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MEMORANDUM FOR

Dr. Lee A. DuBridge

As we reported to you in May, the electro-optical imaging satellite will provide us an intelligence capability which we do not now have and which has always been our goal since the beginning of satellite reconnaissance: on-call, always available photography of important targets. We believe that the technology needed for such a capability is now available. The FY 70 Program Plan now before the Executive Committee for decision would do the component engineering and the system design studies necessary to exploit this technology expeditiously but without committing the government to a development program. The program is designed to demonstrate feasibility of critical components and to define the system design, costs and schedules so that by next year at this time the Committee could make a high-confidence decision to proceed with full system development.

The design concept around which the plan is constructed assumes a

[redacted]

permits. During the past nine months, we have investigated the state of technology of the critical components of this system and the general characteristics of the system itself. In this memorandum, we report to you our views on the value of the system, on its technical feasibility and on the FY 70 program plan now before the Executive Committee for decision.

A serious defect in overhead reconnaissance as a source of intelligence has been lack of continuity. As the vehicles become more elaborate and more expensive, they are flown less often. Our only nearly-continuous source of information is communications which are overheard electronically

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and which are not encoded. With the increased use of microwaves, and with simplification of encoding techniques, less and less intelligence can be acquired from communications. We are left, therefore, both blind and deaf to the continuity of happenings that proceed in the long intervals between the flights of our reconnaissance vehicles.

The solid intelligence from overhead reconnaissance has been a major source of the information upon which our national policies are based. The quality and value of this intelligence has, at every stage of its development, exceeded the hopes of those who planned for its progress. Nevertheless, a small army of good men is kept busy drawing from the limited amount of solid evidence conclusions that necessarily carry these analysts into speculative domains. For speculation is the only tool now available to divine what is happening during the long intervals when no observations can be made.

For decades, all of us associated with overhead reconnaissance have been waiting for the time when the convergence of engineering development and basic new technological advances could provide a simple, reliable, permanent vehicle for continuous and direct reporting. That time has now come. With a minimum of further exploratory research, a system can now be designed for the continuous transmission of images

We all tend to turn our backs to the magnitude of the problems involved in maintaining the present systems -- the newly built instrumentation for each vehicle with vast groups involved in the final check-out of the instrumentation, in the control of the launching, in the management of the special flights, in the recovery at sea, in the transportation of the films to the processing stations, in the storage and distribution of the final images. Because the results of this activity are of monumental national importance, and because we have no other way of achieving these results, we accept as an inevitable part of the budget the financial burden associated with our contemporary techniques.

The new system lends itself inherently to flights of duration. The electro-optical design is of such consummate simplicity, is so free from moving members, that there seems to be no point in waiting for an examination of alternatives. For, while alternatives can possibly be found that are as simple, we cannot see how any alternative could be simpler. Those who have had to live with all the problems of

thermal interchange between the optics and the surround, with the stability of film transport, with the vibration of massive mirrors, with the corona discharge across the films, and with literally hundreds of similar incidental yet vital problems, will hardly believe the good fortune that the country has come upon in this new opportunity. A mirror fixed at one end of a cylinder, with the cylinder pointing only towards earth, the image on a rigid, solid, compact array, fixed in the focal plane -- these add together to a breathtaking simplicity, solidity, and reliability.

[redacted]

We feel that if we can bring into being rapidly a vehicle with this reliability, economy, and long life, and use this vehicle for the continuous surveillance of all the activities in those portions of the world that represent hazards or opportunities to us, then the very nature of the intelligence process will be revolutionized.

Your Panel is firmly and unanimously convinced that the state of technology now makes this possible. The solid-state-array sensor, which is the most critical of the component developments, has already produced very convincing test data and we are confident that within a year a flight-[redacted] and its associated processing electronics can demonstrate the required system performance in a way that will leave no doubt about its full system capability.

In arriving at our recommendation to use the solid-state-array as the sensor device for this two-foot resolution system, we studied and considered the tape storage/image tube technology. We believe that the image tube will require a great deal more study and development before it can be considered competitive with the inherent reliability of the solid-state-array. (Typical of the nagging problems associated with the tape/image tube is the difficulty of preserving an effective photocathode in the same envelope with a moving drum equipped with adequate bearings. Not only must this be accomplished but it must be demonstrated to have an adequate life.) Moreover, the solid-state-array offers growth potential in the direction of [redacted] control of satellite imaging operations as well

as broader spectral response, possibilities of potential importance to surveillance and crisis intelligence that the tape/image tube does not offer. Nevertheless, we would support a continuing technology program for the tape/image tube because it gives promise of yielding eventually a readout capability for very high resolution systems.

The other system components are well within the state of the art and do not present significant development risks. The optical system development will be greatly assisted by the fact that all the optical elements are fixed in position, with the large mirror well protected from the thermal environment, and by the recent advances in polishing techniques which were not available for the GAMBIT and MOL developments. In brief, the solid-state-array readout system has the almost unique characteristic of providing a dramatic improvement in intelligence capability with a system significantly simpler than today's photographic systems. It represents a quite reasonable development risk even at this time and we are convinced that by next year the proposed component development and system definition work will allow the government to make a development decision with much higher confidence than has been the case with new systems in the past.

In view of this, we urge that the Executive Committee commit sufficient funds in FY 70 to a program which would allow a high confidence decision in August 1970 whether to initiate full system development. Such a program would need to include both intensive component development to demonstrate feasibility, and parallel system definition studies to determine design trade-offs and establish expected costs and schedules. An expenditure in FY 70 of about [redacted] along the lines of the proposed program plan would do this without committing the government now to a system development.

We recognize that an alternative to this program would be to limit FY 70 work to component technology and defer work on system definition studies until FY 71. However, while this might save [redacted] in FY 70, it would delay eventual operation of the system, should we later decide to develop it, by about a year. Furthermore, we believe that the component technology needs guidance from the information that would be developed by parallel system studies. Without this guidance we might easily take component design down unproductive paths.

In view of the possibility that arms limitation talks will proceed to the point where by next year the government may be anxious to put great emphasis on intelligence collection, even at the expense of weapons systems, it seems to us prudent to spend the necessary funds in FY 70 for system studies so that in August 1970 the option exists to proceed without delay to an early operational satellite. It is important to recognize that the proposed FY 70 expenditures are prerequisite to system development in any case, the question being one of urgency.

Finally, we cannot leave this subject without recognizing that two highly desirable systems (the [redacted] readout and the Very High Resolution) are unfortunately in competition for very limited FY 70 and FY 71 funds. We have lost none of our enthusiasm for [redacted] resolution pictures and continue to feel that this is a very important objective to pursue. Indeed, we would like to see sufficient FY 70 funds put on system definition studies to bring both the Readout and the VHR systems simultaneously to the point where by August 1970 the government would have sufficient confidence in estimated performance, costs and schedules of each to decide on a constructive course for the ultimate acquisition of both. However, if it becomes necessary, we would give priority to the readout system, allocating sufficient funds ([redacted] in FY 70) to system definition work to support a high confidence development decision in August 1970. We would allocate the remainder to VHR definition, hoping that by next summer there would be a basis for deciding whether to make marginal improvements on Gambit or go in the direction of a new very high resolution system, such as Gambit 4.

Attached are subcommittee technical reports which document our conclusions in more detail.

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