SIMULATORS STATUS & PLANS

MANAGEMENT & TECHNICAL PROBLEMS

WITH

RECOMMENDED SOLUTIONS

MOREY M. GIBBS
11/19/68

SECRET DORIAN

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BRIEFING OUTLINE

- INTRODUCTION/BACKGROUND

- CURRENT STATUS & PLANS - PROBLEMS

    / MANAGEMENT PROBLEMS

    / TECHNICAL PROBLEMS

- SELF-IMPOSED CONSTRAINTS

- POSTULATED SOLUTIONS & ATTRIBUTES

- RECOMMENDATIONS/ACTIONS

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INTRODUCTION & BACKGROUND

SIMULATOR OBJECTIVES/REQUIREMENTS & IMPLEMENTATION

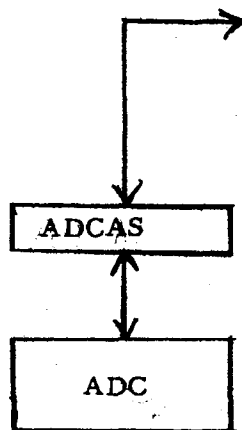| OBJECTIVES/REQUIREMENTS	IMPLEMENTATION		
	EDS	MDS	MS
SUPPORT & VALIDATE AVE DESIGN	X	*	
DEVELOP & VALIDATE FLIGHT CREW PROCEDURES		X	
PROVIDE FLIGHT CREW TRAINING		*	X
SUPPORT AVE SOFTWARE DEVELOPMENT/VALIDATION		X	
SUPPORT AVE & STC SOFTWARE VERIFICATION			X
SUPPORT MCC OPERATIONS PERSONNEL TRAINING			X
SUPPORT DEVELOPMENT OF FLIGHT PLAN & MISSION RULES			X

NOTE

    X = PRINCIPAL FUNCTION
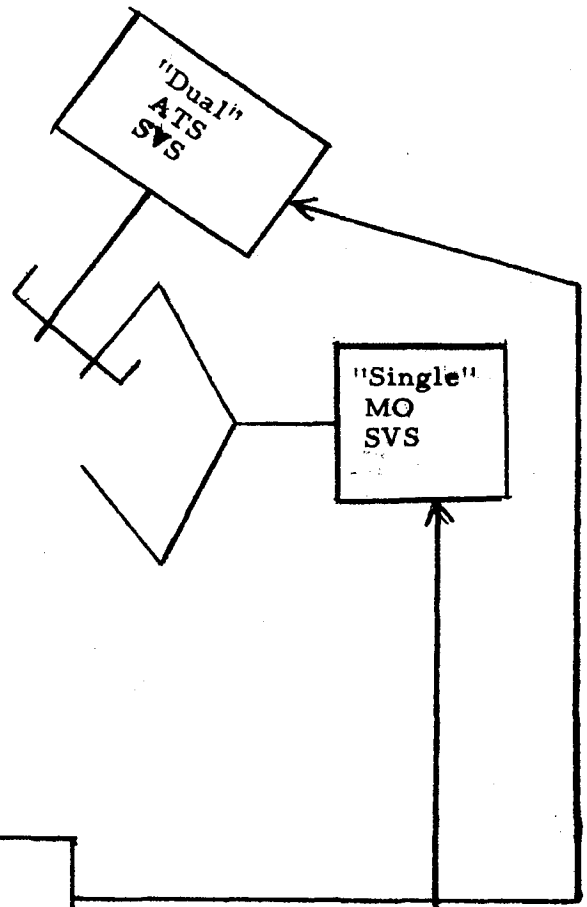   * = SECONDARY OR BACKUP FUNCTION

PHASE 0 MDS

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PHASE 3 MDS

ADCAS

ADC

"Dual"
ATS
SVS

"Single"
MO
SVS

EK
Hdwr

Add'l
Consoles

Add'l
Racks

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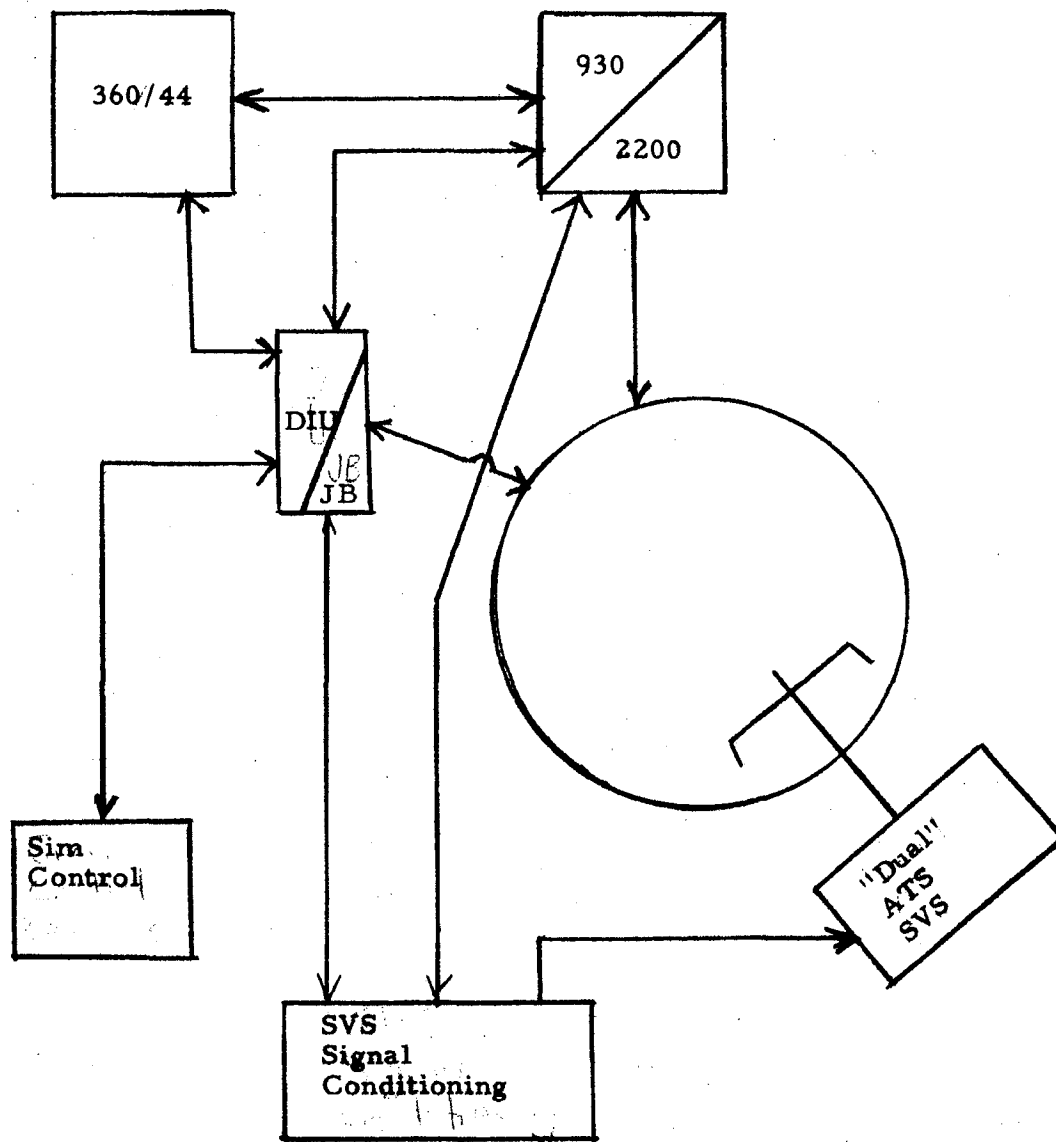
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MISSION SIMULATOR BLOCK DIAGRAM

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GBPS

Instructor Consoles

I/O Gear

STC (MCC)

Digital Interface Unit

SLM

SVS

930 | 2200

360-44

CCAU

360-65

ADCAS

40

(MMSC)

(LMSC)
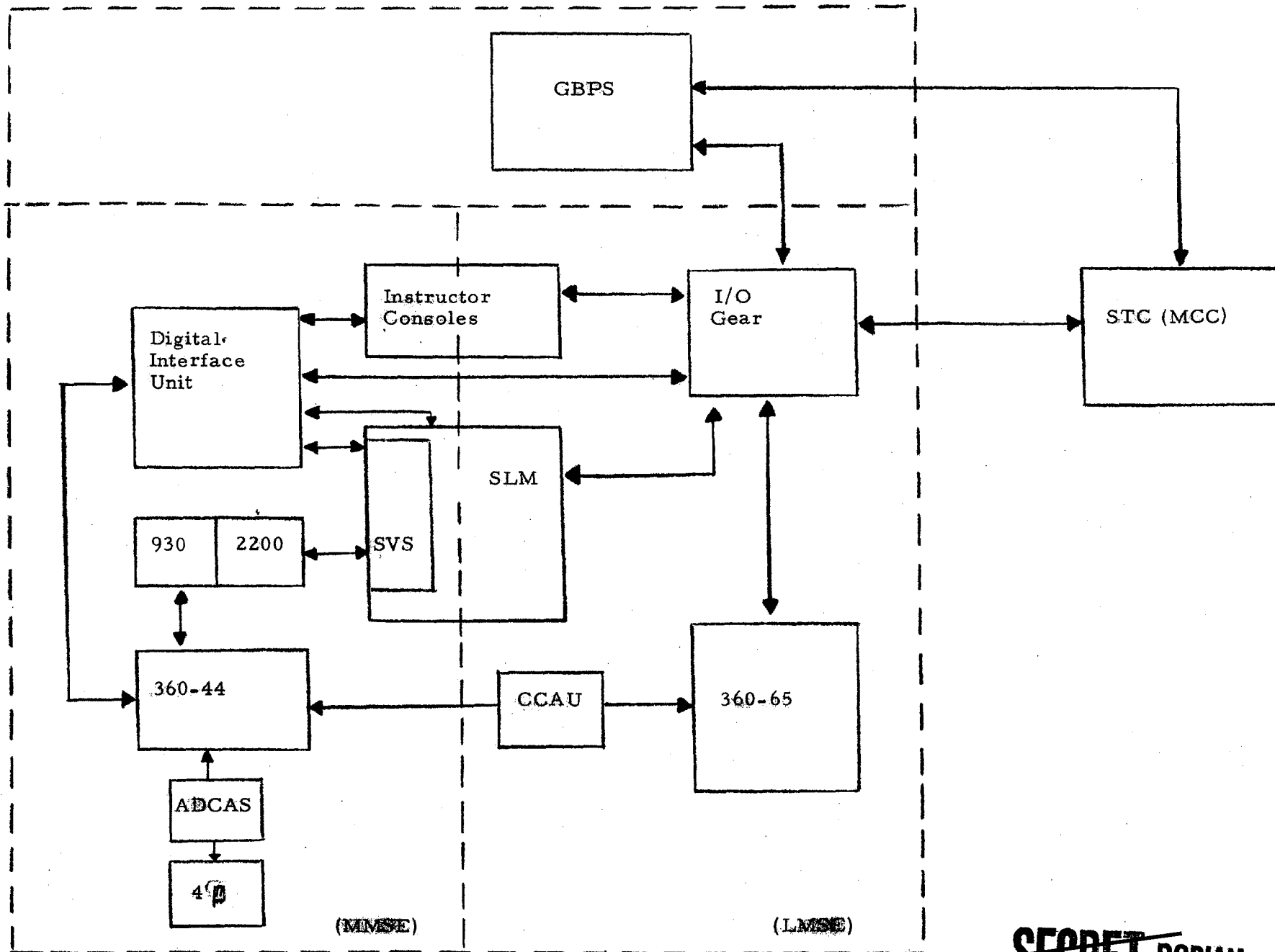
SIMULATORS DEVELOPMENT PHILOSOPHIES

MDS/MMSE PHILOSOPHY

- MDS HI-FIDELITY (ESSENTIALLY ENGINEERING TYPE) SIMULATOR

    / MDS INCLUDES AVE ADC & SOFTWARE AS INTEGRAL ELEMENTS

    / MDS SUPPORTS AVE SOFTWARE DEVELOPMENT & QUALIFICATION

- MDS/MMSE CONFIGURATION COMMONALITY

- MDS/MMSE SEQUENTIAL DESIGN & MANUFACTURE

LMSE PHILOSOPHY

- LMSE FUNCTIONAL (TRAINER TYPE) SIMULATOR

- LMSE DEVELOPMENT - CONSTANT MANPOWER/EXTENDED DURATION

MS PHILOSOPHY

- MDAC-W DESIGNATED AS MODIFIED COMPUTER PROGRAM INTEGRATION CONTRACTOR (MCPIC)

- NO ONE CONTRACTOR CONTRACTUALLY RESPONSIBLE FOR MISSION SIMULATOR (MS)

CURRENT STATUS & PLANS - PROBLEMS

MDS VERSUS MMSE

- GE UNDER AF/AEROSPACE PRESSURE TO GET MDS OPERATIONAL ASAP.

  / MDS HAS UNDERGONE NUMEROUS SLIPS FROM 7/67 TO 3/69.

  / ACTUAL MMSE DESIGN EFFORT SLIPPING IN REAL TIME.

- LIMITED BUDGET CREATES CONFLICTS IN MANPOWER ALLOCATION.
  ARBITRARY MANAGEMENT MANPOWER CUTS.

  / GE PLACES HEAVY EMPHASIS ON MDS MANNING.

  / AEROSPACE ESTIMATES MDS AND MMSE UNDERSTAFFED. ESTIMATES-
  TO-COMPLETE RANGE FROM 40,000 TO 80,000 MH ADDITIONAL. (.8M
  TO 1.6M)

- GE UNABLE TO ADEQUATELY SUPPORT DAC SOFTWARE IFS.

  / PROPOSED ONE MAN FOR EK IFS, ONE FOR DAC IFS, "LEVEL OF EFFORT".
  CRISIS MANAGEMENT.

	68	69	70

106 Phase 0

EDS

Ø 0 Buildup   Ø 0 Ops

△ TDR   △ FDR

106 Phase 3

Ø 3 Buildup   Ø 3 Ops

△ TDR   △ FDR   △ FACI
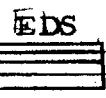
MMSE

Computer Complex Only - 802 Support   Buildup   Ship   I & C

and Develop Ø/3 Software   △ PDR   △ GDR   △ Cat. 1

LMSE

MMSE S/W IES
Design Freeze
Hardware CDR
Software CDR
Matl Selection
    Delivery

△   △   △   △   △ Buildup   Ship   I & C

△ Integ. & Valid.   △ Cat. 1

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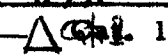
CONTRACTORS PROPOSED OTEF ACTIVATION
FOR MISSION SIMULATOR

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1970

|Mar |Apr |May |Jun |Jul |Aug |Sep |Oct |Nov |Dec |

1971

|Jan |Feb |Mar |Apr |May |Jun |Jul |

Cat. I Tests

(GE) ② ③ ④

MMSE (AF) ② ③ ④

9 Mos. Operations
Prior to Flight No. 3

LMSE ① ② ③ ④ ⑤ ⑥

GBPS ① ② ③ ④
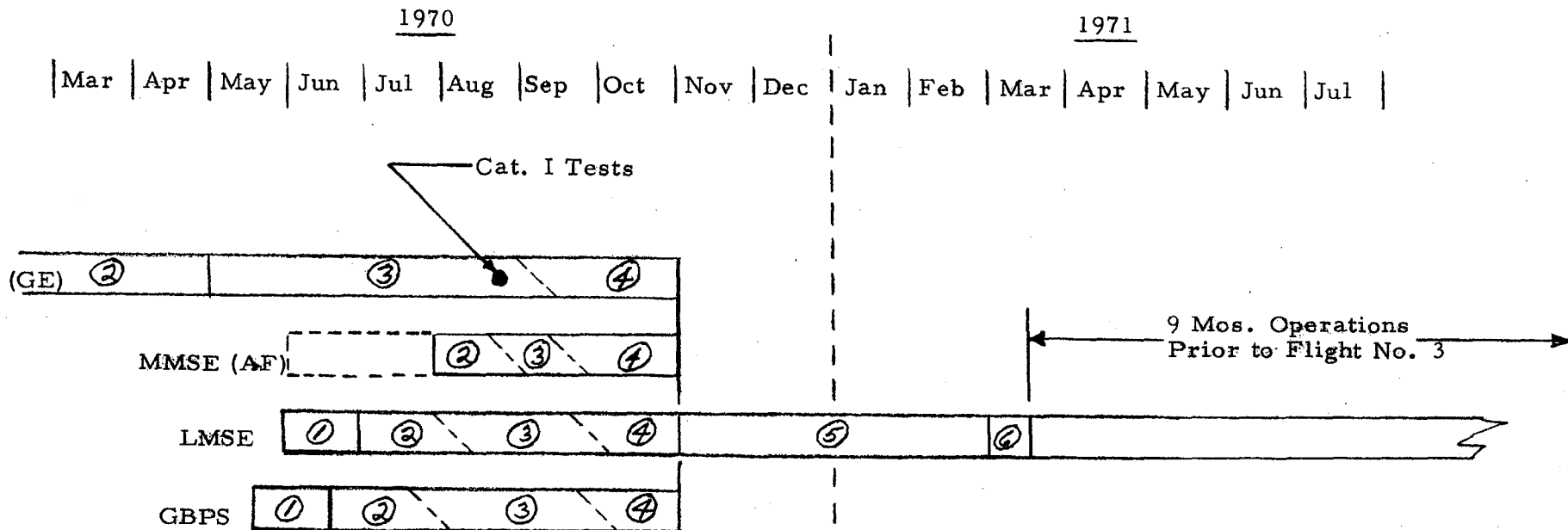
LEGEND:
① = INCENTIVE PERIOD
② = SEGMENT SIMULATOR INSTALLATIONS
③ = SEGMENT SIMULATOR CHECKOUT
④ = SEGMENT SIMULATOR BLOCK CHANGE
⑤ = MISSION SIMULATOR INTEGRATION
⑥ = MISSION SIMULATOR ACCEPTANCE TEST
(CAT II TESTS COMPLETED)

MMSE STAFFING (TYPICAL)

CALENDAR YEAR QUARTERS

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LMSE-MMSE INTERFACE STATUS

- **HARDWARE IFS**

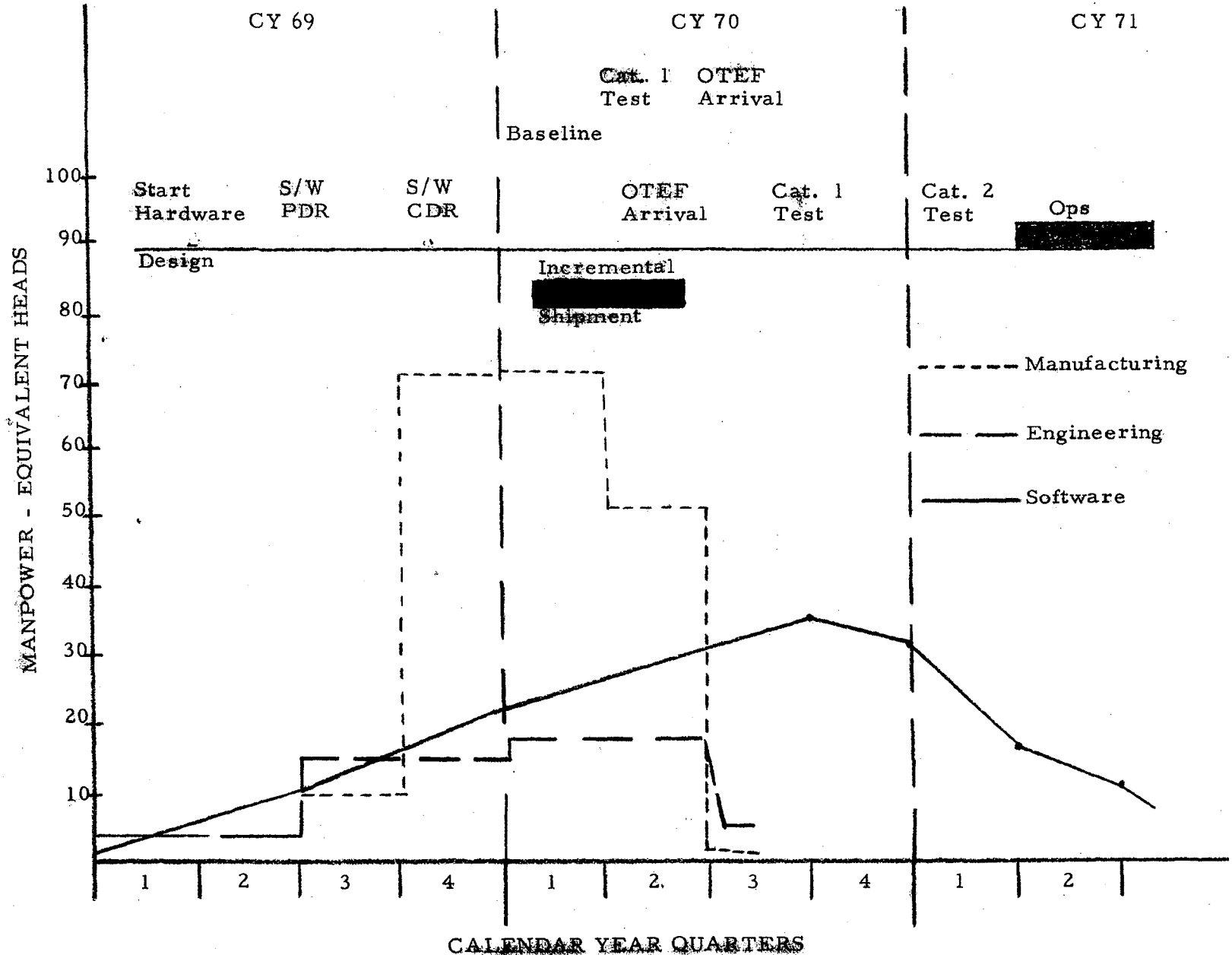 / ALREADY SIGNED-OFF ON 4-1-68

- **SOFTWARE IFS**

  / MUST BE WORKED INCREMENTALLY. CONTRACTORS CANNOT AGREE TO DATES.

ITEM	MDAC-W DATE	GE DATE	DELTA
DATA CONVERSION	APR '69	AUG '69	4 MO
SIMULATION CONTROLS	JUN '69	AUG '69	2
INTERFACE TRAFFIC	APR '69	AUG '69	4
FRAME SYNC	APR '69	APR '69	0
ACCURACY & RESOLUTION	JAN '69	OCT '69	9
MESSAGE DEFINITION	MAY '69	AUG '69	3
MATH MODEL INTERFACE	FEB '69	AUG '69	6
TELEMETRY MESSAGE	MAY '69	JUN '69	1

KEY PROPOSAL ASSUMPTIONS

NO IN-HOUSE INSTALLATION OF MMSE

NO SECOND SLIDE CHANGER FOR 106 "A-1" SVS

NO FORMAL EXPERIMENT RESULTS REPORTS

DEFER MMSE PLANNING

NO ADDITIONAL MEASUREMENTS TEST EFFORT

STOP EXTENDED 106 OPERATIONS IN JUNE 1972

ONE-SHIFT OPERATION ON 106 WHEN MMSE BECOMES
OPERATIONAL.

TASK 4 - S & T MANPOWER

TAB RUN DATED
10/22/68

START 106 OPERATIONS

START
MMSE
DESIGN

START
MMSE
FABRICATION

DELIVER

START
MMSE
OPERATIONS

HEADS

106 OPER.

P.A.

MANUFACTURING

ENGINEERING

DRAFTING

S T & D

111 OPERATIONS

CY   68   69   70   71   72

FY   69   70   71   72
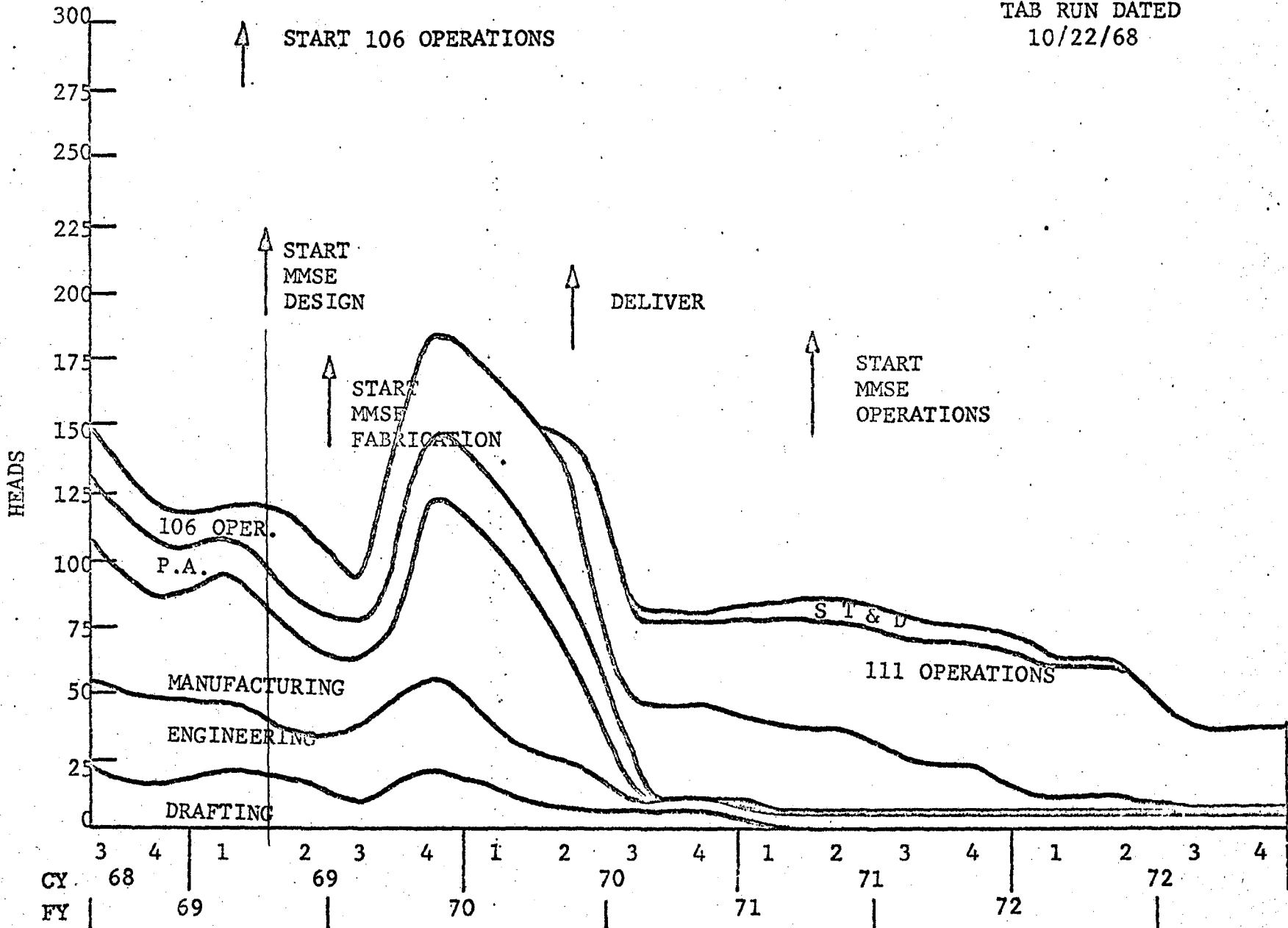
GE SIMULATOR MANAGEMENT/ORGANIZATION

General Manager
M. S. Malkin

System Engr.
G. S. Hall

Program Manag.
L. A. Binegar

Development Subcontracts
W. Ussler

Manufacturing
L. P. Huggins

Simulation & Training
T. O. Haig

Computer S/W
J. D. Rogers

Sim & Training
J. A. Katz

(SVS Vendor)
E. Caba

Engineering
S. Cheney

Simulation Software

106
W. White

Simulation Hardware
J. Davis

Operations
P. Warnshuis

Reqmt's
R. Noll

Design
J. Finley

MMSE
E. Rubenstein

AVE Software

Software
H. McIntire

Reqmt's
Cheezer

Design
Schroth

GE MANAGEMENT DEFICIENCIES

- UNILATERALLY CHANGES SCHEDULE

- UNILATERALLY CUTS REQUIREMENTS TO STAY IN BUDGET

- UNILATERALLY CUTS MANPOWER TO STAY IN BUDGET

  / QUOTES "CALCULATED RISKS", BUT DOES NOT IDENTIFY THESE RISKS
  UNLESS QUERIED BY AF/AEROSPACE

  / SOME MANPOWER CUTS CLEARLY PROVIDE INADEQUATE MANNING.
  EXAMPLE: ONE MAN TO WORK DAC SOFTWARE IFS

  / ABOVE RISKS MUST BE "DUG OUT" BY AF/AEROSPACE

- LACK OF CANDOR IN REPORTING PROBLEMS

  / TECHNICAL PROBLEMS OFTEN ARE UNCOVERED BY AEROSPACE

  / SCHEDULE PROBLEMS USUALLY REPORTED TOO LATE FOR HELP

- COMPLETE INABILITY TO MANAGE VENDOR

  / DEVELOPMENT SUBCONTRACTS OFFICE RATIONS TRIPS BY GE ENGINEER-
  ING TO VENDOR PLANT

  / UNABLE TO CONTROL VENDOR COST AND SCHEDULE

  / UNABLE TO MANAGE OPTICAL MEASUREMENTS PROGRAM

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TECHNICAL PROBLEMS
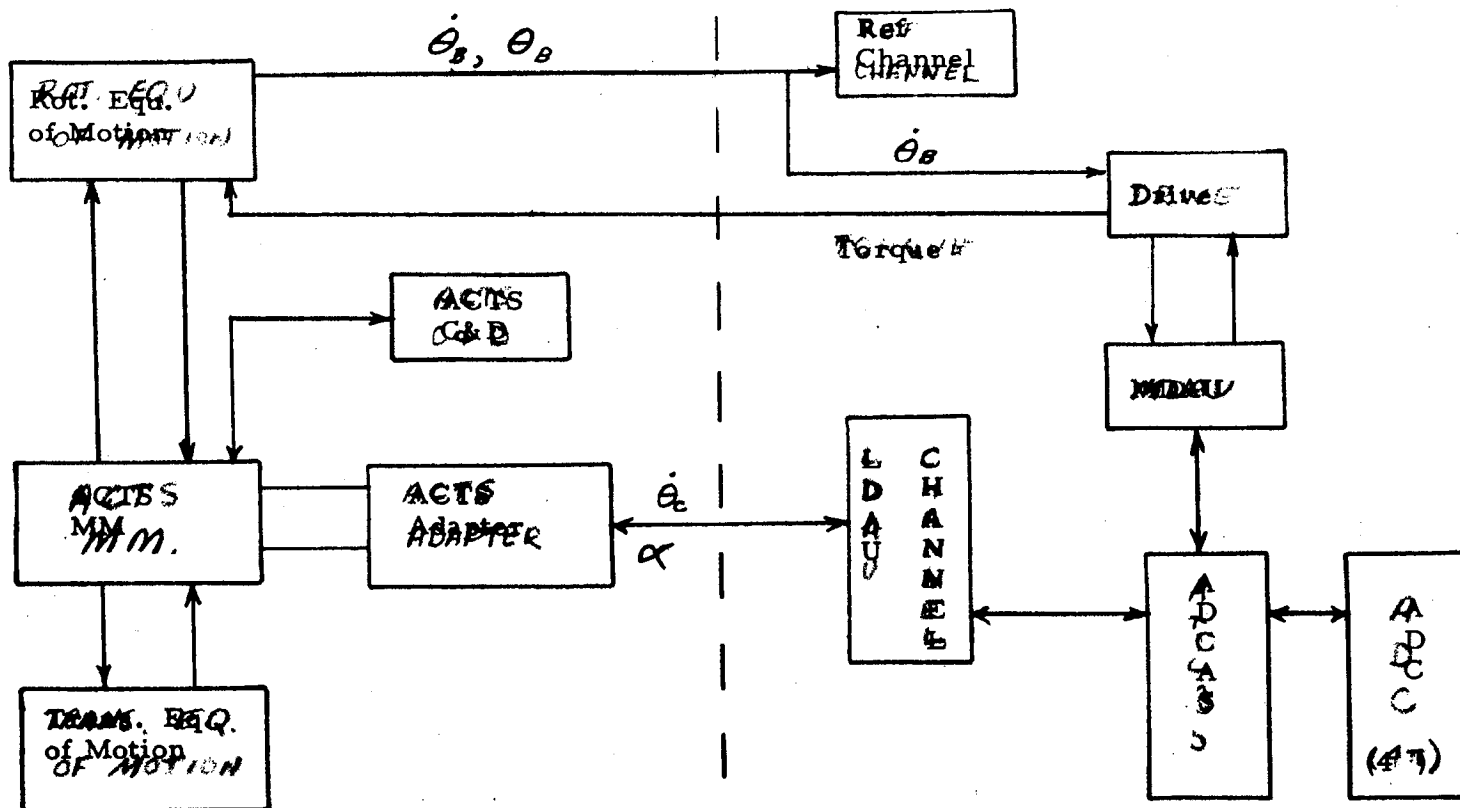
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MDS/MMSE CORE & TIMING (11/68)

	360/44	SDS 930
Core	80%	155%
Timing	100% (120% without new adapter, not presently baseline)	150%

ACTS   ACTS/INTERFACE (PRESENT) (CONT)

ACTS INTERFACE (PROPOSED)

SOFTWARE FUNCTIONAL BLOCKS

LMSE

MMSE

| Rot. Eq. of Motion | ACTS C&D |

| AACTS |

Non-Pass Mode

Payload-Pass Mode

S/W Switch

| Trans. Eq. of Motion |

B

B

B

| Rot. Eq. of Motion |

B

B

Reference Channel

T

| ACTS (1/3) |

T

| Drive |

| MDAU |

| ACTS Adapter |

Enable

| LDAU Channel |

| ADCAS |

| ADC |

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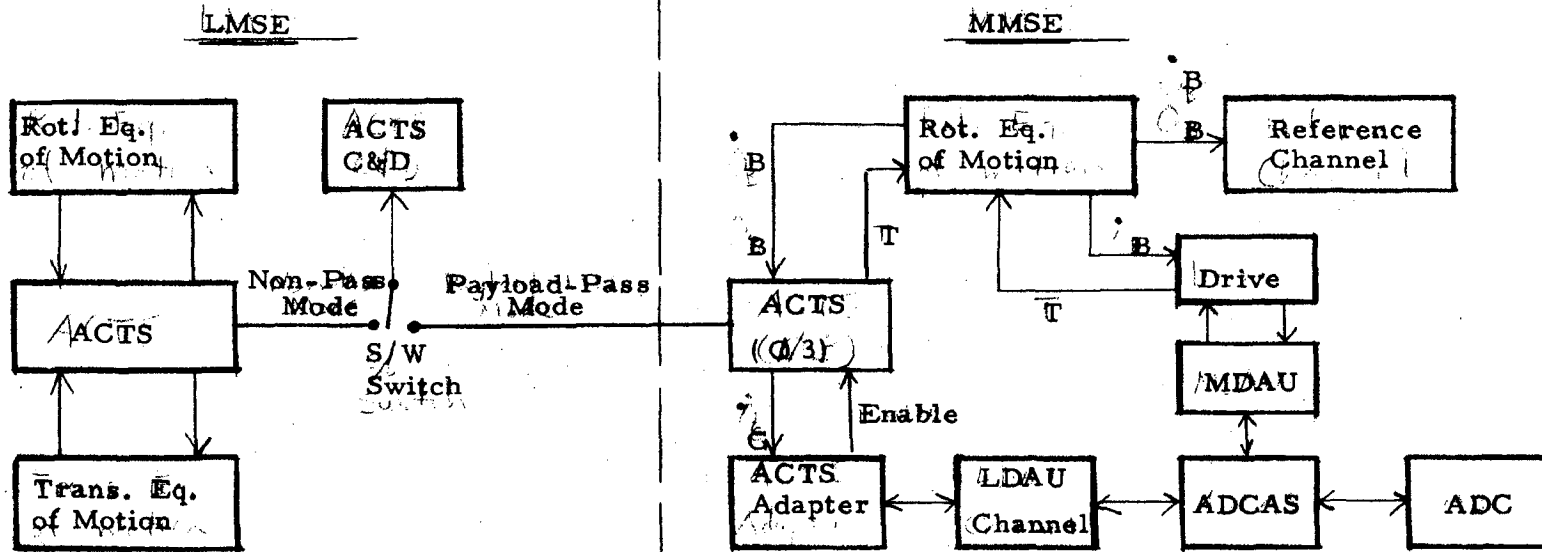
DATA SUBSYSTEM SIMULATION

FUNCTIONAL SOFTWARE INTERFACES

LMSE

MMSE

Present Interface

Lab Decoder

Vehicle Timer

Computer Subsystem Controller

Time Adap.

Printer

RCVR

Command Logic Unit

Printer Adapter

AMU

MDAU   SCET

XMTR

TLM

LDAU Channel

Command Adapter

ADCAS

ADC

TIA

LAB T/M

TLM Adapt.

DASG

KDU Channel

KDU

KDU Adapter

MM TLM
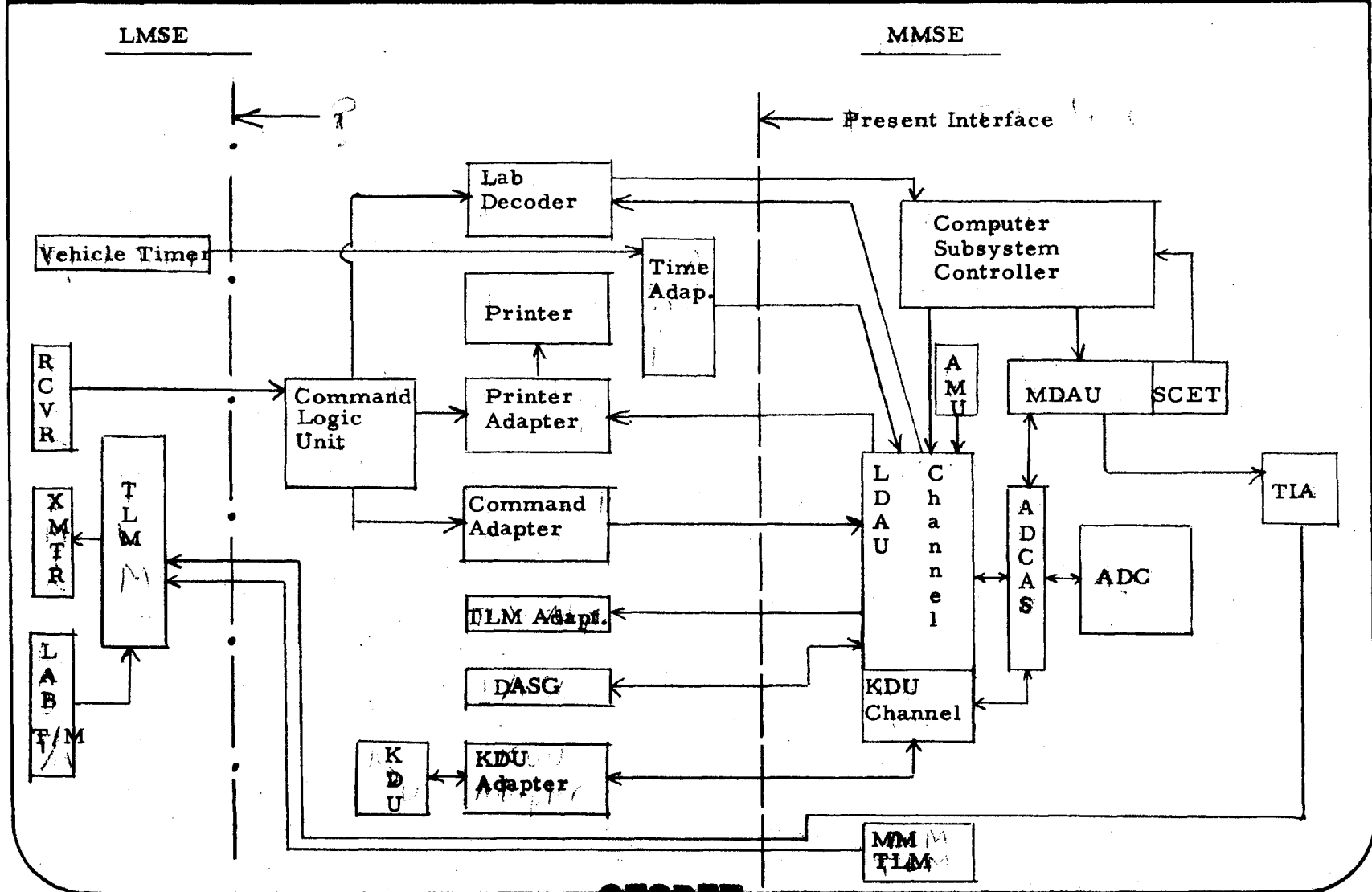
POST-PASS TLM STATUS

- CONTRACTUAL

  / STUDY C.A.R. ONLY (3 MAN-MONTHS: 45 DAYS)

  / DUE APPROXIMATELY 15 NOVEMBER 1968

  / BOTH GE AND MDAC-W REQUESTED AN INCREASE IN
     ALLOWED TIME - REPORT EXPECTED ON OR ABOUT
     1 FEBRUARY 1969

- ANTICIPATE THAT IMPLEMENTATION WILL IMPOSE ADDITIONAL
  MISSION SIMULATOR COMPUTER LOADING (CORE AND TIME)

SELF-IMPOSED CONSTRAINTS

SELF-IMPOSED CONSTRAINTS FOR POSTULATING SOLUTIONS

- MAINTAIN MISSION SIMULATOR OPERATIONAL SCHEDULE - NINE (9) MONTHS FOR INTEGRATED REHEARSALS WITH MCC PRIOR TO FLIGHT NO. 3

- TECHNICAL REQUIREMENTS MUST BE MET

- MINIMIZE OVERALL SIMULATOR PROGRAM COSTS

- MINIMIZE CONTRACTUAL PERTURBATIONS TO MDAC-W

- MEET PRESENT PROGRAM FLIGHT SCHEDULE

POSTULATED SOLUTIONS & ATTRIBUTES

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POSTULATED SOLUTIONS & ATTRIBUTES

POSTULATED SOLUTIONS	ATTRIBUTES
(1) USAF APPLY PRESSURE TO GE MANAGEMENT TO FORCE COMPLIANCE WITH TECHNICAL & SCHEDULE REQUIREMENTS WITH CURRENT MDS/MMSE CONFIGURATIONS AND CURRENT LMSE INTERFACE.	WILL NOT ASSURE SUCCESS o COMPUTER CAPACITY LIMITATIONS o LACK OF SYSTEMS/SOFTWARE ENGRS o AVE SOFTWARE/ADC UNKNOWNS o UNCERTAIN TECHNICAL FEASIBILITY OF PRESENT INTERFACE
(2) MODIFY MDS TO MEET MMSE FUNCTIONAL REQUIREMENTS AND SHIP TO OTEF / CANCEL MMSE / REPLACE MDS AT GE WITH SIMPLE SIMULATOR	DO NOT RECOMMEND o COMPUTER CAPACITY LIMITATIONS o INSIGNIFICANT COST SAVING o CANNOT SUPPORT AVE SOFTWARE AT GE o INSUFFICIENT HI-FI SIMULATOR OPERATIONAL TIME FOR FLIGHT CREW
(3) MAINTAIN MDS AT GE; DESIGN/MANUFACTURE TRAINER TYPE MISSION MODULE SIMULATOR FOR MISSION SIMULATOR AT OTEF	DO NOT RECOMMEND o INSUFFICIENT TIME/ENGINEERS AT GE OR MDAC-W o INSIGNIFICANT COST SAVING o PRECLUDES EXERCISE OF AVE/STC SOFTWARE
(4) REPLACE IBM 360/44 WITH IBM 360/65 OR EQUIVALENT IN MMSE; MAINTAIN MDS BASELINE CONFIGURATION	DO NOT RECOMMEND o LMSE/MMSE INTERFACE CAN BE TECHNICALLY SOLVED o GE MUST DEVELOP & MAINTAIN TWO SIMULATOR SOFTWARE PROGRAMS o MDS COMPUTER LIMITATIONS
(5) REPLACE IBM 360/44 WITH IBM 360/65 OR EQUIVALENT IN MDS AND MMSE	RECOMMEND o LMSE/MMSE INTERFACE CAN BE TECHNICALLY SOLVED o MDS & MMSE SOFTWARE PROBLEMS ALLEVIATED o BASELINE MDS/MMSE PHILOSOPHY IMPLEMENTED

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RECOMMENDATIONS/ACTIONS

RECOMMENDATIONS/ACTIONS

STEP #1

USAF TO EXTRACT FROM HIGHEST LEVELS OF GE MANAGEMENT COMMITMENTS
TO.....

(A)   ESTABLISH AN ENGINEERING GROUP DEVOTED EXCLUSIVELY
TO MMSE/MS DEVELOPMENT.

(B)   ASSIGN AN AUTONOMOUS MMSE/MS PROJECT ENGINEER WITH
FOLLOWING CHARACTERISTICS:

1.   TECHNICALLY & MANAGERIALLY COMPETENT WITH
DYNAMIC PERSONALITY

2.   SOLE COMMITMENT TO DEVELOPING MMSE/MS

3.   CAN ANTICIPATE PROBLEMS & IMPLEMENT TIMELY
SOLUTIONS

4.   WILL CONTINUOUSLY INFORM USAF/AEROSPACE OF
MMSE TECHNICAL & SCHEDULE STATUS AND UN-
RESOLVED PROBLEMS

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RECOMMENDATIONS/ACTIONS (CONT'D)

STEP #2

USAF TO REQUEST MDAC-W TO ....

   (A)   ESTABLISH A MISSION SIMULATOR DEVELOPMENT TEAM

   (B)   ASSIGN AN AUTONOMOUS MISSION SIMULATOR PROJECT
         ENGINEER WITH THE FOLLOWING CHARACTERISTICS:

         1.   TECHNICALLY & MANAGERIALLY COMPETENT
              WITH DYNAMIC PERSONALITY

         2.   SOLE COMMITMENT TO DEVELOPING/INTEGRA-
              TING/TESTING A MISSION SIMULATOR

         3.   VIEW LMSE & MMSE AS (MERELY) ELEMENTS OF
              THE MISSION SIMULATOR

         4.   CAN ANTICIPATE PROBLEMS & IMPLEMENT TIMELY
              SOLUTIONS.

         5.   WILL CONTINUOUSLY INFORM USAF/AEROSPACE OF
              MISSION SIMULATOR, TECHNICAL & SCHEDULE STATUS
              AND UNRESOLVED PROBLEMS

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RECOMMENDATIONS/ACTIONS (CONT'D)

STEP #3

USAF/AEROSPACE TO REQUIRE MDAC-W/GE TO IMMEDIATELY ESTABLISH A SIMULATOR
TASK FORCE CHAIRED BY AEROSPACE.

GROUND RULES

1. CONSIDER IBM 360/65 OR EQUIVALENT FOR MDS/MMSE

2. CONSIDER MODERATE COST INCREASE FOR MORE
   ENGINEERS

3. DEVELOP MDS & MS ON PRESENTLY DEFINED OPERA-
   TIONAL SCHEDULES

OBJECTIVES (RESULTS DUE IN FOUR (4) WEEKS)

1. DEFINE MDS/MMSE COMPUTER COMPLEX

2. DEFINE LMSE/MMSE INTERFACE

3. DEFINE REALISTIC SCHEDULES & REALISTIC MANPOWER
   ALLOCATIONS

4. (DEFINE LMSE COMPUTER COMPLEX; MDAC-W MAY VOLUN-
   TEER TO USE IBM 360/44 INSTEAD OF IBM 360/65 FOR LMSE
   AND ADD AN SCF/RTS COMPUTER TO IMPLEMENT POST-
   PASS TLM CAPABILITY)