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JAN 16 1967

MEMORANDUM FOR RECORD

SUBJECT: January 5, 1967 MOL Management Meeting

This memorandum provides an official record of the MOL Program Office and Systems Office understanding as regards the decisions and direction for each of the subjects which follow:

Program Funding

The Phase II development program will proceed against an FY 67 funding level of \$228.0 million NOA and a planning level of \$510.0 million for FY 68. FY 67 funds will be tracked very closely to conserve funds, where possible, to apply to FY 68.

We will proceed with an FY 68 program based on the "Blue Book" baseline requirement for \$587.0 million until such time as a departure from this baseline is dictated by FY 68 funding limitations or technical problems. We will also protect the option to pursue an FY 68 program funded to a level of \$480.0 million, and will make a decision during late FY 67/early FY 68 as to the level on which we can proceed.

I have assigned this as a joint Program/Systems Office action.

Negotiation of Undefined Program Requirements

The schedule for completing negotiations by June 1967 for the presently undefined program requirements was approved by Dr. Flax and the Director, MOL.

This is a Systems Office Action.

Special Contractual Procedures

The contract termination liability clause is to be excluded from MOL program black contracts. This clause is already excluded from the MOL white contracts.

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

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This action will allow the Systems Office to place on contract only those funds which can actively be used for the attainment of program baseline efforts, and will avoid having some portion of contract funds set aside as a reserve for contract termination.

Approval is necessary for proceeding on an expenditure funding basis for all MOL contracts in lieu of the present commitment basis. The FY 67 "Blue Book" estimates are based on expenditure funding.

The MOL Program Office will pursue these actions in concert with OSAF-FM.

#### Saturn IVB Participation

We will continue to participate, along with other Air Force activities, in the NASA spent stage experiments program. The Systems Office, however, will re-examine the usefulness of including an active molecular sieve experiment. The Program Office will meet with NASA to definitize responsibility and establish firm costs for MOL experiments integration. We will continue to process, through normal channels, experiments which may be useful to MOL, but MOL astronauts will not participate in the SIVB program.

This is a MOL Program Office/Systems Office action.

#### Readout and Data Recovery

We will continue to include both systems in the MOL baseline program. As soon as possible, the Systems Office will provide the costs of protecting the readout system studies and associated integration effort. By 1 April the CBS and Douglas studies will be evaluated and presented to Dr. Flax with an assessment of the cost impacts and required decision dates for each of the systems. Prior to presentation to Dr. Flax, there will be a MOL internal review.

Colonel Battle, SAFSS and the Systems Office have this action.

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Thermal Doors

The engineering design of doors to minimize the thermal distortion problem will be re-examined in February when newly generated data and Cer-vit results will be available from GE/EK/DAC. In the interim, however, the GE proposed louvre and pitch mask design will continue.

This is a Systems Office action in concert with the Program Office.

Acoustic Testing

We will continue to protect the long lead time requirements for a low level segment test facility at EK, and protect the option for a higher level acoustic test facility. Dr. Flax concurred with the plan for low level acceptance testing of all system segments and vibration testing of the lab module.

Contractor cost estimates will be acquired for a laboratory module test program based on qualification and flight level testing.

Efforts will continue to determine the best combination of facility/location to satisfy MOL program requirements.

Expenditure of \$50K is authorized as a holding action.

Action is assigned to the Systems Office.

Support Module

The current 30 day baseline engineering design was approved and will provide the physical capacity for an up to 60 day capability.

Contingency Planning

A procurement plan is to be developed to cover the contingency of a failure of flight #1 or failure of one of the manned flights 3, 4, or 5. This plan will consider making flight 6 or 7 a manned flight and would be accomplished by parallel vehicle procurement.

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This would then leave the present flight 6 or 7 article available for later use. If this plan is approved, firm costs and decision dates will be developed for an additional equipped laboratory module, time phased for use as a back-up to flight 6, but intended for use with flight 8 or beyond. The availability of the laboratory module will enhance schedule flexibility.

At the earliest possible date the Systems Office will submit, to Dr. Flax and the Director, MOL, an analysis of the firm costs and required decision dates to provide an additional Gemini B in a time frame which would have it available to cover flight #5.

Action is assigned to Systems Office.

#### Acquisition and Tracking Scope

The selection of ITEK as the subcontractor to GE was concurred with by Dr. Flax and the Director, MOL. The ITEK contract and GE and DAC integration cost total of \$19.5 million is \$16.5 million less than had been budgeted for this task.

#### Extended Life

A paper for Dr. Foster on extended life time considerations is to be prepared for Dr. Flax's signature.

This is a Program Office Action.

#### Program Priority and Authority

The DX priority rating letter prepared for Dr. Brown's signature and transmittal to OSD is to be signed within the next few days.

The letter authority to proceed with MOL Phase II activities will be signed by OSAF shortly.

This is a Program Office action.

#### Simulation

Dr. Flax was concerned with two aspects of simulation. He desired to validate that a human operator

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could indeed distinguish ground scenes under conditions of actual scene lighting and actual scene contrast. Since it is very difficult to recreate actual conditions by ground simulations using scene photographs, Dr. Flax was of the opinion that an aggressive aircraft simulation program should be undertaken. It was agreed that the Systems Office would examine the situation and develop a simulation program.

Although a general consensus held that design of simulators, and simulation materials was a major problem, the Systems Office is to continue an active program to improve simulation fidelity, and adequacy of materials.

This is a Systems Office action.



HARRY I. EVANS  
Major General, USAF  
Vice Director, MOL Program

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A. FUNDS

On January 7, DoD approved a FY 1967 funding level of \$228.4 million for the MOL Program in lieu of the \$178.4 million previously approved. Simultaneously, the FY 1968 budget was reduced to \$430.0 million from the \$480.0 million previously approved. This action brought FY 1967 requirements and approved budget into agreement. However, the FY 1968 approved budget of \$430.0 million is now approximately \$157.0 million less than the Systems Office estimated requirements and \$381.0 million less than the contractors' estimated requirements.

The objectives, within the environment of negotiated fixed price incentive contracts, has been to hold the MOL baseline schedule as long as possible. However, in light of the large disparity between requirements and the approved budget for FY 1968, there is an immediate need to examine a schedule change which will bring program requirements into accord with funding levels which the DoD will support. The Vice Director, MOL conferred with contractors top management on February 2 on this problem. At this meeting each of the major associate contractors were asked to examine two alternatives:

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1. Examine schedule capability within funding constraints of \$228.4 million for FY 1967, \$500.0 million for FY 1968, and \$600.0 million for FY 1969.

2. Examine funding requirements with a nine-month slip of the baseline flight test schedule.

For both exercises, the contractors were told that the technical content of the program was not to change and that a dollar limited DX industrial priority should be assumed. The contractors are to submit their results to the Deputy Director, MOL on February 14. On February 15, top government and contractor management will meet to examine the cost and schedule data. At that time each Corporate Vice President will be asked to address their proposals to Dr. Flax and General Ferguson and, in addition, express their views on any adjustments to the MOL Program, which they feel is worthy of top management attention.

It was emphasized to the contractors that this is only an exercise of serious program problems and that they should continue to operate to the baseline schedule until a firm decision to change schedule is made.

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B. SPECIAL CONTRACTING PROCEDURES

On January 31, 1967 Dr. Flax was briefed on the need for change to the existing DORIAN contract management and SE/TD responsibilities of General Martin, SAFSP and the Deputy Director, MOL. The need for change stems from the fact that the Director, MOL, because of the fragmentation of contract and engineering responsibility, does not have the necessary authority or control to discharge his responsibilities for total program accomplishment.

Three options for rectifying the problem were presented to Dr. Flax, together with the advantages and disadvantages of each. The three options were:

-- To give the Deputy Director, MOL equivalent authority to that now held by the Director, SAFSP.

-- To extend General Keeling's authority to include approval authority for deviations from the ASPR/AFPI.

-- To clearly establish the responsibilities of SAFSP and SAFSL-1 so that SAFSP would provide all DORIAN contracting services to SAFSL-1, and SAFSL-1 would be responsible for GSE/TD for all MOL segments other than the payload sensor.

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Dr. Flax agreed that the present working arrangement should be changed, and it is his intention to discuss the matter with the Director, SAFSP on his trip to the West Coast during the week of February 13.

A memorandum treating this subject was provided to Dr. Flax, at his request by the Vice Director, MOL on February 8. This memorandum was coordinated with General Keeling, General Berg and [REDACTED]

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C. SIVB PROGRAM PARTICIPATION

In a letter to Dr. Mueller dated January 27, 1967, Mr. D. J. Fink, Deputy Director (Strategic and Space Systems) ODDR&E, expressed DoD concern over the NASA decision to prorate integration costs among the sponsors of Orbital Workshop experiments. The letter suggests a reevaluation of the decision to bill DoD for integration costs, and requests an estimate of the integration costs for each of the five DoD experiments involved in the event that these costs are to be borne by the experimenters. A response by February 10 was requested.

Mr. Fink's letter to Dr. Mueller is attached.

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D. READOUT AND DATA RECOVERY

Dr. Flax has authorized limited expenditure of funds to retain the MOL readout option through April 1. On or before this date a firm decision will be made on whether to retain or drop this capability in the baseline design.

Colonel Anderson of the Air Staff has informed the Vice Director, MOL that there is a tri-service interest in developing a data-link readout capability for aircraft applications and \$1.0 million is immediately available to fund this effort with CBS. With this funding assistance, only a nominal \$30K will be required of MOL to sustain the DORIAN studies at CBS. Under these arrangements, it is our intent, that the initial work statement for the tri-service data-link be tailored to meet MOL needs.

Douglas integration costs are included as part of the baseline program and limited funds will be used to support Douglas design studies pending a decision on or before April 1.

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E. THERMAL DOORS

The engineering design of doors to minimize thermal distortion will be an agenda item for the February 15 meeting.

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F. ACOUSTIC TESTING

The plan, location and costs of laboratory module test program based on qualification and flight level testing will be an agenda item for the February 15 meeting.

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G. CONTINGENCY PLANNING

The procurement plan for the acquisition of additional manned flight hardware to cover the possibility of a failure of flight #1, or one of the programmed manned flights, is in preparation. The plan envisions an additional laboratory module time-phased to be available for flight #6, and an additional Gemini to back up flight #5. Expected completion date is February 27.

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H. EXTENDED LIFE PAPER FOR DDR&E

At the January 5, 1967 management meeting, Dr. Flax asked that a paper be prepared for Dr. Foster on the subject of extended lifetime for the unmanned automatic version of MOL. A paper in the form of a memorandum to the DDR&E from Dr. Flax, was submitted to Dr. Flax for his review on January 16, 1967.

Dr. Flax made changes in the memorandum and sent it to Dr. Foster on January 20, 1967. The most important changes were to add the note that "the proposed approach to MOL lifetime extension was similar to practices successfully followed in other reconnaissance programs of the NRO", and the addition of a request for DDR&E concurrence in the approach proposed for the automatic-mode MOL.

Colonel Heran was advised of this action on January 31, 1967 by a teletype from General Evans. The message quoted an anticipated go-ahead memorandum from Dr. Foster to Dr. Flax. The approving memorandum from the DDR&E was sent to Dr. Flax on January 31, 1967.

The MOL Program Office is preparing a memorandum for Colonel Heran, providing direction on the implementation of the extended lifetime support module.

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I. MOL PRIORITY

In a memorandum for the Secretary of Defense dated January 7, 1967, Dr. Brown recommended action to establish BRICKBAT .01/DX status for MOL. Secretary McNamara has assigned the matter to Assistant Secretary (I&L) Ignatius for staff action. No official response from OSD has been received. Dr. Flax has directed preparation of a detailed, current justification for DX industrial priority for use in discussions with OSD in the event such discussions are required. Preparation of this package is in progress.

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J. SIMULATION

An investigation of the feasibility of an aircraft simulation program is in progress; a draft plan is in internal Systems Office review, and the question of aircraft availability is under study. This is an agenda item for February 15.

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IV. A. MOL TERMINATION COST, FY 1967 AND 1968

The MOL funds available through FY 67 are presently considered adequate to fund the major contractors through June on the basis of expenditures incurred plus earned fee, but are not adequate to cover termination liability as well. The funding disparity in FY 68, already recognized as a major problem, will be compounded even further if we are required to fund contracts on a commitment rather than an expenditure basis. Under normal DoD funding policies, reserves for termination liability are to be specifically earmarked, although not necessarily to be released to the contractors.

The present forecast is that termination liabilities for the major contractors will approximate \$91.0 million by the end of June 1967, increased to \$112.6 million by December 1967, and then steadily decrease reaching \$80.8 million by the end of June 1968. All major contractors involved have stated that they will accept expenditure funding for the contract periods. The specific problem then is to identify potential funding sources in the event the program should terminate in any particular month.

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This problem was addressed at the January 5 MOL Management Meeting and again with Dr. Flax on three separate occasions since then. Based on information provided him, Dr. Flax has agreed to work this problem by either identifying a potential source of funds within the Air Force, or, if this is not possible then asking DoD concurrence and assistance in meeting the eventuality of program termination.

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IV. B. AUTHORITY TO PROCEED WITH PHASE II

On January 13, 1967, Dr. Flax formally authorized continuation of engineering development of the MOL Program. A copy of his memorandum is attached.

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OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING  
WASHINGTON, D. C. 20301

27 JAN 1967

Dr. George E. Mueller  
Associate Administrator  
Office of Manned Space Flight  
National Aeronautics and Space  
Administration  
Washington, D. C. 20546

Dear George:

I have recently been informed about NASA plans regarding the allocation of costs for integrating Air Force experiments in the S-IVB Orbital Workshop. In negotiations with NASA Headquarters and Center personnel on acceptance of DOD experiments for the Orbital Workshop, it was initially understood that NASA intended to pay for the integration of all experiments. It is now our understanding that NASA plans to prorate these costs and bill the DOD for experiment integration.

I am concerned that the costs of doing the experiments may end up poorly defined and dependent on uncertain schedules. At present, we have no basis for making a valid estimate of integration costs. I would appreciate your re-evaluation of the decision to require the experiment sponsor to defray integration costs.

We are reviewing the experiments in DOD to re-evaluate our participation in the Orbital Workshop. In the event that integration costs are to be borne by the experimenter, will you please provide me your estimate of the integration cost for each of the five DOD experiments, together with an explanation of the basis or ground rules used in deriving these estimates. It will be appreciated if this information can be provided by 10 February 1967.

Sincerely,

A handwritten signature in dark ink, appearing to read "Fiñk".

Daniel J. Fiñk  
Deputy Director

(Strategic and Space Systems)

DEPARTMENT OF THE AIR FORCE  
WASHINGTON

OFFICE OF THE SECRETARY

January 13, 1967

MEMORANDUM FOR DIRECTOR, MANNED ORBITING LABORATORY (MOL)  
PROGRAM

SUBJECT: Authorization to Proceed with the Engineering  
Development Phase of the MOL Program

As Director of the MOL Program, you are authorized to continue with the engineering development of the MOL System.

Release of DOD deferred FY 67 funds in the amount of \$120,000,000 is granted to continue the contracted MOL Phase II Development Program with the understanding that actual obligations and expenditures on each major segment of the program are to be reviewed in detail prior to release of remaining FY 67 funds. Control of FY 67 and FY 68 expenditures and commitments to minimum levels compatible with approved program objectives is essential. FY 67 funding is now established at a maximum of \$228 million. However, reductions of FY 67 program fund requirements which may result from actions initiated or taken at the January 5, 1967 MOL management meeting should be fully considered. FY 68 funding levels will be established following resolution of issues addressed at that meeting and updating of the financial plan based on actual experience prior to the last quarter of FY 67.

I request to be advised on a continuing basis of any disparity that might exist between fund availability and baseline requirements as actual experience in obligating funds develops. Based on this experience, reprogramming of additional program funds, as necessary, or alternatively slipping development and flight schedules for all or part of the baseline program will be examined.

*Alexander H. Flax*  
Alexander H. Flax  
Assistant Secretary  
Research & Development

Notebook for  
JAN 5 - 1967

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AGENDA  
FOR  
MOL MANAGEMENT MEETING

January 5, 1967  
Washington, D. C.

MORNING SESSION

- |   |                    |             |
|---|--------------------|-------------|
| A. INTRODUCTION   | General Evans      | 0900 - 0910 |
| B. TIME - COST PROGRAM OPTIONS<br>Status of FY 67/FY 68 Funds -<br>Optimum Time to Recognize<br>Slippage if Funds are Limited | Colonel Randall    | 0910 - 0940 |
| C. SCHEDULE FOR DEFINITIZING<br>CONTRACTUALLY DEFERRED ITEMS  | Colonel Dietrich   | 0940 - 1000 |
| D. SATURN IVB<br>Reevaluation of Air Force<br>Participation in NASA Program   | Lt/Colonel Skantze | 1000 - 1020 |
| - - - - - B R E A K - - - - -   |                    | 1020 - 1030 |
| E. WIDE BAND READ OUT<br>Review of MOL Implementation Plans<br>for a Read-out System  | Mr. Strong         | 1030 - 1045 |

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- F. THERMAL DOORS  
Proposed Baseline Design Change Mr. Emerson 1045 - 1105
- G. ACOUSTIC TESTING  
Acoustic Test Requirements at Contractor/Government Location Mr. Tennant 1105 - 1135
- H. DISCUSSION AND EXECUTIVE SESSION 1135 - 1215

AFTERNOON SESSION

- A. IMAGE VELOCITY SENSOR  
Performance Capability of IVS as a Cloud Sensor Mr. Strong 1330 - 1400 3 PM
- B. SUPPORT MODULE STUDIES  
Baseline Configuration and Extended Life Capability Mr. Meltzer 1400 - 1430
- C. ACQUISITION AND TRACKING SCOPE  
Studies on Enlarged Scope Mr. Sampson 1430 - 1500
- B R E A K ----- 1500 - 1515
- D. SIMULATION STUDIES AND PLANNING  
For Exploring Astronaut Capabilities and Time Lines Mr. Bernstein 1515 - 1545

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ACTIVE TARGET DETECTION SIMULATION ACTIVITIES

- INITIAL SIMULATION ACTIVITIES
  - AEROSPACE/SAFSL
  - LOCKHEED
- PLAN FOR FUTURE SIMULATION ACTIVITIES

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INITIAL SIMULATION ACTIVITIES

● PURPOSE

... ...

LINES TO:

TARGET INDICATORS

- "SEARCH LIMITED DESIGNATED AREAS"

OF

● ENVIRONMENTAL FA

... ...

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AEROSPACE/SAFSL SIMULATION

● SIMULATION CONDITIONS

- TWO CONTRAST LEVELS
- SIX VARIATIONS IN EQUIPMENT
- FIVE SETS OF SUBJECT MATTER (GAMBIT MATERIAL:  
    ~ 300 SCENES/20% ACTIVE)
- THIRTEEN SUBJECTS (P.I.'s)
- VOICE CUEING
- STATIC DISPLAY

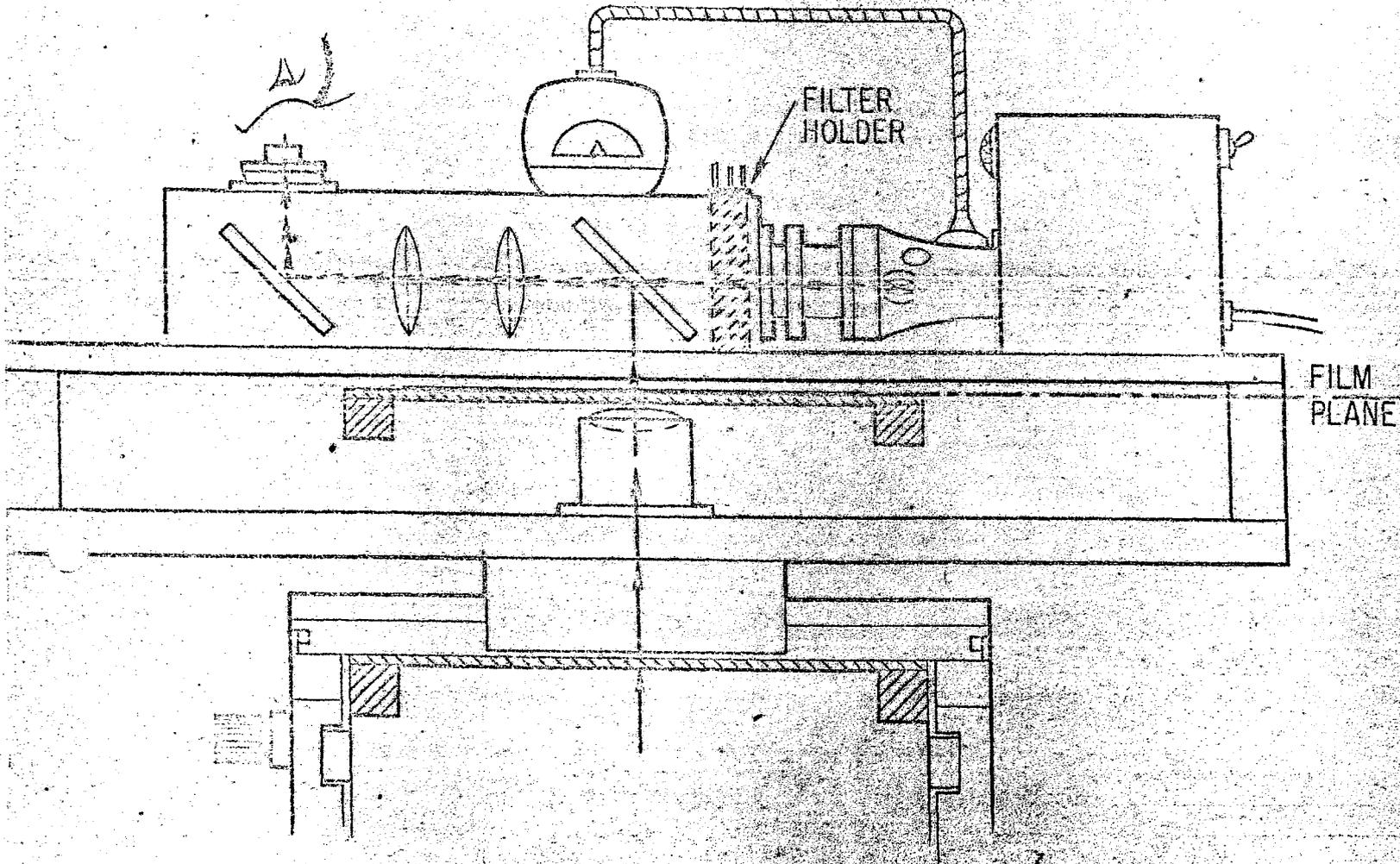
● SIMULATION PROCEDURES

- SIX- AND 10-SECOND DISPLAY TIME
- SUBJECTS REQUIRED TO DECIDE STATUS
- SUBJECTS REQUESTED TO RESPOND AS RAPIDLY  
    AS POSSIBLE
- IMPORTANCE OF MINIMIZING FALSE ALARMS STRESSED  
    (PARTICULARLY 6-SECOND TESTS)

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SPECIAL HANDLING

# TRACKING TELESCOPE SIMULATOR



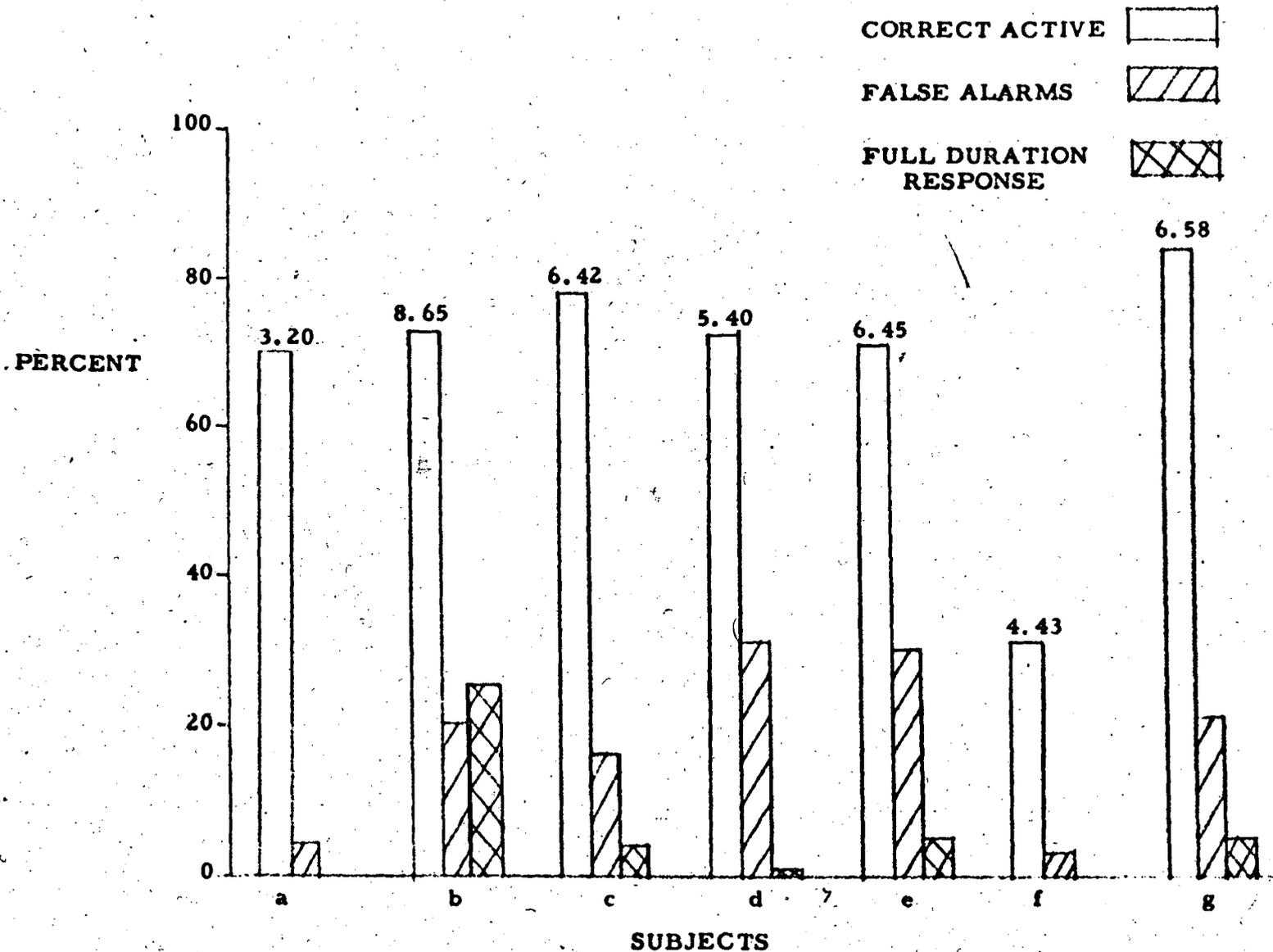
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SUBJECT SCORES

● 10-SECOND RESPONSE TIME



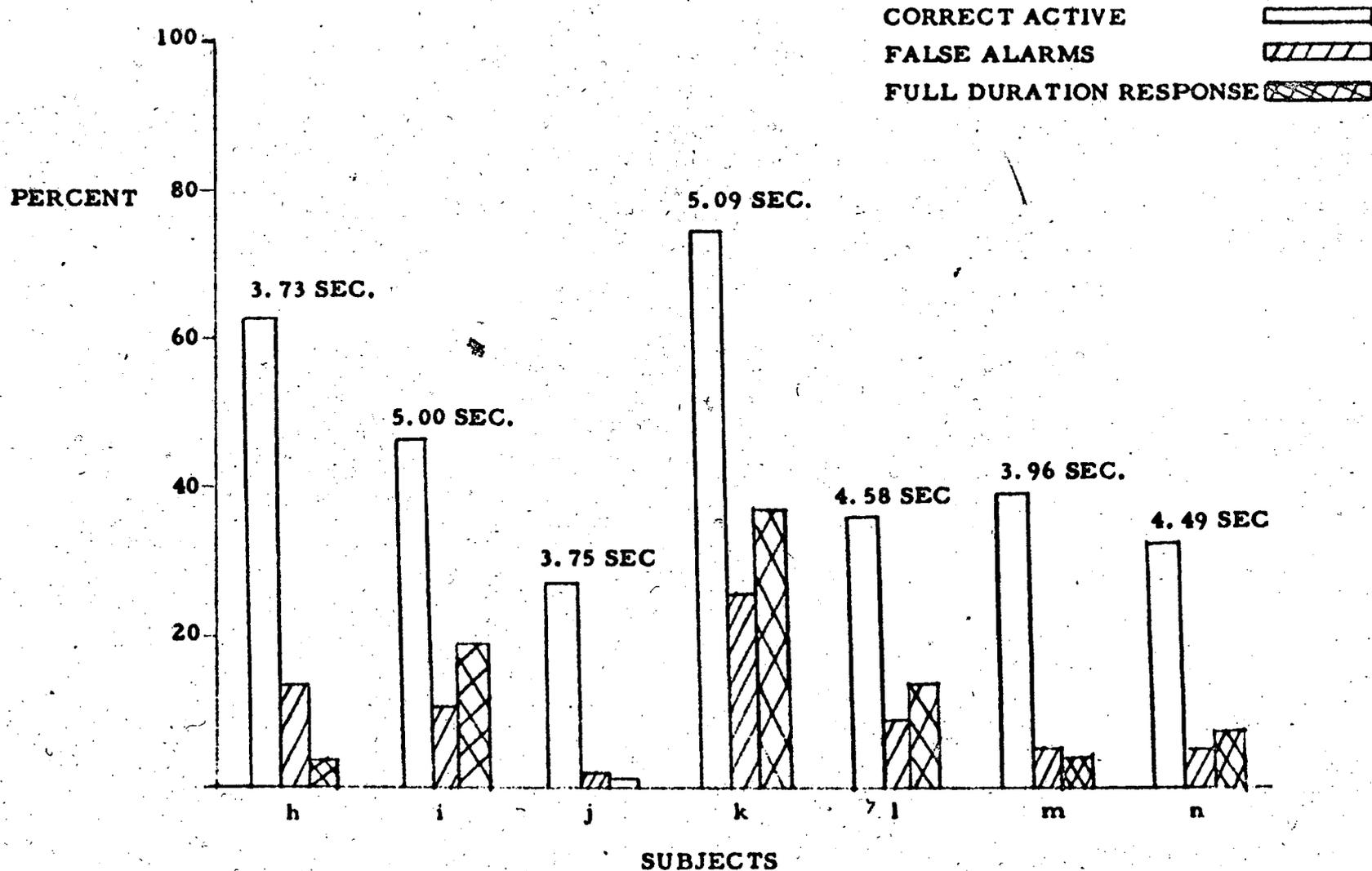
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SUBJECT SCORES

● 6-SECOND RESPONSE TIME

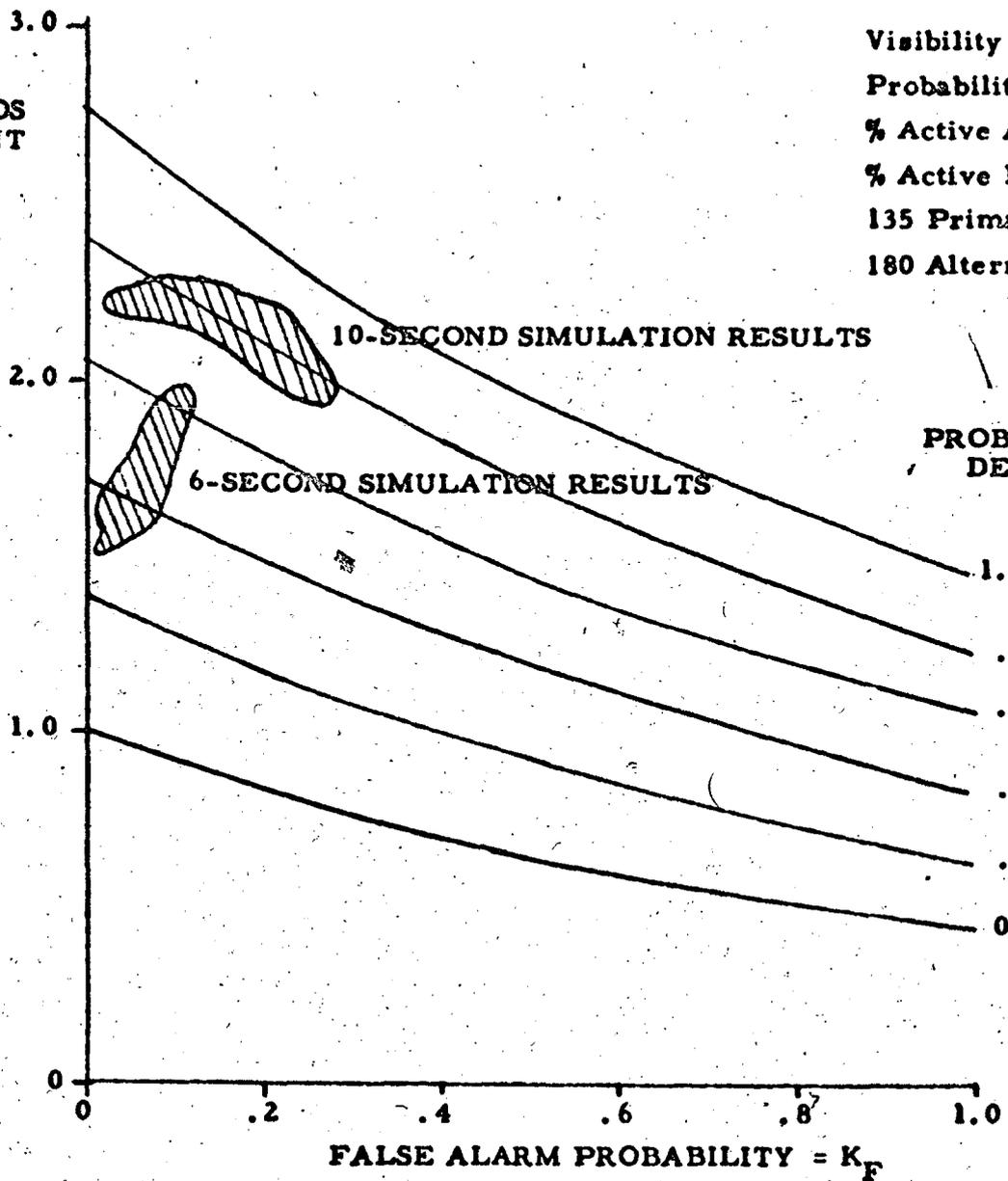


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SPECIAL PHOTOS ENHANCEMENT FACTOR VS. ACCURACY

● Active Target Mode

SPECIAL PHOTOS  
ENHANCEMENT  
FACTOR



Visibility = .5

Probability of Losing Next Cluster = .5

% Active Alternates = 6

% Active Primaries = 4.2

135 Primaries/day

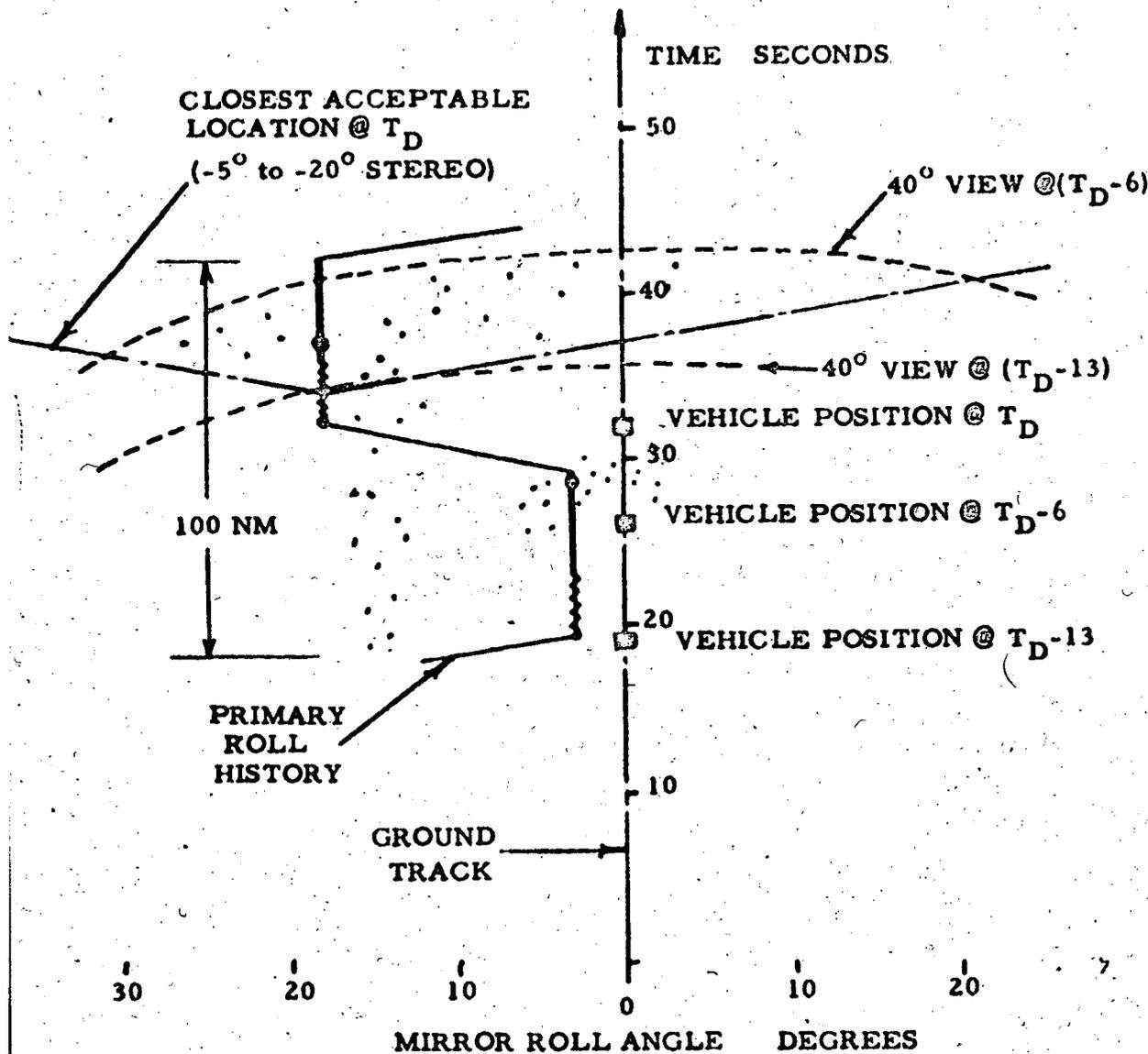
180 Alternates/day

PROBABILITY OF CORRECTLY  
DETERMINING ACTIVITY =  $K_A$

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SPECIAL PHOTOS ENHANCEMENT FACTORS FOR CLUSTERED TARGETS

o 0.5 VISIBILITY



|       |       | ENHANCEMENT FACTOR |               |
|-------|-------|--------------------|---------------|
| $K_A$ | $K_F$ | 100 NM CLUSTER     | 50 NM CLUSTER |
| 1.0   | 0     | 8.02               | 4.8           |
|       | .1    | 6.21               | 4.16          |
|       | .2    | 5.00               | 3.96          |
| .85   | 0     | 7.15               | 4.29          |
|       | .1    | 5.49               | 3.7           |
|       | .2    | 4.35               | 3.18          |
| .7    | 0     | 6.43               | 3.87          |
|       | .1    | 4.73               | 3.19          |
|       | .2    | 3.7                | 2.74          |

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LOCKHEED SIMULATION

● SIMULATION CONDITIONS

- FOUR VARIATIONS IN EQUIPMENT (ZOOM CAPABILITY)
- THREE CONTRAST LEVELS (CHANGE EVERY 8 TARGETS)
- THREE SETS OF SUBJECT MATTER (GAMBIT EPD MATERIAL)
- DYNAMIC DISPLAY WITH STATIC AND SCAN TARGETS
- VISUAL/VOICE CUEING
- SUBJECTS (PRIMARILY FLIGHT CREW)
  - 14 TESTED ON STATIC TARGETS
  - 8 TESTED ON SCAN TARGETS

● SIMULATION PROCEDURES

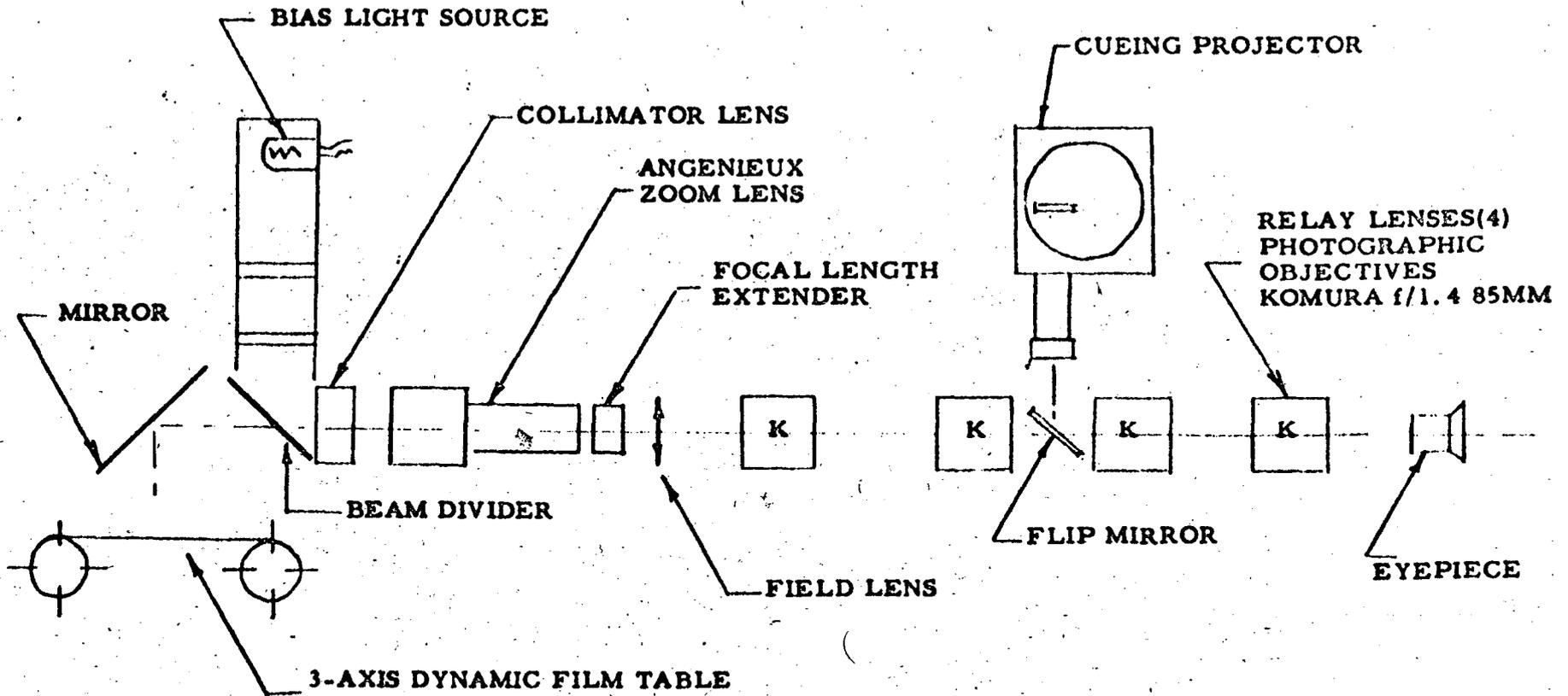
- FORCED CUEING, 7-10 SECONDS, CUES AT 50X
- 10-SECOND DISPLAY TIME FOR STATIC TARGETS, 15 SECONDS FOR MULTIPLE TARGETS
- SUBJECTS REQUESTED TO RESPOND RAPIDLY/MINIMIZE FALSE ALARMS
- TARGET AUTOMATICALLY REJECTED IF NO DECISION MADE IN DISPLAY TIME

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LOCKHEED SIMULATOR

12910



|                                 |              |         |                         |                |
|---------------------------------|--------------|---------|-------------------------|----------------|
| Optics Simulated                | 5 Inch       | 10 Inch | 10 Inch                 | 15 Inch        |
| Magnification in Zoom Range     | 25x - 100x   | 50x     | 50x - 100x(150X)        | 75x - 150x     |
| Exit Pupil Diameter (Requested) | 5mm-1.25mm   | 5mm     | 5mm - 2.5mm             | 5mm - 2.5mm    |
| Exit Pupil Diameter (Provided)  | 2.5mm-1.25mm | 2.5mm   | 2.5mm-2.5mm<br>(1.67mm) | 2.5mm - 1.25mm |

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LMSC SIMULATION RESULTS

● **STATIC TARGETS (48 SCENES; 19 ACTIVES)**

- **OVERALL SCORES**

- **CORRECT ACTIVES ~ 78%**
  - **FALSE ALARMS ~ 17%**
- } NO NOTICEABLE EFFECTS OF  
VARYING OPTICAL CONFIGURATION

- **TIME OF RESPONSES (EFFECT OF AUTOMATIC REJECTION @ T<sub>MAX</sub>)**

- **78% OF CORRECT ACTIVES OCCUR AT ≤ 6 SECONDS**
- **80% OF CORRECT REJECTS OCCUR AT ≥ 10 SECONDS**
- **93% OF MISSED ACTIVES OCCUR AT ≥ 10 SECONDS**
- **48% OF ALL RESPONSES OCCUR AT ≥ 10 SECONDS**

● **SCAN TARGETS (7 SCAN AREAS, 16 TARGETS, 6 ACTIVES)**

- **OVERALL SCORES**

- **CORRECT ACTIVES ~ 70%**
- **FALSE ALARMS ~ 5%**

● **VALIDITY OF RESULTS**

- **LIMITED SAMPLES (REPEATED RUNS AGAINST SAME MATERIAL)**
- **CUEING AIDS PREPARED FROM TRIAL MATERIALS**
- **AUTOMATIC REJECT**
- **TIME RESPONSE DATA**
- **INDICATOR DEFINITIONS**

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FUTURE SIMULATION PLANS

- ADDITIONAL LIMITED (A) /SAFSL SIMULATIONS
- ADVANCED SIMULATIONS
  - EDS/MDS AT GENERAL ELECTRIC
  - OTHERS (?)

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FUTURE ① / SAFSL SIMULATION EFFORT

● PURPOSES:

- CONTINUE SIMULATION ACTIVITIES UNTIL GE SIMULATOR AVAILABLE
- PROVIDE ADDITIONAL STATISTICAL DATA
- BIOCULAR VS MONOCULAR VIEWING
- DEVELOP SIMULATION PROCEDURES

● NEW SIMULATOR

- 50X → 100X (RAPID STEP CHANGE OF MAGNIFICATION)
- BIOCULAR & MONOCULAR EYEPIECES

● MATERIALS: SAME AS PRECEDING IN-HOUSE WORK

● SUBJECTS:

- PI AND DESIREABLY CREW
- BETTER SUBJECT SCREENING

● VIEWING TIME: VARIABLE ~ NO LONGER THAN 10 SECONDS

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ADVANCED SIMULATIONS

● PURPOSES

- EQUIPMENT DEVELOPMENT
- ACTIVE TARGET MODE CONCEPT VALIDATION/  
STATISTICAL DATA
- TRAINING

● SIMULATION REQUIREMENTS

- COMPATIBLE WITH ACQUISITION SYSTEM RESOLUTION  
PERFORMANCE
- ~ 60° APPARENT FIELD
- ZOOM CAPABILITY 60X - 120X
- SIMULATE SCENE DRIFT
- SIMULATE SCANNING LIMITED AREAS
- VARIABLE HAZE/CONTRAST LEVELS

● POSSIBLE APPROACHES

- 2D SIMULATION USING ONLY G & G<sup>3</sup> STIMULUS  
(MINIMUM REQUIREMENT)
- ABOVE PLUS ADDITIONAL STIMULUS FROM AIRCRAFT  
OR MODEL PHOTOGRAPHY
- 3D SIMULATIONS VIA AIRCRAFT OR MODELS

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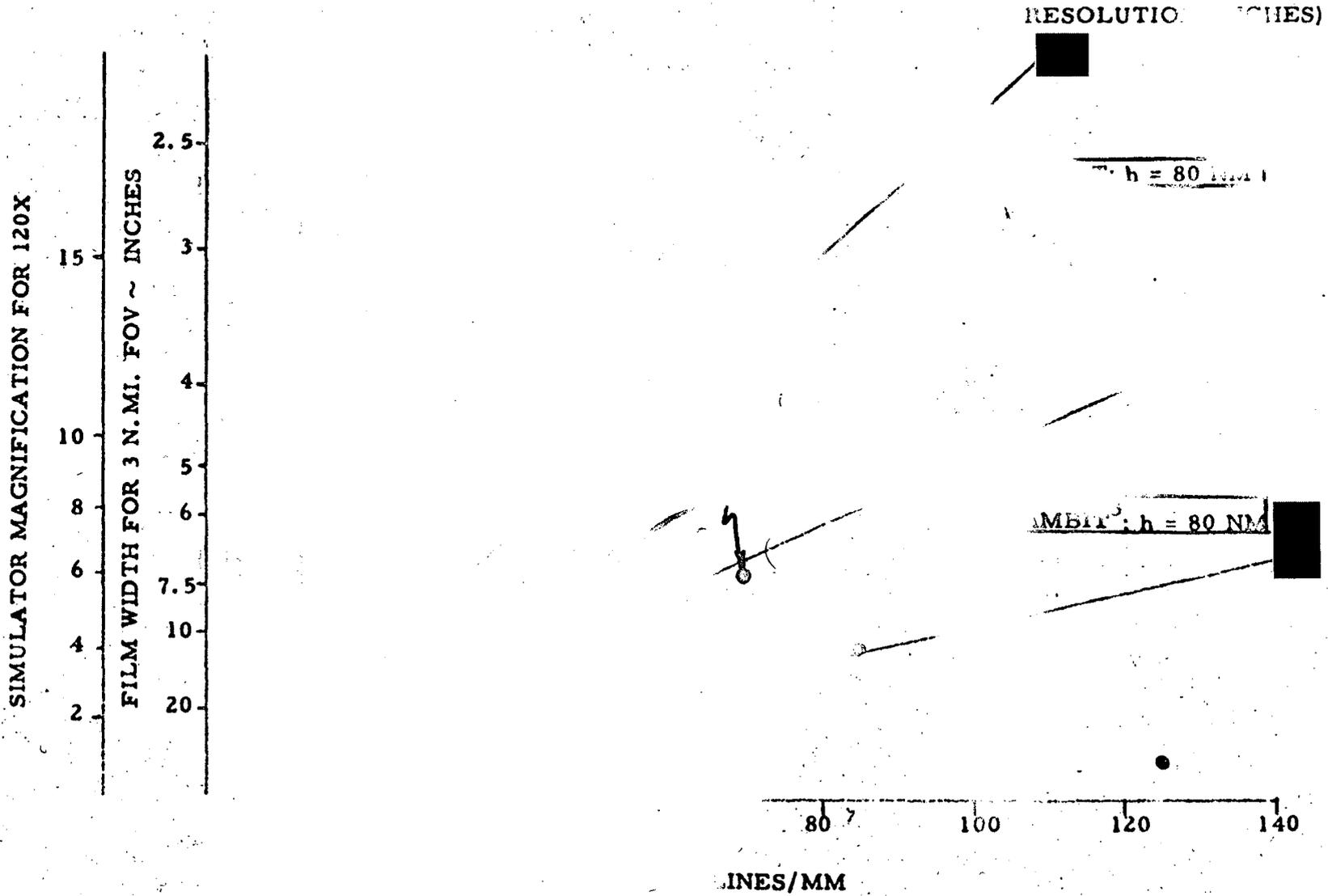
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USE OF ZI TARGETS

| <u>TARGET CATEGORIES</u>            | <u>APPLICABILITY<br/>OF US</u> |
|-------------------------------------|--------------------------------|
| MISSILE DEPLOYMENT & TEST           | RESPECTIVELY YES TO ?          |
| GROUND FORCES                       | ?                              |
| AIRFIELDS                           | < ?                            |
| RADAR/COMMUNICATIONS DEPLOYMENT     | > ?                            |
| INDUSTRY                            | NO                             |
| MISSILE PRODUCTION & LOGISTICS      | NO                             |
| NUCLEAR WEAPONS                     | ?                              |
| BW/CW                               | ?                              |
| NUCLEAR MATERIALS                   | ?                              |
| AIRCRAFT PRODUCTION                 | NO                             |
| NAVAL ACTIVITY                      | YES                            |
| RADAR/COMMUNICATIONS<br>MAJOR & R&D | < ?                            |

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SIMULATOR STIMULUS MATERIAL TRADE-OFFS

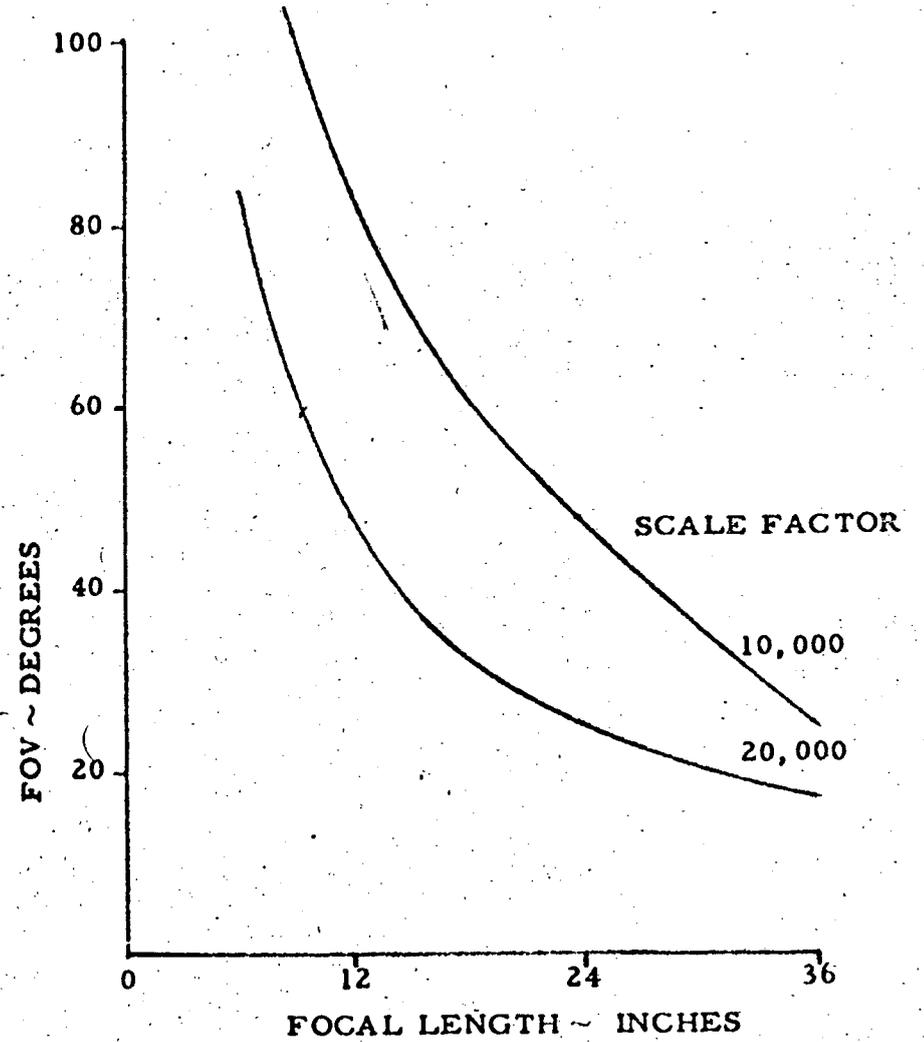
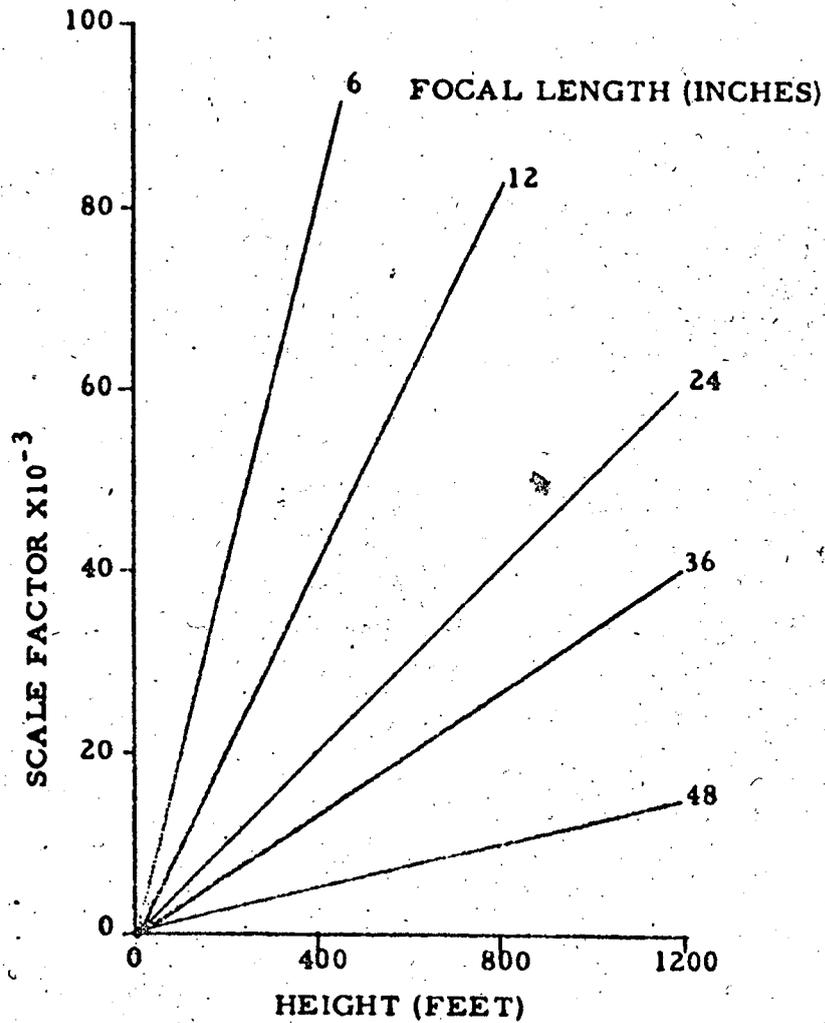


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STIMULUS MATERIAL FROM MODEL PHOTOGRAPHY

- o MODEL SCALE = 100
- o SIMULATE 3 NAUTICAL MILES ON GROUND



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2D SIMULATION CRITIQUE

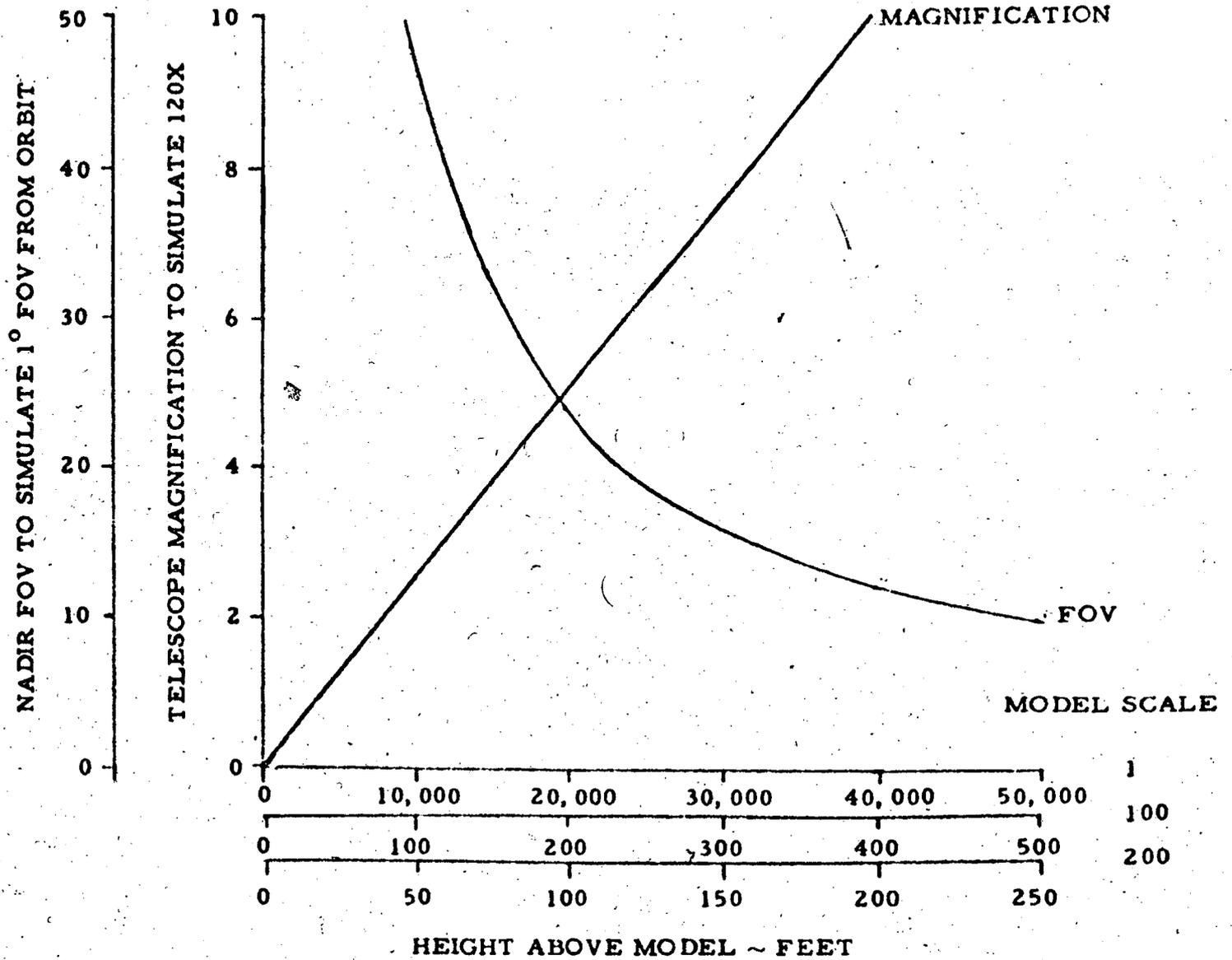
- NEED 2D ADVANCED SIMULATOR UTILIZING G & G<sup>3</sup> STIMULUS
  - MANDATORY FOR TRAINING
  - REASONABLE RESOLUTION/CONTRASTS, PARTICULARLY WITH G<sup>3</sup>
  - G<sup>3</sup> MATERIAL IN COLOR MIGHT BE AVAILABLE IN LIMITED QUANTITY
  
- DON'T CONSIDER GENERATION OF ADDITIONAL STIMULUS VIA AIRCRAFT OR MODEL PHOTOGRAPHY
  - REALISM
  - SCALING/FACILITY PROBLEMS
  - PERSPECTIVE DISTORTION
  - EXTENSIVE MOSAIC WORK
  - QUALITY SIGNIFICANTLY BETTER THAN G<sup>3</sup> VERY DIFFICULT TO OBTAIN

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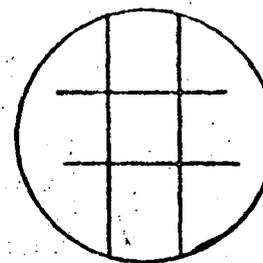
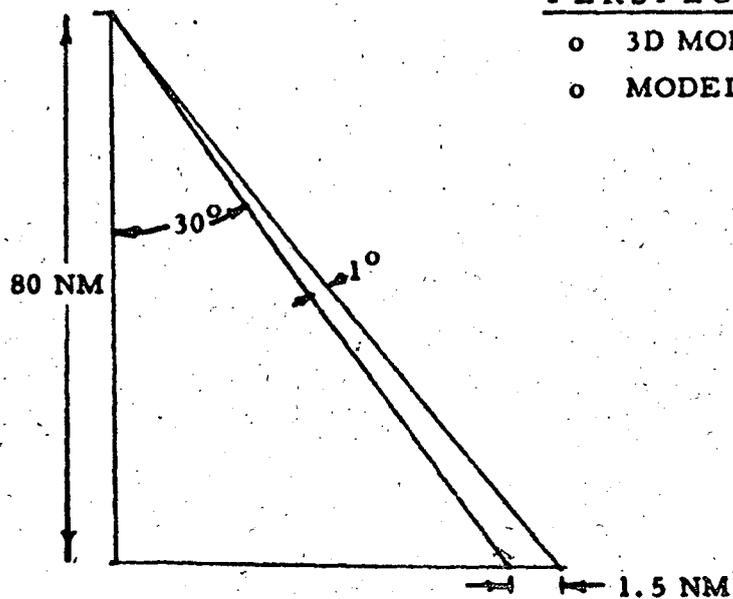
3-D SIMULATION SCALING PARAMETERS



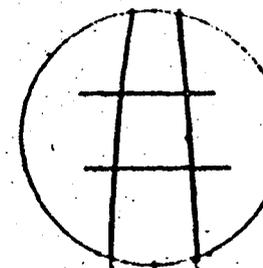
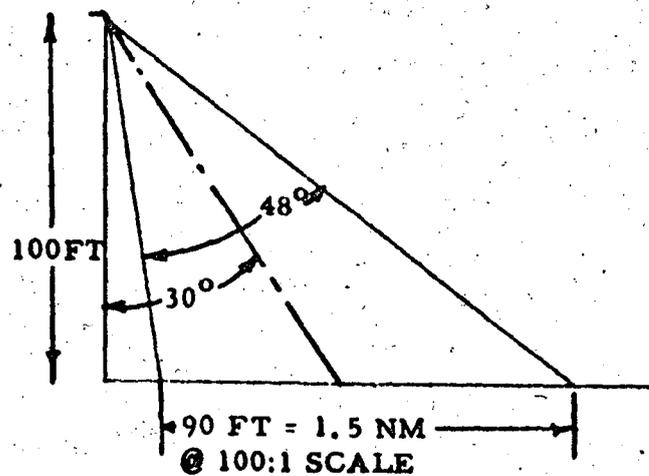
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PERSPECTIVE DISTORTION

- o 3D MODEL SIMULATION
- o MODEL SCALE = 100



FROM ORBIT



IN SIMULATOR

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3D SIMULATION CRITIQUE

AIRCRAFT WITH TELESCOPE

3D MODEL WITH TELESCOPE

o ADVANTAGES

- o REALISTIC COLOR REFLECTIONS & ILLUMINATION

- o CONTROLLED TEST CONDITIONS OF ILLUMINATION, ETC.

- o NOT RESOLUTION LIMITED

- o ESSENTIALLY NOT RESOLUTION LIMITED

o PROBLEM AREAS

- o DIFFICULT TO CONTROL ENVIRONMENTAL FACTORS

- o LARGE FACILITY REQUIRED TO PERMIT MODEL VIEWING

- o SCALING PROBLEM IN RETAINING PERSPECTIVE

- o EITHER VERY LARGE MODELS OR MODEL SCALE >> 100:1 REQ'D

- o REASONABLE LIMITS ON NUMBERS OF FLIGHTS PROHIBIT AMASSING STATISTICAL DATA

- o SCALING PROBLEM IN RETAINING PERSPECTIVE

- o REAL-TIME SEQUENCING OF TARGETS UNATTAINABLE

- o FEW SCENES WOULD DETRACT FROM STATISTICS

- o CONTROL OF GROUND SITUATIONS

- o MODEL REALISM QUESTIONABLE

- FINE DETAIL
- REFLECTANCES
- COLOR

- o HIGH COST

- o TARGET REALISM HIGHLY QUESTIONABLE

- o REAL-TIME SEQUENCING OF TARGET UNATTAINABLE

- o HIGH COST

oo RECOMMENDATION: DON'T CONSIDER EITHER

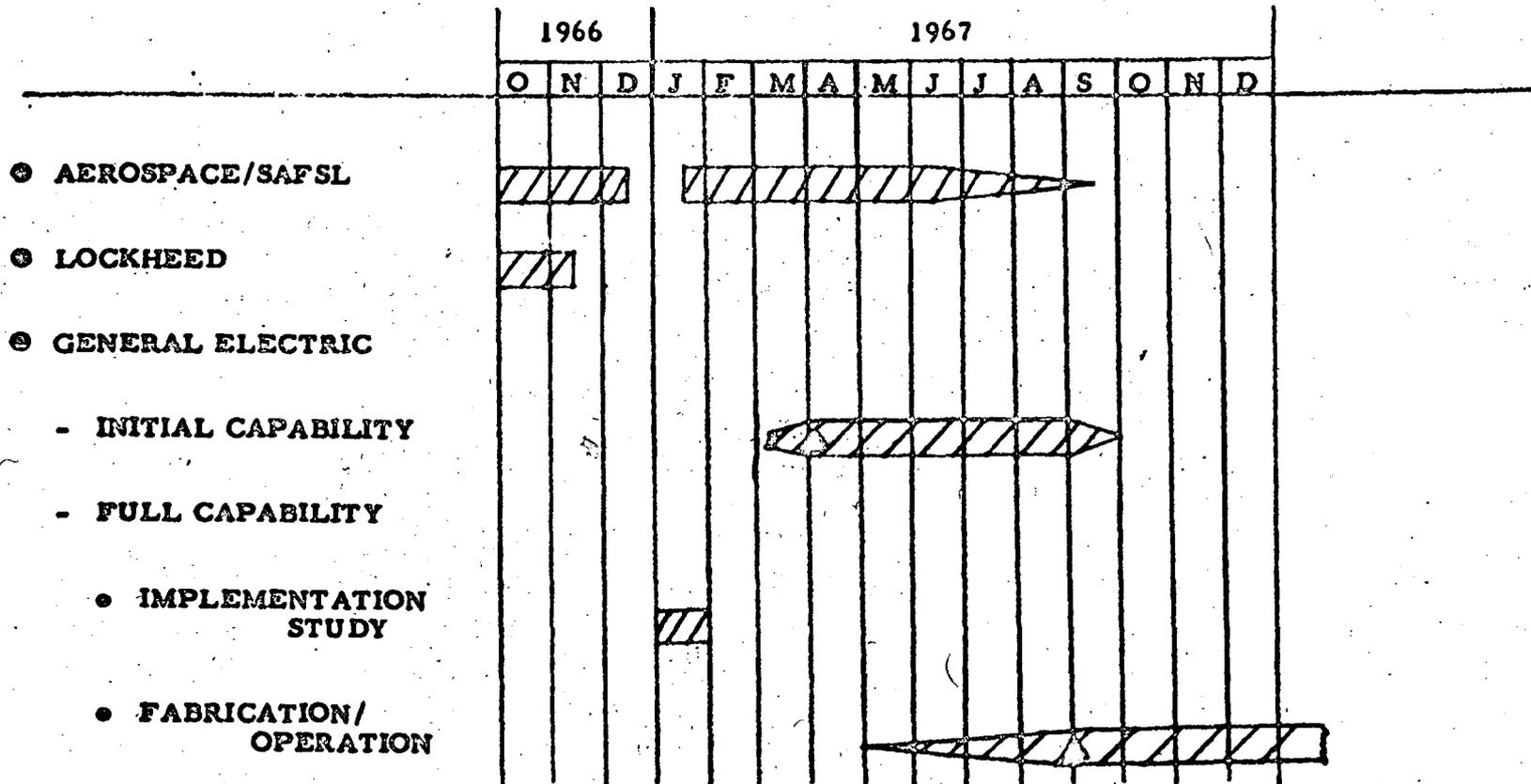
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ESTIMATED SIMULATION SCHEDULE

• ACTIVE TARGET MODE



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ACQUISITION SYSTEM STATUS

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REQUIREMENTS

FUNCTIONS:

- ACQUISITION AND TRACKING (BACK UP TO AUTOMATIC OPERATION)
- TARGET ACTIVITY DETECTION
- SCAN WITHIN LIMITED AREA
- BACKUP NAVIGATION

DESIGN REQUIREMENTS:

- 3 FT. RESOLUTION FOR HIGH CONTRAST TARGETS FOR ACTIVE INDICATOR IDENTIFICATION
- 1° FOV FOR INITIAL ACTIVE INDICATOR ACQUISITION OR TARGET ACQUISITION AND POINTING
- 4° FOV FOR NAVIGATION REQUIREMENT
- SCAN ANGLE REQUIREMENTS
  - LATERALLY  $\pm 45^\circ$
  - LONGITUDINALLY  $+ 40^\circ$  to  $- 10^\circ$ , NO VIGNETTING
  - $+ 70^\circ$  to  $- 40^\circ$  DESIRED, VIGNETTING ACCEPTABLE

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CONTRACTOR STUDY RESPONSIBILITIES

OPTICAL CONTRACTORS

- PARAMETRIC PERFORMANCE AND DESIGN STUDY
- PRELIMINARY DESIGN OF IMPROVED ACQUISITION TRACKING SCOPE
- COMPATIBILITY WITH MOL LAB VEHICLE

DOUGLAS

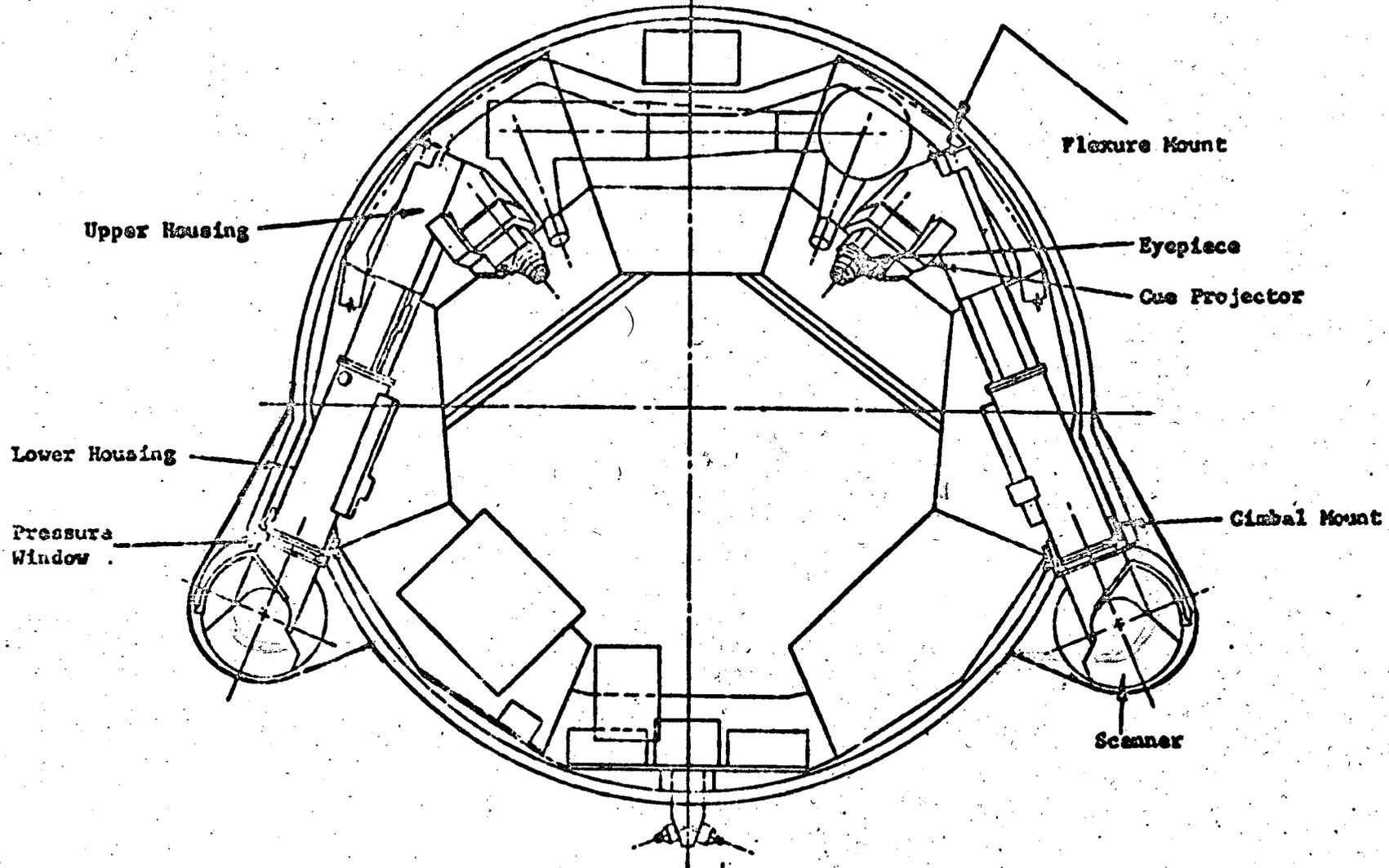
- INTEGRATION INTO LAB  
SPACE ENVELOPES/STRUCTURE/DEFLECTIONS/ENVIRONMENTAL CONTROL
- FAIRINGS  
WEIGHTS/PROPULSION EFFECTS
- ENVIRONMENTS  
VIBRATION - ACOUSTIC - THERMAL, ETC.
- SCHEDULE/TEST/AGE

GE

- OPERATIONAL MODES
- SYSTEM LEVEL REQUIREMENTS
- ACQUISITION SUBSYSTEM DESIGN  
CUES/CONTROLS/ALIGNMENT MONITOR/INSTALLATION
- TESTING/SIMULATION/TRAINING

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Figure 1-2. 10-Inch Systems Installed in Vehicle  
Cross Section

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DETAILED INSTRUMENT PARAMETERS

ZOOM OPTICS 16 - 32X LOW RANGE

60 - 120X HIGH RANGE

EYEPIECE 60° APPARENT FIELD

MINIMUM EXIT PUPIL 2 MM

APERTURE 10 INCHES

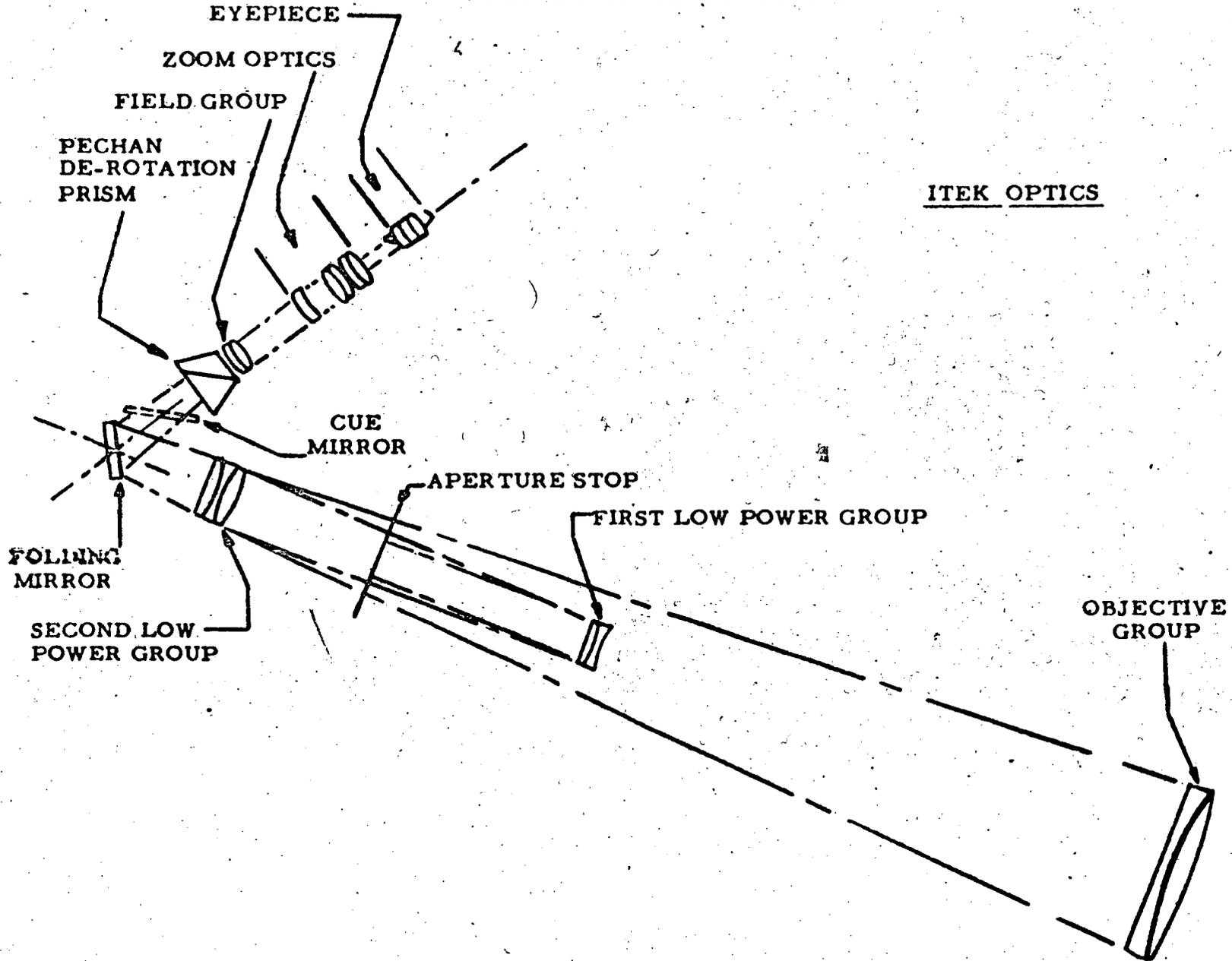
MONOCULAR EYEPIECE

DEROTATION CAPABILITY

CUE PROJECTION CAPABILITY

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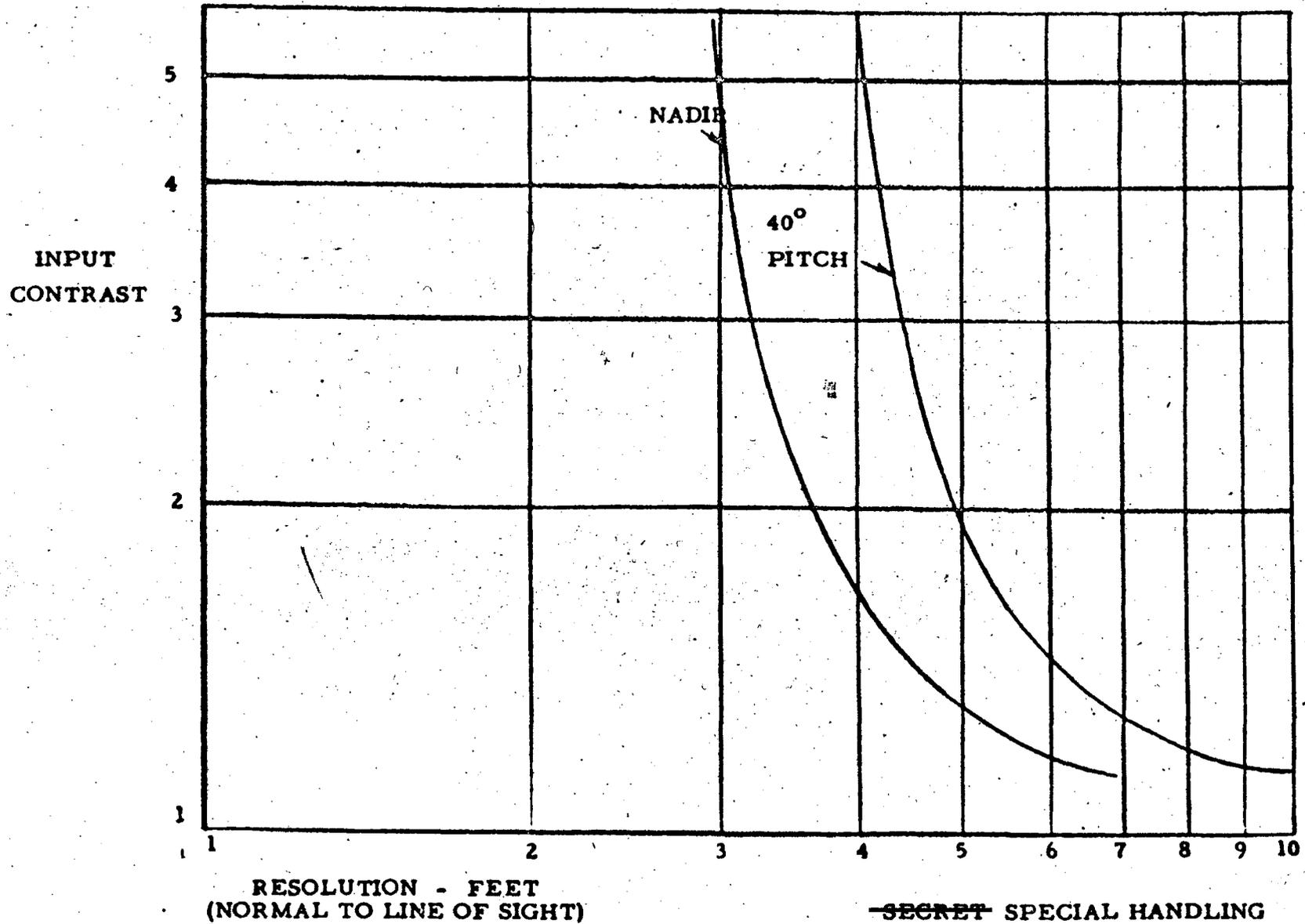
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GROUND RESOLUTION:  $\lambda/4$  OPTICS  
20° SUN ELEVATION ANGLE  
80 N. MI. ALTITUDE



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10 INCH SYSTEM

|                     |           |
|---------------------|-----------|
| TELESCOPE/SCANNER   | 295       |
| MOUNTING AND WINDOW | 42        |
| FAIRING             | 130       |
| CONTROL ELECTRONICS | <u>10</u> |
| TOTAL HARDWARE      | 477       |

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10 INCH SYSTEM SUMMARY

|                       | <u>10 INCH</u>             | <u>PREVIOUS SYSTEM</u> |
|-----------------------|----------------------------|------------------------|
| INSTALLED WEIGHT      |                            |                        |
| OPTICAL SYSTEM        | 477#                       | 301                    |
| WEIGHT INCREASE       | 176#                       |                        |
| POWER*                |                            |                        |
| PEAK                  | 210W                       | 323W                   |
| AVERAGE               | 14W                        | 21W                    |
| RELIABILITY ALOCATION |                            |                        |
| BOTH                  | .979                       | .979                   |
| ONE                   | .99                        | .99                    |
| RESOLUTION            |                            |                        |
| 2:1 CONTRAST          | 4.9 FT 40°<br>3.6 FT NADIR | ~ 10 FT NADIR          |
| 4:1 CONTRAST          | 3.0 FT NADIR               |                        |

\*NOT INCLUDING CUES

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10 INCH SYSTEM STATUS

FORMAL EVALUATION OF ITEK AND PERKIN ELMER PROPOSALS  
ITEK FINAL NEGOTIATIONS ON GE SUBCONTRACT  
GE TO SUPPLY CONTROL LOOP

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TRACKING HEAD AND FAIRING  
(STORED IN LAUNCH POSITION)

ENCODERS AND  
PITCH DRIVE MOTOR

FAIRING

SUN SHIELD

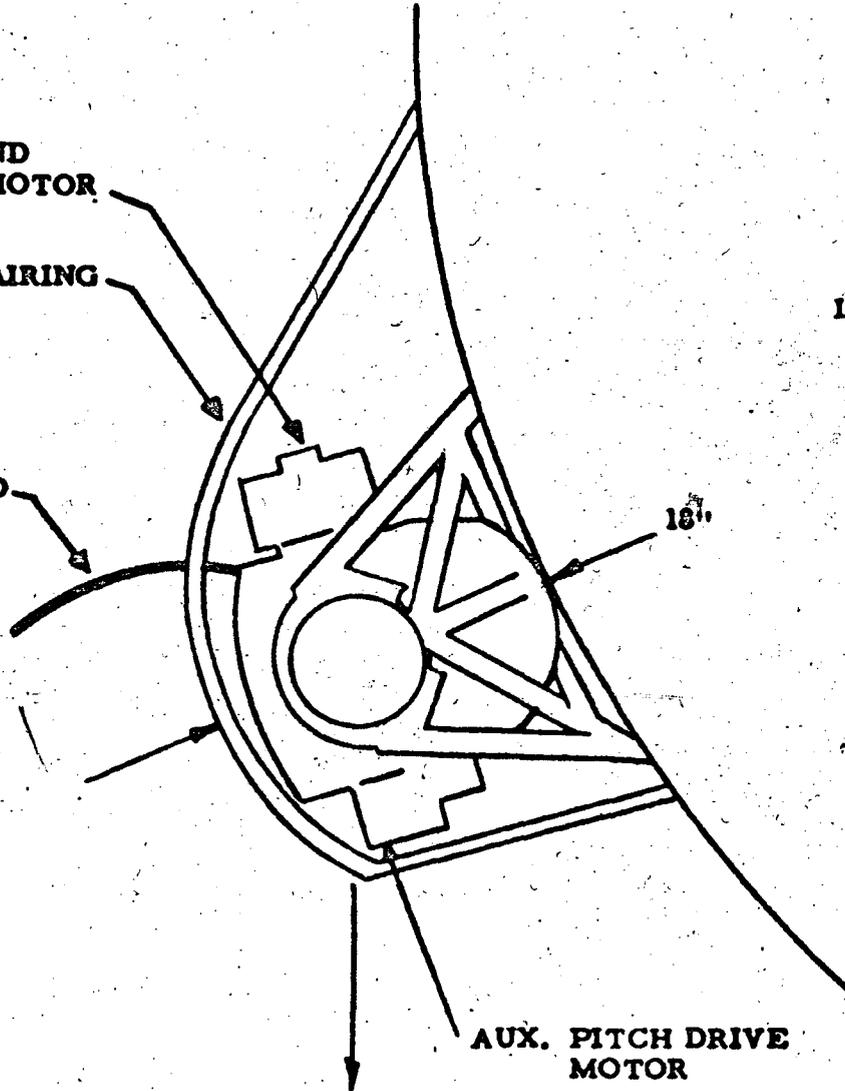
LAB

18"

AUX. PITCH DRIVE  
MOTOR

NADIR

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ACOUSTIC AND VIBRATION TESTING

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QUESTIONS TO BE ADDRESSED

- o WHAT SHOULD THE OVERALL VIBRATION/ACOUSTIC TESTING PROGRAM BE FOR MOL?
- o IS THERE A REQUIREMENT FOR AN ACOUSTIC FACILITY AT EKC FOR MOL?

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TEST OBJECTIVES

- o DEVELOPMENT TESTING  
ENGINEERING TEST TO PROVIDE COMPONENT ENVIRONMENTAL  
DESIGN AND QUALIFICATION TEST DATA, AND TO VERIFY  
STRUCTURAL DESIGN
- o QUALIFICATION TESTING  
PROVE DESIGN IS ADEQUATE FOR EXPECTED ENVIRONMENT  
WITH MARGIN
- o ACCEPTANCE TESTING  
PROVE PARTICULAR ARTICLE IS BUILT TO SPECIFICATIONS  
AND READY FOR FLIGHT.

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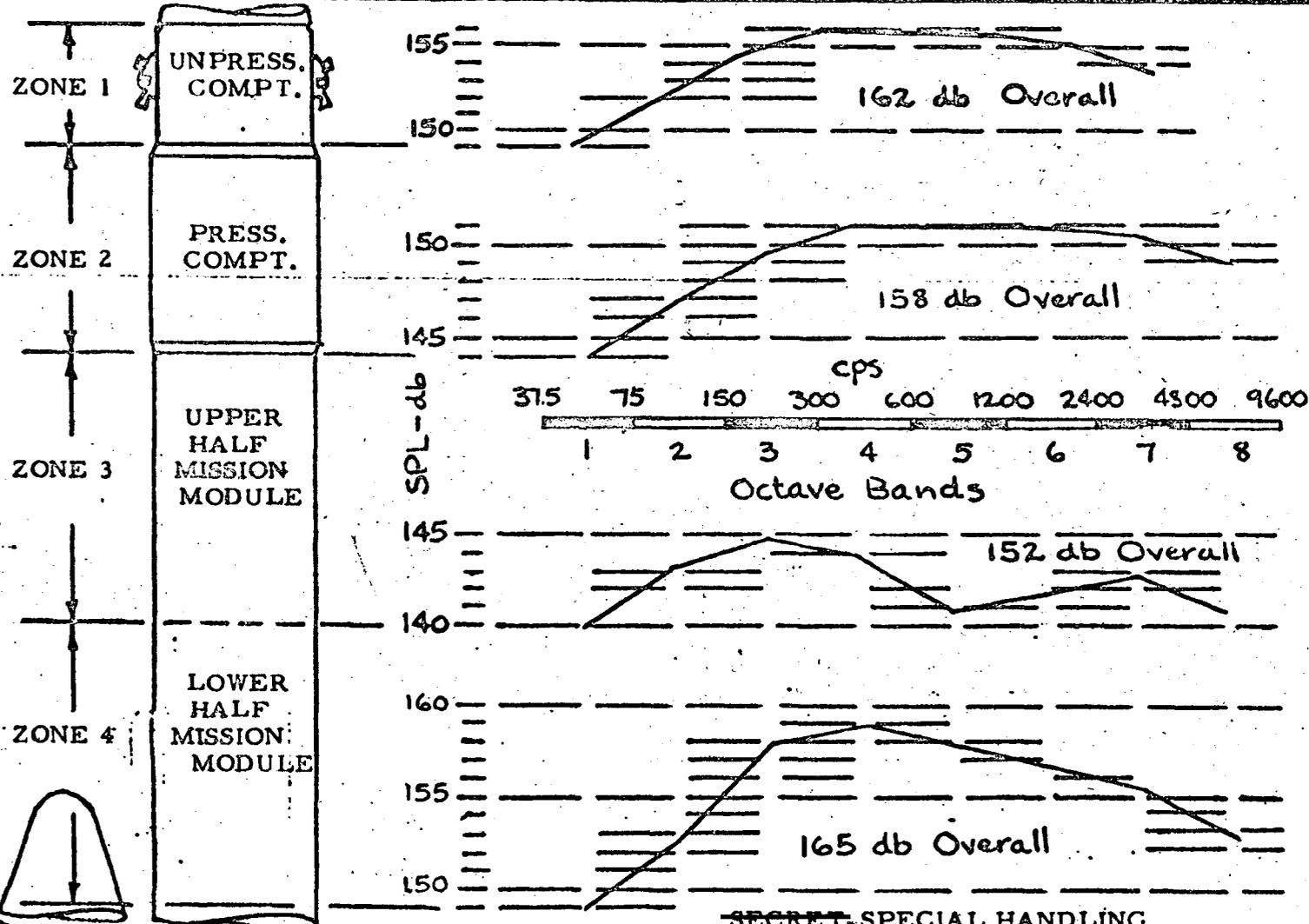
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PRESENT TEST PLAN

| SYSTEM   |   | SEGMENT                       |                   |                   | COMPONENT              |       |                         |
|----------|---|-------------------------------|-------------------|-------------------|------------------------|-------|-------------------------|
|          |   | LM                            | TMB               | COAB              | LM                     | TMB   | COAB                    |
| DEVELOP. | 0 | ACOUSTIC<br>(QUAL.<br>STRUC.) | ACOUSTIC<br>(EKC) |                   | VIBR.<br>AND<br>ACOUS. | VIBR. | VIBRATION &<br>ACOUSTIC |
| QUAL.    | 0 | ----                          | VIBR.             | ACOUSTIC<br>(EKC) | VIBR.<br>AND<br>ACOUS. | VIBR. | VIBRATION &<br>ACOUSTIC |
| ACCEP.   | 0 | ----                          | VIBR.             | ACOUSTIC<br>(EKC) | VIBR.                  | VIBR. | VIBRATION &<br>ACOUSTIC |

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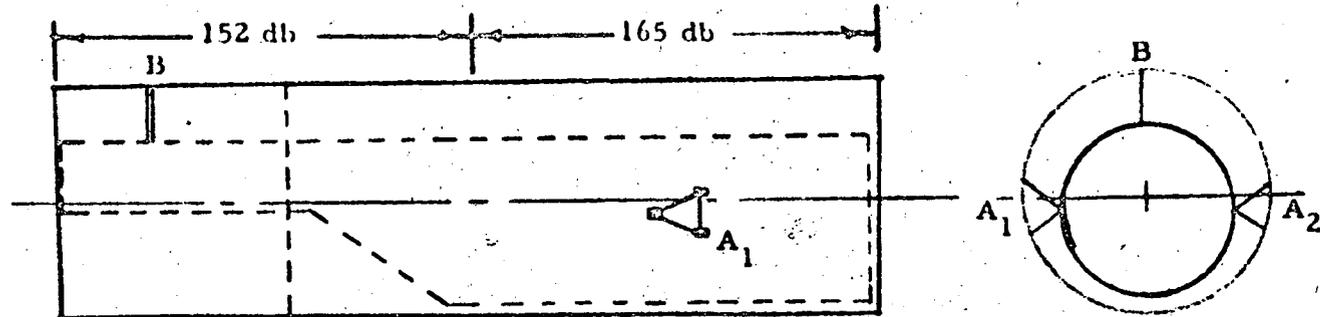
# External Sound Pressure Levels



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## THE MISSION MODULE PROBLEM

o THE EXCITATION (REF: SAFSL 10003)



o THE TRANSMISSION PATHS

'A' FRAMES AT A<sub>1</sub> & A<sub>2</sub>; HINGED STRAP AT B

INTERNAL ACOUSTICS

o VIBRATION TEST?

REQUIRES: TEST FIXTURES FROM SHAKERS TO ATTACH PTS A<sub>1</sub> A<sub>2</sub> & B

- EXTENSIVE STRUCTURAL MODS AT ATTACH POINTS

A DIFFICULT TEST DESIGN PROBLEM

o ACOUSTIC TEST

SIMULATES REAL ENVIRONMENT

CAPABILITIES OF SOME EXISTING ACOUSTIC FACILITIES

| LOCATION                      | SIZE                                    | EQUIPMENT                           | TEST LEVELS<br>(OVERALL) | PROGRAM                     |
|-------------------------------|---|-------------------------------------|--------------------------|-----------------------------|
| ASD, DAYTON                   | 150,000 ft <sup>3</sup><br>(42 ft high) | PURE TONE<br>SIRENS                 | 162 db<br>'QUASI' RANDOM | AIRCRAFT FATIGUE            |
| DOUGLAS,<br>SANTA MONICA      | 10,000 ft <sup>3</sup><br>(30 ft high)  | ELECTROPNEU-<br>MATIC<br>TRANSDUCER | 158 db<br>RANDOM         | MISSILE & SPACE<br>VEHICLES |
| WYLE LABS,<br>HUNTSVILLE      | 100,000 ft <sup>3</sup><br>(36 ft high) | "                                   | 155 db<br>RANDOM         | SATURN                      |
| NORTH AMERICAN<br>LOS ANGELES | 9000 ft <sup>3</sup><br>(22 ft high)    | "                                   | 160 db<br>RANDOM         |                             |
| JPL,<br>PASADENA              | 1000 ft <sup>3</sup><br>(14 ft high)    | "                                   | 154 db<br>RANDOM         | SPACECRAFT                  |
| NORTHROP,<br>HAWTHORNE        | 170 ft <sup>3</sup>                     | HIGH PRESSURE<br>AIR MODULATOR      | 165 db<br>RANDOM         | SPACECRAFT<br>COMPONENTS    |
| MARTIN,<br>DENVER             | 74 ft <sup>3</sup><br>(5 ft high)       | RANDOM SIREN                        | 166 db<br>'QUASI' RANDOM | TITAN<br>COMPONENTS         |
| MSC - NASA                    | DUCT SHROUDS                            | ELECTRO-<br>PNEUMATIC<br>TRANSDUCER | 169 db<br>RANDOM         | APOLLO<br>VEHICLE           |

CONCLUSIONS: DOUGLAS & WYLE FACILITIES REPRESENT CURRENT STATE OF ART.  
165 db REALIZED ONLY IN SMALL CHAMBERS, OR BY SPEC. TECHNIQUES.

ASD SONIC FATIGUE FACILITY

① DESCRIPTION

- LARGE ACOUSTIC CHAMBER (70X56X42 FT) - DOOR 16X16 FT
- SOUND EQUIPMENT - 36 PURE TONE SIRENS - "WARBLD"  
THROUGH 50 CPS FILL 1/2 SPECTRUM  
BELOW 2400 CPS; 1/20 SPECTRUM ABOVE  
- AIR SUPPLY - 310,000 CFM @ 14.6 PSIG
- INSTRUMENTATION - 72 ANALOG DATA CHANNELS → 342 CHANNELS  
BY (10X30) +42

② DEFICIENCIES

- DOOR SIZE
- RELIABILITY OF SIREN EQUIPMENT (FATIGUE FAILURES)
- NON CONTINUOUS SPECTRUM - POOR SIMULATION OF ACOUSTIC  
EXCITATION
- DATA ACQUISITION AND ANALYSIS SYSTEM - CUMBERSOME  
AND TIME CONSUMING

③ MODIFICATIONS REQUIRED FOR MOL TESTING

- INCREASE DOOR SIZE
- PROCURE NEW (ELECTROPNEUMATIC TRANSDUCER) RANDOM  
NOISE SYSTEM
- PROVIDE HIGHER PRESSURE AIR SUPPLY
- REPLACE DATA ACQUISITION AND ANALYSIS SYSTEM WITH  
DIGITAL SYSTEM

④ IMPACT

- NEW FACILITY EXCEPT FOR MODIFIED CHAMBER - COST  
APPROXIMATELY 3.7M (152/165 LOCAL)

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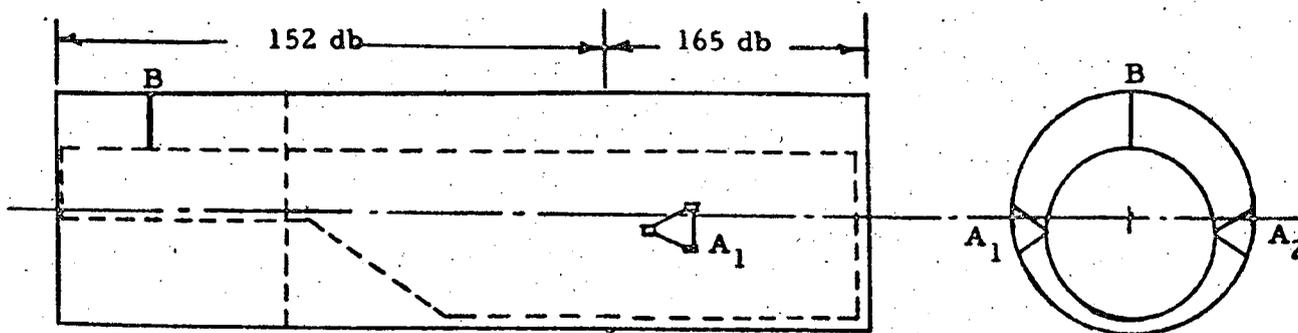
EK PROPOSED ACOUSTIC FACILITY

|                  |  |
|------------------|--|
| REVERBERANT ROOM | 32' x 42' x 60'  |
| ACOUSTIC LEVELS  | 152 DB REVERBERANT<br>165 DB DIRECT RADIATION (12' LONG)               |
| RUN DURATION     | 2 MIN. AT FULL POWER<br>CONTINUOUS AT 7 DB DOWN                        |
| ACOUSTIC HORNS   | 4 NORAIR MK VII REVERBERANT<br>30 LTV 94 DIRECT RADIATION              |
| AIR SUPPLY       | 57,000 CU. FT. STORAGE @ 130 PSIG<br>12,000 CFM/3000 HP AIR COMPRESSOR |
| APPROXIMATE COST | \$4.9M   |

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A POSSIBLE APPROACH - MISSION MODULE ACOUSTIC TESTING



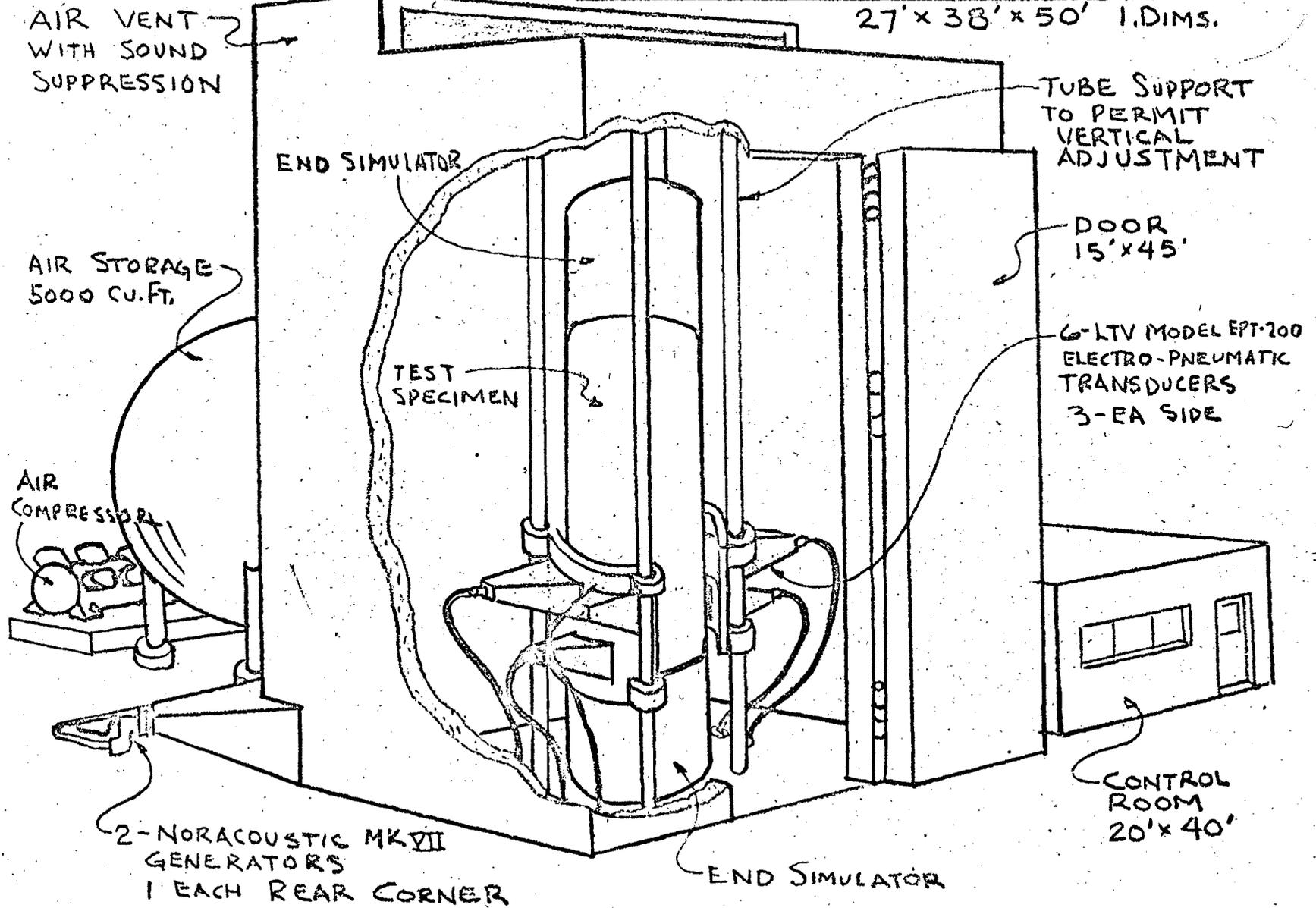
**RATIONALE: THE A-FRAMES FORM THE PRIMARY TRANSMISSION PATH FOR RESPONSE EXCITED BY THE 165 DB ENVIRONMENT**

- o PROVIDE A BASIC ACOUSTIC EXCITATION OF 152 DB OVERALL
- o ADD HORN ARRAYS TO EXCITE A-FRAME MOUNTING POINTS TO THE SPECIFIED LEVEL OF 165 DB OVERALL
- o THIS APPROACH MAY REDUCE EKC FACILITY COST TO \$3.0M

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# ACOUSTIC TEST FACILITY

27' x 38' x 50' I.D. DIMS.



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DEVELOPMENT TESTING

- o ACOUSTIC TESTING IS NEEDED TO DETERMINE ACCELERATION LEVELS RELIABLY THROUGHOUT THE VEHICLE
- o SEGMENT TESTS ARE TECHNICALLY SOUND BECAUSE OF THE NATURE OF ACOUSTIC EXCITATION
- o DEVELOPMENT TEST SHOULD BE RUN AT QUALIFICATION LEVELS
- o TEST PLANNING SHOULD NOT COUNT ON THE USE OF EKC FACILITY BECAUSE OF POTENTIAL DIFFICULTIES IN BRINGING IT ON LINE IN TIME AND MAKING AVAILABLE TO DAC
- o TWO CANDIDATES EXIST:

WYLE AT HUNTSVILLE

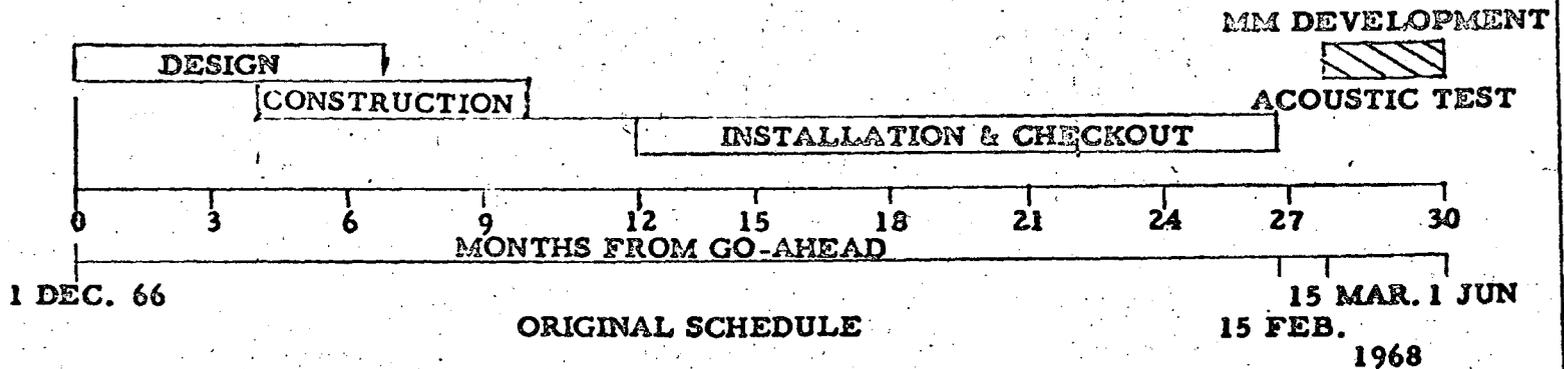
DOUGLAS AT SANTA MONICA

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WHS-

EKC ACOUSTIC FACILITY SCHEDULE



SOURCE: BRIEFING BY DAVID SMITH, EKC - 28 NOVEMBER 1966

EK TWX DATED 18 NOVEMBER 1966 STATES: "LONG LEAD ITEMS  
(COMPRESSORS) FOR THE ACOUSTIC TEST FACILITY WILL  
DELAY SHIPMENT OF DSMM UNTIL 15 JUNE 1968."

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WYLE AND DAC S-M FACILITY MOD COST  
(DEVELOPMENT TESTING)

| <u>WYLE</u>               |                | <u>DAC</u>            |                |
|---------------------------|----------------|-----------------------|----------------|
| <u>MODS (LM &amp; MM)</u> |                | <u>MODS (LM ONLY)</u> |                |
| EXCAVATE CHAMBER          | .08            | NEW BUILDING          | .40            |
| 6 HORNS (EPT-200)         | .13            | 3 HORNS (EPT-200)     | .06            |
| 9000 CFM COMPRESSOR       | .15            | SHROUD                | .05            |
| MODEL TEST PROGRAM        | .04            | INSTRUMENTATION       | .25            |
| AIR SYSTEM                | .03            | ENGINEERING           | .23            |
| MECHANICAL AGE            | .12            | AIR SUPPLY            | .01            |
| ENGINEERING               | .54            |                       | <u>\$1.00M</u> |
|                           | <u>\$1.00M</u> |                       |                |
|                           |                | <u>LM AND MM</u>      |                |
|                           |                | 3 HORNS (EPT-200)     | .06            |
|                           |                | COMPRESSOR            | .22            |
|                           |                | LINES                 | .01            |
|                           |                | ENGINEERING           | .09            |
|                           |                |                       | <u>\$.38M</u>  |
|                           |                | GRAND TOTAL           | \$1.38M        |

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~~SECRET~~-SPECIAL HANDLING

QUALIFICATION TESTING

- COMPLETE LAB VEHICLE QUALIFICATION APPEARS DIFFICULT
- SEGMENT QUALIFICATION TESTS WITH PROPER INTERFACE SUBSTITUTES CAN ESSENTIALLY PROVIDE SATISFACTORY TEST
- DEVELOPMENT TEST PROVIDES GOOD STRUCTURAL QUALIFICATION, BUT ONLY GROSS COMPONENT ENVIRONMENT SIMULATION
- WYLE FACILITY REPRESENTS MOST DIFFICULT LOGISTICS PROBLEM FOR LM AND MM
- MODIFIED SANTA MONICA FACILITY COULD BE USED FOR BOTH LM & MM WITH LEASE LINE CONNECTION TO AGE IN HUNTINGTON BEACH (USE THERMAL VACUUM AGE INTERFACE UNITS AND VIDEO LINK)

~~SECRET~~-SPECIAL HANDLING

ACCEPTANCE TESTING CONSIDERATIONS

- TWO SCHOOLS OF THOUGHT
  - PRE- AND POST-CHECK WITH ARTICLE SUBJECTED TO FLIGHT LEVEL ENVIRONMENT (LIKE 1 MIN)
  - LOWER THAN FLIGHT LEVEL VIBRATION TESTS WITH CHECK FOR INTERMITTENT FAILURES DURING EXCITATION (UP TO MANY HOURS)
- MAJOR PROBLEM IS CHECKOUT TIME (SUMMARY CHECK OF MOST CIRCUITS)
  - LABORATORY MODULE      15 MIN > t < 60 MIN
  - TMB                              2 MIN > t < 10 MIN
  - COAB                             1 MIN

~~SECRET~~-SPECIAL HANDLING

TYPICAL ACCEPTANCE VIBRATION DEFECTS

- o LOW LEAKAGE RESISTANCE, NOISE IN RECORD PATH,  
W81 CABLE REPLACED
- o THREE SCREWS ON HEATER CONTROLLER AND TWO SCREWS  
ON TEST BOX CONNECTION LOOSENED IN VIBRATION - REPLACED
- o INTERMITTENT CPL-3 OUTPUT - WIRE WAS INTERMITTENT,  
OPEN AT LUG
- o LOOSE CONNECTING ROD ON APERTURE MASK ASSEMBLY - REPLACED
- o SCREW AND WASHER LYING IN CAMERA - BELIEVED DROPPED  
DURING ASSEMBLY
- o CAMERA ROLLER EXCESSIVE END PLAY - REPAIRED
- o PIVOT STUD BACK OUT - REPAIRED

~~SECRET~~-SPECIAL HANDLING

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ACCEPTANCE TESTING

- AT LEAST "LOW LEVEL" TEST MANDATORY AT SEGMENT LEVEL
- SOME TYPE OF COMPLETE SYSTEM TEST NEEDED FOR REASONABLE ASSURANCE OF FLIGHT READINESS
- SEGMENT ACCEPTANCE TEST ON MM NEEDED BEFORE SHIPPING
- "BUNGEE SUPPORTED" SYSTEM TESTS USING SMALL SHAKERS AT INTER-SEGMENT POINTS APPEAR TO BE FEASIBLE

~~SECRET~~ SPECIAL HANDLING

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LOW LEVEL EKC FACILITY

o ACOUSTIC FACILITY

|                  |                               |
|------------------|-------------------------------|
| REVERBERANT ROOM | 32' x 42' x 60'               |
| ACOUSTIC LEVEL   | 140 DB REVERBERANT            |
| RUN DURATION     | CONTINUOUS                    |
| ACOUSTIC HORNS   | 1 NOR. IR MK V                |
| AIR SUPPLY       | 1200 CFM/300HP AIR COMPRESSOR |
| APPROXIMATE COST | \$1.8M                        |

o VIBRATION FACILITY

|                  |                 |
|------------------|-----------------|
| TEST LEVEL       | 4G RMS (RANDOM) |
| SHAKERS          | 2 C-210 SYSTEMS |
| AMPLIFIERS       |                 |
| EQUALIZERS       |                 |
| CONTROLS         |                 |
| LABORATORY SPACE |                 |
| APPROXIMATE COST | \$1.4M          |

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CONCLUSION CHART

- ACOUSTIC DEVELOPMENT TESTING NEEDED.
- SEGMENT LEVEL ACOUSTIC QUALIFICATION TEST HIGHLY DESIRABLE.
- LOW LEVEL ACCEPTANCE TEST IS A PRACTICAL NECESSITY AT BOTH SEGMENT AND SYSTEM LEVEL.
- LOW LEVEL ACOUSTIC TEST OF MM APPEARS TO BE THE SAME COST OF VIBRATION TEST.
- HIGH LEVEL MM ACOUSTIC TESTS SHOULD USE LOCALIZED HORN APPROACH.
- IF LAB MODULE QUALIFICATION IS PERFORMED, THE SANTA MONICA FACILITY SHOULD BE MODIFIED.

~~SECRET SPECIAL HANDLING~~

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ALTERNATE 1  
FULL ACOUSTIC TESTING  
DEVELOPMENT-QUALIFICATION-ACCEPTANCE

|          | SYSTEM                 | SEGMENT   |            |            | COMPONENT       |      |                      |
|----------|------------------------|-----------|------------|------------|-----------------|------|----------------------|
|          |                        | LM        | TMB        | COAB       | LM              | TMB  | COAB                 |
| DEVELOP. | 0                      | ACOUSTIC* | ACOUSTIC*  |            | VIB. & ACOUSTIC | VIB. | VIBRATION & ACOUSTIC |
| QUAL.    | LOW-LEVEL INTERMITTENT | ACOUSTIC* | ACOUSTIC** |            | VIB. & ACOUSTIC | VIB. | VIBRATION & ACOUSTIC |
| ACCEP.   | LOW-LEVEL INTERMITTENT | ACOUSTIC* | VIB.       | ACOUSTIC** | VIB.            | VIB. | VIBRATION & ACOUSTIC |
|          |                        |           |            |            |                 |      |                      |

\* TEST AT SANTA MONICA  
\*\* TEST AT EK (LOCALIZED HORNS)

| <u>DAC</u>            |                       | <u>EK</u>         |        |
|-----------------------|-----------------------|-------------------|--------|
| SPECIAL QUAL. ARTICLE | 15.0 M - 20M          | ACOUSTIC FACILITY | \$2.1M |
| TEST MANHOURS         | .4 M                  |                   |        |
| SM FACILITY           | 1.0 M                 |                   |        |
| ACCEPT. TEST          | .5 M                  |                   |        |
|                       | <u>16.9 M - 21.9M</u> |                   |        |
| TOTAL COST            | 19.0 M - 24.0M        |                   |        |

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VIB.

ALTERNATIVE NO. 2  
FULL DEVELOPMENT AND ACCEPTANCE TESTING  
SEGMENT QUALIFICATION TESTING ON LM ONLY

|          | SYSTEM                 | SEGMENT                |                       |      | COMPONENT        |
|----------|------------------------|------------------------|-----------------------|------|------------------|
|          |                        | LM                     | TMB                   | COAB |                  |
| DEVELOP  | 0                      | ACOUSTIC*              | ACOUSTIC*             |      | VIBR. & ACOUSTIC |
| QUAL.    | LOW-LEVEL INTERMITTENT | ACOUSTIC*              | VIBR.                 |      | VIBR. & ACOUSTIC |
| ACCE PT. | LOW-LEVEL INTERMITTENT | LOW-LEVEL INTERMITTENT | LOW-LEVEL TEST AT ONF |      | VIBRATION        |

\*TESTS AT DAC SANTA MONICA

DAC

- ⊙ SM FACILITY MOD \$ 1.4M
- ⊙ TEST MANHOURS .4M
- ⊙ QUAL. LM USING COMPONENTS FROM QUAL. PROGRAM 15.0M - 20.0M
- ⊙ ACCEPT. TEST .5M

\$17.3 - 22.3M

EK

- ⊙ LOW LEVEL FACILITY \$ .90M
- ⊙ TEST MANHOURS .40M
- ⊙ USE QUAL TEST MM FOR FL.#7 -10.00M
- (SAVING) \$- 8.70M

TOTAL NET COST ≈ \$8.6M - \$13.6M

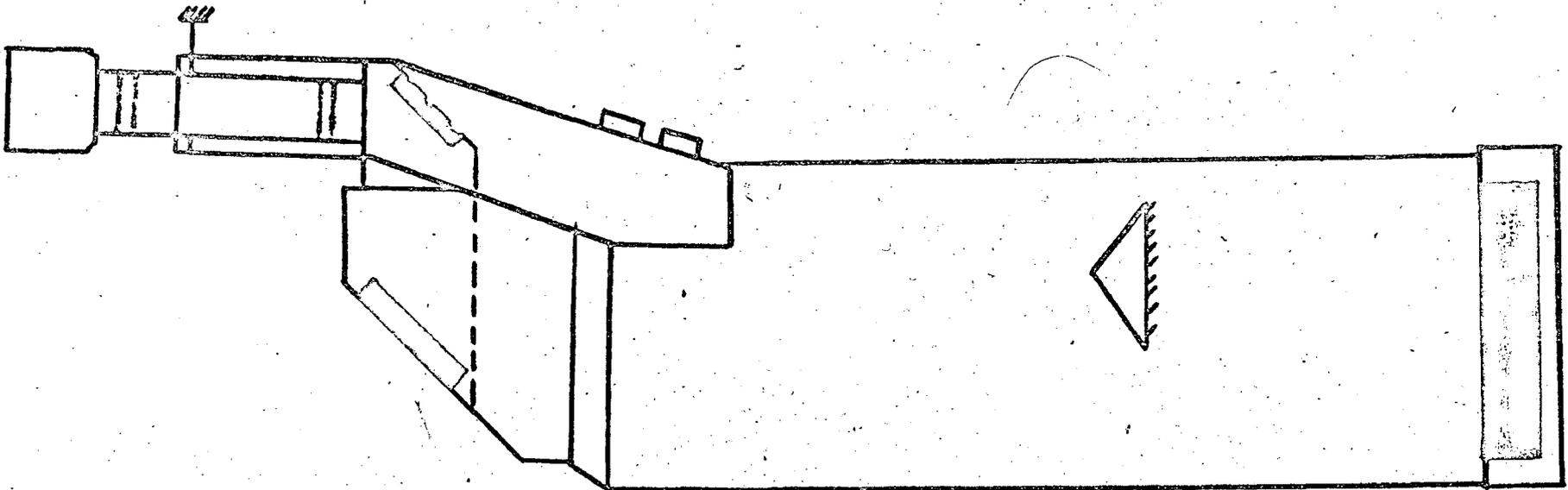
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MISSION MODULE STRUCTURAL ARRANGEMENT



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WIS.

ALTERNATE NO. 3  
FULL DEVELOPMENT AND ACCEPTANCE TESTING  
SEGMENT QUALIFICATION TESTING ON MM ONLY

|         | SYSTEM                                  | SEGMENT                 |                   |                   | COMPONENT           |       |                     |
|---------|---|-------------------------|-------------------|-------------------|---------------------|-------|---------------------|
|         |   | LM                      | TMB               | COAB              | LM                  | TMB   | COAB                |
| DEVELOP | ---                                     | ACOUSTIC*               | ACOUSTIC<br>AT EK |                   | VIBR. &<br>ACOUSTIC | VIBR. | VIBR. &<br>ACOUSTIC |
| QUAL.   | ---                                     | ---                     | ACOUSTIC<br>AT EK |                   | VIBR. &<br>ACOUSTIC | VIBR. | VIBR. &<br>ACOUSTIC |
| ACCEPT. | LOW-LEVEL<br>INTERMITTENT<br>VIBR. TEST | LOW-LEVEL<br>VIBR. TEST | VIBR.             | ACOUSTIC<br>AT EK | VIBR.               | VIBR. | VIBR. &<br>ACOUSTIC |

\*TEST PERFORMED AT SANTA MONICA

DAC

ACCEPT. TEST \$ .5M

TOTAL COST ≈ \$2.6M

EK

MODIFIED HIGH LEVEL  
ACOUSTIC FACILITY \$3.1M

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RECOMMENDATIONS

- ① SEGMENT LEVEL ACOUSTICAL QUALIFICATION TESTING SHOULD BE ADOPTED UNIFORMLY THROUGHOUT THE PROGRAM FOR MINIMUM RISK.
- ① LOW-LEVEL ACCEPTANCE TEST FOR WORKMANSHIP AND FUNCTIONAL CONTINUITY SHOULD BE IMPLEMENTED AT THE SEGMENT AND SYSTEM LEVEL.
- ① CONTRACTOR ASSESSMENT OF COSTS AND SCHEDULE IMPACTS OF PROPOSED ALTERNATES SHOULD BE OBTAINED.

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TRACKING MIRROR DISTORTION PROBLEM

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(2)

(3)

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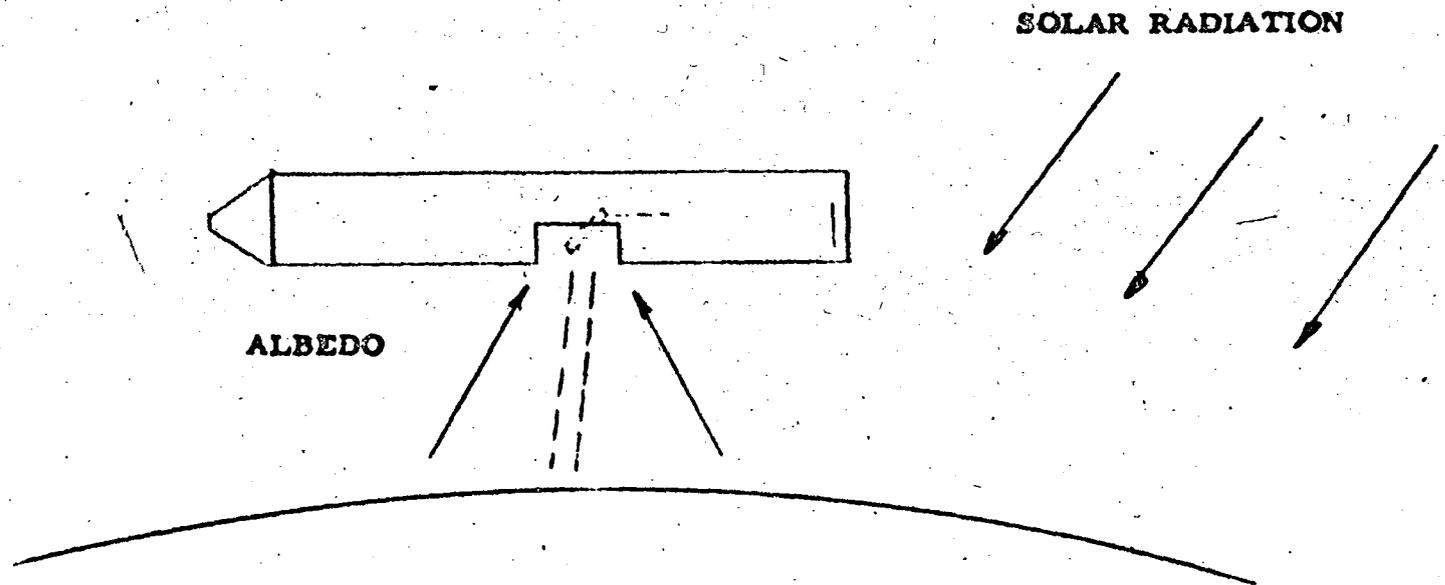
TRACKING MIRROR HEATING

MIRROR COATING

SOLAR ABSORPTION 11%

VISIBLE REFLECTION 96%

INFRARED EMISSION 4%



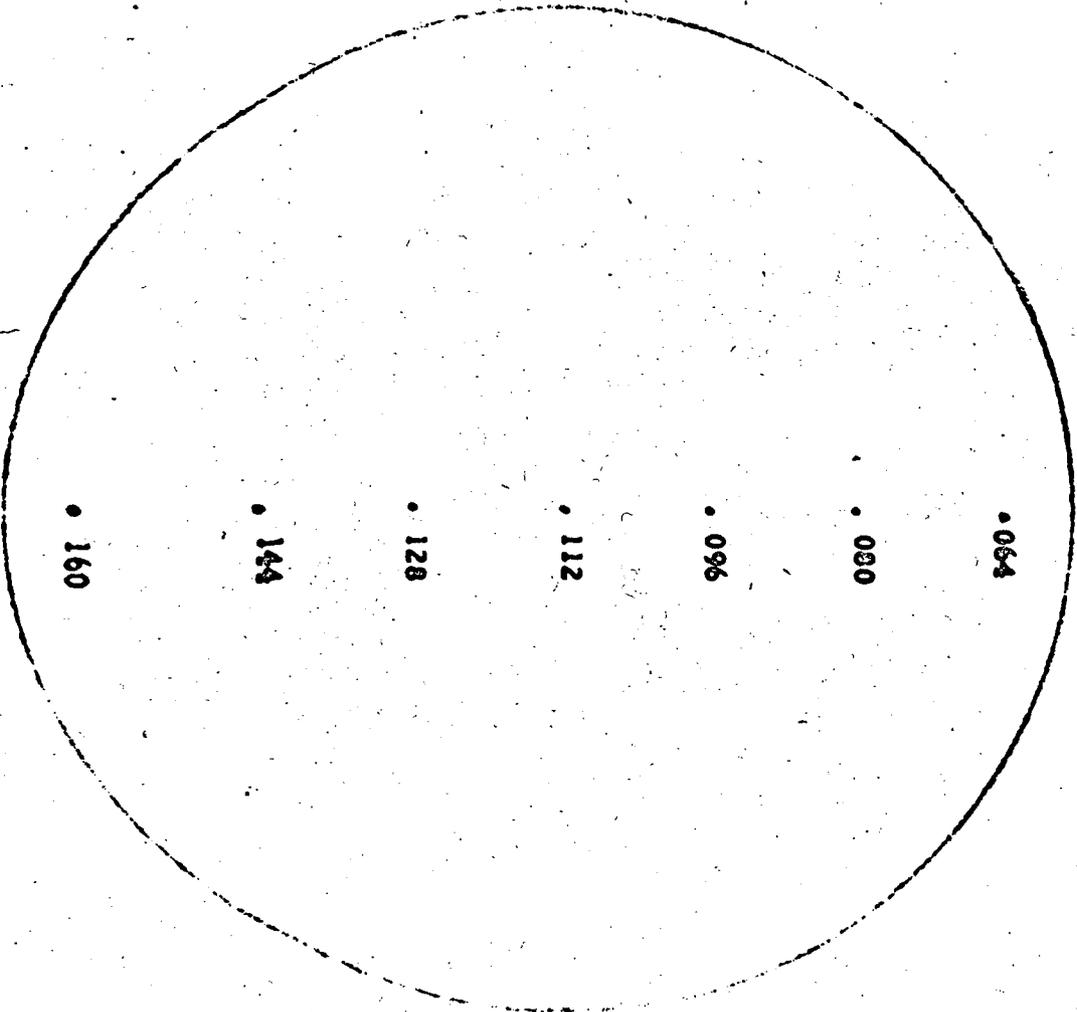
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**SECRET SPECIAL HANDLING**

**PRELIMINARY VIEW FACTOR REQUIREMENTS**

6/27/66



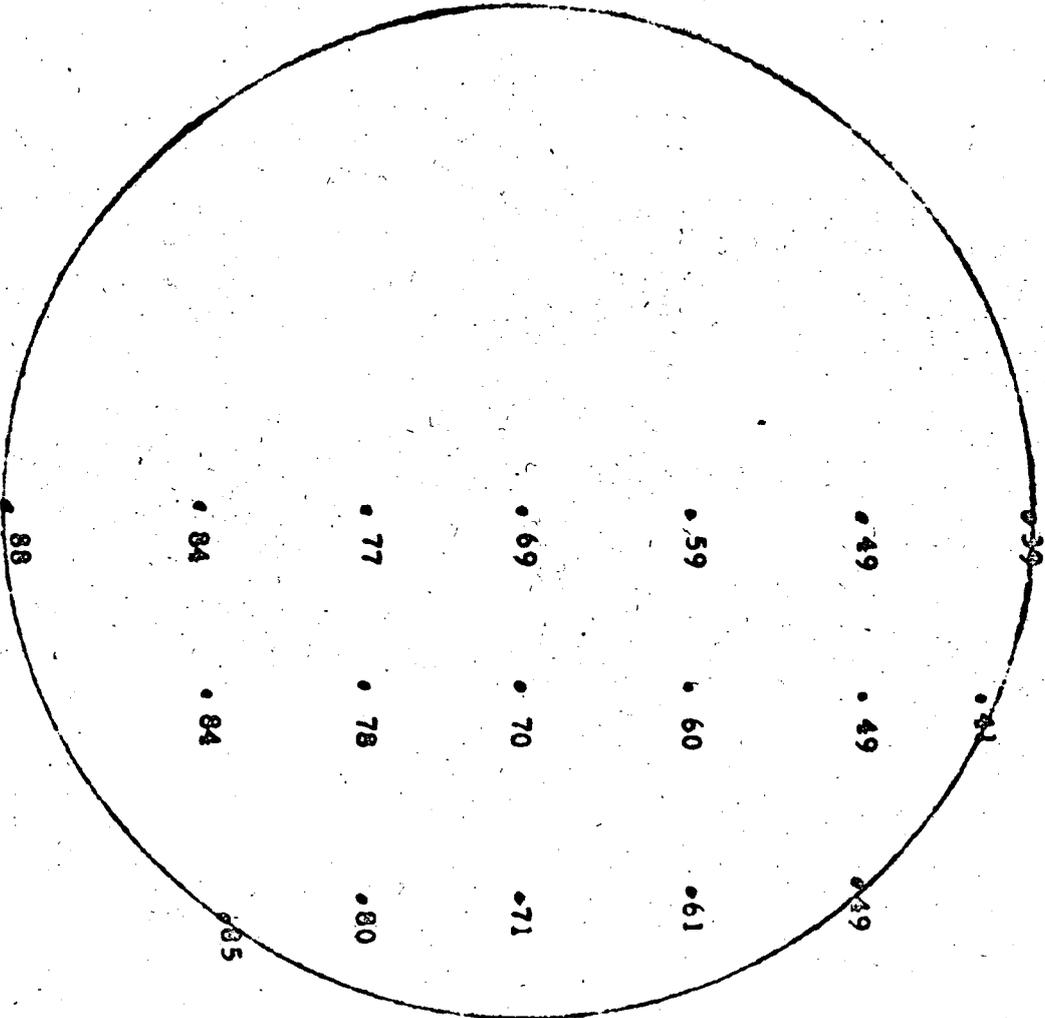
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WIDE OPEN HOLE

NADIR

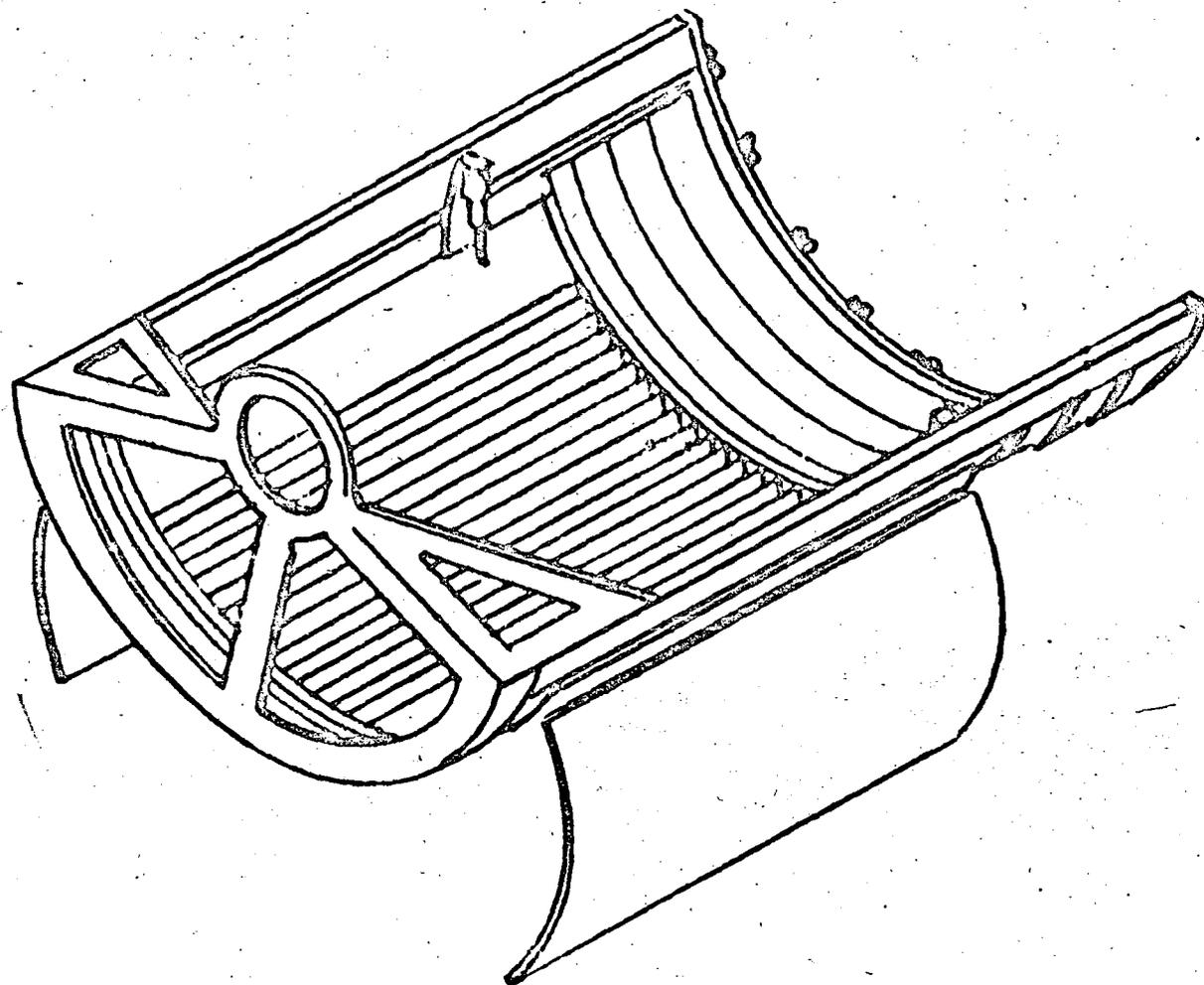


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*Handwritten notes and signatures, including a signature that appears to be 'M. S. ...' and some illegible text.*

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GE PHASE IC DOUBLE ACTUATED DOORS WITH LOUVERS

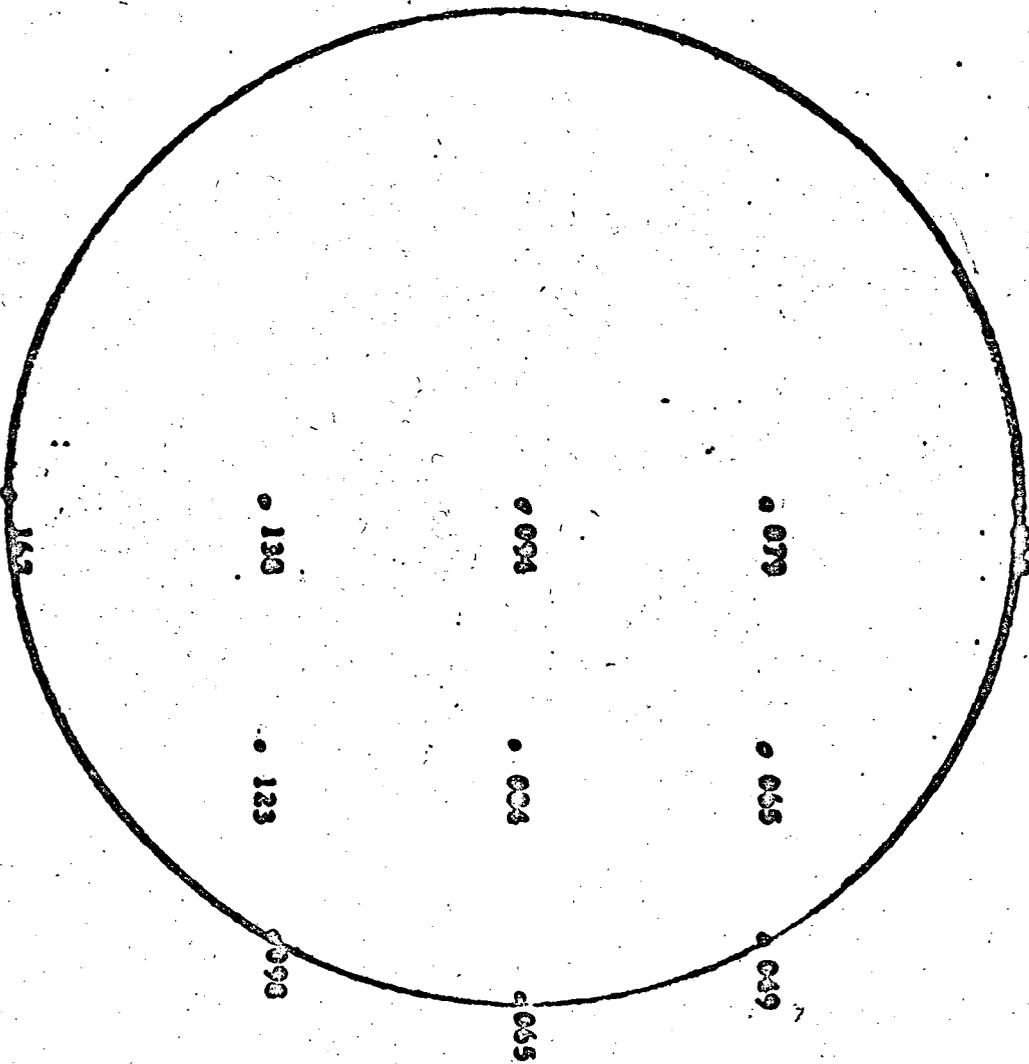
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~~SECRET~~ IC CONFIGURATION

~~SECRET~~ DRODLE ACTIVATED

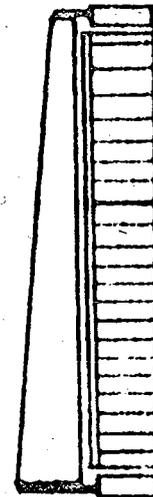
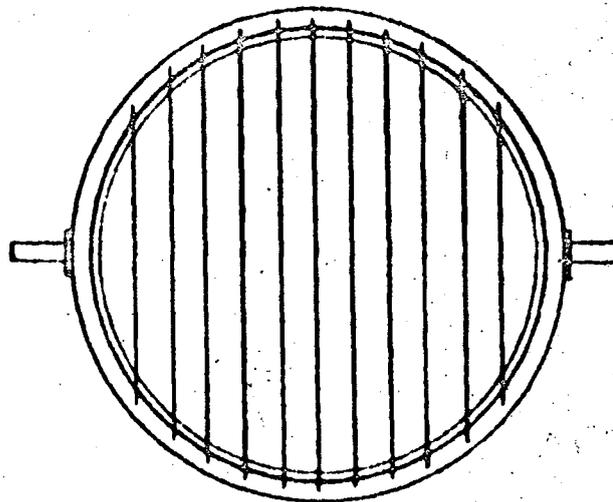
~~SECRET~~ LOWERS IN DOOR 4 - 2.0



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TRACKING MIRROR WITH LOUVERS

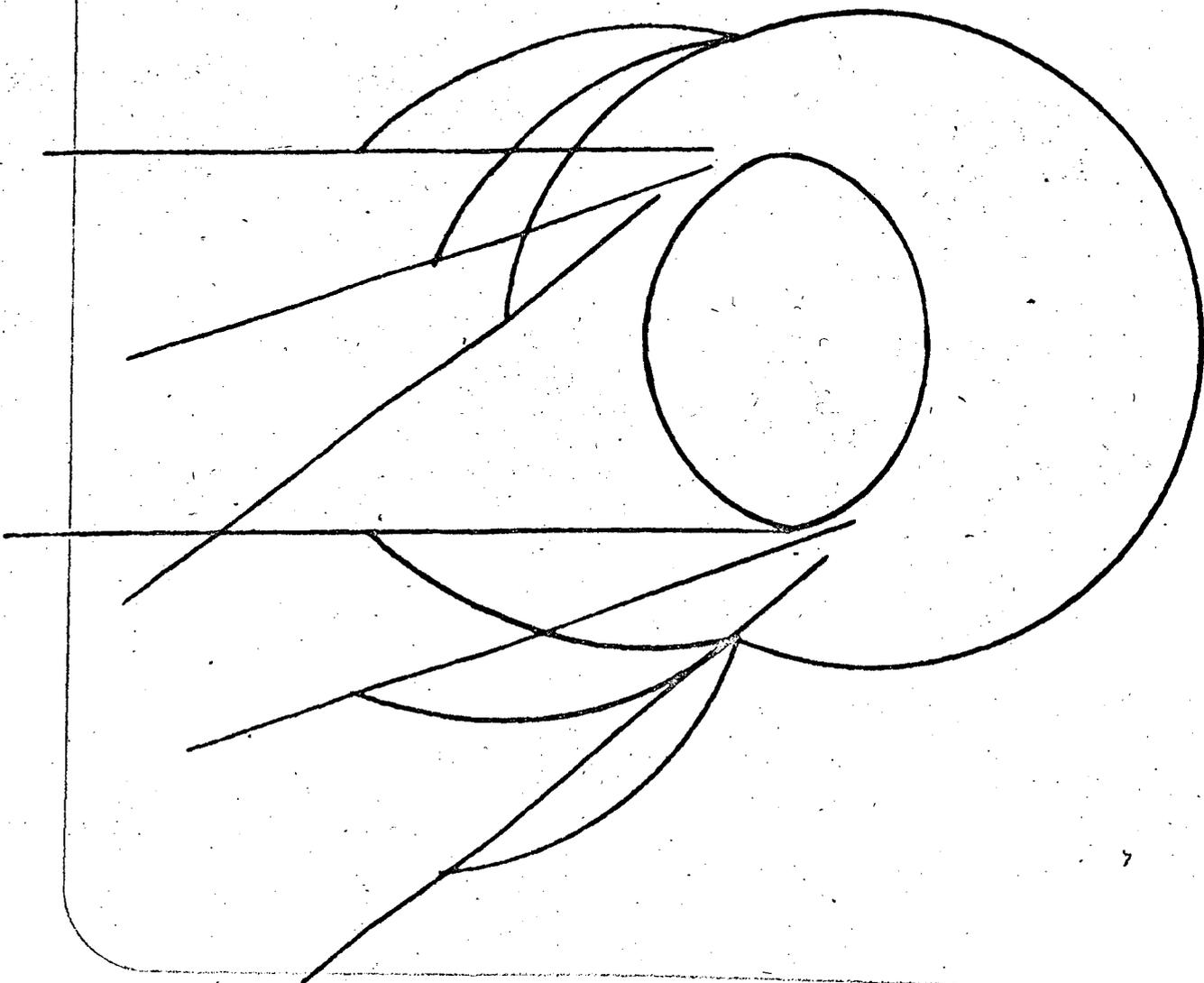


MIRROR

MIRROR MOUNTING RING

TAPERED LOUVER

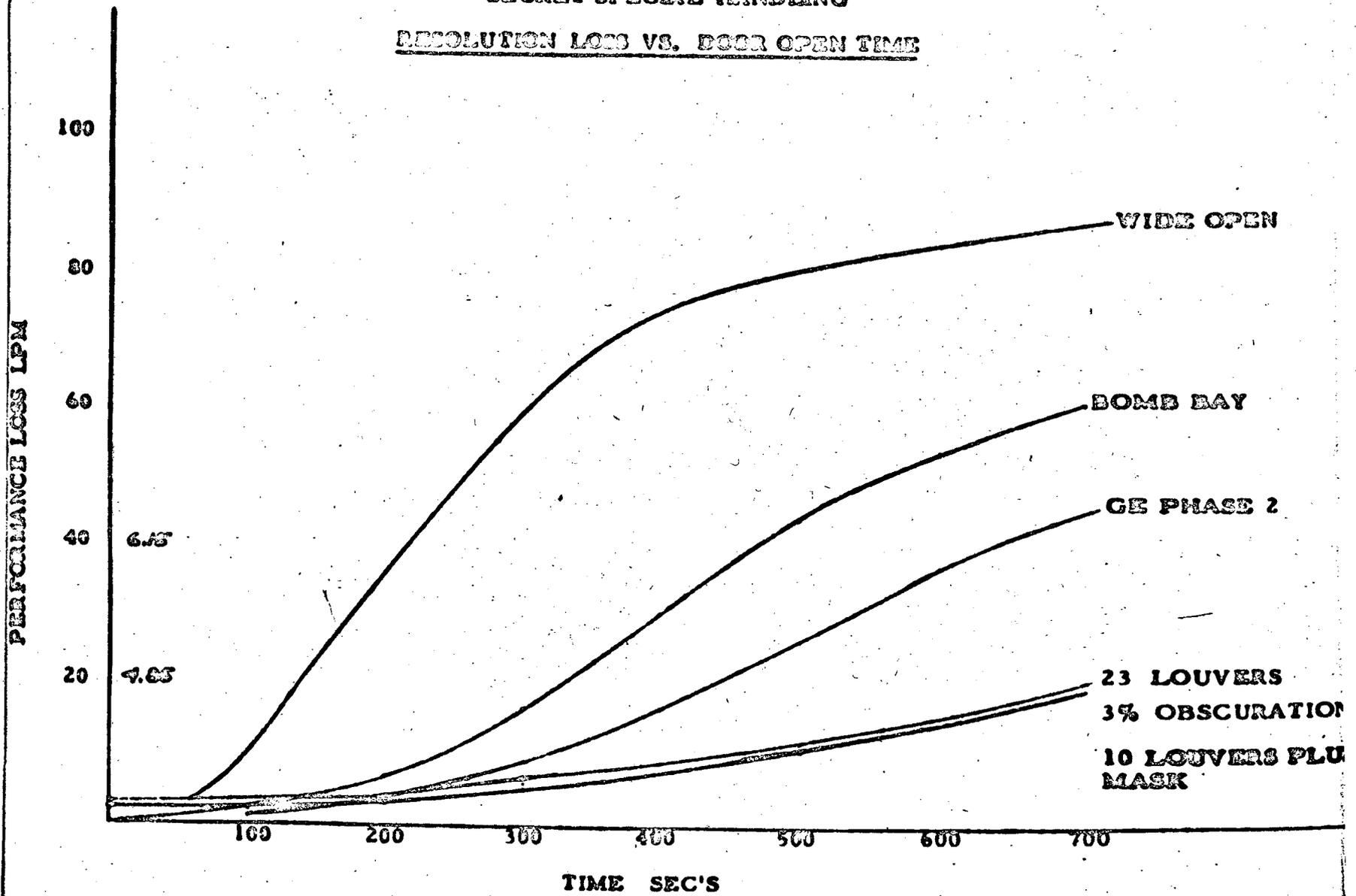
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ACTUATED BOMB BAY DOORS

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RESOLUTION LOSS VS. DOOR OPEN TIME

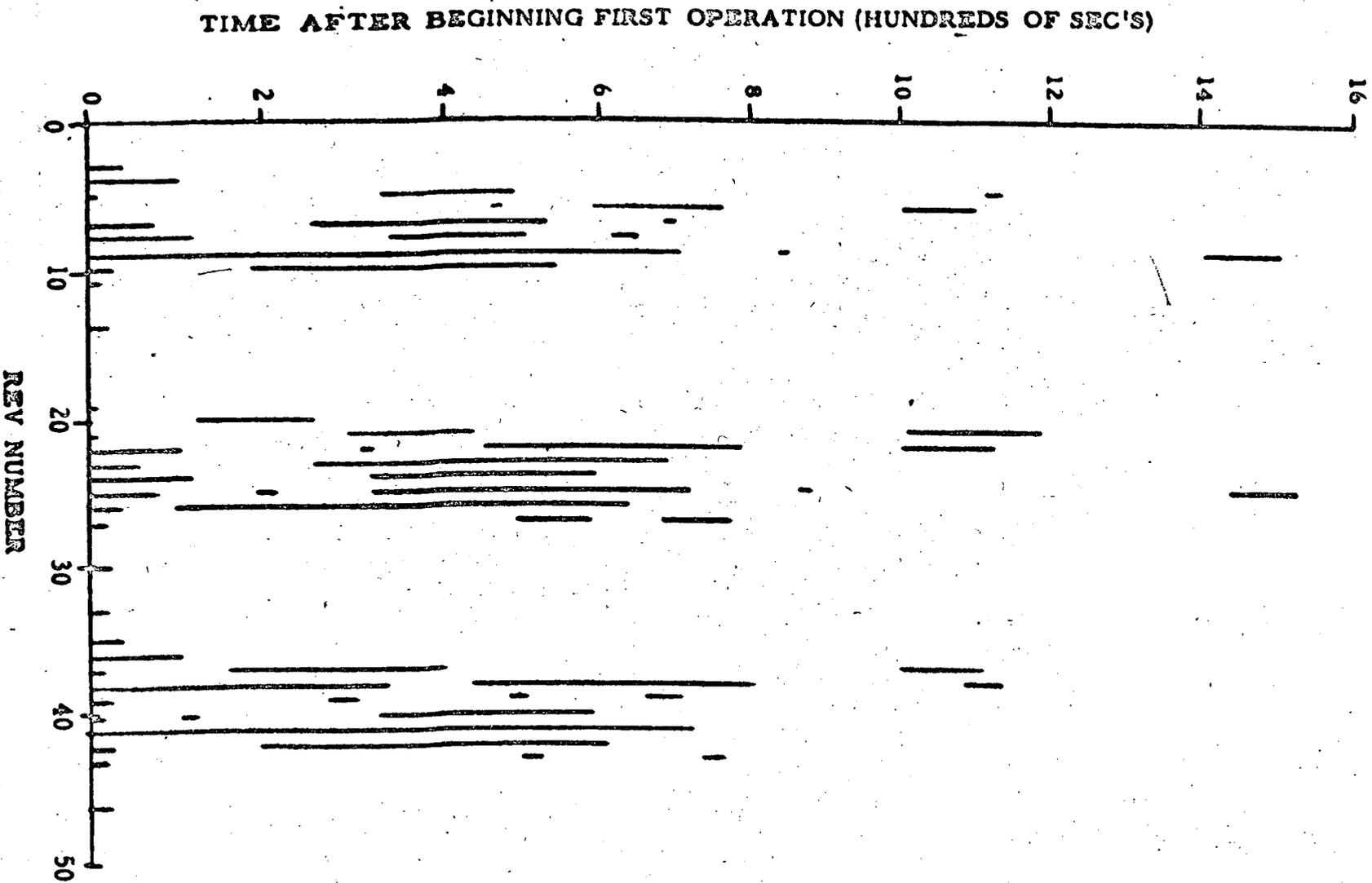


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PAYLOAD ACTIVITY TIME VS. REV NUMBER

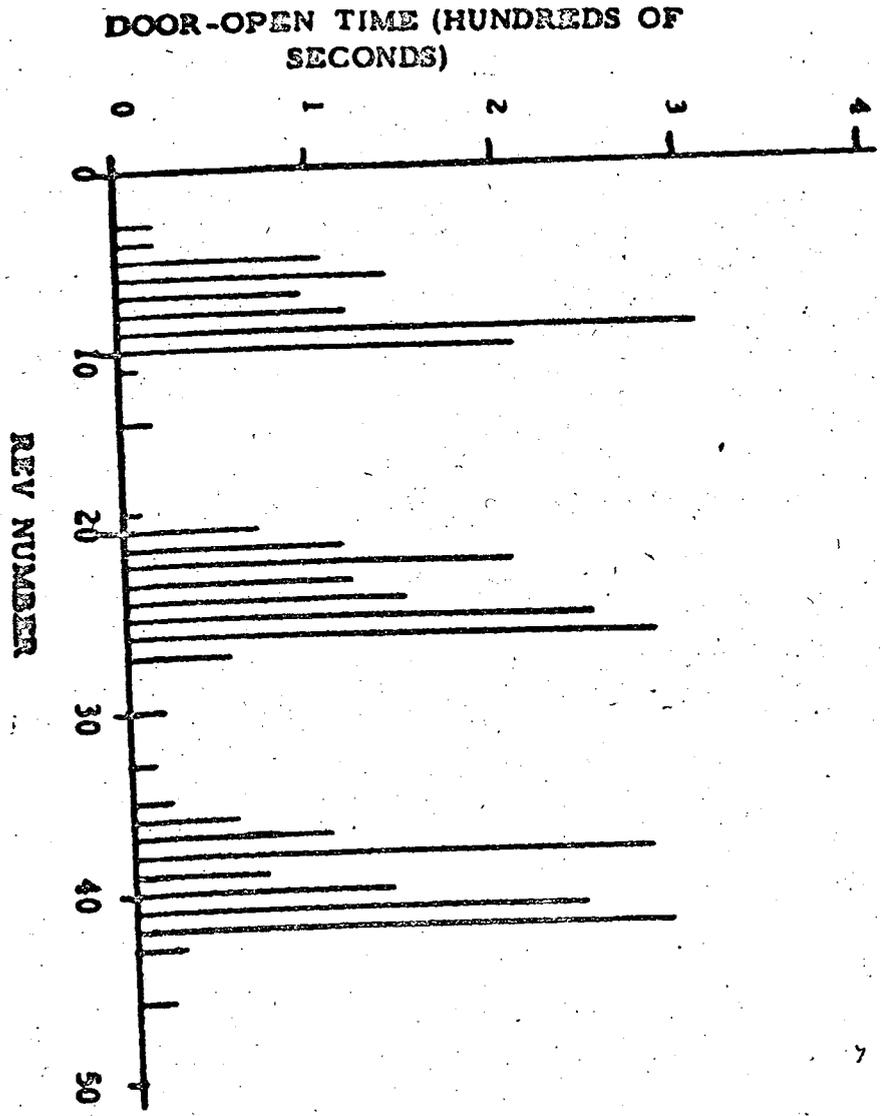
GAPS REPRESENT INTERVALS BETWEEN OPS) 100 SEC.



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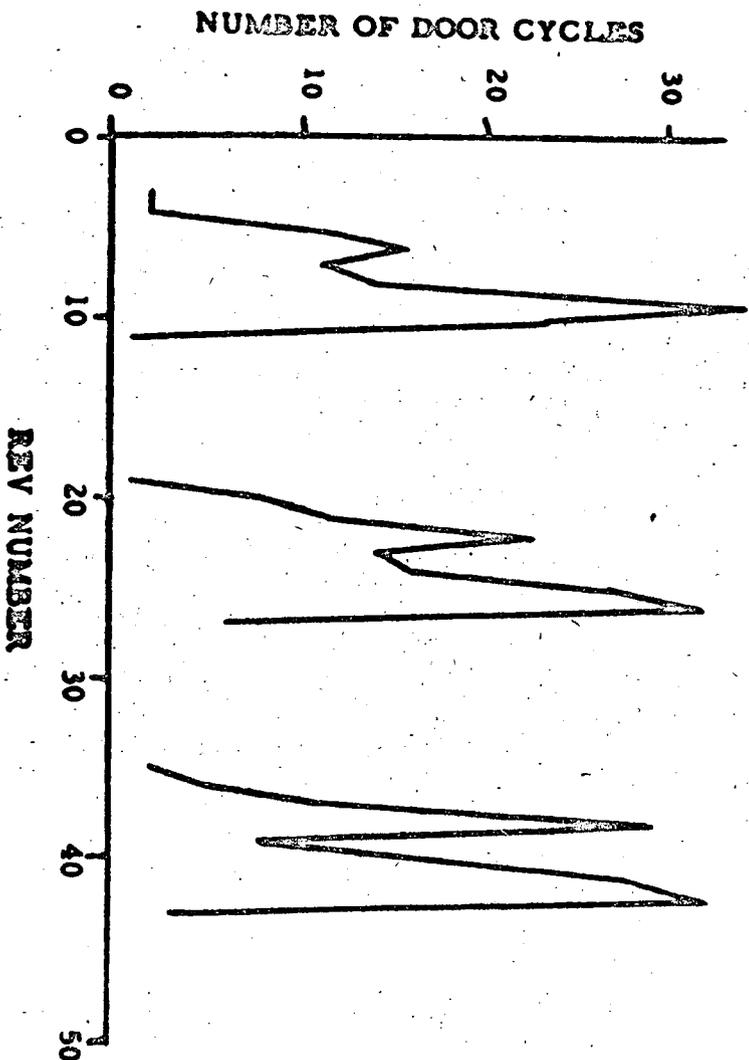
5 SEC. DOOR CYCLE TIME



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**SECRET** SPECIAL HANDLING

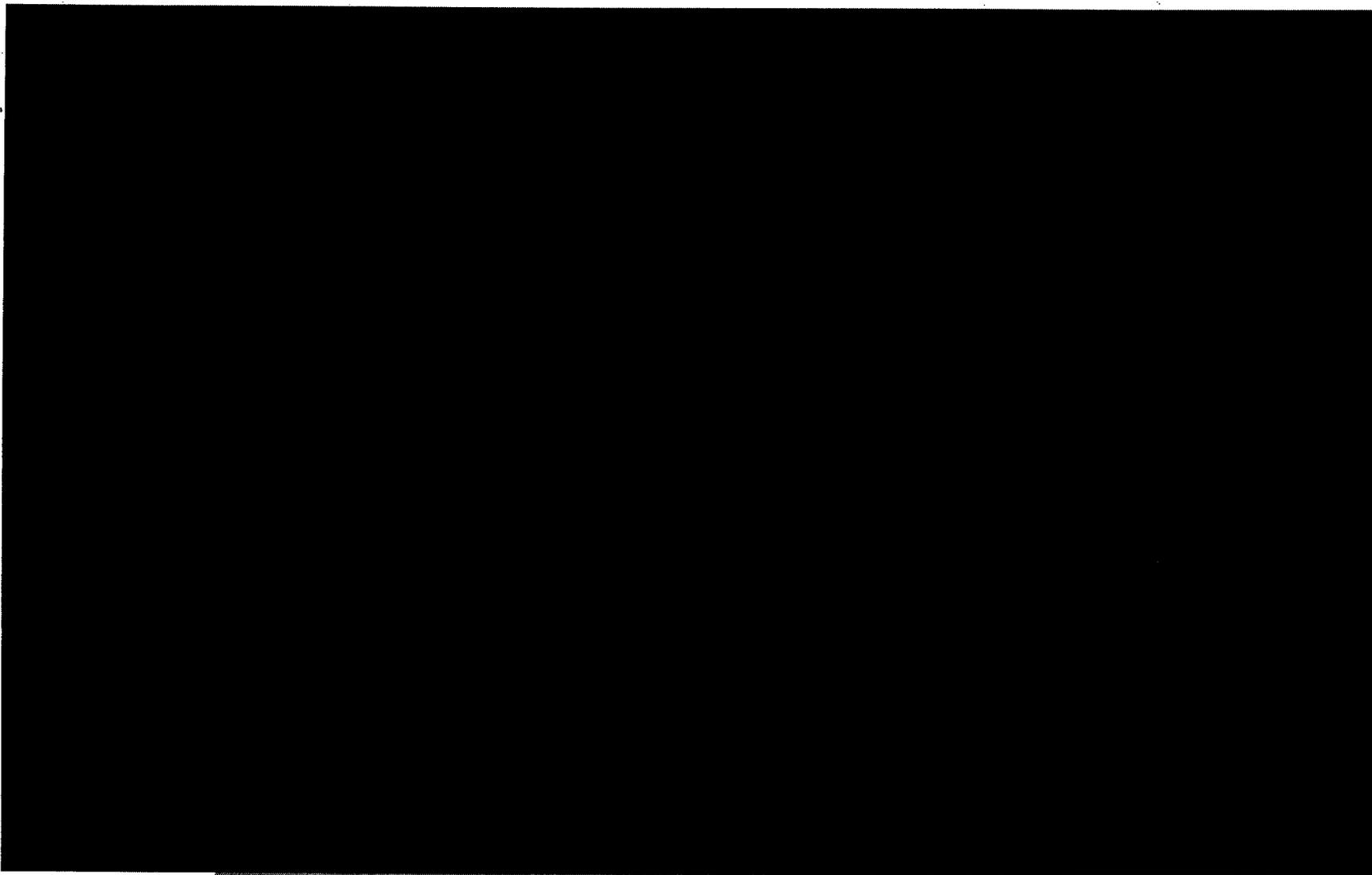
**DOOR CYCLE TIME = 5 SEC.**



**SECRET** SPECIAL HANDLING

NRC APPROVED FOR  
RELEASE 1 JULY 2015

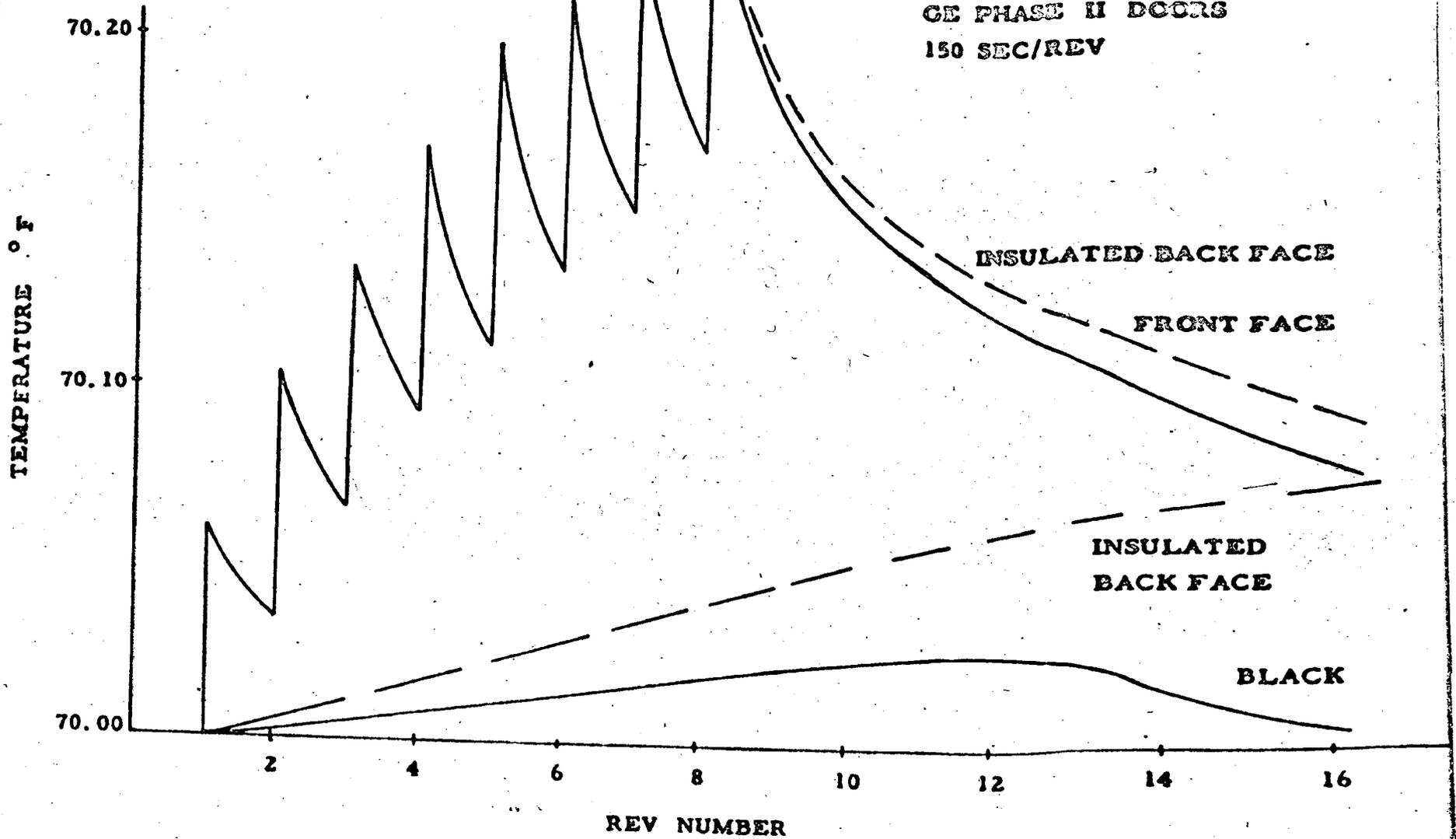
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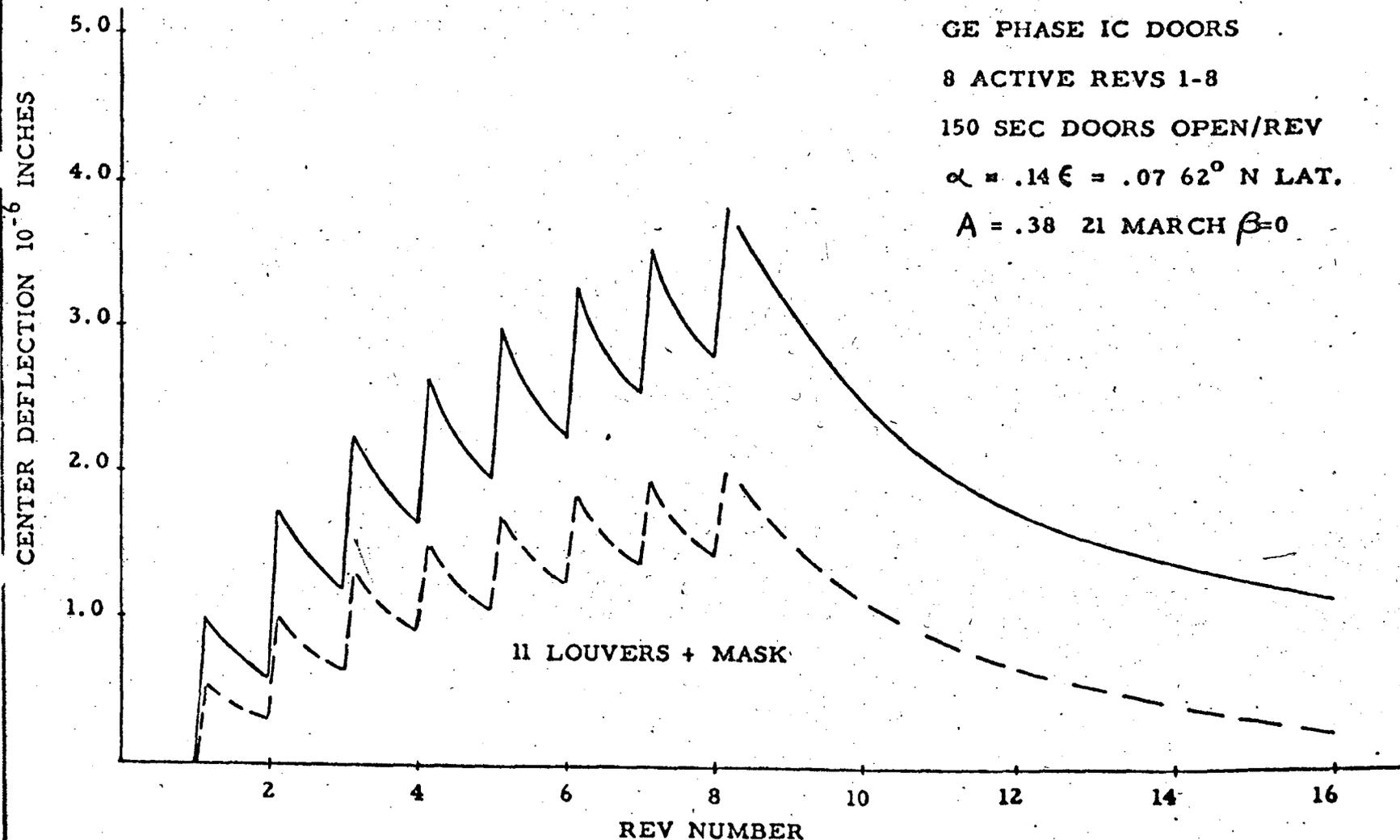
DIURNAL TEMPERATURE HISTORY  
GE PHASE II DOORS  
150 SEC/REV



~~SECRET~~ SPECIAL HANDLING

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PERFORMANCE LOSS VS. TIME



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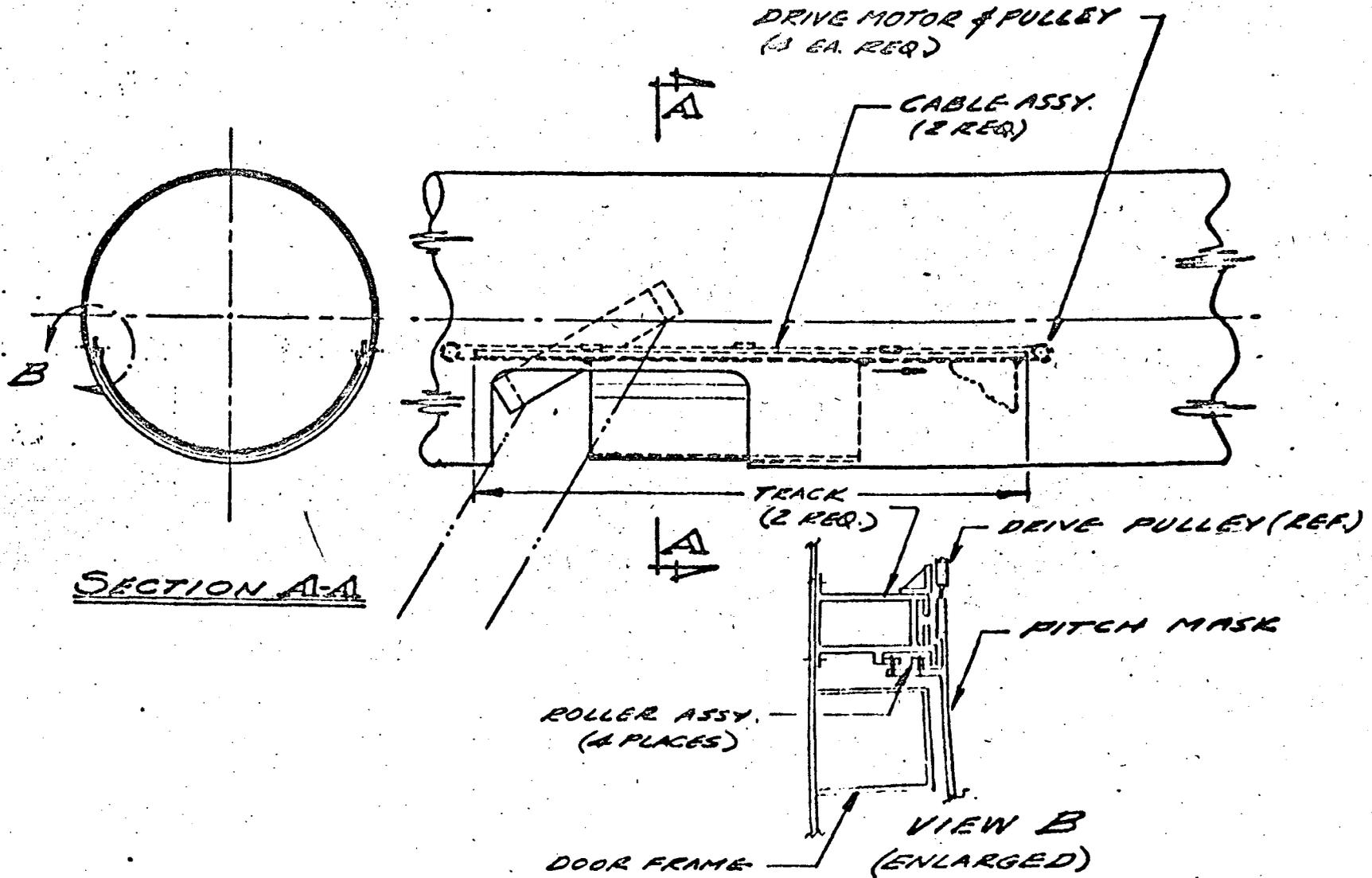
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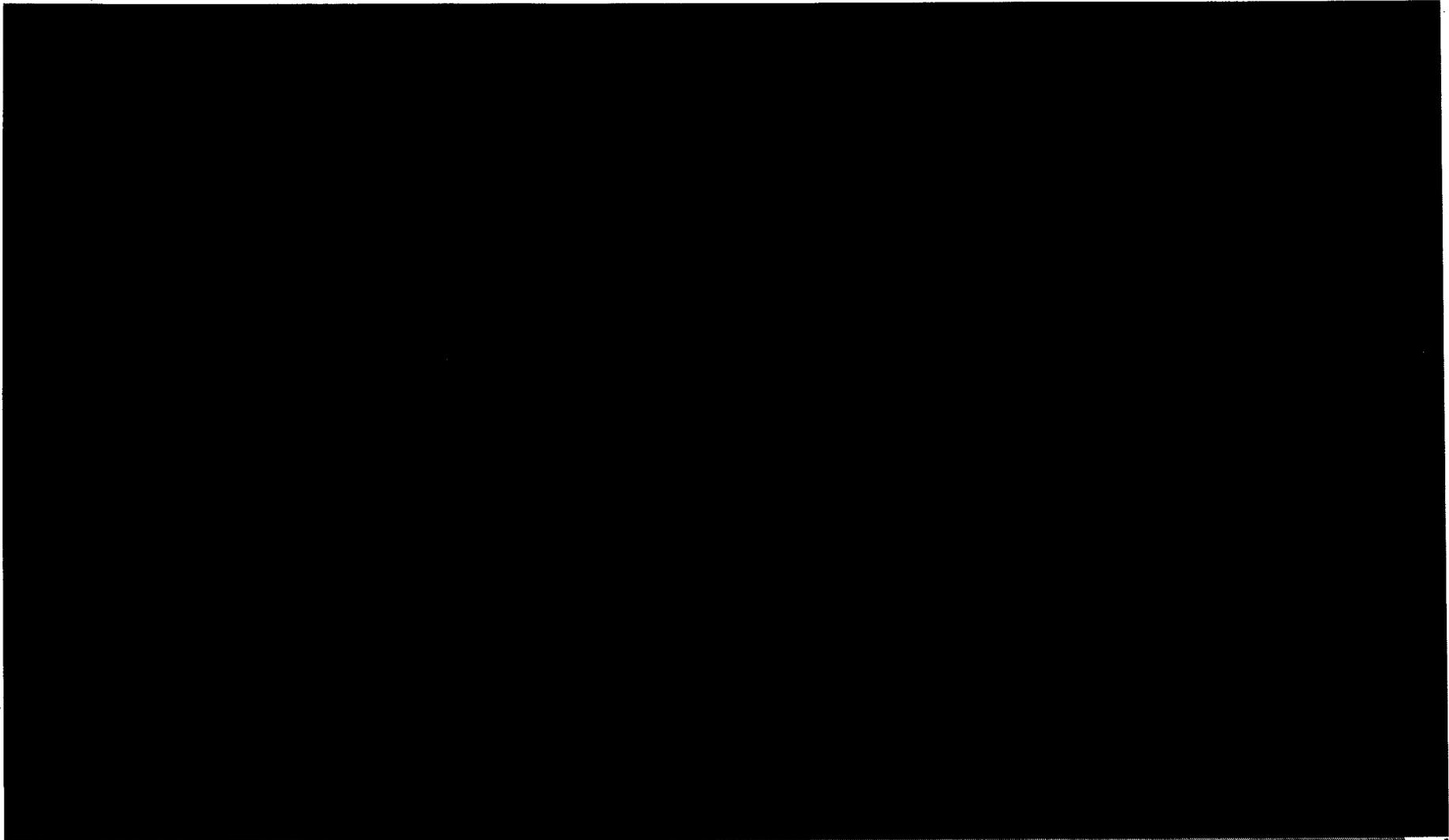
# PITCH MASK INSTALLATION PULLEY/CABLE DRIVE



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NRO APPROVED FOR  
RELEASE 1 JULY 2015

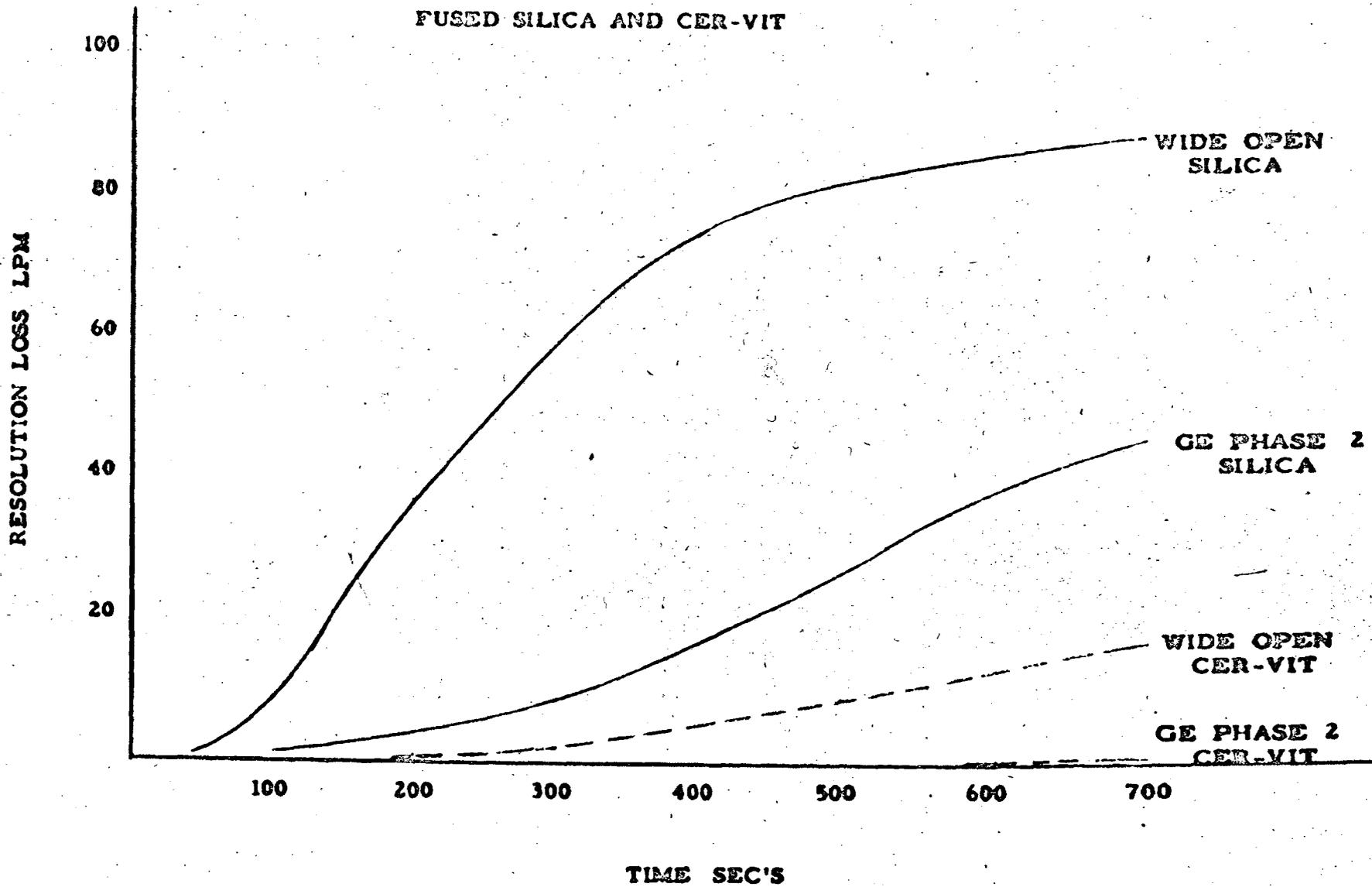
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RESOLUTION LOSS VERSUS DOOR OPEN TIME  
FUSED SILICA AND CER-VIT



~~SECRET~~ SPECIAL HANDLING

SECRET

~~SECRET~~ SPECIAL HANDLING

CONCLUSIONS

o KNOT HOLE

LACK PERFORMANCE  
COMPLEX  
NOT ADAPTABLE TO CERVIT  
WEIGHT - BASELINE

o BOMB BAY DOORS

LACK PERFORMANCE  
LOUVERS AND DOORS REDUNDANT  
COMPLEX (DOOR CUTTINGS)  
IS ADAPTABLE TO CERVIT  
WEIGHT  $\Delta$  -100 LBS.

o LOUVERS

STATIC PERFORMANCE LOSS  
BEST LONG-TIME PERFORMANCE  
SIMPLE  
ADAPTABLE TO CERVIT  
WEIGHT  $\Delta$  -150 LBS.

~~SECRET~~ SPECIAL HANDLING

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CONCLUSION

- o TWO OPTIONS
  - ROLLING APERTURE
  - LOUVERS + SLIDING MASK
  
- o LOUVERS + MASK      BETTER PERFORMANCE
  - BETTER CER-VIT CONFIGURATION
  
- o PROGRAM IMPACT OF CONFIGURATION SWITCH NOT DETERMINED

~~SECRET~~ SPECIAL HANDLING

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TECHNICAL RECOMMENDATIONS

- ALIGN MIRROR GIMBAL TO COA
  
- INSTITUTE EK LOUVER DESIGN
  
- INSTITUTE GE PITCH MASK DESIGN
  
- INSTITUTE ACTION REQUIRED TO ENSURE THAT CERVIT AND ULE ARE SUITABLE BACKUPS TO FUSED SILICA
  
- RE-DIRECT DAC TO PROVIDE SHORTENED STRUCTURAL BLOW-OFF DOOR

~~SECRET~~ SPECIAL HANDLING

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READOUT SYSTEM

~~SECRET~~ SPECIAL HANDLING

~~SECRET~~ SPECIAL HANDLING

BASE LINE PROGRAM

CBS SCANNER

BTL WIDEBAND



DAC INTEGRATION INTO VEHICLE

~~SECRET~~ SPECIAL HANDLING

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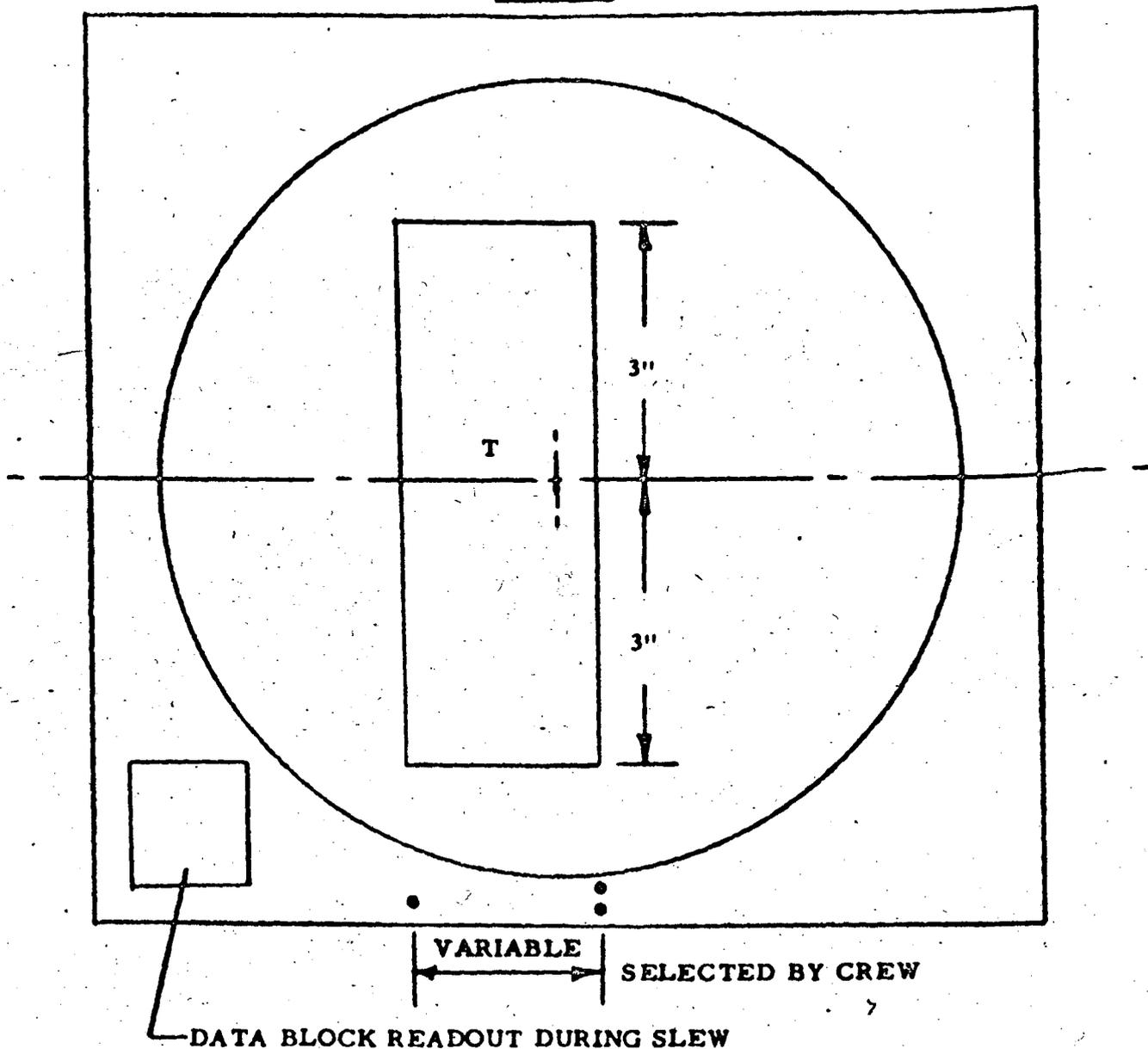
SYSTEM CAPABILITY

- o 100 LP/MM SCANNER CAPABILITY FOR 110 LP/MM INPUT
- o 2 - 50 MC CHANNELS
- o POINTING ANTENNA
- o 160 FRAMES/DAY (2" X 6") READOUT
- o 50 FRAMES/DAY PROCESSED FILM
- o AUTOMATIC AFTER EDITING
- o ROUTINE TARGETS ~ 24 HOURS
- o SPECIAL INTEREST TARGETS - UP TO 12 HOURS

~~SECRET~~ SPECIAL HANDLING

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FORMAT



~~SECRET~~ SPECIAL HANDLING



- o EXISTING
  - 2 STORY BUILDING
  - 22' ANTENNA
  
- o BTL COST INCLUDES
  - RECEIVER - TRANSMITTER
  - CONSOLES
  - ANTENNA DRIVE
  
- o CBS COST INCLUDES
  - REPRODUCER
  - PROCESSOR
  
- o OPERATIONS
  - 15 MAN/MONTH

~~SECRET~~ SPECIAL HANDLING

~~SECRET~~-SPECIAL HANDLING

SYSTEM INSTALLATION

|                      | <u>SUBSYSTEM<br/>TOTAL</u> | <u>ABOVE<br/>BASELINE</u> |
|----------------------|----------------------------|---------------------------|
| o WEIGHT             |                            |                           |
| SCANNER/READOUT      | 431#                       | 431#                      |
| - OBS SCANNER (162#) |                            |                           |
| - BTL READOUT (173#) |                            |                           |
| - DACO INSTAL. (96#) |                            |                           |
| EK FILM & PROCESSOR  | 222#                       | 0                         |
| o POWER              |                            |                           |
| PEAK                 | 530W                       | 0                         |
| AVERAGE              | 30W                        | 0                         |
| o COST               | \$16-25M                   | \$0.5-9.5M                |

~~SECRET~~-SPECIAL HANDLING

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SYSTEM INSTALLATION

|                      | <u>SUBSYSTEM<br/>TOTAL</u> | <u>ABOVE<br/>BASELINE</u> |
|----------------------|----------------------------|---------------------------|
| o WEIGHT             |                            |                           |
| SCANNER/READOUT      | 431#                       | 431#                      |
| - OBS SCANNER (162#) |                            |                           |
| - BTL READOUT (173#) |                            |                           |
| - DACO INSTAL. (96#) |                            |                           |
| EK FILM & PROCESSOR  | 222#                       | 0                         |
| o POWER              |                            |                           |
| PEAK                 | 530W                       | 0                         |
| AVERAGE              | 30W                        | 0                         |
| o COST               | \$16-25M                   | \$0. 5-9. 5M              |

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|        | <u>COSTS</u>              |                           |
|--------|---------------------------|---------------------------|
|        | <u>CONTRACTOR<br/>ROM</u> | <u>SPO/<br/>AEROSPACE</u> |
| CBS    | 6M                        | 15M                       |
| BTL    | 5M                        | 5M                        |
| DAC    | 4M                        | 4M                        |
| GROUND | <u>1M</u>                 | <u>1M</u>                 |
|        | \$16M*                    | \$25. M                   |

\* AUSTERE PROGRAM

MINIMUM INTERFACES

NO TECHNOLOGY PROGRAM

NO WEIGHT REDUCTION PRODUCT IMPROVEMENT

NO RELIABILITY/ LIFE IMPROVEMENT

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*Back up*

~~SECRET~~ SPECIAL HANDLING

MOL BASELINE RECONNAISSANCE DATA RETURN PROVISIONS

- o **END OF MISSION DATA RETURN**
  - **FOUR DATA RETURN CAPSULES (DRC) IN GEMINI B**  
**(TOTAL CAPACITY 230 LBS. 9" FILM)**
  
- o **INTERMEDIATE DATA RETURN**
  - **ONE DATA RE-ENTRY VEHICLE (DRV) WITH SPACE PROVISIONS**  
**FOR A SECOND DRV**  
**(CAPACITY 60 LBS. 9" FILM PER DRV)**
  - **FILM READOUT SYSTEM USING A WIDEBAND DATA LINK**  
**(UP TO 160 2" X 6" FRAMES PER DAY)**

~~SECRET~~ SPECIAL HANDLING

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USES FOR INTERMEDIATE DATA RETURN

- o **FOR A SURVEILLANCE MISSION**
  - **TARGET RE-PROGRAMMING**
  - **SENSOR PERFORMANCE ANALYSIS**
  - **PROVIDES TIME URGENT RECONNAISSANCE INFORMATION**  
**(CRISIS, TACTICAL, ARMS CONTROL, ETC.)**
  
- o **FOR A TECHNICAL INTELLIGENCE MISSION**
  - **TARGET RE-PROGRAMMING**
  - **SENSOR PERFORMANCE ANALYSIS**
  
- o **FOR THE MOL/DORIAN MISSION**
  - **ALL OF THE ABOVE**

~~SECRET~~ SPECIAL HANDLING

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COMPARISON OF READOUT AND DRV FOR DATA RETURN

| <u>FUNCTIONS</u>                              | <u>READOUT *</u> | <u>DRV</u>               |
|---|------------------|--------------------------|
| TIME URGENT RECON<br>INFORMATION              | DAILY BASIS      | ONCE OR TWICE            |
| TARGET RE-PROGRAMMING<br>DURING MISSION       | DAILY BASIS      | ON FIRST WEEK<br>TARGETS |
| SENSOR PERFORMANCE<br>ANALYSIS DURING MISSION | DAILY BASIS      | AFTER FIRST<br>WEEK      |

\* ALL FUNCTIONS COULD BE PERFORMED TO SOME EXTENT BY FLIGHT CREW  
MONITORING SECONDARY FILM

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OPTIONS

- o **DRV ONLY**
  - DETAILED ANALYSIS OF FIRST WEEK PRIMARY RECORD
  - 60-LB PAYLOAD CAPACITY ABOVE GEMINI LIMIT (230 LBS)
  - SAVE \$15.5M CURRENTLY DEFERRED FOR READOUT
  
- o **READOUT ONLY**
  - WEEKLY - PRIMARY RECORD SAMPLE
  - DAILY - 1 FRAME/TARGET - SECONDARY RECORD
  - NET WEIGHT INCREASE OF 81 LBS
  - NET COST INCREASE \$4.5M (EXCESS OVER DEFERRED READOUT COSTS MINUS CREDIT FOR DRV DELETION)
  
- o **DRV AND READOUT**
  - WEIGHT INCREASE OF 431 LBS
  - COST INCREASE OF \$9.5M ABOVE CURRENT BUDGET
  
- o **NEITHER DRV NOR READOUT**
  - WEIGHT DECREASE OF 731 LBS
  - COST DECREASE OF \$30+ M

~~SECRET~~ SPECIAL HANDLING

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CONCLUSIONS

- o THE READOUT SYSTEM AND DRV ARE OVERLAPPING
  
- o ONE OR BOTH SHOULD BE ELIMINATED TO REDUCE COSTS AND VEHICLE WEIGHTS
  
- o IF INTERMEDIATE DATA RETURN ON A NEAR REAL-TIME BASIS IS A DOD REQUIREMENT, THE DRV SHOULD BE ELIMINATED
  
- o IF INTERMEDIATE DATA RETURN IS NOT A DOD REQUIREMENT, THE COSTS, WEIGHTS AND COMPLEXITY OF NEITHER THE READOUT SYSTEM NOR THE DRV ARE JUSTIFIED

~~SECRET~~ SPECIAL HANDLING

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RECOMMENDATION

IF A REQUIREMENT EXISTS FOR INTERMEDIATE  
DATA RETURN, THEN READOUT IS RECOMMENDED  
AS PROVIDING THE MOST FLEXIBILITY AND  
OVERALL COST EFFECTIVENESS

~~SECRET~~ SPECIAL HANDLING

MOL

CHANGES IN NASA PROGRAM SINCE MSFEB OF 19 SEP 66:

1. MOL WILL BE BILLED FOR INTEGRATION COSTS
  2. CHANGE TO CLUSTER MISSION FOR SA-209, 210, (211 and 212) WITH LAUNCH CHANGE FROM APR 68 TO JUNE - JULY 68
  3. RENDEZVOUS WITH MAPPING & SURVEY SYSTEM
1. ADDITIONAL COSTS WHICH ARE SOMEWHAT OPEN-ENDED
  2. - ADDITIONAL CONTRACTUAL PERIOD  
- RELAX HARDWARE DELIVERY SOMEWHAT  
- MOL LEARNING OUTCOME DELAYED  
- NEW LOCATION FOR EXPERIMENTS IN MULTIPLE DOCKING ADAPTER  
- EXTENDED DURATION QUALITICATION  
- MULTIPLIES MANAGEMENT COMPLEXITY  
- WITHDRAWAL OF CONSIDERATION OF MOL ASTRONAUT PARTICIPATION

MOL

ALTERNATIVES FOR MOL PARTICIPATION

1. CONTINUE PARTICIPATION IN NASA PROGRAM.
2. REDUCE SCOPE AND FUNDING OF MOL EXPERIMENTS.
3. WITHDRAW MOL PARTICIPATION FROM NASA PROGRAM.
4. WITHDRAW ALL USAF PARTICIPATION FROM NASA PROGRAM.



### FACTORS FAVORING CONTINUED PARTICIPATION

- \* EARLY EXERCISE OF MOL PECULIAR EQUIPMENT IN EXTENDED SPACE MISSION.
- \* DEVELOPMENT OF PROCEDURES FOR ASTRONAUT MOBILITY, EQUIPMENT MAINTENANCE AND TIMELINES FOR MOL.
- \* STIMULATION OF DAC TO PAY MORE ATTENTION TO HUMAN FACTORS AND EARLY PRODUCTION OF PROTOTYPE MOLECULAR SIEVE.
- \* DEMONSTRATION OF COOPERATION BETWEEN NASA AND DOD (COMMITMENTS TO NASA MAY BE DIFFICULT TO WITHDRAW).
- \* MOL EXPERIMENTS FEW OF MANY, BUT TO DATE TREATED BY NASA WITH HIGH PRIORITY AND SCHEDULE FLEXIBILITY.
- \* SPECIFIC MOL CREW CONDITIONING AND MEASUREMENT HARDWARE AND PROCEDURES BEING INTEGRATED INTO JOINT NASA/AFAMD BIOASTRONAUTICS EFFORT.
- \* APOLLO APPLICATION PROGRAM IS REPORTED TO BE APPROVED BY BOB AND THE PRESIDENT AT A LEVEL OF \$400 TO \$450 MILLION IN FY 68.

MOL

### FACTORS AGAINST PARTICIPATION

- SAVES \$3 TO \$4 MILLION FOR BASELINE MOL.
- DISTRACTS MOL MANAGEMENT ATTENTION AND MANPOWER.
- INFORMATION ON EXTENDED MANNED SPACE MISSIONS WILL BE AVAILABLE WITHOUT PARTICIPATION.
- BASIC APOLLO PROBLEMS MAY DELAY OR CANCEL ORBITAL WORKSHOP MISSION.
- SCHEDULE DELAYS LIMIT LEARNING UTILITY TO MOL.
- MANAGEMENT COMPLEXITY WITH CLUSTER MISSION.
- MAPPING AND SURVEY SYSTEM TEST IN EARTH ORBIT POSES POLICY PROBLEMS FOR DOD PARTICIPATION.
- POOR EXPERIENCE FROM DOD PARTICIPATION IN GEMINI
- AF PARTICIPATION STRENGTHENS NASA'S ENTRY INTO SPACE STATION MISSIONS.
- PUBLIC INFORMATION PROBLEMS REGARDING NASA SUPPORT OF MOL.

MOL

SAA 209/210 CANDIDATE EXPERIMENTS

ENGINEERING

M401 LUNAR MAPPING PHOTOGRAPHY (M&SS)  
(EARTH ORBITAL QUALIFICATION)  
M402 ORBITAL WORKSHOP  
M469 ST-124 REMOVAL & DISASSEMBLY  
M479 ZERO-G FLAMMABILITY  
M486 ASTRONAUT EVA EQUIPMENT  
\* M487 HABITABILITY/CREW QUARTERS  
M488 HIGH PRESSURE GAS EXPULSION  
M489 HEAT EXCHANGER SERVICE  
M492 TUBE JOINING IN SPACE  
M493 ELECTRON BEAM WELDING

MEDICAL

M018 VECTORCARDIOGRAM  
\* M050 METABOLIC ACTIVITY  
\* M051 CARDIOVASCULAR FUNCTION ASSESSMENT  
\* M052 BONE & MUSCLE CHANGES  
M053 HUMAN VESTIBULAR FUNCTION  
M054 NEUROLOGICAL STUDY (EEG)  
\* M055 TIME & MOTION STUDIES

TECHNOLOGY

TO02 MANUAL NAVIGATION SIGHTINGS  
TO17 METEOROID IMPACT & EROSION  
TO20 JET SHOES  
TO21 METEOROID VELOCITY  
TO22 HEAT PIPE  
TO23 SURFACE ADSORBED MATERIALS

SCIENCE

S009 NUCLEAR EMULSION  
S027 GALACTIC X-RAY MAPPING  
S065 MULTIBAND TERRAIN PHOTOGRAPHY  
(HAND HELD)

DEPARTMENT OF DEFENSE

D017 CO<sub>2</sub> REDUCTION (AMD)  
D018 INTEGRATED MAINTENANCE (MOL)  
D019 SUIT DRESSING & SLEEP STATION  
EVALUATION (MOL)  
D020 ALTERNATE RESTRAINTS EVALUATION (MOL)  
D021 EXPANDABLE AIRLOCK TECHNOLOGY (RTD)  
D022 EXPANDABLE STRUCTURE FOR RECOVERY (RTD)

\* GROUND SIMULATION OF BIOMEDICAL EFFECTS OF WEIGHTLESSNESS AND TESTING TEAM WILL BE SAME FOR MOL.

MOL

FACTORS AFFECTING SCOPE REDUCTION

- DELETION OF MOLECULAR SIEVE SAVES MORE THAN \$1 MILLION AND EASES SCHEDULE PROBLEM SOMEWHAT, BUT IS SIGNIFICANT REDUCTION OF OBJECTIVES.
- ACTIVE PARTICIPATION BY MOL SPO AND DAC IS RETAINED TO ASSURE MORE THOROUGH LEARNING AND INFORMATION TRANSFER.

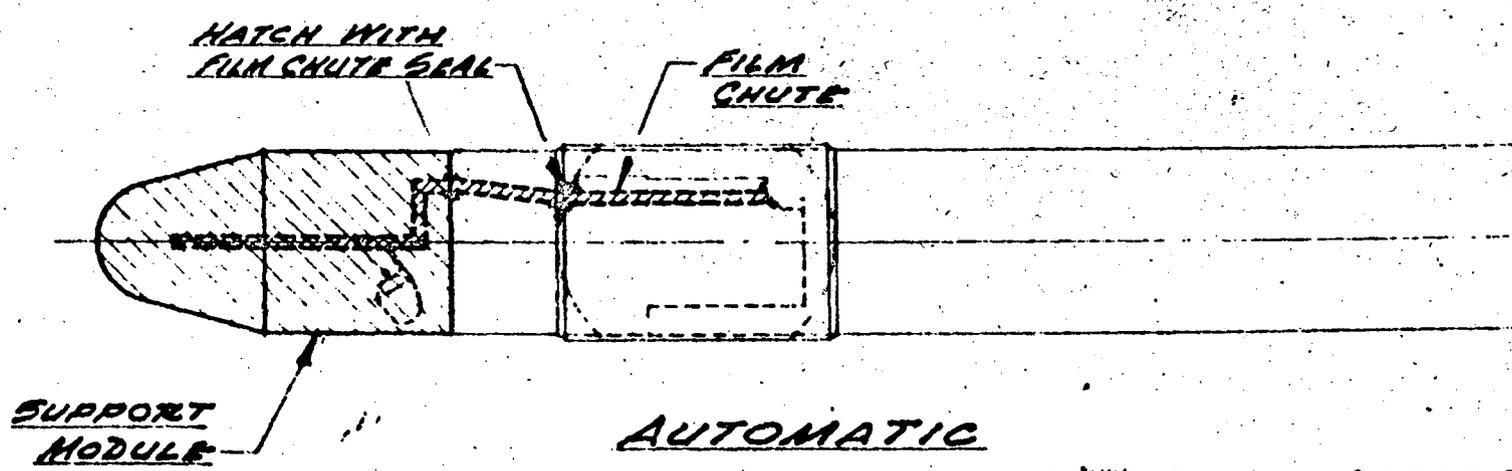
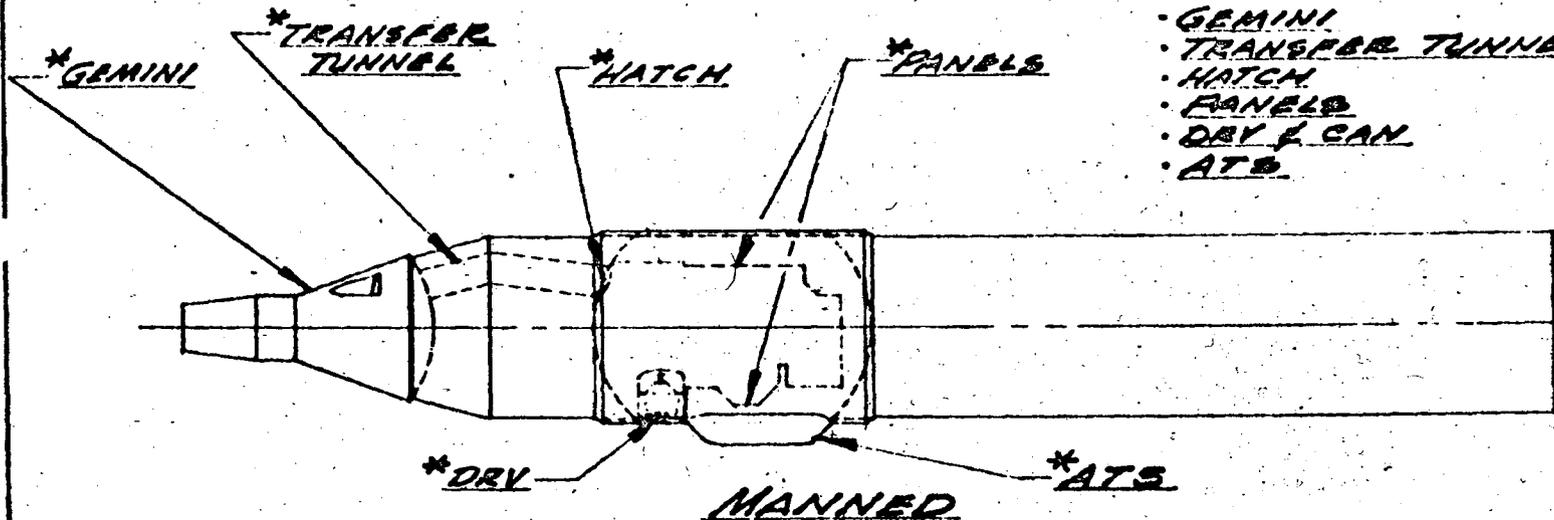
MOL

RECOMMENDATION

1. CONTINUE FULL PARTICIPATION ON THE  
CONDITION THAT NASA PROVIDE INTEGRATION  
COSTS OR AGREE TO FIRM FIXED PRICE.
2. DOD SUPPORT OF THE POLICY ON INTEGRATION  
COSTS IS REQUIRED.

# MANNED → AUTOMATIC CONVERSION

- \*REMOVE:**
- GEMINI
  - TRANSFER TUNNEL
  - HATCH
  - PANELS
  - DRY & CAN
  - ATS



SHADED AREAS TO  
BE ADDED

~~SECRET~~ SPECIAL HANDLING

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FLIGHT 6 & 7 ASSEMBLY PROCEDURES A/M

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

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~~SECRET~~ SPECIAL HANDLING

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FLIGHT 6 BASELINE SCHEDULE

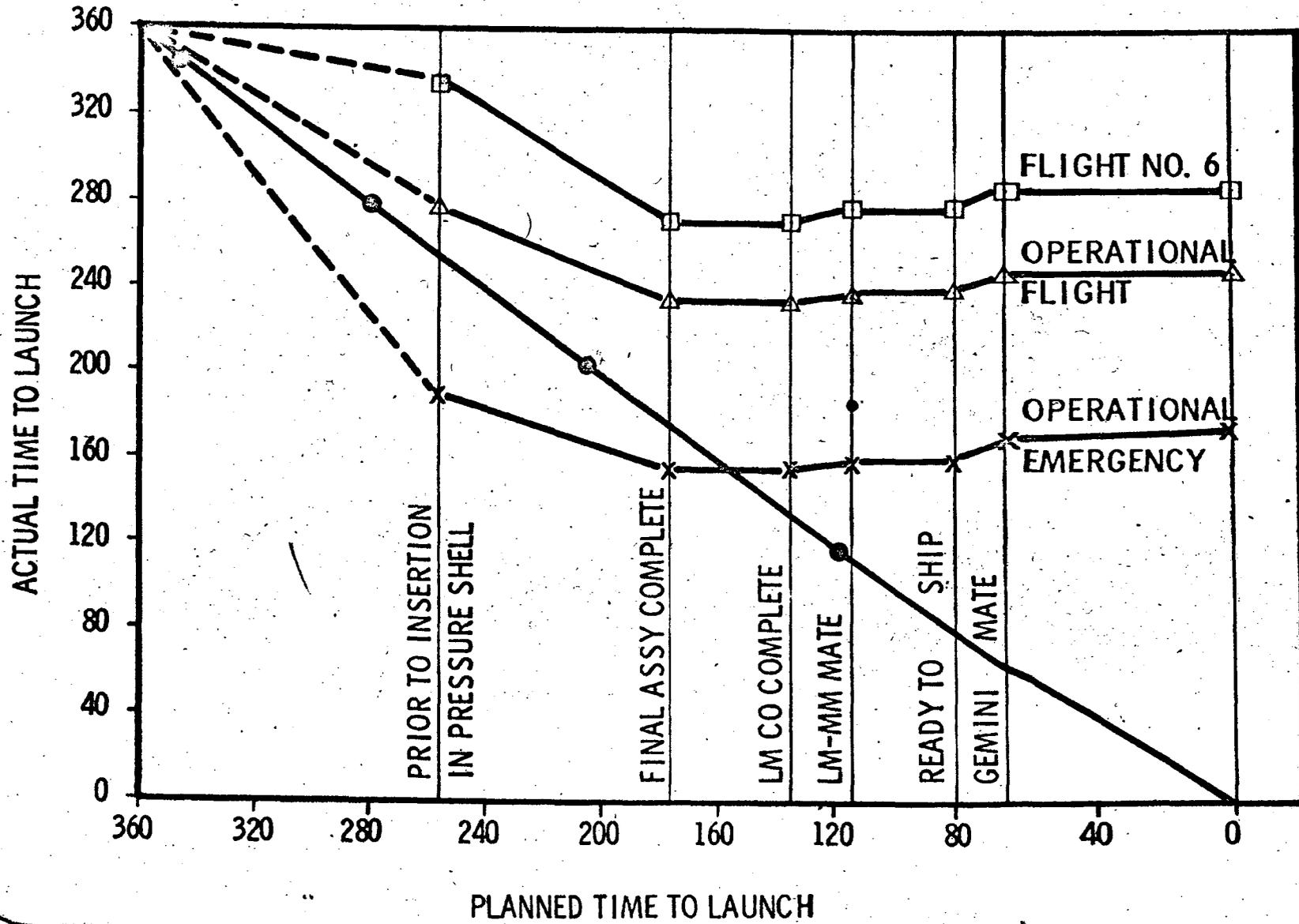
| <u>EVENT</u>   | <u>START DATE</u> | <u>SPAN/MONTHS</u> | <u>MONTHS TILL LAUNCH</u> |
|--|-------------------|--------------------|---------------------------|
| ● FAB STARTS<br>STRUCTURE AND BIRDCAGE                         | APRIL '69         | 6                  | 18                        |
| ●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

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V820-8

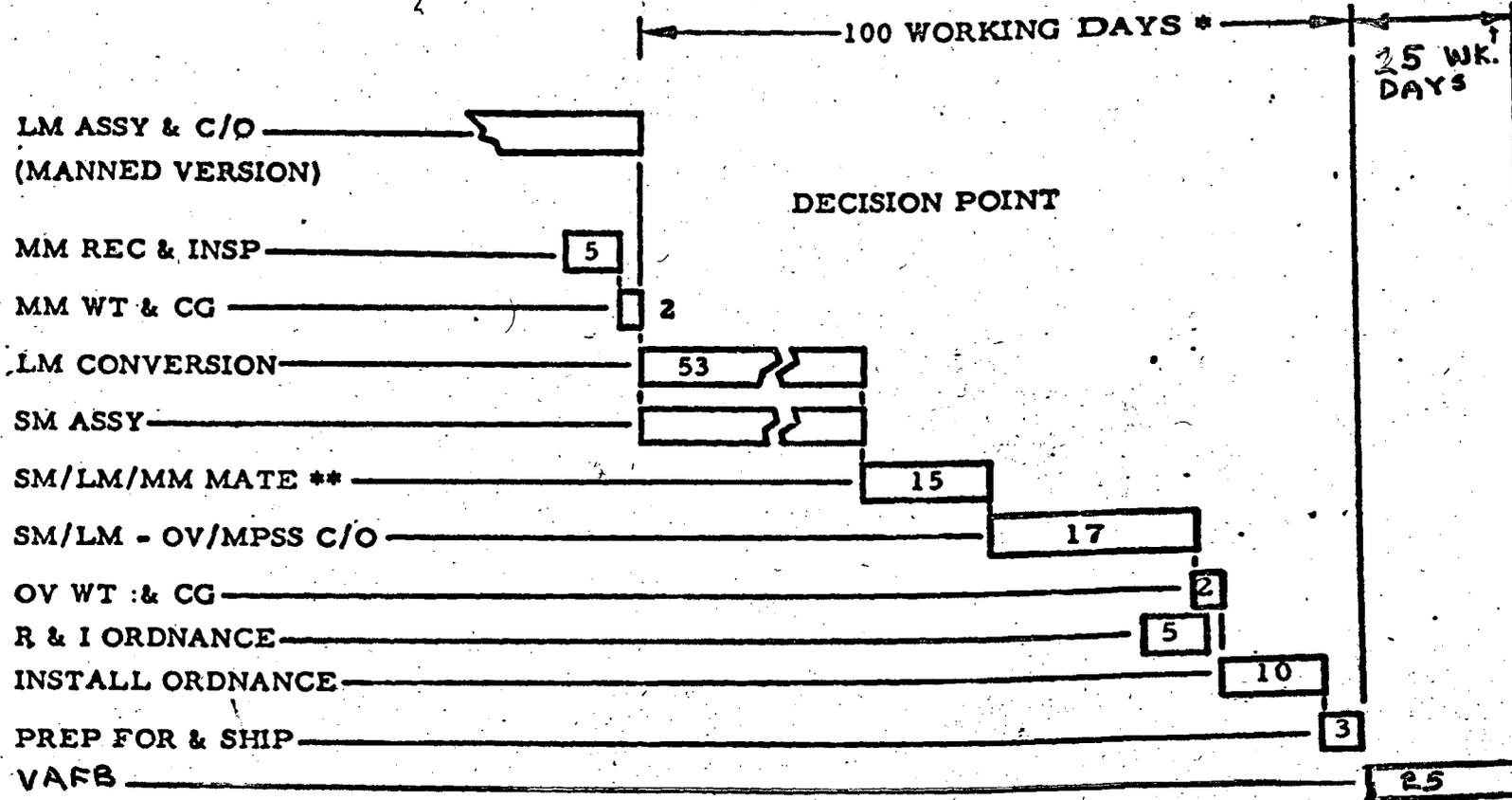
# LABORATORY CONVERSION TIME



WHS-155

B035-2

~~SECRET~~ SPECIAL HANDLING  
MINIMUM RESPONSE TIME



\*117 CALENDAR DAYS, ASSUMING 6 WORKING DAYS PER WEEK AT H13

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

1146 CALENDAR DAYS (TOTAL) 2WK SLIP

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~~SECRET~~ SPECIAL HANDLING

CONVERSION FLIGHTS 6 AND 7 TO M/A

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

|           |         |
|-----------|---------|
| FLIGHT #6 | \$ 63M  |
| FLIGHT #7 | \$ 45 M |
| TOTAL     | \$108 M |

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FLIGHT 6 CONVERSION OPTION

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

~~SECRET~~ SPECIAL HANDLING



**IMPACT ON FISCAL YEAR FUNDING**

**△ COST INCREASES OVER BASELINE**

| FISCAL YEAR                     | 1968 | 1969           | 1970             | 1971        | 1972 | TOTAL       |
|---------------------------------|------|----------------|------------------|-------------|------|-------------|
| <b>1. FROM AM → M/AM</b>        |      |                |                  |             |      |             |
| <b>FLIGHT #6</b>                |      | <u>2.0</u> 6.0 | <u>10.0</u> 23.0 | <u>34.0</u> |      | <u>63.0</u> |
| <b>HARDWARE PROCUREMENT</b>     |      | 2.0            | 16.0             | 18.0        |      | 36.0        |
| <b>CONVERSION</b>               |      | 4.0            | 7.0              | 16.0        |      | 27.0        |
| <b>FLIGHT #7</b>                |      |                | <u>15.0</u>      | <u>30.0</u> |      | <u>45.0</u> |
| <b>HARDWARE PROCUREMENT</b>     |      |                | 10.0             | 20.0        |      | 30.0        |
| <b>CONVERSION</b>               |      |                | 5.0              | 10.0        |      | 15.0        |
| <b>2. FROM M/AM → AM FLT #6</b> |      |                |                  |             |      |             |
| <b>FLT #6 TO M/AM</b>           |      | <u>2.0</u>     | <u>10.0</u>      | <u>20.0</u> |      | <u>32.0</u> |
| <b>HARDWARE PROCUREMENT</b>     |      | 2.0            | 10.0             | 20.0        |      | 32.0        |
| <b>4 MOS BEFORE LAUNCH</b>      |      | <u>2.0</u>     | <u>21.0</u>      | <u>36.0</u> |      | <u>59.0</u> |
| <b>CONVERSION TO AM</b>         |      |                | 11.0             | 16.0        |      | 27.0        |
| <b>10 MOS BEFORE LAUNCH</b>     |      | <u>4.0</u>     | <u>13.0</u>      | <u>25.0</u> |      | <u>42.0</u> |
| <b>CONVERSION TO AM</b>         |      | 2.0            | 3.0              | 5.0         |      | 10.0        |
| <b>3. SPARE AM - 4 MONTHS</b>   |      | <u>2.0</u>     | <u>30.0</u>      | <u>45.0</u> |      | <u>77.0</u> |
| <b>HARDWARE PROCUREMENT</b>     |      |                | 20.0             | 25.0        |      | 45.0        |
| <b>SPARE AM - 10 MONTHS</b>     |      | <u>2.0</u>     | <u>20.0</u>      | <u>34.0</u> |      | <u>56.0</u> |
| <b>HARDWARE PROCUREMENT</b>     |      |                | 10.0             | 14.0        |      | 24.0        |

INCREASED COST OF AM OPTION - FLIGHT #6

| ADDITIONAL HARDWARE                               | FLIGHT #6      |                              | M/AM<br>OR AM | SPARE AM<br>△ |
|---|----------------|------------------------------|---------------|---------------|
|   | BASELINE<br>AM | OR<br>BASELINE △<br>FOR M/AM |               |               |
| GEMINI B/SM                                       | 4.0            | 19.0                         | 23.0          |               |
| DACO (DISPLAYS, CONTROLS,<br>STRUCTURE, FAIRINGS) | 29.5           | 6.0                          | 35.5          | 24.0          |
| PAYLOAD (DISPLAYS, CONTROLS,<br>ATS, RV's)        | 24.0           | 5.0                          | 29.0          | 21.0          |
| OTHER   | 2.7            | 1.5                          | 4.2           |               |
| TITAN III   | 21.0           | 0.5                          | 21.5          |               |
| BASELINE  | \$81.2M        | + \$32.0M                    | = \$113.2M    | \$45.0M       |

| CONVERSION COSTS                          | DECISION BEFORE LAUNCH |           |
|---|------------------------|-----------|
|   | 4 MONTHS               | 10 MONTHS |
| CONVERSION PLANNING & TECHNIQUE           | 6.0                    | 3.0       |
| CONVERSION TOOLING & EQUIPMENT            | 3.0                    | 2.0       |
| CONVERSION LABOR                          | 10.0                   | 2.0       |
| REPEAT ASSEMBLY & CHECKOUT                | 6.0                    | 2.0       |
| OPERATIONS, SOFTWARE, LAUNCH,<br>RECOVERY | 2.0                    | 1.0       |
| SUBTOTAL CONVERSION                       | \$27.0M                | \$10.0M   |
|   | 32.0                   | 32.0      |
| TOTAL COST INCREASE                       | \$59.0M                | \$42.0M   |

\$45.0M

MOL

MOL MANAGEMENT MEETING

5 JAN 67

AGENDA

MORNING SESSION - Program Management Meeting

AFTERNOON SESSION - Technical Report on Completed  
Studies

TYPE OF BRIEFING

- o Information / Updating
- o Action, Approval Requested

MOL

## AGENDA ITEMS

### 1) TIME - COST OPTIONS

PURPOSE: INDICATE PROGRAM DECISION POINT FOR ADJUSTING TO FY 68 FUND LEVELS.

MANAGEMENT ACTION: AUTHORIZATION TO PROCEED WITH BASELINE PROGRAM UNTIL EARLY FY 1968. OBTAIN A DX PRIORITY FOR PROGRAM.

### 2) PROCUREMENT SCHEDULE FOR CONTRACTUAL DEFERRED ITEMS

PURPOSE: PRESENT CURRENT STATUS AND PLANS FOR DEFINITIZING CONTRACTURALLY DEFERRED ITEMS.

MANAGEMENT ACTION: INFORMATION AND SCHEDULE ACCEPTANCE

### 3) SATURN IVB

PURPOSE: REVIEW CURRENT STATUS OF MOL PROGRAM PARTICIPATION IN NASA PROGRAM.

MANAGEMENT ACTION: REVALIDATION OF COURSE OF ACTION

MOL

4) WIDE BAND READOUT

PURPOSE: REVIEW OF CURRENT PLANS FOR A MOL READOUT SYSTEM.

MANAGEMENT ACTION: APPROVE RECOMMENDED APPROACH.

5) THERMAL DOORS

PURPOSE: DISCUSSION OF PROPOSED DESIGNS.

MANAGEMENT ACTION: INFORMATION BRIEFING.

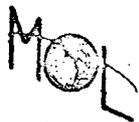
6) ACOUSTIC TESTING

PURPOSE: REVIEW THE REQUIREMENT FOR ACOUSTIC TESTING IN THE  
MOL PROGRAM.

MANAGEMENT ACTION: DISCUSSION OF THE REQUIREMENT  
AND GUIDANCE ON APPROACH TO  
BE TAKEN.

7) EXECUTIVE SESSION: DESIGNATED INDIVIDUALS.

~~Secret~~ / Byeman / Dorian



8) REPORT ON COMPLETED STUDIES

- a. IMAGE VELOCITY SENSOR
- b. SUPPORT MODULE STUDIES
- c. ACQUISITION AND TRACKING SCOPE
- d. SIMULATION STUDIES AND PLANNING

PURPOSE: INFORMATION BRIEFING

MANAGEMENT ACTION: TO BE DETERMINED.

~~Secret~~ / Byeman / Dorian

Col Keeler



FINANCIAL MANAGEMENT



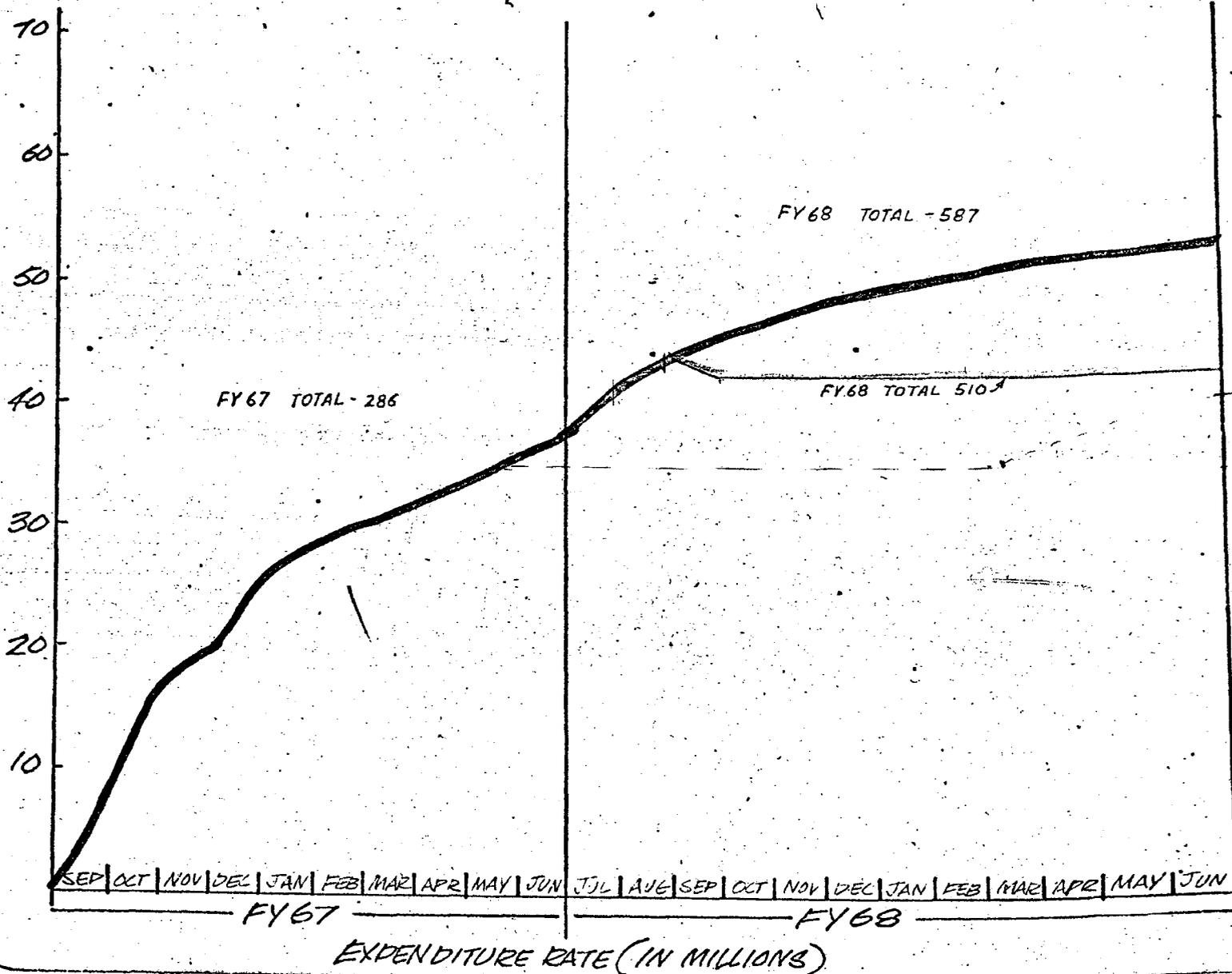
## CONSTRAINTS ON OPERATION

- o NO PROVISION FOR CHANGES
- o AUTHORITY NEEDED FOR EXPENDITURE LEVEL  
FUNDING
- o TIGHT SCHEDULE LIMITS RESEQUENCING  
WORK
- o FPI CONTRACTS LIMITS SPO
- o DX PRIORITY
- o REPROGRAMMING COSTS MONEY

8

*[Handwritten signature]*

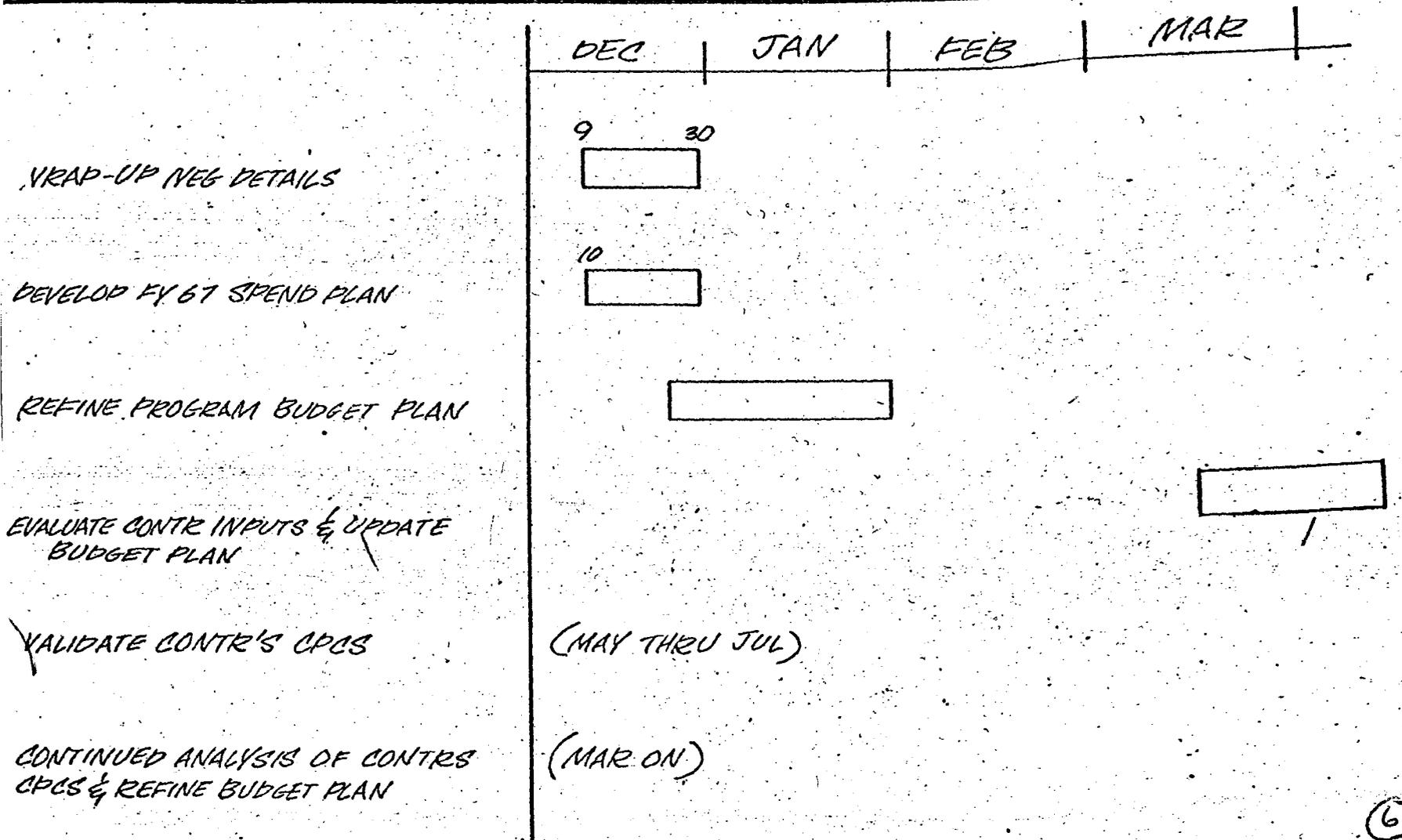
# MONTHLY FUNDING REQUIREMENTS (EXPENDITURES + FEE ONLY)



⑤ ⑦



# SPRO ACTIVITIES



MOL

# CONTRACTOR ACTIVITIES

DEC

JAN

FEB

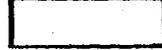
MAR

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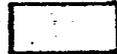
SPO/CONTR NEG "HANDSHAKE"

9 30

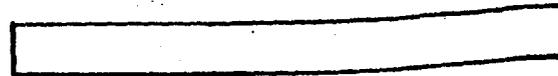


SPO/CONTR WRAP-UP NEG DETAILS

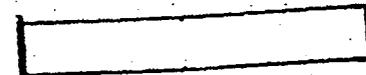
14 30



PRELIMINARY & INPUTS TO SPO  
(FOR PLANNING PURPOSES ONLY)

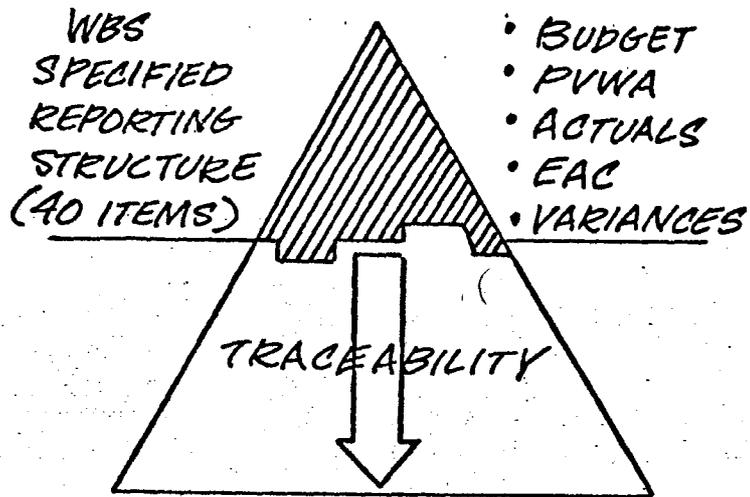


IN-HOUSE NEGOTIATIONS & DEVELOP  
BUDGET PLAN

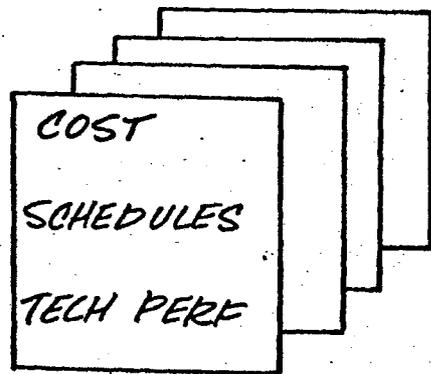


INITIAL SUBMISSION OF FINANCIAL  
REPORTS (MEANINGFUL DATA)

CPCS



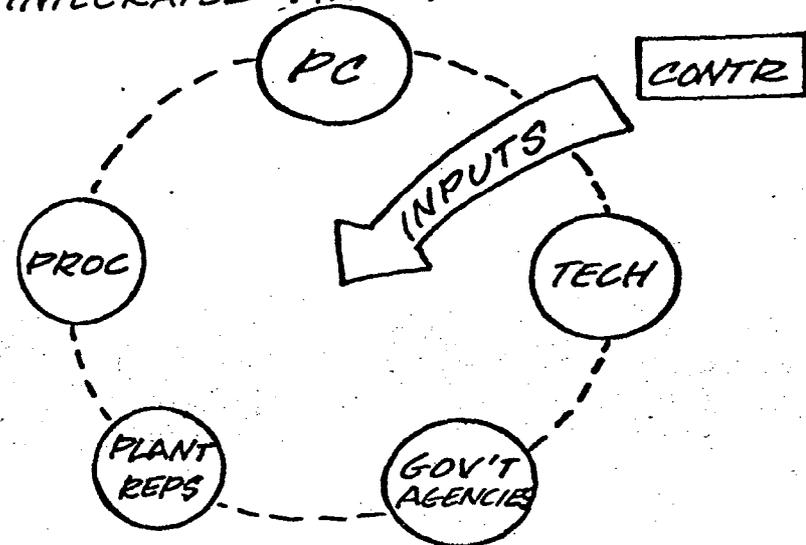
CRITICAL WBS BLOCKS (SUBSYSTEMS)



AVAILABLE SORTS:

- WBS
- COST ELEMENTS
- BUDGET CENTERS
- NON RECURRING/RECURRING

PEOPLE  
INTEGRATED ANALYSIS TEAM



ACTIVITIES:

- STATUS
- PROBLEM IDENTIFICATION & ANALYSIS
- TRACKING
- INTEGRITY CHECKING
- TRADE-OFF STUDIES
- UPDATE REQUIREMENTS

MOL

MEANS AVAILABLE  
FOR FINANCIAL MANAGEMENT

◦ PRODUCTS OF AFSC CMIP

◦ PEOPLE

MOL

## CONCEPTS OF OPERATION

- MINIMIZE EARLY YEARS FUNDING
  - VALIDATE CONTRACTOR'S TIME PHASED REQUIREMENTS
  - EXPENDITURE LEVEL FUNDING
- MAINTAIN BALANCED PROGRAM
- TRACK EXPENDITURES (CLOSELY
- RECOMMEND REPROGRAMMING IF:
  - PROGRAM BECOMES UNBALANCED
  - EXPENDITURES BREAK TRACK

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~~SECRET~~ SPECIAL HANDLING

SUPPORT MODULE

EXTENDED LIFE STUDY

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~~SECRET~~ SPECIAL HANDLING

STUDY OBJECTIVES

- FEASIBILITY OF EXTENDED LIFE AM.
- PRELIMINARY DESIGN OF SUPPORT MODULE.
- RECOMMENDED BASE LINE CHANGES.
- EXTENDED LIFE GROUND TEST PROGRAM RELIABILITY EVALUATION.

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STUDY ROLES & RESPONSIBILITY

- o DACO - STRUCTURE  
EXPENDABLES  
OVER ALL INTEGRATION SM
- o EK - FILM HANDLING
- o GE - DRV'S  
SOFTWARE
- o ALL - SYSTEM SEGMENTS

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~~SECRET~~ SPECIAL HANDLING

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CONTENTS

CONFIGURATIONS

CAMERA DESIGN

S/M ARRANGEMENTS/EXPENDABLE TANK SIZING

FILM REQUIREMENTS/NO. OF RV'S

WEIGHTS/LIFE/INCLINATIONS

LAB/DRV PRESSURE

DRV PAYLOAD

DESIGN IMPACT

TESTING REQUIREMENTS

COSTS

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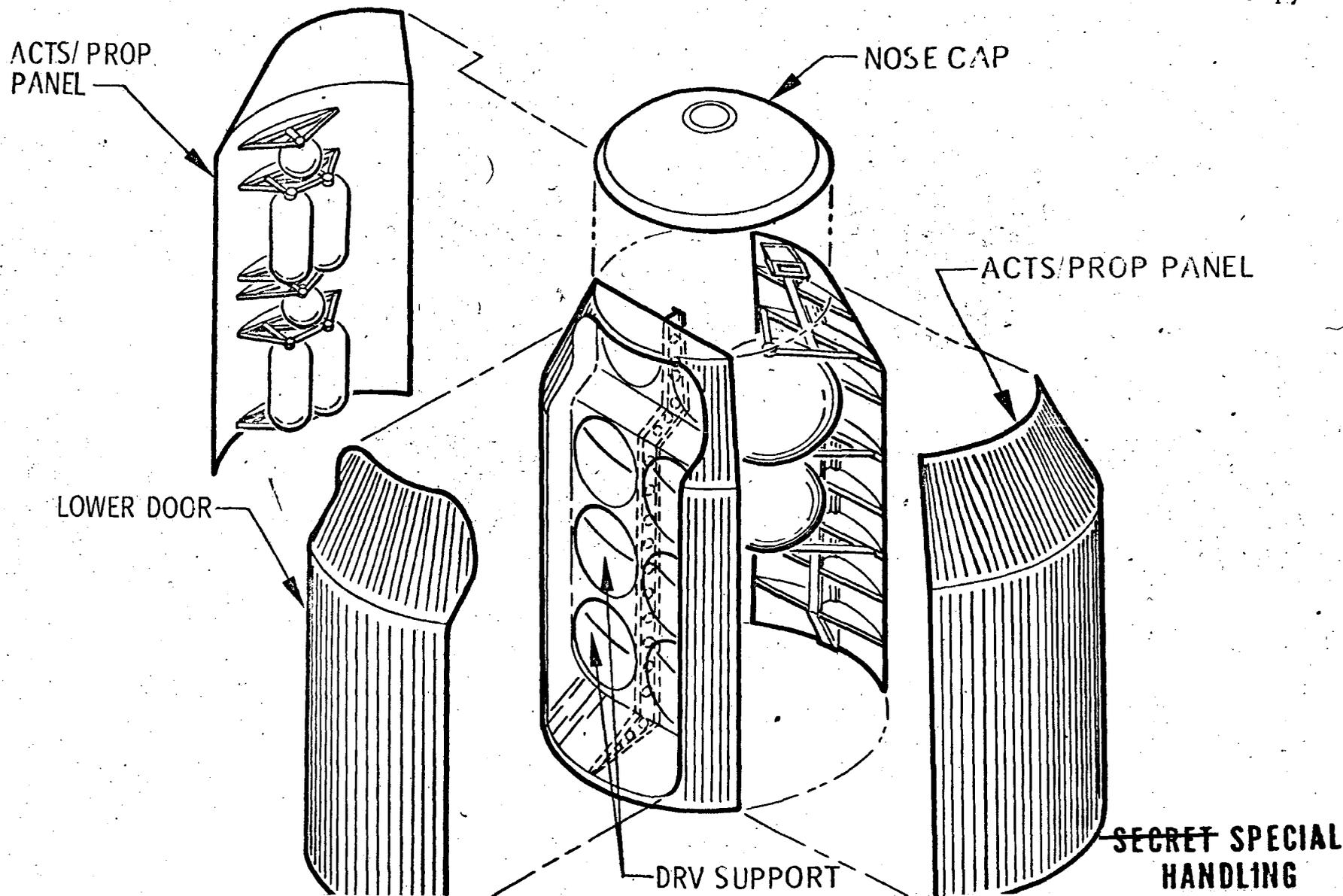
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# SUPPORT MODULE STRUCTURE

WHS-155

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FILM WEIGHT

| <u>DAYS</u> | <u>CLOUD SENSOR<br/>EFFECTIVENESS</u> | <u>NO. TARGETS*</u> | <u># FILM*<br/>REQUIRED</u> | <u>NO. DRV'S</u> |            |
|-------------|---------------------------------------|---------------------|-----------------------------|------------------|------------|
|             |                                       |                     |                             | <u>58#</u>       | <u>70#</u> |
| 30          | 100                                   | 2340                | 215                         | 4                | 3          |
|             | 70                                    | 3280                | 300                         | 6                | 5          |
|             | 0                                     | 4680                | 425                         | 8                | 6          |
| 40          | 100                                   | 3120                | 285                         | 5                | 4          |
|             | 70                                    | 4370                | 400                         | 7                | 6          |
|             | 0                                     | 6240                | 570                         | 10**             | 8          |
| 60          | 100                                   | 4680                | 425                         | 8                | 6          |
|             | 70                                    | 6550                | 595                         | 11**             | 9**        |
|             | 0                                     | 9360                | 850                         | 15**             | 12**       |

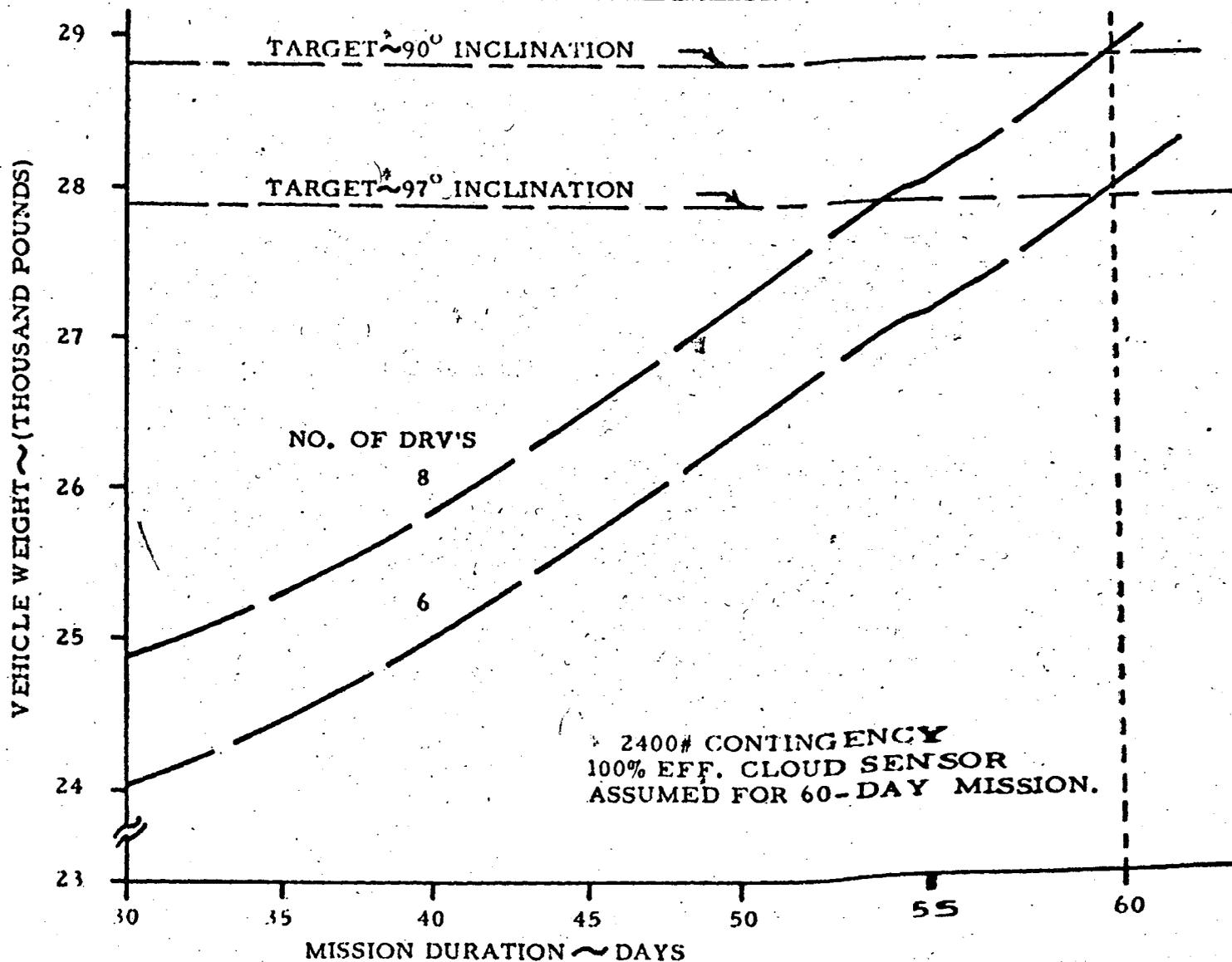
\* 156 PER/DAY 6 FRAMES/TARGET.

\*\* NOT FEASIBLE.

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CONFIGURATION WEIGHT VS DURATION



~~SECRET~~ SPECIAL HANDLING

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2 PSIA AND 5 PSIA PRESSURE TRADE OFF

2 PSIA  
(MOD. TO LM)

MODIFY PRESSURE REGULATORS

MODIFY VENT VALVES

ADD ADDITIONAL VENT VALVE

MODIFY CABIN FANS

5 PSIA  
(MOD. TO DR V)

REDESIGN COVERS

MODIFY OUTFLOW RELIEF VALVE

LOWER ROM COST

~~SECRET~~ SPECIAL HANDLING

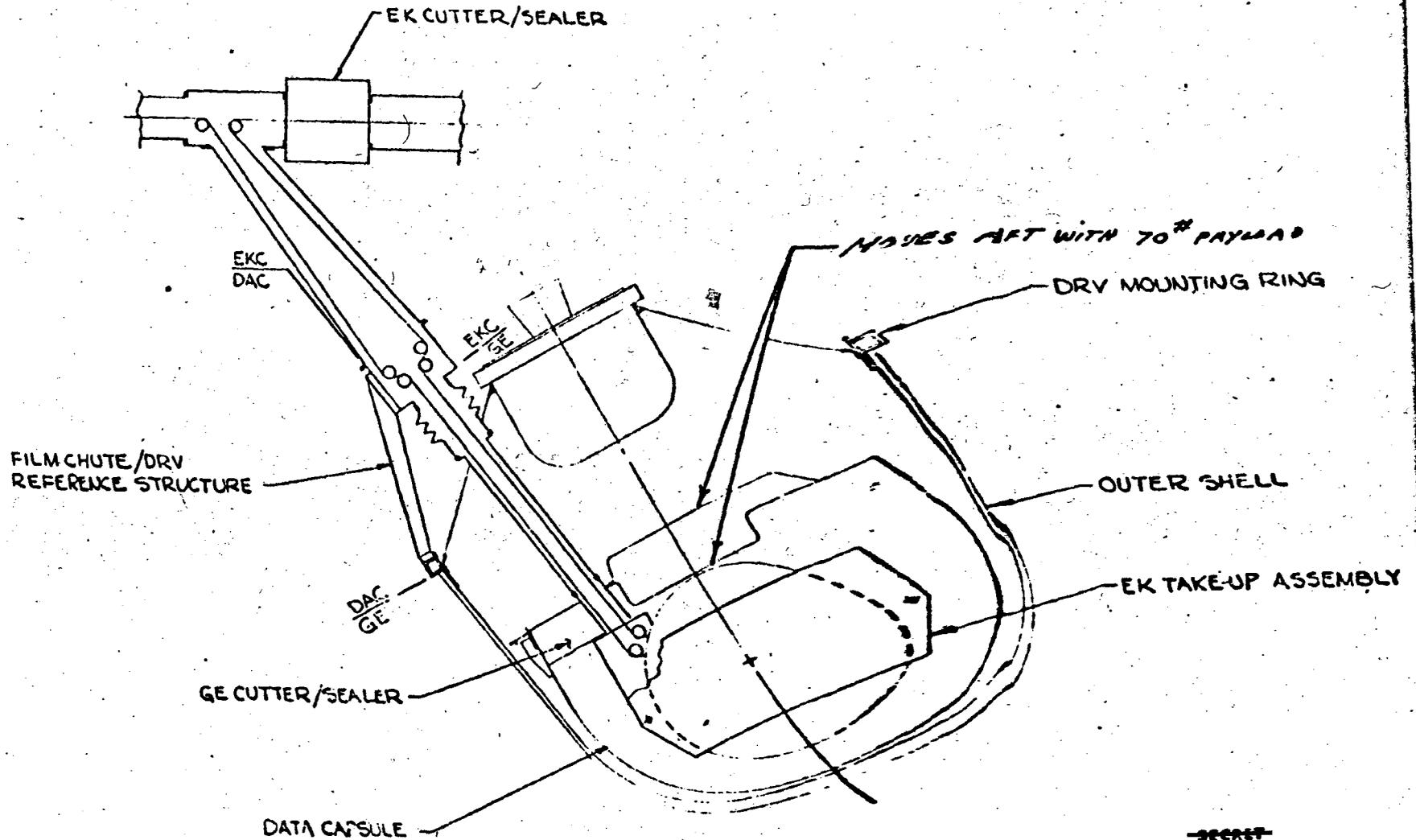
SPECIAL HANDLING

~~SECRET~~

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ROUGH DRAFT

FILM CHUTE/DRV ALIGNMENT METHOD



~~SECRET~~  
SPECIAL HANDLING

~~SECRET~~ SPECIAL HANDLING

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VARIABLES

COMMENT

- |                                 |                                   |
|---------------------------------|-----------------------------------|
| ● ORBITAL LIFE                  | 60 DAYS FEASIBLE                  |
| ● 300 - 550# FILM WEIGHT        | FEASIBLE                          |
| ● 58 - 70# R/V CAPACITY         | EITHER FEASIBLE/70# RECOMMENDED   |
| ● 6, 8 OR 10 R/V'S              | 8 OR LESS                         |
| ● CUT AND WRAP OR CUT & SPLICE  | CUT AND WRAP                      |
| ● 2 OR 5 PSI LAB PRESSURIZATION | EITHER FEASIBLE/5 PSI RECOMMENDED |
| ● ONE OR TWO PLATEN CAMERA      | EITHER FEASIBLE/ONE RECOMMENDED   |
| ● INCLINATION                   | 90 - 97° FEASIBLE                 |

~~SECRET~~ SPECIAL HANDLING

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~~SECRET~~-SPECIAL HANDLING

EXTENDED LIFE IMPACTS

- IDENTIFIED IN STUDY AS POTENTIAL WEAROUT PROBLEMS.
  - DACO - 3 ITEMS - BEARINGS - SEPARATOR PUMPS
  - GE - 14 ITEMS - REDUNDANCY FOR ELECTROMECHANICAL DEVICES
- ALL IDENTIFIED ITEMS SHOULD BE CHANGED IN MANNED BASELINE.
- 30-DAY QUALIFICATION OF SUPPORT MODULE
- SELECTED TESTS OF CRITICAL COMPONENTS FOR WEAR OUT.
- PROJECTED RELIABILITY OF AUTOMATIC SYSTEM  
FOR 60 DAYS = 0.55.

~~SECRET~~-SPECIAL HANDLING

WHS-155

~~SECRET~~ SPECIAL HANDLING

FLIGHTS 6 & 7

APPROACHES

COST IN MILLIONS

- o EXTENDED LIFE APPROACH
  - M CONFIGURATION 61 - 69
    - 2 PLATENS
    - 8 DRV'S
  - V CONFIGURATION 53 - 69
    - 1 OR 2 PLATENS
    - 8 DRV'S
- o "30" DAY - GROWTH TO 60 DAYS 25
  - DESIGN STRUCTURE FOR EXTENDED MISSION
  - SPACE PROVISIONS FOR EXPENDABLES AND 8 DRV'S
  - V CONFIGURATION - SINGLE PLATEN
  - 6 DRV'S
- o "30" DAY ONLY
  - V CONFIGURATION - SINGLE PLATEN
    - 4 DRV'S 19
    - 6 DRV'S 23

~~SECRET~~ SPECIAL HANDLING

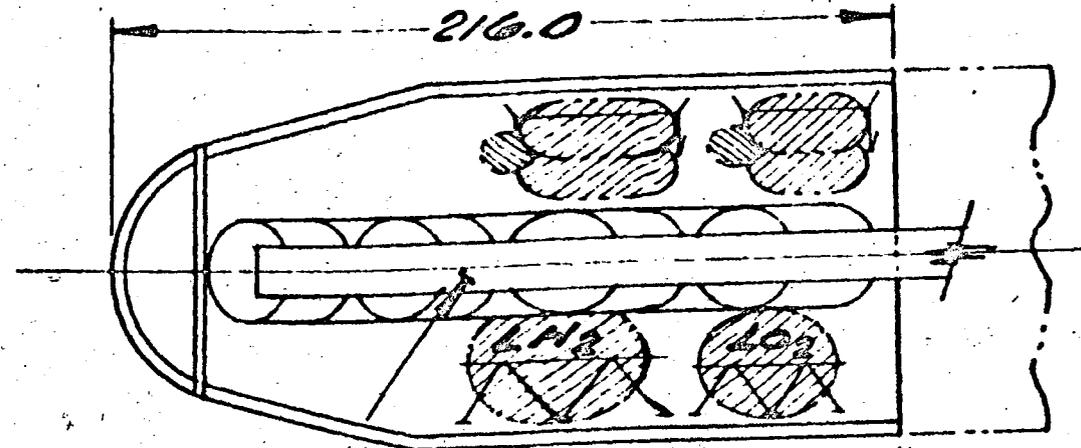
~~SECRET~~ SPECIAL HANDLING

WHS-155

SUPPORT MODULE

30 DAY - WITH 60 DAY

GROWTH CAPABILITY



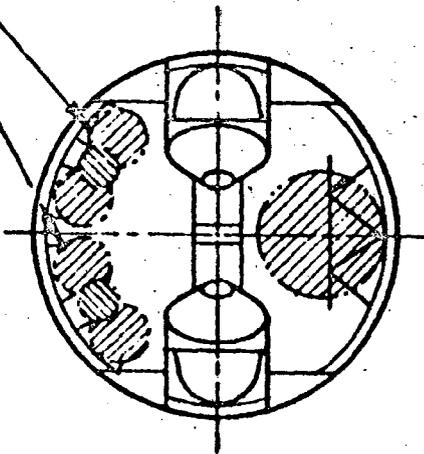
FILM CHUTE

A

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STA 786.0

ACTS PROPELLANT



SECTION A-A

SHADED AREAS TO  
BE ADDED

~~SECRET~~ SPECIAL HANDLING

~~SECRET~~ SPECIAL HANDLING

WHS-155

RECOMMENDATIONS

- "30" DAY - GROWTH TO 60 DAYS
  - MODS TO LM MINOR
  - IDENTIFIED WEAR OUT AND REDUNDANCY ITEMS
    - CHANGED ON MAM
  - OXYGEN CRYO TANKS REQUIRE 6# ADDITIONAL INSULATION
    - CHANGED ON MAM
  - CONTINUE DESIGN EFFORT TO INSURE GROWTH COMPATABILITY
    - SPACE PROVISIONS FOR EXPENDABLES, WET INTERFACE AND 2 DRV'S
- BASELINE EXPENDABLES USED IN S/M

~~SECRET~~ SPECIAL HANDLING

OUTLINE FOR MOL-SIVB EXPERIMENTS BRIEFING

I. PURPOSE: REVIEW THE STATUS OF MOL PARTICIPATION ON THE NASA SA-209

WORKSHOP PROJECT.

A. BACKGROUND

B. MANAGEMENT ACTIVITY

C. CURRENT STATUS

D. ALTERNATIVES

**II. BACKGROUND:**

**A. DESCRIPTION OF SA-209 ORBITAL WORKSHOP**

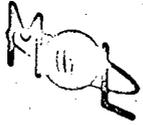
**B. DIRECTION FROM GEN EVANS TO EXAMINE DESIRABILITY OF MOL**

**PARTICIPATION ON SA-209 - 3 FEB 66**

**1. SATURN IVB AD HOC COMMITTEE - 29 MAR 66**

**2. GUIDELINES FOR PARTICIPATION**

**C. DESCRIPTION OF PROPOSED MOL EXPERIMENTS**



## NASA OBJECTIVES OF SAA-209 "ORBITING WORKSHOP"

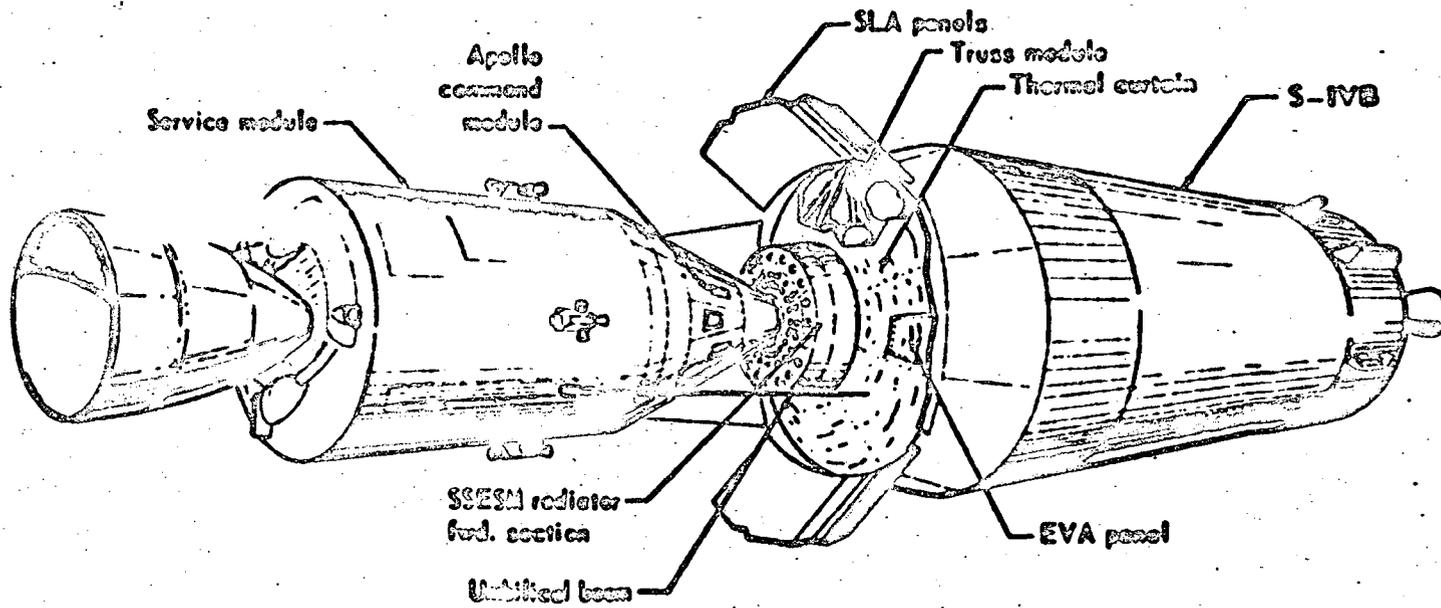
- EXPERIMENTAL INVESTIGATION AND OPERATION OF LARGE ENVIRONMENTALLY CONTROLLED VOLUME IN EARTH ORBIT (SHIRT SLEEVE ENVIRONMENT)
- DESIGN OBJECTIVE FOR 30 DAY FLIGHT WITH LOWER LIMIT OF 14 DAYS
- EXPAND MAN'S KNOWLEDGE ON HABITABILITY AND WORKING CAPABILITIES IN SPACE
- ACTIVATION OF THE S-IV B SPENT STAGE FOR MANNED OCCUPANCY
- \*○ ACCOMMODATE AT LEAST 1,500 LBS OF COROLLARY EXPERIMENTS
- ACCOMPLISH OBJECTIVES WITH MINIMUM COST, MAXIMUM RELIABILITY AND MINIMUM IMPACT ON APOLLO PROGRAM HARDWARE.

\* MOL PARTICIPATION

OSOEM

REPORT NO. 2399 VOLUME 4 17 JUNE 1966

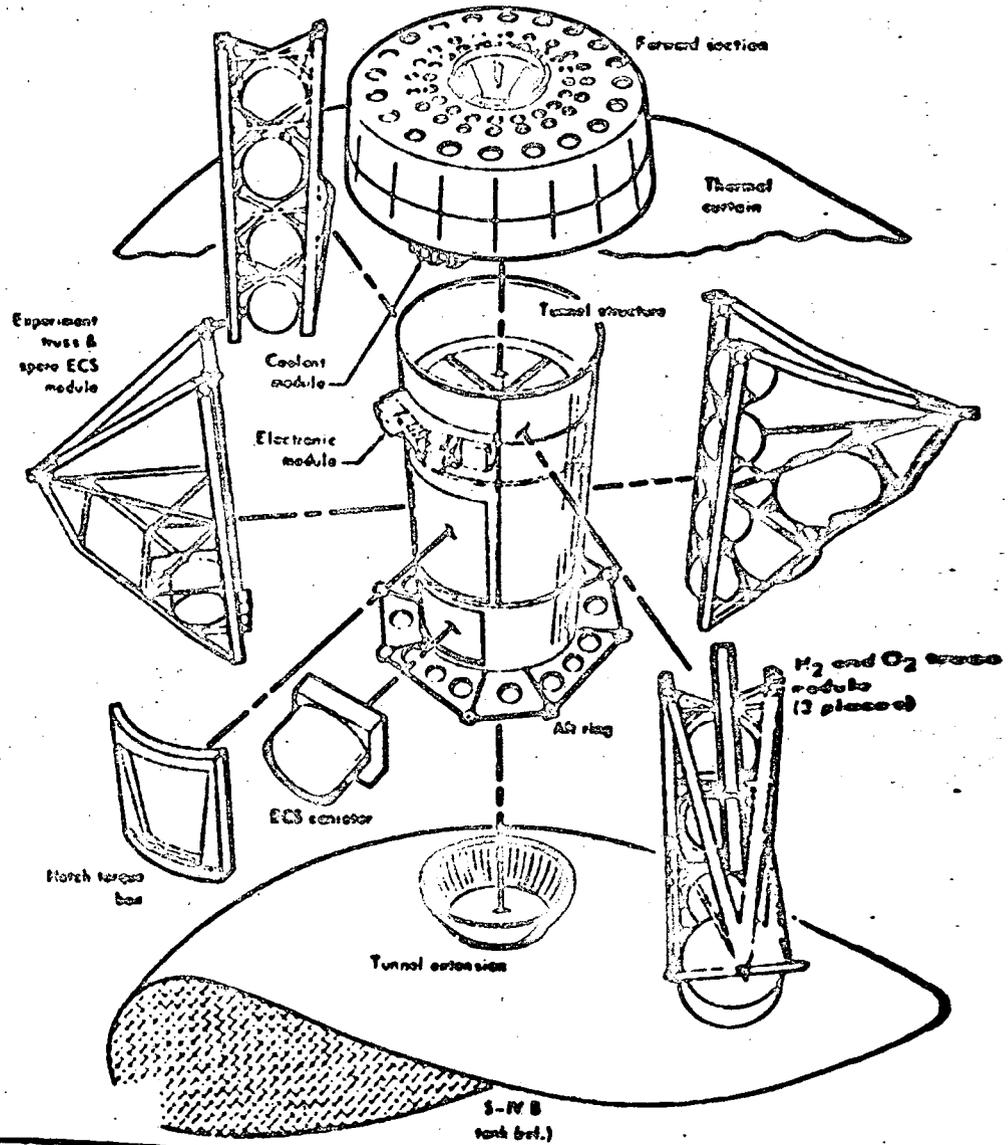
### ORBITAL CONFIGURATION WHOLE VEHICLE

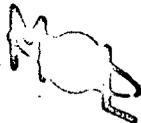


SEEM

REPORT NO. 2339 VOLUME 4 17 JUNE 1966

EXPLODED VIEW





GROUND RULES FOR MOL PARTICIPATION SA-209

- NO CHANGES IMPOSED ON APOLLO PROGRAM OR HARDWARE
- EXPERIMENT MUST BE UNIQUE TO MOL BASELINE
- ORBITAL TEST JUSTIFIABLE
  - FUNCTIONAL ASPECTS THAT CANNOT BE FULLY TESTED ON GROUND OR AIRPLANE
  - MEANINGFUL DATA MUST BE ACQUIRED
- MAN PARTICIPATION ESSENTIAL TO TEST
  - MAN/EXPERIMENT RELATIONSHIP IMPORTANT
- SA-209 WILL PROVIDE ADEQUATE SHIRTSLEEVE ENVIRONMENT IN LH<sub>2</sub> TANK
- PARTICIPATION TO BE ON NON-INTERFERENCE BASIS WITH BASIC MOL PROGRAM EFFORT
- CONSTRAINTS ON PROPOSED MOL EXPERIMENTS:
  - PACKAGABLE TO "SUITCASE" CONCEPT
  - DATA AND DATA RETURN TO ACCOMMODATE "SUITCASE" CONCEPT
  - EVA ONLY TO EXTENT OF LEM HANGAR AREA

MOL

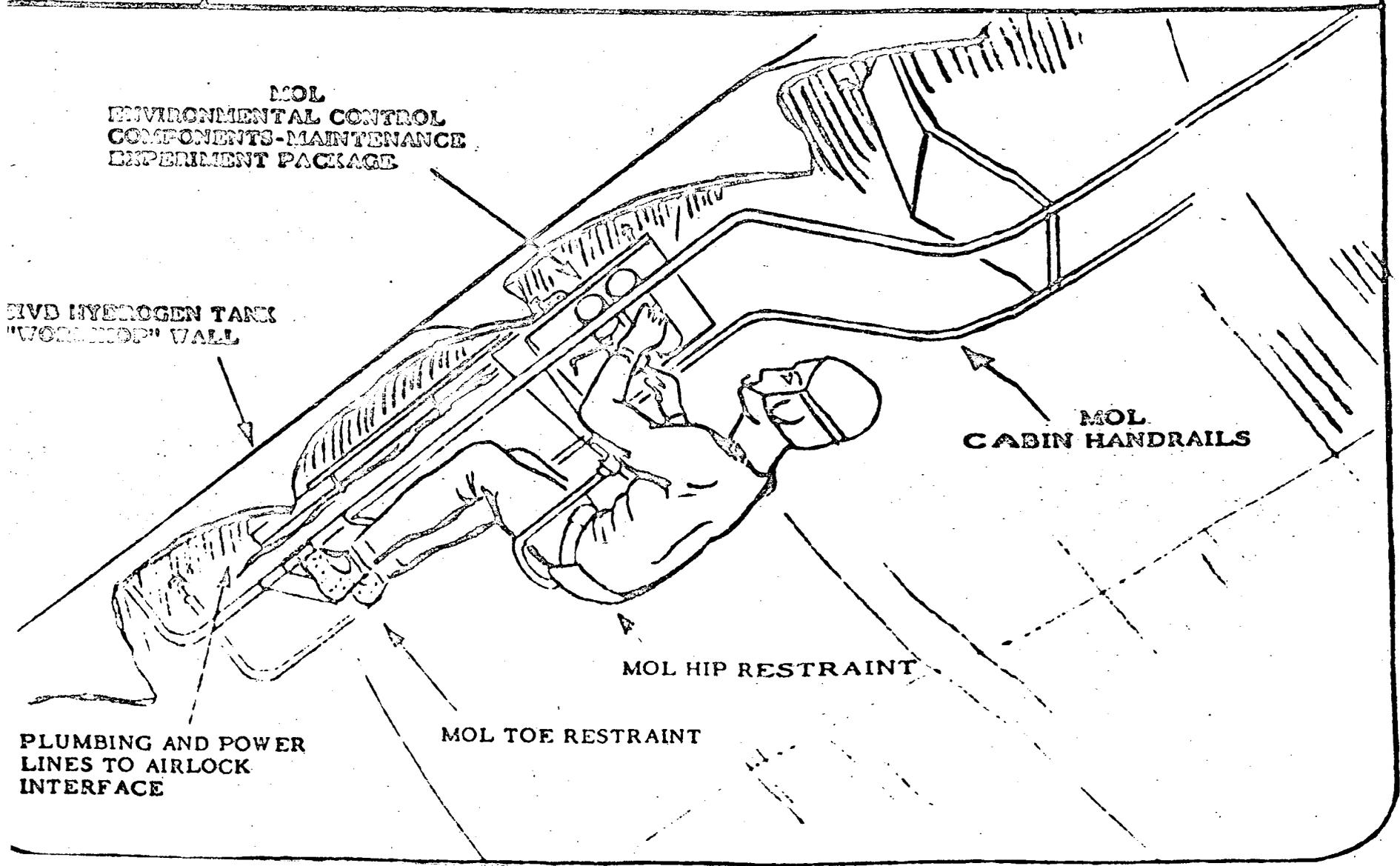
MOL EXPERIMENTS ON SAA-209 "ORBITING WORKSHOP"

|  | <u>WT</u> | <u>VOL. *</u>       | <u>POWER</u>  |
|--|-----------|---------------------|---------------|
| ○ <u>INTEGRATED MAINTENANCE EQUIPMENT</u><br><u>(D-018)</u>  | 165 LBS.  | 39 FT. <sup>3</sup> | 30 WATTS AVE. |
| ○ SELECTED EC/LS MAINTAINABLE<br>COMPONENTS  |           |                     |               |
| ○ MOL TYPE CREW RESTRAINTS   |           |                     |               |
| ○ TOOLS  |           |                     |               |
| ○ MAINTENANCE PROCEDURES   |           |                     |               |
| ○ TASK TIMELINES   |           |                     |               |
| ○ ILLUMINATION LEVEL   |           |                     |               |
| ○ <u>SUIT-DONNING AND SLEEP STATION</u><br><u>EVALUATION (D-019)</u>                                       | 15 LBS.   | 8 FT. <sup>3</sup>  | --            |
| ○ MOL SLEEP RESTRAINT & SUIT STA.  |           |                     |               |
| ○ SPACE SUIT ALTERNATIVES  |           |                     |               |
| / APOLLO BLOCK 2 SUIT  |           |                     |               |
| / MOL SUIT   | ADD'L     |                     |               |
| ○ <u>EVALUATION OF ALTERNATE RESTRAINTS</u><br><u>FOR MOBILITY AND MAINTENANCE TASKS</u><br><u>(D-020)</u> | 7 LBS.    | 2 FT. <sup>3</sup>  | --            |
| ○ VELCRO SLIPPERS  |           |                     |               |
| ○ VELCRO CARPET  |           |                     |               |
| ○ VELCRO STRAP-ON RESTRAINTS<br>(SHIN AND THIGH)   |           |                     |               |

\*VOLUME IN STOWED CONDITION DURING ASCENT FLIGHT.



# POSSIBLE MOL EXPERIMENT, SA-209 INTEGRATED MAINTENANCE EXPERIMENT - MAINTENANCE TASKS



MOL  
ENVIRONMENTAL CONTROL  
COMPONENTS-MAINTENANCE  
EXPERIMENT PACKAGE

51VD HYDROGEN TANK  
"WORKSHOP" WALL

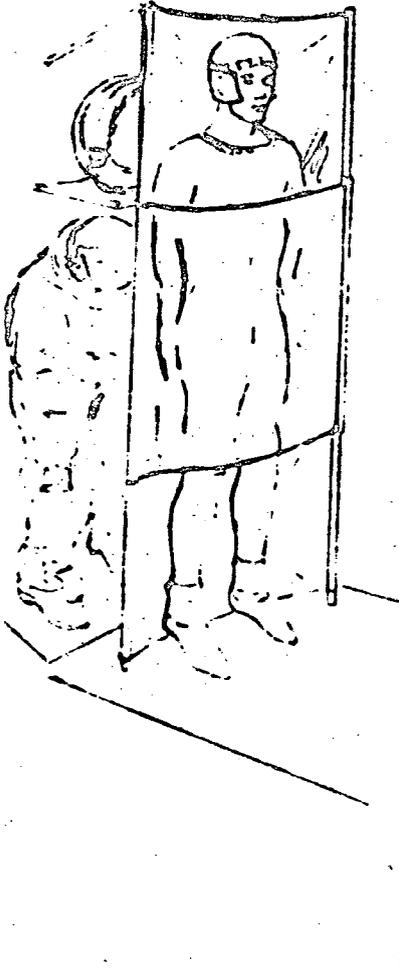
MOL  
CABIN HANDRAILS

MOL HIP RESTRAINT

MOL TOE RESTRAINT

PLUMBING AND POWER  
LINES TO AIRLOCK  
INTERFACE

POSSIBLE MOL EXPERIMENT. SA-209  
SUIT-DONNING AND SLEEP STATION EVALUATION



STEP 1



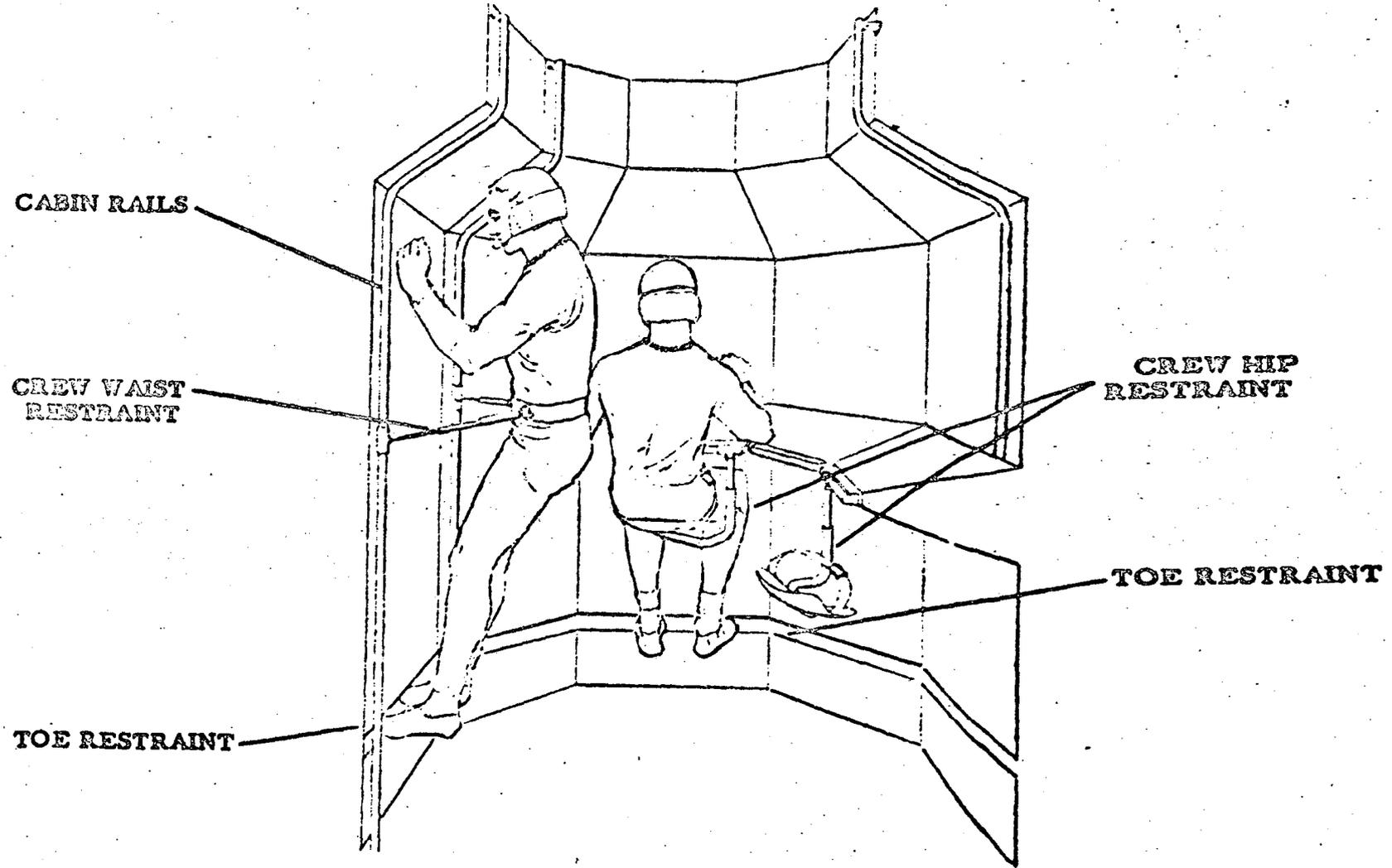
STEP 2



STEP 3

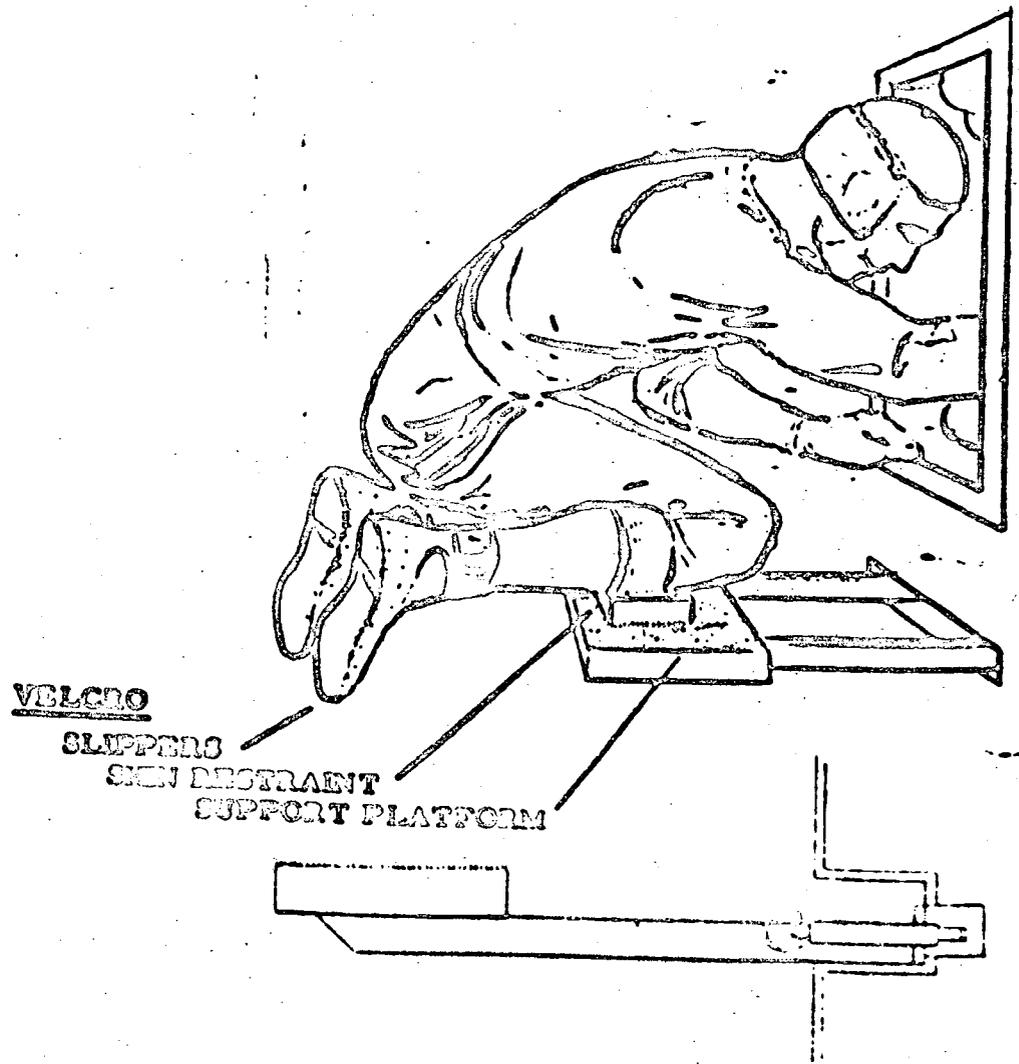


### REPRESENTATIVE LAYOUT OF CONSOLES SHOWING MOL CREW RESTRAINTS





POSSIBLE MOL EXPERIMENT, SA-309  
EVALUATION OF ALTERNATE RESTRAINTS  
FOR MOBILITY AND MAINTENANCE TASKS



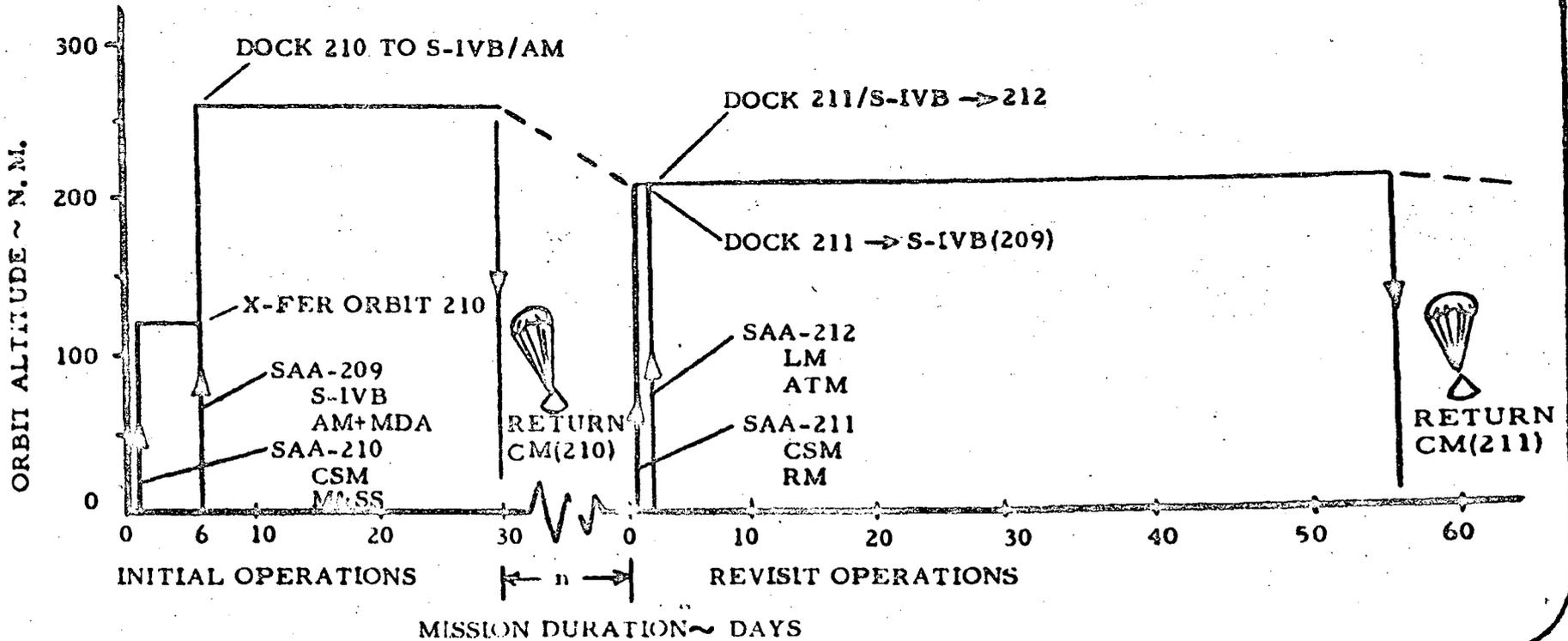
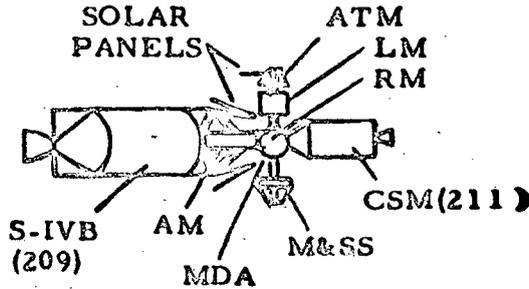
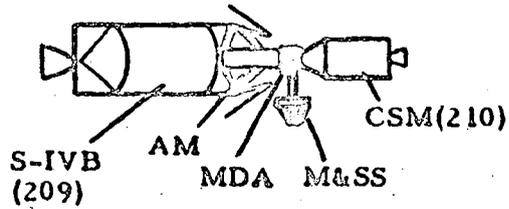
**III. MANAGEMENT ACTIVITY:**

- A. MOL EXPERIMENTS PROPOSED TO MSFEB ON 19 SEP 66**
- B. GEN EVANS GUIDANCE TO MOL SPO TRANSMITTING DR FLAX APPROVAL OF MOL EXPERIMENTS PROGRAM ON 20 SEP 66**
- C. SPO ACTIONS 30 SEP - 1 JAN 67**
  - 1. ESTABLISHED SPO MANAGEMENT TEAM**
  - 2. WORKING RELATIONSHIP WITH SSD DET 2 AT HOUSTON**
  - 3. ESTABLISHED NASA MANAGEMENT RELATIONSHIPS WITH MSFC AND MSC AND SET UP DECISION-MAKING MECHANISM**
  - 4. NEGOTIATED ACCEPTABLE SCHEDULE AND OTHER TECHNICAL AGREEMENTS WITH MSFC AND MSC**
  - 5. SENT RFP TO CONTRACTOR ON 14 NOV 66**
  - 6. RECEIVED PROPOSAL FROM CONTRACTOR ON 15 DEC 66**
  - 7. COMPLETED PRELIMINARY PROPOSAL EVALUATION ON 23 DEC 66**



# NASA PRELIMINARY FLIGHT PLAN FOR ORBITING WORKSHOP

## MISSION PROFILE AND POSSIBLE VEHICLE CONFIGURATION



CONFIDENTIAL

**IV. CURRENT STATUS:**

**A. PROPOSAL EVALUATION (PRELIMINARY):**

- 1. RESPONSE IS ACCEPTABLE FOR FIXED PRICE NEGOTIATION  
(ASSUMING INTERIM COVERAGE BY LETTER CONTRACT)**
- 2. EXPERIMENTS ARE TECHNICALLY VALID AND IN ACCORDANCE  
WITH ORIGINAL GUIDELINES ON MOL PARTICIPATION**
- 3. SCHEDULE HAS SLIPPED DUE TO LACK OF CONTRACTUAL COVERAGE**
- 4. CONTRACTOR BID IS 3.2 MILLION**
- 5. SPO ESTIMATE IS AS FOLLOWS:**

|                  |       |
|------------------|-------|
| BASIC CONTRACT   | 2.8   |
| MOL SUITS        | .2    |
| INTEGRATION      | .75   |
| CONTRACT CHANGES | .2    |
|                  | <hr/> |
|                  | 3.95  |

- 6. SAFSL GUIDELINE IS 3.0 MILLION**







CONTRACT/CONTRACT DEFINITIZATION PLAN

|   |   |  |                             |   |
|---|---|--|-----------------------------|---|
| JULY RELEASE 1 JULY 2015<br><b>PETER DERGIN</b> | CONTRACT NUMBER<br><b>FO4-075-67-C-0074</b> | SYSTEM<br><b>MOL</b>                   | CONTRACT TYPE<br><b>FFP</b> | ESTIMATED S.S.M<br><b>ESTIMATED S.S.M</b> |
| WBSU<br><b>SAFSL-B</b>                          | CONTRACTOR<br><b>1</b>                      | TITLE<br><b>PRESSURE SUIT ASSEMBLY</b> | SECURITY CLEARANCE          |   |

|    | ORIG FCST DATE | CURR FCST DATE | ACTUAL DATE | EST/TARGET COST \$ |     |     |     | TARGET-FIXED FEE/PROFIT % |     |  |  |  |  |
|----|----------------|----------------|-------------|--------------------|-----|-----|-----|---------------------------|-----|--|--|--|--|
|    |                |                |             | JAN                | FEB | MAR | APR | MAY                       | JUN |  |  |  |  |
| 1  |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 2  |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 3  |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 4  |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 5  |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 6  |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 7  |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 8  |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 9  |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 10 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 11 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 12 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 13 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 14 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 15 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 16 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 17 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 18 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 19 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 20 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 21 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 22 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 23 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 24 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 25 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 26 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |
| 27 |                |                |             |                    |     |     |     |                           |     |  |  |  |  |

COORDINATION:  APPRO  PRICING (SSKP)  IND RES (SSKI)  PROC COMM (SSKK)  CONTR WRITING (SSKSW)

MILESTONE SYMBOLS

-  OPEN ARROW - DATE MILESTONE TO BE ACCOMPL (FORECAST)
-  SOLID ARROW - DATE MILESTONE COMPL (ACTUAL)
-  SOLID DIAMOND - SLIP FROM DATE SHOWN TO NEW DATE (OPEN ARROW ->)
-  SOLID HORIZONTAL LINE - TIME PERIOD OF PARTICULAR EFFORT



VOL 10000 110110

|                           |              |
|---------------------------|--------------|
|                           | <u>1000</u>  |
| DAC - VAFB TEST EFFORT    | 71.9         |
| VAFB SIMULATOR OPS        | 2.0          |
| SUPPORT MODULE            | 27.9         |
| ATS INTEG                 | 6.0          |
| WIB & INTEG               | 15.5         |
| NSA                       | <u>2.5</u>   |
| \$                        | 125.4        |
| MAC - SPARES              | 16.2         |
| REMOTE SITE OPS           | 21.7         |
| VIB TEST                  | 9.0          |
| SIMULATOR O&M             | 1.3          |
| PACS                      | 4.5          |
| CPCS                      | <u>1.0</u>   |
| \$                        | 54.2         |
| G.E. - FIELD TEST PROGRAM | 24.3         |
| ATS                       | 21.1         |
| DRV                       | 9.1          |
| EXCHANGE HARDWARE         | 15.0         |
| LOGISTIC SPARES           | 8.9          |
| ALIGNMENT EQUIPMENT       | .9           |
| VIR                       | <u>5.0</u>   |
| \$                        | 84.3         |
| ONF - MPS LEVEL TESTING   | 30.0         |
| ACOUSTIC TESTING          | 4.0          |
| LIQUID NITROGEN PLANT     | <u>2.0</u>   |
| \$                        | <u>36.0</u>  |
| TOTAL                     | <u>299.9</u> |

# DOUGLAS

## DEFERRED ITEMS

- VAFB TEST EFFORT
- VAFB SIMULATOR OPS
- SUPPORT MODULE
- ATS INTEG
- W/B & INTEG
- NSA

## DEFINITIZATION PLAN

TECHNICAL PACKAGE

REQUEST QUOTE

AF POSITION

COMPLETE NEGOTIATIONS

DISTRIBUTE CONTRACT

|                       | FEB | MAR | APR | MAY | JUN |
|-----------------------|-----|-----|-----|-----|-----|
| TECHNICAL PACKAGE     | 1   | 22  |     |     |     |
| REQUEST QUOTE         | 7   |     | 7   |     |     |
| AF POSITION           |     | 3   |     | 12  |     |
| COMPLETE NEGOTIATIONS |     |     | 7   |     | 2   |
| DISTRIBUTE CONTRACT   |     |     |     | 26  | 30  |

McDONNELL

DEFERRED ITEMS

- SPARES
- REMOTE SITE OPS
- VIB TEST
- SIMULATOR O&M
- PACS
- CPBS

DEFINITIZATION PLAN

|              | JAN | FEB | MAR | <del>APR</del> | MAY | JUN |
|--------------|-----|-----|-----|----------------|-----|-----|
| AL PACKAGE   | 15  | 1   |     |                |     |     |
| QUOTE        | 17  | 15  |     |                |     |     |
| ITION        |     | 10  |     |                | 15  |     |
| NEGOTIATIONS |     | 20  |     |                | 31  |     |
| ITE CONTRACT |     |     |     | 7              |     | 30  |

# GENERAL ELECTRIC

- DEFERRED ITEMS
- FIELD TEST PROGRAM
- ATS
- DRV
- EXCHANGE HARDWARE
- LOGISTIC SPARES
- ALIGNMENT EQUIPMENT
- V/R

## DEFINITION PLAN

|                       | JAN. | FEB | MAR | APR | MAY | JUN |
|-----------------------|------|-----|-----|-----|-----|-----|
| TECHNICAL PACKAGE     | 1-31 |     |     |     |     |     |
| COST PROPOSAL DUE     |      | 21  |     |     |     |     |
| AF POSITION           |      |     |     | 14  |     |     |
| COMPLETE NEGOTIATIONS |      |     |     |     | 5   |     |
| DISTRIBUTE CONTRACT   |      |     |     |     |     | 30  |

ONF

DEFERRED ITEMS

MPS LEVEL TESTING  
ACOUSTIC TESTING  
LIQUID NITROGEN PLANT

DEFINITIZATION PLAN

|                     | JAN   | FEB   | MAR | APR | MAY |
|---------------------|-------|-------|-----|-----|-----|
| TECHNICAL PACKAGE   | 10-20 |       |     |     |     |
| COST PROPOSAL DUE   | 31    |       |     |     |     |
| AF POSITION         |       | 13-20 |     |     |     |
| NEGOTIATIONS        |       | 20-29 |     |     |     |
| DISTRIBUTE CONTRACT |       |       | 3   |     |     |