Paper ID: 12586
oral
student

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

Author: Mr. Ralf Boden
Technische Universität München, Germany, boden.ralf@mytum.de

Mr. Andreas Hein
Technische Universität München, Germany, andreas.hein@mytum.de
Dr. Junichiro Kawaguchi
Japan Aerospace Exploration Agency (JAXA), Japan, Kawaguchi.Junichiro@jaxa.jp

TARGET SELECTION AND MASS ESTIMATION FOR MANNED NEO EXPLORATION USING A BASELINE MISSION DESIGN

Abstract

Continuing increase of interest in Near-Earth Objects (NEOs) has given rise to considerations of using them as targets for manned missions. Based on scientific value and easy access, these targets can offer mission opportunities that can help bridge the gap between currently available spaceflight technologies and human exploration missions focusing on Mars as final goal. The interest in scientific research of the NEO population itself provides opportunities for research with these mission acting as a stepping stone towards developing human spaceflight capabilities necessary for reaching Mars.

Continuous new NEO discoveries as well as an already large NEO population (8094 as of May 2011) greatly increase the chance of finding promising opportunities. However, the size of the NEO population requires identifying and evaluating promising opportunities, based on interest in them as well as feasibility in terms of mass requirements.

The focus of this paper is on providing a baseline mission architecture for a human NEO mission restricted to a total duration of one year between 2015 and 2035. This allows identifying promising targets and launch windows based on availability and delta-v requirements. By developing a mass model for the required spacecraft, the in LEO masses for a first human NEO mission can be estimated. Missions can then be chosen based on minimum mass requirements and help indicate associated costs.

Mission opportunities are presented as a selection of promising targets including possible example missions with focus on targets that would allow proximity and surface operations. Options for advanced concepts that can improve mass requirements as well as the drawbacks associated with them are also discussed.

The acquired data and mass model of the spacecraft can be used as a basis for developing future, advanced mission architectures and evaluate these architectures with the baseline mission as a reference.