SPACE OPERATIONS SYMPOSIUM (B6)
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INCREASING OPERATIONAL SECURITY TO SUPPORT SCIENCE MISSIONS

Abstract

Before being sent into space, astronauts undergo extensive preparation and training. Given the intricacy of space operations, maintenance, and payload operations and servicing, astronauts must specialize in the preparation, so that at least one crewmember is specifically equipped to handle each task.

While generally effective, this poses some obvious problems, such as if the trained crewmember is unavailable when a specific task is to be performed. Redundancy in the training is usually constrained to critical components, which leaves other tasks unperformed or passed on to a crewmember that has not been trained on the given task, when the original crewmember is unable to perform the given task. . NASA introduced the concept of a Standard Operating Procedure (SOP) partially to mitigate the potential problems of such occurrences. An SOP includes detailed step-by-step instructions about how to perform a specific task. Unfortunately, there are several examples where tasks have been carried out erroneously by inexperienced crewmembers, even though they consulted the relevant SOPs.

Currently, the SOP is typically written in very dense and technical language. Adding the stressful space environment (with the discomforts and loud background noise that is typical), an astronaut is at a huge disadvantage when attempting to decipher the instructions and apply them to the task at hand. Although somewhat standardized in nature, the rules for creating an SOP allow for flexibility that leads to dramatic variances in the writing style, level of detail and illustration between SOPs from different organizations. Further exacerbating the problem is the lack of appropriate before and after step imagery to add to the performers' understanding of the task to be completed.

Simplifying and standardizing the SOP across organizations and vendors, in terms of language, grammar and the addition of appropriate images and video demonstrations, can improve performance accuracy. This allows as inexperienced crewmember, already experiencing negative stress with the surrounding environment and the task to be completed, to (with greater speed and accuracy) determine what needs to be done, how to do it, and successfully complete the task.

This paper presents several changes that can be made to astronaut training, the SOP (and surrounding documentation), and the support personnel and validation procedures used to ensure efficient and accurate completion of both critical and non-critical tasks. This both enhances the operational security of the space mission, and serves to increase the productivity of scientific research.