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THE DEFINITION STUDY FOR IMPLEMENTATION
OF THE IMAF MISSION

FINAL TECHNICAL REPORT

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NAGW-4136

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The Imagers for the Magnetosphere, Aurora and Plasmasphere (IMAP) mission was proposed in response to NASA A.O. OSSA 2-92 "Small Explorer Missions" dated 25 September 1992. This Small Explorer Mission is intended to provide the first global visualization of Earth's inner magnetosphere. IMAP promises to greatly advance our knowledge of the global distributions and dynamics of near-Earth radiation environment by obtaining first simultaneous images of the plasmasphere at extreme ultraviolet wavelengths, of the extraterrestrial ring current and the earthward portions of the plasma sheet as seen in their emissions of neutral atoms from charge exchange of plasma hot ions with geocoronal hydrogen atoms, and of the aurora in its far-ultraviolet emissions.

Although the IMAP proposal was given the highest possible rating in all categories during the NASA peer review, for programmatic reasons this mission was not selected. At the request of the Space Physics Division of NASA Headquarters, a proposal was submitted to provide a definition study for accommodating the IMAP scientific instruments with an Argentine Scientific Applications Satellite (SAC-D).

Significant scientific participation from both Argentina and the United States is required for this instrumentation to fly on SAC-D. A vital criterion in the final selection for the instrumentation is to establish a partnership with an Argentine scientist. This has been accomplished. Professor Silvia Duhau has agreed to a partnership with the IMAP mission.

The intent is to have both USA and Argentina scientists have a significant scientific contribution to the design, development, and flight operations of the instruments. It is anticipated that the SAC-D spacecraft, its electrical harness, control systems and telemetry capabilities are to be built in Argentina and be funded by CONAE. Argentina is to provide at least one spacecraft control and data acquisition ground station.

Determining the feasibility of accommodating the electrical, thermal, and mechanical interfaces of the IMAP instruments with those of the SAC-D spacecraft requires the availability of the Argentina scientists and engineers. Due to schedule delays experienced by the Pegasus XL launch vehicles and subsequently the SAC spacecraft, communications with the Argentineans were limited.

Preliminary engineering assessments were performed. The FUVIM sensor design was reworked as a result of these assessments. As proposed, the FUVIM sensor photocathode was directly applied to the microchannel plate (MCP). After further study, it is recommended that the photocathode be applied to inside the front window of the intensifier. This change requires no mass, power, or mechanical change to the proposed instrument.

Another recommendation is to change the image intensifier output from a customized anode array with charge amplifiers to a phosphor output that is optically coupled to a Charge Coupled Device (CCD). Further study is recommended. This approach will require both electrical and mechanical modifications to the FUVIM.

The anticipated mid-term report for presentation in Buenos Aires, Argentina, during September 1994 was not prepared because no meeting was scheduled due to the delays in SAC-B. The final report anticipated for presentation in Washington, D.C. during December 1994 was not scheduled.

The electrical engineers attended the 1996 Society of Photo-Optical Instrumentation Engineers (SPIE) Conference and the 1997 SPIE Conference to increase their knowledge of sensor technology.

In anticipation of a possible future cooperative mission, preliminary engineering assessments were accomplished.