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## **DEVELOPING A CROSS-PROJECT SUPPORT SYSTEM DURING MISSION OPERATIONS: DEEP SPACE 1 EXTENDED MISSION FLIGHT CONTROL**

Low budget missions have begun to look at cross-project support to reduce the cost of operations. During its mission the Deep Space 1 (DS1) project realized that they needed to find a system of cross support in order to stay within their budget. This paper is meant to address the specific tasks involved in arranging cross support, and also to show what led to the successful adaptation to cross support. Launched in 1998, DS1, was the first mission of NASA's New Millennium Project (NMP). NMP conducts low cost missions with the objective of flight testing new, high-risk technologies in order to reduce costs and risks for future scientific missions. DS1 had tested all of its twelve new technologies successfully by September of 1999. An encounter with Comet Borrelly ended the extended mission in September of 2001. The hyper-extended mission conducted end of life tests on the ion propulsion system and other technologies. In the extended and hyper-extended missions DS1 was given funding for only a very small, full time flight team. The Flight Control Team (FCT) in particular found themselves short on aces (call sign for flight/mission controllers) to staff critical operations during DSN passes.

As the extended mission got underway DS1 started looking for a way to support all the passes on their limited budget. The Flight Control Engineer asked other projects to lend aces to help support. Two projects, Cassini and Galileo, offered to help. This meant that DS1 only needed to find a budget for a few extra hours of ace support a week. Two systems were created for the "borrowed" aces: one where the ace would track from the DS1 Mission Support Area (MSA), and one where the ace tracked DS1 from his project's MSA. The project referred to the first ace as a "dedicated ace" and the second as a "multi-mission ace". A dedicated ace was used when there was a significant amount of commanding, the spacecraft needed constant attention, and/or other important operations where the flight team wanted to communicate with the aces. The other system was to allow the ace to track DS1 at the same time as his usual spacecraft. This system was used for shorter tracks, or parts of long tracks, when little or no commanding was needed.

The Flight Control Engineer's job changed to account for these changes to the traditional system, that of aces specializing in one project. Because of the multiple support options and multiple schedules to work with and around, scheduling ace support became more complicated. Inter-project relations became more important to DS1, and especially the FCT lead, as the other projects became a part of the flight team. Tools for supporting DSN passes also became a larger part of the FCT lead's job. Ensuring that the scattered ace computers were operable was important to the success of a track, as was making project procedures and the NOP (Network Operations Plan) available to the cross support aces. DS1 found that cross support could be a successful method of finding ace support.