Impact Risk Assessment Summary

  • Impact scenarios and trajectories are developed and provided by NASA’s Near Earth Objects Office at JPL (Paul Chodas).
  • These results represent purely *hypothetical* impact scenarios, and do *not* reflect any known asteroid threat.

• Risk assessment was performed using the Probabilistic Asteroid Impact Risk (PAIR) model developed by the Asteroid Threat Assessment Project (ATAP) at NASA Ames Research Center.

• This presentation includes sample results that may be presented or used in discussions during the various stages of the impact exercise
  • Some cases represent alternate scenario options that may not be used during the actual impact exercise at the PDC17 conference.
  • Updates to these initial assessments and/or additional scenario assessments may be performed throughout the impact exercise as different scenario options unfold.

5/11/17
L. Wheeler, D. Mathias
INJECT 1 (S05): MAY 15, 2017
Swath Trajectory Parameters

Inject 1 (s05)

Velocity Distribution, Inject 1 (s05), With Irons

Entry Angle Distribution, Inject 1 (s05), With Irons
Asteroid Parameter Distributions

Diameter Distribution, Inject 1 (s05)

H-mag Distribution, Inject 1 (s05)

Albedo Distribution, Inject 1 (s05)

Density Distribution, Inject 1 (s05)

Impact Energy Distribution, Inject 1 (s05)

Class & Structure Distribution

Cc (2%)
Cf (6%)
Cr (31%)
Sc (13%)
Sf (10%)
Sr (39%)
Mean Affected Population
Mean Affected Population
Damage Ranges (min/mean/max)
Damage Level Probabilities

Total Impact Damage Risk
PDC17 5/15/2017, 1% Impact Probability

Probability

Affected Population

PDC17 5/15/2017, 1% Impact Probability

Probability

Affected Population

5/11/17

L. Wheeler, D. Mathias
Damage Exceedance Risk

- Probability of an impact causing at least a given damage level or greater.
- Complementary cumulative distribution function (CCDF)
INJECT 2 S20: NOV 30, 2018
Swath Trajectory Parameters
Asteroid Parameter Distributions (1k realizations)
Blast Damage Zones

1-2 psi
2-4 psi
4-10 psi
10+ psi
Mean Affected Population

[Map showing affected population distribution across East Asia and Japan, with a color scale indicating population density.]
Damage Ranges (min/mean/max)
Damage Level Probabilities

Total Impact Damage Risk
PDC17 11/30/2018, 96% Impact Probability

Damage Exceedance Probabilities
PDC17 11/30/2018

Exceedance Probability

Affected Population Threshold
INJECT 3 S08: MAY 20, 2020
Swath Trajectory Parameters
Parameter Distributions
Mean Affected Population

[Map showing the affected population in a region with a color scale ranging from 10^0 to 10^7. The map includes cities like Tokyo, Seoul, and Naha.]
Damage Ranges (min/mean/max)
Damage Level Probabilities

Total Impact Damage Risk
PDC17 5/20/2020, 100% Impact Probability

Damage Exceedance Probabilities
PDC17 5/20/2020
Swath Trajectory Parameters
Asteroid Parameter Distributions

Diameter Distribution, Inject 3 (s10)

Density Distribution, Inject 3 (s10)

Impact Energy Distribution, Inject 3 (s10)
Blast Damage Zones

1-2 psi
2-4 psi
4-10 psi
10+ psi
Mean Affected Population

Sources: Esri, HERE, DeLorme, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, TomTom, © OpenStreetMap, GIS User Comm.
Tiles Courtesy of Esri ArcGIS Online
Map: World Street Map
Mean Affected Population

Mean Damage Along Swath
PDC17 5/20/2020

Mean Burst Latitude

Mean Burst Longitude

Mean Affected Population
Damage Ranges (min/mean/max)

Damage Ranges Along Swath
PDC17 5/20/2020

Affected Population

Mean Burst Longitude

L. Wheeler, D. Mathias
Damage Level Probabilities

Total Impact Damage Risk
PDC17 5/20/2020, 100% Impact Probability

Damage Exceedance Probabilities
PDC17 5/20/2020
INJECT 4 S16W: FEB 25, 2024
Swath Trajectory Parameters

[Graphs showing velocity and entry angle distributions for different regions]
Asteroid Parameter Distributions

Diameter Distribution, Inject 4 (s16w)

Density Distribution, Inject 4 (s16w)

Impact Energy Distribution, Inject 4 (s16w)
Blast Damage Zones

1-2 psi
2-4 psi
4-10 psi
10+ psi

L. Wheeler, D. Mathias
Mean Affected Population
Damage Ranges (min/mean/max)
Damage Level Probabilities

Total Impact Damage Risk
PDC17 2/25/2024, 100% Impact Probability

Damage Exceedance Probabilities
PDC17 2/25/2024, 100% Impact Probability
INJECT 4 S16E: FEB 25, 2024
Swath Trajectory Parameters
Asteroid Parameter Distributions

Diameter Distribution, Inject 4 (s16e)

Density Distribution, Inject 4 (s16e)

Impact Energy Distribution, Inject 4 (s16e)
Blast Damage Zones

- 1-2 psi
- 2-4 psi
- 4-10 psi
- 10+ psi
Mean Affected Population
Damage Ranges (min/mean/max)

Damage Ranges Along Swath
PDC17 2/25/2024
Damage Level Probabilities

Total Impact Damage Risk
PDC17 2/25/2024, 100% Impact Probability

Damage Exceedance Probabilities
PDC17 2/25/2024

- Probability vs. Affected Population
- Exceedance Probability vs. Affected Population Threshold
INJECT 4 S16LD: FEB 25, 2024
Swath Trajectory Parameters
Asteroid Parameter Distributions

Diameter Distribution, Inject 4 (s16ld)

Density Distribution, Inject 4 (s16ld)

Impact Energy Distribution, Inject 4 (s16ld)
Blast Damage Zones

- 1-2 psi
- 2-4 psi
- 4-10 psi
- 10+ psi
Mean Affected Population

Sources: Esri, HERE, DeLorme, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, TomTom, © OpenStreetMap, GIS User Comm.
Tiles Courtesy of Esri ArcGIS Online
Map: World Street Map
Damage Ranges (min/mean/max)
Damage Level Probabilities

Total Impact Damage Risk
PDC17 2/25/2024, 100% Impact Probability

Damage Exceedance Probabilities
PDC17 2/25/2024