

**Increases in Efficiency and  
Enhancements to the  
Mars Observer Non-stored Commanding Process**

**ABSTRACT**

**Robert N. Brooks Jr.  
Mars Observer  
Planning and Sequencing Team Chief**

**J. Leigh Torgerson  
Mars Observer  
Deputy Spacecraft Team Chief for Operations**

The Mars Observer team was, until the untimely loss of the spacecraft on August 21, 1993, performing flight operations with greater efficiency and speed than any previous JPL mission of its size. This level of through-put was made possible by a Mission Operations System which was composed of skilled personnel using sophisticated sequencing and commanding tools.

During cruise flight operations, however, it was realized by the project that this commanding level was not going to be sufficient to support the activities planned for mapping operations. The project had committed to providing the science instrument principle investigators with a much higher level of commanding during mapping. Thus, the project began taking steps to enhance the capabilities of the flight team. One mechanism used by project management was a tool available from Total Quality Management (TQM). This tool is known as a Process Action Team (PAT).

The Mars Observer PAT was tasked to increase the capacity of the flight team's non-stored commanding process by fifty percent with no increase in staffing and a minimal increase in risk. The outcome of this effort was to, in fact, increase the capacity by a factor of 2.5 rather than the desired fifty percent and actually reduce risk. The majority of these improvements came from the automation of the existing command process. These results required very few changes to the existing mission operations system. Rather, the PAT was able to take advantage of automation capabilities inherent in the existing system and make changes to the existing flight team procedures.

This paper will describe in detail the enhancements recommended by the PAT for the non-stored command generation process on Mars Observer. This will be contrasted with the process used by the flight team prior to implementation of these improvements. Finally, there will be a discussion of the applicability of the techniques devised by the PAT for enhancement of the non-stored command process to present and future projects.