Final Report for Sounding Rocket Grant NAG5-5121
from NASA to the University of Michigan

John T. Clarke, Principal Investigator

Period of performance: 11 February 1997 - 31 January 2000

This grant is the second to support the planetary rocket program at the University of Michigan. Overall, this project has resulted in 4 launches from the White Sands Missile Range of our payload in different stages of development, on:

4 May 1991	Flight 36.062
16 June 1993	Flight 36.101
1 April 1995	Flight 36.104
28 October 1996	Flight 36.149

For each flight, the following activities were accomplished:

- prepare the experiment, including replacement and upgrading of critical components, at the University of Michigan

- integrate the payload either at the Wallops Flight Facility

- perform final far-UV calibration of instrument

- perform final alignment, integration, and electrical checks at WSMR

- launch payload from WSMR

- check condition of recovered payload

- perform post-flight calibration, if necessary and applicable

- reduce and analyze flight data.

On the following page an overview of the most recent flight is given. In the period of this grant, we have completed the flight activities from the last flight 36.149, including post-flight calibration and data reduction. In the first year of this program, our budget was reduced to $100K so that NASA could support other rocket flights to observe Comet Hale-Bopp, and our budget was reduced to allow for those other programs. Since we had just flown, we could not be ready in time

for that flight. We used the first year's funding to perform the post-flight calibration, and also to begin development of a laboratory high vacuum UV calibration facility for future flights. We held a Project Initiation Conference for the next flight in November 1997 at WFF, and after this meeting NASA decided to rewire the complete telemetry system in our experiment. This required both NASA and us to re-order our telemetry signals and channels, to change numerous data formats, and to re-wire our cabling harnesses and connectors. A late start on this work at WFF prevented us from making our launch window in the second year of the grant, and in addition to wiring changes we continued work on the calibration facility. We now have a complete and working UV calibration facility, which we are using to optimize the experiment for the next launch. We held a desing review for flight 36.174 in October 1998. We have taken the payload to WFF in June 1999 for a complete integration, and we took the payload to Univ. of Colorado for initial UV calibration in November 1999. We have been optimizing the experiment at UM since that time.

We are presently preparing the payload for the next flight 36.174 in summer 2000. The planned target has changed to Comet c/Linear 1999S4, which was recently discovered. We will take the experiment to Univ. of Colorado for pre-flight UV calibration in May 2000, and we plan to launch in July 2000 from WSMR.

October 1996 Flight 36.149: To prevent high voltage arcing as expereinced during the previous flight, we performed thorough testing of the MCP detectors before flight, including repeated operation at all external pressures, and after this testing the connectors were not unplugged before flight. We also tested the response of our signal processing electronics to simulated arcing events to develop a system that can recover and continue counting photons even if an event were to occur in the detector high voltage system. In addition, in the October 1996 flight we had two MCP detectors, so that a mission success could be achieved with flight data from either detector, although experience has shown that known problems are *always* corrected and problems that do occur are due to elements that have not received sufficient attention. This had been the first failure due to the experiment in this project, and it was corrected in the October 1996 flight.

Sounding rocket flight 36.149 was launched the night of 28 October 1996 from the White Sands Missile Range, and all of the success criteria were met in this flight. Both the set-up star (Altair) and Jupiter were acquired by the ACS on time, and our payload startracker centered the images of both objects at the correct location on our aperture plate for H Ly alpha emission to enter our aperture. Jupiter was tracked to within 1-2 arc sec, as expected, and both MCP detectors functioned as expected with no high voltage glitches. We clearly see the UV image of Jupiter in the MCP data, however the count rates on both detectors were lower than we had expected. We are now engaged in post-flight measurements to determine the source of the lower than expected throughput in the instrument. We have received the payload back in good condition, and we look forward to future flights.

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15 March, 2000

William B. Johnson
Code 810.0
NASA Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Subject: Final Technical Report NAG5-5121

Dear Mr. Johnson:

On behalf of the project director, John Clarke, and in compliance with the requirements of the grant NAG5-5121 entitled "Continuation of the University of Michigan Sounding Rocket Program: Sounding Rocket Measurements of Comet Hale-Bopp and a Short Period Comet...", I am forwarding the enclosed final technical report .

If you have any questions or need additional information please contact John Clarke at (734)647-3540.

Sincerely,

Cheri Hovater

Cheri Hovater
Administrative Assistant

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cc: D.A.Harrison w/o encls.
CASI
ONR Chicago w/o encls
K.DeWitt(DRDA) w/o encls.
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