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EVALUATION OF AERODYNAMIC DECELERATORS FOR EXPLORING KUIPER BELT OBJECTS

Abstract

Since the flyby of NASA's New Horizons spacecraft in 2015, Pluto has attained considerable scientific attention as a very exciting Kuiper Belt Object (KBO). Of particular interest is the discovery of a large but low-density proper atmosphere. This begs the question, how would a probe land on Pluto using a New Horizons-like fast hyperbolic trajectory that enables a low-cost, fast mission opportunity? New Horizons was traveling at 14 km/s during its flyby of Pluto and to land, a probe would require an impractical amount of retro-propulsion due to the high delta-V and as a result, the cost of such a mission would be beyond the cost bounds of a NASA New Frontiers mission. A proposed method of decelerating a New Horizons-like fast hyperbolic trajectory is the use of an Enveloping Aerodynamic Decelerator (EAD). EAD's are able to achieve this because Pluto's atmosphere extends much farther than Earth's atmosphere due to its lower gravity meaning that the EAD can use a gradual increase in atmospheric drag to blead off most of the incoming speed leaving the final 100 m/s up to a propulsive lander. This presentation details effort into EAD requirements and envelope construction techniques to increase the thermal and load performance of the EAD. We will present results on scale EAD models for both packing and inflation tests as well as for aerodynamic drop testing. Finally, we will discuss the potential to use these for the exploration of other outer solar system planetary bodies.