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ROUTE SHEET
PRNC-NRL-10-863c (Rev. 5-54)

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CODE	DATE	INITIALS	*PURPOSE	REMARKS
5435	4-15	RBO		
5430	4/15	[illegible]		
5400	4/16/59	[illegible]		APR 15 1959
1570	4/20	[illegible]		
1525	4/21	[illegible]		
1523A	4/21	[illegible]		mailed
5430A	4/23/59	B.W.S.		Return to
5000	4/27/59	GWP		Show green
1040	5-14			
1030	5/14/59	[illegible]		" "
4010	5/5	[illegible]		Show green MAY 5 1959
5402	5/6	[illegible]		MAY 6 1959 Show green
1071	5/8	[illegible]		
1072	5/15	[illegible]		
1073	5/11	[illegible]		
2027	5/20	[illegible]		Classified by: Dir NRL Review on: 21 Apr 1989
1523A				

INSTRUCTIONS

Prepare 2 copies of this route sheet and forward ALL copies together with necessary correspondence and other documents.

*PURPOSES

1. FOR INFORMATION	7. FOR GUIDANCE
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NAVY-DPPO PRNC., WASH., D.C.

FROM: Director, USNRL
To: Chief, BUAER

DIVISIONS DO NOT FILL IN

DATE OF MATERIAL:

BRANCH IDENT. SYMBOL: 5430-83:RBO:zw

ORIG. IDENT. SYMBOL (Mail Room Fill In): SER: 00223

DATE MAILED: 21 APR 1959

FILE NO.: R06-29

SUBJECT:

Intercept System, Lightweight, Subminiaturized, for Supersonic Vehicles; BUAER Project No. AV-42004; NRL Problem 54R06-29; quarter progress report on

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R/S No. (Mail Rm. Fill In)

~~Craft~~ [redacted]

5430-83:RBO:zw
SER: 00223
21 APR 59

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From: Director, U. S. Naval Research Laboratory, Washington 25, D. C.
To: Chief, Bureau of Aeronautics (Aer-AV-42)

Subj: Intercept System, Lightweight, Subminiaturized, for Supersonic Vehicles; BUAER Project No. AV-42004, NRL Problem 54R06-29; quarterly progress report on; forwarding of

Ref: (a) BUAER Conf ltr Aer-AV-4212 Ser 02982 of 5 Mar 1958

Encl: (1) 4 copies of subject report 5430-83A:RBO:zw of 13 Apr 1959 (Secret)

1. In accordance with reference (a), enclosure (1) is forwarded herewith.

2. This is an interim report; work is continuing on this problem.

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5430-33A:RBO:zw
APR 13 1959

Subject: Quarterly Progress Report on Intercept System, Lightweight, Subminiaturized, for Supersonic Vehicles

1. Work has progressed on many phases of the development of an unattended intercept system suitable for operation in supersonic vehicles and designed to receive, amplify and re-transmit (on another frequency) radar signals in S band.

2. A brief outline of the work during the quarter from 1 January to 31 March follows.

3. The 108-mc transmitters required for a tracking signal and for the telemetry of the biological data were ordered from the DuKane Corporation. Three transmitters have been delivered on schedule and two additional units are expected within two weeks. The transmitter is designed to provide sixty milliwatts of unmodulated r.f. power and, when modulated, provide forty milliwatts of average power. The first three units are now being tested to determine their characteristics under the satellite environmental conditions. Power output and frequency are being measured over the temperature range of 0° to 60° C and Rieke diagrams for the transmitters at room temperature are being made.

4. A breadboard model of the eight-channel telemetry system has been completed using a transistorized commutator. The subcarrier oscillators have been completed and the telemetry system is being tested using fixed resistors in place of the sensors. The system operates on a power of 120 milliwatts in its present state. Components required for the production of five of these telemetry systems are now on hand.

5. The power supply, consisting of silicon solar cells and nickel-cadmium storage batteries, has been designed by USASRDL, Fort Monmouth, N. J., to supply 0.9 watts average power to a spinning satellite in a 60-percent sunlight orbit. Thirty-nine Hoffman solar cells with ten-percent efficiency, and an area of two square centimeters will be assembled in series to obtain sufficient voltage to charge nine series-connected nickel-cadmium batteries. Four of these patches of 39 cells each will be mounted on a planar surface forming an assembly nine inches square which when facing the sun will provide 1.6 watts average power to the storage system. Since the satellite is intended to spin, six of these 9-inch-square patches will be located symmetrically on the sphere providing for adequate solar power regardless of the attitude of the satellite. The electrical energy will be stored in nine series-connected nickel-cadmium "D" size cells providing a nominal +12 volt supply to the electronics in the satellite. The storage system insures that the system will have a low ripple voltage for the estimated one-year life.

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Review on: 21 Apr 1989

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Encl (1) to NRL ltr 5430-33:RBO:zw
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6. The mechanical design of the patches has been agreed on and USASRDL is designing dies for making the covers. One breadboard 9 by 9 patch has been delivered to us and it is being used for breadboard tests. The first prototype set of six patches is scheduled for completion by USASRDL by 1 July 1959. A storage pack of Sonotone Ni Cd cells is being assembled for tests. The flight batteries ordered from Sonotone will be hermetically sealed units. These will not be available for sixty days and therefore it will be necessary to use mechanically sealed units for breadboard work.

7. The data-link transmitter design is complete and a breadboard model capable of one-half watt cw power output is being tested. The transmitter will be adjusted to provide 250 mw average-power output when pulse modulated with a 50-percent duty cycle. The trigger circuit for modulating the data link transmitter is now being added to the breadboard circuit.

8. The sequencer providing for the 40-minute operation of the data link on ground command has been designed around a latching relay and a 40-minute timer that starts as a dc motor and runs as an ac motor driven by a transistorized converter. The timer operates on 36 mw and the latching relay requires no hold-in power. Construction of flight units will begin after space allocation in the satellite package is determined.

9. The command receiver design is similar to the Vanguard command receiver except that the first local oscillator is incorporated within the receiver and the receiver operates from a two-terminal power supply of twelve volts. The five and one-half inch diameter unit is one and one-quarter inches thick and it operates on a power of forty milliwatts. The receiver output is a relay closure which initiates the sequencer cycle. Five units of this receiver design have been constructed. Receiver tests over the temperature range from 0° to 60° C have been completed.

10. Oscillator converters needed to provide -18 volts for the telemetry transmitter and -23 volts for the data link transmitter have not yet been received from USASRDL. Breadboard units scheduled for completion by March 13th demonstrated unreliable starting characteristics and delivery has been delayed until this is corrected. Because of these delays other sources of supply are being investigated.

11. The design of the satellite structure is being done by Engineering and Design Drafting Branch. The twenty-inch diameter aluminum shell will have a uniform thickness on the top hemisphere but the lower hemisphere will be tapered to provide greater thickness at the base. The structure within the shell will be

similar to the Vanguard design. The machine shop has begun work on spinning two prototype spheres and these will be complete in about two weeks.

12. The prototype of the transistorized S-band crystal-video receiver assembly has been delivered by ITT Laboratories; acceptance tests of the prototype are in progress.

13. The ground-based command transmitters (for actuating the data-link transmitter through the command receiver) have been received and tests preliminary to a pilot installation are being made.

14. In an effort to make a preliminary check of the adequacy of the proposed data-link intercept system, an experimental receiving station was set up to observe the emissions from Vanguard I (Beta '58) and Vanguard II (Alpha '59). Recordings were made of the transmissions of both satellites to and beyond their optical horizons.

R. B. OWENS

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