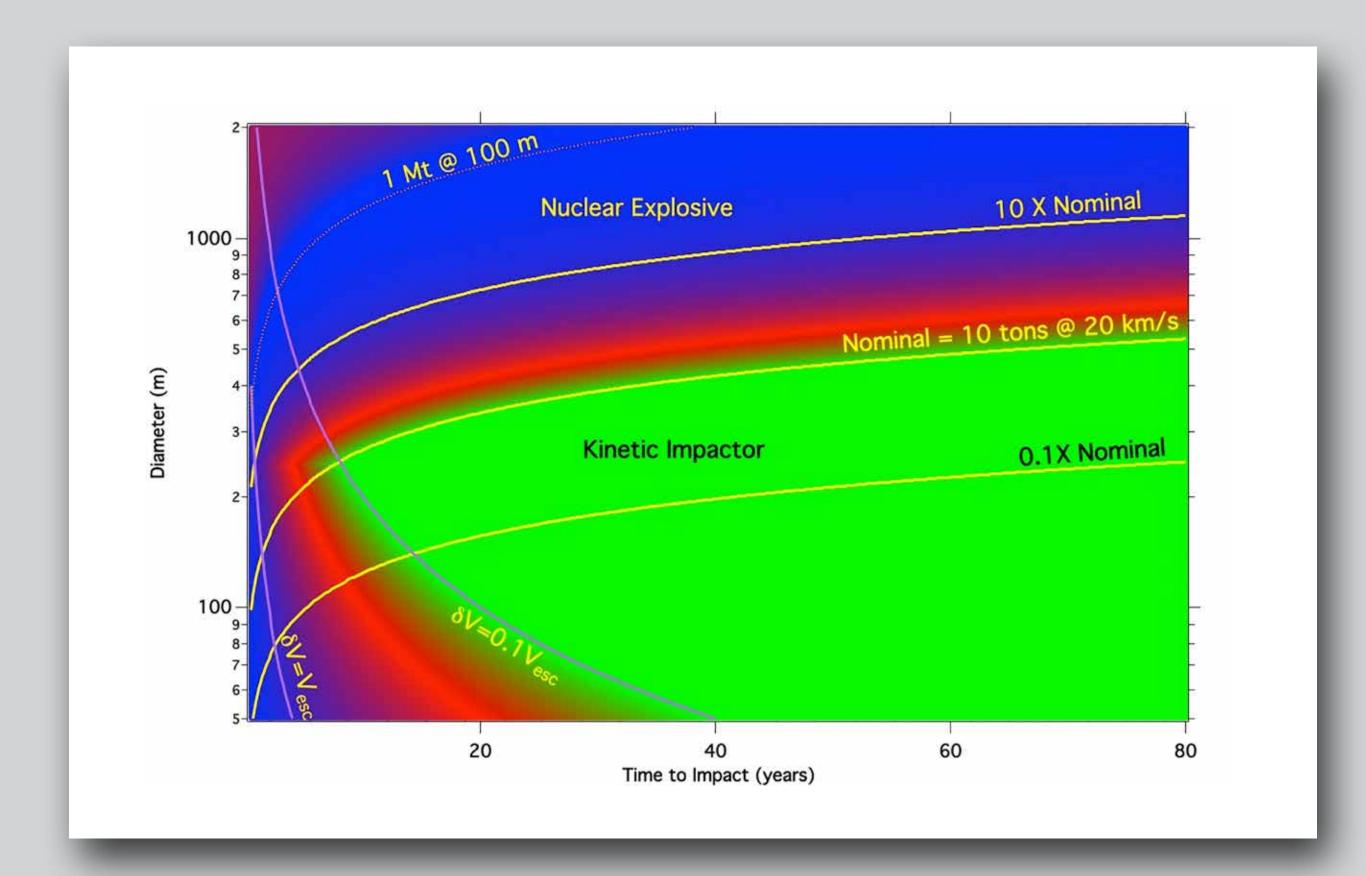


Scenario-Based Case Study Analysis of Asteroid Mitigation in the Short - Response Time Regime

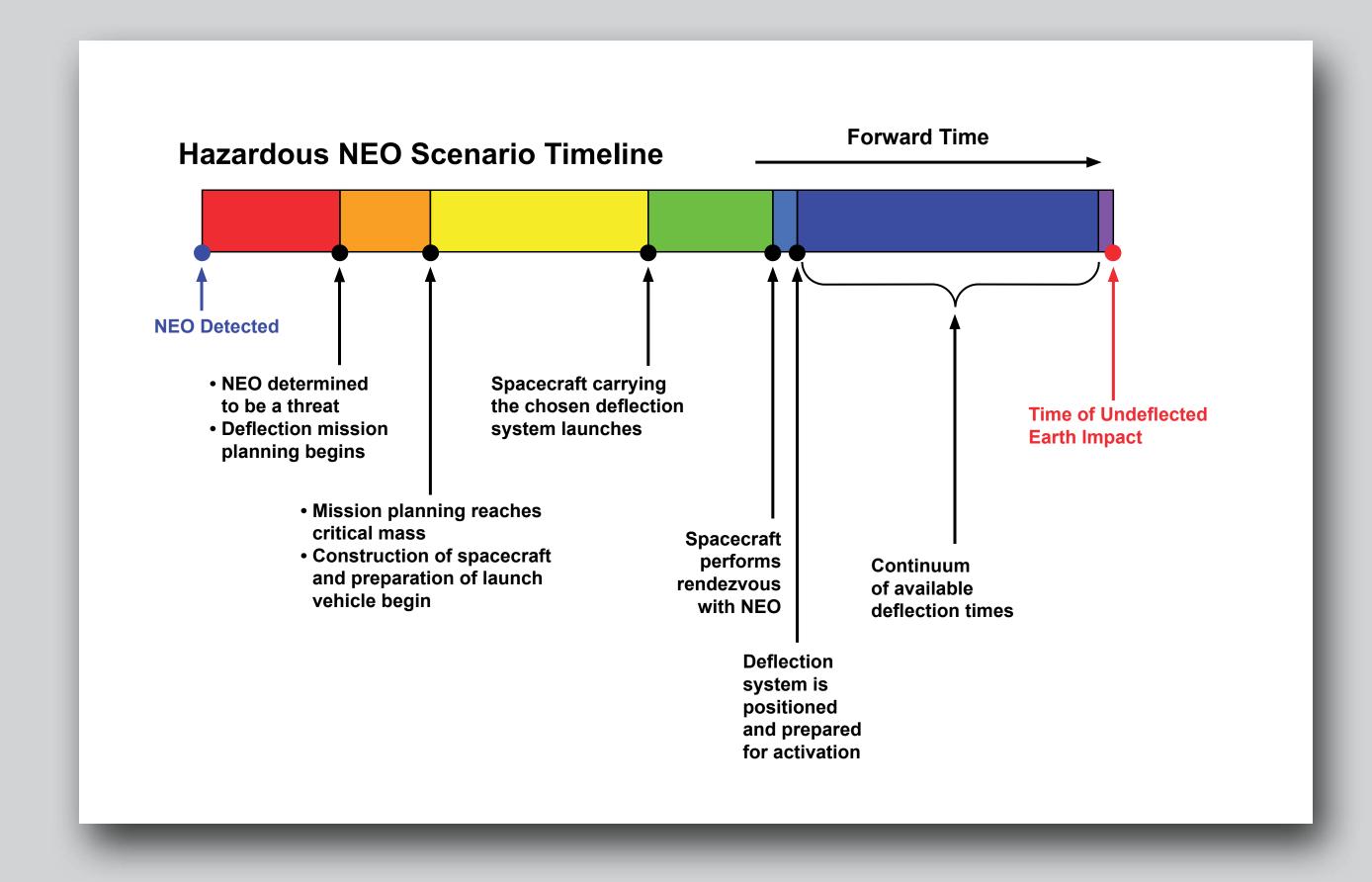


by Bernard D. Seery - NASA Goddard Space Flight Center and Kevin Greenaugh - National Nuclear Security Administration

Regime of Applicability for Impulsive Deflection Methods



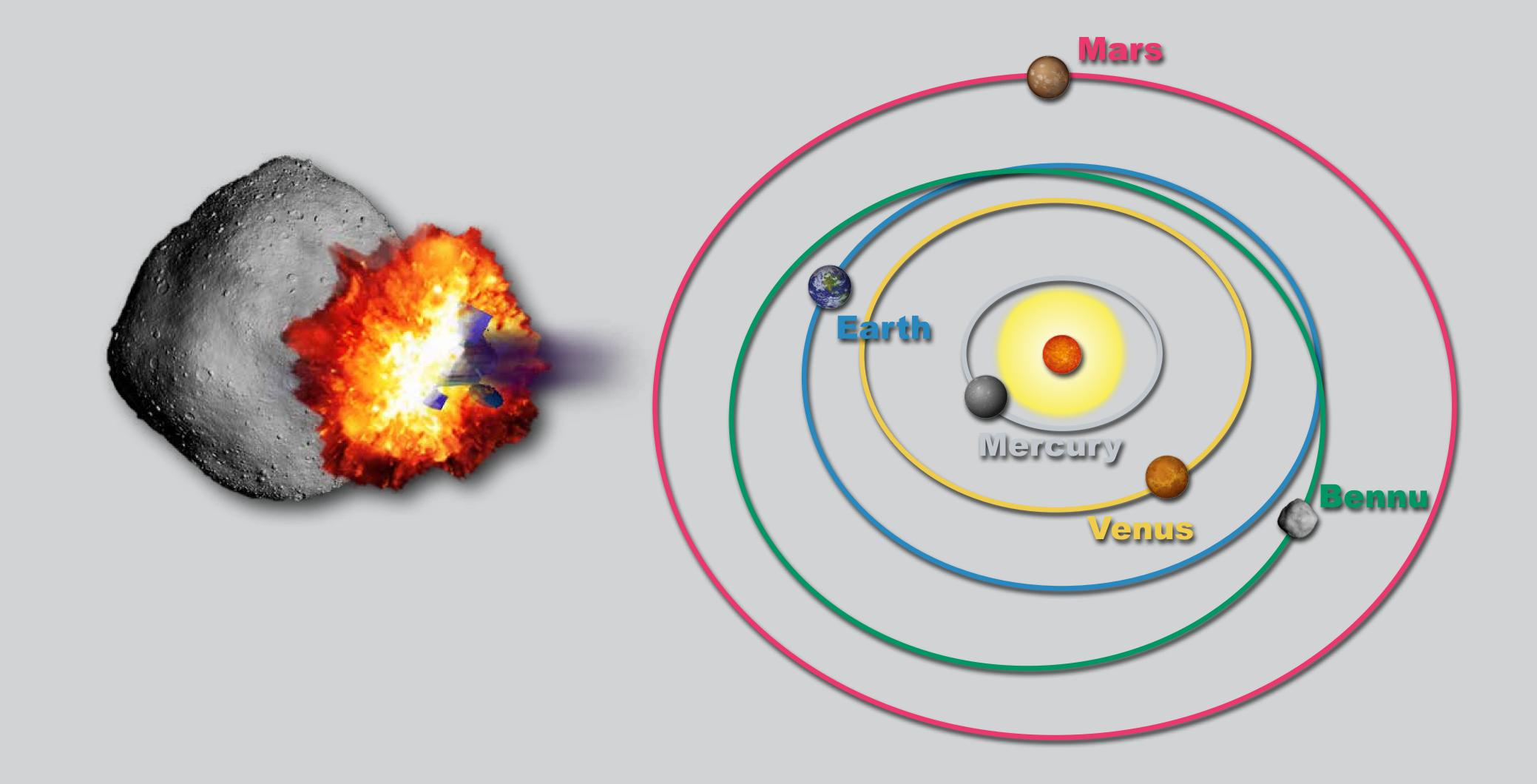
Hazardous NEO Scenario Timeline



NEO Reconnaissance Missions

- Provides essential information, not obtainable from Earth, on the impact probability and physical properties of the object
- Rendezvous or flyby reconnaissance missions could be relatively small, inexpensive, and responsive
- Could increase the potential viability of a kinetic impactor approach

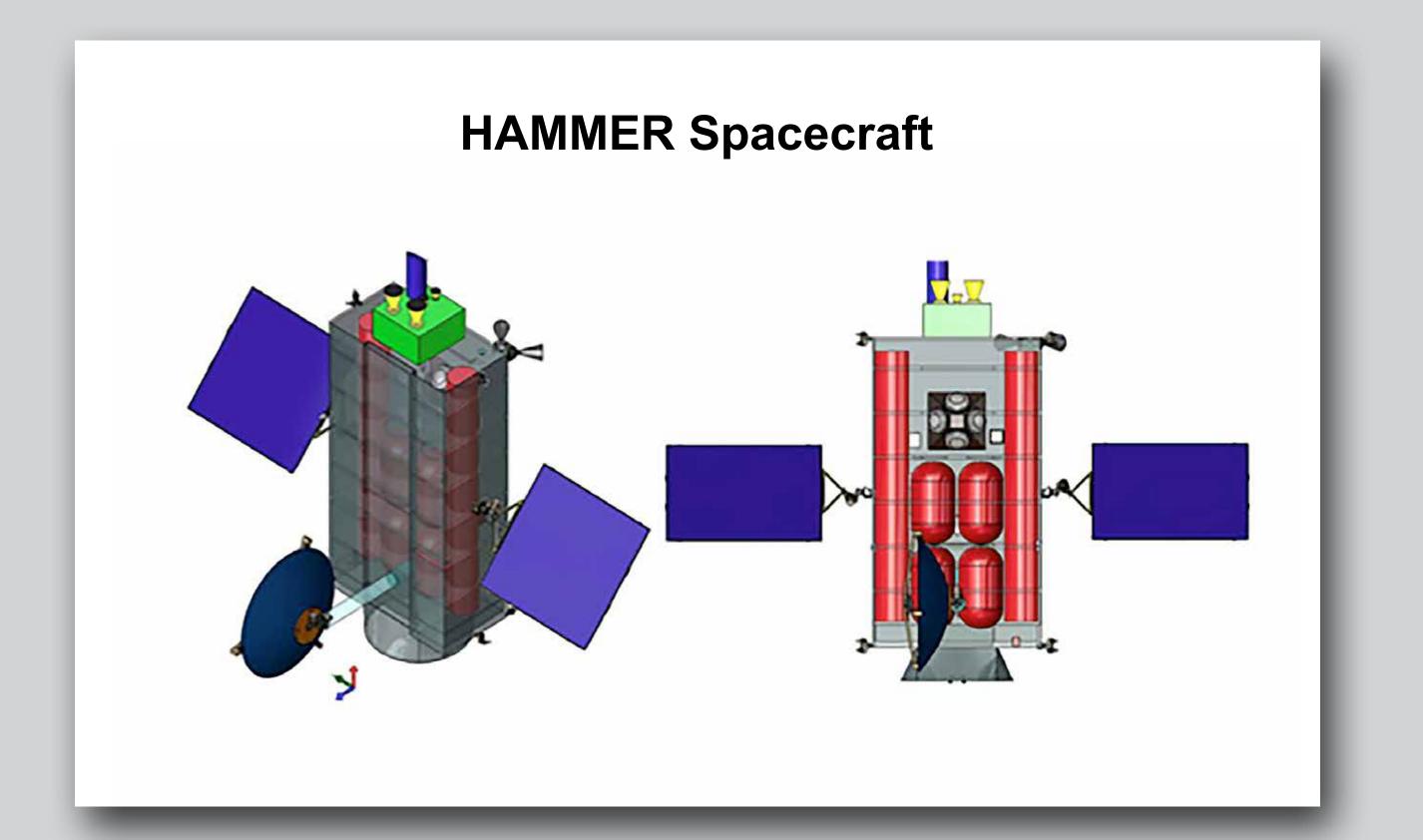
Deflection of a Potentially Hazardous Asteroid RQ 1999 Apollo Asteroid Bennu in the Short Response Regime

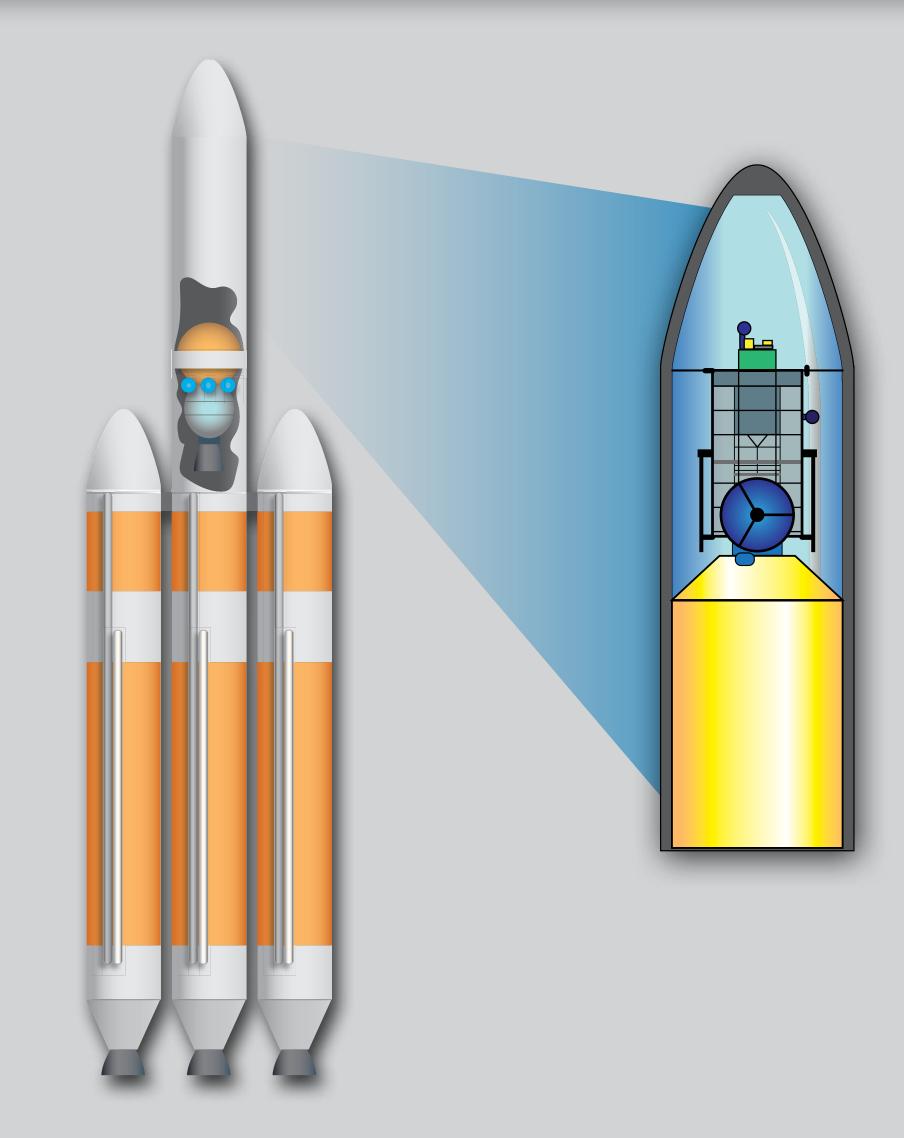


Lessons Learned using Case Study Methodology

- No general rules of thumb; devil is in the details
- Case study approach using a well-posed, systematic analysis is useful to uncover many important details
- Rendezvous recon mission is highly desirable and would remove key physical property uncertainties and increase probability of a successful kinetic impactor mission
- Political constraints aside, the nuclear ablation method is the momentum delivery method of choice

Hypervelocity Asteroid Mitigation Mission for Emergency Response (HAMMER)





Concept pushed the edges of the trade space, where we used all the launcher performance and Delta V to impart momentum to the object