

Between the years 2006 and 2011, three catastrophic in-flight cargo fires originated within unit loading devices (ULDs). This led to a great deal of research by the National Transportation Safety Board (NTSB) and the Federal Aviation Administration (FAA) to better understand the root cause of the accidents and ways that future accidents can be mitigated. The accident investigation and research found that ULDs have a significant effect on the time it takes for a fire to become detectable to an outside smoke detector. This allows for an extended period of exponential fire growth before the activation of the aircraft fire suppression system. Two ULD-installed fire detection systems such as air sampling smoke detectors and battery-powered wireless smoke detectors have demonstrated the ability to detect fires inside ULDs before being detectable by cargo compartment fire detection systems. However, large startup expenses, recurring maintenance, inventorying, and scheduling for the approximated one million ULDs that are in use are preventing these systems from being used. Ultra-high frequency (UHF) radio frequency identification (RFID) systems can collect data from one or more unpowered assets simultaneously without a line of sight. Recent advances in RFID tags allow them to sense physical parameters such as temperature, moisture, and pressure of unpowered assets. The research proposes an investigation of using UHF RFID for the early detection of fires originating inside ULDs. Passive temperature sensing tags have been selected because of their low cost and long life span. They can theoretically act as heat detectors to alert the flight crew of a potential fire earlier than what is currently possible with cargo compartment fire detection systems. This work would involve system design and integration, experimental validation, and a cost-benefit analysis for the installation of the UHF RFID false alarm resistant heat detection system inside aircraft cargo compartments and ULDs.