

ROUTE SHEET

NDW-NRL-5511/1552 (Rev. 5-54)

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BYE-51901-69

FILE NO.

SUBJECT

Mission 7106, 7107
details for effort on

costing

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NAVAL RESEARCH LABORATORY

WASHINGTON, D.C. 20390

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9 MAY 1969

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From: Director, Naval Research Laboratory
Washington, D.C. 20390
To: Director, Program "C" (CAPT MOFFIT)

Subj: Mission 7106, 7107 costing details for
NRL effort on

Ref: (a) WHIG msg 011239Z CITE WHIG 8916
(b) NRO Memo to Dir Program "C" of 10 Mar 69,
(BYE-12627-69)
(c) NRL ltr to Dir NRO of 7 Feb 67, (BYE-26904-67)

Encl: (1) NRL Cost Summary for FY-69, FY-70 and FY-71

1. Background:

In accordance with the guidance provided in references (a) and (b) the Naval Research Laboratory has summarized the FY-69 POPPY financial program, formulated recommendations for the 7106 and 7107 financial program for FY-70 and prepared the budget recommendations for the NRL portion of the POPPY program for FY-71. These are all included in enclosure (1).

The basis for the cost estimates for FY-70 are (1) the first-year costs of a two-year development cycle for Mission 7107, (2) the costs estimated necessary to deploy Mission 7106 into orbit and (3) the cost necessary to carry out the required engineering evaluations prior to placing Mission 7106 on operational schedule. Note that a Proposal for Mission 7107 Design Concept, now in draft form, will be submitted as requested in reference (a). This concept differs somewhat in detail from the one submitted over two years ago as reference (c). This up-dated design concept reflects the most recent guidance provided in reference (a) as well as that provided in draft SORS recommendations for ELINT collection and processing from overhead platforms through the 1974 time-frame. In conformance with demonstrated capability of

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the earlier POPPY Missions, the major emphasis proposed for 7107 is to collect ELINT leading toward the early discovery and the initial assessment of previously unheard radar emissions. In addition, a main-beam associated technical measurement capability, coupled with the selective location-analysis response, available from the digital sites, provides a high potential for timely [] to Targets of Opportunity, as well as the versatile provision (with a long life capability) for maintaining adequate Electronic-Order-of-Battle and Surveillance on previously identified and deployed weapon system radar.

2. Schedule:

It is necessary by budgetary cycle timing, to provide the costing and schedule estimates, enclosure (1), at a time prior to the actual approval of the design detail concept and goals for Mission 7107. However, it should be pointed out that as the goals are finalized the restraints of budget and schedule must be taken into consideration, or other adjustments made. These goals must be finalized at the earliest time prior to the launch of Mission 7106 in order that the long lead-time items for Mission 7107 may be placed under development.

Since the degree of difficulty anticipated for Mission 7107 will exceed that encountered in Mission 7106, an 18 month production schedule is unattainable and consequently NRL has not submitted the 18 month schedule option in enclosure (1). It should be noted that NRL believes that Mission 7107 might be completed for a launch 24 months following that of Mission 7106. However in order to certify a 24 month development cycle at this time, requires further definition of the detailed design goals for Mission 7107. Furthermore the operational lifetimes attained in the recent launches of POPPY have been exceeding 24 months rather consistently, so that a 24 month development cycle for Mission 7107 does seem quite reasonable assuming a successful deployment of Mission 7106.

Several techniques will be employed to assure that a 24 month cycle can be attained. The basic design of [] will be almost identical, so that the solution to an early problem will serve the spacecraft which follow later in the development schedule. Where a pace setting

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problem area is identified early in the schedule parallel engineering approaches will be carried along to the point where the choice of approach may be made on the basis of both schedule and technical attributes.

In addition opportunity for Mission 7107 design improvement will be derived through an intensive evaluation of the engineering functions and performance of the Mission 7106 spacecraft during the early portion of their operational period.

The major technique which is available to be employed in order to assure the shortest possible development cycle will be to get a "running start" on the pace-setting design and delivery items. It is therefore imperative that the detailed design-goals be determined as soon as possible. It is absolutely essential that this approval be obtained prior to the launch of Mission 7106 so that a large portion of the NRL design team may continue working on POPPY rather than, of necessity, be diverted to other work to bridge a gap in the POPPY effort.

3. Ground Station Changes:

Following the guidance provided in reference (a) and (b) all spacecraft designs which would affect the adequacy of the ground stations will be justified separately. The major emphasis at this time surrounding the ground station systems is in connection with the Mission 7106 and a full evaluation of the performance of these data receiving, recording, timing, and analysis systems will probably reveal certain areas of varying inadequacy which will be corrected during FY-70 in support of Mission 7106. In the final analysis though, the ground station changes which will result in direct support for Mission 7107 will not be discernible for at least another year, probably only after significant experience with the operational demands of Mission 7106.

NSA has verbally discussed a potential requirement for placing a semi-automatic field digital-system at the POPPY facility in [] in order to enhance this site's POPPY contribution in the face of the community withdrawal from []. A study will be undertaken in the near future in support of this philosophy but no cost estimates are included in FY-69 or FY-70 in support of this change in the ground station configuration.

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In the past, the major limitations in the overall POPPY system data accuracy has been the instrumental error inherent in the ground receiving and recording systems. However, deployment of the field digitizer system at the POPPY site in [] in May 1967, has changed the situation to the point that with the fantastic improvements in observation accuracy of this digital system, the spacecraft now is rapidly approaching the point of determining the overall data accuracy. Two areas of endeavor are now underway toward further improvements in data accuracy within the spacecraft:

(1) R&D spacecraft #176 will be launched along with Mission 7106 which will provide early experience with spacecraft data system improvements, particularly in the area of the thresholding scheme used in POPPY. As the evaluation of these experimental efforts are completed it is anticipated that a significant reduction of the timing errors, inherent in the spacecraft, will result for Mission 7107.

(2) Spacecraft in-flight evaluation in the past has been limited to a brief period during the initial portion of the Mission lifetime. Later on, analysis of spacecraft systems is done only when a specific inquiry has been raised by the tasking or analysis communities. In the face of the increasing dependence upon the spacecraft for the determination of the overall system observational accuracy it is now essential that the spacecraft be periodically evaluated for changes in the data time delay characteristics. Even though minute, these changes must be known and included in the overall site instrumental-error which can be "calibrated out" or taken into account in the analysis of the data. Toward this end, it is anticipated that the local ground station at [] will be upgraded to provide not only the existing capability for measurement of the engineering aspects of the spacecraft in orbit, but it will also be equipped to provide for a significant variety of analysis on the intelligence collection systems while in orbit.

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Such an improved local facility could also additionally impact heavily upon the operational capability of the program with Mission 7107, since the spacecraft will have the provision of using stored commands. Commands can be loaded into the on-board memory system up to 12 hours in advance of the time when changes in operational tasking are required. A domestic station would permit these tasking commands to be loaded without adversely detracting from the vital data collection duties of the overseas sites which have in the past had to carry out both the command and data collection efforts. A domestic command station will greatly increase the versatility of the Mission and NRL proposes to undertake the first experimental steps in this direction with Mission 7106 during FY-70.

4. Summary:

The Naval Research Laboratory will require at least 24 months (after Mission 7106) to prepare the four primary POPPY spacecraft for Mission 7107 launch. It is understood that a P-11 spacecraft will accompany the POPPY Mission 7107 on the same launch vehicle. Note that the cost summaries provided by NRL do not include any P-11 interface estimates.

The design goals for a space available R&D spacecraft will be submitted at a later date as the experience with Mission 7106 R&D spacecraft #176, is evaluated. NRL firmly subscribes to the necessity for providing R&D opportunity with each POPPY launch so that the vital future techniques and systems can move forward through the essential degree of evolution and be available for operational deployment at a much earlier time.

The FY-69 funding is programmed to be expended by 30 June 1969; there is no anticipated carryover funds to support the initial period of FY-70. Thus it is essential that a portion of the FY-70 funds be made available to NRL as early in FY-70 as possible so there will be no funding discontinuity on this program at this critical pre-launch period of the effort.

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Subj: NRL Cost Summary for FY-69, FY-70 and FY-71

Ref: (a) WHIG msg 011239Z CITE WHIG 8916
(b) NRO Memo to Dir Program "C" of 10 Mar 69,
(BYE-12627-69)
(c) NRL ltr to Dir NRO of 20 Aug 68, (BYE-51911-68)

1. The Naval Research Laboratory has prepared cost estimates in accordance with the guidance and requests received in reference (a) and (b) and is herewith submitting same for the financial program in support of Mission 7106, 7107 []

[] This information is provided in tabular form and is separated by fiscal year. The basis for these cost estimates are as follows:

(a) NRL has nearly completed the two year development cycle leading to Mission 7106 and because of the wide areas of similarity this experience provides an excellent basis for the estimation.

(b) The Design Concept for Mission 7107 exists in draft form at this time (it will be promulgated within the next two weeks). This has been the basis for the determination of the degree of technical difficulty of the overall Mission 7107 effort.

2. TABLE I presents in tabular form, the NRL obligations for each of the first nine months of FY-69. This period was chosen since it is the period for which the latest budgetary-status reporting information is available at the Naval Research Laboratory. In addition, the information on the Total FY-69 funds available for the NRL portion of the FY-69 POPPY effort has been provided on the bottom of TABLE I. The FY-68 carryover into FY-69 represents the cumulative difference between obligated funds and actual expenditures during the FY-68 period and was not a programmed carryover.

3. TABLE II has been prepared in two parts; the first columns headed "Obligated", reflect those funds obligated at NRL on the POPPY program for the period of the first nine months of FY-69, while the second two columns labeled "Anticipated", refer to the estimate of expenditures which NRL will incur during

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the last three months of FY-69. Note that the PAYLOAD costs in the last three months of FY-69 represents the estimate for Mission 7107 long lead time items and at the same time proposes costs for the "ground station" investment assigned for Mission 7106. This reflects the site requirements for both the operational overseas data collection sites and the domestic post-flight evaluation site in [REDACTED]

4. TABLE III: the information provided in TABLE III represents the estimates for the NRL financial program for Mission 7106, 7107 [REDACTED] for the time period of FY-70 and FY-71. Note that the payload costs for Mission 7106 in FY-70 are low, reflecting pre-launch costs for the period of about two months. The major share of the ground station burden for the FY-70 period is assigned to Mission 7106 in support of the in-flight operational site support costs.

The total FY-70 cost estimate has risen about 3 1/2% from that provided in reference (c) (enclosure (4)), even though the effort has been significantly redirected to support the Mission 7107, the pre-launch and the 7106 post-launch efforts.

The FY-71 cost estimates for Mission 7107 [REDACTED] are provided as the proposed financial program for these efforts in this time frame. [REDACTED]

5. Summary:

The Naval Research Laboratory will continue to carry out an orderly program of POPPY development that is based on sound technical grounds. The long demonstration of POPPY "Firsts" in the initial intercept of "new and unusual" ELINT signals has demonstrated clearly the importance and value of this intercept philosophy. The NRL team will continue to be responsive to the priority National objectives in the design

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and production of the spacecraft systems for Mission 7107. The proposal for the ELINT collection and Mission 7107 concept which is now in draft form is in conformance with and in response to, the latest SORS and Dir NRO guidance provided to POPPY and this concept has been the major element in determination of the cost estimates provided herein.

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FY-69 Monthly Obligation Rate (Nine Months of FY-69)

<u>Month FY-69</u>	<u>Obligations In Thousands \$</u>	<u>Cumulative Total In Thousands</u>
July	413.3	413.3
Aug	720.5	1,133.8
Sep	427.8	1,561.7
Oct	474.4	2,036.1
Nov	766.7	2,802.7
Dec	644.7	3,447.4
Jan	287.4	3,734.8
Feb	358.3	4,093.1
Mar	436.9	4530.0

FY-69 Funds Available

1	=	MIPR	=	FN-2822-9-153	\$6238.0 K
2	=	MIPR	=	FN-2822-9-156	554.4 K
3	=	MIPR	=	FN-2822-9-175	395.0 K
4	=	FY-68 Carryover	=		352.6 K
Total FY-69					= \$7540.0 K

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TABLE I

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TABLE II
FY-69 FINANCIAL PROGRAM FOR MISSION 7106-7107

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FY-69 FINANCIAL PROGRAM FOR MISSION 7106-7107

	Obligated		Anticipated	
	FY-69	(9 Mo)	FY-69	(3 Mo)
	7106	7107	7106	7107
I. PAYLOAD (Development-recurring)				
A. Electronic Equipment (Data&TM)	455.	109.	87.	785.
B. Stabilization Systems	117.		10.	75.
C. Power Systems	20.			60.
D. Control Systems				75.
E. Compat & Envir Tests	25.		145.	
F. Mech Struct & Fab	148.		35.	
G. NRL Salaries & Overhead	900.	38.	345.	44.
H. Misc. Mat. Travel & Shipment	480.	93.	110.	104.
	(2145.0 K)	(240.0 K)	(732.0 K)	(1143.0 K)
II. GROUND STATION (investment)				
A. Electronics (Rec. Record & Tim)	195.		150.	
B. Antenna Systems	25.		100.	
C. NRL Salaries	560.	22.	185.	20.
D. Misc. Mat Travel & Shipment	385.		205.	25.
E. A-D Systems	120.		200.	
	(1285.0 K)	(22.) K)	(840.0 K)	(45.0 K)
III. FACILITIES (investment)				
A. Test Equipment & facilities	313.		120.	
	(313.0 K)		(120.0 K)	
IV. SERVICES (operational)				
A. Operational Field Ass't	450.		110.	
B. Computer Services	75.		20.	
	(525.0 K)		(130.0 K)	
	(4268.0 K)	(262.0 K)	(1822.0 K)	(1188.0 K)
	(4530.0 K)		(3010.0 K)	
	FY-69 = \$7540.0 K			

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FY-70, FY-71 FINANCIAL PROGRAM FOR MISSIONS 7106, 7107

FY-70

FY-71

7106

7107

7107

I. PAYLOAD (Development-recurring)

A. Electronic Equipment (Data&TM)	78.	1035.	277.
B. Stabilization Systems		325.	78.
C. Power Systems		95.	45.
D. Control Systems		45.	75.
E. Compat & Envir Tests	23.	155.	125.
F. Mech Struct & Fab	18.	112.	122.
G. NRL Salaries & Overhead	198.	1225.	744.
H. Misc. Mat Travel & Shipment	<u>175.</u>	<u>625.</u>	<u>627.</u>
	(492.0 K)	(3617.0 K)	(2193.0 K)

II. GROUND STATION (investment)

A. Electronics (Rec Record & Tim)	607.		478.
B. Antenna Systems	73.		58.
C. NRL Salaries	650.	71.	822.
D. Misc. Mat Travel & Shipment	495.	125.	622.
E. A-D Systems	<u>120.</u>		<u>75.</u>
	(1945.0 K)	(196.0 K)	(2055.0 K)

III. FACILITIES (investment)

A. Test Equipment & Fab	<u>330.</u>	<u>425.</u>	<u>485.</u>
	(330.0 K)	(425.0 K)	(485.0 K)

IV. SERVICES (operational)

A. Operational Field Ass't	460.	221.	660.
B. Computer Services	<u>190.</u>	<u>45.</u>	<u>224.</u>
	(650.0 K)	(266.0 K)	(884.0 K)
	(3417.0 K)	(4504.0 K)	(5617.0 K)

FY-70 = \$7921.0 K

FY-71 =

TABLE III

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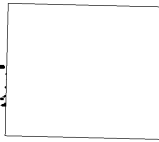
I hereby acknowledge receipt for (one copy of each unless otherwise indicated) and will insure proper control and stowage for the above identified messages until returned to the NRL Special Project Office (Code 1055).

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1970

SECTION MEETING

1. Budgetary Dilemma

On 1 May there was \$1.8 M in the till with two months, May and June to go this FY the expected amount for Routine Costs is \$900 K, leaving about \$900 K for Major outside purchases (over \$5 K). Alread in the first two weeks of this month there has been about \$303.2 K in stubs go through budget. Thus leaving only about \$600. K for major expenditures for the next six weeks. The priority procurements must be selected so that those items which can NOT wait are given first chbice - This includes some of the procurements which have been processed to supply during the past three weeks.

2. Therefore each member of this team must identify each procurement in writing for period from 21 April through 23 June. Both experienced and anticipated. This need not be elaborate, just enough so that I may judge effectively the overall degree of priority value to place on the particular procurements. Place your own priority on your own procurements and I will fit these within the overall program effort, judging between the mandatory items of all groups. Vince's, Fred's Pete's, Mark's George's, Charlie's and Withrow's . Just make a list of those thing ordered giving cost and quantity. Give about ten words on delivery schedule and time frame needed. List those items not yet ordered with schedule and need.

3. Keep in mind that the effect of this is quite far-reaching since the time during which we were laboring under the misapprehension of a \$900 K FY-68 carryover into this FY, embraced the effort just finished when we submitted the official request for FY-70 funds. This reflected a greater long-lead-time procurement for Mission 7107 than we are going to be able to undertake with the restrained Budget. What this means is that within our official Budget status we will be somewhat more restarined than would have been the case. In other words the problem will not entirely "go away" when we get next years  it will just be spread over an entire year and we will be  ss responsive to changes in the effort which are costly.

Mission 7107 Concept advanced May 1969.

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All collection systems above to have sectoral collection coverage.

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	7107 BRAVO	7107 CHARLIE	7107 DELTA
1	50 to 81 Mhz	73 to 100 Mhz	
2	155 - 165	155 - 165	100 - 125 Mhz
3	165 - 200	165 - 200	200 - 350
4	350 - 450	350 - 450	450 - 550
5	810 - 930	810 - 930	550 - 860
6	1080 - 1210	1080 - 1210	860 - 1080
7	1210 - 1400	1210 - 1400	1400 - 2070
8	2580 - 2680	2580 - 2680	2070 - 2580
9	2680 - 2930	2680 - 2930	3600 - 4000
10	2930 - 3120	2930 - 3120	6720 - 7900
11	3120 - 3300	3120 - 3300	9100 - 9340
12	3300 - 3600	3300 - 3600	9340 - 9400
13	3900 - 4850	3900 - 4850	9400 - 9600
14	4850 - 5300	4850 - 5200	9600 - 10500
15	5200 - 5850	5200 - 5850	10.5 - 12.0 Ghz
16	5850 - 6720	5850 - 6720	13.0 - 14.0 Ghz
17	7900 - 8600	7900 - 8600	34.5 - 35.0 Ghz
18	8600 - 9100	8600 - 9100	
19	14.5 - 15.1 Ghz	14.5 - 15.1 Ghz	
20	34.9 - 35.3 Ghz	15.0 - 18.0 Ghz	

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CONTROL SYSTEMS JOINTLY