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NASA Final Technical Report
Co-Investigator Participation in the Mars-94 Mission:
Studies of the Martian Magnetic Field
NAGW-2573

and
Co-Investigator Participation in the Mars 96 Mission:
Studies of the Martian Magnetic Field
NAG5-4612
For the period 02/1/91 – 01/31/98

Principal Investigator: C. T. Russell

This report covers two awards: the first NAGW-2573 was awarded to enable participation in the Mars 94 mission that slipped to become the Mars 96 mission. Upon the unfortunate failure of Mars 96 to achieve its intended trajectory, the second grant was awarded to closeout the Mars 96 activities. Our initial efforts concentrated on assisting our colleagues: W. Riedler, K. Schwingenschuh, K. Gringanz, M. Verigin and Ye. Yeroshenko with advice on the development of the magnetic field portion of the investigation and to help them with test activities. We also worked with them to properly analyze the Phobos magnetic field and plasma data in order to optimize the return from the Mars 94/96 mission. This activity resulted in 18 papers on Mars scientific topics, and two on the instrumentation. One of these latter two papers was the last of the papers written, and speaks to the value of the closeout award. These 20 papers are listed in the attached bibliography.

Because we had previously studied Venus and Titan and since it was becoming evident that the magnetic field was very weak, we compared the various properties of the Martian interaction with those of the analogous interactions at Venus and Titan (1,2,3,7,19) while other papers simply analyzed the properties of the interaction as Phobos 2 observed them (4,6,12). One very interesting observation was the identification of ions picked up in the solar wind, originating in Mars neutral atmosphere (5). These had been predicted by our earlier observation of cyclotron waves at the proton gyrofrequency in the region upstream from Mars in the solar wind. Of course, the key question we addressed was that of the intrinsic or induced nature of the Martian magnetic field. We found little evidence for the former and much for the latter point of view (8,9,10,11,13,14,15,17,18). We also discussed the instrumentation planned for the Mars balloon (16) and the instrumentation on the orbiter (20). In all these studies were very rewarding despite the short span of the Phobos data. Although they did not affect the eventual analysis of the Mars 96 data, these studies did pave the way for the Mars Global Surveyor and have been fully confirmed by the measurements at much closer distances than Phobos 2 ever reached.

No patents or inventions resulted from the work.

Papers in Journals and Books

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