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AIRCRAFT SAFETY AND SPACE VEHICLE HAZARDS: HOW SAFE FROM SPACE DEBRIS HAZARDS WILL YOUR FUTURE FLIGHTS BE?

Abstract

The nexus between aviation safety and space operations has emerged as a controversial topic in the public's eye and a serious matter for space safety professionals. Media reports have drawn the public's attention to controversial events, such as the closing of European airspace given the threat posed by the reentry of a Chinese upper-stage that later impacted the Indian Ocean without incident. The FAA reported to Congress that "the probability of an aircraft downing accident in 2035 would be 0.0007 per year," based on an analysis by the Aerospace Corporation that accounted for the projected growth in global aircraft traffic and the number of on-orbit objects. SpaceX objected strongly to that report in a letter that described the claims of potential risk of injury and death associated with Starlink as "preposterous, unjustified and inaccurate." SpaceX claimed that the report's analysis was "deeply flawed" because the Starlink satellites completely burn up on reentry, unlike other, earlier satellites such as Iridium spacecraft. A FAA study of the Columbia accident computed between 0.003 and 0.1 expected collisions of Columbia debris with commercial aircraft using the actual commercial aircraft trajectory data at the time of the accident. The highest probability of impact to any individual aircraft was between 1 in 1,000 and 1 in 100, depending on how many small fragments survived to aircraft altitudes but were unrecovered.

This paper will uncover the underlying truth beneath the controversies and explain what is currently done to protect aircraft from potential impacts by space debris during launch and reentry. This multimedia presentation will use readily understood graphics and plain language to reveal the pillars of aircraft protection during launch and reentry:

- How does the FAA establish how safe is safe enough for aircraft that are potentially threatened by a collision with space vehicle debris?
- How does the FAA establish the regions of airspace that are closed or notified to ensure safety during US launch and reentry operations?
- What is done to alert aircraft to debris hazards from unplanned or uncontrolled space debris (including natural debris such as meteoroids)?

This paper will answer a key question: are the current best practices enough to sustain today's high level of aircraft safety given the potential threats from the lifecycle of large LEO constellations, including all the launches needed to deploy them, or should we be working together to develop more advanced methods?