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LMSD-6134

~~PRO A-1~~

~~(1960)~~



©

# WS 117L

**SENTRY SYLLABUS**

LOCKHEED AIRCRAFT CORPORATION  
MISSILE SYSTEMS DIVISION  
SUNNYVALE, CALIFORNIA

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LMSD-6134

12 AUGUST 1958

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85 SHEETS



# WS 117L

## SENTRY SYLLABUS

LOCKHEED AIRCRAFT CORPORATION  
MISSILE SYSTEMS DIVISION  
SUNNYVALE, CALIFORNIA

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**FOREWORD**

The chart and photograph reproductions which comprise this report are pertinent to a presentation made to Mr. Roy W. Johnson, Director, Advanced Research Projects Agency, and members of his staff. Essentially, the presentation was given in two parts.

Part I . . . . a detailed technical briefing on the Sentry Weapon System 117L as currently programmed or proposed, and

Part II . . . . a discussion of advanced component requirements and possible system applications to other programs.

Information pertinent to the system is presented herein. The presentation was given at the Pentagon on 14 and 15 August 1958.

W7L/ARPA BRIEFING  
14-15 August 1958  
Pentagon, Room 3E144

Thursday 14 August

0900	Introduction - Mission Concept	Lt. Col. Lee Battle
0910	Sentry System Program	J. H. Carter
0925	System Development Plan	F. W. O'Green
0940	Present Status	
	Support Systems	R. D. King
	Facilities and GSE	
	Recovery	
	Operations Control Plan	
1020	Break	
1040	Subsystems	
	Airframe	} F. W. O'Green
	Propulsion	
	Guidance and Control	
	Power	C. W. Burrell
1200	Lunch	
1300	Visual	} F. W. O'Green
	Biomedical	
	Ferret	P. D. Doersam
	Infrared	J. J. Knopow
	Communications	} J. G. Schaub
	Data Control	
1430	Break	
1450	Film: Progress Report No. 7	
1510	Questions	
1600	Brochure	
1615	Conclude	

117L/ARPA BRIEFING  
14-15 August 1958  
Pentagon, Room 3E144

Friday 15 August

0900	Advanced Components	
	Power	C. W. Burrell
0930	TV Sensing	Peter C. Goldmark
1000	Ferret	P. D. Doersam
1015	Infrared Detection & Tracking	J. J. Knopow
1035	Break	
1055	Data Storage	J. P. Nash
1125	Propulsion	J. E. Laurance
1200	Lunch	
1300	Other Applications of the Sentry System	
	General Satellite Tracking	} J. Jenkins
	Communications	
1330	Weather	E. V. Stearns
1345	Scientific Measurements	F. S. Johnson
1400	Break	
1420	MIS	J. W. Brandon
1440	AICBM	S. H. Browne
1500	Summary	J. H. Carter
1520	Conclude	

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CHART REPRODUCTIONS:

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- P142(3)      Advanced Reconnaissance Vehicle
- P14(4)      Advanced Reconnaissance System Evolution
- P799        Sentry Operational Objectives
- P250(3)     WS117L Program Objectives
- P257(5)     WS117L Development Program
- P102(5)     Sentry Facilities
- P800        Sentry Payload - Defined
- P238(3)     The Sentry Subsystems
- P283(5)     WS117L R&D Organization
- P566        WS117L Airframe and Propulsion
- P567        WS117L Payload
- P568        WS117L Ground Support Equipment
- P565        Lockheed Facilities for WS117L
- P235(1)     WS117L Trajectory to Orbit
- P229(1)     WS117L Orbital Test Vehicle Design Parameters  
              - Booster Stage
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              - Sustainer Stage
- P792        Altitude vs. Payload - Sentry/Thor
- P791        Altitude vs. Payload - Sentry/Atlas
- P171(3)     WS117L Ground Traces of 83<sup>0</sup> Orbits

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P468(1) WS117L Structural Breakdown

P422(2) WS117L Propulsion System

P315(2) WS117L Auxiliary Power Supply

P162 Advanced Auxiliary Power Systems

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- Typical Sentry Ascent (Thor - Prog. IIIA)

P166(4) Guidance and Control System  
- Typical Sentry Ascent (Atlas - Prog. I)

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- Guidance and Control Functioning Components

P708(1) Sentry Coast Phase  
- Guidance and Control Functioning Components

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- Satellite Power Requirements vs. Supply

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P376(1) WS117L Weather Surveillance  
P545 Types of Weather Data  
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**PHOTOGRAPH REPRODUCTIONS:**

Photo No.

P3017 Flight Test Vehicles Nos. 1 and 2 in Mod & Checkout  
- LMSD Palo Alto  
P3018 Flight Test Vehicles Nos. 1 and 2 in Mod & Checkout  
- LMSD Palo Alto



P3022 Flight Test Vehicle No. 2 in Mod & Checkout  
- LMSD Palo Alto

P3021 Flight Test Vehicle No. 2 in Mod & Checkout  
- LMSD Palo Alto

P3039 Model XLR Engines - JP4 and UDMH

P3043 UDMH Propellant Tank

P2862 Horizon Scanner

P2864 Horizon Scanner

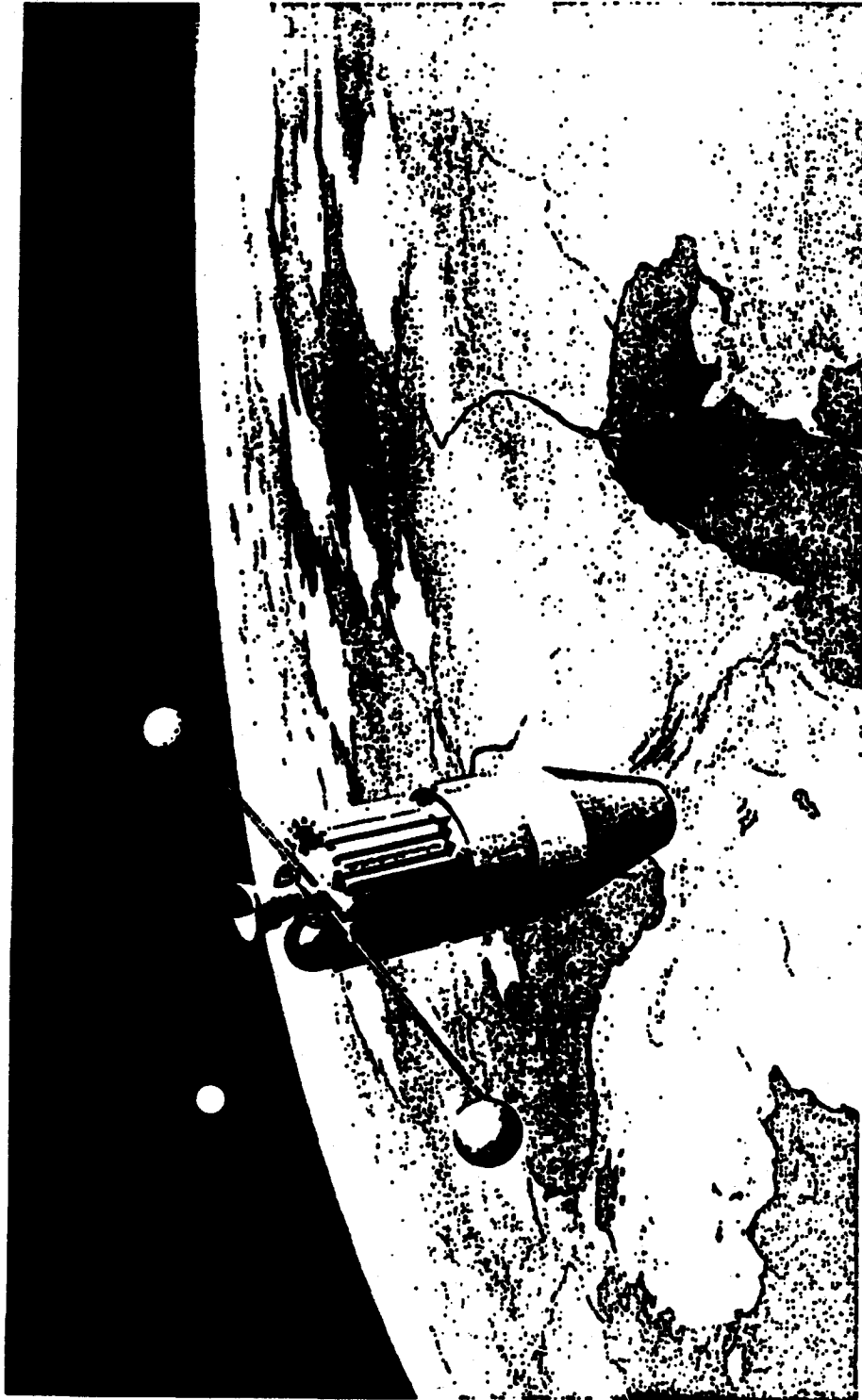
P3046 Systems Checkout Complex (excluding LACE U ..)

P3047 LACE Unit (Systems Checkout Complex)

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# ADVANCED RECONNAISSANCE VEHICLE

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P142 (U) 5 01/22/57  
WD-55-029-43

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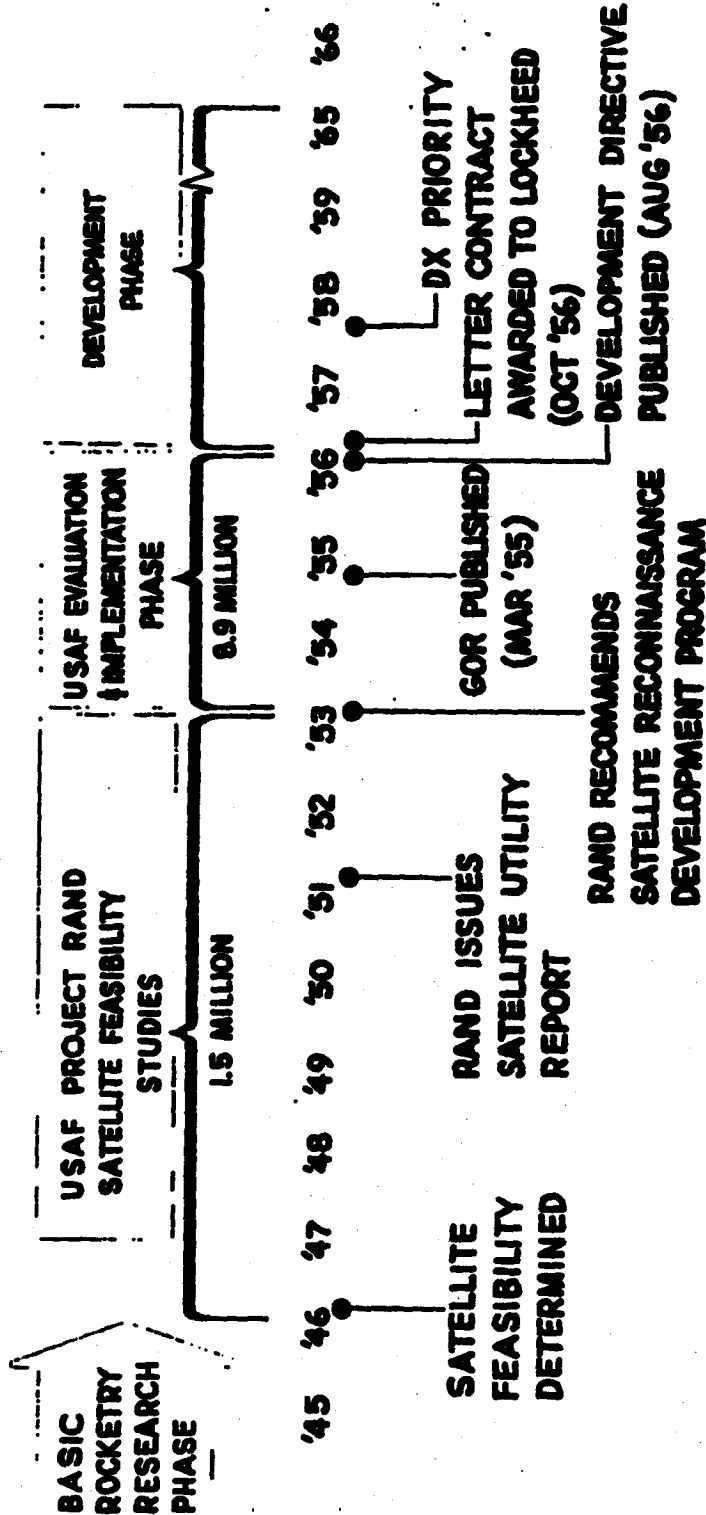
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MISSILE SYSTEMS DIVISION

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# ADVANCED RECONNAISSANCE SYSTEM EVOLUTION

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PM 4 (4) S 5/7/58  
WD-58-01306

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# SENTRY OPERATIONAL OBJECTIVES

## VISUAL RECONNAISSANCE

- MAPPING OF USSR AND SATELLITES
- \* STRATEGIC WARNING INDICATIONS
  - WEAPONS AND BASES IN BEING
  - MILITARY LOGISTICS
  - INDUSTRIAL WAR CAPABILITIES
- NUCLEAR DETONATION DETECTION
- WEATHER OBSERVATION

\* OPEN SKY NATIONAL OBJECTIVES

## ELECTRONIC RECONNAISSANCE

- \* DETECT & OBTAIN INFORMATION ON ELECTRONIC EMITTERS IN AREAS OF USSR & SATELLITES NOT NOW AVAILABLE

## INFRARED RECONNAISSANCE

- \* ICBM ATTACK WARNING

## COMMUNICATIONS

- \* SATELLITE LINKS FOR SECURE & RAPID GLOBAL COMMUNICATIONS

P 799

8/8/58

WD-58-05103

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# WS 117L PROGRAM OBJECTIVES

## PROGRAM TITLE

## MAJOR DEVELOPMENT OBJECTIVES

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- |   |   |
|---|---|
| I. ENGINEERING PROTOTYPE DEVELOPMENT & TESTS                                  | PLACE STABILIZED SATELLITES ON ORBIT AT 300 I.M. ALTITUDE<br>TEST RECONNAISSANCE PAYLOAD AND GENERAL SYSTEM OPERATIONS  |
| II. PIONEER VISUAL RECONNAISSANCE   | PROVIDE SMALL SCALE PHOTOGRAPHIC COVERAGE OF USSR<br>SATELLITE-BORNE FILM PROCESSING; VIDEO TRANSMISSION OF PHOTO IMAGES<br>100 X 1200 MILE PHOTO STRIP PER PASS AVERAGE<br>100 FT. RESOLUTION<br>1 MILE TARGET LOCATION ACCURACY   |
| II.A. EARLY ACHIEVEMENT OF ORBITAL CAPABILITY<br>TEST CAPSULE RECOVERY SYSTEM | PLACE SATELLITES ON POLAR ORBIT; INCORPORATE RECOVERABLE<br>CAPSULE IN SELECTED SATELLITES FOR BIOMEDICAL<br>RESEARCH PURPOSES  |
| III. PIONEER FERRET RECONNAISSANCE  | INTERCEPT USSR ELECTROMAGNETIC EMISSIONS IN THE 30-10,000 MCS SPECTRUM<br>RECEIVE AND MEASURE BASIC SIGNAL PARAMETERS; 50-100 MILE LOCATION ACCURACY<br>SORT KNOWN SIGNALS FROM UNKNOWN SIGNALS<br>PROVIDE GUIDANCE FOR DESIGN OF ADVANCED FERRET EQUIPMENTS  |
| IV. ADVANCED VISUAL RECONNAISSANCE  | PROVIDE HIGH RESOLUTION PHOTOGRAPHS OF SPECIFIC GROUND TARGETS<br>17 MILE SWATH WIDTH<br>20 FT. RESOLUTION<br>1/2 MILE TARGET LOCATION ACCURACY   |
| V. ADVANCED FERRET RECONNAISSANCE   | MORE ACCURATELY DETERMINE PARAMETERS OF ELECTRONIC SIGNALS<br>FREQUENCY RANGE: 50-10,000 MCS  |
| VI. VISUAL SURVEILLANCE   | SIMILAR TO PROGRAM IV, BUT USING:<br>LONG DURATION POWER SUPPLY<br>MULTIPLE VEHICLES<br>HIGHER RESOLUTION<br>HIGH SPEED GROUND TRANSMISSION OF DATA   |
| VII. INFRARED SURVEILLANCE  | POSSIBLY SUBSTITUTE TV WITH TAPE RECORDING FOR FILM   |
| VIII. FERRET SURVEILLANCE   | PROVIDE SATELLITE SYSTEM TO FURNISH INSTANTANEOUS WARNING OF AN ICBM ATTACK<br>LATER SATELLITE SYSTEM TO PROVIDE PRECISION AICBM DETECTION-PREDICTION DATA<br>SIMILAR TO PROGRAM V, BUT USING:<br>MULTIPLE FUNCTIONS AND FLEXIBILITY<br>MULTIPLE VEHICLES<br>LONG DURATION POWER SUPPLY<br>IMMINENCE OF HOSTILITIES WARNING |

P-250 (S) S 2/17/58  
WD-58-00776

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LOCKHEED AIRCRAFT CORPORATION  
P.O. BOX 1081  
FORT WORTH, TEXAS

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# WS117L DEVELOPMENT PROGRAM

## \* FLIGHT TEST SCHEDULE

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	CY 1958	CY 1959	CY 1960	CY 1961	CY 1962	CY 1963	CY 1964
	JFMAMJJASON	JFMAMJJASON	JFMAMJJASON	JFMAMJJASON	JFMAMJJASON	JFMAMJJASON	JFMAMJJASON
PROGRAM I PROTOTYPE DEV. SM 65 (8)		o o o o o					
PROGRAM II PIONEER VISUAL RECONN. - SM 65 (4)			o o o o				
PROGRAM IIA PROTOTYPE DEV. SM 75 (4)							
PROGRAM III PIONEER FERRET RECONN. - SM 65 (4)							
PROGRAM IV ADVANCED VISUAL RECONN. - SM 65 (10)							
PROGRAM V ADVANCED FERRET RECONN. - SM 65 (9)							
PROGRAM VI VISUAL SURVEILLANCE SM 65 (14)							
PROGRAM VII INFRARED EARLY WARNING - SM 65 (12)							
PROGRAM VIII FERRET SURVEILLANCE SM 65 (14)							

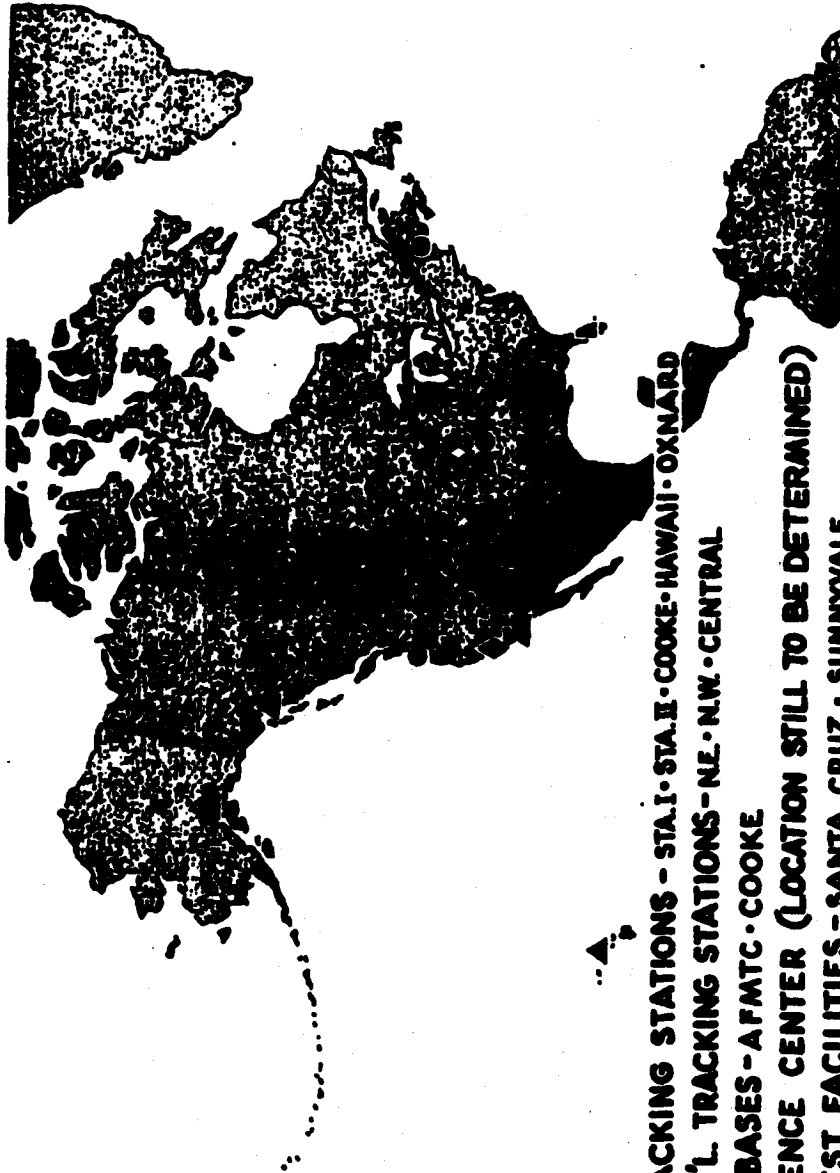
# WS117L STATEMENT OF WORK, AFBMO, 16 APRIL 1958  
 AS AMENDED 7 JULY 1958

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P257 (5)-5/22/58  
 WD-58-02843

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# SENTRY FACILITIES



### LEGEND

- ▲ TEST TRACKING STATIONS - STA. I - STA. II - COOKE - HAWAII - OXNARD
- DEV./OPN'L. TRACKING STATIONS - NE - N.W. - CENTRAL
- ◆ LAUNCH BASES - AFMTC - COOKE
- ◇ INTELLIGENCE CENTER (LOCATION STILL TO BE DETERMINED)
- ◆ LMSD TEST FACILITIES - SANTA CRUZ - SUNNYVALE

P102 (5) 50 5/2/58  
WD-58-02843

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# SENTRY PAYLOAD - DEFINED

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## RECONNAISSANCE MISSIONS:

- ALL SENSING, PROCESSING & STORAGE EQUIPMENT
- ALL RELATED AUXILIARY POWER SYSTEM EQUIPMENT
- ALL RELATED COMMUNICATIONS EQUIPMENT

## BIOASTRONAUTIC RECOVERY MISSIONS:

- RECOVERY CAPSULE & ROCKET
- CAPSULE CARGO

P 800 8/8/58  
WD-58-03183

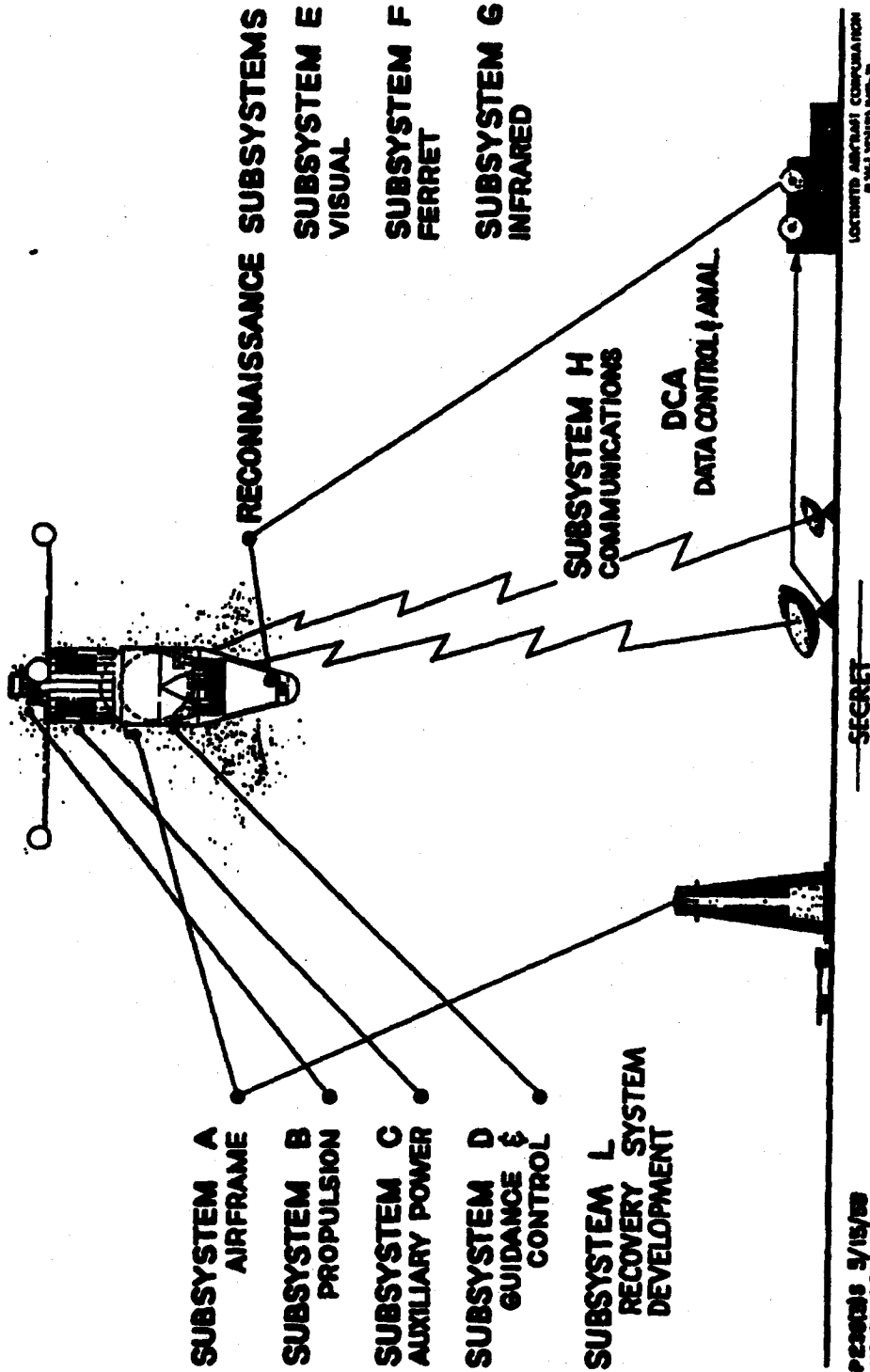
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FORMERLY MISSILE SYSTEMS DIVISION



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# THE SENTRY SUBSYSTEMS



PC20205 5/15/78  
WD 88 02848

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# WS117L R&D ORGANIZATION

## LOCKHEED AIRCRAFT CORP. MISSILE SYSTEMS DIVISION WEAPON SYSTEM CONTRACTOR

RESEARCH & ANALYSIS  
ANTENNA DEVELOPMENT  
TELEMETRY  
AIRFRAME FABRICATION  
CHECKOUT & ASSEMBLY  
STATIC & FLIGHT TESTS

### PRINCIPAL SUBCONTRACTORS

#### PROPULSION

- BELL AIRCRAFT CORP.
- AEROJET-GENERAL CORP.

#### AUXILIARY POWER

- SONOTONE CORP.
- EAGLE-PICHER CO.
- ENGINEERED MAGNETICS
- HOFFMAN ELECTRONICS CORP.
- BECHCRAFT R&D INC.

#### GUIDANCE & CONTROL

- DETROIT CONTROLS CORP.
- REEVES INSTRUMENT CORP.
- MINNEAPOLIS-HONEYWELL REGULATOR CO.
- BENDIX AVIATION CORP.

#### VISUAL RECONN.

- EASTMAN KODAK CO.
- COLUMBIA BROADCASTING SYS.
- SPICA INC.
- AMPEX CORP.

#### FERRET

- AIRBORNE INSTRUMENTS LAB. INC.
- HALLER, RAYMOND & BROWN INC.

#### INFRARED RECONN.

- EASTMAN KODAK CO.
- BAIRD ATOMIC CO.
- AEROJET-GENERAL CORP.
- GENERAL MILLS INC.

#### GROUND-SPACE COMM.

- PHILCO CORP.
- REEVES INSTRUMENT CORP.
- RADIATION INC.
- LOCKHEED AIRCRAFT SERVICES INC.
- HUGHES AIRCRAFT CO.
- TEXAS INSTRUMENT CORP.

#### TEST MGMT & OPERATIONS

- AEROJET-GENERAL CORP.
- RALPH N. PARSONS CO.

#### GROUND SUPPORT EQUIP.

- OTIS ELEVATOR CO.
- CONSOLIDATED AVIONICS CORP.
- BEMCO, INC.
- STANDARD MFG. CO. INC.
- HUFFORD CORP.

#### BIO MEDICAL CAPSULE

- GENERAL ELECTRIC CO.
- ALL AMERICAN ENGINEERING CO.

### ASSOCIATE CONTRACTORS

#### BOOSTERS

- DOUGLAS A/C CORP (SM-75)
- CONVAIR AERONAUTICS (SM-85)

#### GUIDANCE & CONTROL

- INSTRUMENTATION LAB., MIT
- GENERAL ELECTRIC CO.

#### AUXILIARY POWER

- THE MARTIN CO.
- ATOMICS INTERNATIONAL

#### DATA PROCESSING

- RAMO-WOOLDRIDGE CORP.

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P283 (5) 'S' 8/4/58  
WD-58-02843

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EXEMPT ANALYST CATEGORICAL

# WS 117L AIRFRAME & PROPULSION

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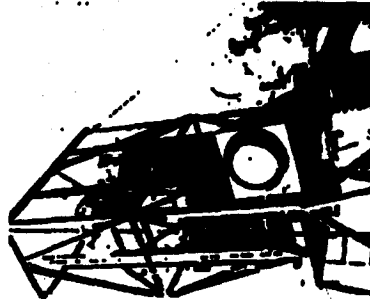
MOCK UP



FUNCTIONAL  
MOCK UP



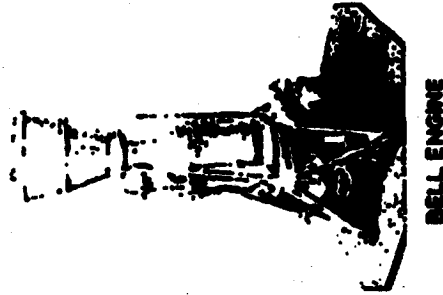
AIRFRAME



PROPULSION  
CHECK OUT



P 566 S 6/9/58  
WD-58-09155



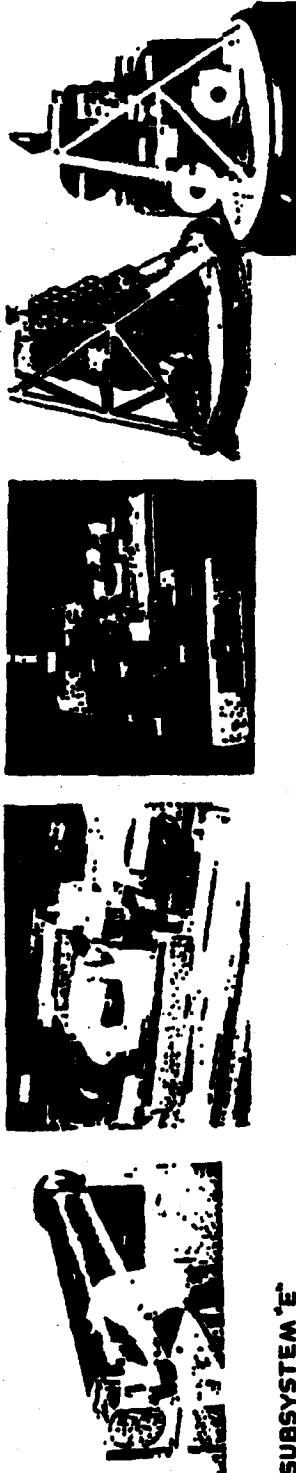
BELL ENGINE

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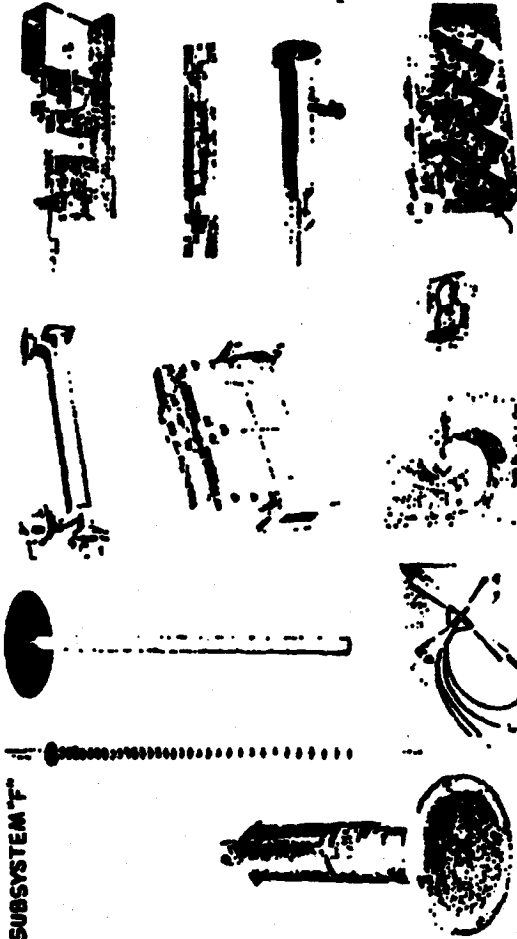
**WS117L PAYLOAD**

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SUBSYSTEM 'E'

SUBSYSTEM 'F'



SUBSYSTEM 'G'



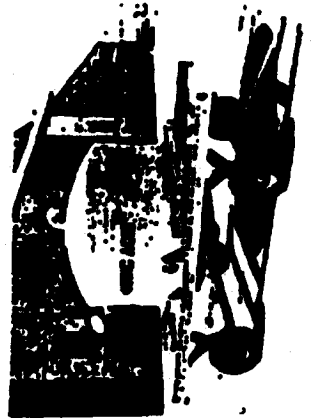
P567 S 6/3/58  
WD-58-03455

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# ANSI Z39-18 GROUND SUPPORT EQUIPMENT

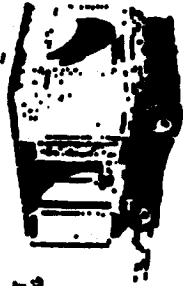


FUEL DUMP TRAILER

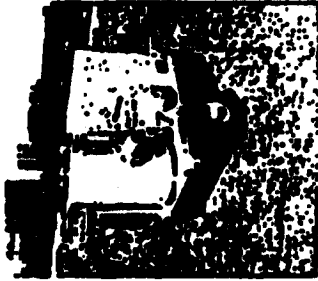


ACID DUMP TRAILER

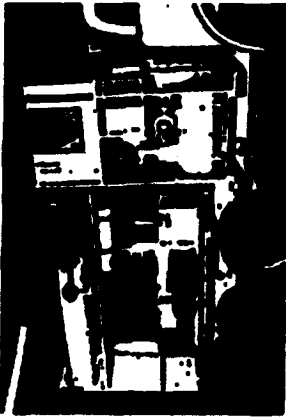
ENGINE THRUST  
CHAMBER FLUSHING



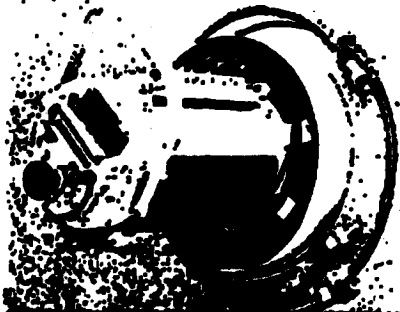
FUEL TRUCK



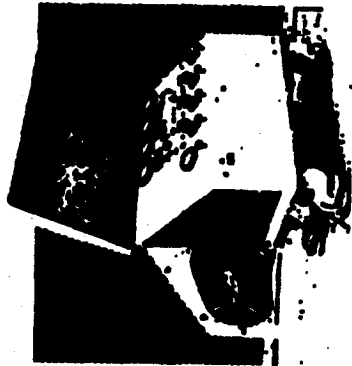
ENGINE FLUSHING TRAILER



ACID TRAILER AND  
PUSHING TRUCK



UDM LOADER



PROPULSION CHECKOUT CONSOLE  
MODIFIED BELL UNIT

P. 568 GSE 6/3/58  
WD-58-03455

... UNIT 4 74 ...

# LOCKHEED FACILITIES FOR WS117L



VAN NUYS  
AIRFRAME FABRICATION



SUNNYVALE  
COMPONENT ASSEMBLY



PALO ALTO  
PROJECT MGMT. SYSTEM DESIGN  
VEHICLE MOD. & CHECKOUT

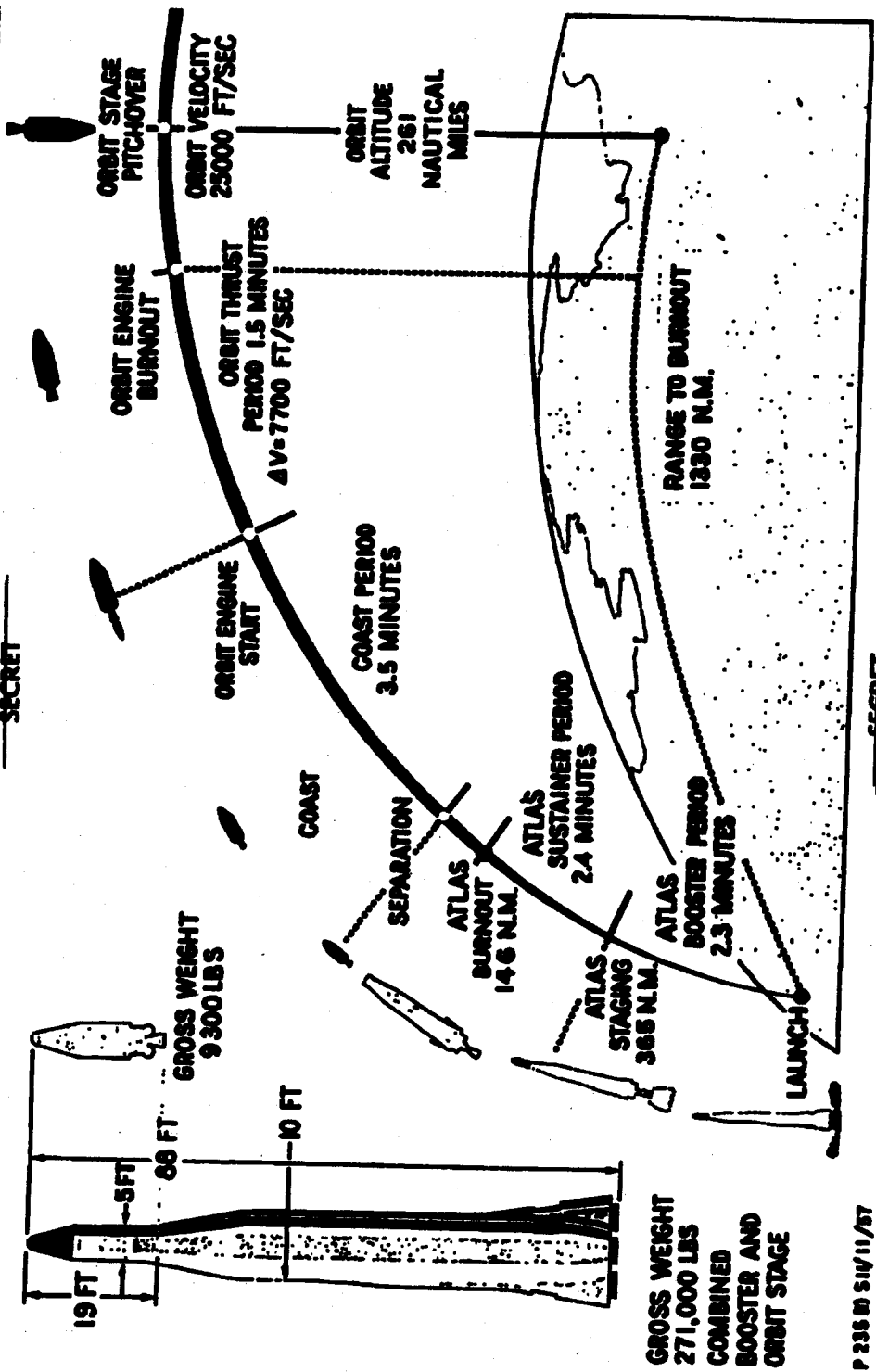


SANTA CRUZ  
HAZARDOUS TEST FACILITY

P 565 SO 6/8/58  
WD-58 03455

NOTE: BURBANK C-1 - COMPONENT MFG. & TEST

# ATLAS-17E TRAJECTORY TO ORBIT



LOCKHEED AIRCRAFT CORPORATION  
DALLAS, TEXAS

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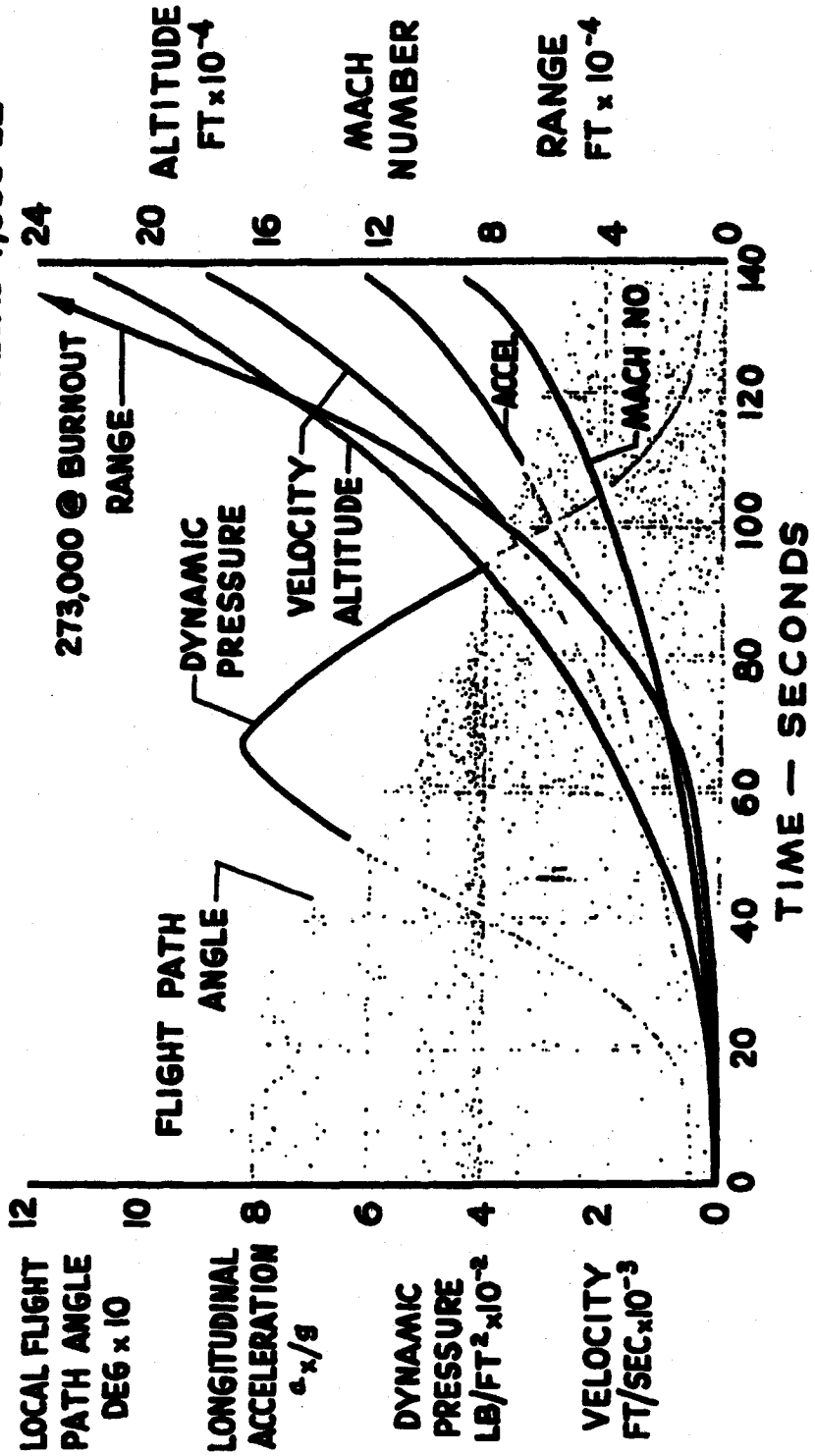
P 238 00 SIX 11/57

# WS17L ORBITAL TEST VEHICLE DESIGN PARAMETERS

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## BOOSTER STAGE

GROSS WT @ LAUNCH 27,163 LB      BOOSTER PAYLOAD 9,300 LB



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P 229 (I) 58-A 3/27/58  
WD-58-01388

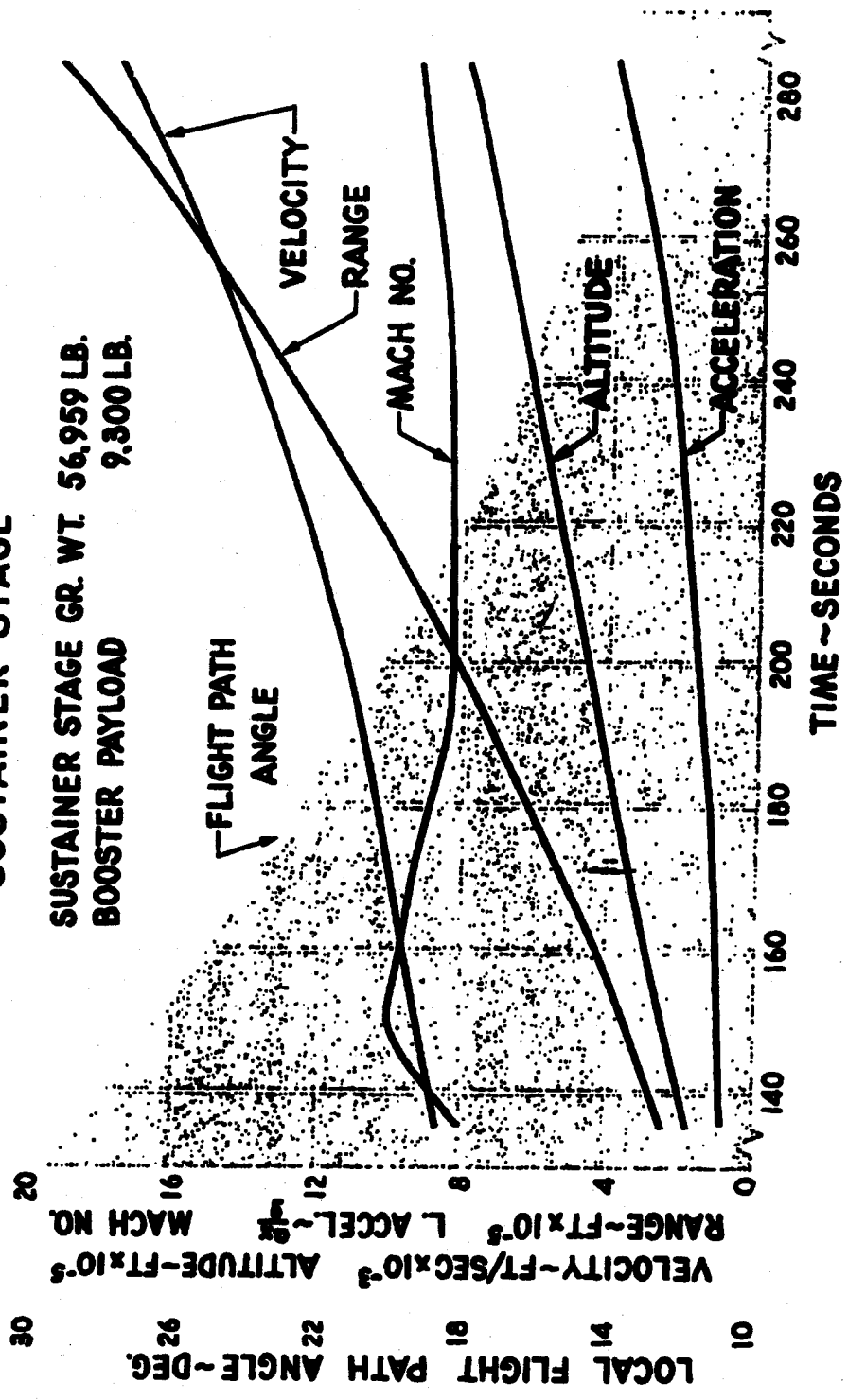


# WS117L ORBITAL TEST VEHICLE DESIGN PARAMETERS

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## SUSTAINER STAGE

SUSTAINER STAGE GR. WT. 56,959 LB.  
 BOOSTER PAYLOAD 9,300 LB.



P228 (1) 86'A 3/20/58  
 WD-55-01266

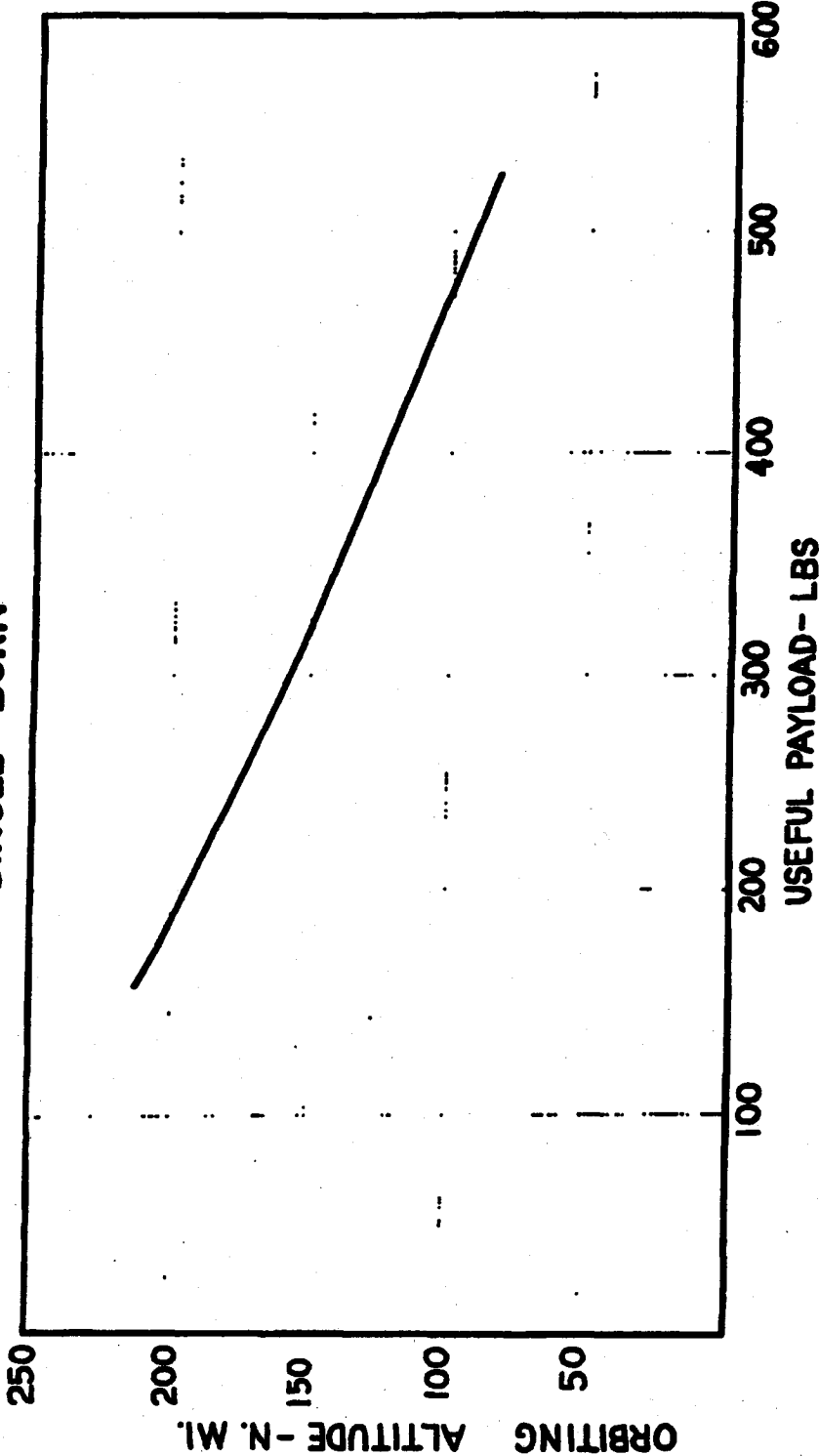
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# ALTITUDE VS. PAYLOAD-SENTRY/THOR

## SINGLE BURN



EXEMPT FROM GDS, F. S. 1055 (a)

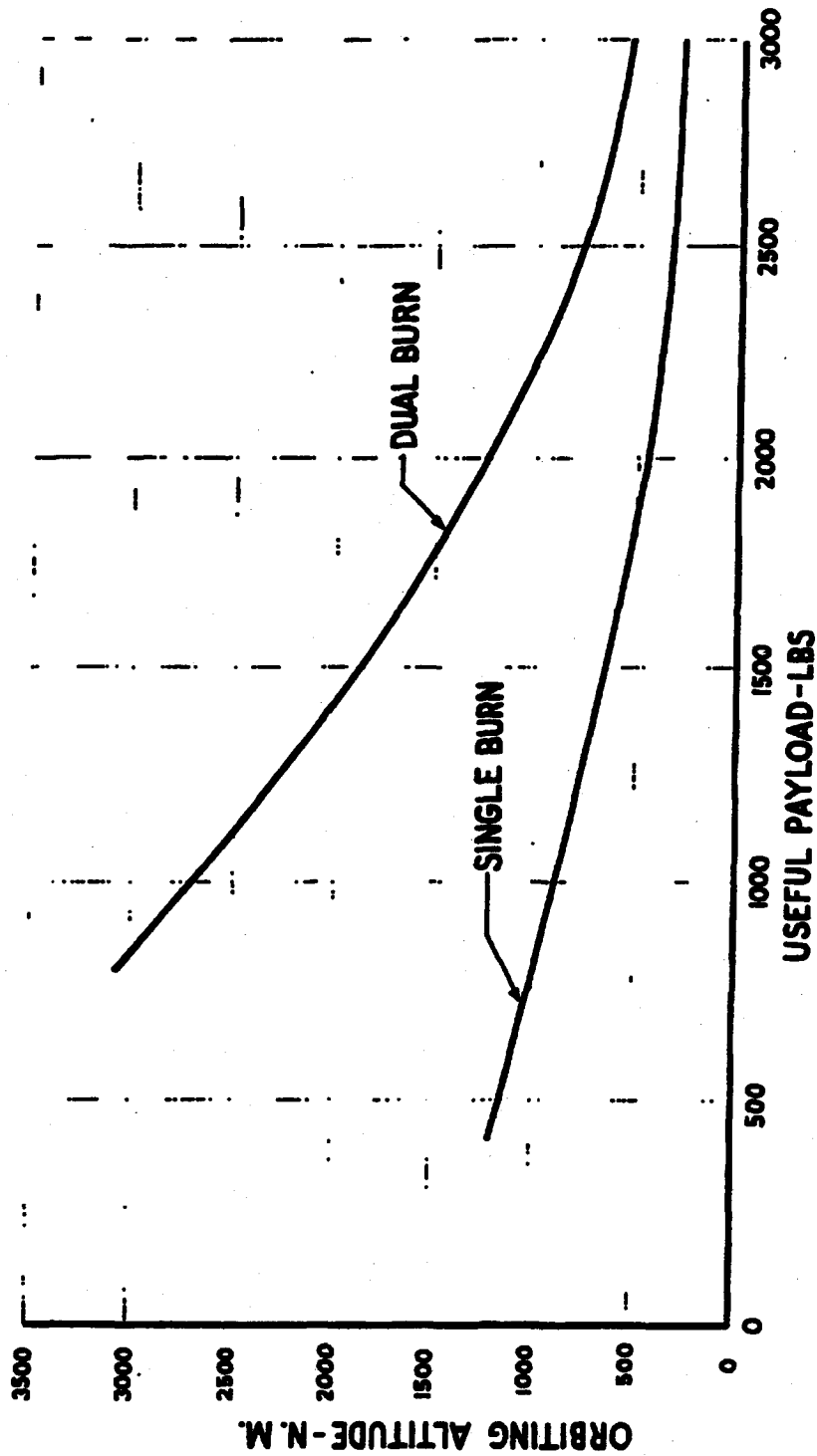
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8/8/58

P 792  
WD-58-08183

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# ALTITUDE VS PAYLOAD-SENTRY/ATLAS



IC-00118 MISSILE SYSTEMS DIVISION

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6/8/58

P 791  
WD-58-05183

LOCKHEED AIRCRAFT CORPORATION

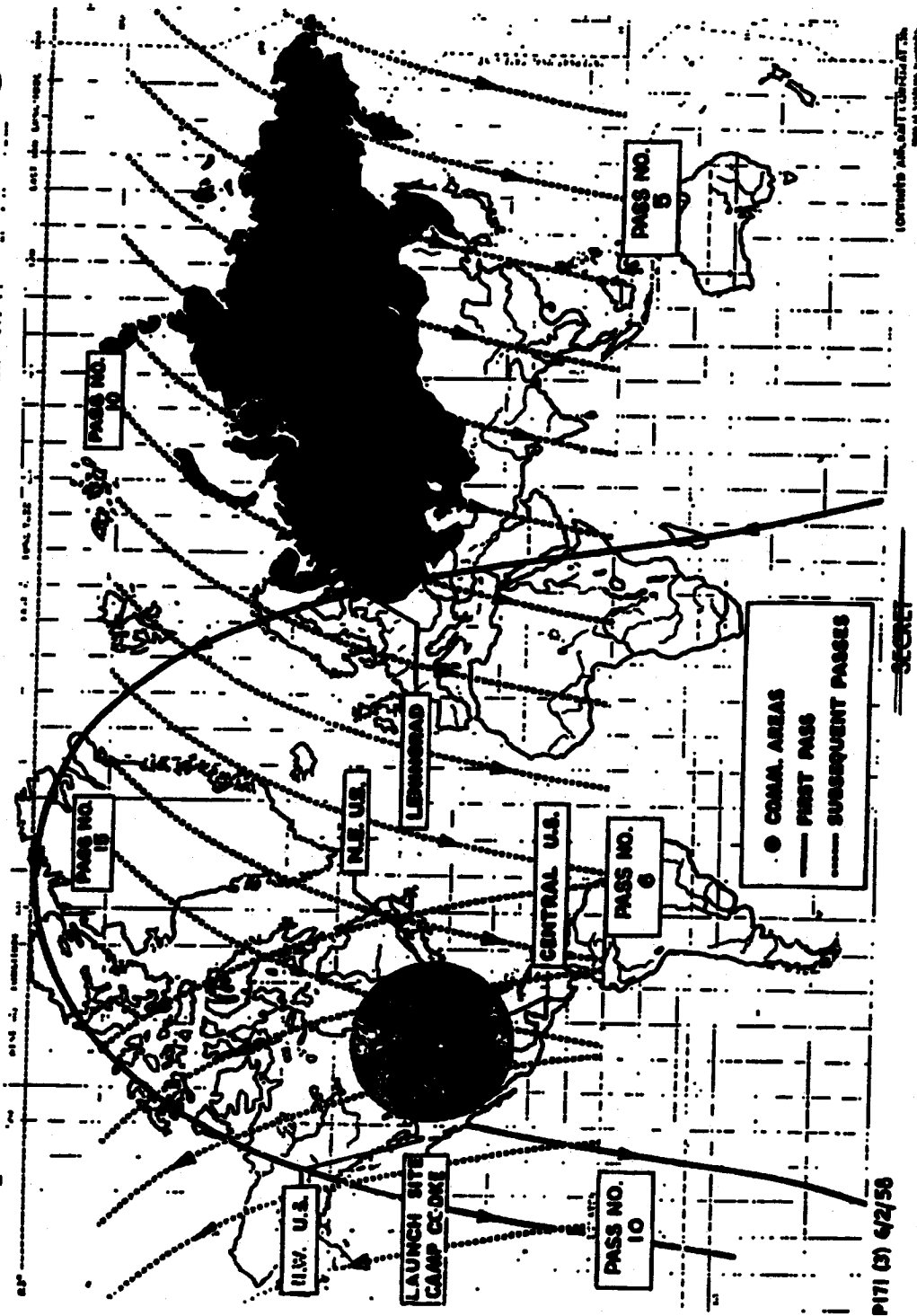
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MISSILE SYSTEMS DIVISION

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# WS 117L GROUND TRACES OF 83° ORBITS

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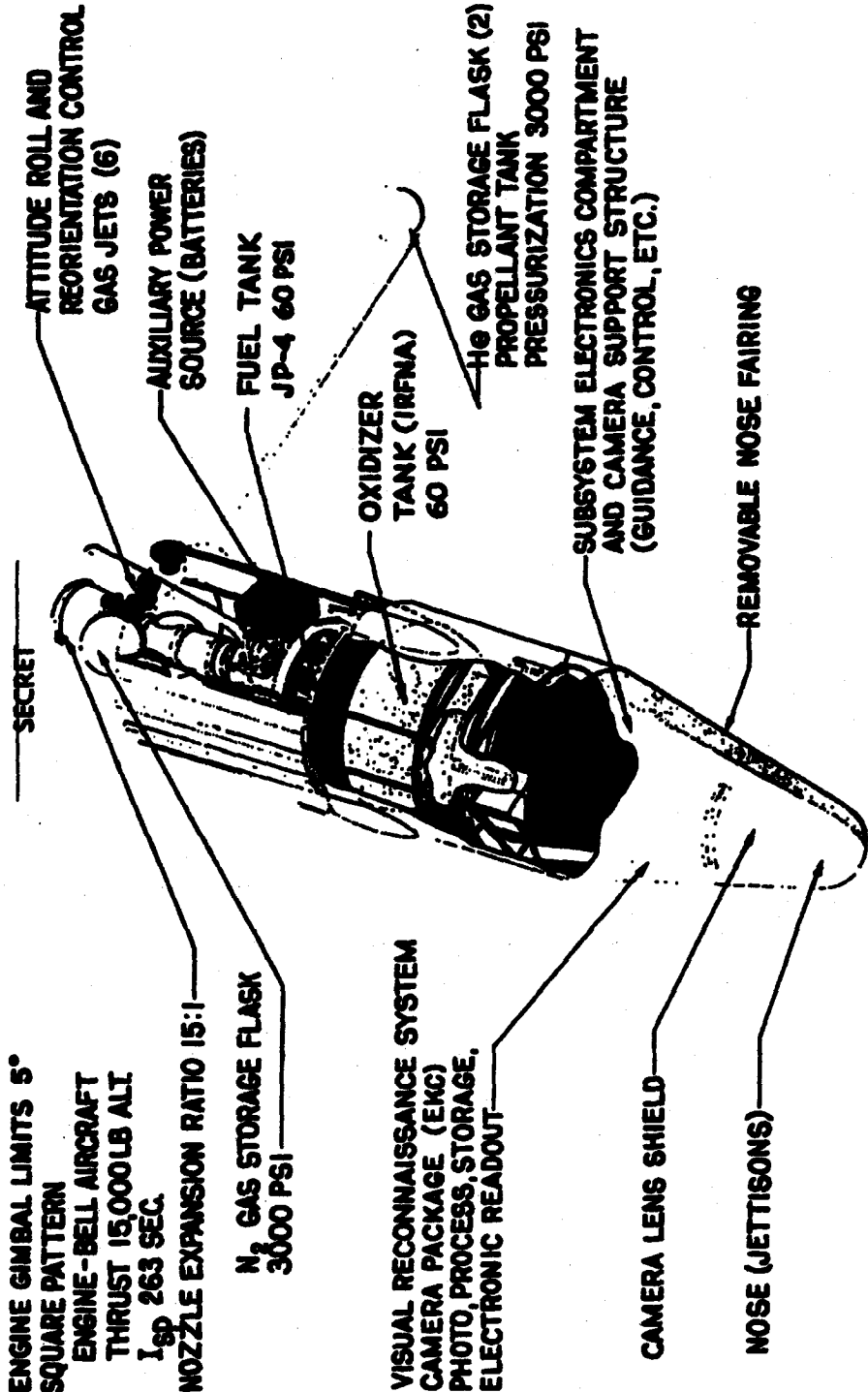
Corrected 10/15/58  
Date of Revision Issued

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P171 (3) 6/2/58

# VEHICLE

## VISUAL RECONNAISSANCE MODEL



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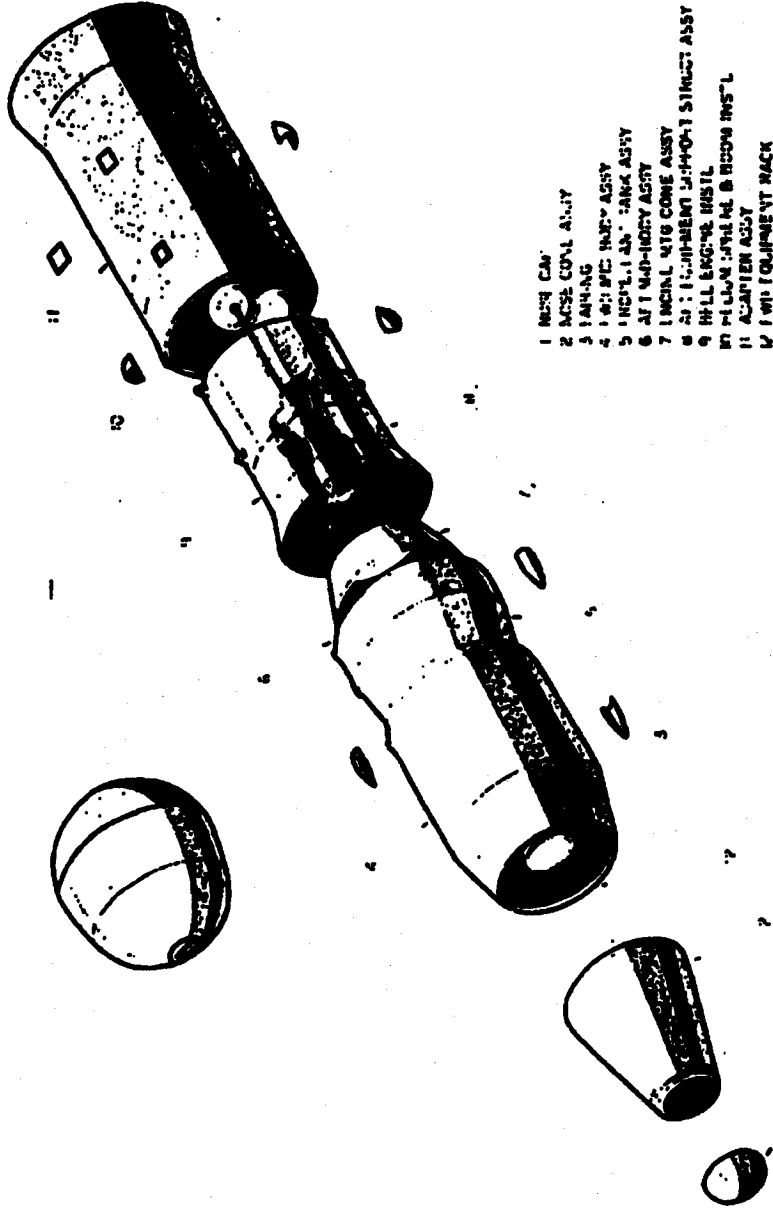
P232 (2) SSA 5/20/58  
 WD-58-00776

LOCKHEED AIRCRAFT CORPORATION  
 10000 WILSON AVENUE  
 TOLSON, MD 21086

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W5H7E STRUCTURAL BREAK

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- 1 MISS CAN
- 2 MISS COYL ASSY
- 3 TANK
- 4 100 PFC INBY ASSY
- 5 100 PFC INBY TANK ASSY
- 6 AT 1 NAD-INBY ASSY
- 7 INCLAL NTR CONE ASSY
- 8 AT 1 EQUIPMENT SUPPORT STRUCT ASSY
- 9 HULL ENGINE INSTL
- 10 FILLION STAKE & BUSHING INSTL
- 11 ACQUIER ASSY
- 12 1 W/1 EQUIPMENT RACK

P 400 (1) SS'A 6/13/58  
WD-58-03455

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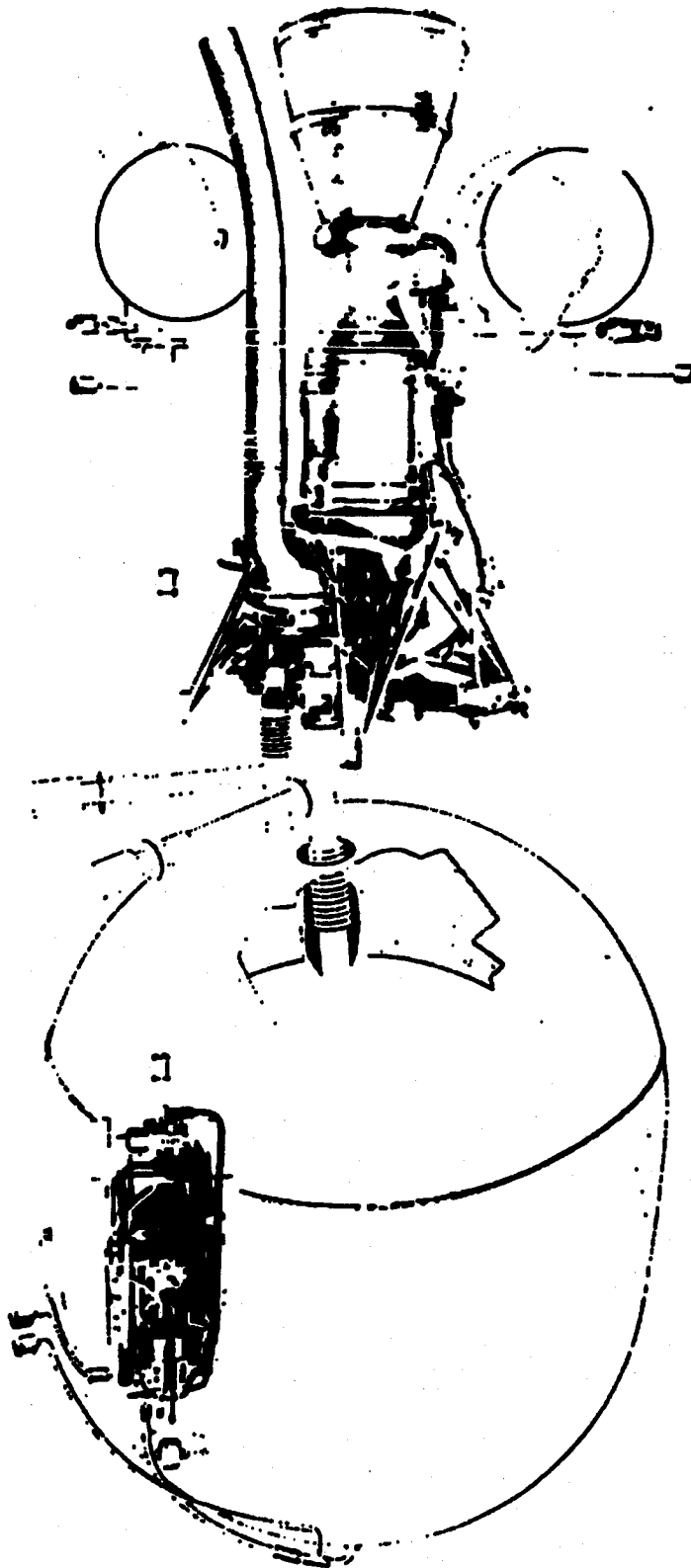
LOCKHEED AIRCRAFT CORPORATION

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MISSILE SYSTEMS DIVISION

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# WS117L PROPULSION SYSTEM



ULLAGE ROCKETS

CONTROL JETS  
NITROGEN SUPPLY

JP4

IRFNA

P422 (2) 55" 3/21/58  
WD-58-01380

# SENTRY AUXILIARY POWER SUPPLY

## DEVELOPMENT PROGRAM

- CONVENTIONAL PRIMARY BATTERIES  
SILVER PEROXIDE
- HIGH ENERGY BATTERY  
HYDROGEN - OXYGEN
- SOLAR VOLTAIC CONVERTER  
SILICON BORON DIFFUSED P-n JUNCTION
- NUCLEAR THERMOMECHANICAL  
RADIOISOTOPE HEAT SOURCE
- REACTOR HEAT SOURCE

ENERGY YIELD	ADVANTAGES	DISADVANTAGES
75 WATT HRS/LB.	COMMERCIALY AVAILABLE	LOW ENERGY YIELD
180 WATT HRS. PER LB.	HIGH ENERGY YIELD	NOT DEVELOPED
200 WATT CONT. 600 LB.	OPERATES INDEFINITELY	REQ'S DEVELOPMENT TEMR CONTROL. METEORITE DAMAGE
500 WATT 200 LB. + SHIELD LIFE: 60 DAYS 5 KW 500 LB. + SHIELD LIFE: 1 YEAR	LONG LIFE	HEAVY SHIELD REQUIRED
	LONG LIFE	HEAVY SHIELD REQUIRED

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P 315 (A) 66°C 3/13/66

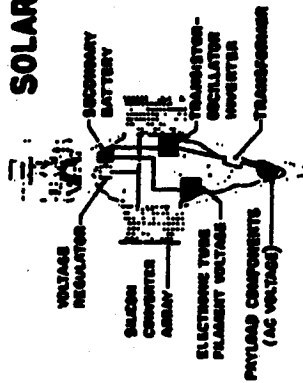
LOCKHEED AIRCRAFT CORPORATION  
Missile Division 2-1-1-1



# ADVANCED AUXILIARY POWER SYSTEMS

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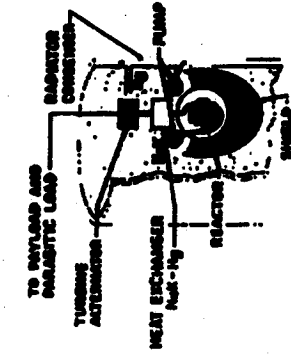
## SOLAR



## CHARACTERISTICS

- (1) 4-10% CONVERSION EFFICIENCY (10-12 WATTS/FT<sup>2</sup>)
- (2) NICKEL CADMIUM SECONDARY BATTERY OF 10 WATT-HRS/LB ~ 2500 CYCLE LIFE
- (3) POWER SYSTEM LIFE LIMITED BY BATTERY AND/OR METEORIC BURNING
- (4) TWILIGHT ORBIT ADVANTAGES: CONSTANT IRRADIATION AT NORMAL INCIDENCE, NO HELIO-TIMING, COOLER CELLS (BETTER TRANSDUCER EFFICIENCY)

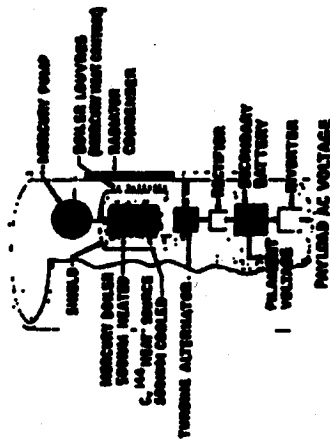
## NUCLEAR REACTOR



## CHARACTERISTICS

- (1) 2KW CONTINUOUSLY (LONG DURATION (~1 YEAR))
- (2) SHIELDING REQUIRED (OR SEPARATION)
- (3) PAYLOAD COMPATIBILITY PROBLEMS

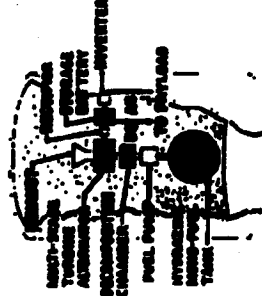
## ISOTOPE



## CHARACTERISTICS

- (1) 500 WATTS AT 60 DAYS
- (2) 250 WATTS AT 340 DAYS
- (3) TUBE FILAMENTS PROVIDE PARASITIC RESISTIVE LOAD FOR EXCESS POWER IN EARLY VEHICLE LIFE DURING COAST PERIODS
- (4) SHIELDING REQUIRED
- (5) TOTAL WEIGHT WITH SHIELD 700-800 POUNDS

## CHEMICAL (POWER SOURCE)



## CHARACTERISTICS

- (1) LIFE LIMITED BY MONOFUEL SUPPLY
- (2) EXHAUST PRODUCTS USEFUL FOR ORBIT ECCENTRICITY CONTROL
- (3) POWER LEVEL EASILY CONTROLLABLE

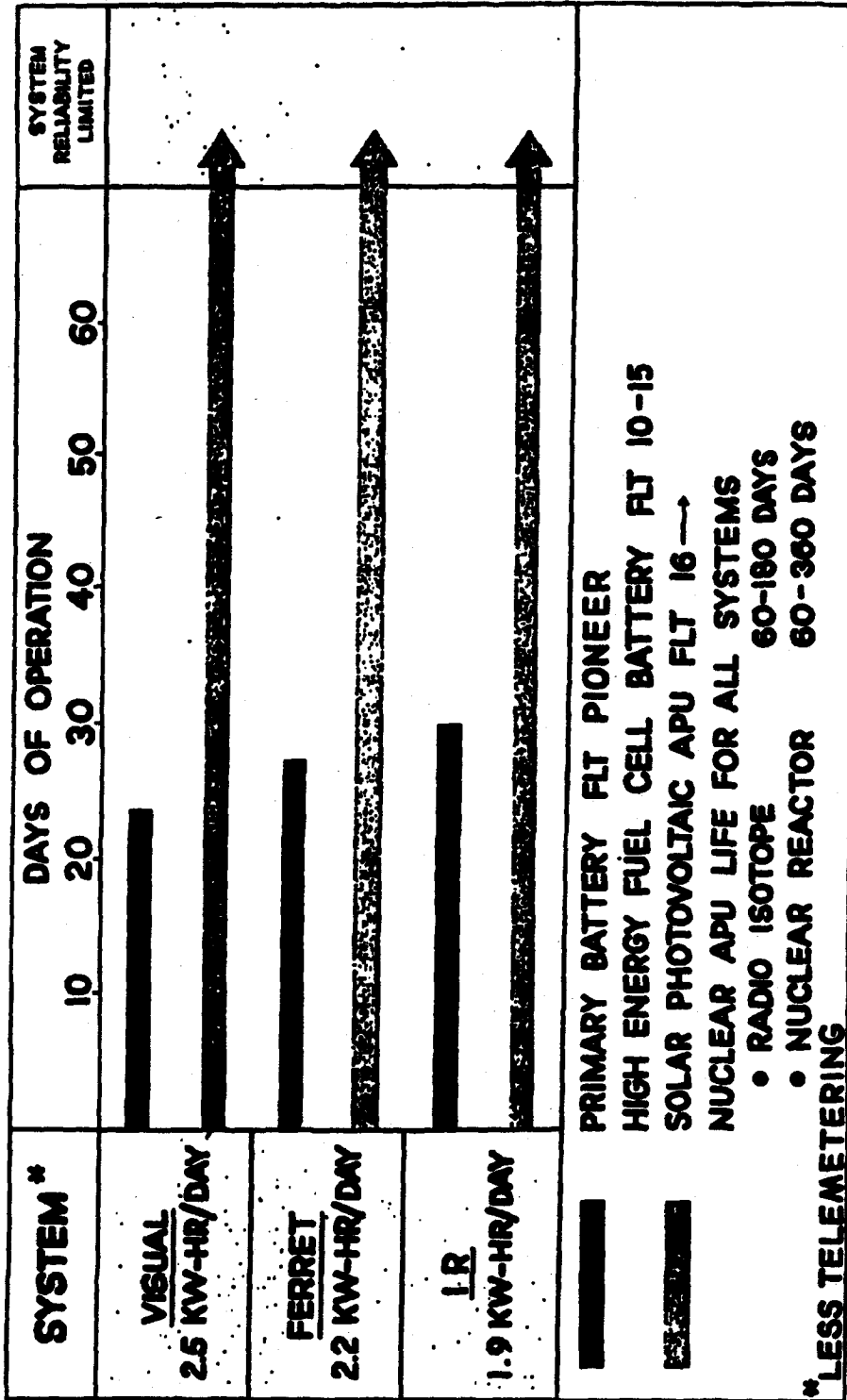
PAGE 4/10/67

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LOCKHEED AIRCRAFT CORPORATION  
MAY 1967

# WS-117L SYSTEM APU LIFE LIMITATIONS

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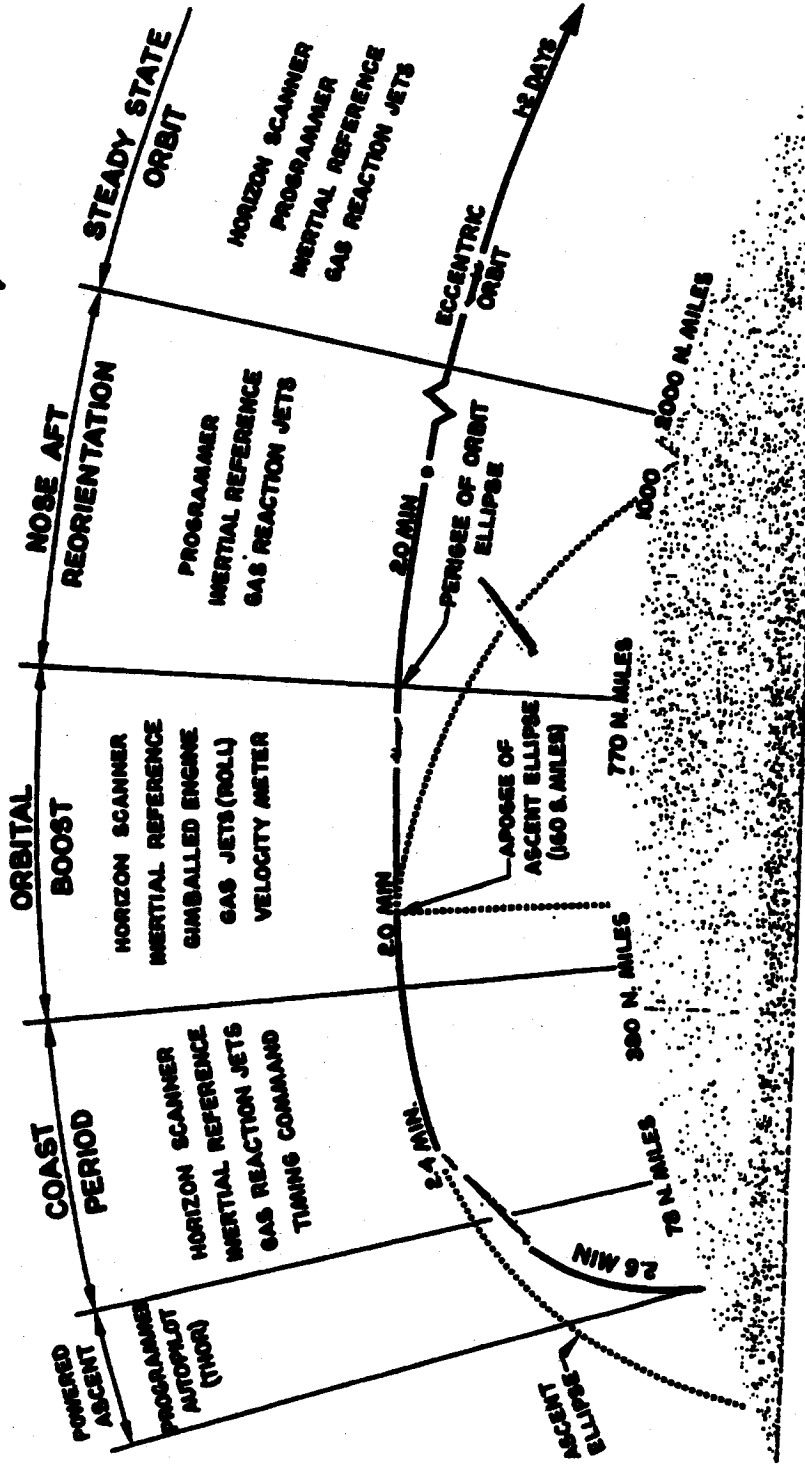
LOCKHEED AIRCRAFT CORPORATION

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P 338(1)55C 2/13/56  
WD-56-01366

# GUIDANCE & CONTROL SYSTEM

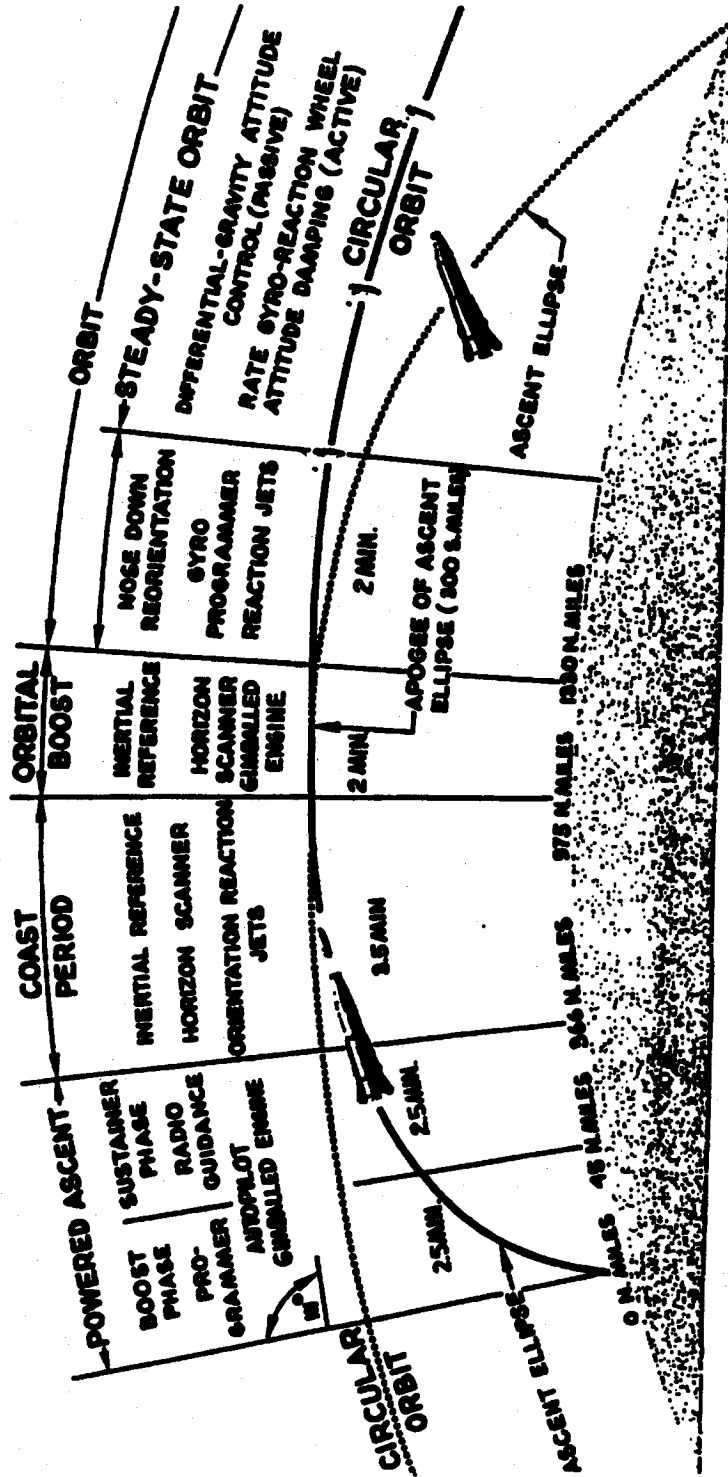
## TYPICAL SENTRY ASCENT (THOR-PROG. IIA)



P 763 88'D' 8/4/58  
WD-58-05183

# GUIDANCE & CONTROL SYSTEM

## TYPICAL SENTRY ASCENT (ATLAS-PROG I)



PI 66 (4) SS'D' 8/4/58  
WD-58-05183

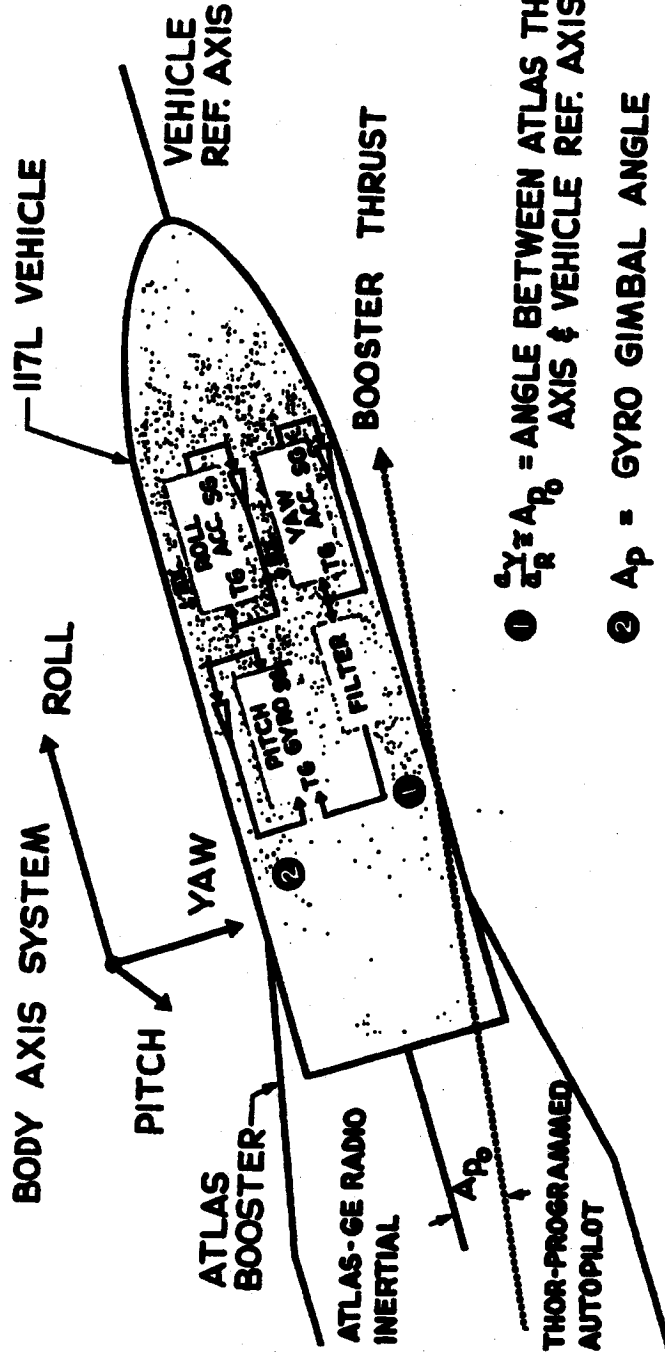
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# SENTRY ASCENT BOOST PHASE

## GUIDANCE & CONTROL FUNCTIONING COMPONENTS



- ①  $\alpha_{R} \pm A_p$  = ANGLE BETWEEN ATLAS THRUST AXIS & VEHICLE REF. AXIS
- ②  $A_p$  = GYRO GIMBAL ANGLE

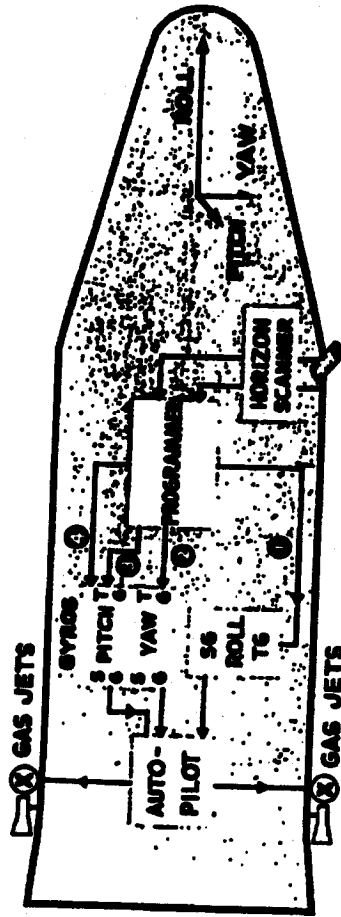
P. 707 (1) 8870 7/25/60  
WB-50-04445

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UNCLASSIFIED EMISSION SYSTEMS GROUP

# SENTRY COAST PHASE

## GUIDANCE & CONTROL FUNCTIONING COMPONENTS



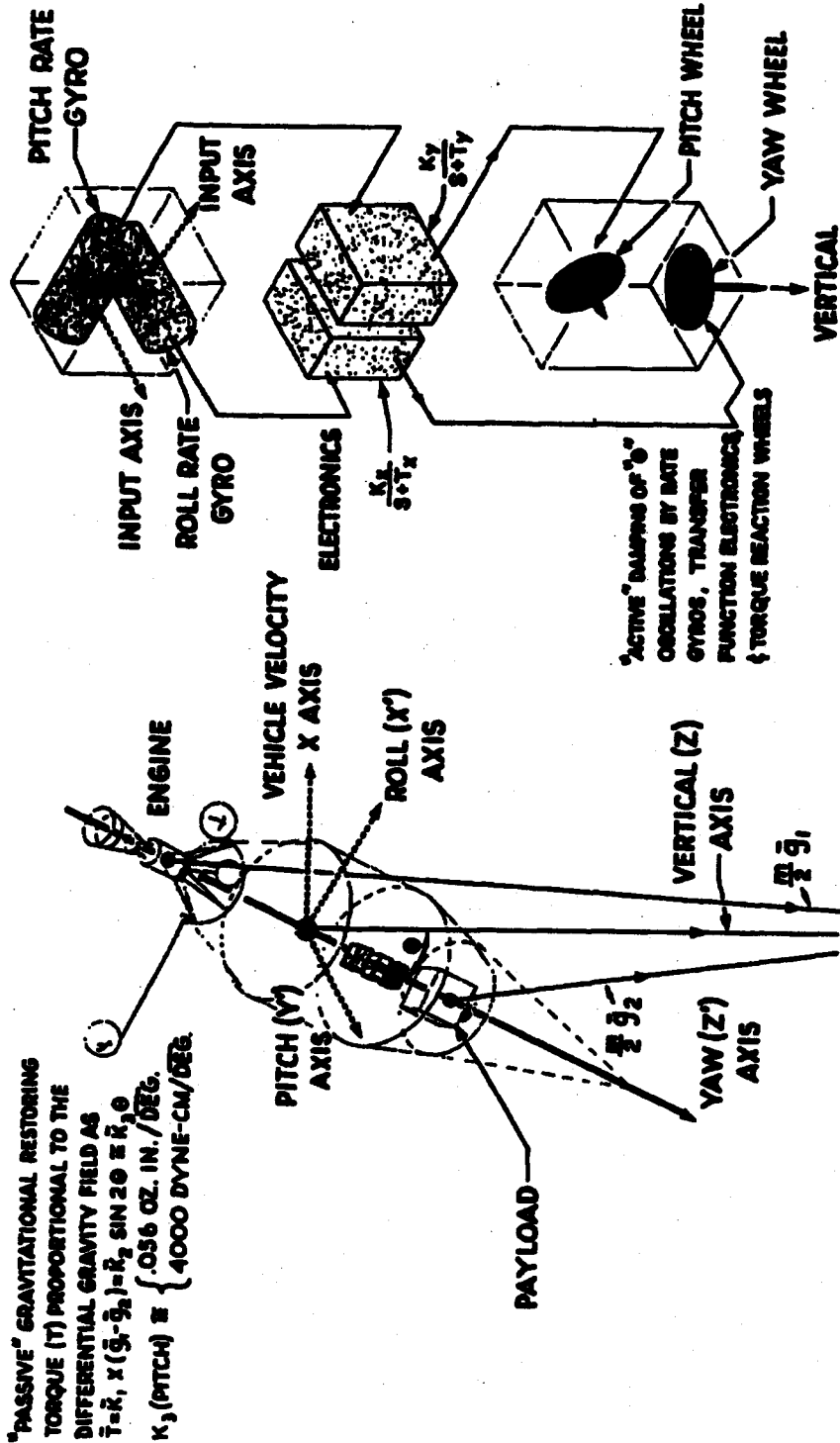
- ① HORIZON SCANNER ROLL ERROR SIGNAL
- ② YAW ANGLE RESET
- ③ HORIZON SCANNER PITCH ERROR SIGNAL
- ④ PROGRAM PITCH RATE

PROGRAMMER COMMANDS  
 GYRO PACKAGE REF. ATTITUDE,  
 GAS JETS VIA AUTOPILOT  
 ALIGN VEHICLE ATTITUDE  
 TO GYRO REF. ATTITUDE.

P 708 (1) SS "D" 7/22/56  
 WP 30 01446

# STEADY-STATE ORBITAL ATTITUDE CONTROL SYSTEM

(PITCH CASE - TYPICAL)



"PASSIVE" GRAVITATIONAL RESTORING TORQUE (T) PROPORTIONAL TO THE DIFFERENTIAL GRAVITY FIELD AS  $\vec{T} = \vec{R}_1 \times (\vec{g}_1 - \vec{g}_2) = \vec{R}_2 \sin 2\theta \approx \vec{R}_2 \theta$   
 $K_3$  (PITCH)  $\approx \{ .036 \text{ OZ. IN. / DEG. } \}$   
 4000 DYNE-CM/DEG.

P 164 (4/8/57)  
WD-58-01556

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# WS117L SENTRY VEHICLE WEIGHT

	PROGRAM IIA(0) LBS.	PROGRAM I(2) LBS.
VEHICLE PAYLOAD (INCLUDES PRIMARY PAYLOAD & A.R.S. TELEMETRY, & COMMUNICATIONS)	573	3197
STRUCTURE GROUP (INCLUDES AIRFRAME & EQUIPMENT SUPT. STRUCTURE)	402	554
PROPULSION GROUP (INCLUDES ENGINE, PROPELLANT TANKS, PRESS. SYSTEM & ULLAGE ROCKETS)	593	593
CONTROLS GROUP (INCLUDES ASCENT & ORBITAL CONTROLS)	160	123
GUIDANCE GROUP (INCLUDES ASCENT & ORBITAL GUIDANCE)	100	140
VEHICLE WEIGHT EMPTY	1828	4607
PROPELLANTS	6624	4693
BOOSTER PAYLOAD	8452	9300
VEHICLE WEIGHT ON ORBIT	1776	4466

(1) UDMH-IRFNA ENGINE & LAUNCHED FROM CAMP COOKE - THOR BOOSTED NOM. CIRCULAR ORBIT  
 ALTITUDE = 160 STATUTE MILES

(2) UDMH-IRFNA ENGINE & LAUNCHED FROM AFMTC - ATLAS BOOSTED NOM. CIRCULAR ORBIT  
 ALTITUDE = 300 STATUTE MILES

P 262 (3) 5 7/77/58  
 WD-58-04445

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WEIGHTS IN POUNDS

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# WS-117L VISUAL RECONNAISSANCE SYSTEM

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## TECHNICAL SUMMARY

		PIONEER	ADVANCED		
FOCAL LENGTH		6"	36"		ADVANCED
LENS SPEED		f2.8	f2.8		
DURATION		9 DAYS	30 DAYS		300 WATTS
STRIP ON GROUND - WIDTH		100 MI.	17 MI.		660 WATT HR/DAY
STRIP ON GROUND - LENGTH		2000 MI. AVG.	360 MI. INTERMITTENT		1:3,168,000
AREA COVERED		107 X 10 <sup>7</sup> SQ. MI.	9.9 X 10 <sup>8</sup> SQ. MI.		1:528,000
CAMERA WT. INCLUDES FILM & PROCESSOR		300 LB. 3.4 LB.	400 LB.(EST.) 11.4 LB.		100 FT. 20 FT.
		ELECTRICAL POWER REQUIREMENTS			
		PEAK			
		AVERAGE			
		SCALE ON VEHICLE FILM			
		RESOLUTION ON GROUND AT LOW(2:1) CONTRAST			

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FILM USED: MICROFILM EASTMAN F5740-6  
 FILM RESOLUTION: 250  $\mu$ /mm HIGH CONTRAST  
 > 100  $\mu$ /mm LOW CONTRAST

GROUND ENLARGEMENT 53:1 FOR USE

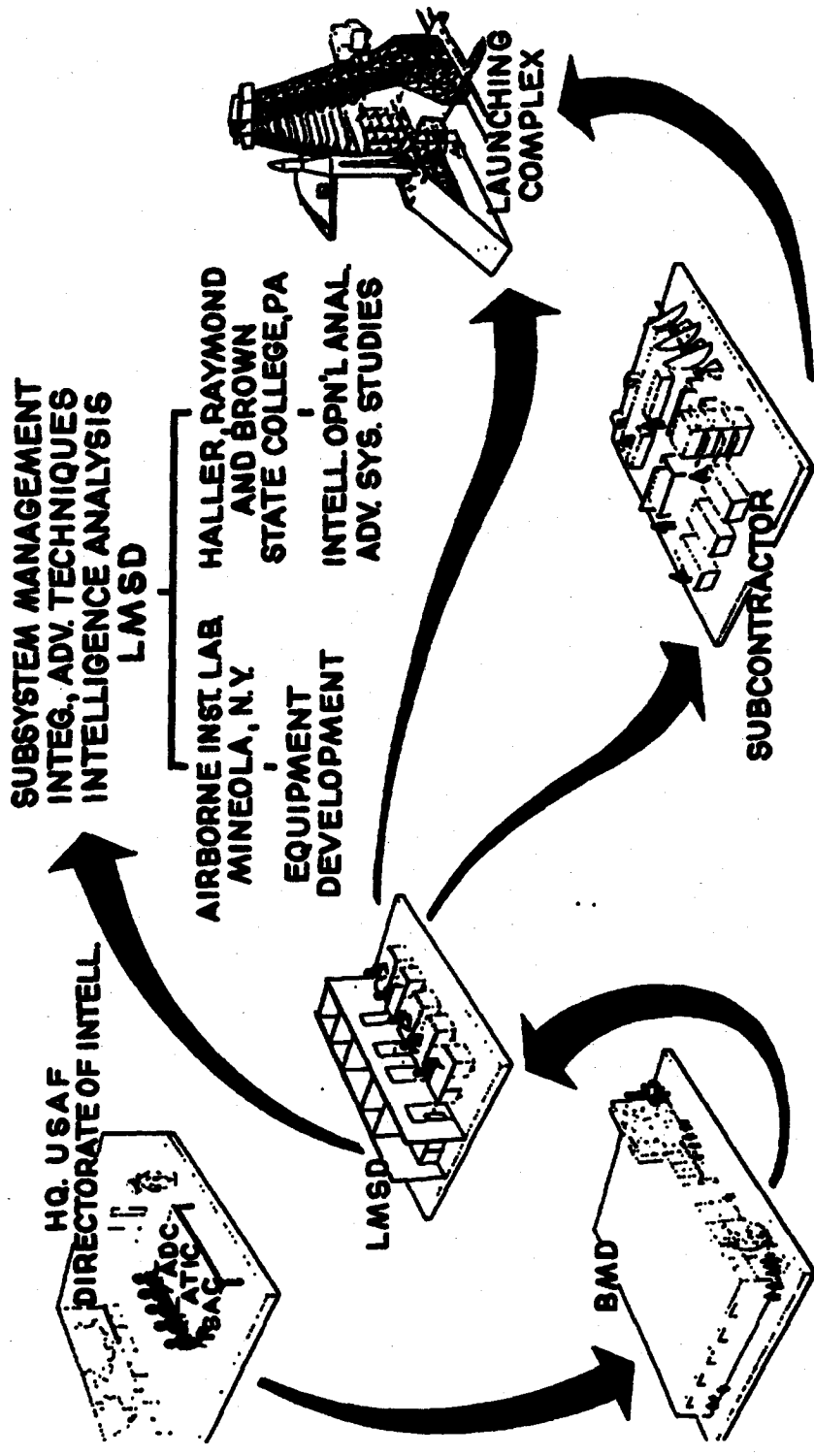
P400 55-1 12/9/57

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FORM 10-64 (REV. 11-22-54)

# WS117L FERRET SUBSYSTEM-PROJECT STRUCTURE

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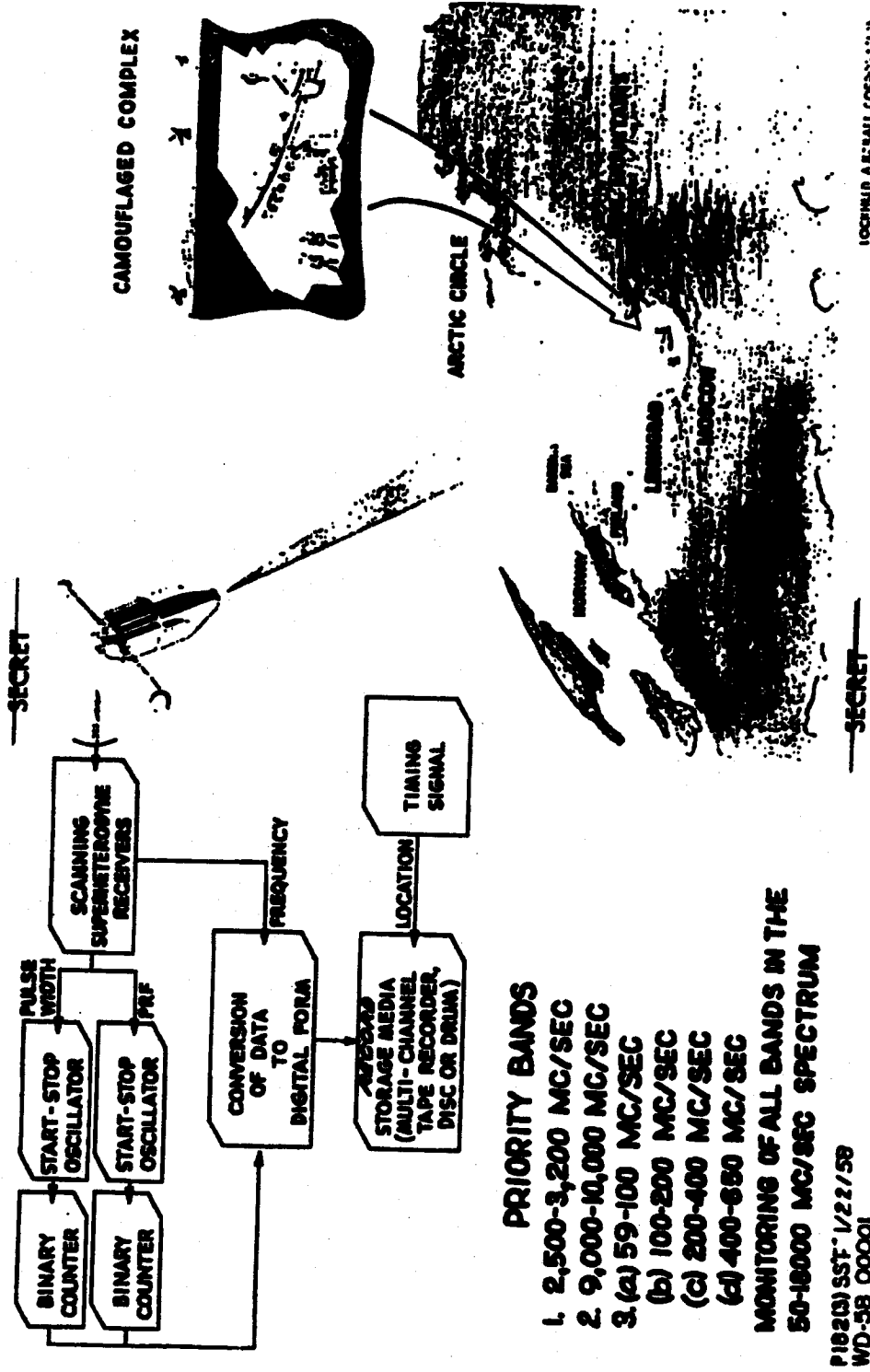


P 175 (4) 6/30/56 SS"R"  
WD-56-03455

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100-44110-442-7841

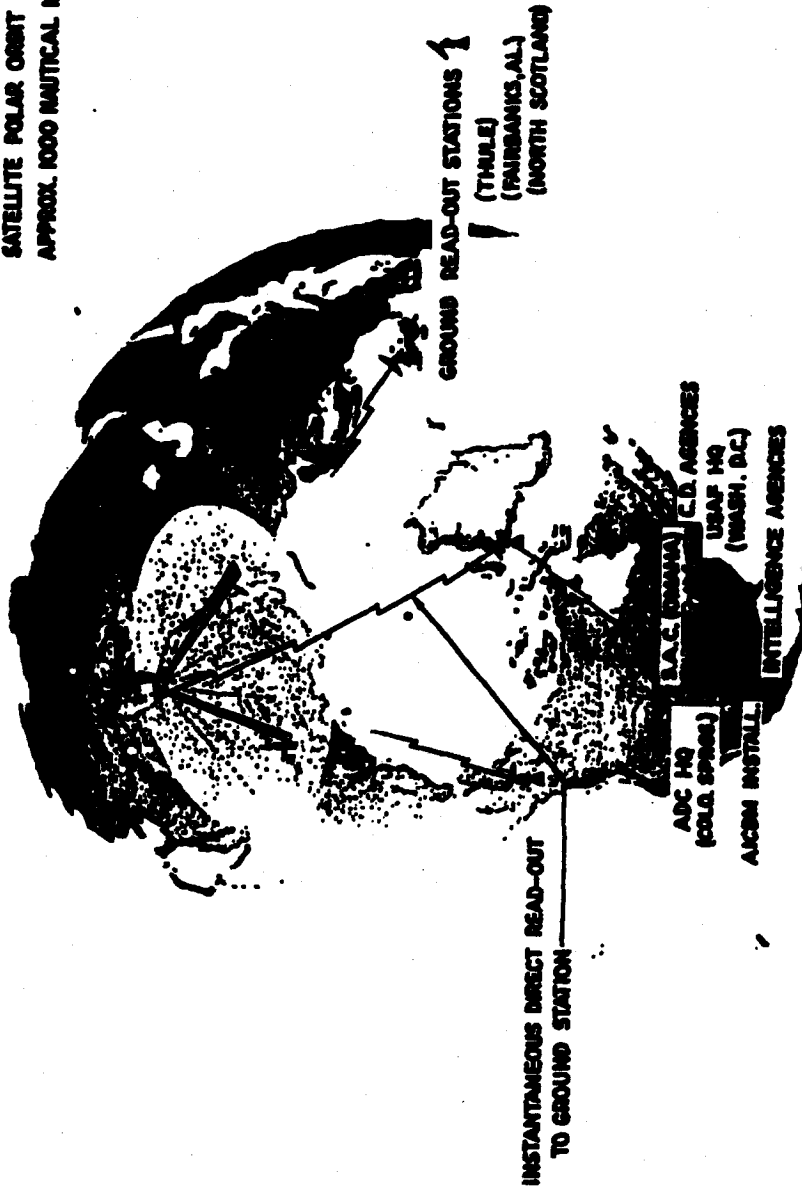
# AIRBORNE RECEPTION



# ICBM ATTACK ALARM

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SATELLITE POLAR ORBIT ALT.  
APPROX. 1000 NAUTICAL MILES



PRO-408578-9/7/58  
WD-58-02943

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LOCKHEED AIRCRAFT CORPORATION  
MILWAUKEE, WISCONSIN

# PROPOSED ICBM ATTACK ALARM SYSTEM

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## SATELLITE POWER REQM'TS VS. SUPPLY

POWER REQUIREMENTS		SOLAR POWER SUPPLY	
UNIT	WATT HR/DAY	UNIT	WATT HR/DAY
TRANSMITTER	171		
RECEIVER	117	SOLAR CELL OUTPUT	3796
DECODER	176		
TIMER & PROGRAMMER	120		
SUBSYSTEM "G"	180	LOSS: DEGRADATION, CONVERSION STORAGE, REGULATION	2548
ATTITUDE DAMPING SYST.	240	OTHER	
YAW STAB. GYRO WHEEL	96		
<b>TOTAL REQM'T</b>	<b>1100</b>	<b>TOTAL USEFUL POWER FOR EQUIP:</b>	<b>1248</b>

- 80 FT<sup>2</sup> SOLAR CELLS REQUIRED AT 1000 N. MI. ALTITUDE ON MOON ORBIT
- OVERALL PERFORMANCE FACTOR - 33%

PG0901 SC 6 424/88  
WD-88-084-85

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# ICBM ATTACK ALARM SYSTEM

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VEHICLE PAYLOAD

EQUIPMENT

DESCRIPTION

INFRARED

BOUWERS CONCENTRIC OPTICAL SYSTEM  
7-INCH APERTURE, 1.3 APERTURE RATIO  
UNCOOLED LEAD-SULPHIDE DETECTORS  
MODULATING RETICLE MOUNTED ON ROTATING SCANNER FRAME  
TRANSISTORIZED INFRARED SIGNAL AMPLIFIERS

COMMUNICATIONS

TRANSMITTER & MODULATORS  
COMMAND RECEIVER  
DECODER  
TIMER/PROGRAMMER  
4 QUADRANT RECEIVING ANTENNAS  
TRANSMITTER ANTENNA

AUX. POWER

SOLAR ENERGY COLLECTOR CELLS  
400 CYCLE INVERTER  
2000 CYCLE INVERTER  
28V DC REGULATOR  
NICKEL-CADMIUM BATTERY

P620 (1) 886' 6/4/58  
WD-58-03455

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LOCKHEED AIRCRAFT CORPORATION

# PROPOSED ICBM ATTACK ALARM SYSTEM

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## OPERATIONAL GROUND BASE REQUIREMENTS

1. LAUNCH SITE - COOKE AIR FORCE BASE
  - LAUNCH PADS THREE
  - GRND. SUPP. EQUIP. THREE SETS
  - ASSEMBLY HANGARS ONE
  
2. TRACKING STATIONS - NORTHWEST, NORTH, & SOUTH CENTRAL
  - SAME UHF INSTALLATIONS AS PROGRAMS I, II, & III  
(IF VHF IS UTILIZED, ADDITIONAL EQUIPMENT REQUIRED)
  
3. READ OUT STATIONS - THULE, GREENLAND, FAIRBANKS, ALS, N. SCOTLAND
  - THREE 60 FT. TRACKING ANTENNAS FOR IR DATA & TELEMETRY RECEPTION.
  - THREE DATA LINK & THREE TELEMETRY RECEIVERS.
  - TWO DIRECTION FINDERS & TWO COMMAND TRANSMITTERS WITH ANTENNAS.
  - THREE SETS OF DISPLAY CONSOLES & CONTROL CONSOLES.
  - MASTER CONTROL CONSOLE, DATA RECEIVERS, ORBIT TRACKING PROGRAMMER.

P 617 (2) 55 '6' 01/4/58  
WD-58-034-55

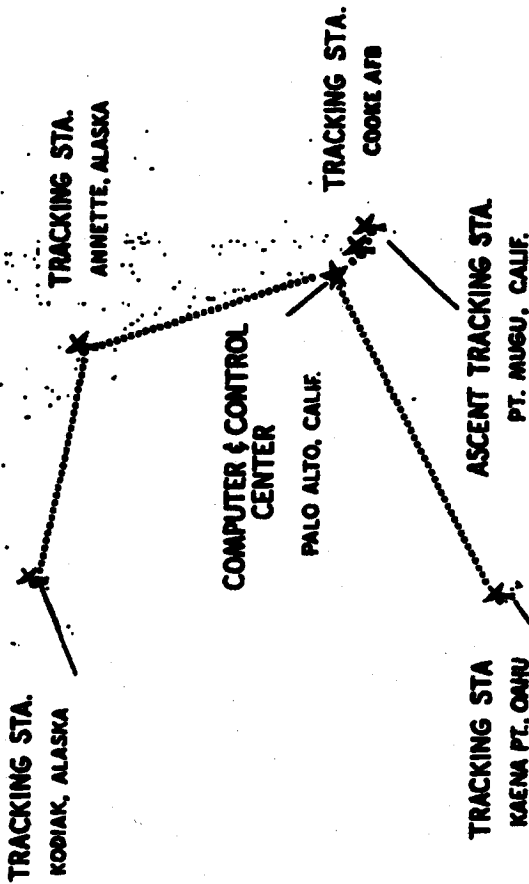
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# STATION LOCATIONS (THOR)



REF ID: A661 0001 0001 0001

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P 009 00 20 "11" 7/4/78  
WB-20-01118

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MISSILE SYSTEMS DIVISION

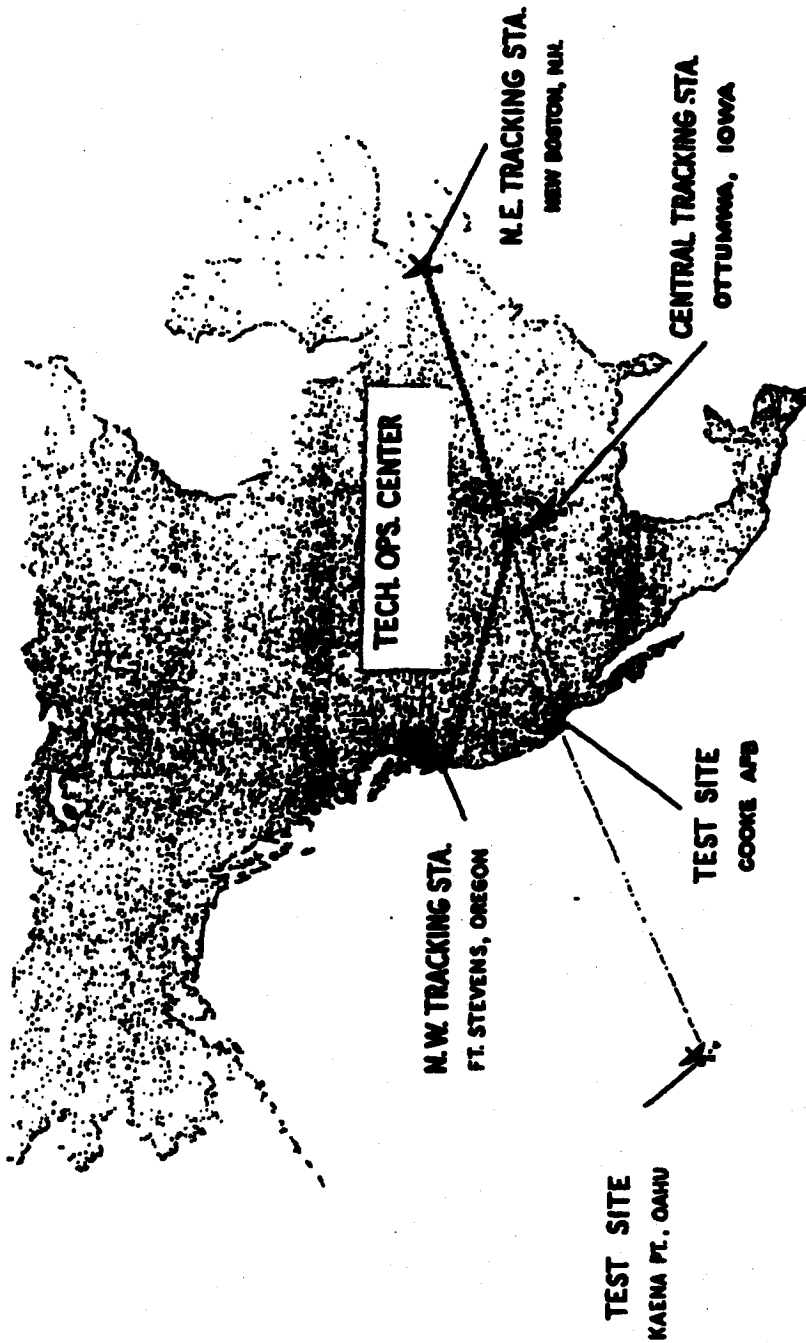
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# STATION LOCATIONS (ATLAS)



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P 215 08 25 17 7/7/70  
WB-22-04445

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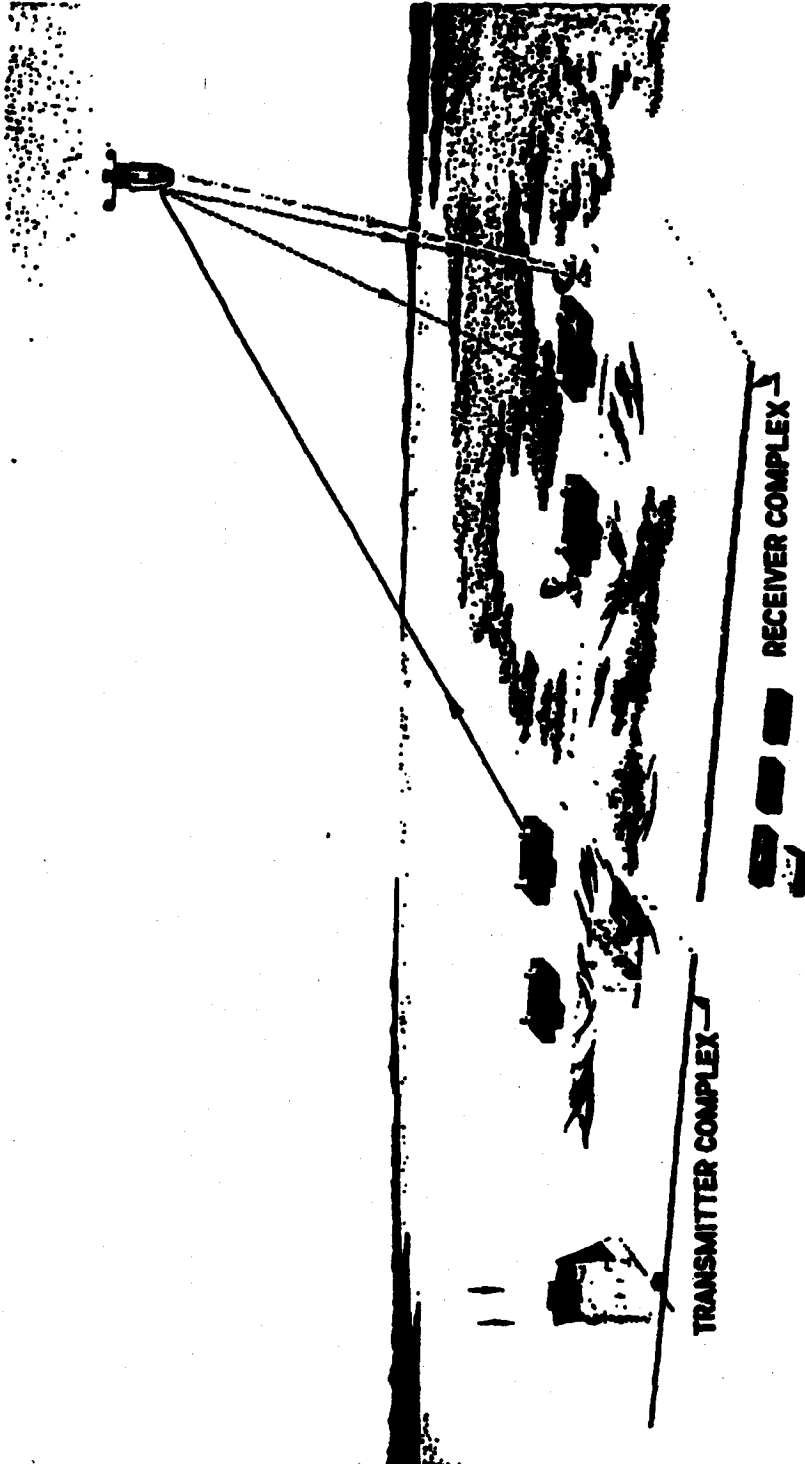
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# G-S COMMUNICATION INTERCEPT STATION

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LOCKHEED AIRCRAFT CORPORATION  
10000 WILSON AVENUE  
ANN ARBOR, MICHIGAN 48106

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P 163(2) SS-H 7/10/57

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# ORBITING OBJECT-TRAFFIC INTELLIGENCE

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- ● ● IDENTIFY & TRACK VEHICLES ENTERING ORBIT  
ATTACK ALARM SYSTEM  
PRECISION TRACKING & PREDICTION SYSTEM
- ● ● MAINTAIN DATA ON ACTIVE U.S. VEHICLES  
BEACON TRACKING  
ORBIT PREDICTION
- ● ● MAINTAIN DATA ON INACTIVE U.S. VEHICLES  
SKIN TRACKING (VISUAL & IR TRACKING)  
ORBIT COMPUTATIONS
- ● ● MAINTAIN DATA ON FOREIGN VEHICLES  
SKIN TRACKING (VISUAL & IR TRACKING)  
RAPID ORBIT & TRAJECTORY COMPUTATIONS

P 540 GDC 5/12/58  
WD-58-02843

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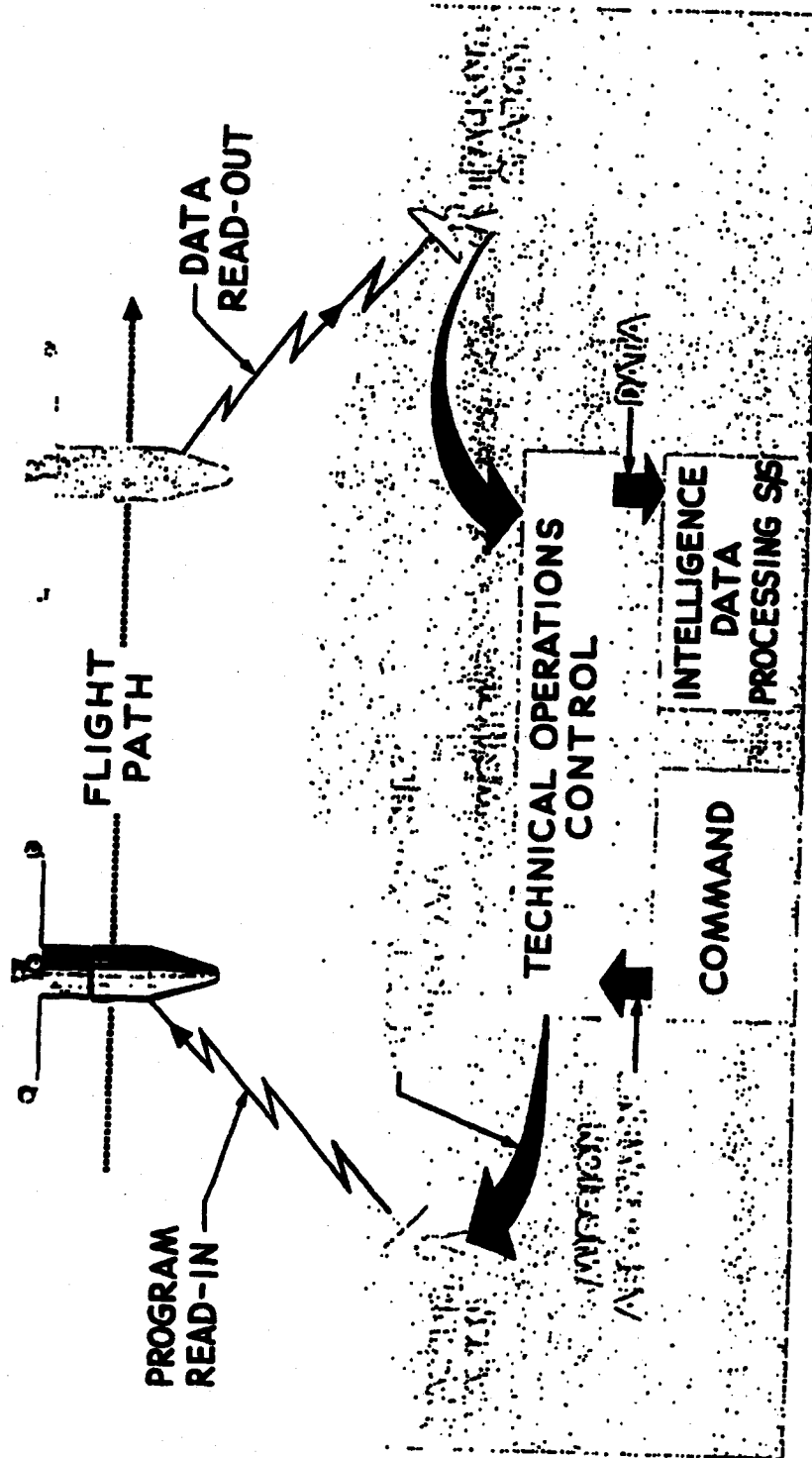
LOCKHEED AIRCRAFT CORPORATION

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MISSILE SYSTEMS DIVISION

# WS117L DATA CONTROL

## RECONNAISSANCE MISSION



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RECONNAISSANCE MISSION

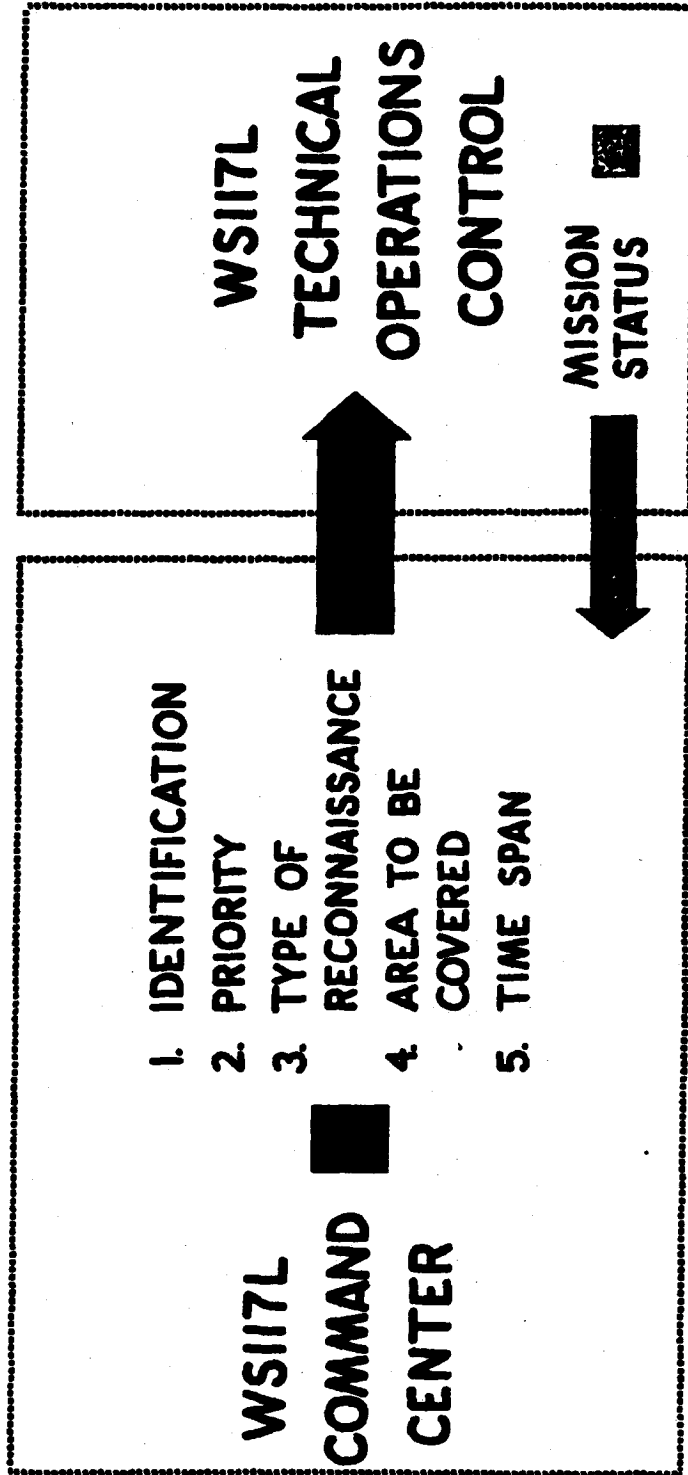
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P-864 DCA 7/11/78  
WD-88-04445

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# WSII7L DATA CONTROL

## RECONNAISSANCE MISSION ASSIGNMENT



RECONNAISSANCE MISSION ASSIGNMENT

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P-683 8CA 7/11/58  
WD-58-0444E

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# WS117L DATA CONTROL

## DATA INDEXING

TRACKING DATA 

ATTITUDE 

VEHICLE TIME DRIFT 

~~INTELLIGENCE DATA INDICES~~ 

DATA  
CONTROL  
OPERATIONS

PERFORMANCE DATA

CALIBRATION DATA

PERFORMANCE STANDARDS

P-652 (1) 5 7/22/50  
WD-50-04445

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CONTROL MODEL SYSTEM DESIGN

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# WS 117L/SM-75 PROGRAM OBJECTIVES

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## PRIMARY

- LAUNCH OF WS 117L/SM-75 COMBINATION
- ACHIEVEMENT OF ORBIT
- DEVEL. WS117L AIRBORNE & GROUND SYSTEMS
- DEVEL. OF GROUND/SPACE COMMUNICATIONS

## SECONDARY

- RECOVERY
- AEROMEDICAL MEASUREMENTS
- G. R. D. MEASUREMENTS

P-465 SO 324/58  
WD-58-01888

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MISSILE SYSTEMS DIVISION

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# FLIGHT MISSIONS & OBJECTIVES

## PROGRAM II A

NOM. CIRCULAR ORBIT	EMPTY	NOZZLE		
FLY ENERGY ALT.	WT ON ATT.	PAYLOAD	FUEL	EXP. RATIO
S. AL.	ORBIT			FLY. OBJECTIVES

	225	1275	VERT.	JP4/IRFNA	14.85:1	PHASE A
1						ENGINEERING TESTS
2	190	1359	"	"	"	PHASE A ENGINEERING TESTS
3 & 4	145 ( $M_p = 140$ S.M.L.E. = .02 163° LAUNCH AZIMUTH)	1547	HORIZ.	"	"	BIO-MEDICAL EXPERIMENT
5-7-9	240	1458	"	UDMH/IRFNA	20:1	PHASE B ENGINEERING TESTS
6-8 & 10 THRU 14	160 ( $M_p = 140$ S.M.L.E. = .02 180° LAUNCH AZIMUTH)	1649	"	GRD. ALBEDO DENSITY COSMIC RAY	"	BIO-MEDICAL EXPERIMENT

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WD-53-00445

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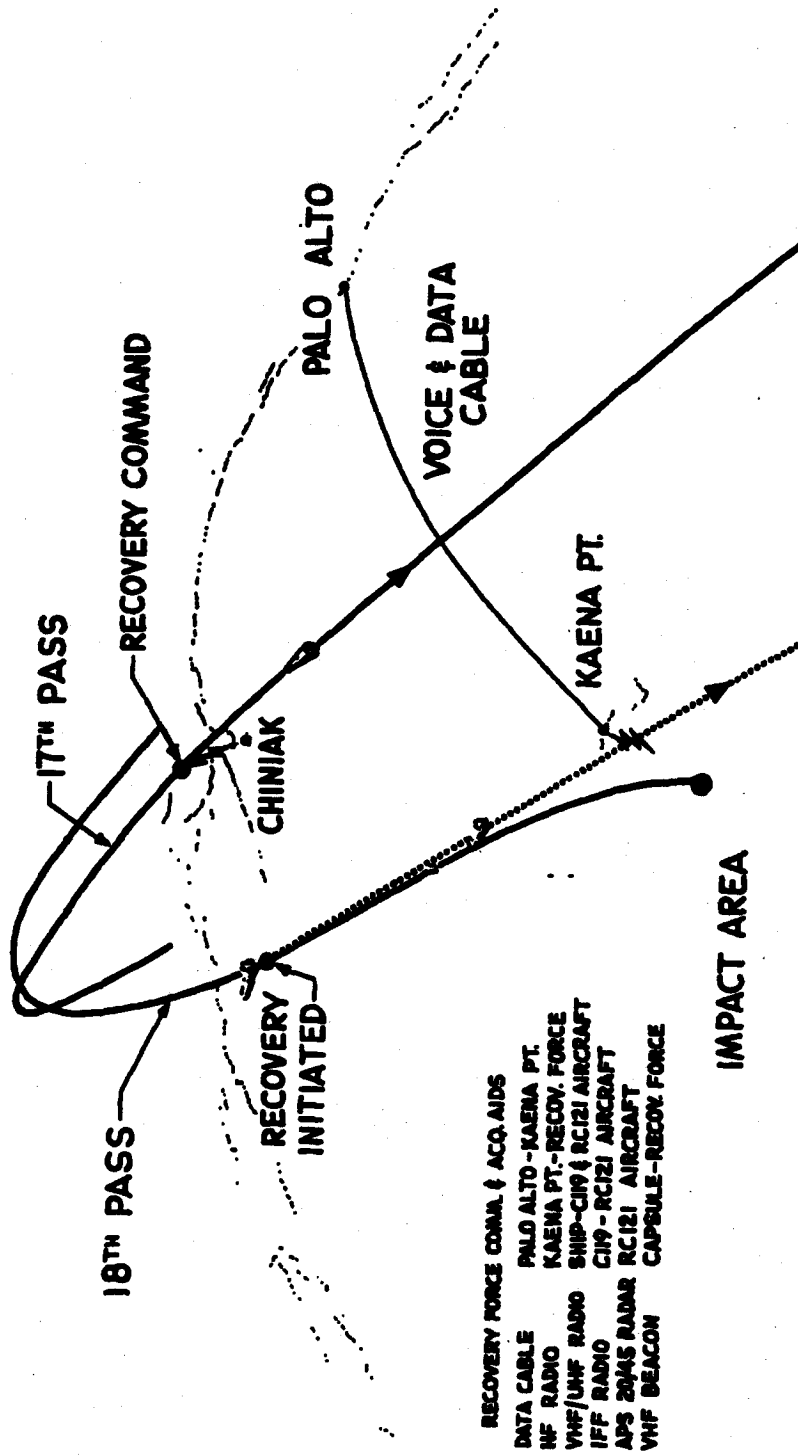
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# WS117L RECOVERY ORBITS

## PROGRAM IIA



- RECOVERY FORCE COMMA. & ACQ. AIDS
- DATA CABLE PALO ALTO - KAENA PT.
- NF RADIO KAENA PT. - RECOV. FORCE
- VHF/UHF RADIO SHIP-C119 & RC121 AIRCRAFT
- IFF RADIO C119 - RC121 AIRCRAFT
- APS 2045 RADAR RC121 AIRCRAFT
- VHF BEACON CAPSULE - RECOV. FORCE

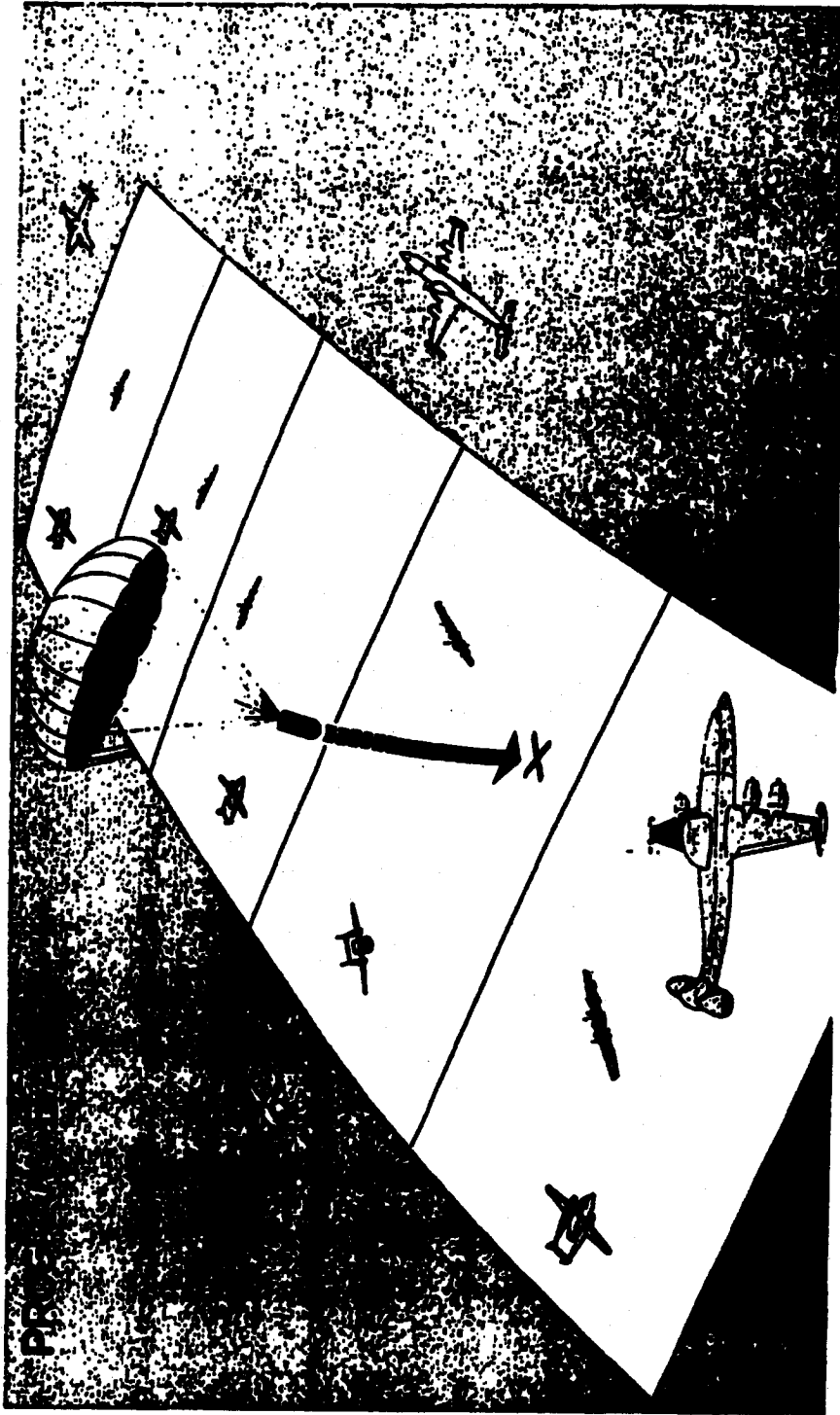
P639 50 7/7/56  
WD-55-04445

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NSA-413 (Rev. 1) (Public Edition)

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# SENTRY RECOVERY OPERATIONS



LOCKHEED AIRCRAFT CORPORATION  
MILWAUKEE, WISCONSIN 53211

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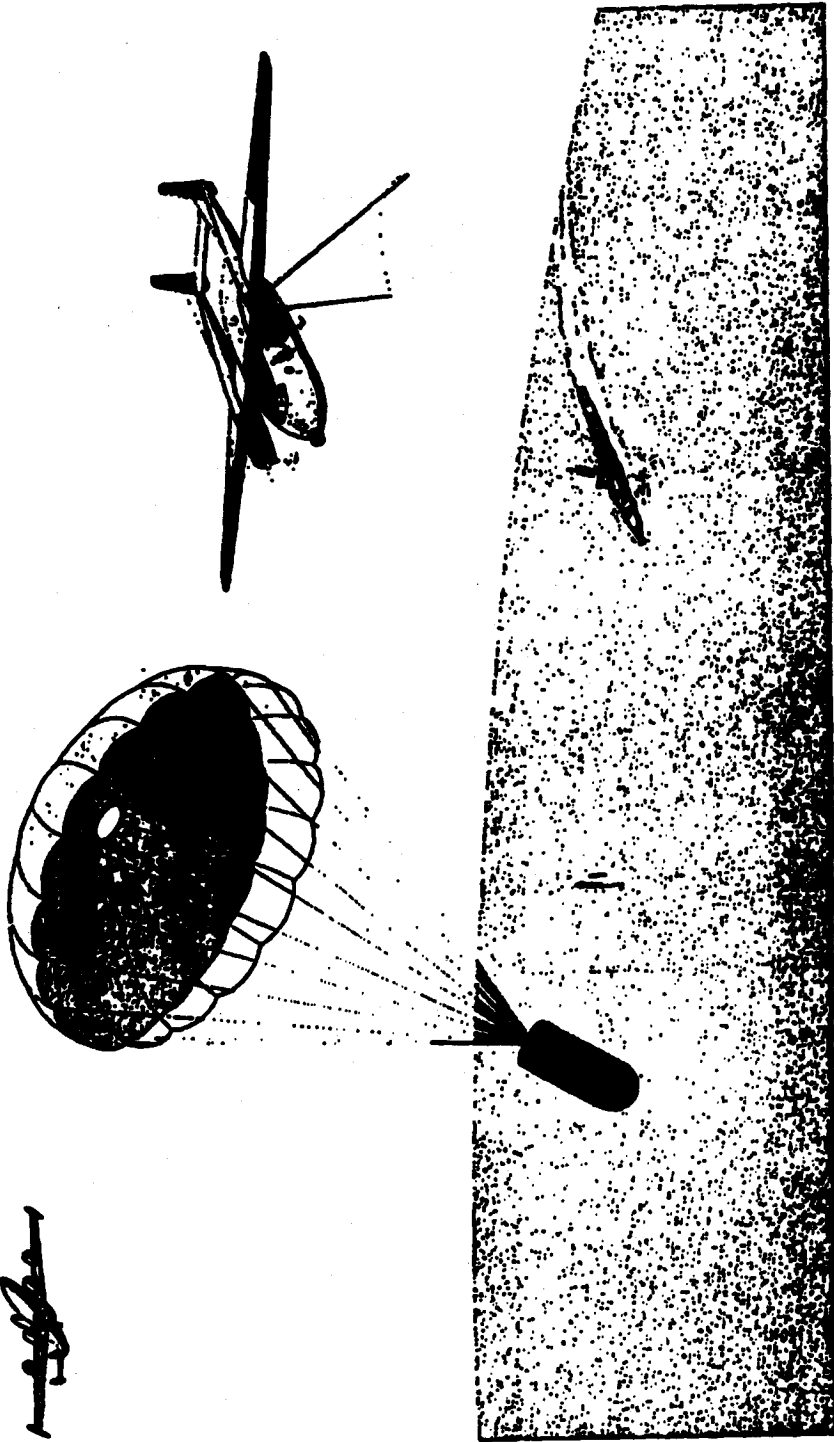
PAGE 02 20 6/24/58  
WD-58-08485

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MISSILE CAPSULE RECOVERY

PROGRAM IIA

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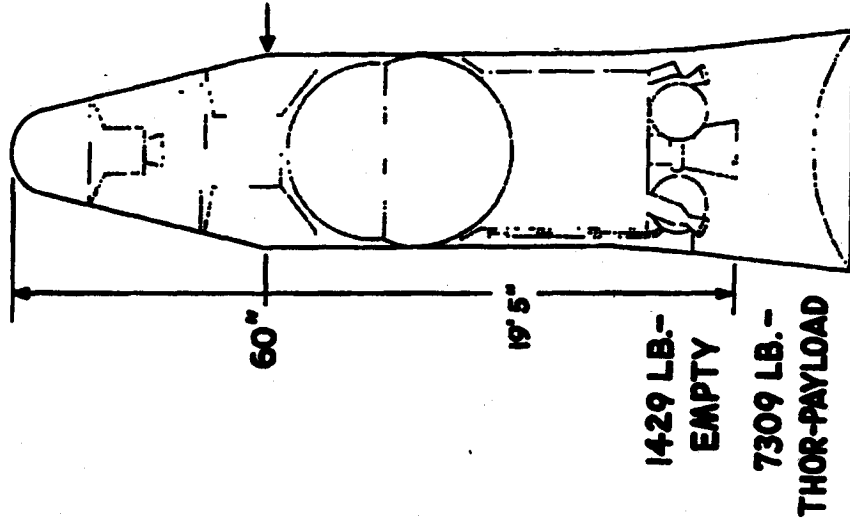
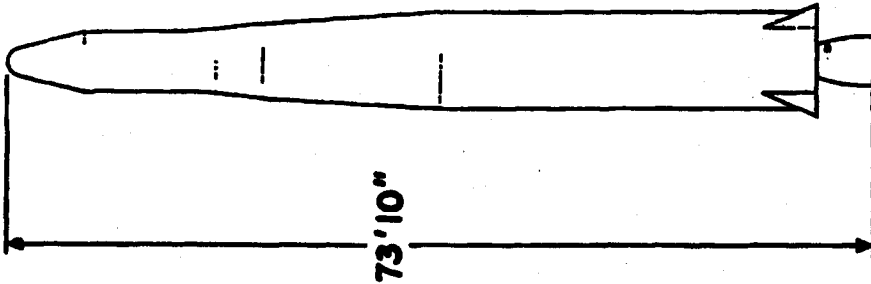
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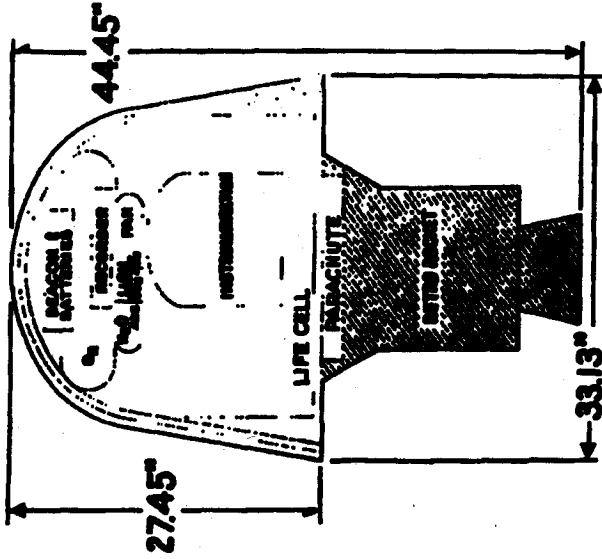
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# WS117L BIO MED VEHICLE

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195 LB. - JP4  
279 LB. - UDMH



P544(056 "L" 6/3/58  
WD-58-03455

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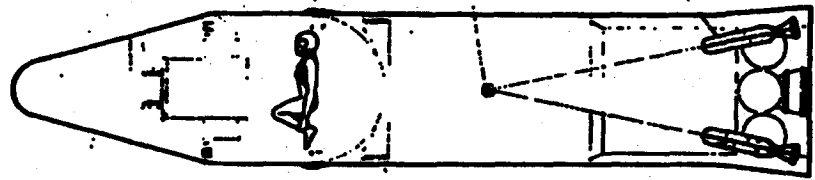
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# WS117L AERO-MED RECOVERY CONFIGURATIONS

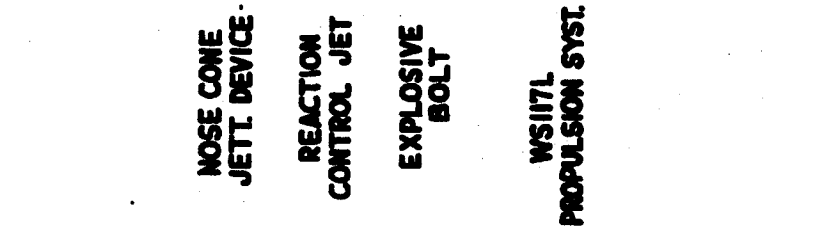
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MAN

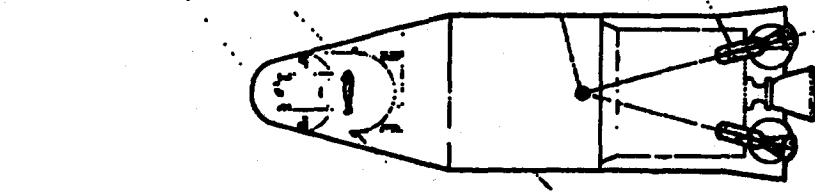
SMALL ANIMAL



NOSE CONE  
 REACTION CONTROL JET  
 SER. JOINT  
 CAPSULE SER. DEVICE  
 WS117L PROPULSION SYST.  
 RETRO-THRUST ROCKET



NOSE CONE JETT. DEVICE  
 REACTION CONTROL JET  
 EXPLOSIVE BOLT  
 WS117L PROPULSION SYST.  
 RETRO-THRUST ROCKET



NOSE CONE  
 RECOVERY CAPSULE  
 SER. JOINT  
 CAPSULE SER. DEVICE  
 CENTER OF GRAVITY  
 RETRO-THRUST ROCKET

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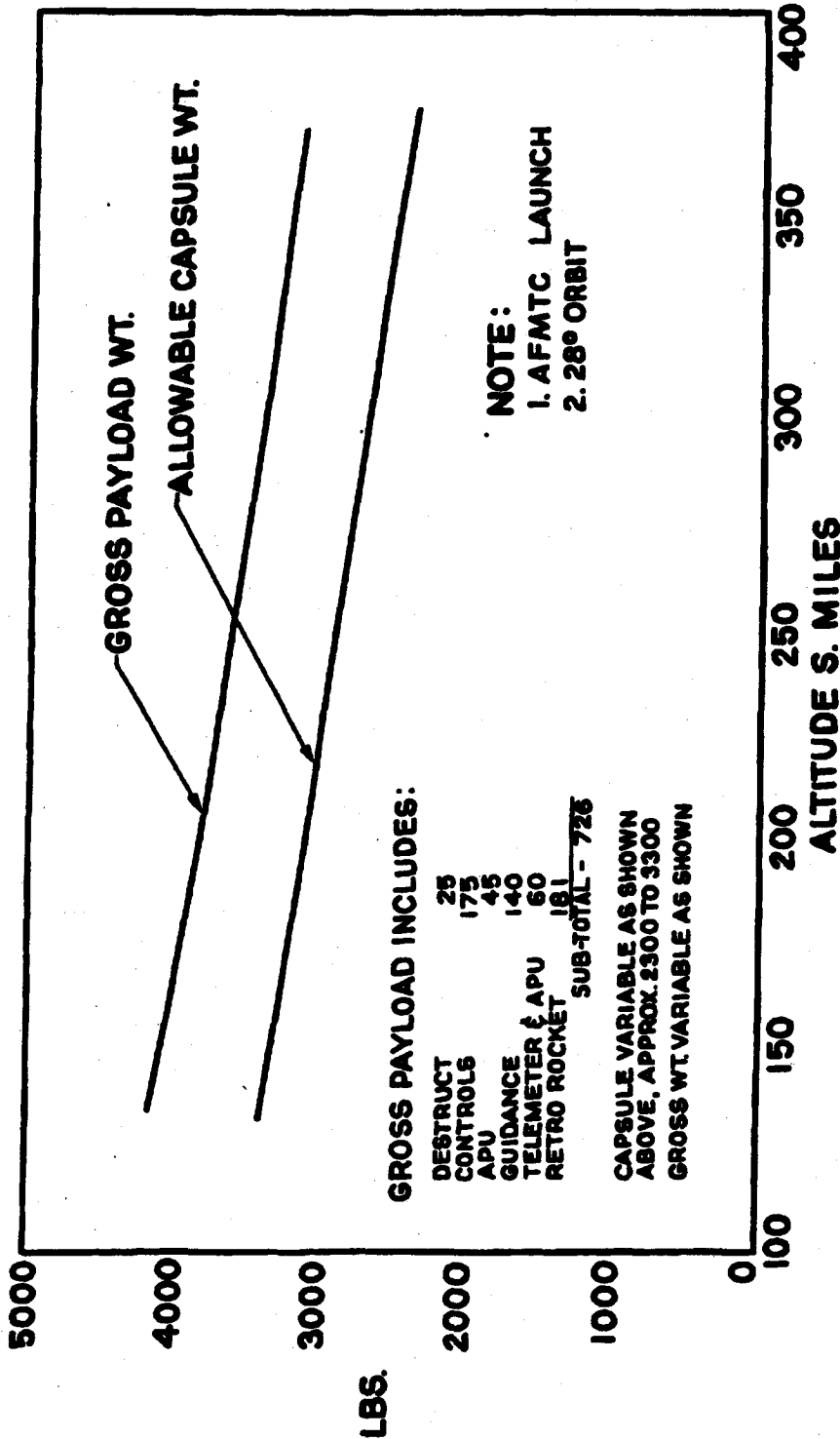
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P 475 6 4/30/58  
 WD-58-0275

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 1000 W. ALHAMBRA, CALIF.

# WS117L USEFUL PAYLOAD WEIGHT VS ALT.

## PROPOSED MAN IN SPACE PROG.



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P503 SS'L' 6/3/58  
WD-58-03495

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**SATELLITE WEATHER MISSIONS**

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**SCIENTIFIC RESEARCH**

**DETERMINE MEANS FOR UTILIZING SATELLITE DATA  
CORRELATE DATA OVER LARGE AREAS OF EARTH  
PERFORM STUDIES ON WEATHER CONTROL**

**STORM PATROL**

**DETECT PRESENCE OF MAJOR STORM CENTERS  
PERFORM TIMELY TRACKING AND WARNING**

**DOMESTIC WEATHER FORECASTING**

**AUGMENT PRESENT SYSTEM OF STATIONS  
PROVIDE ADDITIONAL COVERAGE**

**MILITARY MISSIONS**

**WEATHER DATA FOR OPERATIONAL MISSIONS  
INTELLIGENCE INFORMATION  
WS-117L TECHNICAL SCHEDULING**

P646 5/28/58  
WD-58-02843

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MISSILE SYSTEMS DIVISION

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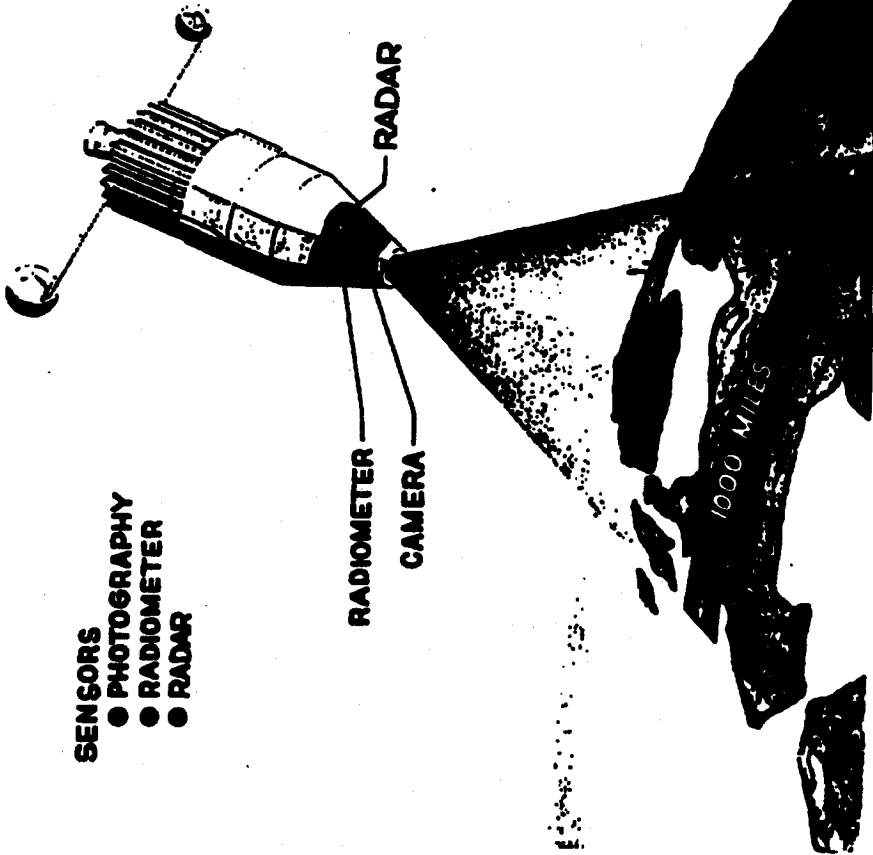
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# SENTRY WEATHER SURVEILLANCE



STATUS MOSAIC AT WEATHER CENTER



## AFFORDS SYNOPTIC RECORD

- CLOUD TYPE
- CLOUD COVER
- CLOUD VELOCITY
- CLOUD ALBEDO
- TERRESTRIAL RADIATION SPECTRUM
- TERRESTRIAL HEAT BALANCE

P 37646 10/14/57  
WD-56-05163

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**TYPES OF WEATHER DATA**

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**MILITARY AND DOMESTIC**

**PRESENT METHODS**

**TEMPERATURE**

**PRESSURE**

**HUMIDITY**

**WIND VELOCITY**

**RECENT WEATHER HISTORY**

**SATELLITE DATA**

**VISUAL**

**CLOUDS - SEMI QUANTITATIVE**

- 1. EXISTENCE
- 2. WIND VELOCITY
- 3. WIND SHEARS
- 4. VERTICAL STRUCT
- 5. WATER VAPOR
- 6. AIR STABILITY
- 7. LEE CLOUDS OVER MOUNTAINS
- 8. FRONTAL CLOUDS

**RADIO METRIC**

**ALBEDO**

**OZONE CONCENTRATIONS**

**SOLAR RADIATIONS**

**RADAR**

**PRECIPITATION**

**ALBEDO**

P846 5/29/58  
WD-56-02843

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# POSSIBLE SCIENTIFIC EXPERIMENTS

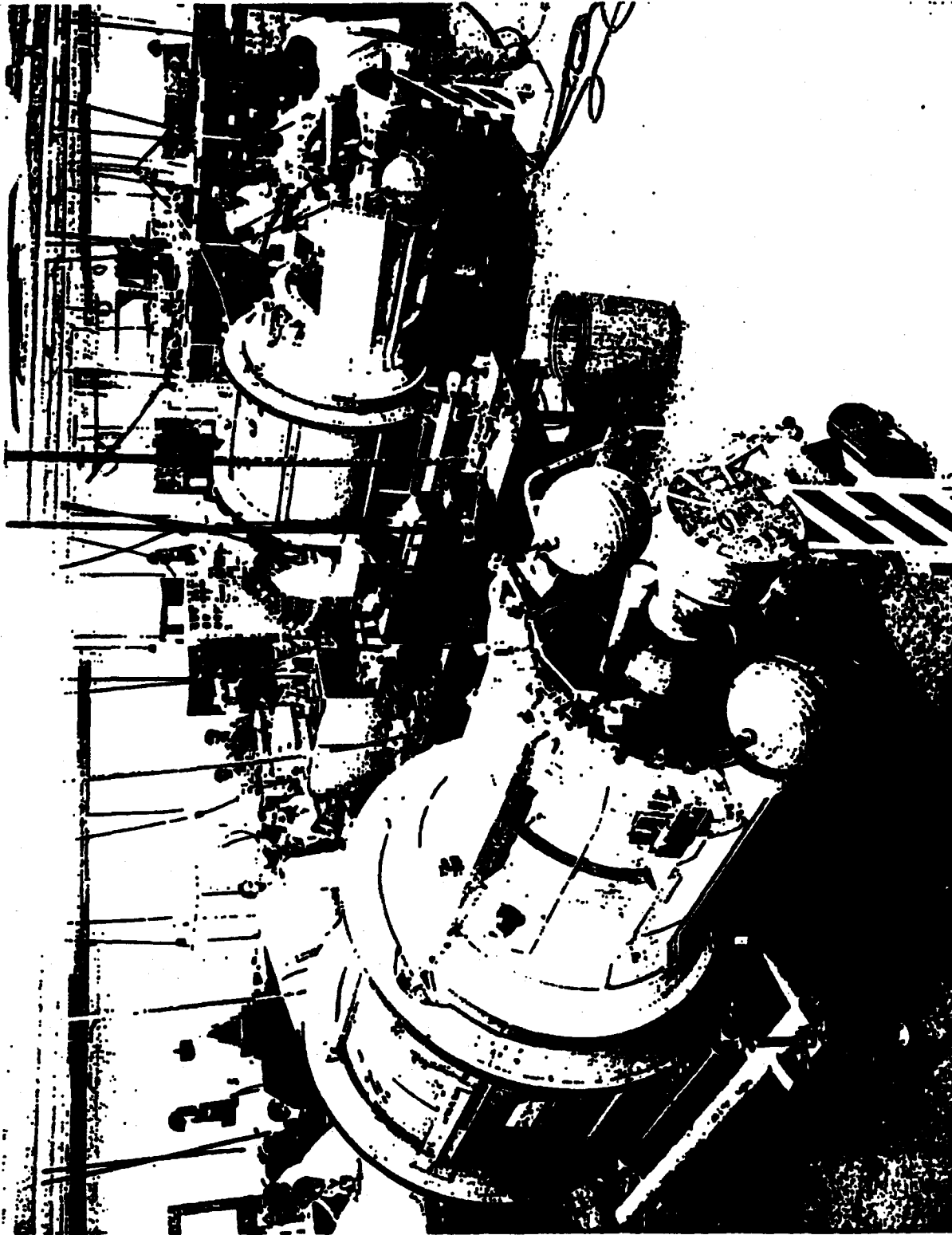
UTILIZING WS-117L VEHICLE

	LARGE PAYLOAD	DATA STORAGE & WIDE-BAND TRANSMISSION	LARGE POWER (LONG LIFE)	POLAR ORBIT	CONTROLLED ATTITUDE	INTER-SATELLITE COMM.	CONCISE-TYPE EXPERIMENTS
DRAG							
SOLAR UV, X-RAYS, & TOTAL RADIATION		▲	▲		▲		
PRIMARY AND ALBEDO COSMIC RAYS	●	▲	▲	●	▲		
AURORAL PARTICLES AND X-RAYS		▲	▲	●	▲		
MICROMETEORITES		▲	▲		▲		
MAGNETIC FIELD		●	▲	●			
EARTH RADIATION		●	▲	●	●		
ALBEDO AND CLOUD COVER		●	▲	●	●		
LIGHT ION DETECTOR		●	▲	●			
ION SPECTROMETER	●	●	▲	●	▲		
MICROMETEORITE VELOCITIES		▲	▲		●		
LYMAN-ALPHA TELESCOPE	●	▲	▲		●		
ATOMIC CLOCK	●		▲				
ELECTRON DENSITY IN IONOSPHERE		●	▲	●			
DENSITY AND TEMPERATURE IN ORBIT	▲	●	▲	●	●	●	

- NOT NECESSARY FOR THE MEASUREMENT
- ▲ USEFUL FOR THE MEASUREMENT
- ADDS GREATLY TO VALUE OF MEASUREMENT

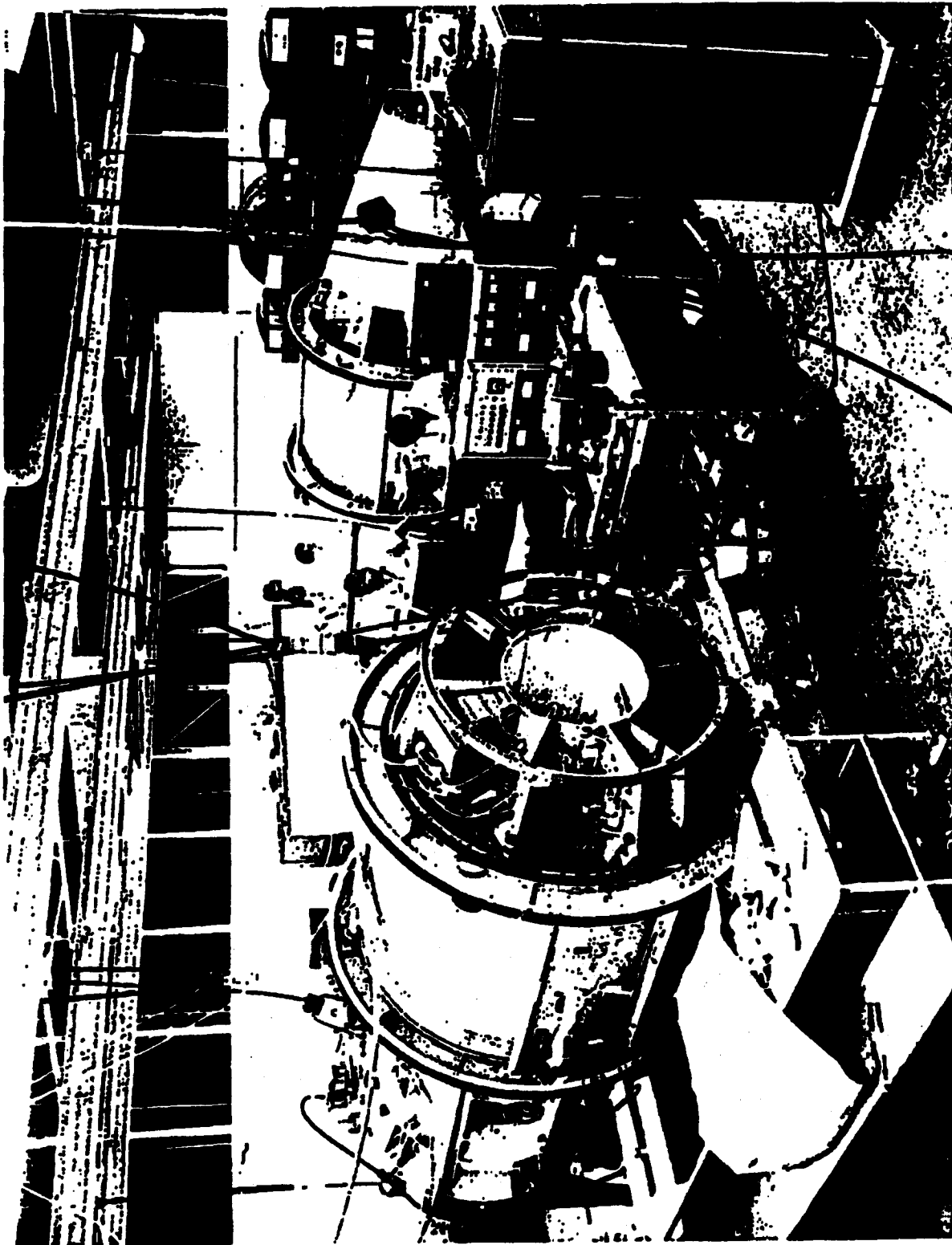
P374 6 10/14/57

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P 3017 FLIGHT TEST VEHICLES NOS. 1 AND 2 IN MOD & CHECKOUT - LMSD PALO ALTO

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P-2018 FLIGHT TEST VEHICLES NOS. 1 AND 2 IN MOD & CHECKOUT - LMSD PALO ALTO

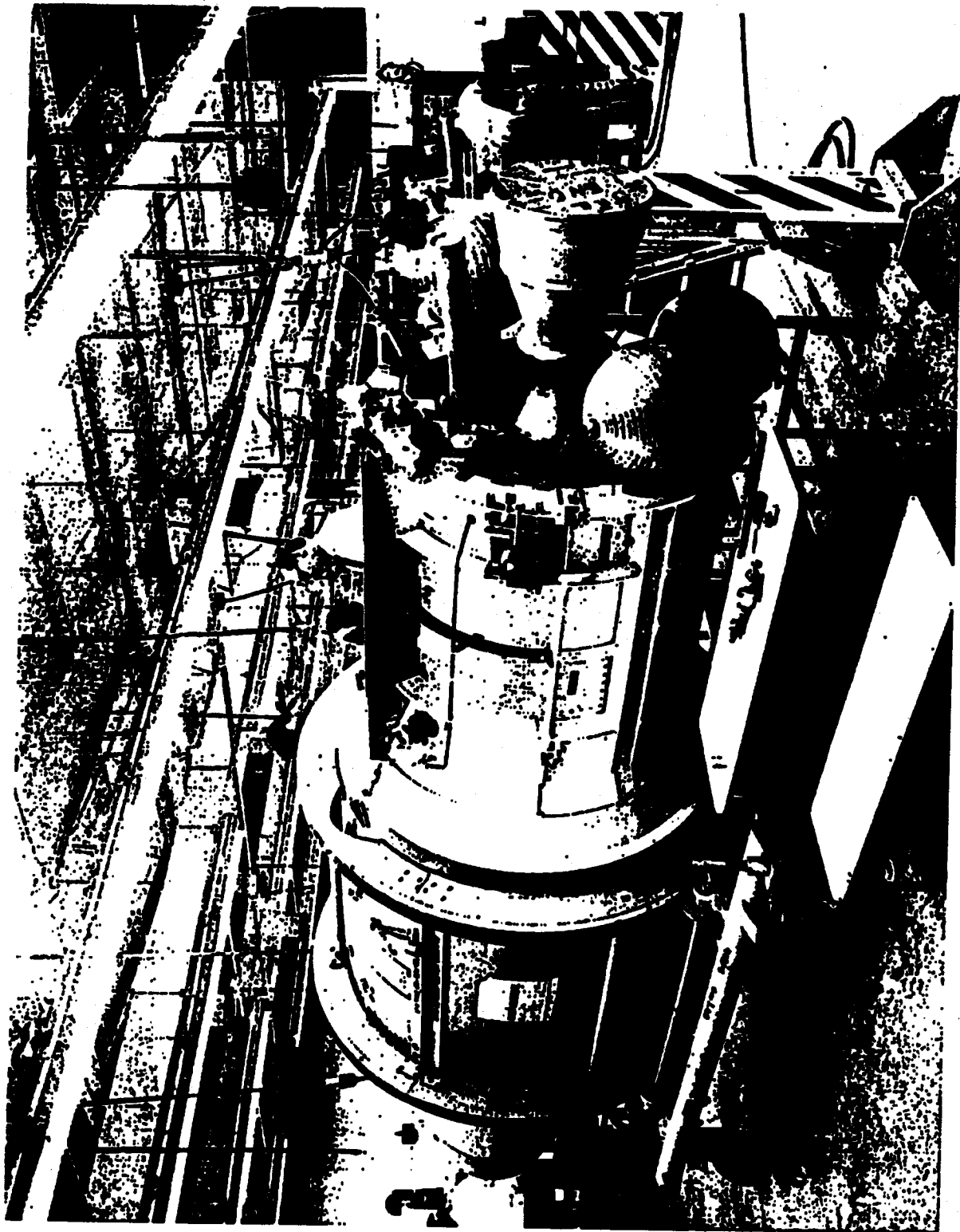
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P-2022 FLIGHT TEST VEHICLE NO. 2 IN MOD & CHECKOUT - LMSD PALO ALTO

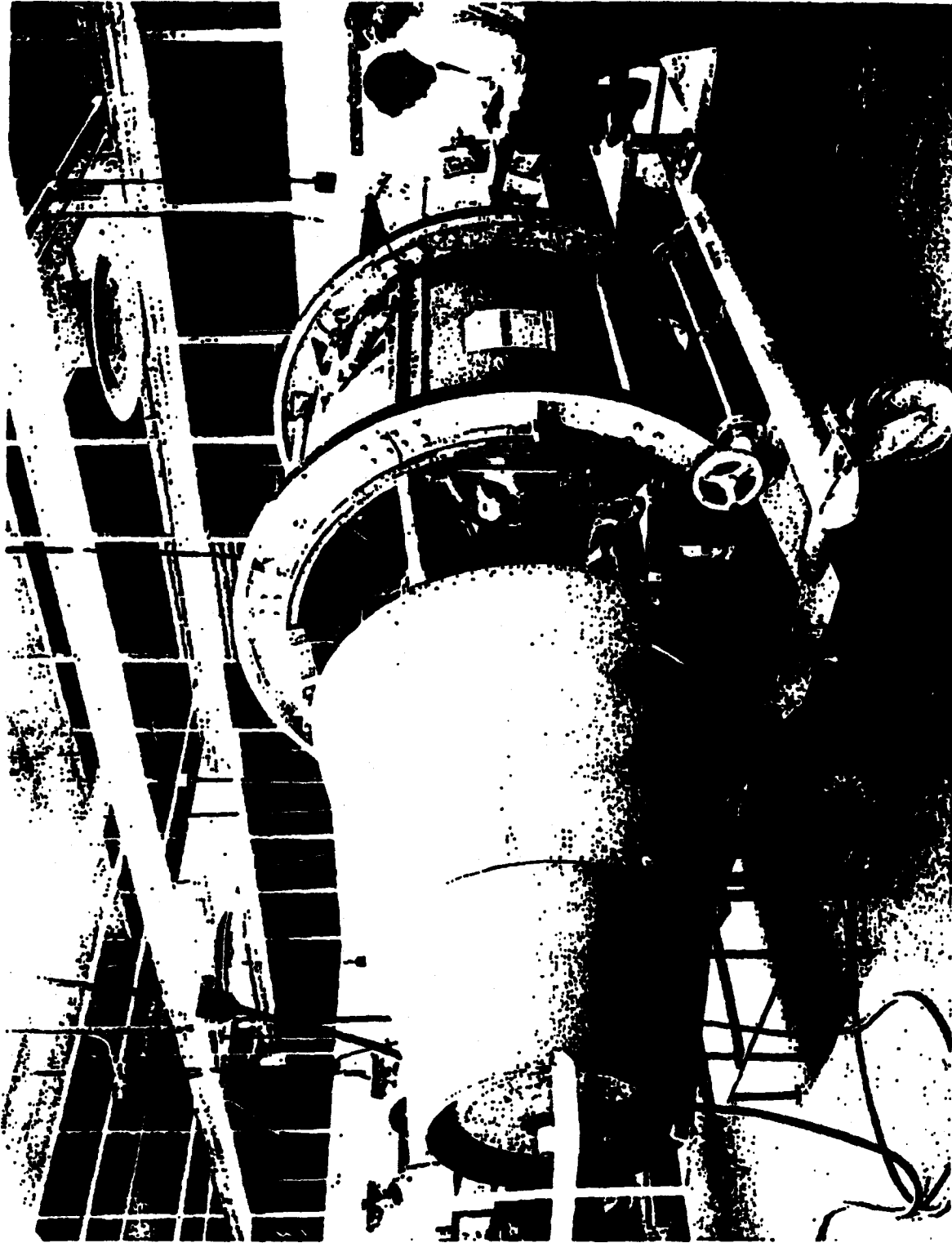
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P-3021 FLIGHT TEST VEHICLE NO. 2 IN MOD & CHECKOUT - LMSO PALO ALTO

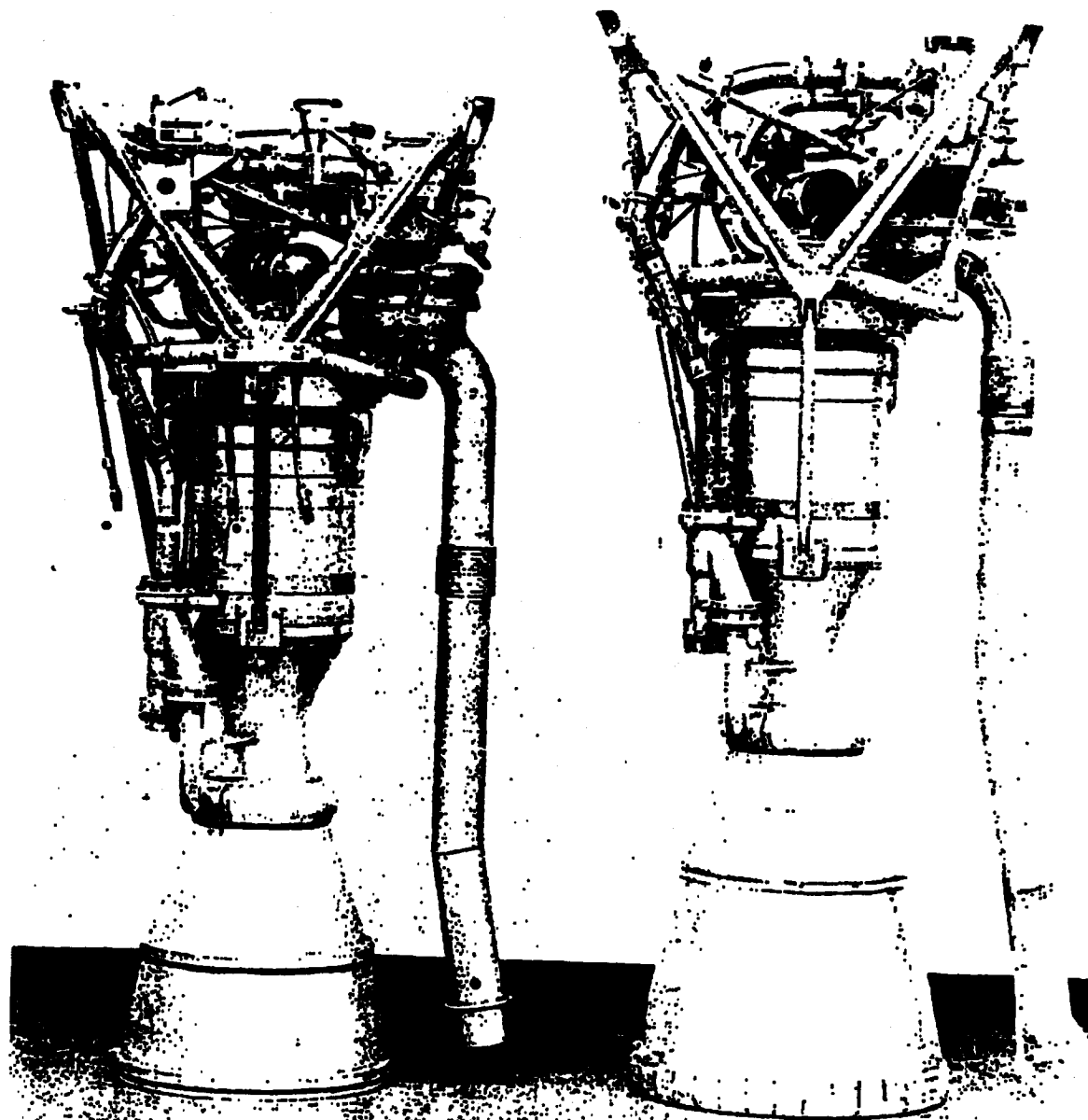
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P3039 MODEL XLR ENGINES - JP4 (LEFT) AND UDMH

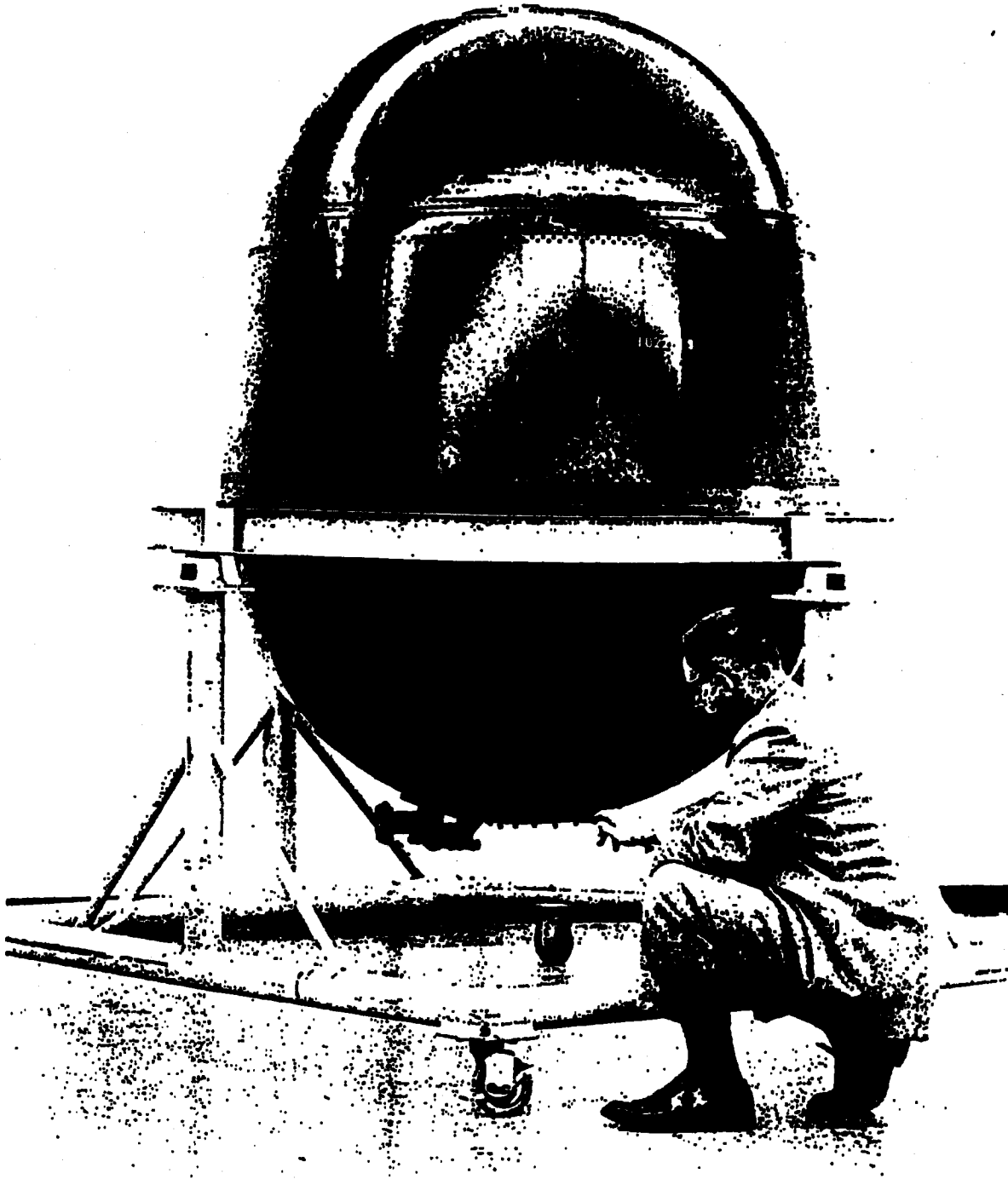
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P 3043 UDMH PROPELLANT TANK

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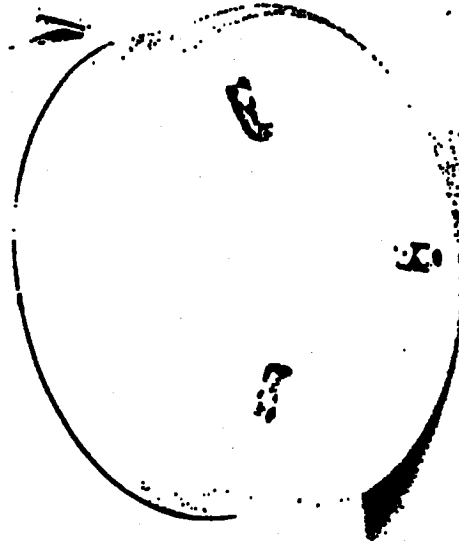
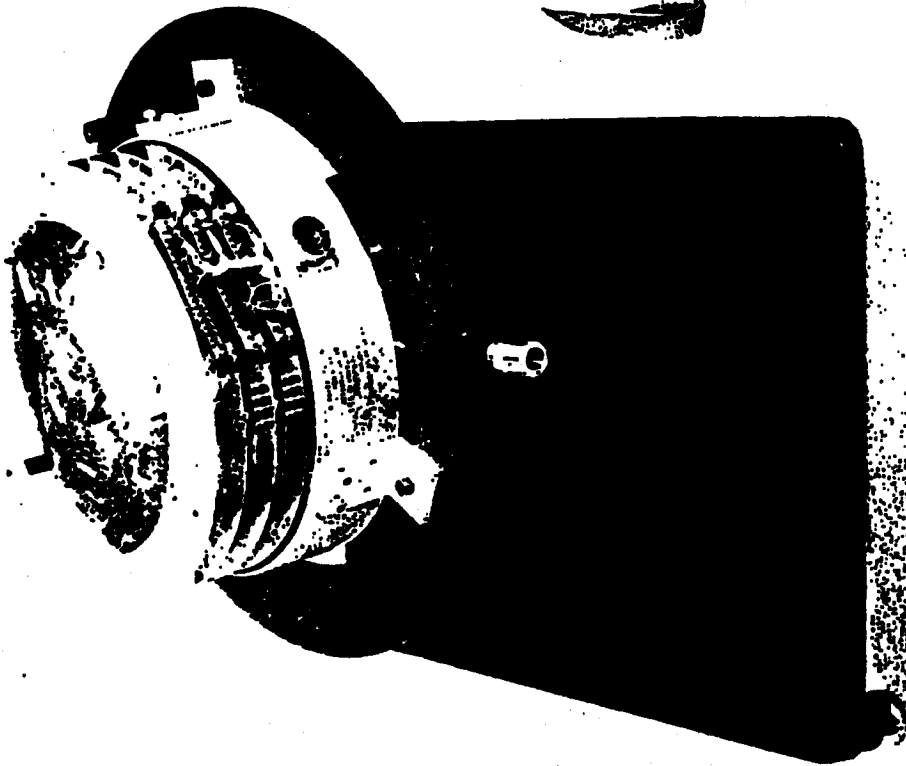
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P-2862 HORIZON SCANNER

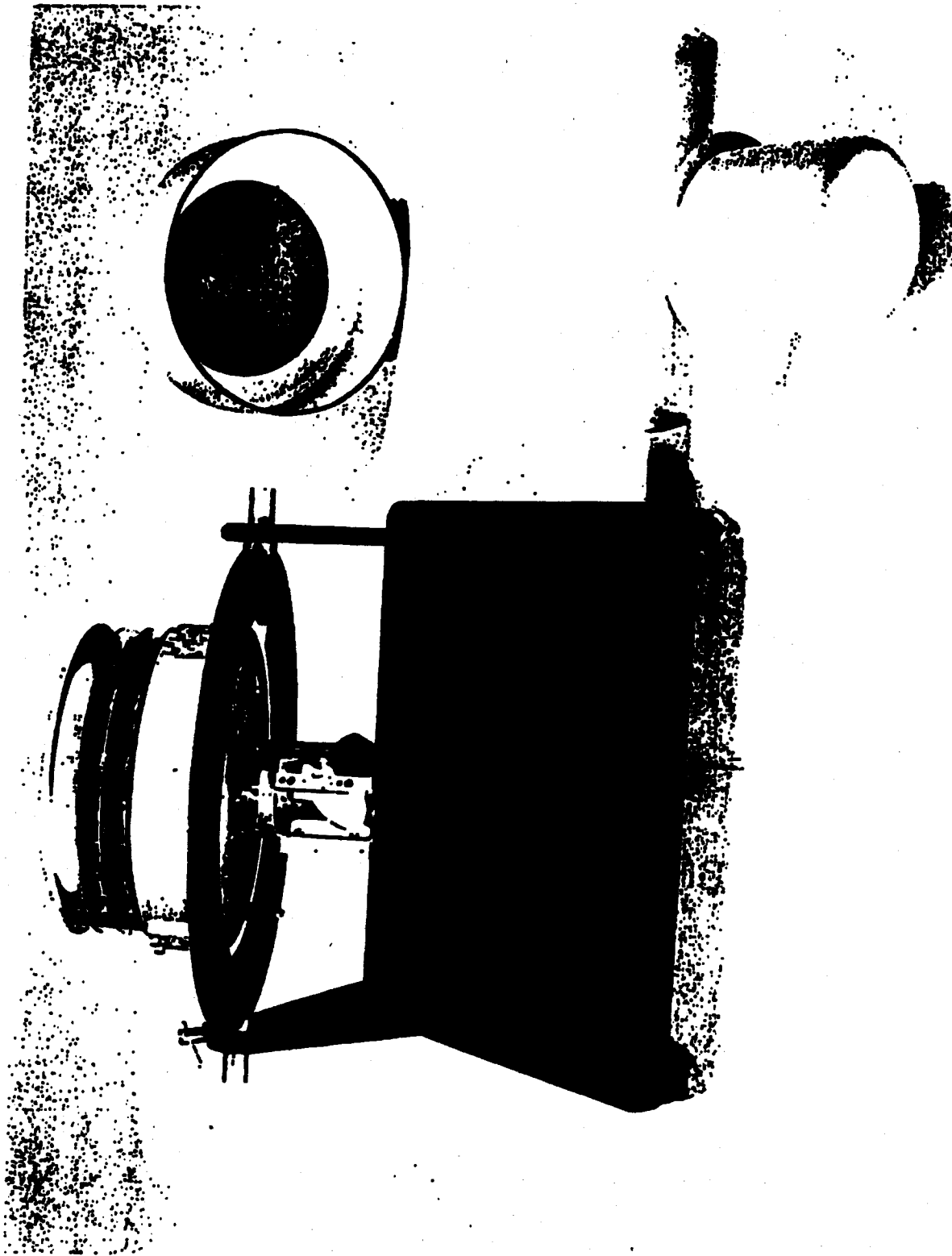
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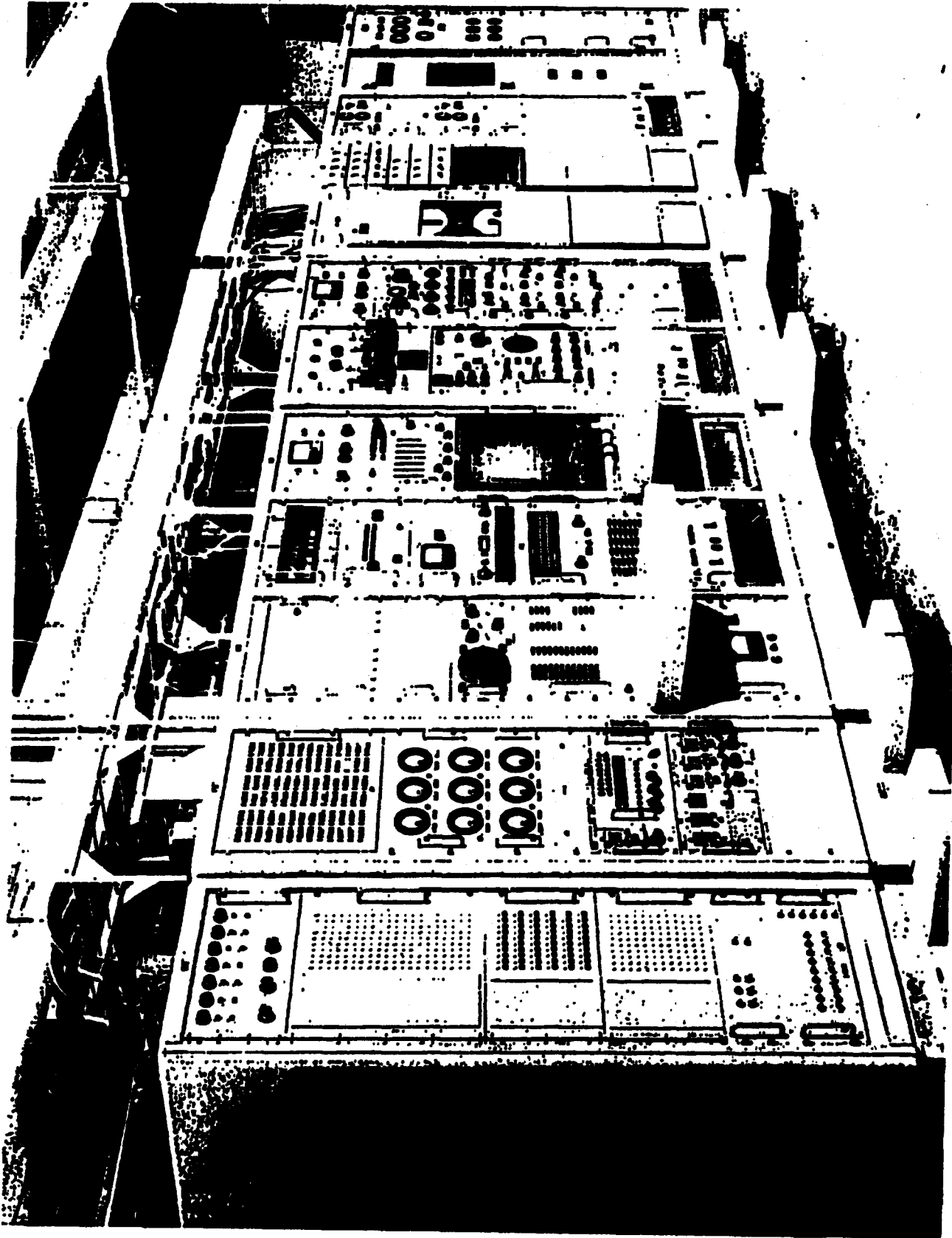
P 2884 HORIZON SCANNER

LOCKHEED AIRCRAFT CORPORATION

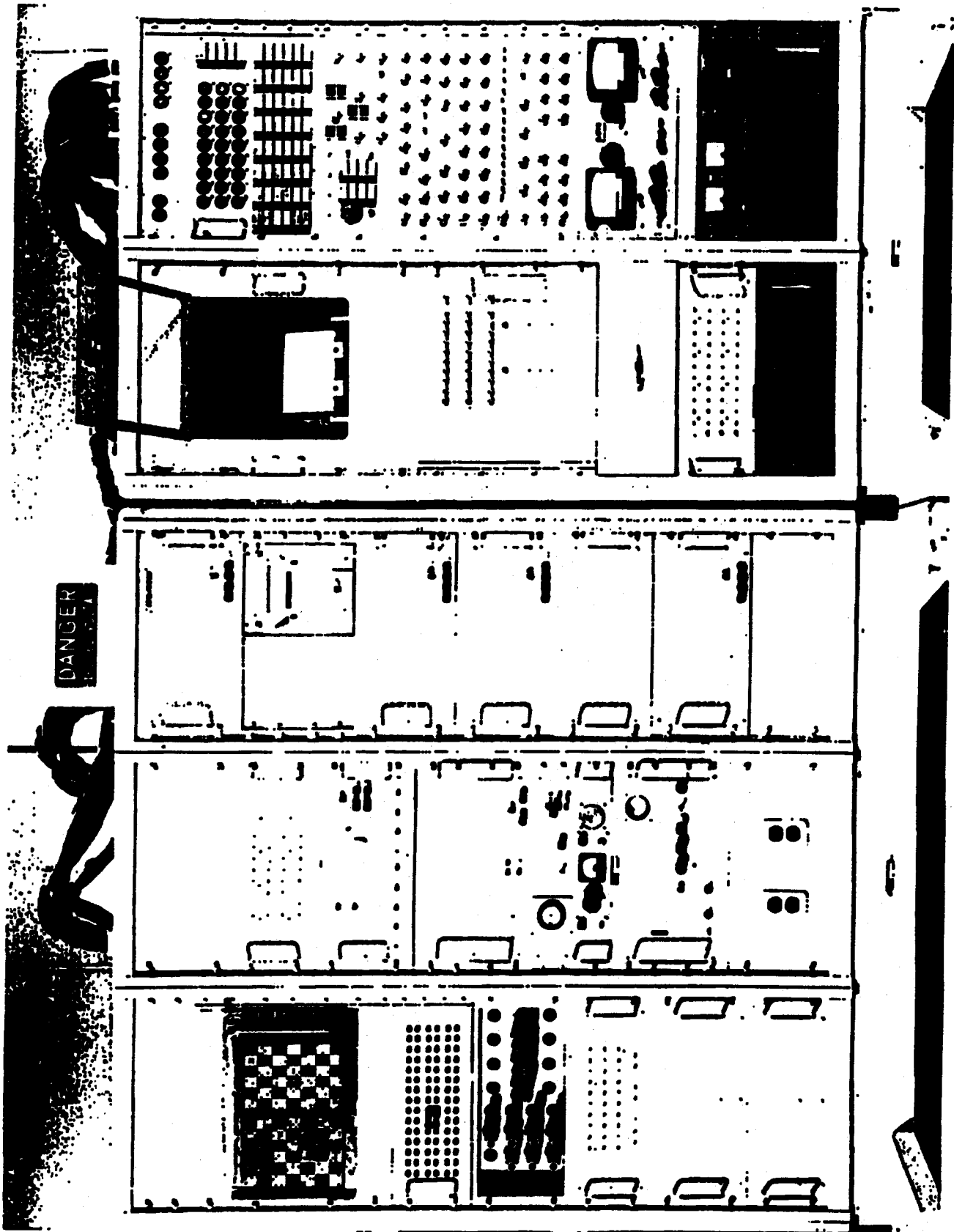
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P 2046 SYSTEMS CHECKOUT COMPLEX (EXCLUDING LACE UNIT)



P-3047 LACE UNIT (SYSTEMS CHECKOUT COMPLEX)

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