

REVIEW OF PROGRAM STATUS & PROBLEMS  
FOR  
VICE DIRECTOR, MOL  
7 JULY 1967

<u>TIME</u>	<u>SUBJECT</u>	<u>BRIEFER/OPR</u>
0800-0810	Introduction - Agenda	M/G Bleymaier
0810-0840	Mission Operations	Maj Macleay
0840-0900	Recovery Security	LCDR Finley
0900-1030	Business Session T-IIIM Summary Technical Overview Cost & Schedule Status Contract Status AFPRO at GE	Col Kniss Col Brassfield Col Kester Col Dietrich Col Dietrich
1030-1045	Break	
1045-1200	Executive Session New Management Directive Agenda for Total Program Review Manpower Package Stratton Subcommittee Hearings Foster Visit Logistics	Discussion Items
1200-1300	Lunch	
1300-1330	Mission Software	Lt Col O'Toole
1330-1400	Aircraft Simulation	Mr. Bernstein

<u>TIME</u>	<u>SUBJECT</u>	<u>BRIEFER/OPR</u>
1400-1440	Re-incorporation of WBDL	
1440-1510	Alternate Recovery Sites	Lt Col Paige
1510-1525	Break	
1525-1625	Apollo & Brooks Findings	Mr. Henry
1625-1645	C-V Status	
1645-1730	Mission Enhancement	Capt Gooch/Mr. Thompson

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Handle via BYEMAN  
Control System



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MOL

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OPERATIONS CONCEPT FOR THE MOL/DORIAN  
MANNED/AUTOMATIC CONFIGURATION

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24 pages

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## THE MOL/DORIAN PROBLEM

THE OPERATIONS CONCEPT FOR THE MANNED MOL/DORIAN SYSTEM IS DICTATED BY THE FOLLOWING:

- o SMALL FIELD OF VIEW
- o BONUS TARGETS VIRTUALLY NON-EXISTENT
- o IN ORDER TO INSURE MAXIMUM TECHNICAL INTELLIGENCE CONTENT OF THE PHOTOGRAPHY WE MUST BE:
  - HIGHLY SELECTIVE IN TARGETING
  - ACCURATE
- o REMAIN RESPONSIVE TO THE REQUIREMENTS OF THE USER ON A WORLD-WIDE BASIS

MOL

BACKGROUND

- o MAN'S ORIGINAL FUNCTIONS
  - TARGET ACQUISITION, CENTERING, IMAGE MOTION COMPENSATION
  - INSPECTION AND SELECTION OF WEATHER ALTERNATES WITH LOW RESOLUTION TV
- o SYSTEM DEVELOPMENTS
  - IMPROVED TARGET LOCATION ACCURACY
  - ADVANCED ORBITAL EPHEMERIS SYSTEM
  - STAR TRACKERS
  - DRAG ACCELEROMETERS
  - IMAGE VELOCITY SENSOR



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- o MAN'S NEW PRIMARY ROLES
  - INCREASE TECHNICAL INTELLIGENCE CONTENT THROUGH ACTIVE AND/OR WEATHER ALTERNATE TARGET SELECTION PROCESS
  - BACK UP AUTOMATIC SYSTEMS
  - VERIFY SYSTEM PERFORMANCE
  - VALIDATE AND CHECKOUT AUTOMATIC (UNMANNED) SYSTEM PERFORMANCE
- o TOOLS FOR THE JOB
  - HIGH RESOLUTION ACQUISITION AND TRACKING TELESCOPES (BIG EYE)
  - AIRBORNE DIGITAL COMPUTERS
  - MISSION DISPLAYS AND CONTROLS

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## THE ACTIVE INDICATOR CONCEPT

### PURPOSE:

TO INCREASE THE TECHNICAL INTELLIGENCE VALUE OF THE  
MOL/DORIAN PHOTOGRAPHY THROUGH REAL-TIME EXAMINATION  
OF TARGETS FOR THE PRESENCE OF ACTIVITY INDICATORS.

~~TOP SECRET DORIAN~~

INDICATORS OF TRANSITORY INTELLIGENCE POTENTIAL

PHOTO TARGET

INDICATORS

DECISION RESOLUTION

Missile Sites  
(Completed)

Missiles Exposed	10 Ft
Erection/Loading Equipment Exposed	10
Vehicular Activity	10
GSE Exposed	5
Silo Door Open	5
Special Vehicles	3
Snow Removal	10

Airfields

New Aircraft	3-15
Unusually Configured Aircraft	3-10
Aircraft in Unusual Locations	15
Disassembled Aircraft	5
Aircraft/Ground Equipment in Weapons Loading Areas	10
Aircraft in Maintenance Areas	10
Vehicle Activity Around Aircraft	5
Aircraft Subsystems in Open	3

Ground Forces/  
Army Equipment

Vehicles Present	10
Particular Vehicles Present	3
Vehicle Activity	15

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## CONCEPT FEATURES

PROVIDES THE FLIGHT CREW WITH THE MEANS TO MAKE THE MAXIMUM CONTRIBUTION TO THE TECHNICAL INTELLIGENCE GATHERING CAPABILITY OF THE MOL/DORIAN SYSTEM THROUGH:

- o INPUTS FOR TARGET SELECTION BASED ON OBSERVED CONDITIONS
- o BACK-UP CAPABILITY OF AUTOMATIC SYSTEMS
- o A MAN-COMPUTER INTERFACE WHICH ATTEMPTS TO OPTIMIZE ADVANTAGES OF BOTH
- o OVERALL SYSTEM FLEXIBILITY



## TARGET SELECTION GROUND RULES

- o PRIMARY AND ALTERNATE TARGETS GROUND SELECTED BASED ON:
  - CURRENT INTELLIGENCE
  - USER REQUIREMENTS
  - FORECAST WEATHER
  - VEHICLE CAPABILITIES
- o A PRIMARY TARGET AND ITS ALTERNATES FORM A TARGET GROUP
- o ALL TARGETS IN A GROUP HAVE A GROUND ASSIGNED PREFERENCE FOR ACTIVE AND INACTIVE STATES
- o TARGET SELECTION DECISIONS MADE BY THE COMPUTER ON A GROUP BASIS USING THE GROUND DETERMINED PREFERENCE AND FLIGHT CREW INPUTS ON OBSERVED TARGET CONDITIONS
- o IN THE ABSENCE OF FLIGHT CREW INPUTS THE MAIN OPTICS WILL TRACK AND PHOTOGRAPH THE PRIMARY TARGETS

MOL

TARGET CATEGORIES

- o PRIMARY
  - MANDATORY
  - INTERDICTABLE
- o ALTERNATE
  - WEATHER
  - ACTIVITY
- o VISUAL INTELLIGENCE





## FLIGHT CREW FUNCTIONS

- o VIEW AS MANY TARGETS PER GROUP AS POSSIBLE IN THE TIME AVAILABLE (15 TO 25 SECONDS PER GROUP)
- o INPUT TO THE COMPUTER THE OBSERVED CONDITIONS OF THE TARGETS
- o BE PREPARED TO:
  - MANUALLY ACQUIRE, CENTER, AND TRACK TARGETS
  - UPDATE EPHEMERIS AND POINTING THROUGH THE COMPUTER
  - ACCOMPLISH MANUAL PHOTOGRAPHY
  - ADJUST EXPOSURE SETTING
  - OTHERS



OTHER FLIGHT CREW FUNCTIONS

- o SYSTEM ANALYSIS, DIAGNOSIS, VERIFICATION, AND REPAIR
  - MONITOR AND ALARM SYSTEM
  - TELEMETRY ACCESS
- o PERSONAL VERIFICATION OF SYSTEM PERFORMANCE
  - ON BOARD PROCESSING
  - VIEWING THROUGH MAIN VISUAL OPTICS DURING PHOTOGRAPHY
- o MANUAL CONTROL OF SUB-SYSTEMS

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MOL

## FLIGHT CREW TRAINING

- o IN ADDITION TO TRAINING ON THE ORBITING VEHICLE AND ITS SUB-SYSTEMS, THE FLIGHT CREW MUST BE EXPERT IN THE TASKS OF:
  - TARGET RECOGNITION AND WEATHER DETERMINATION
  - TARGET ANALYSIS
- o THE FLIGHT CREW MUST BE TRAINED AS AN EXPERT IN NEAR INSTANTANEOUS TARGET EVALUATION ON EVERY TYPE OF TARGET
  - SOME PRELIMINARY TRAINING ACCOMPLISHED
  - PRELIMINARY SIMULATION PROVES THIS IS A FEASIBLE GOAL

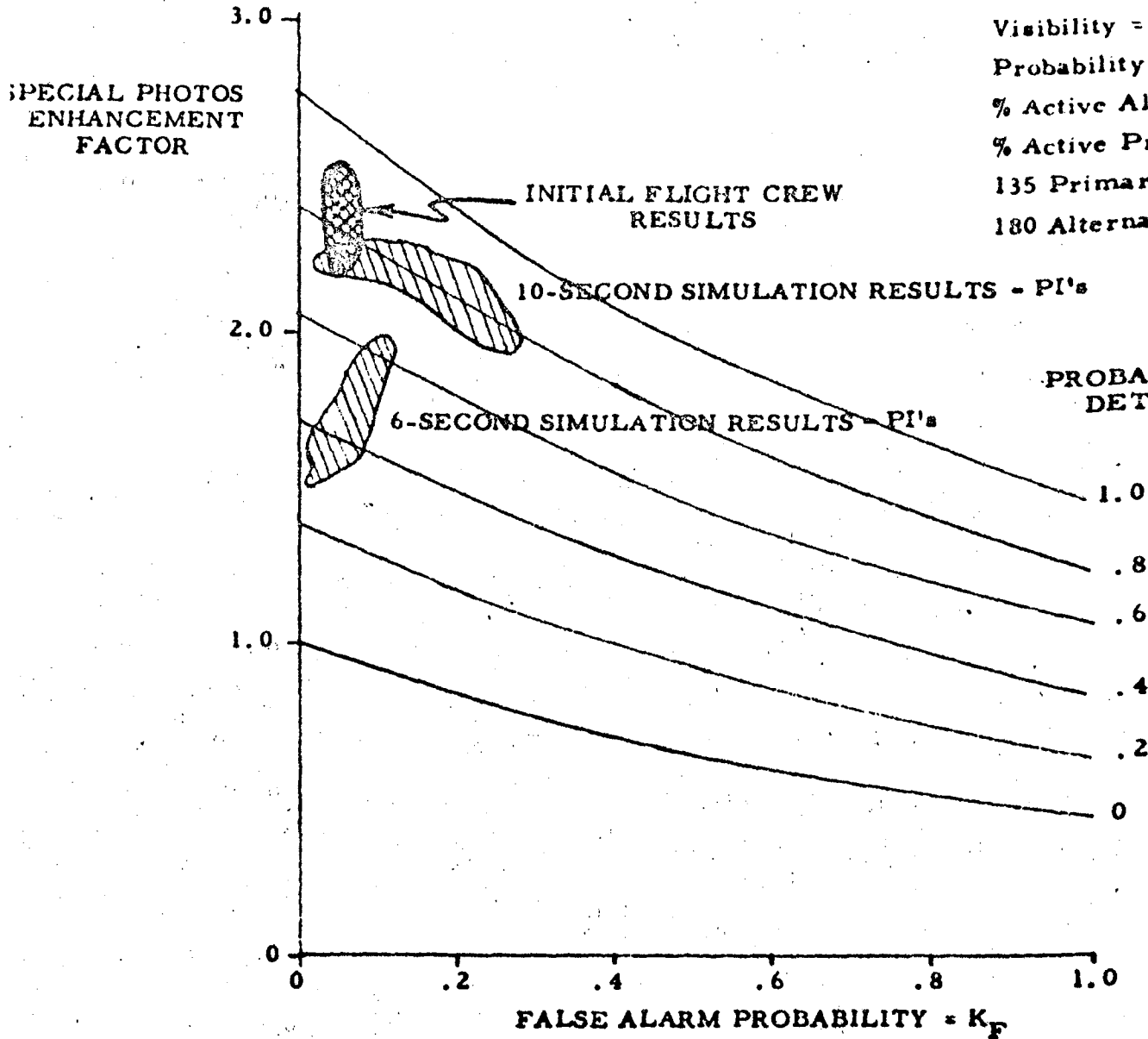
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HANDLE VIA BYEMAN SYSTEM ONLY

ByE 66681-6 /

SPECIAL PHOTOS ENHANCEMENT FACTOR VS. ACCURACY

● Active Target Mode



Visibility = .5

Probability of Losing Next Cluster = .5

% Active Alternates = 6

% Active Primaries = 4.2

135 Primaries/day

180 Alternates/day

PROBABILITY OF CORRECTLY  
DETERMINING ACTIVITY =  $K_A$

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## FLIGHT CREW INPUTS FOR TARGET SELECTION

- o REJECT (WX, ETC.)
- o INACTIVE ACCEPT (CLEAR BUT INACTIVE)
- o ACTIVE ACCEPT (CLEAR AND ACTIVE)
- o OVERRIDE (EXTREME TECHNICAL VALUE)

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## AVE COMPUTER FUNCTIONS IN TARGET SELECTION

- o GATHERS FLIGHT CREW INPUTS ON SCHEDULED TARGET GROUPS  
(PRIMARY PLUS ITS ALTERNATES)
- o COMPARES FLIGHT CREW INPUTS WITH GROUND SELECTED  
PREFERENCE ORDER FOR THE TARGET GROUP  
(ACTIVE AND INACTIVE STATES)
- o SELECTS TARGET FOR PHOTOGRAPHY AT GROUP DECISION TIME
  - PRIMARY IMPLIED INACTIVE ACCEPT
  - ALTERNATES IMPLIED REJECT



## MANNED MODES OF OPERATION

### MODE A (AUTOMATIC)

- o CREWMAN A VIEWS EACH PRIMARY TARGET AND UP TO THREE ALTERNATE TARGETS PER GROUP
- o CREWMAN B VIEWS UP TO FOUR ALTERNATE TARGETS PER GROUP
- o BOTH CREWMEN MAKE THEIR INPUTS TO THE COMPUTER
- o COMPUTER MAKES ULTIMATE SELECTION
- o SELECTED TARGET TRACKED AND PHOTOGRAPHED BY THE MAIN OPTICS
- o MAXIMUM NUMBER OF TARGETS VIEWED PRIOR TO DECISION
- o HIGHLY FLEXIBLE

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MODE B (BACK-UP)

- o MANUAL CONTROL OF MALFUNCTIONING AUTOMATIC SYSTEMS
- o COMPUTER STILL MAKES ULTIMATE DECISION ON TARGET SELECTION
- o GRACEFUL RETREAT FROM MALFUNCTIONS THROUGH CONTINUED USE OF ALL OPERATIONAL AUTOMATIC FEATURES
- o IMMEDIATE CREW REACTION TO CONTINGENCY SITUATIONS
- o HIGHLY FLEXIBLE

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## EXAMPLES OF BACK-UP CAPABILITY

- o IMAGE VELOCITY SENSOR FAILURE
- o POINTING ANOMOLIES
- o MAIN OR SECONDARY CAMERA FAILURE
- o FOCUS
- o ALIGNMENT
- o MAIN OPTICS DOOR
- o MISSION BAY ENVIRONMENTAL CONTROL
- o VEHICLE ATTITUDE CONTROL
- o OTHERS



## EXAMPLES OF CONTINGENCY OPERATIONS

- o IVS FAILURE
  - FLIGHT CREW PROVIDES MANUAL IMAGE MOTION COMPENSATION
  - FLEXIBILITY IN THE TARGETS SELECTED FOR VIEWING
  - FEWER TARGETS VIEWED PRIOR TO DECISION
- o POINTING ANOMOLIES
  - CONTINUED USE OF IMAGE VELOCITY SENSOR FOR IMC
  - MANUAL CENTERING ON ATS
  - COMPUTER UPDATE
    - / BENCHMARK TARGETS
    - / OTHER TARGETS
  - FEWER TARGETS VIEWED PRIOR TO DECISION
  - FLEXIBILITY IN THE TARGETS SELECTED FOR VIEWING

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- o IVS FAILURE AND POINTING ANOMOLIES
  - MANUAL CENTERING AND IMAGE MOTION COMPENSATION THROUGH BOTH THE ATS AND MAIN VISUAL OPTICS
  - FLEXIBILITY IN THE TARGETS SELECTED FOR VIEWING
  - REQUIRES TWO MAN OPERATION FOR MAXIMUM EFFICIENCY
  - LEAST NUMBER OF TARGETS VIEWED PRIOR TO DECISION
- o MANUAL EXPOSURE CAPABILITY
  - COMPUTER STANDS BY FOR MANUAL EXPOSURE SIGNAL FROM THE FLIGHT CREW
  - MAIN OR SECONDARY CAMERA CAPABILITY
  - TIME DELAY
- o OTHERS

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SUMMARY

- o MAN-COMPUTER INTERFACE DESIGNED TO OPTIMIZE MISSION SUCCESS
- o NO ON BOARD SOFTWARE CHANGES FOR CONTINGENCIES
  - GROUND SOFTWARE ADJUSTMENTS TO VEHICLE CAPABILITIES DESIRABLE BUT NOT IMMEDIATELY MANDATORY FOR CONTINUED MISSION SUCCESS
- o CHECKOUT OF UNMANNED VEHICLE
- o VERIFICATION OF PHOTOGRAPHIC SUCCESS
- o HIGHLY FLEXIBLE AND RESPONSIVE SYSTEM
- o IMMEDIATE CREW REACTION TO SYSTEM ANOMOLIES TO KEEP THE MISSION GOING WITH MINIMUM LOSS

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DG

PURPOSE

TO DENY TECHNICAL AND MILITARY INTELLIGENCE

TO FOREIGN EYES

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DG

EXCLUDED FROM AUTOMATIC  
REGRADING; DOD DIR. 5200.10  
DOES NOT APPLY

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GUIDELINE

IN ORDER TO DENY THE PERTINENT TECHNICAL INTELLIGENCE..  
BASED UPON THE ABILITY OF THE COMMUNITY TO ASCERTAIN  
THE DESIRED INFORMATION FROM FRAGMENTATION. ALMOST  
TOTAL DESTRUCT OF CERTAIN AREAS IS REQUIRED.

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of 1a  
pg 2

METHODS OF DESTRUCT AVAILABLE

1. EXPLOSIVE
2. CHEMICAL
3. RADIATION
4. LIGHT
5. OPERATIONAL

SUBJECT \_\_\_\_\_

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AREAS OF INVESTIGATION

1. PHYSICAL AND MECHANICAL EQUIPMENT AREAS

2. AREAS OF INTENDED OPERATION OF THE VEHICLE

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AREAS OF PHYSICAL EQUIPMENT INTEREST

1. VEHICLE (LAB)
  - MISSION MODULE
  - CREW COMPARTMENT
  - UNMANNED VEHICLE
2. GUES
3. FILM
4. DeRec.
5. MISCELLANEOUS
  - TAPE RECORDER
  - TELEPRINTER
  - SCRAP PAPER

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pg 4*

VEHICLE

1. MISSION MODULE  
LARGE AREAS REQUIRE COVERAGE  
GREAT INCREASE IN WEIGHT  
NO GUARANTEE OF SUCCESS
2. LAB MODULE  
FILM  
CUES  
DeReC  
MISCELLANEOUS
3. UNMANNED VEHICLE
4. DEORBIT CAPABILITY

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pg 5

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FILM

CARRIED ALOFT IN ONE LARGE ROLL

DESIGNED AGAINST ALL HAZARDS

COVERS LARGE AREA OF VEHICLE

PREVIOUS EXPERIENCE

RE-ENTERING VEHICLE

ATTEMPTS TO BURN

POSSIBLE METHODS OF DESTRUCT

ALL AVAILABLE

NON-FEASIBLE

ECK AND (A) EXPERIMENTS

RETURNED ON TIGHTLY WOUND ROLLS

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DRC

SHAPE GENERALLY DEFINED  
MATERIAL UNDER INVESTIGATION  
METHOD OF SINK UNDER STUDY  
FLOTATION UNDER STUDY  
SIZING AND PACKAGING CRITICAL

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SUBJECT

CUES

UNDER STUDY AND DEFINITION

PROBABLE TYPES

CARTRIDGES

OPERATIONAL CONCEPT PENDING

PROBLEMS

WHERE CARRIED - ALL PHASES OF FLIGHT

MECHANIZATION

PACKAGING

ABILITY TO DESTROY

ON PERSON

IN VEHICLE

DOES APPEAR FEASIBLE

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MOZ

AREAS INVESTIGATED - ALL CONTINGENCY

ASCENT

(1) ABORT - VEG AREA

LAND  
WATER

(2) ABORT - ZI AREA

LAND  
WATER

(3) ABORT - LAND RECOVERY

NON-BELLIGERENT  
BELLIGERENT .00001

(4) ABORT - WATER RECOVERY

NON-BELLIGERENT  
BELLIGERENT

MISSION

(5) INTERCEPTION

SUFFICIENT WARNING TIME  
NO WARNING TIME

(6) KNOCK DOWN BY FOREIGN POWER

(7) LAND RECOVERY

NON-BELLIGERENT  
BELLIGERENT .0005

(8) WATER RECOVERY

NON-BELLIGERENT  
BELLIGERENT

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CONSTRICTING PARAMETERS

NO GUARANTEE OF SUCCESS

FILM DESIGNED AGAINST JUST SUCH CONTINGENCIES

NO ONE SYSTEM WILL COVER ALL AREAS

ACTUATION DEVICES MUST BE AUTOMATICALLY OR MANUALLY  
ACTUATED - - THEREFORE SUBJECT TO DUAL FAILURE

INADVERTENT ACTUATION OF ANY SUCH DEVICE WITH LOSS OF TAKE  
AND/OR CREW

MAJOR ENGINEERING PROBLEMS (COST AND WEIGHT INVOLVED IN  
ANY HARDWARE SYSTEM)

MAJOR INTERFACE PROBLEMS WITH CREW AND VEHICLE. I.e. Ee  
TOXICITY AND/OR RADIATION HAZARD

RESTRICTION ON CREW SELF DESTRUCT

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pg 7

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PREVIOUS PROGRAMS AND GUIDELINES

ATMOSPHERE

DESTRUCT BUT NO PROBABILITY OF TOTAL SUCCESS

SPACE

MULTIPLICITY OF PROBLEMS PREVIOUS CITED - NO CREW

BITE THE BULLET

ALL OTHER PROGRAMS COVERT - OURS OVERT. ANY ATTEMPT AT

DESTRUCT WITH A FAILURE ONLY ADDS TO PROBLEM

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CONCLUSIONS AND RECOMMENDATIONS

CUES CAN AND SHOULD BE DESIGNED AND PACKAGED FOR DESTRUCT  
CUES CARRIED ALOFT WITH CREW AND MANUALLY DESTROYED PRIOR TO  
RETURN OR IN AN EMERGENCY, TIME PERMITTING.

WATER DESTROY IS FEASIBLE

DUE TO OPERATIONAL PROBABILITY AND MECHANICAL COMPLEXITY, PROGRAM  
ASSURANCE SHOULD COME FROM OPERATIONAL PROCEDURES

INSURE THROUGH ENGINEERING THAT SENSITIVE AREAS (CUES, TAPE RECORDER,  
ETC) DESIGNED TO MINIMUM STRUCTURAL PROTECTION

CONTINUE E E AND (A) STUDIES TO SEE IF A FEASIBLE APPROACH PRESENTS  
ITSELF - HIGHLY DOUBTFUL

BEGIN CONTINGENCY OPERATIONAL PLANNING NOW - IN ORDER TO  
ASSURE MAXIMUM SECURITY

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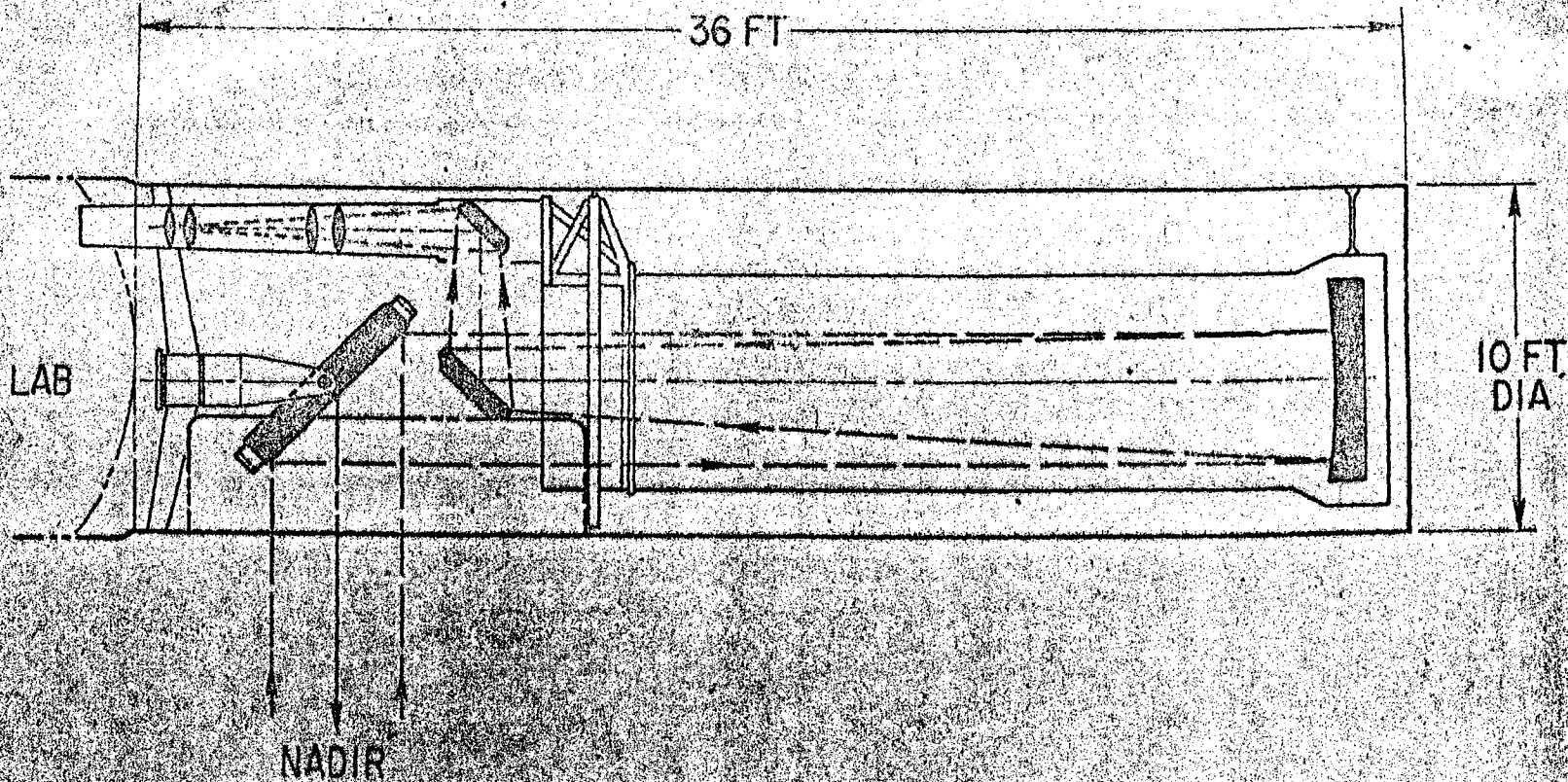
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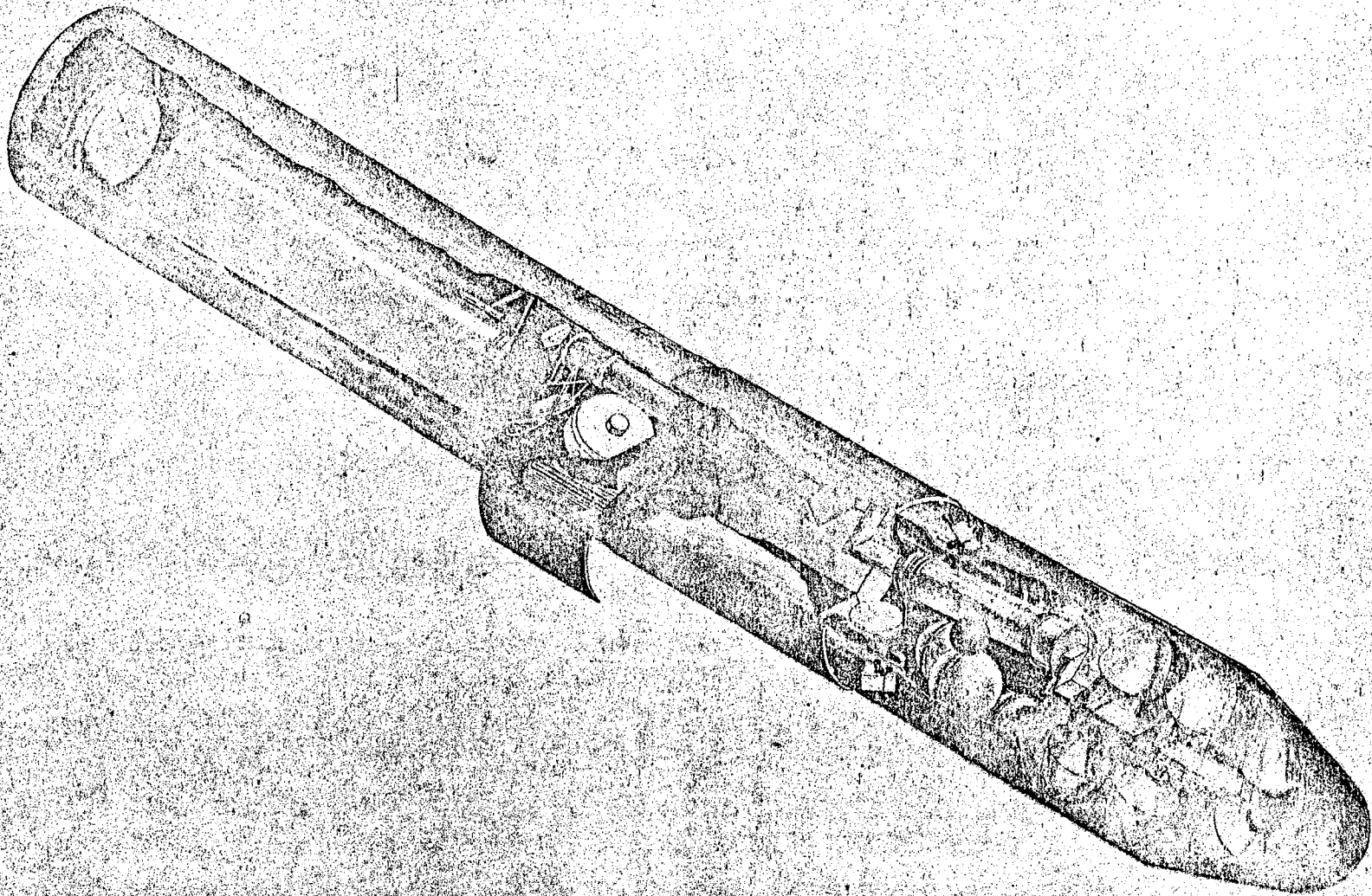
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SPECIAL HANDLING

# MISSION MODULE



SPECIAL HANDLING  
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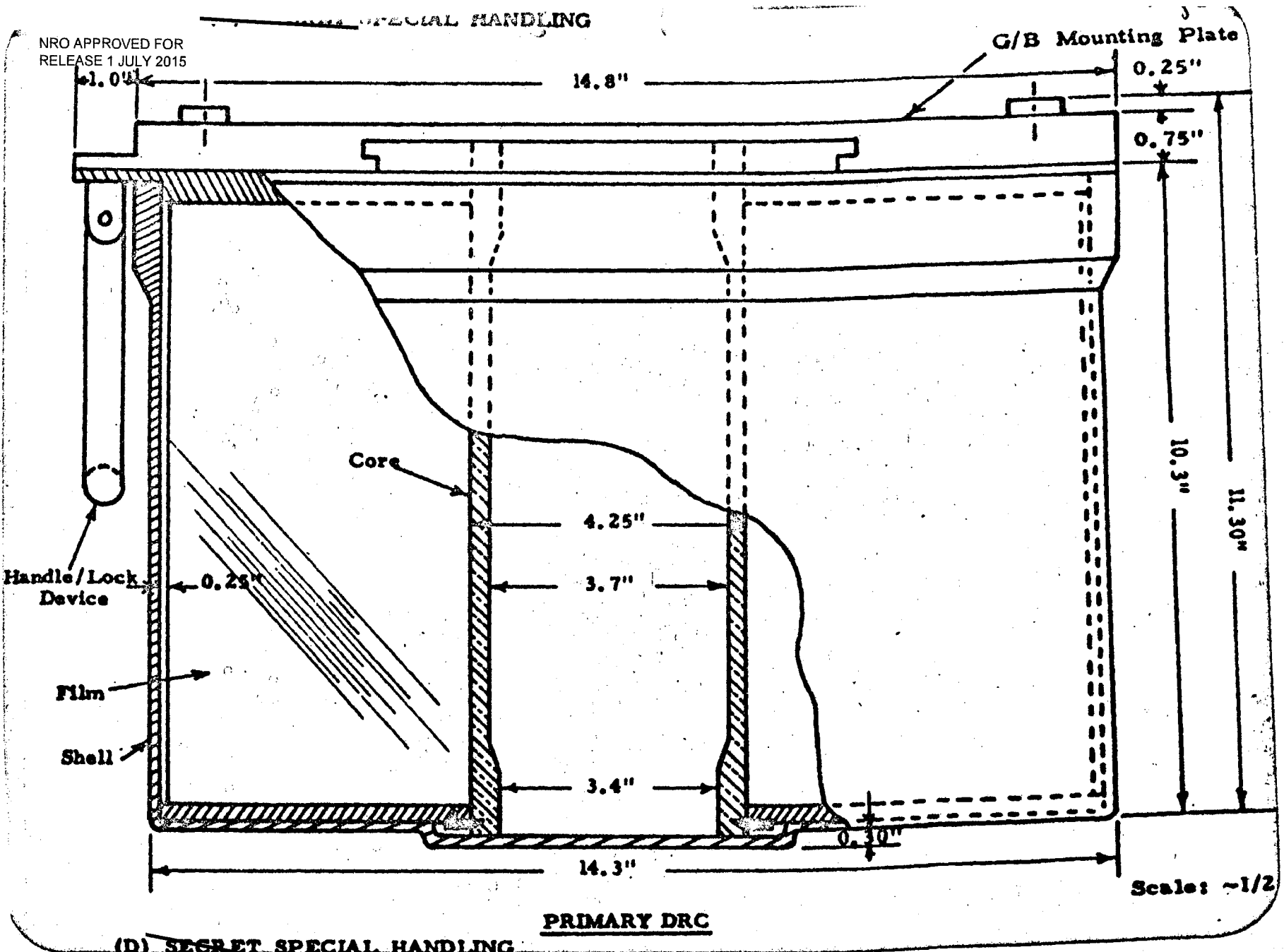
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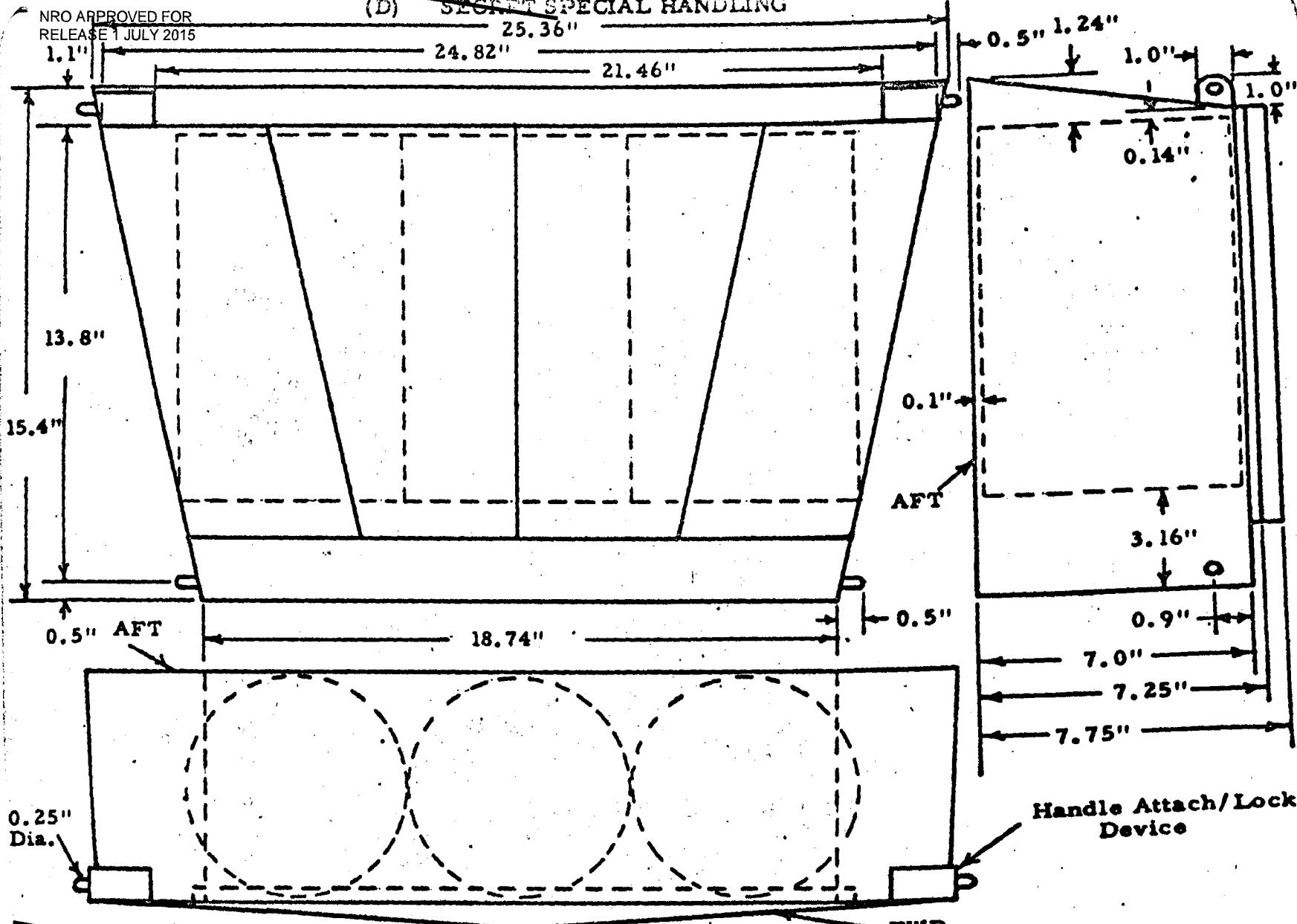
PRIMARY DRC

~~(D) SECRET SPECIAL HANDLING~~

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(D) ~~SECRET SPECIAL HANDLING~~



0.25" Dia.

~~SECRET SPECIAL HANDLING~~

SECONDARY DRC (UPPER)

FWD

Handle Attach/Lock Device

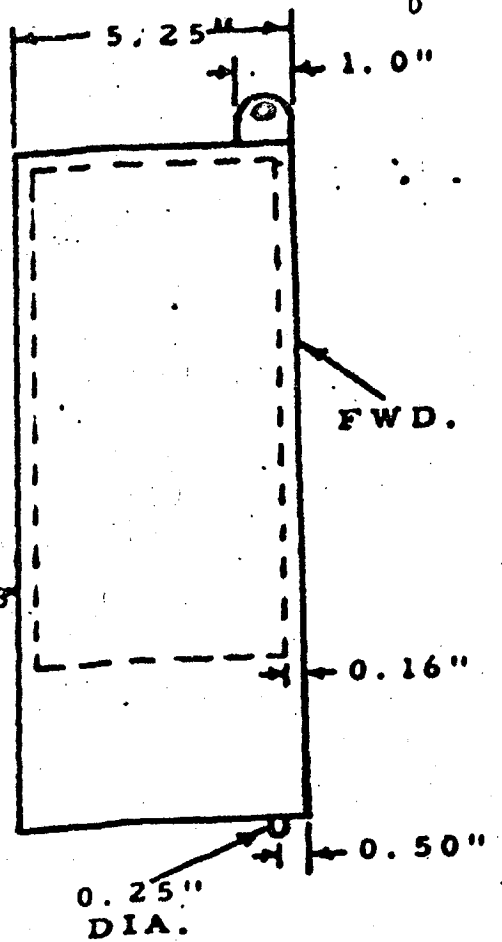
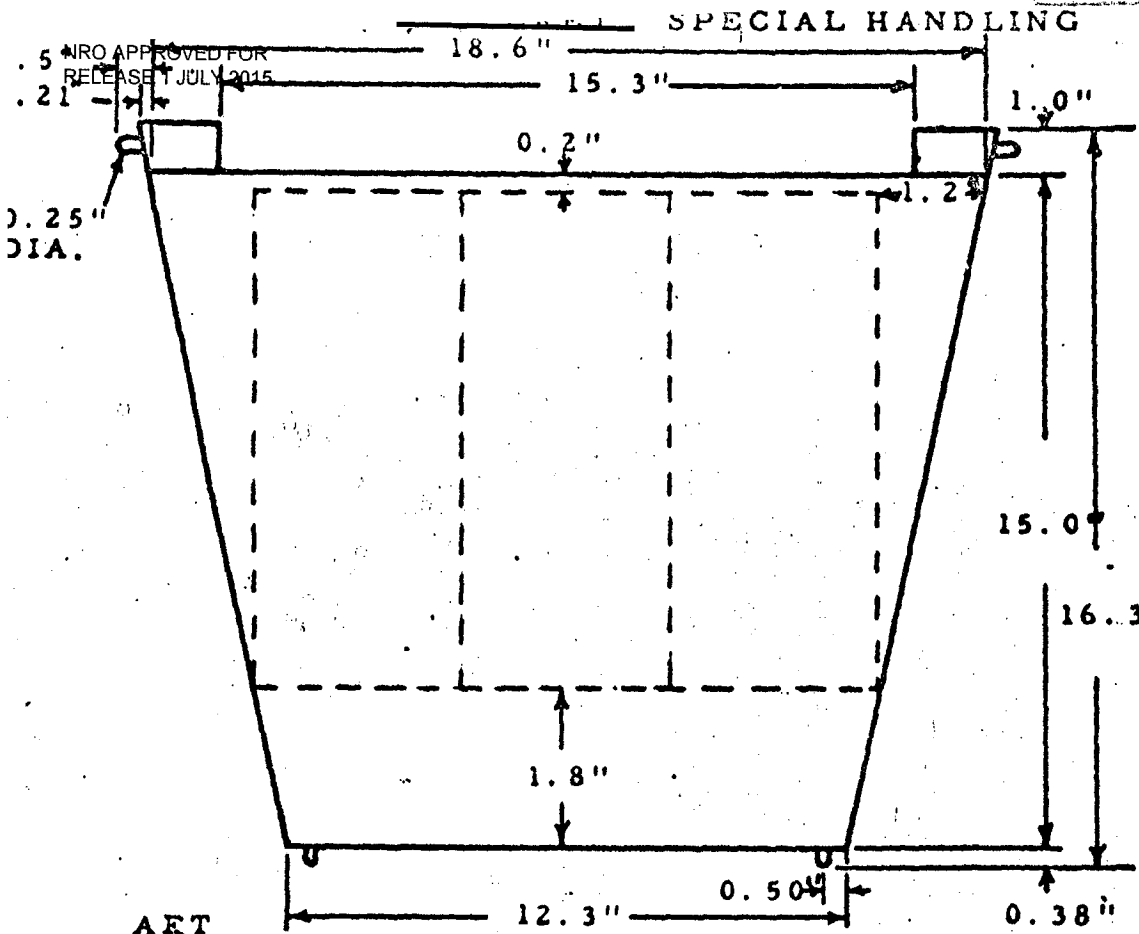
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SPECIAL HANDLING

0.25"  
DIA.



FWD.

AFT

SCALE: 2 1/4

HANDLE ATTACH/  
LOCK DEVICE

FWD.  
SECONDARY DRC (LOWER)

(D) SECRET  
SPECIAL HANDLING

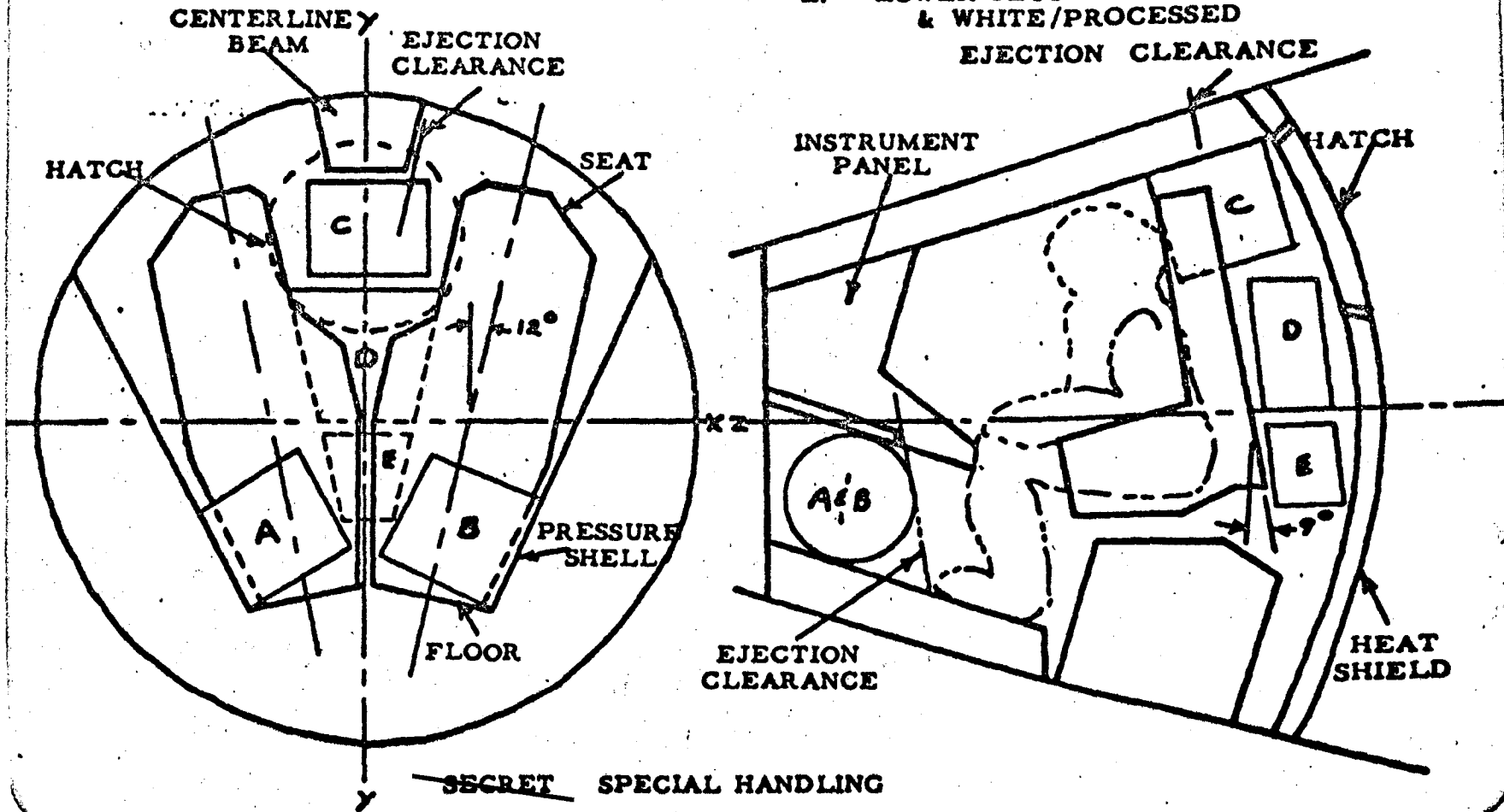
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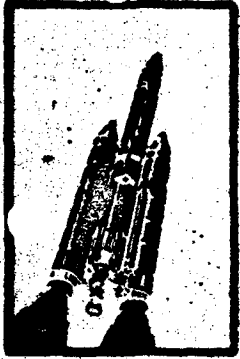
### GEMINI - B DATA STORAGE CAPABILITY

- A, B, C: PRIMARY DRC'S - 60# FILM EACH
- D: UPPER SECONDARY DRC - 30# SPECIAL FILM
- E: LOWER SECONDARY DRC - 20# BLACK & WHITE/PROCESSED



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# SPACE SYSTEMS DIVISION DEPUTY FOR 624 AND 623A

~~CONFIDENTIAL~~

DATE: 5 JULY 1967

**TITLE:** TITAN IIIM PROGRAM REVIEW

**BRIEFING OFFICER:** COLONEL KNISS

**ATTENDEES:**

~~CONFIDENTIAL~~



TITAN IIM SUMMARY MILESTONE CHART

AS OF: 5 JULY 1967

<u>CONTRACTOR</u>	<u>MILESTONE</u>	<u>PERT EVENT NUMBER</u>	<u>SCHEDULE DATE</u>	<u>ACTUAL DATE</u>
MGC	PHASE II GO-AHEAD	33-600002		1 SEP 66*
ACED	PHASE II GO-AHEAD	32-100000		1 SEP 66*
AGC	PHASE II GO-AHEAD	35-000002		1 JAN 67*
ACED	SIGNAL CONDITIONER CDR	32-613171		4 MAY 67
UTC	PHASE II GO-AHEAD	36-000199		1 JUL 67
ACED	MISSILE GUIDANCE COMPUTER CDR	32-612036	15 JUL 67	
ACED	1st PRODUCTION MGC	32-714001	1 OCT 67	
ACED	1st PRODUCTION SC	32-714101	30 SEP 67	
ACED	IGS MARRIAGE TEST	32-630009	31 OCT 67	
AGC	AGE DESIGN COMPLETE	35-513916	1 MAR 68	
MGC	BASIC DESIGN COMPLETE	33-701301	15 JUL 68	
AGC	COMPLETE ENGINE DEMO. STAGE I	35-132475	1 MAR 68	
UTC	1st SEM DEVELOPMENT	36-630040	1 NOV 68	

\* Contract Phase II Effectivity Date

NOL LAUNCH COMPLEX

(COMPLETION PERCENTAGES)

AS OF: 5 JULY 1967

LAUNCH PAD & FLAME BUCKET	16 %
RAILROADS	79 %
LAUNCH CONTROL CENTER	25 %
WATER STORAGE TANKS & LINE	40 %
	<hr/>
OVERALL	20.0 %

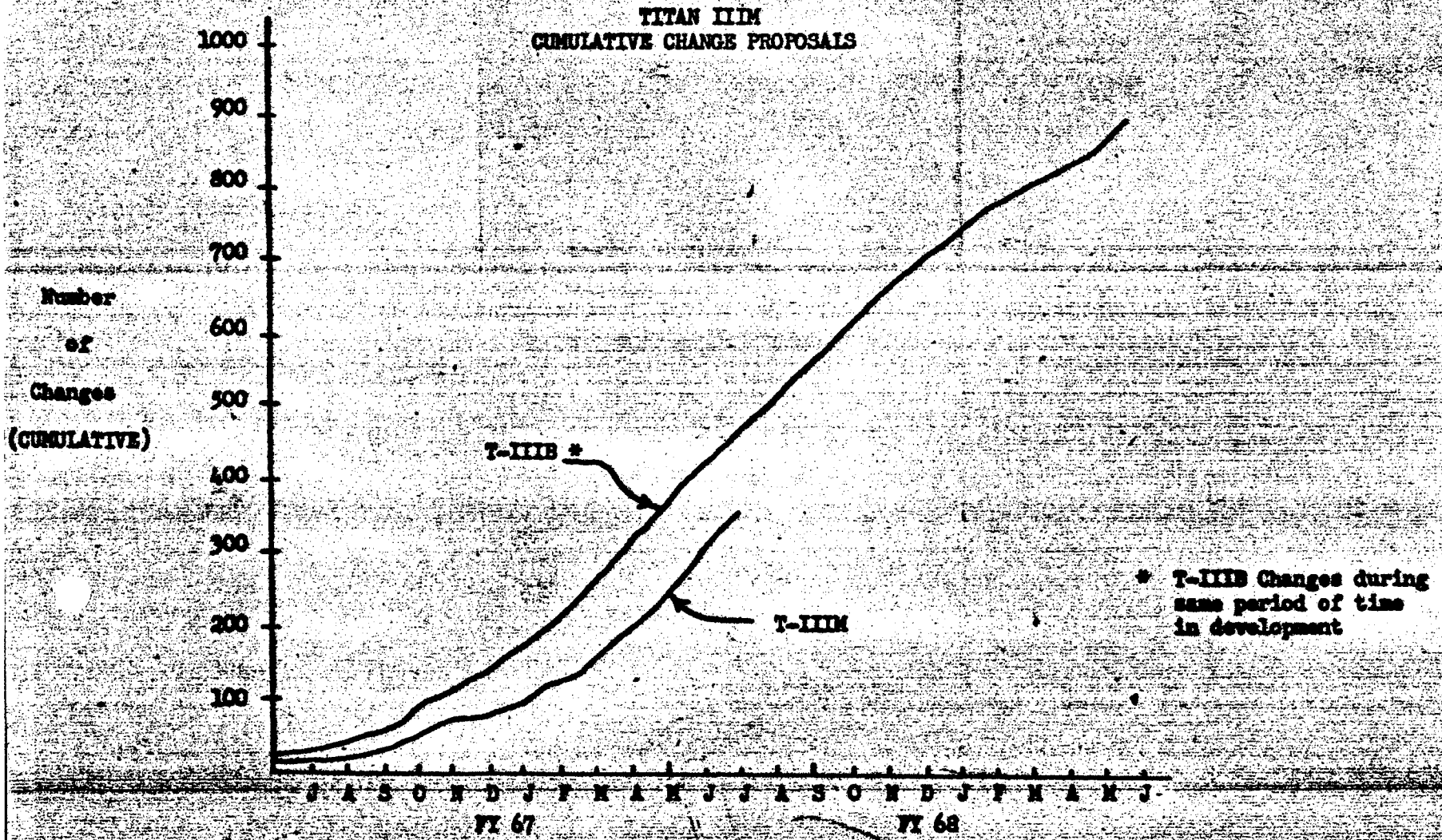












TITAN IIM CHANGE STATUS

<u>From 1 June 67</u>	<u>MMC</u>	<u>UTC</u>	<u>ACE</u>	<u>AGC</u>	<u>AERO</u>	<u>FBCP</u>	<u>TOTAL</u>
Proposals rec'd as of 30 June 67	253	26	11	7	9	38	344
Proposals rec'd 1 Jun - 30 Jun 67	21 (\$791,499)	10 (\$6,347)	5 (-0-)	1 (-0-)	1 (-0-)	2 (-0-)	40 (\$797,846)
Proposals Approved 1 Jun - 30 Jun 67	9 (-0-)	3 (-0-)	1 (-0-)	0 (-0-)	0 (-0-)	8 (-0-)	21 (-0-)
Proposals Disapproved 1 Jun - 30 Jun 67	2 (\$621,000)	0 (-0-)	0 (-0-)	0 (-0-)	0 (-0-)	0 (-0-)	2 (\$621,000)
Proposals Undisposed as of 30 Jun 67	40 (\$3,555,018)	15 (\$8,517)	4 (\$16,637)	3 (-0-)	4 (-0-)	4 (-0-)	70 (\$3,580,172)



FOR THE MONTH OF JUNE 67

TIIM PROPOSALS OVER \$50,000

PROPOSALS APPROVED

NONE

PROPOSALS DISAPPROVED

RETRO ROCKET ADDITION TO TIIM

\$310,500

FOR THE MONTH OF JUNE 67

APPROVED PROPOSAL COST DISTRIBUTION

NO COST	22
UNDER \$5,000	0
5K-15K	0
15K-30K	0
30K-50K	0
50K-100K	0
OVER 100K	0
TOTAL	<u>22</u>

**TITAN IIM PROGRAM REVIEW - PHASE II**

**AS OF 6 JULY 1967**

	<b>MFC</b>	<b>UTC</b>	<b>ACED</b>	<b>AGC</b>
<b>PERIOD OF CONTRACT</b>	<b>1 SEP TO COMPLETION</b>	<b>1 JUL TO COMPLETION</b>	<b>1 SEP TO COMPLETION</b>	<b>1 JAN TO COMPLETION</b>
<b>WORK STATEMENT</b>	<b>COMPLETED</b>	<b>COMPLETED</b>	<b>COMPLETED</b>	<b>COMPLETED</b>
<b>RFP ISSUED</b>				
<b>COST PROPOSAL RECEIVED</b>				
<b>ACC COST ANALYSIS RECEIVED</b>				
<b>NEGOTIATION COMPLETED</b>		<b>27 JULY 1967</b>		
<b>CONTRACT GO-AHEAD</b>	<b>1 SEP 1966</b>	<b>1 JULY 1967</b>	<b>1 SEP 1966</b>	<b>1 JAN 1967</b>
<b>CONTRACT WRITING AND INITIAL REVIEW COMPLETE</b>		<b>30 AUG 1967</b>		
<b>CONTRACTOR EXECUTES CONTRACT</b>		<b>10 SEP 1967</b>		
<b>PROCUREMENT COMMITTEE APPROVAL</b>		<b>27 SEP 1967</b>		
<b>AFSC APPROVAL</b>		<b>7 OCT 1967</b>		
<b>CONTRACT DISTRIBUTED</b>	<b>21 MAR 1967</b>	<b>10 OCT 1967</b>	<b>17 MAR 1967</b>	<b>30 JUN 1967</b>

PROCUREMENT PLAN FOR STRETCHOUT

AS OF 6 JULY 1967

	MNC	ACC	ACED	UTC
RFP ISSUED	COMPLETED	COMPLETED	COMPLETED	STRETCHOUT FOR SERM IS INCLUDED IN NEGOTIATIONS FOR PHASE II
COST PROPOSAL RECEIVED	COMPLETED	17 AUG 1967	COMPLETED	
NEGOTIATIONS COMPLETED	21 AUG 1967	13 OCT 1967	31 AUG 1967	
CONTRACT WRITING AND INITIAL REVIEW COMPLETED	18 SEP 1967	10 NOV 1967	18 SEP 1967	
CONTRACTOR EXECUTES CONTRACT OR SA	28 SEP 1967	27 NOV 1967	29 SEP 1967	
PROCUREMENT COMMITTEE APPROVAL	2 OCT 1967	29 NOV 1967	3 OCT 1967	
AFSC APPROVAL	23 OCT 1967	15 DEC 1967	N/A	
CONTRACT OR SA DISTRIBUTED	30 OCT 1967	20 DEC 1967	9 OCT 1967	



TITAN IIM FY67 FUND STATUS

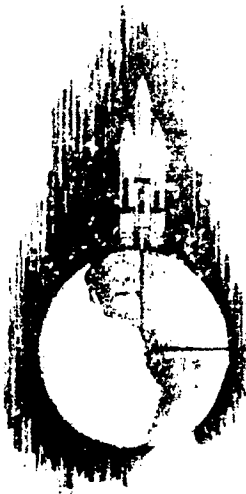
632A FUNDS

(IN MILLIONS)

AS OF: 5 JULY 1967

<u>CONTRACTOR/EFFORT</u>	<u>INITIATED</u>	<u>COMMITTED</u>	<u>OBLIGATED</u>
MARTIN MARIETTA	\$ 18.482	\$ 18.482	\$ 18.482
AC ELECTRONICS DIV	9.098	9.098	9.098
AEROJET-GENERAL	6.700	6.700	6.700
UNITED TECHNOLOGY CENTER	5.898	5.896	5.896
SE & ED	2.700	2.700	2.700
INDUSTRIAL FACILITIES	.040	.040	
PROPELLANTS	.222	.222	.222
NON-ASSOCIATES	.080	.080	.080
TOTAL	\$ 43.220	\$ 43.218	\$ 43.178

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SPACE LAUNCHING SYSTEMS  
DEVELOPMENT DIRECTORATE

TITLE TITAN IIIM LAUNCH VEHICLE STATUS

SUMMARY \_\_\_\_\_

BRIEFER R. H. SCHACK

PACK NO. 67-2150-M-203 DATE 7 JULY 1967

LOCATION MOL CONTROL ROOM

ATTENDING \_\_\_\_\_

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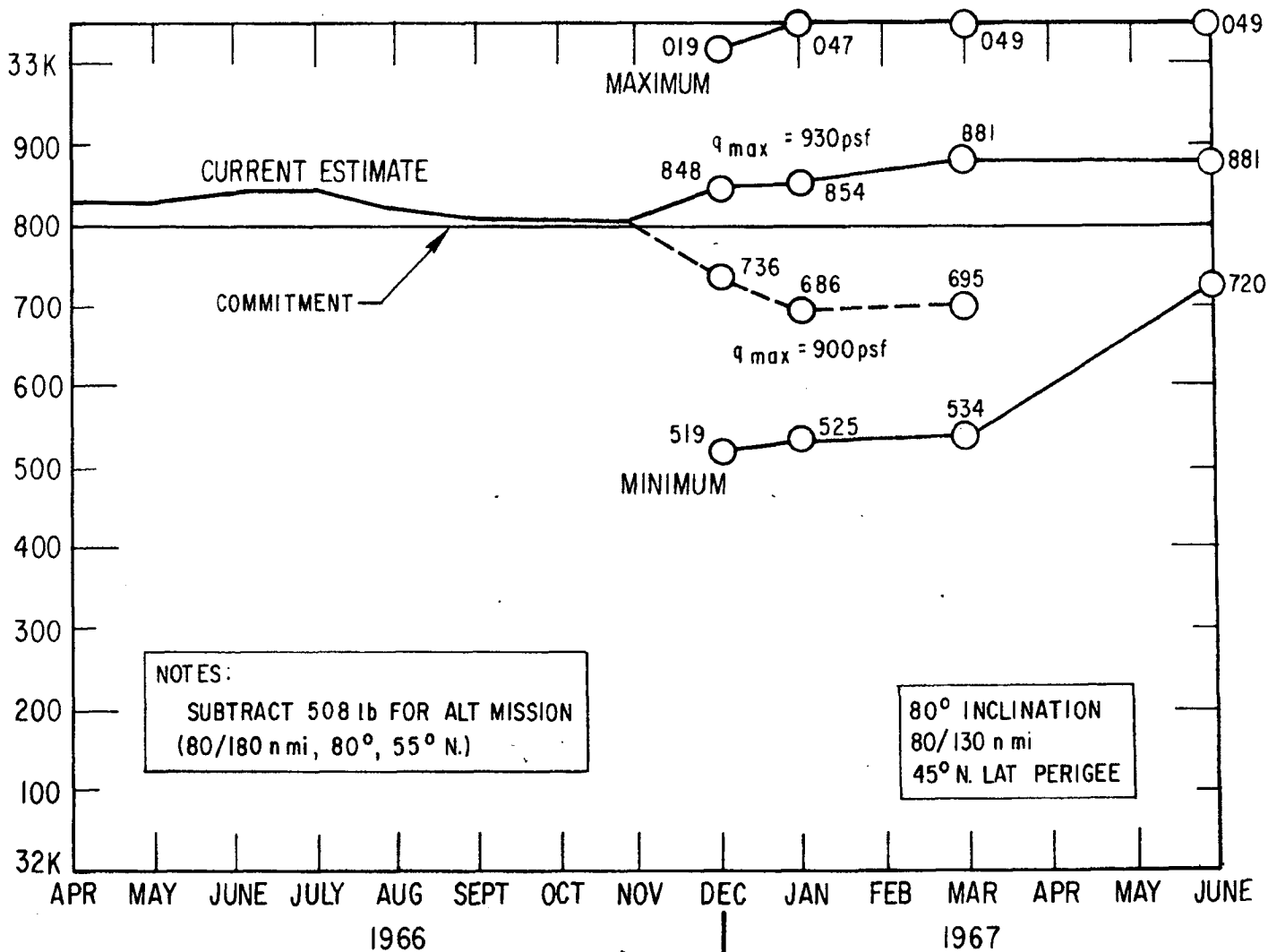
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## TITAN IIM LAUNCH VEHICLE STATUS

- PERFORMANCE
- CREW SAFETY
- STATUS OF TECHNICAL DEVELOPMENT
- CURRENT OPEN AREAS

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# TITAN III PERFORMANCE ESTIMATE (3σ)



NOTES:  
 SUBTRACT 508 lb FOR ALT MISSION  
 (80/180 n mi, 80°, 55° N.)

80° INCLINATION  
 80/130 n mi  
 45° N. LAT PERIGEE

DOWNGRADED AT 12 YEAR INTERVALS;  
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AEROSPACE CORPORATION

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**TITAN IIM LAUNCH VEHICLE STATUS  
CREW SAFETY CONSIDERATIONS**

- **HIGH Q ESCAPE STATUS (STAGE 0)**
  - / **RIDE-OUT MODE IS NOT SATISFACTORY FOR CERTAIN ABORT CASES--VEHICLE BREAKUP OCCURS BEFORE SAFE ESCAPE CONDITIONS ATTAINED**
  - / **COMMAND PITCH-UP AT TT PROVIDES SAFE ESCAPE MARGIN FOR ALL TITAN IIM MALFUNCTIONS**
    - **ESCAPE WINDOW IS APPROXIMATELY 100 MSEC WIDE FOR WORST MALFUNCTION**
  - / **COMMAND PITCH-UP PLUS AUTOMATIC ABORT APPEARS TO BE OPTIMUM SYSTEM**
    - **IMPLEMENTATION OF AUTOMATIC ESCAPE INITIATION UNDER INVESTIGATION**
    - **FURTHER STUDIES AND SIMULATIONS IDENTIFIED**
- **TITAN IIM/OV SEPARATION MECHANIZATION BEING EVALUATED**
  - / **PRESENT SEPARATION SCHEME USING ACTS APPEARS MARGINAL**
  - / **STAGE II RETROS, INTERFACE SPRINGS, AND OTHER ALTERNATIVES UNDER CONSIDERATION**

TITAN IIM LAUNCH VEHICLE STATUS  
TECHNICAL DEVELOPMENT -- MARTIN MARIETTA CORPORATION

- LOADS ANALYSIS
  - / LOAD CYCLE IIIA COMPLETE
    - ALL RESULTS VALIDATED EXCEPT LAUNCH LOADS WHICH ARE BASED ON QUESTIONABLE SRM THRUST DATA
    - RE-EVALUATION OF SRM THRUST DIFFERENTIAL AT IGNITION IN PROCESS--DUE 14 JULY 1967
  - / BOOSTER AND OV CAPABILITY EXCEEDED FOR ALTERNATE PAYLOAD CONFIGURATION AT  $M = 1.411$ 
    - REVISED ALTERNATE CONFIGURATION NOT EXPECTED UNTIL JANUARY 1968
  - / LOAD CYCLE IV
    - INPUT/OUTPUT REQUIREMENTS DEFINED FOR DYNAMIC ANALYSIS
- WIND TUNNEL TESTS COMPLETED WITH REVISED OV PROTUBERANCE MODELS
  - / ABORT AERODYNAMIC TEST
  - / SRM STAGING TEST
  - / BUFFET TEST
  - / FORCE AND PRESSURE TEST
    - DRAG LOWER THAN PREDICTED

TITAN IIM LAUNCH VEHICLE STATUS

TECHNICAL DEVELOPMENT -- MARTIN MARIETTA CORPORATION (CONTINUED)

- ELECTRICAL SYSTEM
  - / OV STAGING CONNECTOR REDUNDANCY UNDER STUDY IN CONJUNCTION WITH REVISED STAGING SYSTEMS
  
- FLIGHT CONTROL SYSTEM
  - / ALL CDR'S COMPLETE EXCEPT FLIGHT CONTROL COMPUTER, CAD PACKAGE AND HYDRAULIC SYSTEM
  - / FLIGHT CONTROL COMPUTER MOD DEFINED FOR CREW SAFETY PITCH-UP MANEUVER
    - "DROP-DEAD" INCORPORATION DATE BEING DEFINED
  - / STAGE I ENGINE BENDING-COUPLING PROBLEM RESOLVED AS A RESULT OF 10.5 CPS ENGINE NATURAL FREQUENCY DEMONSTRATED BY AGC TEST.
    - AGC ESTIMATE WAS 9.5 CPS

**TITAN IIM LAUNCH VEHICLE STATUS**  
**TECHNICAL DEVELOPMENT -- AEROJET-GENERAL CORPORATION**  
**STAGE I -- 15:1 ENGINE**

- **CDR SCHEDULED FOR AUGUST 1967**
  
- **ENGINE FRAME**
  - / **STRUCTURAL TEST SUCCESSFULLY COMPLETED**
  
- **THRUST CHAMBER ASSEMBLY**
  - / **18 OF 24 VERIFICATION TESTS COMPLETE--DETERMINE PERFORMANCE INFLUENCE COEFFICIENTS**
  - / **FUEL FILM COOLANT INJECTOR ORIFICES MODIFIED TO PREVENT MOUNTING FLANGE EROSION**
  
- **INJECTOR**
  - / **BAFFLE ROOT WELD CONFIGURATION MODIFIED TO PREVENT CRACKS IN WELD**

**TITAN IIM LAUNCH VEHICLE STATUS**

**TECHNICAL DEVELOPMENT -- AEROJET-GENERAL CORPORATION (CONTINUED)**

**STAGE I -- 15:1 ENGINE**

- **TURBOPUMP ASSEMBLY**
  - / **DEVELOPMENT TESTING COMPLETE ON THREE OF SEVEN TPA ASSEMBLIES--  
UP TO 300 SEC DURATION**
  - / **REMAINING TPA'S WILL START TEST IN JULY WITH IMPROVED PINION GEAR  
AND SHAFT**
  
- **ENGINE TESTING**
  - / **SUCCESSFUL 300 SEC ENGINE TEST WITH PROTOTYPE HARDWARE**
  - / **ENGINE NATURAL FREQUENCY TEST COMPLETED**
    - **10.5 CPS MINIMUM FREQUENCY**

TITAN IIM LAUNCH VEHICLE STATUS  
TECHNICAL DEVELOPMENT -- UNITED TECHNOLOGY CENTER

- PHASE II STATEMENT OF WORK NEGOTIATED
  
- ADDITIONAL SRM SUBSCALE TESTING COMPLETED
  - / DATA INDICATES SCALE-UP FACTOR FOR TITAN IIM IDENTICAL TO TITAN IIC
  
  - / ENABLES MORE ACCURATE PREDICTION OF TITAN IIM FULL SCALE BALLISTICS
  
- PROPOSAL TO OPTIMIZE PAYLOAD BY INCREASING PROPELLANT BURN RATE OBLIATED BY LOWERED DRAG DATA
  - / CURRENT SRM BASELINE PROVIDES MAXIMUM PAYLOAD WITHIN CONSTRAINTS

**TITAN IIM LAUNCH VEHICLE STATUS**  
**TECHNICAL DEVELOPMENT -- AC ELECTRONICS DIVISION**

- **DESIGN REVIEW STATUS**
  - / PDR'S AND CDR'S COMPLETE ON ALL AIRBORNE AND GROUND EQUIPMENT
  
- **INTERFACE STATUS**
  - / ALL AC ELECTRONICS/MMC INTERFACES DEFINED
  - / GIGS TO BIGS DIGITAL DATA TOLERANCES NEARING RESOLUTION
  - / CURRENTLY DEFINED GBIS NOT ACCEPTABLE TO TITAN IIM FOR VTF TESTING
  
- **UNIVAC 1824 MGC**
  - / FIRST UNIT DELIVERY (TITAN IIC) RESCHEDULED FROM 24 JULY 1967 TO 24 SEPTEMBER 1967 BECAUSE OF UNIVAC STRIKE
  
- **GUIDANCE EQUATIONS**
  - / AEROSPACE PRELIMINARY GUIDANCE AND MALFUNCTION DETECTION EQUATIONS RELEASED
  - / EQUATION SIMULATIONS IN PROCESS

**TITAN IIM LAUNCH VEHICLE STATUS**

**CURRENT OPEN AREAS**

- **OV ALTERNATE CONFIGURATION LOADS**
  
- **TITAN IIM/OV STAGING SYSTEM**
  
- **STAGE 0 ABORT MECHANIZATION**



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WHS-390  
Cy 1 of 2  
7 July 1967  
16 pages

WEIGHT AND POWER BRIEFING

By S. M. Tennant

7 July 1967

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EXCLUDED FROM AUTOMATIC  
REGRADING; DOD DIR 5200.10  
DOES NOT APPLY

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ELECTRICAL POWER SUMMARY

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p. 3

MODE DEFINITIONS

MODE

A	SLEW TRACKING MIRROR
B	PHOTOGRAPH
C	SGLS PLUS PAYLOAD
D	ALL OTHER
E	SGLS
F	WIDEBAND
G	SGLS PLUS WIDEBAND
H	OTHER ON-ORBIT
I	MAN IN GEMINI "B" - i. e., EARLY & LATE ORBIT
J	ASCENT

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p. 4

OV ELECTRICAL LOAD SUMMARY  
(CONTRACTOR REPORTED)

	Average Power (Watts)	<u>PEAK POWER MODES (WATTS)</u>										
		<u>MPSS OPER.</u>					<u>COMM</u>					
		A	B	C	D	E	F	G	H	I	J	
		TMS	PO	+SGLS	Other	SGLS	WB	SGLS/WB	Other	EO/LO	Ascent	
GEMINI B	93	235	235	235	235	320	235	320	235	735	0	
LABORATORY	1040	1791	1791	1925	2354	2158	1755	2024	2728	2215	886	
MPSS	434	1948	1227	1227	1154	569	569	569	498	543	604	
PPAC	273	586	1103	1103	593	259	243	259	521	274	274	
WIDEBAND	13	0	0	0	0	0	700	700	0	0	0	
TOTAL	1853	4560	4356	4490	4336	3306	3502	3872	3982	3767	1764	
PEC. ALLOC.	1825						4500					

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POTENTIAL POWER REDUCTION

o EMPLOY ADDITIONAL INHIBITS

APPROX. WATTS REDUCTION

ITEM

90

GEMINI-B RCS TANK HEATERS

220

PPAC THERMAL HEATERS

200

ATS LOAD MANAGEMENT

100

MISCELLANEOUS

o FURTHER REFINEMENT AND NEGOTIATION

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IMPACT OF PEAK AND AVERAGE POWER  
EXCEEDING SPEC

OVER-SPEC PEAK POWER

- EXERCISE ADDITIONAL OV POWER MANAGEMENT, E.G., PROVIDE ADDITIONAL INHIBITS, CHANGE MISSION EVENT SEQUENCES, ETC.
- ADD PEAK POWER BATTERY
- CHANGE FUEL CELL OPERATING PHILOSOPHY

OVER-SPEC AVERAGE POWER

- PRESENT REACTANT TANKS SIZED FOR 2.1 KW (ADDITIONAL 41 LBS.)
- ABOVE 2.1 KW
  - / DECREASE MISSION DURATION/OPERATIONS
  - / PROVIDE ADDITIONAL REACTANT STORAGE TANKS

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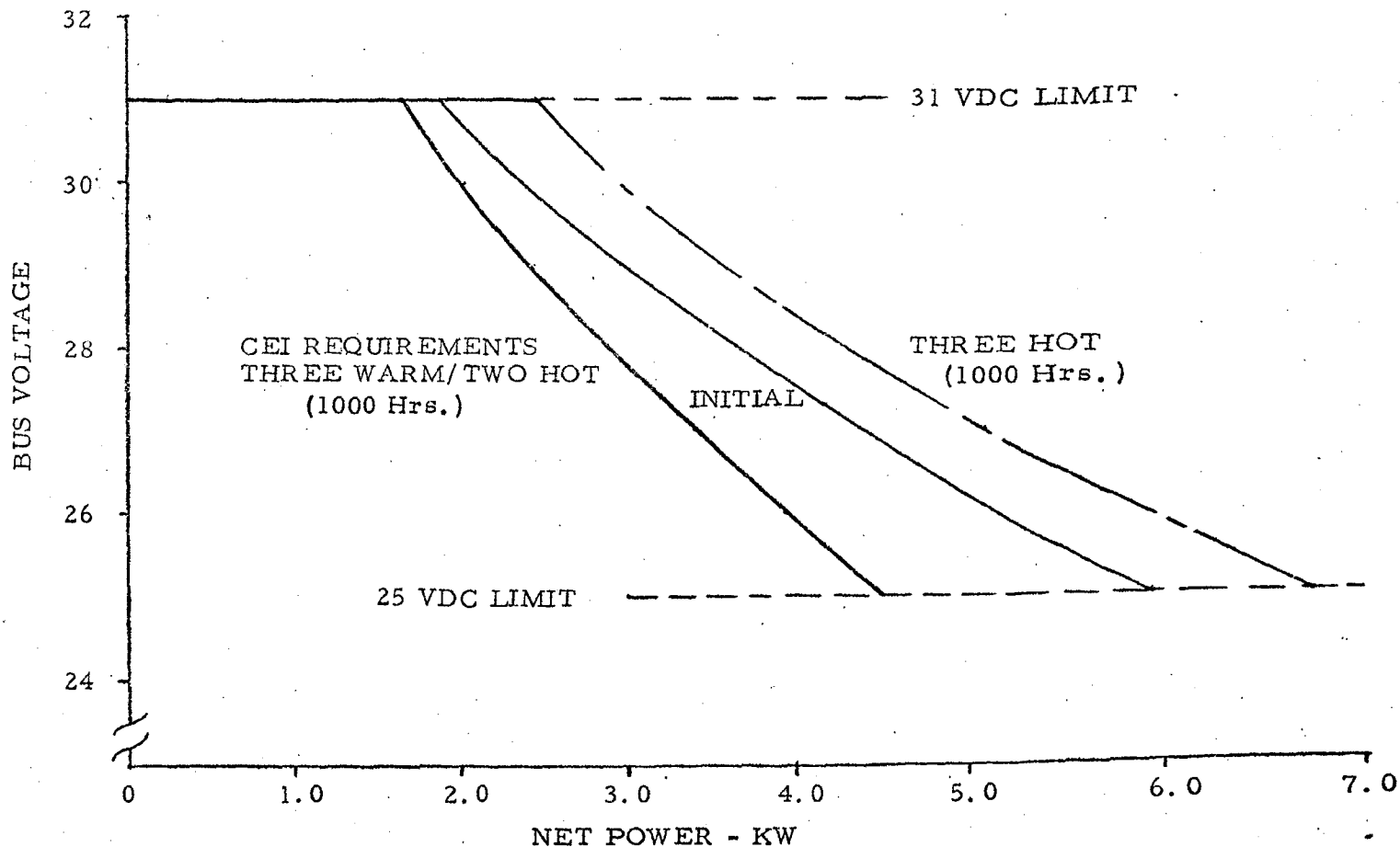
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FUEL CELL OUT OF LIMITS CAPABILITY

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MOL

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ELECTRICAL POWER MANAGEMENT

WITS-398  
Y-8

SPEC CONTROLS

- SEGMENT CEI's SPECIFIES AVERAGE AND PEAK POWER
  
- POWER COORDINATION CONTROL BOARD (BIMONTHLY)
  - / CONTRACTORS REPORT STATUS OF POWER NUMBERS,  
ELECTRICAL SYSTEM DESIGN, AND PROBLEM AREAS
  
  - / CONTRACTORS EXCHANGE MISSION TIMELINE COMPUTER  
PROGRAM STATUS
  
  - / SPO/AEROSPACE PROVIDES DIRECTION TO ENSURE  
COMPATIBLE POWER SYSTEM

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ELECTRICAL POWER MANAGEMENT

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P. 9

PROPOSED ADDITIONAL CONTROLS

• SEGMENT POWER REPORTS

- / INSTITUTE 1423 LINE ITEM FOR DETAILED PERIODIC (BIMONTHLY) POWER REPORT FOR EACH CONTRACTOR
- / FORMAT OF REPORT TO BE UNIFORM AND TO INCLUDE AVERAGE AND PEAK POWER BY MODES

• OV MISSION POWER TIMELINE

- / DAC TO PROVIDE OV MISSION POWER TIMELINE COMPUTER PROGRAM
- / SUBMIT INTEGRATED OV MISSION POWER TIMELINE REPORTS BIMONTHLY

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WEIGHT SUMMARY

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*WITS-390  
p. 11*

ORBITING VEHICLE SYSTEM SEGMENT  
WEIGHT SUMMARY - 1 JULY 1967

	<u>Contractor</u>	<u>SP/DR Weight</u>	<u>Projected Changes to SP/DR</u>	<u>Adjusted SP/DR Weight</u>	<u>Current Predicted Weight</u>
<u>GEMINI B</u>		6,120	+320	6,440	6,425
GEMINI B SYSTEM SEGMENT	MAC	5,680	+320	6,000	5,982
FLIGHT CREW SYSTEM SEGMENT	SPO	360	----	360	360
PRESSURE SUIT ASSEMBLY SEGMENT	SPO	80	----	80	80
LABORATORY VEHICLE SYSTEM SEGMENT (AVE)	DAC	14,449	+195	14,644	14,715
<u>MISSION PAYLOAD SYSTEM SEGMENT</u>		8,622	-298	8,324	8,227
G. E.	GE	2,435	+ 27	2,462	2,480
E. K.	EK	5,583	+134	5,717	5,602
GFE	SPO	441	-296	145	145
WIDEBAND READOUT SYSTEM		163	-163	0	0
<u>TOTAL</u>		<u>29,191</u>	<u>+217</u>	<u>29,408</u>	<u>29,367</u>

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p.12

PROJECTED WEIGHT CHANGES TO SP/DR

ESTIMATED CONTRACTUAL  
WEIGHT CHANGES

o	GEMINI B - MAC		
-	PAD ABORT CONTROL SYSTEM	+ 46	
-	REDESIGN TENSION STRAPS DUE TO SHUTDOWN LOADS	+ 14	
-	BLAST SHIELD	<u>+260</u>	+320
o	LABORATORY VEHICLE SYSTEM SEGMENT - DAC		
-	REMOVE DRV PROVISIONS	- 70	
-	PROVISIONS FOR EXTENDED MISSION DURATION	+ 12	
-	PROVISIONS FOR ACQUISITION SYSTEM - △ WEIGHT	+201	
-	REVISE GEOMETRY OF AFT BULKHEAD BATHTUB FITTING	+ 16	
-	CHANGE STIFFNESS CHARACTERISTICS OF MM PAYLOAD FORWARD MOUNTING STRUCTURE	+ 20	
-	THERMAL DOOR PROVISIONS	<u>+ 16</u>	+195

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PROJECTED WEIGHT CHANGES TO SP/DR (CONTINUED)

ESTIMATED CONTRACTUAL  
WEIGHT CHANGES

o	MISSION PAYLOAD SYSTEM SEGMENT		
-	GE		
	REMOVE DRV PROVISIONS	- 57	
	REMOVE 5" ACQUISITION SYSTEM	-326	
	ADD 10" ACQUISITION SYSTEM	+537	
	THERMAL DOOR REDESIGN	<u>-127</u>	+ 27
-	EK		
	REMOVE DRV TAKEUP	- 20	
	ADD MIRROR LOUVRES & MOUNTS	+ 97	
	INCREASE CAPACITY FOR FILM SUPPLY (CCN 14)	+ 23	
	INCREASED HARDWARE FOR POWER SWITCHING (CCN 11)	<u>+ 34</u>	+134
-	GFE		
	REMOVE DRV	-300	
	MISC. GFE REVISIONS - SEE GFE CHART	<u>+ 4</u>	-296
-	WIDEBAND READOUT SYSTEM		
	DELETE SP/DR WEIGHT		<u>-163</u>
o	<u>TOTAL PENDING WEIGHT CHANGES TO SP/DR</u>		<u><u>+217</u></u>

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HANDLE VIA BYEMAN SYSTEM ONLY

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~~D SECRET SPECIAL HANDLING~~

MISSION PAYLOAD SYSTEM SEGMENT  
GFE WEIGHT SUMMARY

	<u>BASIS FOR SPEC. WT.</u>	<u>1 JUNE 1967</u>
IMAGE VELOCITY SENSOR (I/V)	22	20
HARD COPY PRINTERS (2)	20	0 *
CUE FILM & CONTAINERS	20	10
COMPUTER	68	85
TERRAIN CAMERA & FILM	11	0
DATA RECOVERY VEHICLE (DRV)	300	0
SPECTRAL PAINT ON AFT MM (E. K.)	---	30 **
	<hr/>	<hr/>
TOTAL	441	145

\* 2 PRINTERS CARRIED IN DAC WEIGHT

\*\* EK WORK STATEMENT SPECIFIES THAT AFT MM SPECTRAL PAINT IS GFE TO EK  
(SPECTRAL PAINT FOR FORWARD MM(16 LB) IS INCLUDED IN G. E. WEIGHT)

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OV WEIGHT MARGIN

<u>CONFIGURATION</u>	ORBIT 80° INCL. <u>80/169, 55°N.</u>	ORBIT 90° INCL. <u>80/187, 55° N.</u>	
	<u>INCLUDES DRV &amp; WIDEBAND</u>	<u>NO WIDEBAND</u>	<u>WITH WIDEBAND</u>
BOOSTER CAPABILITY	32,475	31,090	31,090
PREDICTED SP/DR OV WEIGHT*	30,373	29,308	29,916
P/L MARGIN	2,102	1,782	1,174
PERCENT OF DRY WEIGHT.	7.9	7.0	4.5
<hr/>			
* ADJUSTER SP/DR	29,408	29,408	29,408
MODIFIED PROCESSOR & BIMAT	----	-100	-----
WB	508	-----	508
DRV	<u>457</u>	<u>-----</u>	<u>-----</u>
PREDICTED SP/DR OV WEIGHT	30,373	29,308	29,916

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MOL WEIGHT CONTROL

7-6-67

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p. 16

- o MOL MASS PROPERTIES CONTROL BOARD ORGANIZED
  - REQUIREMENTS DEFINED IN SAFSL 21016 AND 24016
  - . DAC - MASS PROPERTIES INTEGRATING CONTRACTOR
  - CONTRACTORS REPORTING PER MIL-M-38310
- o COST INCENTIVES ON ASSOCIATE CONTRACTORS SPECIFICATION WEIGHTS
- o CONTROL BOARD MEETS MONTHLY
- o CONTRACTORS SUBMIT DETAIL STATUS REPORTS MONTHLY
- o DAC OPERATING IN-HOUSE WEIGHT CONTROL BOARD
  - MEETS MONTHLY - REPORTS MONTHLY TO MOL CONTROL BOARD
  - CONSISTS OF DAC ENGINEERING TECHNICAL DIRECTOR, DESIGN CHIEF & ASSOC.
  - REVIEWS DETAIL DESIGN FOR WEIGHT CONTROL/MONITORS SUBSYSTEM TARGET WEIGHTS
- o WEIGHT CONTROL - AGENDA ITEM EVERY MONTHLY MOL MANAGEMENT MEETING AND PROGRAM REVIEWS
- o CONTROL EFFECTIVE - CURRENT WEIGHT WITHIN ONE PERCENT SPECIFICATION WEIGHT

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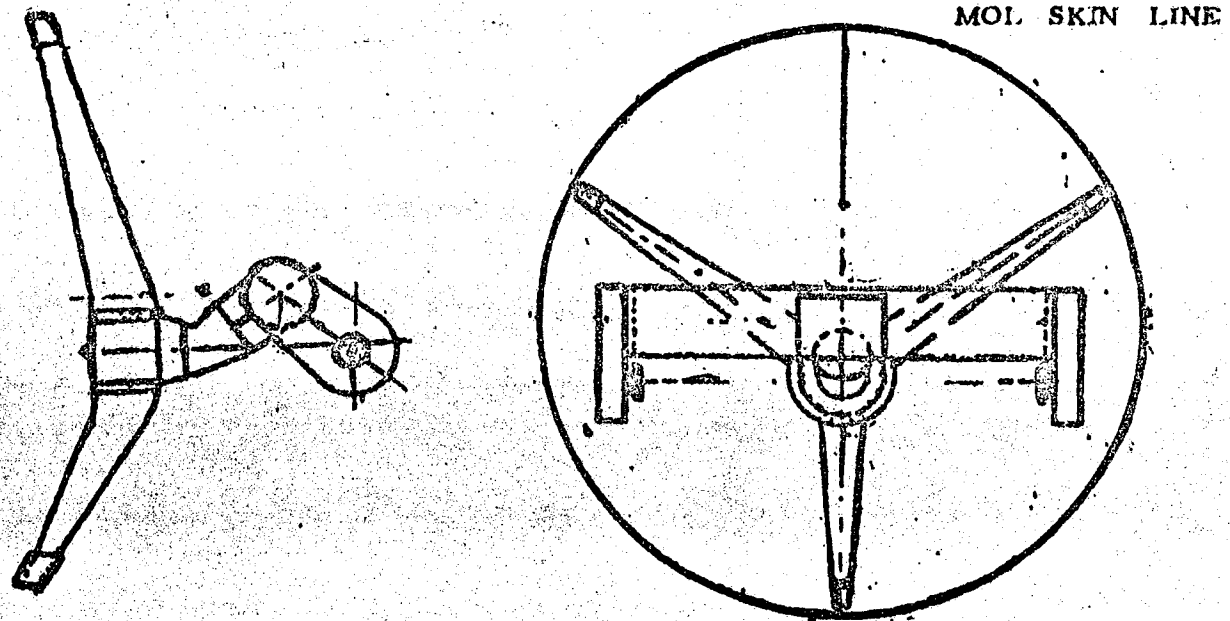
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PITCH AND ROLL GIMBAL BEARINGS

- BALL BEARINGS CHOSEN FOR MIRROR GIMBAL AXES
- WHY IS THERE A PROBLEM?
- WHAT IS BEING DONE ABOUT IT?

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(D) ~~SECRET~~ SPECIAL HANDLING



GIMBAL TRIPOD AND T-BAR ASSEMBLY

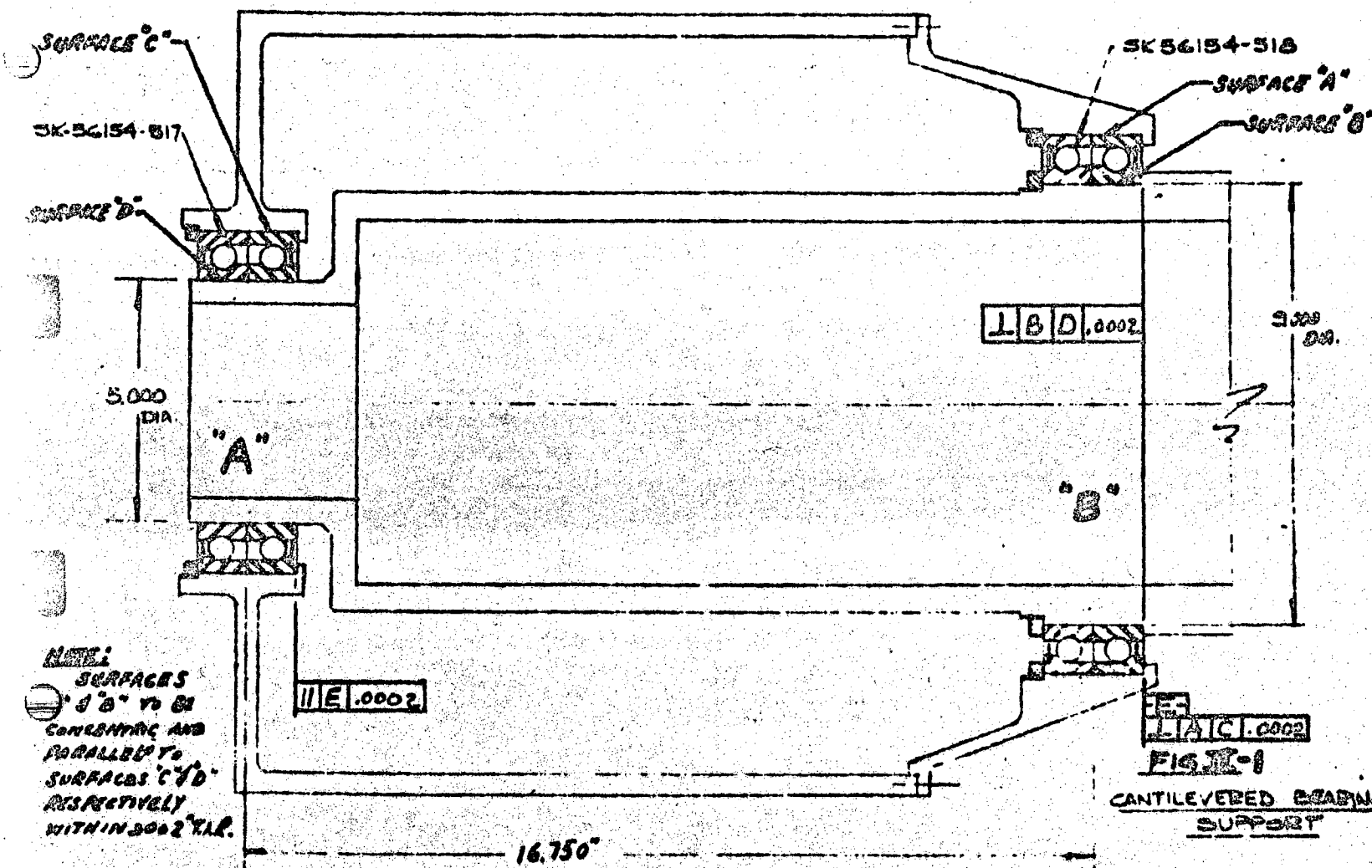
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(D) ~~SECRET~~ SPECIAL HANDLING

IV.A.9



(D) ~~SECRET~~ SPECIAL HANDLING

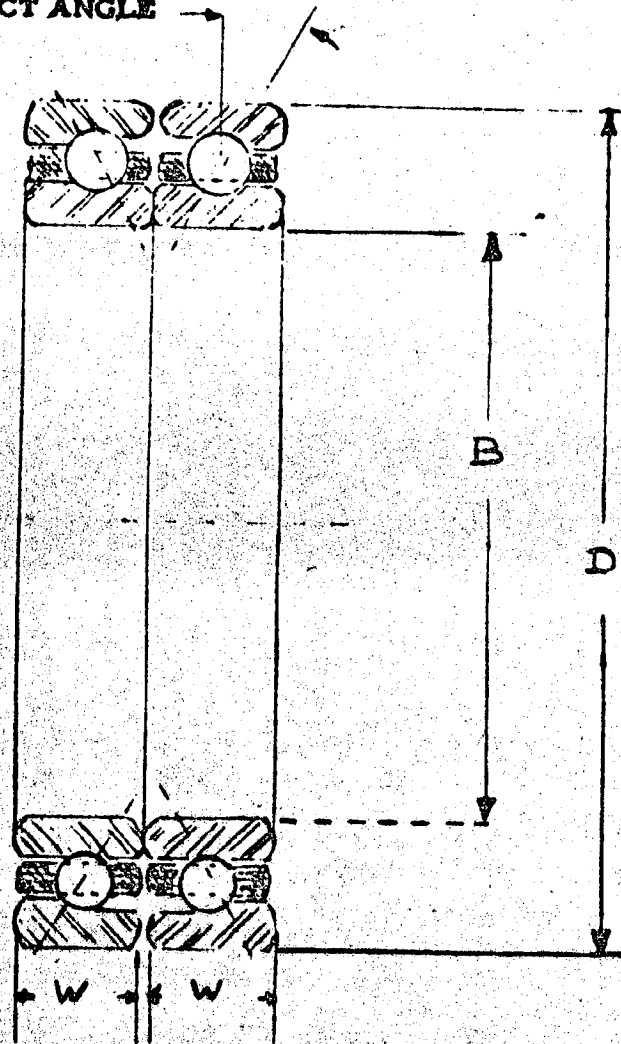
HANDLE VIA BYEMAN SYSTEM ONLY

B/C-66687-6

~~(D) SECRET SPECIAL HANDLING~~

ANGULAR CONTACT BEARING

CONTACT ANGLE

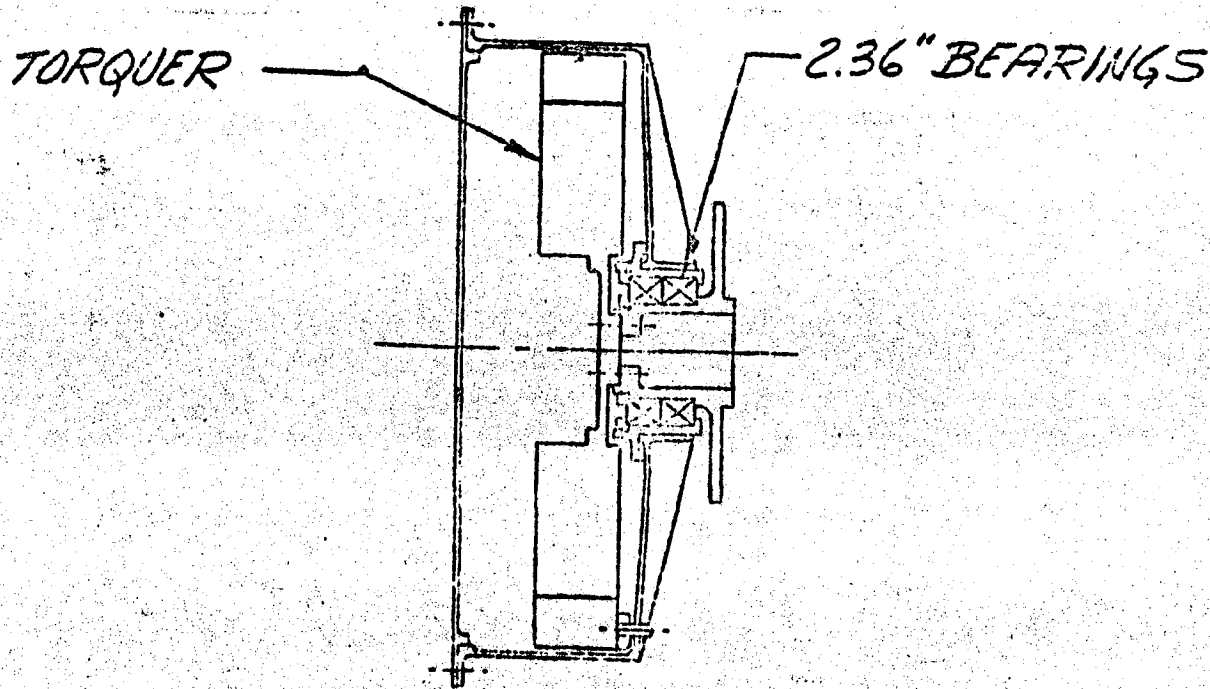


~~(D) SECRET SPECIAL HANDLING~~

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BYE-666 87-6  
25  
2

~~(D) SECRET SPECIAL HANDLING~~



PITCH BEARINGS & TORQUER INSTALLATION

~~(D) SECRET SPECIAL HANDLING~~

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~~(D) SECRET SPECIAL HANDLING~~

BEARING REQUIREMENTS

- SMOOTHNESS (EFFECT ON TRACKING MIRROR DRIVE)
  - / SMEAR BUDGET
    - LINE OF SIGHT ANGULAR RATE
      - PITCH: 15  $\mu$  RAD/SEC
      - ROLL: 10  $\mu$  RAD/SEC
- STIFFNESS (FOR GIMBAL STRUCTURE NATURAL FREQUENCY >13 CPS)
  - / 2 TO 3 X 10<sup>6</sup> LB/IN

~~(D) SECRET SPECIAL HANDLING~~

~~(D) SECRET SPECIAL HANDLING~~

FACTORS AFFECTING BEARING NOISE

- BEARING CONFIGURATION
- PRE LOAD (INTERACTS WITH STIFFNESS REQUIREMENT)
- LUBRICATION
- QUALITY OF BEARING
- EXTERNAL ENVIRONMENT
  - / BRINELLING
  - / FRETTING
  - / EFFECT ON LUBRICATION
  - / FOREIGN PARTICLES
- MANUFACTURING AND ASSEMBLY TOLERANCES

~~(D) SECRET SPECIAL HANDLING~~

HANDLE VIA BYEMAN SYSTEM ONLY



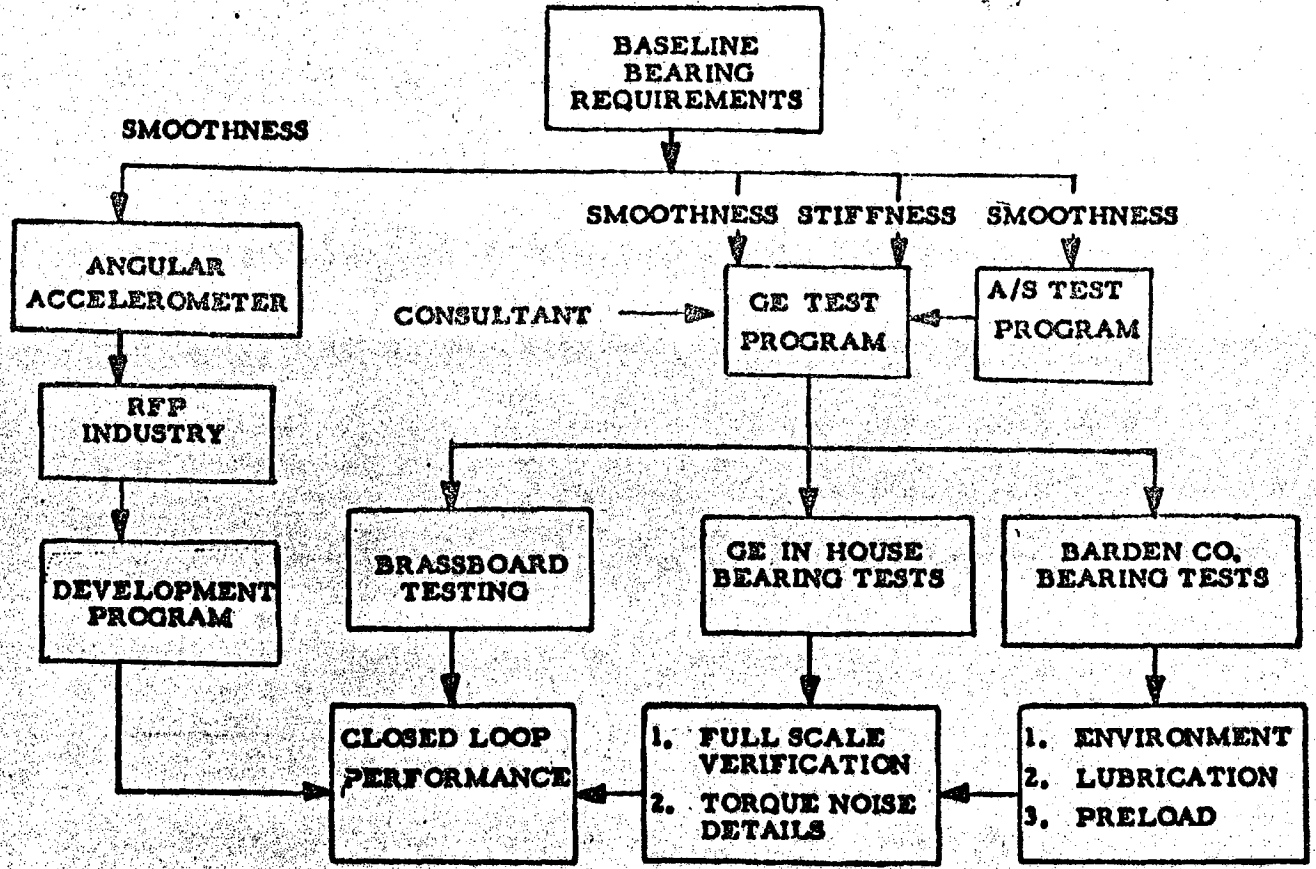




BYE-66687-61

(D) ~~SECRET~~ SPECIAL HANDLING

MAJOR EFFORT IS EXTENSIVE TEST PROGRAM



(D) ~~SECRET~~ SPECIAL HANDLING

BYE-66687-67

(D) ~~SECRET~~ SPECIAL HANDLING

BEARING TEST PROGRAM

A. SMOOTHNESS

- |    |                                 |         |                |
|----|---------------------------------|---------|----------------|
| 1. | PRELIMINARY BRASSBOARD          | 1 JUN   | 31 DEC         |
| 2. | BARDEN RIPPLE                   |         |                |
|    | SMALL BEARINGS                  | 28 MAY  | 5 AUG          |
|    | 60 MM BEARINGS                  | 6 AUG   | 8 OCT          |
| 3. | LUBRICATION SELECTION           |         |                |
|    | AMBIENT                         | 1 MAY   | 11 JUN         |
|    | VACUUM                          |         | INTERIM REPORT |
|    | MoS <sub>2</sub> & SILVER PLATE | 4 JUN   | 30 JULY        |
|    | F-50                            | 23 JULY | 17 SEPT        |
|    | FINAL REPORT                    |         | 1 OCT          |

B. MATERIAL SELECTION

1. MICRO-BRINELLING
2. LONG TERM CREEP
3. ADEQUACY

HANDLE VIA BYEMAN SYSTEM ONLY



TEST PROGRAM FOR FULL SCALE BEARING TESTS

- APPLY STATIC POWERED FLIGHT LOADS TO BEARING THEN REMOVE LOADS
- MEASURE BREAKAWAY TORQUE & RECORD TORQUE VS ANGULAR POSITION (AT 1°/sec)
- APPLY IG LOADS TO BEARINGS -
- RECORD BREAKAWAY & RUNNING TORQUES. THESE MEASUREMENTS OCCUR OVER A 30-DAY PERIOD
- REMOVE ALL LOADS FROM BEARINGS - PLACE IN VACUUM CHAMBER ( $10^{-8}$  TORR)
- AMBIENT TEMPERATURE +75°F
- CYCLE BEARING (1°/sec) FOR 30 DAYS
- MEASURE BREAKAWAY & RUNNING TORQUES AT REGULAR INTERVALS

~~D-SECRET~~ SPECIAL HANDLING

BEARING TEST SCHEDULE

- ① ADEQUACY DECISION
- ② VERIFICATION

	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O
SMOOTHNESS TESTING																		
PRELIM BRASSBOARD-PITCH/ROLL		△	R	R					△									
BORDEN RIPPLE TESTS		△				△												
LUBRICATION SELECTION		△				△												
MATERIAL EVALUATION																		
MICRO BRINNELING		△				△												
LONG TERM CREEP*					△	R	R	R			R					R		
MATERIAL ADEQUACY														△				
PROTOTYPE TESTING (FULL SCALE)																		
SET #1 (F-50)				△			△											
SET #2							△				△							
SET #3									△				△					
TEST REPORT																△		
LONG TERM CREEP*					△	R	R	R			R						R	
DEMONSTRATION TESTING (DRIVE A)									△				△					
DSS-1 TESTING (NEC)													△					△

① ↓  
 67/68  
 ② ↓

19-18977-2/8  
 BYE-46687-67

~~D-SECRET~~ SPECIAL HANDLING

R REPORTS  
 \* SAME TESTS

~~SECRET~~  
BYC-66687-67  
CMI

SPECIAL HANDLING  
OBLIGATION STATUS AS OF 30 JUN 67

FY 67 BUDGET 286.446  
CARRYOVER 6.241  

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FY 67 BUDGET REVISED 292.687

<u>BUDGET</u>	<u>A</u>	<u>B</u>	<u>TOTAL</u>
FY 67 BUDGET	208.547	77.899	286.446
CARRYOVER	5.637	.604	6.241
REVISED BUDGET	214.184	78.503	292.687
 <u>ACTUALS</u>			
INITIATED	214.184	78.503	292.687
OBLIGATED	214.083	78.503	292.586
UNOBLIGATED	(.101)	(0)	(.101)
 <u>UNOBLIGATED</u>			
T-IIIIM (BSD AND UTC)	.041	0	.041
FLT CREW EQ (AMD)	.060	0	.060
	.101	0	.101

SPECIAL HANDLING

HANDLE VIA BYEMAN SYSTEMS

Bye-66687-67  
CMT

~~SECRET~~ SPECIAL HANDLING  
CONTRACT STATUS - FINANCIAL

<u>DAC:</u>	<u>FY-68</u>	<u>TOTAL</u>
NEGOTIATED	275.6	687.7
AUTHORIZED-NOT NEGOTIATED	(84.5)	115.7
IDENTIFIED	8.7	140.4
FORECAST	-0-	-0-
TOTAL	<u>199.8</u>	<u>943.8</u>
	FY 67 CARRY-OVER	
	<u>7.9</u>	
	NET 68	191.9
<u>MAC:</u>		
NEGOTIATED	50.6	206.7
AUTHORIZED-NOT NEGOTIATED	.2	.3
IDENTIFIED	10.8	52.1
FORECAST	5.9	20.1
TOTAL	<u>67.5</u>	<u>279.2</u>
	FY 67 CARRY-OVER	
	<u>2.7</u>	
	NET 68	64.8

EXCLUDED FROM AUTOMATIC  
REGRADING; DOD DIR 5200.10  
DOES NOT APPLY

~~SECRET~~ SPECIAL HANDLING



Bye-00687-67

~~SECRET~~

SPECIAL HANDLING

Contract Status-Financial (cont'd)

GE:	<u>FY-68</u>	<u>TOTAL</u>
NEGOTIATED	77.9	170.5
AUTHORIZED-NOT NEGOTIATED	(13.7)	18.8
IDENTIFIED	39.5	170.7
FORECAST	8.9	33.4
TOTAL	<u>112.6</u>	<u>393.4</u>
	FY 67 CARRY-OVER	
	<u>1.1</u>	
	NET 68	
	111.5	

EASTMAN:

NEGOTIATED	82.7	258.5
AUTHORIZED-NOT NEGOTIATED	-0-	11.0
IDENTIFIED	29.4	139.5
FORECAST	-0-	39.0
TOTAL	<u>112.1</u>	<u>448.0</u>
	FY 67 CARRY-OVER	
	<u>5.4</u>	
	NET 68	
	106.7	

EXCLUDED FROM AUTOMATIC  
REGRADING: DOD DIR 5200.10  
DOES NOT APPLY

~~SECRET~~

SPECIAL HANDLING

HANDLE VIA BYEMAN SYSTEM ONLY

BYE-06087-07

~~SECRET~~ SPECIAL HANDLING

CONTRACT STATUS - NEGOTIATIONS

SCHEDULE EXTENSIONS:

DAG AND MAG PROPOSALS RECEIVED

GE PROPOSAL - DELAY

O PROPOSAL - 17 JULY

PRESSURE SUIT:

START 10 JULY

SELECTION NOT ANNOUNCED

FOOD PACKAGE:

START 11 JULY

SELECTION NOT ANNOUNCED

~~SECRET~~ SPECIAL HANDLING

HANDLE VIA BYEMAN SYSTEM ONLY

BYE-66687-67

~~CONFIDENTIAL~~

CONTRACT STATUS - NEW CONTRACTS

GEMINI-B ABORT SIMULATOR STUDY - LTV

172,840.00

ATP 1 JULY

APOLLO EXPERIMENT - DAC + SUITS

800,000.00 TO 2.7

ATP MID-SEPT

~~CONFIDENTIAL~~

HANDLE VIA BYEMAN SYSTEM ONLY

BYE-66687-67

UNCLASSIFIED

APPRO AT GE

- TRANSITION ACCOMPLISHED BY HQ AFSC
  - PAPER TRANSFER OF PEOPLE
  - PHASE-OUT OF OTHER SERVICES' MILITARY
  
- NEED TIGER TO WORK PROBLEMS AT GE
  - ACCOUNTING PRACTICES
  - OVERHEAD
  - FACILITIES
  
- DISCUSSIONS WITH GEN. RILEY AND STAFF

HANDLE VIA HYEMAN SYSTEM ONLY

*J.R. Henry*

*MOP*

STATUS REPORT  
MOL FIRE SAFETY ACTIVITIES  
JULY 7, 1967

MOL

CONTENT OF BRIEFING

- o GENERAL BACKGROUND ON MOL SAFETY ACTIVITIES  
/ SUMMARY OF POST-APOLLO FIRE ACTIVITIES
- o COMPARISON OF MOL ACTIVITIES TO APOLLO 204 REVIEW  
BOARD RECOMMENDATIONS
- o BROOKS AFB INCIDENT
- o SUMMARY

MOL

GENERAL BACKGROUND - MOL SAFETY ACTIVITIES

- o MOL SAFETY DID NOT START WITH THE APOLLO 204 INCIDENT
  - / CONSIDERABLE ANALYSES AND PLANNING HAD BEEN PERFORMED
  - / PHASE II CONTRACTS INCLUDED MANY SAFETY REQUIREMENTS AND TASKS
  - / BASELINE DESIGN INCLUDED MANY SAFETY FEATURES
  
- o APOLLO 204 INCIDENT CAUSED:
  - / ACCELERATION OF MANY BASELINE ACTIVITIES
  - / INITIATION OF SOME NEW TASKS
  - / INCREASED SAFETY AWARENESS AND STRONGER SAFETY ORGANIZATION
  
- o MAJOR IMPACT OF INVESTIGATION
  - / GEMINI B ATMOSPHERE ON PAD
  - / ORBITING VEHICLE MATERIALS SELECTION AND CONTROL

MOL

MOL ACTIVITIES - POST APOLLO FIRE

- o MOL SPO AND AEROSPACE SUPPORTED/FOLLOWED APOLLO REVIEW BOARD ACTIVITIES
- o REVIEW OF MATERIALS SELECTION AND CONTROL REQUIREMENTS
- o RE-EVALUATION OF GEMINI B AND LABORATORY VEHICLE ATMOSPHERE COMPOSITION AND PRESSURE HISTORY
- o REVIEW OF EGRESS CAPABILITY
- o REVIEW OF STATE OF THE ART IN FIRE DETECTION AND SUPPRESSION FOR USE IN:
  - / AIRBORNE VEHICLE
  - / FACILITIES
- o RE-EVALUATION OF EQUIPMENT, PLANS, PROCEDURES, ETC. FOR:
  - / SPACE CHAMBER TESTS
  - / LAUNCH PAD TESTS
- o ESTABLISHED A MORE POSITIVE SAFETY ORGANIZATION
  - / WITHIN SPO AND AEROSPACE
  - / WITHIN ASSOCIATE CONTRACTORS
- o REVIEWING APOLLO BLOCK II CCB ACTION FOR APPLICABILITY TO MOL

L. V.



MOL

COMPARISON OF APOLLO BOARD RECOMMENDATIONS  
AND MOL ACTIVITIES



APOLLO BOARD FINDING 2

- o BOARD RECOMMENDATION
  - / THE AMOUNT AND LOCATION OF COMBUSTIBLE MATERIALS IN THE COMMAND MODULE MUST BE SEVERELY RESTRICTED AND CONTROLLED
  
- o MOL ACTIVITIES
  - / REVISED SAFSL EXHIBIT IN PREPARATION
    - o BASED ON INCORPORATING PERTINENT ASPECTS OF APOLLO SPECIFICATION ASPO-RQTD-D67-5A
    - o INCLUDES MATERIAL CRITERIA, TEST REQUIREMENTS AND CONTROL
    - o REVISION WILL BE ADDED TO ALL ASSOCIATES' CONTRACTS
  - / STATUS
    - o DRAFT CIRCULATED FOR CONTRACTOR COMMENTS
    - o REVIEW WITH CONTRACTORS WEEK OF 10 JULY 1967
    - o INTEND TO PUBLISH FINAL DOCUMENT AND APPLY CONTRACTUALLY AS SOON AS POSSIBLE

MOZ

BASIC MATERIALS CRITERIA

- o MATERIALS CATEGORIZED PRIMARILY BY FUNCTIONAL APPLICATION AND LOCATION IN ORBITING VEHICLE
- o MATERIALS QUALIFIED IN MOST SEVERE O<sub>2</sub> ENVIRONMENT RELATIVE TO END USE
- o GEMINI B AND LABORATORY MODULE
  - / PRESSURIZED AREAS: 6 PSIA 100% OXYGEN
  - / UNPRESSURIZED AREAS: AIR
- o MISSION MODULE: AIR
- o CREW EQUIPMENT
  - / PRESSURE SUIT ASSEMBLY
  - / SUIT LOOP: 19.0 PSIA 100% OXYGEN
  - / HIGH PRESSURE OXYGEN SYSTEM: 100 PSIA 100% OXYGEN
- o TEST RESULTS AT HIGHER PRESSURE MAY BE USED TO QUALIFY MATERIALS FOR LOWER PRESSURE USE

RH

MOP

APOLLO REVIEW BOARD FINDING 4

o BOARD RECOMMENDATION

/ THE TIME REQUIRED FOR EGRESS OF THE CREW BE REDUCED  
AND THE OPERATIONS NECESSARY FOR EGRESS BE SIMPLIFIED

o MOL ACTIVITIES

/ CURRENT GEMINI EGRESS CAPABILITY

- o HATCH OPEN (~9 SEC) AND BOTH CREWMEN ON  
PLATFORM IN 15 TO 21 SECONDS

/ POSSIBLE CHANGES FOR RAPID OPENING HATCH (~5 SEC)  
EVALUATED

/ IMPROVEMENTS IN ENVIRONMENTAL SHELTER HAVE BEEN DEVELOPED

- o TO ELIMINATE PERIOD REQUIRING EGRESS THROUGH ONLY  
ONE HATCH (3 MIN)
- o TO ELIMINATE PERIOD WITH NO EGRESS CAPABILITY (2 MIN)

/ STATUS

- o DIRECTION IN COORDINATION TO MAC TO CONDUCT:

/ ADDITIONAL EGRESS TESTING ON EXISTING SYSTEM

/ PRELIMINARY DESIGN OF AUTOMATIC HATCH UNLOCKING  
DEVICE

- o DIRECTION IN PREPARATION TO A&E TO:

/ EVALUATE PROPOSED ENVIRONMENTAL SHELTER AND  
UMBILICAL TOWER MODIFICATIONS

/ PROPOSE OTHER ALTERNATIVES

*MOL*

CURRENT GEMINI B HATCH EGRESS CAPABILITY

- o PRIOR TO MES BREAKUP (T-120 TO T-90)
  - / WITHOUT OUTSIDE AID
    - o 9 SECONDS TO OPEN HATCHES (WITH UNTRAINED PERSONNEL)
    - o 21 SECONDS (TOTAL) TO STEP ON PLATFORM
  - / WITH OUTSIDE AID
    - o 5 SECONDS TO OPEN HATCHES
    - o 15 SECONDS (TOTAL) TO STEP ON PLATFORM
- o DURING MES BREAKUP
  - / 3 MINUTE PERIOD FOR EGRESS THROUGH SAME HATCH
    - o 35 SECONDS TO STEP ON PLATFORM
  - / 2 MINUTE PERIOD WITH NO EGRESS
- o AFTER MST REMOVAL
  - / RETRACTABLE AND AUXILIARY PLATFORMS
    - o 63 SECONDS TO EXTEND OR RETRACT
    - o UP TO T-3 MINUTES
  - / SALVO FIRE OF RETROS FOLLOWED BY SEAT EJECTION (PAD ABORT)
    - o 1-5 SECONDS CREWMEN CLEAR OF SPACECRAFT

*R11-4*

MOL

APOLLO REVIEW BOARD FINDING 5

o BOARD RECOMMENDATION

- / MANAGEMENT CONTINUALLY MONITOR THE SAFETY OF ALL TEST OPERATIONS AND ASSURE THE ADEQUACY OF EMERGENCY PROCEDURES
- / ALL EMERGENCY EQUIPMENT (BREATHING APPARATUS, PROTECTIVE CLOTHING, DELUGE SYSTEMS, ACCESS ARM, ETC.) BE REVIEWED FOR ADEQUACY
- / PERSONNEL TRAINING AND PRACTICE FOR EMERGENCY PROCEDURES BE GIVEN ON A REGULAR BASIS AND REVIEWED PRIOR TO THE CONDUCT OF A HAZARDOUS OPERATION
- / SERVICE STRUCTURES AND UMBILICAL TOWERS BE MODIFIED TO FACILITATE EMERGENCY OPERATIONS

o MOL ACTIVITIES

- / LAUNCH SITE SAFETY
  - o LAUNCH SUPPORT CONTRACTS ARE NOT YET NEGOTIATED
  - o CONTRACTOR SAFETY POLICIES, CONSTRAINTS AND CRITERIA ARE SET FORTH IN A SEGMENT GROUND SAFETY PLAN
    - / PRESENTS DETAILED GROUND SAFETY PLANNING FROM ARRIVAL OF FLIGHT HARDWARE THROUGH LIFTOFF
    - / DOCUMENT DUE NINE (9) MONTHS BEFORE FIRST LAUNCH



APOLLO REVIEW BOARD FINDING 5 (CONT'D)

/ LAUNCH SITE SAFETY (CONT'D)

- o THE LAUNCH OPERATIONS WORKING GROUP INTEGRATES THE SEGMENT REQUIREMENTS INTO A MOL SYSTEM SAFETY PLAN
- o CONTRACTOR CHECKOUT REQUIREMENTS PLANS TO INCLUDE THE DETAILED SAFETY (EMERGENCY) REQUIREMENTS FOR EACH TEST PROCEDURE AND ACTIVITY.

/ SPACE CHAMBER SAFETY

- o DAC AND MAC SPACE CHAMBERS HAVE BEEN REVIEWED FOR DESIGN AND PROCEDURES SAFETY FEATURES
- o INTERNAL EVALUATION CURRENTLY IN PROGRESS TO IDENTIFY ITEMS REQUIRING CHANGE

/ ENVIRONMENTAL SHELTER AND SERVICE TOWERS

- o MOL SERVICE STRUCTURES SAFETY FEATURES WERE REVIEWED AND FOUND TO BE ACCEPTABLE WITH TWO MAJOR EXCEPTIONS.
  - / CREW EGRESS
  - / FIRE EXTINGUISHING WITHIN THE ENVIRONMENTAL SHELTER

/ MOL WILL INSTITUTE SENIOR MANAGEMENT REVIEW OF DESIGN, PLANS AND PROCEDURES PRIOR TO TEST

R11-7

MOL

APOLLO BOARD FINDING 6

o BOARD RECOMMENDATION

/ THE GROUND COMMUNICATION SYSTEM BE IMPROVED TO ASSURE  
RELIABLE COMMUNICATIONS BETWEEN ALL TEST ELEMENTS AS  
SOON AS POSSIBLE AND BEFORE THE NEXT MANNED FLIGHT.

/ A DETAILED DESIGN REVIEW BE CONDUCTED ON THE ENTIRE  
SPACECRAFT COMMUNICATION SYSTEM.

o MOL ACTIVITIES

/ MOL GROUND COMMUNICATION IS BASICALLY SOUND.

o WILL INSTITUTE DISCIPLINE IN ITS USE

/ SPACECRAFT COMMUNICATION SYSTEM - BASICALLY SAME AS  
NASA GEMINI

o RECENTLY CONDUCTED PDR (SPACECRAFT AND AGE)

/ THE VCC IN GEMINI B HAS CAPABILITY FOR VOICE OPERATED  
MICROPHONE (VOX)



*MOL*

APOLLO BOARD FINDING 7

o BOARD RECOMMENDATION

- / TEST PROCEDURES AND PILOT'S CHECKLISTS THAT REPRESENT THE ACTUAL COMMAND MODULE CONFIGURATION BE PUBLISHED IN FINAL FORM AND REVIEWED EARLY ENOUGH TO PERMIT ADEQUATE PREPARATION AND PARTICIPATION OF ALL TEST ORGANIZATION
- / TIMELY DISTRIBUTION OF TEST PROCEDURES AND MAJOR CHANGES BE MADE A CONSTRAINT TO THE BEGINNING OF ANY TEST

o MOL ACTIVITIES

- / SEGMENT AND INTEGRATED CHECKOUT REQUIREMENT PLANS TO BE AVAILABLE NO LATER THAN 12 MONTHS BEFORE LAUNCH
- / DETAILED SEGMENT AND INTEGRATED TEST PROCEDURES AVAILABLE NO LATER THAN 30 DAYS PRIOR TO SCHEDULED USE
  - o MAJOR REVISIONS TO ANY TEST PROCEDURE WILL BE APPROVED ONLY AFTER EXAMINING THE IMPACT ON CREW PREPARATION AND FAMILIARITY
  - o ONLY THOSE PROCEDURE CHANGES WHICH ARE ABSOLUTELY NECESSARY FOR ATTAINMENT OF TEST OBJECTIVES OR ARE OF A "MAKE PLAY" NATURE WILL BE APPROVED
  - o DOCUMENTS WILL INCLUDE BOTH NORMAL AND EMERGENCY PROCEDURES

413

MOL

APOLLO BOARD FINDING 8

- BOARD RECOMMENDATION
  - / FULL-SCALE MOCKUPS IN FLIGHT CONFIGURATION BE TESTED TO DETERMINE THE RISK OF FIRE
- MOL ACTIVITIES
  - / MOL IS STILL EVALUATING VALUE OF FULL SCALE MOCKUP TESTS AS A QUALIFICATION TEST
  - / FULL SCALE (BOILERPLATE) TESTS HAVE DEFINITE VALUE TO EVALUATE HAZARD DUE TO RESTRICTED USAGE MATERIAL
    - ALSO FOR EVALUATION OF FIRE DETECTION AND EXTINGUISHING SYSTEMS
    - USE IS HEAVILY DEPENDENT ON RESULTS OF MATERIALS PROGRAM

MOL

APOLLO BOARD FINDING 9

o BOARD RECOMMENDATION

- / THE FIRE SAFETY OF THE RECONFIGURED COMMAND MODULE BE ESTABLISHED BY FULL-SCALE MOCKUP TESTS
- / STUDIES OF THE USE OF A DILUENT GAS BE CONTINUED WITH PARTICULAR REFERENCE TO ASSESSING THE PROBLEMS OF GAS DETECTION AND CONTROL AND THE RISK OF ADDITIONAL OPERATIONS THAT WOULD BE REQUIRED IN THE USE OF A TWO-GAS ATMOSPHERE

o MOL ACTIVITIES

- / BASIC CRITERION - NO MANNED HIGH PRESSURE OXYGEN (>6 PSI) TESTING
- / GEMINI B
  - o BASELINE GEMINI B ATMOSPHERE 100% OXYGEN WITH PRESSURE HISTORY ESSENTIALLY SAME AS APOLLO 204
  - o STUDIED ALTERNATIVE TWO-GAS SYSTEMS
  - o HAVE SELECTED GROUND BASED TWO-GAS SYSTEM
  - / DIRECTION TO MAC IN COORDINATION



GEMINI B ATMOSPHERE TRADEOFFS

	BASELINE ATMOSPHERE	TWO GAS ON BOARD	TWO GAS GROUND BASED	AIR
LAUNCH ATMOSPHERE	15psi-100% O <sub>2</sub>	4psi O <sub>2</sub> /11psi He	4psi O <sub>2</sub> /11psi He	15psi AIR
ON ORBIT ATMOSPHERE	5psi O <sub>2</sub>	3.5psi O <sub>2</sub> /1.5psi He	3.5psi O <sub>2</sub> /1.5psi He	5psi O <sub>2</sub>
HAZARD OF LAUNCH ATMOSPHERE	GREATEST	MINIMAL	MINIMAL	LEAST
APPROXIMATE WEIGHT PENALTY, LBS	0	19 (Use Lab He)	12	14
COMPLEXITY OF PAD PROCEDURES	LEAST	INCREASED	INCREASED	SLIGHTLY INCREASED
COMPLEXITY OF ON ORBIT PROCEDURES	LEAST	MINIMAL	MINIMAL	GREATEST
EFFECT ON VEHICLE EQUIPMENT	LEAST	SIGNIFICANT	MINIMAL	MINIMAL

ALL VERSIONS USE 100%  
OXYGEN SUIT LOOP



APOLLO BOARD FINDING 9 (CONT'D)

/ LABORATORY VEHICLE

- o BASELINE ATMOSPHERE IS TWO-GAS
  - / LAUNCH HAD PURE OXYGEN PURGE AND HIGH (10.5 PSI) OXYGEN LEVEL
  - / ON-ORBIT - 5 PSI (3.5 PSI OXYGEN-1.5 PSI HELIUM)
- o EVALUATED ALTERNATIVE LAUNCH ATMOSPHERES
  - / SELECTED 80% HELIUM, 19% OXYGEN, 1% H<sub>2</sub>O
  - / DIRECTION IN COORDINATION
- o EVALUATED INCREASED LEVELS OF DILUENT ON ORBIT
  - / HAVE DECIDED TO RETAIN BASELINE FOR NOW
  - / REQUEST MAC AND DAC TO EVALUATE IMPACT OF 7 PSI (3.5 PSI OXYGEN, 3.5 PSI HELIUM)

/ GEMINI B - LABORATORY VEHICLE INTERFACE

- o DELETING 100% OXYGEN REPRESSURIZATION OF GEMINI
  - / REPRESSURIZING WITH LABORATORY TWO-GAS
- o DECREASING TIME REQUIRED TO REPRESSURIZE GEMINI B

90/30

L



LABORATORY PAD TESTING AND LAUNCH  
ATMOSPHERE ALTERNATIVES

	BASELINE 70% O <sub>2</sub> 30% He	100% HELIUM	CLEAN AIR	80% He 19% O <sub>2</sub> 1% H <sub>2</sub>
HAZARD OF ATMOSPHERE	GREATEST	LEAST	MINIMAL	MINIMAL
WEIGHT PENALTY, LBS (1) EQUIVALENT PAYLOAD	0	~0	+23	+3
PERMITS MONITORING PO <sub>2</sub> SENSOR	YES	NO	YES	YES
PROVIDES HABITABLE ATMOSPHERE FOR UNSCHEDULED CORRECTIVE MAINTENANCE	YES	NO	YES	YES
COMPLEXITY OF PAD PROCEDURES	REQUIRES PURGE	REQUIRES PURGE	SIMPLEST NO PURGE REQ'D	REQUIRES PURGE
COMPLEXITY OF ON ORBIT PROCEDURES	SIMPLEST	Requires depressurization and re-pressurization from Gemini B prior to crew transfer - these differ only in pressure levels for LM decompression		

(1) ASSUMES ASCENT VENT TO 5 PSI AND LATER  
CHANGE TO ON ORBIT ATMOSPHERE (BASED ON  
5% PENALTY DURING ZERO STAGE BURN)

MOD

APOLLO BOARD FINDING 10

o BOARD RECOMMENDATION

- / AN IN-DEPTH REVIEW OF ALL ELEMENTS, COMPONENTS AND ASSEMBLIES OF THE ENVIRONMENTAL CONTROL SYSTEM BE CONDUCTED TO ASSURE ITS FUNCTIONAL AND STRUCTURAL INTEGRITY AND TO MINIMIZE ITS CONTRIBUTION TO FIRE RISK
- / PRESENT DESIGN OF SOLDERED JOINTS IN PLUMBING BE MODIFIED TO INCREASE INTEGRITY OF THE JOINTS BE REPLACED WITH A MORE STRUCTURALLY RELIABLE CONFIGURATION
- / DELETERIOUS EFFECTS OF COOLANT LEAKAGE AND SPILLAGE BE ELIMINATED

o MOL ACTIVITIES

/ GEMINI B

- o ECS HARDWARE PDR HELD OCTOBER 1966
- o ALL JOINTS EITHER MECHANICAL OR BRAZED
- o PROBLEM - ALUMINUM COOLANT LINES IN CABIN WITH FLAMMABLE COOLANT

/ LABORATORY VEHICLE

- o EC/LS HARDWARE PDR HELD APRIL 1967
- o ALL JOINTS EITHER MECHANICAL OR BRAZED
- o WATER IS USED AS COOLANT IN CABIN, FREON OUTSIDE



GEMINI B ECS COOLANT CONSIDERATIONS

- COOLANT ENTERS CABIN FOR SUIT HEAT EXCHANGER
  - / LOWER AFT PORTION ONLY
  - / OXYGEN/COOLANT LINES ENTER CABIN 2 INCHES APART
  
- SYSTEM CONTAINS 30 POUNDS OF COOLANT
  - / TWO SEPARATE LOOPS
  
- COOLANT FLUID
  - / NASA GEMINI AND CURRENT GEMINI B USE MONSANTO MCS - 198 (SILICONE ESTER)
    - FLASH POINT OF 175°F
  
- HAZARD IS SERIOUS - IF THERE IS A LEAK

*Handwritten initials or mark.*



*NOZ*

GEMINI B COOLANT FLUID STATUS

- o ALTERNATIVES
  - / REMOVE SUIT HEAT EXCHANGER FROM PRESSURIZED AREA
  - / CHANGE COOLANT FLUID
    - o POSSIBLE NEW FLUIDS
      - / MONSANTO OS-139
        - o ORIGINAL NASA FLUID
      - / FREON (FC-75)
        - o NO FLASH POINT
      - / WATER
- o DIRECTION TO MAC IN COORDINATION

*R/h*

MOL

APOLLO BOARD FINDING 10 (CONT'D)

o BOARD RECOMMENDATIONS (CONT'D)

- / REVIEW OF SPECIFICATIONS BE CONDUCTED, 3-DIMENSIONAL JIGS BE USED IN MANUFACTURE OF WIRE BUNDLES AND RIGID INSPECTION OF ALL STAGES OF WIRING DESIGN, MANUFACTURE AND INSTALLATION BE ENFORCED
- / VIBRATION TESTS BE CONDUCTED OF A FLIGHT-CONFIGURED SPACECRAFT

o MOL ACTIVITIES

- / REVIEWING ALL APPLICABLE WIRING DOCUMENTS, INCLUDING CONTRACTOR MANUFACTURING, INSPECTION, TRAINING, HANDLING, STORAGE, SHIPPING, AND QUALITY CONTROLS SPECIFICATIONS
  - o PURPOSE - TO INTEGRATE CONSISTENT SET OF REQUIREMENTS FOR ALL ASSOCIATE CONTRACTORS
- / VIBRATION TESTS OF FLIGHT-CONFIGURED SPACECRAFT IS BASELINE
  - o FLIGHT 1 (GEMINI B) IS TESTED TO 75% QUAL. LEVELS
  - o LABORATORY QUALIFICATION VEHICLE IS ACOUSTICALLY TESTED TO:
    - / QUALIFICATION LEVELS - STRUCTURES
    - / FLIGHT LEVELS - WITH EQUIPMENT
  - o FLIGHT LABORATORY MODULES
    - / LOW LEVEL ACCEPTANCE TEST



APOLLO BOARD FINDING 10 (CONT'D)

- o BOARD RECOMMENDATIONS (CONT'D)
  - / THE NECESSITY FOR ELECTRICAL CONNECTIONS OR DISCONNECTIONS WITH POWER ON WITHIN THE CREW COMPARTMENT BE ELIMINATED.
  - / INVESTIGATION BE MADE OF THE MOST EFFECTIVE MEANS OF CONTROLLING AND EXTINGUISHING A SPACECRAFT FIRE. AUXILIARY BREATHING OXYGEN AND CREW PROTECTION FROM SMOKE AND TOXIC FUMES BE PROVIDED.
  
- o MOL ACTIVITIES
  - / THERE ARE COMMUNICATIONS/CREW TRANSFER RELATED CONNECTIONS/DISCONNECTIONS
    - o DIRECTION IN PREPARATION TO ELIMINATE
  - / FIRE DETECTION AND EXTINGUISHING
    - o REVIEWING EFFORT UNDER WAY AT OTHER AGENCIES
    - o DERIVING REQUIREMENTS FOR MOL
  - / OXYGEN MASKS ARE BASELINE FOR MOL
    - o TWO IN LABORATORY
    - o TWO IN TRANSFER TUNNEL

NRO APPROVED FOR  
RELEASE 1 JULY 2015



## COMBUSTION DETECTION SYSTEMS

- o CURRENT ACTIVITIES

- / REVIEWING EFFORT UNDERWAY AT:

- o NASA
    - o BROOKS AFB
    - o WPAFB
    - o OTHER AGENCIES

- / DETERMINE REQUIREMENTS FOR DETECTION SYSTEMS

- o CANDIDATE SYSTEMS

- / CONDENSATION NUCLEI COUNTER
      - / IR RADIATION DETECTOR
      - / UV RADIATION DETECTOR
      - / EUTECTIC SALTS

- o FUTURE ACTIVITIES

- / INITIATE STUDY (TESTS) TO ASSIST IN SYSTEM SELECTION  
OR TO DETERMINE FEASIBILITY

- / INITIATE DEVELOPMENT AND/OR PROCUREMENT OF  
APPROPRIATE SYSTEMS

NOV 1962

SPACECRAFT FIRE SUPPRESSION

o MOST PROMISING AGENTS

/ WATER

o ADVANTAGES

/ NON TOXIC

/ AVAILABLE FROM FUEL CELLS

/ VERY EFFECTIVE AGENT

o DISADVANTAGES

/ DIFFICULT POST FIRE RECOVERY

/ FREON 1301

o ADVANTAGES

/ VERY EFFECTIVE AGENT

/ NO DAMAGE TO HARDWARE BY SUPPRESSANT

/ NO HARDWARE DAMAGE OR TOXIC EFFECT IN  
EVENT OF UNNECESSARY USE

o DISADVANTAGES

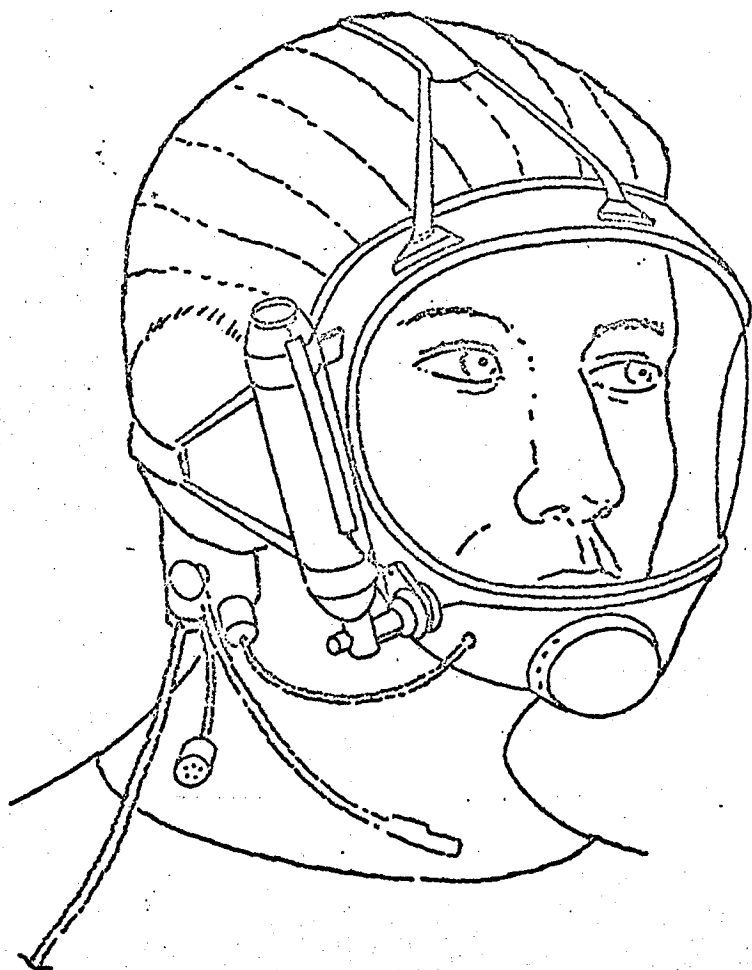
/ SIGNIFICANT TOXIC PRODUCTS IF USED ON  
LARGE HOT FIRE

/ POSSIBLE OVERPRESSURIZATION OF CABIN

o CURRENT INVESTIGATION NOT LIMITED TO THE ABOVE



## MOL EMERGENCY OXYGEN MASK



1. 10 MINUTES SELF CONTAINED OXYGEN SUPPLY
2. CAPABILITY TO USE VEHICLE OXYGEN SUPPLY FOR LONGER DURATION
3. WEIGHT-5.1 POUNDS EACH

MOL

APOLLO BOARD FINDING 11

o BOARD RECOMMENDATION

/ EVERY EFFORT MUST BE MADE TO INSURE THE MAXIMUM CLARIFICATION AND UNDERSTANDING OF THE RESPONSIBILITIES OF ALL THE ORGANIZATIONS INVOLVED, THE OBJECTIVE BEING A FULLY COORDINATED AND EFFICIENT PROGRAM.

o MOL ACTIVITIES

/ MOL SAFETY PLAN IN PREPARATION

o OVERALL MANAGEMENT LEVEL DOCUMENT

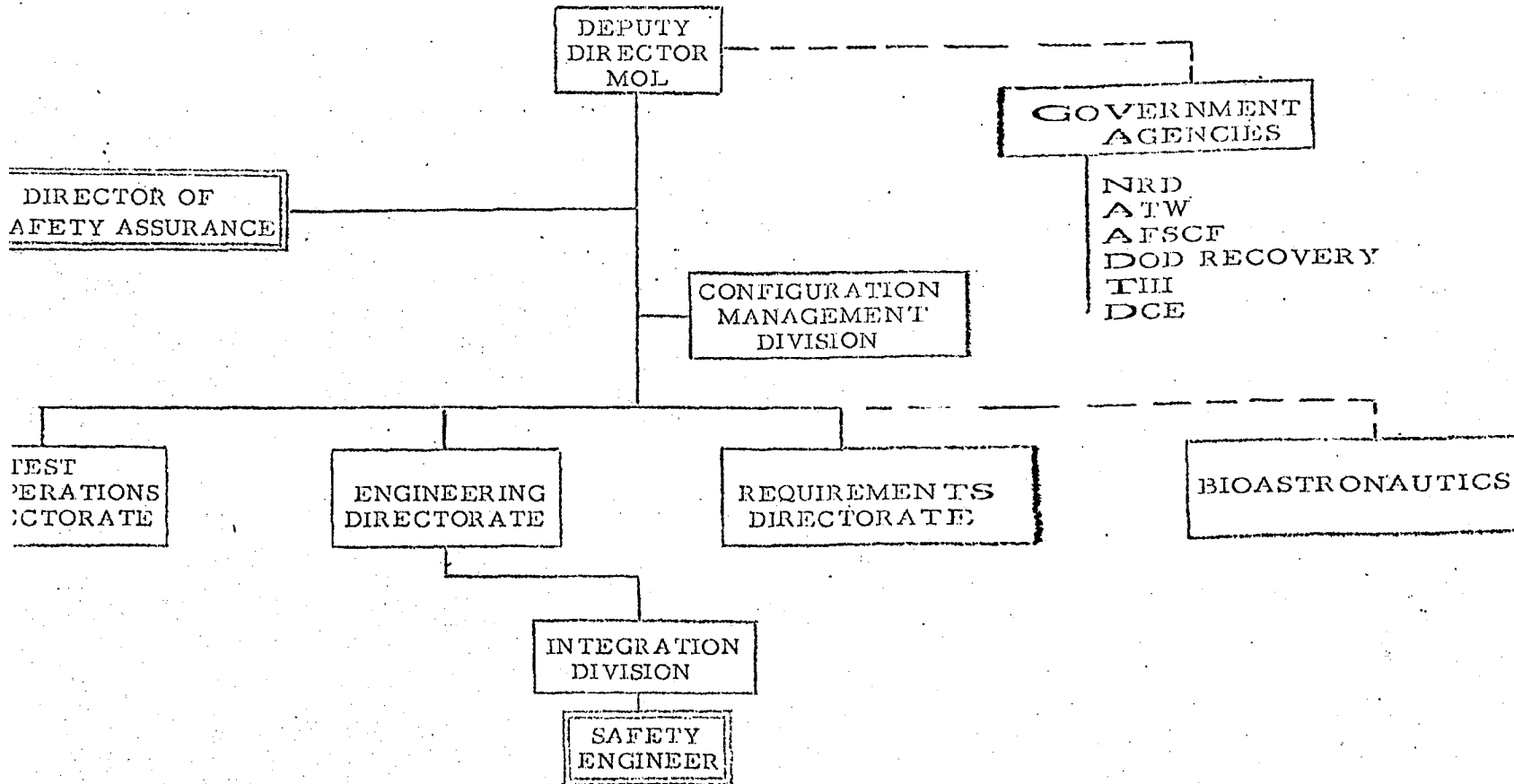
o PURPOSE TO:

/ SET REQUIREMENTS FOR INTEGRATED TOTAL PROGRAM

/ IDENTIFY ORGANIZATION RESPONSIBILITY FOR VARIOUS ACTIVITIES

/ IDENTIFY CONSISTENT SET OF LOWER TIER SAFETY DOCUMENTS

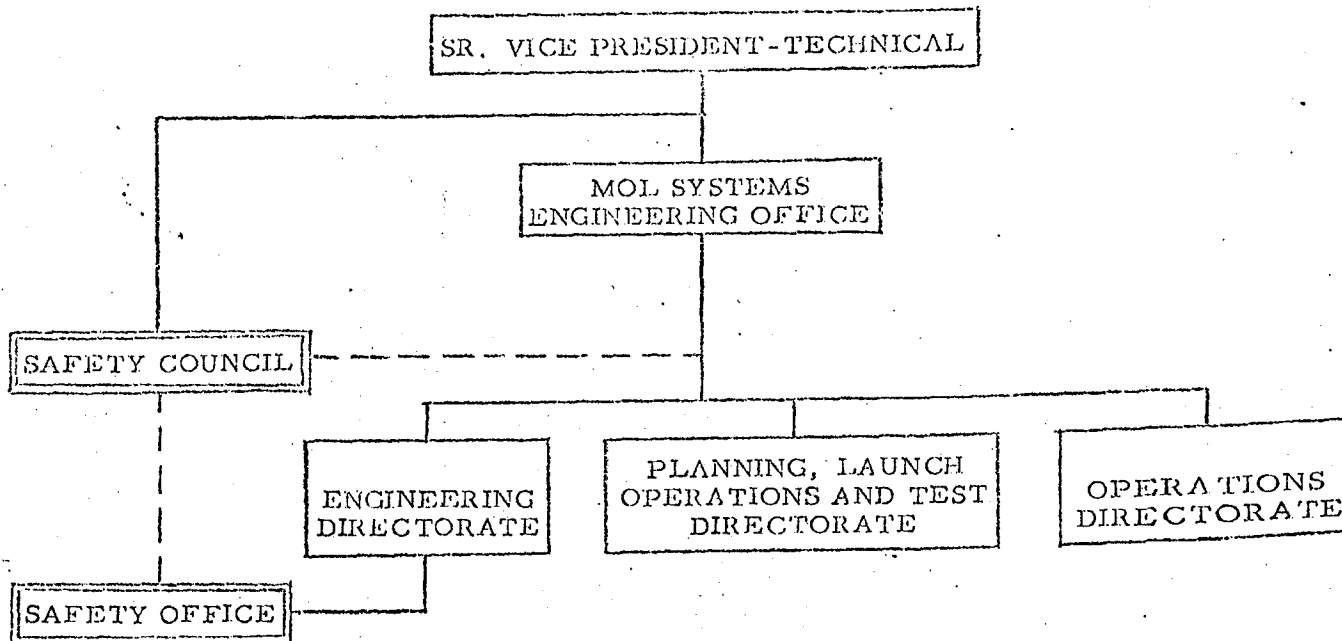
MOL SPO SAFETY ORGANIZATION







AEROSPACE CORPORATION  
MOL SAFETY ORGANIZATION





SYSTEM SAFETY GROUP

o EXECUTIVE COUNCIL

/ MEMBERSHIP

- o MOL SPO
- o TITAN III SPO
- o AEROSPACE CORPORATION

/ RESPONSIBILITY

- o SAFETY PROGRAM POLICY AND DIRECTION

o WORKING COUNCIL

/ MEMBERSHIP

- o MOL SPO
- o TITAN III SPO
- o 6595 ATW
- o HQ. USAF DIRECTORATE OF AEROSPACE SAFETY (AFIAS)
- o AEROSPACE CORPORATION
- o ASSOCIATE CONTRACTORS

/ RESPONSIBILITY

- o SAFETY PROGRAM AND REQUIREMENTS PLANNING
- o SAFETY PROGRAM SURVEILLANCE
- o PARTICIPATE IN ACCIDENT/INCIDENT INVESTIGATION

NOI

EVALUATION OF BROOKS AFB ACCIDENT



BROOKS AFB ACCIDENT

- o FATAL ACCIDENT OCCURRED IN EXPERIMENTAL LOW PRESSURE CHAMBER ON 31 JANUARY 1967
  - / EXPERIMENT - INFLUENCE OF NEAR PURE OXYGEN AT ONE-HALF ATMOSPHERE ON BLOOD FORMING ORGANS OF MAMMALS
  - / CHAMBER WAS AT 7.5 PSIA PURE OXYGEN
  - / TWO AIRMEN ENTERED CHAMBER TO FEED AND WATER THE RABBITS, REMOVE WASTE AND REPLACE PAPER LINING IN TRAYS
  
- o SIGNIFICANT EVENTS
  - / 0837 - AIRMEN WERE AT CORRECT PRESSURE WITH ACCESS TO TEST CELL
  - / 0846 - CREW CHIEF SAW FIRE
  - / 0847 - START CHAMBER DUMP ( 15 SECS)
    - o DOOR WAS OPEN IN 31-33 SECS FROM START OF FIRE
  - / 0851 - BOTH AIRMEN REMOVED

MOL

CONCLUSIONS OF INVESTIGATING BOARD

- o PROCEDURES DID NOT EXCLUDE EXCESSIVE FLAMMABLE SOLID MATERIALS FROM BEING USED ROUTINELY
  - / MOL POSITION - NEW MATERIALS SPECIFICATION WILL CONTROL
  
- o PROCEDURES DID NOT DEMAND EXCLUSION OF ALL POSSIBLE IGNITION SOURCES
  - / MOL POSITION - ACTIVELY REVIEWING AND CONTROLLING ALL POTENTIAL IGNITION SOURCES: PARTICULAR ATTENTION TO ELECTRICAL SYSTEM
  
- o TRAINING PRACTICES NOT SUFFICIENTLY FORMALIZED TO ASSURE STANDARDIZATION IN ACCOMPLISHMENT OF MAINTENANCE AND OPERATIONS
  - / MOL POSITION - ALL TESTING WILL BE COVERED BY FORMAL WRITTEN PROCEDURES
  
- o INADEQUATE TIME FOR SENIOR SCIENTIFIC SUPERVISORS TO PARTICIPATE DAILY IN THE PROGRAMS
  - / MOL POSITION - PROPER SENIOR LEVEL SUPERVISION WILL BE GIVEN TO ALL HAZARDOUS TESTING. IN GENERAL, MOL TESTS ARE NOT ROUTINE.



CONCLUSIONS OF INVESTIGATING BOARD (CONT'D)

- o GROUND SAFETY PROGRAM NOT AS HIGHLY DEVELOPED AS IT COULD BE  
/ MOL POSITION - MOL IS CURRENTLY STRENGTHENING GROUND  
SAFETY PROGRAM
  
- o EMERGENCY RESPONSE OF FIRE AND MEDICAL SERVICES WAS EXTREMELY  
FAST  
/ MOL POSITION - FIRE AND MEDICAL SERVICES REACTION TIMES  
AT BROOKS DEMONSTRATED THAT QUICK REACTION  
IS POSSIBLE AND SET PRACTICAL STANDARDS  
FOR MOL
  
- o FIRE PROBABLY RESULTED FROM A SPARK CAUSED BY STEPPING  
ON A TEFLON INSULATED ELECTRICAL LAMP CORD WHICH WAS ON  
A METAL FLOOR

TOP

S U M M A R Y

MOL

SUMMARY

- o IN GENERAL, MOL PROGRAM INCLUDED THE ELEMENTS  
REQUIRED FOR SAFETY
  - / DESIGN FEATURES
  - / PLANNING
  
- o HOWEVER, THE ACCELERATED REVIEW HAS IDENTIFIED  
SOME AREAS FOR IMPROVEMENT
  - / CORRECTING THESE WILL HAVE COST AND  
WEIGHT IMPACT
  - / WILL BE LATE SUMMER BEFORE ALL STUDIES  
ARE COMPLETE AND IMPACT IS KNOWN
  
- o THE SAFETY PROCEDURES, PLANS, ANALYSES AND STUDY ACTIVITIES  
WILL RESULT IN IDENTIFYING OTHER POTENTIAL HAZARDS
  - / DUE TO INCREASED EMPHASIS ON SAFETY
  - / DUE TO STRONGER SAFETY ORGANIZATIONS





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WHS-391  
Cy 1 of 2  
7 July 1967  
18 Pages

WIDEBAND DATA SYSTEM

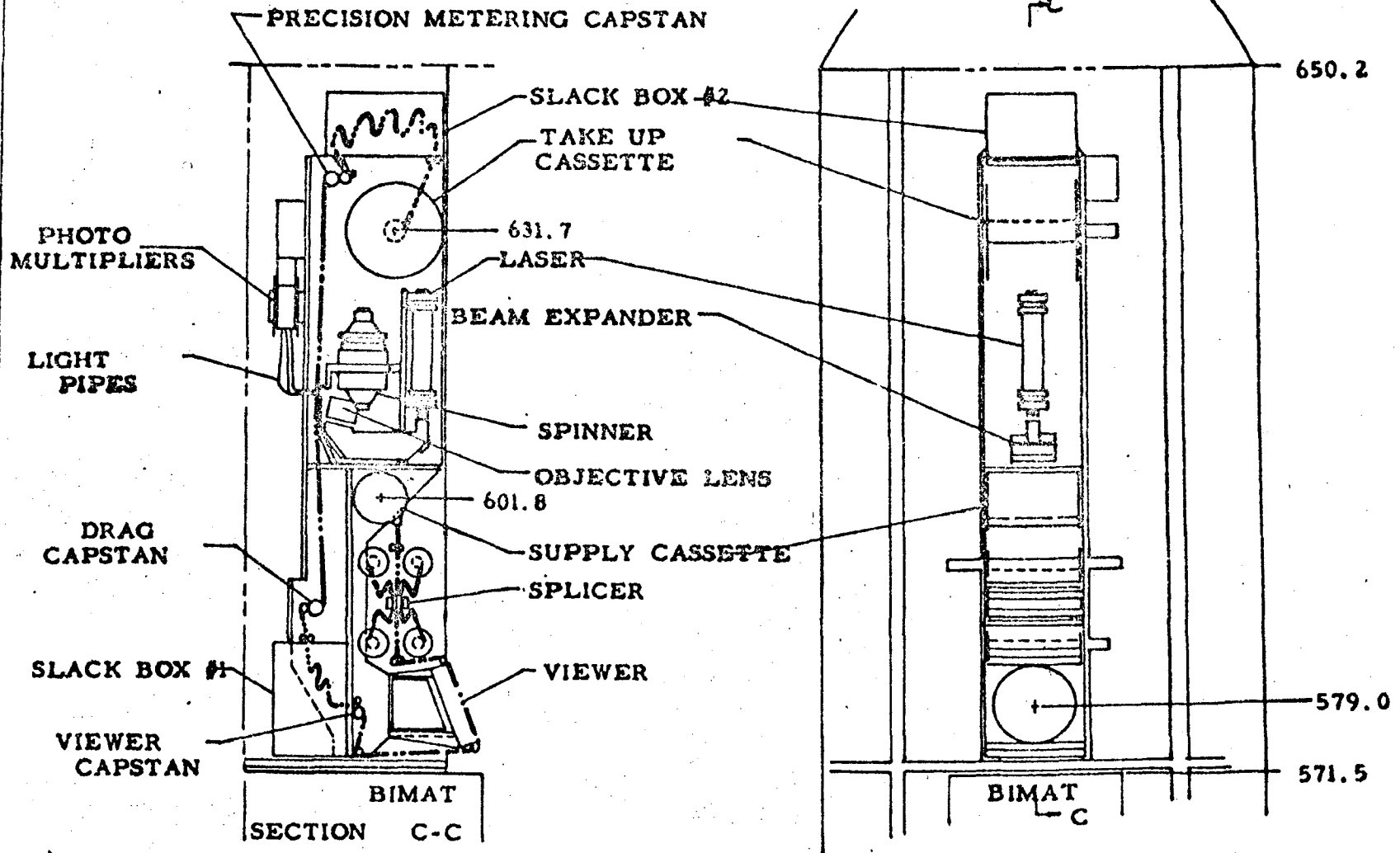
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~~SECRET~~ SPECIAL HANDLING



COMPONENT ARRANGEMENT FOR CASSETTE LOADING FROM BIMAT PROCESSOR


~~SECRET~~ SPECIAL HANDLING

BYC-06081-015

**D** ~~SECRET~~ SPECIAL HANDLING

WHS-391  
P. 3

PERFORMANCE PARAMETERS

<input type="radio"/>	TOTAL VIDEO BANDWIDTH	100	MHz
		50	MHz PER CHANNEL
<input type="radio"/>	TOTAL RF BANDWIDTH	600	MHz
<input type="radio"/>	FILM WIDTH SCANNED	4.5	IN.
		2.25	IN. PER CHANNEL
<input type="radio"/>	RESOLUTION		lp/mm
<input type="radio"/>	AREA SCAN RATE	100	IN/SEC
		0.371	IN/SEC
<input type="radio"/>	LINEAR FILM RATE		
<input type="radio"/>	SPINNER ROTATIONAL RATE	33,946	RPM

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1  
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BVC-66081-016

W15-391  
p.4

BTL SYSTEM DESCRIPTION

- o INTEGRAL COMMAND, TELEMETRY, AND VIDEO DATA TRANSMISSION SYSTEM
- o SATELLITE AUTOTRACK OF COMMAND SIGNALS, GROUND AUTOTRACK OF TELEMETRY SIGNALS, FULL BANDWIDTH SYSTEMS
- o COMMAND - 9.65 GHZ, TELEMETRY - 9.85 GHZ
- o TWO 300-MHZ VIDEO CHANNELS AT 10.85 GHZ AND 11.2 GHZ
- o 3-FOOT PARABOLIC ANTENNA - CASSEGRAIN FEED HORN DESIGN, 37 DB GAIN
- o TLM HAS FIVE DOWN LINK CHANNELS; CHANNEL A 960 BPS FOR BTL;  
CHANNEL B 500 BPS - VEHICLE TIME AND ROLL; CHANNEL C 1500 BPS;  
CHANNEL D 1500 BPS; CHANNEL E 1800 BPS FOR CBS
- o 19 COMMANDS/SEC - 72 POSSIBLE COMMANDS
- o GROUND STATION AT WHIPPANY, NEW JERSEY, 22 FT NIKE ZEUS ANTENNA,  
55 DB GAIN.
- o AIRBORNE WEIGHT 171 LB, PEAK POWER 296 WATTS

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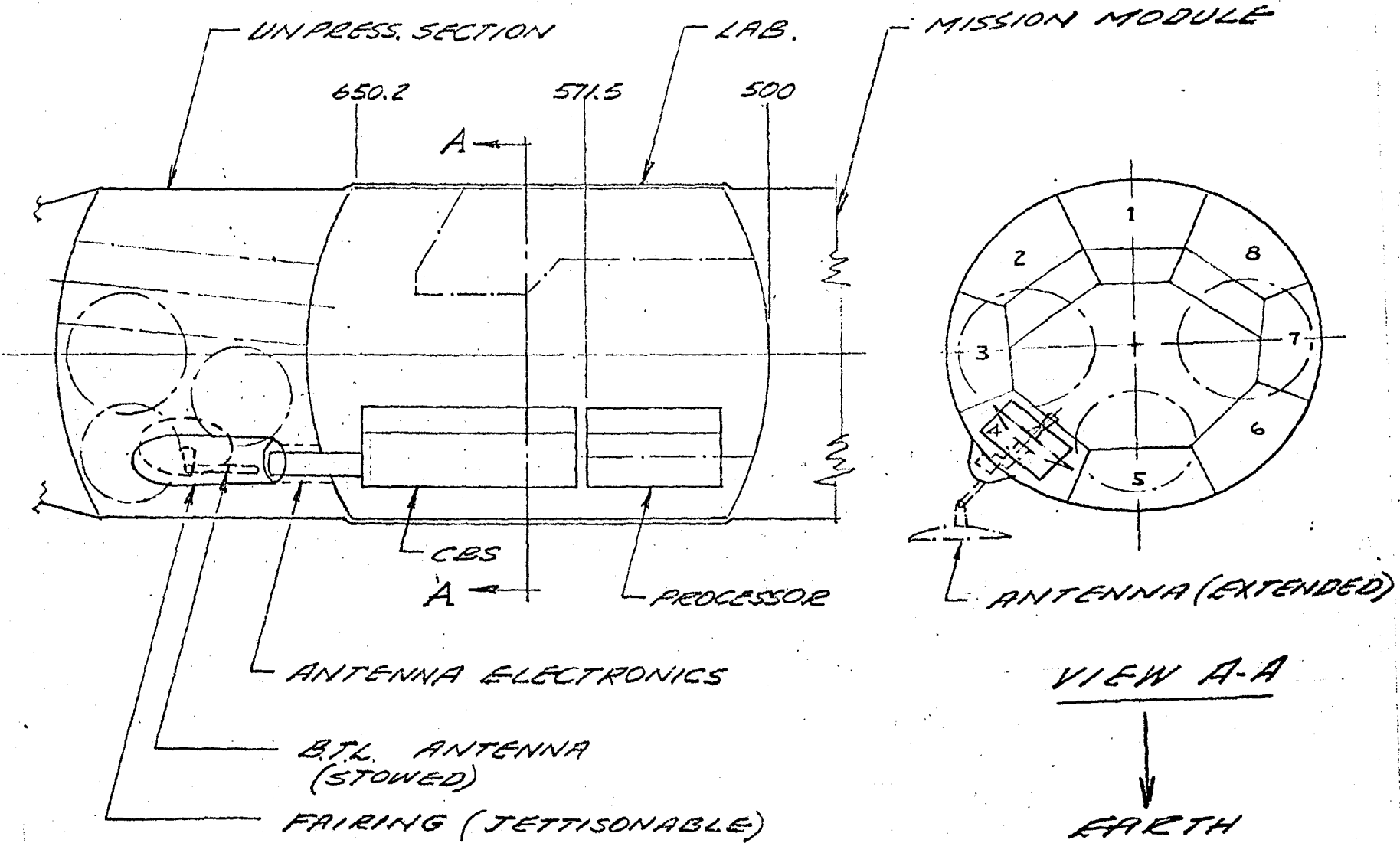
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HANDLE VIA BYEMAN SYSTEM ONLY

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BTL WIDE-BAND SYSTEM

DYU-00008101

WHS-391  
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EFFORT REQUIRED FOR WIDEBAND INCORPORATION  
(DACO)

- o SPACE PROVISIONS - RELOCATE EXISTING EQUIPMENT
  - UNPRESSURIZED COMPARTMENT
  - PRESSURIZED COMPARTMENT - TOP OF BAY 4
  - WIRE HARNESS & PLUMBING
  - RELOCATION OF UMBILICAL & ASSOCIATED AGE/FACILITY
  
- o STRUCTURAL PROVISIONS
  - BLOW OFF DOOR IN UNPRESSURIZED COMPARTMENT
  - BAY 4 SEALED ENCLOSURE
  - STRUCTURAL SUPPORTS
  
- o SUBSYSTEM MODIFICATION
  - INCREASE HELIUM CAPACITY
  - ADDITIONAL COLD PLATES
  - OVERBOARD DUMP VALVE
  - MONITOR & ALARM ADDITION
  - ADDITION TO ELECTRICAL DISTRIBUTION SYSTEM
  - T/M AND COMMAND ADDITIONS
  - INSTRUMENTATION
  
- o SYSTEM TESTING
  - EDCTU & QUAL TEST INCORPORATION
  - VAFB
  
- o SIMULATOR
  
- o AGE & FACILITY
  - INCORPORATION INTO SYSTEM AGE (ASTEAG)
  - WIDEBAND CHECKOUT LINK
  - FACILITY SPACE PROVISIONS

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BYE-6668 1-61

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W145-391

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WIDEBAND GROUND TEST

- o ASSUMED SECURITY GROUND RULE
  - THE FACT THAT MOL HAS WIDEBAND (X-BAND) ABOARD IS BLACK
- o EFFECTS AT VAFB & HB
  - THE WIDEBAND ANTENNA & ASSOCIATED EQUIPMENT CAN NOT BE VIEWED EXCEPT IN SECURE AREA
  - ALL AREAS & AGE EQUIPMENT ASSOCIATED WITH WIDEBAND MUST MEET SECURITY STANDARDS (FED. ST 222) PHYSICAL & ELECTRICAL
  - LEAKAGE/RADIATION FROM TESTS MUST BE ELIMINATED
- o IMPLEMENTATION AT VAFB
  - NO OPEN LOOP TESTING - NO CHECKOUT OF POINTING ACCURACY
  - CLOSED LOOP VIA "DISGUISED" WAVE GUIDE TO AGE BUILDING
  - SECURE AREA IN AGE BUILDING - 2 NEW ROOMS
  - ELECTRICAL AGE BUILT TO SECURITY REQUIREMENTS - NEW AGE DESIGN
  - DATA SENT TO LAUNCH CONTROL CENTER MUST BE CRYPTO
- o NOT FEASIBLE TO HIDE X-BAND CAPABILITY AND DO SYSTEM TESTING

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WHS-391  
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DACO WIDEBAND INSTALLATION

(COST IN MILLIONS)

BASIS	FY 67	FY 68	FY 69	FY 70	FY 71	FY 72	TOTAL
ECP 44 & 45	.279	.979	3.040	3.145	1.378		9.889
05	.086	.574	.443	.179	.071	.051	1.406
TOTAL	.365	1.553	3.483	3.324	1.449		11.295

NOTE: DACO ESTIMATES 20% INCREASE FOR TOTAL AND FY 68 COSTS

~ \$1.9M FY 68

~ \$13.5M TOTAL

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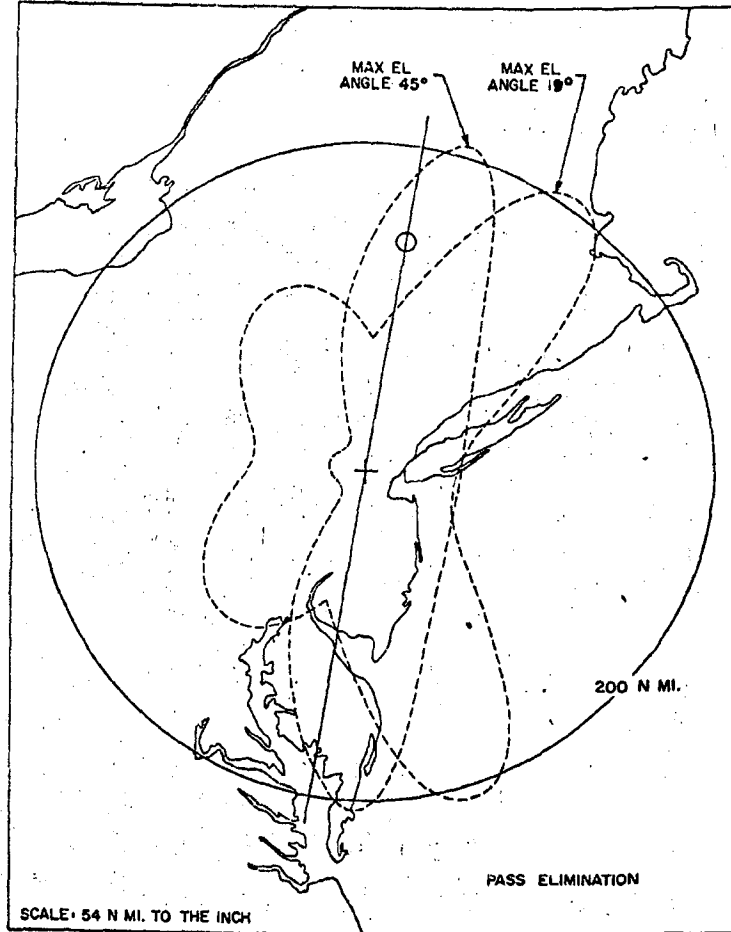
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PROGRAM \_\_\_\_\_

SEQUENCE NO. \_\_\_\_\_

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V.G. No. \_\_\_\_\_

1  
~~(D) SECRET-SPECIAL HANDLING~~

BYE-6668-1-61

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p. 10

SYSTEM PARAMETERS NEEDING DEFINITION  
FOR DATA LINK

- o NEED FOR INTEGRAL TELEMETRY AND COMMAND SYSTEM VERSUS SGLS
- o USE OF WHIPPANY STATION VERSUS NEW LOCATION
- o DEVIATION FROM SP/DR ON REDUNDANCY RULE
- o POWER PROGRAMMING
- o SIDELobe NOISE INJECTION
- o NEED FOR REAL-TIME COMMAND CAPABILITY
- o USE OF AUTOTRACK STEERING VERSUS COMPUTER COMMAND SYSTEM

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BYE-4440 / W1

WHS-391

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REQUIREMENTS DEFINITION NEEDED

- o OPERATIONAL SYSTEM VERSUS CAPABILITY DEMONSTRATION
- o MOL-PECULIAR SYSTEM VERSUS BEING SELF-CONTAINED FOR USE ON OTHER PROGRAMS
- o NEW STATIONS, IF ANY, WITH SGLS OR WITHOUT
- o INTERCEPTABLE RADIATION CONTAINED WITHIN CONUS
- o SECURITY RULING RELATIVE TO WIDEBAND ANTENNA ON MOL
- o MANAGEMENT RESPONSIBILITY FOR WIDEBAND SYSTEM

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WIDEBAND SCHEDULE

ATP	1 AUGUST 1967
TRADE STUDIES BTL	1 AUGUST 1967 TO 15 SEPT. 1967
INTERFACE DEFINITION	15 OCTOBER 1967
MOCKUP	12 FEBRUARY 1968
EDCTU	12 JUNE 1968
LMQTV	1 MAY 1969 (DAC 1 MARCH 1969)
MASS SUBSTITUTES	
STV	26 SEPTEMBER 1968
FLIGHT #2	24 APRIL 1969
FLIGHT #3	23 OCTOBER 1969
FLIGHT #4	18 MARCH 1970
FLIGHT #5	30 JULY 1970

~~D SECRET SPECIAL HANDLING~~

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p.13

ACTIONS REQUIRED TO IMPLEMENT WIDEBAND CAPABILITY  
ASSUMING 1 AUGUST ATP

SPO

- o ATP TO SPO 7 JULY
- o PREPARE RFP PACKAGE TO CONTRACTORS 7 AUGUST

BTL

- o REQUIREMENTS DEFINITION 1 AUGUST
- o HIGH LEVEL CONTACT 2 AUGUST
- o RFP ISSUED 14 AUGUST
- o PROPOSAL SUBMITTAL 14 SEPTEMBER

CBS

- o RFP ISSUED 14 AUGUST
- o PROPOSAL SUBMITTAL 14 SEPTEMBER

DACO

- o CCN ISSUED FOR SCHEDULE CRITICAL ITEMS 14 AUGUST
- o REVISED ECP REQUESTED 1 AUGUST

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ST-2088

HANDLE VIA BYEMAN SYSTEM ONLY

BVE-6608161

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~~(D) SECRET-SPECIAL HANDLING~~

ROM COST SUMMARY

	<u>PROGRAM TOTAL</u>		<u>FY 68</u>	
	<u>JANUARY</u> (CONTRACTOR)	<u>(ADJUSTED)</u>	<u>CURRENT</u>	<u>CURRENT</u>
BTL	4.25	4.25	20.0	3.5
CBS	6.25	13.75	19.45	5.0
DAC	<u>4.5</u>	<u>7.0</u>	<u>13.5</u>	<u>1.6</u>
	15.0	<u>25.0</u>	53.0	10.1

~~(D) SECRET-SPECIAL HANDLING~~

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BTL ESTIMATE ORIGIN

- o BTL PREVIOUS PROGRAM ESTIMATE 15.0M  
(3 FLIGHT ARTICLES- ONE SET OF AGE) 3-YEAR PROGRAM
- o TWO ADDITIONAL FLIGHT ARTICLES - ONE DAC QUAL TEST, 2.0M  
ONE CBS/BTL ENGINEERING TEST UNIT
- o TWO ADDITIONAL SETS OF AGE - ONE FOR DAC, ONE RETAINED AT BTL 1.0M
- o ONE YEAR ADDITIONAL TEST SUPPORT 1.0M
- o FIELD SUPPORT FOR REMOTE TESTING 1.0M
- 20.0M

~~(D) SECRET-SPECIAL HANDLING~~

ST-2085

HANDLE VIA SYEMAN SYSTEM



BYE-6000101  
WH5-391  
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~~D~~SECRET SPECIAL HANDLING

STATUS WIDEBAND INCORPORATION

- o SEPT - DEC. 1966 STUDY ON MOL WIDEBAND SYSTEM CBS-BTL DAC
- o JAN. 1967 WASHINGTON BRIEFING  
FULL PROVISION FOR SYSTEM
- o FEB. 1967 DAC - MODIFY SCHEDULE CRITICAL ITEM  
START FULL INCORPORATION
- o MAY 1967 WASHINGTON BRIEFING  
SPACE PROVISIONS ONLY
- o MAY 1967 DAC - STOP EFFORTS ON FULL INCORPORATION  
- SPACE PROVISION ONLY  
- SUBSYSTEMS RETURN TO PRE-WIDEBAND BASELINE
- o JUNE 1967 DAC - SUBMITS FULL INCORPORATION ECP  
- PARTIALLY INVALID  
STOP WORK ORDER  
CHANGES IN ASSOCIATE DESIGNS  
CHANGE IN SCHEDULE  
- ATP OF 1 AUGUST  
FLY ON FLIGHT #3  
SYSTEM TESTING  
MINIMUM RETESTING EFFORT  
ASSOCIATES ALSO ON CONTRACT  
INCREASED \$ - OVERTIME TO MAKE UP TIME

~~D~~SECRET SPECIAL HANDLING

ST-2075

HANDLE VIA BYEMAN SYSTEM ONLY

1  
~~(D) SECRET-SPECIAL HANDLING~~

BYE-66687-67

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PROPOSED TRW SYSTEM DESCRIPTION.

- o CONCEPT BASED ON REAL-TIME SGLS LINK FOR COMMAND AND TELEMETRY
- o GROUND STATION IN NEW HAMPSHIRE NEAR BOSTON SGLS STATION
- o 30-FOOT GROUND DISH SERVO SLAVED TO 60-FOOT SGLS DISH
- o HIGH NOISE RECEIVER (NON-CRYOGENIC)
- o AIRBORNE SYSTEM
  - PHASED ARRAY PSEUDO OCTAGON, 36 IN. DIA. x 4 IN. THICK
  - 912 EQUALLY SPACED, CAVITY BACKED, EQUAL ANGLE SPIRALS WITH > 34 DB GAIN
  - AUTOTRACK 8.4 GHZ GROUND SIGNAL
  - NOISE INJECTION FOR SIDELOBE SUPPRESSION
  - 8.0 TO 8.8 TWO-BAND, 300 MHZ VIDEO TRANSMISSION
  - BEAM WIDTH 2.4°, TRACKING ACCURACY ± 0.24°
- o PROPOSED WEIGHT 60 LB, PEAK POWER 35 WATTS

~~(D) SECRET-SPECIAL HANDLING~~

ST-2068

HANDLE VIA BYEMAN SYSTEM ONLY

~~SECRET~~

SPECIAL HANDLING

JDW 7-5-67  
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SUMMARY OF TRW COST PROPOSAL ADJUSTMENTS

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DOLLARS IN THOUSANDS

	<u>TRW</u>	<u>Δ ADJUSTMENT</u>	<u>TOTAL ADJUST</u>
1. PROJECT MANAGEMENT	\$ 710	\$ 135	\$ 845
2. DESIGN & DEVELOPMENT	1,517	--	1,517
3.1 FAB, ASSY, TEST SC, EQUIPMENT	1,831	1,100	2,931
3.2 FAB, ASSY, TEST SC, GRD STA EQUIP	870	--	870
3.3 FAB, ASSY, TEST SPACECRAFT, AGE	945	315	1,260
4. SPECIAL TOOLS & TEST EQUIPMENT	175	--	175
5. QUALIFICATION TESTS	125	100	225
6. ACCEPTANCE TESTS (WITH 3)	--	--	--
7. QUAL ASSURANCE	240	0	240
8. RELIABILITY	175	0	175
9. DOCUMENT	50	100	150
SUBTOTAL	\$6,638	\$1,750	\$ 8,388
FEE	697	190	887
SUBTOTAL	\$7,335	\$1,940	\$ 9,275
GROUND ANTENNA, INSTALLATION & CHECKOUT O&M	1,348	--	1,348
SUBTOTAL	\$8,683	\$1,940	\$10,623
COST ESCALATION & SCHEDULE	--	1,377	1,377
TOTAL	\$8,683	\$3,317	\$12.0M

RECAP

TRW				SPO	
SPACECRAFT + GROUND STATION = TOTAL	FY 68			TOTAL	FY 68
5,544 + 3,139 = 8,683	785			12.0	4.0

~~SECRET~~

SPECIAL HANDLING

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| SPECIAL HANDLING

COMPARISON  
OF  
BASELINE PROCESSOR  
AND  
HEALTH CHECK PROCESSOR

SECRET

D ~~SECRET~~ SPECIAL HANDLING

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HEALTH CHECK & BASELINE PROCESSORS

ELIMINATION OF READOUT WOULD DELETE THE REQUIREMENT FOR A "PRODUCTION" PROCESSOR WITH ONLY THE HEALTH CHECK REQUIREMENT REMAINING. THEREFORE A PRELIMINARY INVESTIGATION WAS INITIATED WITH THE CONTRACTOR TO DEFINE A PROCESSOR TO SUPPORT THE FOLLOWING HEALTH CHECKS:

OPTICAL ALIGNMENT

SMEAR TESTS (IMC)

INITIAL FOCUS

CAMERA/VISUAL OPTICS BORFSIGHTING

THROUGH FOCUS CHECK

CAMERA OPERATION & SEQUENCING

~~SECRET/SPECIAL HANDLING~~

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3

~~SECRET/SPECIAL HANDLING~~

PROCESSOR COMPARISON

	<u>BASELINE</u>	<u>HEALTH CHECK</u>
SIZE	54 x 28 x 18	15" x 28" x 18"
WEIGHT	193# (60# Bimat)	100# Initial Est. (15# Bimat)
AVERAGE POWER	90W	60W
FILM CAPACITY	1270'	300'
WARM-UP	10 Minutes	Zero
PROCESSING & DRYING TIME 20' BATCH	62.4 Minutes	69.4 Minutes
TOXICANTS & MOISTURE TO LAB	None	Acceptable (For Health Check Amounts Only)
PROCESSING TEMPERATURE	Controlled	Variable
SENSITOMETRIC QUALITY	Uniform	Temperature Dependent
PROCESSOR OPERATION & CONTROL	Mostly Automatic	Mostly Manual
PRESENT DEVELOPMENT/TESTING	All Applicable	Some New
PRESENT STATUS	Spec. PDR Complete Design Layout 50% Complete	Concept Only
CAPABILITY	Health Check + Intelligence Function	Health Check Only

~~SECRET~~

SPECIAL HANDLING

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4

~~SECRET/SPECIAL HANDLING~~

CONCLUSIONS

1. THE HEALTH CHECK PROCESSOR CANNOT BE EASILY UPGRADED TO SUPPORT READOUT OR OTHER INTELLIGENCE FUNCTIONS.
2. BASELINE PROCESSOR CAN BE OFF LOADED FOR A HEALTH CHECK MODE.
3. NO SIGNIFICANT COST SAVING ASSOCIATED WITH HEALTH CHECK PROCESSOR.
4. HEALTH CHECK PROCESSOR PROVIDES MODEST WEIGHT AND ELECTRICAL POWER SAVINGS.

~~SECRET~~

SPECIAL HANDLING

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BYC-0000' <sup>u</sup> <sub>cy</sub> 1



~~SECRET-SPECIAL HANDLING~~

MISSION PLANNING AND EVALUATION SOFTWARE

- THE MISSION PLANNING SOFTWARE IS THAT GROUND-BASED SOFTWARE WHICH WILL MANIPULATE THE DORIAN TARGET DECK TO SCHEDULE TARGET ACQUISITION AND PHOTOGRAPHY IN AN OPTIMUM MANNER
  
- THE MISSION CORRELATION SOFTWARE IS THAT GROUND-BASED SOFTWARE WHICH WILL PROVIDE FOR CORRELATION OF ACTUAL CAMERA ACTIVITY WITH RESULTING PHOTOGRAPHS



*Bye 66687-01*

~~SECRET-SPECIAL HANDLING~~



## MISSION PLANNING & EVALUATION (MP&E) REVIEW

- CURRENT STATUS
- REQUIREMENTS BACKGROUND
- MP&E INTERFACES
- PROPOSAL EVALUATION BOARD REVIEW

*BYE-06087-01*  
~~SECRET-SPECIAL HANDLING~~



### CURRENT STATUS OF MP/E

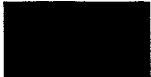
- REQUEST SECRETARIAL AUTHORITY TO PROCEED INTO NEGOTIATIONS IMMEDIATELY AS PER WIRE FROM COL HERAN TO GEN STEWART, 29 JUNE 1967
- PROPOSAL EVALUATION BOARD ACTION COMPLETED 13 MARCH 1967
- EXTENSION PERIOD ON PROPOSALS RUNS OUT 15 JULY 1967
- SELECTED CONTRACTOR HAS BEEN ASKED TO UPDATE HIS PROPOSAL ON BASIS OF REVISED WORK STATEMENT-- DUE 7 JULY 1967
- FURTHER SLIP GREATLY ENDANGERS ACHIEVEMENT OF INTEGRATED SOFTWARE PACKAGE FOR MOL

HANDLE VIA BYEMAN SS

BYE-66687-01

(D)(G) ~~SECRET-SPECIAL HANDLING~~

ADVANCES IN SYSTEM FLEXIBILITY

- CHARACTERISTICS OF PAST SYSTEMS
  - MIRROR HAD DISCRETE PITCH AND ROLL POSITIONS
  - SCORE FOR A PHOTOGRAPH WAS A DISCRETE FUNCTION
  - SCORE BASED ON PRIORITY AND OBLIQUITY AS VARIABLES
  - PHOTO PARAMETERS SENT TO 
- CHARACTERISTICS OF THE DORIAN SYSTEM
  - MIRROR POSITION IS CONTINUOUS IN PITCH AND ROLL
  - SCORE IS NOW A CONTINUOUS FUNCTION



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~~SECRET-SPECIAL HANDLING~~

ADVANCES IN SYSTEM FLEXIBILITY

(CONT'D)

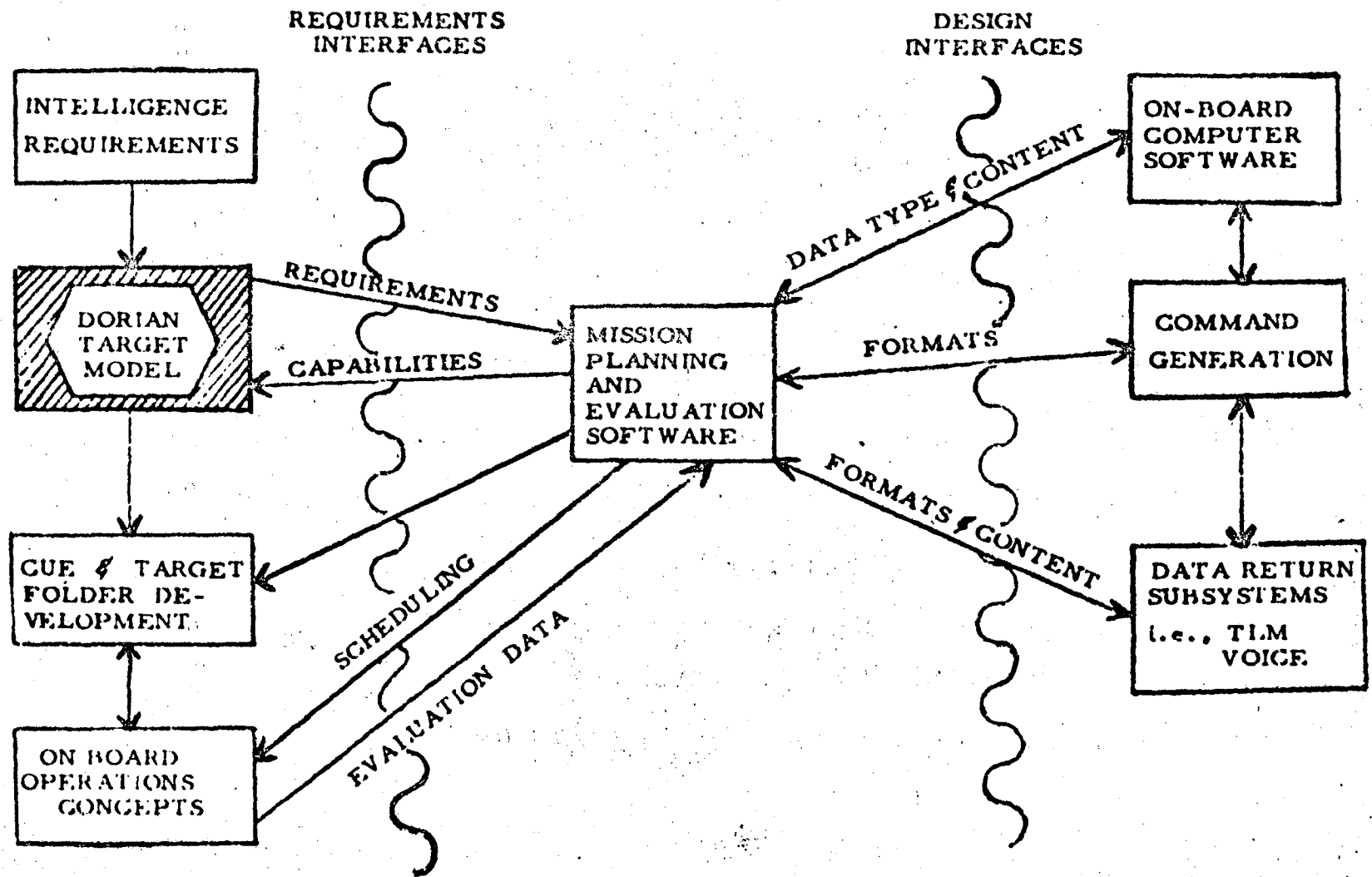
- SCORE IS A FUNCTION OF FOUR VARIABLES:  
PRIORITY, OBLIQUITY, MEAN ASPECT ANGLE,  
AND STEREO CONVERGENCE ANGLE
- ON-BOARD COMPUTATION OF PHOTO PARAMETERS
- INTERLEAVING CAPABILITY NOW PRESENT
- ACQUISITION AND TRACKING SCOPES HAVE TO  
BE SCHEDULED EFFICIENTLY

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~~SECRET-SPECIAL HANDLING~~

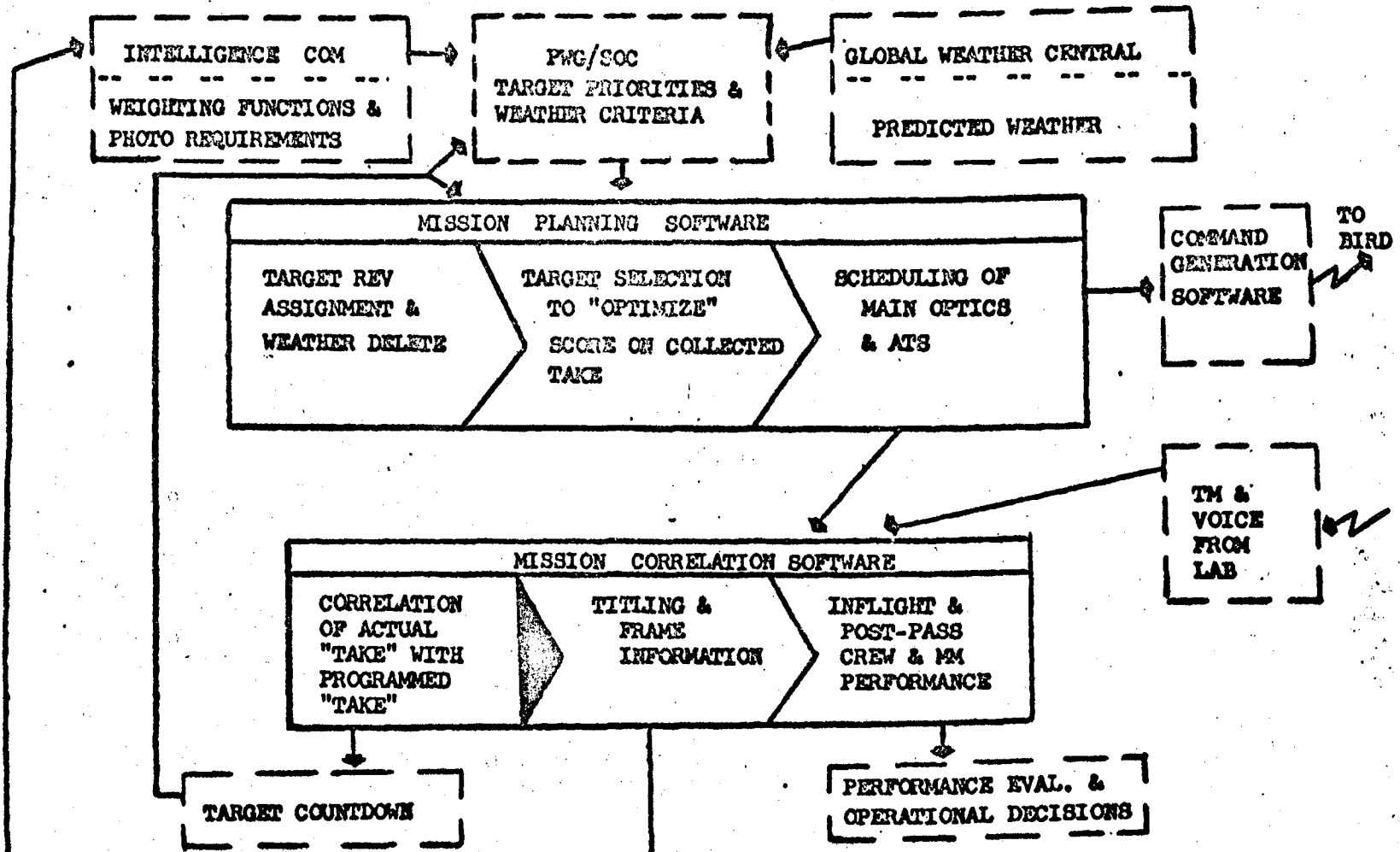
### MP & E DEVELOPMENT PHASE INTERFACES



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(D) SECRET-SPECIAL HANDLING

MISSION PLANNING AND MISSION CORRELATION SOFTWARE



(D) SECRET-SPECIAL HANDLING

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PROPOSAL EVALUATION BOARD MEMBERS

J P O'TOOLE, PRESIDENT

D B COLEMAN

L G STANGE

H J MARKER

R VOYLES

L MACLEAY

J R PIXTON

L L GOOCH, RECORDER

~~SECRET-SPECIAL HANDLING~~

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TECHNICAL ADVISORY GROUP MEMBERS

K SMITH

C TONIES

A HALENBECK

D LÜDERS

R HANSEN

J ALDER

M SHUCART

H KARRENBERG

D THOMPSON

C WINSLOW

R GEDDES

~~SECRET-SPECIAL HANDLING~~





BYE-66681 41 3

MOL

CONCLUSIONS AND RECOMMENDATIONS

- REQUEST AUTHORITY TO PROCEED IN NEGOTIATING WITH TRW FOR THE DEVELOPMENT THROUGH MS-5 OF MP&E SOFTWARE
- DEFER MAINTENANCE UNTIL COMPLETION OF DEVELOPMENT PHASE
- A STUDY PERIOD SHOULD BE INITIAL PHASE OF CONTRACT TO INCORPORATE ALREADY KNOWN IMPROVEMENTS TO ALGORITHM
- EFFORT SHOULD BE NEGOTIATED IN ACCORDANCE WITH FOLLOWING SCHEDULE

~~SECRET-SPECIAL HANDLING~~

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Int. Cont. Dissem. Control

~~SECRET~~

BYE-000081-21

MOL

DECISION REQUESTED

- ADEQUATE FUNDING FOR PROCUREMENT OF THIS SOFTWARE IS CURRENTLY CARRIED IN THE BLUE BOOK
- REQUEST AUTHORITY TO PROCEED IN PROCUREMENT OF THIS CRITICAL SOFTWARE PACKAGE

~~SECRET~~

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COMPARISON OF HAWAII VS. WAKE-MIDWAY  
FACILITIES FOR RECOVERY  
SUPPORT  
(UNEQUAL)

	WAKE-MIDWAY/ASCENSION	HAWAII/ASCENSION
MISSION OPERATIONS	DAYLIGHT LANDING OPPORTUNITY EACH 12 HOURS	DAYLIGHT LANDING OPPORTUNITY VARYS DEPENDING ON ORBIT CHARACTERISTICS (15 HRS/6 HRS IN SAMPLE CASE)
S/C LOITER REQUIREMENTS	14 HOURS PER CURRENT SPEC.	SUFFICIENT AVAILABLE (17 HRS FOR CASE STUDIED) REDUCES SOME BACKUP REDUNDANCY
ISLAND PAIRS AVAILABLE FOR POSSIBLE HELO OPERATIONS	YES WAKE-MIDWAY ASCENSION-ST. HELENA	NO
SEA & AIR TRAFFIC	LIGHT	HEAVY
AIRCRAFT RANGE FROM BASE TO MOST DISTANT POINT IN FENCE	FENCE SPLIT BETWEEN WAKE-MIDWAY ≈ 550 NM FENCE CENTERED ON WAKE ≈ 750 NM	HICKAM AFB ≈ 1100 NM HAWAII ≈ 1000 NM
WEATHER STATISTICS FOR RECOVERY	STATISTICAL WEATHER ACCEPTABLE ENTIRE YEAR	STATISTICAL WEATHER DATA INDICATES POSSIBLE LIMITATIONS DURING WINTER MONTHS

22  
12/

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OPERATIONAL SUITABILITY  
OF  
WAKE-MIDWAY FACILITIES

QUOTED FROM SURVEY TRIP REPORT OF PACIFIC ISLAND FACILITIES  
FOR APOLLO RECOVERY BY CTF 130 TEAM. (NOVEMBER 1966).

"FROM THE STANDPOINT OF PHYSICAL CAPABILITIES, NO  
PROBLEMS WERE ENCOUNTERED WHICH WOULD AFFECT  
THE UTILIZATION OF THESE BASES\* FOR APOLLO SUPPORT  
EXCEPT WAKE ISLAND. DURING THE PERIOD 1 APRIL  
THROUGH 30 JUNE 1967, THE RUNWAY AT WAKE WILL BE  
CLOSED DURING DAYLIGHT HOURS FOR RESURFACING".

\*MIDWAY, WAKE, JOHNSTON, KWAJALEIN, SAMOA

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~~CONFIDENTIAL~~

CONCLUSIONS

- O PRESENT GEMINI "B" SYSTEM DESIGN HAS SUFFICIENT LOITER TIME CAPABILITY TO UTILIZE THE HAWAII - ASCENSION RECOVERY FENCE CONFIGURATION
  
- O FROM RECOVERY STANDPOINT EXACT FENCE LOCATION DECISION NEED NOT BE MADE UNTIL APPROXIMATELY 1 MONTH PRIOR TO MISSION

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TALK SECOND POINT

BYEMAN  
Cy 1

G (~~D~~) ~~SECRET~~ - SPECIAL HANDLING

WFS-122  
Cy. 1  
Pages: 15  
7 July 1967

THIS BRIEFING CONTAINS BOTH DORIAN  
AND GAMBIT MATERIAL

ACTIVE TARGET SIMULATION  
VALIDATION EXPERIMENT

Harry Bernstein

G (~~D~~) ~~SECRET~~ - SPECIAL HANDLING

HB-1121

**EXCLUDED FROM AUTOMATIC  
REGRADING: DOD DIR 5200.10  
DOES NOT APPLY**

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15

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WFS-122  
Page 2

BACKGROUND

⊙ 5 JANUARY 1967 SIMULATION PRESENTATION

- MAINSTREAM OF SIMULATION TO UTILIZE TWO-DIMENSIONAL  
STIMULUS MATERIAL OBTAINED FROM G/G<sup>3</sup> FLIGHTS
- USE OF AIRCRAFT, 3-D MODELS NOT ADVOCATED AS A PART  
OF MAINSTREAM SIMULATION
  - ⊙⊙ STIMULUS REALISM
  - ⊙⊙ SCALING PROBLEMS
  - ⊙⊙ SAMPLE SIZE
  - ⊙⊙ FACILITY REQUIREMENTS
  - ⊙⊙ COST & SCHEDULES

⊙ QUESTION POSED

- CAN A LIMITED AIRCRAFT SIMULATION BE PERFORMED TO  
VALIDATE THE MAINSTREAM 2-D SIMULATION?
  - ⊙⊙ TARGET CONTRAST
  - ⊙⊙ RESOLUTION LIMITS OF 2-D STIMULUS
  - ⊙⊙ EFFECTS OF COLOR  
ETC.

(D, G) ~~SECRET~~-SPECIAL HANDLING

HB-1122

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~~(D) SECRET - SPECIAL HANDLING~~

BRIEFING OUTLINE

- PRESENT APPROACH TO SIMULATION FIDELITY
  - CONTRAST SETTING
  
- LIMITED AIRCRAFT VALIDATION PROGRAM
  - ANALYSIS
  - RECOMMENDATION

~~(D) SECRET - SPECIAL HANDLING~~

HB-1123

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SPECIAL HANDLING

# TELESCOPE SIMULATOR

PHOTOGRAPHS OF SIMULATOR

*[Faint handwritten notes]*

SPECIAL HANDLING

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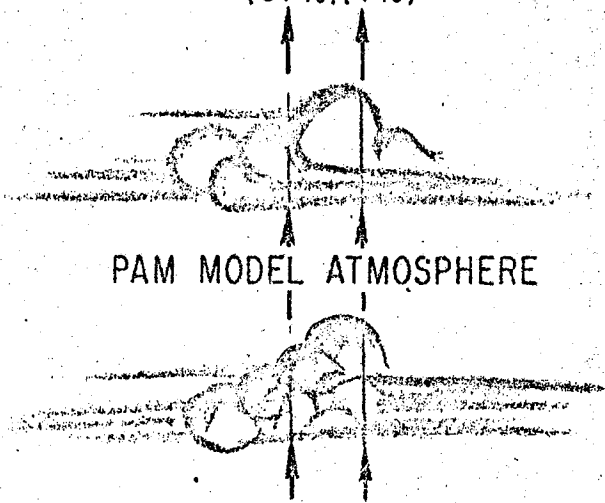
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CONTRAST

SPECIAL HANDLING  
CONTRAST

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Page 5

PREDICTED BRIGHTNESS

(37%)(4%)

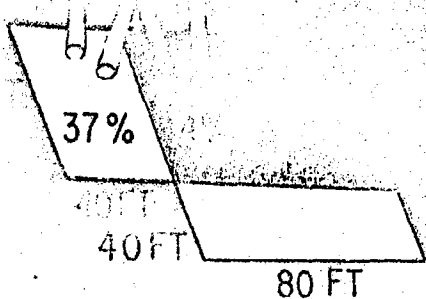


(37%)(4%) DENSITY OF NEGATIVE



MEASURED BRIGHTNESS (37%)(4%)

PHOTOGRAPHIC CAMERA



(D, G) ~~SECRET~~-SPECIAL HANDLING

SIMULATOR ILLUMINATION/CONTRAST PARAMETERS

ILLUMINATION LEVEL  $\approx$  3 TO 25 FT LAMBERTS

CONTRAST CALIBRATION (37%/4% TARGETS)

TARGET NO.	BRIGHTNESS RATIO						
	GROUND		ORBITAL			SIMULATOR	
	Photometer	Camera	PAM Predicted* (Photometer Input)	"G" Camera Contractor	SPPF	Primary	Secondary
1	6.2	7.8	3.1	2.4	3.0	1.8	2.5
2	6.0	8.2	3.1	2.8	3.1	1.6	1.8
3	6.9	10.7	3.4	2.7	2.8	2.7	2.9
4	---	16.6	---	2.5	2.7	2.0	2.6
AVAILABLE DATA POINTS							
	11	41	11	45	77	15	15

\* CONSIDERS ONLY VERY LIGHT HAZE

(D, G) ~~SECRET~~-SPECIAL HANDLING

HB-1089

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EFFECT OF PHOTO PROCESSING/USE OF FLOODING LIGHT

• GENERAL

- PHOTO CONTRAST  $\approx \left(\frac{X_1}{B}\right)^\gamma$

$X_1$  = ILLUMINANCE OF ANY OBJECT

B = BACKGROUND ILLUMINANCE

$\gamma$  = ENHANCEMENT RATIO

- IN SIMULATOR DESIRE  $\frac{X_1^\gamma + Q}{B^\gamma + Q} = \frac{X_1}{B}$  ;  $\frac{X_2^\gamma + Q}{B^\gamma + Q} = \frac{X_2}{B}$  ; ETC.

Q = FLOODING LIGHT ILLUMINANCE

- POSSIBLE ONLY IF  $X_1 = X_2 = X_i$  (i. e., POSSIBLE ONLY FOR ONE OBJECT/BACKGROUND CONDITION) OR  $\gamma = 1$  (i. e., Q = 0, NO FLOODING LIGHT REQUIRED)

• REPRESENTATIVE CASE FOR  $\gamma = 2$  (PRESENT GAMBIT MATERIAL)

	<u>EDGE TARGET</u>	<u>ARBITRARY TARGET</u>
ACTUAL/DESIRED	3:1	1.5:1
GAMBIT PHOTO	9:1	2.25:1
FLOODLIGHT ILLUMINATION	+3	+3
SIMULATED CONTRAST	12:4 = 3:1	5.25:4 = 1:31:1



(D, G) ~~SECRET~~ - SPECIAL HANDLING

CF-122  
Page 8

CONCLUSIONS - PRESENT APPROACH TO CONTRAST SETTING

- USE OF  $\gamma \neq 1$  MATERIAL AND FLOODING LIGHT CANNOT RESULT IN PROPER RENDITION OF TONAL VALUES OVER ENTIRE SCENE
  - HIGH CONTRAST EDGE TARGETS USED TO SET FLOODING LIGHT
    - OBJECTS OF LOWER ILLUMINANCE/ CONTRAST HAVE LOWER THAN ACTUAL CONTRAST AGAINST BACKGROUND
    - APPROACH VERY CONSERVATIVE - YET ACTIVITY INDICATORS APPEAR WELL ABOVE DETECTION THRESHOLD
  - FUTURE TESTS PLANNED TO DETERMINE EFFECTS OF FLOODING LIGHT SETTINGS ON PERFORMANCE
- USE OF  $\gamma = 1$  GAMBIT MATERIALS ONLY APPROACH TO GET PROPER RENDITION OF TONAL VALUES

(D, G) ~~SECRET~~ - SPECIAL HANDLING

HB-1182

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~~(D) SECRET - SPECIAL HANDLING~~

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Page 9

AIRCRAFT SIMULATION PHILOSOPHY

- ③ LIMITED PROGRAM ORIENTED TO INSURING REALISTIC GROUND SIMULATION
- ④ CAPABLE OF BEING PERFORMED IN REASONABLE TIME COMPATIBLE WITH GROUND SIMULATION PROGRAM SCHEDULE
- ⑤ MINIMUM IMPACT ON GROUND SIMULATION EQUIPMENT/PROGRAM SCHEDULES

~~(D) SECRET - SPECIAL HANDLING~~

HB-1125

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Page 10

POSSIBLE COMPONENTS OF AIRCRAFT SIMULATION

PART I

• OBJECTIVE

TO OBTAIN MEASUREMENTS OF ZI SCENES FROM AN AIRCRAFT TO BE  
USED IN SETTING THE SIZE LEVELS IN THE GROUND SIMULATOR

• APPROACHES

- |                                |   |
|--------------------------------|---|
| <u>1</u>                       | <u>2</u>  |
| - PHOTOMETER/AIRCRAFT PHOTO    | - 2 AIRCRAFT PHOTOS   |
| - PHOTO PROCESSED LIKE $G/G^3$ | - 1 PROCESSED WITH $\gamma = 1$ ,<br>THE OTHER LIKE $G/G^3$ |

FOR CALIBRATION OBJECT, REQUIRE SIMULATED CONTRAST =  
MEASURED CONTRAST

• EQUIPMENT REQUIREMENTS

- AIRCRAFT, TELESCOPE, PHOTOMETER/CAMERAS, RECORDERS

(D, G) ~~SECRET~~ - SPECIAL HANDLING

HB-1183

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PART I ANALYSIS/EVALUATION

• ONLY  $\gamma = 2$   
G/G<sup>3</sup> MATERIAL  
AVAILABLE

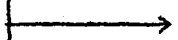
DEFINE CALIBRATION  
OBJECT

AIRCRAFT  
PHOTOMETRIC  
MEASUREMENTS

SET SIMULATOR  
FLOODING LIGHT

- CONTRAST STILL IMPROPER FOR ALL OTHER OBJECTS
- ZI OBJECT = G/G<sup>3</sup> OBJECT ?

•  $\gamma = 1$   
G/G<sup>3</sup> MATERIAL  
AVAILABLE



- NO AIRCRAFT MEASUREMENTS REQUIRED
- ALL OBJECTS HAVE PROPER CONTRAST AGAINST BACKGROUND WITHOUT FLOODING LIGHT

• OF POSSIBLE INTEREST ONLY IF HAZE SETTINGS SHOWN TO EFFECT SCORES

• ACTIVITY NOT RECOMMENDED

• RECOMMEND PROVISION OF  $\gamma = 1$  G/G<sup>3</sup> MATERIAL AT EARLIEST POSSIBLE DATE

(D, G) ~~SECRET~~ - SPECIAL HANDLING

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(D, G) ~~SECRET~~ - SPECIAL HANDLING

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Page 12

POSSIBLE COMPONENTS OF AIRCRAFT SIMULATION (CONCL'D)

PART II

● OBJECTIVE

TO COMPARE HUMAN PERFORMANCE IN AN AIRCRAFT WITH THAT  
OBTAINED BY GROUND SIMULATION

● APPROACHES

- COMPARE AIRCRAFT PERFORMANCE WITH PERFORMANCE  
IN SIMULATOR USING  $G/G^3$  STIMULUS
  - AIRCRAFT PHOTOS FOR AIRCRAFT PERFORMANCE  
SCORING ONLY
- COMPARE AIRCRAFT PERFORMANCE WITH SIMULATOR  
PERFORMANCE AGAINST  $G/G^3$  QUALITY PHOTOS OF  
SAME SCENES
  - AIRCRAFT PHOTOS PROCESSED LIKE  $G/G^3$  AND OF  
SAME LIMIT RESOLUTION

● EQUIPMENT

- PART I REQUIREMENTS PLUS POSSIBLY AN ADDITIONAL TELESCOPE
- REQUIRES SIGNIFICANT ASTRONAUT PARTICIPATION

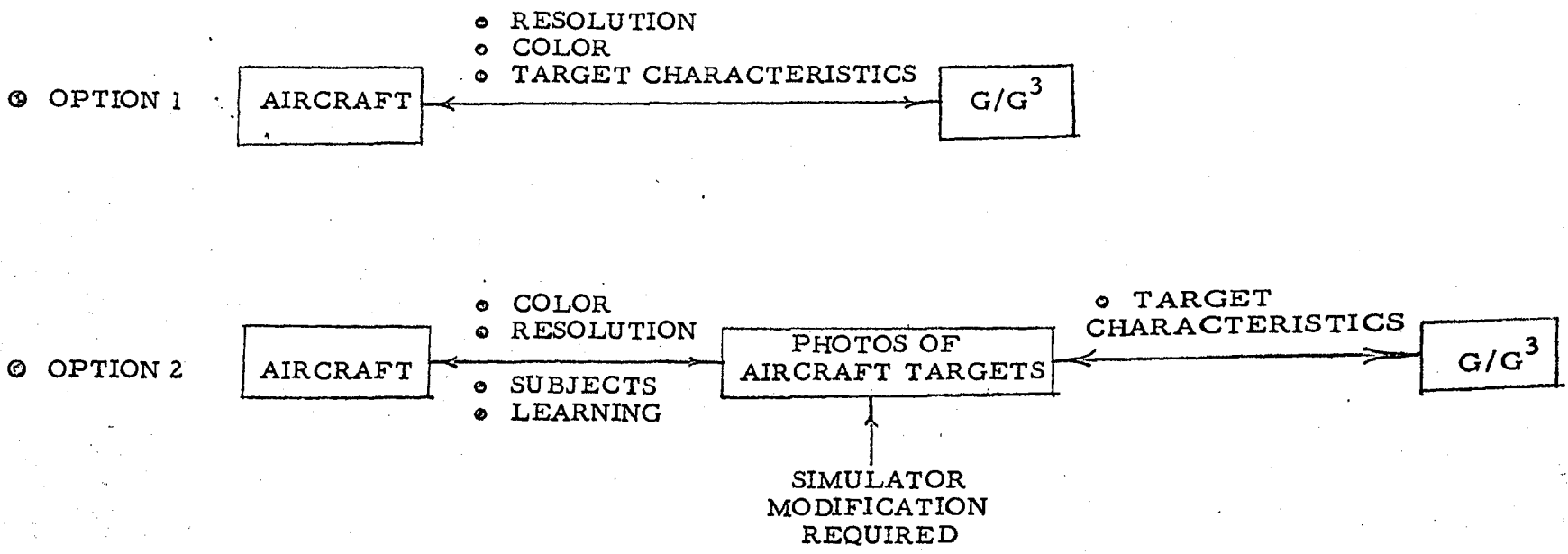
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HB-1128

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(D,G) ~~SECRET~~ - SPECIAL HANDLING

PART II ANALYSIS/EVALUATION



● USE OF AIRCRAFT FOR SIMULATOR VALIDATION NOT RECOMMENDED THOUGH MAY BE DESIRABLE FOR CREW TRAINING PROGRAM

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HB-1129

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(D, G) ~~SECRET~~ - SPECIAL HANDLING

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Page 14

CONCLUSIONS

- PRESENT APPROACH TO SIMULATION CONTRAST CONTROL VERY CONSERVATIVE YET ACTIVITY INDICATORS WELL ABOVE DETECTION THRESHOLD
  - MAJOR PROBLEM IS INFORMATION ASSESSMENT RATHER THAN VISUAL ACUITY
  
- MOST DESIRABLE TO OBTAIN  $\gamma = 1$  GAMBIT POSITIVE TRANSPARENCIES FOR SUBSEQUENT SIMULATIONS TO GET PROPER CONTRAST RENDITION
  - LOGISTICS PROBLEM VS. SIMULATION FIDELITY
  
- USE OF AIRCRAFT TO OBTAIN QUANTITATIVE VALIDATION OF GROUND PHOTOGRAPHIC SIMULATIONS NOT A RECOMMENDED APPROACH

(D, G) ~~SECRET~~ - SPECIAL HANDLING

HB-1135

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~~(D) SECRET~~ - SPECIAL HANDLING

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POSSIBLE USES OF AIRCRAFT SIMULATION

- ACTIVE-INDICATOR CONCEPT REQUIRES CREW TRAINING USING GROUND-BASED FACILITIES AND REALISTIC STIMULUS
  - RAPID ASSESSMENT OF MEANING OF THINGS SEEN AT SPECIFIC TARGETS IS CRITICAL FUNCTION
  - ENHANCEMENT OF THIS CAPABILITY CAN ONLY BE ACCOMPLISHED VIA TRAINING WITH REALISTIC STIMULUS
  
- LIMITATIONS IN GROUND SIMULATION FIDELITY SUGGEST AIRCRAFT SIMULATION AS COMPLEMENTARY TECHNIQUE--GET QUALITATIVE DATA ON EFFECTS OF ACTUAL VIEWING CONDITIONS
  - UNLIMITED STIMULUS "RESOLUTION"
  - COLOR
  - VARIATION IN HAZE WITH LOOK ANGLE
  - THREE-DIMENSIONAL TARGETS
  - CLOUD-COVERAGE PREDICTIONS WHEN LOOKING FORWARD
  - PHOTOGRAPHIC CUES VS. REAL SCENES
  - MOTION AT TARGET
  
- OVERALL PROGRAM CONCEPT FOR USE OF AIRCRAFT SIMULATION IS UNDER DEFINITION

~~(D) SECRET~~ - SPECIAL HANDLING

HB-1199

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MOL

MOL RECOVERY FENCE

LOCATION BRIEFING

This material contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

GROUP 4  
Downgraded to 25 year intervals;  
declassified after 12 years

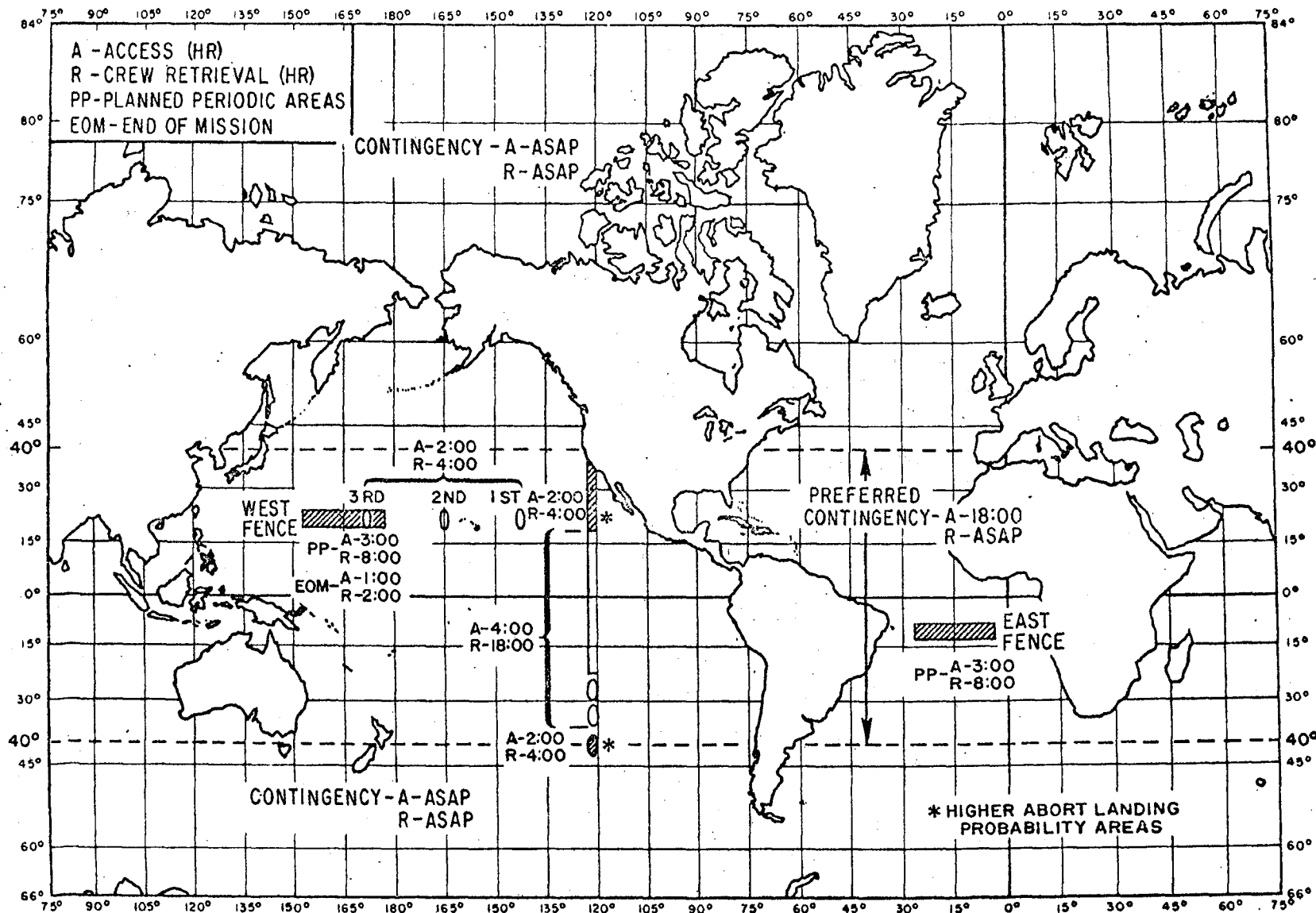


## RECOVERY AREAS

- LAUNCH SITE ABORT RECOVERY
  
- POWERED FLIGHT ABORT RECOVERY
  
- ABORT FROM ORBIT RECOVERY
  - EARLY ORBIT
  - PLANNED PERIODIC
  
- END OF MISSION RECOVERY
  
- CONTINGENCY RECOVERY AREAS

~~CONFIDENTIAL~~

# SYNOPSIS OF MOL RECOVERY REQUIREMENTS



DOWNGRADED AT 3 YEAR INTERVALS;  
DECLASSIFIED AFTER 12 YEARS.  
DOD DIR 5200.10

~~CONFIDENTIAL~~

AEROSPACE CORPORATION  
EL SEGUNDO, CALIF  
FEB 3, 67







FORCE REQUIREMENTS IN THE  
PLANNED PERIODIC RECOVERY AREAS

o EACH FENCE REQUIRES:

- 2 HC130H AIRCRAFT
- 3 HEAVY LIFT HELICOPTERS OR  
2 RECOVERY SHIPS

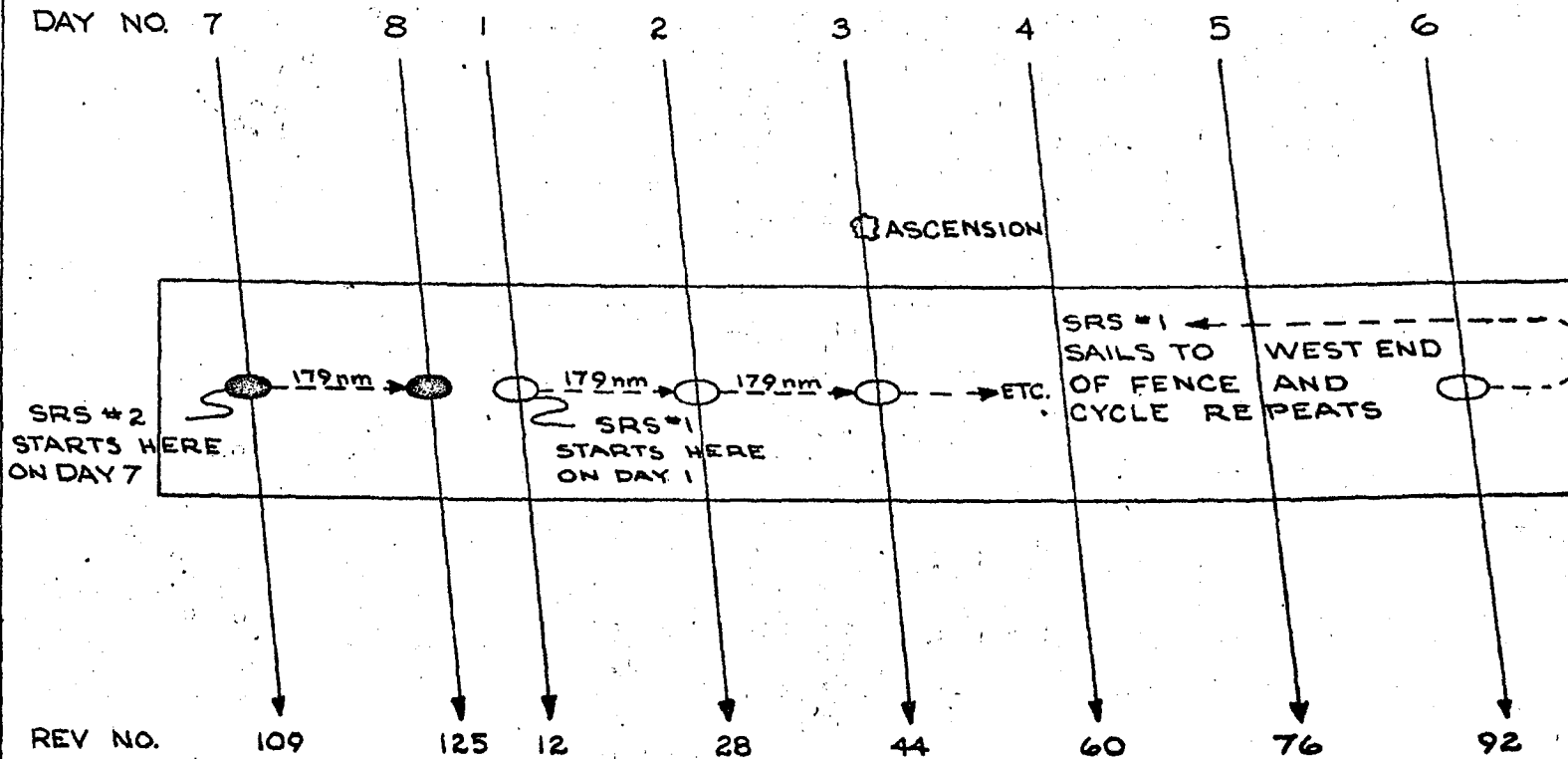
o OPERATIONS

- AIRCRAFT REMAIN AT BASE EXCEPT  
DURING RECOVERY OPERATIONS
- SHIPS ALTERNATELY FOLLOW GROUND  
TRACK REGRESSION (150 TO 200 nm/DAY)



SHIP SUPPORT OF EASTERN FENCE

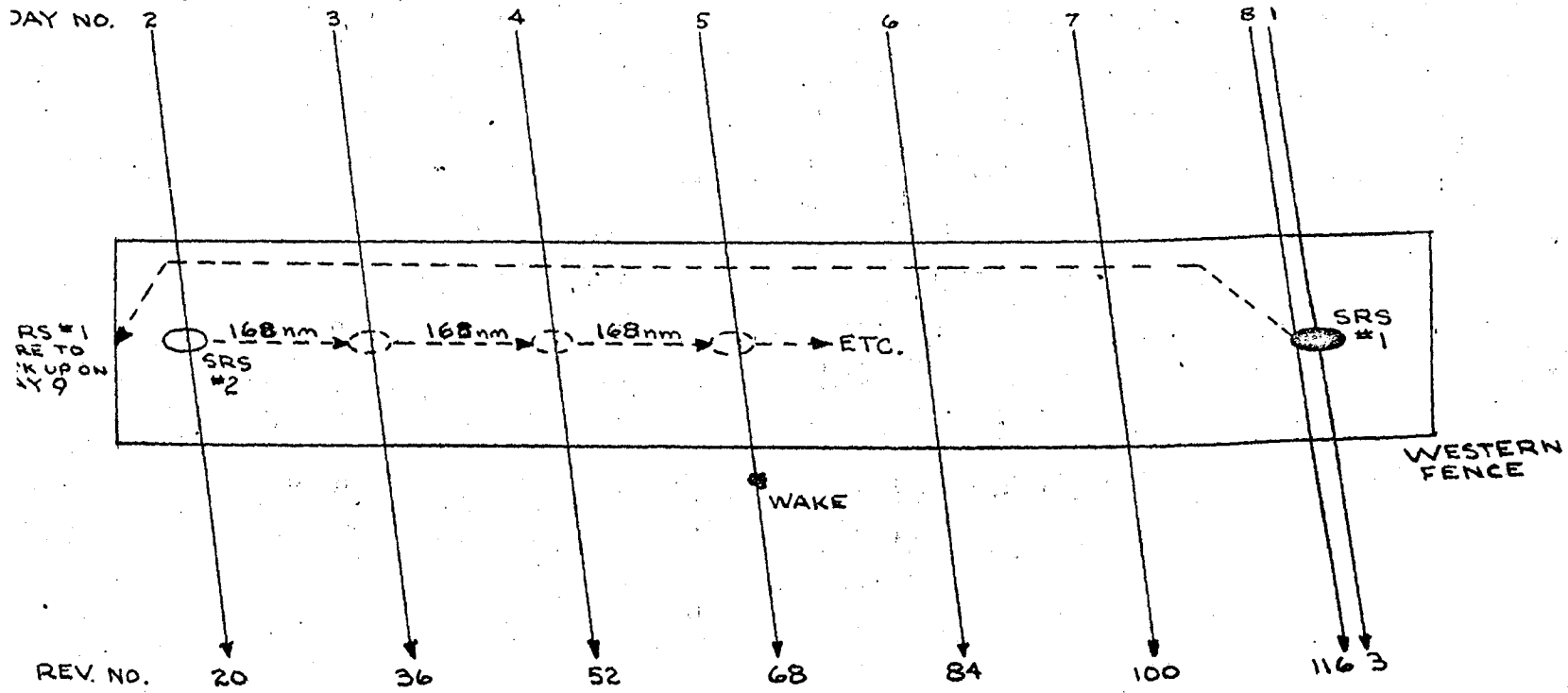
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MOL

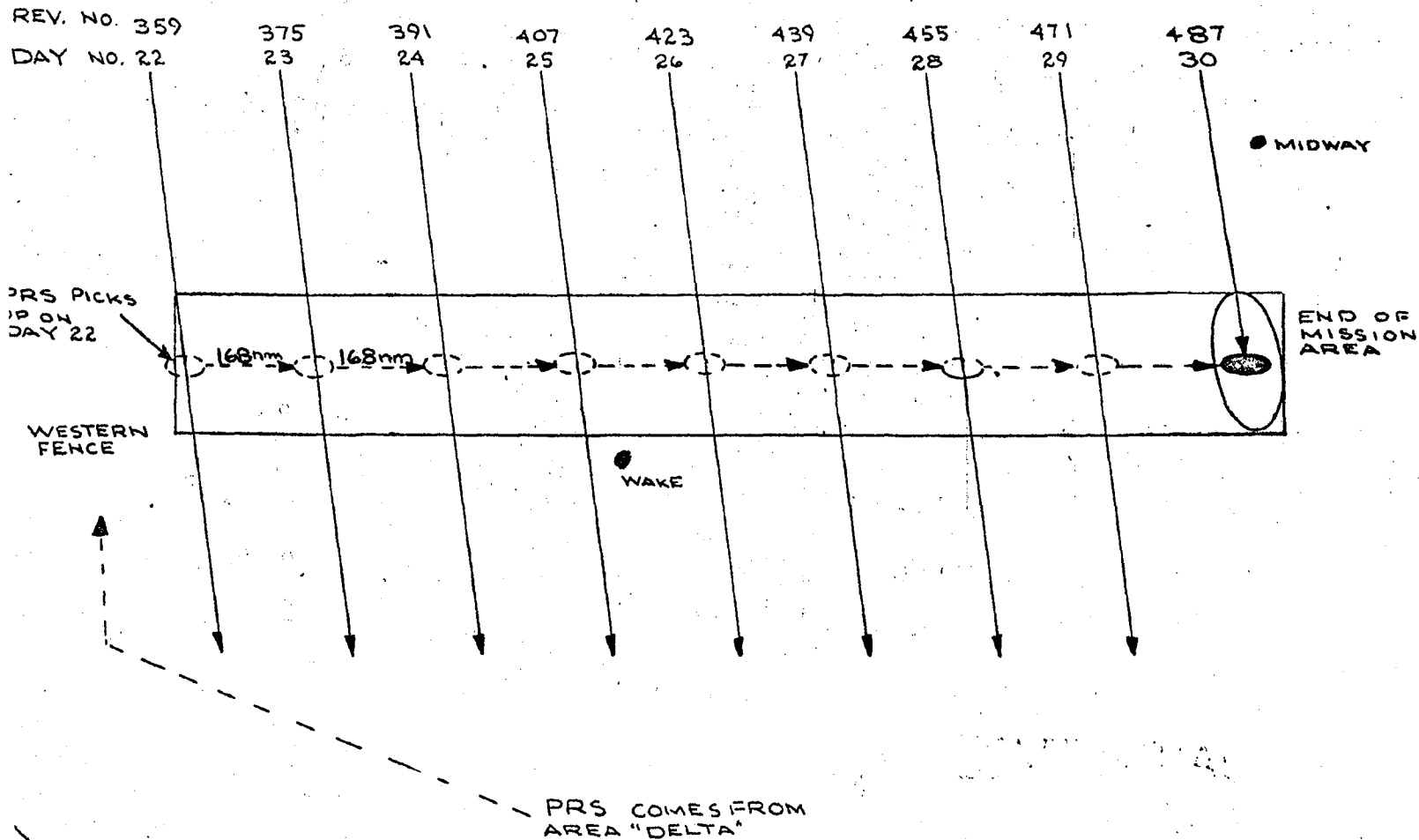
SHIP SUPPORT OF WESTERN FENCE





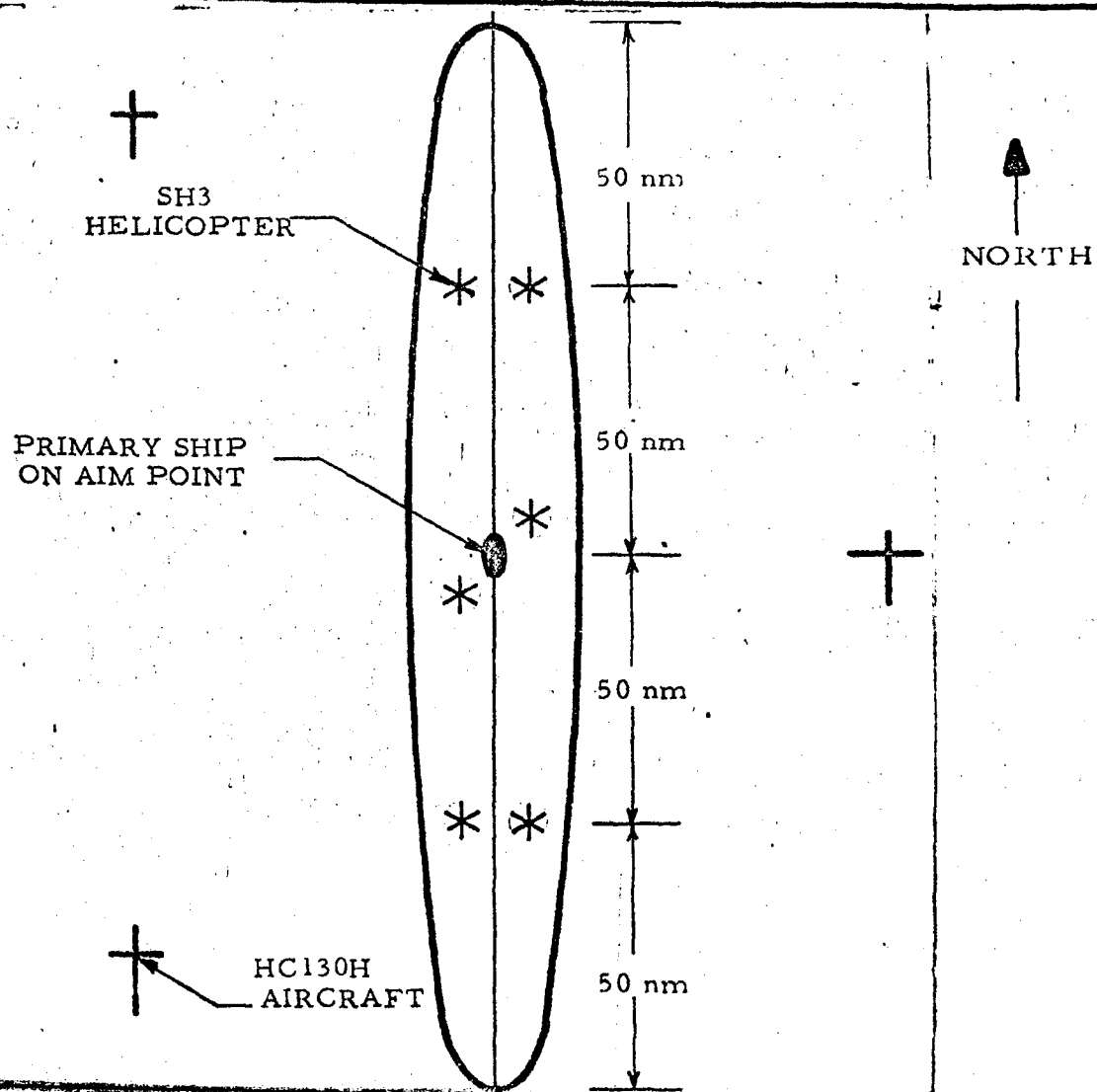
END OF MISSION OPERATIONS

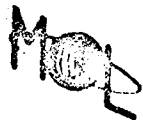
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### SUGGESTED FORCE DEPLOYMENT FOR END OF MISSION RECOVERY





## DISCRETE AREA REQUIREMENTS

- WATER LANDING REQUIRED
  - DAYLIGHT LANDING AND RECOVERY DESIRED
  - GEMINI "B" CAPABLE OF AUTONOMOUS ORBIT FOR 14 HOURS
- THEREFORE: AT LEAST TWO OCEAN AREAS ON DIAMETRICALLY OPPOSED LONGITUDES ARE REQUIRED
- SUCCESSIVE MOL ORBITS WILL BE SEPARATED BY APPROXIMATELY 22.5 DEGREES OF LONGITUDE
  - GEMINI "B" LANDING AREA (UNCERTAINTY ABOUT A POINT) IS 200 NM IN TRACK
- THEREFORE: THESE AREAS MUST BE AT LEAST 22.5 DEGREES IN WIDTH BY 200 NM IN DEPTH
- AIRBORNE RECOVERY SUPPORT FOR THESE AREAS IS REQUIRED
  - POSITIVE COMMUNICATIONS WITH RECOVERY FORCES IS REQUIRED
- THEREFORE: AREAS SHOULD BE LOACTED NEAR AN EXISTING AIR BASE

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STUDY WAS CONDUCTED BY AEROSPACE

○ TWO FENCE CONFIGURATIONS WERE STUDIED

- EXISTING BASELINE WAS CONSIDERED OPTIMUM FOR THREE FENCE CONFIGURATION
- IMPROVEMENT WAS POSTULATED ON REDUCTION OF TOTAL NUMBERS OF RECOVERY FORCES REQUIRED BY USING TWO FENCE CONFIGURATION.

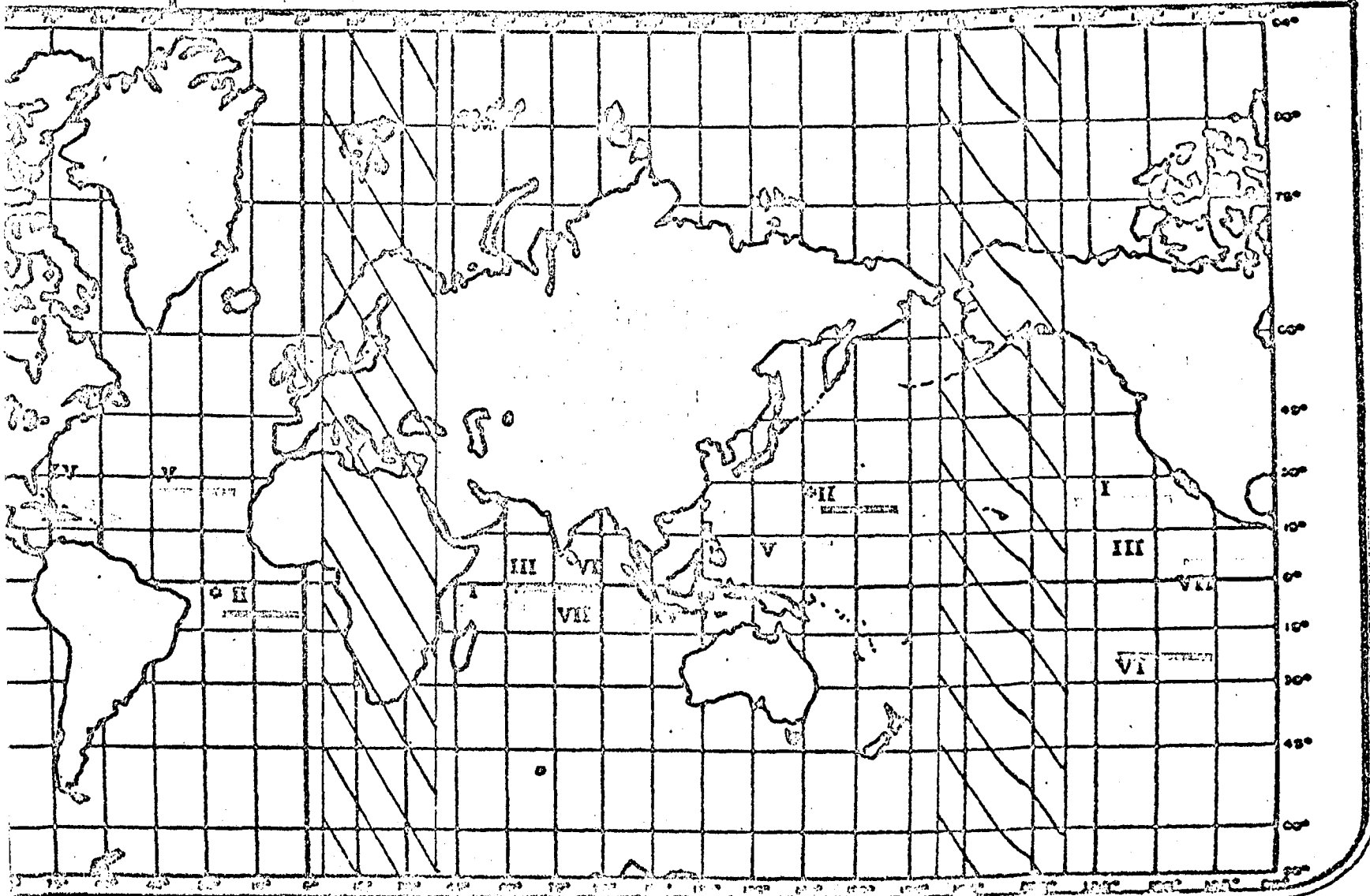
○ STUDY CONSIDERATIONS

- ANTIPODAL LOCATIONS
- WEATHER
  - SEA TEMPERATURE 65° F TO 85° F
  - WAVES 5 FT OR MORE, LESS THAN 30% OF THE TIME
  - WINDS LESS THAN 21 KTS
- NEAR U. S. OR U. K. EXISTING BASES
- LOGISTICS
- TRACKING AND COMMUNICATIONS
- SUPPORT FLEXIBILITY

NRO APPROVED FOR  
RELEASE 1 JULY 2015

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FENCE CONFIGURATIONS CONSIDERED







RECOMMENDED SELECTION

○ WAKE - ASCENSION

/ MEETS ALL STATED REQUIREMENTS

/ EXISTING FACILITIES

○ AIRSTRIPS

○ COMMUNICATIONS

○ MEDICAL

/ DIRECT ACCESS TO CONUS

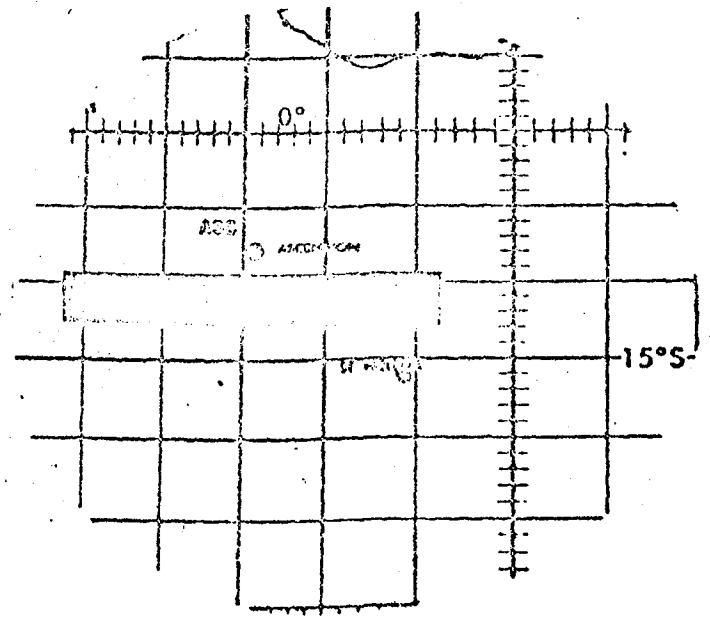
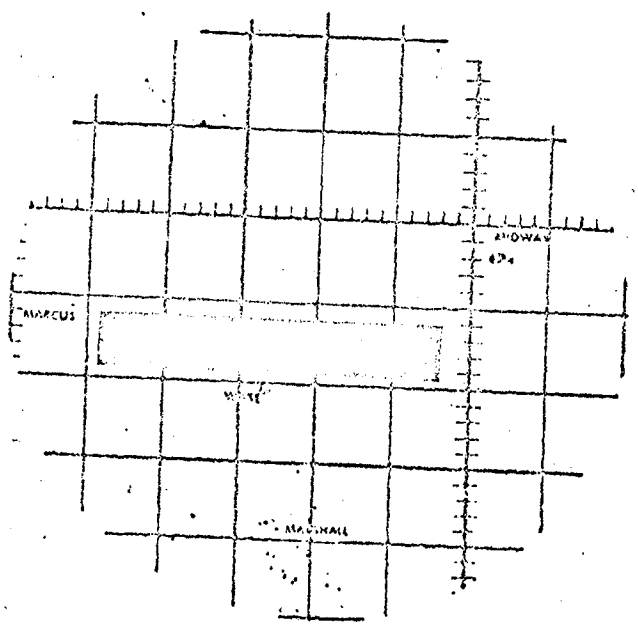
/ POSSIBILITY OF USING TWO ISLAND CONFIGURATION IF REQUIRED

(WAKE, MIDWAY - ASCENSION, ST. HELENA)

/ WESTERN FENCE (END OF MISSION) NEAR HAWAII

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TWO FENCE CONFIGURATIONS

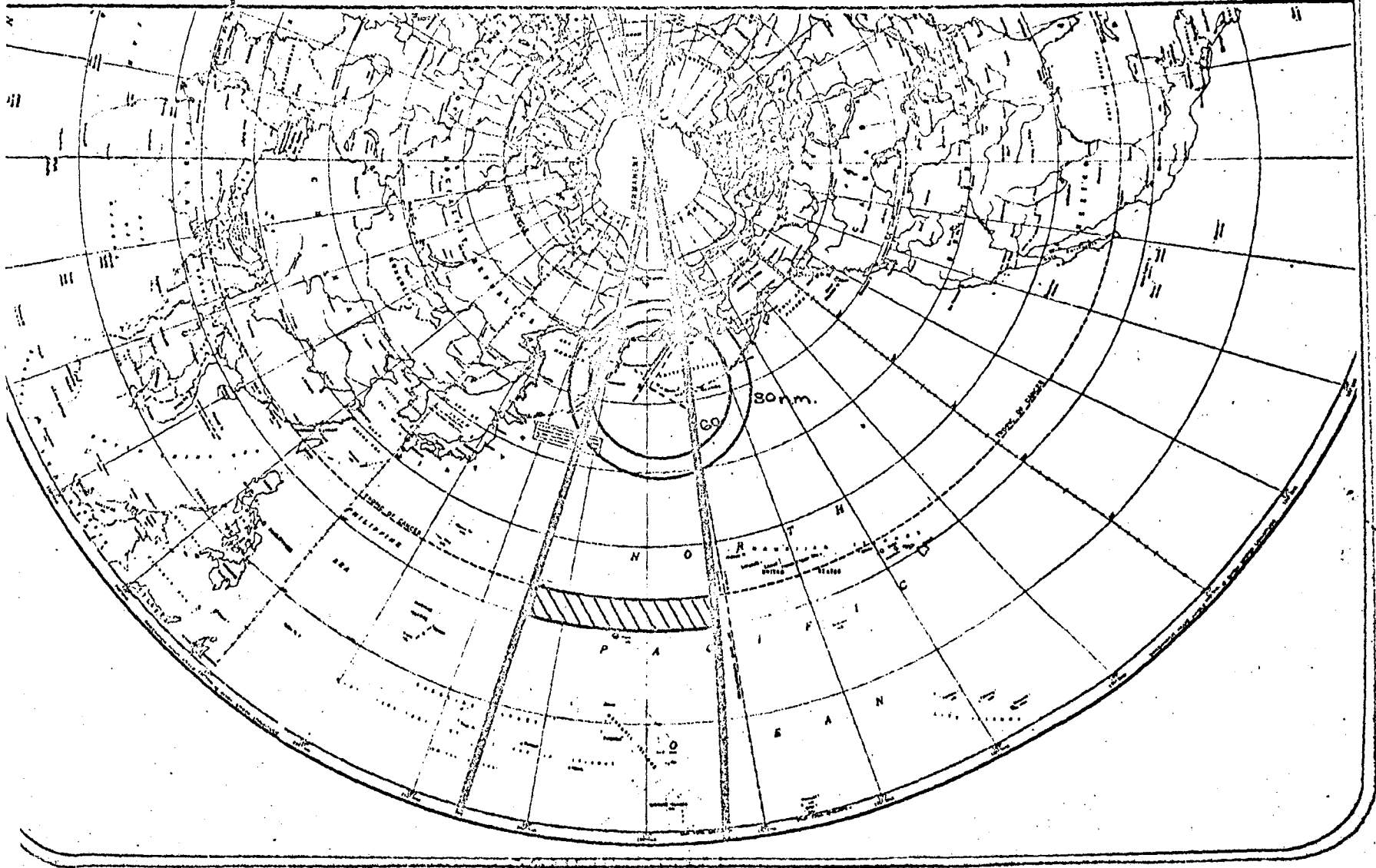


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MOL

# SHEMYA VISIBILITY OF WEST FENCE

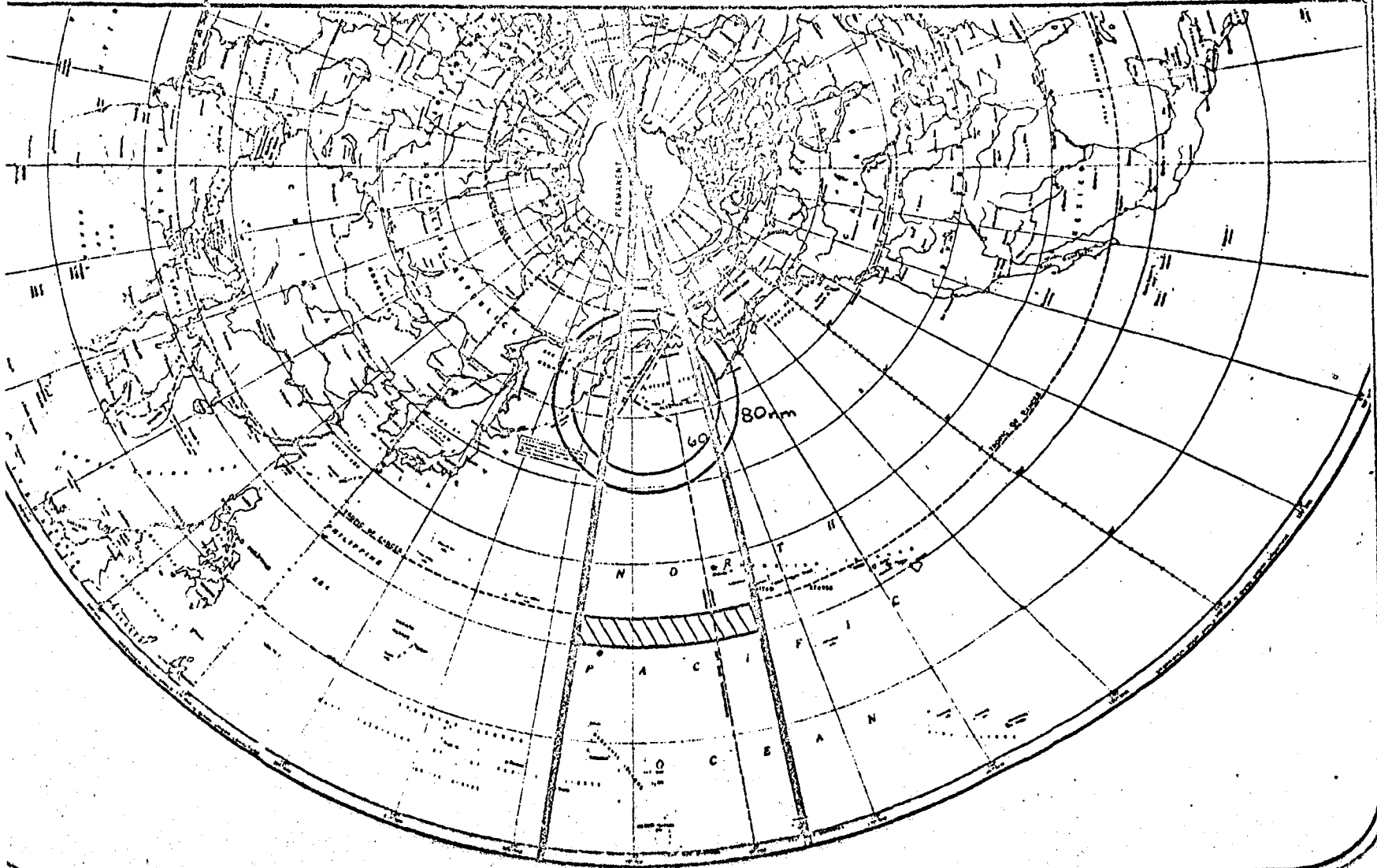
## AT WAKE FOR 90° ORBIT



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SHEMYA VISIBILITY OF WEST FENCE  
AT WAKE - MIDWAY 90° ORBIT





## HAWAII - ASCENSION RECOVERY FENCE STUDY

o STUDY WAS CONTINUED TO ASCERTAIN FEASIBILITY OF USING  
HAWAII AND ASCENSION ISLANDS AS FENCE BASES.

- TRACKING AND/OR VHF VOICE COVERAGE
- GEMINI "B" LOITER TIME REQUIREMENTS
- RECOVERY OPERATIONAL CONSIDERATIONS

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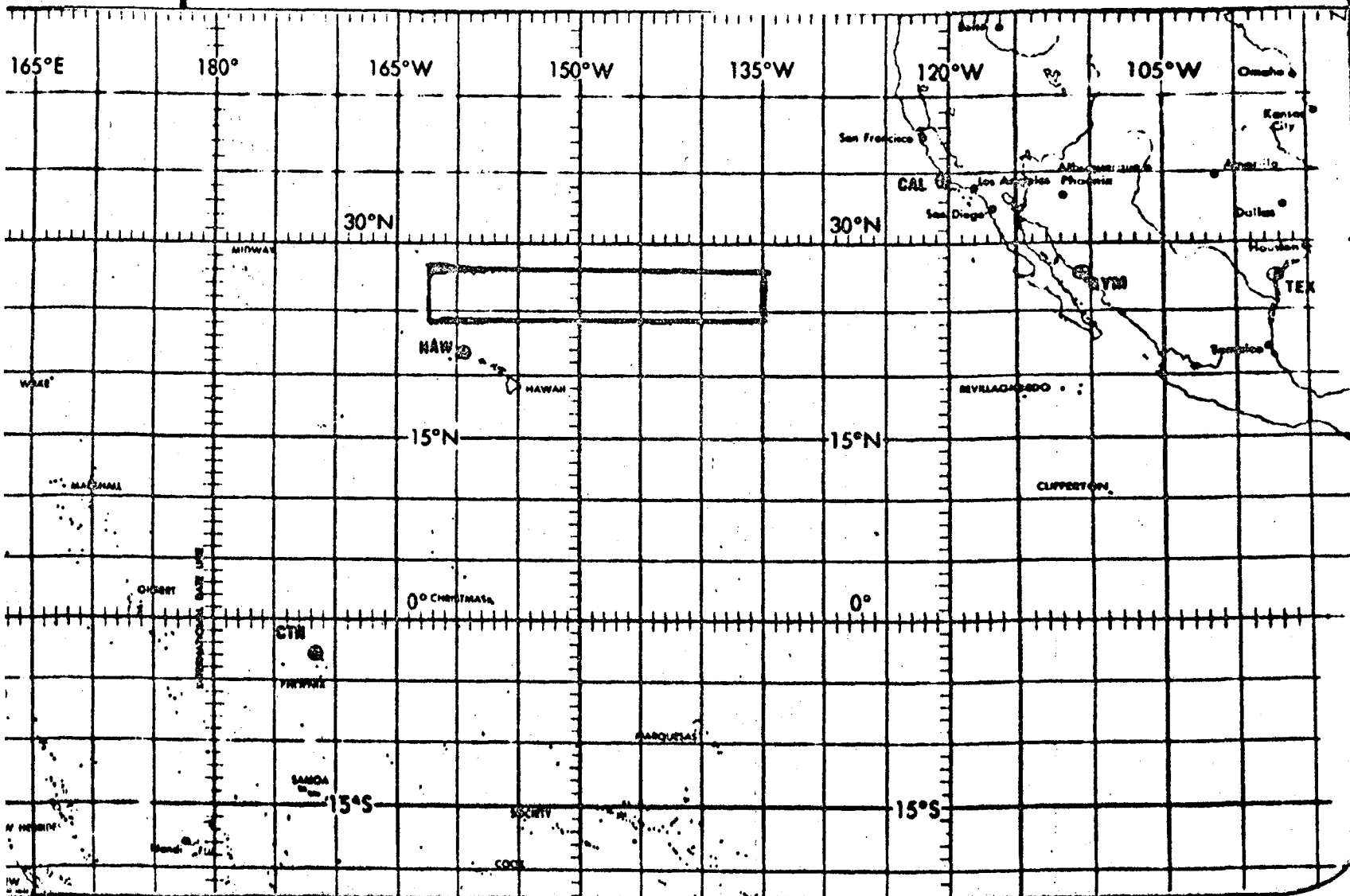
HAWAII - ASCENSION RECOVERY FENCE LOCATIONS

- FENCES LOCATED TO ALLOW ACCESS TIME COVERAGE  
BY HC130 H FROM A STRIP ALERT POSTURE
  
- FENCES LOCATED TO OPTIMIZE POST RETRO VOICE  
COVERAGE FROM UPRANGE STATIONS (0° HORIZON)
  - / HAWAII - KODIAK
  - / ASCENSION - GRAND CANARY ISLAND
  
- FENCES LOCATED TO OPTIMIZE STATISTICAL WEATHER  
CONDITIONS

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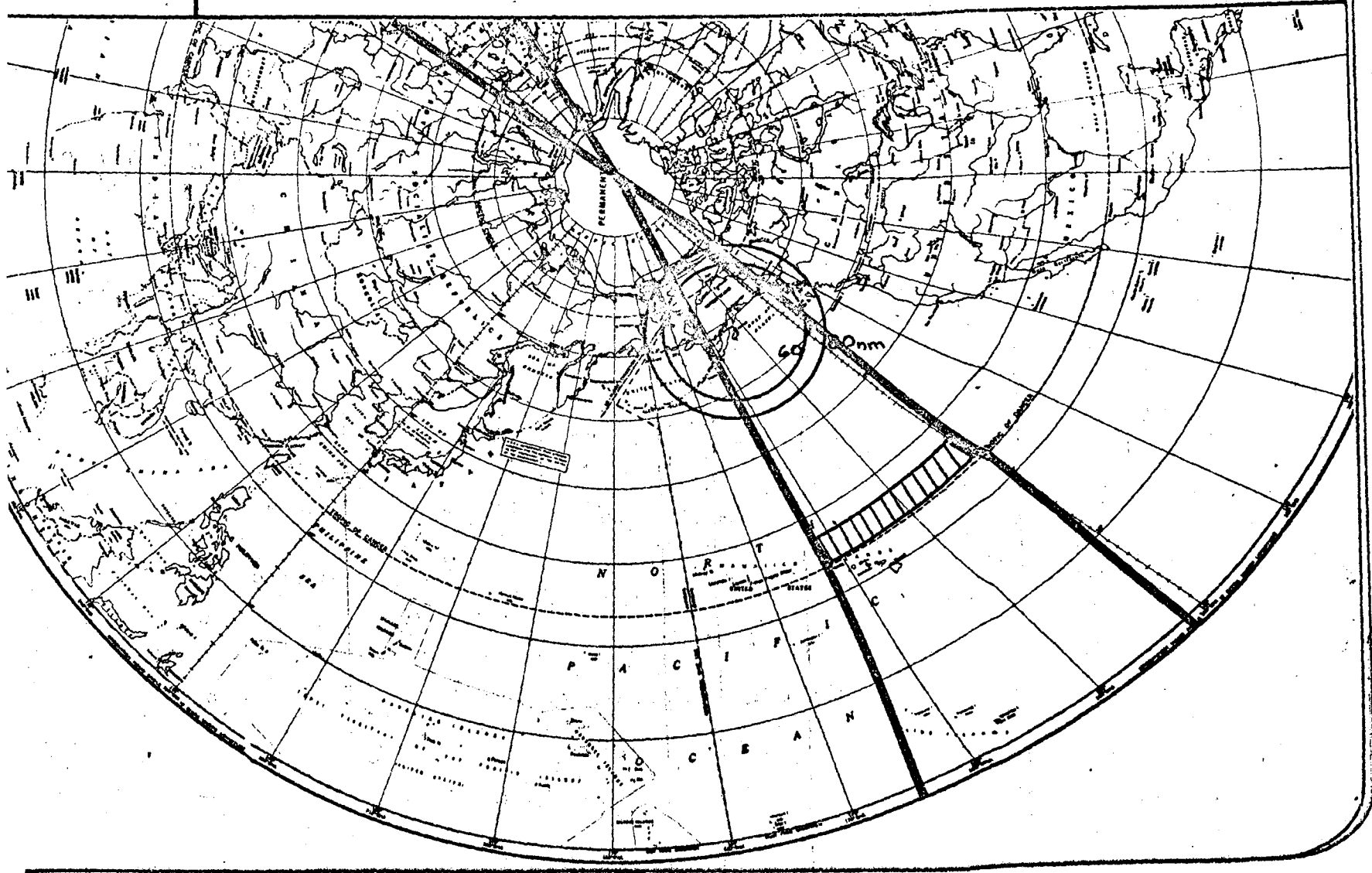
MOL

### WEST FENCE AT HAWAII

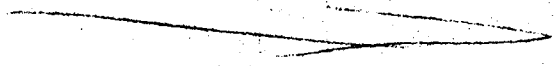




# KODIAK VISIBILITY OF WEST FENCE AT HAWAII 90° ORBIT



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HAWAII - ASCENSION LOITER TIME REQUIREMENTS

- MAXIMUM TIME FROM ASCENSION PASS TO HAWAII PASS -  
7 REVS OR 10.4 HOURS  
/ LOITER TIME REQUIREMENT -  $10.4 + 2 = 12.4$  HOURS
  
- TIME FROM HAWAII PASS TO ASCENSION PASS - 10 REVS  
OR 14.9 HOURS  
/ LOITER TIME REQUIREMENT -  $14.9 + 2 = 16.9$  HOURS
  
- CONCLUSION - TO UTILIZE PROPOSED RECOVERY FENCE  
CONFIGURATION THE GEMINI "B" MUST BE CAPABLE OF  
17 HOURS AUTONOMOUS ON ORBIT LOITER

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GEMINI "B" LOITER TIME CONSIDERATIONS

- GEMINI B HAS SUFFICIENT OXYGEN FOR EXTENDED LOITER
  
- GEMINI B HAS SUFFICIENT COOLING WATER FOR EXTENDED  
LOITER
  
- ELECTRICAL ENERGY AVAILABLE FOR LOITER IS THE  
CRITICAL FACTOR

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FACTORS ON GEMINI "B" ELECTRICAL ENERGY AVAILABLE FOR LOITER

- O GEMINI "B" SPECIFICATION REQUIRES 14 HOURS LOITER AND 36 HOURS POSTLANDING SYSTEM LIFE. THE SPECIFICATION FURTHER REQUIRES THAT THIS CAPABILITY MUST BE MET WITH ONE ADAPTER BATTERY FAILED, AND ONE REENTRY MODULE BATTERY FAILED.
  
- O WITH NO BATTERY FAILURE PRESENT GEMINI "B" SYSTEM PROVIDES CAPABILITY FOR 21 HOURS OF AUTONOMOUS LOITER
  
- O POSTLANDING BATTERY LIFE CAN BE TRADED FOR LOITER TIME IN THE RATIO -  
/ SIX HOURS POSTLANDING TIME FOR ONE HOUR LOITER TIME

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REQUIREMENTS VS CAPABILITIES

- HAWAII - ASCENSION RECOVERY FENCE CONFIGURATION REQUIRES  
17 HOURS LOITER TIME
  
- PRESENT GEMINI "B" SYSTEM CAN PROVIDE 17 HOURS AND RETAIN  
ONE BATTERY IN RESERVE
  
- IN THE EVENT OF FAILURE OF TWO BATTERIES
  - / 18 HOURS OF POSTLANDING BATTERY TIME WOULD BE USED TO  
OBTAIN ADDITIONAL THREE LOITER HOURS REQUIRED
  
  - / 18 HOURS OF POSTLANDING BATTERY LIFE WOULD REMAIN
  
  - / WORST CASE RETRIEVAL TIME FOR LANDING IN FENCE
    - REQUIREMENT IS 8 HOURS
  
    - PRESENT PLAN USING SHIPS ASSURES RETRIEVAL IN  
4 HOURS

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COMPARISON OF HAWAII VS. WAKE-MIDWAY  
FACILITIES FOR RECOVERY  
SUPPORT

	WAKE-MIDWAY/ASCENSION	HAWAII/ASCENSION
SHIP AVAIL- ABILITY	PEARL YOKOSUKA	PEARL
COMMUNI- CATIONS	MIDWAY-60 WPM TTY AVAILABLE -TELEPHONE HF CIRCUIT FULL TIME TO KUNIA -SSB FRT 39 & 40  WAKE -PMR 100 WPM TTY TO KUNIA -TELEPHONE PMR/DCS FULL TIME TO KUNIA	ALL TYPES AVAILABLE
MEDICAL * FACILITIES	MIDWAY - LIMITED BUT ADEQUATE WAKE - VERY LIMITED *PRESENT PLANS ARE FOR INITIAL MEDICAL EVALUATION OF FLIGHT CREW TO BE DONE ON PRIMARY RECOVERY SHIP	EXCELLENT
SUPPORT EQMT ( Fork lifts, trucks cranes, etc.)	AVAILABLE	AVAILABLE
RCC	KUNIA CENTRAL MIDWAY - SAR CENTER WAKE - PMR BUILDING	KUNIA
HARBOR FACILITIES	MIDWAY - SHIPS UP TO 32 FT. DRAFT LIMITED PIER SPACE	PEARL - EXCELLENT
RUNWAY	MIDWAY - 7910 FT LIGHTED WAKE - 9850 FT LIGHTED ALTERNATES AVAILABLE	HICKAM AFB (HON) - 12000 FT LIGHTED ALTERNATES AVAILABLE

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~~(D) SECRET SPECIAL HANDLING~~

MISSION ENHANCEMENT

BY

 PLANETARY PHOTOGRAPHY

- o PLANETARY PHOTOGRAPHY IS SPECIAL CASE   

- o "PRESERVE THE CAPABILITY" NECESSITATES LOOKING INTO  
CURRENT SOFTWARE AND OPERATIONAL CAPABILITIES IN DETAIL  
TO ASSURE CAPABILITIES EXIST.
- o APPROACHED PROBLEM BY DEFINING FUNCTIONAL FLOW OF ACTUALLY  
CARRYING OUT THIS OBJECTIVE AND ENSURING EACH FUNCTION CAN BE  
ACCOMPLISHED.

~~(D) SECRET SPECIAL HANDLING~~

  
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HANDLE VIA BYEMAN SYSTEM ONLY

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STATUS OF MISSION ENHANCEMENT STUDY

9 JUNE METHOD OF ATTACK FORMULATED & BRIEFED

9 JUNE - 18 JULY VARIOUS IN-HOUSE (SUBDIVISION) STUDIES INITIATED  
AND FORMULATION OF QUESTIONS FOR CONTRACTORS

18 JULY FORWARD QUESTIONS TO CONTRACTORS - ASK FOR IMPACTS  
TO THEIR SOFTWARE. ROM OF COSTS FOR NECESSARY MODS  
AND ANSWERS TO SPECIFIC QUESTIONS DUE 18 AUGUST 1967.

18 JULY - 15 AUG. FORMULATE MILESTONE 1 FOR MISSION ENHANCEMENT  
SOFTWARE.

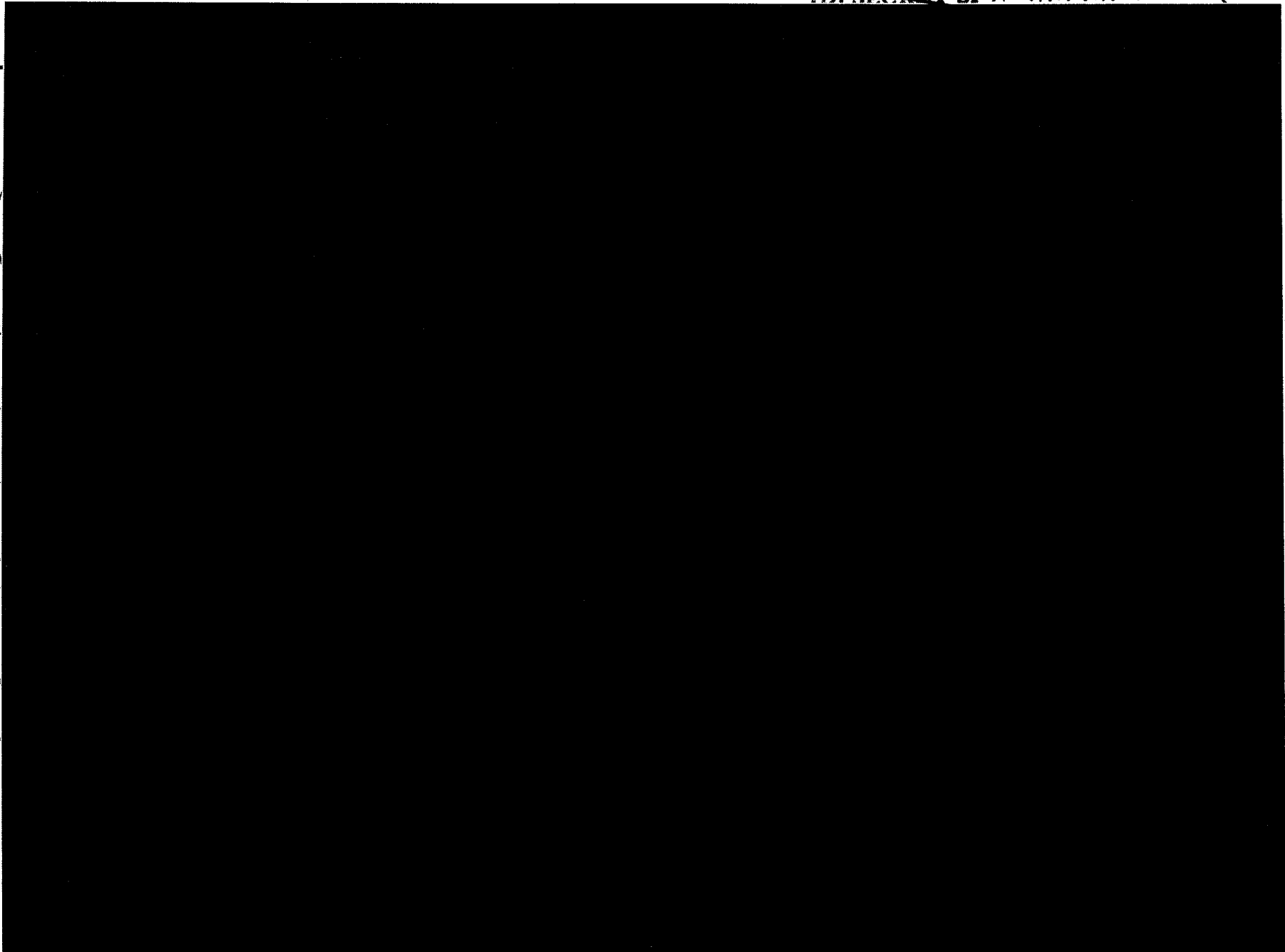
15 AUG. ASK PROSPECTIVE CONTRACTORS FOR ROM OF PRICE FOR  
NEW GROUND MISSION ENHANCEMENT SOFTWARE.

1 SEPT. REPORT TO PROGRAM OFFICE AS TO DETAILED REQUIREMENTS/  
COST TO "PRESERVE CAPABILITY."

~~(D) SECRET SPECIAL HANDLING~~

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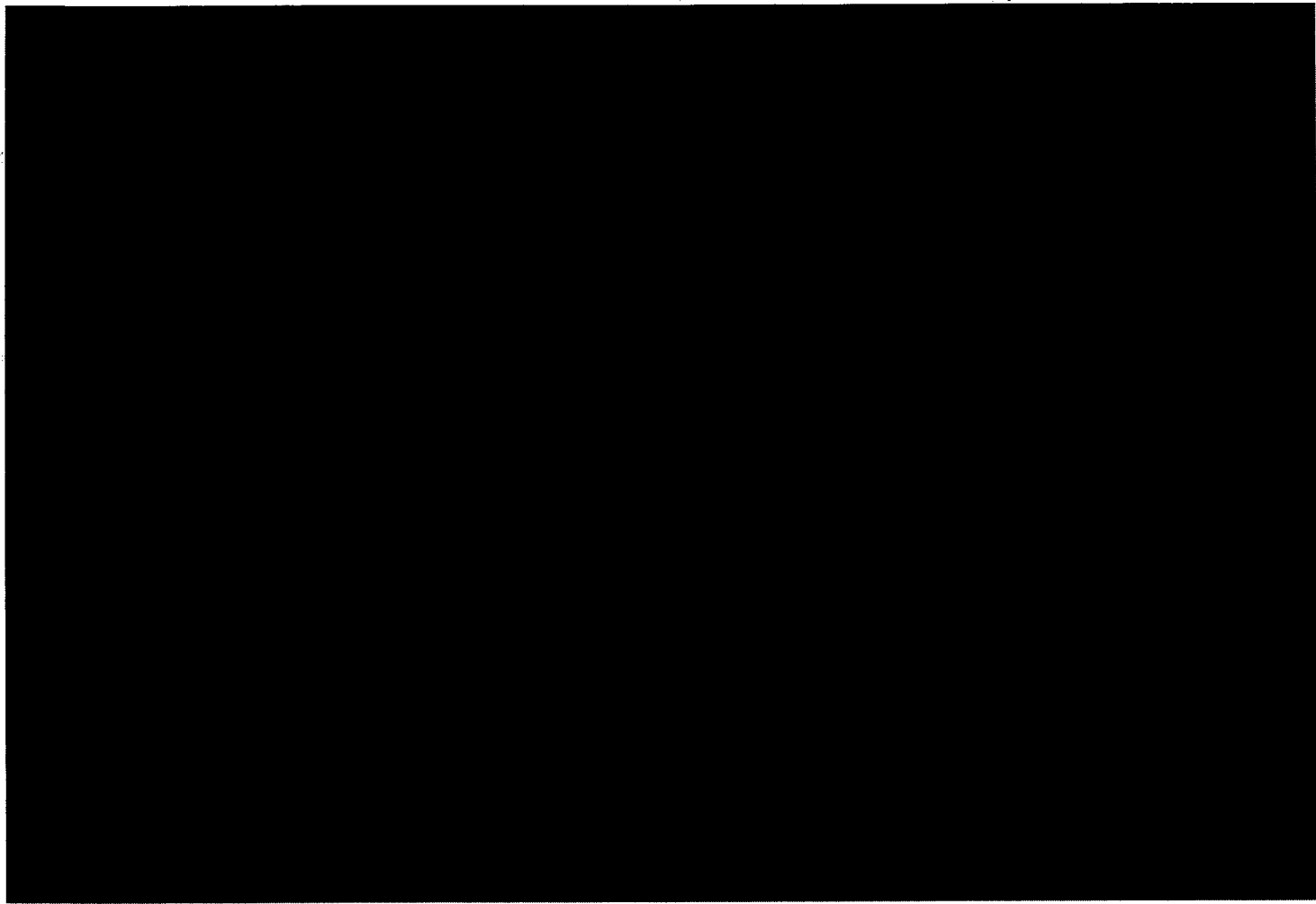
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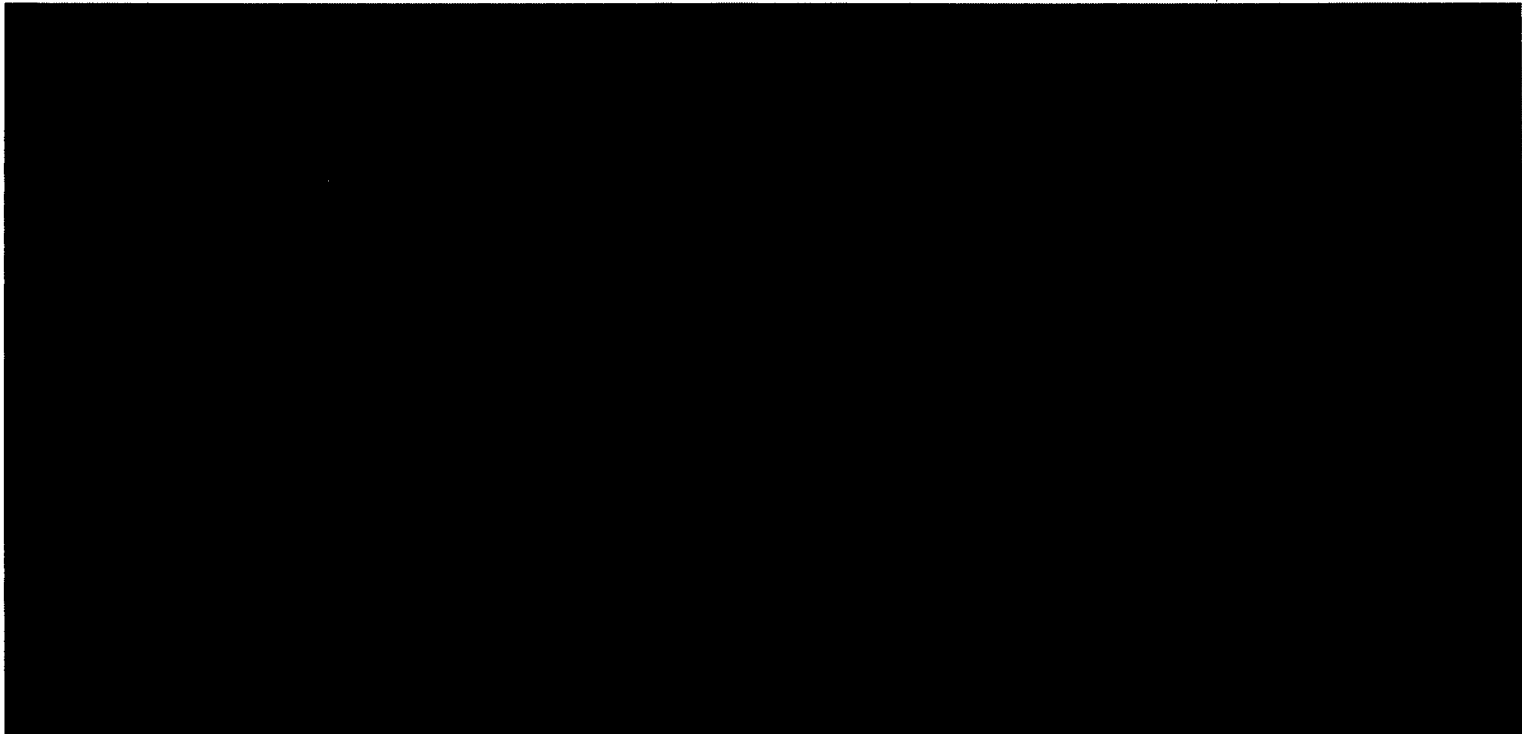
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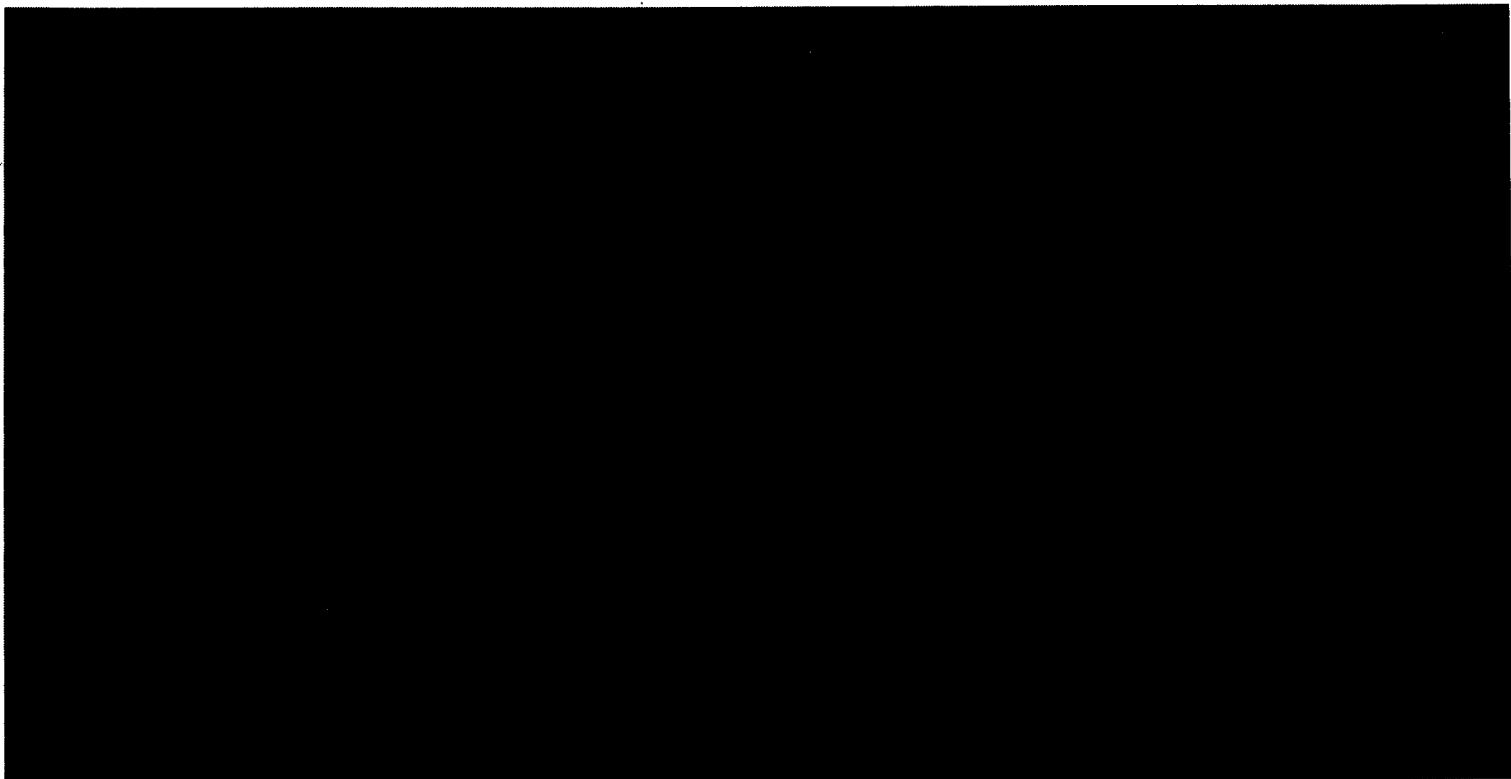


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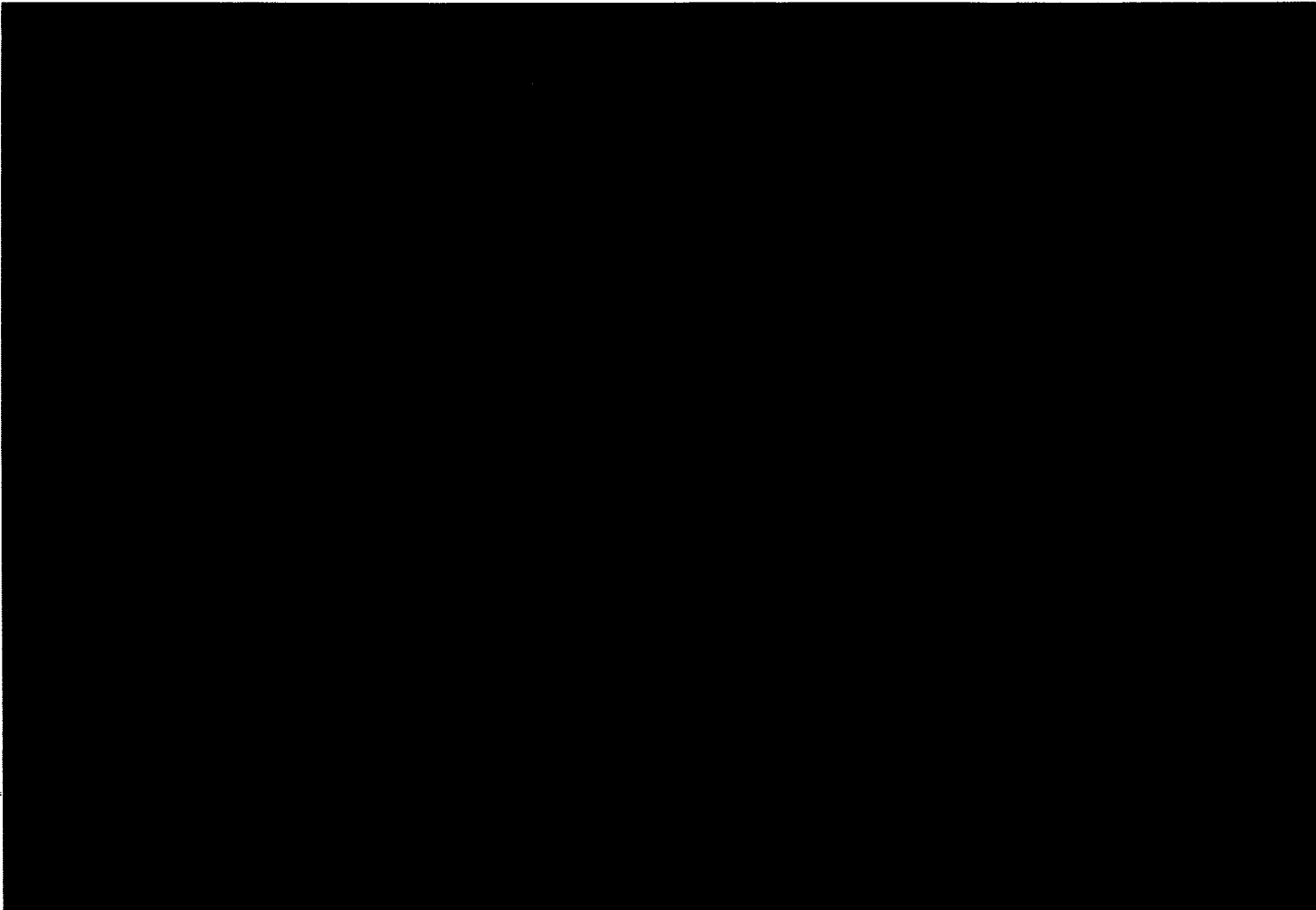


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TASKS BEING PERFORMED BY AEROSPACE

- o EVALUATE ORBIT ADJUST CAPABILITY
  - / CATCH-UP RATE
  - / MISS DISTANCE ENHANCEMENT
- o STAR TRACKER ACQUISITION PROBLEM
  - / MODIFYING EXISTING COMPUTER PROGRAM TO ACCOMMODATE ALL VEHICLE ATTITUDE ORIENTATIONS.
  - / PERFORM PARAMETRIC STUDY TO EVALUATED ACQUISITION PROBLEM.
- o LOGIC OF ATTITUDE MANEUVERS
- o SIMULATION IN SUPPORT OF ASTRONOMY
  - / CAN MAN TRACK FOR EXTENDED PERIODS OF TIME?
  - / PRELIMINARY RESULTS ON FIVE CREW MEMBERS INDICATE MAN CAN PERFORM TASKS WITHIN PERFORMANCE REQUIREMENTS

(D) ~~SECRET~~ SPECIAL HANDLING

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