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April 22, 1968

MEMORANDUM FOR COLONEL FORD

SUBJECT: Schedule Implications of Deferring Unmanned Vehicle Development Costs Until FY 1970 and Beyond

PROBLEM:

Approximately $23 million (FY-69) is related to SM development and achievement of 60-day on orbit capability for flights #6 and #7. (Atch 1) The purpose of this memorandum is to consider the schedule implications of deferring this outlay until FY 70 and subsequent.

BACKGROUND:

Phase I B (Contractor Definition) for Flights #6 and #7 is now in progress. G.E. go-ahead was 15 March; Douglas received authority to proceed on 1 April. The results of these Definition studies are required if Flights #6 and #7 are to be incorporated into UPGRADE/EMILY, and if the target date of December, 1968, for definitive contractual coverage of the entire baseline program is to be met. It does not, therefore, seem feasible to defer work on Phase I B until FY 70. The FY 69 dollar value of the Definition effort has not been precisely determined, but the preliminary milestone schedule (Atch 2) suggests that FY 69 outlays for this work will be minimal.

Any savings to be realized in FY 69 will therefore result from deferral of initiation of Phase II. Past exercises to conserve FY 68 resources have already resulted in postponing development of the unmanned version beyond the optimum start date. As a result, the current tentative development schedule is fairly tight. Consequently, a first order approximation of the schedule impact of deferring initiation of Phase II for 7 months (from 1 December 68 to 1 July 69) would indicate a slip of 7 months in the flight date for vehicle #6, to April 73. It may be possible to recover some of this time by expending additional funds in FY 70 to accelerate the Phase II effort; this possibility is not specifically considered in the discussion which follows.

DISCUSSION:

There are several possible ways to move unmanned system development expenditures out of FY 69. Among the more obvious are:

Option I - Substitute manned flights for #6 and #7 and proceed on the current schedule; defer unmanned operations to a follow-on program.

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Option II - Fly the current manned/unmanned mix, with Flights #1 through #5 on the current schedule, and Flights #6 and #7 delayed 7 months.

Option III - Rubber band the present flight schedule to accommodate a seven month delay in Flight #6. Fly the current manned/unmanned mix with approximately equal spacing, i.e., 5 and 6 month centers, vice 4 and 5 month centers.

Other options would include (1) increased Phase II development outlays in FY 70 to shorten lead times on the unmanned system and (2) combinations and permutations of the options cited above, such as a 4/1 manned/unmanned mix, etc. The following discussion is a partial review of the ramifications of the three principal options:

Option I - Manned-Only Baseline Program.

1. Would require relatively minor rework of existing detailed schedules and funding projections.

2. Would simplify and expedite baseline definition (UPGRADE/EMILY) and contract negotiations.

3. Plan is inconsistent with Sec Def and PSAC guidance on MOL development.

4. Potential FY 69 savings to be realized by deletion of SM development and extended duration capability might well evaporate due to increased requirements for flight hardware for the manned vehicles. Subcontractors and vendors would be required to furnish two additional sets of manned flight subsystems, with attendant cost impact. Schedule phasing is such that it probably is not feasible to defer all of these costs into FY 70 or beyond without closing down and subsequently re-opening subcontractor/vendor production lines.

Option 2 - Flights #1 - #5 on Current Schedule; Flights #6 and #7 Slip Seven Months.

1. Would cause minimum disruption of existing Flights #1 - #5 schedules; allows for a clean breakout of approximately $20 million in FY 69.

2. Delay of #6 and #7 would disrupt manufacturing schedules, particularly at Douglas, where flight structures are currently scheduled to be fabricated in an essentially continuous stream.

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3. Delayed detail design of #6 and #7 would almost surely surface some engineering problems that could have been avoided had design of #6 and #7 proceeded more or less concurrently with #1 - #5. PSAC has stipulated that design should be concurrent, not sequential.

4. Plan would result in a delay of approximately 11 months between Flights #5 and #6, with attendant poor utilization of contractor field personnel, launch crews, and launch facilities.

5. Increased total program time span would be reflected in increased total cost.

Option III - Ruber Band Flight Schedule to Accommodate Seven Month Slip for Flight #6.

1. Would permit a clean breakout of approximately $20 million in FY 69.

2. Rubber banding would be comparatively simple, and would relieve some minor schedule incompatibilities which now exist. Out-year funding would have to be appropriately adjusted.

3. Pure rubber-band stretch would delay the first manned flight to about November 1971.

4. Extended program time span would increase total costs.

CONCLUSION:

The total amount of money that can be recovered in FY 69 by deferral of unmanned system development is relatively small - approximately $20 million at maximum. The available ways of salvaging this comparatively minor sum are not attractive, with the possible exception of Option I, which might be pursued for reasons other than dollar savings. All other things being equal, it would seem preferable to proceed for the time being with the present vehicle mix, on existing schedules.

May

DAVID C. MAY, JR.
Lt Colonel, USAF
Program & Policies Division

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FY-69 UNMANNED SYSTEM DEVELOPMENT COSTS

The FY 69 saving that can be realized from deferral and/or deletion of the unmanned configuration is approximately $23 million, compromised of the following:

Deferral of Service Module Development	$18.0 million
Deferral of Sixty-day Lifetime Development	$ 4.0 million
Reduced Interface Requirements	$ 1.0 million
Total Savings	$23.0 million

These savings were computed from information provided at the February PRC, at which time the SM development and the inclusion of a 60 day lifetime were approved in the amount of $64 million.

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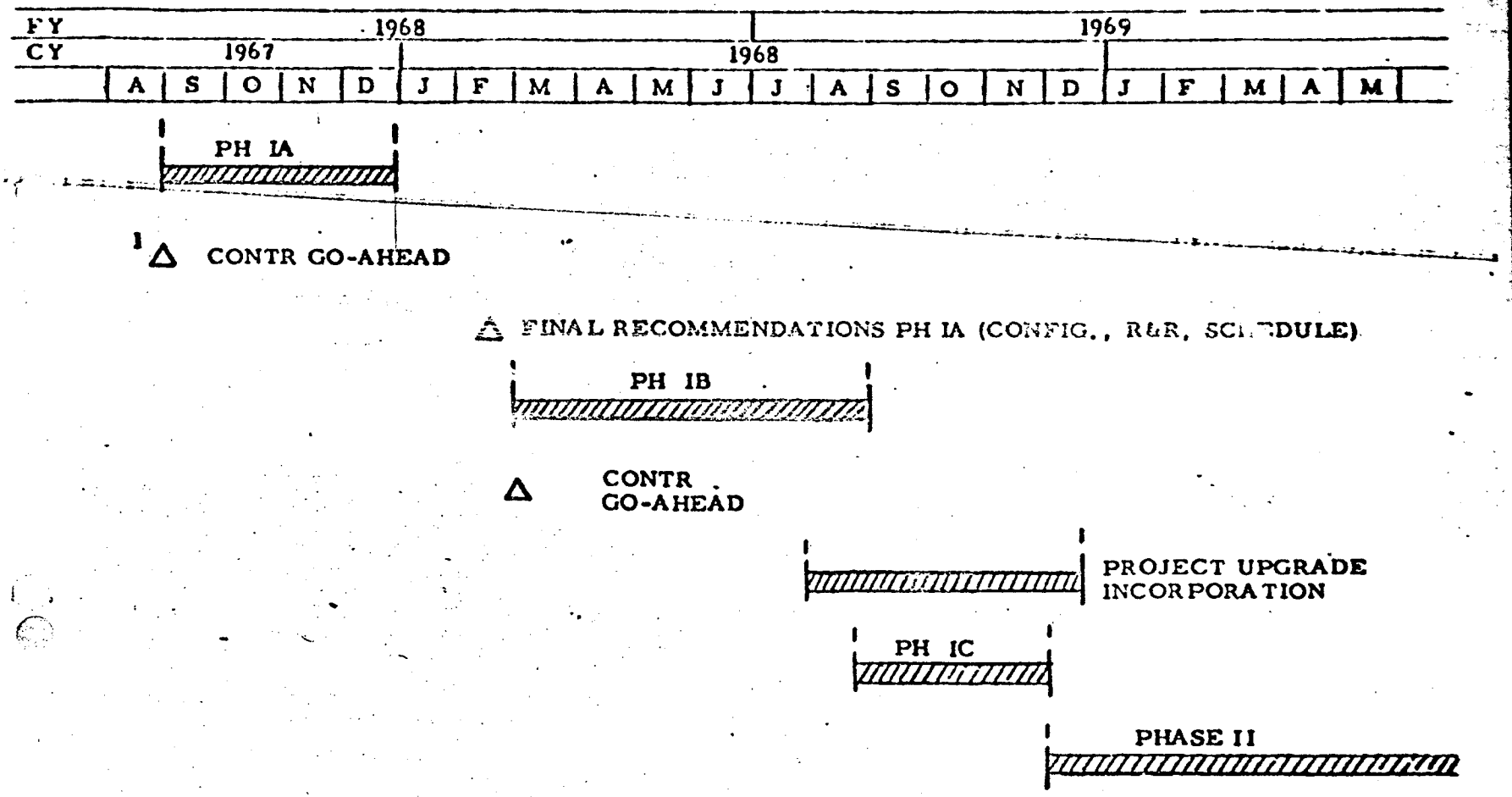
PRELIMINARY MILESTONES FOR FLIGHTS 6/7 ACTIVITY



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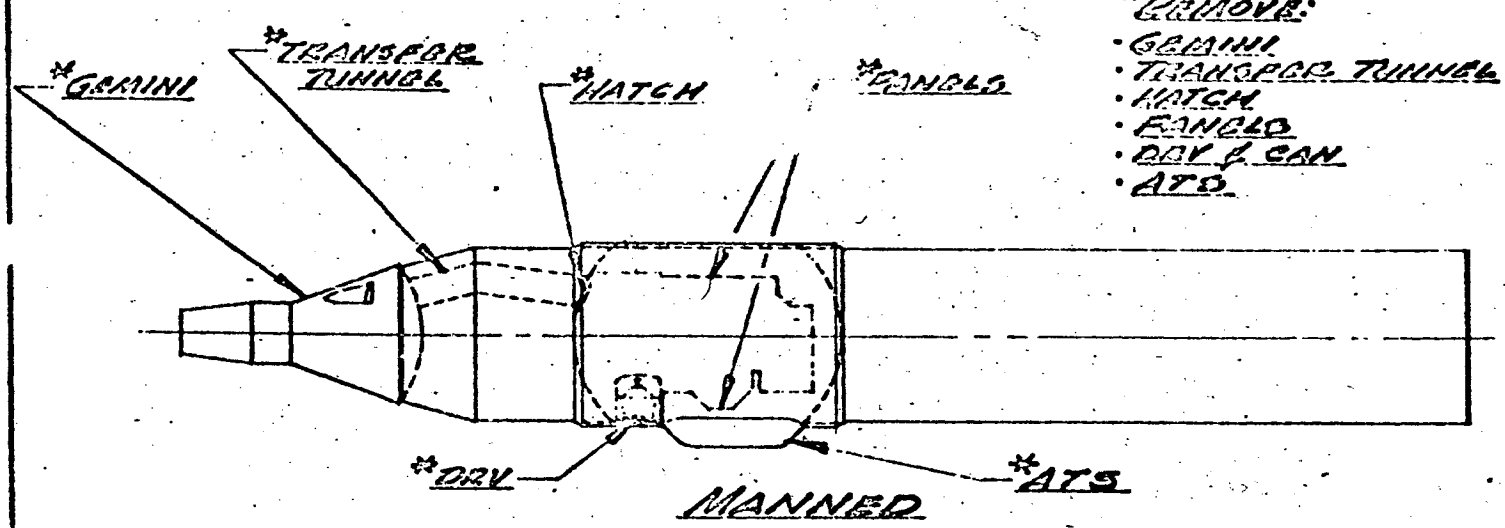
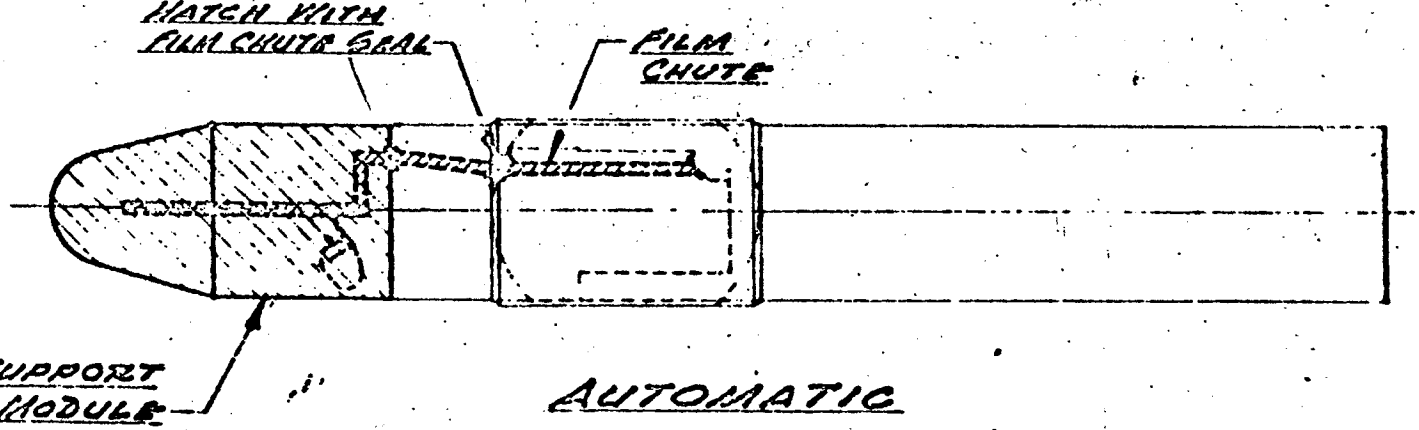
MANNED → AUTOMATIC CONVERSION

*REMOVE:
- GEMINI
- TRANSFER TUNNEL
- HATCH
- RANGLO
- DRV & CAN
- ATO



MANNED



AUTOMATIC

SHADED AREAS TO BE ADDED

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WHS-155

FLIGHT 6 & 7 ASSEMBLY PROCEDURES A/M

- STRUCTURE OMISSIONS PRIOR TO "BIRD CAGE" ASSEMBLY
  - TRANSFER TUNNEL
  - DRV TUBE
  - ACQUISITION SCOPES AND FAIRINGS
- OMISSIONS IN "BIRD CAGE" ASSEMBLY
  - ALL VISUAL OPTICS
  - DISPLAYS AND CONTROLS
  - VOICE SYSTEM
  - LIFE SUPPORT EQUIPMENT AND CREW RESTRAINTS
- ADDITIONS TO LAB MODULE
  - SUPPORT STRUCTURE FOR FILM CHUTES
  - FILM CHUTE SEALS
  - SUPPORT MODULE WIRING HARNESSES
- MATE SUPPORT MODULE

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FLIGHT 6 BASELINE SCHEDULE

EVENT	START DATE	SPAN/MONTHS	MONTHS TILL LAUNCH
O FAB STARTS STRUCTURE AND BIRDCAGE	APRIL '69	6	18
O ASSEMBLY LOADING OF BIRDCAGE AND UNPRESSURIZED SECTION	OCT. '69	5	12
O JOINING BIRDCAGE AND STRUCTURE UNPRESS. TO PRESSURIZED	MARCH '70	2	7
O C/O	MAY '70	1	5
O MATE LM/MM SM/LV	JUNE '70	1	4
O C/O	JULY '70	1-1/2	2-1/2
O PREP. AND SHIP	AUG. '70	1/2	2
O VAFB	AUG. '70	2	0
O LAUNCH	OCT. '70		

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LABORATORY CONVERSION TIME

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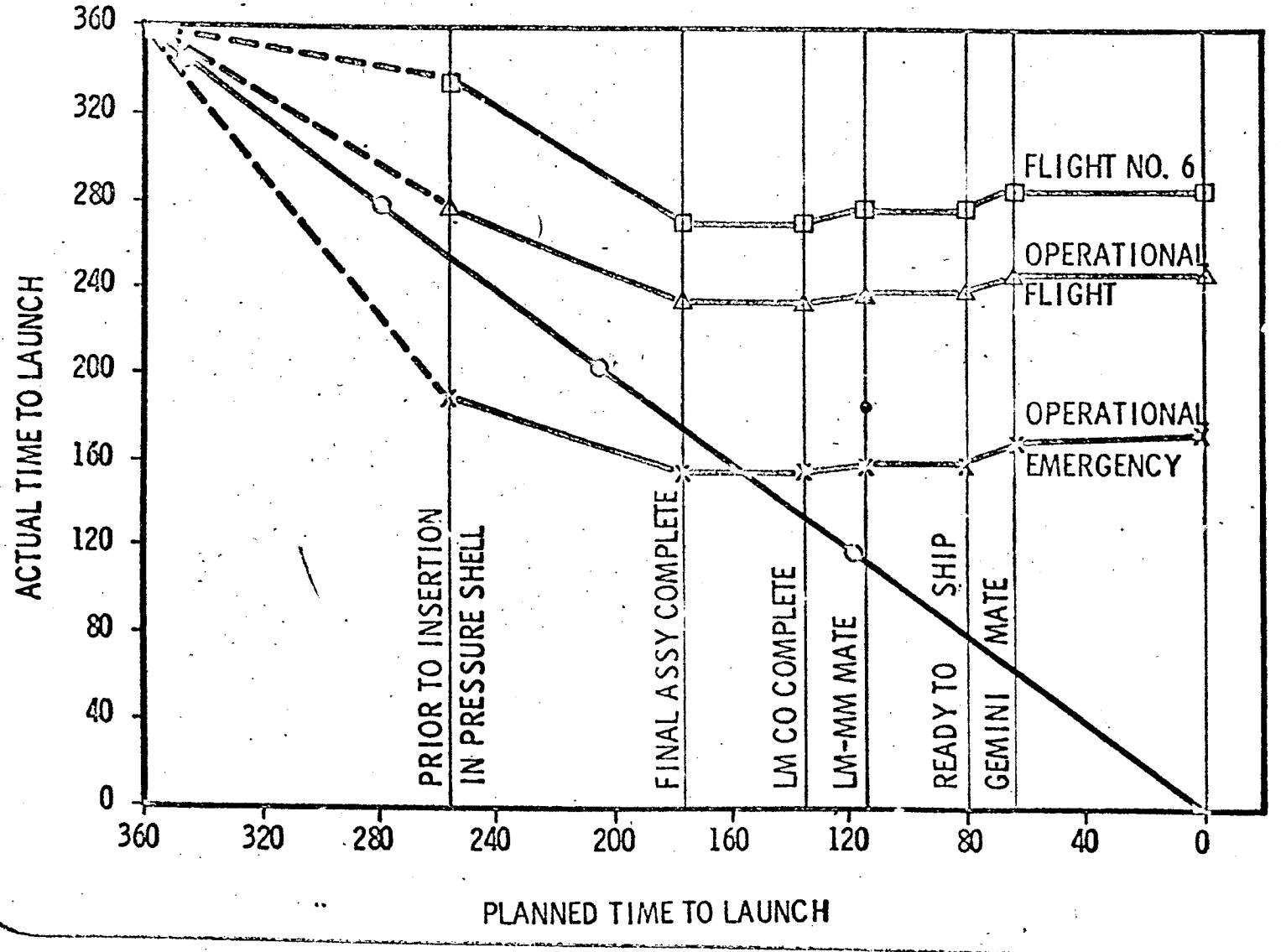

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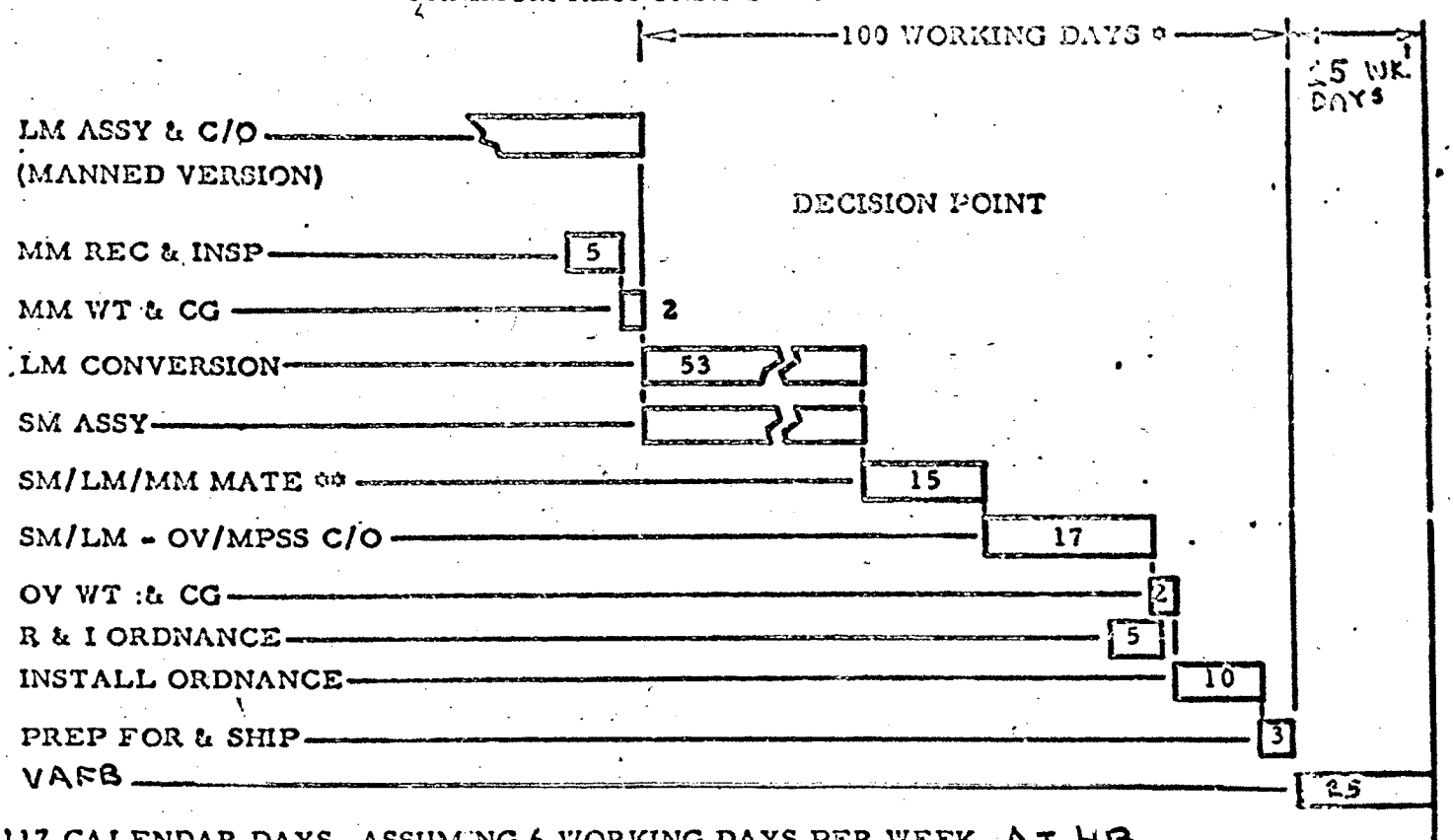
MINIMUM RESPONSE TIME



*117 CALENDAR DAYS, ASSUMING 6 WORKING DAYS PER WEEK AT HB

**SM, LM, & MM ARE MATED BEFORE C/O

† 146 CALENDAR DAYS (TOTAL) 2WK SLIP

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CONVERSION FLIGHTS 6 AND 7 TO M/A

- MANNED PECULIAR EQUIPMENT NOT PRESENTLY ORDERED
- FOR FLIGHTS 6 AND 7.
- MOST MANNED EQUIPMENT AVAILABLE ON SIL FOR FLIGHT 7.
- FLIGHT 6 INITIALLY SCHEDULED AM/FAILURE TO COMPLETE 30-DAY MANNED MISSION
  - DECISION TO CONVERT MADE DURING FLIGHT 5.
  - #6 ON SHIPPING DOCK
  - FLIGHT 6 DELAYED 7 TO 10 MONTHS - BASELINE OF MANNED EQUIPMENT.
- CONVERSION OPTION - DEGRADED RELIABILITY
- SUMMARY OF COST INCREASE

FLIGHT #6	$ 63M
FLIGHT #7	$ 45 M
TOTAL	$108 M

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FLIGHT 6 CONVERSION OPTION

- FLIGHT 6 PLANNED AS MAM
  - OPTION TO CONVERT TO AM
    - LAUNCH DELAY FUNCTION OF CONVERSION DECISION DATE
  - HARDWARE AVAILABLE FOR CONVERSION
    - SUPPORT MODULE
    - AUTOMAT FILM HANDLING EQUIPMENT
    - STRUCTURE MODS
  - ADDITIONAL HARDWARE REQUIRED OVER CURRENT BASELINE
    - GEMINI
    - MANNED PECULIAR LM EQUIPMENT
      - DRV & LAUNCHER TUBE
      - ACQUISITION SCOPES AND FAIRINGS
      - VISUAL OPTICS/DISPLAYS AND CONTROLS
      - VOICE SYSTEM/LIFE SUPPORT EQUIPMENT/CREW RESTRAINTS
  - ADDITIONAL PLANNING, ENGINEERING, FACTORY TIME REQUIRED TO ACCOMODATE DUAL OPTION.

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COST OF AM OPTION - FLIGHT #6

- FLIGHT #6 PROGRAMMED AS A M/AM FLIGHT
- DECISION TO FLY AM MADE — 4 MONTHS PRIOR TO LAUNCH
  10 MONTHS PRIOR TO LAUNCH
- FLIGHT #7 UNCHANGED
- MANNED PECULIAR EQUIPMENT NOT PRESENTLY ORDERED FOR FLIGHT #6
- SUMMARY OF COST INCREASE

	TOTAL	HARDWARE PROCUREMENT	CONVERSION	SPARE AM*
4 MONTHS BEFORE LAUNCH**	$9.0M	$2.0M	$7.0M	$7.0M
10 MONTHS BEFORE LAUNCH*	$2.0M	$2.0M	$0.0M	$6.0M

* △ INCLUDES #6 AS A M/AM FLIGHT - NO SCHEDULE SLIPPAGE
** △ INCLUDES #6 AS A M/AM FLIGHT - 7 MONTHS SLIP OF LAUNCH DATE

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IMPACT ON FISCAL YEAR FUNDING
Δ COST INCREASE OVER BASELINE

FISCAL YEAR	1981	1982	1983	1984	1985	TOTAL
1. FROM AM → II/AM						
FLIGHT #6	—	5.0	23.0	33.0	—	63.0
HARDWARE PROCUREMENT		2.0	15.0	13.0		32.0
CONVERSION		4.0	7.0	16.0		27.0
FLIGHT #7	—	—	13.0	33.0	—	43.0
HARDWARE PROCUREMENT			10.0	20.0		33.0
CONVERSION			3.0	10.0		13.0
2. FROM II/AM → AM FLT #6						
FLY #5 TO II/AM	—	2.0	10.0	23.0	—	35.0
HARDWARE PROCUREMENT		2.0	10.0	20.0		32.0
4 MOS BEFORE LAUNCH	—	2.0	11.0	35.0	—	53.0
CONVERSION TO AM			11.0	26.0		37.0
10 MOS BEFORE LAUNCH	—	4.0	13.0	25.0	—	42.0
CONVERSION TO AM		2.0	3.0	5.0		10.0
3. SPARE AM - 4 MONTHS	—	2.0	30.0	45.0	—	77.0
HARDWARE PROCUREMENT			20.0	25.0		45.0
SPARE AM - 10 MONTHS	—	2.0	23.0	34.0	—	59.0
HARDWARE PROCUREMENT			10.0	14.0		24.0

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INCREASED COST OF ADOPTION - FLIGHT #6

ADDITIONAL HARDWARE	BASELINE A/M	OR	FLIGHT #6 BASELINE Δ FOR M/AM	M/AM OR A/M	SPARE A/M Δ
GEMINI B/M	4.0		19.0	23.0	
DACO (DISPLAYS, CONTROLS, STRUCTURE, FAIRINGS)	29.5		6.0	35.5	24.0
PAYLOAD (DISPLAYS, CONTROLS, ATS, RV's)	24.0		5.0	29.0	21.0
OTHER	2.7		1.5	4.2	
TITAN III	21.0		0.5	21.5	
BASELINE	$81.2M	•	$32.0M	$113.2M	$45.0M

CONVERSION COSTS	DECISION BEFORE LAUNCH 4 MONTHS	10 MONTHS
CONVERSION PLANNING & TECHNIQUE	4.0	3.0
CONVERSION TOOLING & EQUIPMENT	3.0	2.0
CONVERSION LABOR	10.0	2.0
REPEAT ASSEMBLY & CHECKOUT	6.0	2.0
OPERATIONS, SOFTWARE, LAUNCH, RECOVERY	2.0	1.0
SUBTOTAL CONVERSION	$27.0M	$10.0M
	22.0	22.0
TOTAL COST INCREASE	$59.0M	$42.0M