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Near-Earth objects

Near-Earth objects, 2011-2012

Recommendations of the Action Team on Near-Earth Objects for an international response to the near-Earth object impact threat

I. Background

1. Asteroids have impacted the Earth throughout its geological and biological history, and it is certain that such impacts will happen again. The risk that an asteroid would impact the Earth is extremely small, but, depending on its size and impact point, the consequences could be catastrophic. However, perhaps uniquely among natural hazards, there is the potential to prevent near-Earth object (NEO) impact events through timely actions. It is the combination of the potentially catastrophic scale, the predictability of events and the opportunity to intervene that obligates the international community to establish a coordinated response to the NEO threat.

2. The issues involved in protecting the Earth from an asteroid impact could be put simply as: (a) finding them, (b) determining the risk of impact, (c) deciding on a course of action in cases where the risk is relatively high and, if a deflection is necessary, (d) implementing a space mission campaign to deflect the asteroid. These activities involve diverse and complex scenarios that can be best addressed through international cooperation.

3. The Action Team on Near-Earth Objects was established in 2001 by the Committee on the Peaceful Uses of Outer Space in response to recommendations of

* A/AC.105/C.1/L.328.



the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III)¹ and was given the following terms of reference: (a) review the content, structure and organization of ongoing efforts in the field of near-Earth objects; (b) identify any gaps in the ongoing work where additional coordination is required and/or where other countries or organizations could make contributions; and (c) propose steps for the improvement of international coordination in collaboration with specialized bodies. The Action Team has considered annual reports submitted by the Member States active in NEO work, as well as recommendations concerning an international response to the NEO impact threat made by workshops and conferences conducted by the international community.

4. In 2007, the Working Group on Near-Earth Objects was established by the Scientific and Technical Subcommittee with the expectation that it would propose international procedures to address the NEO threat for consideration by the Committee.

5. Many of the elements needed for an international response to the near-Earth object impact threat already exist. Several professional space science institutions and a large number of amateur astronomers are currently engaged in NEO detection, tracking, cataloguing, impact prediction and threat notification.

6. There may be occasions when the international community will need to begin actions before it is certain that an impact will occur. The longer the international community delays in deciding to undertake responsive actions, the more limited the options could become and the greater the risk that any option that is finally chosen may have undesirable consequences. In the absence of any predetermined decision-making process, the international community may miss the opportunity to act effectively against an NEO in time, leaving evacuation and disaster management as the only responses.

7. The Action Team identified three primary components of threat mitigation: (a) discovering hazardous asteroids and comets and identifying those objects requiring action; (b) planning a mitigation campaign that includes deflection and/or disruption actions and civil defence activities; and (c) implementing a mitigation campaign, if the threat warrants. The Action Team emphasizes the value of finding hazardous NEOs as soon as possible in order to avoid unnecessary NEO threat-mitigation missions. The recommendations that follow are meant to: (a) ensure that all nations are aware of potential threats and (b) ensure the design and coordination of mitigation activities among nations that could be affected by an impact and those that might play an active role in any eventual deflection or disruption campaign.

8. An international asteroid warning network should be established by linking together the institutions that are already performing many of the proposed functions, including: discovering, monitoring and physically characterizing the potentially hazardous NEO population; maintaining an internationally recognized clearing house for the receipt, acknowledgment and processing of all NEO observations; recommending policies regarding criteria and thresholds for notification of an

¹ The Space Millennium: Vienna Declaration on Space and Human Development, para. 1 (c) (*Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3), chap. I, resolution 1).

emerging impact threat; and developing a strategy using well-defined communication plans and protocols to assist Governments in the analysis of impact consequences and in the planning of mitigation responses.

9. A space mission planning advisory group should be established by Member States with space agencies. The group should be composed of representatives of spacefaring nations and other relevant entities and, once established, it should be endorsed and its work facilitated by the United Nations on behalf of the international community, with no financial implications for the budget of the United Nations. Its responsibilities should include laying out the framework, timeline and options for initiating and executing response activities, informing the civil-defence community about the nature of impact disasters and incorporating that community into the overall mitigation planning process through an impact disaster planning advisory group.

10. All recommendations contained in the present report should be implemented at no cost to the United Nations.

II. Introduction

11. In accordance with the amended multi-year workplan on near-Earth Objects for 2009-2011, as contained in the report of the Scientific and Technical Subcommittee on its forty-fifth session (A/AC.105/911, annex III), and also in accordance with the continued workplan on near-Earth objects as contained in the report of the Subcommittee on its forty-eighth session (A/AC.105/987, annex III, para. 9) the present report contains the recommendations of the Action Team on Near-Earth Objects on international procedures for handling the threat of a potential NEO impact on the Earth.

12. At its fifty-fourth session, in 2011, the Committee on the Peaceful Uses of Outer Space endorsed the recommendation of the Scientific and Technical Subcommittee and its Working Group on Near-Earth Objects that the multi-year workplan on NEOs be continued for the period 2012-2013.² According to the workplan, the Subcommittee will consider the final report of the Action Team at its fiftieth session, in 2013.

13. The report of the Action Team, reflecting the existing state of knowledge on the NEO hazard, the current understanding of the risk posed by NEOs, the measures required to mitigate that threat and the consensus on prioritization of the issues to be addressed and their possible solutions, is contained in A/AC.105/C.1/L.330.

14. In 2007, the Working Group on Near-Earth Objects was established by the Subcommittee in the expectation that international procedures to address the NEO threat would be proposed by the Working Group for consideration by the Committee. In 2007 and 2008, the Association of Space Explorers (ASE) convened a Panel on Asteroid Threat Mitigation, made up of renowned non-governmental, multidisciplinary experts in science, diplomacy, law and disaster management from around the world. In 2008, ASE submitted a report by the Panel

² *Official Records of the General Assembly, Sixty-sixth Session, Supplement No. 20 (A/66/20)*, para. 134.

entitled “Asteroid threats: a call for global response” (available from www.space-explorers.org/committees/NEO/docs/ATACGR.pdf) to the Action Team and for consideration by the Working Group. In addition, the international community of entities engaged in NEO-related activities has conducted many workshops and conferences in recent years, including International Academy of Astronautics Planetary Defense Conferences in 2007, 2009 and 2011, which have made a number of recommendations concerning an international response to the NEO impact threat.

15. From 2009 to 2012, the Action Team and the Working Group carried out their work in accordance with the amended and continued workplans. During its 2009 and 2010 meetings, the Action Team discussed and reviewed the report by the Panel on Asteroid Threat Mitigation and considered much other information provided by its members, reports on NEO-related activities and other documents submitted to it.

16. In 2011, the intersessional work of the Action Team was carried out during two workshops. The Workshop on International Recommendations for NEO Threat Mitigation, held in Pasadena, California, United States of America, on 25 and 26 August 2011, addressed key issues related to the required response and cooperation needed by a mitigation and mission planning group in preparing for a possible NEO impact threat to Earth. The Workshop prepared a first draft of the terms of reference for a group to study asteroid mitigation and mission planning, an essential part of the overall NEO threat mitigation system. An NEO Media/Risk Communications Workshop, sponsored by the Secure World Foundation (SWF), was held in Boulder, Colorado, United States, on 14 and 15 November 2011. During the Workshop, discussions were held on how best to inform the public of the threat of an NEO impact in a way that would avoid misinformation and on how to provide guidance on the development of an outreach and education plan that fostered accurate and timely information about the possible effects of a potentially hazardous NEO. The report of the Workshop is available from the SWF website (<http://swfound.org>).

17. In 2012, the Action Team met on the margins of the forty-ninth session of the Scientific and Technical Subcommittee and of the fifty-fifth session of the Committee to further develop recommendations for an international response to the near-Earth object impact threat. Also in 2012, the intersessional work of the Action Team was carried out during one workshop on the elements of an international asteroid impact warning network, held via teleconference on 15 November 2012.

18. Complementary to the work of the Action Team and on its recommendation, representatives of space agencies met twice in 2012. One such meeting, facilitated by the Action Team and moderated by representatives of the European Space Agency (ESA) and the National Aeronautics and Space Administration (NASA), was held on the margins of the forty-ninth session of the Subcommittee. The meeting served to introduce to participants the first draft terms of reference for a mitigation and mission planning group that would be established in preparation for planning an overall NEO threat mitigation system. A second such meeting was held on the margins of the fifty-fifth session of the Committee on the Peaceful Uses of Outer Space to discuss those draft terms of reference. A third meeting of representatives of space agencies to continue the discussion of the draft terms of reference is planned to be held in 2013 on the margins of the fifty-sixth session of the Committee.

19. In preparing the present report, the Action Team agreed to propose that the acronym IAWN would henceforth stand for “international asteroid warning network” and that the term “mission planning and operations group”, which had been used in the interim reports of the Action Team, would be replaced by the term “space mission planning advisory group”.

20. On the basis of the discussions held both during its meetings and through correspondence afterwards, the Action Team prepared the recommendations below for an international response to the near-Earth object impact threat for further consideration by the Working Group during the fiftieth session of the Scientific and Technical Subcommittee.

A. Mandate and rationale

21. The Action Team on Near-Earth Objects (Action Team 14) was given a mandate to review the content, structure and organization of ongoing efforts in the field of NEOs; identify any gaps in the ongoing work where additional coordination was required and/or where other countries or organizations could make contributions; and propose steps for the improvement of international coordination or collaboration with specialized bodies. For the purposes of the present document and the work of the Committee, a potentially hazardous NEO is an asteroid or comet whose orbit periodically brings it close enough to be substantially affected by the Earth’s gravitational field. These potentially hazardous objects, a subset of the NEO population, have orbits that bring them to within approximately 7.5 million kilometres of the Earth’s orbit and are large enough to cause ground damage at the surface if impact were to occur.

22. As acknowledged by the establishment of the Action Team, it has become commonly accepted by the international scientific community that there is evidence that the Earth’s geological and biological history has been punctuated by repeated and devastating impacts from space and that NEOs continue to pose an impact risk to humankind and the Earth as a whole. The global nature of the NEO impact hazard and the need for a coordinated international response have also been recognized. The consequences of NEO impact events, although much less frequent than more familiar geological and meteorological hazards, can also be much more severe than hazards resulting from phenomena such as earthquakes or extreme weather events. However, perhaps uniquely among natural hazards, there is the potential to prevent NEO impact events through timely actions, and it is the combination of the potentially catastrophic scale, the predictability of events and the opportunity to intervene that obligates the international community to establish a coordinated response to the NEO threat.

23. Response to the NEO impact hazard requires measures to detect, track and characterize the orbital and physical properties of potentially hazardous NEOs, as well as measures to modify the trajectory of such NEOs in order to prevent an impact and measures to limit the consequences on the ground, such as evacuation and other forms of disaster mitigation and emergency response.

24. According to current scientific knowledge, the number of NEOs increases as the size of the objects decreases. Within the next decade, it is expected that advanced telescopes will greatly facilitate the detection of the numerous smaller

NEOs and thus make it possible to discover a significantly larger number of potentially hazardous NEOs. Because NEO collisions can have disastrous effects on Earth, the international community will need to decide on a response to a detected impact threat.

25. As NEO search, tracking and prediction capabilities improve, astronomers will discover many smaller near-Earth asteroids that present a probability of impact that could cause concern and may predict more impacts from objects large enough to penetrate the atmosphere to strike the surface. The key to preventing a possible damaging impact is detecting them, through an active international search and tracking programme, early enough to take action.

26. As substantial time is needed to execute an NEO deflection campaign, and in some cases there may be limited time before the expected impact, a decision will be needed quickly on what action to take. There may be occasions when the international community will need to begin actions before it is certain that an impact will occur. The longer the international community delays in deciding to undertake responsive actions, the more limited the options could become and the greater the risk that any option that is finally chosen may have undesirable consequences. In the absence of any predetermined decision-making process, the international community may miss the opportunity to act effectively against an NEO in time, leaving evacuation and disaster management as the only responses to an impending impact that could have been preventable. The adoption of an international programme of coordinated activities and a set of preparatory measures for action is therefore considered a prudent and necessary step in anticipation of such a potential impact event. To be effective, such an agreed programme must pre-establish action criteria and campaign plans that can be implemented rapidly, negating the need for extended debate.

27. Once in place, these measures should enable the global community to identify a specific impact threat and quickly implement effective prevention or disaster mitigation responses. A series of outlined recommendations relating to a decision-making programme for a global response to asteroid threats has been developed by organizations engaged in NEO-related activities, including the ASE Panel on Asteroid Threat Mitigation and the international Planetary Defence Conferences. The Action Team agreed that there was benefit to such high-level recommendations, which could have wide acceptance among the global space, civil defence and disaster response community. On the basis of that agreement and in accordance with the United Nations treaties and principles on outer space, the Action Team has therefore derived a set of recommendations for handling the threat of a potential NEO impact on Earth.

B. Application

28. States Members of the United Nations and international organizations should take measures, through national or other applicable mechanisms, to support the implementation of the recommendations below to the greatest extent feasible. Building on existing relationships, institutions and activities, that support will require the availability of a commensurate level of resources to address the specific potential threat posed by NEOs.

29. The proposed recommendations are applicable to Governments and intergovernmental, regional, and non-governmental organizations and institutions. They are also applicable to relevant United Nations entities with responsibility for the coordination of space activities and the safety of citizens and with functions related to disaster reduction and management of the consequences of disasters.

30. It is recognized that the implementation of individual recommendations or elements thereof is governed by the provisions of United Nations treaties and principles on outer space and should not impose any financial obligations on the United Nations budget.

III. Near-Earth object threat mitigation functions

31. There are three primary components of threat mitigation:

(a) Discovering hazardous asteroids and comets and identifying those objects that pose a true threat requiring action;

(b) Planning a mitigation campaign that involves deflection or disruption actions as well as civil defence activities;

(c) Implementation of a mitigation campaign, if the threat warrants.

32. The nature and consequences of the threat posed by asteroids and comets are international, and it is likely that any mitigation effort will require action by and coordination of efforts among many nations. The recommendations made by the Action Team are meant to:

(a) Ensure that all nations are aware of potential threats;

(b) Ensure the design and coordination of mitigation activities, including civil defence measures, among nations that could be affected by an impact and those that might play an active role in any eventual asteroid or comet deflection or disruption campaign.

A. Information, analysis and warning

33. An international asteroid warning network (IAWN) should be established by linking together the institutions that are already performing many of the proposed IAWN functions, including the following, and adding capabilities as needed:

(a) To discover, monitor, and physically characterize the potentially hazardous NEO population using optical and radar facilities and other assets based in both the northern and southern hemispheres and in space;

(b) To provide and maintain an internationally recognized clearing house function for the receipt, acknowledgement and processing of all NEO observations;

(c) To act as a global portal, serving as the international focal point for accurate and validated information on the NEO population;

(d) To coordinate campaigns for the observation of potentially hazardous objects;

(e) To recommend policies regarding criteria and thresholds for notification of an emerging impact threat;

(f) To develop a database of potential impact consequences, depending on geography, geology, population distribution and other related factors;

(g) To assess hazard analysis results and communicate them to entities that should be identified by Member States as being responsible for the receipt of notification of an impact threat in accordance with established policies;

(h) To assist Governments in the analysis of impact consequences and in the planning of mitigation responses.

34. Several institutions are currently engaged in NEO detection, tracking, cataloguing, impact prediction and notification of threats exceeding established risk thresholds. These include the Near-Earth Object Observations Program of NASA, the NASA-supported Minor Planet Center of the International Astronomical Union and the Sentry computational centre at the NASA Jet Propulsion Laboratory. Ongoing NEO programmes also include the computational centre at the Near-Earth Objects Dynamic Site at the University of Pisa, Italy, as well as the NEO survey and follow-up elements of the space situational awareness programme of ESA. Additional expert centres contributing to the objectives of IAWN should be encouraged.

35. To avoid miscommunication, IAWN should develop a strategy using well-defined communication plans and protocols, grounded in the science of risk communications and psychology. News and information should be distributed using words that are easily understood by the public and policymakers and should be accurate, timely and aimed at responding promptly and directly to misinformation and media errors. IAWN should investigate the communication channels and contacts used by other disaster warning networks to communicate with the disaster management community. IAWN could benefit from the large body of knowledge about the human response to other natural disasters and should therefore include among its members risk analysis experts familiar with the behavioural and psychological elements of disaster management. It should also draw on the lessons learned from other disaster response and risk management organizations.

36. In order to inform the public about the risk of NEOs, IAWN should encourage the development of an education plan that identifies the major NEO risk factors. IAWN should coordinate an NEO outreach plan using entities such as the International Astronomical Union, the American Geophysical Union, space agencies, professional astronomical organizations and amateur observers.

37. Continued research will be essential for the efficient functioning of IAWN. IAWN should therefore identify and call for necessary NEO-related research in order to address gaps in knowledge relating to impact prediction, impact effects or other areas necessary for the IAWN mission.

38. IAWN should emphasize the value of finding hazardous NEOs as soon as possible in order to obtain precision tracking data, thus avoiding the considerable costs of unnecessary NEO threat mitigation missions. This strategy requires upgraded NEO search and tracking capabilities:

(a) Rapid enhancements to current detection and tracking systems are a wise investment. Assessment of the impact hazard requires a thorough survey of the NEO population in order to detect the hundreds of thousands of small near-Earth asteroids (and comets) that could cause damage at the Earth's surface should impact occur. The early execution of such a survey, at a relatively modest cost, will enable repeat observations and precise orbit determination that will eliminate many spurious NEO impact scenarios and the associated costs of mounting a deflection campaign;

(b) Priority NEO research should include an analysis of the value of space-based detection and tracking in order to accelerate the identification of potentially hazardous NEOs and enable precise orbit determination.

39. A steering group, composed of IAWN members, should be created to propose and assist the long-term development of the IAWN function. Such a group would then be in an ideal position to integrate relevant functions of the IAWN with the functions to be carried out by a group to study mitigation planning as well as to advise appropriate organizations involved in the implementation of a deflection mission or the development of disaster response plans. The steering group should consider the many issues related to the establishment of IAWN, such as resources, structure, institutional model, and legal and liaison issues.

40. Member States should ensure that IAWN-related facilities are supported at an appropriate level to enable them to perform their critical functions. Further, as appropriate, Member States should establish the capacities and procedures needed to facilitate the following actions for impact warning response at the national and regional levels:

(a) Receiving notification of an impact threat that meets established notification policies;

(b) Taking appropriate action in response to an impact threat notification.

B. Space mission planning advisory group

41. Uncertainties are associated with the discovery and tracking of any asteroid or comet, and those uncertainties will make it difficult to predict an Earth impact with certitude until additional tracking data are available. As a result, it is possible, and even likely, that efforts to mitigate a threat might need to begin before it is certain that a particular object will actually impact the Earth. To facilitate the efficient and timely gathering of observational data that will refine the orbit and physically characterize the potentially hazardous object, it is recommended that generic "target of opportunity" proposals should be lodged with major astronomical observatories that are capable of rapidly deploying powerful and appropriate instruments.

42. The international nature of an asteroid or comet threat necessitates coordination among entities involved in mitigation and civil defence as the threat

evolves. At the same time, it must be recognized that in most cases the threat is likely to vanish once additional data are available.

43. Two activities are essential in order to prepare the foundation for an effective response to a threat of asteroid or comet impact. The first is to lay out the framework, timeline and options for initiating and executing response activities; the second is to inform the civil defence community of the nature of impact disasters and incorporate that community into the overall mitigation planning process.

44. A space mission planning advisory group should be established by Member States with space agencies. The Action Team could assist in that process. The group should be composed of representatives of spacefaring nations and other relevant entities and, once established, it should be supported and facilitated by the United Nations on behalf of the international community, with no financial implications for the budget of the United Nations. Its responsibilities should include:

(a) Recommendation and promotion of key research required for planetary defence. Such research can take the form of NEO characterization, computer simulations, laboratory research and deep space missions;

(b) Identification of research opportunities for international collaboration on technologies and techniques for NEO deflection. This will help to avoid costly duplication of effort and speed the development of an effective deflection capability;

(c) Development and adoption of a set of reference missions addressing a variety of potential NEO impact scenarios and deflection and disruption possibilities. These reference missions will facilitate accurate technical planning and provide a basis for mitigation campaign cost estimates;

(d) Development of decision and event timelines for a variety of potential Earth impactors and trajectories identified for mitigation campaign analysis;

(e) Evaluation of technical maturity and consequences of deflection techniques;

(f) Recommendations to the appropriate decision-makers, in collaboration with IAWN, on criteria and thresholds for action (such as notification of a significant impact risk, initiation of an observation and/or mitigation campaign);

(g) Recommendation of a minimum acceptable Earth-miss distance and/or other criteria for deflection targeting;

(h) Recommendation of operational responsibilities for a mitigation campaign;

(i) Preparation to coordinate with the relevant actors involved in the implementation of the threat response;

(j) Identification of any potential legal issues (e.g. liabilities) that may arise in undertaking NEO mitigation actions or selecting any likely mitigation option;

(k) Communication of its activities to the international community;

(l) Provision of a yearly briefing to the Committee on the Peaceful Uses of Outer Space on the status of its activities.

45. The space mission planning advisory group could be organized and function in a manner similar to the Inter-Agency Space Debris Coordination Committee, with the position of Chair rotating among representatives of spacefaring nations and activities supporting the terms of reference of the group being undertaken by institutions of each member State.

46. The advisory group should identify, for the benefit of space agencies, the technical issues involved in planetary defence in order to take advantage of synergies among human exploration, science and NEO hazard research activities.

47. The preparation of the terms of reference of the space mission planning advisory group could be facilitated by the Action Team.

C. Disaster response planning and coordination

48. The goal of IAWN is to discover potentially threatening objects and provide warnings of their possible impacts with sufficient time for planning and executing both deflection and civil defence actions. While warnings may be available in some cases, at the present time asteroid discovery resources coordinated by IAWN may be unable to detect or provide warning of impacts by objects in the range of 30 to 300 metres in diameter (large enough to destroy a large city or create a regional disaster), or warnings may not provide sufficient time for a deflection attempt. As a consequence, disaster response agencies must plan for disasters caused by unexpected impact events, by events where warning times are short and by impact events predicted to occur years in the future.

49. To prepare for NEO impact events, the Action Team recommends that an impact disaster planning advisory group should be established to link together existing national and international disaster response agencies to prepare coordinated response activities in the case of both predicted and unexpected NEO impact disasters. That advisory group, which might be coordinated with the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER), would:

(a) Review lessons learned from earthquake, tsunami and other large-scale natural disasters to develop recommendations on how nations should coordinate multinational disaster response activities for both unexpected and predicted NEO impact disasters;

(b) Identify research opportunities to enhance understanding of immediate and long-term effects of NEO impacts on humans, weather, environment, infrastructure and economies;

(c) Sponsor, with the advice of IAWN, periodic exercises to build and test national and international responses to disasters that might result from asteroid impacts;

(d) Develop recommendations, timelines and procedures for evacuating areas that would be affected by an impact.

D. Mitigation mission implementation

50. When a threatening object is detected and the threat is deemed credible by IAWN, this fact and the associated details should be presented to the Committee on the Peaceful Uses of Outer Space. The Committee should assess the risk and encourage spacefaring nations to move forward to develop plans, coordinated via the space mission planning advisory group, to deflect the threatening object. At the same time, the Committee should notify the impact disaster planning advisory group of the threat and could establish an ad hoc mitigation mission advisory group to encourage international response activities and advise planning for and response to the threat, including deflection (if time allows), civil defence actions and disaster mitigation.

51. As the threat evolves, the Committee should receive periodic updates on impact location predictions from IAWN, on deflection mission plans and status from the space mission planning advisory group and on response to the potential disaster from the impact disaster planning advisory group. IAWN and both of those advisory groups should maintain tight coordination throughout the evolution of the response. The Committee, with the assistance of the Office for Outer Space Affairs, should also maintain a website containing authoritative information on the international response to the threat. The mitigation mission advisory group should collect and distribute lessons learned and recommended improvements to the process.

52. IAWN will continue to collect tracking data and refine impact predictions and should make that information available to the public, as recommended in the IAWN terms of reference. It must be recognized that as a result of additional tracking data, impact with the Earth may no longer be predicted. At that point, response activities should be terminated. Lessons learned and recommended improvements should be collected in all cases.

53. The Committee should facilitate implementation of an NEO deflection mission or disaster response plan by coordinating efforts of appropriate organs of the United Nations in support of the chosen course of action. In the event of the discovery of an Earth-threatening NEO, the following actions should be taken by a consortium of nations capable of implementing a deflection campaign or segments thereof:

- (a) Determination of criteria and thresholds for action (e.g. notification of a significant impact risk, initiation of observation and/or mitigation campaign);
- (b) Development of decision and event timelines for mitigation campaign analysis;
- (c) Distribution of coordinated actions for mitigation campaign operational responsibilities;
- (d) Identification of methods to engage designated national and international disaster response entities and utilize existing functions and infrastructures;
- (e) Development of detailed agreements on the implementation of a mitigation campaign to include NEO deflection disaster response activities;
- (f) Communication of the agreements to the international community through the relevant United Nations organizations;

(g) Assistance in the coordination of actors involved in the implementation of the agreements.

E. Implementation

54. Action Team 14 should, through its intersessional work, provide guidance and support for the development of IAWN, the space mission planning advisory group and the impact disaster planning advisory group and report on progress to the Scientific and Technical Subcommittee.
