

SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES (D6)  
Commercial Space Flight Safety and Emerging Issues (1)

Author: Mr. Daniel Thomas  
NASA, United States

Mr. Marc Timm  
NASA, United States  
Mr. Gerald Schumann  
NASA Headquarters, United States

HUMAN SPACEFLIGHT MISHAP INVESTIGATIONS: ENABLING A BETTER MODEL FOR  
FUTURE NASA AND COMMERCIAL INVESTIGATIONS

**Abstract**

This paper examines major human spaceflight mishap investigations and the underlying authorities that establish the legal landscape for these investigations. In the next few years, NASA plans to fly three new space vehicles that will carry crew. In addition, commercial companies are preparing to send humans on orbital and sub-orbital flights. Even though the mishaps of Apollo 1, Challenger, and Columbia have been studied extensively, applying those lessons to new investigations will be critical to human spaceflight development. Further, the expanding roles of investigative authorities such as the Federal Aviation Administration (FAA) and the National Transportation Safety Board (NTSB) in commercial spaceflight mishaps will add to the complexity. For example, the NTSB was the sole investigation authority for Virgin Galactic's Space Ship Two mishap in 2014. In the past, NASA conducted mishap investigations based on its inherent authority in the Space Act. However, a 2005 Space Act amendment requires a Presidential Commission to investigate human spaceflight mishaps involving loss of crew or loss of vehicle. When future crewed flights to the International Space Station (ISS) have an FAA license, NTSB may conduct the investigation. In contrast, mishaps involving ISS activities may involve agreements between international partners. The legal structure for the ISS specifically provides for cooperation during mishap investigations. When a European Space Agency astronaut had a close call on ISS in 2013, NASA's investigation included observers from international partners. To reconcile these overlapping authorities, different agreements, and to develop a better model for future investigations, we may draw from the experience of civil space investigations and military mishap investigation processes. In military aviation accidents a safety investigation determines root cause and a legal investigation focuses on responsibility for mishaps. Recent civil space mishaps occurring during launch activities, including loss of the Orbiting Carbon Observatory (2009) and Glory (2011), relied on a NASA-led investigation. A different set of legal authorities were involved in more recent FAA-licensed activities, including Orbital's mishap in October 2014 and the SpaceX mishap in June 2015. FAA, NTSB, NASA, and the commercial provider were involved in these mishaps. Having a clear understanding of the legal authorities involved and the role of these investigations in future spaceflight development will be key. This understanding, in turn, will help both NASA and the international commercial space community develop the most effective investigation model to support the growth of human spaceflight.