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19 December 1961

REPORT ON FUTURE PROGRAM COMMITTEE

Encl (1) Report by Wald and [redacted] on Tracking Systems.

From the report by Wald and [redacted] Encl (1) it appears that the accuracy of orbital elements is sufficient to guarantee the success of [redacted]

Proposal

(1) It is proposed that the Navy continue its program of launching via Scout vehicles simple Satellite systems. However the program should be oriented so some overlap in band coverage is obtained from launch to launch to provide the [redacted] concept. This will allow the coverage of as wide a frequency range as possible in discrete bands while allowing [redacted] program to be applied when [redacted] occurs during the flight programs.

(2) Since NSA has indicated a desire to obtain an early composite launch of the [redacted] from a single vehicle, it is proposed that they endorse such a program and sponsor it in DOD. With Navy providing the instrumentation hardware this could be accomplished as soon as a vehicle could be scheduled without disrupting the existing Navy program.

Recommendation

(1) Navy reorient its program consistant with National Requirements to accomplish the [redacted] objective as outlined in the proposal (1) above.

(2) NSA proceed independently as outlined in proposal (2) above.

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4 Dec 1961

MEMORANDUM FOR TECHNICAL OPERATIONS GROUP

FROM: NRL/NSA Committee

SUBJECT: Orbital Elements

1. 9 November, Mr. Howard Lorenzen, Mr. Reid Mayo and Mr. Bruce Wald of NRL met with Dr. B. C. Getchell, [redacted] of NSA to consider some of the problems of a two satellite GRAB mission. It was immediately obvious to all concerned that no progress was possible if there was no tracking data of sufficient accuracy available to the processing elements of NSA. Therefore Dr. Getchell, Mr. Wald and [redacted] were asked to study the various orbital reports now being produced.

2. Mr. Wald scheduled a meeting at NRL with [redacted] and [redacted] on 14 November. [redacted] is very knowledgable, having worked at "Vanguard" and having set up two computing centers - one at Dahlgren, Virginia for the Navy "Fence" and the other in Greenbelt, Maryland for NASA. [redacted] of Cincinnati University was the chief consultant on both projects. The three of us spent an afternoon with [redacted] much to our benefit. He suggested we follow up our conversation with a visit to Dahlgren.

On 20 November, we met [redacted] at the Space Surveillance System in Dahlgren. [redacted] and his staff were most helpful. After a day there, we agreed that we now had enough information to write this report.

3. Discussion of element reports:

a. NASA WORLD MAPS - NASA tracks only emitting satellites (108 mc) - about 10 in all. In their favor, they have a wide tracking network, two IBM 7090's, and use the most sophisticated extrapolation techniques (Hansen's method). There is no reason to suspect their accuracy is ever worse than one second. We assume they are actually reporting historical data on their world maps and that they are doing all necessary quality control. However, there are obvious difficulties in relying on NASA reports. One is the lack of timeliness. As of 28 Nov 61, the most up to date tape from NASA is dated for the week of 2 Oct. Assuming the processing is to be done on a more current basis than is presently going on, this is a real liability. NSA is at a security disadvantage when asking for details of NASA operating procedure. The forwarding of magnetic tapes is a nuisance. Tracking data buried in 2400 ft of tape takes some time to find on the 704 so any program using this data would run slowly. Finally we wonder if GRAB's unclassified

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cover will vanish when two satellites are being used? Certainly we will have to gather data whenever they are correctly positioned so the sharing of collection time with cover experiments may not be possible.

b. SPADET (Space Detection) - This is the Air Force organization under NORAD. They have available to them all the data from all tracking facilities. They have computing facilities in Colorado Springs and publish reports on a periodic basis. These reports include elements, equator crossings and representative traces. At present the NSA is using these elements and equator crossings. However, the elements being published are most difficult to use correctly. The present NSA program makes the assumption that the nodal period equals the anomalistic period which is all right for G-2 due to its near perfect orbit but might be quite wrong on another satellite. [redacted] indicated some editing techniques used at Colorado Springs that are questionable and NSA has noted some rather large inconsistancies between successive reports from this organization. The reports are essentially future predictions, which we do not require, and for purposes of accuracy, are not very desirable.

c. SMITHSONIAN - The organization produces reports of elements based on NASA calculations. These have all the advantages and disadvantages of (a) except some accuracy is lost if Hansen's method is not used for extrapolation but some time is gained and trouble is lost by the abandonment of the full magnetic tapes in favor of a periodic report. The periods are irregular. The reports sometimes fail to give elements with the equator crossings.

d. SPACE SURVEILLANCE SYSTEM - This is the computing system based on the Navy "Fence" working under NORAD. They keep track of all orbiting man-made bodies on a daily basis. They have accuracies for most well placed satellites of better than one second. They produce reports weekly on all Satellites (emitting or black) and can, on request, furnish more frequent information. The reports are in the form of elements which can be readily utilized by NSA. The people at Dahlgren perform, on a regular basis, quality control and have furnished us copies of their findings. They are anxious to have their reports used and are justifiably proud of them. We can reach them on the standard government dial system so we could get immediate response to future special requests. NSA has written NORAD in order to be placed on regular distribution for SPASUR reports.

e. OTHERS - The above represent the only input sources we know of that we can rely on for continuous high quality reporting of satellite positions.

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4. In summary, there seem to be four sources available who publish periodic reports of satellite locations or elements to an accuracy (approximately [redacted]

[redacted]

Of these, the reports from SPASUR appear to be the best for NSA's purposes. NSA has sent a letter asking for these reports. Less than [redacted] will give any of these tracking systems some difficulty. This will have to be a future consideration in the design [redacted]

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NRA's proposal to Dr. Charyk that a [redacted] intercept system be launched utilizing NRL's instrumentation would permit the following:

1. Early coverage and fixing of major electronics targets in the Soviet Union in frequency bands other than those planned for Project 102.

2. It will highlight the areas in which future Satellites should concentrate their collection.

3. It will provide an additional accuracy check for the entire 102 project, thus establishing a high order confidence factor.

4. Will additionally provide an almost complete closing of the frequency coverage gaps in the Navy program for 1962.

5. It will provide 100% probability frequency coverage in its bands of operation from horizon to horizon and will thus complement the lesser amounts of coverage obtained by the narrower beam antennas in the 102 system.

6. Since the basic components for the [redacted] are the same as for the GRAB satellites, the system has proven reliability and known power threshold levels of operation. Also, no side lobe problems are present to confuse data reduction problems.

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7. One of the major problems in any Satellite fixing system is the accurate determination of time of intercept. In this system, since events are relayed to the ground monitoring station in true time, the problem of establishing the time accurately is provided at the ground station where it can be accurately monitored and corrected.

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