

Exploration of Near Earth Asteroids (06)
Human Exploration of NEAs (1)

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THE FIRST STEPS TOWARDS A DE MINIMUS, AFFORDABLE NEA EXPLORATION
ARCHITECTURE**Abstract**

The impetus for asteroid exploration is scientific, political, and pragmatic. The notion of sending human explorers to asteroids is not new. Piloted missions to these primitive bodies were first discussed in the 1960s, pairing Saturn V rockets with enhanced Apollo spacecraft to explore what were then called "Earth-approaching asteroids." Most recently, the U.S. Human Space Flight Review Committee suggested that near-Earth objects (NEOs) represent a target-rich environment for exploration via the "Flexible Path" option. However, before embarking on such a path, the key is to complete the NEO survey first (coupled with follow-up observations) to identify a sufficient number of targets to enable initial piloted missions of reasonable duration (i.e., <180 days). While approximately 87% of the large NEOs (>1 km

diameter) have been discovered, only about 2 to 3% of the NEO population down to 50 to 100 meters across have been discovered to date. Further, the majority of the NEOs identified by a study team across several NASA centers as "human-accessible" have orbits that are too uncertain, or are probably too small, to consider mounting human expeditions. This initial step of a space-based NEO survey first is the linchpin to laying the foundation of a low-risk architecture to venture out and explore these primitive bodies. We suggest such a minimalist framework architecture from 1) extensive ground-based and precursor spacecraft investigations (while applying operational knowledge from science-driven robotic missions); 2) astronaut servicing of spacecraft operating at geosynchronous Earth orbit (GEO) to retain the essential repertoire of skills and experience with HST servicing, ISS construction, etc.; and 3) applying the sum of these skills, knowledge and experience to piloted missions to NEOs.