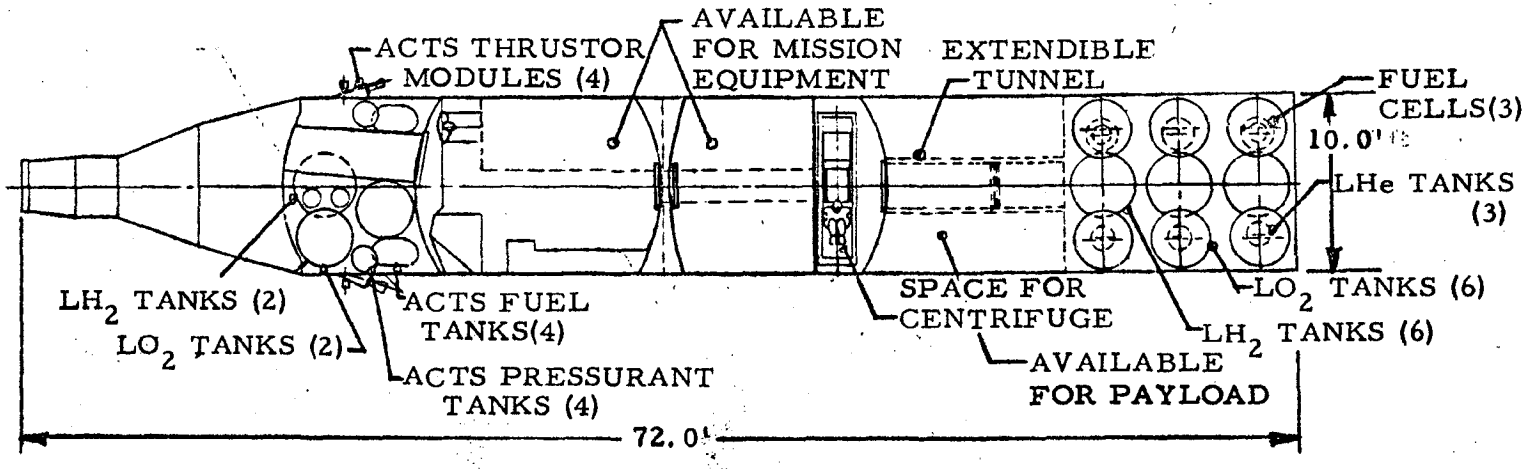
POSSIBLE UTILIZATION OF MOL HARDWARE FOR LONG DURATION BIOASTRONAUTICS TEST MISSIONS

ETR

INTEGRAL LAUNCH DUAL COMPARTMENT LABORATORY

(CONFIGURATION AND PERFORMANCE)

- CONFIGURATION



- PERFORMANCE

TOTAL PRESSURIZED VOLUME (SHIRT SLEEVE ENVIRONMENT)		2,000 FT^3
AVAILABLE PRESSURIZED VOLUME FOR CREW		1,200 FT^3
AVAILABLE PRESSURIZED VOLUME FOR EXPERIMENT EQUIPMENT		600 FT^3
AVAILABLE UNPRESSURIZED VOLUME FOR EXPERIMENT EQUIPMENT		~ 700 FT^3
EXPERIMENT PAYLOAD CAPACITY	(ETR, i = 28.5°, 180 N M CIR)	~5,500 LB
	(WTR, i = 80°, 180 N M CIR)	~1,000 LB
ELECTRICAL POWER (AVERAGE)		1,650 WATTS*
MISSION DURATION		90 DAYS

*INCLUDES 200 WATTS FOR EXPERIMENTS

APPROACH TO INTEGRAL LAUNCH EXTENDED DURATION

	30 DAY MOL BASELINE (80/180 N MI ORBIT, i=80°)	90 DAY EXTENDED DURATION VEHICLE* (180 N MI CIR. ORBIT, i=80°)
● PROPULSION		
PROPELLANTS	2,000 LBS	1,450 LBS
TANKAGE	4 FUEL + 4 OXID.	4 FUEL + 4 OXID.
● PRIME POWER	3 FUEL CELLS	6 FUEL CELLS
	1,650 WATTS	1,650 WATTS
● CRYOGENICS		
FLUID (LO_2, LH_2, LH_e)	1,330 LBS	5,320 LBS
TANKAGE	2 LO_2 + 2 LH_2 + 1 H_e	8 LO_2 + 8 LH_2 + 4 H_e
● PERSONNEL PROVISIONS		
FOOD & PERSONAL GEAR	148 LBS	445 LBS
● SUBSYSTEM SPARES	160 LBS	410 LBS

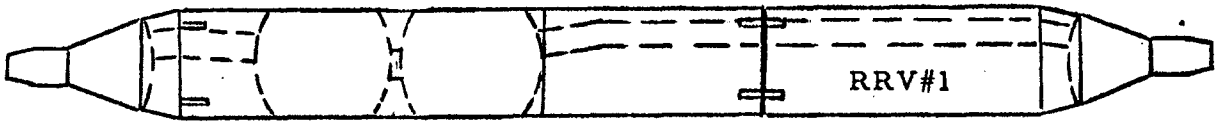
*DUAL COMPARTMENT LABORATORY

MISSION DURATIONS EXCEEDING 90 DAYS

(RENDEZVOUS)

4 MAN DUAL COMPARTMENT LABORATORY

- INITIAL LAUNCH CONFIGURATION (2 MAN OPS)



- FIRST RENDEZVOUS RESUPPLY (4 MAN OPS)

- ON-ORBIT CONFIGURATION (4 MAN OPS)

RRV FUNCTIONS

- ACTS PROPULSION
- PRIME ELECTRICAL POWER
- LIFE SUPPORT EXPENDABLES
- EXPERIMENTS
- SPARE EQUIPMENT

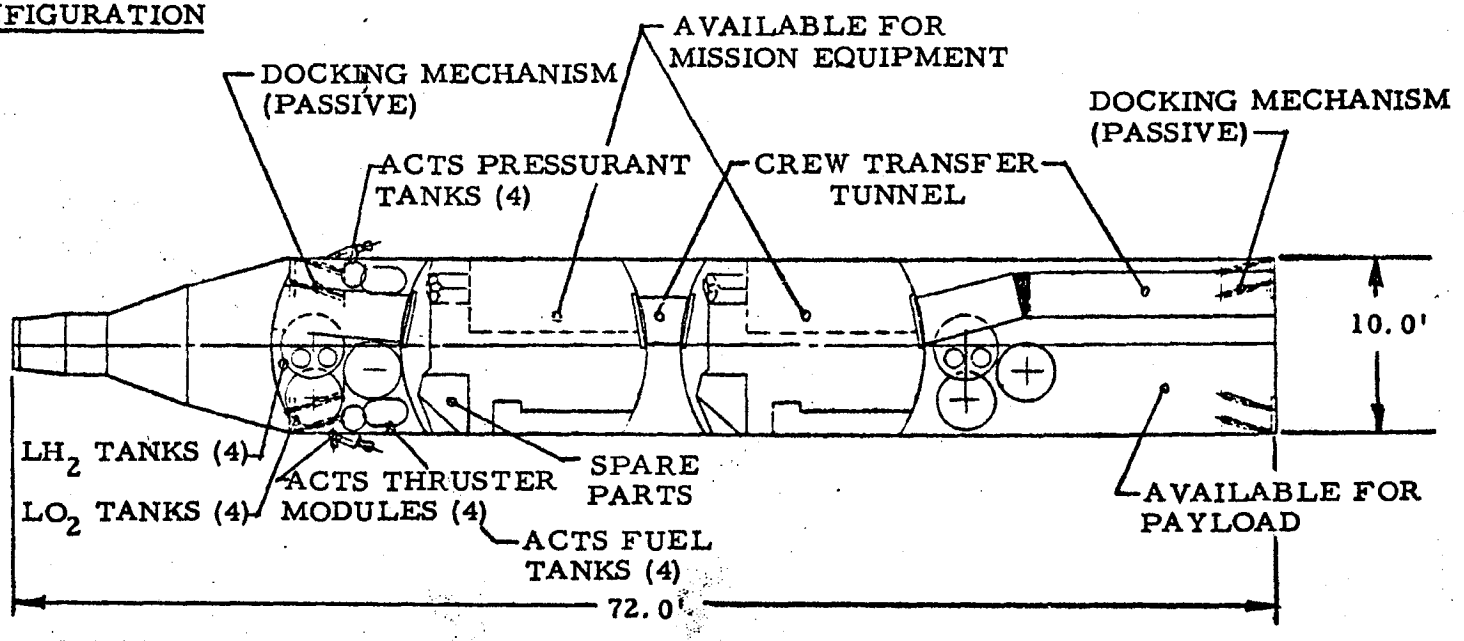
LABORATORY FUNCTIONS

- LIFE SUPPORT/ENVIRONMENTAL CONTROL
- ACTS - REFERENCE
- COMMUNICATIONS/DATA
- BIO-MEDICAL EQUIPMENT
- EXPERIMENTS

4 MAN DUAL COMPARTMENT LABORATORY

(CONFIGURATION AND PERFORMANCE)

- CONFIGURATION



- PERFORMANCE

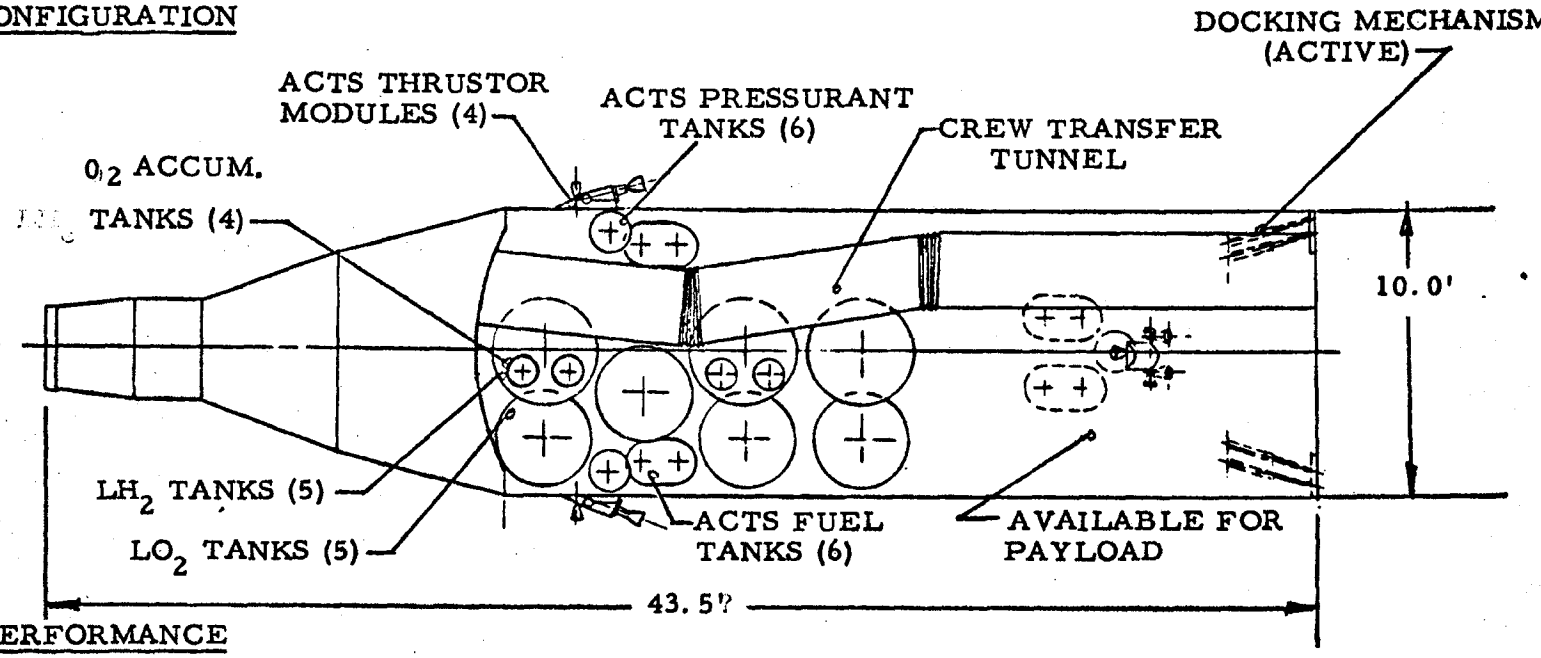
TOTAL PRESSURIZED VOLUME (SHIRT SLEEVE ENVIRONMENT)	2,000 FT^3
AVAILABLE PRESSURIZED VOLUME FOR CREW	1,200 FT^3
AVAILABLE PRESSURIZED VOLUME FOR EXPERIMENT EQUIPMENT	600 FT^3
AVAILABLE UNPRESSURIZED VOLUME FOR EXPERIMENT EQUIPMENT	950 FT^3
EXPERIMENT PAYLOAD CAPACITY (WTR, i = 80°, 180 N M CIR)	5,700 LBS
ELECTRICAL POWER (AVERAGE)	2,000 WATTS*
RESUPPLY CYCLE	60 DAYS

* 200 WATTS AVAILABLE FOR EXPERIMENTS

RENDEZVOUS RESUPPLY VEHICLE

(CONFIGURATION AND PERFORMANCE)

o CONFIGURATION



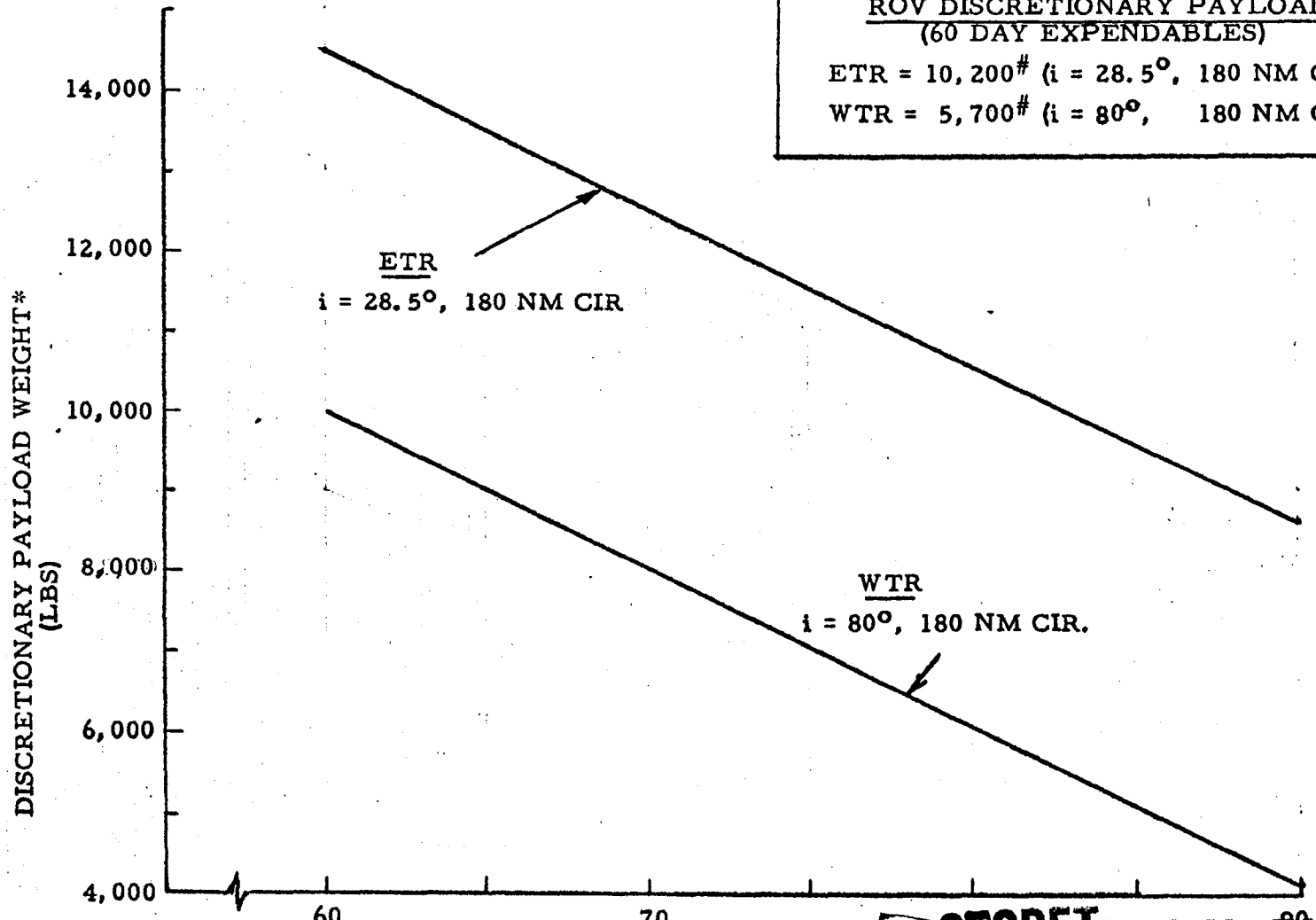
o PERFORMANCE

UNPRESSURIZED VOLUME FOR EXPERIMENT EQUIPMENT	2,000 FT^3
EXPERIMENT PAYLOAD CAPACITY (WTR, i = 80°, 180 N M CIR)	10,000 LBS
ELECTRICAL POWER (AVERAGE)	2,000 WATTS*
RESUPPLY CYCLE (TO SUPPLY 4 MAN CREW)	60 DAYS

*200 WATTS AVAILABLE FOR EXPERIMENTS

RESUPPLY VEHICLE DISCRETIONARY PAYLOAD

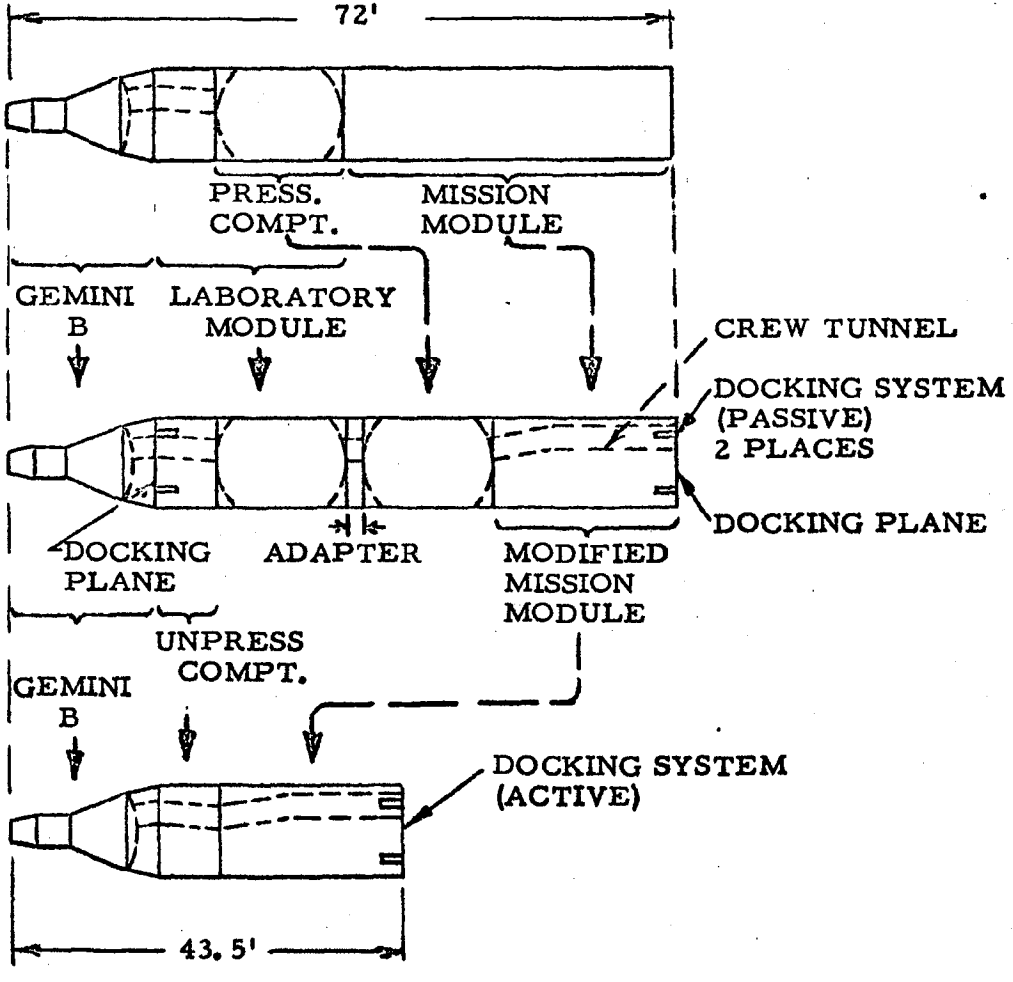
ROV DISCRETIONARY PAYLOAD
(60 DAY EXPENDABLES)
ETR = 10,200# (i = 28.5°, 180 NM CIR)
WTR = 5,700# (i = 80°, 180 NM CIR)



*DISCRETIONARY PAYLOAD = BOOSTER CAPABILITY LESS WEIGHT OF LOADED RRV

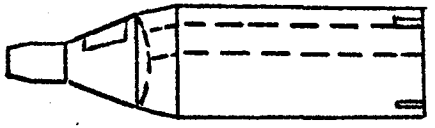
UTILIZATION OF MOL HARDWARE FOR 4 MAN DUAL COMPARTMENT LABORATORY CONFIGURATION

- MOL BASELINE VEHICLE
- RENDEZVOUS INITIAL VEHICLE (RIV)
- RENDEZVOUS RESUPPLY VEHICLE (RRV)

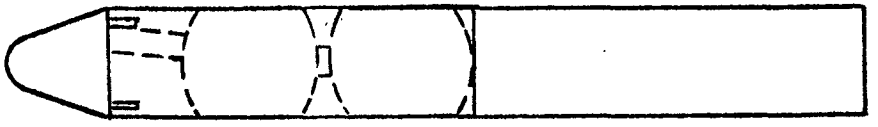


2 MAN DUAL COMPARTMENT LABORATORY CONFIGURATION

(COMBINED MISSION)

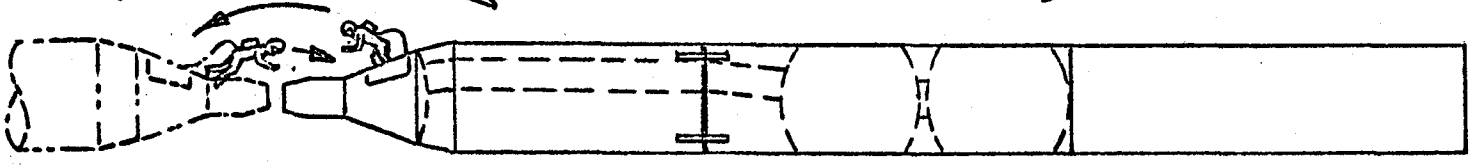


RENDEZVOUS
RESUPPLY VEHICLE
(RRV)



INITIAL LAUNCH RENDEZVOUS
LABORATORY VEHICLE (RIV)

POSSIBLE CREW
TRANSFER FROM
SUBSEQUENT RRV'S



RENDEZVOUS ORBITING VEHICLE
(ROV)

RRV FUNCTIONS

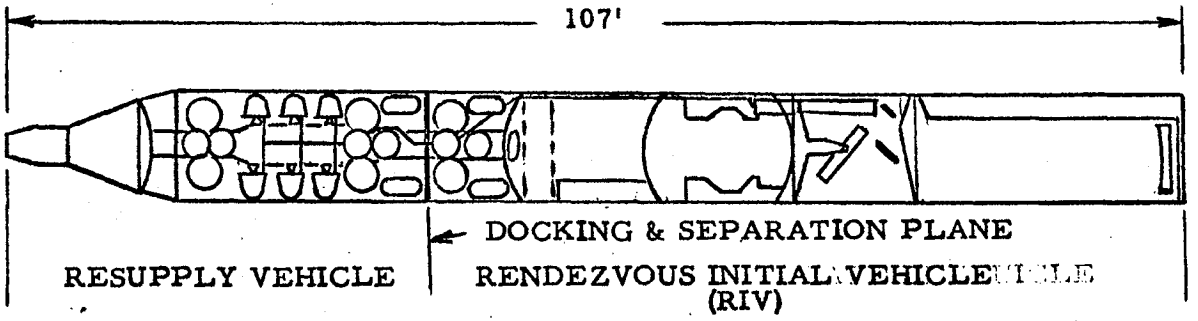
- CREW TRANSPORT VEHICLE
- ACTS PROPULSION
- PRIME POWER
- LIFE SUPPORT EXPENDABLES
- DATA RETURN SYSTEM
- SUBSYSTEM SPARES/REPLACEMENTS

R.I.V FUNCTIONS

- LIFE SUPPORT SYSTEM
- ATTITUDE CONTROL REF. ELECTRONICS
- COMMUNICATIONS AND DATA HANDLING
- ENVIRONMENTAL CONTROL
- PERFORMANCE DATA

2 MAN DUAL COMPARTMENT LABORATORY
CONFIGURATION AND PERFORMANCE SUMMARY
(COMBINED MISSION)

- CONFIGURATION

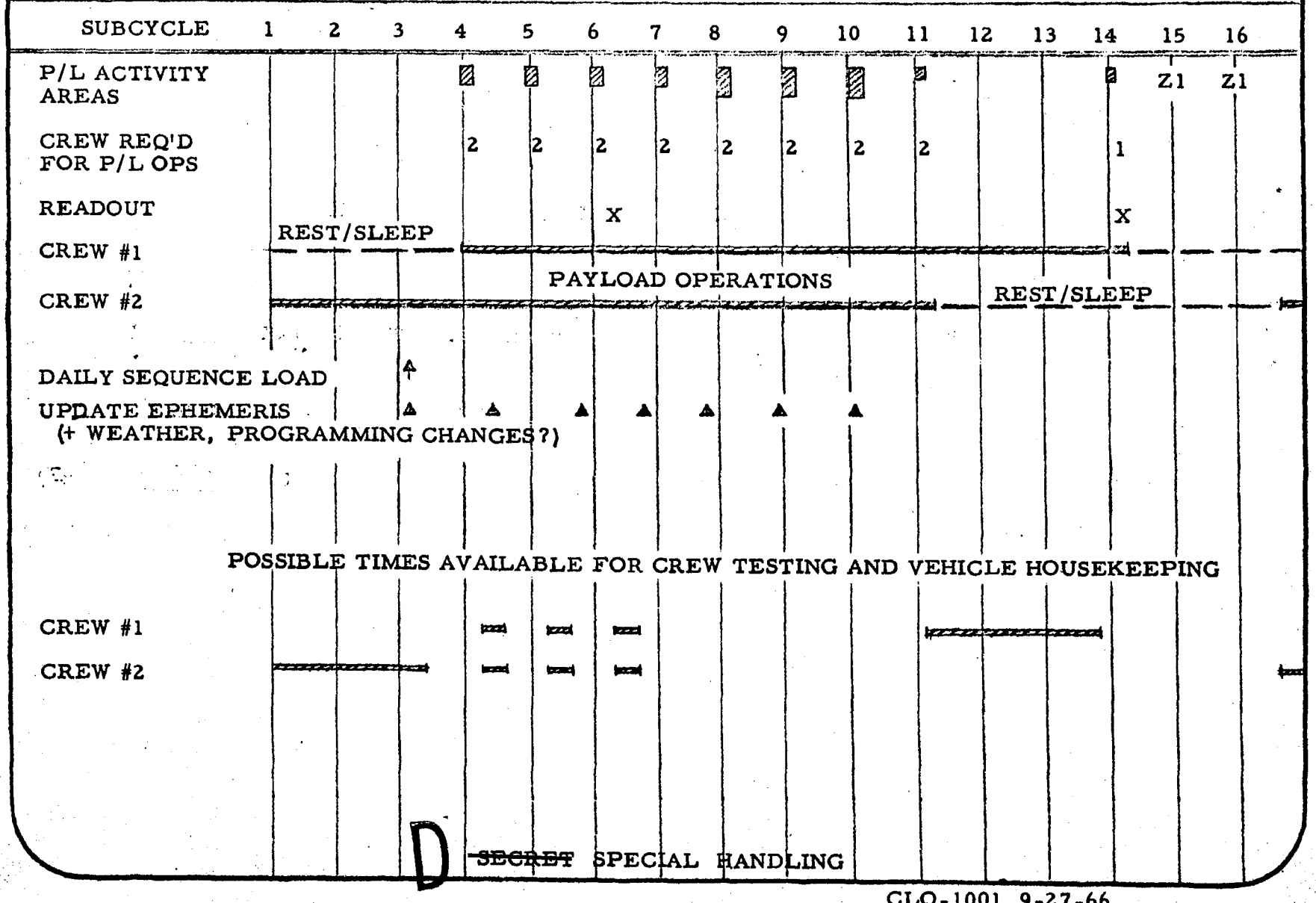


- PERFORMANCE DATA

TOTAL PRESSURIZED VOLUME (SHIRT SLEEVE ENVIRONMENT)	2,060 FT^3
AVAILABLE PRESSURIZED VOLUME FOR CREW	1,200 FT^3
AVAILABLE PRESSURIZED VOLUME FOR EXPERIMENT EQUIPMENT	210 FT^3
R.L.V. EXP. PAYLOAD CAPACITY (i = 96.4°, 80/180 NM)	3,000 LBS
ELECTRICAL POWER (AVERAGE)	1,950 WATTS
RESUPPLY CYCLE	60 DAYS

COMBINED MISSION OPERATIONS

TYPICAL WORKCYCLE FOR A NORMAL DAY



POTENTIAL BIOASTRONAUTICS TEST PROGRAMS

4 MAN - DUAL COMPARTMENT LAB

LAUNCH	DURATION (MONTHS)	ON-ORBIT	TEST DATA
1 & 2	2	2, 2, 2, 0	2
3	4	4, 4, 0, 2	4
4	6	6, 0, 2, 4	6
5	8	8, 2, 4, 6	-
6	10	10, 4, 6, 8	-
7	12	12, 6, 8, 10	12, 6, 8, 10

TEST DATA TOTALS

1 MAN X 2 MO.
1 MAN X 4 MO.
2 MEN X 6 MO.
1 MAN X 8 MO.
1 MAN X 10 MO.
1 MAN X 12 MO.

2 MAN - DUAL COMPARTMENT LAB

LAUNCH	DURATION (MONTHS)	ON-ORBIT	TEST DATA
1 & 2	2	2, 0	2
3	4	0, 2	4
4	6	0, 4	2
5	8	2, 0	6
6	10	4, 0	2
7	12	6, 2	-
8 & 9	14	0, 2	8
10	16	0, 4	2
11	18	2, 6	-
12	20	0, 10	4
13	22	2, 12	2, 12

TEST DATA TOTALS

5 MEN X 2 MO.
2 MEN X 4 MO.
1 MAN X 6 MO.
1 MAN X 8 MO.
1 MAN X 12 MO.

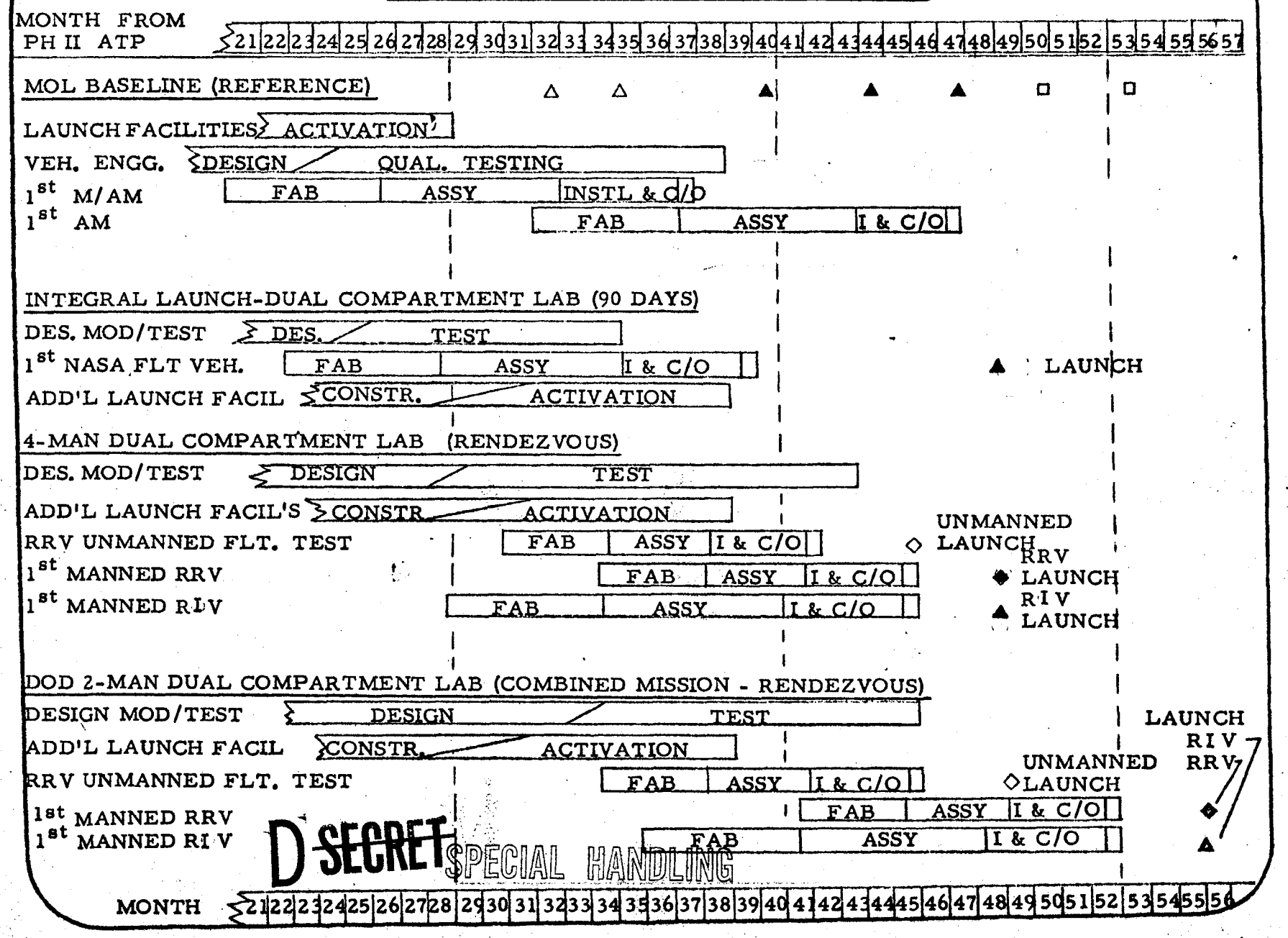
COST RANGE SUMMARY - WTR
INCREMENTS ABOVE MOL BASELINE*

PROGRAM	NONRECURRING COST, M$	RECURRING COST, M$	TOTAL** COST, M$
• 60 TO 90 DAY BIOASTRONAUTICS TESTING			
• 2 MAN - DUAL COMPARTMENT LAB (INTEGRAL LAUNCH)	285	332	562
• 1 YEAR BIOASTRONAUTICS TESTING			
• 1 YEAR PROGRAM 4 MAN - DUAL COMPARTMENT LAB (INTEGRAL LAUNCH)	515	466	981
• 2 YEAR COMBINED MISSION PROGRAM 2 MAN - DUAL COMPARTMENT LAB (RENDEZVOUS)	299	97	396

* 2 MANNED AND 3 UNMANNED LAUNCHES PER YEAR ASSUMED FOR BASELINE FOLLOW-ON PROGRAM

** NOT INCLUDING NASA PAYLOAD ELEMENTS

AVAILABILITY OF ALTERNATE SYSTEMS-WTR

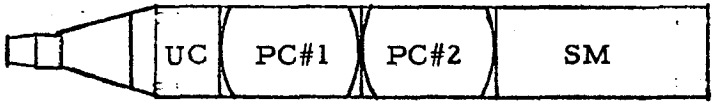


CONCLUSION

- TEST DURATIONS UP TO 90 DAYS APPEAR POSSIBLE WITH MOL INTEGRALLAUNCH APPROACH
- MOL RENDEZVOUS APPROACHES PROVIDE FLEXIBILITY FOR LONGER DURATION TESTING
- COMBINED MISSION APPROACH APPEARS PROMISING BASED ON PRELIMINARY ANALYSIS

2 MAN DUAL COMPARTMENT VEHICLE WEIGHT SUMMARY

(90 DAY BIO-TEST MISSION)



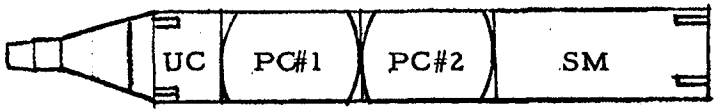
O	GEMINI B + CREW AND EQUIPMENT		6,500 LBS
O	LABORATORY (DRY		17,180
	UNPRESSURIZED COMPARTMENT	3,240	
	PRESSURIZED COMPARTMENT #1	4,660	
	PRESSURIZED COMPARTMENT #2	2,170	
	SERVICE MODULE	4,550	
	WEIGHT MARGIN	2,560	
O	RESIDUALS		400
O	EXPENDABLES		7,220
	PROPELLANT	1,450	
	CRYOGENICS	5,320	
	PERSONNEL PROVISIONS	450	
O	TOTAL VEHICLE WEIGHT		31,300 LBS

(T-III M, i = 80°, 180 NMC ~ 32.6 K) DPL ~ 1.3 K

4 MAN DUAL COMPARTMENT RENDEZVOUS INITIAL VEHICLE

WEIGHT SUMMARY

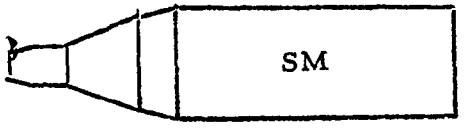
(1 YEAR BIO-TEST MISSION - 60 DAY RESUPPLY)



O	GEMINI B + CREW AND EQUIPMENT		6,500
O	LABORATORY (DRY)		15,820
	UNPRESSURIZED COMPARTMENT	2,940	
	PRESSURIZED COMPARTMENT #1	4,720	
	PRESSURIZED COMPARTMENT #2	2,300	
	SERVICE MODULE	2,680	
	DOCKING SYSTEM	500	
	WEIGHT MARGIN	2,680	
O	RESIDUALS		360
O	EXPENDABLES		3,920
	PROPELLANT	1,000	
	CRYOGENICS	2,620	
	PERSONNEL PROVISIONS (2 MEN, 60 DAY INITIAL LAUNCH REQ.)	300	
O	TOTAL VEHICLE WEIGHT		26,600 LBS

RENDEZVOUS RESUPPLY VEHICLE - 4 MAN BIO TEST

WEIGHT SUMMARY



	60 DAY RESUPPLY	90 DAY RESUPPLY
O GEMINI B + CREW AND EQUIP. + RENDEZVOUS RADAR	6, 600	6, 600
O RESUPPLY MODULE (DRY)		
UNPRESSURIZED COMPARTMENT	3, 250	3, 250
SERVICE MODULE SECTION (INCLUDES SPARES)	4, 340	7, 980
WEIGHT MARGIN	1, 520	2, 250
O RESIDUALS	375	545
O EXPENDABLES		
PROPELLANT	2, 335	2, 715
CRYOGENICS	3, 225	5, 940
PERSONNEL PROVISIONS	590	890
O TOTAL VEHICLE WEIGHT	22, 235 LBS	28, 170 LBS

(T-III M, i = 80°, 180 NMC ~ 32. 6 K)

DPL ~ 10. 4 K

2 MAN DUAL COMPARTMENT LABORATORY COMBINED MISSION RIV

WEIGHT SUMMARY

(WTR, i = 96.4°, 80/180 N. MI.)

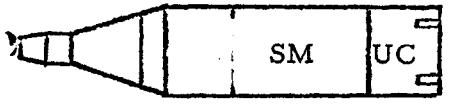
O LABORATORY		12, 450 LBS
UNPRESSURIZED COMPARTMENT, (INCLUDES FAIRING TRADE & DOCKING HARDWR)	3, 540	
PRESSURIZED COMPARTMENT #1	2, 175	
PRESSURIZED COMPARTMENT #2	4, 665	
WEIGHT MARGIN	2, 070	
O MISSION MODULE		11, 500
MISSION EQUIPMENT	7, 600	
MODULE STRUCTURE	2, 000	
WEIGHT MARGIN	1, 900	
O RESIDUALS		390
O EXPENDABLES*		2, 740
PROPELLANT	2, 000	
CRYOGENICS (1000 WATTS AVG.)	740	
O TOTAL VEHICLE WEIGHT		27, 080 LBS

* PROVIDES UP TO 40 DAY ON-ORBIT LOITER TIME
(T-III M, i = 96.4, 80/180 NM ~ 30.6 K)
DPL ~ 3.5 K

RENDEZVOUS RESUPPLY VEHICLE - COMBINED MISSION

WEIGHT SUMMARY

(2 MEN, 60 DAY RESUPPLY)



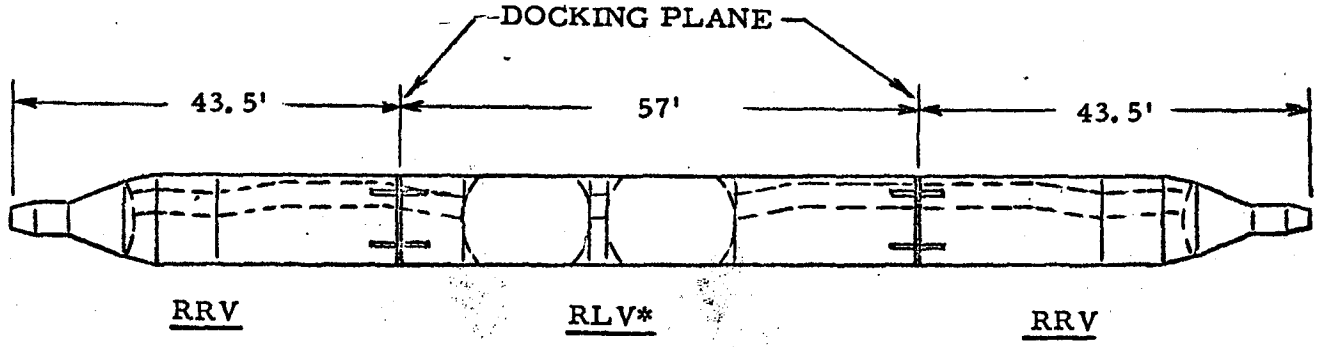
O	GEMINI B + CREW AND EQUIP. + RENDEZVOUS RADAR		6,550 LBS
O	RESUPPLY MODULE (DRY)		10,330
	SUPPORT MODULE SECTION	4,925	
	UNPRESSURIZED COMPARTMENT	3,605	
	WEIGHT MARGIN	1,700	
O	RESIDUALS		910
O	EXPENDABLES		11,980
	PROPELLANT	6,340	
	CRYOGENICS	3,000	
	EXPERIMENTS & DATA HANDLING	1,860	
		480	
	PERSONNEL PROVISIONS	300	
O	TOTAL VEHICLE WEIGHT		29,770 LBS

(T-III M, i = 96.4°, 80/180 NM ~ 30.6 K) DPL ~ 0.8 K

9/16/00

FUNCTION DISTRIBUTION

ORBITING CONFIGURATION



RRV FUNCTIONS (STORAGE END)

- CREW TRANSPORT (STORAGE)

RLV FUNCTIONS

- LIFE SUPPORT
- ENVIRONMENTAL CONTROL
- ACTS - REFERENCE
- COMMUNICATIONS/DATA
- BIO MED EQUIPMENT
- EXPERIMENTS

RRV FUNCTIONS (ACTIVE END)

- CREW TRANSPORT
- ACTS - PROPULSION
- PRIME ELECTRICAL POWER
- LIFE SUPPORT EXPENDABLES
- DATA RETURN SYSTEM
- EXPERIMENTS
- SPARE EQUIPMENT

~~SECRET~~

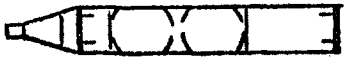
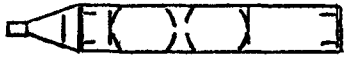
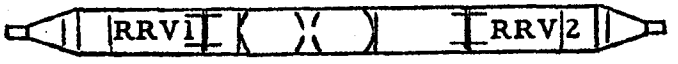
* RENDEZVOUS LABORATORY VEHICLE = R.O.V. LESS GEMINI B

SPECIAL HANDLING

4

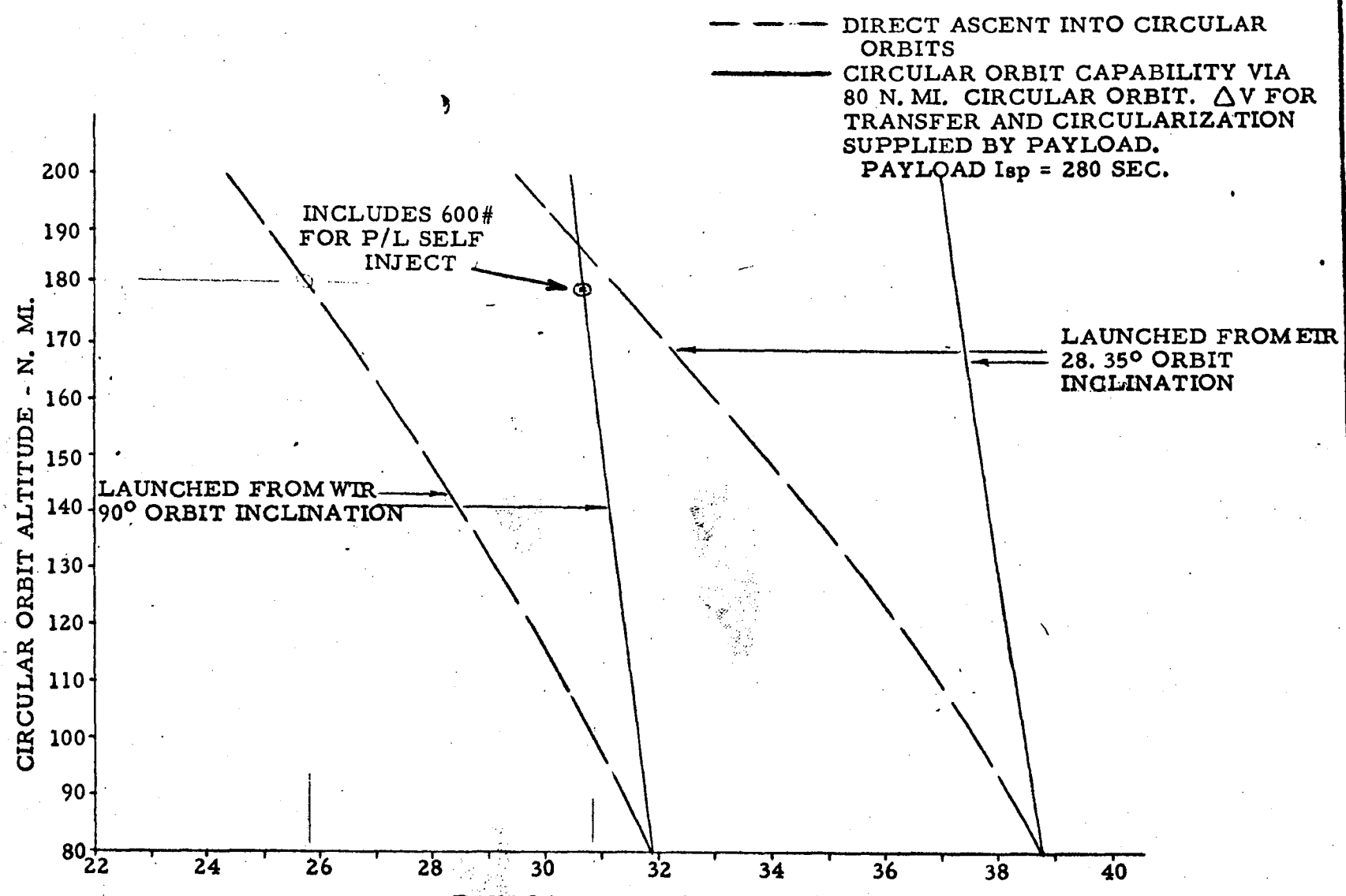
9/16/66

4 MAN - DUAL COMPARTMENT CONCEPT
POSSIBLE RENDEZVOUS/RESUPPLY OPERATIONS

TIME LINE (DAY)	FUNCTION	CREW	CONFIGURATION
0-60	LAUNCH ROV & OPERATE	2	
60	LAUNCH RRV #1	2	
	RENDEZVOUS WITH ROV DOCK & OPERATE ROV SYSTEM	4	
120	LAUNCH RRV #2	2	
	RENDEZVOUS WITH ROV SEPARATE RRV #1 & STATION KEEP DOCK RRV #2 ON P/L COMPARTMENT SEPARATE GEMINI #1 & RETURN DOCK RRV #1 ON ROV/GEM I.F. OPERATE ROV SYSTEM	4	   
180	LAUNCH RRV #3 & SUBS. (REPEAT RRV SEQUENCE)		SAME AS RRV #2 CONFIG.

3

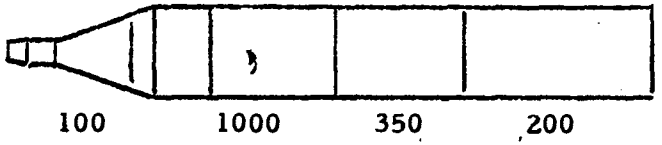
TITAN III M PERFORMANCE DATA



ESTIMATED ELECTRICAL POWER REQUIREMENTS

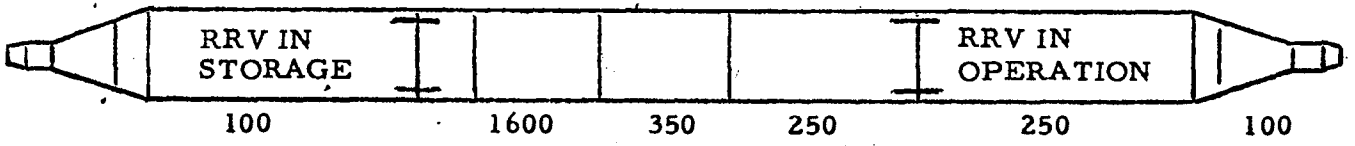
(WATTS)

- 2 MAN DUAL COMPARTMENT VEHICLE - INTEGRAL LAUNCH



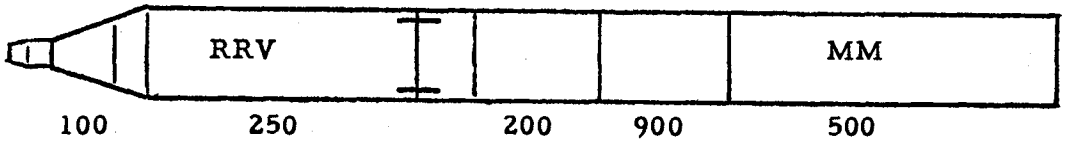
1650 WATTS

- 4 MAN DUAL COMPARTMENT VEHICLE - RENDEZVOUS (BIO TEST)



2000 WATTS

- 2 MAN DUAL COMPARTMENT VEHICLE - RENDEZVOUS (COMBINED MISSION)



1950 WATTS

VEHICLE EXPENDABLES RATES

- 2 MAN INTEGRAL LAUNCH - BIOASTRONAUTICS TESTING (180 N. MI. CIR. E. O.)

PROPELLANT	6.7 LB/DAY
CRYOGENICS	59.1 LB/DAY
PERSONNEL PROV.	5.0 LB/DAY
TOTAL	70.8 LB/DAY

- 4 MAN RENDEZVOUS LAUNCH - BIOASTRONAUTICS TESTING (180 N. MI. CIR. E. O.)

	60 DAY RESUPPLY (LB/DAY)	90 DAY RESUPPLY (LB/DAY)
PROPELLANT	12.6	12.6
CRYOGENICS	53.8	72.7
PERSONNEL PROV.	10.0	10.0
TOTAL	76.4 LB/DAY	95.3 LB/DAY

- 2 MAN RENDEZVOUS LAUNCH - COMBINED MISSION (80/180, i = 94.6°)

PROPELLANT	62.3 LB/DAY
CRYOGENICS	47.6 LB/DAY
PERSONNEL PROV.	5.0 LB/DAY
DRV'S	46.5 LB/DAY
FILM	8.5 LB/DAY
TOTAL	169.4 LB/DAY

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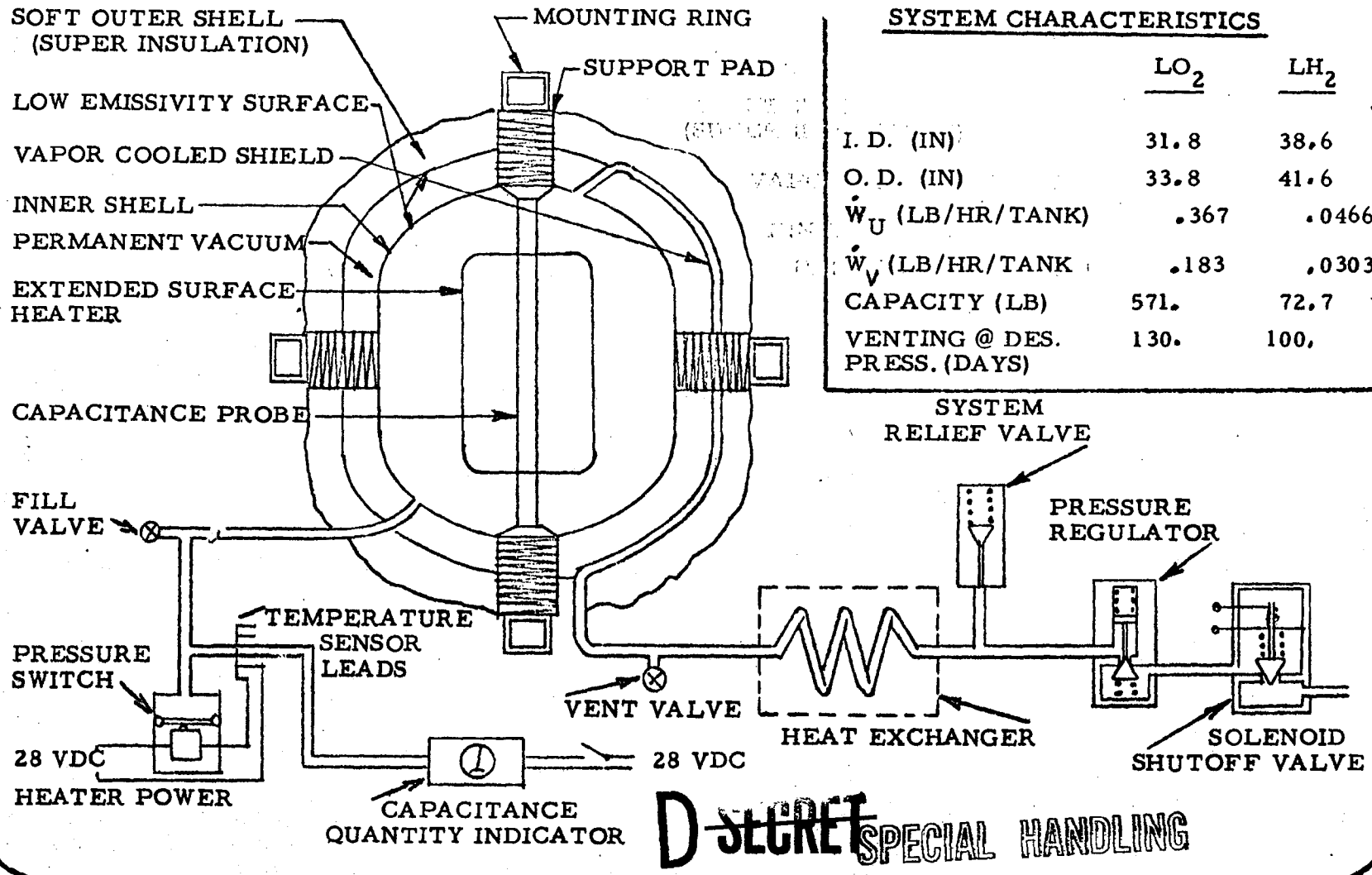
TIME FOR CREW TESTING

	TIME (MAN HRS/DAY)
• POSSIBLE TIME SPANS REQUIRED FOR CREW TESTS	
• BIOMEDICAL AND PHYSIOLOGICAL EVALUATION TESTS	3.00
✓ 90 MINUTES PER MAN PER DAY	
✓ CERTAIN TESTS ARE SCHEDULE DEPENDENT	
✓ SOME TESTING REQUIRES BOTH CREW MEMBERS	
• GENERAL HUMAN PERFORMANCE TESTS	1.00
✓ 60 MINUTES PER MAN EVERY OTHER DAY	
✓ TESTS ARE SELF ADMINISTERED	
• PHYSIOLOGICAL CONDITIONING AND EXERCISE	.50
TOTAL	4.5 MH/DAY
• ESTIMATED CREW TIME ALLOCATION	
• MISSION OPERATIONS	16.00
• LABORATORY VEHICLE OPERATIONS/HOUSEKEEPING	4.00
• GEMINI B (MONITORING)	.25
• CREW SUSTENANCE	20.00
TOTAL	40.25 MH/DAY

- AVAILABILITY OF TIME FOR CREW TESTS APPEARS TO BE SUFFICIENT
  - 4.5 MH/DAY REQUIRED WITH 7.25 MH/DAY POSSIBLY AVAILABLE
  - DAILY SCHEDULING OF TESTS REQUIRED
    - ✓ TESTS DEPENDENT UPON INTERVENING TIME SPAN
    - ✓ TESTS REQUIRING PARTICIPATION OF BOTH CREWMEN

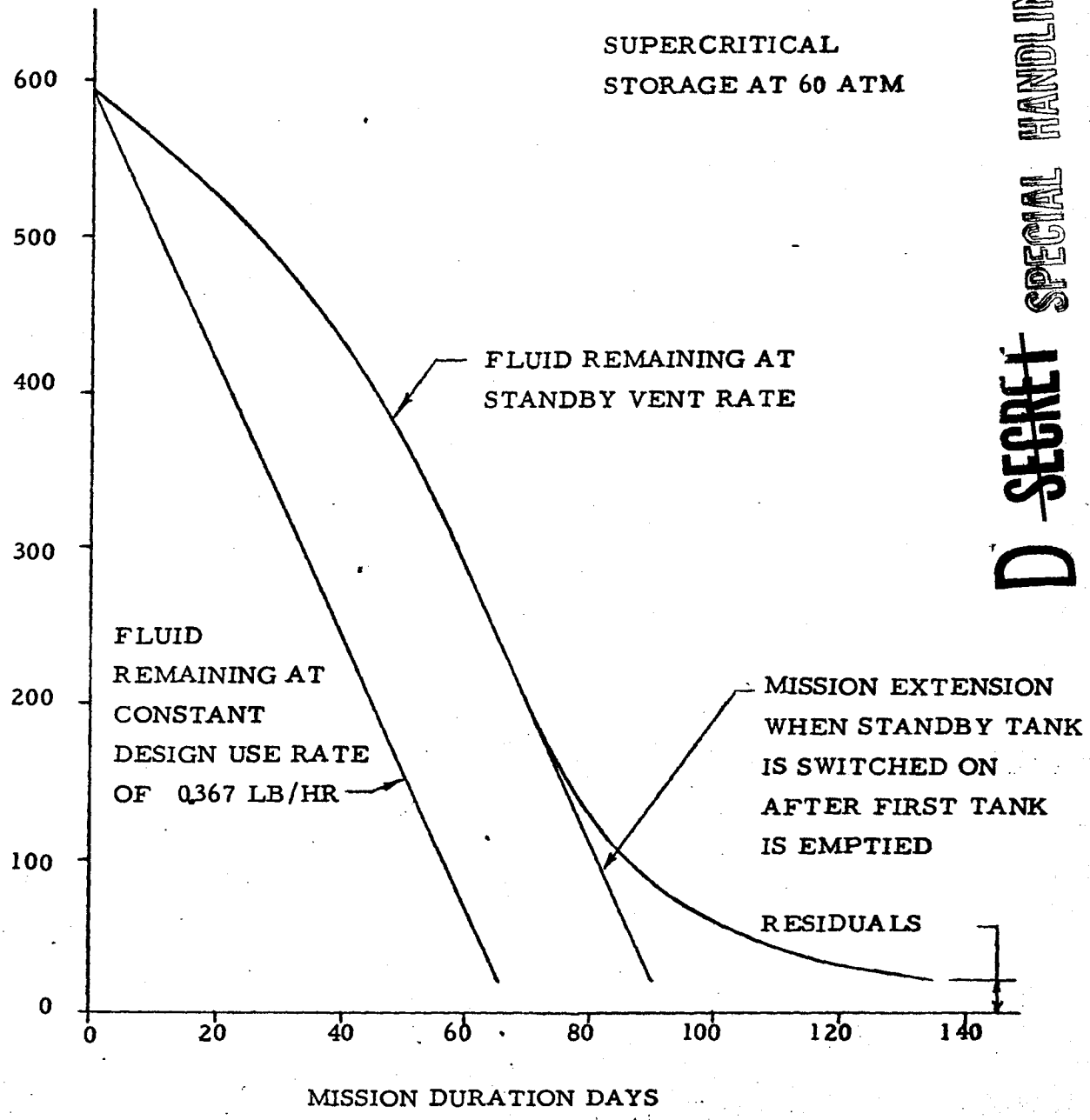
SUPERCRITICAL STORAGE SYSTEM SCHEMATIC

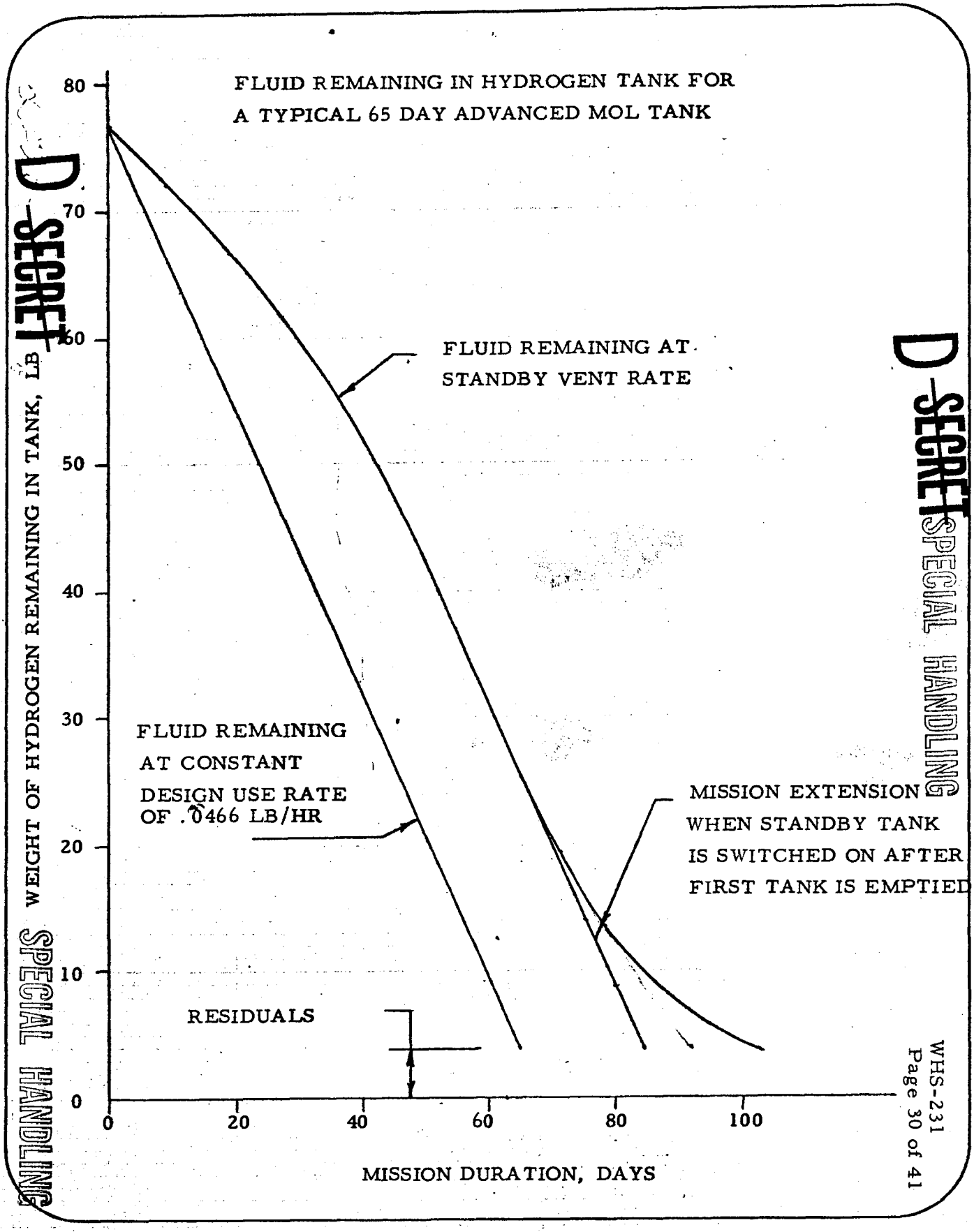


SYSTEM CHARACTERISTICS

	LO_2	LH_2
I. D. (IN)	31.8	38.6
O. D. (IN)	33.8	41.6
$\dot{W}_U$ (LB/HR/TANK)	.367	.0466
$\dot{W}_V$ (LB/HR/TANK	.183	.0303
CAPACITY (LB)	571.	72.7
VENTING @ DES. PRESS. (DAYS)	130.	100.

FLUID REMAINING IN OXYGEN TANK
FOR A TYPICAL 65 DAY ADVANCED
MOL TANK

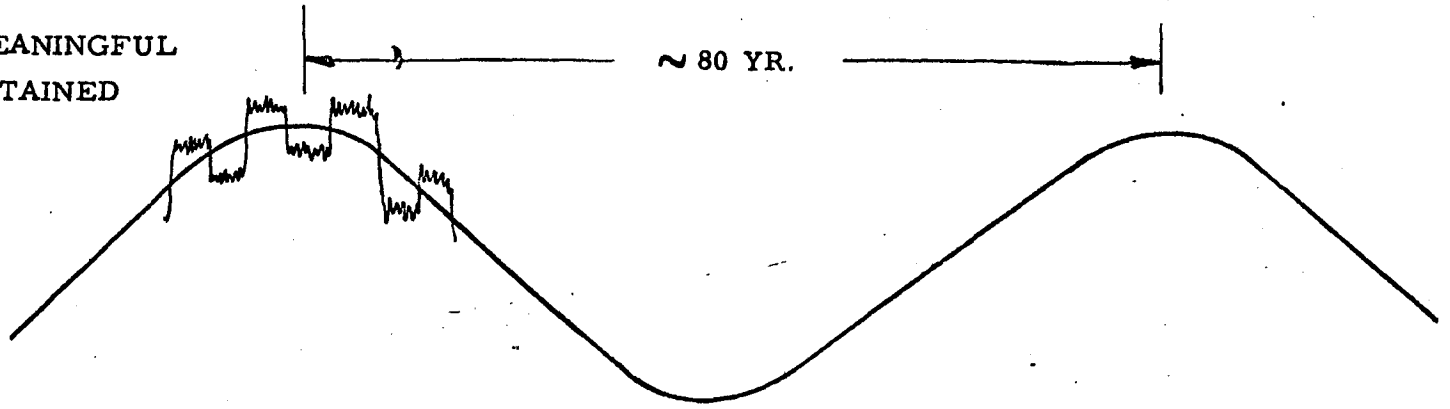




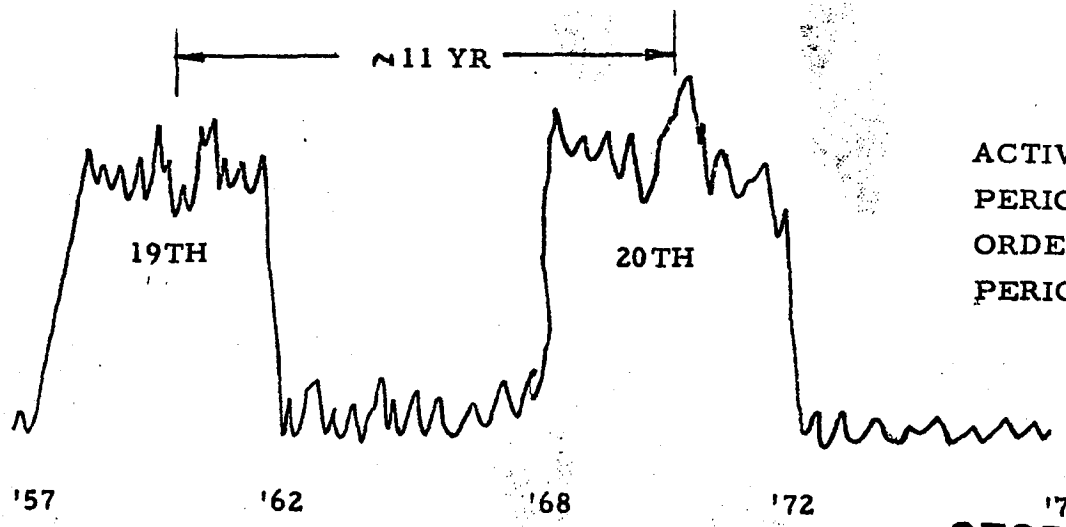
HISTORY OF SOLAR PROTON EVENTS

19TH PERIOD (1957-61)

FIRST MEANINGFUL
DATA OBTAINED

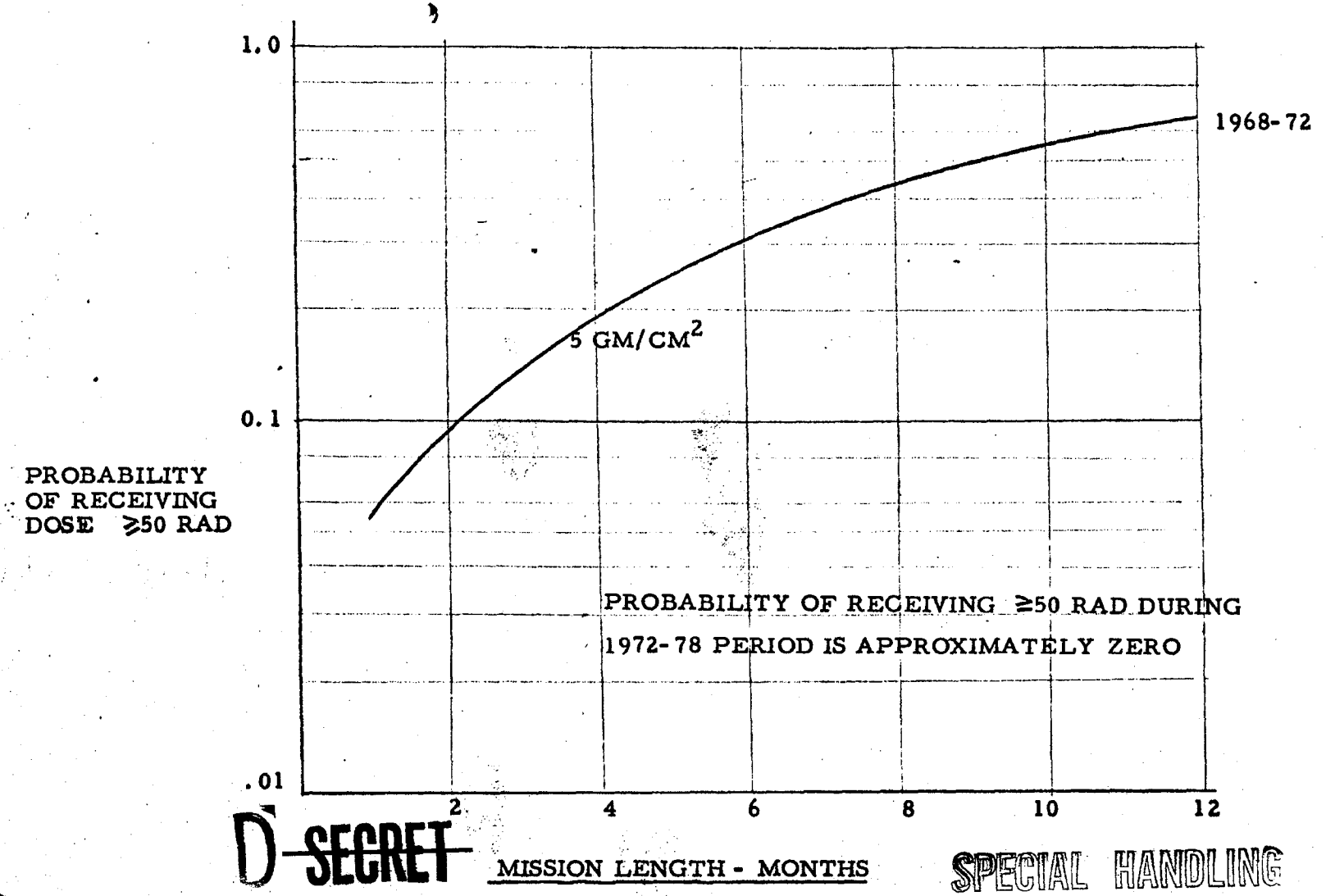


NUMBER OF SUN SPOTS



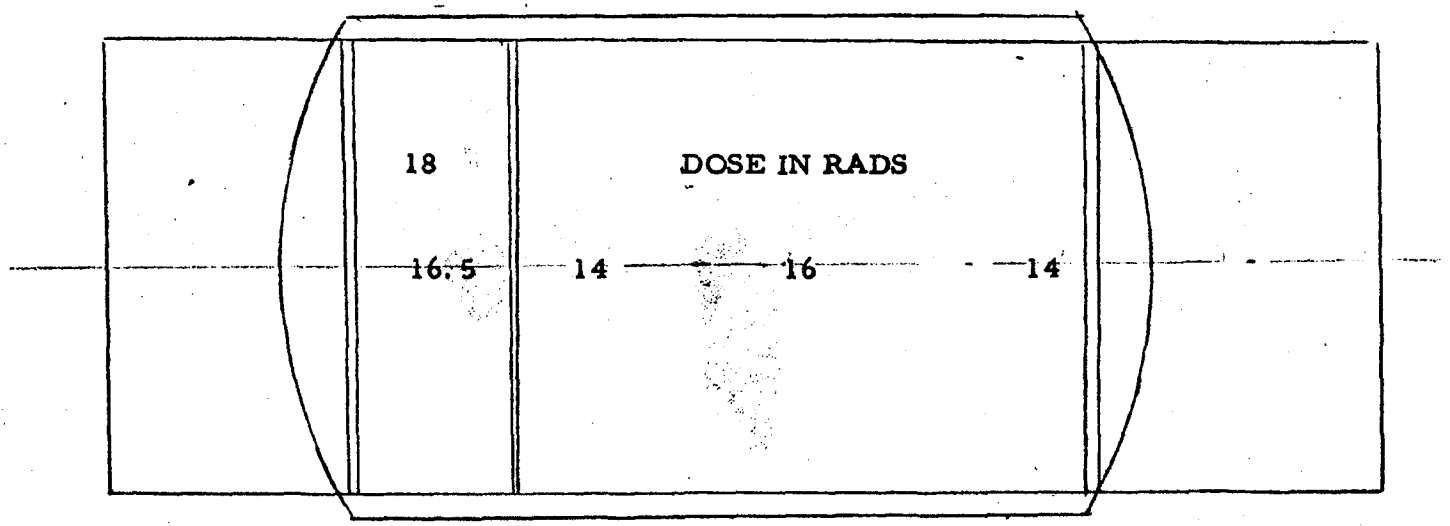
ACTIVITY LEVEL DURING 20TH PERIOD EXPECTED TO BE SAME ORDER OF MAGNITUDE AS 19TH PERIOD.

PROBABILITY OF RECEIVING SOLAR FLARE DOSE



TRAPPED RADIATION DOSE IN MOL

- o YEAR MISSION
- o 90° INCLINATION
- o 200 N. M. ORBIT
- o 1968-70

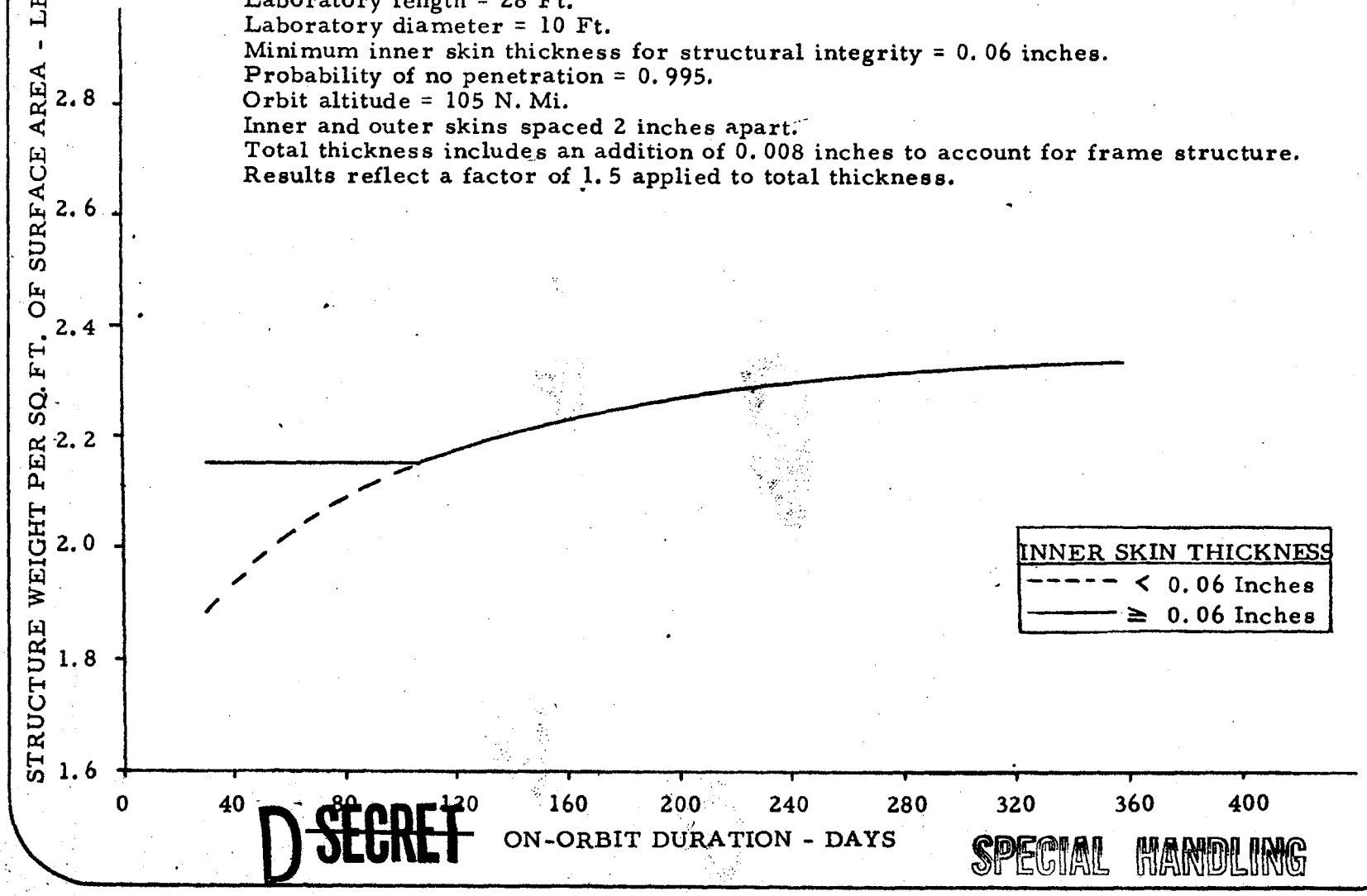


FRC PERMISSIBLE OCCUPATIONAL EXPOSURE = 5 RAD/YEAR (RBE = 1)

ACUTE DOSE REQUIRED TO PRODUCE DETECTABLE PHYSIOLOGICAL EFFECTS = 35 - 50 RAD

METEOROID CRITERIA IMPACT ON LABORATORY STRUCTURE WEIGHT
STRUCTURE WEIGHT PER SQ. FT. OF SURFACE AREA VS. ON-ORBIT DURATION

1.5 Lbs/Cu. Ft. polyfoam insulation between inner and outer skins included in penetration calculations and resulting structure weight.
Laboratory length = 28 Ft.
Laboratory diameter = 10 Ft.
Minimum inner skin thickness for structural integrity = 0.06 inches.
Probability of no penetration = 0.995.
Orbit altitude = 105 N. Mi.
Inner and outer skins spaced 2 inches apart.
Total thickness includes an addition of 0.008 inches to account for frame structure.
Results reflect a factor of 1.5 applied to total thickness.



VEHICLE PROVISIONS FOR CREW TESTS - LONG DURATION MISSIONS

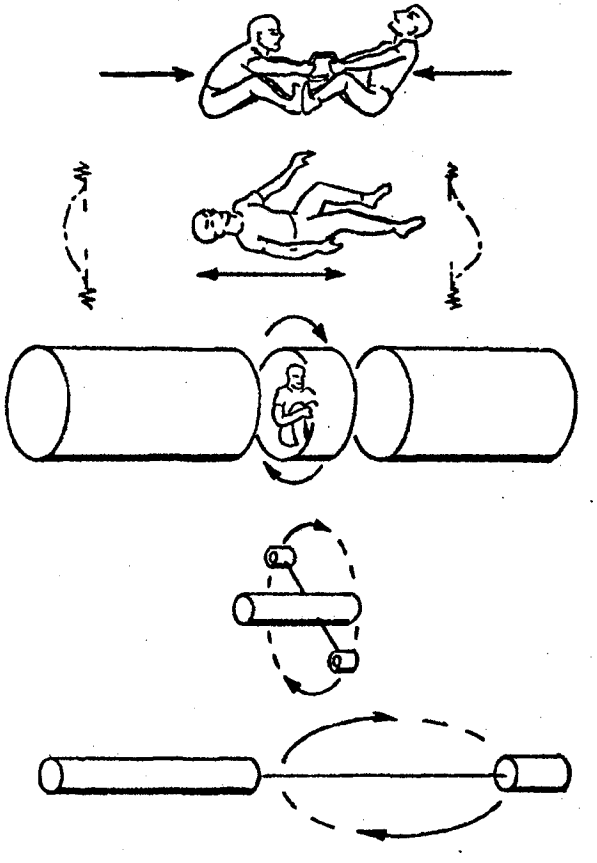
	WT. (LBS)	PRESSURIZED VOL. (FT^3)	AV. PWR. (WATTS)
• BIOMEDICAL AND PHYSIOLOGICAL EVALUATION (P-12)			
• PHYSIOLOGICAL MEASUREMENTS EQUIP.	250	5	26
• RADIATION MEASUREMENTS EQUIP.	45	2	15
• GENERAL HUMAN PERFORMANCE (P-11)			
• CONTROL/DISPLAY EQUIP.	36	1	1
• PHYSIOLOGICAL CONDITIONING AND EXERCISE TESTS			
• MECHANICAL AIDS	40	2	--
• INTERNAL CENTRIFUGE	400	236**	2
TOTAL	771 LB.	246 FT^3	44 WATTS

* WT. DOES NOT INCLUDE ATTITUDE CONTROL PROPELLANT REQUIREMENTS

** VOLUME REQUIRED DURING OPERATION

"ARTIFICIAL G" ALTERNATIVES

- ISOMETRIC EXERCISES
- MECHANICAL AIDS (SPRINGS) TRAMPOLINE, EXERCYCLES)
- INTERNAL CENTRIFUGE
- EXTERNAL CENTRIFUGE
- ROTATION OF VEHICLE VIA CABLE AND COUNTERWEIGHT



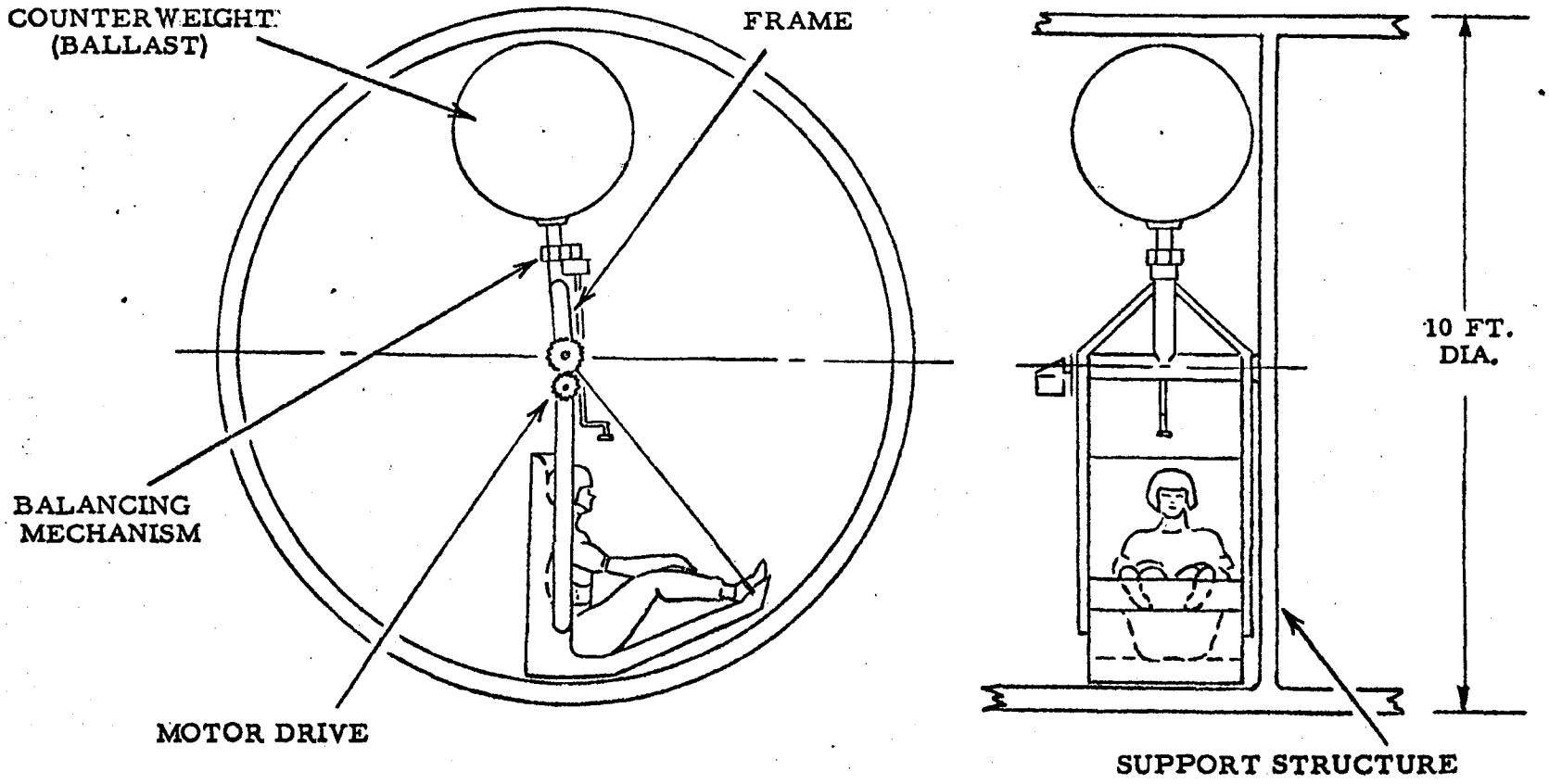
"ARTIFICIAL G" APPROACHES

METHOD	SYSTEM COMPLEXITY	WEIGHT PENALTY	DYNAMICS PROBLEM
ISOMETRIC EXERCISES*	NONE	NEGLIGIBLE	NONE
MECHANICAL AIDS*	NEGLIGIBLE	15# - 50#	NONE
INTERNAL CENTRIFUGE**	MODERATE	400#	MODERATE
EXTERNAL CENTRIFUGE	EXTREME	800#	MODERATE
CABLE & COUNTERWEIGHT	EXTREME	2500#	EXTREME

* PROVIDED FOR IN MOL BASELINE PROGRAM

** PREFERRED APPROACH FOR LONG DURATION AND ADAPTABILITY TO MOL MISSION

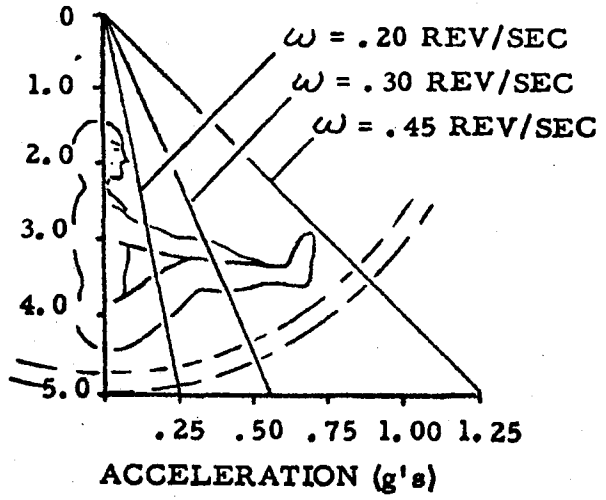
INTERNAL CENTRIFUGE CONCEPT



- WEIGHT PENALTY = 400 LBS. PLUS ATTITUDE CONTROL REQUIREMENTS

INTERNAL CENTRIFUGE

ACCELERATION & ATTITUDE CONTROL FUEL CONSUMPTION



- FUEL CONSUMPTION FOR SPIN CYCLE DURATION - 600 SEC.

• SPIN/DESPIN	1.0
• GYRO COUPLING	0.3
TOTAL	1.3 LBS.

MOL HARDWARE MODIFICATIONS REQUIRED FOR ROV

SECTION	CHANGE
GEMINI B	ADD SEPARATION INTERFACE FOR RESUPPLY VEHICLE. 120 DAY STORAGE CAPABILITY
LAB UNPRESSURIZED COMPARTMENT	ADD DOCKING INTERFACE (MECHANICAL) FOR RRV
FWD. PRESSURIZED COMPARTMENT	REMOVE MOL MISSION CONSOLES, MODIFY AFT DOME FOR CREW TRANSFER TUNNEL
AFT PRESSURIZED COMPARTMENT	REMOVE ALL MOL EQUIPMENTS EXCEPT ATMOSPHERE SUBSYSTEM, LIGHTING, PERSONNEL PROVISIONS, AND INTERCOM SYSTEM; MODIFY AFT DOME FOR CREW TRANSFER; ADD ADAPTER STRUCTURE TO FWD. END.
PAYLOAD COMPARTMENT	MODIFY MISSION MODULE (USE AFT 21.5' AND ADAPT FOR ATTACHMENT TO AFT PRESSURIZED COMPARTMENT), ADD CREW TUNNEL, ADD AFT DOCKING INTERFACE (MECHANICAL AND ELECTRICAL); ADD ONE COMPLETE SET OF BASELINE CRYOGENIC TANKS AND ONE FUEL CELL INSTALLATION, ADD REQUIRED POWER DISTRIBUTION.

9/26/66

~~SECRET~~ RELIABILITY ESTIMATES SPECIAL HANDLING

SUBSYSTEM	EMD INTEGRAL LAUNCH 2 MAN - DCL (90 DAY) R(1)	SPARES WT. LBS.	RENDEZVOUS 4 MAN - DCL (60 DAY CYCLE) R(1)	SPARES WT. LBS.	RENDEZVOUS 2 MAN - DCL COMBINED MISSION (60 DAY CYCLE) R(1)	SPARES WT. LBS.
EPS FUEL CELLS DISTRIB. & CONTROL	.998	21	.999(2)	18	.9988	20
ECS L. SUPPORT/ATMOS CONT.	.982	108	.994	94	.994	94
THERMAL CONTROL	.9998	--	.9999	--	.9999	--
CRYO	.998	--	.999	--	.999	--
ACTS ELECTRONICS	.994	84	.996	72	.996	72
PROPULSION	.9835	--	.989	--	.989	--
COMMUNICATIONS	.998	112	.9989	98	.9989	98
COMPUTER	.928	25	.944	21	.944	21
MALFUNCTION CORRECT/ CONTROL	.988	50	.991	44	.991	44
STRUCTURE	.9998	10	.999	8	.999	8
LAB & SUPPORTING SUBSYSTEMS	.867	410	.912	355	.912	357
GEMINI-B	.982	--	.988	--	.988	--
MISSION PAYLOAD	-- (2)	--	---(2)	--	.907	20
TOTAL	.851	410 LBS.	.901	355 LBS.	.817	377 LBS.

(1) RELIABILITY WITH MANNED MAINTENANCE

(2) MISSION PAYLOAD NOT INCLUDED

~~SECRET~~ SPECIAL HANDLING