

IAF SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES (D6)  
Enabling safe commercial spaceflight: vehicles and spaceports (3)

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ANALYSIS OF THE CAUSES AND CONSEQUENCES OF LAUNCH FAILURES OVER THE PAST 20  
YEARS

**Abstract**

Commercial aviation has a fatal accident rate of above 1 in 10 million. Yet, while space launch technology and its flight cadence are very different, the orbital per launch failure rate remains above 5 per cent and has not significantly improved over the past fifty years. A full set of orbital launch failures exists on the Seradata launch and spacecraft database. By investigation, the causes and consequences of each failure have been analysed and grouped, allowing main subsystems to be identified as the main causes, data which may help rocket engineers avoid making design errors. Each failure has also been analysed relative to its effect on a subsequent space mission through an estimation of capability (a measure of the capacity and life lost). Which launches in the life span of a rocket are most susceptible to failure are analysed. This paper presents the main results which could help to reduce the number of stranded spacecraft, thereby helping to make orbital operations more sustainable. The paper also examines where orbital launches fail according to the phase of flight, and the estimated position relative to the launch site. Both are key for the estimation of launch site safety.