

IAF'96 MGS Abstract

Mars Global Surveyor: Ready for Launch in November 1996

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The Mars Global Surveyor (MGS) spacecraft will be launched toward Mars in November of 1996. This mission is the first in the Mars Surveyor Program and has been under development for the past 24 months. At last year's IAF meeting the technical and programmatic bases for the mission were discussed. In this report the status of the MGS mission, one month prior to launch, will be described along with three specific topics: Aerobraking, the lander-orbiter relay and the common operations project for the Mars Surveyor Program.

The Mars Global Surveyor mission is intended to accomplish a portion of the scientific objectives of the Mars Observer mission which was lost in 1993, three days before entering Mars orbit. The MGS spacecraft will have a launch mass about two and one-half times smaller than Mars Observer. Most of this difference is in the fuel and oxidizer Mars Observer would have used to lower and circularize its orbit about Mars by chemical propulsion. MGS will achieve the same low, sun-synchronous, polar-mapping orbit by using aerobraking to move from an initial orbit, following Mars orbit insertion, of about 48 hours to the final mapping orbit with a period of 118 minutes. Apoapsis is reduced from about 60,000 km to 400 km in this process. For MGS the primary energy and momentum reduction will occur in the vicinity of 110 km above the surface, a region of the atmosphere where few measurements of density and its variability have been made. To accommodate this uncertainty the spacecraft has the control authority and thermal margin to survive an unexpected increase in atmospheric density of 70% at any periapsis.

In addition to being near circular, the final mapping orbit is to be sun-synchronous at 2:00 PM \pm 12 minutes relative to the mean sun. For most of the period of aerobraking the rate of change of the angle of the orbit plane to the sun is controlled by the orbital motion of Mars itself. This requires that aerobraking proceed at a nearly unbroken pace if all the parameters of the final mapping orbit are to be achieved.

MGS carries a Mars Relay (MR) receiver/transmitter, built by CNES, which will be available for operation over the entire five year orbital mission ending in January of 2003. This relay is open for international use and is intended to supplement the data return from Mars landers and provide a backup relay capability for such landers. First use of the MR will be with the small stations of the Russian 1996 mission and will continue with the Mars Surveyor 1998 lander and New Millennium microprobes.

Mars Global Surveyor will be followed by the orbiter and landers of the Mars Surveyor 1998 mission which are now well under development. Operation of the spacecraft in the Surveyor series will be conducted under a single Mars Surveyor Operations Project. Significant improvements in the automation of sequence generation, commanding, health monitoring and navigation will be required to simultaneously operate a series of vehicles at Mars in a single cost constrained program.