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PRC 20 FEB 68

DEPUTY DIRECTOR'S REPORT

PROGRAM STATUS - - - - - GEN BLEYMAIER

1

SPECIAL SUBJECTS:

o SUPPORT MODULE - - - - - DR. LEONARD

2

o LOW COEFFICIENT MATL'S - - - COL KNOLLE

3

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Base 68521-68

62 pag

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GUIDANCE RECEIVED NOV PRC & SUBSEQUENT

- o SCHEDULE APPROVAL
- o \$600M FY 69 BUDGET
- o LOW COEFFICIENT MATERIALS

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68521-68

OPEN ITEMS FROM 8 DEC MEETING

- 0 LMQTV ACOUSTIC TESTING
- 0 SOLID MOTOR THRUST TERMINATION TESTING -
- 0 GEMINI INERTIAL GUIDANCE SYSTEM -
- 0 ABORT BLAST SHIELD -

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PROGRAM ACTIVITY DEC / JAN

30 NOV - 7 DEC	PROGRAM MGRS MET TO DEVELOP NEW BASELINE
8 DEC	BRIEFING TO DR. FLAX
13 - 15 DEC	DEVELOPMENT OF DETAILED SCHEDULES & HEL.
10 JAN	PROGRAM MEETING AT HUNTINGTON BEACH
17 JAN	BRIEFING TO SPACE SCIENCE & TECHNOLOGY PANEL (PSAC)
24 JAN	MOL EXECUTIVE COUNCIL MEETING
2 FEB	MOL TEST OBJECTIVES REVIEW BOARD FINAL REPORT
16 FEB	SUPPLEMENTAL AGREEMENTS ISSUED

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5
B.U.

NON-AF DAC PRESENTATIONS

MOL PROGRAM

<u>DATE</u>	<u>ORGANIZATION</u>	<u>PERSON</u>	<u>SUBJECT</u>
FEB 6, 1967	DDR&E	DAN FINK	PROGRAM OVERVIEW
FEB 14, 1967	NASA	OLLING & RAFFENBERG	PROGRAM OVERVIEW
FEB 15, 1967	NASA	BILL HAYES	MOL OVERVIEW
MAR 21, 1967	DDR&E, BOB	BARFIELD & LINDER	PROGRAM OVERVIEW
APR 10, 1967	NATIONAL SCIENCE COUNCIL	FRANK RAND	PROGRAM OVERVIEW
APR 19, 1967	DDR&E	JOHN KIRK	PROGRAM OVERVIEW
MAY 4, 1967	NASA	BOB GILRUTH	MOL OVERVIEW
AUG 17, 1967	NASA	DR. VON BRAUN	PROGRAM OVERVIEW
NOV 15, 1967	NASA	CHARLEY DONLAN	PROGRAM OVERVIEW
DEC 11, 1967	SENATE APPROPRIATIONS COMMITTEE	VOORHEES & PARKER	PROGRAM OVERVIEW
JAN 25, 1968	NASA	ED CORTRIGHT & PHIL CULBERTSON	MOL OVERVIEW :

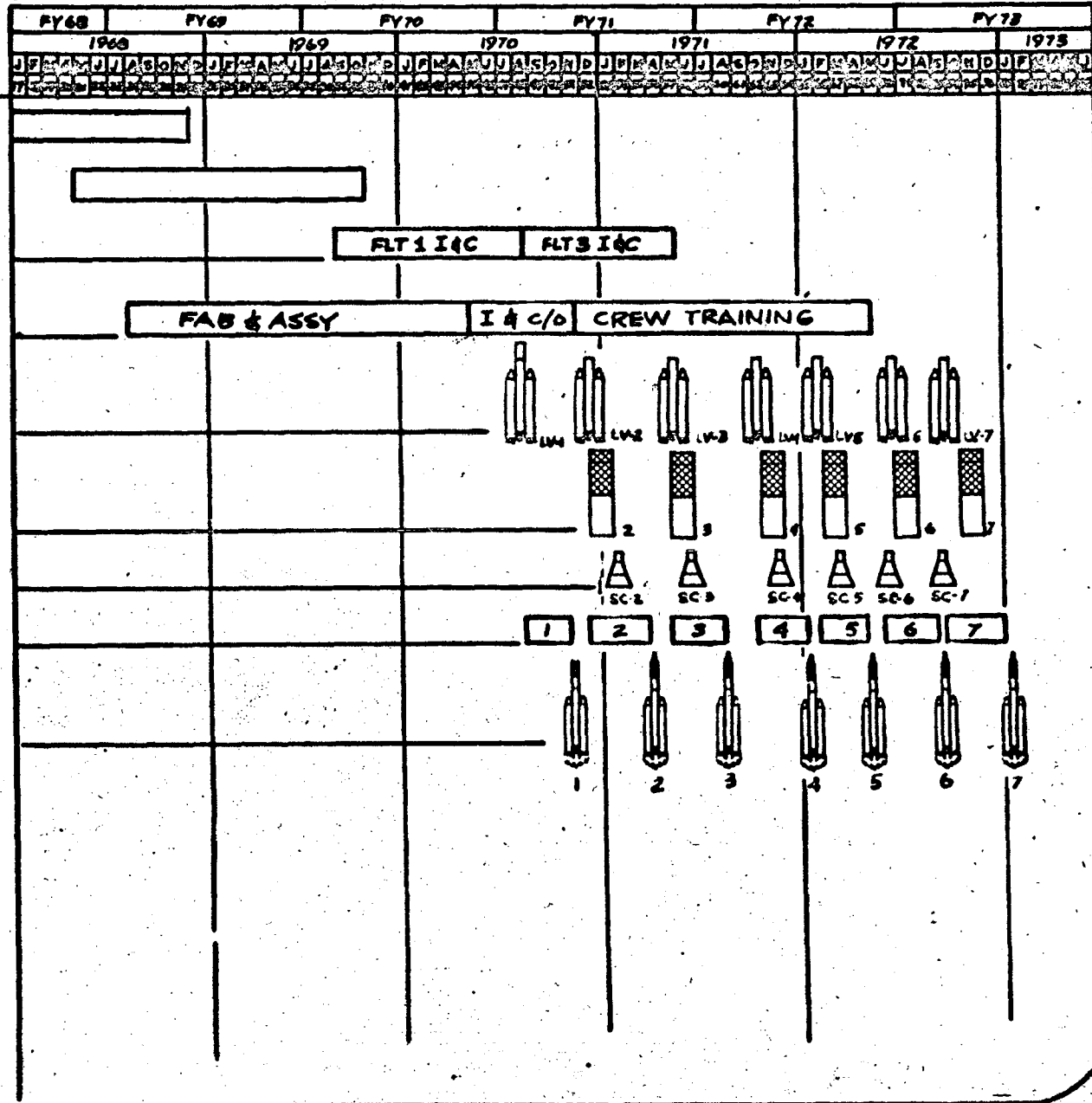
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SPECIAL ACCESS REQUIRED

11

MASTER SUMMARY SCHEDULE

SLC-6 FACIL CONSTR
SUPPORT FACIL CONSTR
LAUNCH SUP AGE I&C
CREW TRNG (MSN SIM)
LAUNCH VEH DEL AT VAFB
LAB VEH DEL AT VAFB
S/C DEL AT VAFB
FLT VEHICLE I&C
OL FLIGHT TESTS



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MILESTONES
FEB 1968 - JUNE 1968

MAR	DAC	•DELIVER PRODUCTION LM FORWARD SECTION
MAR	EKC	•THERMAL MODEL (THM) MISSION MODULE DESIGN RELEASE
APR	MMC	PROGRAMMER CRITICAL PROTOTYPE TESTING COMPLETE
APR	ACED	MISSILE GUIDANCE COMPUTER QUALIFICATION & FACI
APR	GE	•ELIMINATE 1 OF 3 IVS VENDORS BASED ON BREADBOARD TESTS
MAY	MAC	•COMPLETE STATIC ADAPTER NO. 1 STRUCTURE
MAY	AGC	STAGE I EXIT CLOSURE TESTS COMPLETED
MAY	EKC	•CHAMBER I FIRST USE
MAY	EKC	•CHAMBER II FIRST USE
JUN	MAC	•COMPLETE STATIC REENTRY NO. 1 STRUCTURE
JUN	GE	•COMPLETE MISSION DATA ADAPTER UNIT (MDAU) PDR
JUN	DAC	•DELIVER AGE DIGITAL COMPUTER
JUN	MMC	CAGE FINAL BUY/BUILD DESIGN COMPLETE
JUN	MMC	PROGRAMMER FINAL BUY/BUILD DESIGN COMPLETE
JUN	UTC	DESIGN EFFORT FOR ULLAGE BLOWDOWN SYSTEM COMPLETE • CY 68 PROGRAM PROGRESS MILESTONES ON SUPPLEMENTAL AGREEMENTS

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MOL FACILITIES SUMMARY CONSTRUCTION SCHEDULE

AS OF: 12 FEB 68

	SCHEDULED COMPLETION	PERCENT COMPLETE							
		20	40	60	80				
SLC-5									
MOBILE SERVICE TOWER	11-15-68								
UMBILICAL TOWER	7-1-68								
AGE BUILDING	7-1-68								
LAUNCH DECK/BUCKET	7-1-68								
LAUNCH CONTROL CENTER	7-1-68								
PROPELLANT HOLD AREAS	5-1-68								
COMPLEX SERVICE BUILDING	11-15-68								
READY BLDG.	7-1-68								
SRM PROCESSING BLDG.	5-30-68								
MOL SUPPORT FACILITIES									
OPERATIONS TRAINING EVAL. FAC.	10-1-69								
OPERATIONAL READINESS UNIT	10-1-69								
ENGINEERING OPERATIONS BLDG.	3-1-69								
LAB VEHICLE SUPPORT FAC.	8-1-69								
GEMINI B SUPPORT BLDG.	8-1-69								
GEMINI B TEST CELL	9-1-69								

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STATUS OF PROGRAM RESOURCES

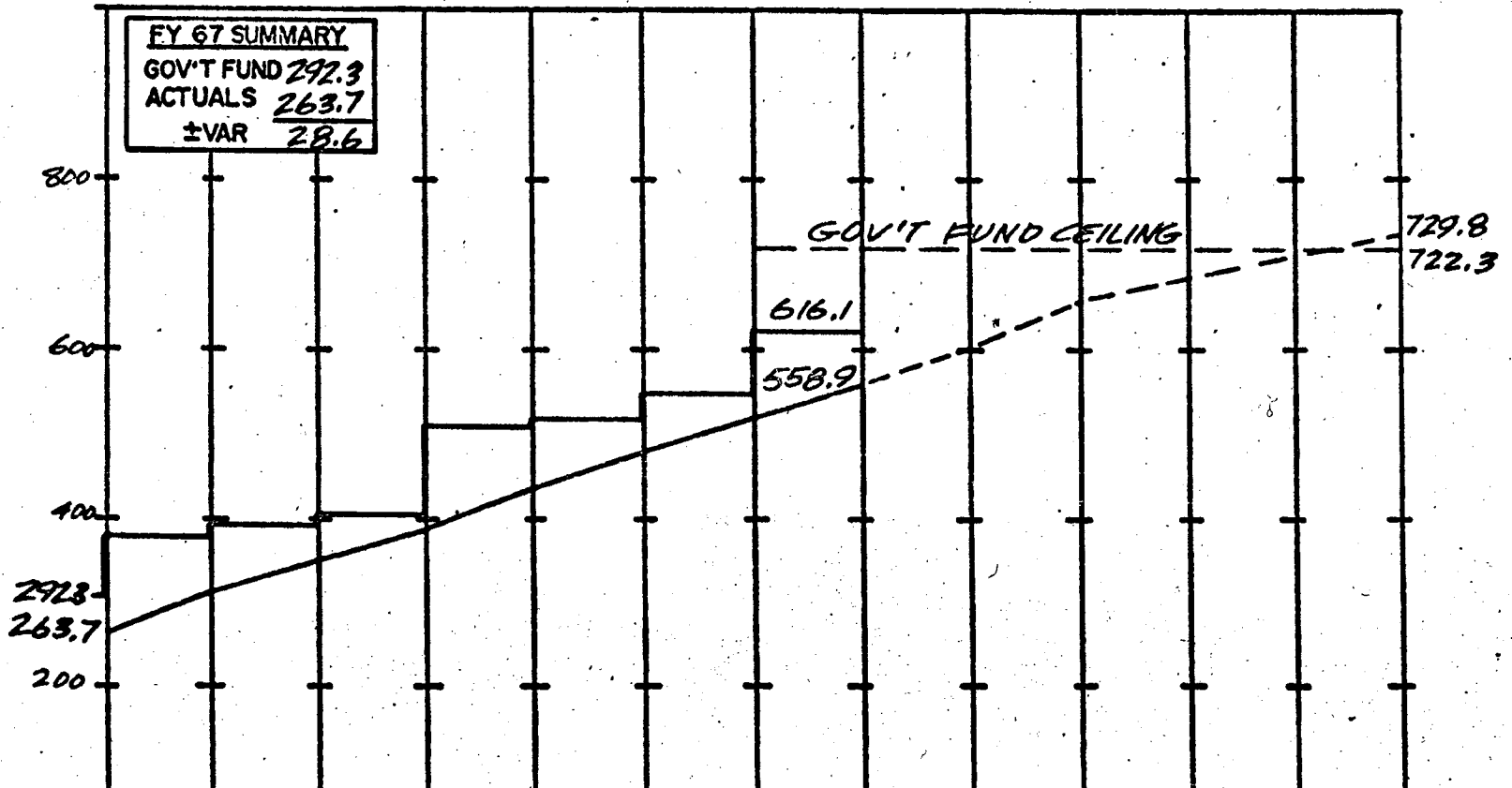
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F2

FINANCIAL STATUS FY 1968 - 8 DEC 67 SITUATION

SYSTEM SEGMENT TOTAL MDL CONTRACTOR ALL DATE REPORT _____

FY 67 SUMMARY
 GOV'T FUND 292.3
 ACTUALS 263.7
 ±VAR 28.6



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
RATE						41.6	49.4	39.0	40.5	39.5	35.4	15.8	466.1
ACTUALS	43.2	38.9	39.1	43.6	40.1	41.7	48.6						
GOV'T FUNDING	90.6	7.1	9.8	117.0	1.4	19.8	78.1	(20.9)	(4.9)	(80.4)			

12 C BASELINE

CURRENT BASELINE

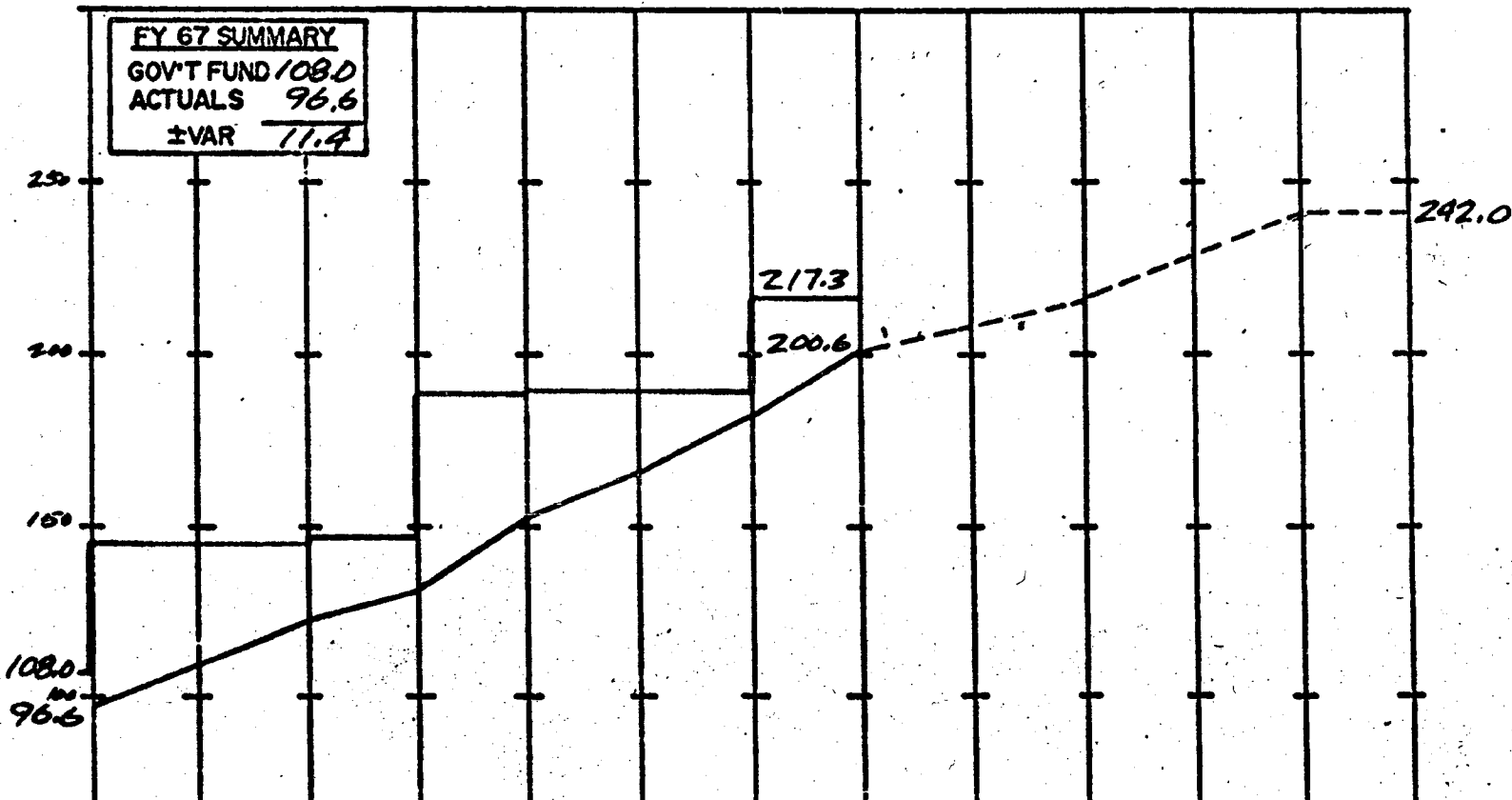
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F3

FINANCIAL STATUS FY 1968

SYSTEM SEGMENT LAB VEHICLE CONTRACTOR DOUGLAS DATE REPORT _____

FY 67 SUMMARY	
GOV'T FUND	108.0
ACTUALS	96.6
±VAR	11.4



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
RATE						17.3	19.0	8.7	9.0	11.6	12.3	15	145.9
ACTUALS	12.5	13.6	13.6	14.8	12.5	17.3	19.8						
GOV'T FUNDING	34.5	0	3.2	40.3	1.6	0	30.7						

12C BASELINE

CURRENT BASELINE

~~SECRET~~ - SPECIAL ACCESS REQUIRED

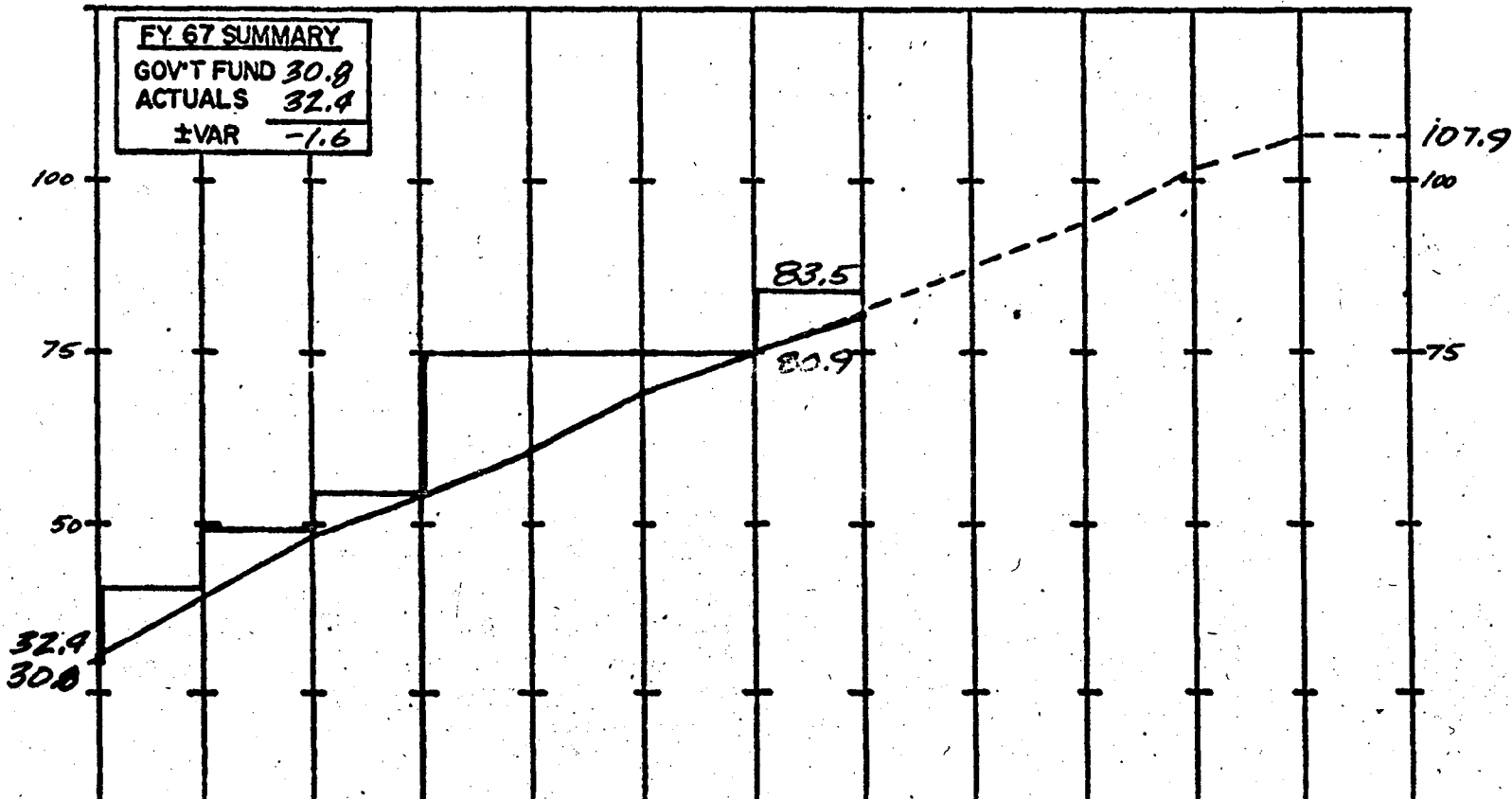
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F4

FINANCIAL STATUS FY 1968

SYSTEM SEGMENT MISSION MODULE CONTRACTOR G.E. DATE REPORT _____

FY 67 SUMMARY	
GOV'T FUND	30.8
ACTUALS	32.4
±VAR	-1.6



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
RATE						6.2	7.3	6.6	6.6	7.8	5.4	0	75.5
ACTUALS	8.5	5.3	8.5	7.5	5.8	6.2	6.7						
GOV'T FUNDING	11.9	6.6	5.7	20.0	0	0	8.5	(13.3)					

12C BASELINE

CURRENT BASELINE

**GE CAPITAL INVESTMENT FOR MDL
(MILLIONS OF DOLLARS)**

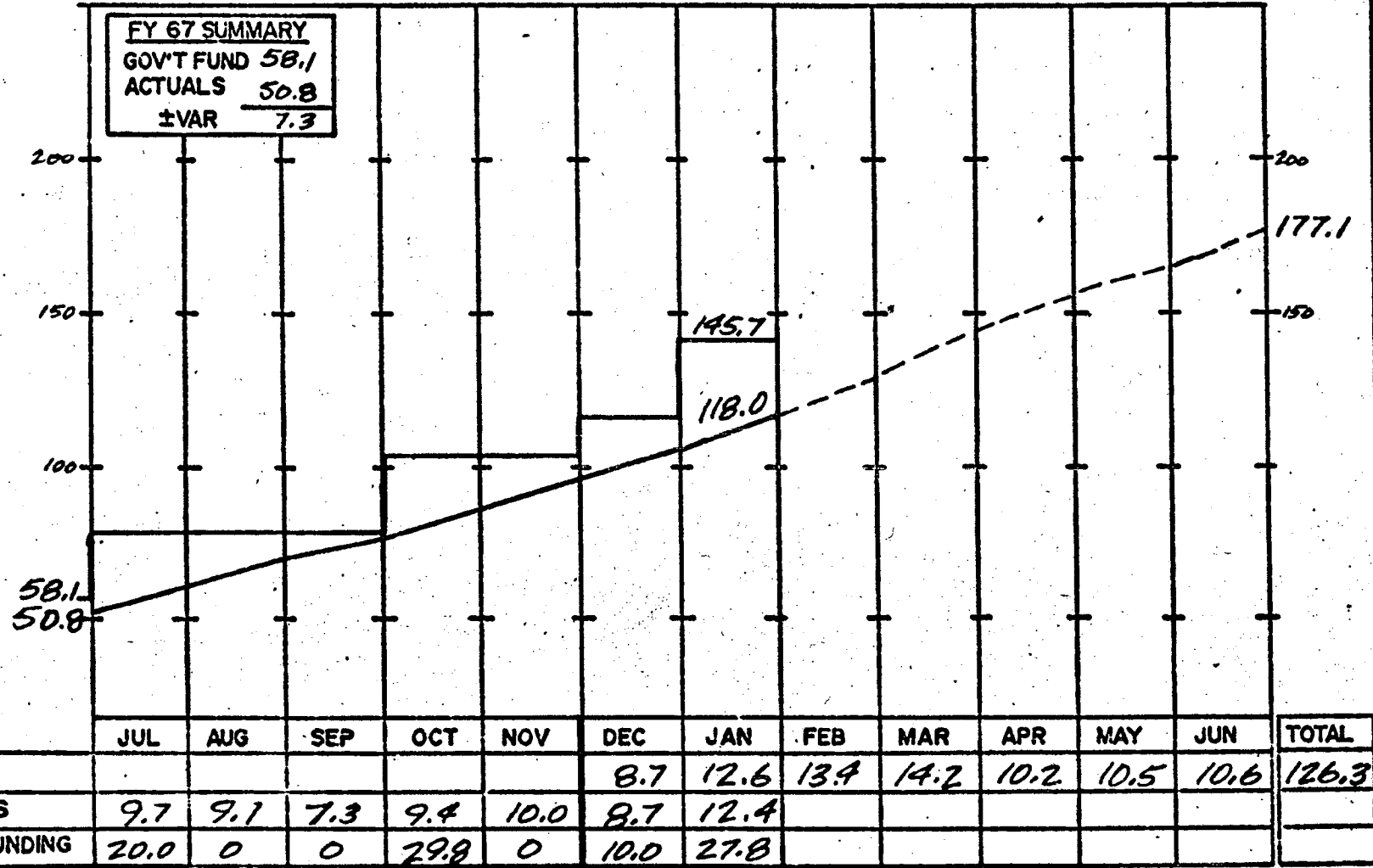
●	NEW GE EQUIPMENT	3.238
	HYBRID COMPUTER COMMUNICATION & INSTRUMENTATION MANUFACTURING SHOP EQUIPMENT VIBRATION SYSTEM E L PANEL	
●	HIGH BAY BUILDING	6.0
●	DEVELOPMENT SUB SYSTEM TEST AREA PREPARATION	0.192
●	MOL CITE AREA PREP	0.080
●	ACOUSTIC NOISE FACILITY	2.3 → 3.1
●	MODIFY THERMAL VACUUM CHAMBER FOR SUPPORT MODULE (IF 38' LENGTH IS REQD)	1.5
	TOTAL	<hr/> 13.310 → 14.110

THERE ARE NO OTHER INVESTMENT REQUIREMENTS ANTICIPATED



FINANCIAL STATUS FY 1968

SYSTEM SEGMENT PAYLOAD CONTRACTOR EKC DATE REPORT _____



12C BASELINE

CURRENT BASELINE

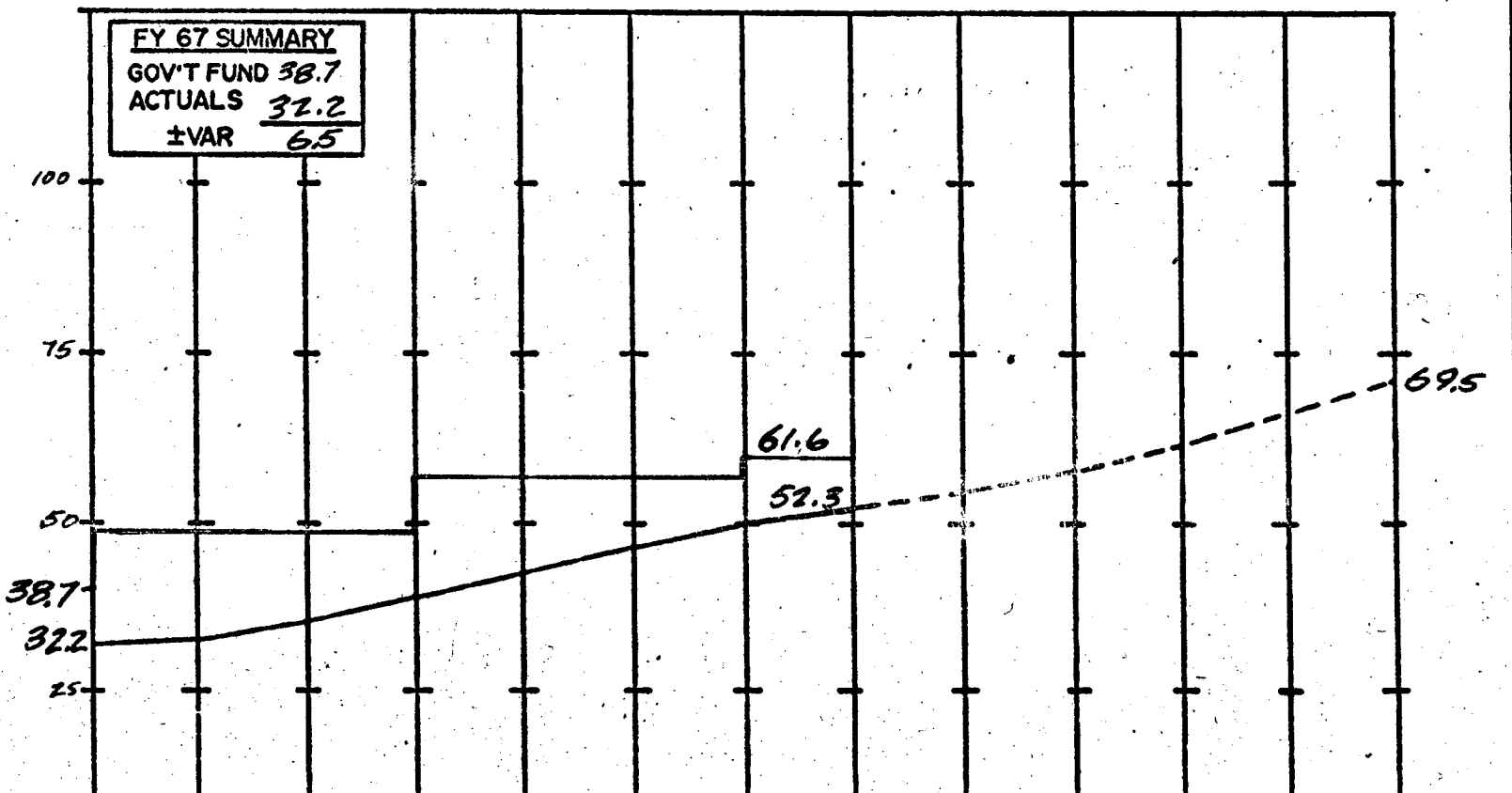
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FINANCIAL STATUS FY 1968

SYSTEM SEGMENT GEMINI 'B' CONTRACTOR MCDONNELL DATE REPORT _____

FY 67 SUMMARY	
GOV'T FUND	38.7
ACTUALS	32.2
±VAR	6.5



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
RATE						2.7	3.4	3.6	4.5	3.9	3.6	1.6	37.3
ACTUALS	2.4	2.6	3.1	3.2	3.2	2.7	2.9						
GOV'T FUNDING	10.4	0	0	10.0	0	0	2.5						

12C BASELINE

CURRENT BASELINE

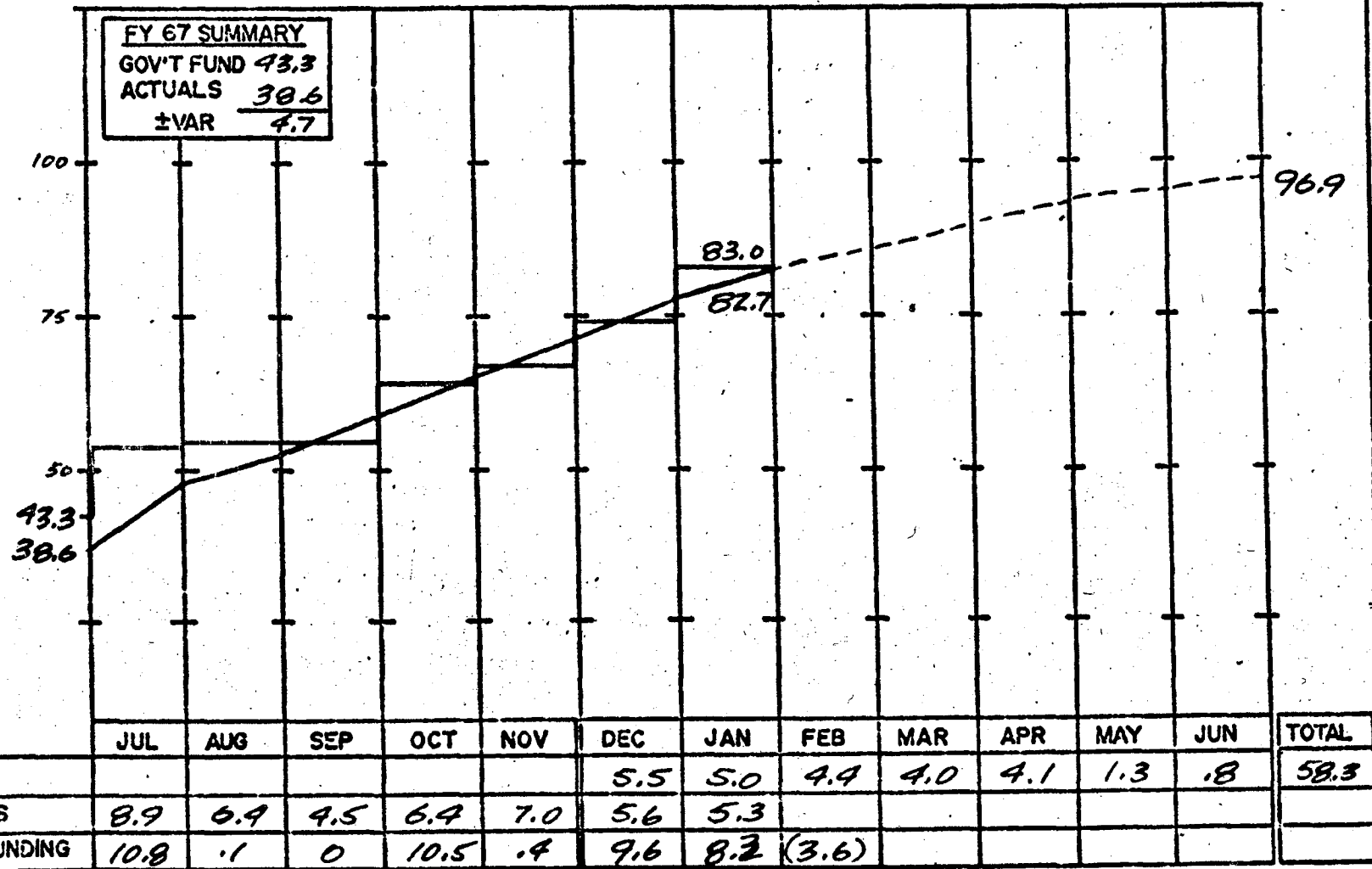
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F7

FINANCIAL STATUS FY 1968

SYSTEM SEGMENT T-III TOTAL CONTRACTOR VARIOUS DATE REPORT _____



120 BASELINE

CURRENT BASELINE

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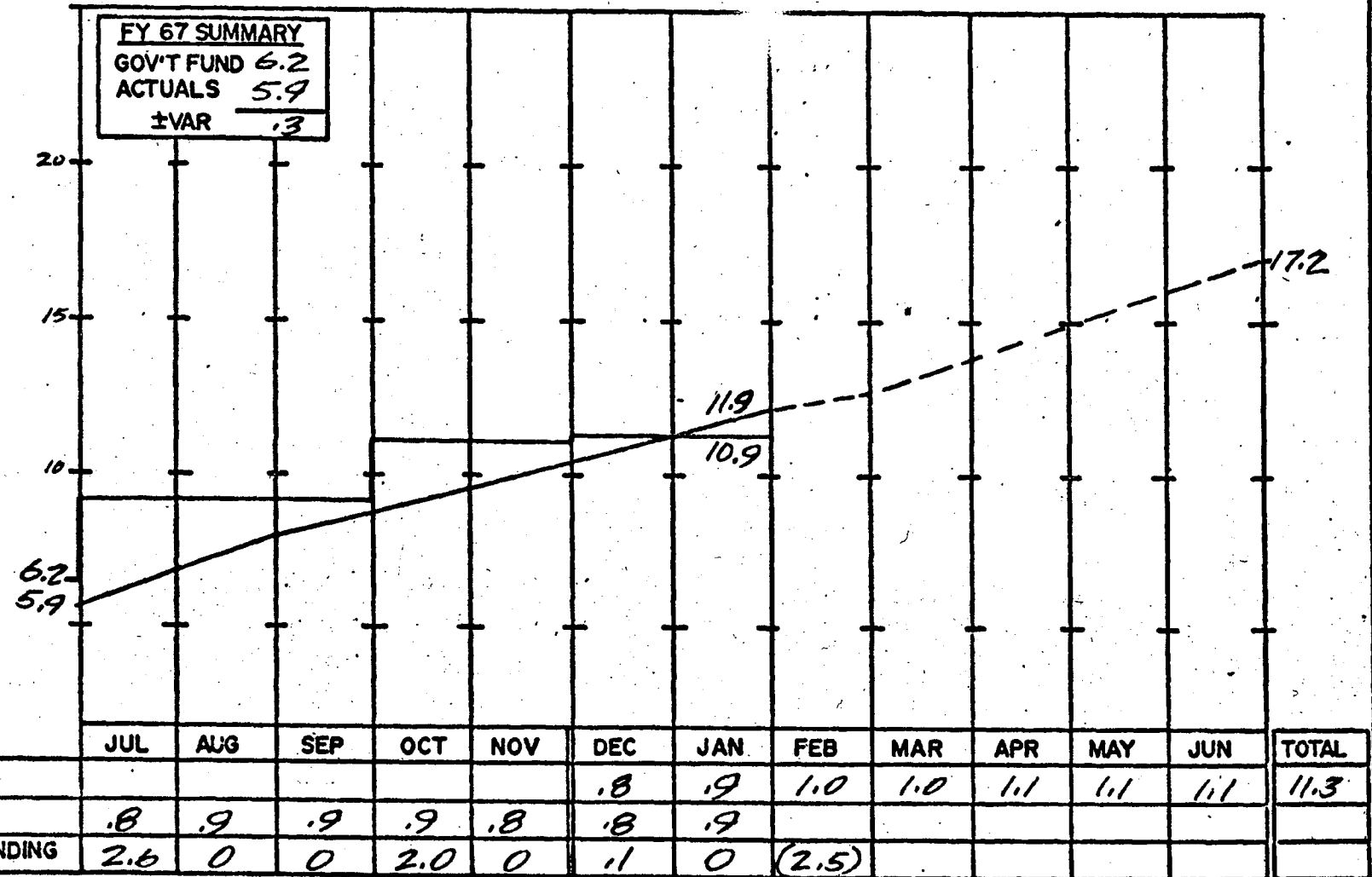
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F8

FINANCIAL STATUS FY 1968

SYSTEM SEGMENT GSE & TO CONTRACTOR AEROSPACE DATE REPORT _____

FY 67 SUMMARY	
GOV'T FUND	6.2
ACTUALS	5.9
±VAR	.3



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
RATE						.8	.9	1.0	1.0	1.1	1.1	1.1	11.3
ACTUALS	.8	.9	.9	.9	.8	.8	.9						
GOV'T FUNDING	2.6	0	0	2.0	0	.1	0	(2.5)					

12C BASELINE

CURRENT BASELINE

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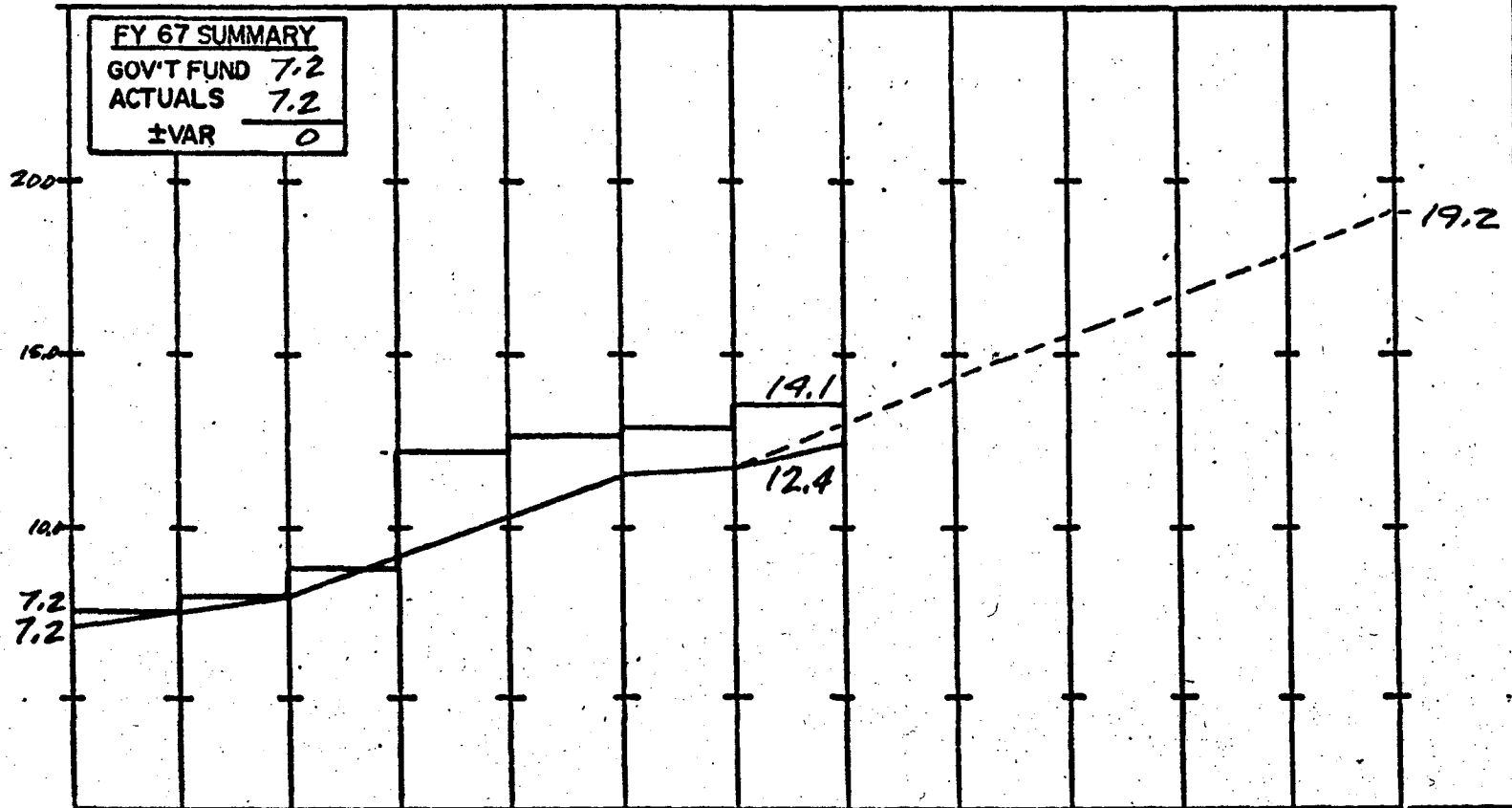
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FINANCIAL STATUS FY 1968

SYSTEM SEGMENT OTHER CONTRACTOR MISC. DATE REPORT _____

FY 67 SUMMARY	
GOV'T FUND	7.2
ACTUALS	7.2
±VAR	0



	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
RATE						.7	1.2	1.3	1.2	1.3	1.2	1.2	12.0
ACTUALS	.4	.4	1.2	1.4	.8	.4	.6						
GOV'T FUNDING	.4	.4	.9	4.4	.4	.1	.3						

12C BASELINE

CURRENT BASELINE

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FY 68 FUNDING STATUS

	<u>12 COMPACT</u>	<u>CURRENT PLAN</u>	<u>YEAR END CUM POSITION</u>	<u>PROBABLE VARIANCE</u>
DAC	175.0	130.6	238.6	-17.5
GE	70.0	74.2	105.0	-12.0
EK	110.0	119.0	177.1	0
MAC	54.0	30.6	69.3	- 3.0
T-IIIM	44.0	53.6	96.9	-11.1
OTHER	27.0	22.0	35.4	0
	<u>480.0</u>	<u>430.0</u>	<u>722.3</u>	<u>-43.6</u>

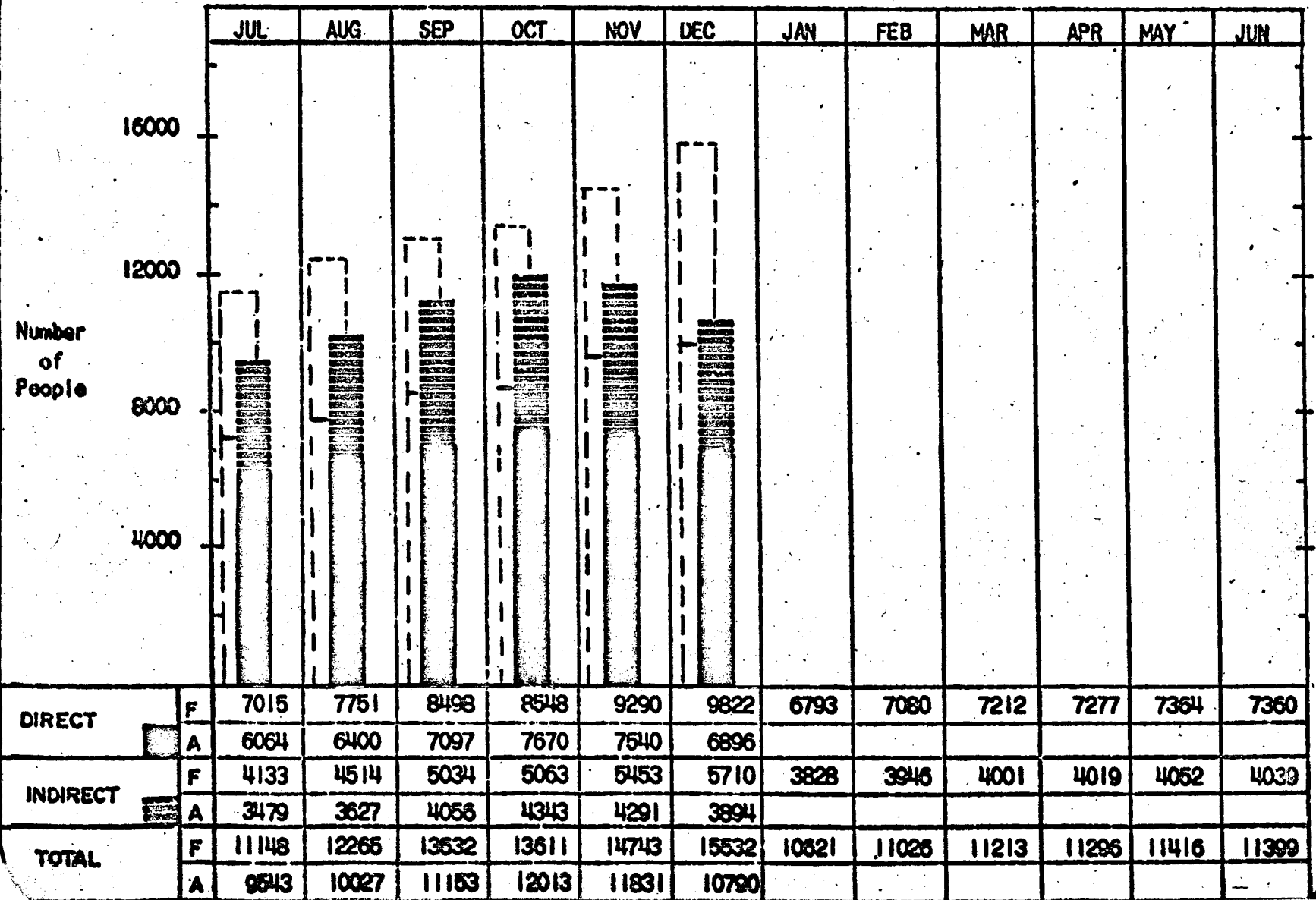
(FUNDED FY 67 292.3)

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F11

MANPOWER FY 1968
DIRECT & INDIRECT

CURRENT BASELINE
(8 DEC 67)
9 FEB 68



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MOL
PROGRAM

MOL PERFORMANCE (U)

AS OF
7 FEB 1968

SPECIAL ACCESS REQUIRED
CLASSIFIED SPACE PROJECT PROGRAM 632A

	TOTAL SYSTEM		LAB VEHICLE SYSTEM SEGMENT	
	SPEC	ESTIMATE	SPEC	ESTIMATE
WEIGHT (LBS)	29,202	28,552	14,641	14,128
SYSTEM EFFECTIVENESS				
CREW SAFETY PROBABILITY	.995	.9935	.999	.998
MISSION COMPLETION PROBABILITY	.87	.8483	.962	.958
DATA ACQUISITION PROBABILITY			NONE	.83
EXPECTED FRACTION OF DATA	.85	.7814		
PROBABILITY OF LAUNCH ON-TIME				
1ST DAY	* .796	.714	.95	.93
WITHIN 3 DAYS	* .934	.965	.985	.999
AVERAGE POWER (WATTS)	1825	1895	1050	1100
PROPELLANT USAGE (LB)	2000	1834		
ATMOSPHERE & REACTANTS (LB)		WITHIN CAPACITY		

* DOES NOT INCLUDE WORLD-WIDE NET OR PRESSURE SUIT

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No. of Pages 37

Sheet 1

SUPPORT MODULE & FLIGHT 6 & 7

STATUS REPORT

FEBRUARY 1968

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INTRODUCTION

● STATUS

- PHASE IA STUDY ON EXTENDED DURATION UNMANNED
VERSION COMPLETED 1 JANUARY 1968.
- SUPPORT MODULE AND ASSOCIATED EFFORTS DEFERRED
AT DACO AND GE.
- EK ON CONTRACT FOR FILM HANDLING SYSTEM
SINGLE PLATEN - SINGLE SUPPLY ~300# - 6 DRV'S.

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INTRODUCTION (CONT'D)

● BRIEFING CONTENT

● SUMMARY OF PHASE IA STUDY.

- EXTENDED DURATION DESIGN.
- TRADE STUDIES ON KEY PARAMETERS.
- TECHNICAL CONFIGURATION RECOMMENDATION.

● 30 VS 60 DAY CONSIDERATIONS.

- DESIGN OPTIONS.
- COSTS.

● SUPPORT MODULE SCHEDULES.

● ALTERNATE APPROACHES.

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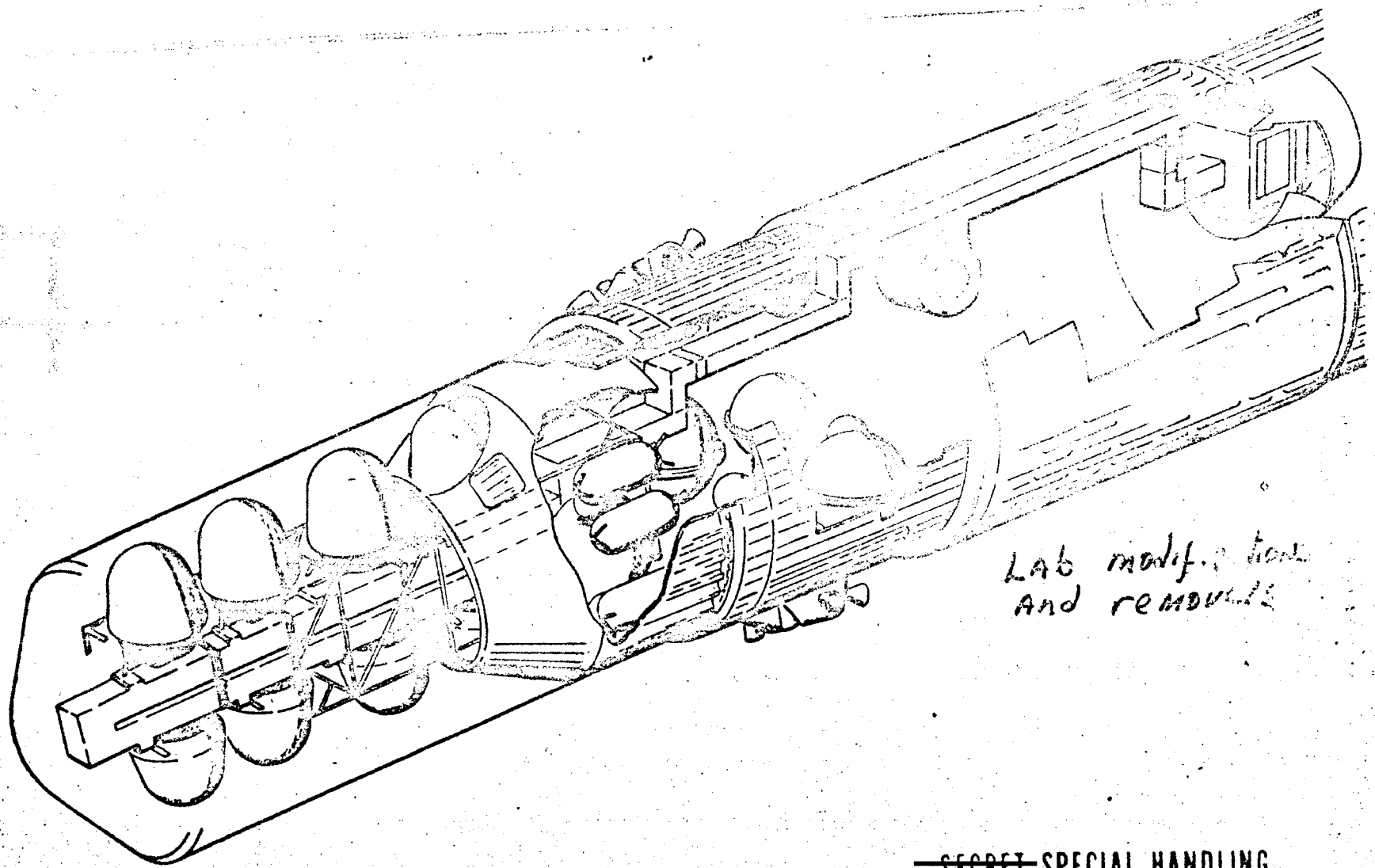
SUPPORT MODULE PHASE IA STUDY

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UNMANNED CONFIGURATION

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Lab modification
And removals

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PHASE IA STUDIES

(EXAMPLES)

● OV DESIGN:

- STRUCTURE & CONFIGURATION
- LAB PRESSURE/ATMOSPHERE COMPOSITION
- NOSE FAIRING DESIGN
- ONE VS TWO PLATEN CAMERA
- TB VS UTB FILM
- TWO SUPPLY REELS/ONE PLATEN
- CUT & WRAP VS CUT & SPLICE
- RELIABILITY
- WEIGHT
- POWER

● DRV DESIGN:

- PAYLOAD INCREASE
- IGNITOR INSTALLATION
- THERMAL CONTROL OF HEAT SHIELDS
- PLUME CHARACTERIZATION

● GROUND SYSTEMS:

- RECOVERY SECTION INTEGRATION LOCATION
- RECOVERY SECTION MATE LOCATION
- TANK SECTION INTEGRATION LOCATION
- ACOUSTIC TESTING
- JOINT QUAL TESTING

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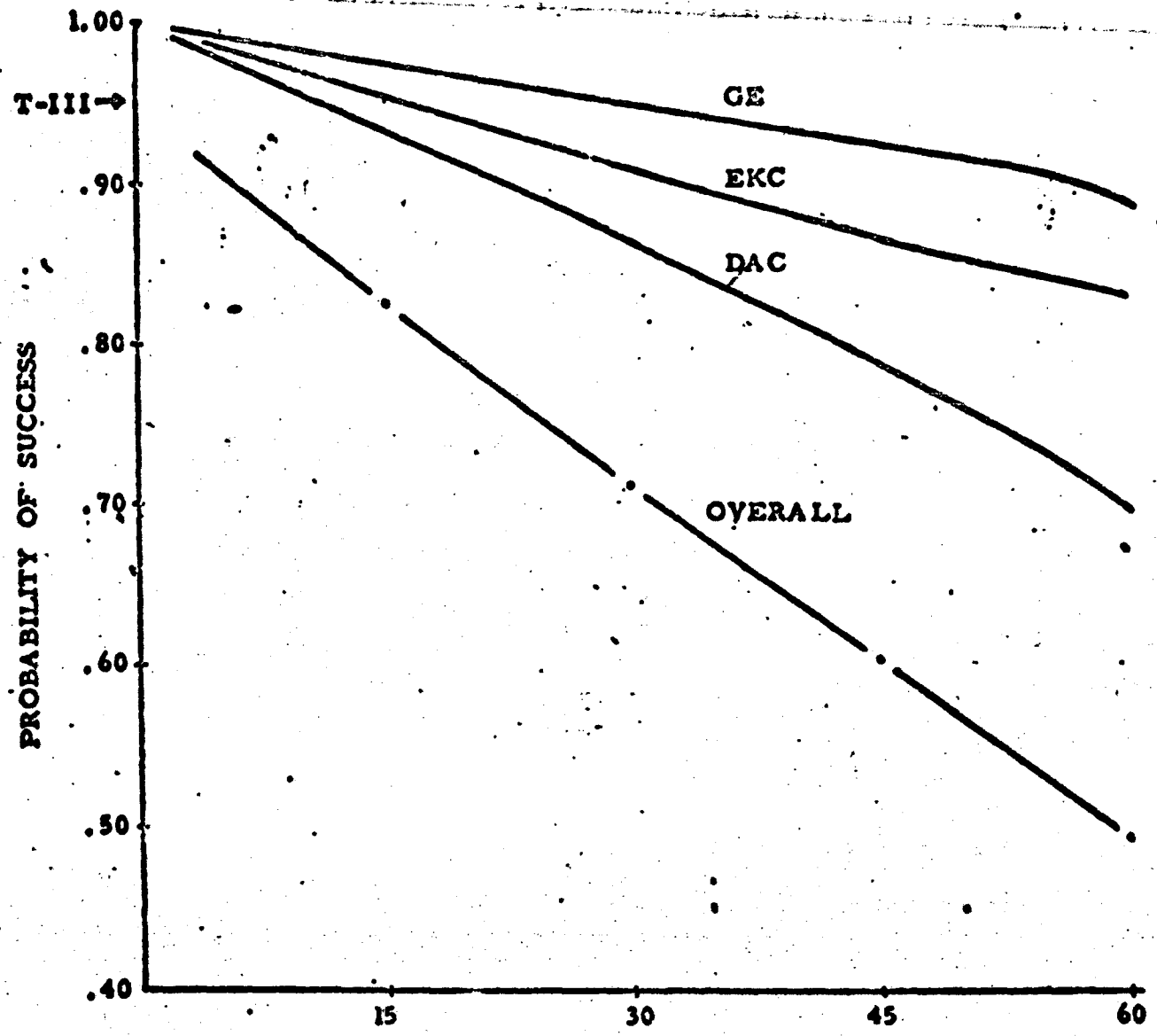
RELIABILITY

- PHASE IA EXAMINED 60 DAY CAPABILITY OF OV
 - RELIABILITY
 - WEAR OUT ITEMS
 - LIFE SENSITIVE COMPONENTS
- NO WEAR OUT ITEMS WERE IDENTIFIED IN PHASE IA
 - EXTENDED LIFE FEASIBILITY STUDY OF LATE 1966 IDENTIFIED WEAR OUT ITEMS.
 - THESE ITEMS WERE ALREADY CHANGED OR MODIFIED (HYDROGEN SEPARATOR PUMP FOR FUEL CELLS, MOTOR BEARINGS, CRYO BOTTLE INSULATION THICKNESS).
- CONTRACTORS IDENTIFIED APPROXIMATELY 45 COMPONENTS WHICH ARE LIFE SENSITIVE.
 - PHASE IB WILL BE USED TO DETERMINE WHICH OF THESE WARRANT LIFE TESTING TO INCREASE CONFIDENCE.
- RELIABILITY
 - EXTENSION OF THE 30 DAY UNMANNED RELIABILITY PREDICTIONS IS CORRECT.
 - MINOR CHANGES IN REDUNDANCY CAN INCREASE RELIABILITY AT 60 DAYS BY 10%.

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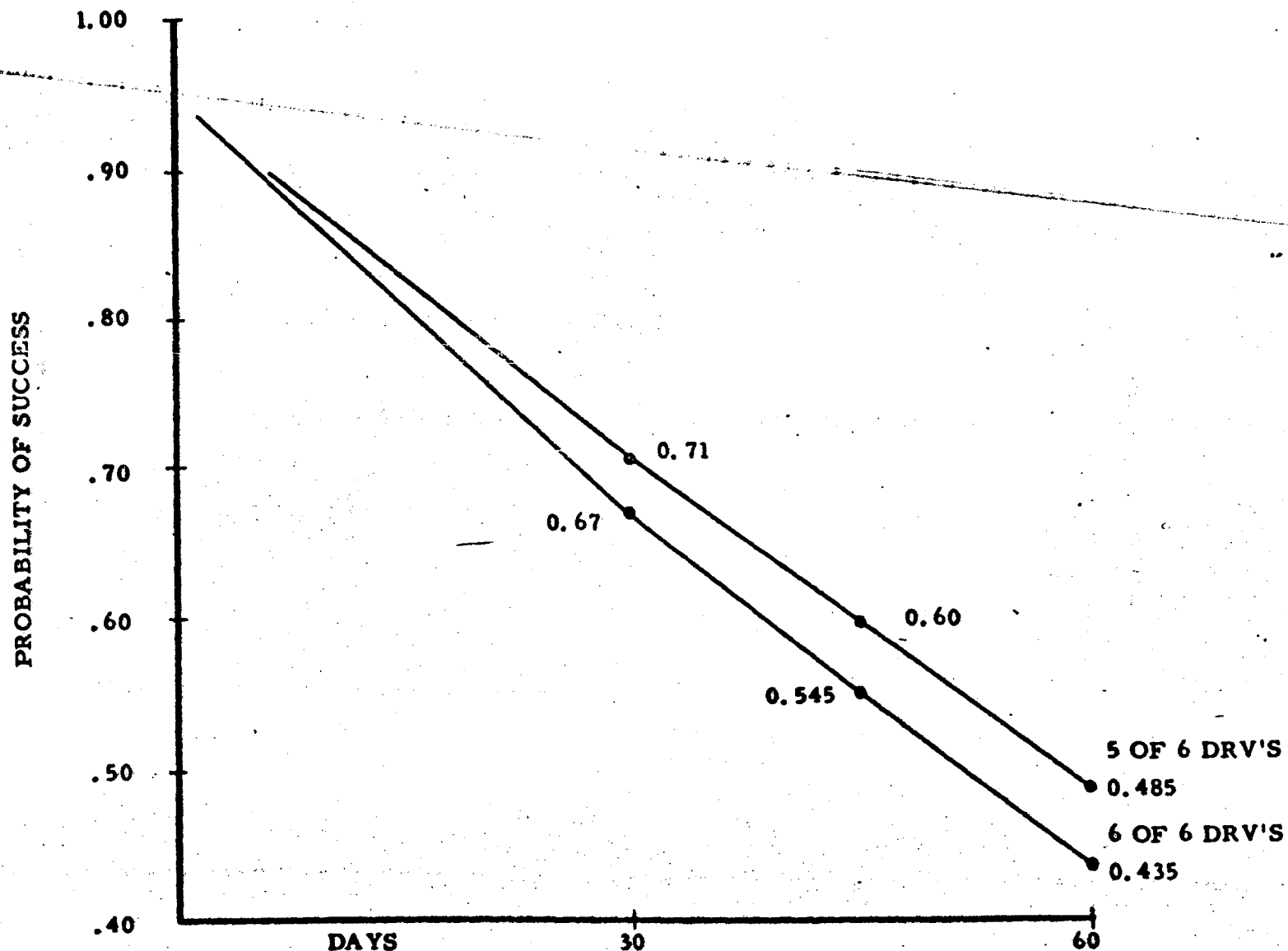
CONTRACTOR RELIABILITIES
(EXCLUDING DRV'S)



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OVERALL A.M. RELIABILITY



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DRV CONSIDERATIONS
(BASED ON 500 FRAMES/DAY)

DAYS	TB FILM			UTB FILM		
	~ FILM WT.	NO. OF DRV REQ.		~ FILM WT.	NO. OF DRV REQ.	
		50#	80#		55#	80#
30	240	5	3	160	3	2
40	305 (ORIGINAL BASELINE)	6	4	210	4	3
60	455	8+	6	310 (PROPOSED)	6	4

NOTE:
6 80# DRV'S
GIVES OVER
50% GROWTH
CAPABILITY

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**AUTOMATIC MODE
POWER - WT. REQUIREMENTS
FOR MISSION DURATION**

DURATION 1825 WATTS/DAY AVERAGE	DURATION 1600 WATTS/DAY AVERAGE	NO. OF CRYO TANKS	ADD. STRUCTURE	SYS. WT. EFFECTIVE)	MARGIN (90° INCL. ORBIT)
36.5 DAYS	42 DAYS **	2 H ₂ , 2 O ₂ 100 LBS. EXCESS O ₂	NONE	23723	7289
48.5 DAYS	56 DAYS	3 H ₂ , 3 O ₂ 160 LBS. EXCESS O ₂	38 IN. TANK MODULE	27372*	3640
53.0 DAYS	61 DAYS	4 H ₂ , 3 O ₂ 59 LBS. EXCESS H ₂	82 IN. TANK MODULE	28302*	2710
66 DAYS	76.5 DAYS	4 H ₂ , 4 O ₂ 220 LBS. EXCESS O ₂	82 IN. TANK MODULE	28932*	2080

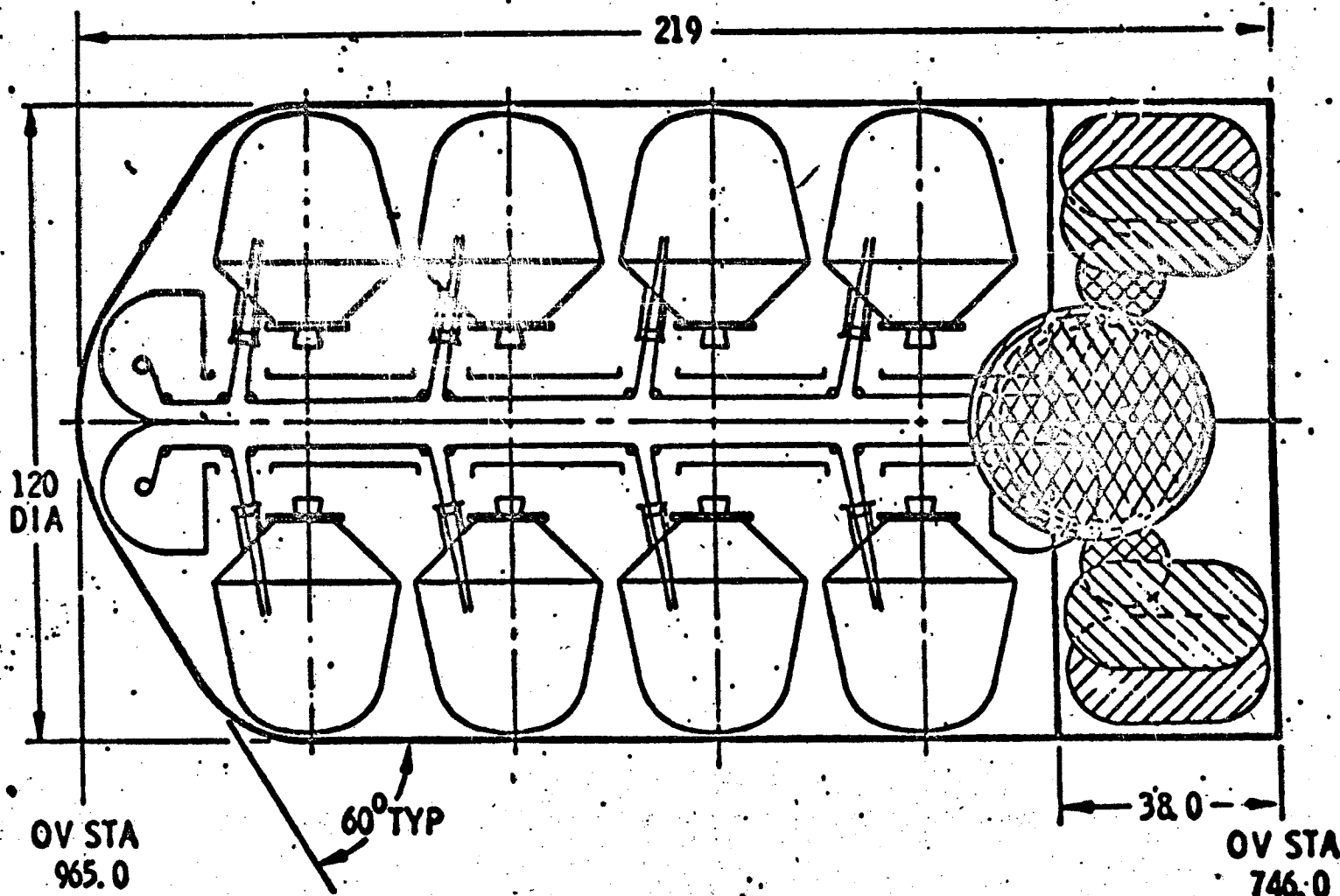
* CONTAINS SECOND COMPLETE SET OF ACTS PROPELLANTS.

** PERIGEE RAISED ~ 3 MILES TO REDUCE PROPELLANT USAGE RATE.

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MODULAR



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AVE RECOMMENDATIONS FOR FLIGHTS 6 & 7

● NOMINAL OR EXTENDED DURATION VERSION:

1. MODULAR DESIGN.
2. MOL PECULIAR FAIRING.
3. 2 PSI WITH 3 PSI PEAK.
4. 70 OXYGEN, 30 HELIUM.
5. ULTRA THIN BASE FILM.
6. SINGLE PLATEN - V CONFIGURATION.
7. 6 DRV'S.
8. DRV ~ 55 POUND CAPACITY. (STANDARD MARK 5) WITH PLANNED GROWTH TO ~ 84 POUNDS.
9. SINGLE FILM SUPPLY WITH APPROXIMATELY 310# CAPABILITY
~ 31,000 FRAMES.
10. PRESERVE SPACE, WEIGHT & POWER CAPABILITY FOR GROWTH IN FOLLOW-ON PROGRAMS TO APPROXIMATELY TWICE THE SUPPLY FILM LOAD.
11. CUT AND WRAP TECHNIQUE.
12. MDAU WITH SWITCHING UNIT FOR DRV EJECTION.

● EXTENDED DURATION VERSION:

1. ADD TANK SECTION WITH ADDITIONAL PROPELLANT AND CRYOGENIC TANKS.

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Page 1A

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FLIGHT 6 & 7 / NOMINAL VS EXTENDED DURATION CONSIDERATIONS

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DEFERRED FLIGHT 6 & 7 AND SM COSTS

- DEFERRED COSTS ASSOCIATED WITH NOMINAL 30 DAY MISSION.
- BASED ON CURRENT ROLES AND RESPONSIBILITY AS DEFINED IN PHASE IA.
- BASED ON 6 DRV - SINGLE PLATEN - SINGLE SUPPLY.

DACO \$ 28.0 M

GE \$ 19.7 M

EK \$ 3.0 M - MAJORITY ON CONTRACT (\$ 20 M)
 - TEST FLOW MODIFICATIONS

\$ 50.7

- APPROXIMATELY EQUALLY DIVIDED BETWEEN FY 69 - 70 - 71.

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MISSION DURATION MATRIX

PARAMETER	NOMINAL DURATION	EXTENDED DURATION
● FILM QUANTITY	- CURRENT SUPPLY 40 DAYS - TB FILM.	- UTB FILM COMPATIBLE WITH EXISTING HARDWARE & 60 DAY DURATION. - TB FILM REQUIRES MAJOR MODIFICATIONS.
● NUMBER OF DRV'S	- 4 STANDARD MK V'S WITH UTB FILM. - 4 MODIFIED MK V'S (INCREASED FILM CAPACITY) WITH TB FILM.	- 6 STANDARD MK V'S WITH UTB. - 8 MODIFIED MK V'S (INCREASED FILM CAPACITY) WITH TB FILM.
● EXPENDABLES	- NO MODIFICATIONS FOR SLIGHTLY OVER 30 DAYS DURATION.	- INCORPORATE TANK MODULE WITH ADDITIONAL EXPENDABLES AND CRYOGENICS.
▶ CAMERA SUBSYSTEM	- BASIC MANNED PRIMARY SUBSYSTEM. - MINOR MODS. TO SUPPLY.	- UTB FILM; BASIC MANNED PRIMARY SUBSYSTEM. - TB FILM OPTIONS: ● CHANGE FILM SUPPLY DESIGN. ● 2 CAMERA PLATENS. ● IN LINE SPLICE.
● WEIGHT MARGIN	- APPROXIMATELY 8,000 POUND MARGIN.	- APPROXIMATELY 2,500 POUND MARGIN.

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PROGRAM OPTIONS

FLIGHT 6 & 7

1. NOMINAL CONFIGURATION:

- NO ADDITIONAL EXPENDABLES (36-42 DAYS OF POWER EXPENDABLES).
- NO DESIGNED IN GROWTH.
- SINGLE PLATEN AND ~ 300# SINGLE FILM SUPPLY.
- 6 DRV'S (4 DRV'S ALSO EXAMINED).

2. NOMINAL CONFIGURATION WITH GROWTH:

- NOMINAL EXPENDABLES WITH PROVISIONS FOR ADDITIONAL EXPENDABLES.
- ENGINEERING & DESIGN FOR GROWTH - PRIMARY STRUCTURE FLOWN.
- SINGLE PLATEN AND 300# SINGLE FILM SUPPLY.
- 6 DRV'S (4 DRV'S WITH SPACE FOR 6 EXAMINED).
 - A) EXTENDED DELAY BETWEEN 7 AND UNMANNED FOLLOW-ON.
 - B) SHORT DELAY BETWEEN 7 AND UNMANNED FOLLOW-ON.

3. EXTENDED DURATION VERSION:

- ADDITIONAL EXPENDABLES ADDED (48-56 DAYS OF POWER EXPENDABLES).
- SINGLE PLATEN AND 300# SINGLE FILM SUPPLY.
- 6 DRV'S (8 DRV'S ALSO EXAMINED).
- 30 DAY QUALIFICATION TESTS.

(D) ~~SECRET~~ SPECIAL HANDLING

(D) ~~SECRET~~ SPECIAL HANDLING

PROGRAM OPTIONS

FLIGHT 6 & 7

(COSTS BY CONTRACTOR - EXCLUDING EK)

OPTIONS	FY 70 (M)	FY 71 (M)	FY 72 (M)	FY 73 (M)	TOTAL (M)
1. 30 DAY ONLY, NO GROWTH					*
2A. 30 DAY GROWTH EXTENDED DELAY					
- DACO (ENGINEERING DESIGN & STR.)		2.66	2.18		4.84
- GE					
<u>TOTAL</u>		2.66	2.18		4.84
2B. 30 DAY GROWTH NEAR FOLLOW-ON					
- DACO (FOLLOW-ON DEVEL & QUAL)		3.53	6.82	1.49	11.84
- GE					
<u>TOTAL</u>		3.53	6.82	1.49	11.84 **
3. 60 DAY					
- DACO		3.78	7.32	1.74	12.84
- GE	.1	.17			.27
<u>TOTAL</u>	.1	3.95	7.32	1.74	13.11

* A DIFFERENCE OF 2 DRV'S IS ESTIMATED AT 1.5-2.0 MISSION.

** DOESN'T INCLUDE FOLLOW-ON HARDWARE.

(D) ~~SECRET~~ SPECIAL HANDLING

(D) ~~SECRET~~ SPECIAL HANDLING

PROGRAM OPTIONS

FLIGHT 6 & 7

EK VARIABLES

OPTION (UTB ON ALL/BASELINE TEST FLOW)	FY 69 (M)	FY 70 (M)	FY 71 (M)	FY 72 (M)	FY 73 (\$M)	TOTAL (\$M)
1. BASELINE - 30 DAY - 6 DRV - SINGLE PLATEN - 300# SUPPLY						
2. EK RECOMMENDED - 2 PLATEN - 2 SUPPLY - 60 DAY COMPONENT TESTS	1.1	2.5	3.2	2.1	1.1	10.0
3. SINGLE PLATEN - 2, 240# SUPPLIES & SPLICE - 80# TAKE-UPS - 60 DAY COMPONENT TESTS	0.6	1.7	2.6	1.5	0.8	7.2
4. SINGLE PLATEN - SINGLE SUPPLY 425# (LARGE) - 80# TAKE-UPS - 60 DAY COMPONENT TESTS	0.4	0.8	2.0	1.3	.7	5.2

NOTE: CHANGE FROM OPTION 1 TO 2 THRU 4 AS FOLLOW-ON BLOCK CHANGE IS ADDITIONAL \$11 MILLION.

(D) ~~SECRET~~ SPECIAL HANDLING

(D) ~~SECRET~~ SPECIAL HANDLING

COST SUMMARY

APPROXIMATE
COST IN MILLIONS

● DEFERRED SUPPORT MODULE AND FLIGHT 6 & 7 COSTS	\$ 51.0
● 30 DAY VERSION WITH GROWTH CAPABILITY FLOWN ON VEHICLES 6 & 7	
ENGINEERING ONLY	5.0
ENGINEERING + DEVEL. & QUAL. OF TANK SECTION	12.0
● 60 DAY VERSION FLOWN ON 6 AND 7	13.0
<hr/>	
● CAMERA SYSTEM MODIFICATIONS:	
- 2 PLATEN SYSTEM	10.0
- 2 SUPPLY REELS	7.0
- LARGE SINGLE SUPPLY REEL	5.0

(D) ~~SECRET~~ SPECIAL HANDLING

(D) ~~SECRET~~ SPECIAL HANDLING

FLIGHT 6 & 7 SCHEDULE CONSIDERATIONS

(D) ~~SECRET~~ SPECIAL HANDLING

(D) ~~SECRET~~ SPECIAL HANDLING

PRELIMINARY MILESTONES FOR FLIGHTS 6/7 ACTIVITY

FY	1968												1969									
CY	1967					1968																
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M



1 Δ CONTR GO-AHEAD

Δ FINAL RECOMMENDATIONS PH IA (CONFIG., R&R, SCHEDULE)



Δ CONTR GO-AHEAD



(D) ~~SECRET~~ SPECIAL HANDLING

(D) ~~SECRET~~ SPECIAL HANDLING

SCHEDULE CONSIDERATIONS

- DEFINITION OF SUPPORT MODULE AND FLIGHT 6 & 7 ACTIVITIES IS REQUIRED TO COMPLETELY EVALUATE PROGRAM CONTENT.
 - FLIGHTS 3 THRU 5 SHARE AVE, AGE AND FACILITIES WITH 6 & 7.
 - INTERFACES ARE COMMON TO ALL FLIGHTS AND CAN'T BE DEFINED COMPLETELY WITHOUT UNMANNED BASELINE DESIGNS.

- POSTPONING FLIGHT 6 & 7 DEFINITIONS.
 - REQUIRE RE-NEGOTIATION OF MANNED BASELINE WHEN DEFINITION COMPLETE.
 - DUAL ACTIVITIES ON TEST & SCHEDULE PLANNING.

- DESIRABLE TO INCLUDE THE SM AND FLIGHT 6 & 7 EFFORTS INTO BASELINE RE-DEFINITION AND NEGOTIATION. (PROJECT UPGRADE)

- SHOULD BE COMPLETE BY JULY - AUGUST OF 1968.

(D) ~~SECRET~~ SPECIAL HANDLING

(D) ~~SECRET~~ SPECIAL HANDLING

ALTERNATE APPROACHES

(D) ~~SECRET~~ SPECIAL HANDLING

NOMINAL APPROACH

- **CONFIGURATION**
 - DESIGN AND BUILD 30 DAY VERSION FOR 6 AND 7.
 - NO DESIGN OR PLANNING FOR EXTENDED DURATION MISSION ABOVE PHASE IA ACTIVITY.
 - MINIMUM COST.

- **ROLES AND RESPONSIBILITY**
 - GE TO INTEGRATE AND TEST RECOVERY SECTION
 - DACO SUPPLY FAIRING AND INTEGRATE OV.

- **SCHEDULE**
 - START REMAINDER OF DEFINITION PHASE (IB) AS SOON AS POSSIBLE IN ORDER TO INCLUDE SUPPORT MODULE AND FLIGHT 6 & 7 ON CONTRACT.

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EXTENDED DURATION APPROACH

● CONFIGURATION

- DESIGN AND BUILD EXTENDED DURATION VERSION WITH SINGLE PLATEN AND SUPPLY FOR FLIGHT 6 & 7.
- \$13 MILLION ADDITIONAL COST OVER 30 DAY VERSION.

● ROLES AND RESPONSIBILITY

- GE INTEGRATE AND TEST RECOVERY SECTION.
- DACO INTEGRATE AND TEST TANK SECTION AND INTEGRATE ORBITING VEHICLE.
- DACO SUPPLY FAIRING.

● SCHEDULE

- START REMAINDER OF DEFINITION PHASE (IB) AS SOON AS POSSIBLE IN ORDER TO INCLUDE SUPPORT MODULE AND FLIGHT 6 & 7 ON CONTRACT.

(D) ~~SECRET~~ SPECIAL HANDLING

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~~SPECIAL HANDLING~~

LOW COEFFICIENT MATERIALS

BRIEFING OUTLINE

- o LOW COEFFICIENT MATERIAL APPLICATIONS
- o COMPARISON OF 71 INCH LIGHTWEIGHT MIRRORS
- o 71 INCH CER-VIT BACKGROUND
- o CER-VIT PRODUCTION STATUS
- o ULE BACKGROUND
- o FUSED SILICA STATUS
- o MIRROR NEED DATES
- o CURRENT PROGRAM APPROACH
- o APPROACH IMPLEMENTATION
- o EVALUATION CRITERIA AND TEAMS

~~SECRET~~

~~SPECIAL HANDLING~~

~~SECRET~~

SPECIAL HANDLING

LOW COEFFICIENT MATERIAL APPLICATIONS FOR MOL

TRACKING MIRRORS

- o IMPROVES TEMPERATURE GRADIENT TOLERANCE ON-ORBIT
- o MANDATORY WITH TWO POSITION DOOR, NO LOUVERS
- o EARLY CONFIRMATION FOR FULL CONFIDENCE IN DOOR, LOUVER DECISIONS
- o REDUCES TEMPERATURE PROBLEMS DURING PROCESSING & TEST

PRIMARY MIRRORS

- o IMPROVES TEMPERATURE GRADIENT TOLERANCE ON-ORBIT
- o REDUCES TEMPERATURE PROBLEMS DURING PROCESSING & TEST
- o EARLIEST NEED DATE

ROSS & NEWTONIAN FOLDING MIRRORS

- o IMPROVES TEMPERATURE GRADIENT TOLERANCE ON-ORBIT
- o GREATER STIFFNESS IN I-G TESTING

SOLID MASTER TEST MIRRORS

- o SELECTED SOLIDS SHOULD BE LOW COEFFICIENT
- o IMPROVES TEMPERATURE TOLERANCE DURING THERMAL TESTS
- o REDUCES TEMPERATURE PROBLEMS DURING PROCESSING & TEST

~~SECRET~~

SPECIAL HANDLING

~~SECRET~~ SPECIAL HANDLING

COMPARISON OF 71 INCH LIGHTWEIGHT MIRRORS

	<u>FUSED SILICA</u>	<u>CER-VIT</u>	<u>ULE (MONOLITHIC)</u>
THICKNESS	12"	10"	12"
MOUNTS	BASELINE	NEW TM RING, FLEXURES & LAUNCH LOCKS MODIFIED COA END CAP	SAME AS FUSED SILICA
WEIGHT	1000#	1000#	885#
SPACING & THICKNESS OF STRUTS	3" X 0.24"	5" X 0.312	3" X 0.20
STIFFNESS	4λ	4λ	3λ
C.G. LOCATION & DENSITY VARIATION	CONTROLLED	ACID PROCESS	CONTROLLED
QUALITY CONTROL	COMPONENT LEVEL	BLANK LEVEL	COMPONENT LEVEL
COEFFICIENT OF EXPANSION	$3 \times 10^{-7}/^{\circ}\text{F}$	$\pm 0.55 \times 10^{-7}/^{\circ}\text{F}$	$+ 0.11 \pm 0.16 \times 10^{-7}/^{\circ}\text{F}$
COST PER BLANK	\$225,000	\$140,000 HARDWARE MODS ADDITIONAL	\$250,000

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~~SECRET~~ SPECIAL HANDLING

71-INCH CER-VIT BACKGROUND

R&D PROGRAM JUL 66 - SEP 67

OBJECTIVE: TO DEMONSTRATE THE FEASIBILITY OF PRODUCING A 71" CER-VIT
PLANO MIRROR BLANK

RESULTS: POUR #14 - JULY 67 - POLISHABLE, NOT FLYABLE - TO UNIVERSITY OF
ARIZONA, THEN TO EKC

POUR #20 - SEPTEMBER 67 - FLIGHT QUALITY - USE AT O-I FOR C.G. AND
MASS DISTRIBUTION DETERMINATION, THEN TO EKC

PRODUCTION CONTRACT

START: OCTOBER 1967

INCLUDES: 5 TRACKING MIRROR BLANKS
6 PRIMARY MIRROR BLANKS

BASED ON: ONE SUCCESSFUL BLANK OUT OF EVERY FOUR POURS
POUR FREQUENCY ONE PER WEEK

DELIVERY SCHED: ONE PER MONTH - JAN 68 THROUGH OCT 68

COST: 1.25M \$115,000/BLANK

CCN: FOR MASS DISTRIBUTION & C.G. DETERMINATION
\$250,000 NON-RECURRING - \$25,000/BLANK

~~SECRET~~ SPECIAL HANDLING

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CER-VIT PRODUCTION STATUS

<u>PLANOS</u>	<u>ASPHERES</u>	<u>DATE</u>	<u>COMMENTS</u>
101		4 OCT	REJECTED, EXCESSIVE GRAPHITE IMPURITIES
	201	16 OCT	REJECTED, EXCESSIVE CRACKS AND IMPURITIES
102		8 NOV	REJECTED, 1.5" DEEP INDENTATION IN FACE PLATE
	202	11 NOV	REJECTED, EXCESSIVE CRACKS AND IMPURITIES
103		13 DEC	INITIALLY ACCEPTED; HOWEVER, ACID TREATMENT PRODUCED UNACCEPTABLE WEB DEFECTS
	203	15 DEC	REJECTED, EXCESSIVE CRACKS AND IMPURITIES
104		29 DEC	REJECTED, CRACKED IN KILN
105		---	NO POUR; TRIAL STOPPED
106		17 JAN	REJECTED DUE TO EXCESSIVE STRAIN IN GLASS; FIRST POUR WITH SILICA MOLD LINER
	204	19 JAN	REJECTED, EXCESSIVE CRACKS AND IMPURITIES
107		25 JAN	SAME AS 106
108		2 FEB	POSSIBLY ACCEPTABLE; RETURN TO GRAPHITE MOLD LINER.

~~SECRET~~

SPECIAL HANDLING

~~SECRET~~ SPECIAL HANDLING

ULE BACKGROUND

R&D PROGRAM

- 2 - 24" ROSS FOLDING MIRRORS (SLOTTED CORE)
FABRICATION BY CORNING - POLISHING BY PERKIN-ELMER
 - o #1 SHIPPED 10 FEB TO EKC - 1/12 λ
 - o #2 SCHEDULED FOR MARCH SHIPMENT TO EKC

- 2 - 27" NEWTONIAN FOLDING MIRRORS (SLOTTED CORE)
FABRICATION BY CORNING - POLISHING BY PERKIN-ELMER
 - o #1 SCHEDULED FOR 19 FEB SHIPMENT TO EKC - 1/15 λ
 - o #2 SCHEDULED FOR MARCH SHIPMENT TO EKC

- 1 - 71" MONOLITHIC (WELDED CORE) PLANO - 10" THICK
 - o SCHEDULED FOR COMPLETION - MARCH 68
 - o PLANNED SHIPMENT TO EKC

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FUSED SILICA STATUS

CURVES

SOLIDS-MASTER SPHERES

824	-1	II	-0.6 λ
	-2	IIG	SubContr 0.75 λ
	-3	B	SubContr 0.75 λ
	-4	IIG	1.5 λ

SOLIDS-MASTER PARABOLAS

723	-1	IIIA & B	1.0 λ
	-2	A	2.7 λ
	-3	FS	0.7 λ

LIGHTWEIGHT PRIMARY MIRRORS

C720	-1	EM	1.4 λ
	-2	THM	Out of Production
	-3	QM	1.8 λ From Sphere
	-4	OAT	1.3 λ From Sphere
	-5	FM-1	Started 19 Jan 68
	-6	FM-2	} NOT STARTED
	-7	FM-3	
	-8	FM-4	
	-9	FM-5	
	-10	MA	

PLANOS

SOLID MASTER PLANOS

722	-1	IIIB	2.1 λ
	-2	IIIA	0.8 λ
	-3	A	1.6 λ
	-4	MA	NOT STARTED

LIGHTWEIGHT TRACKING MIRRORS

P720	-1	FM	1.0 λ
	-2	QM	Completed Tub Grind
	-3	FM-1	} NOT STARTED
	-4	FM-2	
	-5	FM-3	
	-6	MA	
	-7	MA	
	-8	FM-4	} STOP ORDER
	-9	FM-5	

FOLDING MIRRORS

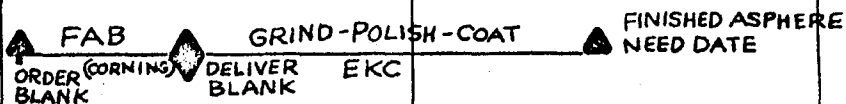
11 24" LIGHTWEIGHT - ROSS
 11 27" LIGHTWEIGHT - NEWTONIAN
 INITIAL ORDER 9-24", 8-27"
 REMAINDER CHANGED TO ULE

~~SECRET~~ / SPECIAL HANDLING

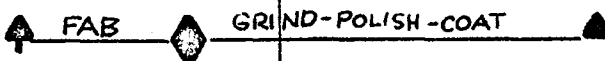
MIRROR NEED DATES

CURVES:

FM-1 (FV-3)



FM-2 (FV-4)

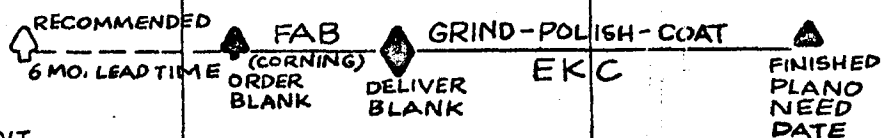


FM-3 (FV-5)

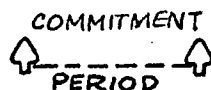


PLANOS:

FM-1 (FV-3)



ULE/CERVIT
DECISION



~~SECRET~~ / SPECIAL HANDLING

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CURRENT PROGRAM APPROACH

o PRIMARY MIRRORS

- o PROGRAM REQUIREMENT - ULE FOR FLIGHTS 5, 6, & 7
- o PROGRAM OBJECTIVE - ULE FOR FLIGHTS 3 & 4

EKC AUTHORIZED TO INITIATE PROCUREMENT OF ULE ASPHERE BLANKS
IF ULE PROVES UNACCEPTABLE - RETAIN PRESENT FUSED SILICA

o TRACKING MIRRORS

- o PROGRAM REQUIREMENT - LOW COEFFICIENT MATERIAL FOR ALL FLIGHTS
- o DECISION BETWEEN CER-VIT & ULE TO BE MADE NO LATER THAN AUG 68

o FOLDING MIRRORS

- o ALL FLIGHT MIRRORS ULE

PREVIOUSLY UNORDERED FOLDING MIRRORS HAVE BEEN CHANGED TO ULE
REORDER MINIMUM OF ONE 27" AND TWO 24" ULE FOLDING MIRRORS

o SOLID MASTER TEST MIRRORS

- o MINIMUM OF THREE SHOULD BE LOW COEFFICIENT - (CER-VIT)

1 - 82" MASTER SPHERE, CHAMBER B & II
1 - 72" MASTER PLANO, CHAMBER A & III
1 - 72" MASTER PARABOLA, CHAMBER A & III

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IMPLEMENTATION

- o EKC CONTRACT MODIFIED BY SUPPLEMENT AGREEMENT TO INCORPORATE
PRIMARY MIRROR, TRACKING MIRROR & FOLDING MIRROR APPROACH.

- o CER-VIT CONTRACT WITH OWENS-ILLINOIS REDIRECTED WITHIN PRESENT FUNDS
TO PLANO PRODUCTION AND SOLID MASTER BLANKS.

- o PLANS FOR COMMITMENT PERIOD - MARCH TO AUGUST 68

EVALUATION OF R&D ULE BLANK - BLANK DELIVERY - MAR

EVALUATION OF CER-VIT BLANK - BLANK DELIVERY - MAR ?

EVALUATION CRITERIA AND PROCEDURES

- o PLANNED PHASE OUT OF FUSED SILICA EFFORT

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SPECIAL HANDLING

~~SECRET~~ SPECIAL HANDLING

EVALUATION

CRITERIA

TEAM

STRUCTURE, MOUNTS, LOCKS, COMPATIBILITY

IN-HOUSE

WEIGHT

IN-HOUSE

DENSITY VARIATION

IN-HOUSE

C.G. LOCATION

IN-HOUSE

RIGIDITY AND STIFFNESS

IN-HOUSE

OVERALL COST

IN-HOUSE

STRUCTURAL INTEGRITY

IN-HOUSE

SURFACE FINISHING CHARACTERISTICS

IN-HOUSE/PANEL ?

EXPANSION COEFFICIENT

IN-HOUSE/PANEL ?

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