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Control System

RATIONALE FOR SIGINT SATELLITE SYSTEM

The objective of this study is to establish a plan for a SIGINT satellite system. Execution of the plan would create a SIGINT reconnaissance force-in-being that would be quickly responsive to changing intelligence requirements. To achieve this flexibility, the plan is built around the following developments.

1. A multi-group payload (Project 315) which would allow four of eight available receivers to be installed in a flight-ready vehicle fifteen days before launching.

2. The ability to fly an NRL payload package in place of a multi-group payload with a lead time for such a decision fifty days before launch.

3. A group of special secondary payloads designed to standard interfaces with the basic vehicle.

4. A SIGINT Agena vehicle standardized to the point of being compatible with last minute receiver changes in multi-group and secondary payloads and with a quick reaction capability for a complete payload change.

An operationally flexible capability requires standardization both in payload and vehicle design. Implicit in the vehicle plan is a standard vehicle interface with both payload packages and a standard set of mission peculiar components installed in the vehicle. Such an approach would provide not only the operational quick reaction capabilities that are sought, but other benefits associated with standardization; i.e., increased reliability, reduced test time and costs, reduced engineering downstream and an achievement of lower unit costs once standardization is accomplished.

PAYLOAD

The mission advantage of combining the analog and digital capability in one multi-group payload is obvious from both the intelligence and economic viewpoints. The combination feature plus the intended thirty-day orbit life will make the payload much more useful than those now being developed. Consider that the payloads (either analog or digital) being flown late in the current contract will have a twenty-day active life, then it can be concluded that one multi-group payload flying thirty days will be at least equal to three of the current payloads in intelligence output. In addition to the economic advantages derived from this combination, it provides an on-orbit system capable of being programmed in real time, to confirm or deny intelligence collected earlier in a given flight. For instance, should either the digital or analog system indicate a new and/or unusual emitter on a given flight, the payload can be programmed for successive intercepts of this emitter.

The developments on which a multi-group payload design depend are believed feasible within the scheduled times as presented (first flight in December 1964). The most significant development associated with the multi-group payload is the all-band conical spiral antenna.

A year ago, the feasibility of a conical spiral antenna was challenged. However, one has been developed for the frequency range 130 - 650 Mcs, and it now has a flight proven capability. The proposed development is to extend the lower limit to 60 Mc and the upper limit to 2000 Mc. To extend the range to the upper limit poses no problem, and it is considered feasible to extend the antenna to the lower limit of 60 Mc. Our past antenna experience should lend credence to the assertion that this development is practical in the time proposed.

VEHICLE

The mission objective for a quick reaction time and compatibility with several payloads establishes the requirement for a standard vehicle/payload interface and consequently a standard vehicle configuration. This is essentially an extension of the already existing standard Agena D concept. The present Agena D, since it must be compatible not only with Project 315 but also with numerous other users, is limited in the scope of its configuration. Aside from basic structure aft of station 247, propulsion system, guidance module, etc., which are standard, there is an extensive list of optional components which along with program peculiar hardware can be packaged and installed at the discretion of the using program. In most instances, this requires special wiring and structure for mounting on a vehicle to vehicle basis. Under the proposed plan, a single complement of equipment (optionals and peculiars) will be chosen, designed, and packaged to obtain, in association with the basic Agena D, a standard 315 vehicle compatible with the multi-group payloads. In addition, per DNRO direction, the vehicle standardization plans have been enlarged to include interchangeability of the NRL payload package with the multi-group payload.

COMMAND & CONTROL SYSTEMS

The number of operating functions associated with the multi-group payload, and the requirements of vehicle standardization dictate a command system other than the one in use in current 315 vehicles. A digital command programmer with an adequate number of commands would enable standardization of hardware interfaces and also provide the commanding flexibility required by the payload. The PCU function would then be simplified so that standard modular units could be used only as required by a specific flight configuration. Two developed programmers amenable to modification for this application are under consideration. Extensive development is not required in either case; however, an in-house study is now in progress to select the programmer providing the most favorable mix of cost and operational capability.

The present 315 vehicles use as many as six tracking, telemetry, and command antennas, two deploying mechanisms, and several RF switches. This situation results from the necessity to meet changing mission requirements with available special purpose equipment. In addition to requiring a unique design for each flight, the system does not provide adequate gain. A well-defined multi-group payload requirement enables the design of a modularized antenna system - antennas, switches, deployment mechanism - from which appropriate selections can be made for any mission. It appears that even the most stringent requirements can be met by a system of three standardized antennas and one deployment device. This design will also provide improved gain, coverage, reliability, and simpler operation in addition to solving the basic problem of standardized design and system interface.

SATELLITE SYSTEM

The standard vehicle and multi-group payload design, coupled with longer life vehicles, will result in over-all savings in booster, Agena D, launch and operational costs and, to a lesser degree, command and control costs.

The standard vehicle will eventually reduce vehicle design and engineering costs, thermal design and analysis, system test time, and the amount of operational planning documentation.

The Satellite Control Facilities and 698BK support areas in these facilities are being standardized to support multi-purpose SIGINT data formatting. The Ground Data Handling Equipment is compatible with minor modifications to support all payloads.

SUMMARY

As conceived, the development of the multi-group payload and the standardized SIGINT Agena will produce an operationally flexible SIGINT collection force.

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PROJECT 315

TECHNICAL DEVELOPMENT PLAN

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TECHNICAL DESCRIPTION OF VEHICLE WORK EFFORT

I. PLANNING OBJECTIVES FOR STANDARD SIGINT SATELLITE DEVELOPMENT

In accordance with the schedules furnished in messages SAFSS-6-M-0047, 25 Feb 63, and SAFSS-6-M-0076, 2 Apr 63, the development program has been prepared to provide for the flexible employment of SIGINT payloads to satisfy data collection requirements as follows:

1. Provide interim 315 payloads for the period March through December 1964.

2. Provide a multi-group 315 payload capable of operating in any four of eight frequency bands between 59 and 12,400 mc/s by December 1964.

3. Provide a secondary capability of the BIRD DOG type and a tertiary capability of the EARPOP type payloads on all 315 flights.

4. Provide an interim vehicle capability to allow 315 payload selection to be made 30 days before launch for flights between February and December 1964.

5. Provide a fully standardized vehicle configuration for the December 1964 and subsequent operating flights which would allow payload selection 15 days prior to launch.

6. Allow choice between 315 or NRL payloads 50 days before launch for flights after December 1964.

II. TECHNICAL SCOPE OF DEVELOPMENT PROGRAM

To insure meeting the above planning objectives, the primary technical effort should begin 1 May 1963 and will be integrated in the following manner:

1. Establish a vehicle standardization program to produce a vehicle configuration which will allow maximum flexibility for employment of multi-group and special payload configurations after December 1964 (Series II).

2. Establish an interim program for vehicle effort to support the limited selectivity payload requirements between February and November 1964 (Series I).

3. Design and build a multi-group payload utilizing many of the present components of the analog and digital payloads for an initial launch in December 1964.

4. Provide three presently designed payloads (ID, IA, AND a IIIA) for an interim capability for March through November 1964.

5. Provide presently planned BIRD DOG payloads, plus any additional required for coverage of frequencies outside the range of BIRD DOGS I & II.

6. Supply EARPOP payloads for each flight as dictated by requirements.

III. TECHNICAL SCOPE OF PROJECT 315 VEHICLE DEVELOPMENT

The Project 315 vehicle development program outlines the effort required to meet the objectives.

1. Interim Vehicle Program to Satisfy Limited Payload Selectivity (SERIES I).

The limited Series I payload selectivity comprises Vehicle 2318, 2319, and 2320. The first choice of payload will be made from three payload groups: Digital and Bird Dog 2 (ID and BD2), or Analog IA and

Bird Dog 3 (IA and BD3), or Analog IIIA and Bird Dog 3 (IIIA and BD3). The next mission flight selection will be either of two remaining payload groups. The third flight will be with the remaining payload group. Vehicle configurations for 2318, 2319, and 2320 include:

3 S-01A vehicles (Agena D)

2 Analog P/L racks

1 Digital P/L rack

3 Aft racks

Each aft rack includes a three-wing solar array. The nose is a 30-degree cone beanie push-off type.

The vehicle configuration for 2358 is similar to 2354 in the current series vehicles and it includes:

1 S-01A vehicle

1 GFE P/L auxiliary rack

1 Aft rack

The aft rack includes a three-wing solar array.

Vehicle configuration for 2359 will include:

1 S-01A vehicle

1 GFE P/L auxiliary rack

1 698BK conversion rack

1 698BK standard aft rack

The 315 standard aft rack includes a two-wing, two-axis control solar array. Use of a 72" diameter clam shell nose cone is under consideration.

Vehicle 2359 will constitute a test vehicle for the Series II conversion rack and a standardized command system. This vehicle will be the first to incorporate these standard items which will be designed for the multi-group payload capability in Series II flights. The conversion rack for vehicle 2359 may not have standard electrical interfaces but the mechanical interfaces will be standard. The forward rack of the Agena D will be slightly modified to take the 315 conversion rack.

2. Vehicle Standardization Program for Vehicles 2321 and Subsequent (Series II).

The multi-group payload capability will be effective on vehicle 2321 and subsequent flights. It will allow operational flexibility which cannot be accomplished with the limited payload selectivity. The 315 vehicle will be a standard vehicle with common interfaces. Effective on vehicle 2321, the selection of the payload can be made as late as launch minus 20 days and for vehicles 2322 and up as late as L-15 days.

The standard SIGINT Agena vehicle configuration for the multi-group payload capability starting with 2321 includes:

1 S-01A vehicle

1 315 standard conversion rack

1 315 standard aft rack

1 315 forward aux. rack (for multi-group payloads only)

The aft rack includes a two-wing solar array. The nose cone configuration is under consideration.

Vehicle configuration for 2360 and up is similar to 2321 except that an NRL payload auxiliary rack will be added instead of the multi-group payload auxiliary rack. A forward auxiliary equipment rack could be added to carry 315 secondary payloads.

IV. MAJOR FEATURES OF THE VEHICLE DEVELOPMENT PLAN

Main features of this development plan are those items which will provide operational flexibility, increased reliability, shorter test spans, lighter weight, vehicle standardization, and economy.

1. Conversion Rack. This rack interfacing with Agena D at station 247 will house those program peculiar (and certain Agena D optional equipments) common to all payloads. These equipments are required to be present with the vehicle for vehicle systems test and therefore cannot be installed in the payload equipment racks. The forward face of the conversion rack mates with the multi-purpose payload assembly or with the NRL payload rack. This single standard design will result in a reduction in present recurring design costs, simplify handling and improve test procedures.

2. Standard AFT Rack. This rack will include standardized hard points for secondary payloads and provisions for the installation of solar auxiliary power equipment, batteries, and control gas storage spheres. 50X1

[redacted]

4. Vehicle Power System. The vehicle power system consists of three basic items: (1) primary battery system, (2) solar array system, and (3) the power conversion system. The following improvements in these three basic items are considered desirable to increase the capability and reliability of the vehicle power system.

a. Primary Battery System. It appears that higher energy batteries will be available in sufficient time to support the December 1964 launched vehicle. These Type XIV batteries now under development by Program 162 will produce 175 watt hours per pound versus our current output of 100 watt hours per pound. This will greatly enhance our capabilities for longer life on orbit.

b. Solar Array System. By utilizing two-wing arrays rather than the three-wing arrays scheduled for vehicles in the current contract, a 30-40 pound reduction of on-orbit weight can be gained. This two-wing array with 2-axes control, keeps solar incidence angle normal to solar panels, thereby reducing the number of solar panels required. The present three-wing array carries up to 30 solar panels, weights approximately 150 pounds, and provides automatic tracking around one axis to maintain optimum sun angle. This system results in an area effectivity of 40% - 60% for all orbit conditions. By using a two wing array with one axis automatic control and a seasonal adjust by real time command for the other axis an area effectivity of 60% to 100% would result. In addition to the weight reduction there would be a cost saving in solar cells of from $30,000 - $50,000 per vehicle.

c. Power Conversion System. The 28-volt unregulated power is converted by use of inverters and converters to meet the voltage, frequency, and accuracy requirements of vehicle equipments. Type IX and Type X DC-DC converters provide regulated 28-volt power for the velocity meter, flight controls, horizon sensor electronics, and communications equipment as required. Two Type XII three-phase inverters provide power for horizon sensor motors and forward rack equipment as required.

5. Digital Command Programmer. The command system in use on vehicles now on contract is composed of the Analog Verlort for 15 Real Time Commands (RTC), the Fairchild Timer for 24 stored commands (SPC), and the Power Control Unit (PCU) for matrixing and time delays to meet the requirements for 84 real time functions and 48 stored program functions. This system requires custom design for each vehicle, freezes that design and all interfaces five months prior to flight, and provides no capability to change stored programs in flight. Even with this custom design, exercise of approximately 50 highly desirable analog payload functions is precluded by the limited basic capability of the system.

The multi-group payload will require commanding of approximately 68 functions in 730 variations. This requirement can be met by a digital command of ten function bits plus appropriate time and machine bits. The number of RTC and SPC required will depend upon the choice of word format, and type of memory. One command programmer will meet the requirements for all Series II vehicles. Two developed programmers are under consideration. Either the GE delay line programmer developed for Program 206 or the GEMINI Type XVI programmer developed by LMSC, appropriately modified, will satisfy the requirements. Selection of a programmer will be based upon an in-house study of comparative cost and operational capabilities.

6. Clam Shell Nose Cones. The use of 60" and 72" base diameter clam shell nose cones for the Series II vehicles is under consideration. This development is not a firm requirement at this time but preliminary investigations indicate a possible gain on the order of 60 pounds on-orbit weight. The present overall plan could proceed with present nose cones without the development of this item.

V. TECHNICAL SCOPE OF MULTI-GROUP PAYLOADS

1. The three payloads to provide the interim capability will be identical to the present Groups ID, IA, AND IIIA.

2. The Multi-Group payload will consist of the following common items:

a. Antenna System for 60-12, 400 mc/s

b. Payload structure

c. Intermediate Frequency Amplifiers, Detectors and video amplifiers

d. Digital Data Handling Components

e. Analog Data Handling Components

f. Payload Control Unit

3. The flexibility will be achieved by providing modularized, solid state plug-in Radio Frequency Units for the following bands:

a. 59-130 mc/s

b. 130-290 mc/s

c. 290-650 mc/s

d. 650-1050 mc/s

e. 1050-2100 mc/s

f. 2100-4200 mc/s

g. 4200-8200 mc/s

h. 8200-12,400 mc/s

Plug-in Receiver Control Units associated with each Radio Frequency Unit would be provided to accommodate their individual characteristics (sweep rate, band width, etc).

V. MAJOR FEATURES OF THE MULTI-GROUP PAYLOAD

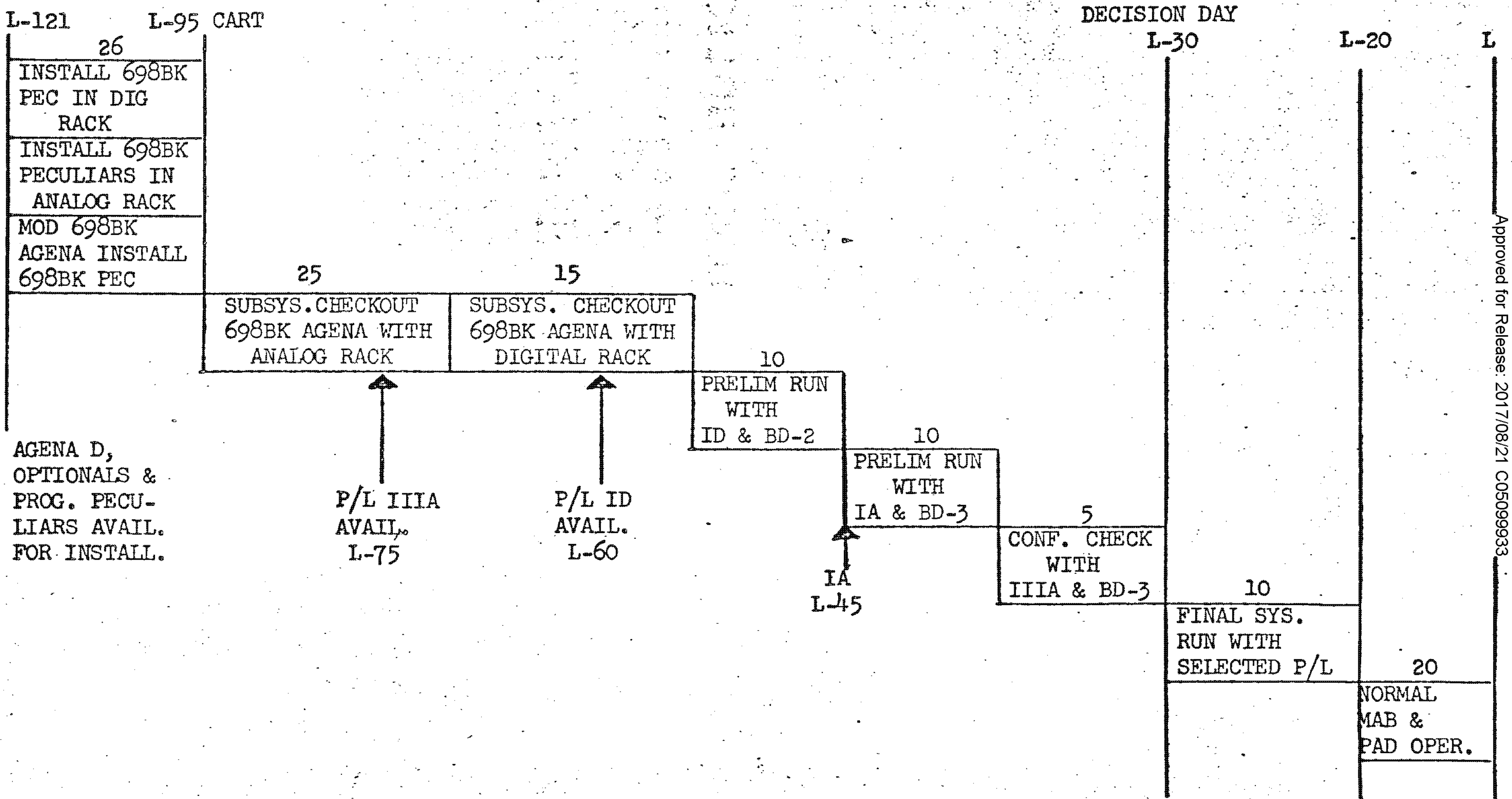
1. A common antenna system will be provided for the entire frequency range of the payload. A double-four arm conical spiral antenna will be designed and built which will cofer 59-2100 mc/s and the upper three bands will be handled by a combination of a smaller spiral and horns (if required). If a combination of only the lower five bands were flown, only the large spiral would be required.

2. By use of a standard solid state local oscillator and varactor multipliers the modules for the Radio Frequency Units of, at least, bands 1-6 would be almost identical with the resultant increase in reliability as well as flexibility. If this technique cannot be extended to bands 7 and 8 the presently developed Backward Wave Oscillators will be utilized.

3. Micro-minature techniques will be applies to the data handling and control sub-systems to insure reliability and achieve major weight reduction.

4. Redundant sub-assemblies will be used in all areas where reliability analyses indicate it is desirable.

VEHICLE TEST PLAN 2318,-19-20 (SERIES I)



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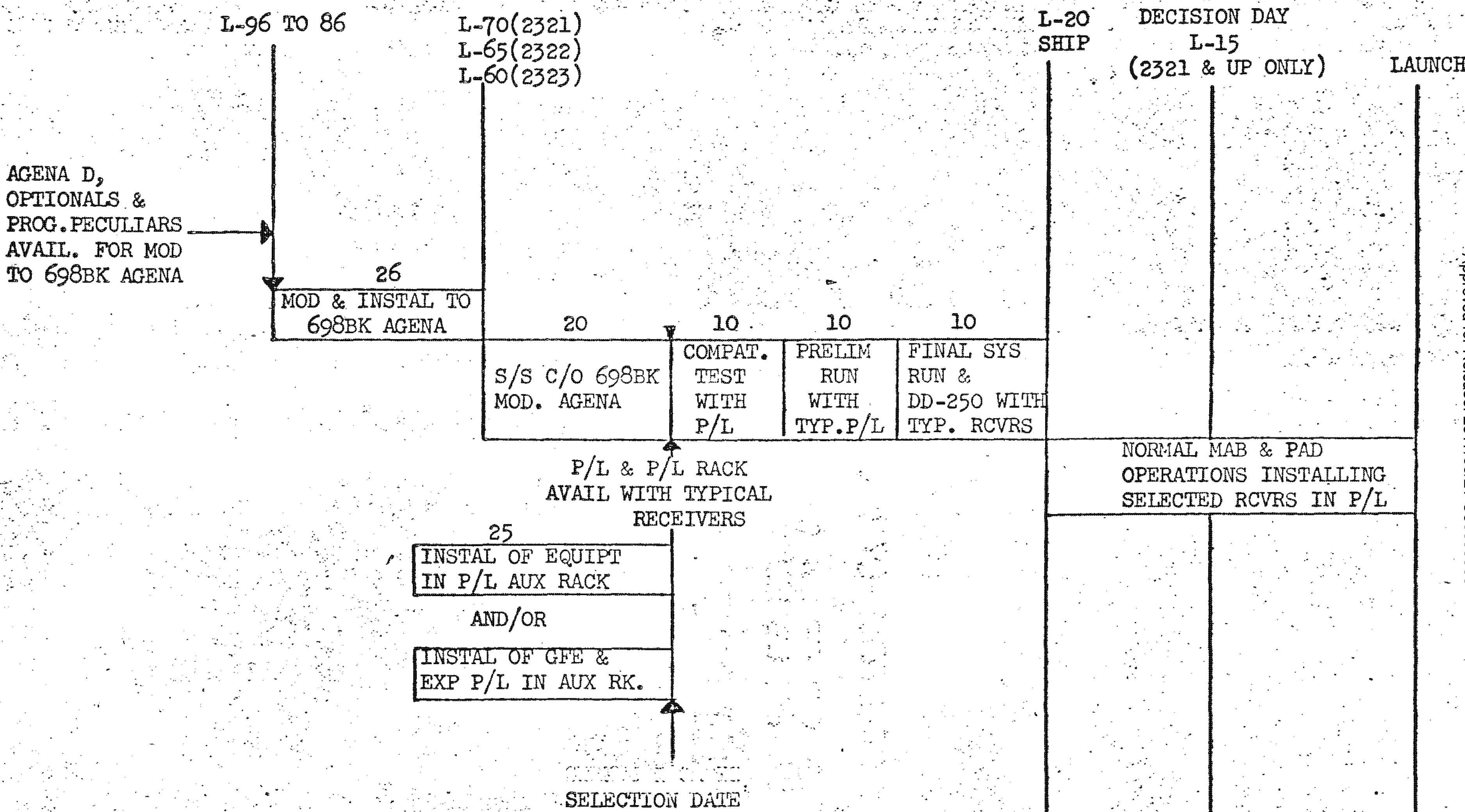
VEHICLE TEST PLAN 2321 & UP, 2359 & UP (SERIES II)



SCHEDULE PER SAFSS-6-M-0047

	1964							1965					
MAR	APR	JUL	AUG	OCT	DEC ***	FEB	MAR	APR	JUN	AUG	SEPT	OCT	
	2318	2319		2320	2321	2322		2323	2324	2325		2326	
	ID & BD-2 OR IA & BD-3 OR IIIA & BD-3	EITHER		LAST	MULTI-GROUP & BD-1	MULTI-GROUP & BD-2		MULTI-GROUP & BD-4	MULTI-GROUP & BD-4	MULTI-GROUP & BD-5		MULTI-GROUP & BD-5	7 launches per year →
2358			2359				2360				2361		
4 NRL SPHERES			4 NRL SPHERES				4 NRL SPHERES				4 NRL SPHERES		
315 SENSOR			315 SENSOR				315 SENSOR				315 SENSOR		

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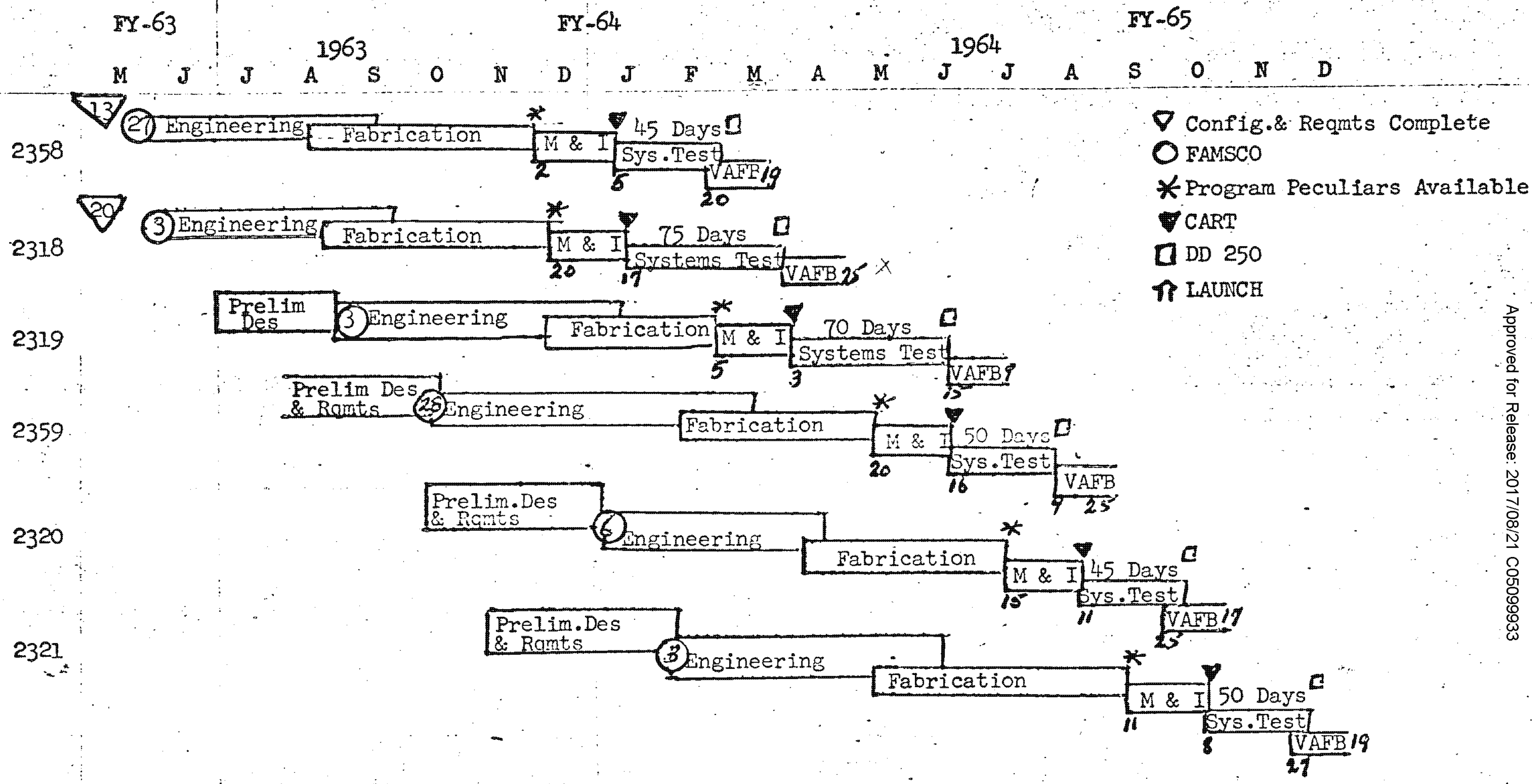
VEHICLE SCHEDULE



PROJECT 315

Funding Requirements (in Millions)

PROPOSED NEW EFFORT	FY63	FY64	FY65	FY66	FY67
VEHICLE	.59	12.75	11.8	9.72	8.03
PAYLOAD	2.76	22.6	18.1	12.79	12.34
ON CONTRACT					
AGENA "B"	.8				
VEHICLE	9.7	7.8			
PAYLOAD	20.0	4.1			
SUPPORT (TOTAL PROGRAM)					
AGENA "D"	8.4	9.1	9.1	9.1	9.10
BOOSTER	4.58	5.54	5.57	5.57	5.57
LAUNCH	5.3	8.12	8.12	8.12	8.12
C & C	10.9	28.65	35.6	34.6	35.5
TWO BACK-UP FLIGHTS		2.96	20.51		
TOTAL	63.03	101.62	108.80	79.90	78.66

(FY68 SAME AS 67)

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PRIME CONTRACT COSTS, ADDITIONS TO CURRENT CONTRACT

CPFF $\$x10^3$

FY-1963

	R & D		Recurring		
	Development for System Improvement	Development for Standardization	Fab & Assy to CART	Sys Test & Launch Ops	Total
Vehicle	155	121	312		588
Payload	1,496	246	1,021		2,763
AGE	- -	- -	- -		- -
Systems Test & Launch Operations	- -	- -	- -		- -
Program Total	1,651	367	1,333		3,351
C & C (Vehicle Only)	30	66			96

BASED ON 1 MAY 63 GO-AHEAD

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VEHICLE COST

FY - 1963

MANPOWER	R & D: Basic Dev. for System Impr. Man-Months	Cost $1000	R & D: Dev. to Standardize Man Months	Cost $1000	RECURRING: Procure and Fab Cost $1000	Systems Test, Launch, Ops. Cost $1000	TOTAL Cost $1000
1. VEHICLE DESIGN:							
SS/A - 2318/2358 Space Allocation	8	21.7					21.7
Initiate Thermal Analysis	2	5.4					5.4
Initiate Stress Analysis	2	5.4					5.4
Pre-FAMSCO Work Anal.& Plan.	4	10.9					10.9
Design Clam Shell Nose Cone,72"			14	36.9			36.9
SS/B - Start Pressurization Sys. Anal.	2	5.4					5.4
Pre-FAMSCO Work Anal & Plan.	1	2.7					2.7
Pyro Dev.for Clam Shell NoseConeSep.			12	31.4			31.4
SS/C - Start Pwr. Load Anal. 2318/2358	4	10.9					10.9
Begin Elect. Sys. Anal.	4	10.9					10.9
Start 2[redacted] Wing Solar Array Dev.				20.5			20.5
Pre-FAMSCO Work Anal. & Plan.	4	10.9	8				10.9
SS/D - Begin Prelim. G & C Analysis	6	16.3					16.3
Dev. Ascent Sequence Criteria	1	2.7					2.7
Prelim. Attitude Control Study	2	5.4					5.4
Pre-FAMSCO Work Anal. & Plan.	2	5.4					5.4
C & C- Coordination							
Prelim. Instrumentation Study	1	2.7					2.7
Start Command & Prog. Design.	2	5.4					5.4
Start Antenna Design	1	2.7					2.7
Pre-FAMSCO Work Anal. & Plan.	1	2.7					2.7
2. SYSTEMS INTEGRATION:	9	24.8	2	5.4			30.2
3. COORDINATION & CONTROL:	1	2.7					2.7
4. MATERIALS-LONG LEAD PROCUREMENT:				26.8	312		338.8
TOTAL	57	$155.0	36	$121.0	$312	0	$588.0

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VEHICLE COST (CONT'D)

FY - 1963

	R & D				RECURRING		TOTAL
	Basic Dev. for System Impr.		Dev. to Standardize		Procure and Fab	Systems Test, Launch, Ops.	
MATERIALS - LONG LEAD PROCUREMENT	Man Months	Cost $1000	Man Months	Cost $1000	Cost $1000	Cost $1000	Cost $1000
1. Clam Shell Nose Cone Separation Thrusters				7.8	3.1		10.9
2. Clam Shell Nose Cone Pyro Linear Charge & Detonators				5.2			5.2
3. Clam Shell Nose Cone Beryllium				10.4			10.4
4. Clam Shell Nose Cone Structural Rings 72" Dia. (2)				3.4			3.4
5. Clam Shell Nose Cone Structural Rings 60" Dia. (4)					3.1		3.1
6. Solar Cells (2358)					90.8		90.8
7. Peculiar Equip. Inverters [redacted]					13.0		13.0
8. Secondary Battery Type VII (4)					19.5		19.5
9. Primary Battery Type 1C (4)					18.2		18.2
10. Solar Torque Drive Motors					3.9		3.9
11. Inverters Type XII (4)					31.1		31.1
[redacted]					129.3		129.3
TOTAL				$26.8	$312.		$338.8
5. C & C STUDIES:							
1. Antenna	5	13.6					13.6
2. C&C Systems	6	16.4					16.4
Development							
1. Command Programmer			15	40.8			40.8
2. Cmd Prog Mfg Checkout Console			2	5.4			5.4
Material							
1. Command Programmer				19.5			19.5
TOTAL	11	$30.	17	$65.7			~~$100.~~ 96.

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Program Costs by Major Functional Areas (Continued)

	FY-1964					FY-1965				
	Devel. for Sys. Improve.	Devel.for Standard.	Fab & Assy to CART	Sys.Test & Launch Ops	Total	Devel. for Sys. Improve.	Devel.for Standard	Fab & Assy to CART	Sys.Test & Launch Ops	Total
Vehicle	1,280	2,532	5,657	150	9,619	-	922	7,024	200	8,146
Payload	5,490	6,160	10,846	101	22,597	1,870	3,053	12,627	485	18,035
AGE	275	400	1,400	50	2,125		200	500	150	850
Sys.Test & Launch Ops				1,000	1,000				2,800	2,800
Total Program	7,045	9,092	15,355	1,301	35,341	1,870	4,175	20,151	3,635	29,831
C & C	300	870	4,700	100	5,970		500	2,500	400	3,400

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Program Costs by Major Functional Areas (Continued)

	FY-1966				FY-1967			
	R & D	Recurring			R & D	Recurring		
		Fab & Assy to CART	Sys. Test & Launch Ops	Total		Fab & Assy to CART	Sys. Test & Launch Ops	Total
Vehicle	30	6,300	200	6,530		5,200	150	5,350
Payload	3,040	9,400	350	12,790	2,620	9,370	350	12,340
AGE		100	285	380			375	375
Sys. Test & Launch Ops			2,800	2,800			2,300	2,300
Total Program	3,070	15,800	3,635	22,500	2,620	14,570	3,175	20,365
C & C		2,500	300	2,800		2,500	300	2,800

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Program Costs by Major Functional Areas (Continued)

FY-1968

	R & D	Recurring: Fab & Assy to CART	Recurring: Sys. Test & Launch Ops	Total
Vehicle		5,200	150	5,350
Payload	2,620	9,370	350	12,340
AGE			375	375
Sys. Test & Launch Ops			2,300	2,300
Program Total	2,620	14,570	3,175	20,365
C&C		2,500	300	2,800

PAYLOAD, VEHICLES 2318, 2319, 2320, SERIES I

	FY-63					FY-64					FY-65	
	Systems Improvement	Systems Standardization	Fab & Assy	Sys.Test Launch/Ops	Total	Systems Improvement	Systems Standardization	Fab & Assy	Sys. Test Launch/Ops	Total	Fab & Assy.	Sys.Test Launch/Ops
Bird Dog I					-			187		187		
Bird Dog II			115		115			248		248		
1-A			210		210			450		450		
1-D			210		210			450		450		
Ampex			100		100							
Spares					-			390		390		
Supplemental Payload	171				171	906		550		1,456		
Payload Department						26		40	92	158		88
Total (incl fee)	184		682		866	1025		2547	101	3673		88
Multi-Group	1312	246	339	___	1897	4465	6160	8299	0	18924	___	___
	$ 1496	$ 246	$ 1021	0	$ 2763	$ 5490	$ 6160	$ 10846	101	$ 22597		

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SECRET

PAYLOAD, SERIES II
VEHICLES 2321 & ON

	FY - 1963					FY - 1964				
	R AND D		RECURRING			R AND D		RECURRING		
	Devel. For System Improve.	Devel. For Standard-ization	Fab & Assy. to Cart	Sys. Test & Launch Ops.	TOTAL	Devel. For System Improve.	Devel. For Standard-ization	Fab & Assy. to Cart	Sys. Test & Launch Ops	TOTAL
Multi-Group P/L	980				980	800	4200	3000		8000
Classifier	38				38	400	100	200		7[illegible]
All Band Ant.	100				100	100	300			4[illegible]
GDHE	20				20		270	675		9[illegible]
P/L C/O							300	200		5[illegible]
AMIE II		155	305		460		315	695		10[illegible]
Ampex II								70		[illegible]
Couplers & Converter								120		1[illegible]
Prod. Impr.						250				2[illegible]
Adv. Develop.	72	48			147	1595		475		2070
Supp. P/L						880		286		1166
Spares								1735		1735
P/L Dpt. Manpwr.		13	9		22	34	115	89		238
	1190	216	314		1767	4059	5600	7545		17204
Fee	122	30	25		130	406	560	754		1720
	1312	246	339		1897	4465	6160	8299		18924

Handle via BYEMAN
Control System

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SECRET

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SECRET

PAYLOAD

	FY - 1965					FY - 1966				
	R AND D		RECURRING			R AND D		RECURRING		
	Devel. For System Improve.	Devel. For Standard-ization	Fab. & Assy. to Cart	Sys.Test & Launch Ops	TOTAL	Devel. For System Improve.	Devel. For Standard-ization	Fab. & Assy. to Cart	Sys. Test & Launch Ops.	TOTAL
Multi-Group P/L		1600	4300		5900			3500		3500
Classified		100	200		300					
All Band Ant.		100			100					
DHE		525	1650		2175			375		375
P/L C/O		300	360		660			360		360
AMIE II			1375		1375			1250		1250
Ampex II			140		140			175		175
Couplers & Converter			300		300			300		300
Prod. Impr.	250				250	250	250			250
Adv. Develop.	1000		1200		2200	2000	2000	500		2500
Supp. P/L	376		330		706	375		330		705
Spares			1095		1095			1345		1345
P/L Dpt.Manpwr.	74	150	529	353	1106	139		410	318	867
	1700	2775	11479	353	16307	2764	2764	8545	318	11588
Fee	170	278	1148	35	1631	276	276	855	32	1163
	1870	3053	12627	388	17938	3040	3040	9400	350	12790

Handle via BYEMAN Control System

SECRET

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PAYLOAD

	FY - 1967				FY - 1968			
	R & D	RECURRING	SYS. TEST	TOTAL	R & D	RECURRING	SYS. TEST	TOTAL
Multi-Group P/L		3375		3375		3375		3375
Classified								
All Band. Ant.								
GDHE		375		375		375		375
P/L C/O		360		360		360		360
AMIE II		1200		1200		1200		1200
Ampex II		175		175		175		175
Couplers & Converter		300		300		300		300
Prod. Impr.	250			250	250			250
Adv. Develop.	2000	500		2500	2000	500		2500
[illegible]		[illegible]		[illegible]		[illegible]		[illegible]
Supp. P/L		500		500		500		500
Spares		1345		1345		1345		1345
P/L Dpt.Manpwr.	132	388	319	839	132	388	319	839
	2382	8518	319	11219	2382	8518	319	11219
Fee	238	852	31	1121	238	852	31	1121
	2620	9370	350	12340	2620	9370	350	12340

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