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BYE-1420-70/1
SORS 16./37

UNITED STATES INTELLIGENCE BOARD
SIGINT COMMITTEE
SIGINT OVERHEAD RECONNAISSANCE SUBCOMMITTEE

~~TOP SECRET~~

21 July 1970

MEMORANDUM FOR: MEMBERS, POPPY 7105 EVALUATION WORKING GROUP

SUBJECT: Final Draft Evaluation of POPPY Mission 7105

1. The final draft evaluation of POPPY Mission 7105 which was agreed to by the working group members is forwarded herewith.

2. Should you find any substantive errors, your advice will be appreciated by close of business 27 July 1970. If no substantive changes are required to the already agreed to draft evaluation of POPPY Mission 7105, it will be forwarded to the Chairman, SORS, for SORS consideration in the immediate future.

[redacted]
CHAIRMAN
POPPY EVALUATION WORKING GROUP

Attachment: a/s

we must have your comments no later than 0830 MONDAY the 27TH.

THANKS, Fred L.

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BYE-1420-70/1
SORS 16./37

21 July 1970

EVALUATION OF POPPY MISSION 7105

I. USIB REQUIREMENTS AGAINST WHICH POPPY, MISSION 7105, WAS DEFINED:

POPPY Mission 7105 was designed to provide an on-orbit capability at all times, available for sampling as required, to search the frequency spectrum between 100 and 15,000 MHz. The specific USIB requirements (USIB-D-41.14/246, 15 April 1965) stated objectives for general search SIGINT satellite collection which were to provide the identification of new and unusual signals whose accurate interpretation and analysis will provide information on new Sino-Soviet technological developments and, by continued monitoring, to detect changes in the electronic environment which could serve as indicators of unusual activity, imminence of hostilities or confirmation of information from other sources. In November 1966, USIB stated the urgent need for SIGINT satellite collection against Soviet ABM/AES systems (USIB-D-41.14/303) which emphasized the need for collection capabilities to search for and locate ABM/AES-associated signals/emitters in the 100-3200 MHz frequency range.

II. POPPY MISSION 7105 DESIGN CAPABILITIES

A. Mission 7105 expands the basic POPPY system capabilities and functions beyond those of previous POPPY systems. The basic POPPY system provides for the acquisition of accurate PRF and scan rate measurements within USIB requirements. The wideband crystal video receivers also provide coarse frequency measurement. Simultaneous intercepts of the same radar by two satellites are used to provide geopositioning data using the [redacted] processing technique. The four Mission 7105 satellites contain 44 receivers; 19 of these receivers are duplicated in different satellites. This additional duplication of receivers, in response to the USIB ABM/AES requirement, provided a more extensive capability to collect data for the locational resolution of intercepted emitters in a larger frequency segment (150-3200 MHz) which was estimated to contain new ABM/AES associated emitters. The versatility of command was enhanced in Mission 7105 to provide tasking on every orbit (12 per day) over the USSR and Communist China by an optional delayed turn-on mode; this increased by three to four orbits per day the number of collection orbits of previous POPPY

multiple manual band

systems. POPPY Mission 7105 also embraced multiple band tasking; however, this latter tasking is limited to a maximum of four bands per unit at one time to resolve any frequency ambiguity. POPPY Mission 7105 also carried experimental [redacted] options to acquire intercept emitter pulse width and [redacted]

B. The POPPY 7105 system consists of four separate satellites traversing the same circular earth orbit at an equatorial inclination of approximately 70° and at an altitude of approximately 500 N.M. generally spaced 50-150 N.M. apart. These four satellites were launched together as a primary payload by a THORAD booster on 31 May 1967 from the Vandenberg Western Missile Range.

III. ON-ORBIT COLLECTION CAPABILITIES

POPPY Mission 7105 has generally met design specifications. The POPPY 7105 system is highly reliable and has operated well beyond its specified life of one year. This mission, now three years old, has functioned with only minor degradation and some intermittent component operation. The experimental pulse width and pulse amplitude data collection options on Mission 7105 responded to operational tasking.

IV. MISSION GUIDANCE

In accordance with the USIB expressed urgency for collecting data on ABM/AES systems, the SORS has provided guidance which requested that the NRO emphasize collection operations using dual satellite capabilities whenever possible against the estimated operating frequencies of ABM/AES-associated emitters. The mission guidance refined geographic locations for target coverage which were generally expressed in the USIB ABM/AES requirement. As Mission 7105 collection operations continued and as data from all sources on certain ABM/AES systems, such as the [redacted] became more abundant, the SORS consequently recommended to the NRO a revision in priorities for collection operations against other frequencies where Soviet technology indicated that a search should be made for new/unusual emitters which may be ABM or SAM associated. This revised mission guidance consisted of a priority listing of frequency bands for collection on a random time basis and implemented the concept of monitoring the Sino-Soviet electronic environment on a continuing basis to guard against technological surprises and to enhance the probability of detecting new ABM/AES associated emitters.

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Varied tasking for POPPY 7105 has been recommended in a number of cases. POPPY Mission 7105 was tasked against specific emitters in North Korea following the North Korean shoot-down of a US Navy EC-121 aircraft. This tasking continued for approximately three months to acquire data relating to the location of North Korean radars and also to monitor any introduction of new Soviet or Chinese threat weapons systems equipment into North Korea. POPPY Mission 7105 was also tasked for general search and activity monitoring of specific SA-5 sites in the Soviet Union, of certain signals believed associated with the Soviet SA-6 system at specific locations and of SA-3 radars in the UAR. POPPY Mission 7105 has been particularly responsive to tasking for ocean surveillance purposes. Generally, this tasking has been against high priority Soviet naval vessels in the Mediterranean and the North Atlantic. Tasking against Soviet naval vessels focuses on the commonly used [redacted] aboard Soviet vessels which generally has a distinctive PRF for each emitter which can be associated with an identified Soviet hull.

V. POPPY MISSION 7105 DATA PROCESSING AND REPORTING

A. There are [redacted] POPPY support/collection sites, [redacted] on foreign soil, located peripheral to the Soviet Union and Communist China, which collect about 100 analog tape recordings per week. Signals of interest are flagged and electrically reported by the support sites to NSA. Analog tapes containing these signals of interest are manually scanned and analyzed for in depth signal review at NSA. Generally all tape recordings are forwarded to NSA for processing which includes conversion of intercept signals into digital form. The POPPY support sites at [redacted] have the capability to digitize in [redacted] POPPY 7105 intercept data for quick reaction processing. This site digitization results in a 500% improvement in [redacted] measurements. Approximately 20 digital tapes are forwarded each week to NSA by [redacted] NSA computer processing automatically provides locations from dual satellite intercepts of circularly scanning radars. Manual analysis of the computer printout also permits the isolation and location of signals of interest and new/unusual signals. With normal

surveillance/monitoring tasking and the present EOB tasking, approximately 40 hours of computer time are required at NSA for the processing of POPPY 7105 intercept data. At a computer cost of approximately $300 per hour, this figure is $12,000 weekly in computer time. A large portion of the computer time involves geopositioning data resulting from the present EOB tasking. Approximately 25 hours per week are spent in AUDICO (analog to digital conversion) procedures to digitize POPPY 7105 intercept data for computer handling. The cost figures for AUDICO processing are relatively small.

B. From POPPY 7105 launch in May 1967 through 30 June 1970, NSA has processed and recorded 2,933,000 radar intercepts from POPPY Mission 7105 in support of the ELINT search and surveillance requirements. The ability to derive emitter locations from POPPY 7105 data was originally intended to be an analytic aid in evaluating the significance of any given intercept and to aid in the identification of new or unidentified signals. In January 1969, an expanded EOB requirement was levied on the POPPY 7105 collection/processing system. Since then, processing of POPPY 7105 data has produced 13,000 radar locations. Some of these locations were unique;

the remainder were confirmations of previous emitters/locations. This reported EOB accounted for approximately 20% of the total EOB reported from SIGINT satellite data during this period.

C. POPPY 7105 end product material is disseminated by NSA in a series of technical and EOB reports which normally reach the consumer within three months after intercept. Preliminary reports based on POPPY support site observations can be released by NSA within 24 hours after intercept. A limited amount of locational data computed by the digitizing facilities at [redacted] are screened at NSA and reported within two weeks after intercept. Reports based on NSA analysis of POPPY support site collected data normally require a minimum of four weeks for production. More sophisticated signals often require additional time for analysis and the collection of additional intercepts is often desired before a final report can be published.

VI. REVIEW OF ACQUIRED DATA

A. POPPY Mission 7105 has successfully collected many of the types of signals for which it was designed and has

made contributions to the fields of technical intelligence,* search/surveillance and EOB. The principal contribution of POPPY Mission 7105 has been the acquisition of data from search/surveillance activities over a broad frequency band, with emphasis on the USIB specified Soviet ABM/AES spectrum. The signal pulse recurrence frequency, its radio frequency band and, in some cases, scan information can be directly derived from Mission 7105 data. In several cases, POPPY 7105 data have guided the tasking and design of technical intelligence collection systems intended to derive detailed signal parametric data. POPPY Mission 7105 served in this capacity when it made early intercepts of the DOG HOUSE and [redacted] Soviet ABM radars. POPPY 7105 made the first intercept of the [redacted] which confirmed estimates, based on new construction activity, that some [redacted]

we added direct info

to not so, new info!

*The CIA Member views the value of POPPY collection in the cases cited above as that of guiding technical collection systems and noted that the technical intelligence which has influenced judgments concerning ABM radars has resulted from these other systems and not Mission 7105 alone.

radars at [redacted] were being updated for missile tracking purposes in addition to their space tracking role. These estimates indicated a Soviet concern with a missile threat from the Southeast, i.e., Communist China.

B. POPPY Mission 7105 was the major source of early intercepts of the suspect DOG HOUSE signal in the summer of 1967. Analysis of these intercepts showed them to be a good candidate for signals from the DOG HOUSE structure, thus indicating testing and calibration of that radar.

C. Analysis of the ABM-associated [redacted] signals acquired by POPPY 7105 have caused the intelligence community to further consider the operational doctrine of this radar. POPPY 7105 intercepts established that two separate [redacted] radars were emitting simultaneously in the Moscow area. POPPY Mission 7105 first intercepted the believed ABM-associated [redacted] at Sary Shagan; analysis of these signals indicated that this radar was not unlike the other Soviet deployed [redacted]

D. Mission 7105 has also intercepted signals from SAM-associated, air surveillance and new Soviet shipborne radars. Analysis of intercepts aided in identifying the target tracking signal of the [redacted] Mission

7105 made the first intercept of signals from the Soviet [redacted].

E. POPPY 7105 provided the first data on the frequencies associated with various beams of the [redacted] and thus permitted an improved intelligence assessment of its function and capabilities as an air surveillance/target acquisition radar.

F. POPPY 7105 intercepts have provided the first indications of Soviet ground J-band emitters with scan characteristics of a fire control nature. These intercepts further suggest that this frequency band may be used by radars which may have applications for missile guidance and fire control.

G. Although POPPY 7105 was not designed primarily to provide EOB data, its intercepts have been processed for this purpose because of problems which developed with other EOB satellite collectors in the fall of 1969. POPPY 7105 EOB data are currently included with those from other satellite sources in the weekly NSA EOB report and comprise approximately 20% of SIGINT satellite acquired EOB data.

H. In 1969 and 1970, POPPY 7105 data were processed by the POPPY support site, [redacted] to provide theater commanders with locations of Soviet naval vessels in the Norwegian and Mediterranean Seas.

I. In summary, analysis of POPPY 7105 intercept data has provided the intelligence community with the following intelligence information:

1. While performing its search role, a number of new radar signals associated with Soviet ABM and SAM systems were intercepted by POPPY 7105. These intercepts primarily served to guide the tasking of other technical intelligence collection resources to acquire detailed technical intelligence data on these systems. Some data were provided by POPPY 7105 intercepts for the analysis of possible functions and capabilities of Soviet ABM and SAM systems.

2. Indications of Soviet usage of J-band for certain weapon system applications.

3. Timely location information on Soviet naval vessels of importance of US tactical fleet commanders.

4. Adjunctive EOB data on an expeditious basis from specific crisis areas in support of theater commanders.

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EVALUATION OF POPPY MISSION 7105

I. USIB REQUIREMENTS AGAINST WHICH POPPY MISSION 7105 WAS DEFINED:

1. POPPY Mission 7105 was designed to satisfy the requirement for providing an ELINT General Search capability, covering the majority of the frequency spectrum from 100 to 14,800 MHz. The specific USIB requirement (USIB-D-41.14/246, 15 April 1965) states the objectives for General Search SIGINT satellite collection to provide identification of new and unusual signals whose accurate interpretation and analysis provides information on new Sino-Soviet technological developments and by continued monitoring detects changes in the electronic environment serving as indicators of unusual activity imminence of hostilities or confirmation of information from other sources. In November 1966, USIB stated the urgent need for SIGINT Satellite collection against Soviet ABM/AES systems (USIB-D-41.14/303) In response to the latter requirement the NRO modified POPPY Mission 7105 to provide dual satellite coverage in the frequency range from 153-3315 150-3200 MHz to provide data for geopositioning purposes using the [redacted] The POPPY command system was modified to permit tasking on every orbit over the USSR and Communist China.

a-to-d conversion

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II. POPPY MISSION 7105 CAPABILITIES:

1. POPPY Mission 7105 expands the basic system philosophy of ELINT collection to provide EOB and technical intelligence along with general search. The basic POPPY system concept arrives at these objectives by collecting PRI, [redacted] radio frequency and main beam illumination patterns using crystal video receivers. Key weapon system parameters are derived by analyses of collected data. These key parameters such as definition of emitter scan rate, sector, orientation, beamwidth, frequency agility, magnitron family identity provide the fundamental elements of weapon system emitter definition. These emitters received by both of a satellite pair are capable of being located by [redacted] analysis.

2. The POPPY Mission 7105 satellites were launched together as a primary payload by a THOR-AGENA booster on 31 May 1967 from the Vandenberg Western Missile Range. The four POPPY spacecraft contain a total of 44 crystal video receiver systems; 19 receivers (14 covering the entire ABM spectrum) are duplicated to provide the data required for [redacted] Versatility of command in Mission 7105 is achieved by incorporating a "delayed turn-on" mode, allowing all orbits over Soviet-Chinese territory to be tasked. The four spacecraft traverse the same circular earth orbit which has equitorial inclination of 70° and altitude of 500 NM. The separation distance between spacecraft [redacted]

[redacted]. The distance [redacted] varies at three year intervals from near synchronism to a difference of half an orbit. In addition to spacecraft technical and operating characteristics, the ground collection and processing capability at [redacted] was materially altered to improve results. Fundamental improvements included [redacted] digitization, adoptive thresholding and developments of computer aided manual analysis techniques on-site.

III. COLLECTION CAPABILITIES

POPPY Mission 7105 has not only met design specifications but in instances, particularly technical intelligence, has exceeded requirements. Examples include:

1. Determined PRF, scan, stagger and RF to 2% for [redacted] and subsequent weapon system deployment into eastern USSR and [redacted]

2. Defined DOG HOUSE scan characteristics including sector, dwell, sweep rate, orientation and scan angle as a function of time of day.

3. Determined PRF of [redacted] along with scan and interrelationship between PRI and lobing (scan rate = PRI/10).

4. Frequency agility recognition capability was demonstrated by monitoring emissions from [redacted].

5. Random PRI collection, identification and location capability was demonstrated by collection of [redacted]

The POPPY system has proven to be highly reliable and has performed well beyond its design life of one year. To date the system has performed over three years with only minor degradations.

IV. MISSION GUIDANCE

In consonance with the USIB expressed urgency for collecting data on ABM/AES systems, the SORS provided guidance requesting the NRO emphasize collection using the dual satellite capabilities for emitter location and scan/beam definition [redacted] whereever possible in frequencies where ABM/AES associated emitters were believed to be. For example, POPPY satellites having 40-700 NM separation were tracked by same emitter, [redacted] Geographical locations of emitters were determined to the accuracies specified in the USIB ABM/AES requirement. Both SA-4 deployment and other technical intelligence requirements were accomplished simultaneously with ABM tasking. Soviet technology indicated a search for new/unusual emitters should be made. As collection progressed and data on certain ABM/AES systems, such as [redacted] became more plentiful, SORS consequently recommended a more uniform collection plan for all bands. Such monitoring was directed to guard against technological surprises while not degrading the routine monitoring of ABM emissions.

For example, in April 1969 the North Koreans shot-down a U.S. Navy EC-121 aircraft. The NRO was immediately requested to task POPPY Mission 7105 against current weapon system emitters in North

Korea and locations were particularly needed. It was also desired to detect the introduction of new Soviet or Chinese threat weapons systems into North Korea.

The POPPY system is extremely versatile and can be tasked on orbit to-orbit basis, it can readily respond to tasking such as a recent Army requirement for [redacted] and similar quick reaction requirements. Also, in 1969 and 1970, POPPY Mission 7105 was tasked for ocean surveillance purposes.

V. POPPY MISSION 7105 DATA PROCESSING

[redacted] collection stations are located peripheral to the Soviet Union because POPPY is a transponder system. About 100 analog tape recordings are made each week. Signals of interest, as determined by SORS priority listings, are flagged and electrically reported to NSA by field sites. These tapes are then forwarded to NSA for processing which includes conversion to digital form. The analog tapes containing signals of interest are manually scanned and analyzed for in-depth signal review.

POPPY sites at [redacted] have the capability to digitize data in [redacted] on-site for quick reactio processing. A very significant aspect of [redacted] digitization is

a factor of five or more improvements in time resolution. This advantage provides significant technical intelligence capabilities not available when using intermediate analog processing. On-site analytical techniques are not limited to closed form solutions normally associated with stable PRI, circular scan emitters. While being more time consuming, the present on-site manual computer techniques have an inherent advantage of processing all scan modes, regardless of PRI stability or modulation. A similar capability is being installed at present in [redacted] with NSA funding and NRO approval. NSA bulk processing provides locations with 90% confidence ellipse. In addition, manual analysis of the computer printout permits isolation and location of signals of interest or new and unusual signals. From launch date to 1 December 1969, NSA has recorded 2,180,000 ELINT intercepts. In support of ELINT General Search requirements approximately 1,400,000 intercepts have been recorded. Additionally, there are approximately 98,000 entries in the history file of signals located by POPPY Mission 7105.

VI. REVIEW OF ACQUIRED DATA

Mission 7105 has been used to search for new radar signals and provide locations, accurate PRF and scan measurements, relative power, and frequency range. POPPY can also provide tip-off for other satellite systems whose coverage is directed towards specific,

known targets. Thus, POPPY has continued to fulfill its primary function of General Search and in addition has provided valuable technical intelligence.

As an indication of the high degree of success of Mission 7105 some of the more notable and most important intercepts are listed below:

A. First US Intercept of ABM Signals: Mission 7105

[redacted]

DOG HOUSE - [redacted]

[redacted]

B. First reported U.S. Intercept of Guided Missile Related Signals:

[redacted]

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C. In addition to the General Search signals detected the following Significant Technical Intelligence Intercepts were made:

D. General:

Since 1 January 1969, 12,200 POPPY locations have been reported, accounting for some 25 percent of the total SIGINT Satellite EOB reported during that time period. The emitters most frequently located are:

TOKEN;

VII. 7105 SYSTEM IMPACT

1. Experience gained from 7105 and predecessors has led to advancement of technology for future mission design guidance. Examples include extended K-band collection capability, polarization, power measuring in all bands, ability for simultaneous collection in all bands for weapons systems having multi-band emissions (this capability was designed into Mission 7105 from 153 MHz to 9350 MHz), and station keeping improvements such as microthrusters and gravity gradient system.

2. The high reliability of POPPY Mission 7105 has demonstrated the soundness of using tested and proven simple concepts and techniques. These include the use of a transponder (in lieu of complexities of tape) and crystal video receivers ~~with~~ (inherent freedom from spurious response) with good dynamic range, non-scanning fixed bandwidth and straightforward simplicity. Consequently, POPPY has provided a long term coverage of essentially all weapon system emitters. This long term coverage permits comparisons between emitters and reveals subtle differences not otherwise detected. For example, during a two to three year observation period a large data base is accured. Changes in activity levels, interrelationships, usage patterns and technical characteristics become readily apparent with a confidence not possible in the short term or more limited ELINT collectors

3. The results of special tasking for Ocean Surveillance purposes permitted [redacted] to supply locations of Soviet major surface force units to threats and fleet commanders on an average time delay of 4.2 hours and to an average accuracy of 3-20 miles, with the mean accuracy 10 miles. This processing has usually been accomplished on intercepts of [redacted] emitters. The [redacted] radar aboard Soviet surface combatants generally has a distinctive PRF for each emitter; this can usually be associated with an identificable Soviet hull. This permits the ready surveillance of certain Soviet naval units by POPPY. This support has received the plaudits of the Fleet Commanders for information provided during the recent high level Soviet Fleet activity of exercise OKEAN.

4. POPPY Mission 7105 has demonstrated a capability of providing quick reaction alert indications to DEFSMAC and other high priority short term requirements. Tip-off capability of six to eighteen minutes on ABM signals provided the alert for critical intelligenc collection operations.

5. Significant signal intercepts were made in response to the USIB urgent need and as a result of the NRO modification of the 7105 mission. On the second day of operational use the first intercept of DOG HOUSE was made and on the fourth day of operation the first intercept of the [redacted] was made. This was later followed by the [redacted] intercept which completely identified the major ABM elements required by the USIB ABM collection guidance of November 1966.

VIII. CONCLUSIC

1. POPPY Mission 7105 has produced much significant data for more than two years beyond its design life. POPPY systems in general, and 7105 in particular, have provided reliable and extremely valuable general search capabilities for monitoring technological advances in Soviet and CHICOM electronic weaponry. The design permits precise measurements of PRF and scan rates and RF measurements. Signal level and pulse width measurements can be accomplished when desired. Mission 7105, and also 7106, have been successfully utilized to provide accurate EOB data although this was not a design function. Additionally, Mission 7105 has provided the only tasking vehicle in response to many short term, high priority national intelligence requirements. The main attributes of Mission 7105, and POPPY systems in general, continue to be low cost coupled with highly reliable wideband ELINT collection for EOB, technical intelligence and general search.

IX. RECOMMENDATION

In view of the foregoing conclusions, it is recommended that the POPPY program be continued and that supporting ground equipment and processing techniques be refined commersurate with the satellite measurement capability.

MEMORANDUM 2 July 1970

~~SECRET~~ [redacted]

TO: NRL-CODE 5

From: Code 5614

Subj: Response to ~~XXXX~~ Mission 7105 Evaluation Working Group.

Ref (a) Draft ~~SORS~~ letter of 25 June 1970, Bye-1414-70 SORS 16./32

1. It was suggested in the NIC meeting of 30 June that the Laboratory prepare at the earliest, a response to Ref (a) so that the Program Office could formulate the total response in time for the first meeting of this Evaluation Working Group on 7 July. This means that NRL response must be available to NIC before endof working day Thusday 2 July 1970. It is therefore urgent that each member of our team prepare his input independantly on his own without any guidance from senior authority at NRL. The only guidance from NIC was to avoid the inditement of any other element of the community because ~~of~~ this will not fit the overall response. . . .

2. the following paragraphs refer to the numbering system of Ref (a):

II. POPPY MISSION 7105 capabilities.

POPPY Mission 7105 retains the basic system design and functions of predecessor POPPY satellites with the major improvements in the area of the ground based data ~~de~~ceiving, recording and A-to-D conversion systems. These [redacted] have provided over a one hundred fold improvement in the observational accuracy in the time domain. ~~for~~ Data which is intercepted by the collection systems of two separate spacecraft are analyzed ~~for~~ to determine the [redacted] Then by [redacted] can be made which will disclose the location. POPPY 7105 also carried parameteric measurement options for both [redacted] & SLX respectively).

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~~SECRET~~ [redacted]

[redacted]

I: Background [redacted]

Mission 7105 is the fifth mission of POPPY under the NRP Program "C". It is a follow on to another ELINT Collection Space program which was also under Nav y Management and funding prior to the establishment of the NRO. There are many elements of Mission 7105 which are common to the earlier Missions and to the one following 7105. The climate in the community which prevailed during the design and development of Mission 7105 clearly emphasized the priority of the ABM/AES emitter search. Parts of this Weapon System had already been identified by earlier POPPY Missions and [redacted] were exclusive intercepts by POPPY with important definition of Beam Sector being made by POPPY against the [redacted]

An evaluation of POPPY Mission 7105 must assess all of the facets where USIB guidance was imposed in (1) the design of the collection systems, (2) the manner in which they were operationally tasked and ~~xxxxx~~ ultimately the degree of exploitation of the data by the analysis community. If this evaluation should disclose a severe unbalance in these three elements, certain recommendations must be made.

II: SPACECRAFT COLLECTION & overseas ground station SYSTEMS:

The general guidance for the design and development of POPPY Mission is provided in USIB-D-41.14/246 of 15 April 1965 and was further modified by USIB-D-41.14/303 which stated the urgent need for collection against Soviet ABM/AES systems. This latter requirement was provided to NRL in December 1966 where the spacecraft systems on 7105C one receiving subsystem was added and in 7105D two receiving systems were added, so that the entire ABM/AES frequency spectrum as then defined (155 to 3300 MHz) was equipped in [redacted] fashion so that emitter location could be possible with Mission 7105 against selected emitters throughout this frequency spectrum. In addition to these relatively easy changes to the spacecraft the mandate was given POPPY Mission 7105 to provide Geographic Location Sort (GLS) against all data to disclose that portion which emenated from one of half dozen High Priority ABM sites in the Soviet Union. In order to do this POPPY Mission 7105 was to undergo a major change at the overseas site in [redacted] For the first time in POPPY the analog data which is normally received & recorded was to be digitized so that each pulse would have the precise time assigned to it's leading edge before that pulse was distorted by a recording media. This analog-to-digital data transfo[redacted]n was to be Quality Controlled by a small computer system. Handle via Byeman-Talent-Keyhol Control Systems Jointly

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The computer processing system at the field sites is a Computer assisted Manual Process[redacted] stem and in no way competitive to the Bulk Processing system at NSA...In the general sense it is complimentary with it. NSA has had a heavy influence onthe manner in which it is employed, thus assuring that it has been effectively calibrated and directed toward the job where it can make the best and most significant contribution.

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RELIABILITY AND TECHNICAL CONTRIBUTIONS OF THE POPPY PROGRAM

Since the Poppy Program provides a Satellite Elint Collection System, it therefore must be evaluated primarily on its Elint contribution. However, one should not neglect the more general technological contributions of the program. After all, it is only through a sound technological base that the "better mousetrap" is ever built.

Poppy has provided some outstanding contributions to the state-of-the-art over its ten year period. Some examples follows:

Reliability: Poppy has achieved an outstanding reliability record. Mission 7105 is today over 3 years old and all four of the spacecraft are still healthy, useful producers of high quality Elint data. 7105A, due to battery problems, had been in a "sunlight only" status for a long period. Engineering its run several months ago at [redacted] indicated a gradual improvement in the batteries to the point where, approximately one month ago, completely normal tasking was able to be resumed on 7105A. 7103C and 7104A lasted 4 and 4½ years respectively. The point is that the design team at NRL has, over the years, evolved a design and testing approach which yields long life systems - in fact the Poppy reliability record is held up as the basis of comparison for other similar systems to try to achieve. In an evaluation program, reliability is a relavent factor when compared relative to some other competing system. In this context, Poppy has an enviable record. Any program such as Poppy, which has consistently demonstrated success in achieving advanced technological goals without sacrifice of reliability is making a valuable contribution.

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Technological contributions: Since Mission 7105 is the system under evaluation, some its technological contributions should be pointed out. Mission 7105D was the first U.S. spacecraft to fly a data storage system to monitor the performance of its gravity gradient stabilization system. The performance data collected by that storage system was a "revelation" to the gravity gradient design community. It dramitically demonstrated to the entire community, at the Symposium on Gravity Gradient Attitude Stabilization in December 1968, that the basic design tools, analysis, and hardware for gravity gradient systems were woefully lacking. As a direct result of the Mission 7105D gravity gradient data, NRL, and others, undertook the development of much improved gradient rods, dampers, configurations, and sensors. This new hardware was flown on Mission 7106 and the results have shown a great improvement and revealed further areas where system optimization can be achieved. These improved systems will be flown on Mission 7107. The history of the gravity gradient evaluation is a perfect example of how the Poppy system has contributed to advancing the state-of-the-art by flying developmental systems, learning from the results and making further improvements. It should be pointed out that these developmental systems have always been implemented in such a way that failure of that new system did not detract from the basic mission--- success however did enhance it. Thus, it is by this approach that Poppy is able to increase its capability with every launch.

Another example of a technological contribution is the development of the microthruster systems for station keeping. A statement was made in the first draft of the "Mission 7105 Evaluation Report" that Poppy "could not maintain optimum position" on the spacecraft. Let us examine the record. Missions 7105B and 7105D each contained micro-

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On mission 7105B, after the initial adjustments required

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to pla[redacted] satellites at the specific distance of [redacted] (which was accomplished during first month in orbit) the spacecraft have never been less than [redacted] It should be noted that the communities opinions as to what constituted an optimum spacing range have changed during the lifetime of Mission 7105. The point is that the microthruster system is capable of providing any reasonable spacing range which is desired. Excluding the first month in orbit the 7105B microthruster has only had to be used 6 times to accomplish their spacing history. In every case it has been done at the direct request of the community and in every case has been accomplished in a desired and predicted manner. As recently as three weeks ago 7105B was thrusted. (It had not required any thrusting for 13 months prior to that). The particular thruster used in the recent operation had not been used in the last 2 1/4 years! When energized, the system performed exactly as it had 27 months ago, resulting in an excellent maneuver. This system not only illustrates a technological advance but also proves that reliability has been achieved in the process. The 7105B microthruster was of a different design and did not prove to be as reliable as the type in 7105B. However, in spite of this, during the period beginning one month after launch to the present time, the spacing has been maintained between the useful limits of [redacted] for 93.3% of the time. Contrary to the negative statement concerning spacing in the "Evaluation Report of Mission 7105", the actual results show excellent performance and represent a significant technological advance.

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SECRET [redacted]

~~SECRET~~ [redacted]

Future Poppy Launch Costs

[redacted]

option selected. During the proposal phase of Mission 7107, [redacted] did provide Poppy with cost estimates for both a TITAN and an AGENA launch of a larger and heavier version of Mission 7107. These estimates showed, for the larger and heavier spacecraft, that the TITAN was actually less expensive than the AGENA. This results from the fact that extensive modifications would have been required for the AGENA but not for the TITAN.

[redacted]

Pg 12, line 11

"Data for military EOB purposes acquired by Stawman/Reaper systems are processed more rapidly, at less cost and are much more voluminous and accurate than do relatively small amount of EOB data derived from POPPY intercepts".

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Reliability and Technical Contributions of the Poppy Program

Since the Poppy Program provides a Satellite Elint collection system, it therefore must be evaluated primarily on its Elint contribution. However, one should not neglect the more general technological contributions of the program. After all, it is only through a sound technological base that the "better mousetrap" is ever built.

Poppy has provided some outstanding contributions to the state of the art over its 10-year period. Some examples follow:

Reliability: Poppy has achieved an outstanding reliability record. Mission 7105 is today over 3 years old and all four of the spacecraft are still healthy and useful producers of high quality Elint data. (A) 7103C and 7104A lasted 4 and 4½ years respectively. The point is that the design team at NRL has, over the years, evolved a design and testing approach which yields long life systems - in fact the Poppy reliability record is held up as the basis of comparison for other similar systems to try to achieve. In an evaluation program reliability is a relevant factor when compared relative to competing systems. In this context, Poppy has an enviable record.

(A) 7105A due to destruct anomalies, had run since "turning off early", a time span of 3 years, 8 months. The age of 3 years and 8 months was selected as a gradual improvement over the 3 year and 4 month life of 7103C. Mission 7105A was added to the record on 7/10/74 when 7105A was declared operational.

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as Ocepeus, which has, coincidentally demonstrated success in achieving advanced technological goals without sacrifice of reliability in making a valuable contribution.

Technological contributions - since Mission 7105 is the system under evaluation some of its technological contributions should be pointed out. Mission 7105D was the first U.S. spacecraft to fly a data storage system to monitor the performance of its gravity gradient stabilization system. The performance data collected by that storage system was a "revelation" to the gravity gradient design community. As graphically demonstrated to the entire community, at the Symposium on Gravity Gradient Attitude Stabilization in Dec 1968, that the basic design tools, analysis and hardware for gravity gradient systems were woefully lacking. As a direct result of the Mission 7105D gravity gradient data, NRL, and others, undertook the development of much improved gravity gradient rods, dampers, configurations and sensors. This new hardware was flown on Mission 7106 and the results have shown a great improvement and revealed further areas where system optimization can be achieved. These improved systems will be flown on Mission 7107. The history of the gravity gradient evaluation is a perfect example of how the Gravity Handle via Byeman/Talent/Keyhole Control Systems Jointly

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It should be noted that the communities opinions as to what constituted an optimum ~~SECRET~~ [redacted] have changed during the lifetime of Mission 7105. The point is that the [redacted] thruster system is capable of providing any reasonable spacing range which [redacted] desired.

System has contributed to advancing the state of the art by flying developmental systems, learning from the results and making further improvements. It should be pointed out that these developmental systems have always been implemented in such a way that failure of that new system did not detract from the basic mission-success however did enhance it. Thus, it is by this approach that Agena is able to increase its capability with every launch.

Another example of a technological contribution is the development of the microthruster system for station keeping. A statement was made in the first draft of the Mission 7105 Evaluation report that Agena could not maintain optimum position on the spacecraft. Let us examine the record. Missions 7105B and 7105D each contained microthrusters. On Mission 7105B, after the initial adjustments required to place the satellites at the specified distance of [redacted] (which was accomplished during first month in orbit) the spacecraft have never been less than [redacted] nor more than [redacted] apart.[1] Excluding the first month in orbit the 7105B microthruster has only had to be used 6 times to accomplish the spacing history. In every case it has been done at the direct request of the community and in every case has been accomplished in a [redacted] predicted manner. As recently as three weeks ago [redacted] was thrusted. (It had not required any thrusting for Handley via Bjerman/Dalent-Reyhole Control Systems jointly

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13 months prior to that.) The particular thruster used in the recent operation had not been used in the last 2½ years. When energized the system performed exactly as it had 27 months ago, resulting in an excellent maneuver. This system not only illustrates a technological advance but also proves that reliability has been achieved in the process. The 7105D microthruster was of a different design and did not prove to be as reliable as the type in 7105B. However in spite of this, during the period beginning one month after launch to the present time, the spacing has been maintained between the useful limits of [redacted] for 93.3% of the time. Contrary to the negative statement concerning spacing in the "Evaluation Report of Mission 7105", the actual results show excellent performance and represent a significant technological advance.

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Future Gappy Launch Costs

[redacted]

[redacted] the original phase of Mission 7107, did provide Gappy with cost estimates for both a TITAN and an AGENA launch of a larger and heavier version of Mission of 7107. These estimates showed, for the larger and heavier spacecraft, that the TITAN was actually less expensive than the AGENA. This results from the fact that extensive modifications would have been required for the Agena but not for the TITAN.

[redacted]

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Pg 12 - line 11 "Data for military EOB purposes acquired by Hawman/Rexter systems are processed more rapidly, at less cost and are much more voluminous and accurate than do relatively small amount of EOB data derived from Poppy intercepts."

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In reviewing the draft report on the poppy 7105 mission several aspects need attention. The first of these are some minor errors and omissions which are discussed in section I. The second aspect is that of some basic points of collection.

a. Launch was a Thor [illegible]
b. Mission provided a Defense Alert capability. (see chart 1).
c. ~~The 7105 sunlight only problem is not correct and it is available 24 hours per day.~~

need for ABM/AFS collection. The primary functions were largely met on the 4th day of operational use by the first intercepts of the [redacted] and on the ~~fourth~~ second day by the first Dog House intercepts that [illegible] The Last ABM unknown was received on the 19th of December in simultaneously with the Facade program. The basic (caps.) comparison with other programs should be made against those that were specified, designed and launched in the 1966/1967 time period.

[redacted]

The results of the intercept data from the mission 7105 need some elaboration. If one subtracts all of the uncoated and deleted data from the 2,180,000 separate intercepts a figure of 4,000 Locations were derived which met the location confidence requirements. This figure is basically in agreement with the results of the batch processing presented to the NRO review on 21 Nov 1969 of the domestic batch processing and the computer aided manual analysis used at the field stations. The summary at that meeting was that the batch processing of the [redacted] data was producing most of its Locations on stable, circularly scan radars and that the manual computer aided approach was producing locations on almost all of weapons systems radars. Specifically in the batch processing in the previous 7 months had produced 1140 location primarily on [redacted]. The manual computer aided approach had produced [redacted] locations the previous week, however, the more typical values were about 50 per week on the unknowns, (see attachment for a sample of a one month tabulation) and other complex radars such as [redacted] etc. Since that review discussions have been held to apply some of the techniques used in the computer

aided manual analysis to the batch processing. In the area where probably the largest errors exist in the the [redacted] system ... i, the satellite positions, NRL has been working with Spasur and the Naval Weapons Laboratory to obtain a more accurate satellite position determination. The an improvement of about 3 to 1 is about to be put into field operation and when this is put into operation at NSA all low altitude systems will benefit. The [redacted] accuracies, however, are basically quite good. The chart on page lists [redacted] some of these results. The batch processing result which solved the [redacted] puzzle by providing the poppy trade mark of scan had a 1 x 4 NM confidence area on at least one [redacted] which was not discarded from the data file.

As a search role is reviewed the and projected for various programs the basic concept of search must be reviewed. For Large fixed structures which are recognizable in photography the effort is one of watching these structures for as much time as possible over as much a frequency range as possible. As a general USIB Weapons system element search for all the different USIB requirements on types of radars which in many cases → Apriori knowledge does not exist. This is not just the search for new elements but also determining the full capabilities of existing elements. An example of this type of search was cited in VI, 1. of the draft. This was the recognition greater sector coverage of the Missile [redacted] this has great implication in the ABM defensive posture. A second is the detection of an extended R.F. range of the [redacted] above and below its old magnition limits. This is highly significant to the jamming or deception equipment on our aircraft.

The ideal system would watch every-
every where for every thing
thing all the time, however, it is impossible
to build an ideal system. And the way
to judge various systems for a search role
is by a figure-of-Merit of how many

There are many factors which enter into
evaluating actual collection systems collecting
against actual radars and any approach
even the full operation use of
systems have qualifing conditions and
involve value judgements in processing and
assertaining the contributions and effectiveness
of systems. One way to obtain a

figure-of-merit which is not all
inclusive, but in this case is used to obtain
a perspective of the systems in a search role is to compare the
instanteous collection frequency spectrum,
the area collected
, and the intercept time over the
over the communist Block

It is
true that this area is not totally within
the soviet Union, but the same condition
exists for the
also. For example, collection against thin skin
along the soviet western border
puts half of the collection area in friendly countries,

17 May - June High Alt. Eve

May storm following atmosphere is expanding fouls low altitude

Other considerations such as the radar scan time for poppy or the dwell time and probabilities of each R.F. step can be included, if assigned, but, these can vary so widely for different emitters that the results can be made to vary any place by picking different extremes. The tabulation used is in Annex A. but the net conclusion is that 27 missions of Strawman are needed to provide the search coverage of the 1968-7105 from [redacted] This is consistent with the basic role of each mission. Poppy to provide search [redacted]

The second aspect of the initial statement was that of providing "full technical parametric and locational data." In reviewing the USIB requirements of the Annex in comparison with the [redacted] the poppy program for almost all emitters determines 8, 9, 12, 13, 14, 27, 28, 29, 30, 31, 32, 33, 35, 36, 37, 38. (See NRL BYE).

This is not including the frequency change or limits capability as was cited in the two earlier examples, which is part of the basic poppy philosophy.

POPPY Mission 7105 retains the basic system design and functions of the earlier POPPY missions. The basic design concept provides for the acquisition of Frequency information only by discrete bands, excellent PRF and emitter antenna scan rate measurements. DAta derived from the intercept of the same radar through two separate satellites collection systems provides the opportunity to assess the [redacted]

[redacted]

7105ALPHA, was equipped to make parametric measurements of [redacted] of the intercepted signals, using one collection band at a time. Another spacecraft, 7105 BRAVO, was equipped to make the parameter measurement of input signal amplitude on any collection band, using only one band at a time.

POPPY Mission 7105 consisted of four independent satellites, each containing about 11 crystal video receiving systems for a total of 44 discrete collection systems for this Mission. 19 of these were duplicated in more than one satellite so that [redacted] location analysis could be used for geopositioning the emitters. This greatly increased the locational capability of this Mission beyond that previously available in POPPY. Only four bands from each satellite could be used at one time so that the data-band of signal origin could (unambiguitiously)be resolved. The spacecraft were [redacted]

[redacted] They were in an orbit with 500 N M altitude and 70° inclination and were launched from a Thor-AGENA from the Western TEst Range on 31 May 1967 into an orbit that minimized the intere[redacted]ssion, from a collection

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II POPPY MISSION 7105 Capabilities:

Mission 7105 is the fifth Mission of POPPY under the National Reconnaissance Program (NRP), Program C under Navy management. It is a follow-on to another ELINT collection satellite program which was also under Navy management and funding prior to the establishment of the NRO. There are many elements of Mission 7105 which are common to the earlier Missions of POPPY and the Mission 7106 which followed. The climate which prevailed in the community during the design phases of Mission 7105, were clearly under a state of change, with the emphasis shifting toward the priority collection of ABM/AES Signals. Parts of this weapons system had already been identified by earlier POPPY [redacted] which had remained as exclusive POPPY sources of data. In addition this data did establish certain important beam scan characteristics and locational information as well as the Pulse Repetition Interval, (PRI) to a high precision.

The evaluation of Mission 7105 must access all of the facets of the USIB guidance which were imposed in (1) Design of the satellite ELINT systems, (2) the dynamics of Operational tasking and (3) the exploitation of the data which was collected. If this evaluation should disclose any significant unbalance between these three elements of the Mission, the unbalance must be identified and recommendations made to relieve it in future missions.

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III. NOMINAL COLLECTION CAPABILITY:

Poppy Mission 7105 has performed generally according to the USIB requirements. There have been some minor engineering restraints imposed in its operational usage and the 7105 ALPHA spacecraft was restrained to a Daylight-Use-only for a period of over one½ years but this situation has corrected itself now and it is fully operational. At this time all four spacecraft are fully operational and they are over three years old, greatly exceeding their design life of one year.

IV. POPPY MISSION 7105 DATA PROCESSING:

All of the overseas sites used to receive and record the analog tape recordings of thePOPPY data, scan the data during and immediately after the data taking portion of the Pass. Certain NSA derived Priority Signals Of Interest (SOI) are flagged by the field sites and electrically by messages sent to NSA summarizing the particular signals, including the New and Unusual signals. The analog tape recordings are then sent by courier to NSA for conversion to Digital record by AUDICO and then processed both Manually and with Computer. Two of the sites were equipped with the A-to-D data conversion and Computer system, [redacted] in April 67 and [redacted] in April 69) so that their tape which is forwarded to NSA has already been converted into the digital format. The Computer data deduction at NSA provides emitter locations from [redacted] intercepts on certain emitters; computer printout also indicates the confidence ellipse of the emitter locations. In addition, Manual analysis is carried out on all of the tapes which have [redacted] intercept of signals of interest reported by the field sites so that NSA can respond electrically to the site on their reports.

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VI. REVIEW OF ACQUIRED DATA:

1. POPPY Mission 7105 became operational on 26 June 1967 after experiencing the normal type engineering evaluation during its first 3½ weeks of flight. The four satellites were deployed [redacted]

2. The second day of operational tasking, provided this Mission with its first major intercept, the first intercept of DOG HOUSE. This was on 28 June, with the sole data source being Mission 7105 until about Oct or November when another program made intercepts of this important ABM signal.

3. On the sixth day of operational usage of 7105 it provided the first intercept of the [redacted], an emitter thought to be the fore-runner of the [redacted] which was first heard from POPPY Mission 7105 on 19 December 1967 and again for a long exclusive intercept on 22 Dec which was subsequently located by the site in [redacted] to be later substantiated by NSA to within [redacted] of their location.

4. The first X-band emitter to be located by POPPY data was at the request of NSA in Sept 68 when [redacted] was requested to provide further testimony of the GUGE emitter, then identified as a Soviet for over 4½ yrs. [redacted] did locate three of these emitters in a period of about 3 to 4 weeks and all of them fell on [redacted] The outcome of this startling effort was the disclosure that in fact the GUGE is really the [redacted] Not that this event was of great intelligence importance, but rather it does illustrate that a combination of processing resources can be more effective than just the single "Bulk Processing" monster without significant human intervention that is used at NSA.

4. Since Apr 1968 ~~this instance~~ many emitters in X-Band have been located by the field site selected processing systems. Submarine emitters are a prime example where the site must do the job if it is to be done in time to be of value. This truley perishable type processing must be done before the opportunity is lost. Locations a week after the fact are not significant, if the target emitter is mobile.

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IV Continued:

for
These analog tapes are analyzed/in depth signal review. Approximately 40 hours per week are required for POPPY 7105 data. At the computer operation cost of approximately $300 per hour, this figure is $12,000 weekly of machine time only. This is only part of the cost of processing inasmuch as approximately 25 hours per week are spent in the AUDICO processing are not available nor are approximate figures for manual depth analysis time. From launch data to le December 1969, the NSA had recorded 2,180,000 separate, although many redundant, intercepts from Mission 7105. This equates to about 90 signals per tape recording since there were a bout 24,000 tapes collected during this period. Of this figure, approximately 678,000 [redacted] intercepts were recently removed from this file and discarded because other EOB data from other satellite programs had provided better locational data. Approximately 1,400,000 intercepts with no locations have been recorded as a result of compter runs. There are also approximately 98,000 entries in the history file of located signals by POPPY Mission 7105; there are no restrictions on the confidence ellipse of these locations.

V. MISSION GUIDANCE:

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Page 12 Line 11..."Data for Military EOB purposes acquired by STRAWMAN/ REAPER systems are processed more rapidly, at less cost and are much moore voluminous and accurate than the relatively small amount of EOB data derived from POPPY intercepts."

1- The matter of productivity is explained by the lower priority afforded the exploitation of POPPY data for EOB purposes at NSA, as pointed out in the basic paper. The matter of cost comparison is difficult to evaluate from this prospectiv since the MULTIGROUP AND P-11 programs costs have not been made available. Assuming that the processing costs per megacycle xxxx collection coverage is used as a valid criteria, then it is possible to evaluate and compare POPPY with the other collection systems. This just places a realistic weighting on the wide frequency covered by POPPY so that it can be able to simultaneoulsy receive all the elements of a Weapon System across the entire spectrum, in accordance with the most recent SORS and USIB requirements.

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Mission 7105 represents a point of inflection in the POPPY program where the accuracy of data observation was increased by over one hunder fold so that the spacecraft could be deployed at closer spacing thus providing over 100 times more data which could qualify for emitter location using the Inverse LORAN analysis techniques. Thus the location capability of POPPY data increased significantly but this was not initially matched with an analysis capability at NSA due to the change-over in the computers being used...IBM had been used in the period before the launch of Mission 7105 and CDC-6600/6400 in the period since the launch. This exchange of computers resulted in a great transient in processing for [redacted] the first six months of Mission 7105. The major accomplishment which increased the POPPY data quality for this Mission was the conversion at the overseas site of the data, from the analog to the digital format. A small computer with modest peripherals was placed at the sites with the A-to-D data conversion capability. The major reason for this computer is to affort near real-time quality assurance of these irreversible A-to-D conversions processes. This computer has been ingeniously employed to provide the mechanism for forward area data analysis including emitter location and has been utilized particularily on that type data which is perisable or mobile, where location is important within hours. In particular the demonstrated cqpability of this complex to locate and report to the 6th Fleet commander, the position of shipborne emitters during Operation OKEAN with a response time of about 4 hours average and an accuracy of better than [redacted] Particularily of value was the contribution of this system in surveillance of the denied areas of the inner Baltic, Black and White seas. Nearly 300 ship locations were reported to the Fleet Commanders in the period 1 April until 25 May 1970. This productivity allowed third priority processing on signals in two portions of the Ship emitter [redacted]

As generally is the case the first month of life of Mission 7105 was devoted to a thorough Engineering Evaluation of the command and control as well as the ELINT subsystems aboard the four spacecraft. Certain restraints were noted in the manner in which the spacecraft could be used during the operational lifetime. These restraints while not severe in nature did insure against the production of artifical or counterfit data. On 26 June 1967 Mission 7105 commenced its operational data collection. Two days later the first intercept of DOG HOUSE was made. This was followed two days later by the first intercept of [redacted] On 19 December POPPY Mission 7105 shared the first intercept of [redacted] and

this first [redacted] intercept was followed by a long intercept by 7105 from [redacted] on 22 December. This intercept was processed by the computer system in [redacted] and a location made which was within [redacted] of the location ultimately provided by the NSA analysis. This was the first significant emitter location made by this overseas complex. [redacted] ultimately resolved as [redacted] was first intercepted by another space collection program but the next 50 or 60 intercpets were made by Mission 7105, with sufficient location data provided to determine the deployment into East Germany at a time just prior to the Czechslovakian crisis. POPPY intercepts and locations were highly significant in ultimatly determining this emitter as being associated with SA-4.

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SUGGESTED OUTLINE FOR RESPONSE TO CIA's WORKING GROUP PAPER 5 July 70.

I. Requirements governing design of collection systems and processing systems.

establish that the design for Mission 7105 had been under progress since before the launch of Mission 7104.

Historically POPPY had been responsive to the changes in operational requirements as they progressed.

The Harry DAVIS review of the ABM stance of collection in NRP led to the mandate for POPPY Mission 7105 to have an analog-to-digital data conversion at [redacted] and in addition for POPPY Mission 7105 to assess each pulse received against its potential of emanating from one of the half dozen known ABM sites in the Soviet Union...Geographic Location Sort. This was merely to integrate along the orbit track, those Delta-T's which provided LOP's through these sites and then simple sorts of these pulses would disclose the ones which met this Delta-T vs. orbit relationship, over a goo portion of the intercept period. This technique was demonstrated in late 1967 but the mandate was not renewed. Instead it was ignored as a productive sort.

II: 7105 Capabilities:

Parameters available from the data...RF Frequency accuracy of [redacted] frequency determination= when it did go outside its band POPPY detected it.

PRF and emitter antenna scan characteristics EXCELLENT.

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TOP SECRET

I. USIB REQUIREMENTS AGAINST WHICH POPPY, MISSION7105 WAS DEFINED:

POPPY Mission 7105 was designed to provide an on-orbit capability at all times, available for sampling as required, to search the frequency spectrum between 100 and 14,800 MHz with gaps between 125 and 153 MHz, and from 9,520 to 14,500 MHz. The specific USIB requirements (USIB-D-41.14/246, 15 April 1965) stated objectives for general search SIGINT satellite collection which were to (1) provide the Identification of new and unusual signals whose accurate interpretation and analysis will provide information on new Sino-Soviet technological developments and (2)by continued monitoring to detect changes in the electronic environment which could serve as indicators of unusual activity, imminence of hostilities or confirmation of information from other sources. In November 1966, USIB stated the urgent need for SIGINT satellite collection against Soviet ABM/AES systems (USIB-D_41.14/303). In response to the latter requirement the NRO modified POPPY Mission 7105 to provide duplicative [redacted] coverageover the frequency range from 153 to 15 33000 MHz, then defined as the ABM Spectrum. [redacted]

[redacted]

The Spacecraft Command systems were modified to permit tasking on collection every orbit over the USSR; thus increasing the possible/[redacted] by three or four orbits per day beyond that available by previous POPPY missions.

The mandate was also established for the site in [redacted] to perform some Geographic Location Sort by (1) Converting the data from analog to Digital form and/(2) then using a small computer, examine the [redacted] along the orbit to sort out pulses those/which might have come from one of a half dozen ABM sites.

-/-

The POPPY Mission was designed to provide an on-orbit capability at all times, available for sampling as required, to search the frquency range from about 100 MHz to above 18,000 MHz with certain specific gaps. The specific USIB requirements x promulgated annually stated objectives for general search SIGINT satellite colxection which were to (1) provide the identification of new andunusual signals whose accurate interpretation and analysis will provide information on new KSino-Soviet technological developments and ;(2) by continued monitoring to detect changes in the electronic enviornment which xxxxx wouldx serve as indicators of unusual activity, immenence of hostilities or confirmation of information from other xx sources. For example in November 1966 the USIB stated the urgent need for SIGINT satellite collection against Soviet ABM/SES systms (USIB-D 41.14/303). In response to these requirements the NRO modified the POPPY Mission 7105 to provide [redacted] collection coverage over the frequiency range from 153 to 3315 MHz, [redacted] the anticipated spectrum of the ABM/AES Threat. The duplicative coverage provided [redacted] for Mission 7105 provided the opportunity to geo-locate radar emmissions observed by two coperative spacecraftx, using [redacted]

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