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DEFENSE MAPPING AGENCY
BUILDING 56, U.S. NAVAL OBSERVATORY
WASHINGTON, D.C. 20305

29 JAN 1974

MEMORANDUM FOR THE DIRECTOR, NATIONAL RECONNAISSANCE OFFICE

SUBJECT: Development of an Improved Orbital Capability for
KH-9 Satellites

1. In our role of being responsive, DMA continuously reviews its capabilities to provide Mapping, Charting and Geodesy (MC&G) support to satisfy requirements of the Unified and Specified (U&S) Commands and Military Departments. In September 1972 the Air Force submitted a validated technical objective for a 100-165 foot geodetic and geophysical (G&G) CEP in support of their advanced ICBM (M-X) program for the 1980 time frame. This figure was concurred with as a technical objective by Defense Mapping Agency in March 1973. This objective was also identified in the COMIREX MC&G Working Group's Memorandum for the Chairman, COMIREX, dated 26 October 1973 subject: Accuracy Requirements for DoD Products Produced with Satellite Photography (copy attached).

2. DMA has been working with Director of Defense Research and Engineering (DDR&E), Defense Advanced Research Projects Agency (DARPA), Naval Weapons Laboratory (NWL), Applied Physics Laboratory, Johns Hopkins University (APL), and USAF's Space and Missile Organization (SAMSO) to obtain the funds and formulate the RDT&E programs that will permit the attainment of this G&G technical objective by the 1980 time frame.

3. Also through studies, DMA has concluded that it will be absolutely essential to improve the accuracy with which the camera stations are positioned in orbit. Of equal importance is the improvement in our knowledge of the earth's gravity field, both in the launch and in-flight portions of ICBM trajectories. These conclusions were identified and included in the COMIREX MC&G Working Group's Memorandum for the Chairman, COMIREX, dated 9 February 1973, subject: MC&G RDT&E Five Year Guidance (para. 2.d.(1) of attached copy).

4. One of the basic problems involved in achieving highly accurate positions in orbit is the ability to obtain continuous observations of a vehicle throughout all of its revolutions. The current practice of increasing the number of earth-based tracking stations has reached

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the point of "no return" as it would relate to achievement of the 100-165 foot CEP. A technique known as satellite-to-satellite tracking offers the potential to obtain a significant increase in the continuity of observations, reduces the degree of dependency on earth-based tracking stations, permits improved accuracies in target positioning and knowledge of the gravitational field. In this technique a satellite whose orbit is not known precisely receives doppler or range signals from another satellite whose orbit is already known. These continuous signals permit the receiving satellite's orbit to be precisely determined.

5. In studies DMA has examined the potential use of the NAVSTAR Global Positioning System, the Navy Navigation Satellite System, and existing or projected near synchronous orbit type satellites in the satellite-to-satellite tracking mode in conjunction with photographic satellites. DMA has concluded that an effective means of achieving the necessary orbit improvement would come by placing a small geodetic package, consisting of a miniceiver (doppler receiver) and an accelerometer on board the KH-9 satellite. In effect, this would allow continuous doppler tracking by the KH-9 satellite of the Navy Navigation satellites and later the NAVSTAR satellites. Currently, six Navy Navigation satellites are in orbit and a minimum of five are programmed to be in orbit simultaneously through the 1987 time period. APL, under contract to the Navy, is developing a ground miniceiver from which much of the technology would be directly transferable for a satellite configuration.

6. We have discussed with LTC Hayden Peake, of your office, the possibility of NRO's developing two geodetic packages based on the DMA concept. It would be desirable if the initial geodetic package could be integrated and tested on a KH-9 satellite no later than the third quarter of FY 77. If NRO's funding is not adequate to finance this activity in the FY 74-75 time period, DMA could provide some support from our overall R&D funds programmed for ICBM CEP improvements. Specific areas for which your assistance is requested, along with tentative schedules, are outlined below:

a. A preliminary meeting to outline specific interface problems, i.e., size, weight, volume and power constraints -- on or before 15 February 1974.

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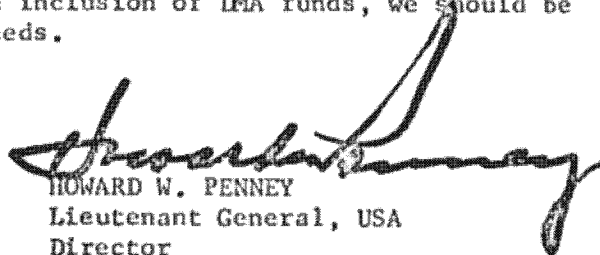
b. Initiation of detailed study of the integration of the geodetic package with the KH-9 satellite -- on or before 1 April 1974.

c. Provision for the installation, checkout, and operation of the geodetic package -- estimated availability approximately July 1975.

7. Your recommendations as to whether or not the proposed schedule can be met will be greatly appreciated. If the achievement of that schedule is dependent upon the inclusion of DMA funds, we should be apprised promptly of these needs.

2 Enclosures

1. TCS-544275-73
2. BYE-47457-73


HOWARD W. PENNEY
Lieutenant General, USA
Director

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