

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

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LAUNCH STRATEGY FOR MANNED SPACECRAFT: IMPROVING SAFETY OR INCREASING OF
LAUNCH MASS?

Abstract

Traditionally the launch mass of a manned spacecraft equipped with a launch abort system (LAS) should be in compliance with the limit of a launch vehicle (LV) power capacity. The only purpose to use the LAS is returning the crew back to Earth in a number of contingency situations on LV's boost path. But at the same time, some extra fuel for LV (that exceeds the required mass to keep the nominal launch trajectory) in addition to the LAS can improve crew safety for wider range of contingency events. Currently applicable rescue strategies are used for the vehicle emergency landing or splashdown along its flight path (for a spacecraft with a low lift-to-drag ratio, such as "Soyuz" descent module) or landing on a back-up runway located near the flight path (for a spacecraft with a high lift-to-drag ratio, such as "Space Shuttle" orbiter). The advanced Russian manned spacecraft with a low lift-to-drag ratio for flight to the International Space Station is designed for use the new "Vostochny" launch site capabilities. Major part of its flight path in this case will pass over the Pacific Ocean. It means that any rescue operations will be very challenging and complex. The paper explores launch strategies which can be applicable in case of the additional LV fuel use. The optimal strategy can be found using the vehicle guidance to reach a splashdown point selected from a set of specified areas. The number and size of the areas should be minimal in order to minimize search-and-rescue time. A qualitative comparison between the traditional and proposed strategies is discussed.