



STANFORD RESEARCH INSTITUTE
Menlo Park, California 94025 • U.S.A.

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Report No. 9

Quarterly Progress Report for period ending March 31, 1969

DEVELOPMENT AND TESTING OF AN IMAGE TUBE CAMERA AND SPECTROGRAPH

By: Robert L. Sharpless

Prepared for:

National Aeronautics and Space Administration
Washington, D. C.

SRI Project No. PAU-6376

Contract No. NASr-49(26)

Approved:

Felix T. Smith, Program Manager
Molecular Physics

E. M. Kinderman, Director
Physical Sciences (Radiation and Molecular Physics)

Copy No. 25

The objectives of this project as stated in the contract were (1) to develop a combination camera and spectrograph using an image intensifier tube to obtain high sensitivity and (2) to provide the necessary qualified personnel, materials, and equipment for operation of the image tube camera and spectrograph in support of the NASA electron beam field mapping experiment. The development of the image tube camera and spectrograph has been covered in previous reports.

The electron beam field mapping experiment was carried out on the morning of January 26, 1969. The SRI image tube camera and spectrograph performed well; however, the flight of the rocket was erratic, and it departed considerably from the intended trajectory. The data reduction done so far indicates that the auroral streaks were out of the field of view of the camera. Figure 1 is one of the exposures obtained during the second signature pulse (pulse No. 11). The line on the left is the location of the auroral streak as calculated by Jaylee Burley Mead and Gilbert D. Mead of Goddard Space Flight Center from preliminary data on the rocket's actual trajectory. The field of view is indicated by the gray region. The black spots are stars (the large ones being "burned in"), and the background is due to night airglow or integrated starlight scattered in the optics, or both. The star chart used to locate the auroral streaks with respect to the camera's field of view showed stars of magnitude as low as 7.75. All of the features shown on the star charts could be identified in the camera picture. Some of the faintest objects in the camera picture were not shown on the star charts. It is estimated that these have magnitudes as low as about 8.5. Since the field of view is determined by some of the optical elements and not by an aperture at the film plane, it is not sharply defined. The large dark patch at the top of the field of view is due to scattered light from equipment pilot lights or electric heaters in the instrument shelter. It only appeared when the camera was looking in a northerly direction. It was not detected during the installation and checkout of the

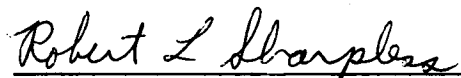
camera, since this was all done with the camera pointed more to the south. The black bar that is visible in the middle of the patch is the indicator for the adjustable iris diaphragm on the objective lens; the length of the bar is proportional to the opening of the iris. The lens was wide open (F/0.75) at the time this picture was taken. The numbers in the upper right corner are auxiliary data. The top number is the elevation angle in tenths of a degree. The dark spot between the first and second number is the "beam on" light that indicates when the pulses occur. The second number is the azimuth angle in tenths of a degree, and the bottom number is range time in minutes and seconds.

The auroral spots were not visible to an unaided observer, nor were they detected on the monitors of any of the optical instrumentation during the rocket flight. The pointing of all the optical instruments was done from a set of look angles, covering many possible trajectories, precalculated by Mr. E. G. Stassinopoulos of Goddard Space Flight Center. Unfortunately the rocket departed further from the optimum trajectory than any of the precalculated look angles. The precalculated look angle for the trajectory that was closest to the actual trajectory was used.

Since it had been decided that it would be necessary to track the auroral spots through the monitor telescope on the image intensifier tube to get good spectrographic information, no attempt was made to use the spectrograph attachment.

Data analysis is now underway and will be reported at a later date.

Respectfully submitted,



Robert L. Sharpless, Physicist
Molecular Physics

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FIGURE 1 PICTURE TAKEN DURING SECOND SIGNATURE PULSE. The line on the left-hand side is the calculated position of the auroral streak, which is clearly out of the field of view of the camera.