

HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Advanced Systems, Technologies, and Innovations for Human Spaceflight (7)

Author: Mr. Mark Hemsell
The British Interplanetary Society, United Kingdom, mark@hempsellastro.com

A CONCEPT STUDY INTO A POST ISS ARCHITECTURE

Abstract

The study examined a potential architecture to sustain a human presence in LEO after the decommissioning of the ISS architecture. The objective was to provide an initial capability that is equivalent to the ISS, with lower cost and increased flexibility for expansion in size and location.

The architecture selected was multiple small PIA (Post ISS Architecture) stations, each around 50 tonnes in mass and a crew of three or four. The core station comprises, a Subsystems Module, a Habitation Module and a Science Module. Each module is sized so that it can be launched any of the world's heavy launch systems. Thus each partner can launch their station with their own launch system keeping a large portion of the acquisition investment within their internal economies. The modules are configured so that the minimum launch mass is 9 tonnes for the smaller launchers but can carry extra supplies and equipment to grow the launch mass to up to 18 tonnes if the launcher has that capability. Each partner can also determine the method of crew and logistics delivery that is most suited to their intended use and circumstances.

The PIA concept relies heavily on ISS legacy; minimising the impact of transition between the two regimes. For example, the Science Module can house 20 International Payload Racks and the new stations could be assembled at the ISS allowing the transfer of racks that would otherwise be lost when the ISS is decommissioned. Other legacy from the ISS includes the RMS, the cargo transfer bags and the power bus voltage.

One aspect that does not follow ISS legacy is that the PIA uses the Universal Space Interface Standard (USIS) rather than any of the docking and berthing ports on the ISS. One key reason the study was conducted, apart from a general contribution to post ISS planning, was as a validation exercise for the USIS requirements.

Four PIA stations roughly match the ISS capability in terms of rack space, available power and other key parameters. Infrastructure expansion beyond this can either be achieved by building more stations or by adding specialist modules to the free berthing port.

It was assumed PIA would be an international venture. Three and four main partner scenarios were examined showing negligible exchange of funds between partners is possible, each partner getting the advantages of international cooperation in shared development, while also enjoying the benefits of independent operational capability.