IAF SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES (D6)
Commercial Spaceflight Safety and Emerging Issues (1)

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# SPACE ACCIDENT INVESTIGATIONS: DEFINING THE SCOPE OF INVESTIGATOR PREPAREDNESS AND TRAINING

**Abstract**

The United States' commercial spaceflight industry is experiencing exponential growth with an increase in commercial launch services. In fact, commercial launches have increased thirteen-fold over the last decade. Nonetheless, spaceflight remains an inherently risky activity and the increased scope and frequency of launch activities raises concerns for safety, risk management, and preparedness for accident and incident response. Approaches to safety include risk assessment, mitigation and remediation, which is addressed in part in U.S. licensing requirements. However, mishaps are inevitable in this dynamically evolving field, requiring forward-looking frameworks to respond to and investigate accidents promptly and efficiently. While, the National Transportation and Safety Board (NTSB) is the independent statutory authority charged with investigating transportation accidents on the whole, commercial space accident investigations are conducted pursuant to a Memorandum of Understanding between the NTSB and the Federal Aviation Administration. In addition, the NTSB recently published a notice of proposed rulemaking with the purpose of solidifying investigation parameters for space launch accidents. Nothing yet, however, specifically addresses the scope of investigator preparedness and training for 'spacecraft' accidents. This raises key questions for investigators in addressing a range of potential launch/reentry accident investigation elements unique to spaceflight. For instance, identifying variances in space launch architectures and technologies compared to aviation, adapting/applying human error frameworks like the Human Factors Analysis and Classification System (HFACS), distinguishing size of the debris field, addressing space specific vehicle and payload components, molten metal analysis etc. Each of these factors have specific relevance in spaceflight that differs from an aircraft investigation.

The purpose of this paper is to provide an analytical review of current investigative frameworks, and identify the needs, challenges and interagency requirements for space launch safety and accident investigation going forward. Specifically, this work highlights relevant regulations and scope of authority for investigators, and provides key inputs from aviation and aerospace professionals. Pertinent issues include reviewing prior case investigations, identifying and analyzing potential deficiencies in the existing spacecraft accident investigation process, and raising approaches for further consideration. The analysis is framed by comparing, contrasting, and distinguishing current accident investigations with the uniqueness of spaceflight technologies and investigator training and protocols. The observations and findings of this research seeks to further discussions on optimizing parameters for space accident investigation preparedness and training.