

File 20100808.2139: On the subject of risk:

Up through the Viking missions in 1975, NASA planetary missions were launched in pairs. This, in part, reflected the uncertainty of a single probe succeeding. But because the recurring cost of a spacecraft is considerably lower than the total cost, making several reduces the unit cost.

Source: [1, pp. 349–50].

While some degree of random failure is inevitable, there is at least empirical support for the notion that ‘stretching the envelope’ leads to failure. The Aerospace Corporation, which has conducted lengthy studies into spacecraft costs and failures, has developed a ‘complexity index’ in an effort to gauge the technical difficulty of a mission. This index incorporates such factors as... successes occupied the upper left of the graph... and failures tended to fall in the lower right (too fast or too cheap).

One conclusion from this study is that the schedule may be a stronger factor than the cost. Cheap or expensive missions can both succeed, but rushed missions almost always fail.

Source: [1, p. 350].

In as much as failures are the means by which the level of effort or margin on a project are determined (the ‘error signal’ in control theory), a non-zero failure rate is inevitable. Otherwise, how do we know we are not overpaying? ... whether an individual mission fails or not gives no statistically significant information.

Source: [1, p. 351].

References

- [1] David M. Harland and Ralph D. Lorenz. *Space Systems Failures: Disasters and Rescues of Satellites, Rockets and Space Probes*. Praxis, Chichester, UK, 2005.