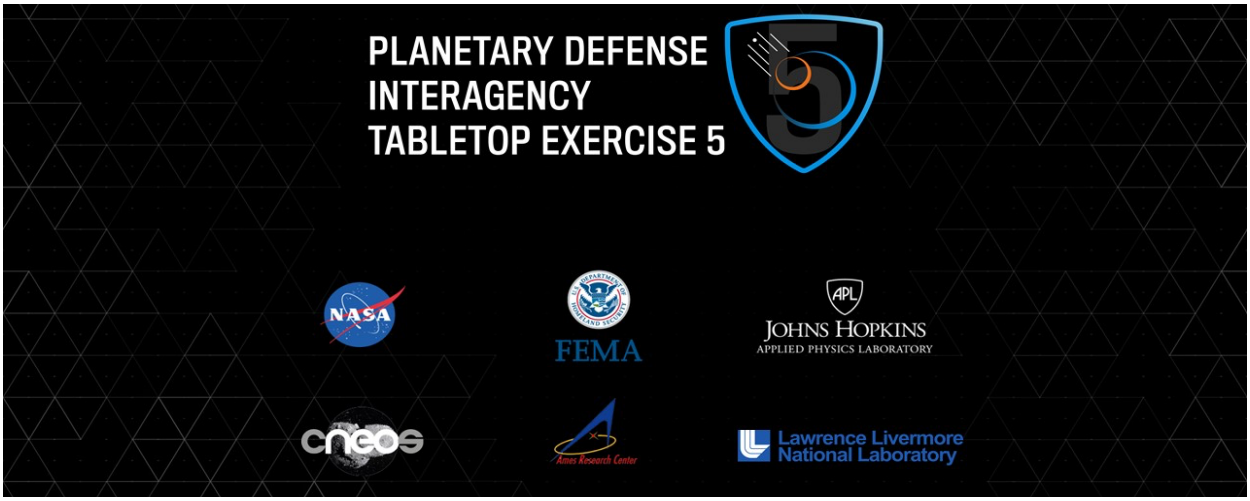

April 2024 Planetary Defense Interagency Tabletop Exercise 5

ACRONYM LIST & GLOSSARY

April 2-3, 2024

This Glossary provides exercise players with acronyms and definitions as an additional tool to assist with executing their roles in the exercise. Additional information may be accessed at the following website: pd-ttx.jhuapl.edu

ACRONYM LIST

Acronym	Definition
ACS	Attitude Control System
ADCS	Attitude Determination and Control Subsystem
AEPS	Advanced Electric Propulsion System
ARC	NASA Ames Research Center
ARRM	Asteroid Redirect Robotic Mission
ASDS	Autonomous Spaceport Drone Ship
ATAP	NASA ARC Asteroid Threat Assessment Project
ATP	Authority to Proceed
AU	Astronomical Unit
BOL	Begin of Life
C3	Characteristic Energy
CCMC	NASA Community Coordinated Modeling Center
CISA	Cybersecurity and Infrastructure Security Agency
CNEOS	NASA JPL Center for Near Earth Object Studies
CONUS	Continental United States
COA	Course of Action
COPUOS	UN Committee on the Peaceful Uses of Outer Space
DART	Double Asteroid Redirection Test
DCO	Defense Coordinating Officer
DHS	Department of Homeland Security
DHS S&T	DHS Science and Technology Directorate
DHS OSE	DHS S&T Office of Science and Engineering
DLA	Declination of the Launching Asymptote
DRCS	NASA Disaster Response Coordination System
DSM	Distributed Spacecraft Missions
DV	Delta-V (*Change in Velocity*)
EOC	Emergency Operations Center
EOL	End of Life
EOP	Emergency Operations Plan Executive Office of the President
EP	Electric Propulsion
ESA	European Space Agency
ESF	Emergency Support Function
EU	European Union
FEMA	Federal Emergency Management Agency
FHE	Falcon Heavy Expendable
FIOP	Federal Interagency Operational Plans
FOC	Federal Operating Concept

Gateway PPE	Gateway Power and Propulsion Element
GEO	Geosynchronous (or Geostationary) Earth Orbit
GFDRR	Global Facility for Disaster Reduction and Recovery
GNC	Guidance, Navigation, and Control
GSFC	NASA Goddard Space Flight Center
GT	Gravity Tractor
HERMeS	NASA Hall Effect Rocket with Magnetic Shielding
HF	High Frequency
HOB	Height of Burst
IAD	FEMA International Affairs Division
IAWN	International Asteroid Warning Network
IB	Ion Beam
IBD	Ion Beam Deflection
I_{SP}	Specific Impulse
JHU/APL	Johns Hopkins University Applied Physics Laboratory
JPL	NASA Jet Propulsion Laboratory
KI	Kinetic Impact Kinetic Impactor
KSC	Kennedy Space Center
kT	Kilotons of TNT Equivalent
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
LEO	Low-Earth Orbit
LV	Launch Vehicle
MPC	Minor Planet Center
Mt	Megatons (*of TNT Equivalent*)
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NED	Nuclear Explosive Device (*for NEO deflection*)
NEO	Near Earth Object
NEOCC	ESA Near-Earth Objects Coordination Centre
NET	No Earlier Than
NEXT-C	NASA's Evolutionary Xenon Thruster - Commercial
NIMS	National Incident Management System
NLT	No Later Than
NNSA	National Nuclear Security Administration
NOAA	National Oceanic and Atmospheric Administration
NORAD	North American Aerospace Defense Command
NRF	National Response Framework
NSF	National Science Foundation
OCHA	UN Office for the Coordination of Humanitarian Affairs

OCONUS	Outside the Continental United States
OEM	Office of Emergency Management
Pa	Pascal (*unit of pressure or stress*)
PAIR	Probabilistic Asteroid Impact Risk Model
PD	Planetary Defense
PDCO	NASA Planetary Defense Coordination Office
PIO	Public Information Officer
PNT	Positioning, Navigation & Timing
PSAP	Public Safety Answering Points
PSD	NASA SMD Planetary Science Division
RECON	Reconnaissance
RTLS	Return to Launch Site
S/C	Spacecraft
SatCom	Satellite Communications
SatNav	Satellite-Based Navigation
SEP	Solar Electric Propulsion
SLTT	State Local Territorial Tribal
SMD	NASA PDCO Science Mission Directorate
SME	Subject Matter Expert
SMPAG	Space Mission Planning Advisory Group
SPA	Solar Phase Angle
SSO/SunSynch	Sun-Synchronous Orbit
ToF	Time of Flight
TTX	Tabletop Exercise
UN	United Nations
UNDAC	United Nations Disaster Assessment and Coordination
UNDRR	UN Office for Disaster Risk Reduction
UNOOSA	UN Office for Outer Space Affairs
UN-SPIDER	UN Platform for Space-based Information for Disaster Management and Emergency Response
USAID	United States Agency for International Development
USSPACECOM	United States Space Command
UT/UTC	Universal Time (*i.e., Greenwich-Meridian Time*)
VC	Vulcan Centaur

GLOSSARY

Advanced Electric Propulsion System (AEPS):

Type of thruster that *provides 12 kilowatts of propulsive power* (more than *two-times more power than the current state-of-the-art in-space electric propulsion systems*). These systems perform with *extremely high fuel economy at lower thrust, providing mission flexibility and capabilities not achievable using traditional chemical propulsion systems*. [1]

Ames Research Center (ARC):
Leads NASA *in conducting world-class research and development in aeronautics, exploration technology and science aligned with the center's core capabilities*. [2]

Asteroid Redirect Robotic Mission (ARRM):
Mission *intended to develop a robotic spacecraft to visit a large near-Earth asteroid and collect a multi-ton boulder from its surface*. [3]

Asteroid Threat Assessment Project (ATAP):
NASA ARC ATAP - Provides *advanced risk analyses to support NASA projects, programs, and missions that involve complex systems or events that are typically difficult to represent effectively using traditional risk assessment methods*. Uses their PAIR *model and high-fidelity simulations to estimate the severity and likelihood of damage—due to blast waves, thermal radiation, tsunamis, and global climatic effects—that could result from potential asteroid impacts*. Helps *to develop the multi-agency threat assessment capabilities that will be employed in the event that an actual asteroid impact threat is discovered*. [4]

Astronomical Unit (AU):
One AU is the distance from Earth to the Sun.

Attitude Control System (ACS):
System that predicts and reacts to the rotational dynamics of a spacecraft. [5]

Attitude Determination and Control Subsystem (ADCS):
Equipment, algorithms, and software *used to determine and control the attitude* of a spacecraft. [5]

Center for Near Earth Object Studies (CNEOS):
NASA JPL CNEOS - *Computes high precision orbits for NEOs, predicts their future motions, assesses their impact hazard, and makes these results available on [their] website*. [6]

Characteristic Energy (C3):
Also known as launch energy; C3 is *the square of the hyperbolic excess velocity (V_∞) of the spacecraft with respect to Earth, a measure related to how much velocity increase must be supplied to the spacecraft by the launch vehicle at launch*. [7]

Committee on the Peaceful Uses of Outer Space (COPUOS):
UN COPUOS - Governs *the exploration and use of space for the benefit of all humanity: for peace, security and development*. [8]

Community Coordinated Modeling Center (CCMC):
NASA CCMC - *Multi-agency partnership enabling, supporting, and performing research and development for next-generation space science and space weather models.* [9]

Cybersecurity and Infrastructure Security Agency (CISA):
Operational lead for federal cybersecurity and the national coordinator for critical infrastructure security and resilience. [10]

Department of Homeland Security (DHS):
United States Department with a mission *to secure the nation from the many threats it faces*. [11]

DHS Science and Technology Directorate (DHS S&T):
The science advisor to the Secretary [of DHS] *and the research and development arm for DHS*. [12]

DHS S&T Office of Science and Engineering (DHS OSE):
Provides *technical expertise, enduring research, analysis, and knowledge products and services to customers across the Homeland Security Enterprise*. [13]

Disaster Response Coordination System (DRCS):
NASA DRCS - Employs *NASA's science expertise and technological innovation to support operational disaster response organizations both in the U.S. and around the globe*. [14]

Distributed Spacecraft Missions (DSM):
A mission that involves multiple spacecraft to achieve one or more common goals. [15]

Double Asteroid Redirection Test (DART):
The first-ever mission dedicated to investigating and demonstrating one method of asteroid deflection by changing an asteroid's motion in space through kinetic impact. [16]

Electric Propulsion (EP):
A class of space propulsion which makes use of electrical power to accelerate a propellant by different possible electrical and/or magnetic means. [17]

Emergency Operations Center (EOC):
The physical location where the coordination of information and resources to support incident management activities (on-scene operations) normally takes place. An EOC may be a temporary facility or located in a more central or permanently established facility, perhaps at a higher level of organization within a jurisdiction. [18]

Emergency Operations Plan (EOP):
A plan for responding to a variety of potential hazards. [18]

Emergency Support Function (ESF):
Describe federal coordinating structures that group resources and capabilities into functional areas most frequently needed in a national response. [19]

European Space Agency (ESA):
International space agency serving Europe with 22 Member States. *Its mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world*. [20]

Executive Office of the President (EOP):

Provides *the President with the support that he or she needs to govern effectively*; *has responsibility for tasks ranging from communicating the President's message to the American people to promoting our trade interests abroad*. [21]

Federal Emergency Management Agency (FEMA):
The U.S.' primary agency for emergency preparedness, response, and recovery with a mission of *helping people before, during and after disasters*. [22]

Federal Interagency Operational Plans (FIOP):
Describe how the federal government aligns resources and delivers core capabilities to implement the five National Planning Frameworks. The FIOPs provide a federal concept of operations, integrating and synchronizing national-level capabilities, for prevention, protection, mitigation, response, and recovery to support all levels of government. These plans also help federal departments and agencies develop and maintain department-level operational plans. [23]

Federal Operating Concept (FOC):
Provides guidance to departments and agencies (D/As), to be used in the development of their operational plans to prepare for, protect against, and mitigate the effects of impending disasters. [24]

Gateway Power and Propulsion Element (Gateway PPE):
Provides the *Gateway with power and [allows] it to maintain its unique orbit around the Moon*. [25]

Geosynchronous or Geostationary Orbit (GEO):
A **geosynchronous** orbit *is a prograde, low inclination orbit about Earth having a period of 23 hours 56 minutes 4 seconds. A spacecraft in geosynchronous orbit appears to remain above Earth at a constant longitude, although it may seem to wander north and south. The spacecraft returns to the same point in the sky at the same time each day*. [26]

A **geostationary** orbit is a geosynchronous orbit *with an eccentricity of zero, and an inclination of either zero, right on the equator, or else low enough that the spacecraft can use propulsive means to constrain the spacecraft's apparent position so it hangs seemingly motionless above a point on Earth*. [26]

Global Facility for Disaster Reduction and Recovery (GFDRR):
A global partnership that helps low- and middle-income countries better understand and reduce their vulnerability to natural hazards and climate change. [27]

Goddard Space Flight Center (GSFC):
NASA GSFC - *NASA's premiere space flight complex and home to the nation's largest organization of scientists, engineers, and technologists who build spacecraft, instruments, and new technology to study Earth, the Sun, our solar system, and the universe*. [28]

Gravity Tractor (GT):
Technique that uses the gravitational attraction of a rendezvous spacecraft to the impactor and a low-thrust, high-efficiency propulsion system to provide a gradual velocity change and alter [an asteroid's] trajectory. [29]

International Affairs Division (IAD):
FEMA IAD - *Defines and manages international partnerships to enhance the Agency's disaster readiness; strengthen regional, hemispheric, and global emergency management capabilities; and, support U.S. Government homeland security priorities*. [30]

International Asteroid Warning Network (IAWN):

International group of organizations involved in detecting, tracking, and characterizing NEOs, tasked with developing a strategy using well-defined communication plans and protocols to assist Governments in the analysis of asteroid impact consequences and in the planning of mitigation responses. [31]

Ion Beam (IB):
Beam of quasi-neutral plasma from an electric propulsion system. [32]

Ion Beam Deflection (IBD):
An asteroid impact mitigation method which involves the redirection of an NEO with an ion beam.

Jet Propulsion Laboratory (JPL):
NASA's only federally-funded research and development center, which is *managed by Caltech. JPL spacecraft, science instruments, and airborne missions help humanity study and track climate change, manage natural resources, and respond to disasters*. [33]

Johns Hopkins University Applied Physics Laboratory (JHU/APL):
A not-for-profit university affiliated research center (UARC) that solves complex research, engineering, and analytical problems that present critical challenges to our nation. [34]

Kennedy Space Center (KSC):
One of 10 NASA field centers and a *premier multiuser spaceport* [35] with a mission *to provide continuous access to space from Earth's premier spaceport through creativity and innovation*. [36]

Launch Vehicle (LV):
A rocket used to launch a satellite or spacecraft. [37]

Lawrence Livermore National Laboratory (LLNL):
A federally funded research and development center for the NNSA, working to ensure *the safety, security and effectiveness of the nation's nuclear deterrent*. It applies *cutting-edge science and technology to achieve breakthroughs in enterprise resilience and counterterrorism, defense and intelligence, energy security and climate resilience and research and development to produce fundamental science discoveries and faster innovation cycles*. [38]

Los Alamos National Laboratory (LANL):
A multi-program, federally funded research and development center for the [NNSA]. Its *priority roles are serving as a nuclear weapons design agency and a nuclear weapons production agency; addressing nuclear threats; and performing national security science, technology, and engineering*. [39]

Low-Earth Orbit (LEO):
Orbit close to surface of Earth; 160-1000km. [40]

Minor Planet Center (MPC):
The single worldwide location for receipt and distribution of positional measurements of minor planets, comets and outer irregular natural satellites of the major planets. The MPC is responsible for the identification, designation and orbit computation for all of these objects. [41]

National Aeronautics and Space Administration (NASA):
Studies Earth, including its climate, the Sun, and the solar system and beyond. Conducts *research, testing, and development to advance aeronautics, including electric propulsion and supersonic flight*. Develops and funds *space technologies that will enable future exploration and benefit life on Earth*. [42]

National Incident Management System (NIMS):
Guides all levels of government, nongovernmental organizations and the private sector to work together to prevent, protect against, mitigate, respond to and recover from incidents. NIMS provides stakeholders across

the whole community with the shared vocabulary, systems and processes to successfully deliver the capabilities described in the National Preparedness System. NIMS defines operational systems that guide how personnel work together during incidents. [43]

National Nuclear Security Administration (NNSA):
A semi-autonomous agency within the U.S. Department of Energy responsible for enhancing national security through the military application of nuclear science. NNSA maintains and enhances the safety, security, and effectiveness of the U.S. nuclear weapons stockpile; works to reduce the global danger from weapons of mass destruction; provides the U.S. Navy with safe and militarily effective nuclear propulsion; and responds to nuclear and radiological emergencies in the United States and abroad. [44]

National Oceanic and Atmospheric Administration (NOAA):
An U.S. agency with a mission *to understand and predict changes in climate, weather, ocean, and coasts, to share that knowledge and information with others, and to conserve and manage coastal and marine ecosystems and resources*. NOAA *holds key leadership roles in shaping international ocean, fisheries, climate, space and weather policies*. [45]

National Response Framework (NRF):
A guide to how the nation responds to all types of disasters and emergencies. It is built on scalable, flexible, and adaptable concepts identified in the NIMS to align key roles and responsibilities. [46]

National Science Foundation (NSF):
An independent federal agency that supports science and engineering in all 50 states and U.S. territories, established to: *promote the progress of science, advance the national health, prosperity and welfare, and secure the national defense*. [47]

Near Earth Object (NEO):
Comets and asteroids that have been nudged by the gravitational attraction of nearby planets into orbits that allow them to enter Earth's neighborhood. [48]

Near-Earth Objects Coordination Centre (NEOCC):
ESA NEOCC - *A core element* of the ESA's *Planetary Defence Office*; it is *the central access point to an entire network of European near-Earth object data sources and information providers*. [49]

North American Aerospace Defense Command (NORAD):
A United States and Canada bi-national organization charged with the missions of aerospace warning, aerospace control and maritime warning for North America. [50]

North Atlantic Treaty Organization (NATO):
An alliance of countries from Europe and North America, linking these continents and *enabling them to consult and cooperate in the field of defense and security, and conduct multinational crisis-management operations together*. [51]

Planetary Defense Coordination Office (PDCO):
NASA PDCO - Manages NASA's *ongoing mission of finding, tracking, and better understanding asteroids and comets that could pose an impact hazard to Earth*. [52]

Planetary Science Division (PSD):
NASA SMD PSD - *Explores the objects in our solar system to better understand its history and the distribution of life within*. [53]

Probabilistic Asteroid Impact Risk (PAIR) Model:
Used by ATAP to *estimate the effects of blast waves, thermal radiation, tsunamis, and global climatic effects that could result from* [asteroid] *impacts*. [54]

Science Mission Directorate (SMD):
NASA SMD - *Engages the Nation's science community, sponsors scientific research, and develops and deploys satellites and probes in collaboration with NASA's partners around the world to answer fundamental questions requiring the view from and into space. SMD seeks to understand the origins, evolution, and destiny of the universe and to understand the nature of the strange phenomena that shape it*. [55]

Solar Electric Propulsion (SEP):
With SEP, a *spacecraft collects energy from the Sun via solar arrays to generate thrust*. [56]

Solar Phase Angle (SPA):
The angle between the sun and Earth as seen from the planet. [57]

Space Mission Planning Advisory Group (SMPAG):
International organization focused on preparing *for an international response to a threat by a near-Earth object through the exchange of information, development of options for collaborative research and mission opportunities, and to conduct NEO threat mitigation planning activities*. [58]

Sun Synchronous Orbit (SSO/SunSynch):
A particular kind of polar orbit. Satellites in SSO, travelling over the polar regions, are synchronous with the Sun. This means they are synchronized to always be in the same 'fixed' position relative to the Sun. [59]

United Nations (UN):
An international organization, *currently made up of 193 Member States*, *where all the world's nations can gather together, discuss common problems, and find shared solutions*. [60]

UN Disaster Assessment and Coordination (UNDAC):
Serves as the international response system for sudden-onset emergencies, such as an earthquake or a flood, and is designed to help the UN and governments of disaster affected countries during the first phase of an emergency. [61]

UN Office for Disaster Risk Reduction (UNDRR):
Lead agency within the United Nations system for the coordination of disaster risk reduction. Collects, collates, and shares *the latest high quality technical information and data about reducing risk and building resilience more effectively*. Works *closely with countries to help them build and strengthen integrated systems to manage risk and implement evidence-based policies in a way that mainstreams DRR across all areas of governance at the local, national and regional levels*. [62]

UN Office for Outer Space Affairs (UNOOSA):
Works to promote international cooperation in the peaceful use and exploration of space, and in the utilization of space science and technology for sustainable economic and social development. The Office assists any United Nations Member States to establish legal and regulatory frameworks to govern space activities and strengthens the capacity of developing countries to use space science technology and applications for development by helping to integrate space capabilities into national development programs. [63]
UN Office for the Coordination of Humanitarian Affairs (OCHA):

Supports *humanitarian organizations to respond effectively to the needs of people caught in crises, to understand and analyze their needs, and to mobilize international assistance*. Provides *tools and services to help humanitarian organizations ensure that no one affected by a crisis is left behind*. [64]

UN Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER):
Develops solutions to address the limited access developing countries have to specialized technologies that can be essential in the management of disasters and the reducing of disaster risks. [65]

United States Agency for International Development (USAID):
Leads the U.S. Government's international development and disaster assistance through partnerships and investments that save lives, reduce poverty, strengthen democratic governance, and help people emerge from humanitarian crises and progress beyond assistance. [66]

United States Space Command (USSPACECOM):
A unified command of the U.S. Department of Defense that *increases the ability of the Joint Force to project power and influence, reduces decision timelines for space operations, and brings focused attention to defending U.S. interests in space*. [67]

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