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BYE-51903-68

3

NRL to NRO Comptroller via D?C 06 + 07 cost detail

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CODE	DATE	INITIALS	*PURPOSE	REMARKS
5614	4/17/68	RDM		
5170 ~~5610~~	4/17/68	RJW		
5600	4/18	HOJ		
5610 ~~5170~~	18 April	JT		
5100	4/18	WRJ.		
1010	4/19/68	JT		
5000		[illegible]		PKG 29-68 4-18-68
4000	4/18	[illegible]		
1000	4/18	[illegible]	4	[illegible]
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FROM Director, NRL
To: Director, NRO

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DATE OF MATERIAL: 18 April 1968

BRANCH IDENT. SYMBOL: 5600-RM:bdk:jch

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SUBJECT

Missions 7106 and 7107; costong details for NRL effort on

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U. S. NAVAL RESEARCH LABORATORY
WASHINGTON, D. C. 20390

IN REPLY REFER TO
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18 April 1968

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From: Director, Naval Research Laboratory, Washington, D. C. 20390
To: Director, National Reconnaissance Office (ATTN: Comptroller)

Via: (1) Director, Program "C" (CAPT Moffit)

Subj: Missions 7106 and 7107; costing details for NRL effort on

Ref: (a) NRO ltr of 11 Mar 68, BYE-12728-68 - NRL B-0009
(b) NRL ltr of 7 Feb 67, BYE-26904-67

Encl: (1) NRL Cost Summary for FY-68, FY-69 and FY-70
(2) Monthly Expenditure for First Eight Months of FY-68
(3) Cost Breakdown for Options 1a and 2a
(4) Cost Breakdown for Options 3 and 4
(5) Cost Breakdown for Option 3a

1. The Naval Research Laboratory has prepared, according to the guidance provided in reference (a), the summary of POPPY funding at NRL for the period of FY-68, FY-69 and FY-70. The basis for the summary of costs for Mission 7107 is reference (b). Reference (b) defined four (4) large primary POPPY payloads on a schedule of 18 months following the launch of Mission 7106. The alternatives offered as guidance in reference (a) provided Options 1 and 2 which required four (4) POPPY payloads, two (2) P-11 payloads in 12 and 16 months respectively from the launch of Mission 7106. NRL believes both of these schedules to be unattainable and has therefore modified these Options to "1a" and "2a". Options "1a" and "2a" are exactly the same Option. That is, four (4) POPPY payloads available 18 months after the launch of 7106 and only one (1) P-11. The 18 month schedule estimate is based on NRL's similar present effort in support of Mission 7106.

In the past, the costs and schedule have been defined first and the operational and technical goals filled in later by NRO. Such procedures may result in compromises not in the best interest of the operational capabilities of the Mission. NRL requests early guidance on the definition of Mission 7107.

The basic POPPY concept has demonstrated a consistent and reliable intelligence product derived from each Mission. POPPY remains a basic

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5600-RM:bdk:jch
BYE-51903-68

general search collection system with long life and a versatile parametric measurement capability. It is therefore recommended that this same basic POPPY concept be retained in the design concept of the future Missions. The basis of these cost summaries has been the design concept for Mission 7107 which was proposed by NRL in reference (b).

2. The already difficult problem of proper installation and checkout of the POPPY payloads aboard the Agena would be made significantly worse, if not impossible, by the inclusion of the P-11 on the front of the launch vehicle. The risk of possible mechanical damage to the POPPY payloads under such adverse installation conditions would be extremely high. In addition to the mechanical problems of the present design, namely that a P-11 simply will not fit in the nose faring with four (4) fully instrumented POPPY payloads, there are other problems. The Agena vehicle, the P-11's deployment mechanism and the P-11 itself (spin up and retro-rocket firing) are all additional manuvers, prior to POPPY deployment, which are necessary in order to separate the P-11 into its desired orbit. A malfunction of these manuvers could severely compromise the POPPY Mission by upsetting the controlled separation rates and directions.

3. With the anticipated total expenditure of FY-68 funds at NRL, there will be little or no carryover at the end of FY-68. Therefore, it is requested that FY-69 funds be made available as early as possible to avoid a fiscal discontinuity at NRL on this program.

4. Of all the options included in this letter, NRL strongly recommends to NRO adoption of Options 1a and 2a. That option provides for the maximum operational capability at the most cost effective price. To drop two (2) of the POPPY payloads would reduce the operational capability by over fifty percent and yet only save 7.9 percent of the cost and only two months on the schedule. Significant changes to the design concept of reference (b) would have to be priced out as the design changes are defined.

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NRL COST SUMMARY REPORT FOR FY 68, 69 AND 70

1. In accordance with the guidance received in NRO ltr of 11 March 1968, BYE-12728-68, the Naval Research Laboratory is herein submitting the following:

a. The N.R.L. POPPY-Program funding summary for the first eight months of FY-68 (see enclosure 2), and the final four months of FY-68 (see enclosures 3 and 4).

b. The estimate of N.R.L. POPPY-Program costs for FY-69 and FY-70 using the four options provided as guidance in NRO ltr of 11 March 1968, BYE-12728-68 (see enclosures 3, 4 and 5).

2. The total FY-68 POPPY-Program fund available at N.R.L. is $8,588 k, including the carry-over and prior year adjustments. The summary of enclosure 2 shows that only $2,352 k remains for the final four months of FY-68 or an average of about $588 k/month; significantly below the average of the first eight months ($780 k/month).

3. These cost summaries and estimates of future costs cover the N.R.L. portion of the POPPY-Mission 7106 and 7107 for the periods of FY-68, FY-69 and FY-70. Previous cost estimated for these efforts as submitted in NRL ltr of 13 June 1967, BYE-26909-67, and NRL ltr of 6 March, BYE-26906-67 are significantly updated. The intensive effort at N.R.L. in the preparation of the four primary payloads for Mission 7106 have provided an excellent basis, because of wide similarity, for estimating the costs and schedule for Mission 7107. The effort for Mission 7107 has been defined in concept by the N.R.L. proposal stated in NRL ltr of 7 February 1967, BYE-26904-67. N.R.L. has, under preparation at this time, a "Preliminary Technical Description of Mission 7106", which should be distributed by 1 June 1968. This will further define the design goals and operational concepts for Mission 7106.

4. The cost break-down of enclosure 3 is provided in response to the Options #1 and #2 of NRO ltr of 11 March 1968, BYE-12728-68, which call for four primary POPPY payloads in a period of twelve and sixteen months, respectively. Option 1a and 2a have been designated by N.R.L. to indicate a change in the schedule to provide at least eighteen months for each of these two options. N.R.L. has, during the past eight months, been intensely engaged in the production effort of Mission 7106 and because of the similarity of this effort with that anticipated for Mission 7107, it is very obvious that twelve months is inadequate to design, fabricate and flight certify four payloads as large and complicated as those for Mission 7107. Thus, the options 1a and 2a are exactly the same....four primary payloads scheduled in the period of eighteen months following the launch of Mission 7106.

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The P-11, which is being considered for front-end Agena mounting during the launch phase of Mission 7107, will have no fiscal support from the N.R.L. POPPY budget as reflected in these costing summaries. N.R.L. views, with great concern, any design interface, which will adversely influence the opportunity for successful launch of the primary POPPY satellites. N.R.L. will carefully evaluate any design which interfaces mechanically or electrically with these primary POPPY payloads. To date, no acceptable P-11 mounting design has been presented for accommodating it in the nose fairing. It is also possible that the shortage of P-11 rides will have been solved prior to this launch of Mission 7107.

5. The cost break-down of enclosure 4 is provided in response to the Option #3 and #4 of NRO ltr of 11 March 1968, BYE-12728-68, which call for two POPPY payloads in sixteen months after the flight of Mission 7106.

No N.R.L. P-11 fiscal support is contained in these summaries of POPPY for Mission 7107.

No R & D experimental payloads are contained in this costing summary for either Option #3 or #4 since the Option #3a is provided separately to define the cost for this eventually.

6. The cost break-down of enclosure 5 is provided as a modification to Option #3, suggested in NRO ltr of 11 March 1968, BYE-12728-68 for two primary POPPY payloads and two P-11 secondary payloads and, in addition, two small R & D space available payloads to accompany the launch of Mission 7107, eighteen months following Mission 7106. The basic need for separate experimental R & D payloads is because of technical and operational incompatibilities between these engineering experiments and the operationally oriented data systems when they are placed in the same satellite package. Intensive tasking for intelligence gathering purposes leaves very little opportunity to use the satellite for engineer evaluation purposes. The future systems for improvement of payload stabilization, interrogation, intercept and data link are urgently needed today for use in 7106 and at least by 7107. The R & D experiments being detailed in the cost summary of this enclosure 5 will be justified individually in separate correspondence. No operational capability is foreseen for these R & D payloads but they will bring about a significant step in the evolution of the future POPPY systems which will have an operational capability.

7. Relative to the plans for including an experimental system aimed at detecting and discerning the parameters of a signal of the [redacted] type, POPPY has, as far back as Mission 7103, provided an experimental capability against the [redacted] This system was operationally available for over four years in orbit on 7103 CHARLIE but rarely used. A similar system can be provided in one or more of the standard POPPY collection bands and depending upon the particular frequency, the cost would range from a low of $35 k to $50 k per band. N.R.L. has not included the costs for this feature in the cost summaries for Mission 7107.

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8. In evaluating the relative merits of two versus four POPPY payloads per launch, several criteria are available....cost being one of them, and operational performance another. Comparing the Mission 7107 costs reflected by the summaries of enclosures 3 and 4, one can see that the cost of the additional two POPPY payloads is about one million dollars over a two years period, FY-69 and FY-70. However, it is not evident what the differences in operational capability really are between the two Mission definitions. A drastic reduction in the program frequency spectrum coverage would result by reducing the Mission 7107 definition to a two payload launch. Consider one very important aspect of the future use of the four POPPY payloads which will effectively double the program capability for locating emittors in certain bands of the highest priority [redacted] emittors where all four payloads are equipped similarily for data collection. With the Field Digitizing System, it will be possible to monitor all four satellites simultaneously by utilizing one of the ground station receiving-antennas to collect data from two satellites [redacted] and at the same time use the other ground station antenna to simultaneously monitor the data from the other two satellites which are tasked against the same high priority signal. Thus, it will be possible with the deployment of the Field Digitizing Systems to collect and digitize in real-time the data from all four satellites simultaneously. This technique will allow the full frequency and azimuth capability normal to POPPY, to be extended to include [redacted]

9. The costs during FY-68 for the Field Digitizer will have totaled $605 k which will allow procurement of two Analog-to-Digital data converter systems and associated computer for [redacted] and up-date the installation in [redacted] The conversion of [redacted] to digital operation will be effected in FY-69.

10. Summary;

The Naval Research Laboratory will require at least eighteen months to prepare the four primary POPPY payloads for Mission 7107. If for some reason, the guidance from the NRO dictates that Mission 7107 be two primary POPPY payloads, the schedule will require at least sixteen months to prepare the payloads. From an overall operational effectiveness standpoint, the four payload Mission 7107 will have significant advantage over the two payload mission. It will more than double the potential for location of the highest priority emmitors and will provide for the first time in the program, [redacted] in the major bands of interest.

Field Digitizer Systems are to be installed in [redacted] in the [redacted] and an up-dated version in [redacted] in the first quarter of FY-69. The Field Digitizing System for [redacted] will be deployable during the third quarter of FY-69.

While the NRO letter of 11 March, BYE-12728-68, suggests the possibility of R & D experimental payloads under Option #3 only, NRL would propose

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separate R & D payloads be included on each future launch. Costs for this have not been supplied due to the restraining influence of the incoming guidance. R & D payloads provide the opportunity to swiftly bring the vital future systems forward through several stages of evolution for early operational deployment.

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MONTHLY EXPENDITURE RATE
(Eight-months of FY-68)

Month	Obligations (In thousand $)	Cumulative total (In thousand $)
July	$ 551.8	$ 551.9
August	1061.1	1612.9
September	552.5	2165.4
October	1132.1	3297.5
November	501.6	3799.1
December	307.5	4106.6
January	1278.5	5385.1
February	855.1	6240.2

Eight month FY-68 Average Monthly Obligations = $780 K

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Enclosure (2)
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END OF

		FY 68		FY 69				FY 70	
		8 Mo. Obligated		4 Mo. Estimated		Estimates		Estimates	
		7106	7107	7106	7107	7106	7107	7107	7108
I.	PAYLOAD (Development-recurring)								
	A. Electronic Equipment (Data & TM)	609.5	175.0	150	235	200	699	800	
	B. Stabilization Systems	317.0		74.0		150	200	400	
	C. Powered Systems	60				10	60	100	
	D. Control Systems	149				25	125	175	
	E. Mechanical Structures & Fabrication	40		14		27	27	55	
	F. NRL Salaries & Overhead	964.7	8.0	535.7	112	616.9	767.5	1408.4	
	G. Misc. Materials, Travel & Shipping	497.6	25	187.4	5	295.4	295.4	690	
		(2637.8)	(208.0)	(961.1)	(352)	(1324.3)	(2173.9)	(3628.4)	
II.	GROUND STATION (Investment)								
	A. Electronics (Rec, Record & timing	624.5	640	417	50	750	450	1000	
	B. Antenna Systems	251.2	75	50	50	75	100	200	
	C. NRL Salaries & Overhead	169	24	109	12	145	155	260	
	D. Misc. Materials Travel & Shipping	263.4	25	150	20	295	320	450	
		(1258.1)	(664)	(876)	(132)	(1265)	(1025)	(1910)	
III.	FACILITIES (Investment)								
	A. Test equipment & facilities	369.6	50	88.2	50	208.1	218.2	350	
		(369.6)	(50)	(88.2)	(50)	(208.1)	(218.2)	(350)	
IV.	SERVICES (Operational)								
	A. Operational field assistance	658		24		330	430	630	
	B. Computer Services	176		20		75	115	180	
		(834)		(44)		(405)	(545)	(810)	
		5149.5	1022	1819.3	534	3202.4	3962.1	6698.4	
		6171.5 k		2343.3 k		(FY 69 - 7164.5) k		(FY 70 -	

(4) POPPY

OPTION 1a and 2a - 18 Months after 7106 (FY 68 - 8514.8)k

Enclosure (3)

-922 K

NROB/E 13062-68 → $6238 new $
NRO B/E 13355-68 → 554.4
395 adds
$7540.8 Total FY 69

352.6 Carryover

Enclosure (3)
Page 1 of 1 page
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	FY-69 Estimates		FY-70 Estimates
	7106	7107	7107
I. PAYLOAD (development-recurring)			
A. Electronic Equipment (Data & TM)	200.0	599.0	600.0
B. Stabilization Systems	150.0	150.0	300.0
C. Powered Systems	10.0	40.0	67.0
D. Control Systems	25.0	93.0	130.0
E. Compatibility & Environmental Tests	-	-	-
F. Mechanical Structures & Fabrication	27.0	27.0	38.0
G. NRL Salaries and Overhead	616.9	767.5	1,158.0
H. Miscellaneous Materials, Travel and Shipping	295.4	275.0	650.0
	(1324.3)	(1951.5)	(2943.0)
II. GROUND STATION (investment)			
A. Electronics (Recv., Record & Timing)	750.0	375.0	975.0
B. Antenna Systems	75.0	100.0	200.0
C. NRL Salaries & Overhead	145.0	155.0	260.0
D. Miscellaneous Materials, Travel and Shipping	295.0	320.0	450.0
	(1265.0)	(950.0)	(1885.0)
III. FACILITIES (investment)			
A. Test Equipment & Facilities	208.1	218.2	350.0
	(208.1)	(218.2)	(350.0)
IV. SERVICES (operational)			
A. Operational Field Assistance	330.0	430.0	630.0
B. Computer Services	75.0	115.0	180.0
	(405.0)	(545.0)	(810.0)
	3202.4 k	3663.7 k	5988.0 k
	FY 69 = 6866.1 k		FY 70 =

Enclosure (4)
Option #3 & 4- (2) POPPY 16 months after 7106

Enclosure (4)
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	FY 68				FY 69		FY 70
	1st 8 months obligation		last 4 months estimate		Estimate		Estimate
	7106	7107	7106	7107	7106	7107	7107
I. PAYLOAD (development-recurring)							
A. Electronic Equipment (Data & TM)	609.5	175.0	150.0	235.0	200.0	649.0	750.0
B. Stabilization Systems	317.0		74.0		150.0	200.0	400.0
C. Powered Systems	60.0				10.0	60.0	100.0
D. Control Systems	149.0				25.0	125.0	175.0
E. Mechanical Structures & Fabrication	40.0		14.0		27.0	27.0	55.0
F. NRL Salaries & Overhead	964.7	8.0	535.7	112.0	616.9	742.5	1383.4
G. Miscellaneous Materials, Travel and Shipping	497.6	25.0	187.4	5.0	295.4	295.4	690.0
	(2637.8)	(208.0)	(961.1)	(352.0)	(1324.3)	(2098.9)	(3553.4)
II. GROUND STATION (investment)							
A. Electronics (Recv., Record & Timing)	624.5	640.0	417.0	50.0	750.0	450.0	1000.0
B. Antenna Systems	251.2	75.0	50.0	50.0	75.0	100.0	200.0
C. NRL Salaries & Overhead	169.0	24.0	109.0	12.0	145.0	155.0	260.0
D. Miscellaneous Materials, Travel and Shipping	263.4	25.0	150.0	20.0	295.0	320.0	450.0
	(1258.1)	(664.0)	(876.0)	(132.0)	(1265.0)	(1025.0)	(1910.0)
III. FACILITIES (investment)							
A. Test Equipment & Facilities	369.6	50.0	88.2	50.0	208.1	218.2	350.0
	(369.6)	(50.0)	(88.2)	(50.0)	(208.1)	(218.2)	(350.0)
V. SERVICES (operational)							
A. Operational Field Assistance	658.0		24.0		330.0	430.0	630.0
B. Computer Services	176.0		20.0		75.0	115.0	180.0
	(834.0)	-	(44.0)	-	(405.0)	(545.0)	(810.0)
	5149.5	1022.0	1819.3	534.0	3202.4	3887.1	6623.4
	6171.5 k		2343.3 k		7089.5 k		

(2) POPPY 18 months
Option #3a - (2) R&D - after 7106
Enclosure (5)

FY 68 = 8514.8 FY 69 FY 70

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