

The US National Near-Earth Object Preparedness Strategy and Action Plan

Briefing to SMPAG

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Planetary Defense Coordination Office

This office was established in January 2016 at NASA HQ to oversee planetary defense related activities across NASA, and coordinate both US interagency and international efforts and projects to address and plan response to the asteroid impact hazard.

Mission Statement:

Lead national and international efforts to:

- Detect any potential for significant impact of planet Earth by natural objects
- Appraise the range of potential effects by any possible impact
- Develop strategies to mitigate impact effects on human welfare

Interagency Working Group (IWG) for Detecting and Mitigating the Impact of Earth-bound Near-Earth Objects (DAMIEN) created under the Committee on Homeland and National Security (CHNS) within the National Science and Technology Council (NSTC)

GOALS FOR THE DAMIEN IWG

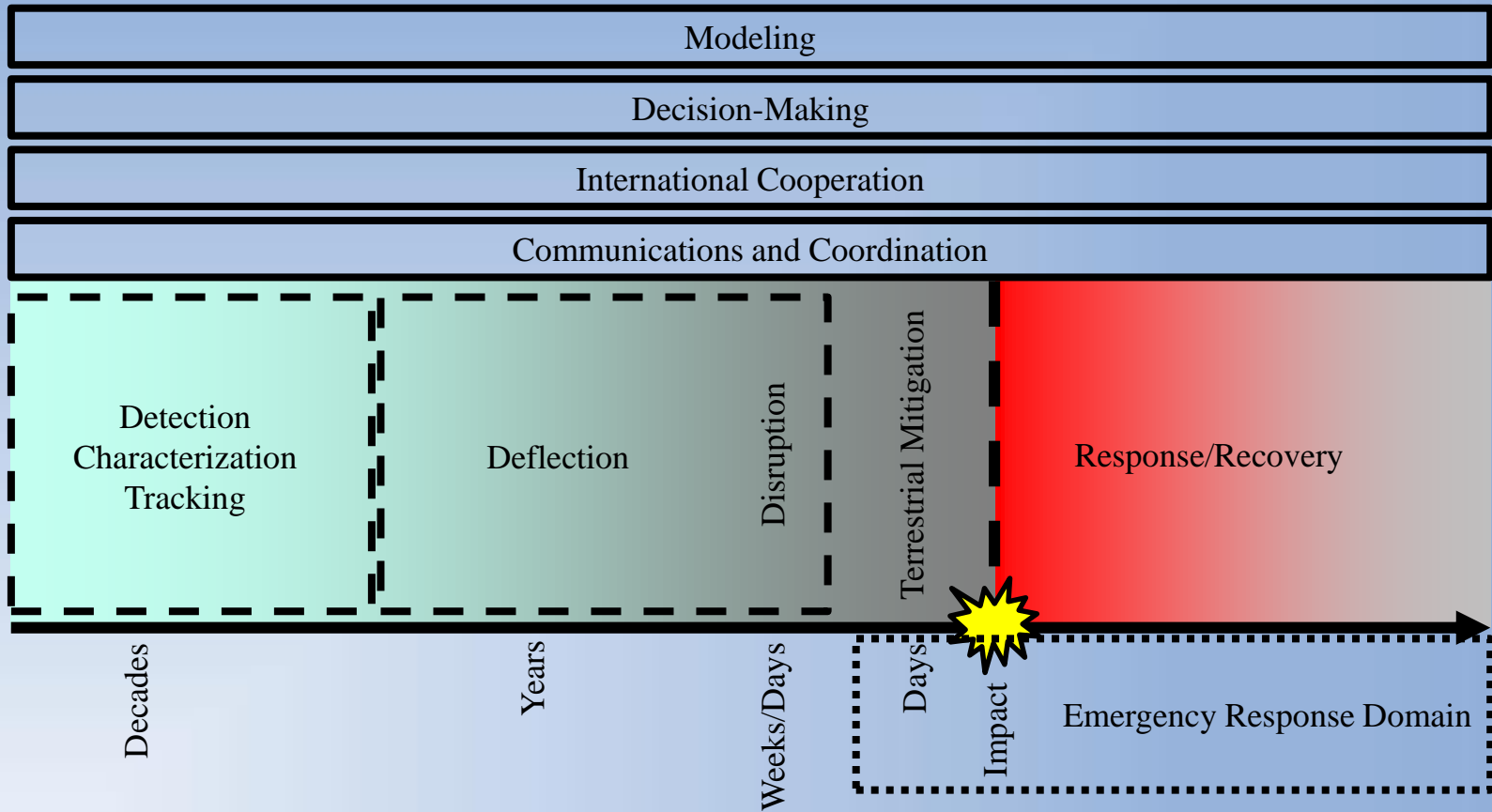
- Develop a National NEO Preparedness Strategy (NNPS) within nine months of this charter
 - Articulate goals for extending and enhancing prediction (detection, characterization and monitoring) and National Preparedness (protection, mitigation, response and recovery) for potentially hazardous or Earth-impacting NEOs.
- Develop a NEO Preparedness Action Plan (NPAP) within fourteen months of the charter
 - Establish actions, timelines, and milestones for the implementation of the NNPS.
- Develop metrics to measure progress of the plan annually, or as needed.





US Interagency Working Group for Detecting and Mitigating the Impact of Earth-bound Near-Earth Objects (DAMIEN)

Planetary Defense Timeline*



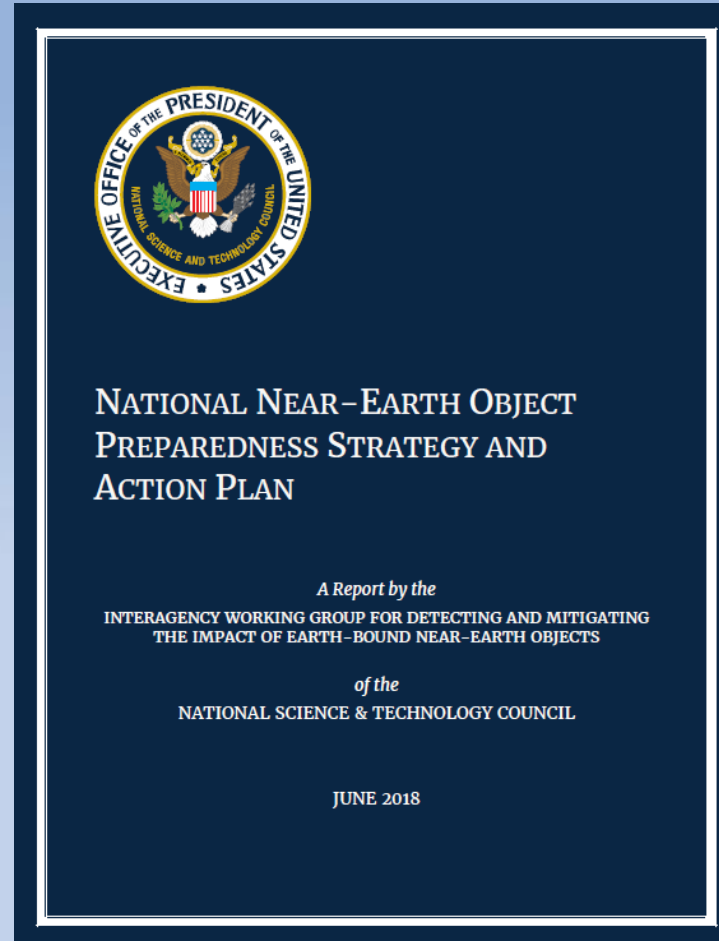
* From National NEO Preparedness Strategy, 30 December 2016





New Guidance released by White House on 20 June 2018

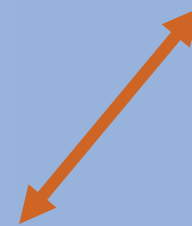
<https://www.whitehouse.gov/wp-content/uploads/2018/06/National-Near-Earth-Object-Preparedness-Strategy-and-Action-Plan-23-pages-1MB.pdf>





Interagency Working Group Membership

- Department of Commerce (NOAA)
- Department of Defense (USAF, USSTRATCOM)
- Department of Energy (NNSA)
- Department of Homeland Security (FEMA)
- Department of the Interior (USGS)
- Department of State (OES)
- NASA Planetary Defense Coordination Office (PDCO) (Co-Chair)
- National Science Foundation (AST)
- National Security Council
- Office of the Director of National Intelligence
- Office of Management and Budget
- Office of Science and Technology Policy (Co-chair)





National NEO Preparedness Strategy and Action Plan

Goals in the New Action Plan

1. Enhance NEO Detection, Characterization, and Tracking Capabilities
2. Improve Modeling, Predictions, and Information Integration
3. Develop Technologies for NEO Deflection and Disruption
4. Increase International Cooperation on NEO Preparation
5. Establish NEO Impact Emergency Procedures and Action Protocols



Goal 1: Enhance NEO Detection, Tracking, and Characterization Capabilities

Objective: Improve national capabilities for NEO detection, tracking, and characterization

- 1. Identify opportunities in existing and planned telescope programs to improve detection and tracking by enhancing the volume and quality of the current data streams, including from optical, infrared, and radar facilities (NASA, NSF, USAF)**
- 2. Identify technology and data processing capabilities and opportunities in existing and new telescope programs to enhance characterization of NEO composition and dynamical and physical properties (NASA, NSF, USGS)**
3. Use the roadmaps developed in Actions 1.1 and 1.2 to inform investments in telescope programs and technology improvements to improve completeness and speed of NEO detection, tracking, and characterization (NSF, NASA, USAF Space Command)
- 4. Establish and exercise a process for rapid characterization of a potentially hazardous NEO (NASA, NSF, USGS)**



Goal 2: Improve Modeling, Predictions, and Information Integration

Objective: Establish an interagency NEO impact modeling group

1. **Establish an interagency working group for coordination and enabling dissemination of the results of NEO threat modeling and analysis** (NASA, DHS S&T, DHS P&PD, and other providers of modeling and analysis results)

Objective: Establish an integrated suite of computational tools for modeling NEO impact risks and mitigation techniques

2. **Ascertain what information each participating organization requires on what timeframe, identify gaps, and develop recommendations for modeling improvements** (NASA, FEMA)
3. Develop and validate a suite of computer simulation tools for assessing the outcome of deflection or disruption techniques applied to a NEO (DOE, NASA)
4. Establish a suite of computer simulation tools for assessing the local, regional, and global risks associated with an impact scenario (DOD DTRA, NRC, NASA, NNSA, NOAA, USGS)
5. **Assess the sensitivities of these models to uncertainties in NEO dynamical and physical properties** (NASA, NNSA, FEMA)

Objective: Exercise, evaluate, and continually improve modeling and analysis capabilities

6. Continually assess the adequacy and validity of modeling and analysis through annual exercises, test problems, and comparison to experiments, and peer review activities (FEMA, NASA, NNSA, USGS and other providers of modeling and analysis results)



Goal 3: Develop Technologies for NEO Deflection and Disruption Missions

Objective: Develop technologies and designs for rapid-response NEO reconnaissance missions

1. **Assess technologies and concepts for rapid response NEO reconnaissance missions (NASA)**
2. **Evaluate the capabilities of current and projected domestic and international launch vehicle infrastructure to support planetary defense missions (NASA, USAF Space Command)**

Objective: Develop technologies and designs for NEO deflection and disruption missions

3. **Create plans for the development, testing, and implementation of NEO reconnaissance mission systems (NASA)**
4. **Identify, assess the readiness of, estimate the costs of, and propose development paths for technologies required by NEO impact prevention concepts (NASA, NNSA, DoD)**
5. **Perform a risk analysis on planetary defense mission success under varying assumptions and circumstances (NASA)**
6. **Develop preliminary mission designs for NEO deflection mission campaigns (NASA, NNSA)**
7. **Conduct a series of flight demonstrations to validate NEO deflection and disruption system concepts (NASA)**





Goal 4: Increase International Cooperation on NEO Preparation

Objective: Build international awareness of potential NEO impacts as a global challenge

1. Inform foreign governments of the need for a comprehensive and coordinated approach to preparing for a NEO event (DOS, NASA)

2. Continue to demonstrate U.S. leadership in technical international NEO organizations, and increase awareness among all countries, in particular space agency officials, of the need to address NEO issues in major international bodies (NASA, DOS)

Objective: Increase international engagement and cooperation on observation infrastructure, numerical modeling, and scientific research

3. Improve international collaboration on observation infrastructure and data sharing, as well as numerical modeling, and scientific research (NASA, NSF)

4. Lead development of a plan for improving NEO monitoring through enhanced coordination (and potential expansion) of U.S. and key country ground-based telescopes (NSF, NASA)

5. Encourage countries around the world to initiate and continue programs to develop space- and ground-based telescopes to detect, track, and characterize NEOs and coordinate via the IAWN (NASA, NSF)

Objective: Foster consultation and coordination of NEO impact planning, mitigation, and response

6. Strengthen the IAWN and SMPAG as the primary international technical bodies for addressing NEO planning and mitigation (DOS, NASA)

7. Encourage participation in tabletop and physical exercises with global partners regarding preparedness, prevention, response, and recovery efforts (DOS, DHS)



Goal 5: Establish NEO Impact Emergency Procedures and Action Protocols

Objective: Establish protocols for conducting a threat-assessment, upon detection of a potential impact, to inform subsequent communication and decisionmaking

1. Develop a set of real-world scenarios based on credible impact threats with observable parameters to inform planning and procedure development (FEMA, DHS, NASA)
- 2. Establish a procedure and timeline for conducting a threat assessment upon detecting a potential NEO impact, and for updating the threat assessment based on improved data (NASA, OSTP, FEMA)**

Objective: Establish protocols for coordinated communications and notifications regarding NEO threats

3. Revisit and validate the current notification protocol chain-of-command based on the response to Congress in an October 2010 OSTP memo (OSTP, NASA, FEMA)
4. Develop protocols for notifying the White House and Congress (including briefing appropriate subcommittees), State and Local Governments, the public, foreign governments, and international organizations, regarding NEO threats (OSTP, NASA, FEMA, DOS)
- 5. Develop education material for different audiences providing basic education, information, uncertainties, and emergency response plans (NASA, FEMA, OSTP)**

Objective: Establish protocols for recommending space-based reconnaissance and mitigation missions

- 6. Establish a procedure and timeline for conducting a risk/benefit analysis for space-based mitigation mission options following a NEO Threat Assessment (NASA, OSTP, DOE, DOD)**
- 7. Develop benchmarks for determining when to recommend NEO reconnaissance, deflection, or disruption missions (NASA, DOE, DOD, OSTP)**

Objective: Establish procedures and protocols for recommending and executing NEO impact emergency preparedness, response, and recovery

8. Incorporate NEO impacts into All-Hazards Response and Recovery Plans (FEMA, NASA, OSTP)



Timeline: Short, Medium, and Long Term Actions

- Short Term: 1-3 years
- Medium Term: 3-5 years
- Long Term: 5-10 years

- Discussion: Examples of short, medium, and long term actions
 - Short: Report, study, research program
 - Medium: Technology development program
 - Long: Spacecraft mission, observation campaign

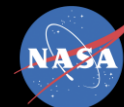




Resource Allocation

- Action Plan is NOT a budget document, but it should be used to leverage resources that could be used to complete the actions
- Discussion: Example resources
 - International Agreements
 - Capability Adaptations, Agency Partnerships
 - Dual Use Technology Development
 - Public-Private Partnerships
 - Share facilities, personnel, equipment





Next Steps

- Initiate near-term actions
- Prioritize and start planning for longer term
- Report annually to the US National Science & Technology Council (NSTC), Subcommittee on Space Hazards and Security
 - “Define, coordinate, and oversee Federal goals, programmatic priorities, and processes related to (1) potentially hazardous or Earth-impacting near-Earth objects (NEOs)...”

