real, but that, although potentially catastrophic, impact by an NEO is a low-probability occurrence. It also recognizes that such objects do not respect national boundaries and that the scale of their effect is such that the NEO hazard is a global issue and can be effectively addressed only through international cooperation and coordination.

III. Replies received from international organizations and other entities

Committee on Space Research

[Original: English]
[4 November 2010]

NEOs are objects orbiting the Earth at perihelion distances of less than 1.3 astronomical units. The NEO population is constantly evolving and being replenished from the main asteroid belt and cometary reservoirs. It consists of objects with a variety of compositions and internal structures. As at 16 October 2010, 7,384 NEOs had been discovered. Among them, some 818 are asteroids with a diameter of approximately 1 kilometre or more, and 1,148 have been classified as potentially hazardous asteroids, indicating a possibility that they might threaten the Earth. The number of NEOs discovered per year is shown in the original document submitted by the Committee on Space Research, which can be found on the website of the Office for Outer Space Affairs of the Secretariat (www.unoosa.org).

Nowadays, NEOs are discovered through automated, ground-based observational programmes. The Panoramic Survey Telescope and Rapid Response System is an astronomical survey that is continuously conducting astrometry and photometry of much of the sky to detect NEOs that could threaten the Earth.

The NASA Wide-field Infrared Survey Explorer (WISE), although designed primarily for astrophysics science objectives, is providing a large amount of data on small objects. The WISE all-sky survey is also detecting most of the known main belt asteroids, providing accurate radii and albedos for over 100,000 objects and detecting many new ones. The NEOWISE programme, which is a supplementary analysis programme, is also discovering and characterizing many new NEOs on a daily basis.

Space missions involving near-Earth objects

The Hayabusa mission is a Japan Aerospace Exploration Agency asteroid mission that was launched in May 2003 to investigate an NEA and to bring a sample from its surface back to Earth. Using solar electric propulsion, Hayabusa arrived at the asteroid (25143) Itokawa in September 2005 and observed it from an altitude of between 3 and 20 kilometres in November 2005. Many new details were obtained on the asteroid's shape, geographical features, surface altitude variation, albedo, spectrum, mineral composition, gravity and main chemical composition. A miniature rover, MINERVA, failed to reach the asteroid, but the spacecraft successfully landed on the surface and may have collected samples, although the amount of material cannot be estimated until the returned capsule is examined in detail. After some technical difficulties with the spacecraft, the sample capsule returned to Earth on 13 June 2010 and was successfully recovered from the Australian desert. Initial inspection of the sample chamber found a small number of microscopic particles, some of which might be extraterrestrial in origin. Analysis was still continuing in October 2010, with an update expected later in the year.

The Origins Spectral Interpretation Resource Identification Security Regolith Explorer project was among the three missions selected by NASA in 2010 for the second round of the next New Frontiers mission competition. It is designed to orbit a primitive NEA and bring a sample back to Earth for study.

Potentially hazardous asteroids

The asteroid (99942) Apophis**,** previously designated 2004 MN4, is estimated to have a close approach to Earth in 2029. A study presented at the meeting of the Division for Planetary Sciences of the American Astronomical Society in Puerto Rico in October 2009 suggested that collision with Earth in several different years, but especially in 2036 and 2068, cannot be excluded, on the basis of the best possible analysis of the information available.

International Astronomical Union

[Original: English]
[30 September 2010]

Activities of the International Astronomical Union Minor Planet Center

In 2010, there were many activities at the Minor Planet Center (MPC). The NASA WISE project successfully began routine operations searching for minor planets in the infrared. MPC also received the first data from the Panoramic Survey Telescope and Rapid Response System survey project, and expects to receive many thousands of observations every year as the project becomes established. In addition to the above-mentioned activities, current surveys such as the Catalina Sky Survey, the Lincoln Near-Earth Asteroid Research survey, the Spacewatch telescope survey and the La Sagra Sky Survey became increasingly productive.

As of September 2010, the MPC archive contained nearly 80,000,000 observations of minor planets and comets, and orbits for 550,000 minor planets and comets. It has witnessed a 20-per-cent increase in data in one year. About 530 NEOs have been discovered for the year so far, including 53 potentially hazardous asteroids, objects larger than about 140 meters that can come within 0.05 astronomical units of the Earth's orbit. Nearly 20 per cent of the 116 NEOs discovered in September 2010 were discovered by the WISE spacecraft.

As at 14 September 2010, the MPC NEO catalogue contained 7,184 NEOs and the NASA goal of finding 90 per cent of the 1-kilometre-sized NEOs has nearly been achieved. It is now fairly rare to find an NEO larger than 1 kilometre. The most recent discovery in this category was the asteroid 2010 RO82, estimated to be 2 kilometres in size, which was discovered by the Siding Spring Survey on 10 September 2010.

Two small NEOs, 2010 RF12 and 2010 RX30, passed within the Moon's orbit on 8 September 2010. Although this was not an exceptionally rare event, it received much media attention and showed how effective the current surveys are at discovering objects in the vicinity of the Earth.

MPC has acquired a much improved and more powerful cluster of computers, which should contribute to increased productivity and processing capability in the coming year.

Since March 2010, the IAU website has a page on NEAs, which includes past and future approaches of known NEAs close to the Earth and milestones in NEO and NEA research (see www.iau.org/public/nea/).

Space Generation Advisory Council

[Original: English]
[20 October 2010]

As a member of the Action Team on Near-Earth Objects, SGAC recognizes the importance of the work of the Working Group on Near-Earth Objects and strongly supports its efforts. As outlined in the workplan of the Working Group for 2009, the International Year of Astronomy acted as a framework for raising awareness of NEO issues among the public and, in particular, among young people. Understanding that young people need to be made aware of these issues, SGAC continues to work on outreach programmes to increase their involvement beyond the International Year of Astronomy (2009).

The "Move an asteroid" competition, held annually by SGAC since 2008, requires students and young professionals to send in novel proposals on how to deflect an asteroid. In 2010, the competition focused on asteroid warning systems. The entries were reviewed by experts, and the winner of the competition was awarded a trip to present his paper at the SGAC annual congress, the Space Generation Congress, which is held in conjunction with the International Astronautical Congress. Through this competition, young people participate in NEO activities and analyse both the technical and political issues surrounding them.

SGAC is an official partner of the 2nd Planetary Defence Conference, which will be held in May 2011 in Bucharest, and two SGAC members are on the organizing committee. SGAC produced a documentary during the 1st Conference in 2009 that included interviews with experts and is aimed at accurately informing the general public about the dangers of NEOs and about current mitigation efforts. The documentary can be found on the SGAC website.

SGAC members also submitted a paper about SGAC NEO activities to the 2010 International Astronautical Congress, which was held from 27 September to 1 October in Prague.

SGAC intends to continue raising awareness and involving young people in the NEO field as well as informing them about current issues, such as the work of the Action Team on Near-Earth Objects. SGAC is convinced that an informed public, and specifically young people, can have a positive impact on finding solutions to the challenges presented by NEOs.

Planetary Society

[Original: English]
[15 September 2010]

The Planetary Society is a member of the Action Team on Near-Earth Objects and has provided financial support to international observers discovering, tracking and observing NEOs. It has long advocated spacecraft missions for exploring such objects for scientific study and characterization. The Planetary Society has also participated in studies on mitigating the threat from NEOs that might be heading toward Earth, and is especially active in providing public information and education about NEOs. The Planetary Society supports the conclusions and recommendations of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space related to increased observations and studies of NEOs. Similar recommendations were also made in the United States National Resource Council report, "Defending planet Earth".

The Planetary Society supports and commends the recommendation of the Association of Space Explorers that calls for an international body to deal with the potential threat and mitigation requirements from a potentially hazardous object. It further supports the recommendation for an international technical forum for policies and plans for dealing with a potentially hazardous object and stands ready to assist such a forum with appropriate public engagement and information.

In addition, the Planetary Society has called for human missions to NEOs as part of human space exploration of the solar system. Asteroids represent natural and advantageous stepping stones beyond Earth's orbit and the Moon as humankind extends its reach into the solar system. International cooperation, building on the experience of the International Space Station, could enhance robotic and human NEO exploration. Such a mission would be exciting and would engage people of the Earth in a new and challenging exploratory goal. Human observers on asteroids could also provide valuable data on the characteristics of such objects and on the requirements for conducting activities on them. This information could help deal with the potential dangers from an approaching object. Planning such a mission would also require more observation and identification of NEOs, bolstering the case for additional programme support from national space and science agencies around the world.