

NASA AEROSPACE FLIGHT BATTERY SYSTEM PROGRAM PLAN

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Summary

The objective of the NASA flight system program is to provide NASA with a policy and posture which will increase the safety, performance and reliability of space power systems. This will be accomplished through better control over battery system integration and improved performance, safety, and quality of primary and secondary cells and batteries. All NASA centers will be involved according to their expertise, resulting in a unified, coordinated effort for future problem avoidance and improved performance, safety, and reliability.

Introduction

Although batteries and related power systems have not been a major contributor to flight failures, their performance, at times, has caused concern within NASA. At the Agency's request, the Jet Propulsion Laboratory (JPL) studied the actual performance of flight power systems. A thorough assessment of the state of technology revealed possible solutions to problems and ways to improve the current status of primary and secondary batteries in addition to power system integration.

This plan outlines the necessary steps to re-establish the quality, safety, and reliability of standard nickel-cadmium cells. It provides for the incorporation of new, advanced technologies, and improvements in the performance and life of battery systems for future NASA missions. It also looks at the present status of primary cells and batteries to reduce the large number of chemistries involved.

Program plan overview

This plan addresses NASA flight battery and related flight power system activities that are essential for safe, reliable, and technically adequate performance during ground and flight operations. The policy, standards, and specifications developed by this plan will provide guidance for NASA project

and program managers. In addition, this plan will provide for the safe and reliable operation of flight batteries, including operation at higher levels of performance. Measures for reliable power systems for flight vehicle applications will be identified. The identification of missing or inadequate technical controls within the Agency and the alleviation of these conditions are essential elements of this plan. Furthermore, the plan will provide for the timely identification of the future technical needs of NASA in terms of hardware development and research.

The NASA Aerospace Flight Battery System Program Plan is intended to be responsive to NASA's anticipated needs for high performance as well as safe and reliable energy storage space power systems. In the near term the program will: (a) establish the necessary data bases, (b) assure that short-term mission requirements will be met, and (c) improve the reliability of power systems. The long range goals are designed to improve the performance and reliability of energy storage power systems to meet NASA's future needs. It will also maintain a data base to ensure problem identification and resolution.

Program tasks

This program is designed to enhance the safety, reliability, and performance of NASA's aerospace primary and secondary batteries as well as battery power systems. It is also intended to bring NASA up to state-of-the-art with current battery technology. A total of four tasks are required, these will be briefly described in this section.

Program management

To provide continuing coordination with all the NASA centers, JPL, NASA Headquarters, and the Battery Steering Committee. To review progress and requirements in order to provide program redirection as required. To provide technical management, cost and scheduling of the program.

Battery systems technology

To improve the reliability of energy storage space power system design, integration and checkout. This is to be achieved through the development of NASA handbooks, training programs, a problem-reporting mechanism, and enhancement of communications throughout the agency.

Secondary battery technology

To improve the performance, quality, safety and reliability of secondary battery systems. It will involve the establishment of a performance data base for state-of-the-art batteries and new procurement processes to resolve present manufacturing problems. This task will focus on the understanding of critical performance parameters and the upgrading of the test facilities to maintain the necessary data bases.

Primary battery technology

To improve the performance, safety and reliability of primary battery systems. To reduce the number of chemistries used for primary batteries in order to improve characterization and controls. The activity will also include the establishment of space-qualified cells and guidelines for design and operation of primary batteries.

Implementation

Successful implementation of the program requires participation and cooperation throughout all NASA levels. The NASA Lewis Research Center has been assigned the responsibility of the lead center. The NASA Battery Steering Committee will provide guidance and recommend priorities for the activities covered. The different tasks will be performed by the assigned NASA center or JPL in line with the expertise of each center. Overall objectives, guidelines and funding will be provided by NASA Headquarters, Code Q. An overview of the structure and responsibilities of the center is shown in Fig. 1.

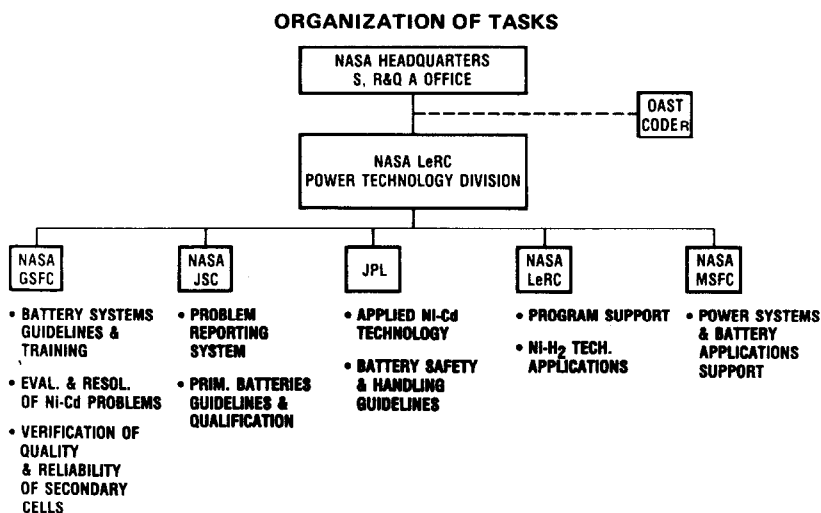


Fig. 1.

Concluding remarks

This program addresses flight battery and related flight power system activities which are essential for safe, reliable, and technically adequate performance during ground and flight operations. The plan responds to battery/system problems and the goals of improved reliability, safety, and performance are attainable. The plan will also enhance understanding and communications throughout the agency resulting in a unified, coordinated effort for future problem avoidance. It is certainly an inexpensive effort relative to benefits.