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NORAD/CONAD

HISTORICAL SUMMARY

(Unclassified)

Declassified by:
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N/J3, Director of
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HQ NORAD
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be assigned responsibility for operating the system.

(C) However, early in October 1966, NORAD learned that DOD had deferred $13.2 million in 440L production funds. It was expected that this action would delay the initial operation of the system one year. USAF was planning to object to this fund deferral.

(S) In the meantime, on 11 July 1966 NORAD sent its display requirements for 440L to ADC. NORAD asked ADC to start action on the requirements and to keep it informed of plans and schedules.

DOD SPACE DETECTION, SURVEILLANCE, TRACKING, AND DATA PROCESSING STUDY

BACKGROUND

(U) In July 1964, the Deputy Secretary of Defense directed an ad hoc group, known as the Detection and Tracking of Satellites (DATOS) Study Group, to make a study of all current and programmed DOD space detection, surveillance, tracking, and data processing equipment. The study was made to recommend ways to reduce, consolidate, and allocate resources, and organize space systems so they would operate as a coordinated program.

(S) NORAD contributed to the study by giving a description of SPADATS equipment and operation and the latest requirements for improving the system. Also, NORAD updated its April 1961 requirement document for an improved SPADATS and sent it to the JCS in January 1965. The JCS wanted to include this new document (NQR 2-65) in their report to the study group.

(S) NORAD pointed out to the JCS, in the letter accompanying the NQR, that there was one major deficiency in the system. The system lacked the ability to give space threat and situation warning before the first pass of a foreign space-

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craft over all unified or specified command areas. NORAD said the implications of this requirement were particularly far-reaching in terms of surveillance coverage.

~~(S)~~ The JCS supported, with minor changes, NORAD's requirement. The JCS told OSD that foreign space activity was a limited but growing threat that must be watched carefully. Therefore, they supported NORAD's mission of space surveillance and recommended approving the NQR for planning purposes. They also recommended that priority research and development effort be given to determining the mission of foreign space objects. However, they felt that tracking a foreign space object and finding out its mission before it passed over a SPADATS user's area was a long range objective rather than a near-term requirement.

~~(S)~~ Based on a recommendation in the DATOS Report, published in March 1965, the Deputy Secretary of Defense disapproved NQR 2-65 on 5 May 1965 and recommended to the JCS that the NQR be revised. Also, he asked the JCS to review NORAD's mission regarding deep space probes. He felt that, possibly, NORAD might be relieved of the responsibility to detect and track deep space probes.

~~(S)~~ On 4 June 1965, the JCS said the NQR would be sent back to NORAD for revision after specific differences over it were settled between the JCS and OSD. Also, the JCS upheld NORAD's mission regarding deep space probes. They said there was an insufficient military requirement for data on these objects at the present time to justify buying special equipment. However, the JCS believed that justification might develop and, under those circumstances, they said that CINCNORAD should control the operation of the special sensors. The JCS said they were against putting an arbitrary altitude limit on SPADATS at that time.

~~(S)~~ On 20 July 1965, the Deputy Secretary of Defense commented on the differences between the

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JCS and OSD. He felt that the issues were settled and his comments could be used to revise the NQR. His comments included the following guidance:

1. There was to be no altitude limit put on the NORAD space mission. However, coverage requirements were to be limited to the needs of specific weapon systems.

2. No further action would be taken by DOD on research programs and operations aimed at determining the mission of space objects until after a group studying the problem made its recommendations. It was believed that there was enough emphasis on research and development in this area.

3. The specific requirements for detecting and tracking space objects should be changed.* Emphasis was to be placed on an adequate research and development program aimed at getting a better capability, quickly and economically, when it was needed.

~~(S)~~ The JCS asked NORAD on 11 October 1965 to revise NQR 2-65.

REVISED NQR APPROVED

(U) NORAD revised the NQR and sent it to the JCS on 8 April 1966. The document was reissued as NQR 2-66 (NORAD Qualitative Requirement for a Space Detection and Tracking System, 22 April 1966). NORAD asked the JCS to approve the NQR so it could serve as the basis for future plans and requirements.

~~(S)~~ The new NQR put first emphasis, the same as the disapproved NQR had, on finding out the

*(U) For detailed SPADATS requirements in NQR 2-65 see NORAD/CONAD Historical Summary, Jul-Dec 1964, pp. 59-62.

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mission of newly launched foreign spacecraft during the first circuit. The new NQR linked mission assessment to step-by-step improvements to SPADATS as technology advanced and space activity increased.

(U) In May, the JCS approved NQR 2-66 and sent it to OSD with a recommendation that it be approved for planning purposes. On 4 June 1966, OSD approved it.

SPACE DETECTION AND TRACKING SYSTEM

NQR 2-66

~~(S)~~ As discussed above, NORAD revised its qualitative requirement for improving the SPADAT System and reissued the document on 22 April 1966 as NQR 2-66. It was approved by the JCS in May and by OSD on 4 June 1966. This document supported NORAD's objectives as stated in NADOP 1967-1976, 15 October 1965. The NADOP had pointed out the shortcomings in SPADATS. The system could not detect all space objects on their first revolution, and detection could vary from a few minutes to several hours after launch. Besides being inadequate for support of space defense weapons, SPADATS was limited in its ability to detect de-orbiting objects and could not determine the mission of space objects.

~~(S)~~ To correct these limitations, the NADOP had recommended deployment of appropriate sensors to detect, track, and determine the mission of all satellites during the first revolution, and to give observations on lunar and deep space vehicles. It also recommended deployment of a launch detection system by the end of FY 1969 for surveillance of the Sino-Soviet land area. Such a system would give early warning of Soviet launch activity, alert SPADATS sensors, and allow the best use of sensor data. Furthermore, the NADOP recommended using other sensor systems, such as Nike X radars, to complement and/or augment SPADATS.

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~~(S)~~ The recommendations in the NADOP, noted above, were supported in the basic considerations in the NQR for improving SPADATS. The detailed qualitative requirements, subject to the limitations of technology, priorities, and money, included:

1. Altitude Coverage: By 1970, capability to detect and track space objects should be provided by selected optical sensors to permit observation at the altitudes of synchronous circular orbits. Selected radar sensors should provide detection and tracking to the maximum altitudes attainable with present technology and available funds. Selected radar sensors should be modified to provide observation of decaying or re-entering space objects down to 70 nm altitude. Beyond 1970, a satellite detection altitude and tracking capability during the first circuit is required to provide accurate tracking data by selected sensors on space objects in synchronous orbits, near circular orbits and in highly elliptical orbits particularly in the vicinity of the apogee where orbital changes are likely to occur.

2. Target Size: Planned improvement should be directed toward a dispersed network of sensors employing technically feasible differing portions of the frequency spectrum such as radar, optics and IR as well as others that may become feasible in the future. In combination these sensors should provide by 1970, a system capability for early detection and tracking of space objects with apparent radar cross section of one square meter, at ranges consistent with the altitude coverage required above. Beyond 1970, the combined system capability should keep pace with the threat and the requirement for support of U.S. space

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activities.

3. Detection Probability: The goal for probability of detecting a foreign spacecraft prior to its first pass over the NORAD area of responsibility should be as near 100 per cent as possible. The probability of detecting a foreign spacecraft prior to completion of its first circuit may be slightly less, unless that circuit passes over the NORAD area of responsibility. By 1970 such detection probabilities should be developed for all satellites on inclinations of 25 to 120 degrees. Beyond 1970, the capability to achieve these detection probabilities should be expanded incrementally to include satellite inclinations from 0 to 180 degrees.

4. Catalog Accuracy: Based on time of arrival at a point in the orbital plane, and using 6,000 nm altitude as a point of reference, the SPADATS catalog should have enough accuracy to ensure that the identity of special interest satellites is not confused. The goal for correlation of catalog elements with satellite observations from selected sensors should be as near to 100 per cent as possible before 1970. Beyond 1970, catalog accuracies should keep pace with user requirements.

5. Weapons Support: By 1970, target position prediction accuracies (one Sigma) of $\pm$ one nautical mile along track, $\pm$ one half nautical mile cross track and $\pm$ one half nautical mile radially are required, computed within four hours of target selection

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or detection, whichever is later. These accuracies are required out to the maximum ranges of non-homing interceptors which may be developed. Beyond 1970, target position prediction accuracies within reaction time constraints should be capable of growth consistent with the support of space defense weapons systems.

6. Space Population: The projected space object population by 1970 is 5,000. The SPADAT System should be improved to provide detection, tracking and weapon support within specified accuracies in this environment by 1970. Design of the improvements should anticipate continuing growth in space activities beyond 1970.

~~(S)~~ On 21 September 1966, General R. J. Reeves, CINCNORAD, in a letter to the Chairman of the Joint Chiefs of Staff, said it appeared that nearly all major improvements proposed by NORAD in NADOP 1967-1976 would be deferred or disapproved. "Unless this trend is reversed," General Reeves said, "NORAD's capabilities will continue to be unsatisfactory." He noted that there were grave risks in almost complete reliance on strategic retaliatory forces for the defense of North America. In this regard, General Reeves pointed out that since 1 January 1966, the Soviets had launched 10 space objects which SPADATS had not been able to detect on the first revolution. He said he was convinced that the potential military threat from space must be recognized and urged the JCS to support NORAD's objectives in the forthcoming NADOP 1969-1976 (published 1 November 1966) for improving SPADATS.

CANADIAN PARTICIPATION IN SPADATS

~~(S)~~ Background. In February 1965, Canadian Forces Headquarters told NORAD that it was making a study to assess "whether there is a place for a space surveillance role in the Canadian participation in NORAD." Over the past few years, two Canadian

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sensors had been giving data to SPADATS: an RCAF-operated Baker-Nunn Camera at Cold Lake, Alberta, and the Defence Research Board's Prince Albert Radar Laboratory in Saskatchewan. Canadian Forces Headquarters asked for NORAD's views on the value of these sensors to SPADATS.

~~(S)~~ In March 1965, NORAD assured Canadian Forces Headquarters that Canada's sensors were valuable to SPADATS and pointed out each sensor's contributions. However, each sensor had its shortcomings. NORAD said that data from the Canadian camera was not equal to data received from the four USAF ADC cameras. Performance could be improved, NORAD said, by modifying the camera, adding some new equipment, giving personnel formal training, and moving the camera about 30 miles from the Primrose Missile Range to the Canadian Station at Cold Lake. Also, NORAD said the lack of secure communications at Prince Albert limited the radar's participation in many projects.

~~(S)~~ Besides information on these sensors, Canadian Forces Headquarters wanted to know the importance of space surveillance in the current defense posture, particularly the value of SPADATS in countering the threat as stated in NADOP 1966-1975. NORAD answered that the threat was an anticipated one that could materialize in 1969. The threat could be large yield nuclear warheads in orbit around the earth. Hence, to keep pace with the threat, all new space objects had to be watched to find their characteristics and mission. Also, NORAD said SPADATS facilities would be needed in any counter-satellite system.

~~(S)~~ Status. On 27 January 1966, Canadian Forces Headquarters told NORAD that the Defence Council had approved renovating and modifying the Baker-Nunn Camera and buying new equipment to bring the

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camera up to the operating level of the USAF cameras.* Also, Canadian Forces Headquarters said the Defence Research Board was losing interest in the Prince Albert radar and a new study was being made to find out whether the Prince Albert radar should become a full time SPADATS sensor. Until this study was finished, no decision would be made on relocating the camera or getting secure and reliable communications. A visit to NORAD was proposed for members of the study group to discuss the Prince Albert radar.

(U) Members of NORAD and the study group met in early March 1966. After studying the problems involved, NORAD decided that there was not enough justification to make the radar a full time SPADATS sensor. The result was the Canadians decided to close the Prince Albert radar and it stopped inputs to SPADATS on 1 July 1966. Research was to continue at the site until about March 1967.

~~(S)~~ In the meantime, on 27 May 1966, Canadian Forces Headquarters informed NORAD of its plans to improve the Baker-Nunn Camera and its facilities. In addition to updating the camera, it was to be

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*(U) USAF was improving its Baker-Nunn Camera system by adding an improved timing system and equipment to make on-site precision measurement of Baker-Nunn film. The new timing system would increase the prediction accuracy of a satellite's position in space by a factor of 20. This accuracy would be gotten by having two or more sites photograph a satellite simultaneously. However the system would lose this accuracy if the Cold Lake camera could not take part because the most important simultaneous observations would come from Edwards AFB and Cold Lake.

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moved to a better site closer to Cold Lake and put in a new building. Communications were to be improved by adding voice and teletype circuits between the NORAD Space Defense Center and the camera site. The Canadian camera was exchanged at McClellan AFB (SMAMA) for an updated one in mid-December 1966. The new camera was to be installed during January 1967.

BALLISTIC MISSILE EARLY WARNING SYSTEM

SITE II TRACKING RADAR

~~(S)~~ One of the improvements that NORAD wanted for BMEWS was to fill the low-angle gaps for detecting missiles with re-entry angles of less than 15 degrees. To fill the gap between Site I (Thule) and Site II (Clear), NORAD wanted a tracking radar at Site II. To fill the gap between Site I and Site III (Fylingdales), NORAD wanted a radar either in Iceland or Greenland.

~~(S)~~ Finally, after the problem was studied and then re-studied, the Secretary of Defense approved in September 1963 a DDR&E recommendation to cancel the requirement for a gap filler between sites I and III. However, he approved the installation of a tracker at Site II.

~~(S)~~ Requests for bids were sent to industry in May 1964. Specifications called for an FPS-92 radar -- an improved version of the FPS-49 -- that would, in addition to filling the gap between sites I and II, provide credibility and serve as a backup to the detection radars at Site II and furnish information on satellites. At that time, the FPS-92 was expected to be operational in mid-1966.

~~(S)~~ The Radio Corporation of America installed the radar and on 1 July 1966 it reached initial operational capability (IOC). On 15 September, the radar was put in full operational capability (FOC) status.

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