

The Pattern and Relationship between Errors and Contribution

Factors in Aviation Maintenance

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Abstract

Increasingly research recognized the contribution of maintenance to accidents and incidents is one of the most pressing threats to the safety of complex aviation systems. Most methods of analyzing accidents or incidents based on broad categories of error/factor, which are hard to address the possible relationships between error and factor, and even harder in quantitative way. Moreover, these research are limited to the study of unsafe acts of human operators reported by maintenance personnel, therefore cannot provide a overall understanding regarding to maintenance contribute to the aviation safety.

This study quantifies and compares the total amount of reports and maintenance-related reports by analyzing three primary sources of data—NTSB Accidents/ Incident reports, FAA/AIDS Incident reports and NASA/ASRS Incident reports from 1999 to 2008. It indicates the high frequency maintenance issues from ASRS contribute to incidents; meanwhile, the narrative text in ASRS contains sufficient information as well as valuable information sources for analyzing maintenance errors and factors. By conducting in-depth analysis sample data drew from ASRS 2008, we found 7.2% of reported incidents by non-maintenance personnel is even a larger proportion comparing with 5.8% incidents by maintenance personnel. In a series of studies, the above type of errors and factors were determined by Maintenance Error Decision Aid; that is, each type of errors was associated with different clusters of factors were determined by qualitative Correspondence Analysis and quantitative Odds ratio. We found quite a few maintenance-caused installation errors, caused by hardware and equipment/tools issues, cannot be detected immediately until they were brought up on the non-maintenance reports. However, to the Inspection and Servicing errors, not only individual factor, but Organizational and Communication factors also have a huge impact on maintenance-related incidents; hence, Organization must be viewed as a system where the maintainer or non-maintenance is just one part of the system, management need to be improved to reduce or eliminate most contributing factors. The goal of this research is to prove ASRS reports as a powerful resource that contains sufficient and accurate information to conduct in-depth analysis based on narrative text, in order to provide recommendations that could improve the quality of maintenance work.