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Approved for Release: 2024/06/10 C05027266 1068

This morning I would like to depart from the format and content of the previous Branch reviews [redacted] dwell on the magnitude and extent of the responsibilities of the group under my direction. It should be noted that nearly 10 years ago (9 March 59) Sec Nav gained approval from ARPA for the founding of this program, to place an ELINT spaceborne data collection system in orbit. Not only was this the first of the ELINT type satellite system, but it still ranks as one of the major candidates for the Future. In similarity, NSA picture.

The staff supporting the ELINT portion of this Program "C" here at NRL has grown from the original two men (Myself and Mr. Rose) to a highly capable group of 12 individuals. MAY I HAVE THE FIRST SLIDE PLEASE?

Of these twelve, Mr Tool, [redacted] have joined us during the past 12 months. With Mr Vincent and Mr. Price only about 18 months ago...so our growth of 50% during the past 18 months, is what I would like to defend and justify.....

The Work will be described by various individual of our technical Team and if there are questions please stop us, there is an enormous ammount of territory to cover in order to describe the "BOW WAVE" of effort which this team has been carrying along this year. I shall only treat briefly that area of the Payload systems since it has been covered adequately in the previous Reviews.... This area of endeavor is under the supervision of Mr. Vincent ROSE and as you can see he has two other men in his Unit, They do prepare the total ELINT subsystem compliment for all four of the primary payloads for MISSION 7106, numbering about 88 individual collection bands. Each part of the spectrum is covered in at least two payloads from 155 to 10,000 Mcs and from 14.6 to 15.1 Gcs. Those portions where known ABM signals are to be found, will be covered in all four payloads. MAY I HAVE THE NEXT SLIDE PLEASE??

The major facility which enables this small group to prepare so many collection systems in the period between launches, is shown here. It is an RF Darkroom which is used to determine the Broad-band frequency collection capability of each of the subsystems as they are to be installed in the spacecraft. Particularly, the relationships between the various antenna systems on the spacecraft can be evaluated here and the most favorable design determined. In an endeavor to enhance the capability of this group to design and build and document a similar number of experiments in a faster shcedule in the future it would be extremely vital to duplicate this facility and provide an experienced Antenna Design engineer to provide a parallel effort to solve the spacecraft antenna problem. The NEXT SLIDE..... AND THE NEXT SLIDE PLEASE.....

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~~TOP SECRET~~ THE NEXT SLIDE [redacted] ...? The work of the INTERROGATION OR COMMAND systems unit is under the supervision of Mr. Withrow, who has over the last ten years been devoted to solving the problems associated with the interrogations of our satellites overseas. As the demands for more and more commands have been levied against the spacecraft, more sophisticated command systems have evolved. Also the need to get the interrogations into the payloads more quickly and to appraise the status of the payloads more quickly after interrogation. Each of these goals have levied heavier lodd of demands on the overseas systems associated in this effort. The first area which was modified was that of the transmitting antenna system. In the past it was able to rotate in azimuth only. Now it has been completly up-dated with a broad band antenna which will move in elevation as well. Broad-band enough to handle both the old and the new command frequencies. The antenna directivity has been improved by addition of the ground screens so that the side and back lobes have been reduced greatly.

PCM telemetry systems will be used for the first time in our spacecraft. This will enable the status of the payload to much more rapidly appraised by using a special Demodulator and Status Description system developed by Code 5170. This system will be deployed to each of our command sites so that the Interrogation of the sapcecraft will be expedited to a great extent.

Next SLIDE PLEASE?? 1968 Deployments have extended the command systems for the future interrogation [redacted].

It is anticipated that the funds and authority to place a digital system in [redacted] will be forthcoming in a month or two. It will take only $427K and about 9 months to get this going in [redacted] after approval.

The Airconditioning system and humidity control and raised flooring have been installed in the digital system spaces [redacted]. Similar flooring has been placed in the space [redacted] is continuing to become the Test site for payload evaluation, it also has had the flooring and air conditioning systems, so that the digital system could be operated there during the post launch evaluation period.... and perhaps as the R & D SITE of the future..

Now we would like like to discuss in varying degrees of depth the portions of the overseas Data-Collection instrumentation which have undergone redesign at NRL (Shown in RED) and those portions which have been up-dated by commercial procurement from vendors (against our specifications) and of course those portions of the systems which remain unchanged over the past year such as the antenna and pre-amplifiers here. It is obvious from the number of red colored blocks on this diagram, the extent to which each of our sites have [redacted] equipment re-design. This has been possible only by the devoted [redacted] effort of many men such as the

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RETEP MODULATOR

DESCRIPTION: Digital switching and timing circuitry.

FUNCTION: To provide modulation for the RETEP transmitter; provides fixed number of pulses at fixed burst rate with burst interval being selectable.

QUANTITY REQUIRED: Two

STATUS: One prototype

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RETEP SUPER-HET RECEIVER AND VIDEO AMP

RECEIVER:

DESCRIPTION: Solid state low power UHF receiver with video thresholder and pulse width discriminator

FUNCTION: To receive pulse signals from the RETEP transmitter

NUMBER REQUIRED: Two operational and one spare

STATUS: Three units completed

VIDEO AMP:

DESCRIPTION: Low power complementary video amplifier with thresholder.

FUNCTION: Used in crystal video RETEP receiver. Also under development for R&D payload.

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CHANEL A TELEMETRY RECEIVER MODEL RA-304

DESCRIPTION: Solid state VHF AM Receiver with three selectable I.F. bandwidths; digital controlled local oscillator.

FUNCTION: To receive telemetry signals in the VHF band

NUMBER REQUIRED PER SITE: Two

TOTAL NUMBER REQUIRED:

STATUS: ONe prototype under construction; completion about 15 April start production 15 May 1969.

(1) modular construction. low to maintenance
(2) select proper polarization
(3)

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[redacted] 1 MHZ DRIVER

MODEL DR-1

(1) Description: Solid State Active 1 MHz Multicoupler with eight outputs.

(2) Function: To distribute the 1 MHz Frequency Standard to the RS-1A Receiving Systems.

Number required per site: Two

Total number required: [redacted]

Status: One prototype production of [redacted] units underway completed 15 April.

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[redacted]

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AUDIO PATCH PANEL

Description: Audio Sterro switching unit with volume control.

Function: To provide selection of the audio output of any of six (four data, 1 Chan. D, 1 Chan. A) receive audio outputs in sterro to two operators.

Number Required per site: two

Total Number required:

Status: completed.

OPERATOR MUST MONITOR ~~TONES~~ DATA OF

(1) ~~oper must monitor~~ INTEREST ~~anything unless~~

(2) ~~not~~ BEFOR

(3) ~~NOW~~ NOW

~~TOP SECRET~~

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RECORDER/MONITOR PANEL

Description: Switching unit having 7 pole three position video switch and Recorder control circuitry.

Function: To be able to monitor the output of seven tracks of any of three recorders on a seven channel oscilloscope; Provide remote turn on capability of three recorders.

Number Required per site: two

Total number Required:

Status: completed

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SYSTEM CALIBRATION UNIT

MODEL SCU-2

Description: Solid State unit with 16 crystal controlled oscillators, front panel selectable; internal or external pulse type modulation; power monitor and attenuator for output power set.

Function: To provide calibration of Receiving System from RF Pre-Amp to APU output. (standard deviation softwave routine)
To provide standardized sensitivity measurement.

Number Required per site: one

Total Number Required:

Status: One prototype, production of units underway completed by 1 April.

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TOP SECRET [redacted]

ANTENNA POLARIZATION SWITCH MODEL APS-1

(1) DESCRIPTION: Solid State Digital unit to compare video signals from five RS-1A receivers

(2)

FUNCTION: Select proper polarization for each of the four Data Receivers.

(3) Where ....

NUMBER REQUIRED PER SITE: Two

TOTAL NUMBER REQUIRED: [redacted]

STATUS: Two prototypes completed and [redacted] production units scheduled for deployment 15 April 1969.

TOP SECRET [redacted]

[redacted] VIA
[redacted]
[redacted] SYSTEM ONLY

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DATA PROCESSING SYSTEM

I. SYSTEM CONFIGURATION

A. Central Processor Unit - SEL 810A
   1. 16 Bit Word Length
   2. 16,384 Word Memory
   3. 1.75 Microsecond full cycle time

B. Paper Tape Reader/Punch
   1. 300 Char/Sec Read
   2. 110 Char/Sec Punch

C. Magnetic Tape Control Unit

D. Magnetic Tape Unit
   1. 120 IPS
   2. 7 Track
   3. 800 BPI

E. Line Printer
   1. 600 Lines per minute
   2. 120 Columns

F. Disc File
   1. Moveable Head
   2. 1,500,000 Words

G. Disc File Control Unit

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MULTICOUPLER / DIPLEXER

THIS UNIT IS AN RF MULTICOUPLER DESIGNED AND DEVELOPED HERE AT NRL. THIS MULTICOUPLER EMPLOYS RF FIELD EFFECT TRANSISTOR AMPLIFIERS, (TO IMPROVE INTERMOD PRODUCTS), IRIS COUPLED FILTERS, (FOR MAXIMUM SELECTIVITY), AND SOLID STATE SWITCHES, (FOR SWITCHING SPEED). NOTE NOISE FIGURE

ISOLATION AND OUTPUTS

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~~TOP SECRET~~ [redacted]

POLARIZATION — SWITCH

MAINTAINING PROPER POLARIZATION ON OUR DATA RECEIVERS IN THE PAST HAS BEEN PERFORMED MANUALLY BY THE FIELD OPERATORS. This SYSTEM HAS BEEN TRIED FOR the PAST 3 YEARS WITH LITTLE SUCCESS. SOME of the PROBLEMS ENCOUNTERED EXTEND FROM FORGETFUL OPERATORS THROUGH NOT KNOWING which of MULTIBLE SWITCHES TO THROW AT THE PROPER TIME. This SLIDE SHOWS THE EFFECTS of RECEIVING ~~four~~ SIGNALS FROM MULTIBLE (TWO) PATHS (PAT —) THROUGH ONE ANTEN THE FOUR RSIA DATA RECEIVERS ON THE GROUND which ARE TUNED TO EACH of the four SIGNALS. TO INSURE THAT THESE four RECEIVERS MAINTAIN PROPER POLARIZATION REQUIRES THAT EACH RECEIVER INDIVIDUALLY BE CHECKED AND COMPARED. THE BOTTOM TRACE SHOWS EFFECTS of NOT PROPERLY SELECTING POLARIZATION (NOTE) VARYING AMPLITUDE THE AUTOMATIC POLARIZATION SWITCH (APS-1) TO DO This JOB

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AUTOMATICALLY AND UPON TESTING THE BREADBOARD REVEILED [illegible]

WITH A 10B DIFFERENCE BETWEEN HORIZONTAL & VERTICAL SIGNALS AND ONLY THREE PULSES RECEIVED IN THE 3 SECOND TIME SAMPLE. THE UNIT CORRECTLY CHOSE PROPER POLARIZATION WITH A + 99.9 % ACCURACY.

DESIGN GOALS ARE TO MINIMIZE AMPLITUDE VARIATIONS THEREBY IMPROVING SIGNAL ACCURACY, AND TO RELIEVE OPERATORS of IMPOSSIBLE TASKS for MORE ESSENTIAL ANALYSIS AND NOTING INTERESTING SIGNALS for computor PROCESSING.

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POLARIZATION SWITCH / MULTICOUPLER SYSTEM

THIS SLIDE SHOWS THE INTERFACE BETWEEN THE MULTICOUPLER (STOP) RECEIVERS (STOP) AND ANTENNA POLARIZATION SWITCH (STOP).

THE TIMING AND SEQUENCE CONTROL SELECTS SEQUENTIALLY ONE of THE FOUR DATA RECEIVERS AND TUNES THE R_S RECEIVER TO THE SAME FREQUENCY. THE Σ AMPLIFIER SUBTRACTS VIDEO SIGNALS (A AND B) TO OBTAIN A DIFFERENCE SIGNAL "A-B". THIS "A-B" SIGNAL REPRESENTS, ON A PULSE BY PULSE BASIS, THE AMPLITUDE DIFFERENCE RECEIVED ON THE HORIZONTAL AND VERTICAL ANTENNAS. THIS A-B SIGNAL IS ACCUMULATED OVER TIME "T" (3 SECONDS) SO THAT AN INTEGRATION OF N PULSES IS OBTAINED TO IMPROVE ACCURACY.

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ADD/S

I (Frontpanel) — As Mr. Mayo has pointed out the grounds station ~~to~~ consists of 8 receivers ~~two on~~ the output of each ~~which~~ receiver is translated to a digital word + ~~Multiplexed~~ with the time of ~~Date~~ Day ~~[illegible]~~ this data is then ~~[illegible]~~ multiplex with ~~[illegible]~~ all other receivers ~~[illegible]~~ ~~organized~~ for output to a digital tape recorder with each pulse having ~~a~~ it's receiver #, [redacted] band designator and the time of day accurate to [redacted] ~~described to an digital~~ ~~in [illegible] IBM compatible~~.

#2 slide

~~[illegible]~~ here we have a more detaile Look in the Adds this is a highly complex unit consisting of 2000 integ. circuits which ~~[illegible]~~ might be over 25,000 individual circuit elements. The construction of this unit was in a book structure as seen with's page open, with functional ~~[illegible]~~ for having a complete

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~~TOP SECRET~~ [redacted]

Next slide

logic function 23 and the minum # of interconnecting wires.

Next slide #24

Here we sommary of ~~high~~ some of the new points of the APP/S

1. ~~full pay~~ 7106 ~~[illegible]~~ 32 Bands ~~as~~ for reference old system on 7105 ~~used~~ in power dumping mode with all dands turned on (or in other words seeing ~~[illegible]~~ a very large # of the ~~[illegible]~~ Soviet & [redacted] radars simultaneously ~~[illegible]~~ the dPU used only 20% of it's capacity.

2. ~~[illegible]~~ better resolution

3. 7105, 7106 or ~~any~~ other such as long pulses or [redacted]

4.

5. [redacted], ~~Tags each~~ pulse ~~with addition information relating the~~ BTS - take Random Elint data to Buffers it to steady rate for high [illegible]ty packing on [illegible] tape.

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George

~~TOP SECRET~~ [redacted]

BACKGROUND

1. 10 YRS IN OPER.
2. LARGE CHANGES
3. IMPACT OF RESULTS ON COMMUNITY

(1) TECH STAFF AT NRL
   1. STRESS GROWTH
   2. 4 DIFF. GROUPS

(2) RF - PRE-AMP

(3) TD RECVR

(4) ANECHOIC CHAMBER

(5) COMMAND SYS - ANT @ HYBLA VALLEY
   UPDATED: (1) [redacted]
   (2) PCM

(6) DEPLOYMENT IN 1968

(7) RECVR & COMMAND ANT IN [redacted]

(8) ~~TOP SECRET~~ [redacted] IN [redacted]

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(20) ~~TOP SECRET~~ TM REC[redacted]R

(21) ADDS PICTURE

(22) ADDS

~~(24)~~ (23) CARD

~~(25) (24) ADDS LIST~~

L.H.

(25) BTS

(26) BTS

(27) COMPUTER (GREY)

(28) COMPUTER (GREY) line printer - disk

(29) Tape Trans - A/C ~~line printer disk~~

F.H.

(30) 2ND & 3RD GEN. SOFTWARE

(31) ANALYSIS [redacted]T WARE

~~TOP SECRET~~ [redacted]

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~~TOP SECRET~~ [redacted]

(9) [redacted] SITE

(10) HARDWARE

SYSTEM BLOCK DIAGRAM

(10) RS-1A → SYSTEM

(11) RS-1 MAINLINE

(12) SCU

(13) ~~POLARIZ. PICTURE~~ MULTI-COUP

(14) POLARIZ. PICTURE

(15) POLARIZ. SYSTEM

(16) POLARIZ. SW.

(17) RECORD MON. PANEL

(18) AUDIO MON. PANEL

(19) ~~TOP SECRET~~ [redacted] DRIVER

MVD

JOC

GP

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32 ~~TOP SECRET~~ FLIP [redacted] CHART

33 RESULTS FROM [redacted] RDM

34 [redacted]

35 - 1969 - FUTURE EFFORTS - RDM

36 R.D. LOAD GP

37 FUTURE R.D. LOAD ____

38 RETEP LN

39 EPH. EVAL. ____

40 LOGISTIC SUPPORT MV

41 LOGISTIC SUPPORT ____

42 PROB. AREAS

43 WHANAU

~~TOP SECRET~~ [redacted]

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~~TOP SECRET~~

RECORDER MON PANEL

1. This unit replaces a 7 POLE 3 POSITION VIDEO SW. and RECORDER CONTROL CIRCUITRY
2. ~~the~~ allows the ~~co~~ OUTPUT OF 7 TRACKS OF 1 OF 3 RECORDERS to be monitored on a 7 CHAN SCOPE
3. PROVIDES REMOTE TURN ON CAPABILITY

AUDIO MON PANEL

1. ~~beto~~ previous to this ha.... an operator could listen to one 2 chan. 1 in each ear.
2. NOW 4 CHAN. - ASNWERS SWITCH. NEED FOR 2 OPER.

1MHz. DRIVER

1. IMC. multicoupler - 1 INPUT, 8 OUTPUT
2. Supplies IMC. TIME STRD TO RECVRS
3. 2 @ ea. site

TM RECEIVER

1. VHF - AM
2. 3 IF bandwidths
3. DIG. CONT. OSC + 2 RF PORTIONS SYSTEM ant. pick best polarization

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~~TOP SECRET~~ [redacted]

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(3) TD RECVR

(4) ANECHOIC CHAMBER

(5) COMMAND SYS - ANT @ HYBLA VALLEY
   UPDATED: (1) [redacted]
   (2) PCM

(6) DEPLOYMENT IN 1968

(7) RECVR & COMMAND ANT IN [redacted]

(8) RECV ANT IN [redacted]

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9 [redacted] SITE

HARD WARE

SYSTEM BLOCK DIAGRAM

10 RS-1A → SYSTEM

11 RS-1 MAINLINE

12 SCU

13 ~~POLARIC. PICTURE~~ MULTI-COUP

14 POLARIZ. PICTURE

15 POLARIZ. SYSTEM

16 POLARIZ. SW.

17 RECORD MON. PANEL

18 AUDIO MON. PANEL

19 [redacted] RIVER

WVD

JOC

GT

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20 TM RECEIVER

21 ADDS PICTURE

22 ADDS

23 CARD

24 ADDS LIST

25 BTS

26 BTS

27 COMPUTER (GREY)

28 COMPUTER (GREY) line printer - disk

29 Tape Trans - A/C ~~line printer - disk~~

30 2ND & 3RD GEN. SOFTWARE

31 ANALYSIS SOFT WARE

L.H.

F.H.

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~~TOP SECRET~~ [redacted]

32 [redacted] FLIP CHART

33 RESULTS FROM [redacted] RDM

34 [redacted]

35 - 1969 - FUTURE EFFORTS - RDM

36 R.D. LOAD GP

37 FUTURE R.D. LOAD

38 RETEP LH

39 EPH. EVAL.

40 LOGISTIC SUPPORT MV

41 LOGISTIC SUPPORT

42 PROB. AREAS

43 ~~TOP SECRET~~ [redacted]

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TOP SECRET

EPHEMERIS EVALUATION

I. The location system depends upon accurate prediction of satellite positions

II. Present predictions are based upon separate NAVSPASUR tracking of each satellite.

III. Efforts are underway to evaluate and improve system accuracy:

(a) Comparison with TIMATION navigation satellite predictions

(b) New hardware (RETEP) will improve estimation of the orientation of the vehicles one to the other

(c) In progress is software for RETEP and efforts to refine orbit prediction.

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(1) TECH STAFF AT NRL

1. STRESS GROWTH
2. 4 DIFF. GROUPS

(2) RF - PRE-AMP

(3) TD RECVR

(4) ANECHOIC CHAMBER

(5) COMMAND SYS - ANT @ HYBLA VALLEY

UPDATED: (1) [redacted]

(2) PCM

(6) DEPLOYMENT IN 1968

(7) RECVR & COMMAND ANT IN [redacted]

(8) RECV ANT IN [redacted]

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HARDWARE

SYSTEM BLOCK DIAGRAM

10 RS-1A ⇔ SYSTEM

11 RS-1 MAINLINE

12 SCU

13 ~~PARAMETRIC PROBE~~ MULTI-COUP

14 POLARIZ. PICTURE

15 POLARIZ. SYSTEM

16 POLARIZ. SW.

17 RECORD MON. PANEL

18 AUDIO MON. PANEL

MUD

SDC

GT

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(20) TM RECEIVER

(21) ADDS PICTURE

(23) ADDS

(~~22~~ 23) CARD

(~~25~~ 24) ADDS LIST

(25) BTS

(26) BTS

(27) COMPUTER (GREY)

(28) COMPUTER (GREY) line printer - disk

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(31) ANALYSIS SOFTWARE

L.H.

F.H.

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32 [redacted] FLIP CHART

33 RESULTS FROM [redacted] RDM

34 [redacted]

35 - 1969 - FUTURE EFFORTS - RDM

36 R.D. LOAD GP

37 FUTURE R.D. LOAD

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43 ~~TOP SECRET~~ [redacted]

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