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July 13, 1970

MEMORANDUM FOR

Dr. Lee A. DuBridge

SUBJECT: Photographic Reconnaissance Systems Status

Your Reconnaissance Panel has reviewed recent progress in the NRP. In the present program, satellite photographic reconnaissance capability utilizes the GAMBIT system for surveillance of specified targets and the CORONA system for search. Sometime within the next 18 months HEXAGON should begin to replace CORONA. When HEXAGON and GAMBIT are fully operational, the presently stated search and surveillance requirements will be satisfied by four launches of each system per year.

The most dramatic new capability in technical reconnaissance is a direct readout system, providing relatively short term access (less than 12 hours) to any target, with essentially instantaneous availability of the picture once the target has been acquired.

Two approaches to the direct readout system have reached the stage of demonstrated feasibility and reasonable maturity -- laser scanning of photographic film developed on orbit; and the use of photosensitive solid state arrays in the focal plane of an optical system. Other techniques are in exploratory development, but are many years from maturity and seem to present no significant operational advantage.

The film technique is relatively straightforward but results in a complex spacecraft system with limited growth potential and attendant concern for reliability. The solid state arrays result in an extremely simple spacecraft system and with the proper choice of design parameters,

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can be expected to satisfy evolving reconnaissance requirements. Film is inherently 100 to 1000 times less sensitive than the solid state detectors and this is to a lesser extent reflected in system performances.

The critical new element in the direct or near real-time readout system was the solid state array. Progress on these elements was encouraging enough to warrant increased funding for the technology programs and initiation of preliminary system studies by agreement of the ExCom last March.

The Panel has reviewed the current status of this activity and is now convinced by the demonstrated progress on the arrays, the large mirrors and the system design that there is no technological impediment to initiating system development of the solid state array real-time readout (ZAMAN) system at the present time.

The next advance in technical reconnaissance may be a VHR capability against selected targets. Although the requirements for this system are still being debated, it is difficult to imagine such a system development being initiated within the next few years with the present Federal funding limitation and the fiscal requirements of the ZAMAN system.

This possible context for funds has led to studies seeking a system which will satisfy essentially all the NRP requirements -- search, surveillance, direct readout and VHR. Such a panacea does not seem available within a reasonable time frame.

However, the ZAMAN system can (suitably configured) reasonably be expected to satisfy the GAMBIT surveillance requirement. To achieve this goal, the initial ZAMAN system design should encompass a primary mirror of approximately diameter. This configuration provides a ground sample distance (GSD) of at an orbit altitude of 200 miles.

As the system can be operated at significantly lower altitudes (about 100 miles) it has therefore the potential for providing a limited amount of very high resolution (VHR) data (less than GSD) from each spacecraft.

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One might envision an operational photographic reconnaissance program in the late 1970s encompassing (1) two HEXAGON launches per year for search and (2) one or two ZAMAN launches per year to maintain an orbital capability of at least three satellites for direct readout, surveillance and high priority VHR.

The Panel believes that such a program will result in the lowest cost NRP over the next decade. However, this program requires initiation of the ZAMAN program at significant funding levels in the near future. The suggested program results in higher funding levels during the next few years and although we recognize the difficulties this presents in the present budget situation, we believe very strongly that the ultimate gain to the nation, both in national photographic reconnaissance capability and in reduced long term budgetary requirements, warrants a full commitment to the ZAMAN real-time system development.

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