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# Suborbital Asteroid Nuclear Disruption: A United States Space Force Planetary Defense Mission Set

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## ABSTRACT

There has been significant policy movement in the United States in the last several years with regards to the need to mitigate the threat of near earth objects. Recently, the National Aeronautics and Space Administration and the newly formed United States Space Force signed a memorandum of understanding describing their collaboration on this issue. In this work, a technical basis is provided for advocating that specific policies be amended to incorporate planetary defense, and specifically mitigation, as part of the mission of the United States Space Force. The Planetary Defense Conference and Federal Emergency Management Agency hypothetical tabletop exercises represent fictitious but realistic asteroid impact scenarios. These scenarios are used as design reference missions along with 6DoF simulation analysis to demonstrate the mission effectiveness of current United States suborbital space launch vehicles, sensor systems, nuclear arsenal, and a proposed nuclear kill vehicle design for an asteroid nuclear disruption mission. The system technical feasibility and performance analysis are evaluated based on robust disruption of the asteroid and risk corridor defense coverage. The proposed system and mission designs are conceived as part of a mission set for the United States Space Force. In addition to technical feasibility and system performance analysis, potential effects from nuclear weapons detonation and asteroid disruption between altitudes of 2,000 km and 35,000 km are assessed. This work also addresses systems engineering aspects of the proposed system development that include testing, risk, schedule, and cost. Some attention has been given to international and space security issues of the proposed mission including weapons treaties, space law, international cooperation, and nuclear security. Finally, recommendations that include a decision to act, policy changes, next steps, further research, and funding are made based on the technical analysis.