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From: Director, U. S. Naval Research Laboratory, Washington, D. C. 20390
To: Office

Subj: Program 758 Requirements, Vehicle Number 2701

Encl: (1) Payload Characteristics, ~~Mechanical~~

1. Present planning calls for an increase of two-to-one in the program's primary mission capability for each satellite. To accommodate this increase, four 24 inch satellites will be utilized. As in the past, a special effort will be made to preserve design concepts that contribute to reliability and long life.

2. Payload Description, General. (A) Payload number 141 will include in addition to the expanded Program 758 system, a separately funded solar x-ray monitoring experiment. This experiment will be provided by Dr. Friedman under the sponsorship of BuWeps. The satellite will be spin stabilized by means of a cold gas system, with backup and re-spin capability provided by command operated solid rockets. (B) Payload number 142, like 141, is being instrumented for omnidirectional coverage with Program 758 experiments. A promising new development by Philco, of a passive gravity gradient damper, is being considered as an additional experiment for 142. The operation of the Program 758 experiments would not be affected by the degree of stabilization achieved.

If the Philco damper is used for earth stabilization, it would be possible to include a simple earth albedo experiment in this satellite. Such an experiment has been proposed by Dr. Friedman. (will add more from [illegible])

(C). Payload number 143 will contain a General Electric Company gravity gradient system. The passive stabilization system will be nearly identical to the system used successfully in the last launch. An improved aspect sensing means will be incorporated in the new design.

The Program 758 experiments will be instrumented so as to take advantage of the two axis stabilization provided. An improvement in performance is expected, since it is possible to use higher gain directional antennas, & fewer channels for each collection experiment.

If the Philco gravity gradient system is not attempted in Payload 142, it may be po[redacted] to include the earth albedo experiment in Payload 143. A careful analysis of available power and mounting space will have

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to be made in order to establish the feasibility of including the extra experiment. TOP SECRET [redacted]

(D) Payload number 144 is being planned to include a three axis passive gravity gradient stabilization system. The development work is being done by the General Electric Company, and will utilize their magnetically anchored viscous damper.

Total aspect sensing will be required to evaluate the performance of the three axis stabilization experiment. Present plans call for the use of improved horizon sensing, combined with a three axis magnetometer, for total aspect indication.

As with the two axis gravity stabilized satellite, payload 144 will be instrumented with directional antennas for Program 758 experiments. In addition, a low level controlled thruster will be provided. This will be used to add or subtract energy from the satellite in orbit, making it possible to provide controlled and constant orbital [redacted] experiments.

3. ~~(C)~~ Two small auxiliary satellites are available for inclusion on the aft rack of the Agena. One satellite would contain 12 extendible antennas to provide an efficient radar reflector. This configuration would also provide information on atmospheric density and drop by virtue of its high area to mass ratio. Total volume is expected to be about equivalent to an 8 inch sphere. Detailed drawings and total weight will be available at a later date. A separation signal and a telemetry separation signal line would be required.

The second package contains a transponder which would radiate a cw signal on 216.930 mcs only while over the Space Surveillande tracking fence. This would provide an active calibration signal combined with an unfurlable reflector in the same package. The total weight on the vehicle for the active package would be $13\frac{1}{2} \pm 1$ pounds. A separation signal and a TM indicator line would also be required for this package.

It is requested that consideration be given to the inclusion of these two small packages. There would be no cost to the program for construction or vehicle integration.

4 ~~3~~. Vehicle Requirements, General

(a) First burn injection altitude should be $\geq$ 105 N.M.

(b) Nominal orbital [redacted] ude remains at ≈ 500 NM circular.

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(c) Nominal orbital inclination remains at 70° prograde.

(d) Launch window is planned for 18 February 1965, from 1100 to 1300 PST.

(E) Three D timer separation signals with complete redundancy are required. The interval between signals to be 10 seconds +2, -0 seconds. The interval between lift-off and first payload separation will be 3815 ±40 seconds. Any aft rack payloads will be separated with one or more of the primary separation signals.

(F) A 12 inch extension of the barrel section of the 72 inch nose fairing is required. This extension will remain with the vehicle upon separation of the nose fairing.

(G) An RF window in the nose fairing similar to previous designs is required.

(H) The vehicle attitude at the time of separation (lift-off plus 3815 seconds) shall be within ±1 degrees of nominal in pitch, roll, and yaw axes. The rate of change of position shall not exceed 0.1 degree per second about any axis at the time of separation.

(I) The mechanical characteristics of the payloads are listed in enclosure (1). Total weights, location of centers of gravity, and moment of inertia values represent the best estimates available at this time.

5 4. Launch Pad Requirements

(a) As an aid in maintaining security during payload installation, a dual shelter similar to that on Launch Complex 75-3, pad 5 is required.

(b) The overhead monorail hoist should extend about 8 feet forward of the Agena-payload interface. This is required for handling the payloads during installation.

(c) Other pad support details will be outlined in the routine request for range support.

6 5. Future requirements in the program indicate the need for more sophisticated instrumentation. An increase in the size of solar power panels will be required to provide additional power as circuit complexity increases. In anticipation of an increase in size of the more complex payloads, it is suggest [redacted] development of a larger nose fairing be undertaken. For exampl [redacted] bstantial increase in the useful space on the forward end of the Agena would be provided by a clam shell configuration.

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Payload No.	Type	Size in.	Wt. on Launch St... lb.	Wt. in Orbit lb $^{\pm 5}$	Separation Velocity ft/sec.	Separation From Vehicle miles/day
141	SR 7B	24	98	90	1.040	44.3
142	Greb	24	88	80	1.000	42.6
142GG	Gravity Gradient (Philco)		101	93		
143	Gravity Gradient 2 Axis Stabilization	24 Wide band	108	110	0.700	29.8
144	Gravity Gradient 3 Axis Stabilization	24 Wide band	123	115	0.780	33.3
		TOTAL	$430^{\pm 20}$	$398^{\pm 20}$		

Payload No.	Position Over Horizon		CG Z-Axis	CG 1-3 Axis	CG 2-4 Axis	I_z Slug-Ft^2	I_{1-3} Slug-Ft^2
141	4		on Center Line	$1\frac{1}{2}$" $\pm\frac{1}{4}$" Below Antenna Plane		$1.4^{\pm 0.2}$	$1.2^{\pm 0.2}$
142	3		on center line	$1\frac{1}{2}$ $\pm\frac{1}{2}$ below antenna plane		1.2 ± 0.2	1.1 ± 0.2
142GG				$\frac{1}{2}$ $\pm\frac{1}{2}$ above antenna plane		1.2 $^{+0.4}_{-0.2}$	1.8 $^{+0.4}_{-0.2}$
143	1		on center line	$\frac{1}{2}$ ± 1 Above Antenna Plane		1.4 $^{+0.4}_{-0.2}$	2.0 $^{+0.4}_{-0.2}$
144	2		on center line	± 1 on Antenna Plane		1.8 $^{+0.4}_{-0.2}$	2.6 $^{+0.4}_{-0.2}$

Payload No.	I_{2-4} Slug-Ft^2	Spin Speed RPM	Separation Sequence Sec.
141	1.2 ± 0.2	Pl 141 only 90 RPM (Cold Gas) $^{+5}_{-0}$ @ T +5 Sec.	T Sec.
142	$1.1^{\pm 0.2}$		T +10 sec.
142GG	1.8 $^{+0.4}_{-0.2}$		
143	2.0 $^{+0.4}_{-0.2}$	45 RPM (Rockets) Respin	T +10 sec.
144	2.6 $^{+0.4}_{-0.2}$		T Sec.

Secondary Payloads

No.	Type	Wt. on Vehicle	Wt. in Orbit
	16" Surcal	$5\frac{1}{2}$ $\pm\frac{1}{2}$	2#
	12 element Passive Reflector	$10\frac{1}{2}$ ± 2	8#

414 # $\pm 22\frac{1}{2}$ Total

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