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10-6-67 *me.*

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*copy 3  
63 pieces*

*6 July 1967*

*1 of 63*

LOCKHEED DORIAN RESUPPLY STUDY

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RESUPPLY APPROACHES

INITIAL OPERATION	RENDEZVOUS AND RESUPPLY	EXTENDED OPERATION
MANNED AUTOMATIC MOL/DORIAN	MAN ASSISTED	MANNED
MANNED AUTOMATIC MOL/DORIAN	MAN ASSISTED	UNMANNED
MANNED AUTOMATIC MOL/DORIAN	UNMANNED	UNMANNED
UNMANNED MODE MOL/DORIAN	UNMANNED*	UNMANNED
P-66	UNMANNED*	UNMANNED

\*MANNED ASSISTED RENDEZVOUS, DOCKING AND CAMERA ALIGNMENT CHECK  
AN ALTERNATE CONSIDERATION.

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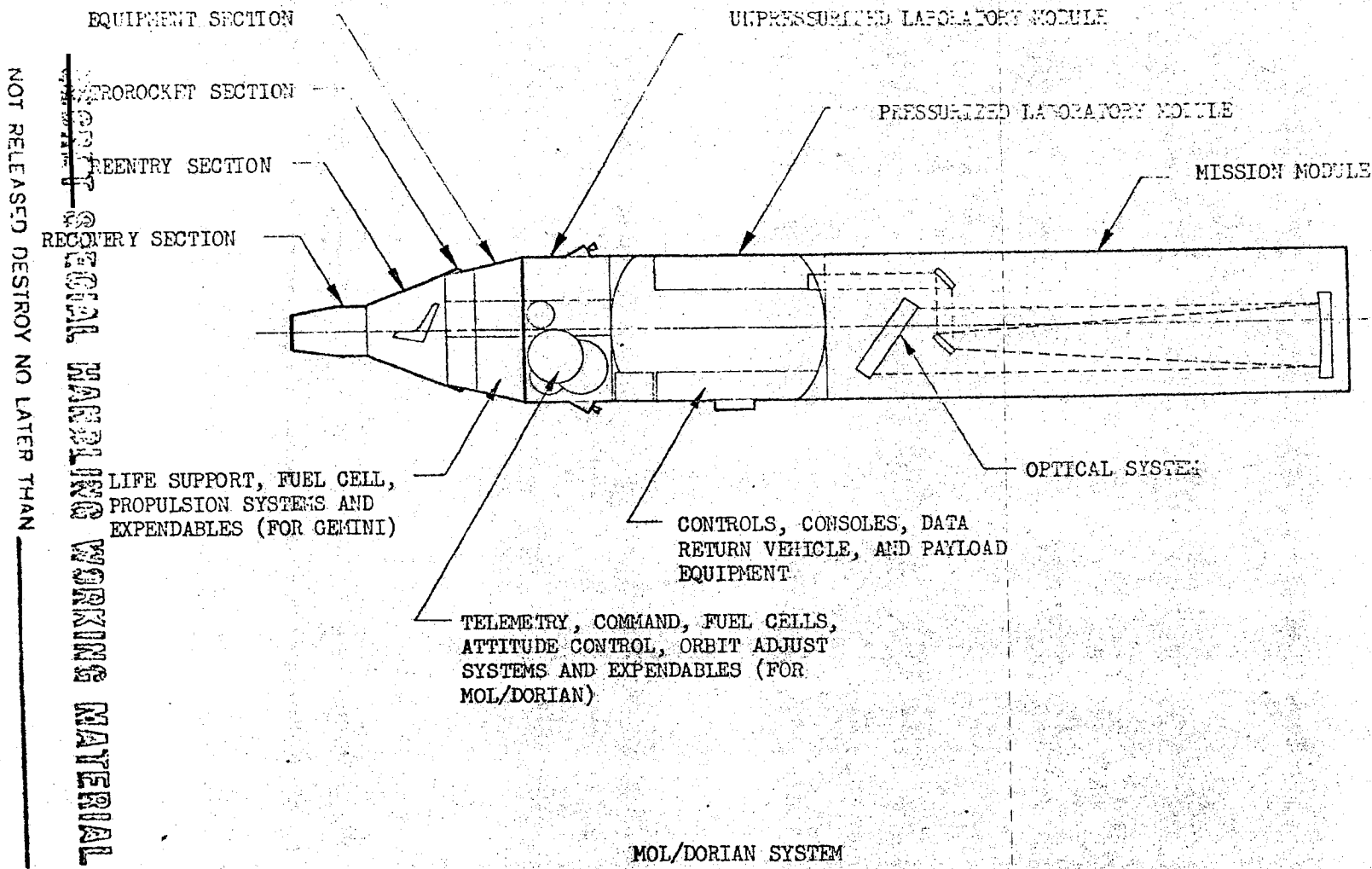
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THE NOI/DORIAN SYSTEM IS PRESENTED TO ESTABLISH A POINT OF REFERENCE FOR THE STUDY.

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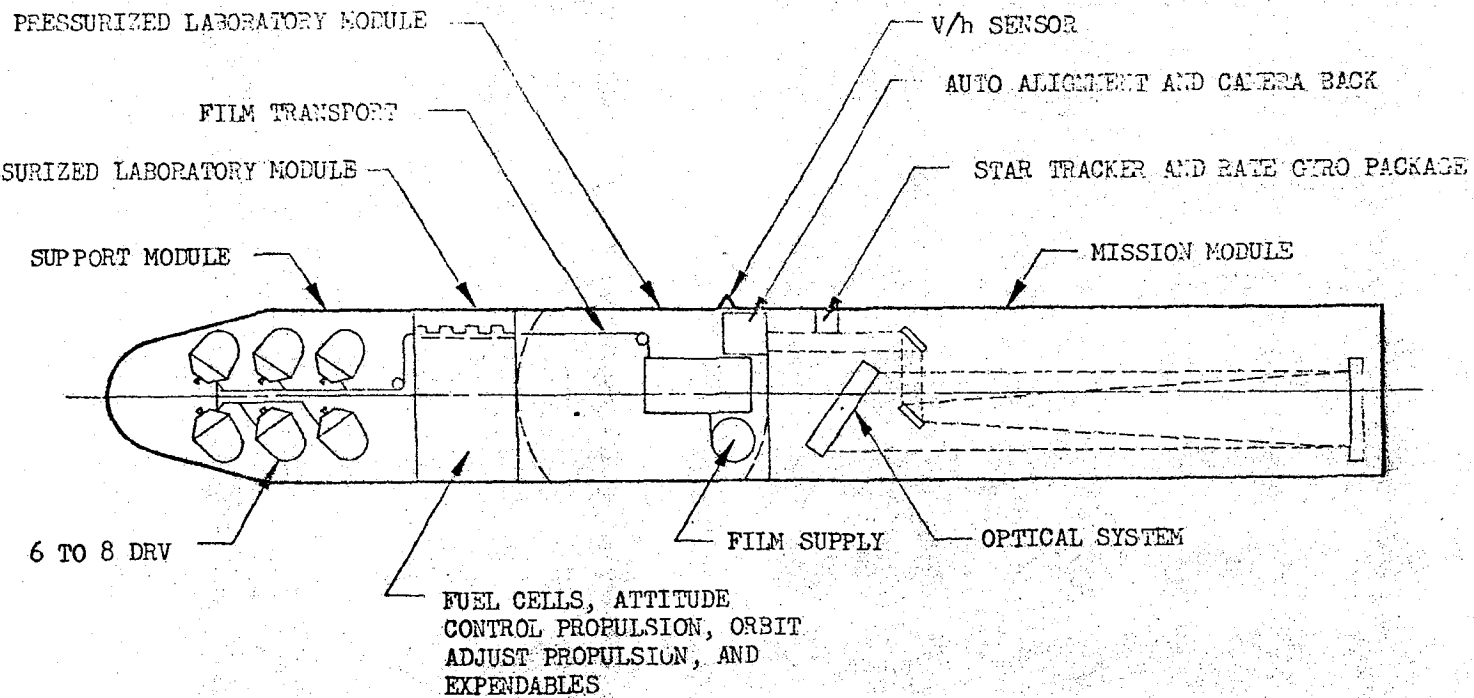
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THE UNMANNED AUTOMATIC MOL/DORIAN SYSTEM CONCEPT IS ALSO  
PRESENTED TO ESTABLISH A POINT OF REFERENCE FOR THE DORIAN  
RESUPPLY STUDY. THE CONCEPT IS A DIRECT COPY OBTAINED FROM  
THE FUNDED UNMANNED DORIAN SYSTEM STUDY (P-66) AND DORIAN  
MISSION TARGETING SOFTWARE PROPOSAL RFP.

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UNMANNED AUTOMATIC MOL/DORIAN SYSTEM CONCEPT

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~~SECURITY INFORMATION~~

THE LOCKHEED UNMANNED DORIAN SYSTEM (P-66) PRESENTED REPRESENTS THE CONFIGURATION PROPOSED TO THE AIR FORCE AS A RESULT OF THE FUNDED UNMANNED DORIAN STUDY (17 JUNE 1966). THE P-66 CONCEPT EMPHASIZES SUBSYSTEM MODULARITY IN THE CONTROL AND MISSION SUPPORT MODULES. THE APPLICATION OF THIS MODULARITY CONCEPT IS CONTINUED ON THE DORIAN RESUPPLY TO FACILITATE SIMPLIFIED RESUPPLY INTERFACES.

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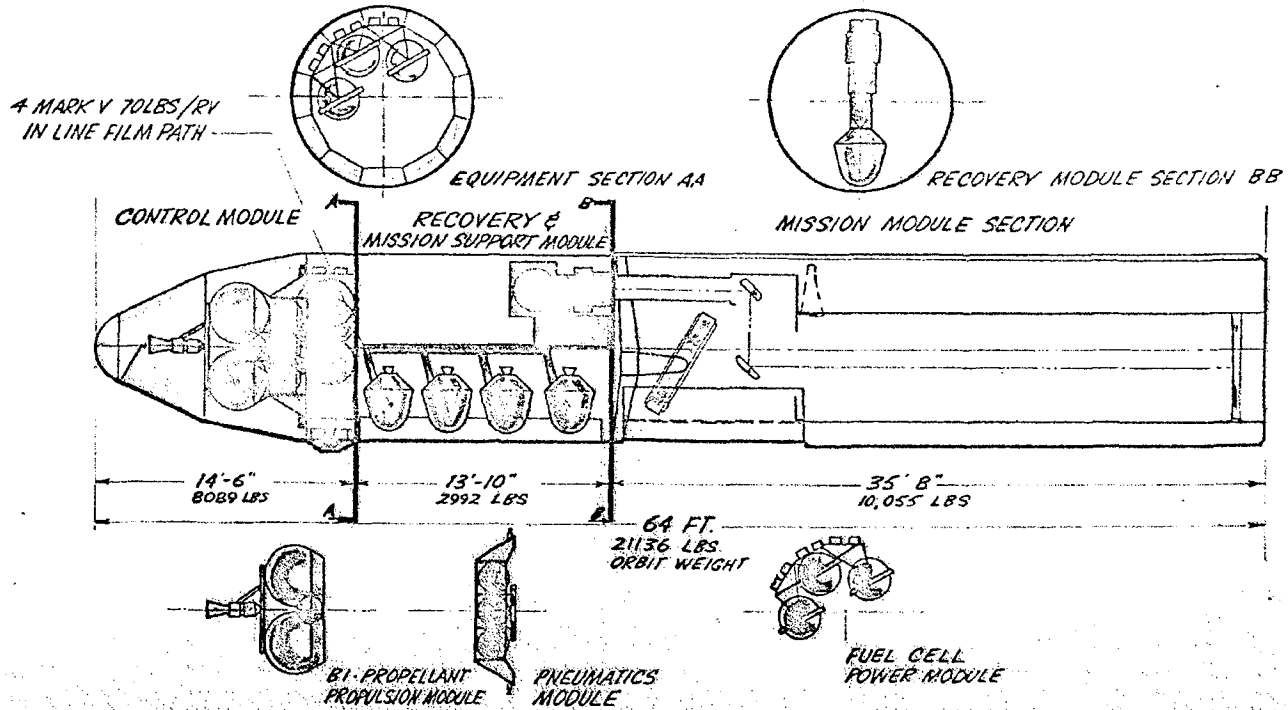
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# 30 DAY DORIAN SYSTEM

TITAN III D-5 SEGMENT BOOSTER - 97° INCLINATION, 70-170 N.M. ORBIT



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P66 UNMANNED DORTAN SYSTEM

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UNMAINED RESUPPLY OF THE P-66 UNMAINED DORIAN SYSTEM  
WAS CONSIDERED IN THIS STUDY. OTHER ALTERNATIVES SUCH  
AS MOL/DORIAN RESUPPLY AND MAN-ASSISTED RESUPPLY HAVE BEEN  
CONSIDERED ONLY IN TERMS OF DETERMINING ROM COSTS. HOWEVER  
MANY OF THE FACTORS DEVELOPED HERE FOR THE P-66 SYSTEM ARE  
PERTINENT TO MOL/DORIAN RESUPPLY.

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GROUND RULES AND APPROACHES

- o MAINTAIN TOTAL SYSTEM OPERATION AS LONG AS PAYLOAD SYSTEM IS OPERABLE
- o RESUPPLY EXPENDABLES AND/OR EQUIPMENT TO EXTEND LIFE
- o P-66 ORBIT (70 NM/170 NM, 97° INCL.)
- o LONG TERM MATERIAL USAGE RATE 65-70 LB/2 WEEKS
- o TITAN CLASS BOOSTERS FOR INITIAL LAUNCH
- o MINIMUM COST BOOSTER FOR SUPPORT LAUNCHES
- o UNMANNED MISSION AND RESUPPLY OPERATIONS

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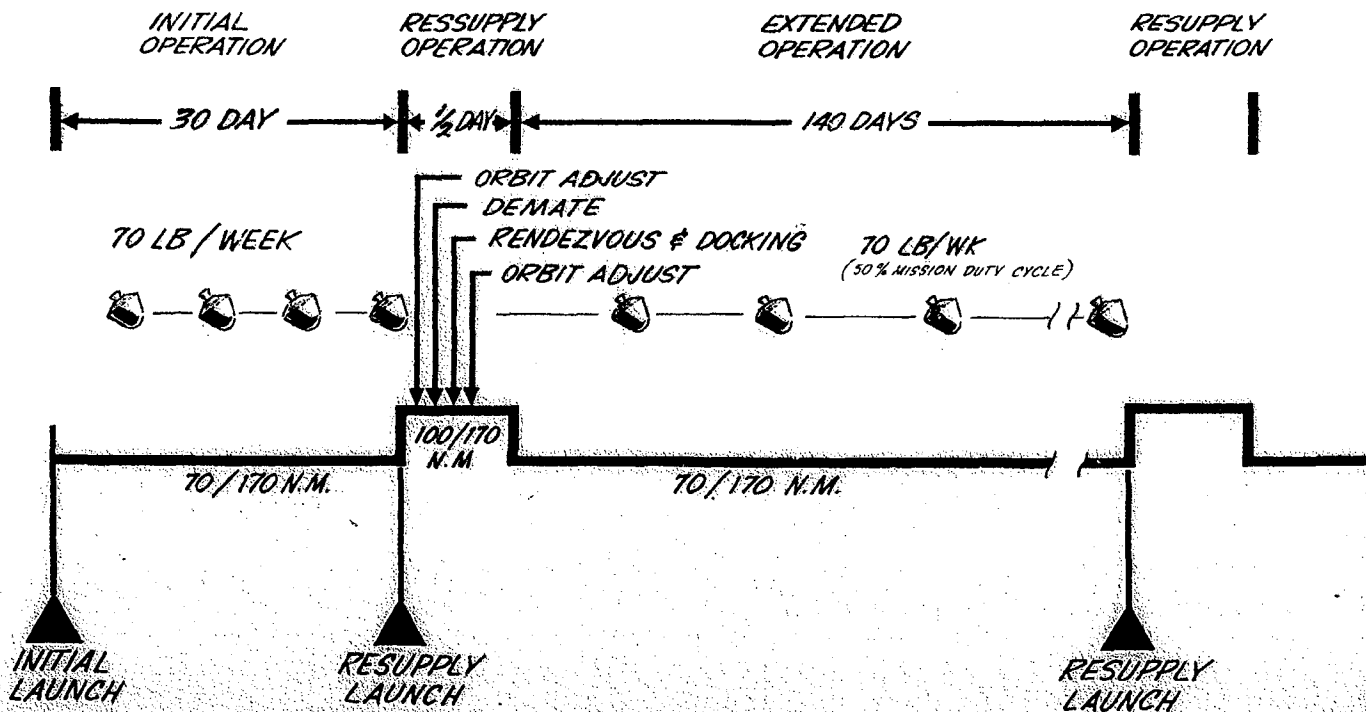
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FOR THE PURPOSE OF THIS STUDY A TYPICAL OVERALL MISSION OPERATIONAL PROFILE WAS CONCEIVED. THE BASIC PREMISE IS A 30 DAY DORIAN MISSION WITH 70 LBS FILM USAGE PER WEEK ON 60 DAY CENTERS (THIS PREMISE WAS USED FOR HENDED UNMARKED DORIAN STUDY). AS SUCH, THE RESUPPLY SYSTEM PROVIDES SUFFICIENT FILM LOAD FOR A 50% MISSION DUTY CYCLE, I.E., 70 LBS FILM/2 WEEKS. HOWEVER, SUFFICIENT EXPENDABLES ARE PROVIDED TO OPERATE THE VEHICLE IN THE 70 NM/170 NM ORBIT CONTINUOUSLY AFTER REMBEZVOUS AND DOCKING. THIS PROVIDES THE FLEXIBILITY TO PHOTOGRAPH TARGETS OF OPPORTUNITY AT ANY TIME. CAPSULE RECOVERY CAN BE SCHEDULED AFTER EVERY SYNCHRONOUS CYCLE OPERATION.

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# OVERALL OPERATION

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THE RENDEZVOUS AND DOCKING OPERATION UTILIZES APPROACHES DEVELOPED IN THE GEMINI PROGRAM. IT IS CONSIDERABLY SIMPLER THAN THE UNMANNED INSPECTION MISSION FOR WHICH LMSC HAS BEEN DEVELOPING EXPERIMENTAL HARDWARE AND SOFTWARE FOR TWO YEARS.

THE ACQUISITION AND TRACKING RADAR AND DOCKING ADAPTER CAN BE SIMILAR TO THOSE USED ON THE GEMINI PROGRAM. BOTH COMPLETELY AUTOMATIC AND SEMI-AUTOMATIC RENDEZVOUS AND DOCKING (MAN IN THE GROUND LOOP) ARE CONSIDERED AS FEASIBLE METHODS.

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RENDEZVOUS AND DOCKING OPERATION

- o TARGET EPHEMERIS KNOWN  
  
EITHER DIRECT ASCENT OR PARKING ORBIT RENDEZVOUS  
MAY BE USED
  
- o COOPERATIVE TARGET  
  
ADJUST ORBIT FOR RENDEZVOUS AS REQUIRED  
STABLE  
BEACON TO AID ACQUISITION AND CLOSING
  
- o DOCKING SYSTEM  
  
LARGE INTERFACE AREA FOR ELECTRICAL MATING AND  
MECHANICAL ALIGNMENT DEVICES  
ACQUISITION AND TRACKING RADAR  
ACQUISITION OPTICS  
COMPUTER  
BEACON ON PARENT VEHICLE

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DEMATE OPERATION

- o MISSION MODULE SEGMENT RETAINS HOUSEKEEPING CAPABILITY AFTER SEPARATION
  - o ATTITUDE CONTROL
  - o POWER
  - o RENDEZVOUS AIDS
  - o TT&C
  
- o EXPENDED SEGMENT TRANSFERRED TO LOW ORBIT AFTER SEPARATION TO AVOID COLLISION AND IMPROVE DE-ORBIT.

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REPLACEMENT CANDIDATES

- EXPENDABLES
  - FILM
  - RE-ENTRY VEHICLE
  - ORBIT ADJUST PROPELLANT
  - ATTITUDE CONTROL GAS
  - FUEL CELL REACTANT
- VEHICLE EQUIPMENT (RELIABILITY CONSIDERATION)
  - FUEL CELL
  - ATTITUDE REFERENCE
  - ATTITUDE ELECTRONIC
  - T, T & C
  - COMPUTER
- MISSION SUPPORT EQUIPMENT (RELIABILITY CONSIDERATION)
  - CAMERA MECHANICS
  - ATTITUDE DETERMINATION EQUIPMENT (STAR TRACKER, GYRO)
  - V/h SENSOR
  - TRACKING MIRROR SERVO AND LOGIC

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RESUPPLY OF EXPENDABLE ITEMS IS SIMPLIFIED BY REPLACING,  
COMPLETELY OR IN PART, THE SYSTEMS IN WHICH THE EXPENDABLES  
ARE USED. THE COST AND WEIGHT PENALTIES ASSOCIATED WITH THIS  
APPROACH ARE MINOR COMPARED WITH RELIABILITY GAINS FROM  
SIMPLIFIED DOCKING INTERFACES. IN GENERAL, EXPENDABLE  
RESUPPLY INTERFACES HAVE BEEN REDUCED TO MECHANICAL ATTACHMENT  
AND ALIGNMENT AND ELECTRICAL CONNECTORS

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EXPENDABLE RESUPPLY CONSIDERATIONS

EXPENDABLE RESUPPLY ITEM	HARDWARE ITEMS RESUPPLIED TO SIMPLIFY INTERFACES	REMAINING INTERFACES	REQUIRED TECHNOLOGY	REASONS FOR RESUPPLY
ORBIT ADJUST PROPELLANT	TANKS, PLUMBING, MOTOR	ALIGNMENT WITH VEHICLE POWER COMMAND STATUS DATA	SELF ALIGNMENT DEVICES ELECTRICAL CONNECTORS	PROPELLANT DEPLETION
REACTION CONTROL PROPELLANT	TANKS, PLUMBING, THRUSTERS	SAME AS ABOVE	SAME AS ABOVE	PROPELLANT DEPLETION
FUEL CELL REACTANTS	TANKS, PLUMBING, FUEL CELLS	POWER COMMAND STATUS DATA	SAME AS ABOVE	REACTANT DEPLETION
FILM, RV'S	FILM TRANSPORT	ALIGNMENT WITH CAMERA POWER COMMAND STATUS DATA FILM FEED THRU CAMERA	SAME AS ABOVE, ALSO CUT AND SPLICE OR SEPARABLE CAMERA BACK	FILM SUPPLY & RV DEPLETION
	FILM TRANSPORT, CAMERA MECHANISM	ALIGNMENT WITH ROSS TUBE* POWER COMMAND STATUS DATA FRAME DATA	SELF ALIGNMENT DEVICES LARGE CAPACITY SIGNAL INTERFACE (400-600 LEADS)	DAMAGED FILM SUPPLY

\*ALIGNMENT MAY BE AUTOMATIC WITH FILM TRANSPORT INSTALLATION

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RESUPPLY OF EQUIPMENT IS BASED ON TWO CRITERIA

- o EXPECTED LIFE
- o COMPLEXITY OF INTERFACES

TO SIMPLIFY INTERFACES IT IS DESIRABLE TO GROUP THOSE UNITS OF EQUIPMENTS WHICH HAVE A HIGH NUMBER OF ELECTRICAL INTERCONNECTIONS INTO A SINGLE REPLACEMENT ASSEMBLY AND TO REDUCE THE INTERFACE REQUIREMENT TO MECHANICAL ALIGNMENT WHEREVER POSSIBLE.

A SECOND CRITERION IS TO GROUP EQUIPMENT OF ABOUT EQUAL EXPECTED LIFE TOGETHER SO THAT MAXIMUM UTILIZATION IS ACHIEVED. THE P-66 RELIABILITY REQUIREMENTS INCLUDED THE STIPULATION THAT NO SINGLE EQUIPMENT FAILURE WOULD RESULT IN LOSS OF A PRODUCTIVE MISSION. AS A RESULT, STANDBY REDUNDANCY WAS REQUIRED IN THE SGLS, ATTITUDE CONTROL ELECTRONICS, COMPUTER, DATA ADAPTERS, AND SIMILAR UNITS.

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EQUIPMENT RESUPPLY CONSIDERATIONS

RESUPPLY ITEM	REASON FOR RESUPPLY	ITEMS RESUPPLIED TO SIMPLIFY INTERFACES	REMAINING INTERFACES	REQUIRED TECHNOLOGY
CAMERA MECHANISM (INCLUDING PRESSURIZATION)	FAILURE OR LIFE EXPECTANCY INTERFACE SIMPLICITY	FILM SUPPLY FILM TRANSPORT	SIGNALS, POWER, MECHANICAL ALIGNMENT, ENVIRONMENT RADIATION	COMMAND/DATA INTERFACE UNITS DOCKING ADAPTER TECHNIQUES SHIELDING USABLE FILM
MISSION COMPUTERS, BULK STORAGE UNIT AND DAU's	FAILURE OR LIFE EXPECTANCY	SGLS, ATTITUDE CONTROL MODULE, V/h SENSOR, STAR ACQ, & TRACKING	SIGNALS, POWER	USE GEMINI MULTIPLEXING, SINGLE DUAL WIRE PLUG FORM/COMMANDS
SC	FAILURE OR LIFE EXPECTANCY	MISSION COMPUTERS, ATTITUDE CONTROL MODULE, DATA ADAPTER UNIT	SIGNALS, POWER	SAME AS ABOVE
ATTITUDE CONTROL ELECTRONICS	FAILURE OR LIFE EXPECTANCY	MISSION COMPUTERS, DATA ADAPTER UNITS, SGLS,	SIGNALS, POWER, ALIGNMENT	PRECISE ALIGNMENT DOCKING
STAR ACQUISITION AND TRACKING	FAILURE OR LIFE EXPECTANCY	MISSION COMPUTERS, SGLS, DATA ADAPTER, V/h SENSOR	PRECISE ALIGNMENT TO OPTICS POINTING REFERENCE POWER, SIGNALS	ALIGNMENT WITH TRACKING MIRROR ASSEMBLY
FILM TRANSPORT	FAILURE, INTERFACE SIMPLICITY	CAMERA, RV's, FILM SUPPLY, PRESSURIZATION	MECHANICAL LINKAGE ENVIRONMENT	LIGHT TIGHT MECHANISMS CUT AND SPLICE ALIGNMENT TECHNIQUES
TRACKING MIRROR SERVO AND LOGIC	FAILURE OR LIFE EXPECTANCY	COMPUTER AND DAU SGLS	TRACKING MIRROR	INTERFACE WITH TRACKING MIRROR ASSEMBLY

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THE COST COMPARISONS PRESENTED ARE BASED ON THE FOLLOWING ASSUMPTIONS

		<u>MOL</u>	<u>P-66</u>	<u>P-66 W/RESUPPLY</u>	
				<u>Initial</u>	<u>Resupply</u>
BOOSTER	\$M	17.0	15.0	15.0	15.0
MISSION MODULE		35.0	35.0	35.0	
MISSION SUPPORT & CONTROL MODULES		<u>50.0</u>	<u>12.0</u>	<u>12.0</u>	<u>14.3</u>
TOTAL		102.0	62.0	62.0	29.3

FOR MOL AND P-66, SIX LAUNCHES PER YEAR OF 30-DAY LIFE VEHICLES WERE ASSUMED. FOR P-66 WITH RESUPPLY, AN INITIAL LAUNCH FOLLOWED BY THREE 130-140 DAY RESUPPLY VEHICLES WAS USED. THE REST OF THE STUDY PRESENTS THE DETAILS OF THE P-66 RESUPPLY CONCEPT.

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ROM ANNUAL RECURRING HARDWARE COST

<u>SYSTEM</u>	<u>ANNUAL COST</u>	<u>SAVINGS VS. MOL</u>
MOL	\$612,000,000	-
P-66	\$378,000,000	\$234,000,000
P-66 RESUPPLY	\$149,000,000	\$463,000,000

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THE DEPLETION, EQUIPMENT FAILURE, AND RESUPPLY INTERFACE CONSIDERATIONS PRESENTED IN THE PREVIOUS CHARTS LEAD TO THE RESUPPLY MODES SHOWN HERE. FROM EXPENDABLES, FILM AND RV'S, THE RESUPPLY LIST CAN BE EXPANDED TO INCLUDE ALL EQUIPMENT SUBJECT TO FAILURE IN OPERATION. IN A MAXIMUM RESUPPLY MODE, MISSION SUPPORT MODULE AND CONTROL MODULE MIGHT BE REPLACED COMPLETELY, AND THE ELECTRO-MECHANICAL ELEMENTS OF THE MISSION MODULE AS WELL. A, B AND C AT THE LEFT IDENTIFY RESUPPLY MODES FOR WHICH VEHICLE CONFIGURATIONS ARE DEVELOPED IN THE FOLLOWING PAGES.

THE GUIDANCE AND TT&C EQUIPMENT OF THE RESUPPLY VEHICLE CAN BE USED ON ORBIT AS MISSION EQUIPMENT AND THEREFORE OFFERS ADDITIONAL BACKUP IN THESE FUNCTIONS.

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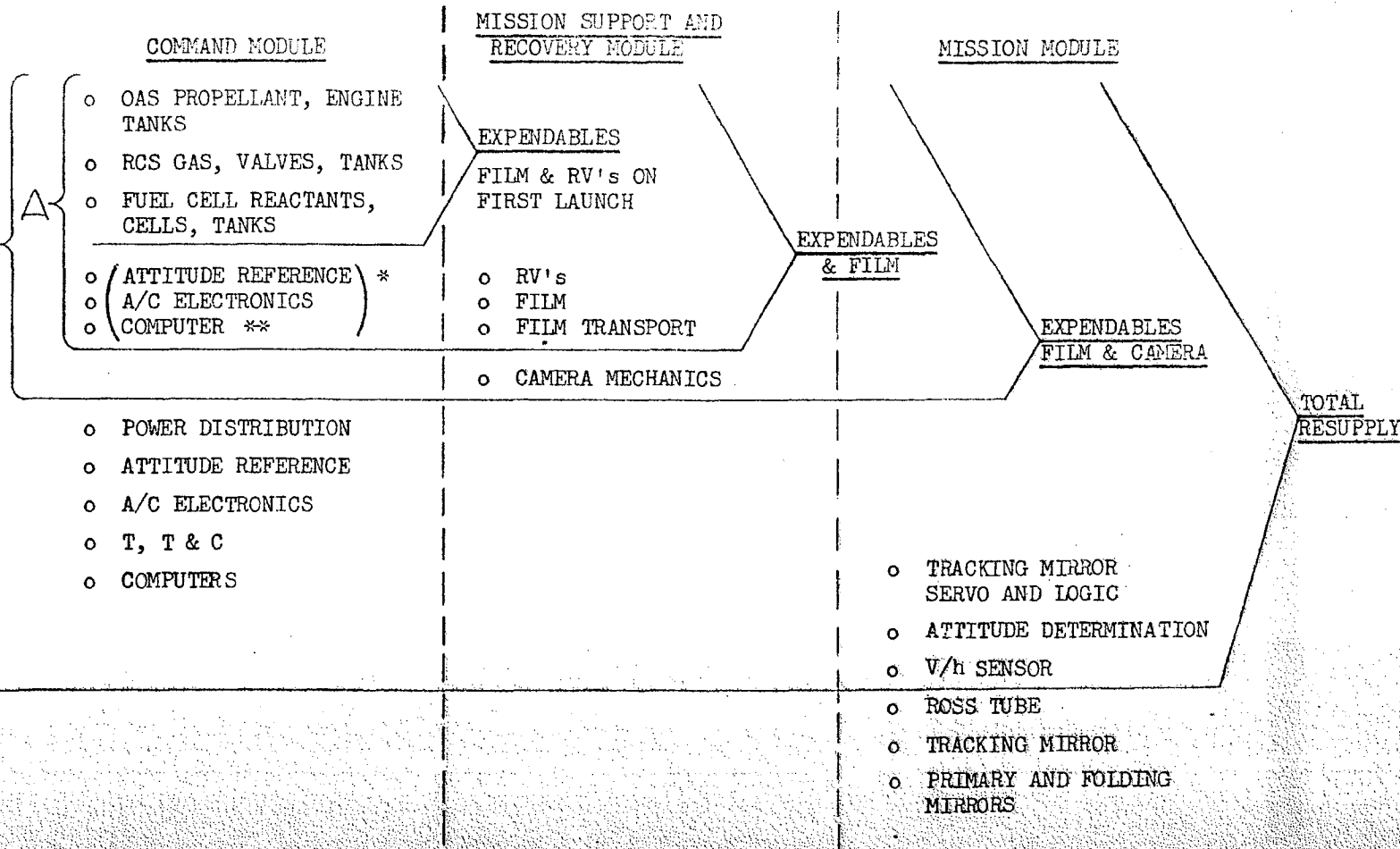
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RESUPPLY MODES

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\*USED FOR ASCENT, RENDEZVOUS DOCKING,  
AVAILABLE AS ON-ORBIT BACKUP  
\*\*THE MISSION COMPUTER OF THE PARENT VEHICLE CAN ALSO BE USED FOR RENDEZVOUS.

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THE INDICATED LIFETIMES ARE ACHIEVED BY PROVISIONING THE VEHICLES WITH EXPENDABLE ITEMS TO THE LIMIT OF ROCKET WEIGHT CAPABILITY. THE BREAKDOWN OF THESE ITEMS IS SHOWN BELOW FOR EACH OF THE CONFIGURATIONS. THE LARGE ORBIT ADJUST AND REACTION CONTROL PROPELLANT REQUIREMENTS REFLECT THE HEAVY DRAG ENVIRONMENT OF THE 70 MK/170 MK ORBIT IN WHICH THE VEHICLES ARE MAINTAINED. BOOSTERS WITH LESS CAPABILITY THAN TIIIB/AGENA (e.g., TIIIB/CONTROL MODULE) DO NOT PROVIDE RESUPPLY LIFETIMES LONG ENOUGH TO BE OPERATIONALLY OR ECONOMICALLY ATTRACTIVE.

		<u>CONFIGURATION A</u>		<u>CONFIGURATION B</u>		<u>CONFIGURATION C</u>	
INITIAL	RV's	4 MK 5		4 MK 5		4 MK 5	
LAUNCH	FILM	280 LB		280 LB		280 LB	
	ORBIT ADJUST PROP	2650		2650		2650	
	REACTION CONT. PROP	590		590		590	
	ELECT POWER	560		560		560	
		<u>TIIID</u>	<u>TIIIB/AGENA</u>	<u>TIIID</u>	<u>TIIIB/AGENA</u>	<u>TIIID</u>	<u>TIIIB/AGENA</u>
RESUPPLY	RV's	8 MK5	2 MK5	8 MK5	2 MK5	8 MK5	2 MK5
LAUNCH	FILM	560 LB	140 LB	560 LB	140 LB	520 LB	140 LB
	ORBIT ADJUST PROP	11200	2870	10850	2620	10400	2270
	REACTION CONT. PROP	1250	200	1200	200	1170	200
	ELECT POWER	SOLAR ARRAY	560 F.C. REACTANT	SOLAR ARRAY	560 F.C. REACTANT	SOLAR ARRAY	560 F.C. REACTANT

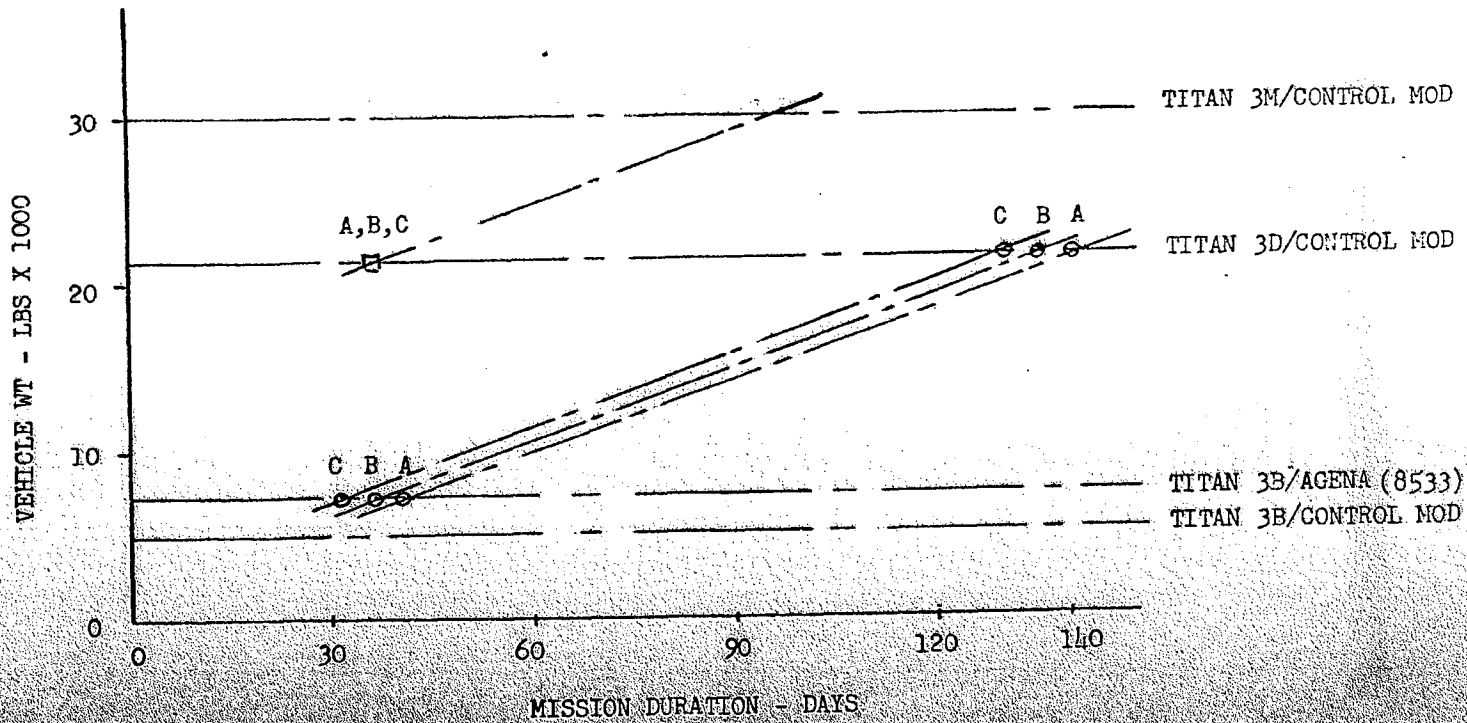
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MISSION LIFE CAPABILITIES

70 NM/170 KM ORBIT  
97° INCLINATION

- RESUPPLY VEHICLES
- INITIAL VEHICLES (UNMANNED)



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~~NOIY~~ ~~NOIZ~~ ~~NOJA~~ ~~NOJB~~ ~~NOJC~~ ~~NOJD~~ ~~NOJE~~ ~~NOJF~~ ~~NOJG~~ ~~NOJH~~ ~~NOJI~~ ~~NOJJ~~ ~~NOJK~~ ~~NOJL~~ ~~NOJM~~ ~~NOJN~~ ~~NOJO~~ ~~NOJP~~ ~~NOJQ~~ ~~NOJR~~ ~~NOJS~~ ~~NOJT~~ ~~NOJU~~ ~~NOJV~~ ~~NOJW~~ ~~NOJX~~ ~~NOJY~~ ~~NOJZ~~ ~~NOKA~~ ~~NOKB~~ ~~NOKC~~ ~~NOKD~~ ~~NOKE~~ ~~NOKF~~ ~~NOKG~~ ~~NOKH~~ ~~NOKI~~ ~~NOKJ~~ ~~NOKL~~ ~~NOKM~~ ~~NOKN~~ ~~NOKO~~ ~~NOKP~~ ~~NOKQ~~ ~~NOKR~~ ~~NOKS~~ ~~NOKT~~ ~~NOKU~~ ~~NOKV~~ ~~NOKW~~ ~~NOKX~~ ~~NOKY~~ ~~NOKZ~~ ~~NOLA~~ ~~NOLB~~ ~~NOLC~~ ~~NOLD~~ ~~NOLE~~ ~~NOLF~~ ~~NOLG~~ ~~NOLH~~ ~~NOLI~~ ~~NOLJ~~ ~~NOLK~~ ~~NOLL~~ ~~NOLM~~ ~~NOLN~~ ~~NOLO~~ ~~NOLP~~ ~~NOLQ~~ ~~NOLR~~ ~~NOLS~~ ~~NOLT~~ ~~NOLU~~ ~~NOLV~~ ~~NOLW~~ ~~NOLX~~ ~~NOLY~~ ~~NO LZ~~ ~~NO MA~~ ~~NO MB~~ ~~NO MC~~ ~~NO MD~~ ~~NO ME~~ ~~NO MF~~ ~~NO MG~~ ~~NO MH~~ ~~NO MI~~ ~~NO MJ~~ ~~NO MK~~ ~~NO ML~~ ~~NO MM~~ ~~NO MN~~ ~~NO MO~~ ~~NO MP~~ ~~NO MQ~~ ~~NO MR~~ ~~NO MS~~ ~~NO MT~~ ~~NO MU~~ ~~NO MV~~ ~~NO MW~~ ~~NO MX~~ ~~NO MY~~ ~~NO MZ~~ ~~NO NA~~ ~~NO NB~~ ~~NO NC~~ ~~NO ND~~ ~~NO NE~~ ~~NO NF~~ ~~NO NG~~ ~~NO NH~~ ~~NO NI~~ ~~NO NJ~~ ~~NO NK~~ ~~NO NL~~ ~~NO NM~~ ~~NO NN~~ ~~NO NO~~ ~~NO NP~~ ~~NO NQ~~ ~~NO NR~~ ~~NO NS~~ ~~NO NT~~ ~~NO NU~~ ~~NO NV~~ ~~NO NW~~ ~~NO NX~~ ~~NO NY~~ ~~NO NZ~~ ~~NO OA~~ ~~NO OB~~ ~~NO OC~~ ~~NO OD~~ ~~NO OE~~ ~~NO OF~~ ~~NO OG~~ ~~NO OH~~ ~~NO OI~~ ~~NO OJ~~ ~~NO OK~~ ~~NO OL~~ ~~NO OM~~ ~~NO ON~~ ~~NO OO~~ ~~NO OP~~ ~~NO OQ~~ ~~NO OR~~ ~~NO OS~~ ~~NO OT~~ ~~NO OU~~ ~~NO OV~~ ~~NO OW~~ ~~NO OX~~ ~~NO OY~~ ~~NO OZ~~ ~~NO PA~~ ~~NO PB~~ ~~NO PC~~ ~~NO PD~~ ~~NO PE~~ ~~NO PF~~ ~~NO PG~~ ~~NO PH~~ ~~NO PI~~ ~~NO PJ~~ ~~NO PK~~ ~~NO PL~~ ~~NO PM~~ ~~NO PN~~ ~~NO PO~~ ~~NO PP~~ ~~NO PQ~~ ~~NO PR~~ ~~NO PS~~ ~~NO PT~~ ~~NO PU~~ ~~NO PV~~ ~~NO PW~~ ~~NO PX~~ ~~NO PY~~ ~~NO PZ~~ ~~NO QA~~ ~~NO QB~~ ~~NO QC~~ ~~NO QD~~ ~~NO QE~~ ~~NO QF~~ ~~NO QG~~ ~~NO QH~~ ~~NO QI~~ ~~NO QJ~~ ~~NO QK~~ ~~NO QL~~ ~~NO QM~~ ~~NO QN~~ ~~NO QO~~ ~~NO QP~~ ~~NO QQ~~ ~~NO QR~~ ~~NO QS~~ ~~NO QT~~ ~~NO QU~~ ~~NO QV~~ ~~NO QW~~ ~~NO QX~~ ~~NO QY~~ ~~NO QZ~~ ~~NO RA~~ ~~NO RB~~ ~~NO RC~~ ~~NO RD~~ ~~NO RE~~ ~~NO RF~~ ~~NO RG~~ ~~NO RH~~ ~~NO RI~~ ~~NO RJ~~ ~~NO RK~~ ~~NO RL~~ ~~NO RM~~ ~~NO RN~~ ~~NO RO~~ ~~NO RP~~ ~~NO RQ~~ ~~NO RR~~ ~~NO RS~~ ~~NO RT~~ ~~NO RU~~ ~~NO RV~~ ~~NO RW~~ ~~NO RX~~ ~~NO RY~~ ~~NO RZ~~ ~~NO SA~~ ~~NO SB~~ ~~NO SC~~ ~~NO SD~~ ~~NO SE~~ ~~NO SF~~ ~~NO SG~~ ~~NO SH~~ ~~NO SI~~ ~~NO SJ~~ ~~NO SK~~ ~~NO SL~~ ~~NO SM~~ ~~NO SN~~ ~~NO SO~~ ~~NO SP~~ ~~NO SQ~~ ~~NO SR~~ ~~NO SS~~ ~~NO ST~~ ~~NO SU~~ ~~NO SV~~ ~~NO SW~~ ~~NO SX~~ ~~NO SY~~ ~~NO SZ~~ ~~NO TA~~ ~~NO TB~~ ~~NO TC~~ ~~NO TD~~ ~~NO TE~~ ~~NO TF~~ ~~NO TG~~ ~~NO TH~~ ~~NO TI~~ ~~NO TJ~~ ~~NO TK~~ ~~NO TL~~ ~~NO TM~~ ~~NO TN~~ ~~NO TO~~ ~~NO TP~~ ~~NO TQ~~ ~~NO TR~~ ~~NO TS~~ ~~NO TT~~ ~~NO TU~~ ~~NO TV~~ ~~NO TW~~ ~~NO TX~~ ~~NO TY~~ ~~NO TZ~~ ~~NO UA~~ ~~NO UB~~ ~~NO UC~~ ~~NO UD~~ ~~NO UE~~ ~~NO UF~~ ~~NO UG~~ ~~NO UH~~ ~~NO UI~~ ~~NO UJ~~ ~~NO UK~~ ~~NO UL~~ ~~NO UM~~ ~~NO UN~~ ~~NO UO~~ ~~NO UP~~ ~~NO UQ~~ ~~NO UR~~ ~~NO US~~ ~~NO UT~~ ~~NO UU~~ ~~NO UV~~ ~~NO UW~~ ~~NO UX~~ ~~NO UY~~ ~~NO UZ~~ ~~NO VA~~ ~~NO VB~~ ~~NO VC~~ ~~NO VD~~ ~~NO VE~~ ~~NO VF~~ ~~NO VG~~ ~~NO VH~~ ~~NO VI~~ ~~NO VJ~~ ~~NO VK~~ ~~NO VL~~ ~~NO VM~~ ~~NO VN~~ ~~NO VO~~ ~~NO VP~~ ~~NO VQ~~ ~~NO VR~~ ~~NO VS~~ ~~NO VT~~ ~~NO VU~~ ~~NO VV~~ ~~NO VW~~ ~~NO VX~~ ~~NO VY~~ ~~NO VZ~~ ~~NO WA~~ ~~NO WB~~ ~~NO WC~~ ~~NO WD~~ ~~NO WE~~ ~~NO WF~~ ~~NO WG~~ ~~NO WH~~ ~~NO WI~~ ~~NO WJ~~ ~~NO WK~~ ~~NO WL~~ ~~NO WM~~ ~~NO WN~~ ~~NO WO~~ ~~NO WP~~ ~~NO WQ~~ ~~NO WR~~ ~~NO WS~~ ~~NO WT~~ ~~NO WU~~ ~~NO WV~~ ~~NO WW~~ ~~NO WX~~ ~~NO WY~~ ~~NO WZ~~ ~~NO XA~~ ~~NO XB~~ ~~NO XC~~ ~~NO XD~~ ~~NO XE~~ ~~NO XF~~ ~~NO XG~~ ~~NO XH~~ ~~NO XI~~ ~~NO XJ~~ ~~NO XK~~ ~~NO XL~~ ~~NO XM~~ ~~NO XN~~ ~~NO XO~~ ~~NO XP~~ ~~NO XQ~~ ~~NO XR~~ ~~NO XS~~ ~~NO XT~~ ~~NO XU~~ ~~NO XV~~ ~~NO XW~~ ~~NO XX~~ ~~NO XY~~ ~~NO XZ~~ ~~NO YA~~ ~~NO YB~~ ~~NO YC~~ ~~NO YD~~ ~~NO YE~~ ~~NO YF~~ ~~NO YG~~ ~~NO YH~~ ~~NO YI~~ ~~NO YJ~~ ~~NO YK~~ ~~NO YL~~ ~~NO YM~~ ~~NO YN~~ ~~NO YO~~ ~~NO YP~~ ~~NO YQ~~ ~~NO YR~~ ~~NO YS~~ ~~NO YT~~ ~~NO YU~~ ~~NO YV~~ ~~NO YW~~ ~~NO YX~~ ~~NO YY~~ ~~NO YZ~~ ~~NO ZA~~ ~~NO ZB~~ ~~NO ZC~~ ~~NO ZD~~ ~~NO ZE~~ ~~NO ZF~~ ~~NO ZG~~ ~~NO ZH~~ ~~NO ZI~~ ~~NO ZJ~~ ~~NO ZK~~ ~~NO ZL~~ ~~NO ZM~~ ~~NO ZN~~ ~~NO ZO~~ ~~NO ZP~~ ~~NO ZQ~~ ~~NO ZR~~ ~~NO ZS~~ ~~NO ZT~~ ~~NO ZU~~ ~~NO ZV~~ ~~NO ZW~~ ~~NO ZX~~ ~~NO ZY~~ ~~NO ZZ~~

THE CHARACTERISTICS OF THE CONFIGURATIONS DEVELOPED FOR UNMANNED  
RESUPPLY ARE DETAILED IN THIS CHART. SUBSYSTEM EQUIPMENT AND  
LIFETIME ARE THE SAME FOR ALL THREE CONFIGURATIONS AT INITIAL  
LAUNCH. RESUPPLY DIFFERENCES ARE NOTED IN THE ATTITUDE CONTROL  
TIME AND MISSILE EQUIPMENT AREAS. THE SMALL EFFECT OF THESE  
RESUPPLY DIFFERENCES ON LIFETIME IS INDICATED

2000546 NOT RELEASED DESTROY NO LATER THAN \_\_\_\_\_

SECRET NOFORN NOVA NOINT NOPI NOAL NOA NOE NOG NOI NOJ NOK NOO NOQ NOV NOX NOY NOZ  
NOAA NOAB NOAC NOAD NOAE NOAF NOAG NOAH NOAI NOAJ NOAK NOAL NOAM NOAN NOAO NOAP NOAQ NOAR  
NOAS NOAT NOAU NOAV NOAW NOAX NOAY NOAZ NOBA NOBB NOBC NOBD NOBE NOBF NOBG NOBH NOBI  
NOBJ NOBK NOBL NOBM NOBN NOBO NOBP NOBQ NOBR NOBS NOBT NOBU NOBV NOBW NOBX NOBY NOBZ  
NOCA NOCB NOCC NOCD NOCE NOCF NOCG NOCH NOCI NOCJ NOCK NOCL NOCM NOCN NOCO NOCP NOCQ  
NOCR NOCS NOCT NOCU NOCV NOCW NOCX NOCY NOCZ NOEA NOEB NOEC NOED NOEE NOEF NOEG NOEH  
NOEI NOEJ NOEK NOEL NOEM NOEN NOEO NOEP NOEQ NOER NOES NOET NOEU NOEV NOEW NOEX NOEY  
NOEZ NOFA NOFB NOFC NOFD NOFE NOFF NOFG NOFH NOFI NOFJ NOFK NOFL NOFM NOFN NOFO NOFP  
NOFQ NOFR NOFS NOFT NOFU NOFV NOFW NOFX NOFY NOFZ NOGA NOGB NOGC NOGD NOGE NOGF  
NOGG NOGH NOGI NOGJ NOGK NOGL NOGM NOGN NOGO NOGP NOGQ NOGR NOGS NOGT NOGU NOGV  
NOGW NOGX NOGY NOGZ NOHA NOHB NOHC NOHD NOHE NOHF NOHG NOHH NOHI NOHJ NOHK  
NOHL NOHM NOHN NOHO NOHP NOHQ NOHR NOHS NOHT NOHU NOHV NOHW NOHX NOHY NOHZ  
NOIA NOIB NOIC NOID NOIE NOIF NOIG NOIH NOIJ NOIK NOIL NOIM NOIN NOIO NOIP NOIQ  
NOIR NOIS NOIT NOIU NOIV NOIW NOIX NOIY NOIZ NOJA NOJB NOJC NOJD NOJE NOJF  
NOJG NOJH NOJI NOJJ NOJK NOJL NOJM NOJN NOJO NOJP NOJQ NOJR NOJS NOJT NOJU  
NOJV NOJW NOJX NOJY NOJZ NOKA NOKB NOKC NOKD NOKE NOKF NOKG NOKH NOKI NOKJ  
NOKL NOKM NOKN NOKO NOKP NOKQ NOKR NOKS NOKT NOKU NOKV NOKW NOKX NOKY NOKZ  
NOLA NOLB NOLC NOLD NOLE NOLF NOLG NOLH NOLI NOLJ NOLK NOLM NOLN NOLO NOLP  
NOLQ NOLR NOLS NOLT NOLU NOLV NOLW NO LX NO LY NO LZ NO MA NO MB NO MC NO MD  
NO ME NO MF NO MG NO MH NO MI NO MJ NO MK NO ML NO MM NO MN NO MO NO MP NO MQ  
NO MR NO MS NO MT NO MU NO MV NO MW NO MX NO MY NO MZ NO NA NO NB NO NC NO ND  
NO NE NO NF NO NG NO NH NO NI NO NJ NO NK NO NL NO NM NO NN NO NO NO NP NO NQ  
NO NR NO NS NO NT NO NU NO NV NO NW NO NX NO NY NO NZ NO OA NO OB NO OC NO OD  
NO OE NO OF NO OG NO OH NO OI NO OJ NO OK NO OL NO OM NO ON NO OO NO OP NO OQ  
NO OR NO OS NO OT NO OU NO OV NO OW NO OX NO OY NO OZ NO PA NO PB NO PC NO PD  
NO PE NO PF NO PG NO PH NO PI NO PJ NO PK NO PL NO PM NO PN NO PO NO PP NO PQ  
NO PR NO PS NO PT NO PU NO PV NO PW NO PX NO PY NO PZ NO QA NO QB NO QC NO QD  
NO QE NO QF NO QG NO QH NO QI NO QJ NO QK NO QL NO QM NO QN NO QO NO QP NO QQ  
NO QR NO QS NO QT NO QU NO QV NO QW NO QX NO QY NO QZ NO RA NO RB NO RC NO RD  
NO RE NO RF NO RG NO RH NO RI NO RJ NO RK NO RL NO RM NO RN NO RO NO RP NO RQ  
NO RR NO RS NO RT NO RU NO RV NO RW NO RX NO RY NO RZ NO SA NO SB NO SC NO SD  
NO SE NO SF NO SG NO SH NO SI NO SJ NO SK NO SL NO SM NO SN NO SO NO SP NO SQ  
NO SR NO SS NO ST NO SU NO SV NO SW NO SX NO SY NO SZ NO TA NO TB NO TC NO TD  
NO TE NO TF NO TG NO TH NO TI NO TJ NO TK NO TL NO TM NO TN NO TO NO TP NO TQ  
NO TR NO TS NO TT NO TU NO TV NO TW NO TX NO TY NO TZ NO UA NO UB NO UC NO UD  
NO UE NO UF NO UG NO UH NO UI NO UJ NO UK NO UL NO UM NO UN NO UO NO UP NO UQ  
NO UR NO US NO UT NO UU NO UV NO UW NO UX NO UY NO UZ NO VA NO VB NO VC NO VD  
NO VE NO VF NO VG NO VH NO VI NO VJ NO VK NO VL NO VM NO VN NO VO NO VP NO VQ  
NO VR NO VS NO VT NO VU NO VV NO VW NO VX NO VY NO VZ NO WA NO WB NO WC NO WD  
NO WE NO WF NO WG NO WH NO WI NO WJ NO WK NO WL NO WM NO WN NO WO NO WP NO WQ  
NO WR NO WS NO WT NO WU NO WV NO WW NO WX NO WY NO WZ NO XA NO XB NO XC NO XD  
NO XE NO XF NO XG NO XH NO XI NO XJ NO XK NO XL NO XM NO XN NO XO NO XP NO XQ  
NO XR NO XS NO XT NO XU NO XV NO XW NO XX NO XY NO XZ NO YA NO YB NO YC NO YD  
NO YE NO YF NO YG NO YH NO YI NO YJ NO YK NO YL NO YM NO YN NO YO NO YP NO YQ  
NO YR NO YS NO YT NO YU NO YV NO YW NO YX NO YY NO YZ NO ZA NO ZB NO ZC NO ZD  
NO ZE NO ZF NO ZG NO ZH NO ZI NO ZJ NO ZK NO ZL NO ZM NO ZN NO ZO NO ZP NO ZQ  
NO ZR NO ZS NO ZT NO ZU NO ZV NO ZW NO ZX NO ZY NO ZZ

CONFIGURATION SUMMARY

ORIGINAL SPECIAL HANDLING - WORKING MATERIAL - NOT RELEASED

SECRET SPECIAL HANDLING - WORKING MATERIAL - NOT RELEASED

	A		B		C	
<u>INITIAL LAUNCH</u>						
BOOSTER	TIIID		TIIID		TIIID	
MISSION LIFE	35 DAYS		35 DAYS		35 DAYS	
ORBIT ADJUST	BIPROPELLANT		BIPROPELLANT		BIPROPELLANT	
ELECTRICAL	FUEL CELL		FUEL CELL		FUEL CELL	
ATTITUDE CONTROL	H/S, STRAP DOWN GYRO, HOT GAS		H/S, STRAP DOWN GYRO, HOT GAS		H/S STRAP DOWN GYRO, HOT GAS	
TT&C	SGLS, COMPUTER		SGLS, COMPUTER		SGLS, COMPUTER	
FILM LOAD	280 LB		280 LB		280 LB	
RV's	4 MK 5		4 MK 5		4 MK 5	
PAYLOAD	MISSION MODULE		MISSION MODULE		MISSION MODULE	
<u>RESUPPLY LAUNCH</u>						
BOOSTER	TIIID	TIIIB/AGENA	TIIID	TIIIB/AGENA	TIIID	TIIIB/AGENA
MISSION LIFE	140 DAYS	40 DAYS	135 DAYS	36 DAYS	130 DAYS	32 DAYS
ORBIT ADJUST	PROPULSION SYSTEM AND PROPELLANT		PROPULSION SYSTEM AND PROPELLANT		PROPULSION SYSTEM AND PROPELLANT	
ELECTRICAL	SOLAR ARRAY	FUEL CELL SYST & REACTANTS	SOLAR ARRAY	FUEL CELL SYST & REACTANTS	SOLAR ARRAY	FUEL CELL SYST & REACTANTS
ATTITUDE CONTROL	THRUSTERS & PROPELLANT		THRUSTERS & PROPELLANT		THRUSTERS & PROPELLANT, ATTITUDE REF. & ELECTRONICS 1/	
TT&C	1/		1/		2/	
MISSION EQUIPMENT	FILM TRANSPORT		FILM TRANSPORT & CAMERA		SGLS AND COMPUTER 2/	
FILM	560 LB	140 LB	560 LB	140 LB	560 LB	140 LB
RV's	4 MK 5	2 MK 5	8 MK 5	2 MK 5	8 MK 5	2 MK 5

1/ RESUPPLY VEHICLE ATTITUDE REFERENCE AND ELECTRONICS AVAILABLE AS BACK-UP.

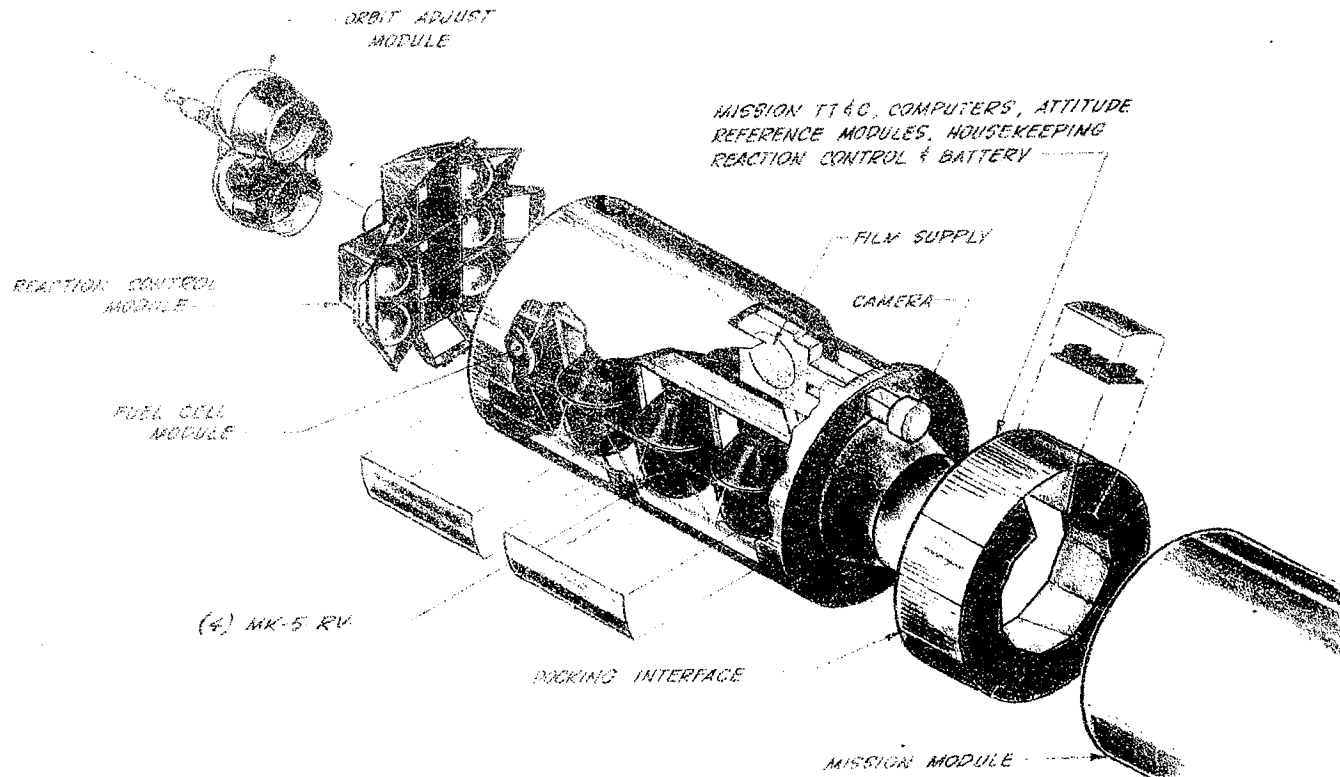
2/ RESUPPLY VEHICLE SGLS AND (RENDEZVOUS) COMPUTER AVAILABLE AS BACK-UP.

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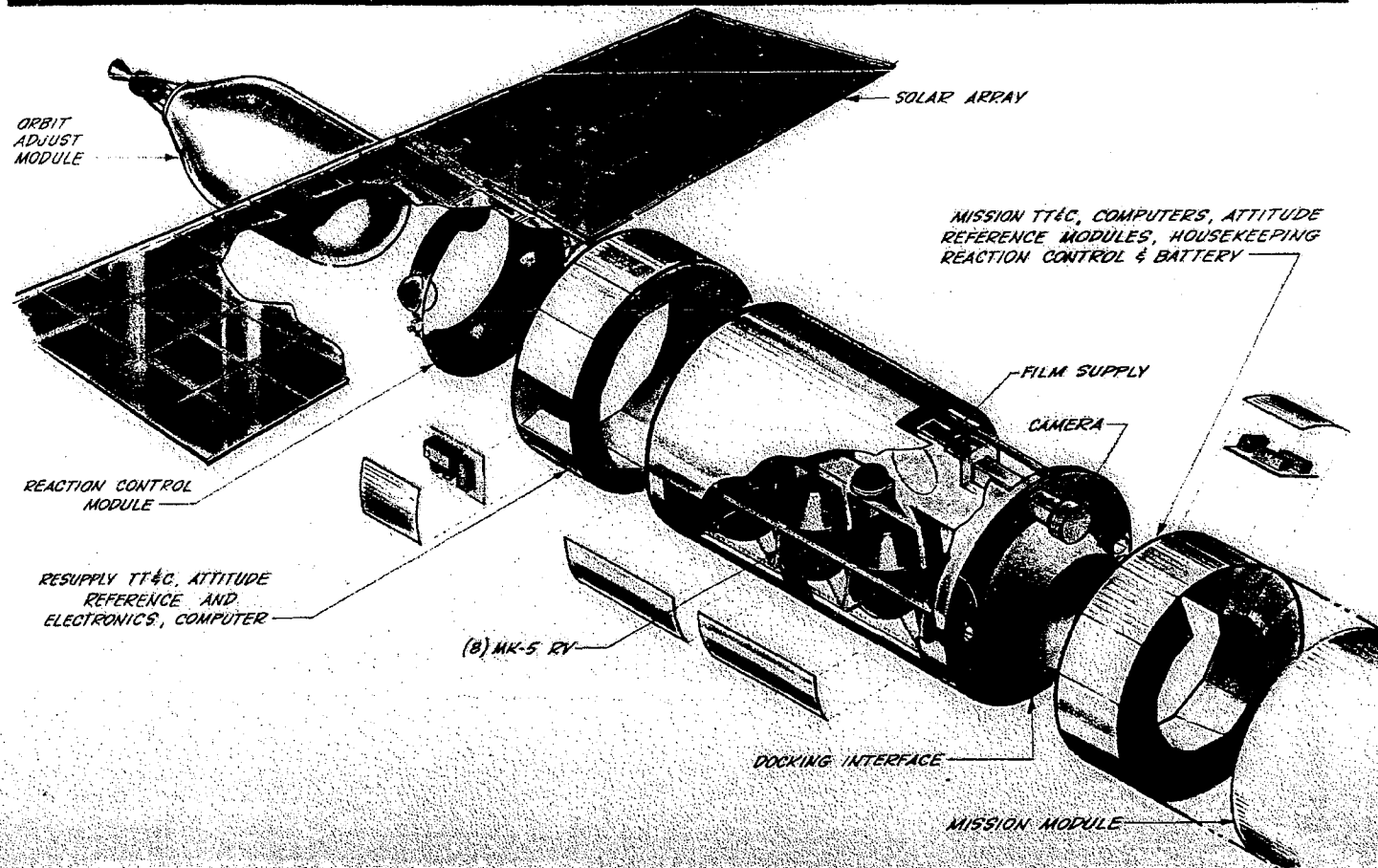
# INITIAL SATELLITE VEHICLE



SECRET — SPECIAL HANDLING — WORKING MATERIAL — NOT RELEASED

SECRET — SPECIAL HANDLING — WORKING MATERIAL — NOT RELEASED 3007-3

# RESUPPLY SATELLITE VEHICLE



SECRET SPECIAL HANDLING - WORKING MATERIAL - NOT RELEASED

~~SECRET~~ SPECIAL HANDLING - WORKING MATERIAL - NOT RELEASED 3/2/53

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~~SECRET~~ SPECIAL HANDLING REQUIRED MATERIAL

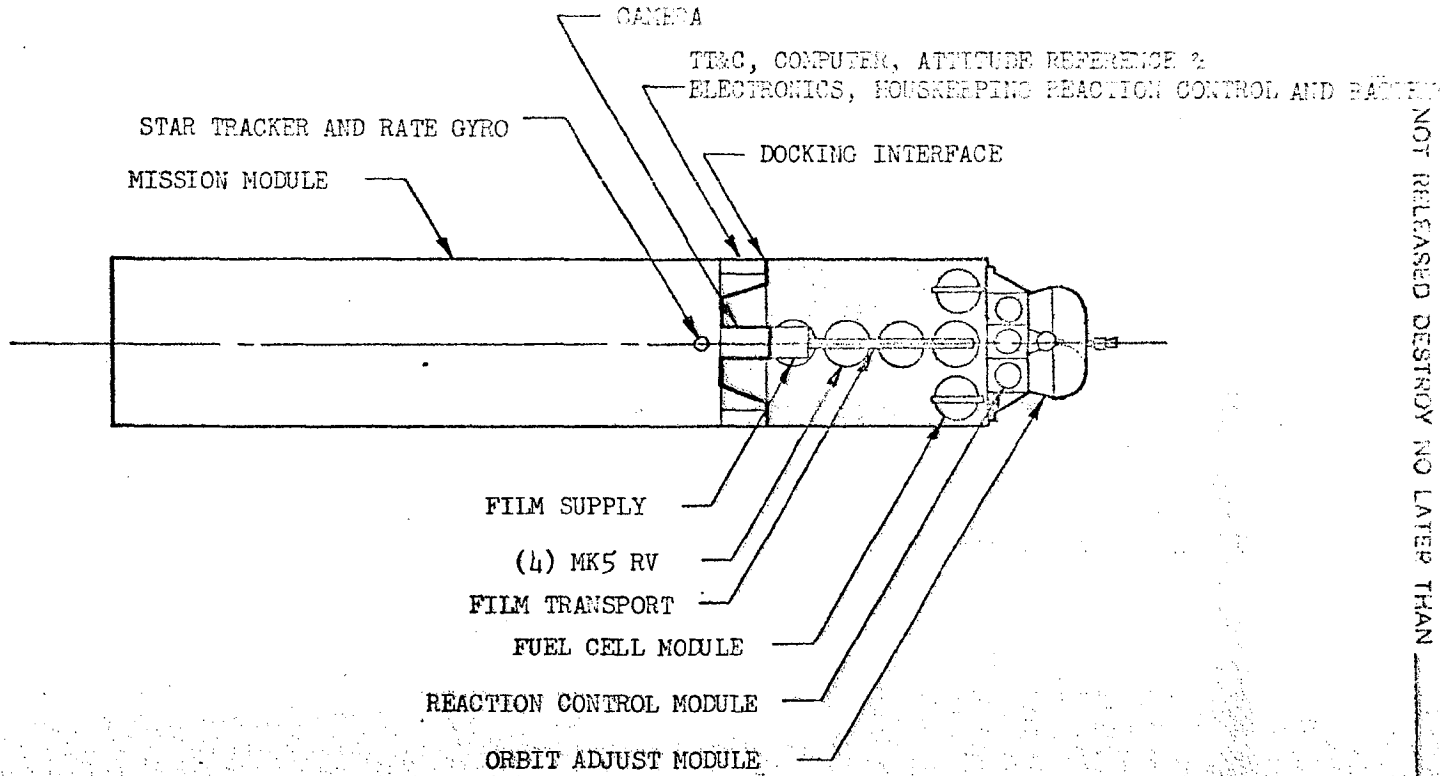
THIS CONFIGURATION IS DESIGNED FOR EXPENDABLE RESUPPLY. THE SATELLITE VEHICLE IS LAUNCHED ON A TITAN IIID BOOSTER AND PROVIDES EXPENDABLES FOR 35 DAYS IN ORBIT. AT THE END OF THAT TIME THE EXPENDABLE MODULES (SHADED) ARE SEPARATED FROM THE MISSION MODULE ON THE LEFT, TO BE REPLACED BY A RESUPPLY VEHICLE. A SEGMENTED CYLINDRICAL SECTION ATTACHED AFT OF THE MISSION MODULE CONTAINS MISSION EQUIPMENT AND A DOCKING ADAPTER AS WELL AS A BATTERY AND REACTION CONTROL EXPENDABLES FOR MAINTENANCE IN ORBIT BETWEEN SEPARATION AND RESUPPLY. CONFIGURATION A VEHICLES ARE NOT RESUPPLIED WITH CAMERAS BUT ONLY WITH FILM AND THE TRANSPORT SYSTEM. THEREFORE, CUT AND SPLICE DEVICES OR A FILM PACK FOR A REDESIGNED CAMERA ARE REQUIRED AT THE INTERFACE.

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NOT RELEASED DESTROY NO LATER THAN

~~SECRET~~ SPECIAL HANDLING REQUIRED MATERIAL  
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CONFIDENTIAL - SPECIAL HANDLING WORKING MATERIAL



CONFIGURATION A - INITIAL SATELLITE VEHICLE

(TITAN ILLD)

CONFIDENTIAL - SPECIAL HANDLING WORKING MATERIAL

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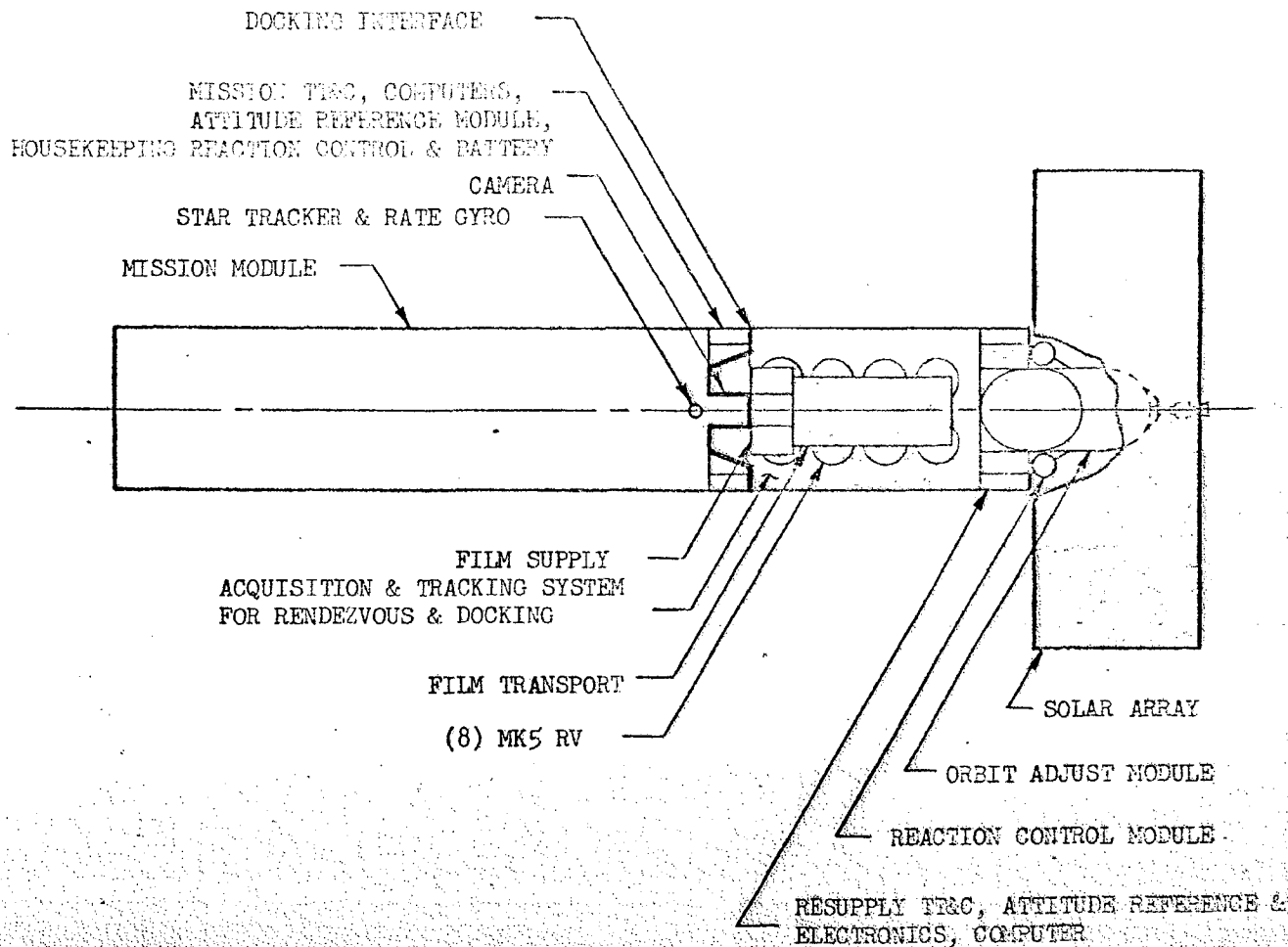
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THE SHADED PORTION OF THE RESUPPLY VEHICLE IS LAUNCHED, LIKE THE INITIAL SATELLITE VEHICLE, ON THE TITAN IIID VEHICLE. IT IS ALSO A MODULARIZED SYSTEM AND CONTAINS EXPENDABLES FOR UP TO 140 DAYS. IT CONTAINS AN ACQUISITION AND TRACKING SYSTEM CONSISTING OF RADAR AND OPTICS UTILIZED DURING THE RENDEZVOUS AND DOCKING SEQUENCE. BECAUSE OF THE LONG ORBIT LIFETIME, A SINGLE-AXIS PROGRAMMABLE SOLAR ARRAY MODULE REPLACES THE FUEL CELL MODULE FOR PRIMARY POWER. THIS CONCEPT MAINTAINS THE MAXIMUM NUMBER OF MISSION SUPPORT FUNCTIONS IN ORBIT AT ALL TIMES AND RESUPPLIES ONLY EXPENDABLES AND THE MINIMUM MISSION EQUIPMENT.

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CONFIGURATION A - RESUPPLY SATELLITE VEHICLE

(TITAN IITD)

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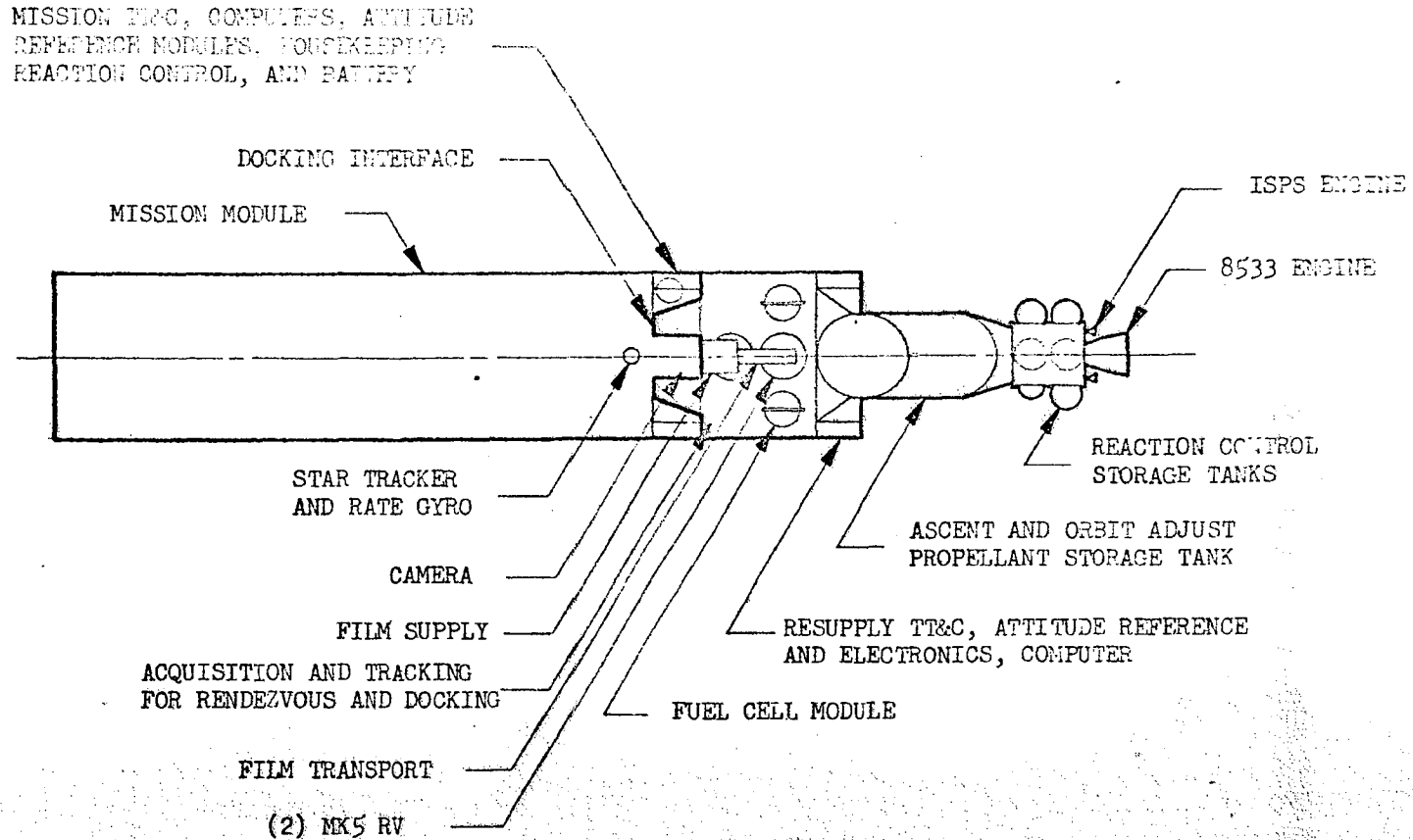
THIS ALTERNATE RESUPPLY VEHICLE, REPRESENTED BY THE RIGHT-HAND SHADED PORTION OF THE SATELLITE, IS LAUNCHED BY THE TITAN IIIB/ AGENA. AFTER MATING WITH THE QUIESCENT MISSION MODULE, THE PROPELLANTS RESERVED IN THE AGENA TANK ARE UTILIZED FOR ORBIT ADJUST IMPULSE BY MEANS OF THE ISPS ENGINES. A FUEL CELL MODULE AND TWO RV'S ARE PROVIDED WITH THIS RESUPPLY VEHICLE BECAUSE OF THE LIMITED ORBITAL LIFETIME (40 DAYS). OTHERWISE THE ELECTRICAL AND ELECTRONIC COMPONENTS ARE THE SAME AS THOSE INCORPORATED IN THE TITID-LAUNCHED RESUPPLY VEHICLE.

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~~SECRET~~ SPECIAL HANDLING WORKING MATERIAL



CONFIGURATION A - ALTERNATE RESUPPLY SATELLITE VEHICLE

(TITAN IILB/AGENA)

NOT RELEASED DESTROY NO LATER THAN

~~SECRET~~ SPECIAL HANDLING WORKING MATERIAL

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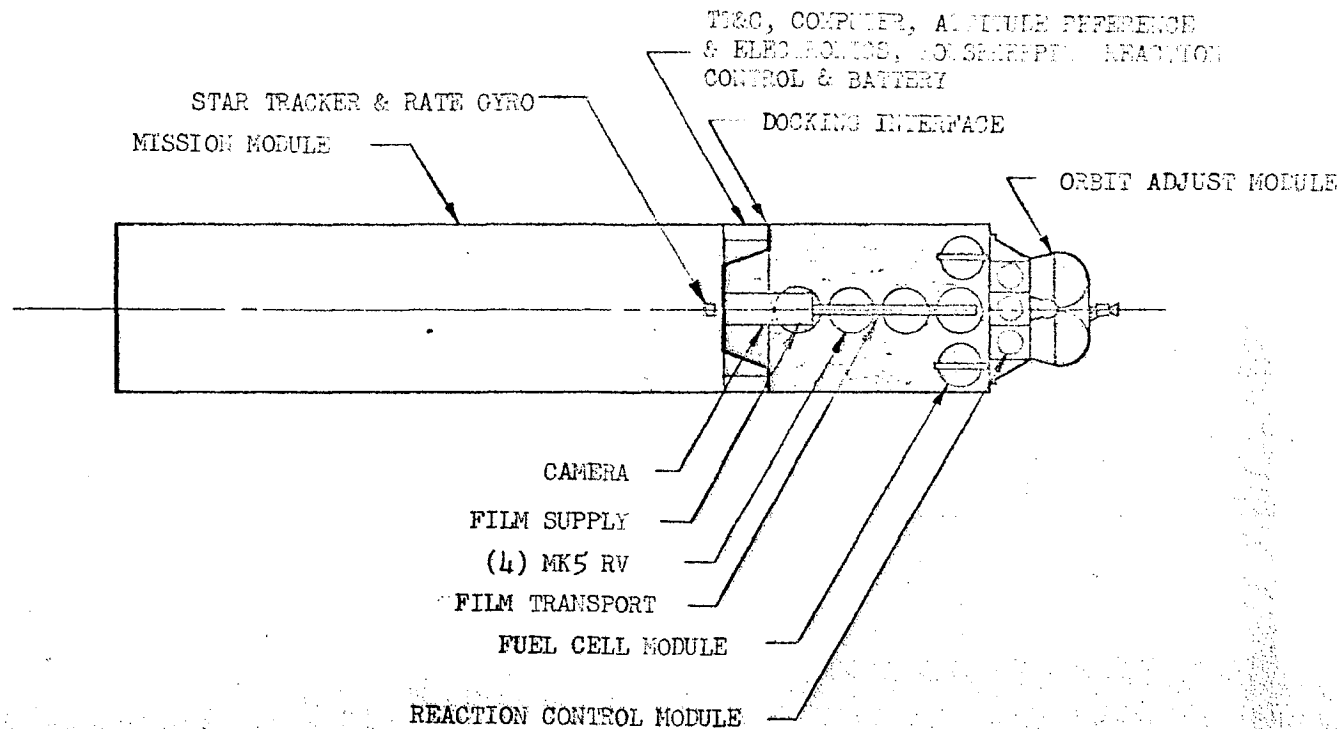
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IN ADDITION TO THE EXPENDABLES, THIS CONFIGURATION ALSO RESUPPLIES THE CAMERA MECHANICS. THE VEHICLE IS LAUNCHED ON THE TITAN IIID BOOSTER AND PROVIDES EXPENDABLES FOR 35 DAYS IN ORBIT. AT THE END OF THAT TIME THE EXPENDABLE MODULES (REPRESENTED BY THE SHADED AREA) ARE SEPARATED FROM THE MISSION MODULE TO BE REPLACED BY A RESUPPLY VEHICLE. A SEGMENTED CYLINDRICAL SECTION ATTACHED AFT OF THE MISSION MODULE CONTAINS MISSION EQUIPMENT AND A DOCKING ADAPTER AS WELL AS A BATTERY AND REACTION CONTROL EXPENDABLES FOR MAINTENANCE IN PERIODS BETWEEN SEPARATION AND SUBSEQUENT RESUPPLY. CONFIGURATION B VEHICLES ARE RESUPPLIED WITH CAMERAS AS WELL AS FILM AND A TRANSPORT SYSTEM. THE DOCKING INTERFACE THEREFORE REQUIRES ONLY A LOCATING AND LOCKING MECHANISM FOR THE CAMERA SYSTEM TO ASSURE ACCURATE ALIGNMENT.

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CONFIGURATION B - INITIAL SATELLITE VEHICLE

(TITAN IIID)

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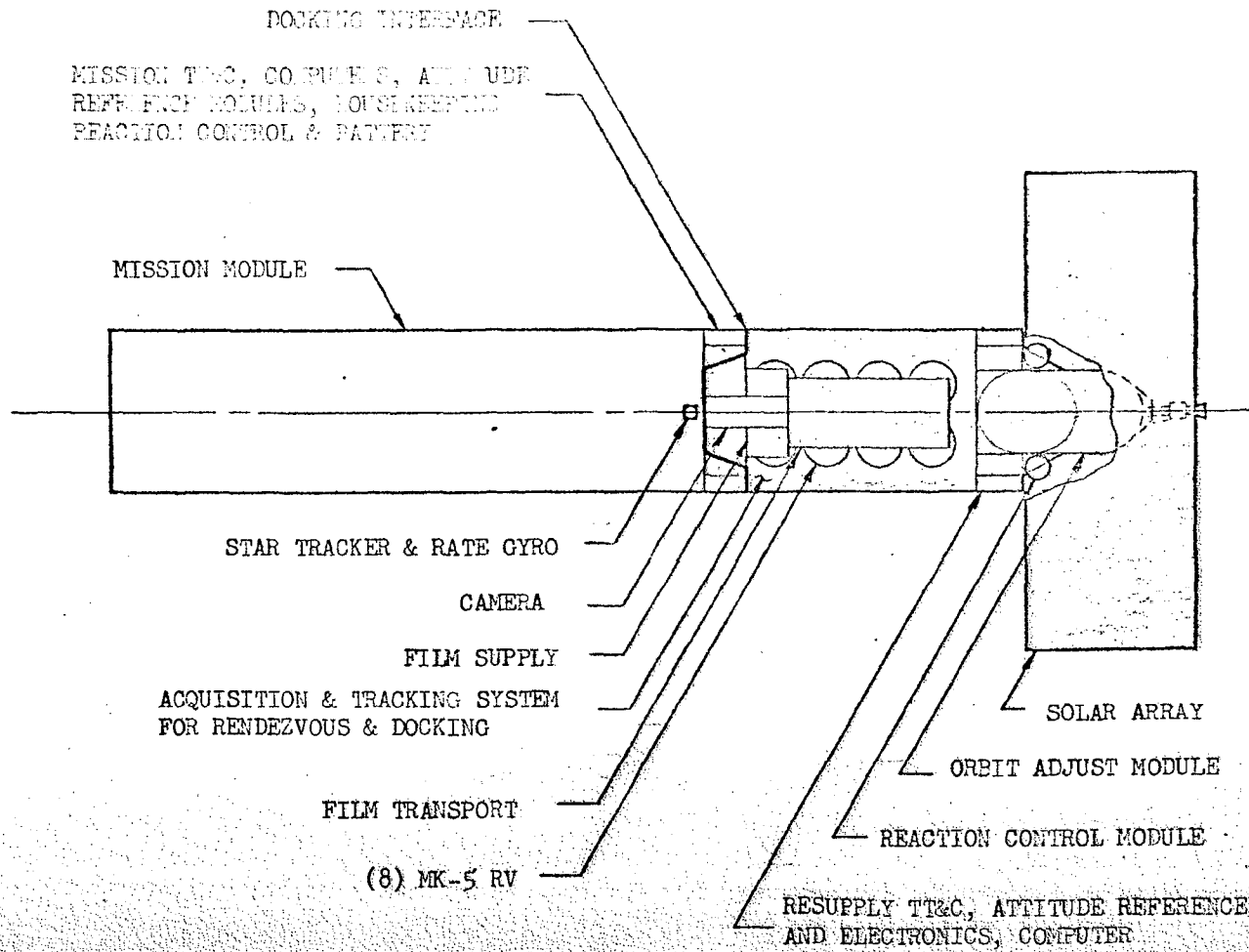
THE SHADED RESUPPLY VEHICLE ON THE RIGHT IS LAUNCHED, LIKE THE INITIAL SATELLITE VEHICLE, BY THE TITAN IIID. IT IS ALSO A MODULARIZED SYSTEM BUT CONTAINS EXPENDABLES FOR UP TO 135 DAYS. IT CONTAINS AN ACQUISITION AND TRACKING SYSTEM CONSISTING OF RADAR AND OPTICS FOR RENDEZVOUS AND DOCKING. A SINGLE-AXIS TRACKING SOLAR ARRAY MODULE REPLACES THE FUEL CELL MODULE IN THE INITIAL VEHICLE BECAUSE OF THE LONG ORBIT LIFETIME. THIS CONCEPT MAINTAINS THE MAXIMUM NUMBER OF MISSION SUPPORT FUNCTIONS IN ORBIT AT ALL TIMES AND RESUPPLIES ONLY NECESSARY EXPENDABLES AND THE MINIMUM MISSION EQUIPMENT.

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CONFIGURATION B - RESUPPLY SATELLITE VEHICLE

(TITAN IIID)

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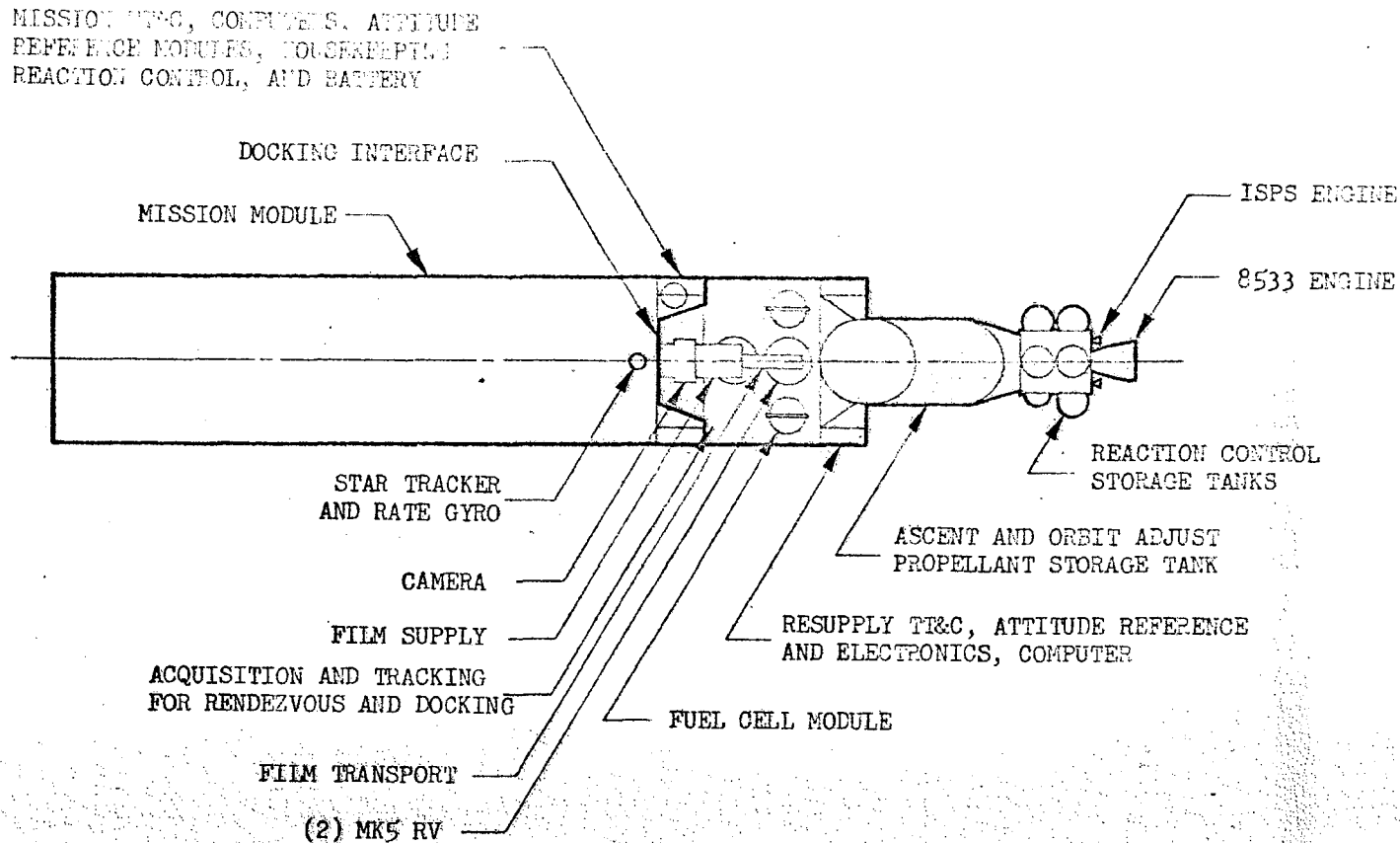
42 213

THE ALTERNATE RESUPPLY VEHICLE, REPRESENTED BY THE RIGHT-HAND SHADED PORTION OF THE SATELLITE, IS LAUNCHED BY THE TITAN IIIB WITH THE AGENA UPPER STAGE. AFTER MATING WITH THE MISSION MODULE THE PROPELLANTS REMAINING IN THE AGENA TANK ARE UTILIZED FOR ORBIT ADJUST BY USE OF THE ISPS ENGINES. A FUEL CELL MODULE AND ONLY TWO RVs ARE PROVIDED WITH THIS RESUPPLY VEHICLE BECAUSE OF THE LIMITED (36 DAYS) ORBITAL LIFETIME AND BOOSTER SYSTEM WEIGHT CAPABILITY LIMITATIONS. OTHERWISE THE ELECTRICAL AND ELECTRONIC COMPONENTS ARE THE SAME AS THOSE INCORPORATED IN THE TIIID-LAUNCHED RESUPPLY VEHICLE.

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CONFIGURATION B - ALTERNATE RESUPPLY SATELLITE VEHICLE

(TITAN IIIB/ACENA)

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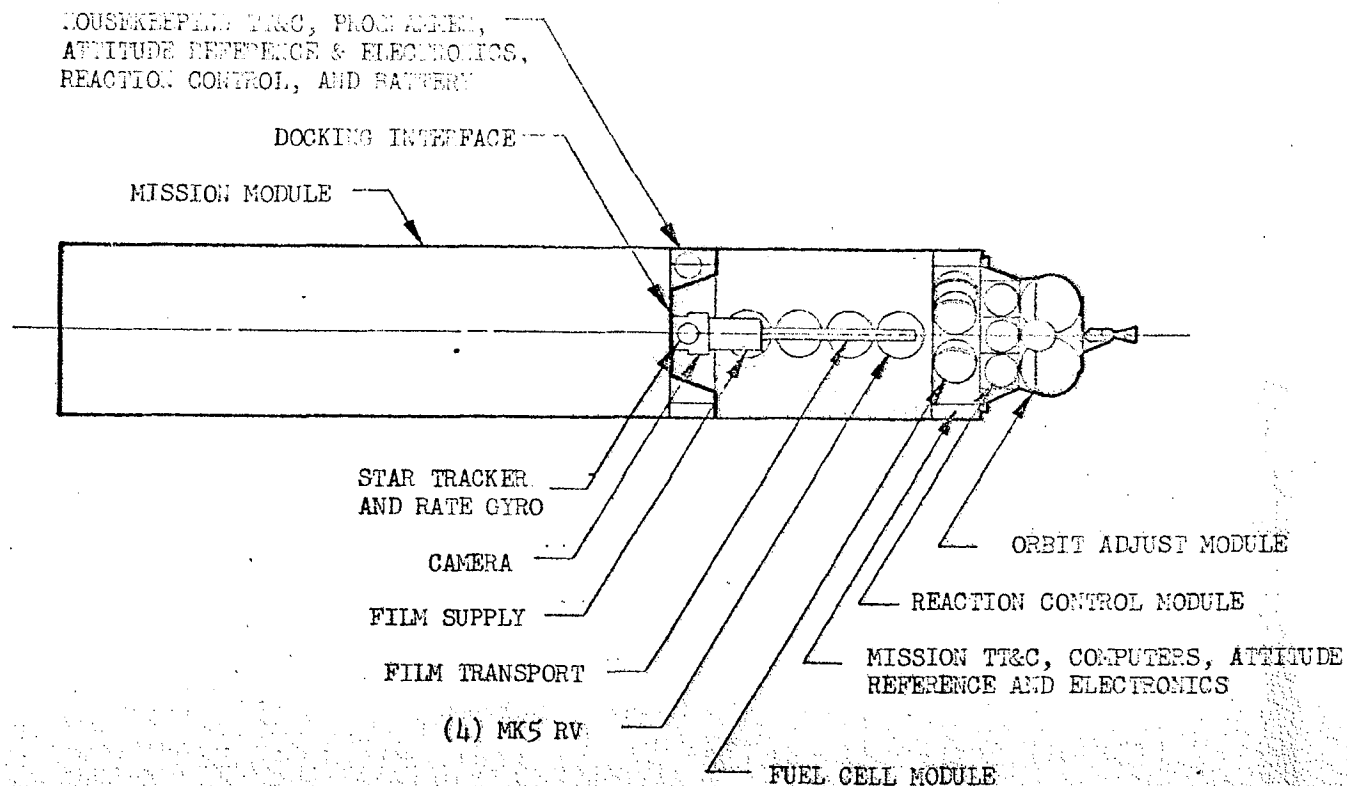
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THIS SATELLITE VEHICLE IS LAUNCHED BY THE TIID AND CONTAINS  
EXPENDABLES FOR 35 DAYS IN ORBIT. AFTER THAT THE INTEGRATED SCS  
AND MSH (SHADED) ARE SEPARATED AT THE DOCKING INTERFACE TO BE  
SUBSEQUENTLY REPLACED BY A RESUPPLY VEHICLE. THE SEGMENTED  
CYLINDRICAL SECTION AFT OF THE MISSION MODULE CONTAINS ONLY  
EQUIPMENT AND EXPENDABLES NECESSARY FOR MAINTENANCE (HOUSEKEEPING)  
FUNCTIONS AND A DOCKING ADAPTER. CONFIGURATION C RESUPPLY VEHICLES  
REPLACE THE COMPLETE CAMERA/FILM/TRANSPORT SYSTEM, THE STAR TRACKER  
AND RATE GYRO PREVIOUSLY CONTAINED IN THE MISSION MODULE, AND ALL  
THE NECESSARY EXPENDABLES. THE DOCKING INTERFACE REQUIRES A LOCATING  
AND LOCKING MECHANISM FOR ACCURATE ALIGNMENT OF THE CAMERA SYSTEM WITH  
THE ROSS TUBE.

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CONFIGURATION C - INITIAL SATELLITE VEHICLE

(TITAN IIBD)

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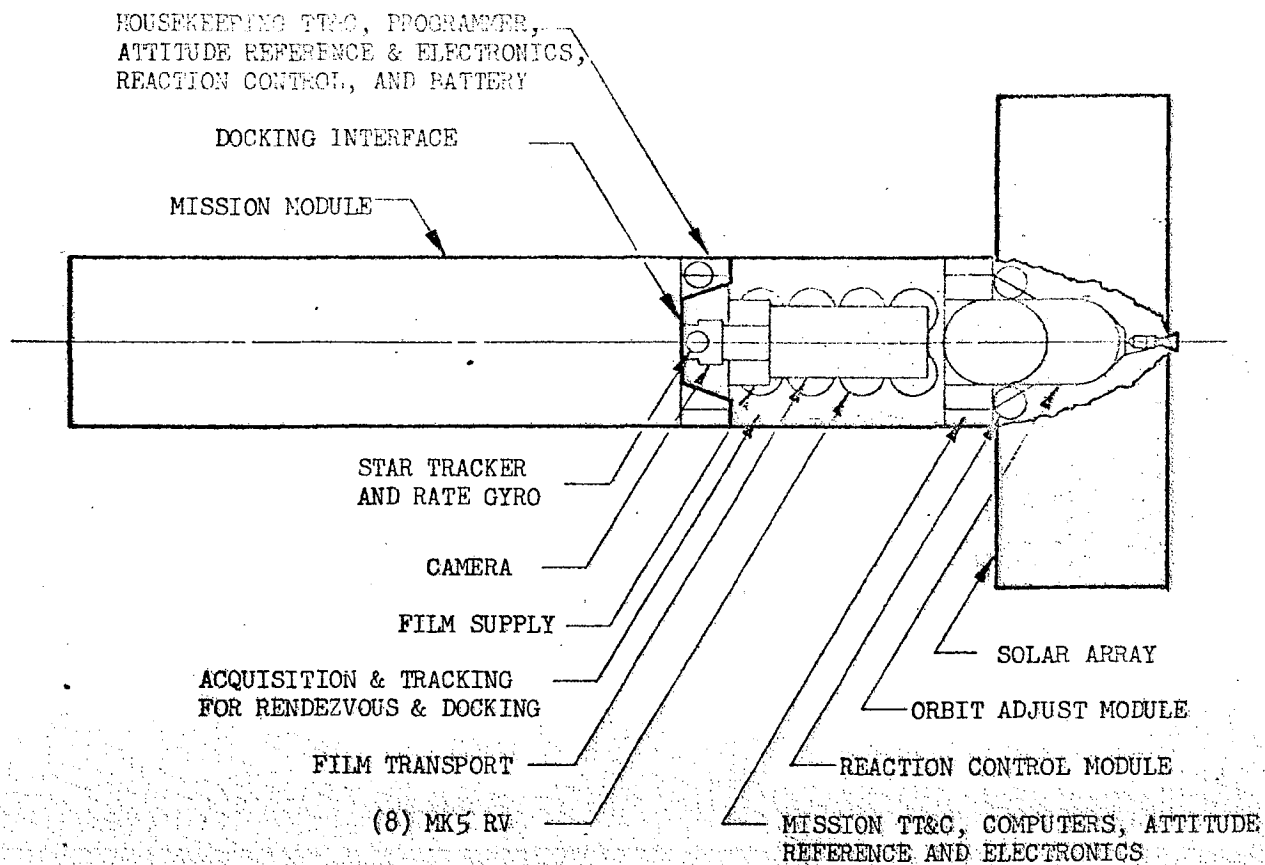
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THIS MODULARIZED RESUPPLY VEHICLE (SHADED), CONTAINING ASCENT EQUIPMENT AND EXPENDABLES FOR UP TO 130 DAYS, IS LAUNCHED BY THE TITID VEHICLE. A SINGLE-AXIS TRACKING SOLAR ARRAY MODULE REPLACES THE FUEL CELL MODULE IN THE INITIAL VEHICLE BECAUSE OF THE LONG ORBIT LIFETIME. THIS VEHICLE ALSO CONTAINS AN ACQUISITION AND TRACKING SYSTEM, CONSISTING OF RADAR AND OPTICS, UTILIZED DURING THE RENDEZVOUS AND DOCKING SEQUENCE. THIS CONFIGURATION MAINTAINS ONLY THE MINIMUM NUMBER OF HOUSEKEEPING FUNCTIONS IN ORBIT, ATTACHED TO THE MISSION MODULE BETWEEN SEPARATION AND RESUPPLY. MOST OF THE MISSION EQUIPMENT, THE COMPLETE CAMERA SYSTEM, AND THE STAR TRACKER AND RATE GYRO ARE RESUPPLIED WITH EACH SUBSEQUENT LAUNCH.

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CONFIGURATION C - RESUPPLY SATELLITE VEHICLE

(TITAN FIELD)

NOT FOR PUBLIC DISSEMINATION

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~~SECRET~~ SPECIAL HANDLING REQUIRED ATTENTION

THE TITAN IIIB IS UTILIZED TO LAUNCH THE RIGHT-HAND (SHADED) PORTION OF THIS SATELLITE VEHICLE AND IT ACHIEVES ITS FINAL ORBIT WITH THE AGENA UPPER STAGE. PROPELLANTS REMAINING IN THE AGENA TANK PROVIDE THE IMPULSE FOR ORBIT ADJUSTMENT AFTER MATING WITH THE MISSION MODULE. A FUEL CELL MODULE AND ONLY TWO RVs ARE PROVIDED WITH THIS RESUPPLY VEHICLE BECAUSE OF THE LIMITED (32 DAYS) ORBITAL LIFETIME AND BOOSTER SYSTEM WEIGHT CAPABILITY LIMITATIONS. OTHERWISE THE ELECTRICAL AND ELECTRONIC COMPONENTS ARE THE SAME AS THOSE INCORPORATED IN THE TTIID-LAUNCHED RESUPPLY VEHICLE.

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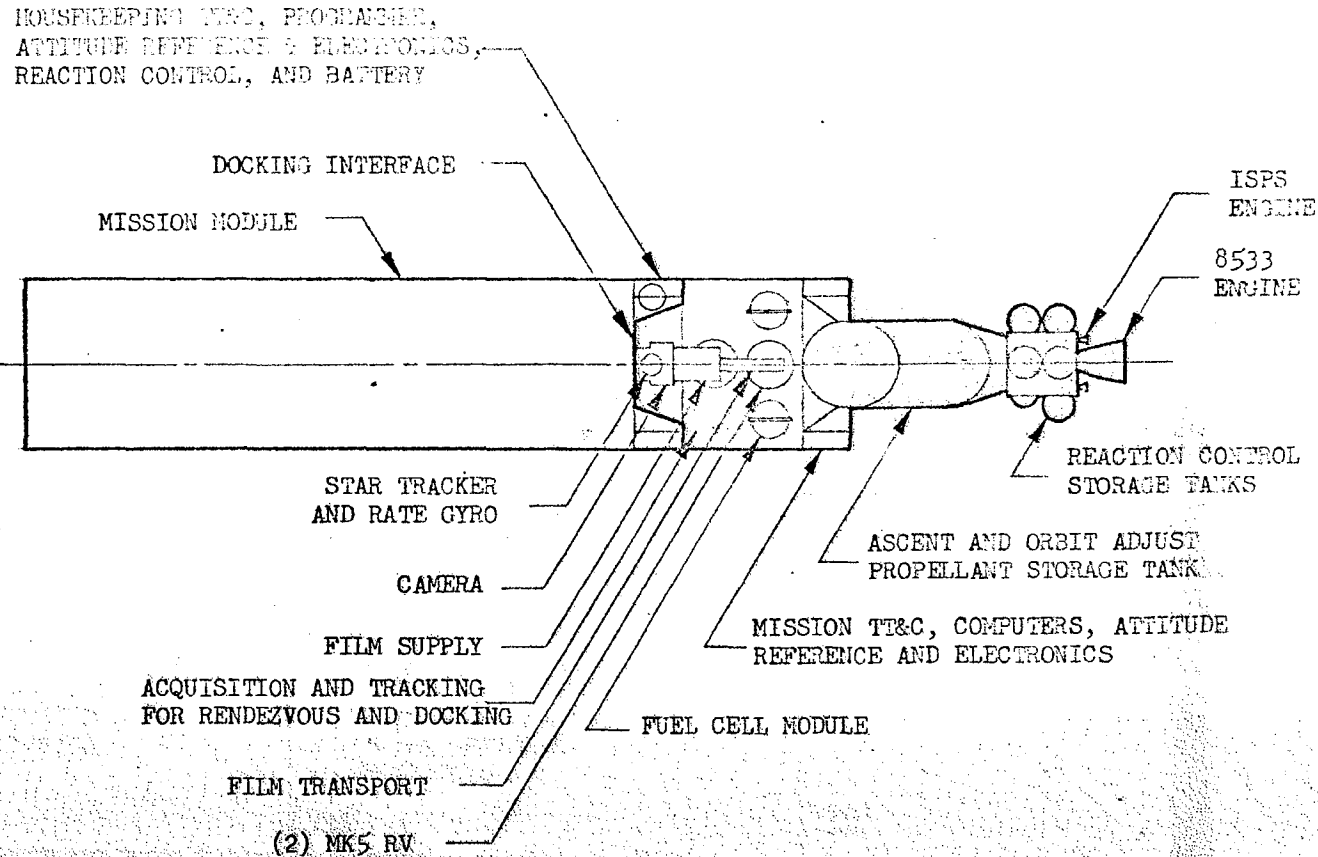
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CONFIGURATION C - ALTERNATE RESUPPLY SATELLITE VEHICLE

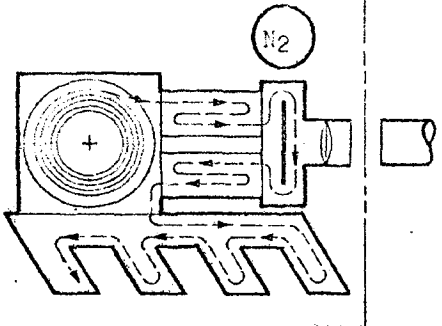
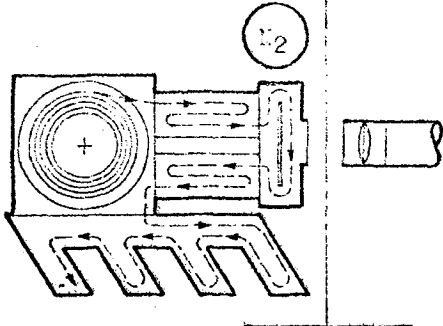
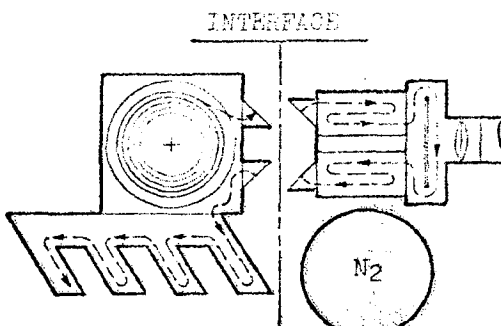
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COMPARISON OF FILM AND CAMERA RESUPPLY CONCEPTS

COMPLETE REPLACEMENT	FILM PACK CONCEPT	PARTIAL REPLACEMENT
 <p style="text-align: center;">INTERFACE</p>	 <p style="text-align: center;">INTERFACE</p>	 <p style="text-align: center;">INTERFACE</p>
<p><u>PRO:</u></p> <ul style="list-style-type: none"> <li>• FILM INSTALLED, SEALED, AND CHECKED OUT BEFORE LAUNCH</li> <li>• SIMPLE INTERFACE</li> <li>• FAILED CAMERA REPLACED WITH NEXT RESUPPLY LAUNCH</li> <li>• SIMPLE TRANSPORT SYSTEM</li> <li>• NO CAMERA REDESIGN</li> </ul> <p><u>CON:</u></p> <ul style="list-style-type: none"> <li>• REQUIRES CAMERA AND ROSS TUBE ALIGNMENT ON ORBIT</li> </ul>	<p><u>PRO:</u></p> <ul style="list-style-type: none"> <li>• FILM INSTALLED, SEALED, AND CHECKED OUT BEFORE LAUNCH</li> <li>• SIMPLE INTERFACE</li> <li>• FAILED CAMERA PARTIALLY REPLACED WITH NEXT RESUPPLY</li> <li>• SIMPLE TRANSPORT SYSTEM</li> <li>• CAMERA OPTICS AND ROSS TUBE PREALIGNED</li> </ul> <p><u>CON:</u></p> <ul style="list-style-type: none"> <li>• REQUIRES CAMERA REDESIGN</li> </ul>	<p><u>PRO:</u></p> <ul style="list-style-type: none"> <li>• ELIMINATES CAMERA REPLACEMENT - MINOR COST ITEM</li> <li>• CAMERA AND ROSS TUBE PRE-ALIGNED BEFORE LAUNCH</li> <li>• NO CAMERA REDESIGN</li> </ul> <p><u>CON:</u></p> <ul style="list-style-type: none"> <li>• REQUIRES SELF-THREADING OR 2 CUT/SPLICE DEVICES</li> <li>• REQUIRES LARGE N<sub>2</sub> SUPPLY OR GAS TRANSFER AT MATE</li> <li>• REPLACEMENT OF FAILED CAMERA REQUIRES NEW MM</li> </ul>

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THIS CHART PRESENTS A POST-DORIAN CONCEPT REPRESENTED BY  
A CONCENTRIC CASSEGRAIN STEREO SYSTEM (F/6). THE INITIAL  
LAUNCH VEHICLE IS CONSIDERED TO BE A TITAN OR SATURN BOOSTER.

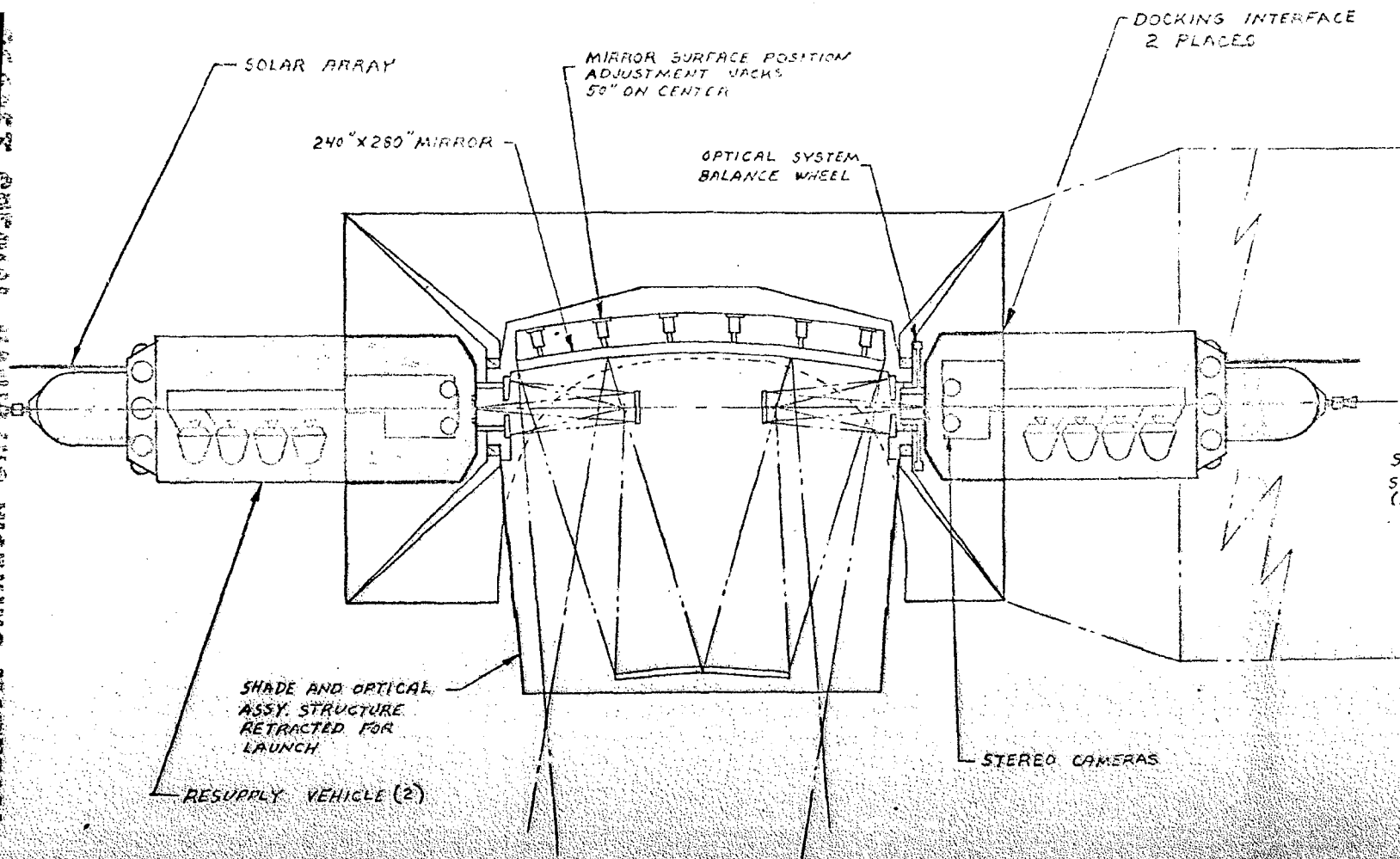
THE P-66 RESUPPLY CONCEPT CAN BE APPLIED WITH VERY LITTLE MODI-  
FICATION TO THE POST-DORIAN SYSTEM AS SHOWN IN THE SHADED AREAS.

THE RESUPPLY VEHICLE WILL BE LAUNCHED FROM THE TITAN IIID BOOSTER.

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POST DORIAN SYSTEM

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THE COST COMPARISONS PRESENTED ARE BASED ON THE FOLLOWING ASSUMPTIONS: (MILLIONS OF DOLLARS)

	P-66	MOL	RESUPPLY CONFIGURATIONS					
			A		B		C	
			L(1)	R(2)	L	R	L	R
BOOSTER	\$15.0	\$ 17.0	\$15.0	\$15.0	\$15.0	\$15.0	\$15.0	\$15.0
MISSION MODULE	35.0	35.0	35.0		35.0		35.0	
MISSION SUPPORT/ CONTROL MODULES	12.0	50.0	12.0	13.4	12.0	14.3	12.3	18.3
	\$62.0	\$102.0	\$62.0	\$28.4	\$62.0	\$29.3	\$62.3	\$33.3

FOR P-66 AND MOL, SIX LAUNCHES PER YEAR OF 30 DAY LIFE VEHICLE WERE ASSUMED. FOR P-66 RESUPPLY, AN INITIAL LAUNCH FOLLOWED BY THREE 130-140 DAY RESUPPLY VEHICLES WAS USED.

THE PRESENT STUDY INDICATES THAT THE COST VARIATIONS BETWEEN THREE TECHNICALLY FEASIBLE RESUPPLY CONCEPTS ARE RELATIVELY MINOR. THE CHOICE BETWEEN THESE APPROACHES WOULD BE BASED ON SIMPLICITY OF INTERFACES AND RELIABILITY OVER THE REQUIRED OPERATING LIFE.

- NOTE (1) INITIAL LAUNCH
- (2) RESUPPLY LAUNCH

ROM ANNUAL RECURRING HARDWARE COST

<u>SYSTEM</u>	<u>ANNUAL COST</u>	<u>SAVINGS VS. MOL</u>
MOL	\$612,000,000	-
P-66	\$378,000,000	\$234,000,000
P-66 RESUPPLY		
CONFIGURATION A	\$146,000,000	\$466,000,000
CONFIGURATION B	\$149,000,000	\$463,000,000
CONFIGURATION C	\$162,000,000	\$450,000,000

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ROM ANNUAL RECURRING HARDWARE COST

(WITH EXPECTED RELIABILITY)

THE EXPECTED LIFE OF SYSTEMS INFLUENCES ANNUAL HARDWARE COST. BASED ON THE MISSION MODULE RELIABILITY ASSIGNMENT FURNISHED TO LOCKHEED IN CONNECTION WITH THE P-66 STUDY, IT APPEARS THAT TWO MISSION MODULE LAUNCHES PER YEAR WOULD BE REQUIRED. THIS FACTOR INCREASES THE COST OF RESUPPLY ABOUT \$30,000,000 PER YEAR.

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ROM ANNUAL RECURRING HARDWARE COST  
(WITH EXPECTED RELIABILITY)

SYSTEM	ANNUAL COST	SAVINGS VS. MOL
MOL	\$673,000,000	-
P-66	\$426,000,000	\$247,000,000
P-66 RESUPPLY (CONFIGURATION C)	\$191,000,000	\$482,000,000

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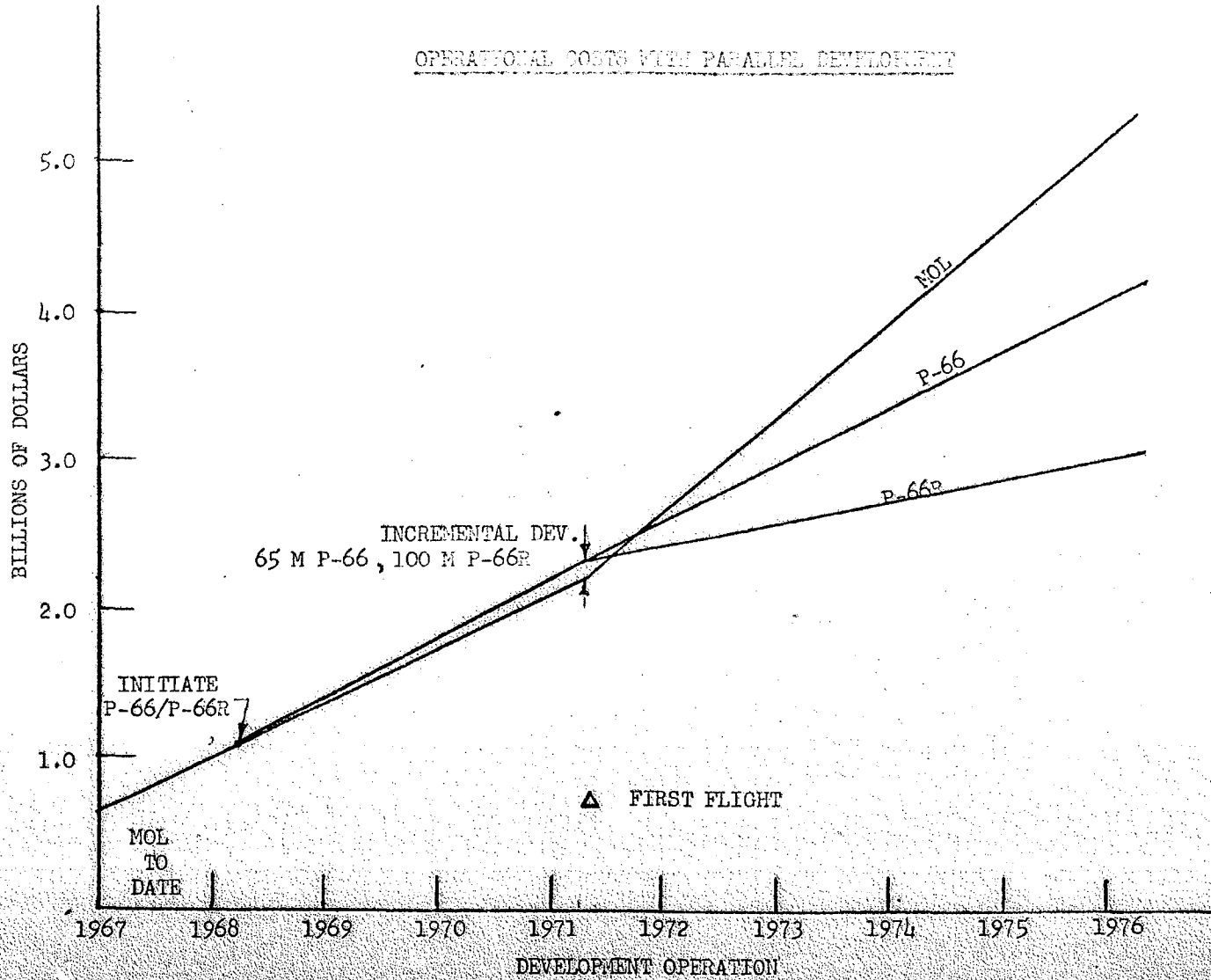
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- o THE CHART ILLUSTRATES THE COST OF DEVELOPING P-66 AND P-66 RESUPPLY CONCURRENTLY WITH THE MOL/DORIAN PROGRAM. IT ALSO COMPARES THE OPERATIONAL COST OF MOL/DORIAN VS. THE P-66 AND P-66 RESUPPLY SYSTEMS.
- o PARALLEL DEVELOPMENT OF P-66 CAN BE ACCOMPLISHED WITH COMPARATIVELY SMALL INCREASE IN PROGRAM COST.
- o IF THE P-66 OR P-66R SYSTEMS ARE THEN EMPLOYED FOR DORIAN OPERATIONS, SAVINGS OF \$1.2 BILLION (P-66) AND \$2.3 BILLION (P-66R) CAN BE ACHIEVED AFTER 5 YEARS OF OPERATION

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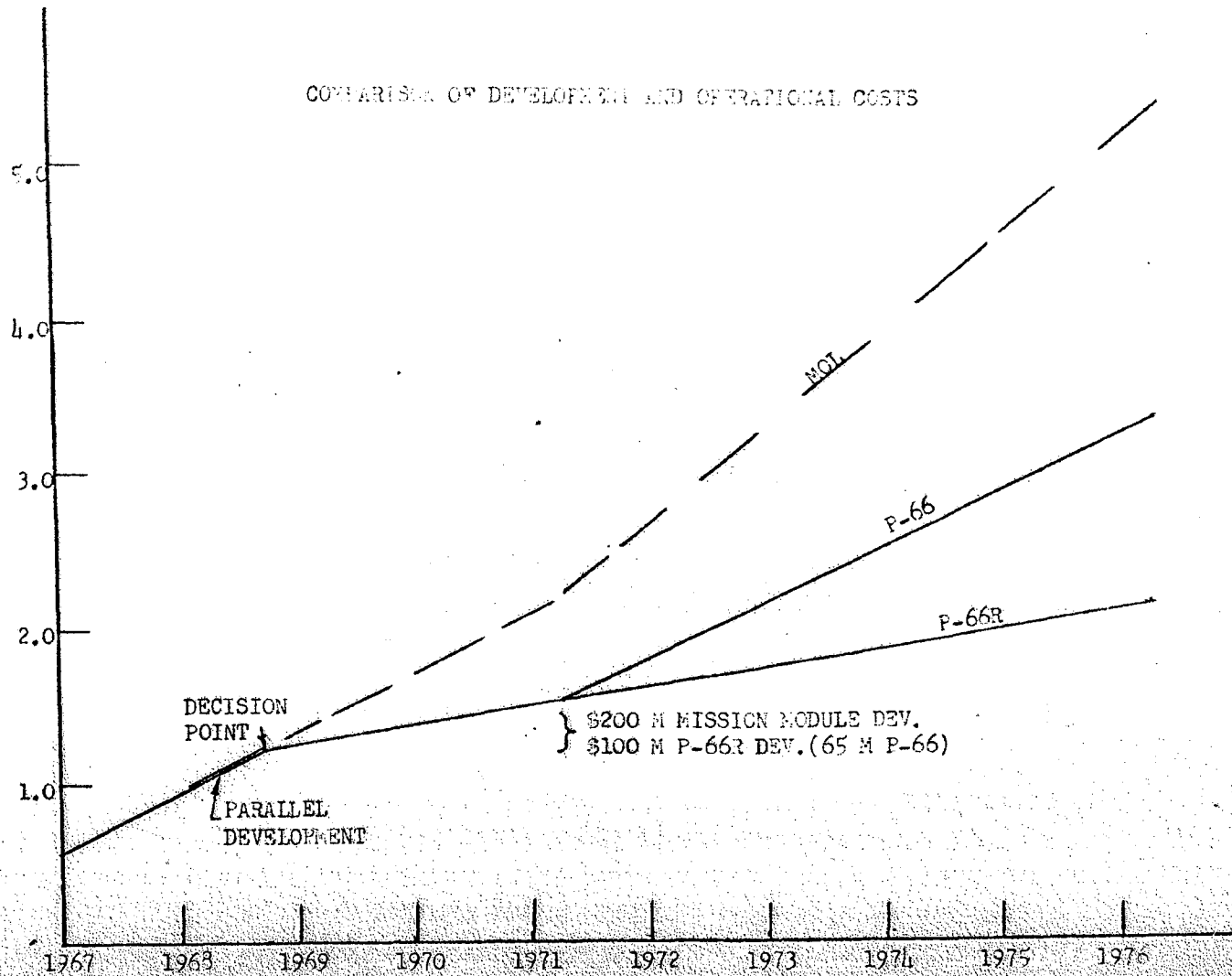
- o THIS CHART ILLUSTRATES THE COST SAVINGS ACHIEVABLE WITH AN EARLIER UNMANNED DURING DECISION. A TYPICAL DECISION POINT IS ILLUSTRATED.
- o BY MOVING THE DECISION POINT FROM THE FIRST LAUNCH DATE TO 1969 THE SAVINGS CAN BE INCREASED TO 2 BILLION (P-66) OR 3 BILLION (P-66R) AFTER 5 YEARS OF OPERATION.

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SUMMARY

- o PRELIMINARY STUDIES HAVE SHOWN THREE TECHNICALLY FEASIBLE CONCEPTS FOR UNMANNED DORIAN RESUPPLY.
- o BOTH THE LMSC P-66/P-66 RESUPPLY CONCEPTS CAN PROVIDE DORIAN OPERATIONAL CAPABILITY EARLIER THAN MOL.
- o DEVELOPMENT SAVINGS WOULD EXCEED \$1,000,000,000 AND ANNUAL OPERATIONAL SAVINGS WOULD RUN \$200,000,000 - \$500,000,000 LESS THAN MOL.
- o NO NEW TITAN BOOSTERS ARE REQUIRED FOR THE UNMANNED APPROACHES.
- o DEVELOPMENT OF P-66/P-66 RESUPPLY WOULD MAKE LARGE AMOUNT OF DEVELOPMENT FUNDS AVAILABLE FOR POST DORIAN SYSTEMS.
- o P-66 RESUPPLY DEVELOPMENT LAYS FOUNDATION FOR POST-DORIAN SYSTEMS DESIGN/OPERATION.

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ROSS TUBE

CAMERA

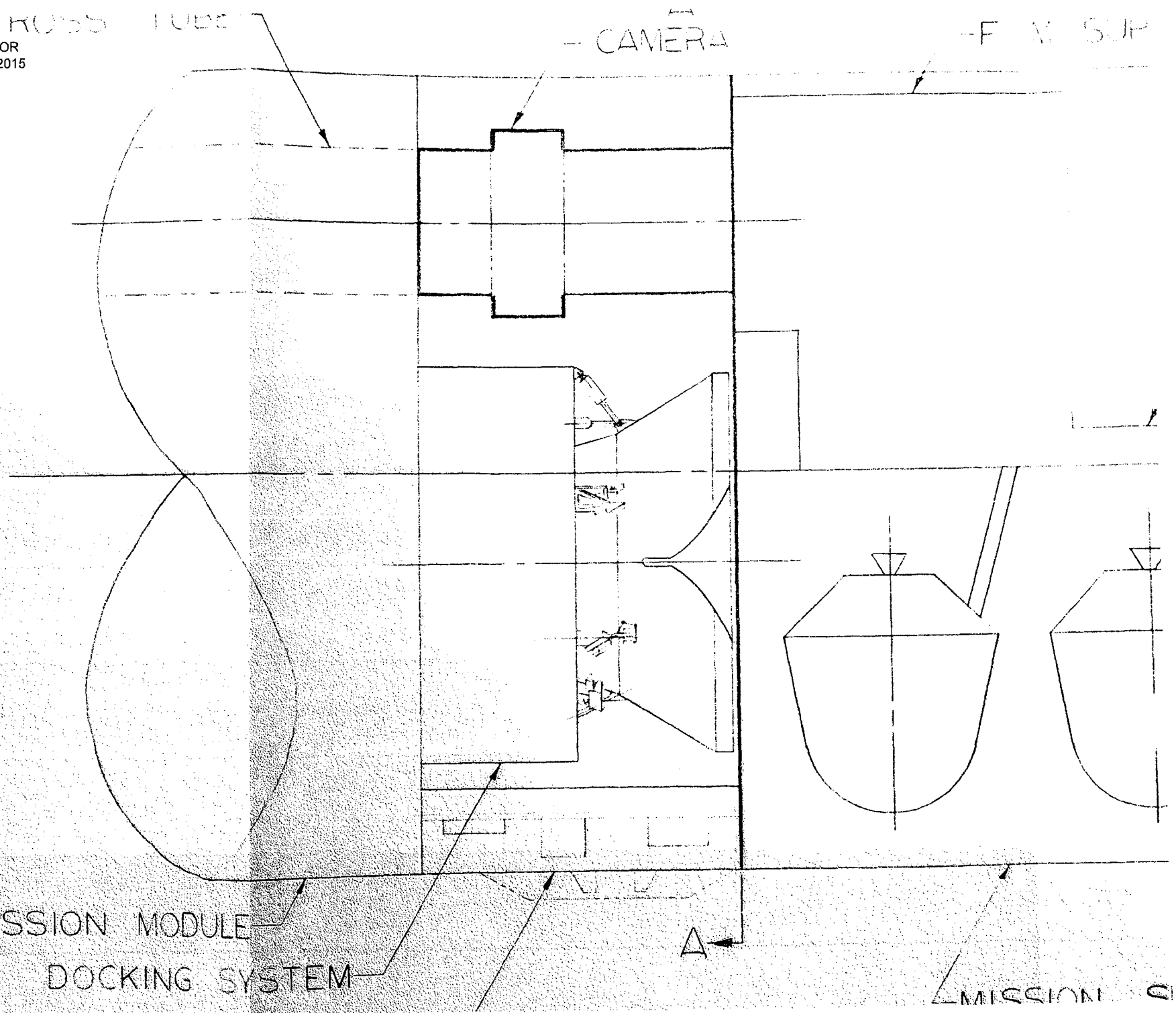
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MISSION MODULE

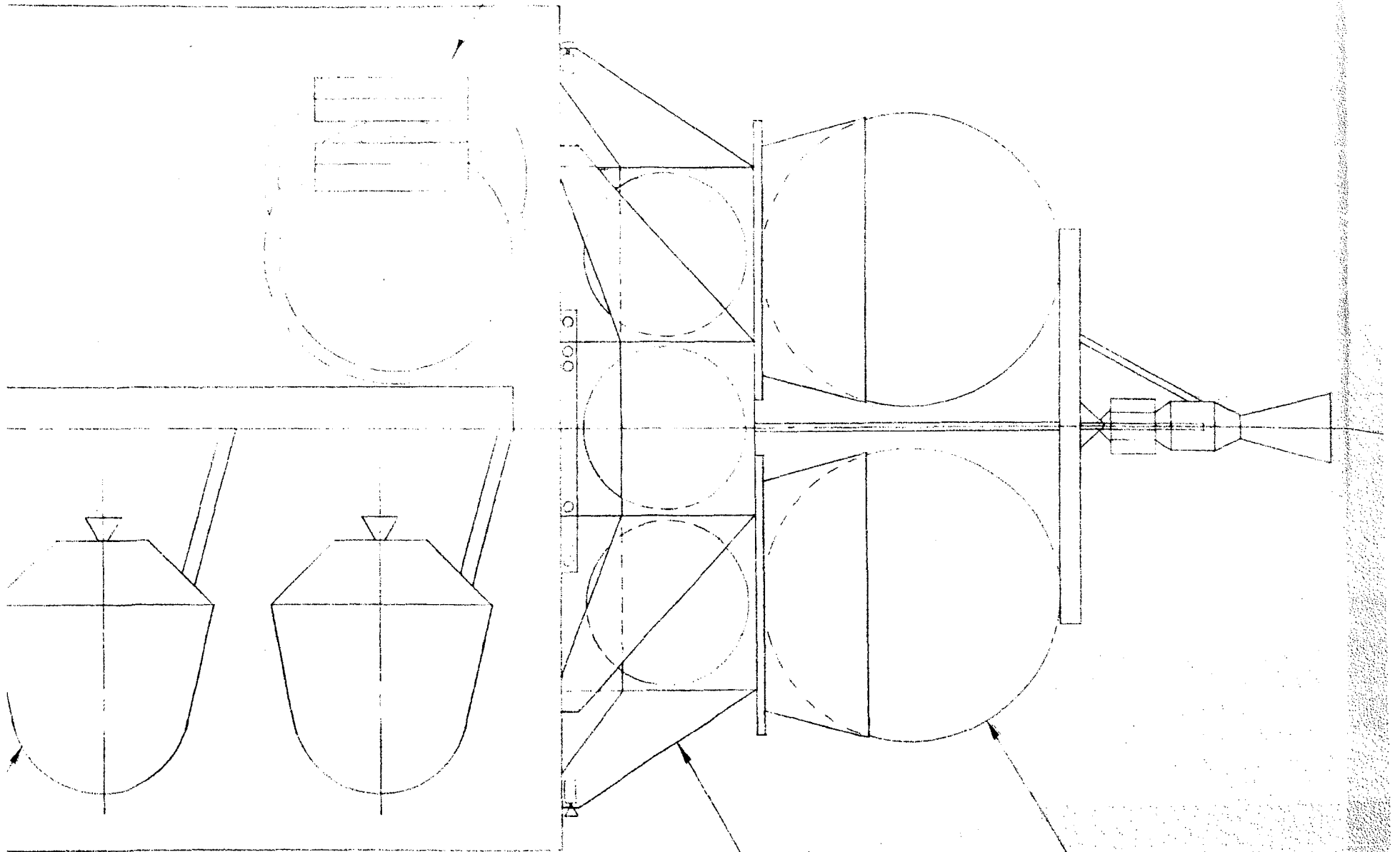
DOCKING SYSTEM

A

MISSION C



# TRANSPORT -- FUEL CELL MODULE



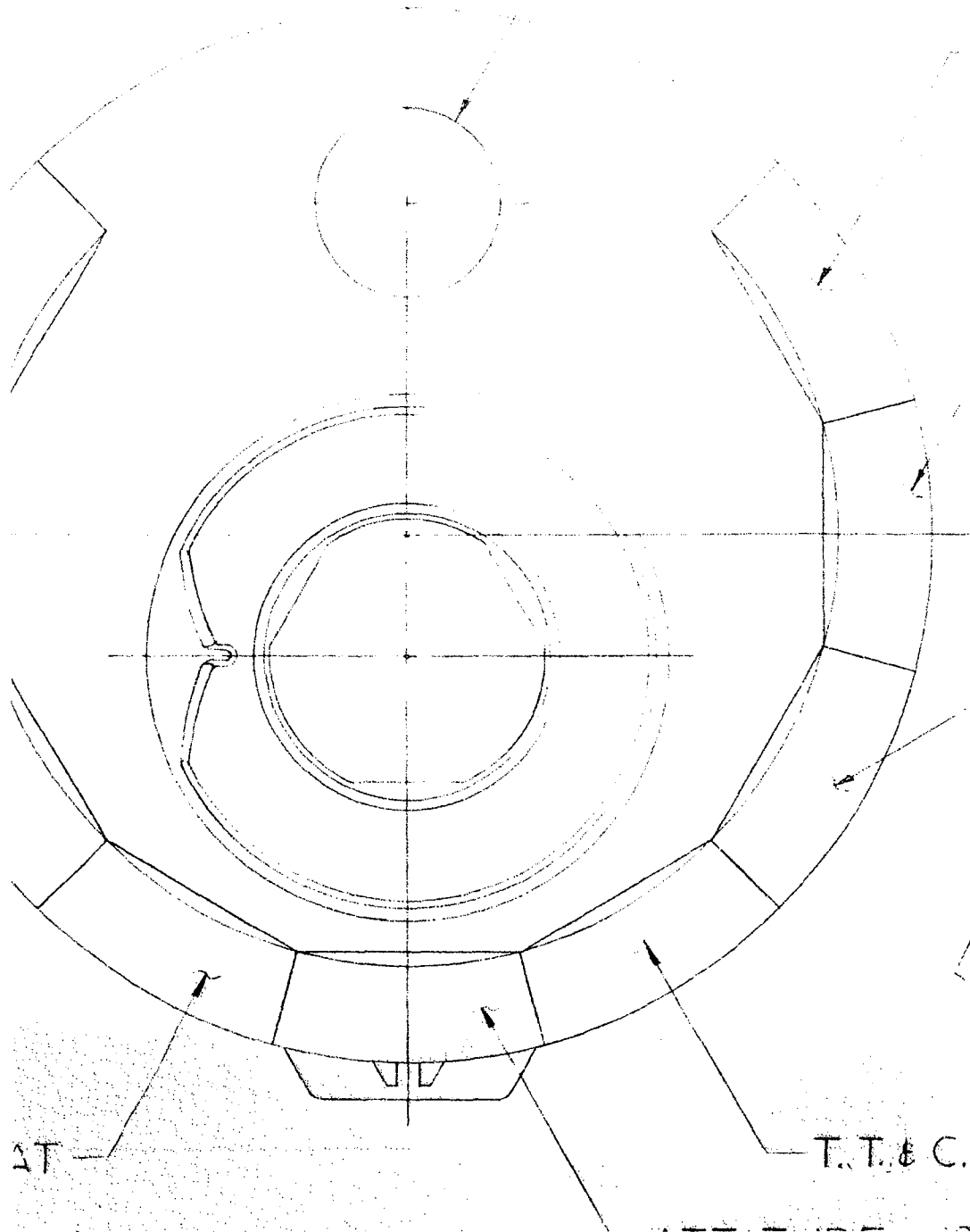
MK 5 RV

ORBIT ADJUSTER



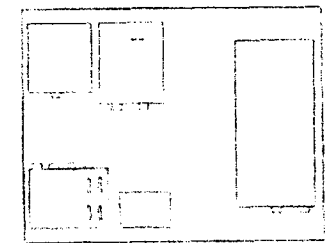


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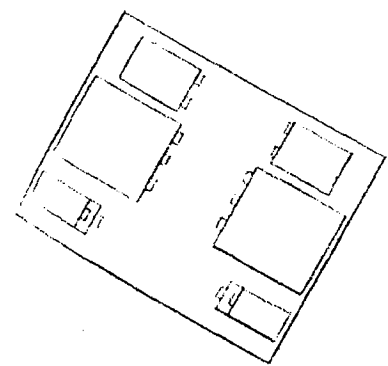


MISSION EQUIP. MODULE

-BACK JP TELEMETRY  
MODULE



COMPUTER SYSTEM MODULE



T.T. & C. MODULE

AT

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GUIDE MODULE

TELEMETRY  
MODULE



SYSTEM MODULE

7

SATELLITE VEHICLE EQUIPMENT ARRANGEMENT  
CONFIGURATION B - INITIAL LAUNCH