

## **NEAR Mission Operations: Demonstrated Strengths and Weaknesses of a "Faster, Better, Cheaper" Program**

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The Near Earth Asteroid Rendezvous (NEAR) Mission was successfully launched on February 17, 1996 from Cape Canaveral Air Force Base. A small mission operations team of 8 to 12 people have controlled the NEAR spacecraft from the JHU/APL campus in Maryland since then, using Deep Space Network ground stations and NASCOM circuitry, a Commercial Off The Shelf (COTS) ground computer system, and a unique streamlined concept of operations.

The primary science data gathering portion of the mission will not begin until rendezvous with the asteroid EROS in January 1999, but 3 exciting "bonus" science observations have already occurred: visible images of the Earth's Moon were taken on mission day 4, passive momentum dumping was demonstrated using solar pressure and small attitude offsets held for long periods of time, and visible images of the comet Hyakutake were taken from 1 million kilometers range on mission day 37. These "bonus" science observations were made possible by the less-formal concept of operations coupled with a very experienced senior group of people running operations.

In the arena of mission operations, the mantra "faster, better, cheaper" should be discarded and replaced with "faster, cheaper, increased risk". No significant failures have occurred in any flight or ground subsystem, and that is fortunate because short-term operational risk was uncomfortably high in the area of contingency readiness. Contingency readiness was limited in scope due to lack of schedule time ("faster") and man-hours ("cheaper"). No long-term operational risks are expected, but there was a sobering amount of team cross training and software tool development which remained unfinished 30 days after launch. The NEAR mission three year cruise period provides ample time to complete this work: early mission experience with simultaneous operations and software tool development will be discussed.

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