NASA's LADEE Mission Mishap

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The revolutionizing LADEE mission was designed to study and collect data on dust conditions on the lunar surface and atmosphere. As a part of this mission, LADEE would help develop future designs for lunar outposts and robotic missions, however, it suffered a major setback during vibration testing. Several changes were made in risk management, team responsibilities, and preparedness as a result of this mishap.

The LADEE mission highlighted the failure to properly use the risk management plan during the testing phase on the Engineering Test Unit (ETU). The testing team did not identify the potential risks of their actions and did not have complete knowledge of the sine burst vibrational tester, the testing device used to "qualify the strength of an item and its design for flight" (Page 1, Paragraph 3). Adding to this, neither the test director nor the test engineer knew that the sine burst test was calibrated using several low-level, wide-band random pulses (Page 2, Paragraph 5). This lack of knowledge led to the devastation of the LADEE ETU. These examples prove that the Risk Management Plan is crucial for any mission since it identifies, assesses, and mitigates potential risks. Five main elements should be included in a risk management plan: identification of potential risks, risk assessment, risk mitigation strategies, defining roles and responsibilities, and monitoring risks. A comprehensive risk management plan with these elements will identify potential hazards, determine the magnitude of the threats posed, eliminate risks, define responsibilities to improve communication, and monitor risks to ensure the mitigation strategies are working.

In addition to the failure to execute the risk management plan, another aspect that led to the incident was the team's lack of understanding of their responsibilities before the test. A fully operational and undamaged sine burst vibrational tester should have been used to ensure proper

testing. However, “Post mishap forensics revealed that the sliptable had indications of damage prior to the mishap.” (Page 3, Paragraph 5). Another example is that the test engineer—the person overlooking the table operator—did not fully understand the control system of the vibration table (Page 3, Paragraph 5). All of these blunders could have been avoided with more training and education, providing the knowledge needed to understand the intricacies of testing procedures which include the roles and responsibilities of each team member. Additionally, conducting simulation exercises can help the team be prepared for potential scenarios. The addition of these measures will help to reduce or completely avoid mishaps like LADEE from happening again.

Even if these measures are implemented, personnel must remain aware and cautious of potential risks that can cause damage to both equipment and personnel safety. Some risks that were highlighted in the LADEE mishap article were equipment malfunctions, calibration errors, human errors, and pre-existing damage to equipment. Equipment malfunctions are fairly likely due to the complexity of high-tech machinery and the frequent glitches that come with them. Calibration errors can be labeled as possible since various types of equipment have certain calibration processes that are unique to them. Human errors, such as miscommunication, are classified as possible since they can arise due to the intricate process of testing procedures. Finally, it is unlikely that there is pre-existing damage to equipment because they are regularly checked and tested for optimal functionality. All these potential hazards are only a few on the huge spectrum of possible risks and further show that personnel should be aware and prepared.

The LADEE mission’s mishap led to crucial changes in risk management, team responsibilities, and overall preparedness. The failure in execution of the risk management plan proved the necessity of it. Additionally, the mishap emphasized the importance of team

education and simulation exercises to avoid similar events from occurring again. Despite measures like these being implemented, personnel must stay aware of potential risks such as equipment malfunction, calibration errors, human errors, and pre-existing damage, based on their likelihood of occurrence. Overall, these approaches to risk management and preparedness are essential in ensuring the success and safety of space missions.