

Summary of Potentially Hazardous Asteroid Workshop Findings

Held 29 May, 2012, at Goddard Space Flight Center

- Near Earth Object 2011 AG5 is a Potentially Hazard Asteroid (PHA) discovered by the NASA supported Catalina Sky Survey on January 8, 2011. Due to the limited observations collected on this object to date, within the current uncertainty of the asteroid's predicted orbit positions is a 0.2% chance that asteroid 2011 AG5 could impact the Earth in February 2040. Should such an impact occur, the estimated 140 meter-sized asteroid could create an energy release roughly equal to 100 megatons TNT.
- The 2040 impact would occur only if the asteroid first passes through a 365 kilometer region in space, called a "keyhole", as it passes within a few million kilometers of Earth during February 2023. There is likewise only a 0.2% chance of this occurring, given our current understanding of its orbit.
- The asteroid is currently unobservable as it is in the daytime sky, but when it becomes easily observable again in Fall 2013, the data expected to be collected will improve our computation of its orbit and could drop the position uncertainty at the 2040 Earth-encounter from its current area of over 200 Earth diameters down to 2-3 Earth diameters. Additional observations expected in 2015-2020 could reduce this uncertainty further.
- Observations of the asteroid earlier than Fall 2013 would be useful, but the object is small, distant and spends much of the time until then on the opposite side of the Sun. Only the largest ground and space telescopes have even a fleeting opportunity to observe it.
- Using observations from Fall 2013 to improve 2011 AG5's orbit has a 95% chance of eliminating the 2040 impact scenario, while further observations in 2015-2016 could drive that to ~99% eliminated.
- On the other hand, in the very unlikely case where the asteroid is actually on an Earth impacting trajectory, the 2013 observations could find the computed impact chance rising to 10% - 15%, and the observations in 2015 - 2016 could find it rising further, to ~70%. Only additional observations in 2013 and 2015 will increase the accuracy of these predictions.
- An impactor spacecraft could be an effective means of deflecting 2011 AG5 to avert an Earth collision. It is desirable to also have a rendezvous spacecraft on station at the asteroid at least a few months before the deflection in order to characterize the object, ease the targeting challenges for the impactor spacecraft, and to provide early confirmation of the magnitude of the deflection. This rendezvous spacecraft could be equipped with a gravity tractor capability as a backup to the impactor spacecraft.
- Many viable mission options exist for carrying out a pre-keyhole (before 2023) deflection campaign for 2011 AG5, using either chemical or solar electric propulsion (SEP) spacecraft, with launches in the 2018-2020 timeframe.
- Viable mission options also exist for carrying out a post-keyhole (after 2023) deflection using existing heavy lift launch vehicles and launch dates in the 2023 - 2030 timeframe.
- While much further study would be required to design optimal pre- and post- keyhole rendezvous and impact missions, this short study has demonstrated that numerous viable deflection mission options are available in the event that the 2011 AG5 is actually on a trajectory leading to a 2040 Earth impact.
- In the unlikely event that observations made in Fall 2013 show a significant increase in the Earth impact probability, there is still sufficient time to plan and carry out a successful deflection campaign.