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~~NATIONAL RECONNAISSANCE OFFICE~~

~~WASHINGTON, D.C.~~

OFFICE OF THE DIRECTOR

February 28, 1968

MEMORANDUM FOR Mr. Nitze
Mr. Helms
Dr. Hornig

SUBJECT: NRP Intercepts of ABM/AES Radars

On December 16, 1966, the EXCOM approved implementation of a near-term program to modify and expand existing NRP SIGINT satellite programs to increase the probability of intercepting signals from suspected Soviet ABM/AES emitters. The purpose of this memorandum is to inform you of the status of NRO actions taken in accordance with EXCOM approvals and to report some of the results achieved to date as a result of those actions.

Comprehensive analyses of the data collected will be forthcoming from the intelligence community and is not attempted herein. The purpose of this memorandum is to provide information on the status of the ABM/AES SIGINT collection which can be related to past and future actions in the NRP. The degree of success of the SIGINT collection program must ultimately be measured in terms of the utility of the data after processing and exploitation. This is not yet possible for the most recently collected data since exploitation has only just begun. However, we have received from the NSA a copy of their January 12, 1968, assessment of the data collected from ABM/AES targets and have used this assessment to provide a basis for provisional judgements as to the effectiveness of ongoing collection programs.

The near-term ABM/AES augmentation program for NRP SIGINT collection approved by the EXCOM included modifications and additions to the POPPY and P-11 ("Piggyback") SIGINT satellite programs and expansion of the BIT BOX program, which provides equipment for monitoring of Soviet radar surveillance and tracking on our photographic satellites. The principal new data on Soviet ABM/AES radars has been provided by the POPPY and P-11 programs. Beginning the June 28, 1967 POPPY program, benefiting from ABM/AES motivated changes in both flight vehicles (Mission [redacted] - four satellites launched May 31, 1967) and ground stations, intercepted a new signal, subsequently identified with high probability as emanating from the northward looking face of the Moscow DOGHOUSE radar. However, it was not until the launch of the first ABM/AES P-11 (FACADE) on November 2, 1968, that sufficient details of signal characteristics were available to

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PAGE 1 OF 2 PAGES

verify the nature of the signal as ABM/ABS related and to provide meaningful technical intelligence on the radar. (The frequency of the radar is UHF and the modulation appears to be PM/CW, which was not generally expected.) However, POPPY satellites and the DOGHOUSE P-11 satellite functioned in a highly complementary fashion since the DOGHOUSE had an omnidirectional antenna with virtually no capability for position fixing, while the POPPY, capable of providing only coarse signal data, provided the localization of the source to the DOGHOUSE area.

Intercepts of the signal ceased on November 23, 1967, so that the P-11 TIVOLI satellite (launched January 24, 1968) and the [redacted] satellite (launched January 17, 1968), which have capabilities for predetection wide-band recording of selected intercepted signals, have not had the opportunity to obtain more detailed technical intelligence data on the DOGHOUSE. As far as is known, identified intercepts of the DOGHOUSE radar were made only by the FACADE and POPPY satellites, in spite of the fact that collection by other means in the Moscow area would have been expected. However, now that frequency, modulation and modes of operation are known, other means may be made more effective for the future.

A more detailed discussion of recent ABM/ABS SIGINT collection activities is provided in the attachment. Included are a summary of BIT BOX evidence of HEN HOUSE tracking of photographic satellites and reports of progress in satellite collection against other ABM/ABS emitters such as the TRIADS and the BIG SCREEN (an unofficial designation of a radar seen as a part of the R&D HEN HOUSE site at Sary Shagan).

Alexander H. Flax

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February 26, 1968

NRP Intercepts of ABM/ABS Radars

The near-term program proposed in my memorandum to the EXCOM of December 15, 1966, and updated in my memorandum of April 10, 1967, consisted of the following:

1. POPPY. The four satellites of mission number 7105 were modified to provide extended frequency coverage [redacted] throughout the frequency range from 150 MHz to 3300 MHz. These satellites were launched on May 31, 1967, after a short delay caused by a minor problem in the boost vehicle. The four satellites are operating well [redacted] 25X1

The next POPPY mission, 7106, has been increased from two satellites to four, and the design, which is now firm, [redacted] 25X1

[redacted] In addition, signal amplitude and [redacted] capability will be available in [redacted] The launch date for 7106 has been delayed to November 1968 because of lead times required to obtain critical circuit components.

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The POPPY ground station at [redacted] was modified during the spring of 1967 to permit field digitization of satellite data, thereby removing the timing errors introduced by recording the analog signals in the field and subsequently digitizing the data from these recordings in the United States. The modification has been highly successful and the digitizing capability will be expanded at [redacted] and a second digitizer will be installed in the Pacific area to provide nearly complete field digitization in time for mission 7106. Significant improvement in location accuracy has resulted from the use of the field digitizer. During the next few months the two least productive POPPY stations [redacted] will be phased out. This reduction in ground station support has been made possible by the new field digitization of data and other improvements in data collection efficiency which has reduced the need for redundant data reception.

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2. P-11. A total of seven P-11 "piggy-back" satellites were programmed either for modification or for design especially to intercept ABM/AES emitters as the major portion of the near-term program. The first of these, PACADE, was launched November 2, 1967, approximately six weeks later than originally planned because of re-scheduling in the

parent vehicle program. FACADE operated efficiently and with excellent results, as described below, until January 20, 1968, when the upper frequency band (1000 to 2200 MHz) failed. FACADE continued to operate in the lower frequency band (250 to 1000 MHz) until February 8, 1968, when that band also failed. The relatively short lifetime of this P-11 may have resulted from the accelerated schedule on which it was designed, built and tested.

The second in the ABM/AES series of P-11 satellites, TIVOLI, was launched January 24, 1968, and is operating well at this time. TIVOLI is the first satellite designed specifically to obtain technical intelligence data on radars and, provided it continues to operate well, TIVOLI should be able to exploit the information gathered by FACADE and POPPY to yield definitive measurements of some of the priority ABM/ AES target signals.

Launch schedules for the other five ABM/AES P-11's have been extended because of stretch-out of the parent vehicle schedules. The next P-11 will consist of two payloads in one satellite called LAMPAN/SAMPAN II which will cover from 1000 MHz to 4000 MHz and is scheduled for launch in March 1968. Development and fabrication of the remaining P-11 satellites are proceeding on schedule.

3. BIT BOXES. The BIT BOXES are small receiver-recorder units flown on photographic satellites to monitor intercepts of our satellites by Soviet radars. Since November 1967, improved BIT BOXES have been flown on all CORONA and GAMBIT vehicles with good results. The program is proceeding on schedule.

The USIB, in a memorandum of November 18, 1966, identified the suspected ABM/AES radars and estimated their frequencies as follows:

DOG HOUSE	150-400 MHz	Moscow
BEER CAN	450-1300 MHz	Leningrad, Kapustin Yar
TRIAD/HEN EGG	600-3000 MHz	Moscow, Sary Shagan Kamchatka (HEN EGG only)
HEN HOUSE	154-162 MHz	Sary Shagan, Olenegorsk, Angarsk, Skrunda
[redacted]	1100-3200 MHz	Moscow, Tallinn, etc.

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During the past year's operation, much has been learned about some of the designated targets. The characteristics of the HEN HOUSE have been defined extensively through repeated intercepts by POPPY, P-11's, and MULTIGROUP satellites as well as ground collection systems, which, in view of the location and characteristics of several of the HEN HOUSE radars, should be and have been reasonably effective against this radar. The BIT BOXES confirmed operational status of the HEN HOUSE

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Page 4 of 11 Pages.
Control No. [redacted]

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installations at Olenegorsk, Skrunda, Angarsk and Sary Shagan in August 1967, and correlation of the BIT with ELINT satellite data and ground data showed that the Soviets were highly interested in tracking our photographic satellites. On August 4, 1967, the SIGINT Overhead Reconnaissance Sub-Committee advised the NRO to reduce tasking the ELINT satellites against the HEN HOUSE installations since the need for further data was no longer of highest priority.

The DOG HOUSE radar is an impressive installation which has been under construction near Moscow for the past five years. Extensive photo satellite coverage has established the physical characteristics of DOG HOUSE. The radar consists of two structures located about 8,000 ft. apart. The larger, which is believed to be the receiver, is a huge A-frame with faces about 350 ft. square oriented at 328° and 148°. The smaller unit, believed to be the transmitter, has two identically oriented faces about 350 ft. long by 25 to 30 ft. high. The first intercept of a new signal, designated [redacted] which is now associated with the DOG HOUSE, was made by POPPY on June 28, 1967. Since that time, POPPY has intercepted the signal 21 more times. In November, the FACADE satellite, which is more sensitive and able to provide

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Page 5 of 11 Pages.
Control No. [redacted]

better technical data than POPPY, was placed in orbit. Between November 3 and November 24, FACADE made 22 intercepts of the [redacted] signal. All intercepts have been from the northern face of the transmitter array. No intercepts have been made since November 28. The satellite intercepts, which thus far have not been substantiated nor augmented by ground collectors, have provided the intelligence community with considerable information on the performance characteristics of the DOG HOUSE radar. [redacted] dated January 12, 1968, and CIA document TCS-1007-68, dated February 9, 1968, present thorough reviews of the intercepted data and full descriptions of the DOG HOUSE as revealed by the data analyses performed to date.

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[redacted] Recent photographic coverage shows a new, generally larger DOG HOUSE type structure being built on the old HEN ROOST site; operations might be expected from the new installation in one to three years.

Data have also been collected by both FACADE and POPPY which may provide a lead on the characteristics of the larger TRIAD. On December 19, 1967, FACADE intercepted an unusual pulse doublet signal at 2148.4 MHz while within range of Sary Shagan. On December 22, 1967, [redacted] POPPY [redacted] analysis within a [redacted] 25X1 (90% confidence level) which falls between the TRIAD installations at Sary Shagan. More accurate location from the intercepted data was not possible [redacted] [redacted] FACADE observed only pulse doublets

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Page 8 of 11 Pages.
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repeated at a rate of 89.6 doublets per second. POPPY saw both single pulses and pulse doublets mixed in an unusual and sometimes random pattern. The signal characteristics and location of the source suggests this may be the first intercepts of the large TRIAD emitters, but positive identification must await collection and analysis of additional data.

Recent satellite intercepts have increased our knowledge of still another signal of high interest from Sary Shagan. The first intercept of the signal designated [redacted] (previously designated [redacted] was made by POPPY in late 1964. Since that time there were more than twenty intercepts of [redacted] at infrequent intervals until September 1967. During September and October, there were sixteen separate intercepts (counting both satellites [redacted] by POPPY, BIT BOXES and MULTIGROUP. From these intercepts, the evidence is strong that the [redacted] signal originates from the "BIG SCREEN" facility attached to the R&D HEN HOUSE at Sary Shagan Site 1. The signal scans upward in frequency over two sub-bands from 860 to 912 MHz and 918 to 970 MHz in step increments of about 100 KHz per step. Pulse duration has been measured at approximately 400 microseconds and there is evidence of pulse modulation with phase reversals at a bit rate of about 0.8

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microseconds. POPPY measurements indicate a pulse rate identical to one mode of the HEN HOUSE signal, 24.414 pulses per second. Scan rates measured by POPPY and BIT are 2.62, 5.24 and approximately 21 seconds per scan; all three rates being related to HEN HOUSE scan modes. There appears to be good reason to believe that the BIG SCREEN radar is scanning vertically as a height finder over a 90° azimuthal sector.

At Skrunda, photographic coverage of the HEN HOUSE site shows a new clearing in the forest and construction which suggests a new dual HEN HOUSE with longer legs, oriented more to the east and west than the present HEN HOUSE. It is possible that the BIG SCREEN activity is related to the new Skrunda installation. In any event, a new Skrunda radar could have a significant capability against submarine based missiles in view of its orientation.

It is worth noting that all of the data gathered to date from the signals associated with the DOG HOUSE and TRIAD radars has come from satellite intercepts. Most of the intercepts have been made by those satellites modified or designed especially to collect ABM/AES emitter signals as part of the near-term program undertaken by the NRO in response to the urgent USIB requirement. The POPPY, MULTIGROUP, and

BIT BOX programs have performed substantially as expected, each program contributing significant information. The P-11 "piggyback" satellite, FACADE, has exceeded most expectations. FACADE was a "quick reaction" satellite made up of equipment obtainable on short notice and, because of its omni-directional antenna, was expected to produce little data that was not too cluttered to be processed. Actually, NSA has experienced little difficulty in processing FACADE intercepts. It is hoped that the more precise measuring capability of the TIVOLI technical intelligence satellite, will provide definitive answers to the many remaining questions concerning these signals. It is unfortunate that the wide-band analog capability of the MULTIGROUP satellite launched on January 17, 1968, was temporarily lost during the first few days in orbit; however, the satellite was restored to full capability on February 8 and is being tasked to obtain high quality recordings of the ABM associated signals.