5600:HOL:sr
BYE 26900-67

4 JAN 1967

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From: Director, Naval Research Laboratory, Washington, D. C.
To: Director, National Reconnaissance Office
Via: Director, Program C

Subj: MISSION 7106, proposed revision for

Ref: (a) NRL ltr 5600:HOL:sr, BYE 26914-66 of 30 Dec 1966
(b) NRL ltr 5600-414 RDM:jch, BYE-26909-66 of 6 Oct 1966

1. In an effort to be more responsive to the ABM problem, the Naval Research Laboratory on 13 December proposed certain changes in the configuration of Mission 7106. This briefing was given to Mr. Harry Davis and later at the request of Major General Stewart to Dr. Flax. The Laboratory desires to implement this proposal with further documentation at this time.

3. All four of the satellites would consist of the basic NRL 27" diameter multiface design with the three axis gravity gradient stabilization configuration used in Mission 7105, B, C and D. Also included would be the capability for (1) inversion, (2) YAW turn-around and (3) on-orbit satellite spacing control. The On-Orbit Satellite Spacing Control System will utilize small microthrusters located along the line of flight which can be activated by command to change the spacing relative to the other satellite of the pair, thus enhancing the location capability.

4. The following payload orbital parameters will be required:

(a) Payload weight = 210 lbs. estimate (840 lbs total)
(b) Orbit inclination = 70°
(c) Orbit altitude = 500 nautical mile circular
(d) Orbital injection accuracy
  (1) Altitude ± 25 nautical miles
  (2) Apogee-Perigee difference = 20 nautical miles or better
  (3) Inclination = $70^{\circ}\ ^{+0}_{-2^{\circ}}$

At payload injection the vehicle performance must be such that all three axis (pitch, yaw and roll) do not exceed a velocity rate of 1°/second and do not exceed a maximum excursion of ± 2 degrees. A smooth clear separation of the payload from the vehicle without tipping the payloads is required.

(e) Optimum launch time
  (1) orbital plane at right angles to that of Mission 7105
  (2) widest possible separation from operating payloads of Mission 7105 to avoid interference of common telemetry frequencies.

5. In this proposal, the Naval Research Laboratory has attempted to be responsive to the requirements for both General Search and Electronic Order of Battle (EOB) data collection, with particular emphasis on improved capability for ABM collection. The proposed bands of frequency coverage are shown in Table 1 below.

Band	7106A		7106B		7106C		7106D	
1.	153	165	153	165	153	165	153	165
2.	165	200	165	200	165	200	165	200
3.	200	320	200	320	200	320	200	320
4.	320	550	320	550	320	550	320	550
5.	550	920	550	920	550	920	550	920
6.	920	1800	920	1800	920	1800	920	1800
7.	1800	2580	1800	2580	1800	2580	1800	2580
8.	2580	2930	2580	2930	2580	2930	2580	2930
9.	2930	3300	2930	3300	2930	3300	2930	3300
10.	3300	3600	3600	4050	5250	5850	7900	8600
11.	4900	5070	4900	5070	7900	8600	8600	9340
12.	5850	6700	5850	6700	8600	9340	9340	10,000
13.	6700	7900	6700	7900	9340	10,000	14,800	15,100

It will be noted that bands 1 through 9 are duplicates in all four satellites, however each will have a unique and different pulse length for data originating in each band, so that tasking of multiple bands will be possible without ambiguity, as to the frequency band of origin. All bands have [redacted] fixing capability except for Bands 10 in 7106A, B and C and Band 13 in 7106D. Stored commands will be utilized in 7106 so every orbit over the Soviet Union can be tasked and utilized for collection by the existing tasking station.

6. The proposed modifications in Mission 7106 are designed to optimize the responsiveness to the ABM problem. However, it is desirable not to modify too radically the basic concepts of the POPPY system such as wide frequency coverage for general search and the [redacted] These features combined with an ability to read-out in the field for specific geographic locations as outlined in reference (a) assist NRO in being more responsive to the ABM problem in a timely fashion in future POPPY launches.

7. Careful cost analysis can not be produced until final agreement is reached and the exact electrical configuration for Mission 7106 is finalized and approved by NRO. However, rough preliminary estimates of the cost indicates that savings effected by the similarity of all satellites, in production line assembly methods, utilizing existing design components and redundancy of component purchases would tend to just about offset the additional costs for the two extra satellites. If funding adjustments are required for the revision of Mission 7106, it is estimated they will be quite minor and totals are about equal with those shown in reference (b). Funding for the proposed field instrumentation to permit geographic location data sorting at field sites contained in reference (a) is not included in the estimates for Mission 7106.

8. A complete technical analysis of the design problems has not been made, however, until the exact electrical characteristics can be agreed upon by NRO and NRL detailed scheduling of various critical items can not be completed. Optimistically NRL estimates it could be ready to launch Mission 7106 ten months after 7105.

9. Early comment on this proposal is requested to assist in the planning required for Mission 7106.

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PROJECT EXPENDITURE STATUS

FY 66

	Monthly Total	Cumulative
July	315	
Aug	740.8	1,056.1
Sept	355.8	1,411.9
Oct	439.0	1,850.9
Nov	516.6	2,367.5
Dec	337.9	2,705.5
Jan		
Feb		
March		
April		
May		
June		
7105* Aug		

2,070.0 K

Carry Over 2,070.0 K

MIPR-66-SSD-11 dated 27 Oct 1964 - 49M

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Program 7105

In order to meet the requirements to be more responsive to the ABM collection prob[redacted]e Navy proposed the full[redacted] coverage from 1[redacted]300 Mc be incorporated at a delay of 7 weeks in this launch. M[redacted]tions were made in the "C" satellite to incorporate the coverage of 920 to 1800 Mc and in the "D" satellite to include band coverage of 200 to 550 Mc and 920 to 1800 Mc. The full coverage is shown in the tabulation below.

Program - Mission 7105

Frequency covered -

	A	dbm	B	dbm	C	dbm	D	dbm	d
1.	153 - 165	-47	153 - 165	-47	100 - 125	-47	200 - 550	-50	
2.	165 - 200	-47	165 - 200	-47	200 - 350	-50	920 - 1850	-50	
3.	550 - 650	-50	550 - 650	-50,60	350 - 550	-50	1800 - 2500	-53	
4.	650 - 850	-50	650 - 850	-50,60	920 - 1850	-50	4930 - 5070	-78	
5.	820 - 920	-50	820 - 920	-50,60	1800 - 2500	-53	6450 - 6700	-75	
6.	920 - 1100	-53	2580 - 2680	-53,65	3600 - 4050	-70	6700 - 7300	-75	
7.	2580 - 2680	-53	2680 - 2930	-53,65	4930 - 5070	-78	7300 - 7900	-75	
8.	2680 - 2930	-53	2930 - 3120	-53,65	6450 - 6700	-75	7850 - 8450	-75	
9.	2930 - 3120	-53	3120 - 3300	-53,65	7850 - 8450	-75	8100 - 8600	-75	
10.	3120 - 3300	-53	3300 - 3600	-53,65	8100 - 8600	-75	8600 - 9340	-75	
					8600 - 9340	-75	9340 - 9500	-75	
					9340 - 9500	-75	14.5 - 14.8GC-100 +15 dbm		

In the "B" satellite a choice of two sensitivities is available from 550 through 3300 Mc one standard sensitivity and the 10 to 12 Db higher. Also in "B" was a capability to read the signal level in 16 - 1½ Db steps one band at a time. In the "A" satellite the capability to measure the pulse width one band at a time. All satellites have a new recycling command system available, which will be able to command all orbits over the Soviet Union. Also more than the usual two RF Bands per data transmitter can be commanded on simultaneously. A CW detection experiment is available in "C" - 7850 to 8450 Mc.

Ground Station Improvements

New broadband solid state receivers and adaptive thresholders in three of the stations will give greatly improved-accuracy data for the[redacted] fixing program at the time of launch. By mid-summer all collection stations will be updated with these new receivers. At[redacted]direct "on-line" analog to digital conversions will be made. Also this station will have available de-interleaving equipment and a small computer to do geographic sorting of the digital data for the five suspect ABM sites to an accuracy of about ±100 NM. Analog to digital conversion equipment will be available at the remainder of the sites by the launch date for 7106.

SECRET [redacted]

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