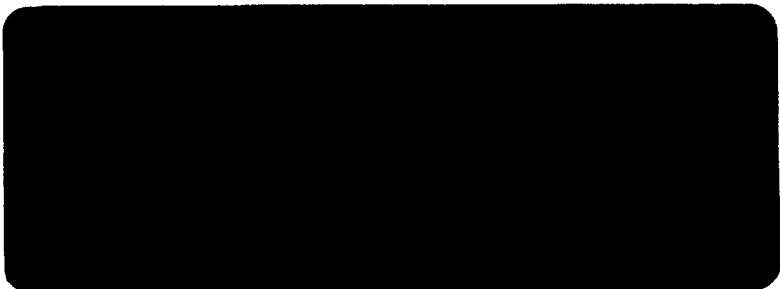


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TITLE MANNED ORBITING LABORATORY (MOL)
TECHNICAL PRESENTATION

ACCESS

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NOTE:

MANNED ORBITING LABORATORY


(MOL)

TECHNICAL PRESENTATION



EDP-4U-Y14100-R

BRIEFING OUTLINE

- *VEHICLE CONSIDERATIONS*
- *MANNED RECONNAISSANCE*
- 
- *BIOASTRONAUTICS*
- *EXPERIMENTS DOCUMENT*

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MOL-3S- Y13672-R

PROGRAM OBJECTIVES

- PROVIDE A MANNED ORBITING LABORATORY (MOL) TO PERFORM CRITICAL TESTS OF MAN'S PERFORMANCE IN MILITARY MISSIONS IN SPACE
- PROVIDE THE FLEXIBILITY FOR MORE GENERAL TESTING OF MAN AND EQUIPMENTS FOR DOD AND NASA PURPOSES
- PROVIDE FOR GROWTH POTENTIAL TO AN INITIAL OPERATING CAPABILITY SHOULD THE RESULTS OF THE PROGRAM AND MILITARY REQUIREMENTS DICTATE

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MOL-3S- Y13673-R

PROGRAM PHILOSOPHY

- MINIMUM MODIFICATIONS TO GEMINI VEHICLE TO PROVIDE LAUNCH AND RE-ENTRY CREW ENVIRONMENT
- USE OF EXISTING SUBSYSTEMS AND TECHNIQUES IN MOL DESIGN
- MINIMUM MODIFICATIONS TO TRANSTAGE TO PROVIDE FINAL LAUNCH PHASE ORBIT ADJUST AND ON-ORBIT STABILIZATION
- USE OF AMP LAUNCH FACILITIES WITH MINIMUM MODIFICATIONS
- USE OF NASA CONTROL NET WITH MINIMUM MODIFICATIONS
- RECOVERY SYSTEM THE SAME AS NASA GEMINI PROGRAM

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TYPICAL GEMINI MODIFICATIONS

- **POSSIBLE DELETIONS**
 - **AGENA RENDEZVOUS AND DOCKING SYSTEM**
 - **LONG TERM POWER AND LIFE SUPPORT SYSTEMS**
 - **LAND LANDING SYSTEM**
 - **GUIDANCE SUB-SYSTEM**

- **POSSIBLE ADDITIONS**
 - **INCREASED RE-ENTRY AND ABORT CAPABILITIES**
 - **STRUCTURAL CHANGES**

- **SPACE STORAGE REQUIREMENTS**
 - **TEST DATA REQUIRED**
 - **PROTECTIVE CONCEPTS**
 - **OPERATIONAL APPROACHES**

- **ESTIMATED GEMINI B WEIGHT \approx 6000 POUNDS**

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MOL DESIGN CONSIDERATIONS

MANNNED OPERATIONS

LARGE APERTURES }
VACUUM CONDITIONS }

SAFETY }
EXTRA VEHICULAR OPERATIONS }

MANNNED OPERATIONS }
BULKY TEST EQUIPMENT }

INCREASE TEST PAYLOAD }
RESUPPLY FOR PMR OPERATIONS }

MISSION APPLICATION }
LONG DURATION & LARGE PAYLOAD }

PRESSURIZED MODULE

UNPRESSURIZED MODULE

2 SEPARATE ENVIRONMENT UNITS

LARGE VOLUME

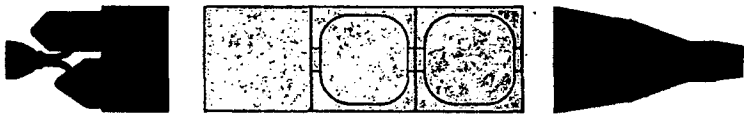
SMALL VOLUME

RENDEZVOUS

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MOL-3S- Y13720-R1

TYPICAL MOL WEIGHT STATEMENTS

|  | 1000 FT ³ PRESSURE VESSEL | 500 FT ³ PRESSURE VESSEL |
|--|---|--|
| PRESSURE VESSEL | 2550 | 1350 |
| LIFE SUPPORT EQUIPMENT * (2MEN) | 2090 | 1650 |
| REACTION CONTROL SYSTEM | 250 | 250 |
| POWER SYSTEM (SOLAR PANEL) | 880 | 880 |
| FURNISHINGS, ELECTRONICS, SPARES, ETC | 1530 | 970 |
| TEST MODULE | 1100 | 1100 |
| TOTAL | 8400 | 6200 |

*30 DAYS EXPENDABLES PLUS RESERVES

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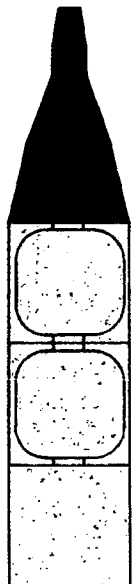



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MOL-3S-V13716-R1

TYPICAL MOL SPACECRAFT CONFIGURATIONS

| <u>AMR</u> | <u>PMR</u> |
|--|---|
|  |  |
| GEMINI B 6000 | GEMINI B 6000 |
| MOL (1000 FT ³)* 8400 | MOL (500 FT ³)* 6200 |
| CONTINGENCY 2000 | CONTINGENCY 2000 |
| <u>TOTAL SPACECRAFT WEIGHT</u> 16,400 | <u>TOTAL SPACECRAFT WEIGHT</u> 14,200 |
| T.I.C., 200 N.MI. | T.I.C., 200 N.MI. |
| 106° LAUNCH AZIMUTH 23,000 | POLAR CONTINGENCY 0 |
| CONTINGENCY 2000 | |
| GROSS PAYLOAD 4,600 | GROSS PAYLOAD 4,800 |

* 30 DAYS EXPENDABLES PLUS RESERVES

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MOL-3 U- Y13686-R

EXPERIMENTAL PROGRAM

- RECONNAISSANCE & SURVEILLANCE
- 
- GENERAL TESTING
- BIOASTRONAUTICS

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EDP-40-Y14101-R

ASSUMED PREATTACK RECONNAISSANCE OBJECTIVES

- DETERMINATION OF KNOWN WEAPON TYPE DEPLOYMENT
- DETECTION OF NEW DEVELOPMENTS AND LONG TERM INDICATORS
- DETERMINATION OF TARGET POSITION DATA
- GATHERING TECHNICAL INTELLIGENCE
- DETERMINATION OF SHORT TERM INDICATORS

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WDL-35- Y13688-R

POTENTIAL MANNED RECONNAISSANCE SENSOR PERFORMANCE
(100 NM ASSUMED)

| SENSOR | RESOLUTION | COVERAGE |
|-----------------------------|------------------|-----------------------|
| ● PANORAMIC CAMERA | 6' | 200 NM |
| ● HIGH RESOLUTION CAMERA | [REDACTED] | 1 NM |
| ● IR SCANNING | 150'-1.0°C | 200 NM |
| ● HIGH RESOLUTION IR | [REDACTED] | 2 NM |
| ● SIDE LOOKING RADAR | [REDACTED] | 25 NM |
| ● POINTING & TRACKING SCOPE | 2'-30' (100X-6X) | .5-10 NM ² |
| ● DIRECT VIEWING SCOPE | 2'-30' (100X-6X) | .5-10 NM ² |

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EDP-48-Y14098-R

TYPICAL MISSION PROFILE

● GENERAL RECONNAISSANCE

○ SENSORS

1. PANORAMIC CAMERA
2. IR IMAGING CAMERA
3. ASTRONAUT VIEWER AND CAMERA
4. SIDE LOOKING RADAR (OPTIONAL)

○ SEQUENCE OF OPERATIONS

1. LOAD CAMERAS AND RADAR CORRELATOR
CHECK ALIGNMENT AND OPERATION
2. DURING OVERFLY OPERATE DIRECT VIEWER,
RECORD COMMENTS, TAKE SELECTED
PICTURES
3. NOTE CLOUD COVER AND RECORD AREAS
REQUIRING ADDITIONAL PICTURES
4. REMOVE FILM AND LOAD RECOVERY CAPSULE
5. ORIENT STATION AND EJECT RECOVERY CAPSULE

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TYPICAL MISSION PROFILE

● SHORT TERM INDICATORS

○ SENSORS

1. SIDE LOOKING RADAR
2. DIRECT VIEWER AND CAMERA

○ SEQUENCE OF OPERATIONS

1. AT PROPER TIME TRANSFER TO ORBIT ALTITUDE TO PROVIDE SYNCHRONOUS COVERAGE
2. CHECK RADAR AND CORRELATOR OPERATION, AND ALIGN ANTENNAE
3. DURING OVERFLIGHT, IF POSSIBLE, USE VIEWER AND CAMERA, ASTRONAUT RECORDS OBSERVATIONS
4. DEVELOP RADAR AND VIEWING CAMERA PICTURES
5. PHOTO INTERPRET TO MAKE ACTIVITY LEVEL COUNTS
6. COMMUNICATE DATA TO GROUND ALONG WITH SELECTED PICTURES

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NSA - 3S- Y13598-R7

TYPICAL MISSION PROFILE

● TECHNICAL INTELLIGENCE

● SENSORS

1. HIGH RESOLUTION CAMERA SYSTEM (HRC)
2. POINTING AND TRACKING SCOPE (PTS)

● SEQUENCE OF OPERATIONS

1. UNCAGE CAMERA, ALIGN MIRRORS, AND FOCUS
2. LOAD FILM DRIVE SYSTEM
3. POINT PTS AT NADIR & USING GRID, ALIGN VEHICLE YAW
4. COMMAND VEHICLE TO ROLL FOR PROPER POSITION
5. VERNIER ADJUST ROLL WITH AUXILIARY TARGET
6. PICK UP TARGET AND INITIATE TRACKING DRIVE
7. ADJUST TRACKING RATES TO HOLD RETICLE STATIONARY RATE
SAMPLING SMOOTHED BY COMPUTER
8. UPON COMPLETION OF OVER FLIGHT, DEVELOP PICTURES AND
DETERMINE IF SATISFACTORY
9. SCAN PORTIONS OF INTEREST & SEND TO GROUND VIA TELEVISION LINK
10. GET GROUND READ UP OF COORDINATES AND PICTURES OF
NEW TARGET AREAS
11. DEVELOP READ UP PICTURES, CALCULATED ROLL COMMANDS,
PICK AUXILIARY TARGETS

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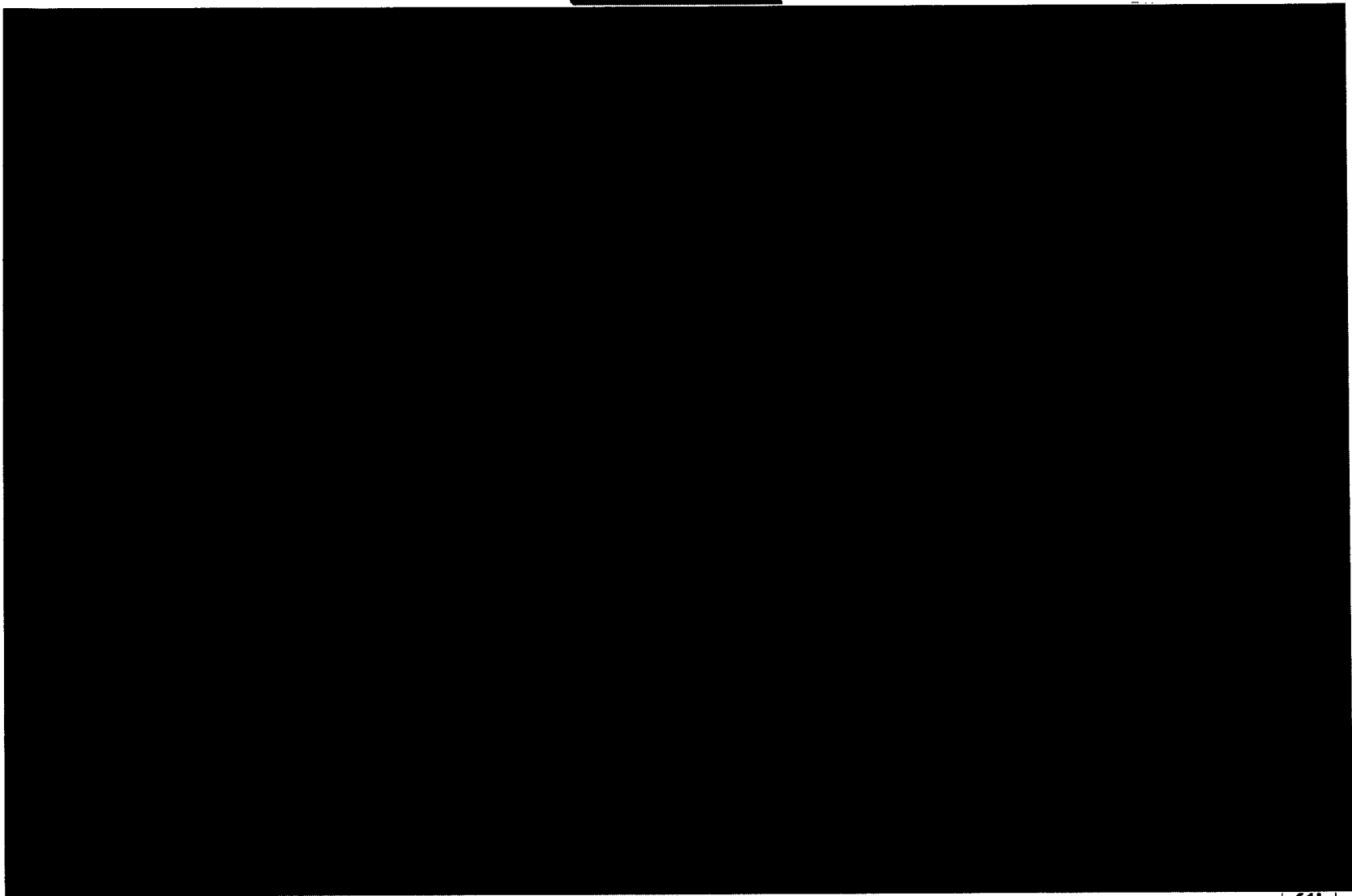
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NSA-3S- Y13605-R1

MANNED RECONNAISSANCE PRELIMINARY WEIGHT ESTIMATE

● FIXED

| | |
|---|----------|
| ● HIGH RESOLUTION CAMERA | 2200 |
| ● POINTING & TRACKING SCOPE AND CAMERA | 300 |
| ● PANORAMIC CAMERA | 150 |
| ● IR IMAGING CAMERA | 150 |
| ● SIDE LOOKING RADAR | 1000 |
| ● FILM PROCESSER | 100 |
| ● MISCELLANEOUS EQUIPMENT | 500 |
| ● TELEMETRY, SCANNERS COMMUNICATION | 300 |
| ● POWER EQUIPMENT (BATTERIES + SOLAR CELL) 2 KW AVERAGE, 10 KW PEAK | 1500 |
| | <hr/> |
| | 6200 LBS |

● PER MONTH

| | |
|-----------------------|----------------|
| ● 3 RECOVERY CAPSULES | 900 |
| ● FILM | 400 |
| | <hr/> |
| | 1300 LBS/MONTH |

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WOL-3S-Y13689-R

TYPICAL MANNED RECONNAISSANCE TEST REQUIREMENTS

| ELEMENT | WT. | MOM VOL (FT ³) | TM VOL (FT ³) | POWER (KW) |
|--|------|-------------------------------|------------------------------|---------------|
| ● HIGH RESOLUTION CAMERA WITH PROCESSOR (INCLUDES IR) | 2000 | 18 | 250 | .25 |
| ● POINTING & TRACKING SCOPE | 150 | 1 | 4 | .10 |
| ● IR SCANNING CAMERA | 84 | 1 | 4 | .3 |
| ● PANORAMIC CAMERA | 150 | 4 | 0 | .30 |
| ● SIDE LOOKING RADAR (1) | 300 | 12 | 0 | 5.0 |
| ● ANTENNA | 200 | — | — | — |
| ● CORRELATOR | 200 | 12 | 0 | — |
| ● FILM VIEWER | 10 | 2 | 0 | .02 |
| ● MISCELLANEOUS | 150 | 6 | 0 | — |
| ● SPARES & TEST EQUIPMENT | 400 | 16 | 0 | .20 |
| ● FILM | 275 | 4 | 0 | — |
| ● POWER SUPPLY | 343 | 0 | 10 | — |
| ● CONTROL PROPULSION | 100 | — | — | — |
| | 4362 | 76 | 268 | |

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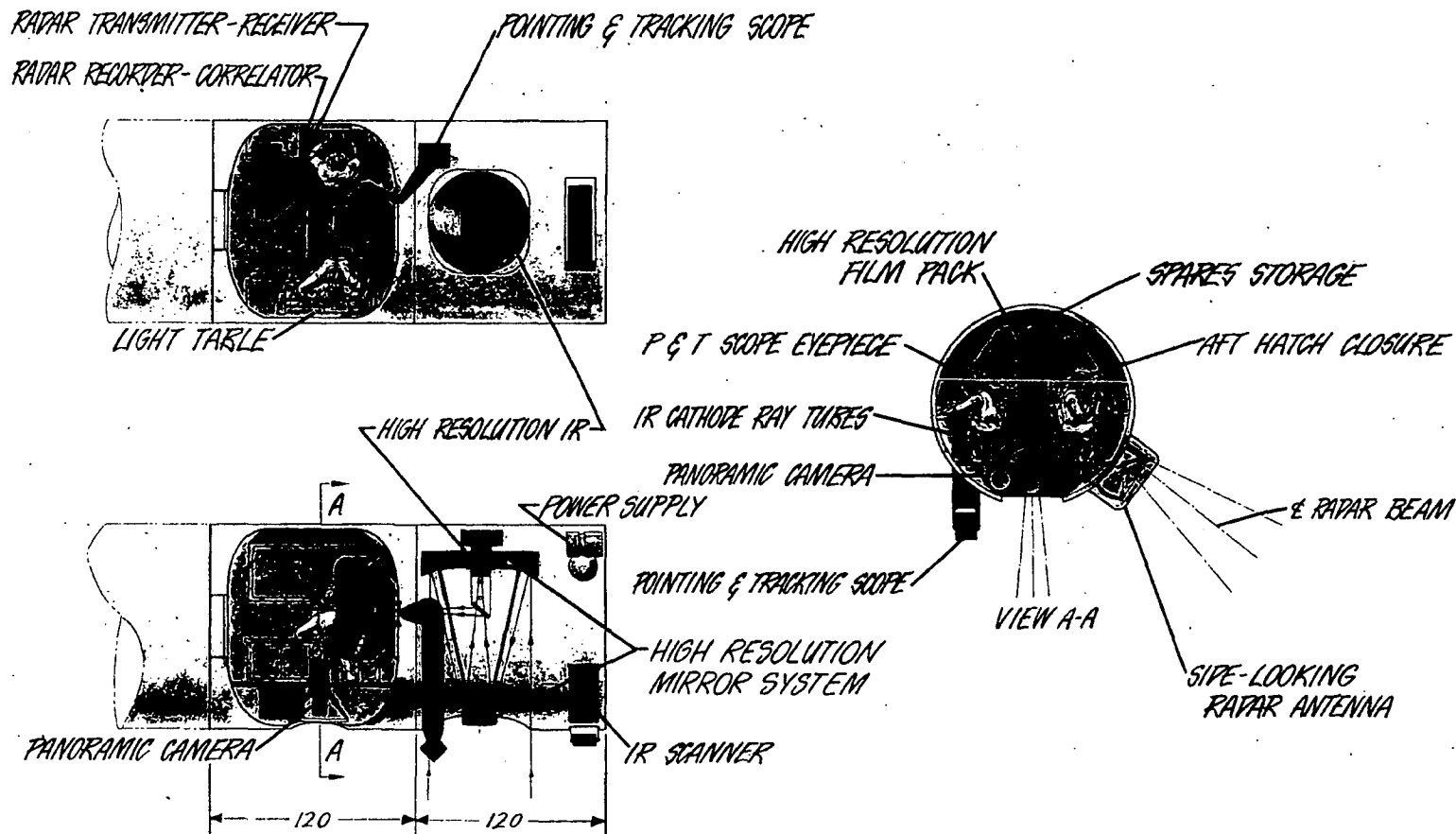
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WOL-3S- Y13690-R1

TYPICAL MANNED RECONNAISSANCE TEST LAYOUT



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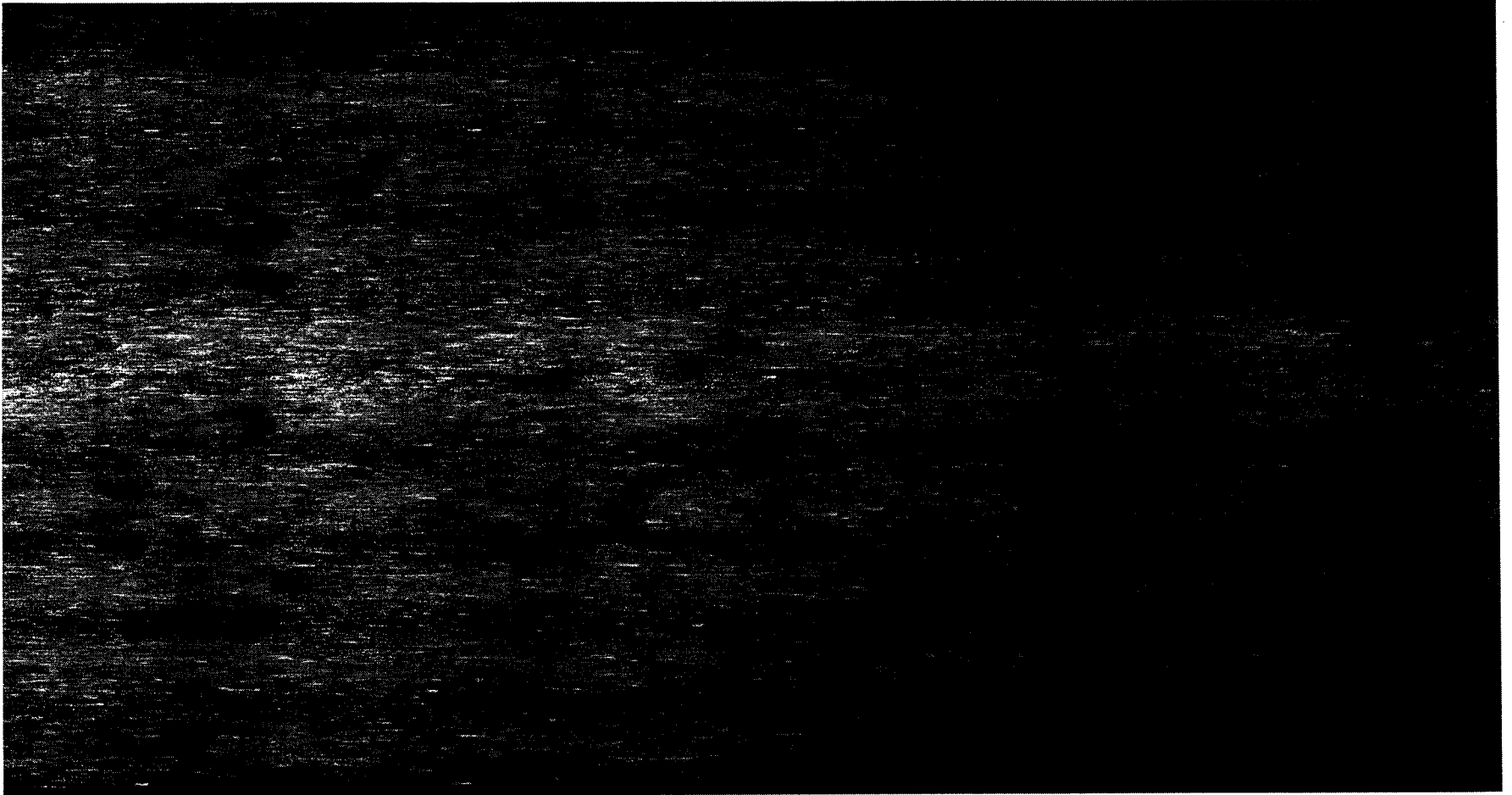
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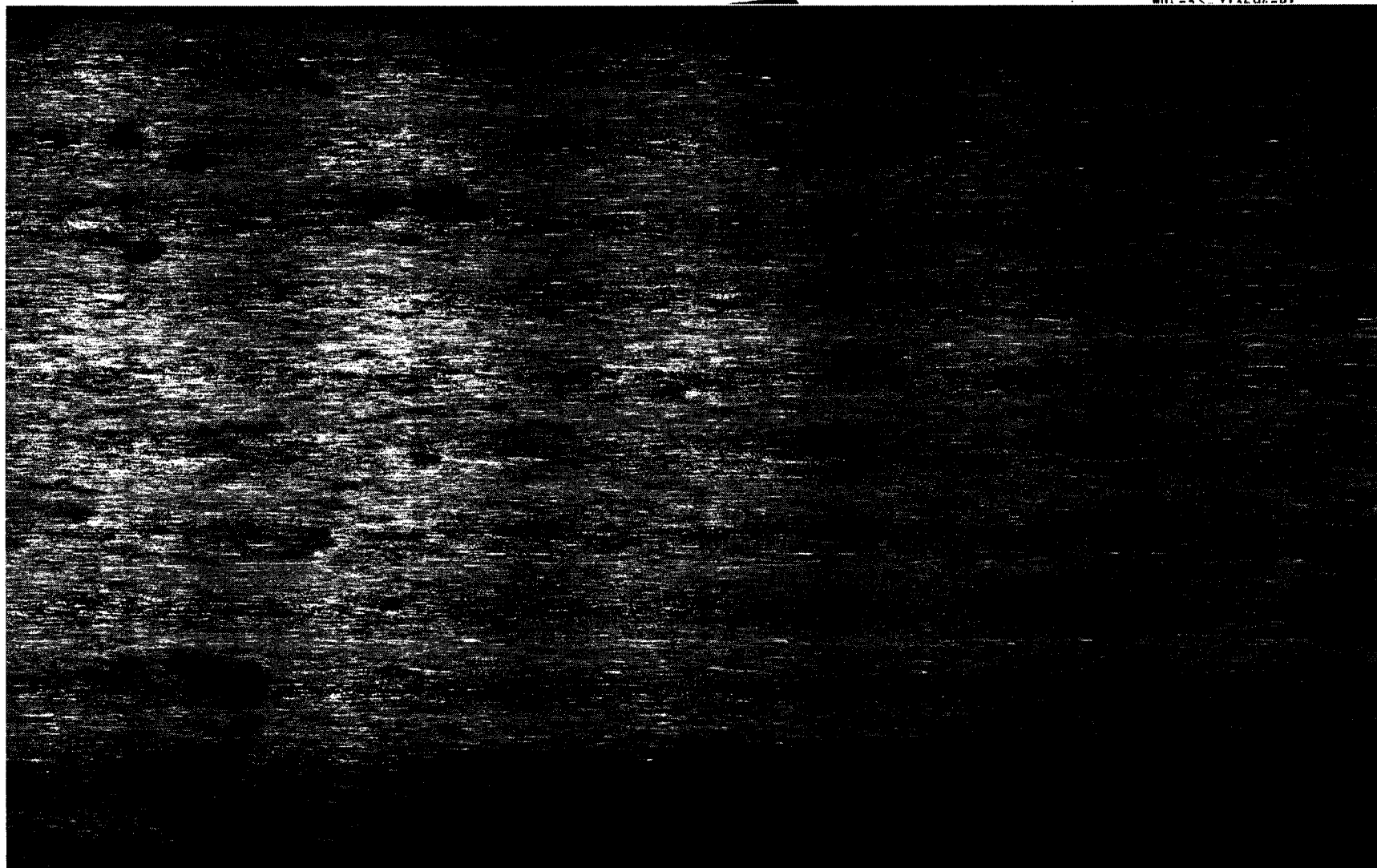
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NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEAN-
ING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C. SECTION 793
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GENERAL TESTS

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TYPICAL GENERAL TEST EXPERIMENTS

| EXPERIMENT | WT. (LBS) | OBJECTIVE |
|--|--------------|--|
| ● SUBSYSTEM DEVELOPMENT ● CATALYTIC REGENERATION OF OXYGEN | 120 | QUALIFY ADVANCED LIFE SUPPORT SUB-SYSTEM |
| ● SPACE OPERATIONS ● EXTRAVEHICULAR OPERATIONS | 410 | EXPLORE REPAIR, MAINTENANCE, AND TESTING CAPABILITIES |
| ● SPACE PHYSICS ● RADIANCE MEASUREMENTS. | 243 | PROVIDE BASIC DATA ON IR, UV, AND MM |
| ● ENGINEERING TECHNOLOGY ● EXPOSED MATERIALS AND MECHANISMS PERFORMANCE | 388 | DETERMINE DATA ON BEARINGS, EXPANDABLES, SEALS, ETC. |



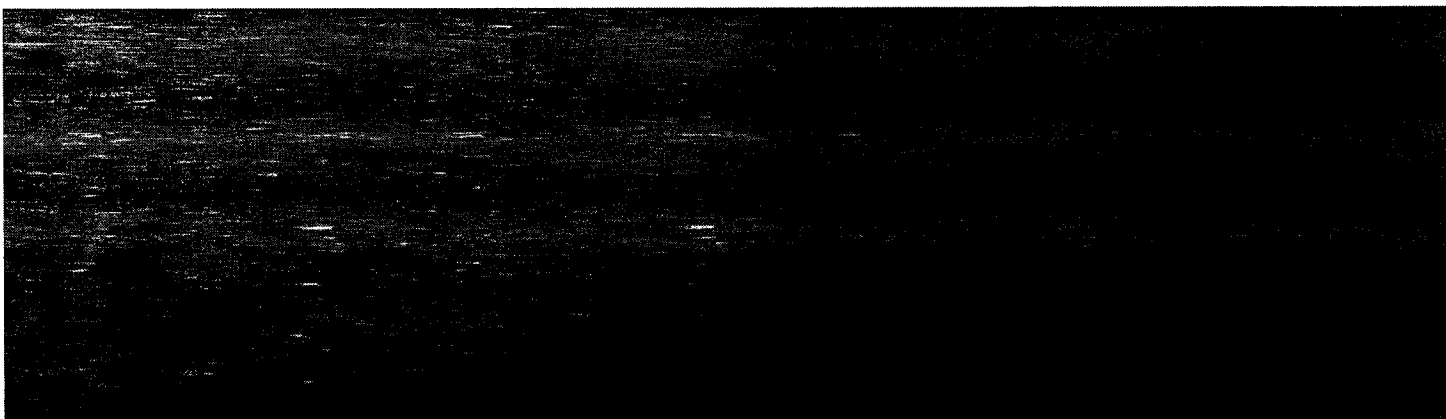
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TYPICAL GENERAL DEVELOPMENT TEST TASK DEFINITIONS

● EXTRAVEHICULAR OPERATIONS

- CHECKOUT SPACE SUIT AND AMU IN SPACECRAFT
- DECOMPRESS MODULE, EXIT WITH TETHERED LINE, TEST TETHER FOR RECOVERY WITH AND WITHOUT AMU
- TEST AMU MANEUVERING CAPABILITY
- EXAMINE SPACECRAFT EXTERIOR AND TEST REPAIR KIT
- EXAMINE EXPOSED MATERIAL TESTS AND ENPLACE NEW TESTS
- RETURN TO SPACECRAFT HATCH AND BOARD



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BIOASTRONAUTICS

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BIOASTRONAUTICS TEST REQUIREMENTS

- MEASUREMENT OF GRAVITY SENSITIVE HUMAN FUNCTIONS TO:
 - DEFINE THE RESIDUAL EFFECTS OF WEIGHTLESSNESS USING "BEST" INITIAL PREVENTIVE MEASURES
 - DEVELOP IMPROVED METHODS FOR EXTENDING MISSION DURATIONS TO OBVIATE (IF POSSIBLE) NEED FOR ARTIFICIAL GRAVITY
- MEASUREMENT OF HUMAN PERFORMANCE IN TASKS SUCH AS:
 - ACQUISITION AND TRACKING OF TARGETS
 - INFORMATION MANAGEMENT
 - MULTIPLE-MODE OPERATIONS
 - MAINTAINING SYSTEMS

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BIOASTRONAUTICS TEST EQUIPMENT

| | WEIGHT (LBS) | VOLUME (FT ³) | POWER (WATTS) |
|--|-----------------|------------------------------|---------------------|
| • MEDICAL MONITORING & MISSION SAFETY | 140 | 6 | 25 (40% TIME) |
| • BIOMEDICAL TESTING | 330 | 24 | 50 |
| • HUMAN PERFORMANCE TESTING | 260 | 25 | 500 (10-15 MIN.) |
| • CABINETS, RACK WITH STORAGE WIRING, ETC. | 140 | 70 | |
| • WORKING, "FREE" VOLUME | | 400 | |
| TOTAL | 870 | 470 * | 500 (MAX) |

* CABINETS + WORK VOLUME UNCLASSIFIED

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SIMULATION: TYPICAL ASPECTS

- ***MATHEMATICAL MODELS***
TRANSFER FUNCTION METHODS WHEN FEASIBLE
- ***MOCKUP SIMULATION***
FEASIBLE FOR ISOLATED OPERATIONAL MODES
 - *OPERATOR PERFORMANCE DATA*
 - *EVALUATION OF DESIGN CONCEPTS*
- ***OPERATIONAL SIMULATION***
INTEGRATED TESTING UNDER OPERATIONALLY EQUIVALENT CONDITIONS
 - *OPERATOR PERFORMANCE :*
 - BASELINE DATA*
 - TRAINING*
 - VALIDATION OF MISSION PROFILE*
- ***CONFIRM EQUIPMENT DESIGN AND OPERATIONAL FEASIBILITY***



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