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THE WHITE HOUSE  
WASHINGTON

BYE 11,897/68 *TK*

October 21, 1968

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Dear Dick:

On October 2, the Land Panel held a meeting to review the status of the technology which would be needed for an "indications and warning," quick response satellite system. Their report, which I think you will find very interesting and most timely, is attached.

You will notice that the Panel plans to study special aspects of the problem further. I hope that we can allow sufficient latitude in the budget decisions we make on November 13 so that we can accommodate the actions they recommend if the additional work by the Panel and the NRO bears out their initial views. I think it would also be useful if we would take the opportunity of our next meeting to determine whether any FY 1969 funds could be made available if it turns out to be desirable.

I have sent a copy of this to Paul Nitze also.

Sincerely,



Donald F. Hornig  
Special Assistant to the President  
for Science and Technology

Enclosure - BYE 11,896/68, Cy 2

Honorable Richard Helms  
Director of Central Intelligence  
Washington, D. C. 20505

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16 OCT 1968

BYE 11,896/68

MEMORANDUM FOR: DR. DONALD F. HORNIG

This document consists of 3 pages  
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Since the beginning of the concept of satellite reconnaissance, the ultimate goal has been to give decision-makers an "on-call" capability to view any interesting area of the world [redacted] Our dream has been, in effect, to "see it now." So far, however, technical limitations have forced us to compromise this goal. To get high resolution and reasonable area coverage we have had to use photographic film, physically recovered from orbit. In addition, short equipment operating lifetimes have been an economic barrier to keeping satellites in orbit continuously over the U.S.S.R. and China.

We have just reviewed the technology programs being sponsored under the National Reconnaissance Program by the Air Force and the CIA and we would like to let you know that the necessary technology for [redacted] system has become available. From a technical standpoint, it will be possible within the next year or so to begin development of a system [redacted] which could view any location in the U.S.S.R. and China every few hours and send a high quality (KH-7 like) image [redacted] Here are the capabilities that have been developed over the past few years which now make this a realistic expectation:

1. We have learned how to build satellite systems which can operate reliably for a year and more in space. Thus, we can confidently build an economical system which will have satellites over the Soviet Union and China [redacted]

3. The technology of satellite electro-optical imaging systems has advanced to the point where we can foresee in the very near future the capability to view the ground with high resolution and in a manner which makes this image available for rapid and, with some systems, [redacted] transmission to the U. S.

However, in order to be prepared for a system development decision within the next few years, it will be necessary to give priority attention and funding to the development of each of the several feasible imaging system alternatives and to studies of the optical and communication system characteristics that may be peculiar to each of these approaches. The

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imaging techniques that have potential for supporting a near term system decision are the following:

- a. A reusable electrostatic tape storage/electron beam scanner, funded by the Air Force at [REDACTED]
- b. A return beam vidicon system, proposed by the CIA but not now being funded.
- c. A line array of solid state detectors arranged in the image plane of the optical system, funded by the CIA at [REDACTED]

All of these systems have advantages and disadvantages, but all have promise and -- in view of the tremendous potential of a [REDACTED] surveillance system -- ~~all should be funded at a level which will establish a basis for decision by, say late 1969.~~

We are especially attracted to the solid state array which offers the possibility of building a simple solid system having no moving parts and no electron optics, with further possible advantages in redundancy and adaptability to optical designs exploiting curved fields. We intend to investigate the solid state array and the return beam vidicon further, but our tentative opinion is that both these alternatives should be carried as rapidly as possible through advanced development of a transducer system, as we understand is planned and as we also recommend for the [REDACTED] electrostatic image camera. We estimate that all three of the approaches could be carried through to at least a critical technology feasibility demonstration within the next year. We also plan to investigate the possibility of a transducer which would use standard return-beam vidicons whose target would be a continuously-rotating drum of photoconductive material -- drum being "exposed" by the optical system on one side and "read out" by the vidicons on the other.

With the potential gain so large, the panel is concerned that the present funding squeeze is diverting resources from these relatively inexpensive programs. As a result, ~~two of the image system possibilities -- the solid state array and the vidicon -- are not being pushed along as rapidly as the technology would allow and the key demonstrations of feasibility have not been defined and scheduled to assure that within a year or so the data on which to make a system decision will be available.~~

Furthermore, the panel is unanimous in feeling that the system studies in this area to date have lost sight of the ultimate goal, essentially [REDACTED] information from an always available sensor. The communication links suggested were, for example, of limited capacity even though current technology will support a system of sufficient bandwidth to handle all the information as it is produced. The computers on the other hand,

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were unnecessarily ambitious, emphasizing light weight at the expense of reliability and long lifetime. As the Air Force and the CIA proceed with component engineering development and the necessary design analyses to define the parameters of other components of the system, it is important that the following system characteristics remain uncompromised until such time as a full-scale system development program is begun:

1. Long life in orbit; therefore, long-lifetime components and highly redundant design.
2. High-resolution imagery.
3. [ ] transmission to the U.S. of all the information at the sensor at the rate at which it is produced.

In addition, attention must be given to techniques for processing the data on the ground and displaying and recording it in a manner which will capitalize on the [ ] nature of the information. ~~We saw no indication of any current activity to investigate technology relevant to this need.~~

To meet our requirements of the future we will have to continue to use film-based systems to photograph large areas for search and get very high resolution for technical intelligence. The Hexagon and Gambit Cubed will provide this capability. Now the technology is nearly available to build a system which will provide the [ ] surveillance which we have found to be so important and which Hexagon and Gambit cannot provide. The potential value of such a system is so great that all applicable technologies, component development and system studies should be funded concurrently and at a level adequate to allow system definition about a year from now -- ~~if necessary, at the expense of some current operating capability.~~ The system that is finally selected will benefit by a wide participation by, and competition among governmental and industrial organizations and we suggest that both the CIA and the Air Force be given wide latitude to investigate system designs and trade-offs applicable to the sensor systems each has proposed and to recommend component development programs for them.



Edwin H. Land

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