

Exploration of Near Earth Asteroids (06)
Precursor Missions to NEAs (2)

Author: Mr. Rob Landis

NASA Wallops Flight Facility, United States, rob.r.landis@nasa.gov

Mr. Lindley Johnson

NASA Headquarters, United States, lindley.johnson@nasa.gov

Dr. Paul Abell

National Aeronautics and Space Administration (NASA), Johnson Space Center, United States,
paul.a.abell@nasa.gov

Mr. Brent Barbee

National Aeronautics and Space Administration (NASA), Goddard Space Flight Center, United States,
brent.w.barbee@nasa.gov

FINDING THE NEAR-EARTH ASTEROID DESTINATIONS FOR HUMAN EXPLORATION

Abstract

The space between Earth and Mars swarms with near-Earth asteroids and comets. These objects represent the leftover building blocks of the early Solar System formation and contain information crucial to understand the processes that influenced planetary accretion and the origins of life. These primitive objects are also some of the most easily accessible bodies in interplanetary space. However, current number of catalogued near-Earth objects represents just a small percentage of the estimated population that is projected to exist within near-Earth space. In order to plan for affordable future human spaceflight (HSF) opportunities, a more complete set of human-accessible near-Earth asteroids (NEAs) with well-known orbits must be obtained. The critical first step towards the goal of sending piloted missions to NEAs is to complete a near-Earth object (NEO) survey using a more effective space-based asset. The current number of known targets is limited and this can be attributed to the fact that all NEO observing assets are currently confined to the vicinity of the Earth. While ongoing ground-based surveys and data archives maintained by the NEO Program Office and the Minor Planet Center (MPC) have provided a solid basis upon which to build, a more complete catalog of the NEO population is required to inform a robust and sustainable HSF exploration program.

Once complete, the resulting catalog of candidate NEOs would be transformed into a matrix of opportunities for robotic and human missions for the next several decades. This matrix would include critical mission parameters (e.g., required Δv , mission duration, departure opportunities, launch windows, etc.), and would be shared with the international community. This matrix would not drive architectures or schedules, but would illustrate opportunities that could be exploited by the respective agencies of the world based on their capabilities and budgets.

The overall return to the NEO community in terms of foundational Solar System science, close proximity flight techniques, and technology/instrument demonstration would be increased through international cooperation, and would provide many targets for piloted missions. Currently, the Global Exploration Roadmap (GER), omits this critical first step for viable exploration of NEAs – a completed space-based survey. We present an overview of four space-based survey concepts; any one of which will discover highly accessible NEO targets suitable for human exploration after just a few years of operation.