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Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and
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Author: Mr. Fred Francis
United States, fhfrancis@socal.rr.com

CHALLENGING THE PARADIGMS OF REUSABLE SPACECRAFT ARCHITECTURE: A FRESH
LOOK AT AN EARLY CONCEPT

Abstract

While heavy-lift capability (100 tons or more to LEO) is essential for manned space exploration, the cost of expendable heavy-lift boosters remains high. The impetus to reduce costs therefore remains, and continues to drive efforts to develop a fully reusable spacecraft. Designing such a spacecraft has nevertheless proven to be an elusive goal. For different reasons, both winged vehicles and Single Stage to Orbit (SSTO) vehicles must be very large to attain the economies of scale necessary for heavy lift, putting their development costs out of practical reach. Given an appropriate paradigm shift, however, recent progress in the relevant technologies may now be sufficient to achieve full reusability, and heavy lift, within the current state of the art. In that context, this paper reexamines one of the original concepts for reusable spacecraft, Philip Bono's ROMBUS/PEGASUS spacecraft, as the basis for an alternative approach.