(S) NATIONAL RECONNAISSANCE OFFICE

WASHINGTON, D.C.

THE NRO STAFF

30 November 1966

MEMORANDUM FOR DR. FLAX

SUBJECT: Recommended Budget Requirements for Readout and Ocean Surveillance Programs

In accordance with your guidance and in line with recent ExCom decisions, the following special line items are submitted herewith:

A. [redacted] Data Link Technology

FY '67
FY '68 [redacted]

At the present time [redacted] has a collection of laboratory components which have been strung together in a model sufficient to demonstrate conceptual feasibility of the data link. It is proposed to demonstrate that these laboratory concepts can be reduced to practical, reliable hardware during the remainder of FY 67. By October 1968 a brassboard model will have been tested. No attempt will be made to configure this model for a particular satellite vehicle. During the remainder of FY 68 the effort will be aimed at increasing the time bandwidth product of the data link subsystem. Several methods of doing this have been discussed with [redacted] If they elect to continue work for us, the most promising technique will be chosen, and, where appropriate, critical components will be breadboarded.

At this time, it is virtually certain that [redacted] will elect to discontinue their role in this work. We therefore should expect to be faced with possible cost increases due to start-up with another contractor.

B. Electro-Optical Readout

FY '67
FY '68 [redacted]

We frequently review progress made in electro optics by [redacted] and others. It is our considered judgment that [redacted] approach is still the most promising. They have fully demonstrated feasibility of an image section and storage section consistent with 100 lP/MM resolution and 50 mcs bandwidth. The readout gun has demonstrated spot size and beam current consistent with these overall performance parameters; however, the electron beam has not actually been deflected at this rate. We propose to design, build, and test a complete laboratory model of the electro optical readout system. The readout gun is the highest risk component in this system. Therefore, we propose to continue work with [redacted] to demonstrate their Digiscan concept. Although it is still too early to say for sure, this concept may be a breakthrough solution to the problem of producing and deflecting a small diameter, high intensity electron beam.

C. Film Readout

FY '67
FY '68 [redacted]

It is emphasized that the aim of this work is to advance the technology, and not to develop flight hardware. Further this work will be necessary to the electro optical effort, but is best done by the film readout group, to allow early test of the analysis and concepts involved. The following work is proposed:

1. Vertical aperture compensation. Resolution in the "in scan" direction is inherently greater than transverse to the scan. [redacted] has proposed a device that promises to boost system response in the vertical direction. We propose to build and test this device with the engineering model now on board.

2. Complete a math model of the film readout system. Many components developed for the film readout system, e.g., the ground reproduction equipment, will be incorporated into the electro optical system. A complete mathematical description of the film readout system, therefore, will help us understand not only the film readout but also electro optical readout.

3. Obtain a cosmetically perfect image. The hard copy obtained from the breadboard was marred by such things as a 600 CPS hum in the picture. Imagery being produced by the engineering model is significantly better but is still marked by mirror flaws. The effort outlined in [redacted] will help correct these flaws. The imagery produced will be useful in comparing the film readout and electro optical readout systems.

D. Readout System Studies

FY '67
FY '68

As distinguished from efforts described under the long life budget item, work under this item will be aimed at designing systems capable of three to six months orbital life to provide routine surveillance of the Sino-Soviet land mass. The possibility of adding a sea surveillance capability will also be investigated.

*CHARGE Message 3560 of 21 November 1966 has requested an additional $125,000 for CBS and $75,000 for BTL to extend the MOL readout study for 10 weeks.

E. Radar - Ocean Surveillance

FY '67
FY '68

It is proposed that this program be divided in the following 8 tasks, with Tasks I, II and III running parallel for 9 months beginning January 1967:

Task	Description	Schedule	Funding FY 67	Funding FY 68
I	Determine characteristics for candidate radar types, together with associated on-board recorder/processing, data links and power supplies. System to be capable of automatically detecting ocean surface traffic from low orbit. Define detection probabilities and false target rates as a function of the applicable operational parameters including target signature, ocean surface and weather conditions. Calculate reliability and identify high risk technical problem areas. Investigate fail safe techniques for insuring operation over designated target areas.	9 months		
II	Determine the wide band data link requirements and surface communications links required to utilize	9 months		

Task	Description	Schedule	Funding FY 67	Funding FY 68
	the data gathered by the above satellite radar system in the conduct of an Ocean Surveillance mission. Determine constellation of satellites necessary when operating as part of a total Ocean Surveillance System.			
III	Trade-off Study (Systems Analysis) - Conduct trade-off studies comparing candidate systems in terms of operational feasibility versus technical feasibility versus cost (systems effectiveness).	9 months	[redacted]	
IV	Determine impact of imposing additional requirements upon the candidate sensor systems, such as requiring that the Ocean Surveillance System perform a Bomb Damage Assessment mission.	3 months		[redacted]
V	Evaluate the impact of countermeasures both active and passive which might be employed against system.	3 months		
VI	Investigate MOL, AGENA and other spacecraft to determine feasibility and most effective means of conducting on-orbit piggyback experiments.	3 months		
VII	Preliminary design of sensor package to be developed including interface to the total system. Conduct life tests on critical components.	6 months		
VIII	Plan on-orbit operational development test.	6 months		

Major decision points expected are:

1 Oct 67 - At the end of Tasks I, II, and III at which time a radar will be selected.

1 Jan 68 - Select sensor system required to meet objectives.

1 Apr 68 - Planning estimates for FY 69 and FY 70 budgetary requirements.

1 Jul 68 - Complete procurement package for acquisition of hardware for operational development tests (including any piggyback) and complete planning for an operational exercise.

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