

Cross-Planetary Debris Risk Analysis

Hex-Impact Event: Orbital Ejecta Dynamics & Terrestrial Threat Assessment

1. Impact Dynamics & Ejecta Velocity

The collision of six 60 km diameter asteroids with Mars releases kinetic energy equivalent to roughly **300 billion megatons of TNT**. A significant portion of Martian crustal material is accelerated beyond Mars' escape velocity (5.03 km/s).

Primary Risk Factor: High-velocity silicate ejecta and vaporized rock plumes escaping the Martian gravity well into heliocentric orbits.

2. Statistical Probability of Earth Impact

While millions of tons of debris will enter space, the "chances" of a significant terrestrial hit depend on orbital mechanics and time scales.

Debris Class	Collision Probability (First 100 Years)	Estimated Impact Effect on Earth
Micro-Debris (Dust)	99.9%	Atmospheric "Meteor Storms" / Colorful Sunsets

Debris Class	Collision Probability (First 100 Years)	Estimated Impact Effect on Earth
Small Fragments (1m - 10m)	~15% - 25%	High-altitude airbursts (Chelyabinsk-style)
Large Chunks (>100m)	< 0.001%	Regional devastation (City-killer)

3. Factors Reducing Earth's Immediate Risk

- **The Orbital Gap:** Mars is roughly 54.6 million km to 401 million km away from Earth. Debris must cross the vast vacuum of the Inner Solar System.
- **Jupiter's Influence:** The massive gravity of Jupiter acts as a "vacuum cleaner," pulling a large percentage of ejected Martian debris away from the inner planets and toward the outer solar system or the Sun.
- **Time Dilution:** Most Martian meteorites found on Earth today were ejected **1 million to 15 million years ago**. Debris from your hex-impact would likely take thousands of years to reach Earth in significant quantities.

4. Conclusion

The immediate threat to Earth (within the first decade) is **Extremely Low**. However, the event would create a permanent "Martian Ring" of debris in the inner solar system, increasing the long-term meteoroid flux for Earth over the next several million years.