

HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)
How Can We Best Apply Our Experience to Future Human Missions? (2)

Author: Mr. Mark Hemsell
Reaction Engines Ltd., United Kingdom, mark@hempsellastro.com

SPACE STATION ELEMENT COMMONALITY BETWEEN LEO AND LUNAR INFRASTRUCTURES

Abstract

Previous work has shown the many advantages, in terms of cost, speed of acquisition and reliability, of constructing a large in-orbit infrastructure composed of many small stations which maximise the utilisation of common modular elements. This previous work assumed this infrastructure extended out to geostationary and lunar locations but without detailed consideration of the implications of operations beyond Low Earth orbit (LEO). This paper considers implications of the extension of the approach to lunar orbit and the lunar surface in more detail.

The lunar environment imposes both different and additional requirements and constraints on the station modules. These include different radiation environments, different transport systems, different communications and navigation infrastructures and, in the case of lunar surface, a different gravity environment.

It is shown through feasibility concept designs that these new requirements can be incorporated in some modules that can also be used in LEO without any significant impact on their effectiveness, although all the requirements do need to be included at the start of the module development. The approach is considered for both a lunar orbit station and a lunar surface base. The philosophy of a core station of common modules with one or two unique modules providing the specialist function of each of the stations, is shown apply although some new core modules are need for the lunar surface base in the concept designs used as illustration.

It is also argued that the inclusion of lunar infrastructure requirements into the common modules almost completely scopes the additional requirements for operation in geostationary orbit.