SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems Technologies (5)

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THE REQUIREMENT GENERATION PROCESS FOR THE SKYLON LAUNCH SYSTEM

Abstract

The final stage of the concept definition phase of the Skylon launch system development programme included a revision of the configuration from C1 to D1. The existence of 25 years of studies on both the HOTOL and Skylon projects means the redesign was a modest revision of the existing concept rather than a complete redesign. The previous C1 configuration design was created nearly a decade ago and two factors have changed driving the re-examination; the first factor is the change in the payload model and the second the improvement in technical understanding which is the result of various research projects.

After a re-examination of trends in the Space launch market and a series of utilisation studies exploring new applications. The payload model that was derived suggested raising the nominal LEO payload from the 12 tonnes of C1 to the 15 tonnes of D1. This increase was driven by the increasing mass of GEO communication satellites, the need to guarantee 10 tonnes to the ISS, and an allowance that in a reduced launch cost environment the optimum technologies would mean heavier satellites. The increase mass was reflected in an increased size of payload bay from 4.6 m to 4.8 m diameter.

The output of these user requirements studies were used to create a full User Manual with a level of detail comparable to current operational launch systems. This is intended to enable outside organisations to incorporate Skylon into technical studies on the same basis as existing launch systems and to thus hopefully obtain external feedback on the payload provisions, which in part is a validation of the user needs. However, in the technical requirement generation process, the subject of this paper, it was used in place of a user requirement specification as the source stakeholder needs that were incorporated in Skylon's Requirement Specification.

The requirements based on technical feasibility were informed by the results of several technology development programmes conducted since configuration C1. While a few studies have shown that past assumptions were a little optimistic, the majority have improved the performance. The most obvious change is the use of advanced expansion-deflection nozzles to improve the engine performance throughout the powered flight profile. This and other technical advances have enabled realistic system parameters to be set with comfortable performance margins.