

REFERENCE SHEET

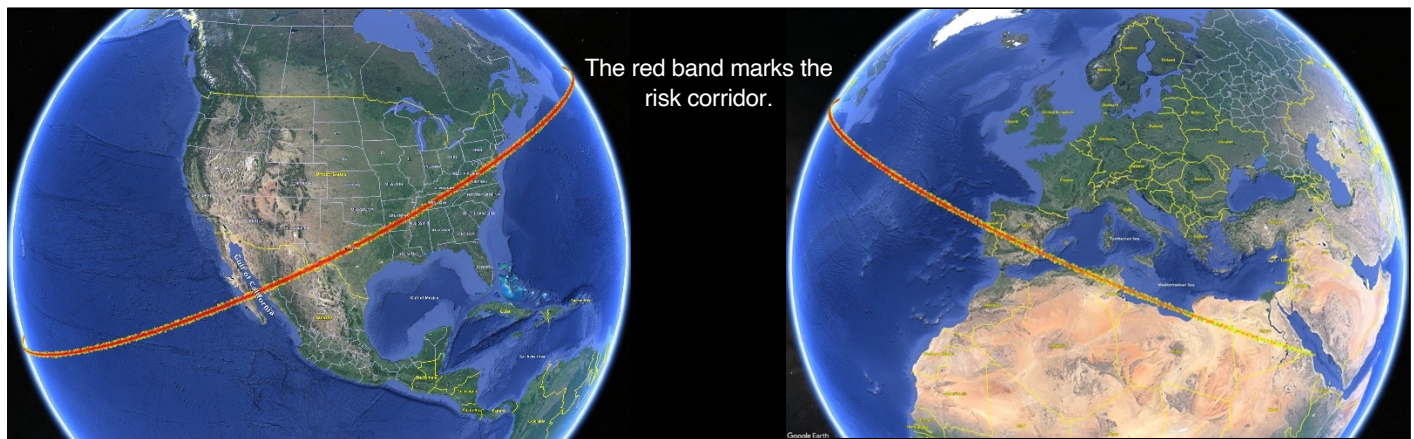
Hypothetical Scenario

PLANETARY DEFENSE
INTERAGENCY
TABLETOP EXERCISE 5



THE ASTEROID THREAT SCENARIO

| Current Date | Asteroid name | Potential Earth impact date | Impact probability | Approximate asteroid size |
|--------------|---------------|-----------------------------|--------------------|--|
| 2 April 2024 | 2023 TTX | 12 July 2038 | 72% | Highly uncertain. Mostly likely ~100–320 m in diameter. Full range of ~60–800 m. |



POSSIBLE DAMAGE FROM AN ASTEROID IMPACT

| Diameter of impacting asteroid | Type of event | Approx. impact energy (MT) | Avg. time between impacts (years) |
|--------------------------------|------------------------------------|----------------------------|-----------------------------------|
| 5 m (16 ft) | Bolide | 0.01 | 1 |
| 10 m (33 ft) | Superbolide | 0.1 | 10 |
| 25 m (80 ft) | Major airburst | 1 | 100 |
| 50 m (160 ft) | Local-scale devastation | 10 | 1000 |
| 140 m (460 ft) | Regional-scale devastation | 300 | 20 000 |
| 300 m (1000 ft) | Continental-scale devastation | 2 000 | 70 000 |
| 600 m (2000 ft) | Below global catastrophe threshold | 20 000 | 200 000 |
| 1 km (3300 ft) | Possible global catastrophe | 100 000 | 700 000 |
| 5 km (3 mi) | Above global catastrophe threshold | 10 000 000 | 30 million |
| 10 km (6 mi) | Mass extinction | 100 000 000 | 100 million |

The asteroid size is highly uncertain. Mostly likely ~100–320 m in diameter. Full range of ~60–800 m.

Reference: Report on Near-Earth Object Impact Threat Emergency Protocols (2021)

OVERVIEW OF IAWN AND SMPAG

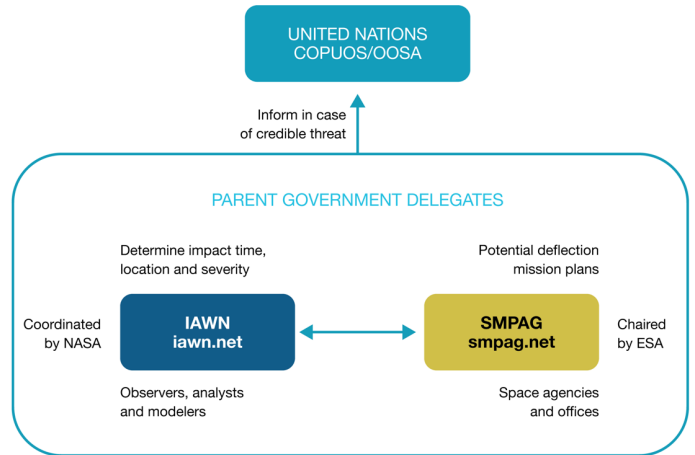
International Asteroid Warning Network (IAWN)

Detects, tracks, and predicts any near-Earth object (NEO) impact hazard and determines aspects of the potential impact threat, including time, location, and the range of potential damage severity.

Space Mission Planning Advisory Group (SMPAG)

Coordinates potential space-based responses and collaborates to recommend viable concepts for a potential mitigation campaign.

COPUOS: Committee on the Peaceful Uses for Outer Space
OOSA: Office for Outer Space Affairs



TYPES OF PLANETARY DEFENSE SPACE MISSIONS

RECONNAISSANCE

FLYBY: A spacecraft flies past the asteroid at high speed while gathering information on the asteroid’s position and properties. Typical time from build to launch is 3 years.

RENDEZVOUS: A spacecraft arrives at the asteroid and observes it up close for an extended period of time. This proximity allows the spacecraft to monitor the asteroid and make measurements over days, months, or even years. Typical time from build to launch is 5 years.

| Mission type | Impact location uncertainty | Asteroid size uncertainty | Asteroid mass uncertainty | Other asteroid information gained |
|--------------|-----------------------------|---------------------------|---------------------------|---|
| Flyby | ~100 km | ~10% | ~50% | Some surface images and high-level composition classification |
| Rendezvous | <10 km | <1% | <1% | Extensive surface imaging and detailed composition mapping |

From analyses of previous planetary defense exercises and data from asteroid missions. Specific information gained would depend on the specific mission.

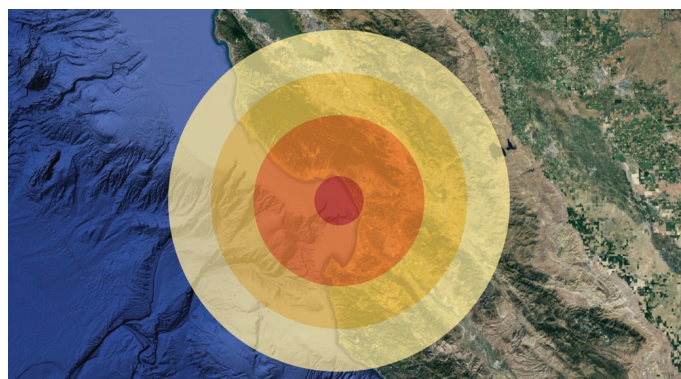
EARTH IMPACT PREVENTION

KINETIC IMPACT (KI): A spacecraft rams into the asteroid at high speed, creating ejecta that provides an additional push to change the asteroid’s orbit. *Demonstrated by NASA’s DART mission.*

ION BEAM (IB): A rendezvous spacecraft fires its ion beam engines at the asteroid for many months or years to slowly push the asteroid into a new orbit. *Has not been demonstrated for asteroid deflection.*

NUCLEAR EXPLOSIVE DEVICE (NED): A spacecraft deploys a NED, which is detonated near the asteroid to vaporize surface material and cause blowoff-induced recoil. *Has not been demonstrated for asteroid deflection and has international law and treaty restrictions.*

MAPS OF PREDICTED DAMAGE



Damage maps shown at the TTX will be formatted in this manner.

| Damage Level Description | |
|--------------------------|--|
| Serious | Windows shatter, some structure damage |
| Severe | Widespread structure damage, or third-degree burns |
| Critical | Residential structures collapse, or clothing ignites |
| Unsurvivable | Devastation, structures flattened or burned |