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ROUTE SHEET ~~SECRET~~ [redacted]

PRNC-NRL-10-863 (Rev. 9-54)

CODE	DATE	INITIALS	*PURPOSE	REMARKS
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FROM: ~~Code 7100~~ Dir NRL to U of Michigan

DATE OF MATERIAL:

BRANCH IDENT. SYMBOL: 7100-76:HF:ms

ORIG. IDENT. SYMBOL (Mail Room Fill in): 1724

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DATE MAILED: 19 FEB 1959

FILE NO.: R06-29

SUBJECT: ltr to Dr. [redacted] re satellite experiments @ NRL

[redacted] Proposals on

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NAVY-DPPO PRNC, WASH., D.C.

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19 FEB 1959

[redacted]
Chairman, Committee on Astronomy
Space Science Board
The Observatory
University of Michigan
Ann Arbor, Michigan

[redacted]

Accompanying this letter is a copy of a letter which I sent to [redacted] at NASA, indicating the nature of satellite experiments that we would be interested in developing at NRL. The proposals are the same as those originally suggested more than a year ago to the TPESP of the USNC for the IGY.

In all of this work it is possible to adjust the scope to meet short-range or long-range objectives. Simple experiments such as our solar Lyman-alpha and x-ray measurement planned for the ABM Juno vehicle which is assigned the combined IGY payload require only a few pounds and little power. To a certain extent such experiments may be considered almost in the category of "on the shelf" items. Increasing payload and power supply mean a proportional increase in wavelength coverage and dynamic range.

It would be a great mistake however to assume that more advanced experiments for satellites can be specified at this time without extensive detector developments. Even though the experiments may involve components that have been flown frequently in rockets, very few are in the category of "on the shelf" items. Detectors with limited life characteristics may be entirely acceptable for rocket experiments but not for satellites. There are few detectors for ultraviolet and x-ray measurements that have been engineered for satellite environments and lifetimes.

At the present time we are actively engaged at NRL in detector development for the entire x-ray and ultraviolet region. Many promising leads exist. For example, we have obtained photo surfaces with 40 percent yield at the helium resonance line, 584 Angstroms, and less than one percent at Lyman-alpha. Selected transmissions of metallic films

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in the extreme ultraviolet may provide a variety of windows centered at different wavelengths. Aluminum films, for example, provide a window between 850 Angstroms and 175 Angstroms. We are carrying on a basic program of investigating the optical properties of thin films in this part of the spectrum. At longer wavelengths there are encouraging prospects of obtaining ionization chamber responses in a number of discrete wavelength intervals above and below Lyman-alpha. Between 1700 and 3000 Angstroms there has been much progress made with filters and photo surfaces capable of partitioning the range into three or more bands.

We could undertake to instrument an elaborate satellite experiment at NRL but would accept the responsibility only on the basis of an adequate period of preparation and the assurance of a number one priority to the experiment as against any other function of the satellite. Although I recognize the urgency of pushing the execution of satellite experiments designed to satisfy obvious military objectives, I don't see a similar time factor in the conduct of basic astrophysical measurements. The blueprint for a satellite payload should not be fixed at a time when we do not have the required basic detection techniques. I rather favor the assignment of a project to a competent group on the basis of a broadly defined scope, the vehicles to be scheduled when the experimenters produce a satisfactory package. A certain amount of duplication in assignments should be encouraged and supported since there are more approaches to the solution of the optical measurement problems than any one laboratory is capable of pursuing simultaneously.

When it comes to planning spectrographic instrumentation for satellites, the need for a preliminary program of rocket measurements must be stressed. Almost no effort has yet been made to develop scanning spectrographs with telemetered output. There is a direct tie-in with the above mentioned detector problems and with the preparation of highly reflecting optical surfaces. In the latter area, excellent progress has recently been made. Tousey and Haas have succeeded in obtaining 80 percent reflectivity at Lyman-alpha and hope to accomplish similar improvements at shorter wavelengths. Finally, in our NRL program, is the development of a spectrograph for the study of the contour of Lyman-alpha with high resolution. A prototype flight model has a resolution of 0.03 Angstroms and we are seeking to improve it. This experiment should be ready for

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flight in an Aerobee-Hi with photographic registration this summer. It will be followed by substitution of photoelectric scanning and telemetered data in place of photographic film. Until we have succeeded with such rocket experiments and have evaluated the designs, we would be very reluctant to undertake a satellite program.

We hope to be granted appropriate support to participate in the nation's space science program in astronomy and shall continue to plan our approach in the manner that has paid off so well in our rocket experiments.

Sincerely yours,

[redacted]
Superintendent
Atmosphere & Astrophysics Division
By direction of the Director

Encl: w/o Encl
(1) NRL ltr. 7100-43:HF:mhr of 2 Feb 1959

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