

SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FAR FUTURE (D4)
Novel Concepts and Technologies (1)

Author: Mr. Huai-Chien Chang
The University of TOKYO, Graduate school, Japan, billchan1108@yahoo.co.jp

Mr. Chun-Chieh Wang
National Taipei University of Technology, Taiwan, China, oshukezu@gmail.com

UTILIZING NEAR EARTH OBJECTS (NEOS) AS SPACECRAFT FOR MANNED
INTERPLANETARY EXPLORATION

Abstract

How can we go beyond Mars to explore Europa and finally arrive to the moon Titan, to search for life, with limited ECLSS capability, food/water amount, fuel, etc.?

Near Earth Objects or NEOs are comets or asteroids which have potential orbital intersection and closely approach to Earth. Despite many precursor researches have concluded that Near Earth Objects can be future resources of raw materials for building interplanetary spacecraft, this paper indicates utilizing Near Earth Objects itself would a possible transportation vehicle with habitat for manned interplanetary mission due to it's plenty in amount and abundant resources (e.g. water ice, rare metals, etc.) Advantages of this proposal are: (a) To procure water by mining ice on NEO surface or interior for human life support and ECLSS management.; (b) To obtain sufficient Hydrogen and other possible substances for propellant needs; (c) The paper especially focus on designing of a habitat space by using regolith for an expedition crew (4 to 6 persons) on which NEO provides efficient surface area to do so. Also, regolith may provide a solution for cutting cosmic ray causing harmful result to human body while during interplanetary flight. (d) Plenty of space and soil material for plant factory which may provide nutrition or food for crew members is acquirable by utilizing surface or partial interior of the asteroid or comet.

Mission profile is considered: (a) Sending a core module with a crew of 4 to rendezvous with PHO target; (b) Mining and surface modification will be an on-site process, meanwhile, to produce propellant fuel and necessary material for plants to grow (e.g. food) and potable water; (c) During its flyby to Earth, new modules and crew are launched to rendezvous with the asteroid to extend habitat space; (d) To alter its orbit into Hohmann Transfer Orbit to proceed interplanetary flight course. Detailed sequence of asteroids selection and habitat design is included in full paper.

Utilizing NEOs (or PHAs) for manned interplanetary exploration mission not only is an alternative solution for avoiding designing massive space ship, carrying enormous amount of supplies (i.e. water, food) is unnecessary and cost reducible, but also it opens up a new possibility to procure asteroid resources for human space exploration purpose.

In summary, although this research also points out issues that remain to be discussed in near future, helps to establish further strategies to achieve certain goals on multidisciplinary efforts.