Research results have shown that more than half of aviation, aerospace and aeronautics mishaps/incidents are attributed to human error. Although many existing incident report systems have been beneficial for identifying engineering failures, most of them are not designed around a theoretical framework of human error, thus failing to address core issues and causes of the mishaps. Therefore, it is imperative to develop a human error assessment framework to identify these causes.

This research focused on identifying causes of human error and leading contributors to historical Launch Vehicle Ground Processing Operations mishaps based on past mishaps, near mishaps, and close calls. Three hypotheses were discussed. The first hypothesis addressed the impact Human Factor Analysis and Classification System (HFACS) contributing factors (unsafe acts of operations, preconditions for unsafe acts, unsafe supervision, and/or organizational influences) have on human error events (i.e. mishaps, close calls, incident or accidents) in NASA Ground Processing Operations. The second hypothesis focused on determining if the HFACS framework conceptual model could be proven to be a viable analysis and classification system to help identify both latent and active underlining contributors and causes of human error in ground processing operations. Lastly, the third hypothesis focused on determining if the development of a model using the Human Error Assessment and Reduction Technique (HEART) assessment could be used as a tool to help determine the probability of human error occurrence, in order to help minimize human error in ground processing operations.

A model to analyze and identify contributing factors to mishaps or incidents, and generate predicted Human Error Probabilities (HEPs) of future occurrence was developed using the HEART and HFACS tools. The research methodology was applied (retrospectively) to six Ground Processing Operations (GPO) Scenarios and 30 years of Launch Vehicle Related Mishap Data. Surveys were used to provide Subject Matter Experts’ (SMEs) subjective assessments of the impact Error Producing Conditions had on specific tasks.

This research generated a Logistic Binary Regression model which identified the four most significant contributing HFACS human error factors and provided predicted probabilities of future occurrence of mishaps when these contributing factors are present.

The results showed that the HEART and HFACS methods, when modified, can be used as an analysis tool to identify contributing factors, their impact on human error events, and predict the potential probability of future human error occurrence. This methodology and framework was validated through consistency and comparison to other related research. A contribution methodology for other space operations and similar complex operations to follow was provided from this research. Future research should involve broadening the scope to explore and identify other existing models of human error management systems to integrate into complex space systems beyond what was conducted in this research.

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The public is welcome to attend.