

FINAL

NASA/CR-97- 205787

**Proposal Title:** Mars Observer Laser Altimeter  
**Principal Investigator:** Maria T. Zuber  
**Grant:** NAG5-2222

### Introduction

The objective of this study was to support the rebuild and implementation of the Mars Orbiter Laser Altimeter (MOLA) investigation and to perform scientific analysis of current Mars data relevant to the future investigation. The instrument is part of the payload of the NASA Mars Global Surveyor (MGS) mission. The instrument is a rebuild of the Mars Observer Laser Altimeter that was originally flown on the ill-fated Mars Observer mission.

### Work Completed

The following tasks were accomplished as part of the investigation:

- Participated in initial planning of the Mars Global Surveyor mission after the loss of Mars Observer, including instrument re-design and rebuild.
- Attended meetings and reviews in support of the MOLA investigation.
- Assisted in preparation of budgets, schedules and documentation.
- Participated in the development of a new gravitational field for Mars from re-analysis of Mariner 9 and Viking Orbiter Doppler tracking data.
- Performed re-analysis of Mariner 9 and Viking Orbiter occultations to develop a new shape of Mars.
- Participated in simultaneous estimation of the masses of Mars and its natural satellites Phobos and Deimos.
- Determined a formalism to remove the attraction of the Tharsis bulge from the Mars gravity field.

### Refereed Publications

- Smith, D.E., F.J. Lerch, R.S. Nerem, M.T. Zuber, G.B. Patel, S.K. Fricke, and F.G. Lemoine, An improved gravity model for Mars: Goddard Mars Model-1 (GMM-1), *J. Geophys. Res.*, 98, 20,871-20,899, 1993.
- Smith, D.E., and M.T. Zuber, New gravity field for Mars fuels new research, *EOS Trans. Am. Geophys. Un.*, 75, 97, 1994.
- Smith, D.E., F.G. Lemoine, and M.T. Zuber, Simultaneous estimation of the masses of Mars, Phobos, and Deimos from spacecraft distant encounters, *Geophys. Res. Lett.*, 22, 2171-2174, 1995.

Smith, D.E., and M.T. Zuber, The shape of Mars and the topographic signature of the hemispheric dichotomy, *Science*, 271, 184-188, 1996.

Zuber, M.T., and D.E. Smith, Mars without Tharsis, submitted to *J. Geophys. Res.*, 1997.

Budget Summary

To be provided by Johns Hopkins University, where most of the work was performed.