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Copy No. [REDACTED]



14 February 1968

To: [REDACTED]

From: [REDACTED]

Subject: A/P Weight Reduction Study

1. Forwarded herewith is J-3 P/L Weight Reduction Study which was prepared for the [REDACTED] Program Office. This effort forms a part of a directed and paid study being undertaken to determine what must be done to be able to fly [REDACTED] payloads in conjunction with J-3 payloads in the 1970-71 time period.

2. Specific ground rules used in the study were as follows:

- a. J-3 type payloads only to be considered.
- b. Operating altitude to be increased to 120 n. miles but ground resolution shall not be degraded more than 50% from that expected at normal J-3 operating altitudes.
- c. Modified payload and vehicles shall be ready for launch 30 days after a decision is made. A J-3 payload and [REDACTED] Agena is to be pulled from storage and modified. No special payloads and vehicles will be held for this capability.
- d. Minimum contact with associate contractors shall be made due to security provisions. Reasons for modification will not be disclosed without prior approval of the Program Office at [REDACTED]
- e. Effort shall be carried to the point of establishing feasibility of the proposed modifications and to estimate cost and schedule for a base line revision. For A/P planning, the base line was designated as the panoramic instruments, one recovery system, and sufficient expendables for a 3 to 5 day mission. Target positioning capabilities could be compromised.

[REDACTED] Manager

Advanced Projects

[REDACTED]
Declassified and Released by the N R G

In Accordance with E. O. 12958

on NOV 26 1997

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J. 6



*Unhatched (6/1) Program
Dispersed to 1 MSC*

J-3 P/L VEHICLE WEIGHT REDUCTION

VIA

SELECTED EQUIPMENT DELETION

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INTRODUCTION

- PECULIAR MISSION REQUIREMENTS MAY REQUIRE OFF LOADING WEIGHT FROM THE J-3 P/L VEHICLE BY 500 TO 700 POUNDS.
- WEIGHT REDUCTION IS TO BE ACCOMPLISHED BY "STRIPPING" A CHECKED OUT VEHICLE IN STORAGE.
- TIME ALLOWED FROM GO-AHEAD TO FLIGHT IS 30 DAYS.
- MODIFICATION IS TO BE PERFORMED WITH THE AID OF PRE-MANUFACTURED MODIFICATION KITS, PRE-RELEASED INSTALLATION DOCUMENTATION & TEST PROCEDURES.

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SCOPE

- THE PURPOSE OF THIS DOCUMENT IS TO:
 - SHOW THE EXTENT TO WHICH THE J-3 P/L VEHICLE MUST BE MODIFIED (STRIPPED OF EQUIPMENT) TO MEET VARIOUS WEIGHT REDUCTION REQUIREMENTS.
 - TO DETERMINE THE FOLLOWING FOR THE 1/2 MODIFIED VERSION:
 1. MODIFICATION KITS REQUIRED
 2. CHECK-OUT AND TEST DOCUMENTATION FOR THE MOD KITS
 3. MOD KIT INSTALLATION DOCUMENTATION
 4. DOCUMENTATION REQUIRED FOR CHECK-OUT AND TESTING OF THE MODIFIED P/L VEHICLE
 5. THE SPECIAL TOOLS, JIGS, FIXTURES, OR TEST EQUIPMENT NEEDED IN THE MANUFACTURE, INSTALLATION, AND TESTING OF THE MOD KITS AND THE RESULTING P/L VEHICLE.
 - TO QUOTE A COST AND PROVIDE A SCHEDULE COVERING THE FOLLOWING ITEMS FOR THE 1/2 MODIFIED VERSION:
 1. ENGINEERING, MANUFACTURE AND TESTING OF THE MOD KITS
 2. PREPARATION OF CHECK-OUT AND TEST DOCUMENTATION FOR THE MOD KITS
 3. PREPARATION OF MOD KIT INSTALLATION DOCUMENTATION (INCLUDING STRIPPING INSTRUCTIONS)
 4. PREPARATION OF THE MODIFIED P/L VEHICLE CHECK-OUT AND TEST DOCUMENTATION
 5. ENGINEERING, MANUFACTURING AND TESTING OF SPECIAL TOOLS, JIGS, FIXTURES OR TEST EQUIPMENT
 6. INSTALLATION OF MOD KITS IN P/L VEHICLE
 7. CHECK-OUT AND TEST OF MODIFIED P/L VEHICLE IN PREPARATION FOR FLIGHT
 8. RETURN THE MODIFIED P/L VEHICLE TO ITS ORIGINAL CONDITION AND RETEST.

DISCUSSION

TABLE I SHOWS THE MAJOR COMPONENTS INSTALLED IN THE STANDARD J-3 P/L VEHICLE. THREE DISCRETE STEPS IN THE MODIFICATION (STRIPPING) ARE PRESENTED; EACH STEP REPRESENTS REMOVAL OF ADDITIONAL MAJOR EQUIPMENTS. EACH STEP PROVIDES GREATER WEIGHT REDUCTION AT A GREATER COST IN TIME AND MONEY.

AT R-30 THE DEGREE OF WEIGHT REDUCTION WILL BE KNOWN AND THE LOWEST DEGREE OF MODIFICATION WHICH WILL MEET THIS REQUIREMENT WILL BE CHOSEN. STRIPPING THE COMPONENTS FROM THE VEHICLE AND INSTALLATION OF THE "OFF-THE-SHELF" MODIFICATION KITS WILL BE PERFORMED PER PREVIOUSLY RELEASED INSTALLATION DOCUMENTATION. P/L VEHICLE CHECK-OUT AND ACCEPTANCE TESTING WILL ALSO BE PERFORMED PER PREVIOUSLY RELEASED DOCUMENTATION.

THE DETAILED STUDY COVERED IN THIS DOCUMENT IS CONCENTRATED ON THE 1/2 MODIFIED VERSION. A LIST OF MODIFICATION KITS REQUIRED IS PRESENTED, ALONG WITH A WEIGHT SUMMARY AND A LIST OF THE DOCUMENTATION REQUIRED. THE MOD KITS AND DOCUMENTATION WILL BE PREPARED IN SUCH A MANNER THAT IT IS NOT MANDATORY TO REMOVE ALL THE EQUIPMENT LISTED, I.E., VERSIONS BETWEEN THE 1/4 MOD AND THE 1/2 MOD COULD BE SELECTED AT R-30 IF DESIRABLE.

TABLE I

MAJOR EQUIPMENT REMOVED OR MODIFIED ON J-3 P/L VEHICLES																									
	CR INST.	SRV "A"			SRV "B"		SUPPLY C.		P/L		SWITCH PROGRAMMER	PMU	FWD T/H BOX	A TO B TRANSFER	CUT & SPLICE	THERMAL CURTAIN	CLOCK & SLP COND.	DISIC		COMB STRUCTURE	WEIGHT				
		DISIC INST.	TAPE REC.	DISIC W. S.	DISIC CASE	STD.	NEW DESIGN	CR	1000 FT.	#1								#2	STD		NFM	LAUNCH	LAUNCH	DOORS	ORBIT
STD. J-3	X	X	X	X	X	X	X	na	16	16	X	X	X	X	X	X	X	X	X	na	1789.7	NONE	25.0	1764.7	NONE
1/4 MOD.	X	X	X	X	X	X	X	na	8	8	X	1/2	X	0	0	0	X	X	na	1355.3	434.4	25.0	1330.3	434.4	
1/2 MOD.	X	X	0	0	0	0	X	8	8	0	0	0	0	0	0	0	0	0	X	1144.9	644.8	23.4	1121.5	643.2	
3/4 MOD.	X	0	0	0	0	0	X	8	0	0	0	0	0	0	0	0	0	0	X	970.0	819.7	21.2	948.8	815.9	

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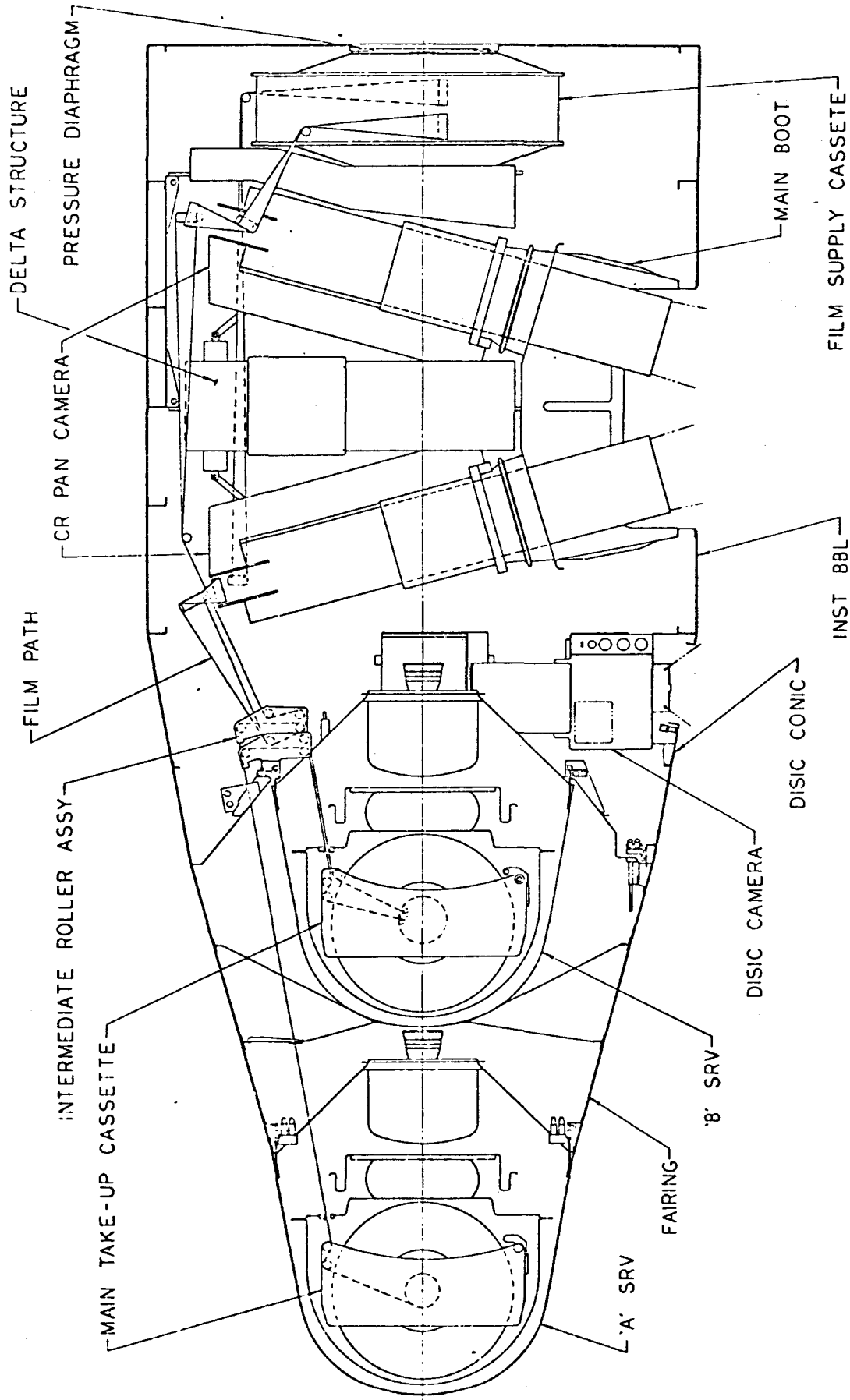
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1/2 ONE BOTTLE ONLY

na NOT APPLICABLE

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STANDARD P/L VEHICLE CONFIGURATION

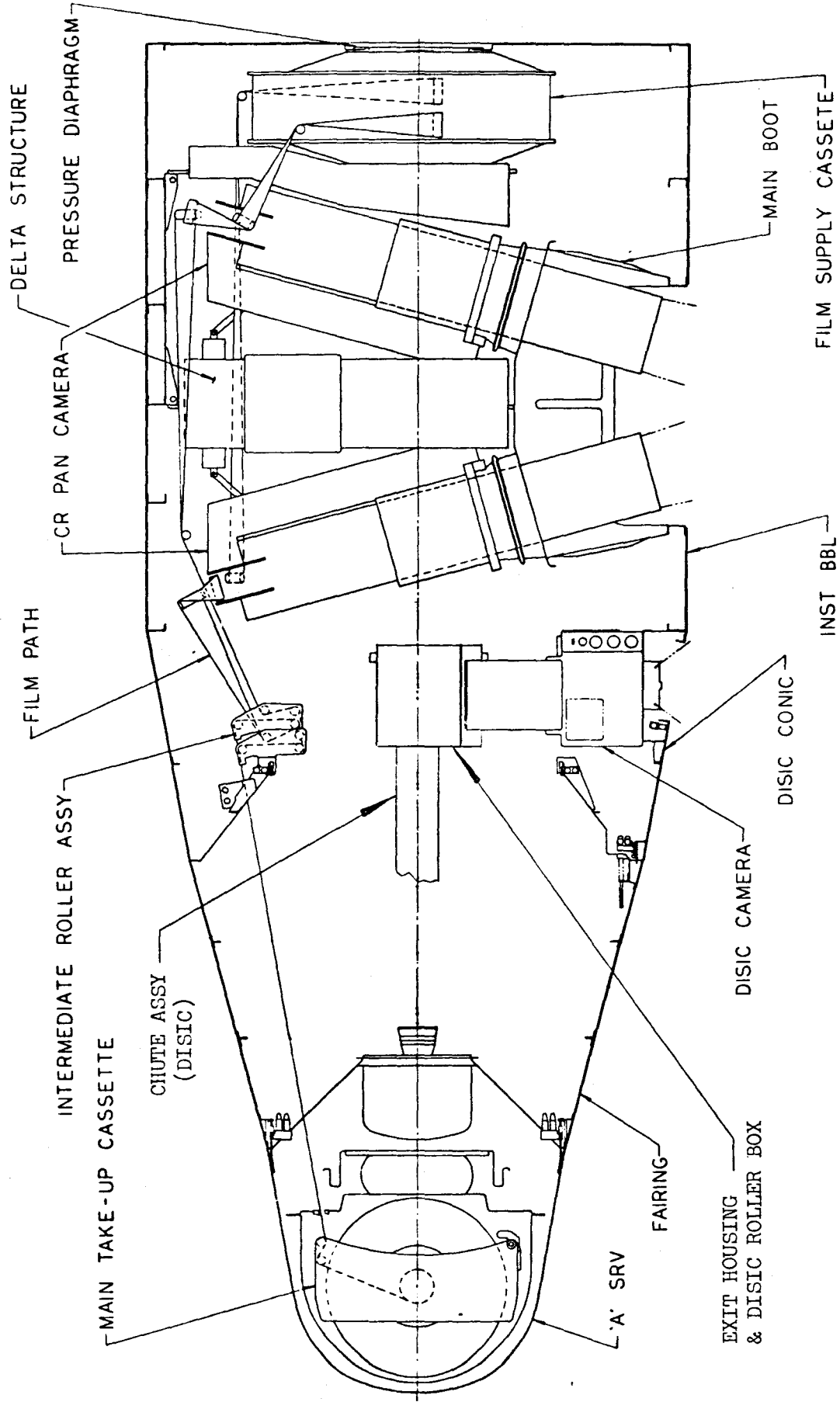


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SPECIAL P/L VEHICLE CONFIGURATION

1/4 MODIFIED VERSION

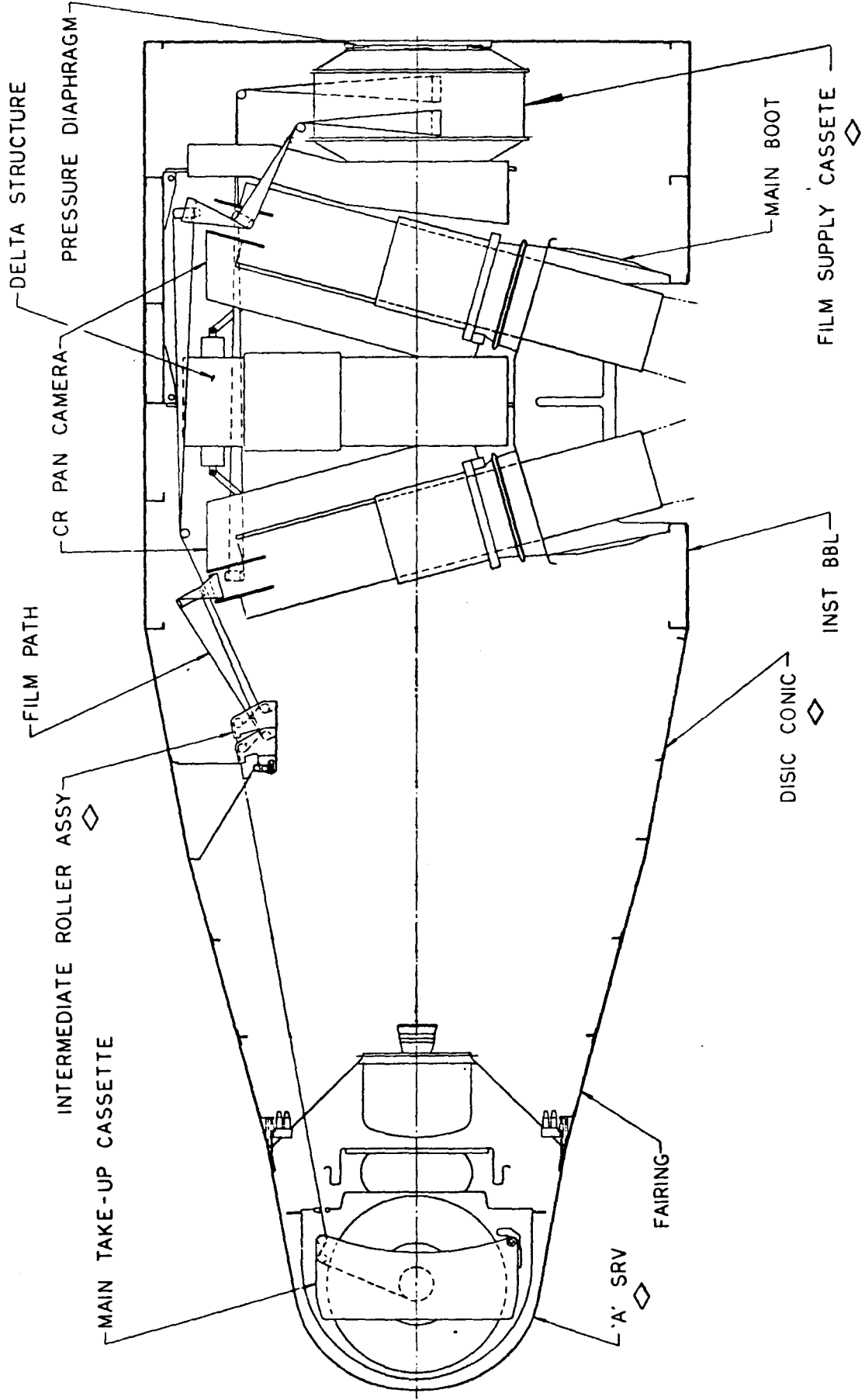


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SPECIAL P/L VEHICLE CONFIGURATION

1/2 MODIFIED VERSION



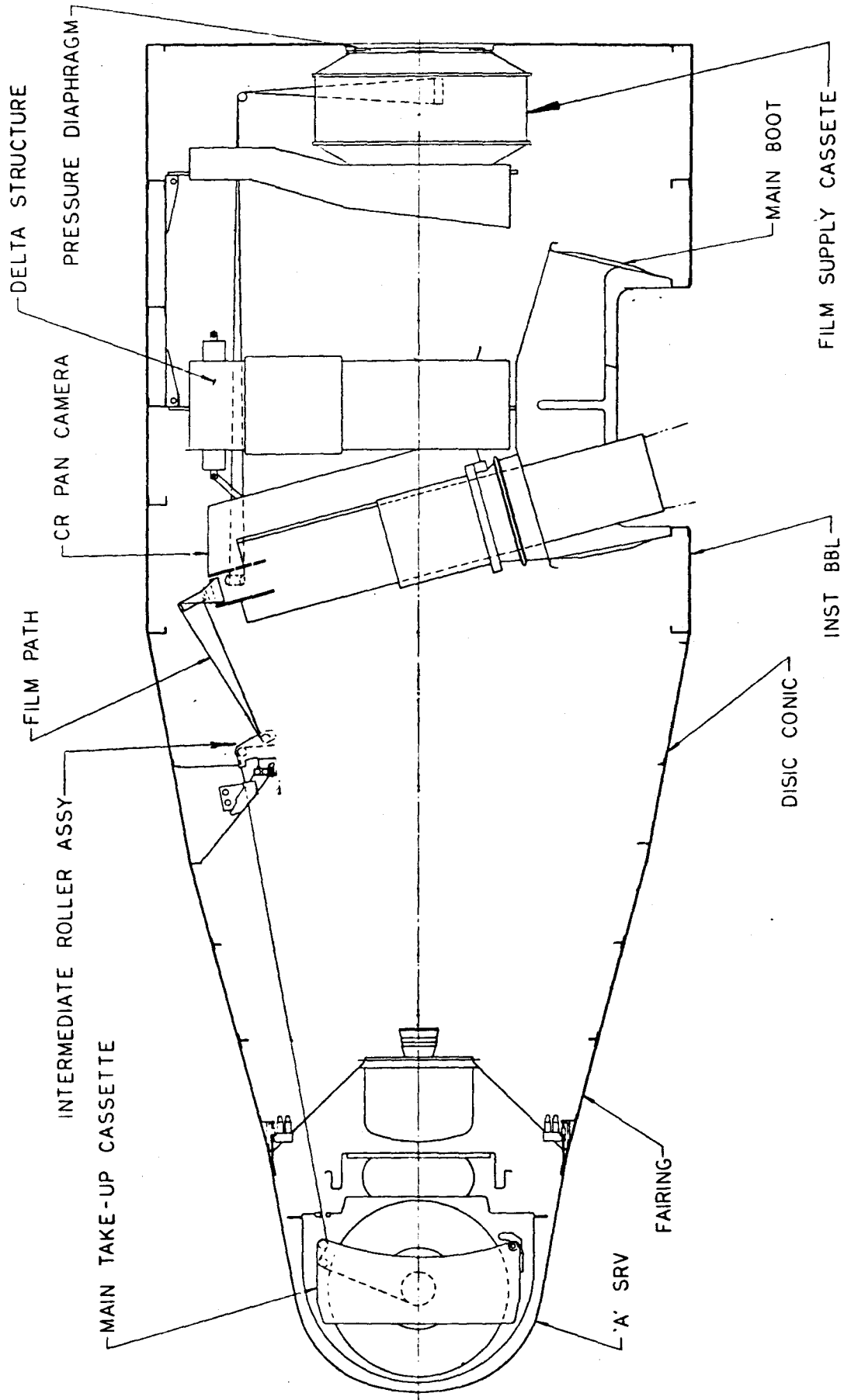
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SPECIAL P/L VEHICLE CONFIGURATION

3/4 MODIFIED VERSION



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WEIGHT SUMMARY

	STD.	1/4 MOD	1/2 MOD	3/4 MOD
SRV-A (empty)	323.3	323.3	300.6	296.5
SRV-B (empty)	324.9	-	-	-
FAIRING				
Structure	38.2	38.2	38.2	38.2
Separation devices	1.6	1.6	1.6	1.6
Thermal shield	2.5	2.5	2.5	2.5
DISIC P/L chutes	3.1	3.1	-	-
Thermal curtain	1.8	-	-	-
Fwd. TM box	1.8	1.8	-	-
Harnesses	3.3	3.3	3.3	3.3
Paint, pyros, misc.	7.0	7.0	7.0	7.0
DISIC conic				
Basic structure (less doors)	34.5	34.5	36.1	36.1
Ejectable doors	1.6	1.6	-	-
Door frames	1.0	1.0	-	-
SRV-B mount	19.0	19.0	-	-
Mount for IR assy.	-	-	1.5	1.5
Thermal shield	2.3	2.3	2.3	2.3
Equipment mounts	6.4	6.4	1.3	1.3
PMU & mount	23.0	16.7	-	-
IR assy.	2.4	2.4	2.0	2.0
DISIC P/L chutes	1.3	1.3	-	-
Pyro box	8.2	8.2	8.2	8.2
A-B transfer box	4.9	2.0	2.0	2.0
Power box	1.4	1.4	1.4	1.4
DISIC cycle counter	1.7	1.7	-	-
Tuna	8.7	2.5	-	-
DISIC	47.0	47.0	-	-
Exit box	4.3	4.3	-	-
AP baffles	1.4	1.4	-	-
DISIC S/C (full)	38.5	25.0	-	-
Harnesses	20.6	20.6	15.0	15.0
Cable termination kits	-	-	2.0	2.0
Paint, pyros, misc.	4.1	3.8	3.5	3.5

WEIGHT SUMMARY
(continued)

	STD.	1/4 MOD	1/2 MOD	3/4 MOD
INSTRUMENT BARREL				
Structure (less doors)	102.0	102.0	102.0	103.2
Ejectable doors	23.4	23.4	23.4	21.2
Pressure diaphragm	6.2	6.2	6.2	6.2
Thermal shield	8.7	8.7	8.7	8.7
Equipment mounts	8.0	8.0	8.0	8.0
Instrument assy.	329.4	329.4	329.4	203.0
Boots	6.2	6.2	6.2	6.2
Covers for main & AO boots	-	-	-	2.0
S/C & mount	69.5	69.5	47.5	42.5
Main P/L (TB)	159.0	80.5	80.5	40.3
TM box	21.0	21.0	19.6	19.6
Power box	3.2	3.2	3.2	3.2
Clock	11.1	11.1	-	-
SLP conditioner	8.9	8.9	-	-
Slope programmer	14.4	14.4	14.4	14.4
Switch programmer	10.2	10.2	-	-
Command box	18.9	18.9	18.9	18.9
Pyro current monitor	0.7	0.7	0.7	0.7
Vacuum gauge	3.4	3.4	-	-
Differential amplifier	1.0	1.0	1.0	1.0
Harnesses	36.2	36.2	36.2	36.2
Cable termination kits	-	-	2.0	2.0
Paint, pyros, misc.	8.5	8.5	8.5	8.3
LAUNCH WEIGHT				
	1789.7	1355.3	1144.9	970.0
Less ejectable doors				
	-25.0	-25.0	-23.4	-21.2
ORBIT WEIGHT				
	1764.7	1330.3	1121.5	948.8

MAJOR MODIFICATION KITS REQUIRED

1/2 MODIFIED VERSION

(ASSUMING DELETION OF EQUIPMENT LISTED IN TABLE 1)

LOCATION	REMARKS	MOD KITS REQUIRED
"A" SRV	REMOVE DISC CASSETTE & RE-POSITION BATTERY TO MINIMIZE BALANCE WEIGHT REQUIRED	<ul style="list-style-type: none"> o BATTERY MOUNTS o HARNESSES (3) o BALANCE WEIGHT o BALANCE WEIGHT MOUNT o CABLE TERMINATION KITS o DISC WATER SEAL HOLE COVER
FAIRING	REMOVE FORWARD T/M BOX	<ul style="list-style-type: none"> o CABLE TERMINATION KIT OR NEW CABLE
DISC CONIC	REPLACE PRESENT DISC CONIC ASSEMBLY WITH NEW ASSEMBLY WITHOUT DOORS OR MOUNTS FOR UNUSED EQUIPMENT	<ul style="list-style-type: none"> o DISC CONIC ASSEMBLY WITH NEW: <ul style="list-style-type: none"> STRUCTURE IR ASSEMBLY MOUNT HARNES BOLTS - SPECIAL FAIRING ATTACHMENT CABLE TERMINATION KITS CABLE CONNECTORS - FAIRING TRANSFER BOX - MODIFIED

MAJOR MODIFICATION KITS REQUIRED
(Continued)

LOCATION	REMARKS	MOD KITS REQUIRED
INSTRUMENT BARREL	REMOVE: DRCG SLP CONDITIONER SWITCH PROGRAMMER PYRO CURRENT MONITOR REPLACE: AFT T/M BOX	<ul style="list-style-type: none">○ CABLE TERMINATION KITS FOR EQUIPMENT REMOVED & OPEN T/M POINTS○ AFT T/M BOX (LESS ANALOG TO DIGITAL CONVERTER)
CR INSTRUMENT	REPLACE: SUPPLY CASSETTE INTERMEDIATE ROLLER ASSEMBLY	<ul style="list-style-type: none">○ 1/2 SIZE SUPPLY CASSETTE○ 1/2 IR ASSEMBLY

DOCUMENTATION REQUIRED

- o ENGINEERING LAYOUTS, DETAIL, ASSEMBLY AND INSTALLATION DRAWINGS FOR MOD. KITS.
- o CHECK-OUT AND TEST SPECIFICATIONS AND PROCEDURES FOR MOD. KITS.
- o MOD. KIT INSTALLATION PROCEDURES (INCLUDING P/L VEHICLE STRIPPING INSTRUCTIONS).
- o MODIFIED P/L VEHICLE CHECK-OUT AND TEST SPECIFICATION, TEST PLAN, AND TEST PROCEDURES.
- o PROCEDURES FOR RETURNING THE MODIFIED P/L VEHICLE TO ITS ORIGINAL CONDITION.
- o ABBREVIATED TEST PLAN, AND PROCEDURES FOR CHECK-OUT AND RETEST OF REBUILT P/L VEHICLE.
- o ENGINEERING DRAWINGS ON SPECIAL TOOLS, JIGS, FIXTURES, HANDLING EQUIPMENT OR TEST EQUIPMENT THAT MAY BE REQUIRED.
- o TEST SPECIFICATIONS AND PROCEDURES ON THE ABOVE LISTED SPECIAL TOOLS, ETC.
- o THERMAL STUDY AND RECOMMENDED PAINT PATTERN CHANGE FOR THE MODIFIED P/L VEHICLE.

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SPECIAL TOOLS, JIGS, FIXTURES OR TEST EQUIPMENT REQUIRED

- TOOLING
 - INTERMEDIATE ROLLER ASSEMBLY INSTALLATION FIXTURE
 - "A" SRV MODULE INSTALLATION FIXTURES
 - MISC. TOOLS AND MODIFICATIONS
- GROUND HANDLING EQUIPMENT
 - MODIFICATION KIT STORAGE BOXES
 - MISC. GHE MODIFICATIONS
 - TOOL USAGE PROCEDURES
- ELECTRICAL AGE REVISIONS
 - CTI CABLE MODIFICATIONS
 - PAYLOAD SIMULATOR PROCEDURE MODIFICATIONS

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DRY RUN INSTALLATION OF MOD KITS & TESTING OF MODIFIED P/L VEHICLE

- A 1/2 MODIFIED P/L VEHICLE SHOULD BE ASSEMBLED USING A STORED J-3 SYSTEM, TESTED MOD. KITS, AND RELEASED DOCUMENTATION TO:
 - SERVE AS A DEVELOPMENT TEST BED
 - PROVES PROPER INSTALLATION AND FIT CHECKS
 - PROVES COMPATIBILITY OF MOD. KITS AND HARNESES
 - ESTABLISHES P/L TENSION REQUIRED FOR PROPER TRACKING
 - PROVIDES COMPLETE SYSTEM FUNCTIONAL CHECK-OUT
 - PROVES ACCEPTIBILITY OF DOCUMENTATION
 - VERIFIES THE R-30 DAY CAPABILITY
 - PROVIDES EXPERIENCE FOR INSTALLATION AND TEST
- SERVE AS A QUALIFICATION UNIT
- PASSING A COMPLETE FUNCTIONAL CHECK-OUT AFTER MODIFICATION SHALL ESTABLISH FLIGHT QUALIFICATION
 - NO STRUCTURAL TESTING ANTICIPATED
 - NO THERMAL ALTITUDE TESTING REQUIRED
 - NO QUAL VIBRATION REQUIRED EXCEPT FOR MODIFIED "A" SRV
- ELECTRICAL COMPATIBILITY TEST WITH MODIFIED AGENA

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R DAY ACTIVITY
R-30 AND DOWN

ACTIVITY	WEEK				
	1	2	3	4	5
<ul style="list-style-type: none">○ STRIP AND MODIFY○ DISASSEMBLE STRUCTURES○ REMOVE SELECTED COMPONENTS○ INSTALL "A" SRV MOD. KITS○ INSTALL PAYLOAD VEHICLE MOD. KITS					
<ul style="list-style-type: none">○ TEST AND EVALUATE○ TRACKING VERIFICATION○ FUNCTIONAL TESTS○ LIGHT LEAK TESTS○ EVALUATE MATERIAL					
<ul style="list-style-type: none">○ FLIGHT PREPS○ INSTRUMENT READINESS TESTS○ LOAD PYROS○ FINAL ASSEMBLY AND CHECK-OUT○ TRANSPORT TO VAFB					
<ul style="list-style-type: none">○ LAUNCH ACTIVITIES○ MATE WITH AGENA○ CONFIDENCE AND COMPATIBILITY○ LAUNCH					

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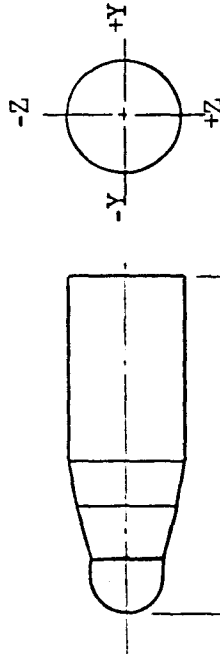
SCHEDULE

		MONTHS											
		1	2	3	4	5	6	7	8	9	10	11	12
ENGINEERING MOD. KITS													
MFG. MOD. KITS													
MOD. KIT C/O & TEST SPECS. & PROCEDURES													
MOD. KIT C/O & TEST													
MOD. KIT INSTALLATION DRAWINGS													
MODIFIED VEHICLE C/O & TEST PROCEDURES													
DRY RUN:													
o INSTALLATION OF MOD. KITS													
o C/O & TEST MOD. P/L VEHICLE													
o COMPATIBILITY TEST W/MOD. AGENA													
RETURN P/L VEHICLE TO ITS ORIGINAL CONDITION													
C/O & TEST P/L VEHICLE													

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MASS PROPERTIES

	STD.	1/4 MOD.	1/2 MOD.
WEIGHT - LBS.	1790	1355	1145
X - AGENA STA. NO.	180.3	182.9	182.9
C.G. (X - INCHES	-.41	-.41	-.55
(Y - INCHES	+.67	+1.02	+0.05
(Z - INCHES			
I _X - SLUG - FT ²	112.4	100.1	80.7
I _Y - SLUG - FT ²	1098	977	910
I _Z - SLUG - FT ²	1075	966	901



AGENA STA. 247

AGENA
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CAMERA MODIFICATION COSTS

816P SIZE SUPPLY CASSETTE

ONE TIME COSTS

[REDACTED]

UNIT COST

[REDACTED]

MODIFIED INTERMEDIATE ROLLER ASSEMBLY

UNIT COST

[REDACTED]

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PAYLOAD MODIFICATION COSTS

CALC TIME COSTS

ENGINEERING

PROCEDURES AND INTEGRATION

FLIGHT PROGRAMMING

TOOLING AND TEST HARDWARE

DEMONSTRATION TEST*

QUALITY ASSURANCE

UNIT COST

[REDACTED]

*STRIP TO 1/2 MOD VERSION, TEST, REBUILD TO ORIGINAL CONDITION AND RETEST.

[REDACTED]

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