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MISSION 7105 EVALUATION 26 July 1967

1. Domestic and overseas/operational and engineering evaluation through 26 June resulted in transferring to the operational forces of the NRO, four payloads whose entire SIGINT collection capability was adequate for tasking; ALPHA and BRAVO had no defects while CHARLIE and DELTA each have four bands which could be tasked in pairs and one single band which would perform satisfactorily only by itself so it must be tasked alone. DELTA was inverted on 14 July after considerable difficulty and now flys right-side-up as designed. [redacted] [redacted] an operational first time for the Program.

2. A great deal of effort went into the overseas collection systems particularily at [redacted] where we do our R & D work. Here we had installed a complete system for converting the data from its usual analog form to the digital form which makes it amenable for reduction at the site or if the urgency warrants, it is easily put into a high speed communication system for electrical transmission to thestates. New solid-state data type receivers have been used operationally for the first time on this Mission 7105 and also an adaptive thresholder which measures the data pulse at precisly the half amplitude point so that variations of signal strentgh do not result in variations in pulse width as seen in the data. This has been instrumental in effecting a five to one improvement in the standard deviation of the resolution of time in our data. In addition the A-to-D conversion of data before it is ever recorded, has and additional improvement in this time resolution of two-or three-to-one.

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very high priority target areas of the world. The instrument has been successfully programmed and the data can be weighed as described but it is undergoing significant calibration to make sure that the data does in fact come from the site which is sorted against and not be actually similar emmissions from a nearby emittor.

In late August it is our intent that an engineering moritorium be called so that the following efforts may be accomplished:

1. Complete calibration of the geographic location sort.

2. Install an Executive program routine in the computer which will allow the easy access to any of the many programs now routinely used by feeding in a perforated paper tape through a tape reader. This will allow the computer to be used with vastly more fleximbility and saving of time.

3. Evaluation of each of the cross-talk bands which must now be tasked in specific combination to avoid the generation of false data or rather the appearance of data from a band where it is not really located, by transferral inside the payload through the power systems or through the generation of righ harmonics in thetransmittor and these harmonics will in turn be picked up by one of the on-board collection systems.

4. Installation of the Selectric typewriter in the digitizer and its digital tape transport so that the information required for NSA tapes at the beginning and at the end (Header and Trailer) can be electrically written on the digital tape recording from the BTM-9.

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MISSION 7105 SIGINT SPECIFICATIONS:

1. The Highest Frequency and Sensitivity thus far attained in the POPPY Program are provided in the 14,500 to 14,800 MC collection band in 7105D. with sensitivities in excess of -100 dbm.

2. Mission 7105 contains 18 individual portions of the frequency spectrum

3. 7105A has available upon command, one band at a time, nine collection bands which can utilize a to display the

4. 7105B has available upon command, one band at a time, nine bands which can utilize a Signal Amplitude (level) measuring in experiment (SLX). This SLX experiment will describe in birary fashion the incoming signal pulse amplitude with 16 levels of about 1¼ db each.

5. 7105D in band 6 covering 7800 to 8450 mc has available upon command an experiment which will interrupt the incoming signals at a predetermine rate of 250 times per second and thus allow for the first time in POPPY program the ability to detect the presence of type signal in this frequency band.

6. Sensitivites in excess of -78 dbm are available through the X-Band protion of the frequency spectrum in 7105C and 7105D.

7. All satellites will have the ability to be interrogated beyond the horizon range of the command sites by use of a delayed command timer and in one mode this timer will recycle the command 50 minutes ON then 50 minutes OFF, until reset by a command from one of the command sites.

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For Mission [redacted] NRL has ~~gone to~~ provided the following up-dating changes at [redacted] to improve the Standard ~~x~~ Deviation in the resolution of time in our data::::

1. Doubled the rf bandwidth of the receiviers

2. made the receivers phase linear so that time delay would not be a functinn of either amplitude or tuning.

3. Added an adaptive thresholding (APU) to note the half-amplitude point in each data pulse. thus eliminating the amplitude variation in pulse width which is seen in a fixed level clipping system like Audico.

4. Installed and calibrated a calibration signal source so that the relative time delays in each of the receiving and recording channels can be accurately known at the analysis site.

5. Provided an Analog to Digital data conversion system so that the precise time of the leading edge of each pulse can be known relative to a given time-bench-mark and this observation made prior to an recording and/without the usual errors associated with tape systems therefore is is available on record and playback.

6. The standard deviation for the resultant data is known to be less than two microseconds under normal circumstances but to date NSA has not used any except the first two items, the phase linear receivers with twice the bandwidth which existed in Mission 7104.

An investigation by HRB-Singer shows the first order effects of spacing, and delay time variables so that some consideration of vehicle positioning and pre-processing variables can be obtained in the geographic location of the emittor. This study clearly shows the effects of payload spacing ~~when seen without the simultaneous influence~~

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TOG MEETING 2% JULY 1967

1. Review of Mission 7105 Operational Evaluation

A. All systems are working with only minor inconvieniences in tasking group compatibility due to slight cross-talk between certain bands. Compatible task groups have been worked out which all the operational tasking of all collection experiments.

B. Computer in [redacted] is functioning properly but needs calibration against known unique emittors which have been selected and forwarded last week by message. Certain streamlining of the computer operation is being undertaken which will allow the computer to be used Off-Line for computation only and not for the production of real-time digital tape. A Selectric IBM typewriter is being readied for installation so that NSA Headers can be typed on to the digital tape made by the Ampex BTM-9 recorder on the output of the A-to-D data conversion system.

C. While extremely dense data has been seen the Overflow condition has not been reached in the A-to-D data conversion system.

D. 7105DELTA is now right side up and flying backwards with about plus and minus 10° of YAW motion. This has slowed down from ± 40° seen three days ago. It will be possible to attempt thrusting in about a week...it is [redacted] ahead of 7105CHARLIE.
BRAVO is parked now about [redacted] miles ahead of Alpha, (14.4 seconds apart). and separating about one mile each 4½ days....

2. The majority of the improvements in the timing resolution of the data have not yet been evaluated by NSA...Adaptive thresholder, A-to-D data conversion at the site, PDM recording in the Pacific to provide the second and third sites with high quality low standard-deviation data in the community. This decision has been hastily made and should be opened for consideration once again....

If one plots Standard Deviation of time resolution of the data against the confidence circle are for 95% location, it can be seen that this is a major effect and worthy of being exploited in normal data improvement effort. Such was the goal of NRL in providing the new receivers, a-to-d data conversion system and the adaptive thresholder to the various sites.

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Controversy about widening the A to B payload spacing.... 25 July.

1. First ofall parking these two payloads has been extremely tedious and has taken 1/3 of the available fuel about five or six thrusting efforts. A large order of business which should be undertaken next only after a thorough evaluation has been made on the present spacing. Theoretically this spacing could provide location circle areas of

GEOG [redacted] LOCATION SORT & TIMING*

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1. The geographic location sort of emmitor signals has been found to be our most powerful tool for the data reduction.

2. With the present ephemeral accuracy and sophistication of computer software, emmittor locations can be sorted down to a [redacted] radius on most geometric intercept situations. On direct overhead passes this sort is limited to somewhat less accuracy.

3. The present output form of this sort is a magnetic tape; listing this tape on the teletype page printer is very slow since the arrival time [redacted]

4. Software is being developed to compact and compress the information into ~~xxxxxxxxxxxx~~ mean scan or burst time and mean prf for each scan. It is anticipated that this information can be plotted in a convenient format for operator appraisal to high-light any new or interesting emitters arising in a specific geographic location.

5. The speed at which an operator receives this information after the Mission is dependant on (1) the density of data of the entire Mission, (2) the density of the data which is from within the areas of the sort, (3) and the number of different areas sorted against.

6. At the present time up to 10 sites can be sorted at one time.

7. If all pre-mission calculations are done ~~xxxxxxxxxx~~ prior to the actual mission, the geographic location sort takes about 5 minutes for each site sorted against. This puts the information in magnetic tape form at this point in time.

8. Within two weeks we will get the first high speed page printer and assuming a smooth interface and no significant software problems the output can be made available to operator in near sort time, or 5 minutes per site.

9. Further improvements, streamlining and simplification of the computer software is continually being made to facilitate easier and faster pre-mission calculations and to reduce operatore errors to a minimum.

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TOG SUBJECTS

Up-dating sites: [redacted] to move indoors on or about 15 September.

[redacted] not before mid October

Mission 7105...Progress Report.

Attitude
Voltage
Malfunctions
Operational Capabilities Lost or reduced...

Interrogation and Data Enhancement at sites...

Firsts for POPPY. [redacted]

Data Density due to wider angle of intercept not increased sensitivty
Can task opposite quadrants in 5000 mc band and 8600-9340 bands.

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