H 15 & 2-9

April 15, 1969

MEMORANDUM TO LT COLONEL CAHILL

SUBJECT: Correction of Minutes of PRC Meeting, 11 February 1969

Reference is made to Colonel Dalton's 17 March memorandum to me, subject as above. I have filed Col Dalton's memo noting his correction to the records with our records of the 11 February meeting.

/s/

RALPH J. FORD
Colonel, USAF
Chief, Program and Policies
Div, SAFSL

Cys to:
SAFSL - Chron File
SAFSLP - Official File
SCG Read
Col Ford/SAFSLP/50945/15Apr 69/shw

DEPARTMENT OF THE AIR FORCE
OFFICE OF THE SECRETARY

MEMORANDUM

Col Ford

I'm amenable to change down to the last sentence. I believe this may be somewhat out of context — it seems to me schedule adjustment mainly pertained to FY 70 budget.

DEPARTMENT OF THE AIR FORCE
MANNED ORBITING LABORATORY, SYSTEMS OFFICE (OSAF)
AF UNIT POST OFFICE, LOS ANGELES, CALIFORNIA 90045

SAFSL-4

17 March 1969

MEMORANDUM FOR COLONEL FORD

SUBJECT: Correction of Minutes of PRC Meeting, 11 February 1969

Your written minutes of the 11 February 1969 PRC have been reviewed and after a careful check of the tape recordings, the following more nearly reflects what was actually discussed. It is requested that the appropriate paragraph of the minutes be changed accordingly:

General Bleymaier then discussed proposed reprogramming actions which would insure that no contractor would experience a cash flow problem. All contractors forecast expenditures would be fully covered. With this funding level, contractors were projecting an end FY 69 variance of $85 - 90 million. At this point, Dr. Flax stated that was too high a variance and had to be reduced. Dr. Flax recalled that almost a year ago we were discussing a variance of $80 - 85 million, which was reduced to $27.1M by the end of FY 68. General Bleymaier stated that we couldn't get down to that figure. Dr. Flax acknowledged this and went on to repeat that last year we didn't want to go over $40M and ended up with $27M. He further stated that, "I would like to get back down to that 40 figure if we can." General Bleymaier acknowledged that we would like to too and we're really going to audit what is included in the variance. Dr. Flax indicated agreement with this action. General Bleymaier also pointed out that while an adjustment to the schedule may be necessary, he preferred, and this is our recommendation, to continue with the present contract negotiations based on our FY 69 schedule and established baseline program content in order to establish a reference position prior to assessing any funding impacts. Dr. Flax agreed with this recommendation.

WILLIAM L. DALTON, Col, USAF
Director, Program Control

~~SECRET~~/DORIAN

ROUGH DRAFT

AGENDA

DEPUTY DIRECTOR'S REPORT	MAJ GEN BLEYMAIER
FINANCIAL	
SCHEDULES	
VAFB CONSTRUCTION	
ORBITING VEHICLE DIRECTORATE REPORT	
GEMINI B	LT COL SUMNER
LABORATORY VEHICLE	LT COL DIVALL
MISSION MODULE DIRECTORATE REPORT	COL GANDY
PHOTOGRAPHIC PAYLOAD DIRECTORATE REPORT	COL KNOLLE
TEST OPERATIONS DIRECTORATE REPORT	COL O'TOOLE
TECHNICAL PRESENTATIONS	AEROSPACE CORPORATION
IVS	MR. TENNANT
CONTAMINATION	DR. WILLIAMS
FUEL CELL STATUS	MR. GRAFF
OPTICS INCLUDING SMEAR BUDGET	MR. TENNANT
VICE DIRECTOR'S REPORT	MAJ GEN STEWART
EXECUTIVE SESSION	

MOL PROGRAM FINANCIAL REVIEW

- REVIEW OF PROGRAM PLANNING
- ACTUAL PERFORMANCE FOR FY 68
- ESTIMATED PERFORMANCE FOR FY 69
- PRELIMINARY ASSESSMENT OF FY 70

Byeloe 8244-69.

BRIEFING.
11 FEB 69

ROUGH DRAFT

1966 PROGRAM PLANNING

- $587/FY 68, $647/FY 69 AND RECOGNIZED THAT THE SCHEDULE WAS PACED AS MUCH BY TECHNICAL PROGRESS AS AVAILABILITY OF FUNDS

IN MARCH 1967 - ACTUAL FUNDING LEVEL FOR FY 68 SET AT 480. . . PLANNING 620/FY 69

- SERIES OF SCHEDULE CONSIDERATIONS FOLLOWED, RESULTING IN 12-COMPACT BASELINE (MAY)

ROUGH DRAFT

FY 68

OCT - NEW PROBLEM AS FY 68 FUNDING LEVEL REDUCED FROM 480 TO 430

- SCHEDULE EVALUATIONS STARTED AND DEFICIT ANTICIPATED

NOV - CONTRACTOR ALLOCATIONS ADJUSTED TO CONFORM WITH DOLLARS AVAILABLE AND THE PACING CONTRACTOR.

DEC - SCHEDULE ADJUSTMENT FINALIZED AND CONTRACTOR AGREEMENT OBTAINED ON 20 MOS BASELINE EXTENSION (12C + 8)

- ACTUAL 430/FY 68 . . . 640 CHANGED TO 600 FOR FY 69

JUN - ACTUAL VARIANCE OF 27 MILLION

- EXPENDITURES FULLY COVERED
- ACTUALLY DEFERRED 23 OF THE ORIGINAL 480

~~SECRET / SAR~~

FY 69 PLANNING

ROUGH DRAFT

INITIAL PROBLEM - 600 FUNDING LEVEL UNLIKELY THEREFORE, VARIOUS SCHEDULE OPTIONS EVALUATED

JULY DECISION - FY 69 SET AT 515 . . . FY 70 PLAN 600

15 JUL AGREEMENT WITH CONTRACTORS

- CONTRACTORS ACCEPT NEW SCHEDULE AND DOLLARS
- VARIABLE SCHEDULE ADJUSTMENT

  FV #1 PLUS 1 MOS, FV #2 PLUS 3 MOS, FV #3 PLUS 4 MOS
- AN END FY 69 FUNDING VARIANCE RECOGNIZED
- PROJECT UPGRADE TO BE ACCOMPLISHED

~~SECRET / SAR~~

~~CONFIDENTIAL~~ ROUGH DRAFT

PROJECT UPGRADE

- FIRM REQUIREMENT DEVELOPED IN-HOUSE RESULTING IN FULLY DEFINED TECHNICAL BASELINE
- CONTRACTOR AGREEMENT SECURED ON MEANING, INTENT AND SCOPE OF TECHNICAL BASELINE
- CONTRACTORS' ROLES AND RESPONSIBILITIES WERE DEFINED AND NEGOTIATED RESULTING IN STATEMENT OF WORK
- TECHNICAL INTEGRITY ASSURED
- TECHNICAL DEFINITION COMPLETED IN AUGUST
- NOW WORKING CONTRACTUAL WRAP-UP

ROUGH DRAFT

TODAY

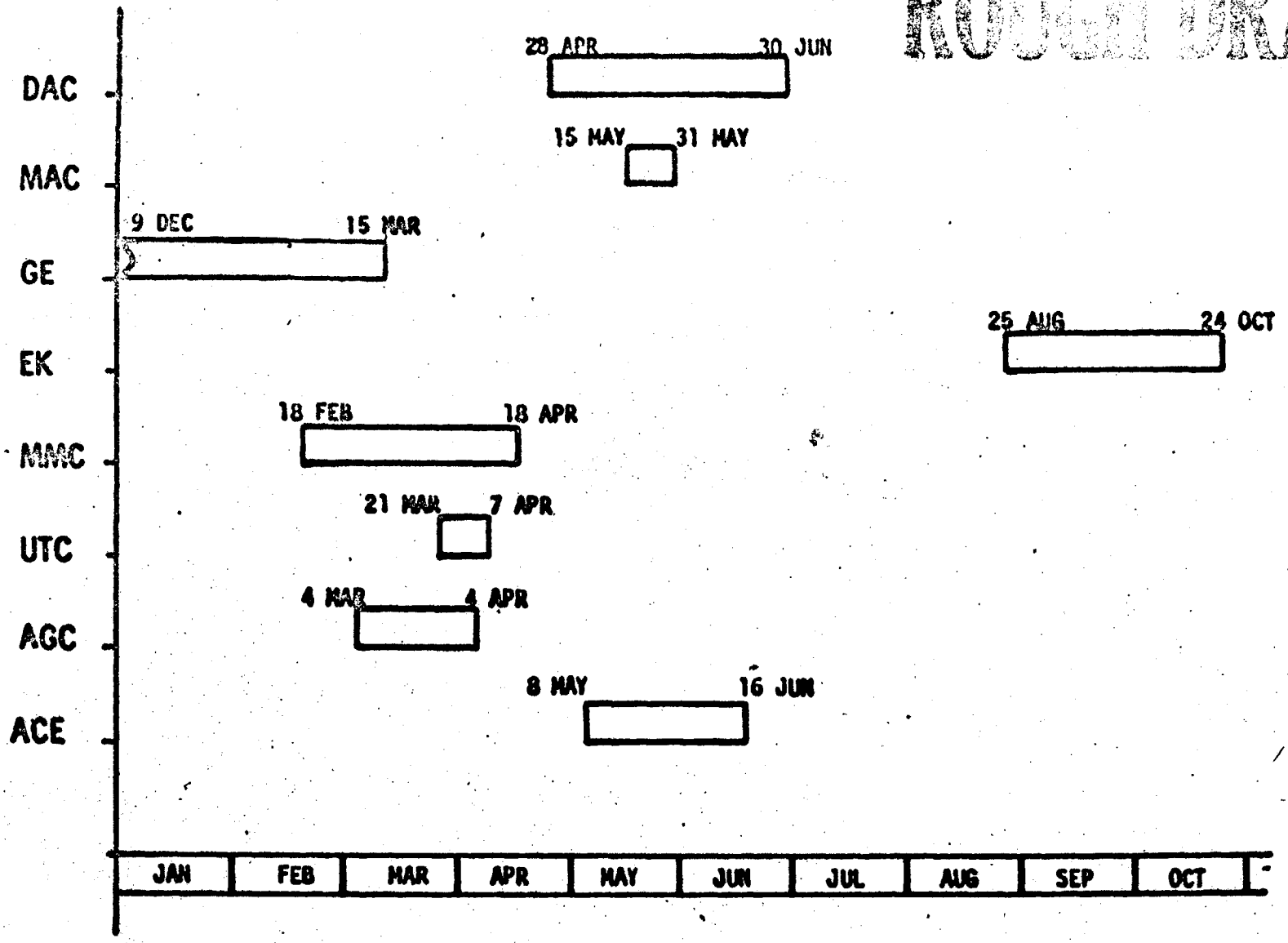
PRESENT UNIFORM UNDERSTANDING FOR CONDUCT OF EFFORT:

- TECHNICAL REQUIREMENTS WILL BE MET WITHOUT DEVIATION OR COMPROMISE.
- PROGRAM SCHEDULES WILL BE MET INSOFAR AS TECHNICALLY POSSIBLE AND FINANCIALLY REASONABLE.
- ADDITIONAL REQUIREMENTS WILL BE IMPOSED WHERE NECESSARY IN FY 69 WITH HIGH PROBABILITY OF NO ADDITIONAL FUNDING.

~~SECRET~~/DORIAN

TIME FORECAST OF NEGOTIATIONS

ROUGH DRAFT



~~SECRET~~ / DORIAN

~~SECRET~~/DORIAN

FY 68
ACTUALS (E + P + NCC)

ROUGH DRAFT

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
LAB VEH	14.0	13.5	13.6	14.8	12.5	17.3	19.8	9.3	8.7	12.5	14.4	11.3
MSN MOD	8.5	5.3	8.5	7.5	5.8	6.2	6.7	5.3	6.1	8.8	8.2	7.8
PHOTO SYS	8.2	11.2	6.3	8.8	7.7	11.3	12.8	13.0	6.0	16.1	11.4	9.9
GEMINI B	2.4	2.6	3.1	3.3	3.2	2.6	2.8	.8	3.3	2.8	2.9	4.0
T-IIIM	5.2	5.9	4.3	6.3	6.9	5.7	2.7	4.5	4.0	4.3	3.8	5.4
AEROSPACE	.8	.9	.9	.9	.8	.8	1.0	1.0	1.0	1.1	1.0	1.0
OTHER	.4	.4	1.2	.8	.8	.5	.9	.6	2.2	.3	.5	.5
	39.5	39.8	37.9	42.4	37.7	44.4	46.7	34.5	31.3	45.9	42.2	39.9

12 COMPACT BASELINE — 20 MONTH EXTENSION B/L

ACTUALS END FY 67	267.5	CUM 68 ACTUALS	749.7
ACTUALS FY 68	482.2	CUM 68 FUNDING	722.6
TOTAL	749.7	VARIANCE	-27.1

~~SECRET~~/DORIAN

~~SECRET~~/DORIAN

ROUGH DRAFT

END OF FY 68 POSITION

ACTUALS

	EXPEND	NCC	TOTAL	GOVT FUND	DEFICIT TOTAL
LAB VEH	239.8	17.0	256.8	238.5	- 18.3
MISSION MOD	105.5	11.6	117.1	108.1	- 9.0
PHOTO SYS	153.2	21.5	174.7	174.9	.2
GEMINI B	50.7	15.3	66.0	66.0	0
T-III M	96.1	5.6	101.7	100.0	- 1.7
AEROSPACE	17.1	0	17.1	17.4	.3
OTHER	15.8	.5	16.3	17.7	1.4
TOTAL	678.2	71.5	749.7	722.6	- 27.1

1P

ROUGH DRAFT

ESTIMATED PERFORMANCE FOR FY 69

ROUGH DRAFT

SLACK - 20.8

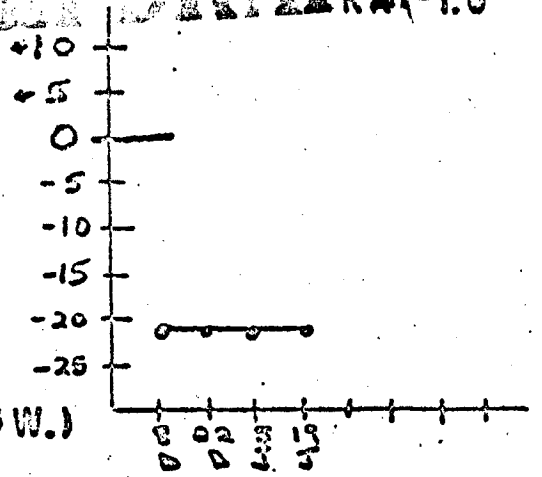
CONTRACTOR - GENERAL ELECTRIC / EK

PROBLEM 0 LATE SHIPMENT OF EG-48 (TRACKING MIRROR DYNAMIC SUBSTITUTE)

BACKGROUND 0 USED IN DSS-1 TESTING @ GE

0 DELAY OF DSS-1 COMBINED TESTS DELAYS GD-5 BY 20.8 W. (GE PERT -23 W.)

0 GE STRAWMAN SCHEDULE COULD ACCEPT THIS ITEM AS LATE: 1 JUNE 1969



FY 69 CONSTRAINT

EG-48 TM DYNAMIC SUBSTITUTE ON DK GE → DRIVE "A" ASSY INTO STRUCTURE → DSS-1 COMBINED TEST → DYNAMIC ELECTRICAL SUBSTITUTES ON DK DACO → INSTALL & C/O DYN ELEC. SUB., TURN-OVER TO DAC → EDCTU SOFTWARE DEV.

GD-5

-20.8 W

CONSTRAINT

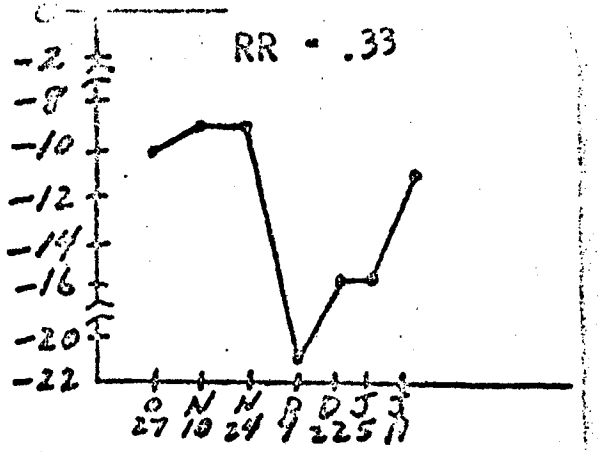
LMQTV

NEED: 15 APR 69
PROMISE: 1 OCT 69

~~SECRET~~/DORIAN

CONTRACTOR - MDAC-WD

PROBLEM AREA - EDCTU



SLACK			
-11.2	15-205-189 REMOTE SIGNAL CONDITIONING ASSY T_E - 10 DEC 69 T_S - 26 SEP 69		
-10.4	12-215-542 ELECT DIST. UNIT AVAIL. T_E - 19 NOV 69 T_S - 12 SEP 69	15-205-291 EDCTU DEVELOP LM INTEG HDWE	12-202-131 SPACE CHAMBER TESTS
- 4.4	13-223-178 SHIP PHYSIO. SIG. SIM TO EDCTU T_E - 29 JAN 70 T_S - 23 NOV 69		
- 0.8	13-222-226 SHIP BIOMED. CONSOLE TO EDCTU T_E - 26 DEC 69 T_S - 26 DEC 69		

ROUGH DRAFT

BIOMEDICAL CONSOLE

ROUGH DRAFT

SLACK ● -0.8 WEEKS

PROBLEM ● LATE DELIVERY OF THE BIOMEDICAL CONSOLE FOR THE EDCTU APPEARS TO HAVE BEEN RESOLVED.

SOLUTION ● SOLUTION TO THE PROBLEM WAS TO CHANGE THE BUYOFF COMPLETE DATE FROM 19 DECEMBER 1969 TO 24 APRIL 1970.

PHYSIOLOGICAL SIGNAL SIMULATOR

ROUGH DRAFT

SLACK	0	-4.4 WEEKS
PROBLEM	0	DELAY IN PROCUREMENT OF THE WAVE FORM GENERATOR (WFG) FOR THE PHYSIOLOGICAL SIGNAL SIMULATOR (PSS)

ELECTRICAL DISTRIBUTION UNIT

ROUGH DRAFT

SLACK 0 -10.4 WEEKS

PROBLEM 0 LATE ENGINEERING RELEASE OF THE LV ELECTRICAL DISTRIBUTION UNIT CONTINUES TO DELAY COMPLETION OF THE EDCTU BUILDUP AND INTEGRATION.

BACKGROUND 0 ADVANCED ENGINEERING RELEASES ARE BEING USED IN AN EFFORT TO MEET EDCTU SCHEDULED COMPLETION.

0 THE PROBLEM HAS BEEN REPORTED CONTINUOUSLY SINCE THE 13 OCTOBER PERT CYCLE.

REMOTE SIGNAL CONDITIONING ASSEMBLY

ROUGH DRAFT

SLACK 0 -11.2 WEEKS

PROBLEM 0 LATE RELEASE BY DEVELOPMENT ENGINEERING OF DRAWINGS TO PRODUCE HOUSING DETAILS FOR THIS UNIT.

BACKGROUND 0 SLACK HAS PREVIOUSLY BEEN NEGATIVE 5.6 WEEKS.

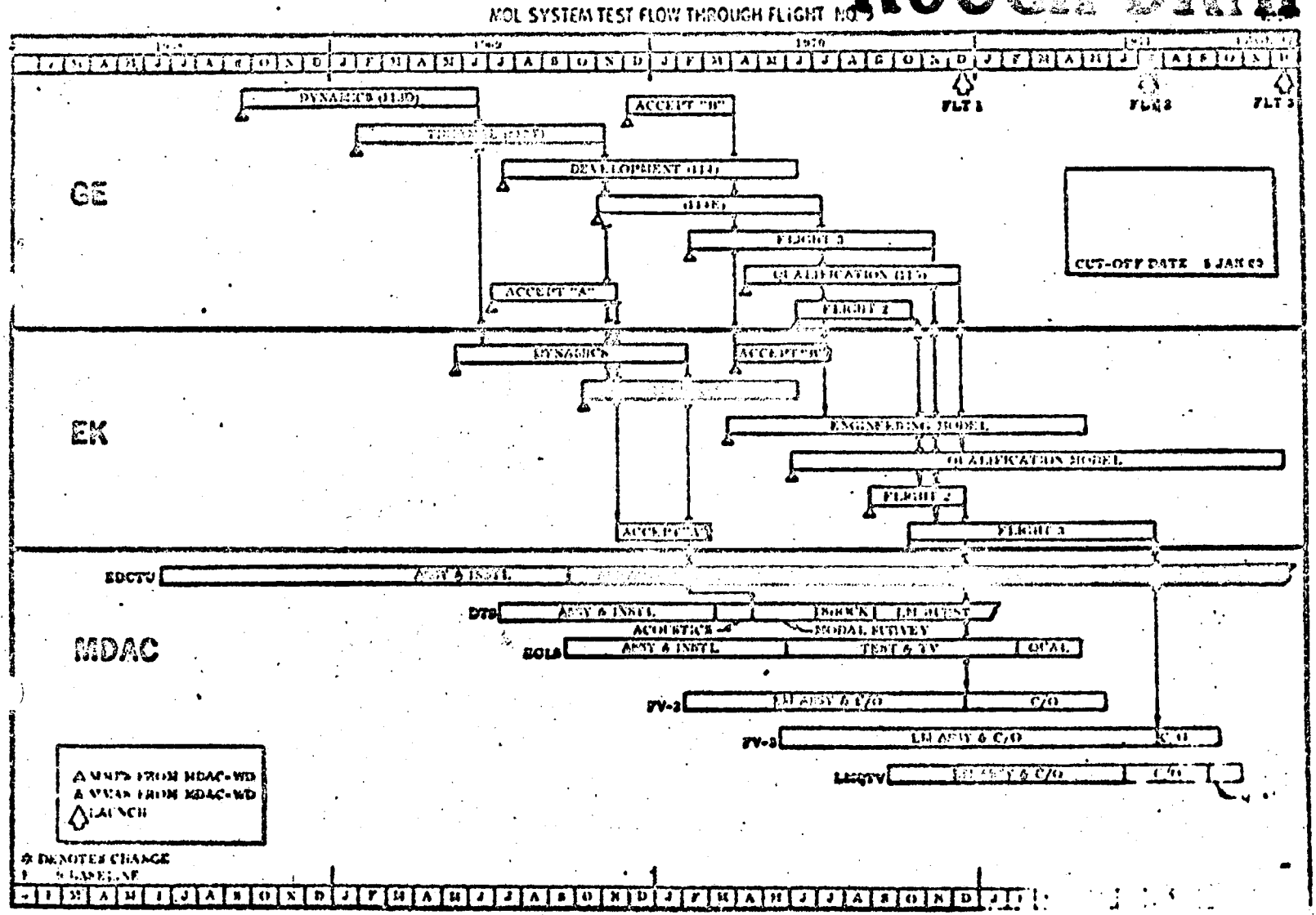


Figure 1-6. MOL System Test Flow Through Flight No. 3

SLACK	TS	ITEM	PROBLEM	OPR(S)	IDENTIFIED
.36	- 8.8	1 SEP 69	GE-76 FAMS LIGHT SOURCE	LATE PROCUREMENT	SL-14	8 DEC 68
.2	- 4.2	20 JUN 69	GE-33 113D ON DK EK	LATE DELIVERY	SL-14	20 DEC 68
.2	- 4.2	20 JUN 69	GE-46 MMFS/MM TRANSPORTER	LATE DELIVERY	SL-14	20 DEC 68
.15	-10.2	20 FEB 70	MCM 5 & 10	DELIVERY DATE	SL-12/13	20 AUG 68*
.14	- 6.8	29 DEC 69	CRYO QUAL TESTING	VALVE PROCUREMENT	SL-12	27 OCT 68
--	UK	31 JAN 69	SHARED AGE GEMINI B	RESCHEDULING PROB.	SL-12	3 NOV 68
--	UK	MOLAC	GBPS TO STC INTERFACE DEFINITION	INTERFACE DEFINITION	SL-12	3 NOV 68
.04	- 4.6	12 FEB 71	DM-10	DELIVERY DATE	SL-12/13	20 AUG 68*

* STILL IN PERT, BUT RESOLVED IN THE ACTIVATION WORKING GROUP MEETING ON 19 DEC 68.

~~SECRET~~/DORIAN

ROUGH DRAFT

A/A	SLACK	TS	ITEM	PROBLEM	OPR(S)	IDENTIFIED
.03	- 2.0	26 MAR 70	DM-8	ENG RELEASE OF ADV. MATERIAL ORDER	SL-12	24 NOV 68
.01	- 6.6	15 DEC 70	115 QUAL VEHICLE	ACTIVITY TIME SPAN	SL-14	25 SEP 68
.01	- 4.0	15 JAN 71	CITE 400C GM 4, 5 & 6	DELIVERY DATE	SL-14/13	10 OCT 68
--	--	15 FEB 69	DUAL GAS TEST FOR PSA AT MDAC-ED	QUALIFIED SUITS NOT AVAILABLE	SL-12C	20 DEC 68
LATE	- 3.6	20 DEC 68	FWR DIST CONTROL	LATE SIGNOFF DSGN SPECS	SL-13	14 DEC 68

ROUGH DRAFT

~~SECRET~~/DORIAN

FY 69

ACTUALS TO DATE

ROUGH DRAFT

	JUL	AUG	SEP	OCT	NOV	DEC
LAB VEHICLE	17.3	14.0	13.6	18.0	13.0	11.8
MISSION MODULE	9.6	7.7	9.1	10.1	7.7	8.2
PHOTO SYS	9.4	8.9	11.1	14.4	10.1	8.3
GEMINI B	1.8	2.4	1.8	2.5	3.7	3.2
T-IIIM	5.1	6.3	7.1	5.8	5.9	8.7
AEROSPACE	1.0	1.0	.9	1.0	.9	.9
OTHER	.2	.5	.5	.8	1.4	.7
TOTAL	44.4	40.8	44.1	52.6	42.7	41.8

~~SECRET~~/DORIAN

~~SECRET/~~DORIAN

CONTRACTOR FORECAST

END OF FY 69 POSITION
AS OF 31 DEC 68

ROUGH DRAFT

	EXPEND	NCC	TOTAL	$ AVAILABLE	DEFICIT EXPEND	DEFICIT TOTAL
LAB VEHICLE	412.5	21.7	434.2	407.5	-5.0	-26.7
MISSION MODULE	215.2	10.4	225.6	209.1	-6.1	-16.5
PHOTO SYS	279.7	16.0	295.7	276.9	-2.8	-18.8
GEMINI B	97.0	22.9	119.9	109.0	12.0	-10.9
T-III M	174.0	11.7	185.7	167.0	-7.0	-18.7
AEROSPACE	28.1	0	28.1	28.4	.3	.3
OTHER	38.7	1.0	39.7	39.7	1.0	0
TOTAL	1245.2	83.7	1328.9	1237.6	-7.6	-91.3

~~SECRET/~~DORIAN

ROUGH DRAFT

	JULY 1968 POSITION		FEBRUARY 1969 POSITION		
	GOVERNMENT FUNDS TO BE AVAILABLE	CONTRACTOR FORECAST NEEDS	CONTRACTOR FORECAST NEEDS	TO COVER EXPENDITURE BY 30 JUN (CASH)	END FY 69 VARIANCE
DAC	164.0 (+5.)	182.6	196.7	170.0	12.3
GE	96.0 (+5.)	122.3	120.0	106.0	9.0
EKC	102.0	117.4	120.8	104.8	(.2)
MAC	53.0 (-10.)	53.2	53.9	31.0	0
NMC	29.0	36.5	37.4	34.4	2.1
ASED	2.0	2.3	3.1	2.8	.1
AGC	7.2	9.7	8.4	8.0	(.8)
UTC	25.0	33.8	32.2	24.2	.9
T-III MISC & OTHERS	36.8	34.5	36.5	33.5	(2.7)
TOTAL	515.0	598.3	609.0	516.7	27.1

ROUGH DRAFT

1

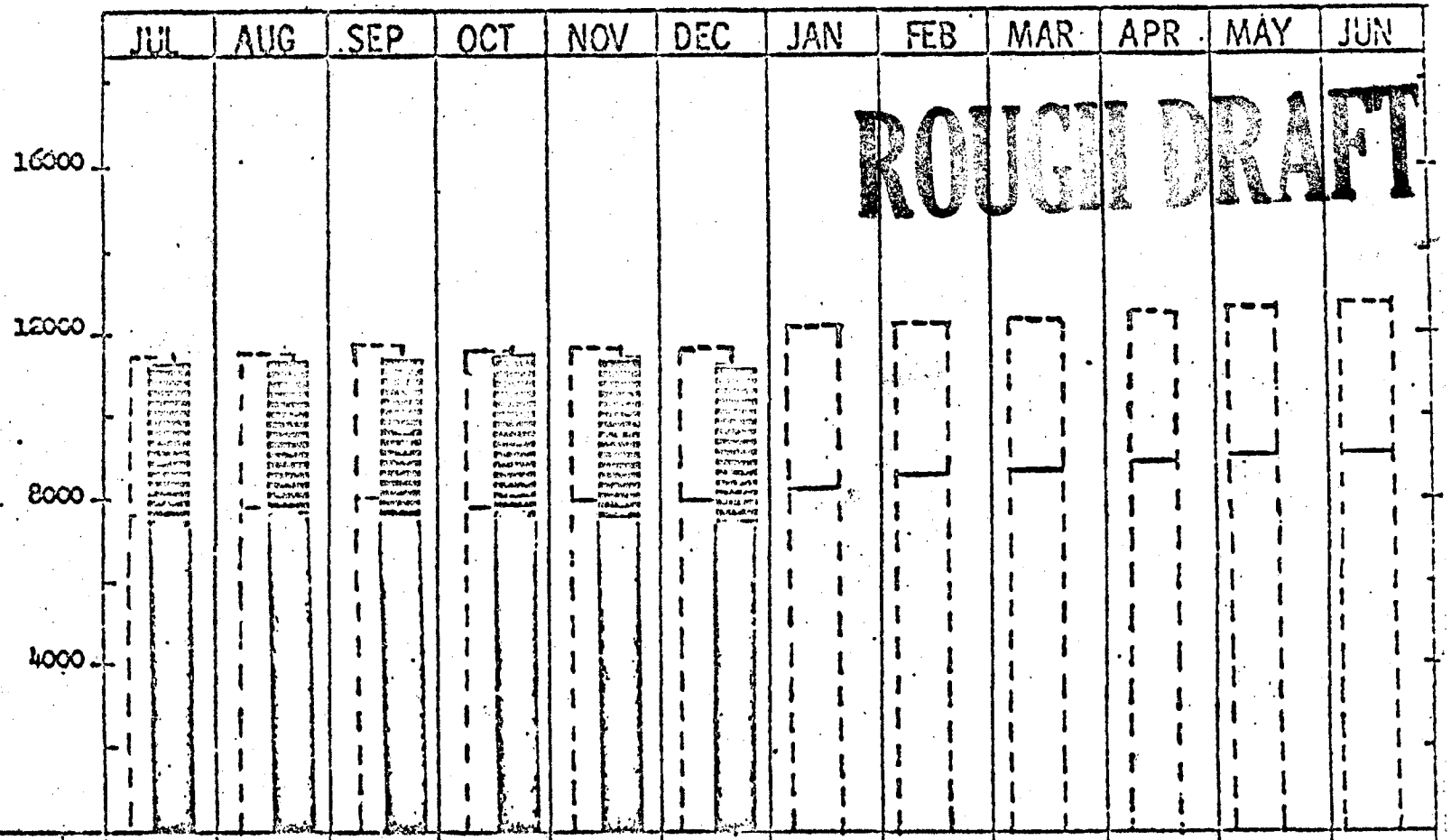
GOVT FUNDS NEEDED TO COVER EXPENDITURE	FORECAST VARIANCE 30 JUN 69 WITHOUT CASH PROBLEM	CONTRACTOR FORECAST NEEDS FY 70	FORECAST VARIANCE 30 JUN 70	VARIANCE LIQUIDATED IN FY 70
1.0	24.7	232.0	21.0 TO 22.0	4.7 TO 6.7
5.0	14.0	182.0	7.0 TO 10.6	3.4 TO 7.0
2.8	16.0	92.0	8.0	8.0
(12.0)	22.9	65.0	20.4	2.5
5.4	3.0	41.5	1.8	1.2
.8	.3	7.0	1.0	(.7)
.8	.4	12.0	2.0	(1.6)
(.8)	8.0	32.6	4.9	3.1
(1.3)	1.0	56.0	1.2	(.2)
1.7	92.3	752.1	66.3 TO 71.9	20.4 TO 25.0

MANPOWER FY 1969

ALL CONTRACTORS

JULY 68 BASELINE

FORECAST AS OF: 1 DEC 68



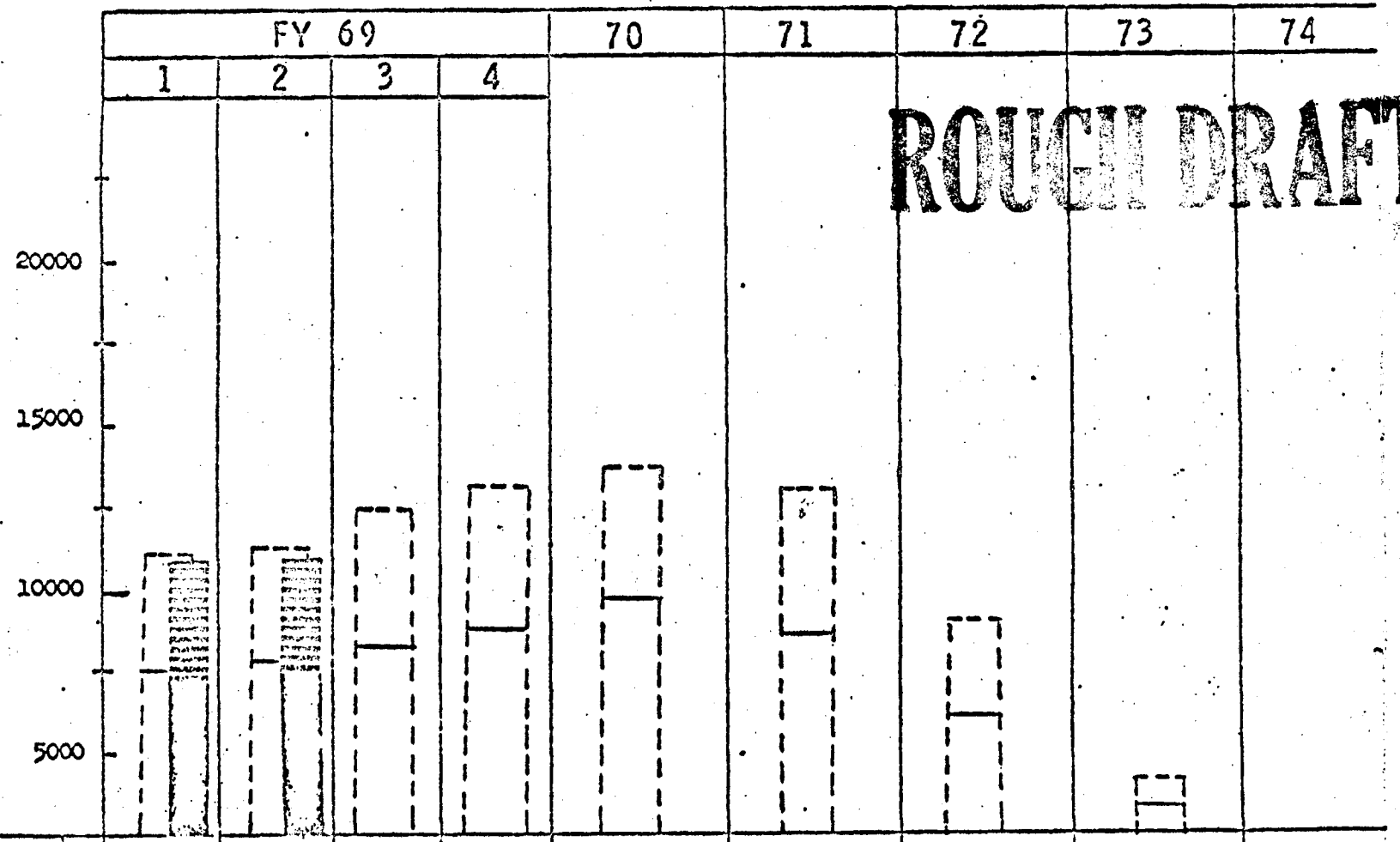
		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
DIRECT	F	7609	7800	7934	7800	7944	7947	8296	8401	8572	8825	8949	9071
	A	7415	7497	7734	7839	7701	7608						
INDIRECT	F	3789	3882	3932	3897	3921	3925	4100	4154	4224	4366	4444	4509
	A	3716	3706	3804	3914	3856	3802						
TOTAL	F	11398	11682	11866	11787	11865	11872	12396	12555	12796	13191	13393	13580
	A	11131	11203	11538	11753	11557	11410						

[redacted]OWER, [redacted]

JULY 68 BASELINE

ALL CONTRACTORS

FORECAST AS OF: 7 JAN 69



		FY 69 1	FY 69 2	FY 69 3	FY 69 4	70	71	72	73	74
DIRECT	F	7863	7966	8469	8963	9861	8749	6333	2604	
	A	7505	7701							
INDIRECT	F	3904	3928	4164	4445	5016	4451	3130	1334	
	A	3717	3856							
TOTAL	F	11767	11894	12633	13408	14877	13200	9463	4028	
	A	11222	11557							

SUMMARY

ROUGH DRAFT

- PROGRAM HAS ADJUSTED TO MAJOR FUNDING REVISIONS.
- FY 69 SCHEDULE IS BEING MADE.
- TECHNICAL PROBLEMS RECOGNIZED ARE BEING WORKED WITHIN SCHEDULE FRAMEWORK.
- FINANCIAL STATUS AS OF THIS DATE INDICATES YEAR END FINANCIAL OBJECTIVES CAN BE ATTAINED.
- THE UCC YEAR END SITUATION WILL BE EXAMINED. CONTINUED GROWTH OF VARIANCE IS NOT FORECAST FOR FY 70.
- CONTRACTORS ARE IN AGREEMENT WITH YEAR END FINANCIAL POSITION - WRITTEN UNDERSTANDING WILL BE CONFIRMED.
- PROGRAM NEEDS FOR FY 70 EXCEED FORECAST BY APPROXIMATELY 20%.

CONSIDERATION

CONTRACT NEGOTIATIONS ARE UNDERWAY BASED ON FY 69 SCHEDULE AND ESTABLISHED BASELINE

CONTINUE -

RECOGNIZE FY 70 FUNDING DEFICIENCY

PLAN TO ADJUST SCHEDULE AT START OF FY 70

NEGOTIATE A NEW EXTENSION - LATER

OR

STOP NEGOTIATIONS

ADJUST SCHEDULE NOW

USE 600M FOR FY 70

PERMIT CONTRACTOR ADDITIONAL TIME TO RESUBMIT

RESUME NEGOTIATIONS

OR

NEGOTIATE TECHNICAL PORTION ONLY

DEFER TEST & OPERATIONS & SCHEDULE WAIT BEFORE ESTABLISHING NEW SCHEDULE

NEGOTIATE BALANCE OF FUTURE DATE

MOL FACILITIES SUMMARY CONSTRUCTION SCHEDULE

AS OF: 31 JAN 68

	SCHEDULED COMPLETION	PERCENT COMPLETE (20 40 60 80 100)
SLC-6		
MOBILE SERVICE TOWER	4-1-69	52
UMBILICAL TOWER	4-1-69	95
AGE BUILDING	2-1-69	96
LAUNCH DECK/BUCKET	4-1-69	96
LAUNCH CONTROL CENTER	8-21-68	100
PROPELLANT HOLD AREAS	7-25-68	100
COMPLEX SERVICE BUILDING	12-2-68	100
READY BUILDING	7-1-68	100
SRM PROCESSING BUILDINGS	9-1-68	100
MOL SUPPORT FACILITIES		
OPERATIONS TRNG EVAL FAC.	8-4-69	54
OPERATIONAL READINESS UNIT	8-4-69	74
ENGINEERING OPERATIONS BLDG.	4-1-69	70
LAB VEHICLE SUPPORT FAC.	6-1-69	32
GEMINI B SUPPORT BLDG.	6-1-69	21

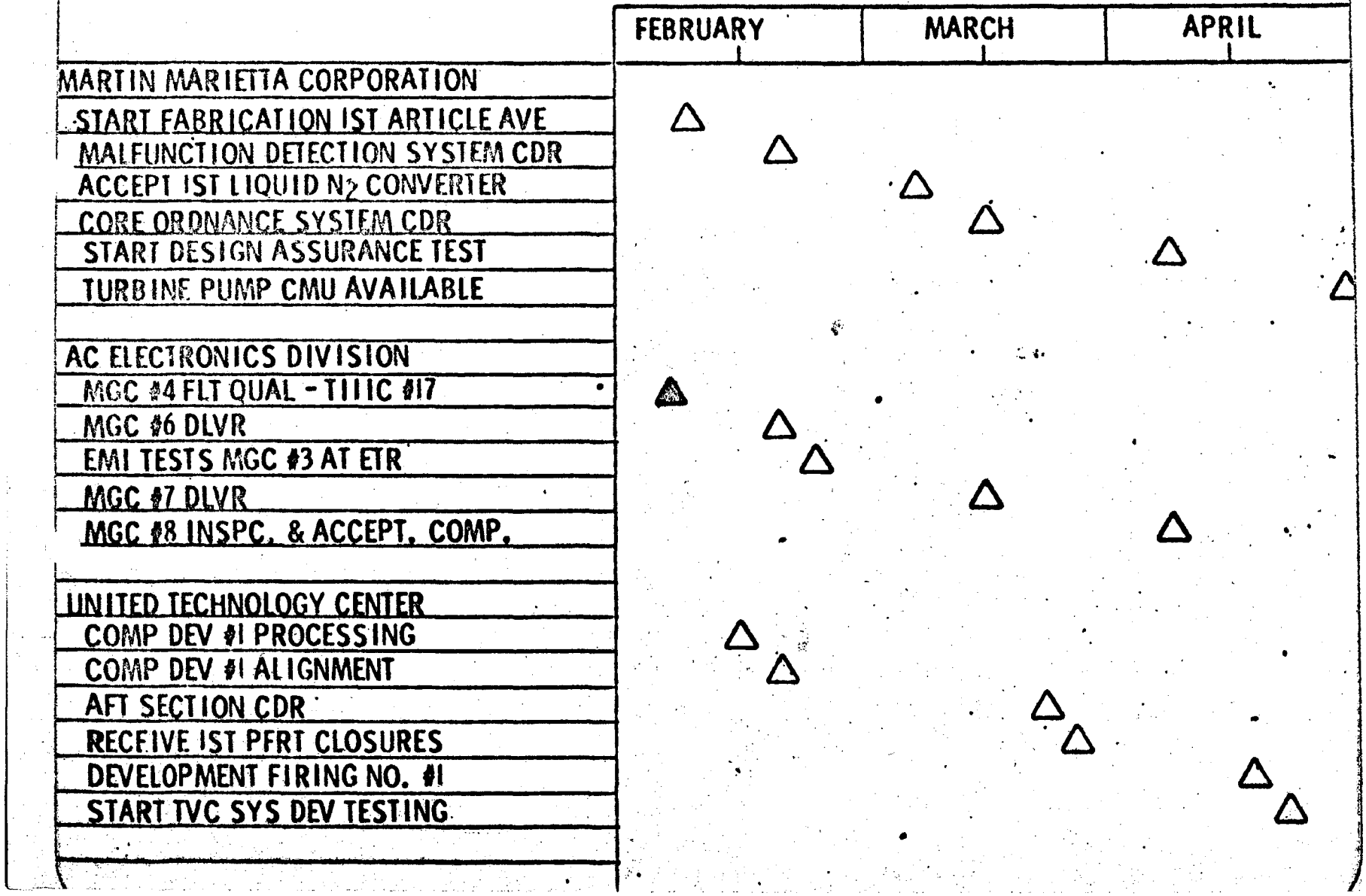
ROUGH DRAFT

6 PHOTO CHARTS

VAFB
FACILITY
CONSTRUCTION

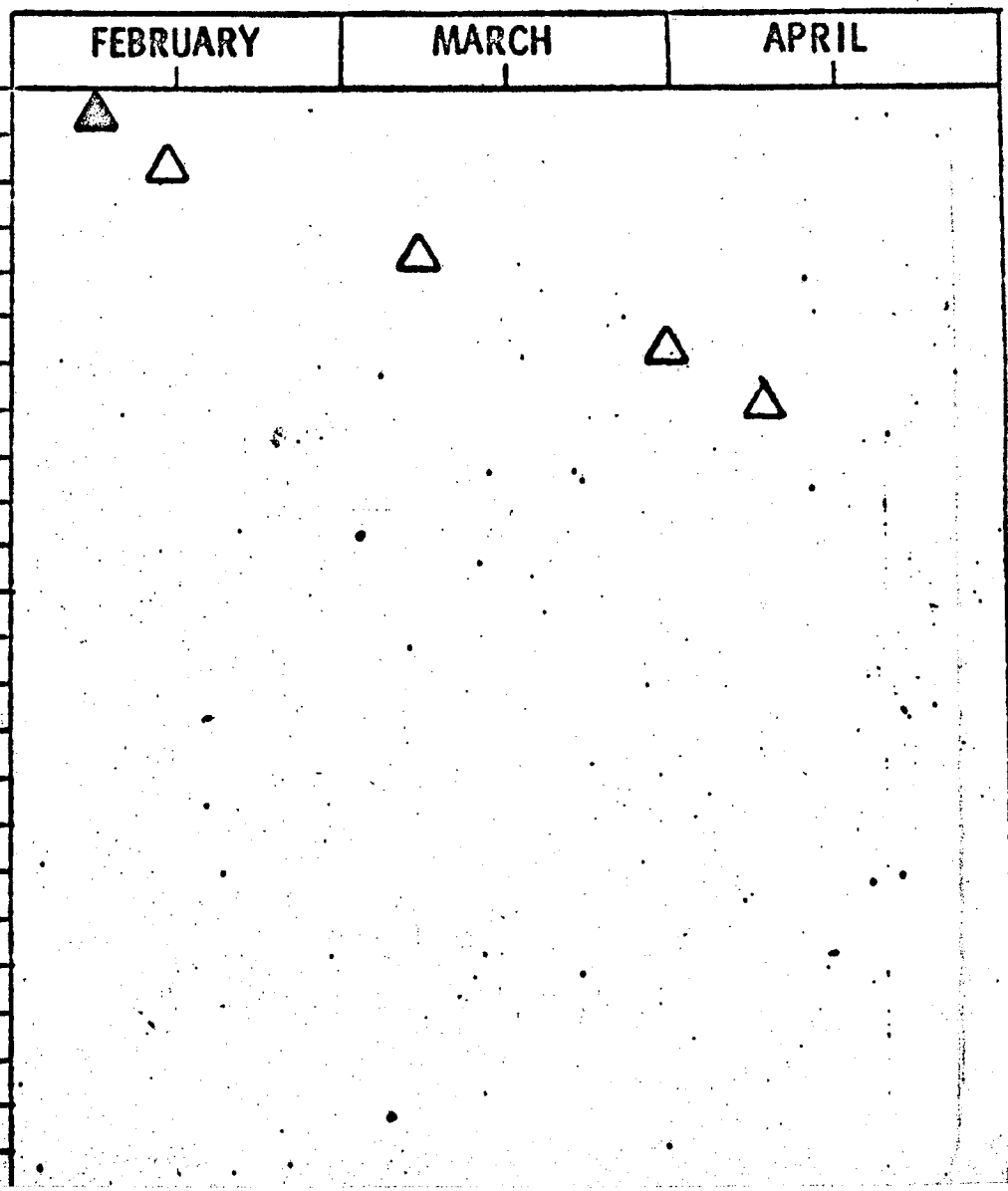
ROUGH DRAFT

90-DAY WINDOW



90-DAY WINDOW

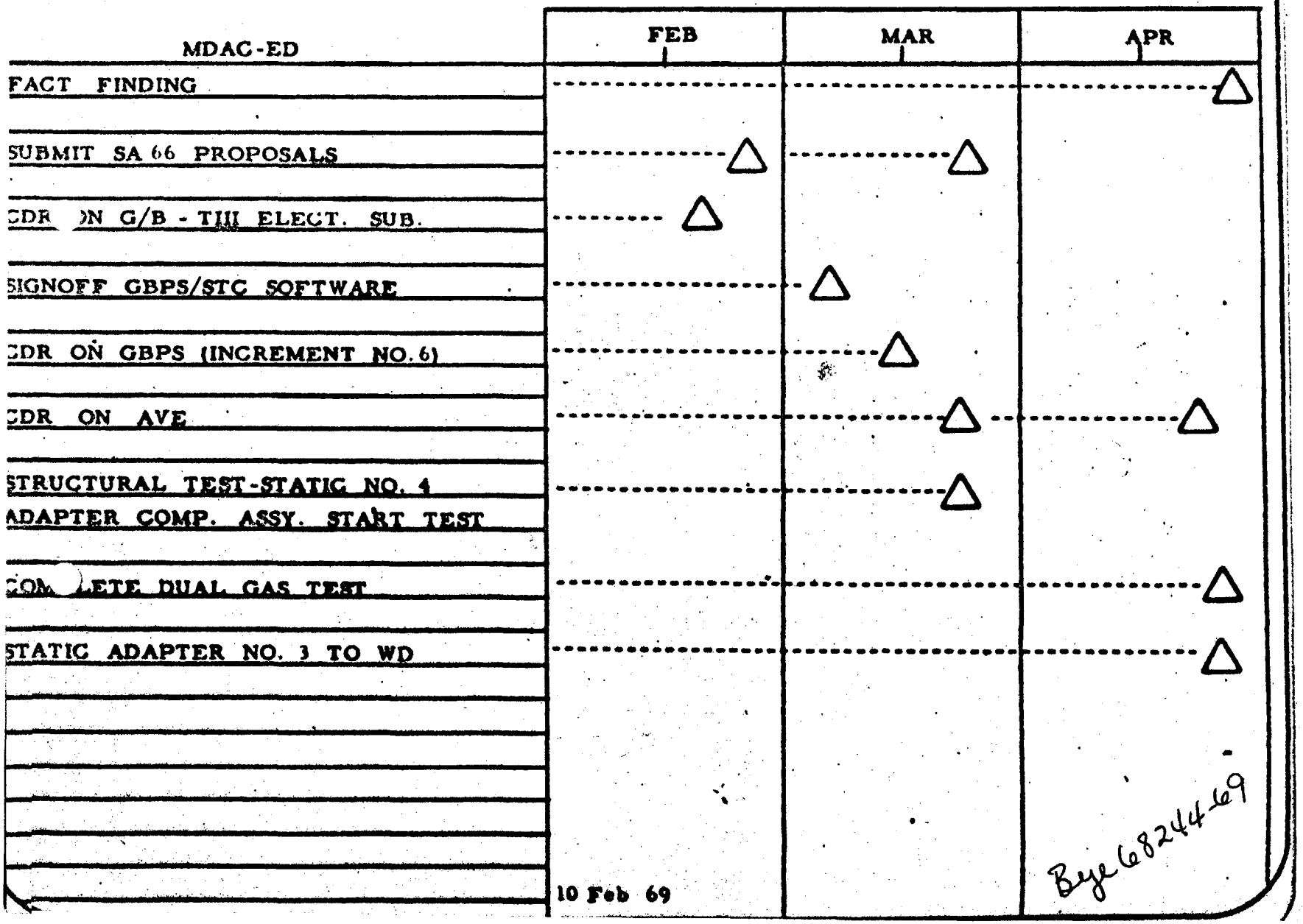
ROUGH DRAFT



ROUGH DRAFT

90-DAY WINDOW

CY-69

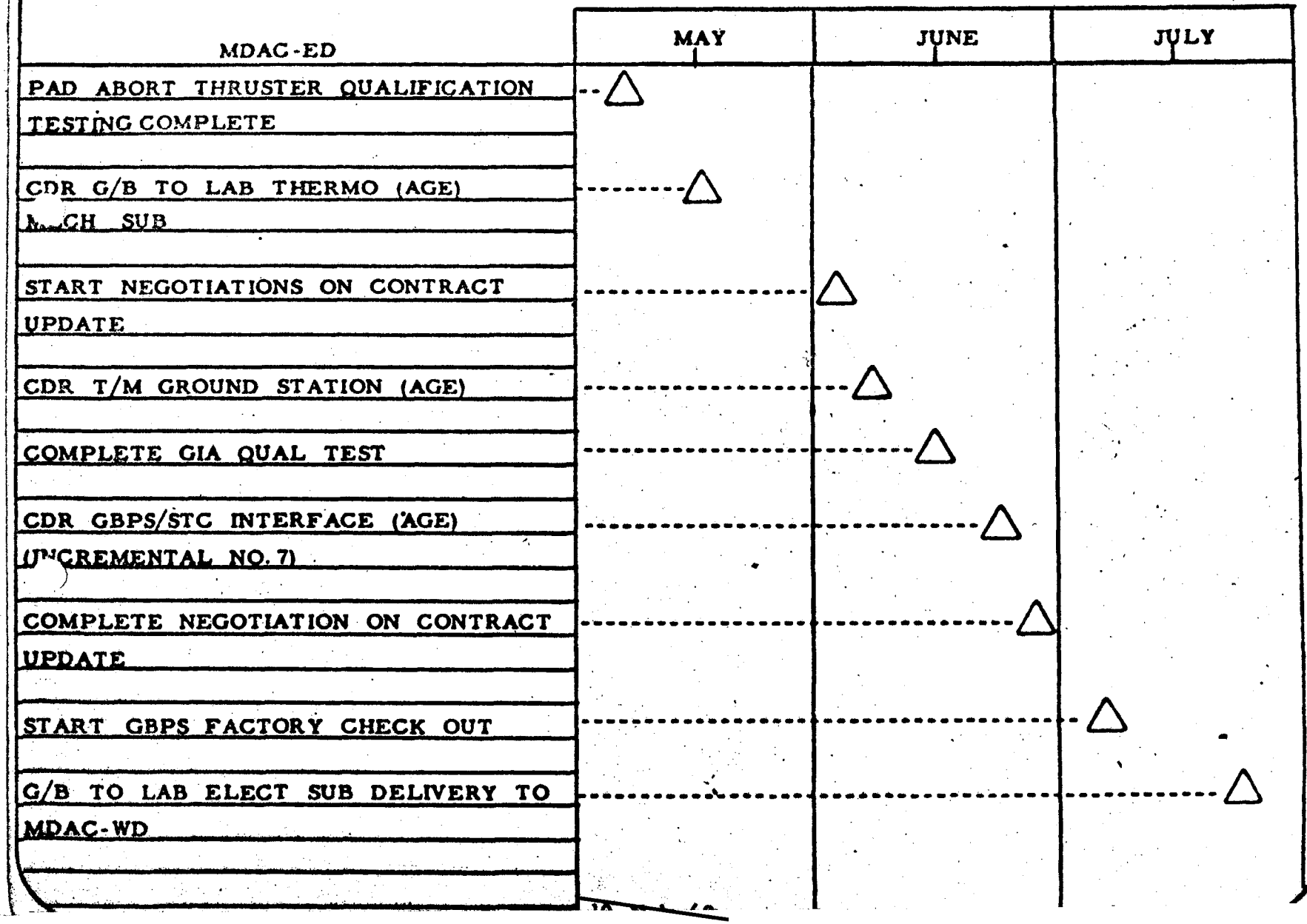


Bye 68244-69

ROUGH DRAFT

90-DAY WINDOW

CY-69



ROUGH DRAFT

INDEPENDENT SAFETY REVIEW BOARD

PRELIMINARY COMMENTS ON

GEMINI B DUAL-GAS SYSTEM TEST

27, 28 JANUARY 1969 - ST. LOUIS, MO.

ROUGH DRAFT

INDEPENDENT SAFETY REVIEW BOARD

NAME	AREA FOR REVIEW & COMMENT	ASSOC. CONTR. CONTACT
* COL. A. G. SWAN	CHAIRMAN	MDAC-ED E. MULDROW HAM.STD. A. MIRABELLA
* L/C R. G. MC IVER L/C LE COCQ	MEDICAL AND HYPERBARIC FACILITIES	MDAC-ED DR. BYRUM
DR. R. BANCROFT	PROCEDURES	MDAC-ED M. MOSELEY
DR. K. SCHELLER MR. B. BOTTERI	FIRE SUPPRESSION	MDAC-ED A. BAY
* MAJ. N. A. STATER CAPT. D. CARTER	ELECTRICAL	MDAC-ED R. SPETH MDAC-ED C. BUNTING
* MR. L. KEIRSEY * MR. J. CHAPPEY	QUALITY STANDARDS	MDAC-ED J. TOPPINS MDAC-ED D. WHITE
DR. B. E. WELCH	EXPERIMENT PROTOCOL - PRE-TEST THROUGH POST EXPERIMENT	MDAC-ED J. BARTON
MAJ. W. SEARS	SELECTION, TRAINING AND CERTIFICATION OF TEST AND RESCUE PERSONNEL	MDAC-ED R. WEISS

* MEMBER OF BOARD (OTHERS ARE CONSULTANTS)

FWB 1/30/69

ROUGH DRAFT

INDEPENDENT SAFETY REVIEW BO[illegible]

SUMMARY OF MEETING AT ST. LOUIS 27, 28 JANUARY 1969

- PRELIMINARY COMMENTS BY BOARD TO MOL SO ATTENDEES (GANDY, SUMNER, LARSH)
  - VERBAL REPORT BY CHAIRMAN AND EACH TEAM CHIEF ON FINDINGS
  - RECOGNITION THAT CONTRACTOR WORK IN PROGRESS AND STILL APPROACHING READINESS FOR TEST START
  - NEED CONFIDENCE THAT CONTRACTOR WILL IMPLEMENT ALL PLANNED ACTIVITY
    - ✓ RECHECK WHEN PRE-TEST WORK COMPLETE
    - ✓ OBSERVE DRY RUN WHEN CONTR. STATES HE IS READY
- BOARD CHAIRMAN TO CONTACT MOL SO FOR ANY ADD'L DATA NEEDED
  - RECOGNIZE THAT AVAILABLE STUDIES AND INTERPRETATIONS WILL ANSWER QUESTIONS NOT ADEQUATELY RESOLVED IN TIME AVAILABLE AT MEETING
- PRELIMINARY REPORT OF BOARD WILL BE REVIEWED WITH MOL SO PRIOR TO FINALIZATION
- SL-12 (CONCURRENCE BY SL-2) TO ADVISE/DIRECT CONTRACTOR FOR ACTION
  - CLEANUP DISCREPANCIES ON TEST HARDWARE
  - MOL SO TO INVESTIGATE ASSISTANCE FROM NAVY DEEP SEA DIVE SCHOOL

STATUS OF INDUSTRIAL STRIKE AT MDAC-ED ST. LOUIS

ROUGH DRAFT

- STRIKE IS BY INTERNATIONAL ASSOC OF MACHINISTS
- AT ST. LOUIS AND CONDUCTRON IN ST. CHARLES
- STARTED 13 JAN 69
- STRIKERS CALM (SO FAR)
- COMPANY OFFER REJECTED
- NEGOTIATIONS IN PROGRESS
- NOW IN A DAY FOR DAY SLIP.

10 Feb 69

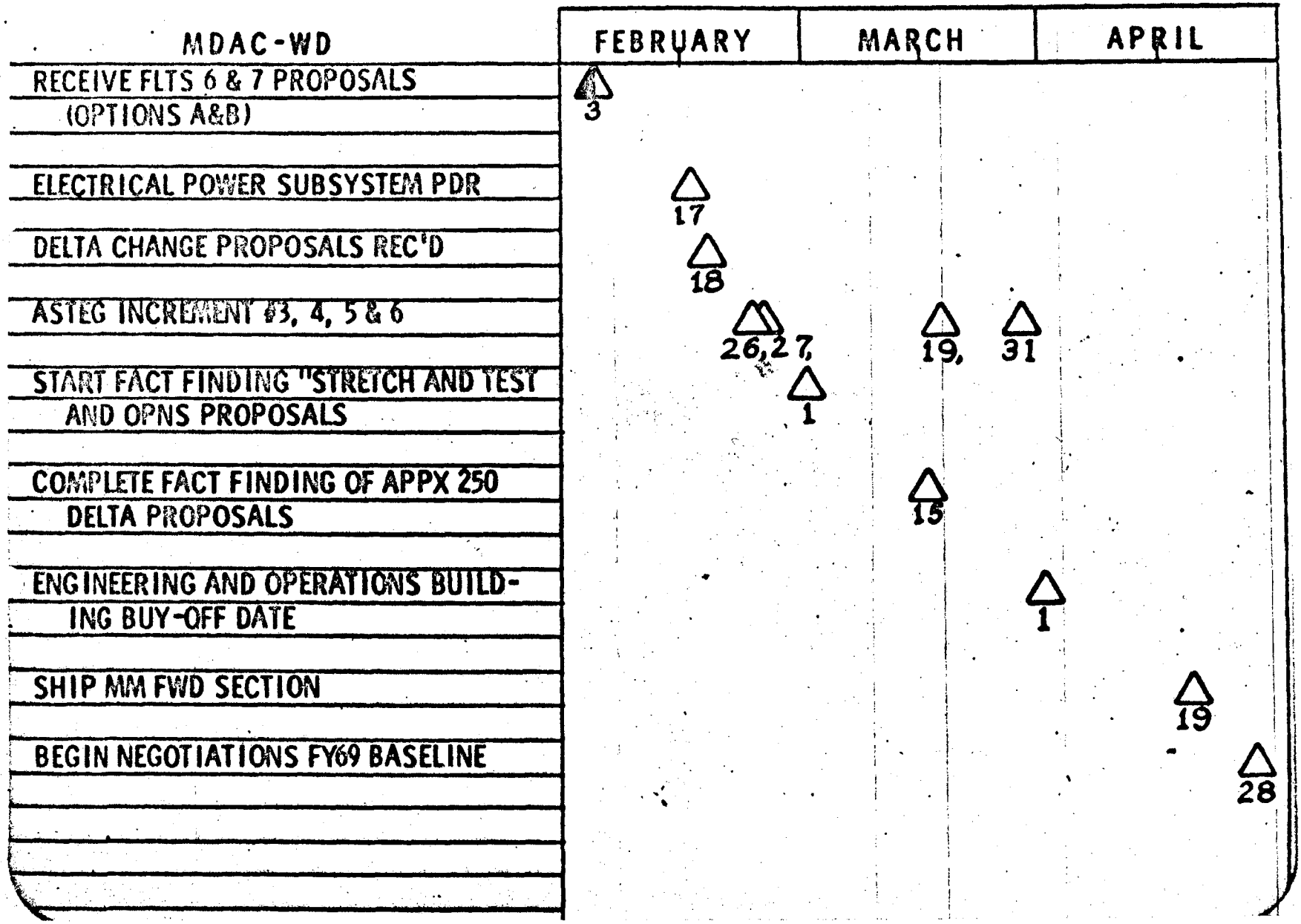
90-DAY WINDOW

MDAC-WD	MAY	JUNE	JULY
SHIP MMAS DTS	16		
LV SUPPORT FACILITY BOD		1	
GROUND VOICE COMM SYSTEM PDR		2	
BEGIN EDCTU BUILDUP		20	
RECEIVE AC FUEL CELL PROTOTYPES (3)		24	
LMSE - STC SOFTWARE DEFINITION COMPLETE			1
SHIP MMFS DEVEL TEST			8
LMSE - MMSE SOFTWARE DEFINITION COMPLETE			15
SUBSYSTEM DEVEL TESTING COMPLETE			31

Bye 68244-69

ROUGH DRAFT

90-DAY WINDOW

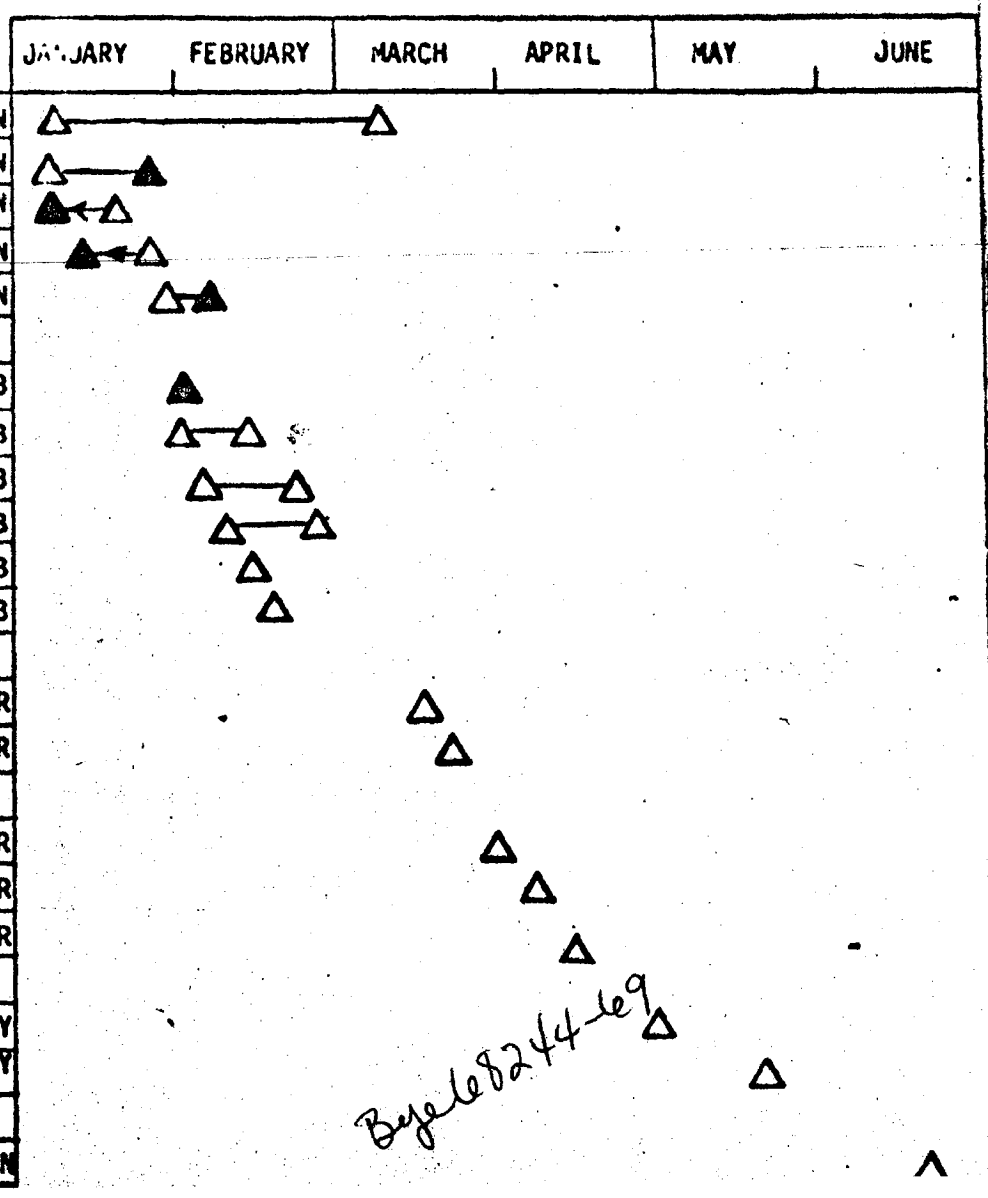


NOTES:

ROUGH DRAFT

GENERAL ELECTRIC

EG 32 - TRK MIRROR ASSY EQ-ON BD GE (C)	2 JAN
THERMAL COVER FINAL ASSY 113D (C)	2 JAN
FLT ALIGN, MONITOR SYS.-VENDOR QUOTES(S)	15 JAN
HSS DEV SIMUL FAB (C)	24 JAN
DG 7 - MMFS ON DK GE FOR 113T (C)	31 JAN
GE 48A - LM COMP. SUPT. STRUCTURE (C)	3 FEB
113D FINAL ASSY (C)	3 FEB
IVS - ENG MODEL TESTS (C)	10 FEB
IVS - SELECT VENDOR (C)	14 FEB
ACQ TRK SYS BREADBOARD TEST (S)	18 FEB
PDR - LOW G ACCELEROMETER (C)	20 FEB
114 DRAWING RELEASE (C)	18 MAR
02 M/S 4 - ON BD COMP. PROG. (C)	24 MAR
INSTALL EG 32 ON 113D (C)	4 APR
GE 48B - COLD PLATES ON BD EK (C)	11 APR
PDR-MTE SOFTWARE (C)	15 APR
COMBINED CC&I, EP&D, DSS-1 TEST (S)	6 MAY
SHOCK TESTS 113D (C)	27 MAY
DSS-1 TESTS CONSOLES (C)	23 JUN



Bye 68244-69

ROUGH DRAFT

SUBJECT

GE SIMULATION PROGRAM

- **EDS** ELEMENTAL DEVELOPMENT SIMULATOR
  - SINGLE CREW STATION (CONSOLE 8)
  - MOTION PICTURES
  - IBM 360 AND 930/2200 COMPUTERS
  - SIMPLE INSTRUCTOR STATION, INTERFACE EQUIPMENT

- **MDS** MISSION DEVELOPMENT SIMULATOR
  - **PHASE ZERO:**
    - NEW SINGLE CREW STATION (CONSOLE 2)
    - ONE ITEK SLIDE VIEWING SYSTEM (SVS)
    - NEW INSTRUCTOR STATION, INTERFACE EQUIPMENT
  - **PHASE THREE:**
    - BOTH CREW STATIONS
    - THREE SLIDE VIEWING SYSTEMS (SVS)
    - AIRBORNE DIGITAL COMPUTER (ADC)
    - HIGH FIDELITY SIMULATION AND COMPUTER SOFTWARE
    - EK PAYLOAD HARDWARE (CAMERA, PROCESSOR, VIEWER, FILM HANDLING, DRC's)

- **MMSE** MISSION MODULE SIMULATION EQUIPMENT
  (GE PORTION OF MISSION SIMULATOR AT VAFB)
  - SIMILAR TO MDS DESIGN
  - ADDED INTERFACE REQUIREMENTS

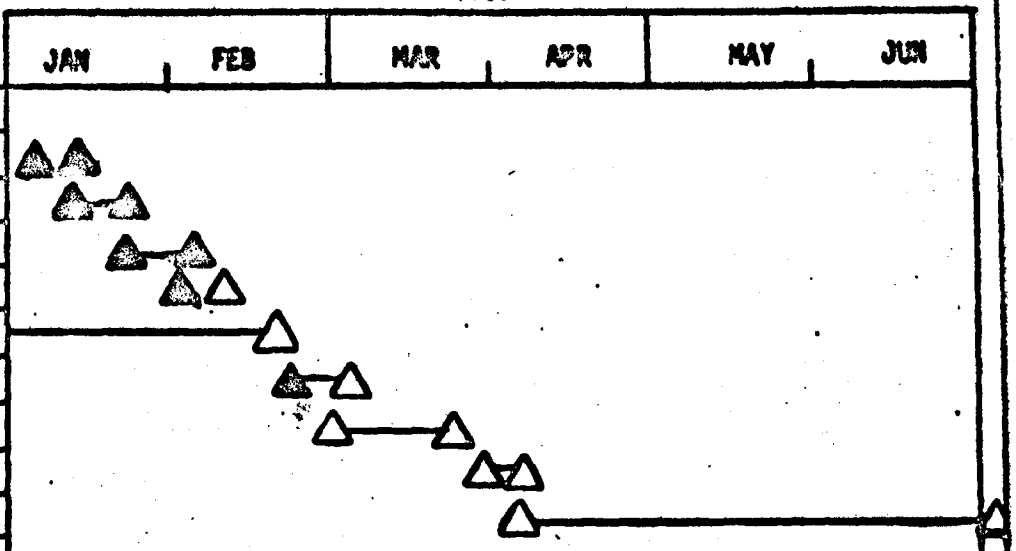
9E

ROUGH DRAFT

PHASE 0 - MDS PROGRAM SCHEDULE

1969

	COMPLETE
DIU/JB/SLM/SCC/PHR COMD TEST	12/1
SYS INSTALLATION & INSPECTION	1/11
SYSTEM ELECTRICAL CHECK	1/25
FINAL OPTICAL ALIGNMENT	2/8
FINAL HARDWARE TEST	2/15
SOFTWARE COMPLETE	2/20
SYS CALIBRATION	3/1
HDWE/SOFTWARE INTEGRATION	3/29
DEMONSTRATION	4/7
OPERATIONS-PHASE 0	7/11



DIU = DIGITAL INTERFACE UNIT
S LM = SIMULATED LAB MODULE
JB = JUNCTION BOX
SCC = SIMULATOR CONTROL CONSOLE
SYS = SLIDE VIEWING SYSTEM

SUBJECT

ROUGH DRAFT

AVE ALIGNMENT

- HISTORY
  - / GE 1968 BASELINE
    - AGE HAD:
      - / ELABORATE GROUND SYSTEM
      - / UTILIZED MANY CHECKS OF SYSTEM AT EK AND DAC
      - / DID NOT CHECK SYSTEM AFTER LEAVING DAC
      - / CONSIDERABLE IMPACT ON ASSOCIATES, BOTH FACILITY AND TEST TIME
    - AVE HAD:
      - / HI RANGE SENSOR FOR COA LOS HOTDOGGING
      - / LOW RANGE SENSOR FROM TRIPOD UPPER LEG TO STARTRACKER
  - / SYSTEMS OFFICE OBJECTED TO GE APPROACH
    - DEFINITE LACK OF SYSTEMS ENGINEERING

- HISTORY (CONTINUED)
  - / SYSTEMS OFFICE DIRECTED A TRADEOFF STUDY
    - STUDY OBJECTIVES/CONSTRAINTS
      - / GENERATE AVE SYSTEM TO REPLACE FACILITY AGE
        - MINIMIZE IMPACT ON TEST TIMELINE
        - UTILIZE ONLY PORTABLE OR VEHICLE BASED AGE AT ASSOCIATES
      - / MINIMIZE IMPACT ON AVE HARDWARE AND SOFTWARE
      - / PROVIDE FOR COMPONENT REPLACEMENT AT PAD
        - STARTRACKERS
        - ATS SCANNER
        - ALIGNMENT SENSORS
      - / PROVIDE CAPABILITY TO VERIFY ALIGNMENT AT PAD AND IN ORBIT PRIOR TO START OF OPERATIONS

ROUGH DRAFT

SUBJECT

- THREE ALTERNATIVE AVE SYSTEMS IDENTIFIED FOR FURTHER STUDY
  - / ALTERNATE 1 - ALL SENSORS ON LOWER TRIPOD LEG
  - / ALTERNATE 2 - SAME AS ALTERNATE 1 EXCEPT TM SENSOR MOUNTED ON STARTRACKER
  - / ALTERNATE 3 - STARTRACKERS MOUNTED ON TRIPOD AND STARTRACKER SELF CHECK LIGHT USED IN PLACE OF LOW RANGE SENSORS

ROUGH DRAFT

SUBJECT

- SUMMARY

  / EXPENSIVE AND TIME CONSUMING AGE HAS BEEN DELETED FROM SYSTEM

    - AVE SYSTEM PLUS PORTABLE AGE WILL MEET REQUIREMENTS

  / STILL EVALUATING AVE ALTERNATE 2 AND 3 FOR IMPLEMENTATION

    - DECISION - EARLY MARCH

CONCEPT TRADE-OFF MATRIX

TRADE-OFF PARAMETERS	CONCEPTS: TRIPOD BASED CONCEPT	STARTRACKER BASED CONCEPT	STARTRACKER TRIPOD CONCEPT
POINTING ACCURACY	7.4 MIN	5.3 MIN	5.1 MIN
WEIGHT	28.9 LBS	22.9 LBS	10.2 LBS
PEAK POWER	27 W	27 W	21 W
COST	2000K (CFR 231)	2100K	1600K
SOFTWARE COMPLEXITY	120 WORDS	920 WORDS	180 WORDS
INTERFACE IMPACT (AGE)		NO PERMANENT AGE IN FIELD	
INTERFACE IMPACT (AVE)		WEDGES ON T.M.	SUPPORT FOR S.T. ELEC.
FIELD ALIGNMENT		AVE SYSTEM WITH VEHICLE BASED AGE	
PAD ALIGNMENT		AVE SYSTEM WITH VEHICLE BASED AGE	
MAINTAINABILITY	AMS COMPONENTS ACCESSIBLE	DIFFICULT IN S.T. AREA	STARTRACKER ACCESSIBILITY IMPROVED
SCHEDULE IMPACT		FIRST PRIME ON 114	

~~SECRET/~~DORIAN

ROUGH DRAFT

SIMULATOR SCHEDULE

EDS	ACCEPTANCE WITH DEVIATIONS	2 AUG 67
	USEFUL OPERATIONS START	2 JAN 68
	OPERATIONS END	2 SEP 68
MDS	PHASE ZERO START	7 APR 69
	PHASE ZERO END	11 JUL 69
	PHASE 3 START	20 NOV 69
	PHASE 3 END	20 JUN 72
MMSE	CAT I TEST COMPLETE VFSTC	17 JUL 70
	MMSE SEGMENT CHECKOUT COMPLETE	1 NOV 70
	CAT II INTEGRATED MISSION SIMULATOR TEST COMPLETE (READY FOR TRAINING)	15 MAR 71

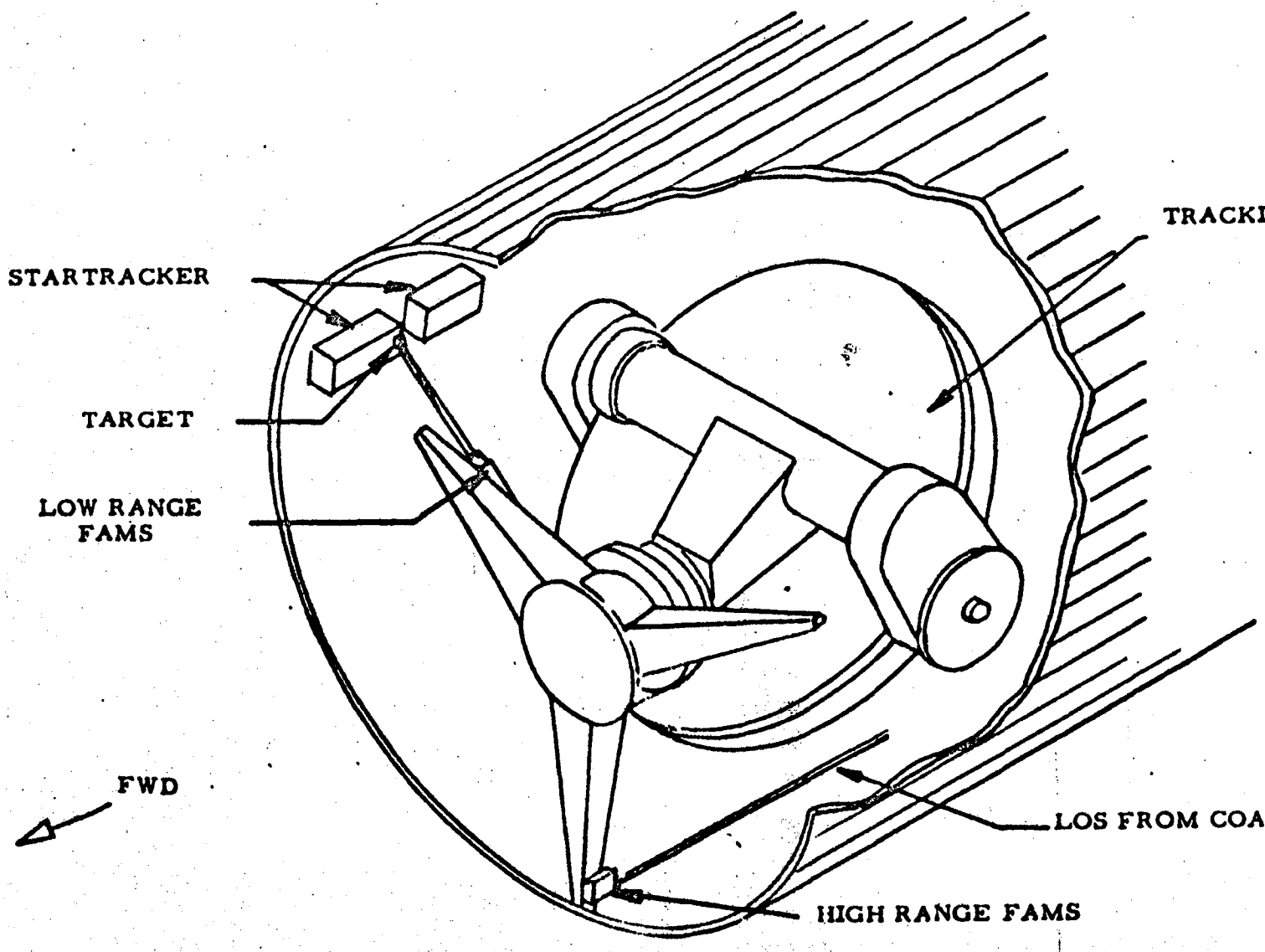
~~SECRET/~~DORIAN

~~SECRET~~/DORIAN

ROUGH DRAFT

SUBJECT

PREVIOUS AVE ALIGNMENT BASELINE



~~SECRET~~ / DORIAN

90-DAY WINDOW

PHOTOGRAPHIC PAYLOAD SEGMENT DEVELOPMENT MODEL STATUS	FEB	MAR	APR
STATIC LOAD STRUCTURE (COA)	LOAD CYCLE 4 TEST PREPARATION		
STRUCTURAL DEVELOPMENT MODEL #1 (COA)	1 ACOUSTIC INSTRUMENTATION INSTALLATION & C/O		
STRUCTURAL DEVELOPMENT MODEL #2 (COA)			1 DISASSEMBLY
THERMAL MODEL - COA	1 CHAMBER B	1 PREPARE FOR AFT SECTION	
FORMULA SAMPLE	COA ASSEMBLY	12 TM ASSEMBLY 10 C/O	20 CHAMB III A OPTICAL TESTS
ENGINEERING MODEL - COA	1 PRIME HDWR TO AGE COMPATIBILITY TEST		15 CHAMBER III B
ENGNEERING MODEL - LAB MODULE COMPS	*	14 LM GROUP TESTING	

* EXCHANGE HARDWARE MODIFICATION EFFORT

Bye 68244-69

~~SECRET~~ / DORIAN

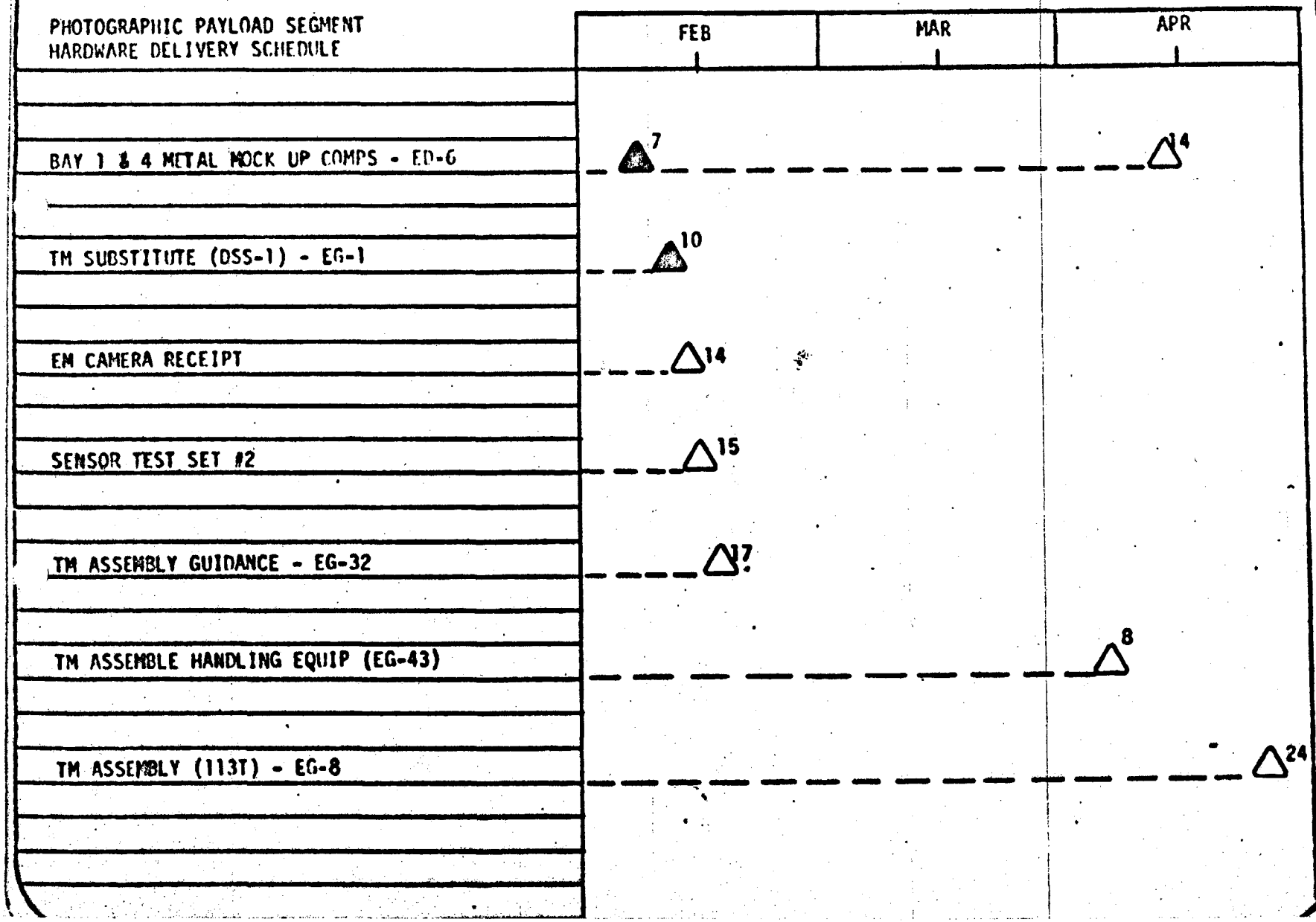
SUBJECT

ROUGH DRAFT

SUBJECT

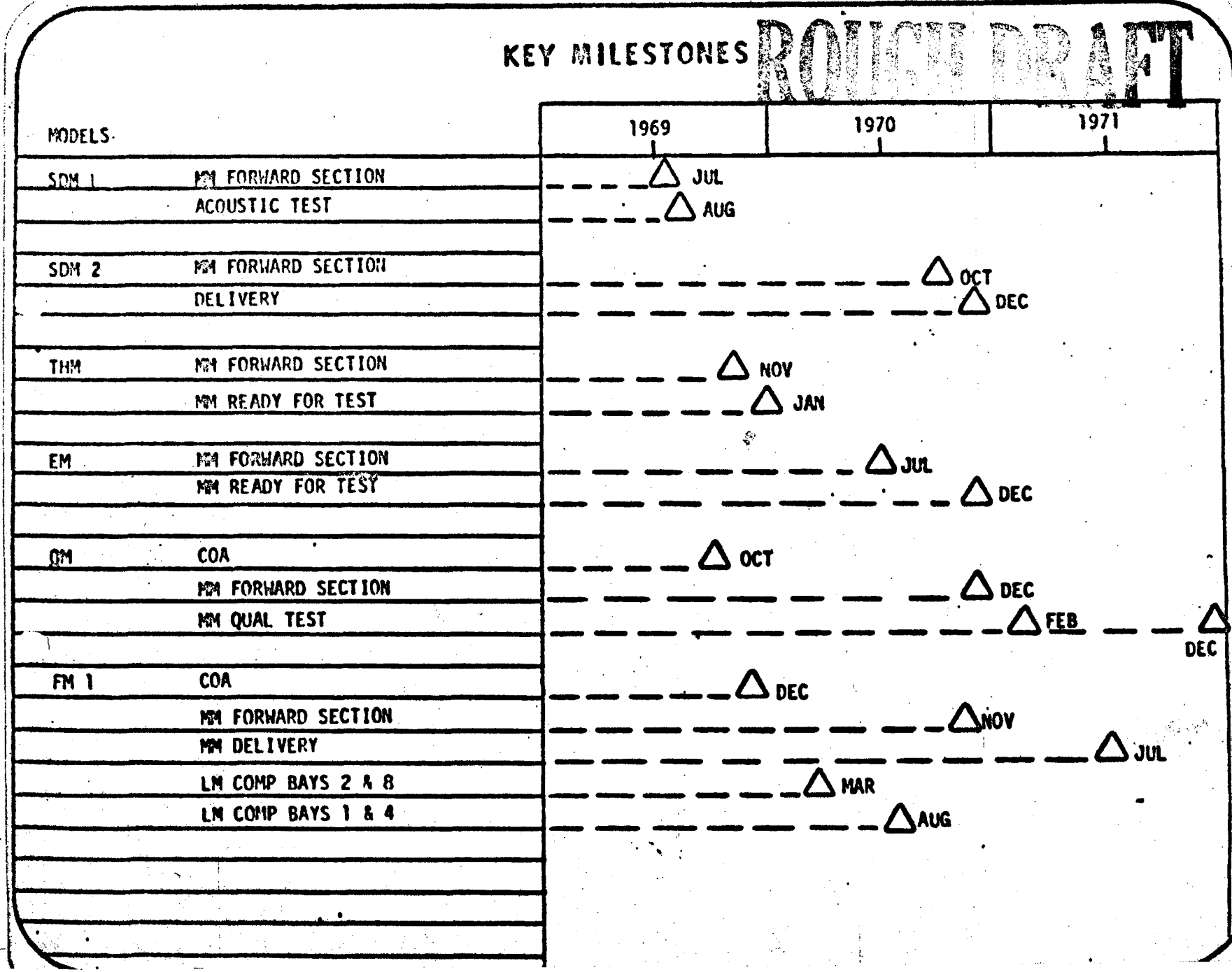
90-DAY WINDOW

PHOTOGRAPHIC PAYLOAD SEGMENT
HARDWARE DELIVERY SCHEDULE



KEY MILESTONES ROUGH DRAFT

SUBJECT



SUBSYSTEMS

- **CAMERA**

  EM UNDERGOING FINAL TESTS AT ITEK.
  ONLY MINOR DEVELOPMENT DISCREPANCIES -
  ACCEPTABLE FOR EKC DEVELOPMENT TESTS

- **FILM HANDLING**

  SUBSYSTEM TESTS COMPLETE
  (POWER-ON, SERVO, GRAVITY INDEPENDENCE TESTS)
  60,000 FT OF TB & UTB FILM PASSED THROUGH

  BEING READIED FOR LM GROUP TEST

- **ALIGNMENT CONTROL SYSTEM**

  INSTALLED IN EM
  COA-QUALITATIVE TESTS PASSED SUCCESSFULLY
  SECOND UNIT DUE IN MAY

- **FOCUS CONTROL**

  BREADBOARD TESTING NEARING COMPLETION
  TESTED WITH SIMULATED CAMERA

- **VISUAL OPTICS**

  EM DUE COMPLETION THIS WEEK
  FORMULA SAMPLE COMPLETE

ROUGH DRAFT

FACILITY STATUS

BLDG 601 - IN USE HOUSING PROGRAM OFFICE, DESIGN ENGINEERING, AND SYSTEMS ENGINEERING FUNCTIONS. INCLUDES COMPONENT AND SUBSYSTEM TEST AREA. IN ADDITION HOUSES CHAMBERS I-EM, II-EM, AND C.

BLDG 101 - (ELMGROVE) COMPLETE - IN USE HOUSING MANUFACTURING, TEST ENGINEERING AND QUALITY CONTROL FUNCTIONS. CONTAINS GRINDING AND POLISHING AREAS, ASSEMBLY AND TEST AREAS AND HIGH BAY AREA CONTAINING TEST CHAMBERS.

ADDITION: 20,000 SQ FT STORAGE AREA IN COMPLETELY ENCLOSED. A & E INITIATED FOR ASSOCIATE CONTRACTOR SPACE - PLANNED COMPLETION THIRD QUARTER FY 70.

BLDG 102 - (ELMGROVE) COMPLETE - HOUSES VIBRATION EQUIPMENT. ACOUSTIC TEST FACILITY IS COMPLETE AND PERFORMED ACTUAL TEST IN DEC 68. VIBRATION EQUIPMENT IN PROCESS OF INSTALLATION AND CHECK OUT.

SUBJECT

TEST CHAMBER STATUS

I & IG - OPTICAL TESTING OF PRIMARY MIRRORS - SOFT VACUUM
OPERATIONAL AND IN USE

II & IIG - OPTICAL TESTING OF TRACKING MIRRORS - SOFT VACUUM
OPERATIONAL AND IN USE - REFERENCE MIRRORS INSTALLED

IIIA & IIIB - OPTICAL TESTING OF CAMERA OPTICAL ASSEMBLIES - SOFT VACUUM
IIIA - ACCEPTED, TEST FLAT INSTALLED
FIRST USE SCHEDULED FOR MAR 69 WITH FORMULA SAMPLE
IIIB - ACCEPTED, TEST EQUIPMENT BEING INSTALLED
FIRST USE SCHEDULED FOR APR 69 WITH ENGINEERING MODEL

B - THERMAL VACUUM TESTING - SPACE ENVIRONMENT AND FAST PUMP-DOWN
OPERATIONAL AND IN USE WITH THERMAL MODEL

A - THERMAL/OPTICAL TESTING IN SPACE ENVIRONMENT
PRESSURE SHELL COMPLETE, LN_2 SHROUDS BEING INSTALLED
NO KNOWN PROBLEMS IMPEDING CONSTRUCTION
FIRST USE SCHEDULED FOR FEB 70

D - TESTING OF LAB MODULE COMPONENTS IN LM ENVIRONMENT
UNDERGOING ACCEPTANCE TESTING

~~SECRET~~/DORIAN

ROUGH DRAFT

ULE DELIVERY REQUIREMENTS

72" ASPHERE

	DUE
FLIGHT MODEL 2	RCVD
RELIABILITY COMPONENT	RCVD
FLIGHT MODEL 3	3-31-69
FLIGHT MODEL 4	6-30-69
FLIGHT MODEL 5	8-30-69
MANUF. ALLOWANCE	10-30-69

72" PLANO

	DUE
QUAL MODEL	5-2-69
FLIGHT MODEL 1	6-2-69
FLIGHT MODEL 2	7-28-69
FLIGHT MODEL 3	11-15-69
FLIGHT MODEL 4	4-1-70
FLIGHT MODEL 5	8-1-70
MANUF. ALLOWANCE	12-1-70

24" FOLD

7 ORDERED, DELIVERY COMPLETE

24" FOLD

7 ORDERED, 6 DELIVERED

CURVED MIRROR STATUS

	ASSIGNMENT	QUALITY (P-V/RMS)	COMMENTS
o SOLIDS			
FUSED SILICA			
82" MASTER SPHERE	II EM	.25/.03	IN USE
82" MASTER SPHERE	II	.28/.03	IN USE
82" MASTER SPHERE	II G	.20/.03	IN USE
82" MASTER SPHERE	SPARE	.15/.025	IN POLISH
72" MASTER PARABOLA	A AND III	.3/.04	IN ACCEPTANCE TEST
72" MASTER PARABOLA	A AND III	.46/.08	IN POLISH
72" ASPHERE	FORMULA SAMPLE	.33/.06	COMPONENT TEST
CER-VIT			
82" MASTER SPHERE	II	- - -	ON ORDER - 3/69
82" MASTER SPHERE	II G	- - -	ON ORDER - DUE 5/69
72" PARABOLA	A AND III	- - -	RECEIVED - 11/68
o LIGHTWEIGHTS - 72"			
FUSED SILICA			
ENGINEERING MODEL		.36/.047	INSTALLED
OPTICAL ASSEMBLY		.37/.05	IN TEST
QUALIFICATION MODEL		.36/.07	IN PLATING CYCLE
FLIGHT MODEL #1		.43/.07	IN POLISH
ULE			
FLIGHT MODEL #2		1.6/.3	IN POLISH
RELIABILITY COMPONENT		- - -	IN GRIND
FLIGHT MODELS 3, 4, 5; SPARE		- - -	ON ORDER

ROUGH DRAFT

PLANO MIRROR STATUS

	ASSIGNMENT	QUALITY (P-V/RMS)	COMMENTS
o SOLIDS			
FUSED SILICA			
72" MASTER PLANO	IIIA	.29/.03	IN PLACE, INVERTED
72" MASTER PLANO	IIIB	.30/.05	BEING INVERTED
72" MASTER PLANO	A	.49/.11	IN POLISH
72" MASTER PLANO	SPARE	2.0/.4	IN POLISH
CER-VIT			
72" MASTER PLANO	A	- - -	IN GRIND
72" MASTER PLANO	IIIA	- - -	ON ORDER - DUE 3/69
72" MASTER PLANO	IIIB	- - -	ON ORDER - DUE 4/69
o LIGHTWEIGHTS 72"			
FUSED SILICA			
ENGINEERING MODEL		.39/.06	IN POLISH
OPTICAL ASSEMBLY TEST		.45/.10	IN POLISH
QUALIFICATION MODEL		1.9/.4	IN POLISH
ULE			
10" R AND D		1.0/.17	IN POLISH
FLIGHT MODELS 1 TO 5; QM, SPARE		- - -	ON ORDER
CER-VIT			
10" R AND D		3.5/.76	IN POLISH

ROUGH DRAFT

SUBJECT

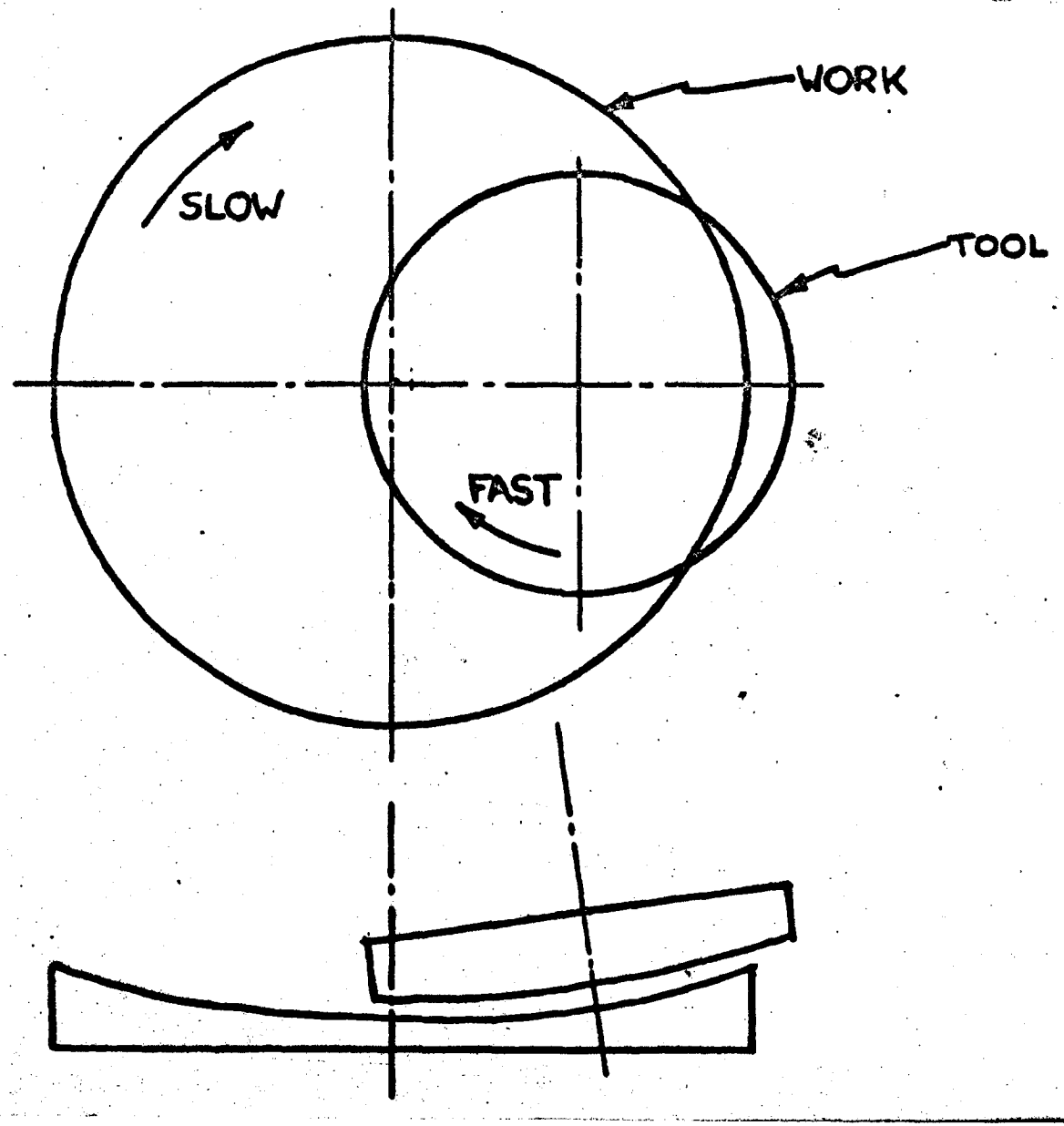
STATUS AND PLAN FOR CU 720-2

CONDITIONS OF ACCIDENT

CURRENT CONDITION

PLAN FOR CONTINUED PROCESS

CURVE GENERATION



CURRENT CONDITION OF CU 720-2

KNOWN DAMAGE	AREA(S) AFFECTED			
	FRONT	CORE	BACK	RING
o SCALLOPS (2) FROM FRONT PLATE	X			X
o CRUSHING DAMAGE TO FRONT PLATE	X			
o IRREGULAR HOLE IN EDGE RING				X
o CRACK IN EDGE RING				X
o STRUT FRACTURE AT FRONT PLATE	X	X		
o STRUT FRACTURES AT BACK PLATE (3)		X	X	

ROUGH DRAFT

PLAN FOR CONTINUED PROCESS OF CU 720-2

- DE-BLOCK AND COMPLETE INSPECTION OF THE PIECE. *
- GRIND/STOPDRILL/ETCH TO REDUCE CHANCE OF FRACTURE GROWTH.
- RESUME WORK; GRIND FRONT PLATE TO MAXIMUM ALLOWABLE THICKNESS.
- DEMONSTRATE INTEGRITY OF BLANK
  - A. SHINE FOR I_{EM} TEST...EVALUATE OPTICAL FIGURE NEAR DAMAGE SITES.
  - B. CONDUCT SPECIAL DEFLECTION AND LOAD TESTS.... EVALUATE STRUCTURE.
- CONTINUE IN NORMAL PROCESS.
- ORIENT IN ASSEMBLY TO PROVIDE SECURE MOUNTING ATTACHMENTS AND AVOID VIGNETTING OF APERTURE.

* INVITE ADVICE AT THIS STAGE FROM CORNING

SUMMARY OF DAMAGE TO OPTICAL ELEMENTS

PERIOD 8/31/66 THROUGH 1/19/69

	PROCESS	HANDLING	EQUIPMENT	MISC	TOTAL
ROSS LENSES	2	0	0	0	1+(2)
SUPPORT OPTICS	0	(1)	3	1	4+(1)
DIAGONAL OPTICS	2+(1)	0	1	0	2+(1)
MAJOR OPTICS	1+(2)	0	1	0	2+(2)
TOTAL	3+(5)	(1)	5	1	9+(6)

NOTE: NUMBERS IN PARENTHESES WERE HUMAN ERROR

SUBJECT

MAJOR OPTICS DAMAGE

DATE	ITEM	DAMAGE	CAUSE	DISPOSITION
4-6-67	PRIMARY C-720-2 FUSED SILICA	BLOCKING BODY CAUSED PLATE FRACTURES AND STRUT SEPARATIONS DURING DEBLOCKING.	IMPROPER DEBLOCKING METHOD	HOLD
5-24-68	FLAT 7110 ULE	PIN IN LAP DRIVE ARM NOT REPLACED. LAP SLID OFF PIECE AND DAMAGED EDGE.	OPERATOR ERROR	IN PROCESS
6-8-68	PRIMARY P-720-3 FUSED SILICA	DIAMOND PELLET BROKE OFF WHEEL AND FRACTURED BACK PLATE.	EQUIPMENT FAILURE	IN PROCESS
1-10-69	PRIMARY CU720-2 ULE	CUTTER NOT RAISED HIGH ENOUGH TO CLEAR BLANK EDGE. AREA BROKEN AWAY	OPERATOR ERROR	IN REVIEW

ROUGH DRAFT

DAMAGE SUMMARY STATISTICS

- 53% OF ACCIDENTS OCCURRED DURING PROCESSING.

  33% OF ACCIDENTS RESULTED FROM EQUIPMENT FAILURE.

  7% OF ACCIDENTS WERE CAUSED BY HANDLING.

  7% OF ACCIDENTS WERE OTHER CAUSES.

- 27% OF ACCIDENTS OCCURRED TO MAJOR OPTICS.

  73% OF ACCIDENTS OCCURRED TO "SMALL" OPTICS.

- 40% OF THE ACCIDENTS WERE CAUSED BY HUMAN ERROR.

ROUGH DRAFT

AUGUST 1968 REVIEW

- ESTABLISH WRITTEN PROCEDURES
- USE CHECK LIST ON KEY OPERATIONS
- EQUIPMENT REVIEWS
- UPGRADED TRAINING
- ADDITIONAL TECHNICAL SUPPORT
- SURVEY TEAMS - 60 RECOMMENDATIONS
- RELIABILITY AUDIT

CURRENT OPERATING RULES

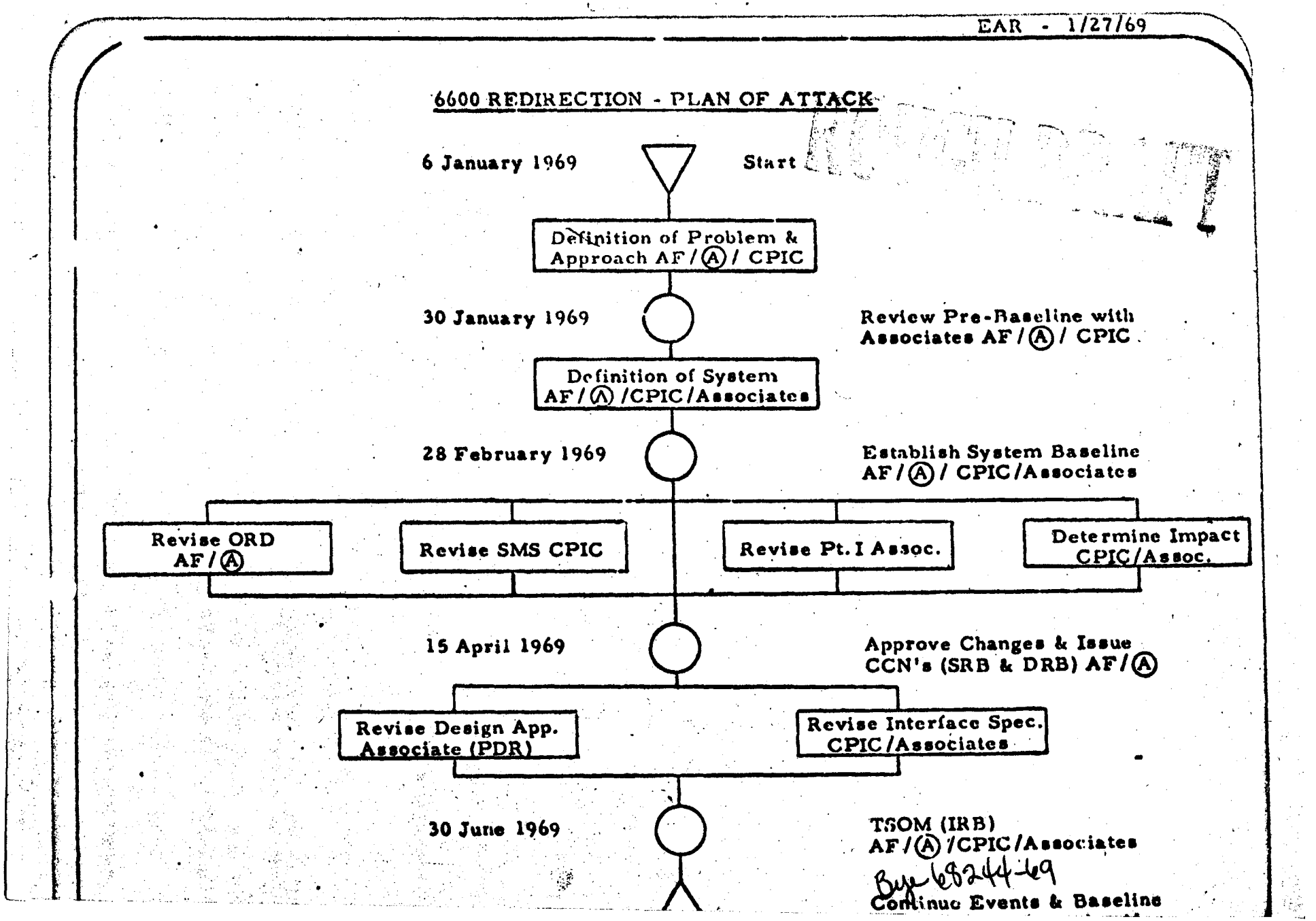
- APPROVED WRITTEN PROCEDURES FOR ALL OPERATIONS INVOLVING THE PIECE
- CHECK LIST AND SIGN-OFF
- PROPER EQUIPMENT
- QUALIFIED PERSONNEL

ROUGH DRAFT

WRITTEN PROCEDURES

- FIRST DRAFT
- WALK-THRU REVIEW AND CRITIQUE
- REVISE AND REPEAT (1) AND (2) AS NECESSARY
- FINAL WRITE-UP AND APPROVAL
- REPRODUCE AND DISTRIBUTE
- USE TO QUALIFY PERSONNEL

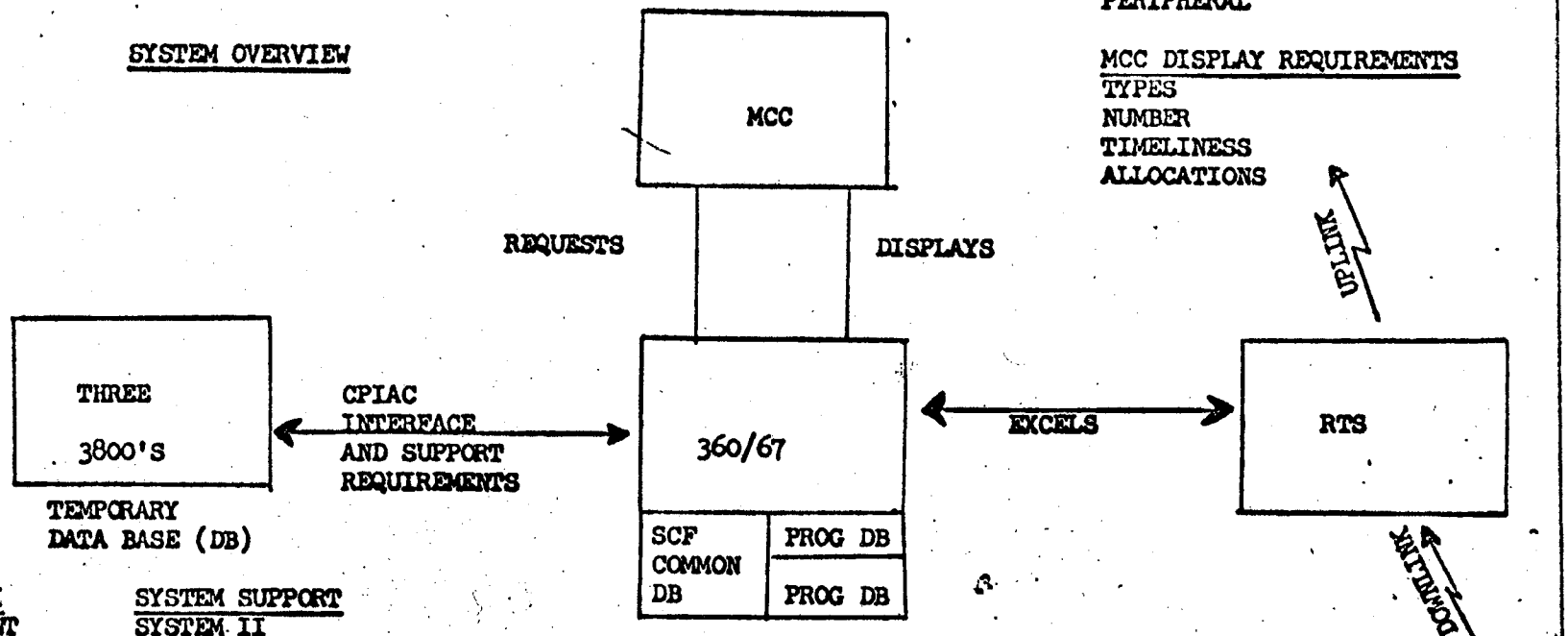
EAR - 1/27/69



ROUGH DRAFT

IR

SYSTEM OVERVIEW



MCC CONTROL REQUIREMENTS
KEYBOARD
PERIPHERAL

MCC DISPLAY REQUIREMENTS
TYPES
NUMBER
TIMELINESS
ALLOCATIONS

TEMPORARY
DATA BASE (DB)

CPCEI
ASCENT
MP&E
LMCP
RE
C&C

SYSTEM SUPPORT
SYSTEM II
J-4 JOVIAL
AOES

360/67 PROCESSING REQUIREMENTS
TM EDITING
DISPLAY DRIVING
CONTROL PROCESSING

REQUIREMENTS
MODES OF OPERATION
FUNCTIONAL
DESIGN
CORE & TIMING
DATA BASE
OPERATIONAL

DATA BASE REQUIREMENTS
SIZE
ACCESS TIME
FREQUENCY
PROTECTION

PREPASS, PASS AND
POSTPASS REQUIREMENTS
COMPRESSION ALGORITHMS
BIT RATE HANDLING
MODE DEFINITION
MESSAGE HANDLING

ROUGH DRAFT

2R

SUMMARY OF MOL 6600 REDIRECTION IMPACTS

	LABOR COSTS ($1000)	CK 1969 COMPUTER HOURS (HRS/$1000)	SCHEDULE DELAY (MO.)
COMMAND & CONTROL	430K	500/625K	4 (NOTE 3)
LABORATORY MODULE COMPUTER PROGRAM	130K	125/125K	3-4 (NOTE 3)
MISSION PLANNING	1500K	270/324K	4½ (NOTE 3)
ASCENT/REENTRY (NOTE 1)	260K	480/576K	1
ETA SOFTWARE	200K	150/180K	--
INTEGRATION (NOTE 2)	600K	--1--	--
	3,120K	1525/1830K	

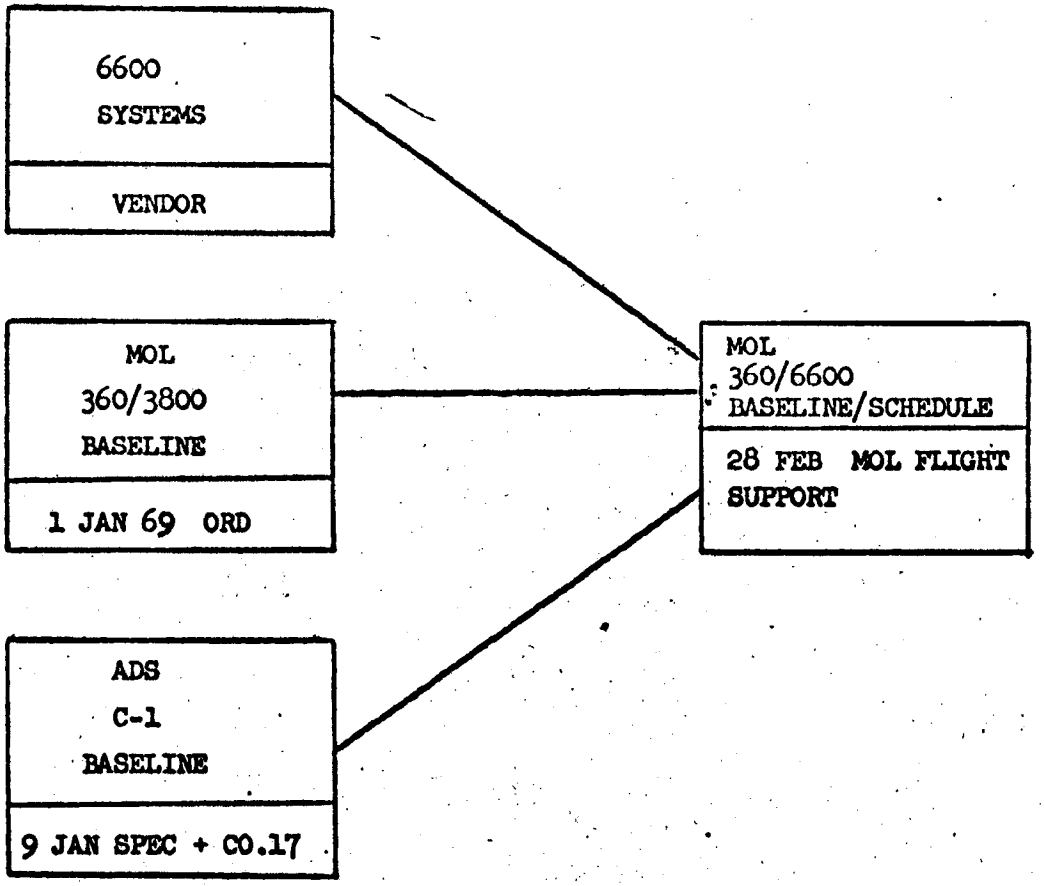
NOTE 1 - INCLUDES EFFORT TO MODIFY SCOPE FOR INTEGRATION WITH CONTROLLER

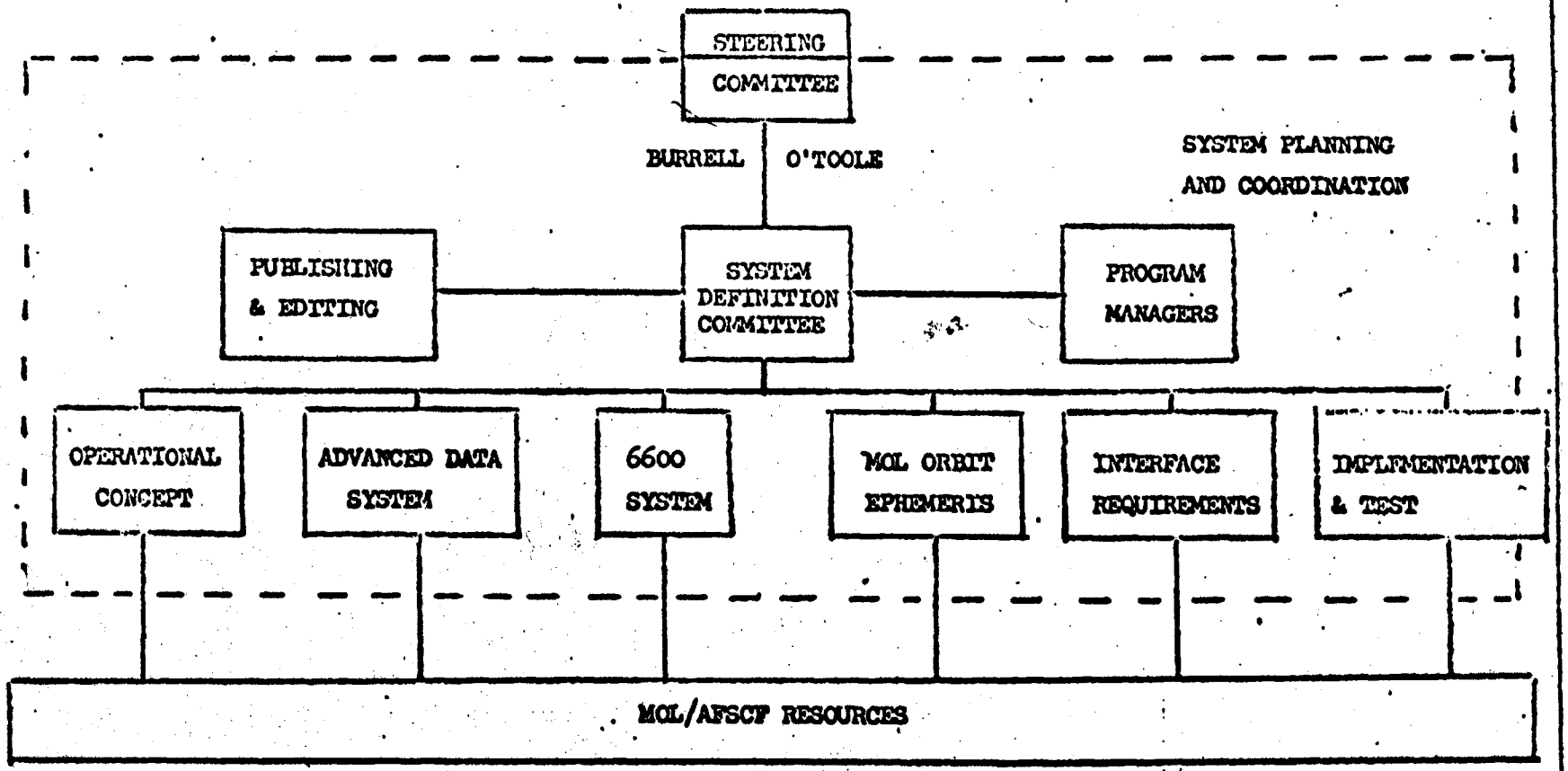
NOTE 2 - INCLUDES ORBIT PROGRAM INTEGRATION

NOTE 3 - WOULD NOT ESTIMATE FACI DATE. THESE DATES REFLECT CDR SLIP.

ROUGH DRAFT

RESOURCES
AVAILABLE





KEY MOL RESOURCES FOR SYSTEM DEFINITION

	MOL AIR FORCE	MOL AEROSPACE	GE CPIC	GE CPAC	TRW ASCENT	TRW ORBITAL	MDAC	FTFD DET 1
ITEM PLANNING & COORDINATION	ACKERSON*	SHUCART	REISS	ROLSTON	METZLAAR	MAGNESS	BERGONZ	JAMES
PUBLISHING & EDITING (SDC RESPONSIBILITY)								
OPERATIONAL CONCEPT	LEWIN	SMITH	OELSCHLAEGER*	MORRIS POTTER	KOENIG	LUETJE	CRAW	ROSE
ADVANCED DATA SYSTEM	REECE	SQUIBB	JOHNSON CRAIG	MICHELOTTI	ROGERS	DINGWALL	ELLIS	BEUHRIG JOHNSON
6600 SYSTEM	CARY	PRESTI* GRISSINGER CHAMBERS	WALTERS	BYRD	NEEDHAM	DINGWALL	JACOBSEN	DAVIS MEADE
MOL ORBIT EPHEMERIS	GOOCH* JOHNSON	HUBBARD BERMAN	JACOBSEN	ELLIS	KLAYMAN	VLASEK	RODGERS	CUNNINGHAM
INTERFACE REQUIREMENTS	CARY JOHNSON	BRUNER	WOLFSON	HEINE	BOLTON	BIRNBAUM	SHORTER	STELL WORMAN BLOCK
IMPLEMENTATION & TEST	CHURCH	RAGLAND*	MOBERG FISCHLE	SOLOMAN	ARCHIBALD	ANDERSON	SMITH	VENEN WORKMAN

SECRET/DORIAN

ROUGH DRAFT

OPTICAL PERFORMANCE

STATUS BRIEFING

10 FEBRUARY 1969

HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

Bye 68244-69

SECRET/DORIAN

CONDITIONS FOR PERFORMANCE ESTIMATE

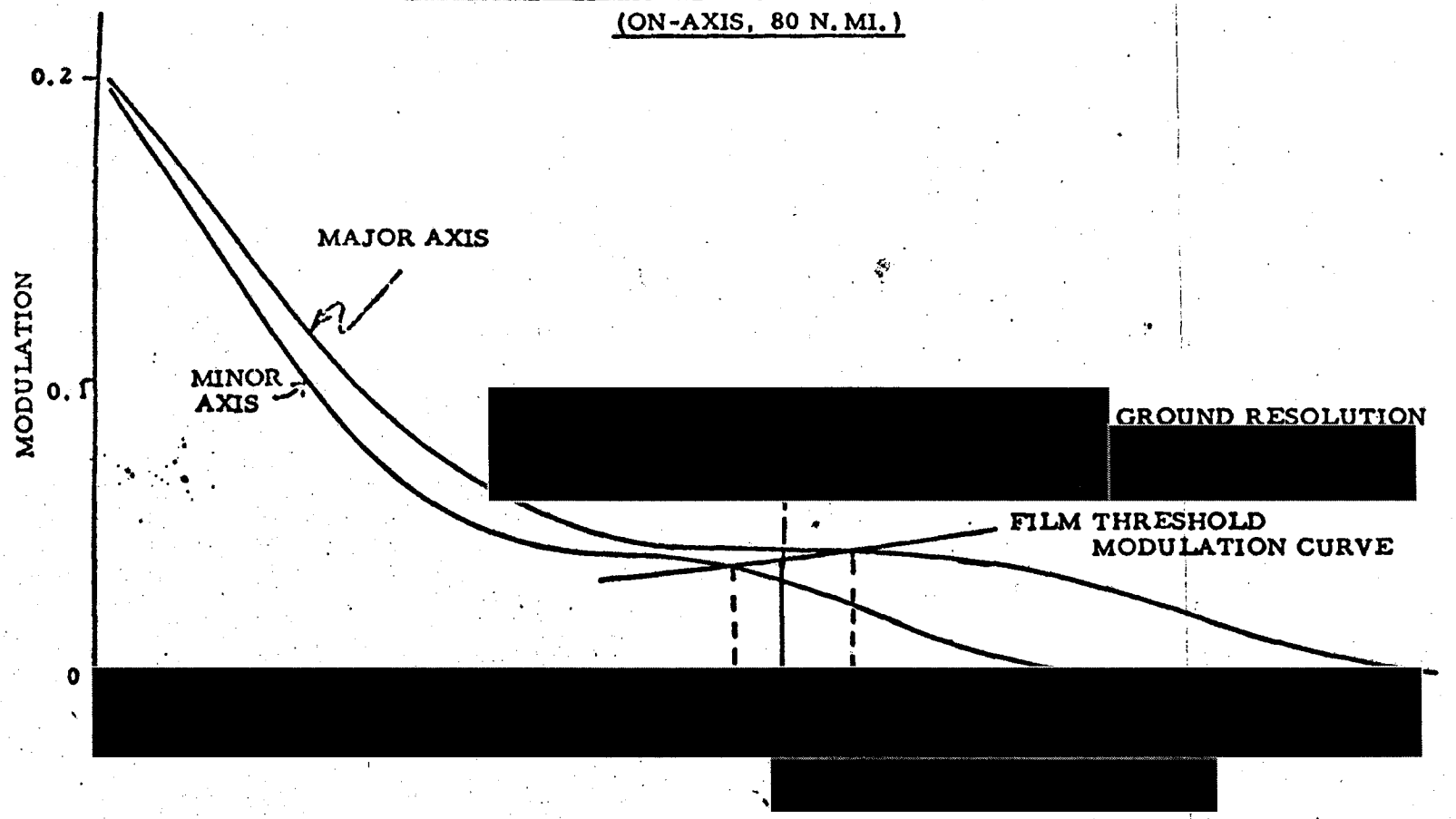
CONDITION	BASELINE VALUE
VEHICLE ALTITUDE	80 N.MI.
CONTRAST AT FILM PLANE	2:1
SCENE LUMINOUS EMITTANCE	B_{MIN} = 890 FOOT-LAMBERTS
EXPOSURE	OPTIMUM (1/165 SECOND)
FIELD ANGLE	ZERO DEGREES (ON-AXIS)
POINTING ANGLE	NADIR
FILM AERIAL EXPOSURE INDEX	AEI = 6.0

PERFORMANCE PREDICTION BUDGET

		RESOLUTION LOSS (CYCLES/MM)
OQF	[redacted] GOAL	
FOCUS ERROR	0.001 INCH AVERAGE	1
ALIGNMENT ERROR (EQUIVALENT PM TILT)	7 ARC SECONDS AVERAGE	1
SMEAR (EQUIVALENT LINEAR)	[redacted] /SEC AVERAGE /SEC (2σ)	3
EXPOSURE TIME	1/165 SECOND	
SHUTTER EFFICIENCY	85 PERCENT	2
FLARE	1 PER CENT	1

NO THERMAL OR CONTAMINATION DEGRADATION

BASELINE DYNAMIC PERFORMANCE PREDICTION
(ON-AXIS, 80 N. MI.)



OPTICAL PERFORMANCE DIFFERENCES

MAJOR DIFFERENCES

- DIFFERENT CALCULATION TECHNIQUE - 7 SPECTRAL WAVE LENGTHS VERSUS MONOCHROMATIC
- CHANGE IN AERIAL IMAGE MODULATION (AIM) CURVE
- LARGER CENTRAL AND TOTAL OBSTRUCTION - 12.7% CENTRAL 17.2% TOTAL
- LOWER LIGHT TRANSMISSION (1/165 SEC VERSUS 1/200 SEC)

POTENTIAL IMPROVEMENT

- OPTICAL QUALITY FACTOR - [redacted] CONTRACT TO [redacted] GOAL

ROUGH DRAFT

MIRROR OPTICAL QUALITY FACTOR BUDGET

		SURFACE ERROR λ(RMS)	WAVEFRONT ERROR λ(RMS) CONTRACT	WAVEFRONT ERROR λ(RMS) GOAL
TRACKING MIRROR	- MANUFACTURING			
	- TEST			
PRIMARY MIRROR	- MANUFACTURING			
	- TEST			
NEWTONIAN MIRROR	- MANUFACTURING			
	- TEST			
ROSS MIRROR	- MANUFACTURING			
	- TEST			
TOTAL WAVEFRONT ERROR (RSS)				

MIRROR OQF

ROSS OQF

OVERALL OQF

HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

TRACKING MIRROR DRIVE GIMBAL RATE ERRORS

μ RAD/SEC (0.95p)

COMPONENT	GIMBAL ALLOCATION	CURRENT 6/20/68	CURRENT 1/20/69
ROLL AXIS - [redacted] LOOP*			
BEARINGS	9.4	21.0	6.5
TORQUERS	2.5	3.7	(5.0)
POWER AMP. & COMP. AMP.	2.0	1.1	1.1
D/A AND BUFFER	4.3	(0.4)	(1.6)
EMI	4.0	[4.0]	[4.0]
GYRO NOISE	2.5	1.7	2.0
ENCODER	0.3	[0.3]	[0.3]
HARNESS	2.0	2.0	2.0
SAMPLING	0.5	[0.5]	[0.5]
COMMAND	1.0	[1.0]	[1.0]
TOTAL ROLL	12.0	22.0	10.0

* BASED ON MAXIMUM ROLL RATE OF 0.25 DEG/SEC

( ) = EXTRAPOLATED TEST DATA

[ ] = ALLOCATION

ROUGH DRAFT

TRACKING MIRROR DRIVE RATE ERRORS

μ RAD/SEC (0.95p)

	ALLOCATION	CURRENT	
		6/20/68	1/20/69
ROLL	12	22	10
PITCH	19	24	19
2-AXIS TOTAL (LOS)	22	33	21
SPECIFICATION REQUIREMENT	26		

~~SECRET~~/DORIAN

VIBRATION SMEAR STATUS

(μRAD/SEC)

	EK REPORT (11 DEC 68)	ALLOCATION
EK		
CAMERA	[redacted]	
FILM HANDLING	NIL	
VISUAL OPTICS	NOT AVAILABLE	
MISCELLANEOUS	NOT AVAILABLE	
	[redacted]	[redacted]
GE		
TM SLEW		
ATS SLEW	NOT AVAILABLE	
THERMAL DOOR	[redacted]	
MISCELLANEOUS	NOT AVAILABLE	
	[redacted]	[redacted]
DAC		
ATTITUDE CONTROL		
PITCH	[redacted]	
ROLL		
YAW		
		[redacted]
MAC	NOT AVAILABLE	
TOTAL	[redacted]	
		SPEC.

[redacted]

~~SECRET~~/DORIAN

SMEAR RATE BUDGET

μ-RAD/SEC 2σ

	ALLOCATION
AUTOMATIC	
TRACKING MIRROR CONTROL SYSTEM	[redacted]
VIBRATION	
IMAGE VELOCITY SENSOR (IVS)	
RSS TOTAL	
MANNED	
CREW	
RSS TOTAL	

~~SECRET~~/DORIAN

IMAGE VELOCITY SENSOR (IVS) PURPOSE

- IVS IS MANDATORY FOR AUTOMATIC MODE TO ACHIEVE [redacted] RESOLUTION
- MOL ON-BOARD DIGITAL COMPUTER COMMANDS TRACKING MIRROR RATES TO WITHIN 1% OF PERFECT TRACKING
- IMAGE VELOCITY SENSOR (IVS) REDUCES TRACKING MIRROR RATES TO WITHIN 0.08% OF PERFECT TRACKING
- IVS ACTS AS A VERNIER COMMAND TO THE TRACKING MIRROR CONTROL SYSTEM TO NULL EPHEMERIS, TARGET ALTITUDE, AND CONTROL SYSTEM LOW FREQUENCY ERRORS

MOL IVS PROGRAM HISTORY

- GOODYEAR, HYCON, AND ITEK CHOSEN TO BUILD BREADBOARD IVS FOR PHASE I EVALUATION
- GE MODIFIED EXISTING EQUIPMENT FOR USE AS REALISTIC IVS TESTER
- AEROSPACE DEFINED EXPECTED IVS LIGHT ENERGY REGIME
- BREADBOARD TESTING AND EVALUATION RECOMMENDATIONS (PHASE I):
  - ITEK BE DROPPED FROM COMPETITION
  - GOODYEAR AND HYCON INCORPORATE DESIGN IMPROVEMENTS FOR ENGINEERING MODEL TESTING (PHASE II)
- BRIAN O'BRIEN COMMITTEE CONVENED AND AGREED THAT GOODYEAR AND HYCON IVS WOULD PROBABLY SATISFY MOL/DORIAN REQUIREMENTS

MAJOR CHANGES TO HYCON IVS

CHANGE	IMPROVEMENT
"HERRINGBONE" (SINGLE OPTICAL TRAIN SERVING IN-TRACK AND CROSS-TRACK AXES)	LARGE WEIGHT SAVINGS
"SHADED APERTURE" (TRANSMISSION DELIBERATELY REDUCED AT EDGES OF FIELD)	ELIMINATES LOW FREQUENCY OSCILLATION ("SCALLOPING")
REDUCED APERTURE	REDUCES TRANSIENTS ("DYNAMIC NULL")
COMMUTATING FILTERS	ENABLES IVS OPERATION OVER SPECIFIED MOL LIGHT ENERGY REGIME
AUTOMATIC GAIN CONTROL (AGC) OF MODULATION	
MEMORY CIRCUITS	MINIMIZES IVS TRANSIENTS DUE TO SIGNAL "DROP OUTS"

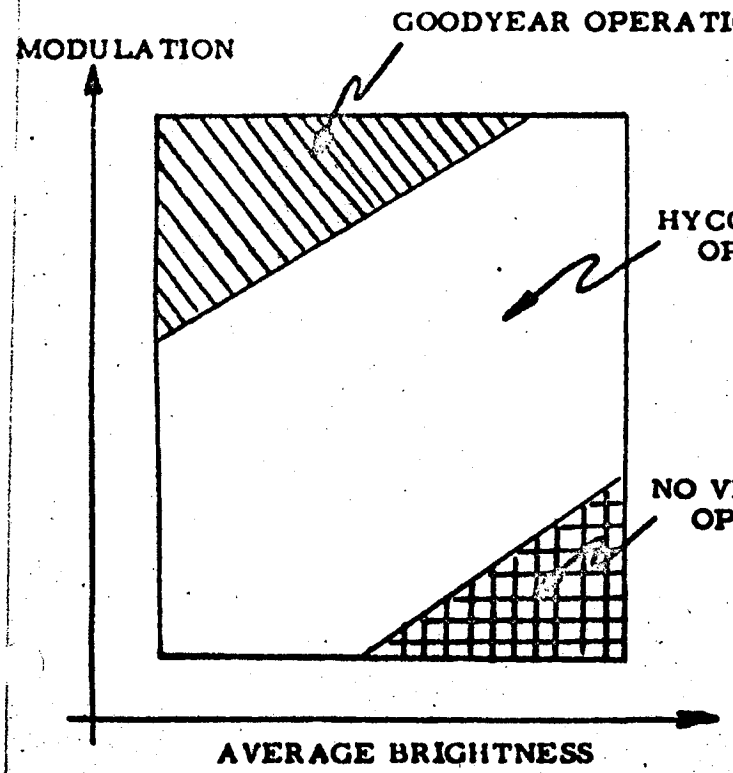
ROUGH DRAFT

~~SECRET~~ / DORIAN

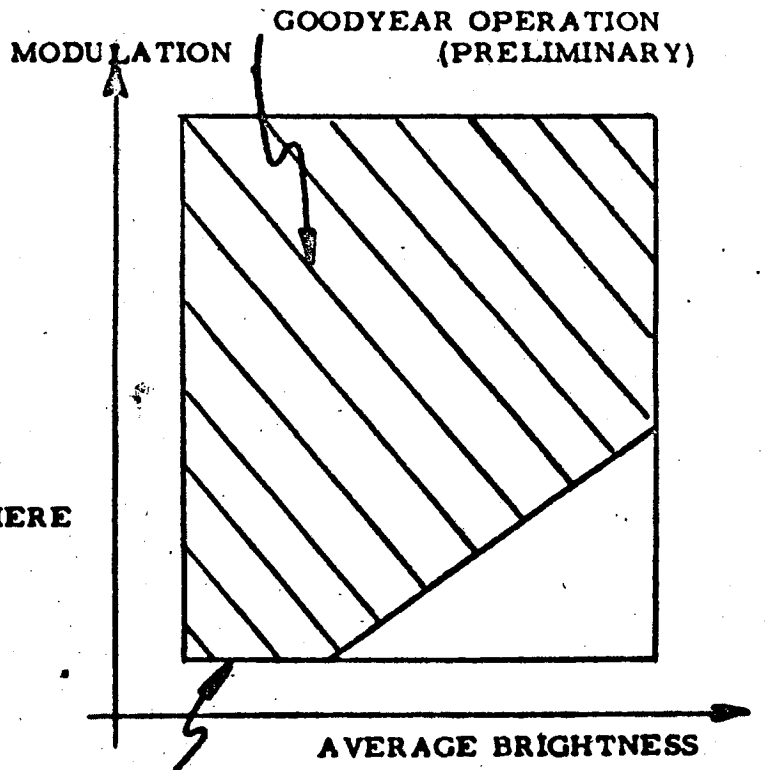
MAJOR CHANGES TO GOODYEAR IVS

CHANGE	IMPROVEMENT
HAZE FILTER (NEAR RED)	BETTER IVS OPERATION OVER SPECIFIED MOL LIGHT ENERGY REGIME
AUTOMATIC GAIN CONTROL (AGC) OF MODULATION	SAME AS ABOVE
IMPROVED "TRACK VERIFY" CIRCUITRY	ENABLES IVS OPERATION AT LOW LIGHT ENERGY AND LOW CONTRAST
COARSER COLLECTOR MESH	SAME AS ABOVE
THICKER DIELECTRIC STORAGE MESH	SAME AS ABOVE
PHOTO-CATHODE SENSITIVITY INCREASE	SAME AS ABOVE
VARIABLE AMPLITUDE NUTATION	SAME AS ABOVE

BREADBOARD TESTS



ENGINEERING MODEL TESTS

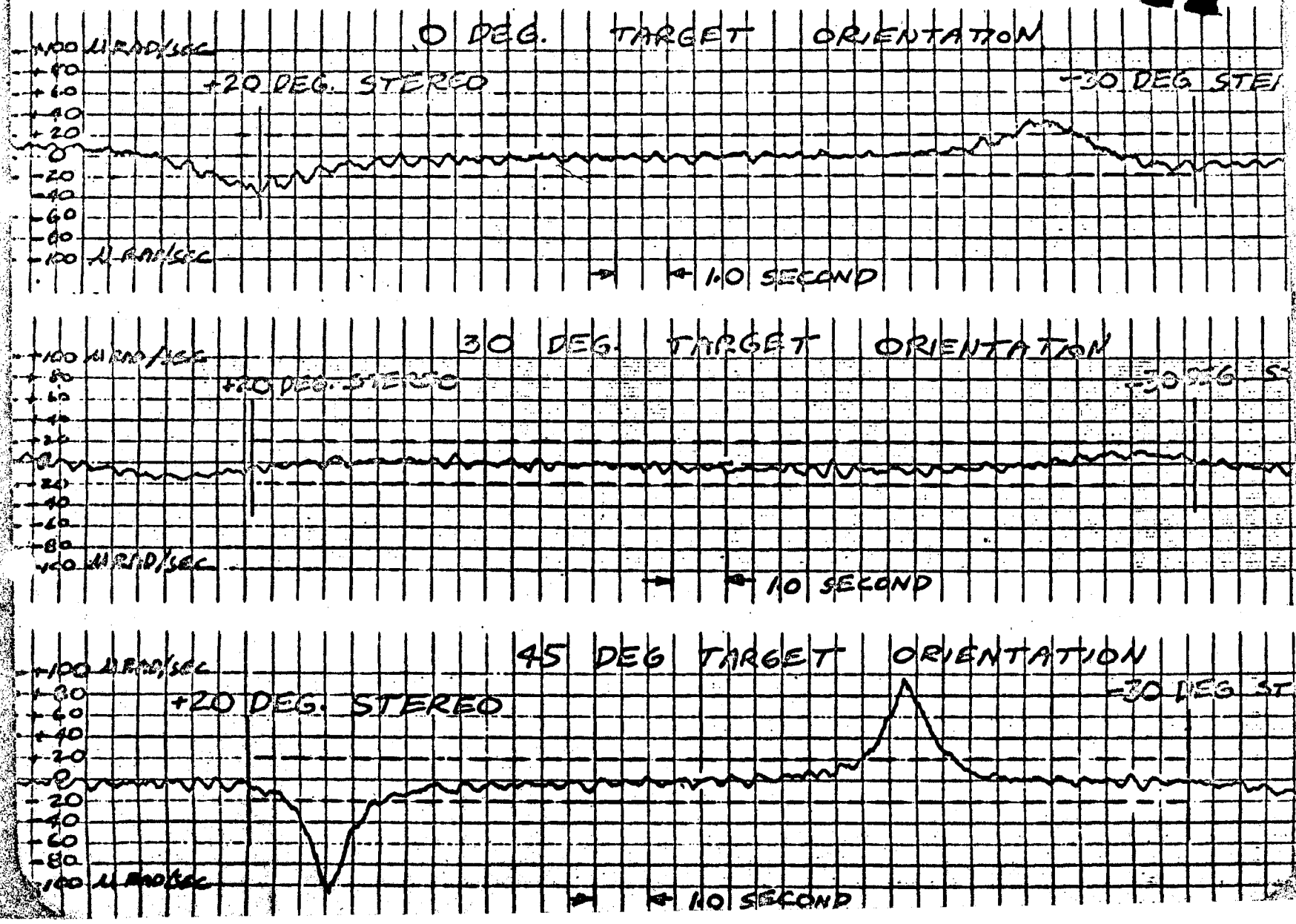


HYCON OPERATES OVER ENTIRE SPECTRUM BUT DOES NOT MEET SPECIFICATION RATE PERFORMANCE.

IVS BRIGHTNESS SPECIFICATION AND ACTUAL PERFORMANCE

~~SECRET~~ DORIAN

HYCON TRACES



PRELIMINARY HYCON IVS TEST RESULTS

- OPERATES OVER ENTIRE WIENER SPECTRUM (MODULATION) RANGE BUT NOT WITHIN SPECIFICATION
- LOS RATE ERROR [redacted] COMPARED TO SPEC OF [redacted] 0.95p BASED 20° TO -30° STEREO ANGLES
- REDUCED APERTURE REDUCES DYNAMIC NULL BUT INCREASES CROSS-COUPLING WITH A RESULTANT INCREASE IN SETTLING TIME (MAXIMUM OF 0.5 SEC)
- CLOSED LOOP PERFORMANCE WORSE THAN OPEN LOOP
  - / TRANSIENTS SMALLER MAGNITUDE BUT LAST LONGER
  - / CROSS-COUPLING OF TRANSIENTS

PRELIMINARY GOODYEAR IVS TEST RESULTS

- IMPROVED OPERATION OVER BREADBOARD
- RAMP OUTPUT DECREASED OVER BREADBOARD
- LOS RATE ERRORS NOT YET EVALUATED
- ONLY A SMALL AMOUNT OF TEST RESULTS HAVE BEEN EVALUATED SINCE IVS TESTER MODIFICATIONS TO MINIMIZE THE FLOOD AND SCENE ILLUMINANCE NON-UNIFORMITIES
- CONCERN OVER TESTER CAPABILITIES TO PROVIDE PROPER SIMULATION FOR GOODYEAR TYPE INSTRUMENT

PRELIMINARY CONCLUSIONS

- CURRENT IVS MODELS DO NOT FULLY MEET PERFORMANCE REQUIREMENTS
- DESIGN MODIFICATIONS IDENTIFIED WHICH MAY ALLOW MEETING SPECIFICATION BUT NEED DEVELOPMENT AND EVALUATION
- SENSOR SELECTION TO BE DELAYED

CURRENT GE PLAN

- PRESENT DATA FOR DETAILED ANALYSIS BY SO
- MODIFY HYCON IVS
  - / REOPTIMIZE SHADING FOR REDUCED APERTURE
  - / RESET MEMORY CIRCUIT
  - / RETEST WITH MODIFICATION
- TEST GOODYEAR IVS WITH MORE REALISTIC SCENE/TESTER COMBINATION
  - / NECESSARY TO MEET LOW MODULATION HIGH LIGHT TARGET
- 3 MARCH SO REVIEW OF GE IVS SELECTION

IMAGE SMEAR - CLOSED LOOP TRACKING

AUTOMATIC MODE

- TRACKING MIRROR DRIVE - HIGH FREQUENCY
- VIBRATION OF OV AND EQUIPMENT
- IVS

RSS TOTAL (CENTER OF FORMAT, NEAR NADIR)

LOS RATE ERROR (0, 95p) μ RAD/SEC

SPEC	CURRENT
[redacted]	

IMAGE SMEAR-CLOSED LOOP TRACKING

MANUAL MODE

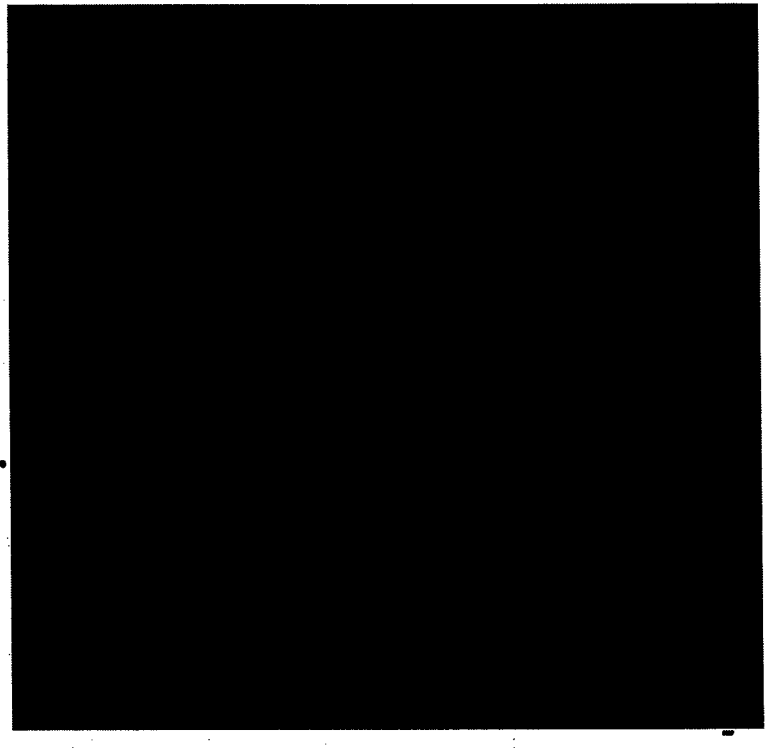
	LOS RATE ERROR (0.95p) μ RAD/SEC	
	SPEC	CURRENT
o TRACKING MIRROR DRIVE - HIGH FREQUENCY		[redacted]
o VIBRATION OF OV AND EQUIPMENT		
o CREW		
RSS TOTAL		

~~SECRET~~/DORIAN

IMAGE SMEAR-OPEN LOOP TRACKING

LOS RATE ERROR (0.95p)μ RAD/SEC

	SPEC	PREDICTED BASELINE	PREDICTED WITH ON-ORBIT RATE CALIBRATION
O SERVO			
/ LOW FREQUENCY			
/ HIGH FREQUENCY			
O COMMAND INCLUDING STRUCTURAL DEFLECTIONS AND VEHICLE RATE MEASUREMENTS			
O VIBRATIONS OF OV AND EQUIPMENT			
O EPHEMERIS UNCERTAINTY (400 FT. ALT. ERROR)			
O TARGET LOCATION UNCERTAINTY (100 FT. ALT. ERROR)			
RSS TOTAL			



~~SECRET~~/DORIAN

CONCLUSIONS

- STATUS REPORTING INDICATES SOME SUBSYSTEMS OUT OF SPECIFICATION
- MODIFICATIONS BEING IMPLEMENTED IN ANALYTICAL TECHNIQUES FOR MORE REALISTIC PERFORMANCE REPORTING
- DEVELOPMENT IS SOUND, AND SYSTEM SHOULD EQUAL OR EXCEED SPECIFICATION REQUIREMENTS

ATS PERFORMANCE (2 σ)

	SPEC	PREDICTED
o RESOLUTION (2:1 CONTRAST TARGET, 80 N.MI., SCHADE EYE DATA)	3.3 FT	2.7 FT
o JITTER (ABOVE 6 CPS)		
PRIMARY MODE	.25 SEC	.19 SEC
BACKUP MODE	.60 SEC	.48 SEC
o POINTING ACCURACY (ASSUMING MDAC CONTRIBUTIONS OF 6 MIN, NO TARGET LOCATION AND EPHEMERIS UNCERTAINTIES)	10 MIN	8.6 MIN
o SLAVED MODE (MAIN OPTICS SMEAR WHEN SLAVED TO ATS)	[redacted]	[redacted]

1 - SPEAKER SIDE

CONTAMINATION

Byé 68244-69

2-SPEAKER SIDE

~~SECRET~~/DORIAN ROUGH DRAFT

SP/DR COVERAGE

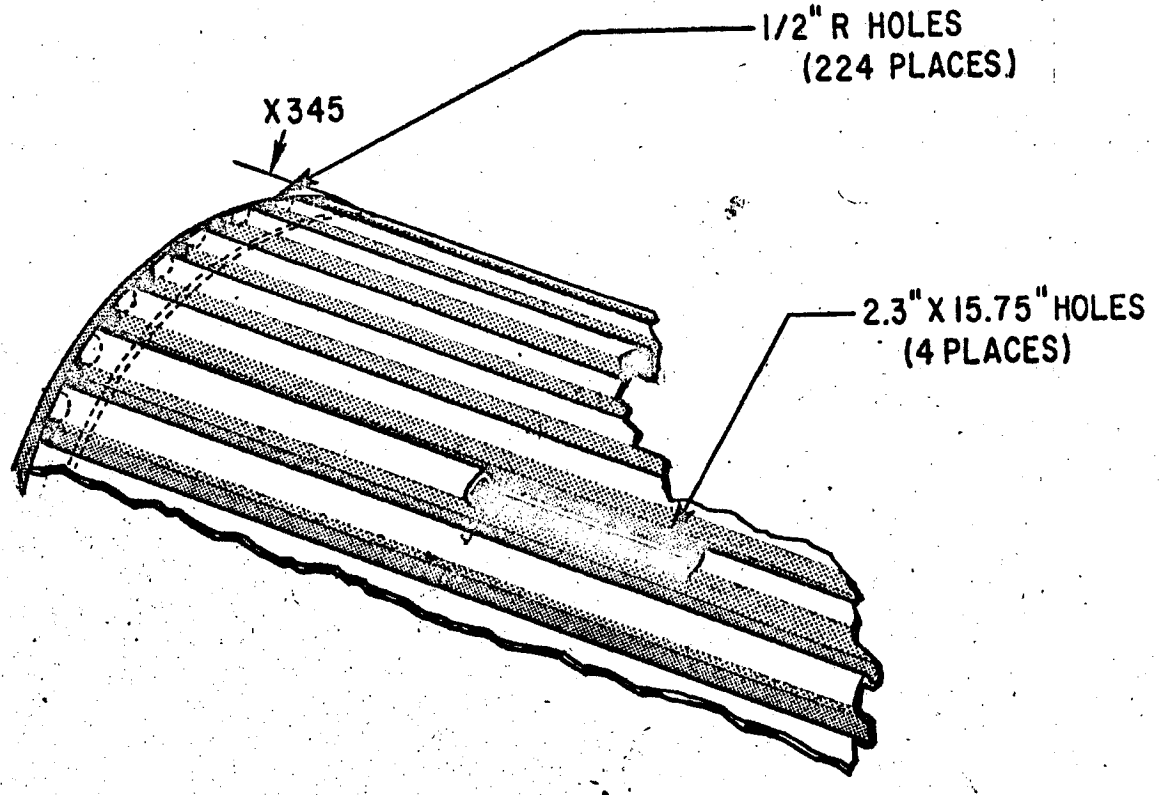
- PARAGRAPH 3.1.1.1.7
  - / NO OUT-OF-SPECIFICATION PERFORMANCE DUE TO CONTAMINATION
  - / NO PERFORMANCE DEGRADATION GREATER THAN:
    - OPTICS - 1% (RESOLUTION)
    - ACQUISITION AND TRACKING SCOPES
    - VIEW PORT WINDOW - 10% (TRANSMISSIBILITY)
  - / MINIMIZE CONTAMINATION EFFECTS BY DESIGN, MATERIAL CONTROL, OUTLET LOCATIONS, FLOW DIRECTION, FILTERING, SEALING, ETC.
  - / EFFLUENTS:
    - OV WASTES
    - LV PROPULSION
    - FAIRING AND DOOR SEPARATION DEVICES
    - TIIM IGNITION, STAGING, RETRO-ROCKETS

SAFSL EXHIBIT COVERAGE

- SAFSL EXHIBITS 10003, 30033, and 12003
  - / ESTABLISHES GROUND CONTAMINATION CONTROL TO A VISIBLY CLEAN LEVEL AND PROVIDES FOR PROTECTION OF SENSITIVE SURFACES BY COVERS, ETC. NO FLIGHT ENVIRONMENT PROVISIONS.

4 - SPEAKER SIDE

MM VENT CONFIGURATION



CONTAMINATION SENSITIVE SURFACES

- EXTERNAL
  - / HORIZON SENSOR
  - / ANTENNAE
  - / PARTICLE SPECTROMETER
  - / THERMAL COATINGS
  - / VELOCITY VECTOR SENSOR ASSEMBLY
  - / VIEWPORT
  - / STARTRACKER
  - / ACQUISITION AND TRACKING SCOPE (INSIDE)
  - / WATER RADIATOR SYSTEM (LM)
- LABORATORY INTERNAL
  - / FILM CHUTES (INSIDE)
  - / ACQUISITION AND TRACKING SCOPE (INSIDE)
  - / VISUAL OPTICS
  - / CAMERA
- MISSION MODULE INTERNAL
  - / TRACKING MIRROR
  - / PRIMARY MIRROR
  - / INSIDE OF COA BARREL AND LIGHT SHIELDS
  - / NEWTONIAN FOLDING MIRROR
  - / ROSS MIRROR
  - / ROSS CORRECTOR ELEMENTS
  - / PELLICLE (SENSITIVE TO RELATIVE HUMIDITY)
  - / ALIGNMENT SYSTEM
  - / DRIVE "A" BEARINGS

6 SPEAKER SIDE

~~SECRET~~/DORIAN

OVERBOARD EJECTIONS

MOLECULAR SIEVE	0.08#/15 MIN	CYCLIC*
WASTE MANAGEMENT	0.05#/HR	RANDOM *
WATER (F/C)	2#/HR NOM. - 4#/HR MAX.	RANDOM *
CONDENSATE	0.05 #/HR NOM. - 0.355#/HR MAX.	RANDOM *
URINE	8-10#/DAY	MANUAL *
H_2 (F/C PURGE)	H_2 0.75#/HR H_2O 0.45#/HR	CONTROLLED
O_2(F/C PURGE)	O_2 1.5#/HR H_2O 0.135#/HR	CONTROLLED

* THESE EFFLUENTS WILL BE INHIBITED DURING OPEN DOOR OPERATION.

7 SPEAKER SIDE

2/10/69

MARQUARDT PULSE MODE CONTAMINATION TESTS 7 FEBRUARY 1969

- 22 LB. THRUSTOR ORIENTED HORIZONTALLY.
- THRUSTOR OPERATING CONDITIONS VARIED.
  - / HARDWARE TEMPERATURE
  - / THRUSTOR OFF TIME
  - / MIXTURE RATIO
- CONTAMINATION NOTED TO BE HARDWARE TEMPERATURE AND DUTY CYCLE SENSITIVE.
- NO VISIBLE CONTAMINATION NOTED OVER RANGE OF EXPECTED MOL OPERATING CONDITIONS.
- PHOTOGRAPHIC DATA BEING EVALUATED FOR CONFIRMATION OF REAL TIME VISUAL RESULTS.
- BASELINE CONFIGURATION APPEARS ADEQUATE.

8-SPEAKER SIDE

STEADY STATE PLUME CONTAMINATION PROBLEM

- SUB-SCALE TEST RESULTS INDICATE A POTENTIAL PROBLEM
- FULL-SCALE CONFIRMATION TEST IMPOSSIBLE DUE TO FACILITY CONSTRAINTS ON FIRING DURATION
  - / MARK I TEST CANCELLED SINCE MARQUARDT TESTS ADEQUATE FOR PULSE MODE. FACILITY LIMITED TO 2 TO 6 SECONDS DURATION WITH 100 POUND THRUSTER
- ANALYZE EXISTING DATA
- REVIEW APOLLO 9 RESULTS
- REVIEW NASA TESTS ON LUNAR MODULE
- DESIGN FIXES BEING STUDIED BY ASSOCIATE CONTRACTORS

9 SPEAKER SIDE

~~SECRET~~/DORIAN

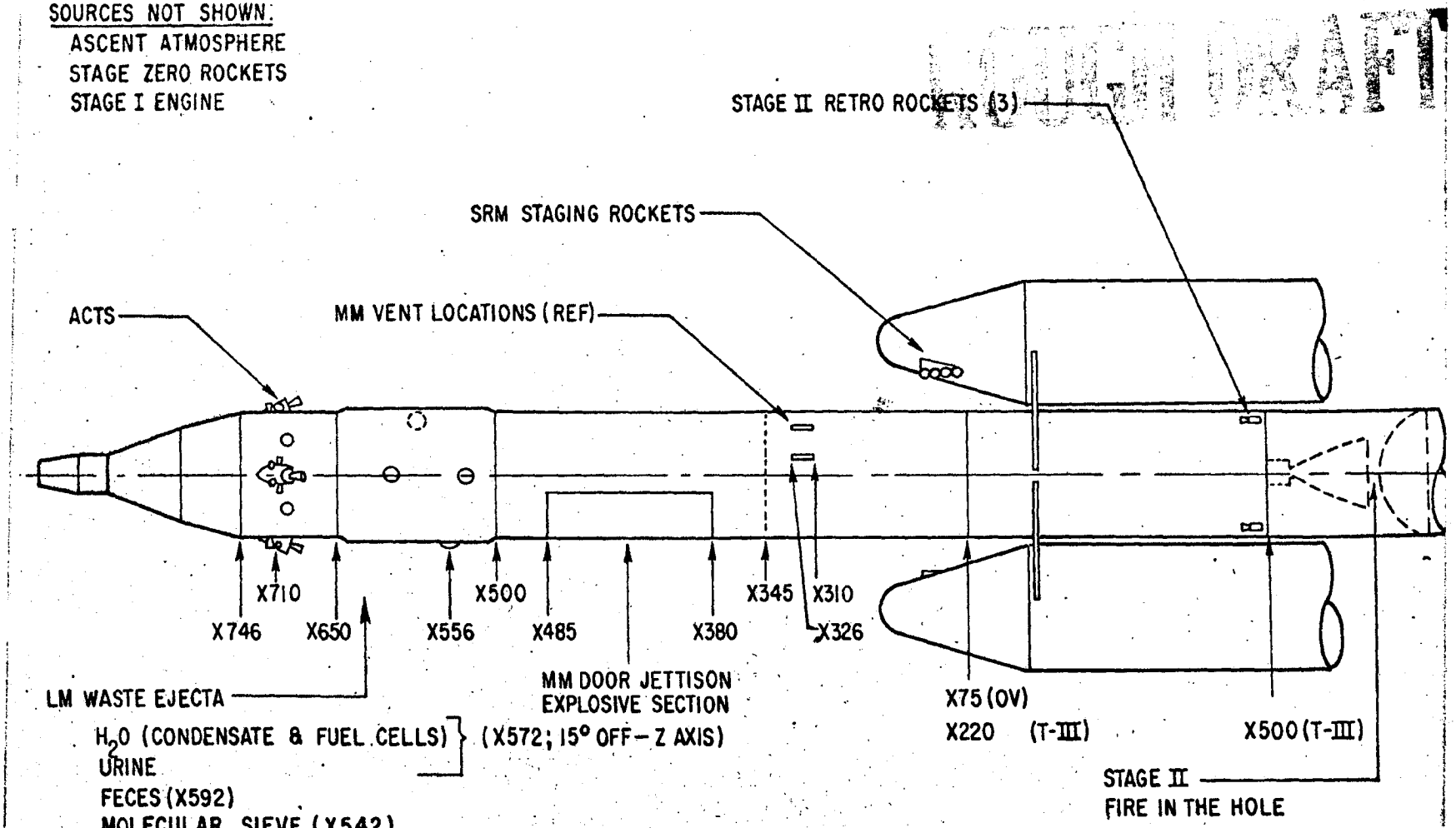
ROUGH DRAFT

- POTENTIALLY AFFECTED AREAS AND FIXES

/	HORIZON SENSOR	EYELID SEAL
/	RADIATOR	REPLUMB
/	MISSION MODULE VENTS	SEAL
/	ACQUISITION AND TRACKING SCOPES	SEAL DOOR
/	STARTRACKER	SEAL OR FENCE
/	MISSION MODULE DOOR	SEAL

POTENTIAL EXTERNAL CONTAMINATION SOURCES

SOURCES NOT SHOWN:
- ASCENT ATMOSPHERE
- STAGE ZERO ROCKETS
- STAGE I ENGINE



H_2O (CONDENSATE & FUEL CELLS) } (X572; 15° OFF – Z AXIS)
URINE
FECES (X592)
MOLECULAR SIEVE (X542)
FUEL CELL PURGE (668 - 6 PLACES)

ROUGH DRAFT

SUMMARY

LABORATORY VEHICLE EJECTA	INHIBIT
ATTITUDE CONTROL THRUSTERS PULSE MODE	NO FIX REQUIRED
TRANSLATION THRUSTERS (STEADY BURNING)	SEAL MM VENTS SEAL EXTERNAL EQUIPMENTS SEAL MM DOOR REPLUMB RADIATOR
BOOSTER EVENTS STAGE "O" SEPARATION STAGE II RETRO	SEAL MM VENTS

ROUGH DRAFT

ELECTRICAL POWER SYSTEM

Bye 68244-69

ELECTRICAL POWER SYSTEM

- POWER ALLOCATION STATUS
- MATRIX FUEL CELL
- FUEL CELL SCHEDULE
- FUEL CELL CONFIDENCE
- NASA COORDINATION
- PROGRAM STATUS

OV PEAK AND AVERAGE POWER

	ALLOCATION	STATUS 12-15-68	VARIANCE WITH ALLOCATION
AVERAGE POWER (WATTS)	1822	1611	-211
PEAK POWER (WATTS)			
A) TRACKING MIRROR SLEW	4326	3841	-485
B) PHOTOGRAPHIC OPERATIONS	4426	4019	-407
C) MISSION PAYLOAD CHECKOUT	4370	4056	-314
D_1) MISSION PAYLOAD ACTIVATION/ PREPARATION	4301	4014	-287
D_2) OTHER MISSION PAYLOAD	4209	3669	-540
E) SGLS STATION	3342	3149	-193
F) WIDEBAND STATION	3851	3359	-492
G) SGLS & WIDEBAND STATIONS	3937	3748	-189
H) ALL OTHER ORBITAL	4196	3850	-346
I) EARLY OR LATE ORBIT	4439	4126	-313
J) LAUNCH AND ASCENT	2791	2289	-502
CAPABILITY (WATTS ESTIMATED)	2310 AVERAGE 5080 PEAK		

HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

MDL

ELECTRICAL POWER SYSTEM

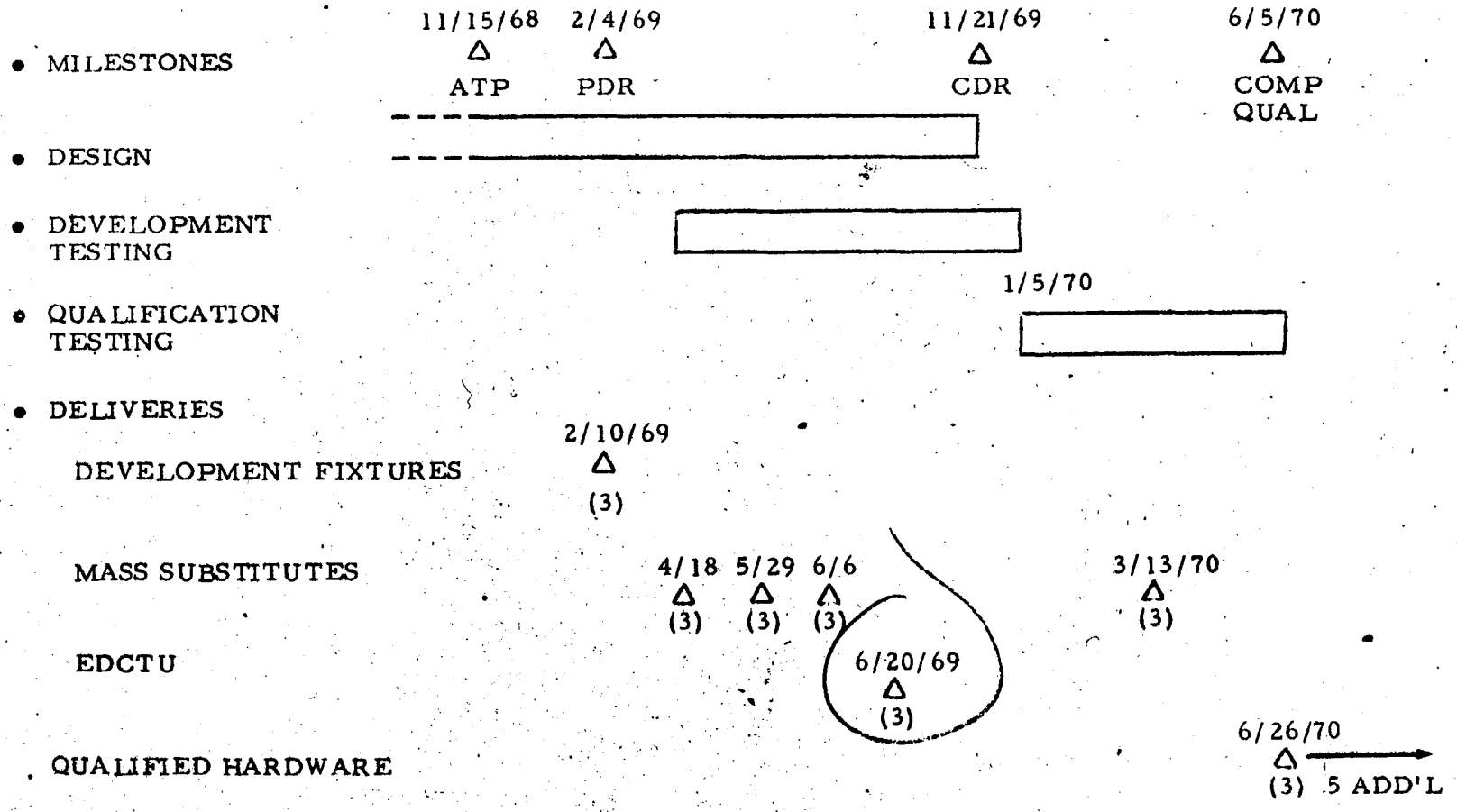
MATRIX FUEL CELL ADVANTAGES

- PROGRAM ADVANTAGES

PERFORMANCE:	- 2400 WATTS VS 2250 WATTS (HTM)
LIFE:	- 2000 HRS VS 1000 HRS
WEIGHT:	- 200 LB. SYSTEM WEIGHT REDUCTION
VOLUME:	- UP TO 30% REDUCTION
OPERATIONS	- IN-SPACE START/STOP CAPABILITY
LOAD TRANSIENTS:	- INCREASED CAPABILITY
EPS SIMPLIFICATION:	- ELIMINATION OF FUEL CELL SWITCHING MODE
	- ELIMINATION OF FUEL CELL DUAL TEMPERATURE MODE
	- START/STOP CONTROLS SIMPLIFICATION

ELECTRICAL POWER SYSTEM

FUEL CELL SCHEDULE



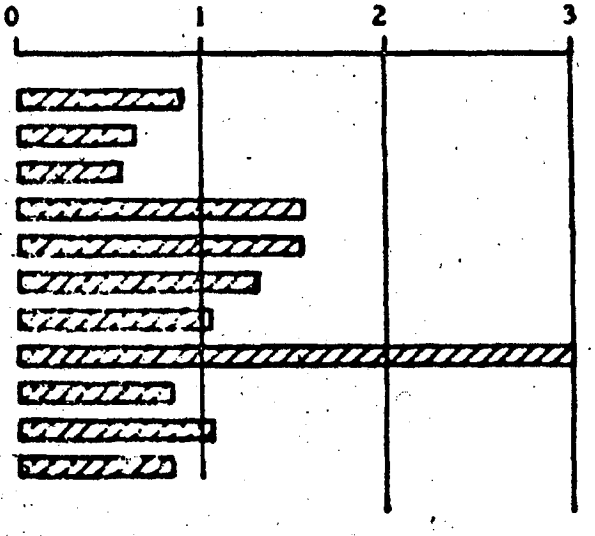
ELECTRICAL POWER SYSTEM

ALLIS CHALMERS MATRIX FUEL CELL TEST HISTORY

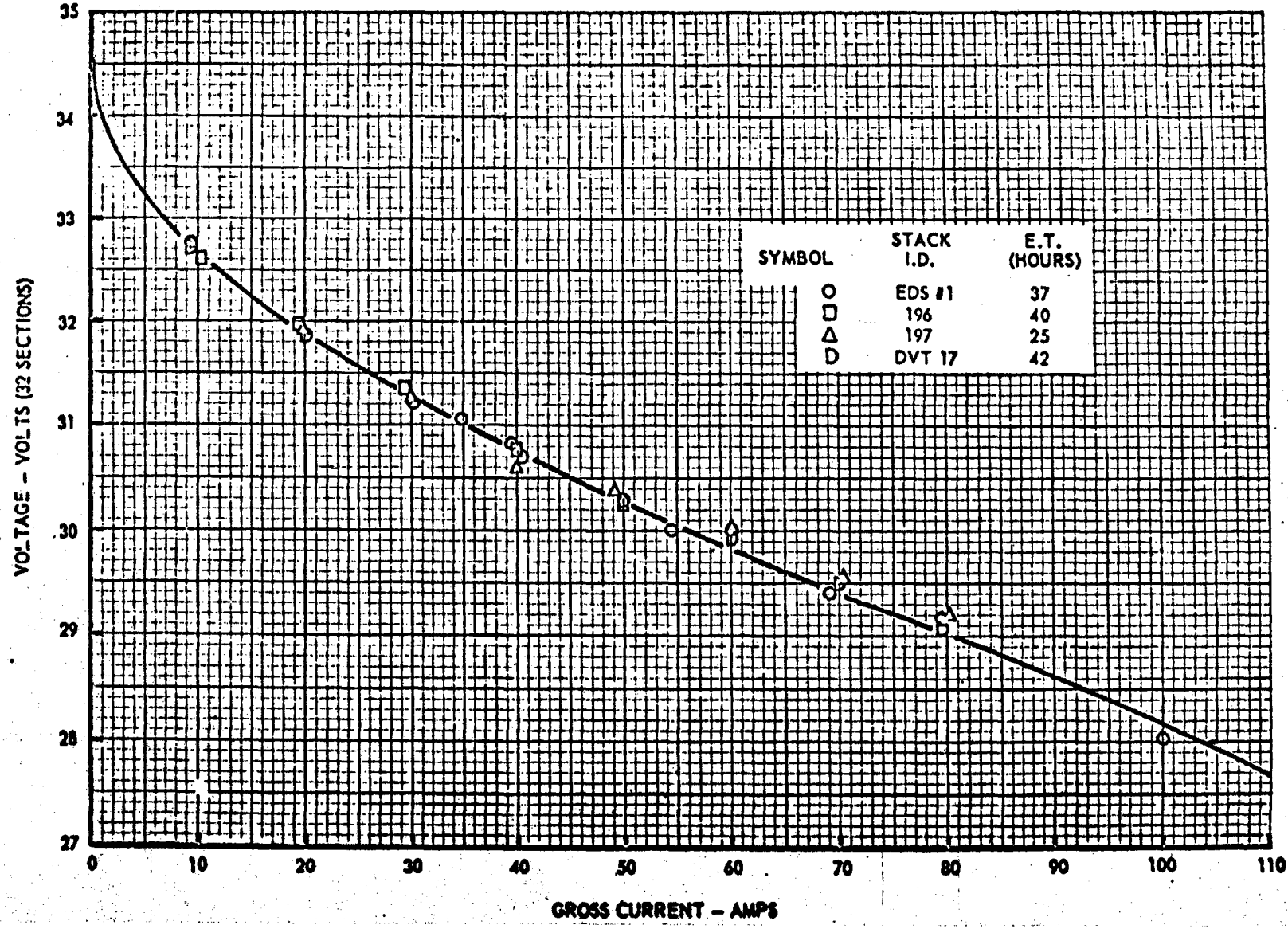
PRIOR TO 1967 ALLIS CHALMERS TESTING RECORDED 15 UNITS MEETING A MINIMUM OF 1,000 HOURS DURATION.

UNIT	DATE
STACK 132	1967
STACK 131	1967
STACK 135	1967
STACK 137	1967
STACK 138	1967
STACK 136	1967
STACK 196	1967/8
EDS-1	1967
DVT SYS 15	1967/8
DVT SYS 16	1967/8
STACK 197	1967/8

ENDURANCE-THOUSANDS OF HOURS



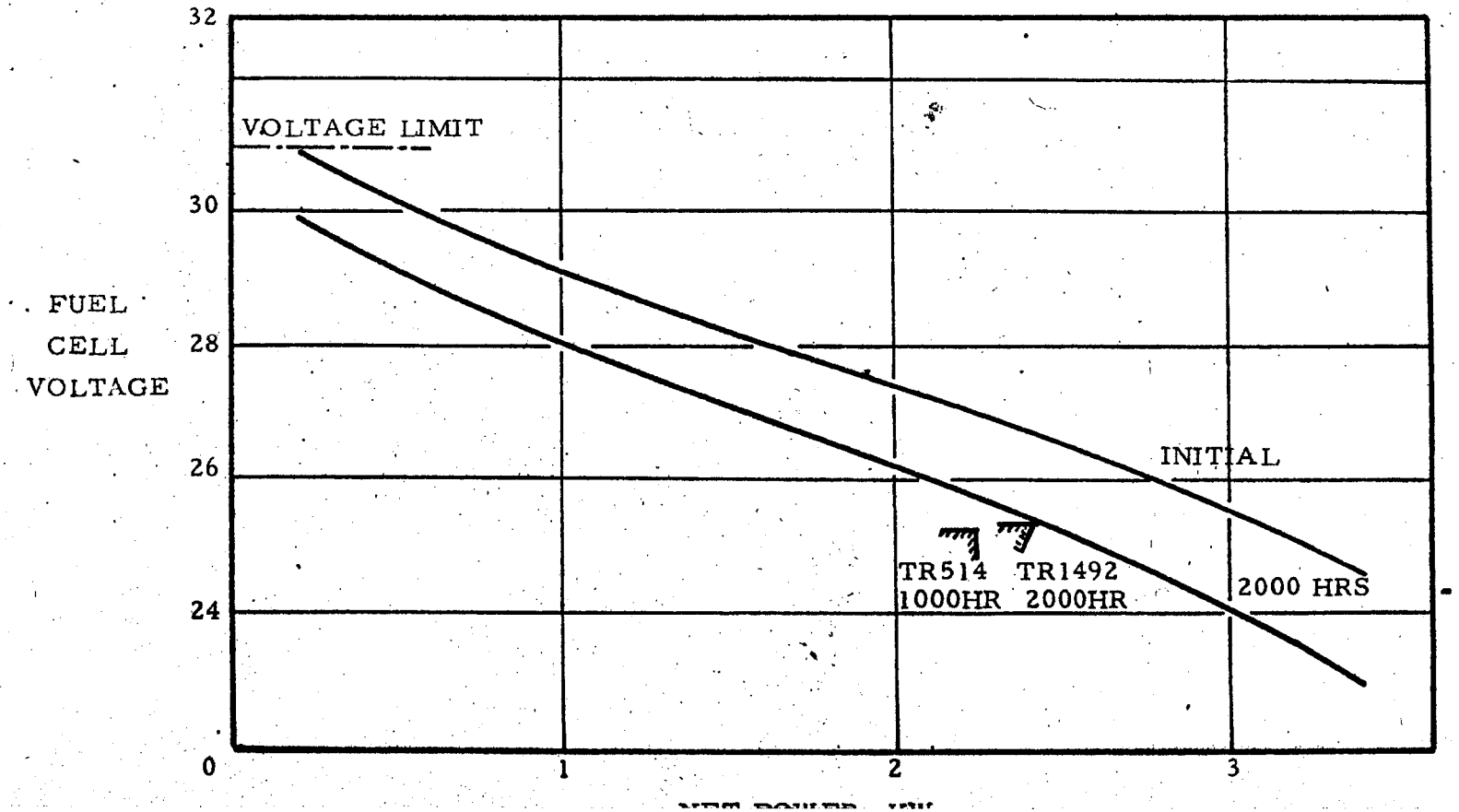
V-A PERFORMANCE CHARACTERISTICS - INITIAL PERFORMANCE BASELINE



MOL

ELECTRICAL POWER SYSTEM

EDS-1 PERFORMANCE
1967



ELECTRICAL POWER SYSTEM

AAP QUAL TEST PROGRAM

	AAP	MOL
• PDR		FEB. 4, 1969
• CDR	APRIL 1, 1969	NOV. 21, 1969
• QUAL TEST		
START	JUNE 1, 1969	JAN. 5, 1970
COMPLETE	JAN. 15, 1970	JUNE 5, 1970
• FINAL REPORT	FEB. 15, 1970	JULY 5, 1970

MOL

ELECTRICAL POWER SYSTEM

FUEL CELL PROGRAM COORDINATION

- AGENCIES
  - AIR FORCE
  - NASA MSC
  - WRIGHT PATTERSON APL
- CONTRACTORS
  - MDAC-WD
  - NAA - AAP
  - AEROSPACE
- DOCUMENTS
  - NASA -MSC TRS
  - NAA AAP TRS
  - DAC-WD TRS
  - DAC-WD WORK STATEMENT PACKAGE

MOL

ELECTRICAL POWER SYSTEM

POTENTIAL COORDINATION BENEFITS & PROBLEMS

- AVOID DUPLICATION OF:
  - COMPONENT DEVELOPMENT & TESTING
  - DOCUMENTATION
  - COSTS
- MAXIMIZE USE OF COMMON QUALIFIED PARTS & SUPPORT EQUIPMENT, i.e. FIXTURES, JIGS, SHIPPING CONTAINERS, AGE, & STE
- ADJUST SCHEDULES TO MINIMIZE MSK LABOR PEAKS & VALLEYS
- POTENTIAL PROBLEMS EXIST BECAUSE:
  - CONFIGURATION DIFFERENCES
  - ENVIRONMENATL REQUIREMENTS
  - DIFFERING PROCESS STANDARDS

ELECTRICAL POWER SYSTEM

FUEL CELL STATUS

- SPECIFICATIONS

  TRS - ON CONTRACT TO ALLIS CHALMERS

  CEI - PRELIMINARY ECP COORDINATED WITH DAC/AIR FORCE/ AEROSPACE

- PROGRAM MILESTONES

  TRS PDR - ACCOMPLISHED FEB. 4, 5, 6, 7

  CEI PDR - SCHEDULED FEB. 17, 1969