HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)
Human Space Endeavour: Overview (1)

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REQUIREMENT GENERATION FOR THE HABITATION EXTENSION MODULE

Abstract

In the last few years there has been a debate within the United Kingdom with regard to the long standing Government policy that eschews involvement in human space flight. To inform this debate the Habitation Extension Module (HEM) study was undertaken in order to explore the implications of a British contribution that would lead to full partnership in the ISS programme. This goal is captured in the objective "to make a contribution to the International Space Station that both creates and demonstrates a UK capability to contribute to human space flight that is comparable to other ESA nations". This objective leads to a complex set of operational, technical and political requirements. Normally having stakeholder level requirements in so many diverse areas creates irresolvable conflicts that can lead to the perceived failure of the project; however, it is argued that in the case of HEM these potential conflicts have been resolved. This paper outlines the requirement generation process showing how this resolution has been achieved.

There would be two groups of stakeholders who must be satisfied if the objective is to be met; namely the ISS partners and the United Kingdom. The ISS partners would require a contribution that minimises the impact on the existing ISS configuration, while making a genuine improvement in the facilities it provides, and also that any UK utilisation of the ISS is not at their expense. For Britain a contribution needs to both acquire access to the ISS infrastructure to support its research community and expand the capability of its space industry into human space flight; and this must be achieved within a budget realistic in the context of UK Government finances.

From these generic stakeholder needs the technical requirements for the HEM were derived. Of the contributions that would be seen as positive by the partners and were also realistic for the UK to undertake, the one that seemed most valuable was to expand the habitation areas and restore some of the facilities lost with the cancellation of the US Habitation Module. Since this is mostly the provision of architectured space it also allows the module to act as a logistic carrier, so one programme can both expand the basic ISS facility and also contribute to its running costs.

A technology evaluation has shown that the HEM is within the capabilities of the British Aerospace industry and that in some areas, such as plastic composite structures and avionics, it would enable current UK aerospace strengths to be expanded into the space sector with world class products that would be valuable for further human space flight initiatives.

The HEM seems to be able to be all things to all stakeholders, meeting all their several diverse needs in one modest programme, something that in the past has proved difficult, if not impossible, to achieve. It is thought the reason is that, while the abstract stakeholder needs are real, the way these needs can be met has considerable flexibility and this flexibility opens up the solution space enough for a single engineered product to meet them all. This is an unusual, if not unique, circumstance and so general lessons on space infrastructure requirement generation cannot be drawn from it. However it does highlight the value of clearly stated objectives that fully encompass the stakeholder needs while not artificially adding constraints that unnecessarily limit the technical solutions open to meet them.