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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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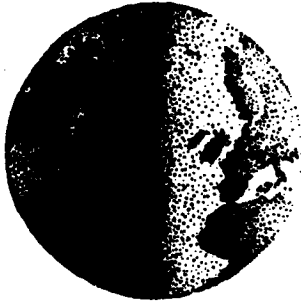
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LMSD-6134

12 AUGUST 1958

COPY NO. 60

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.

117L/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	
	Communications	
	Data Control	
		J. J. Knopow
1430	Break	J. G. Schaub
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	
0930	TV Sensing	C. W. Burrell
1000	Ferret	Peter C. Goldmark
1015	Infrared Detection & Tracking	P. D. Doersam
		J. J. Knopow
1035	Break	
1055	Data Storage	
1125	Propulsion	J. P. Nash
		J. E. Laurance
1200	Lunch	
1300	Other Applications of the Sentry System	
	General Satellite Tracking	} J. Jenkins
	Communications	
1330	Weather	
1345	Scientific Measurements	E. V. Stearns
		F. S. Johnson
1400	Break	
1420	MIS	
1440	AICBM	J. W. Brandon
1500	Summary	S. H. Browne
1520	Conclude	J. H. Carter

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CHART REPRODUCTIONS:

Chart No.

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
P228(1)	WS117L Orbital Test Vehicle Design Parameters - Sustainer Stage
P792	Altitude vs. Payload - Sentry/Thor
P791	Altitude vs. Payload - Sentry/Atlas
P171(3)	WS117L Ground Traces of 83° Orbits

- P232(2) WS117L Vehicle System
- P468(1) WS117L Structural Breakdown
- P422(2) WS117L Propulsion System
- P315(2) WS117L Auxiliary Power Supply
- P162 Advanced Auxiliary Power Systems
- P335(1) WS117L System APU Life Limitations
- P763 Guidance and Control System  
- Typical Sentry Ascent (Thor - Prog. IIA)
- P166(4) Guidance and Control System  
- Typical Sentry Ascent (Atlas - Prog. I)
- P707(1) Sentry Ascent Boost Phase  
- Guidance and Control Functioning Components
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- Guidance and Control Functioning Components
- P164(1) Steady-State Orbital Control System
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- P400 WS117L Visual Reconnaissance System
- P175(4) WS117L Ferret Subsystem - Project Structure
- P182(3) Airborne Reception
- P204(3) ICBM Attack Alarm
- P609(1) ICBM Attack Alarm System  
- Satellite Power Requirements vs. Supply
- P620(1) ICBM Attack Alarm System  
- Vehicle Payload
- P617(2) ICBM Attack Alarm System  
- Operational Ground Base Requirements
- P509(2) Station Locations - Thor
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- P163(2) G-S Communications Intercept Station
- P540 Orbiting Object - Traffic Intelligence
- P654 WS117L Data Control - Reconnaissance Mission
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- P591(4) Flight Missions and Objectives
- P639 WS117L Recovery Orbits
- P621(2) WS117L Recovery Operations
- P577 WS117L Capsule Recovery
- P544(1) WS117L Biomedical Vehicle
- P475 WS117L Aeromedical Recovery Configurations
- P503 WS117L Useful Payload vs. Altitude
- P546 Satellite Weather Missions
- P376(1) WS117L Weather Surveillance
- P545 Types of Weather Data
- P374 Possible Scientific Experiments

**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



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LMSD-6134

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 Unit)

P3047 LACE Unit (Systems Checkout Complex)

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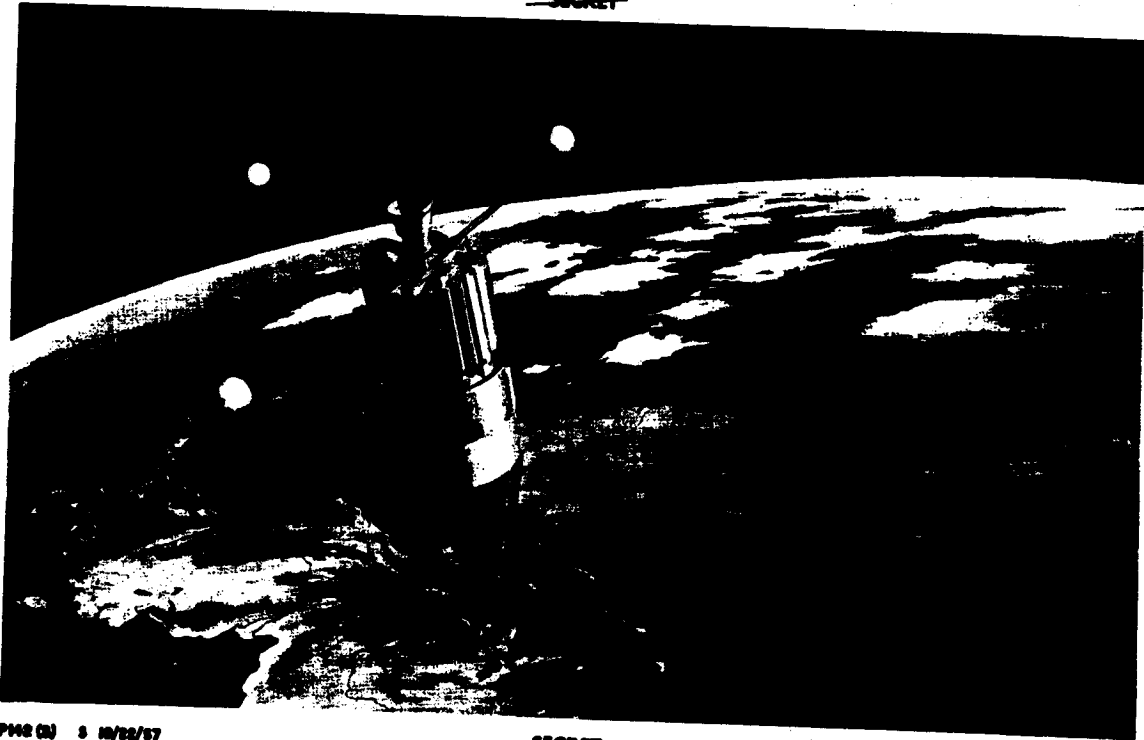
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# ADVANCED RECONNAISSANCE

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MISSILE SYSTEMS DIVISION

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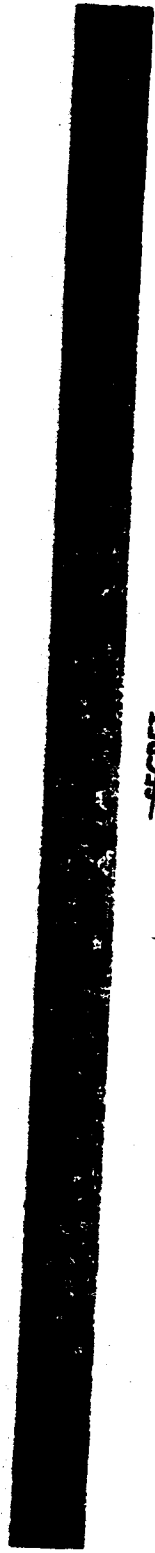
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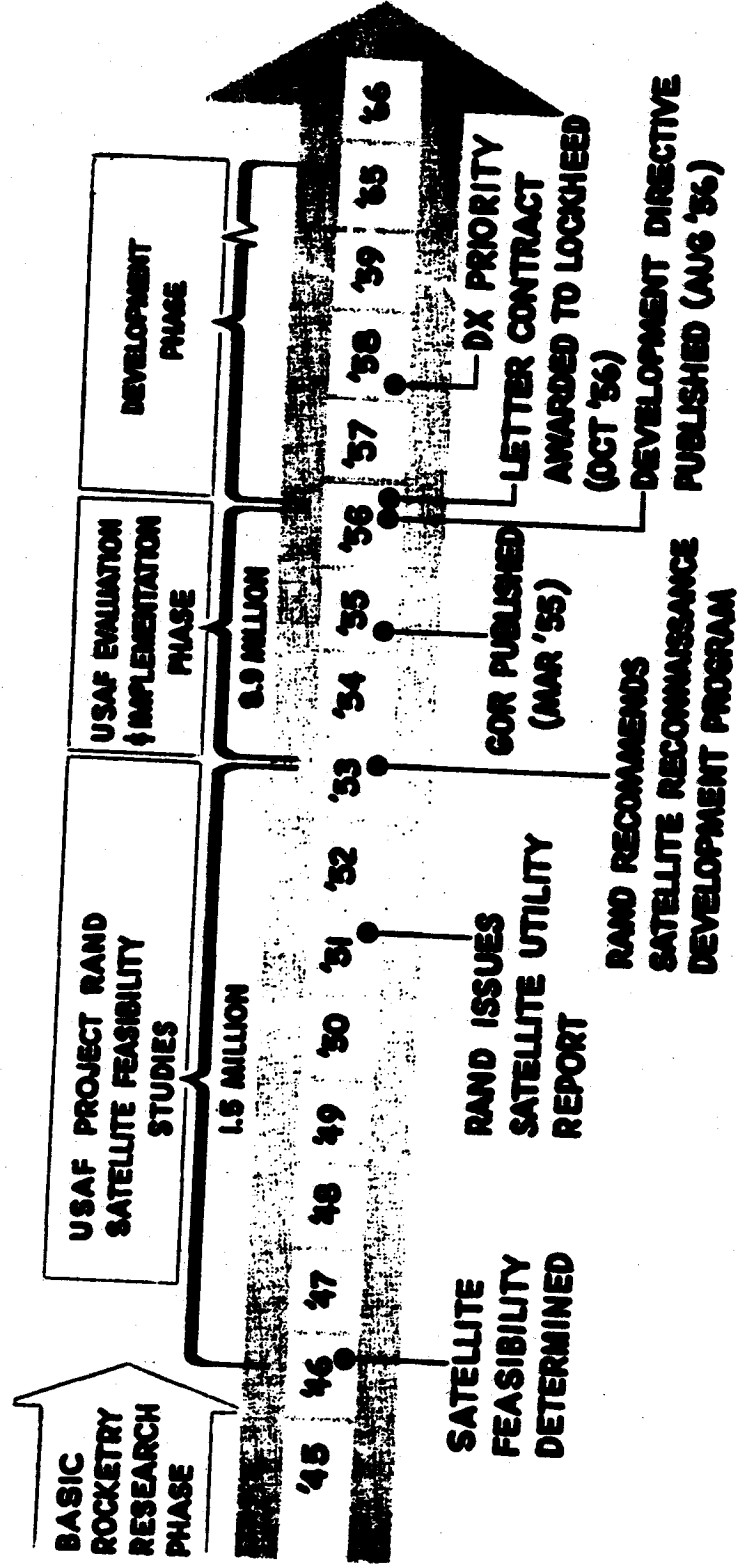
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# SENTRY OPERATIONAL OBJECTIVES

## VISUAL RECONNAISSANCE

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

\* OPEN SKY NATIONAL OBJECTIVES

- NUCLEAR DETONATION DETECTION
- WEATHER OBSERVATION

## 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 6/8/58

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**MAJOR DEVELOPMENT OBJECTIVES**

**PROGRAM TITLE**

- I. ENGINEERING PROTOTYPE DEVELOPMENT & TESTS
- II. PIONEER VISUAL RECONNAISSANCE
  - PLACE STABILIZED SATELLITES ON ORBIT AT 300 S.M. ALTITUDE TEST RECONNAISSANCE PAYLOAD AND GENERAL SYSTEM OPERATIONS
  - PROVIDE SMALL SCALE PHOTOGRAPHIC COVERAGE OF USSR SATELLITE BORING FILM PROCESSING; VIDEO TRANSMISSION OF PHOTO IMAGES 100 FT. X 100 MILE PHOTO STRIP PER PASS AVERAGE 100 FT. RESOLUTION 1 MILE TARGET LOCATION ACCURACY
  - PLACE SATELLITES ON POLAR ORBIT. INCORPORATE RECOVERABLE CAPSULE IN SELECTED SATELLITES FOR BIOMEDICAL RESEARCH PURPOSES.
  - INTERCEPT USSR ELECTROMAGNETIC EMISSIONS IN THE 20-10,000 MGS SPECTRUM RECEIVE AND MEASURE BASIC SIGNAL PARAMETERS; 50-100 MILE LOCATION ACCURACY SORT KNOWN SIGNALS FROM UNKNOWN SIGNALS PROVIDE GUIDANCE FOR DESIGN OF ADVANCED FERRET EQUIPMENTS
  - PROVIDE HIGH RESOLUTION PHOTOGRAPHS OF SPECIFIC GROUND TARGETS 17 MILE SWATH WIDTH 20 FT. RESOLUTION 1/2 MILE TARGET LOCATION ACCURACY
  - MORE ACCURATELY DETERMINE PARAMETERS OF ELECTRONIC SIGNALS FREQUENCY RANGE: 30-6,000 MC
- IIA. EARLY ACHIEVEMENT OF ORBITAL CAPABILITY TEST CAPSULE RECOVERY SYSTEM
- III. PIONEER FERRET RECONNAISSANCE
- IV. ADVANCED VISUAL RECONNAISSANCE
- V. ADVANCED FERRET RECONNAISSANCE
- VI. VISUAL SURVEILLANCE
  - SIMILAR TO PROGRAM IV, BUT USING:
    - LONG DURATION POWER SUPPLY
    - MULTIPLE VEHICLES
    - HIGHER RESOLUTION
    - HIGH SPEED GROUND TRANSMISSION OF DATA
  - POSSIBLY SUBSTITUTE TV WITH TAPE RECORDING FOR FILM
- VII. INFRARED SURVEILLANCE
- VIII. FERRET SURVEILLANCE
  - PROVIDE SATELLITE SYSTEM TO FURNISH INSTANTANEOUS WARNING OF AN ICBM ATTACK LATER SATELLITE SYSTEM TO PROVIDE PRECISION AUCM DETECTION-PREDICTION DATA
  - SIMILAR TO PROGRAM V, BUT USING:
    - MULTIPLE FUNCTIONS AND FLEXIBILITY
    - EMPLOYS MULTIPLE VEHICLES
    - LONG DURATION POWER SUPPLY
    - IMMEDIATE WARNING OF HOSTILITIES WARNING

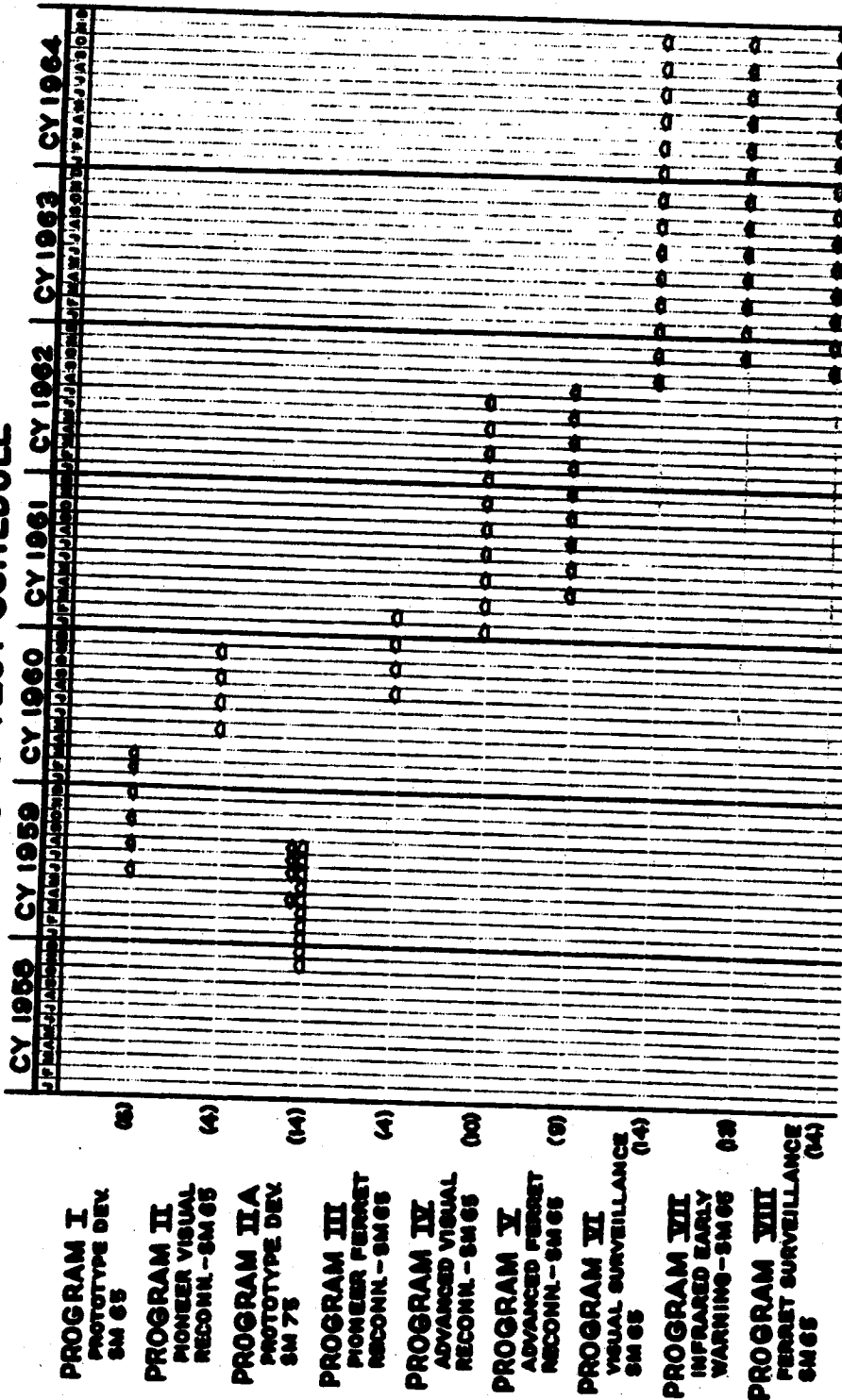
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WD-56-00776

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Missile Systems Division

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### # FLIGHT TEST SCHEDULE



P257 (3)-9/23/59  
WD-56-02843

# WS 117L STATEMENT OF WORK, AFBMO, 16 APRIL 1958  
AS AMENDED 7 JULY 1959

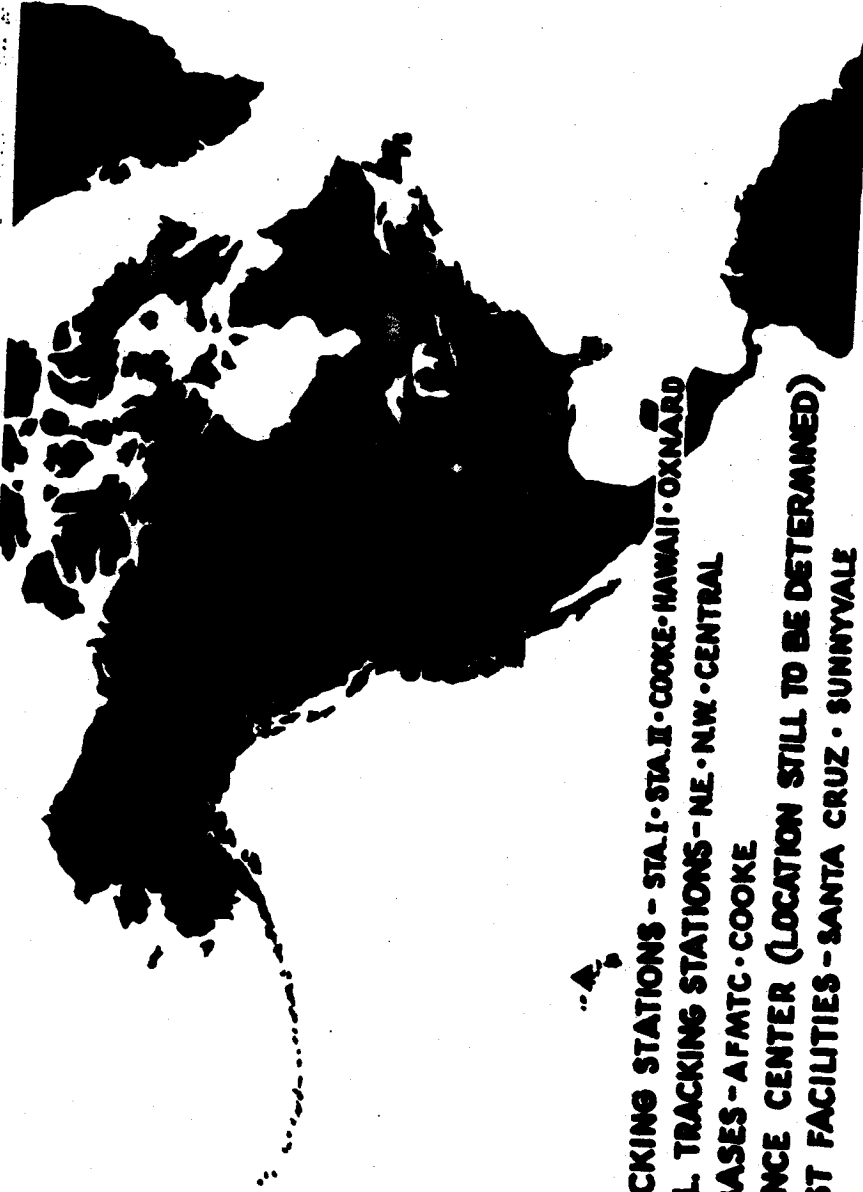
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MISSILE SYSTEMS DIVISION

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# SENTRY FACILITIES



## LEGEND

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

P102 (S) 90 9/2/88  
WD-86-02845

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# SENTRY PAYLOAD - DEFINED

## 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-50-0183

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UNCLASSIFIED

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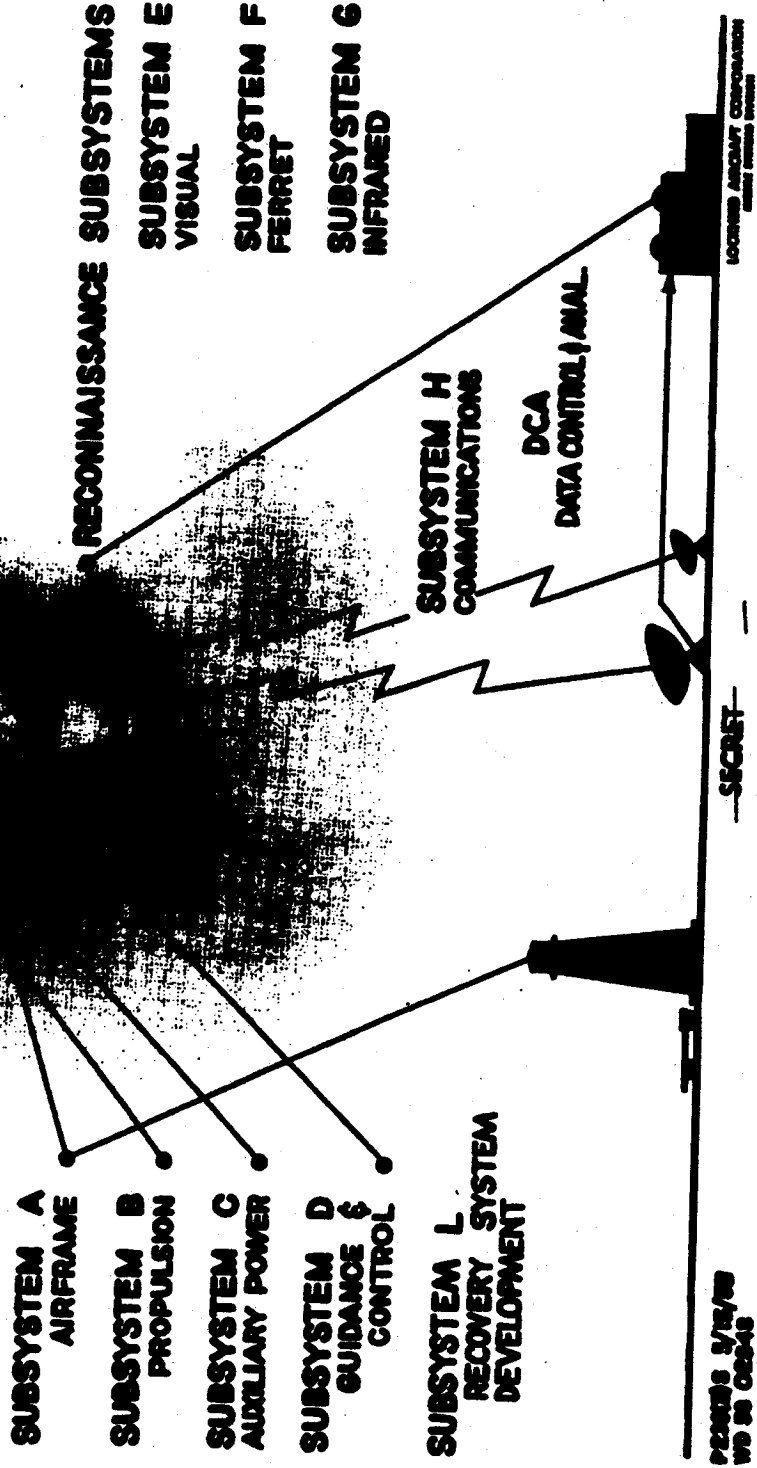
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**MISSILE SUBSYSTEMS**



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# WSIITL 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
- AEROMET-GENERAL CORP

#### AUXILIARY POWER

- SONOTONE CORP
- EAGLE-PICHER CO
- ENGINEERED MAGNETICS
- HOFFMAN ELECTRONICS CORP
- BIECHCRAFT 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
- AMPLEX CORP

#### FERRET

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

#### INFRARED RECONN.

- EASTMAN KODAK CO
- SAIRD ATOMIC CO
- AEROMET-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

- AEROMET-GENERAL CORP
- RALPH E. PARSONS CO

#### GROUND SUPPORT EQUIP

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

#### BIO MEDICAL CAPSULE

- GENERAL ELECTRIC CO
- ALL AMERICAN ENGINEERING CO

### ASSOCIATE CONTRACTORS

#### BOOSTERS

- DOUGLAS A/C CORP (8M-78)
- CONVAIR AERONAUTICS (8M-88)

#### GUIDANCE & CONTROL

- INSTRUMENTATION LAB., MIT
- GENERAL ELECTRIC CO.

#### AUXILIARY POWER

- THE MARTIN CO.
- ATOMICS INTERNATIONAL

#### DATA PROCESSING

- RAMO-WOOLDRIDGE CORP

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P288 (P) S. 8/4/68  
WD-58-02843

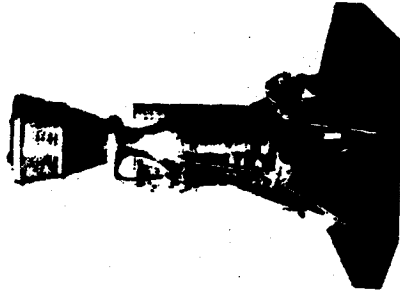
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Missile Systems Division

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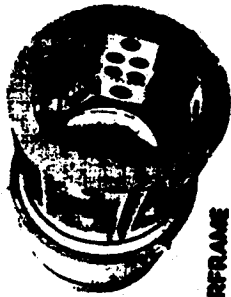


FUNCTIONAL  
MOCK UP

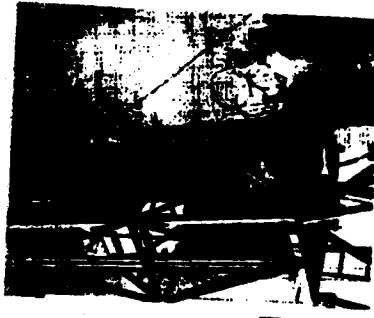


BELL ENGINE

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MISSILE SYSTEMS DIVISION



AIRFRAME



PROPULSION  
CHECK OUT



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MOCK UP



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WD-58-06485

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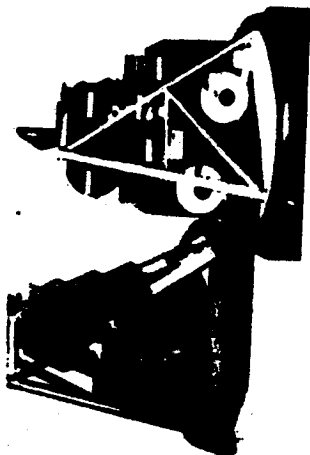
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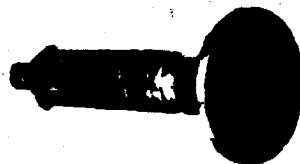
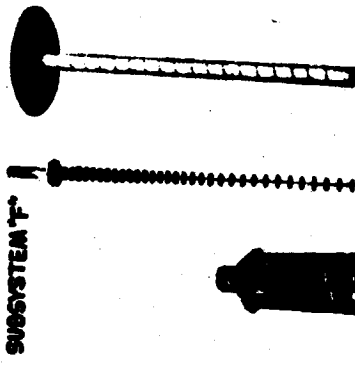


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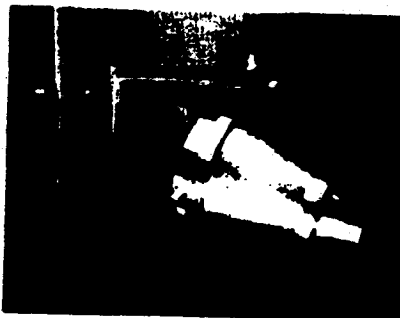


SUBSYSTEM 'E'

SUBSYSTEM 'F'



SUBSYSTEM 'G'



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WD-58-03455

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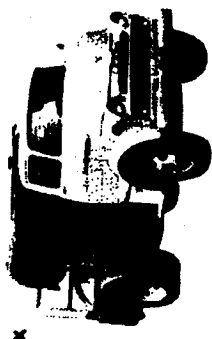
FUEL DUMP TRAILER



ACID DUMP TRAILER



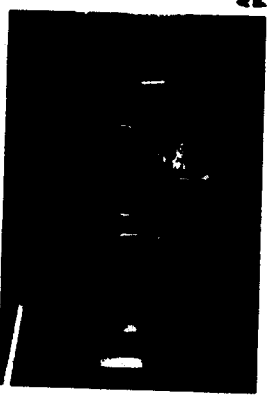
ENGINE THRUST CHAMBER FLUSHING



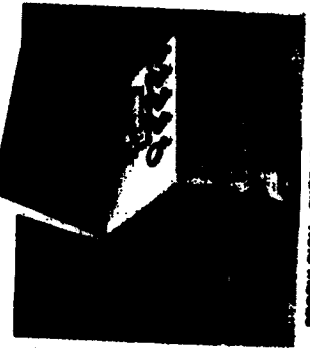
FUEL TRUCK



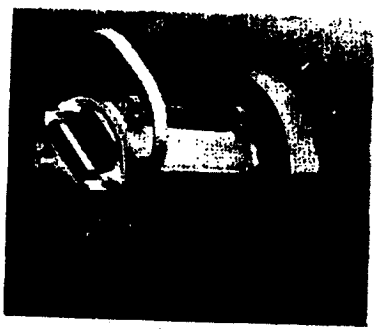
ENGINE FLUSHING TRAILER



ACID TRAILER AND FLUSHING TRUCK



PROPULSION CHECKOUT CONSOLE  
MODIFIED BELL UNIT



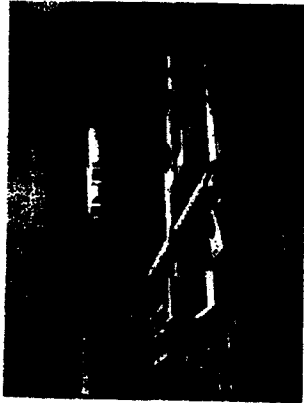
URM LOADER

P. 568 GSE 6/3/58  
WD-88-03488

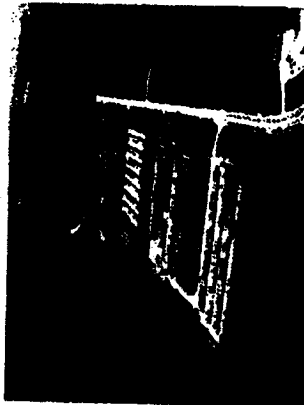
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MISSILE SYSTEMS DIVISION



**VAN NUYS  
AIRFRAME FABRICATION**



**SUNNYVALE  
COMPONENT ASSEMBLY**



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



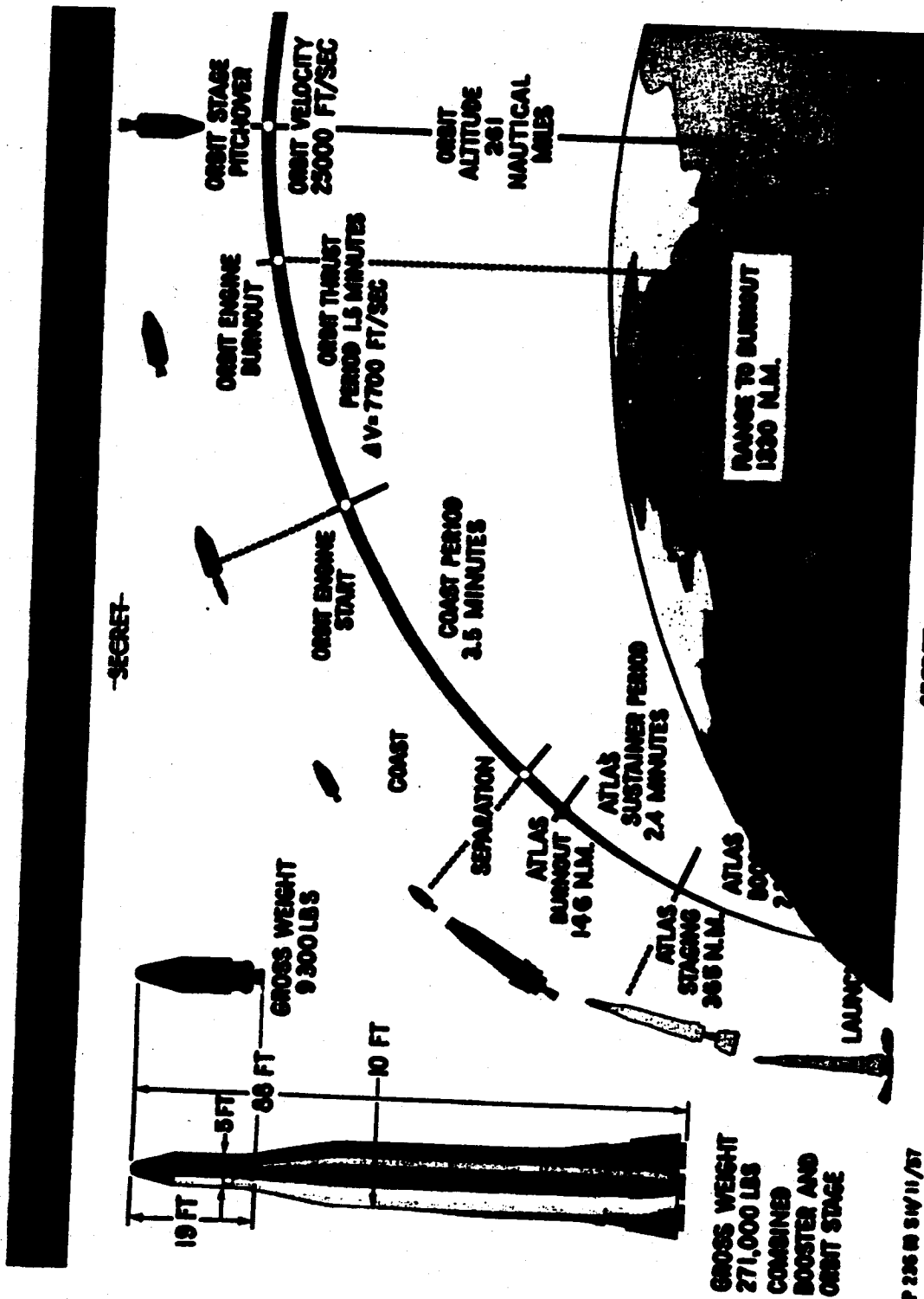
**SANTA CRUZ  
HAZARDOUS TEST FACILITY**

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

**P 565 30 6/2/58  
WD-56 09455**

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MISSILE SYSTEMS DIVISION**

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GROSS WEIGHT  
271,000 LBS  
COMBINED  
BOOSTER AND  
ORBIT STAGE

P 236 08 514 11/57

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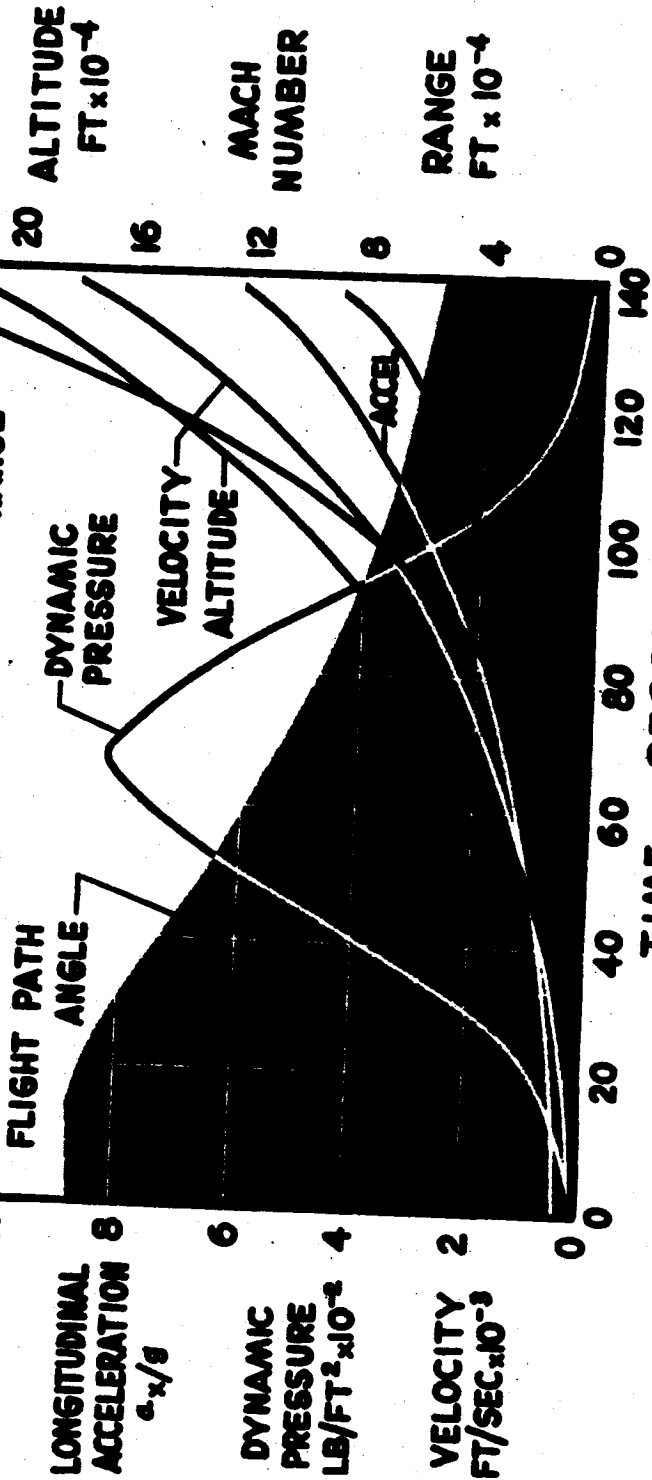
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# BOOSTER STAGE

GROSS WT @ LAUNCH 271,163 LB      BOOSTER PAYLOAD 9,300 LB

273,000 @ BURNOUT

RANGE



P 229 (U) 89-A 3/27/56  
WD-56-01388

LOCKHEED AIRCRAFT CORPORATION  
MARIETTA, GEORGIA

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LOCKHEED AIRCRAFT CORPORATION

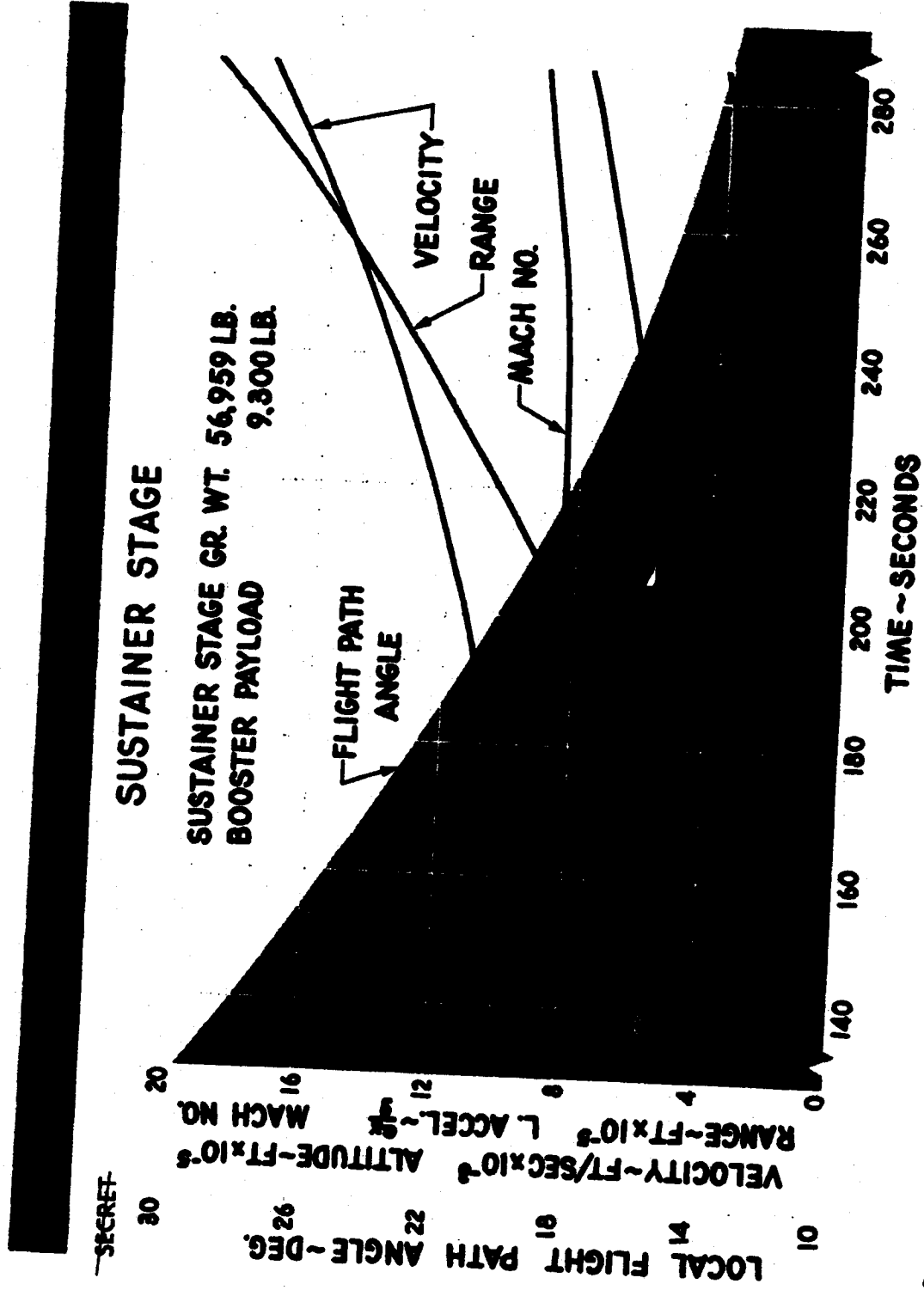
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P 228 (1) 867A 3/20/58  
WD-58-01886

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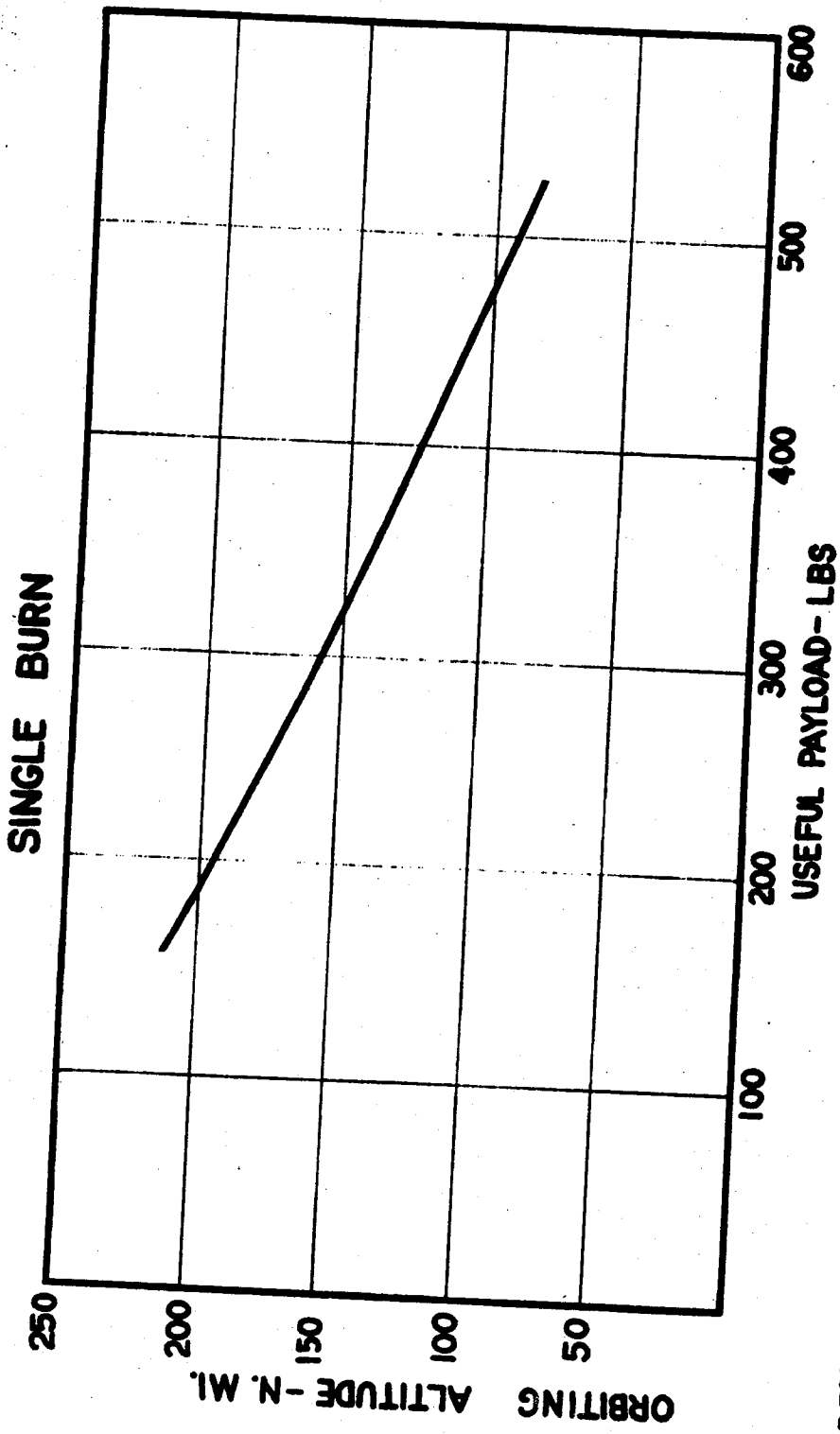
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# ALTITUDE VS. PAYLOAD-SENTRY/THOR



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9/8/58

P 792  
WD-58-08183

LOCKHEED AIRCRAFT CORPORATION

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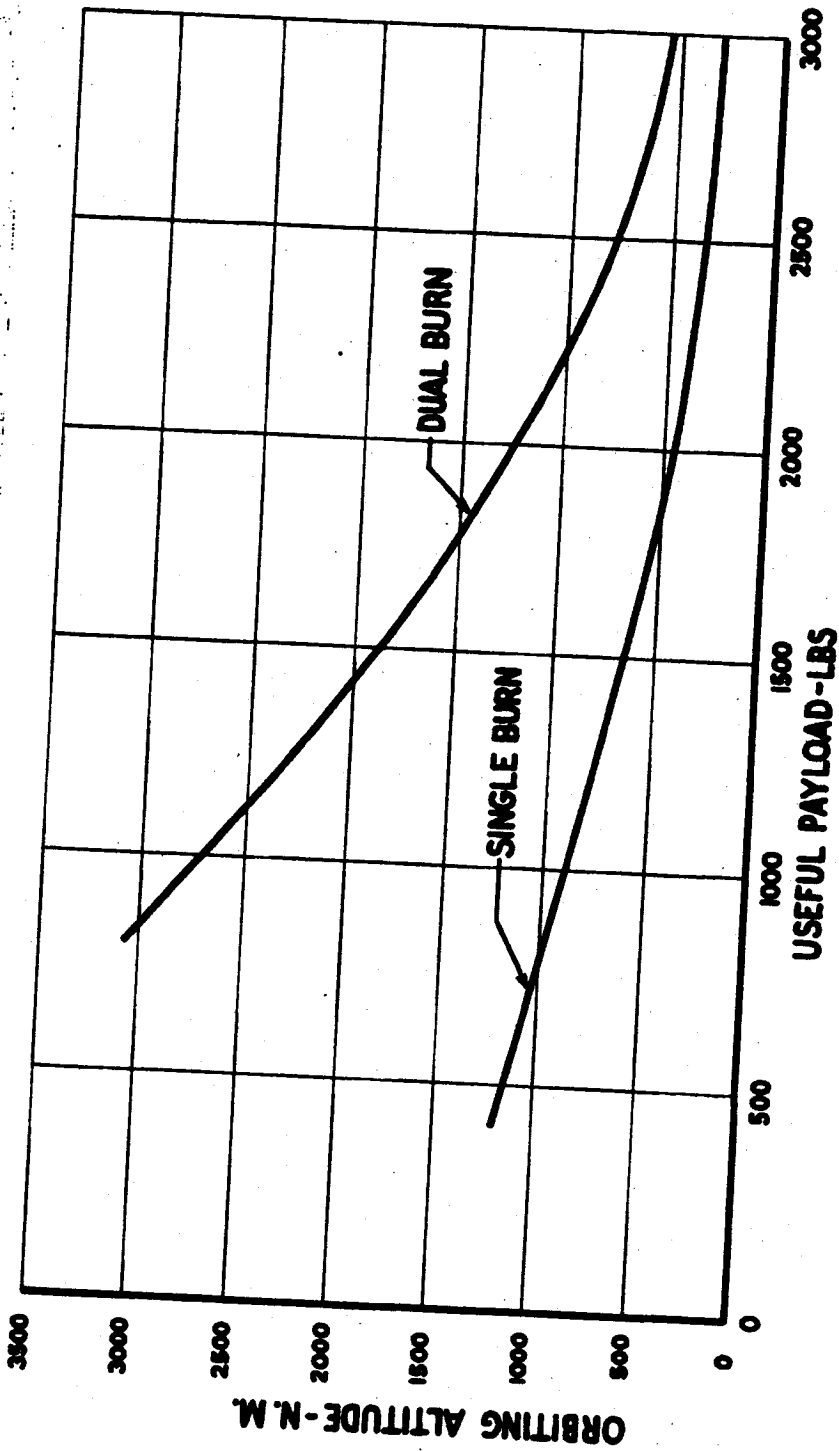
MISSILE SYSTEMS DIVISION

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# ALTITUDE VS PAYLOAD - SENTRY/ATLAS

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8/8/58

P 791  
WD-39-05183

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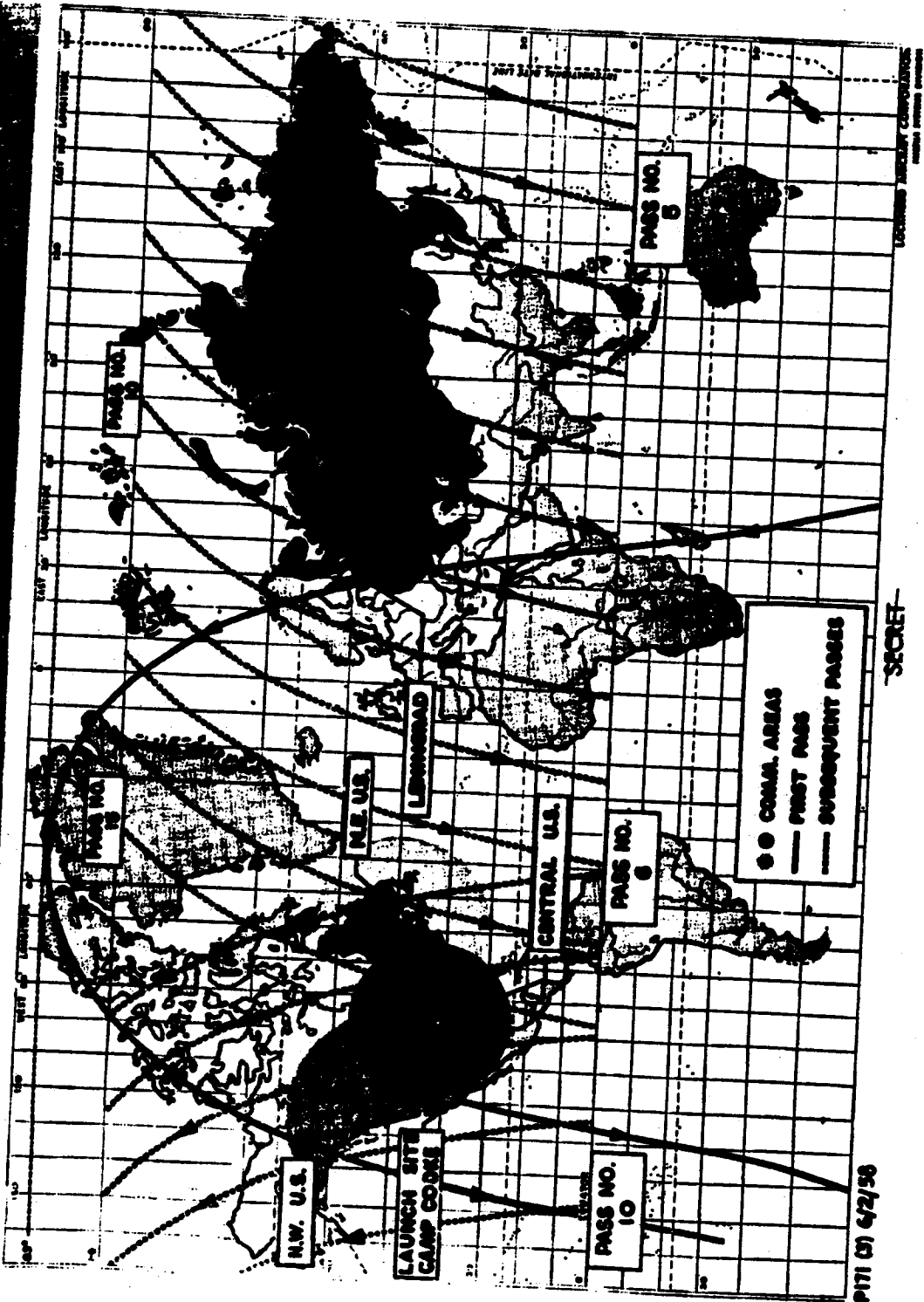
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**VISUAL RECONNAISSANCE MODEL**

ENGINE GIMBAL LIMITS 5°  
SQUARE PATTERN  
ENGINE-BELL AIRCRAFT  
THRUST 15,000LB ALL  
180 263 SEC.  
NOZZLE EXPANSION RATIO 15:1

N<sub>2</sub> GAS STORAGE FLASK  
3000 PSI

VISUAL RECONNAISSANCE SYSTEM  
CAMERA PACKAGE (EKC)  
PHOTO, PROCESS, STORAGE,  
ELECTRONIC READOUT

CAMERA LENS SHIELD

NOSE (JETTISONS)

ATTITUDE ROLL AND  
REDIRECTION CONTROL  
GAS JETS (6)

AUXILIARY POWER  
SOURCE (BATTERIES)

FUEL TANK  
JP-4 60 PSI

OXIDIZER  
TANK (IRFNA)  
60 PSI

He GAS STORAGE FLASK (2)  
PROPELLANT TANK  
PRESSURIZATION 3000 PSI

SUBSYSTEM ELECTRONICS COMPARTMENT  
AND CAMERA SUPPORT STRUCTURE  
(GUIDANCE, CONTROL, ETC.)

REMOVABLE NOSE FAIRING

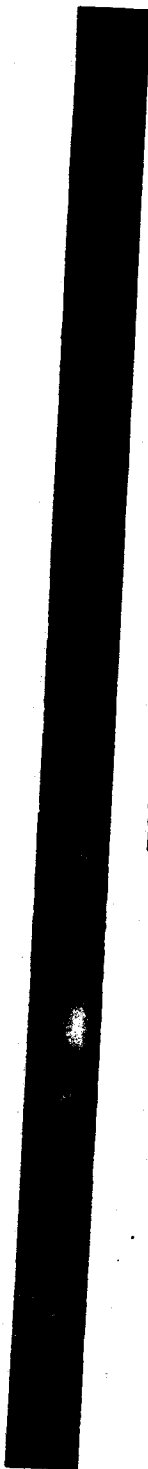
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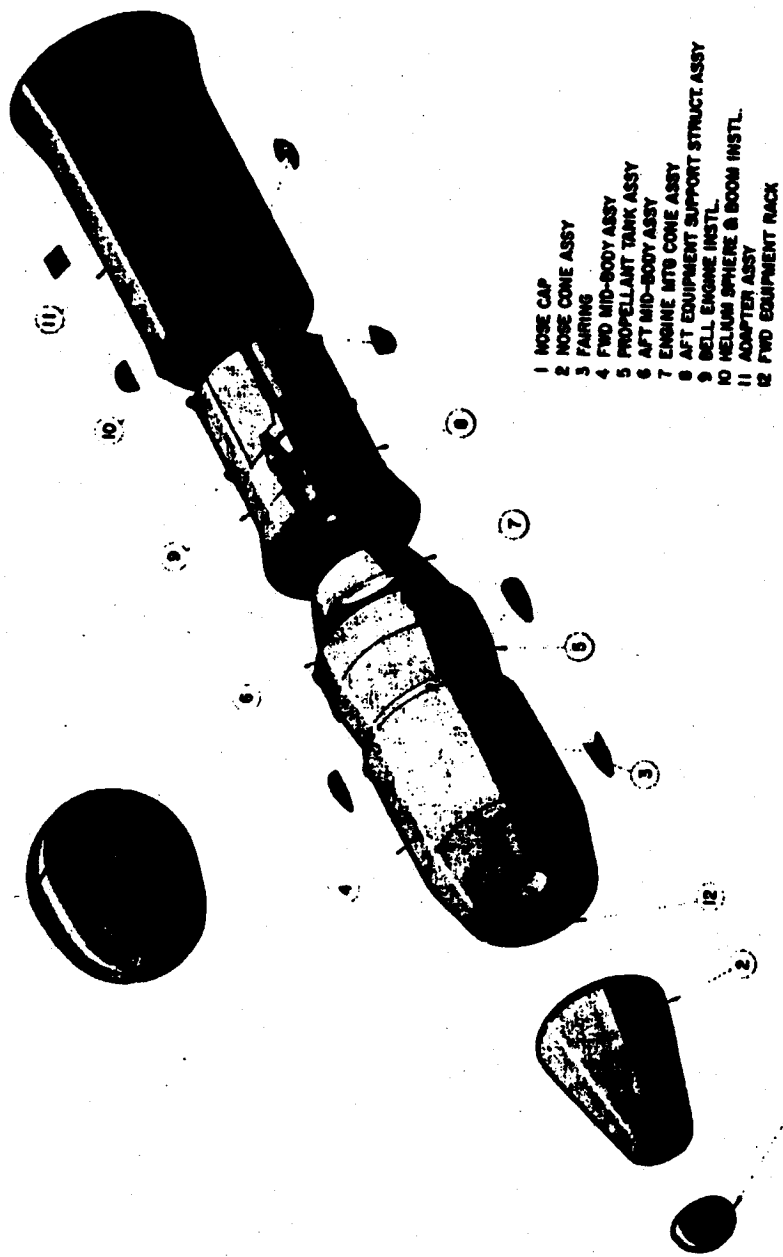
P232 (2) 86A 5/20/68  
WD-58-00776

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MISSILE SYSTEMS DIVISION

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MISSILE SYSTEMS DIVISION

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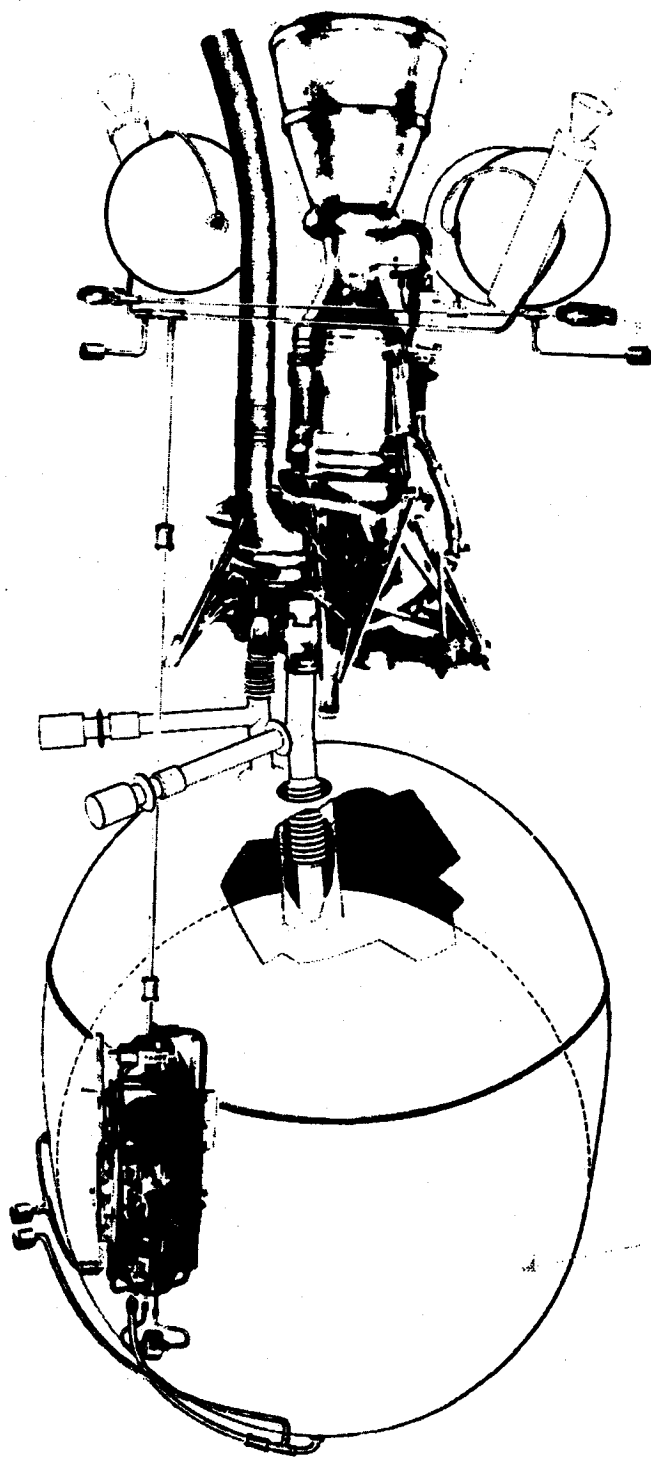
P 468 (1) 887A 6/13/58  
WD-58 -03455

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ULLAGE ROCKETS

CONTROL JETS  
NITROGEN SUPPLY

JP4

IRFNA

P-422 (2) 85°8' 3/21/58  
WD-58-01388

# 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

P 315 (R) 66 "C" 3/13/66



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MISSILE SYSTEMS DIVISION

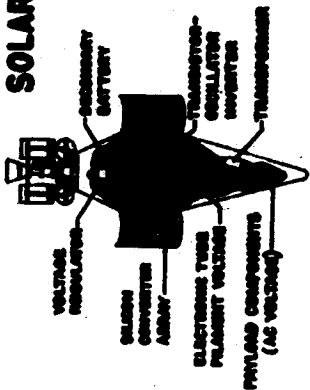


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[REDACTED]

**SOLAR**



**CHARACTERISTICS**

- (1) 5% CONVERSION EFFICIENCY (10-15 WATTS/FT<sup>2</sup>)
- (2) NICKEL CADMIUM RECHARGE BATTERY OF 10 WATT-HRS/LB ~2000 CYCLE LIFE
- (3) POWER SYSTEM LIFE LIMITED BY BATTERY RECHARGE EFFICIENCY
- (4) TRANSPORT AND STORAGE CHARACTERISTICS AT NORMAL TEMPERATURES, NO HAZARDOUS MATERIALS, NO VIBRATION, NO CORROSIVE GASES, NO TOXIC GASES



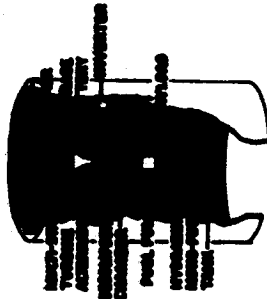
**ISOTOPE**

[REDACTED]

PAGE 4/10/57

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**CHEMICAL (POWER SOURCE)**

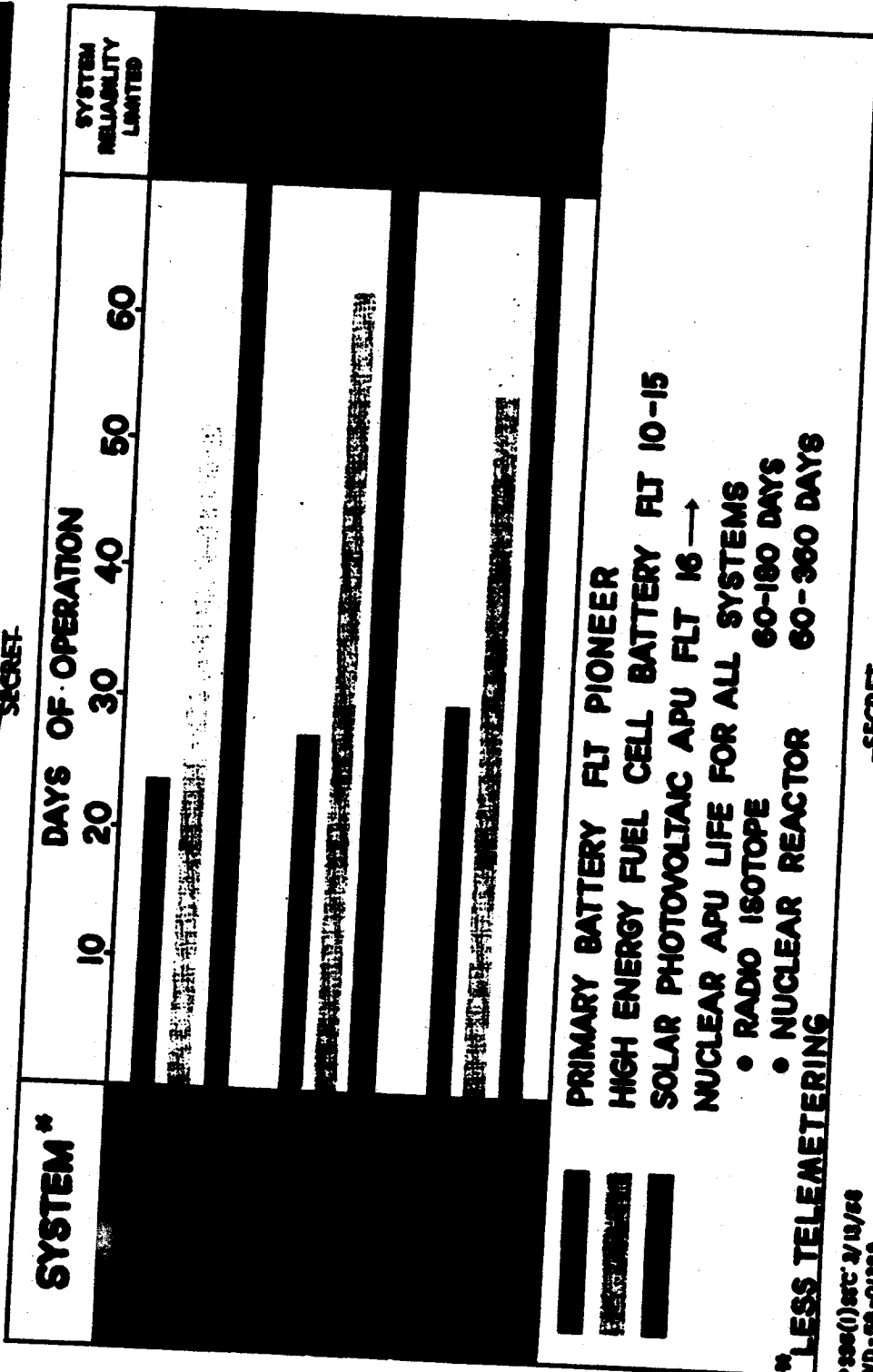


**CHARACTERISTICS**

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

LOCKHEED AIRCRAFT CORPORATION MISSILE SYSTEMS DIVISION

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PRIMARY BATTERY FLT PIONEER  
 HIGH ENERGY FUEL CELL BATTERY FLT 10-15  
 SOLAR PHOTOVOLTAIC APU FLT 16 →  
 NUCLEAR APU LIFE FOR ALL SYSTEMS  
 • RADIO ISOTOPE 60-180 DAYS  
 • NUCLEAR REACTOR 60-360 DAYS

\* LESS TELEMETERING

P 388(1) s/c: 2/15/68  
WD-58-01366

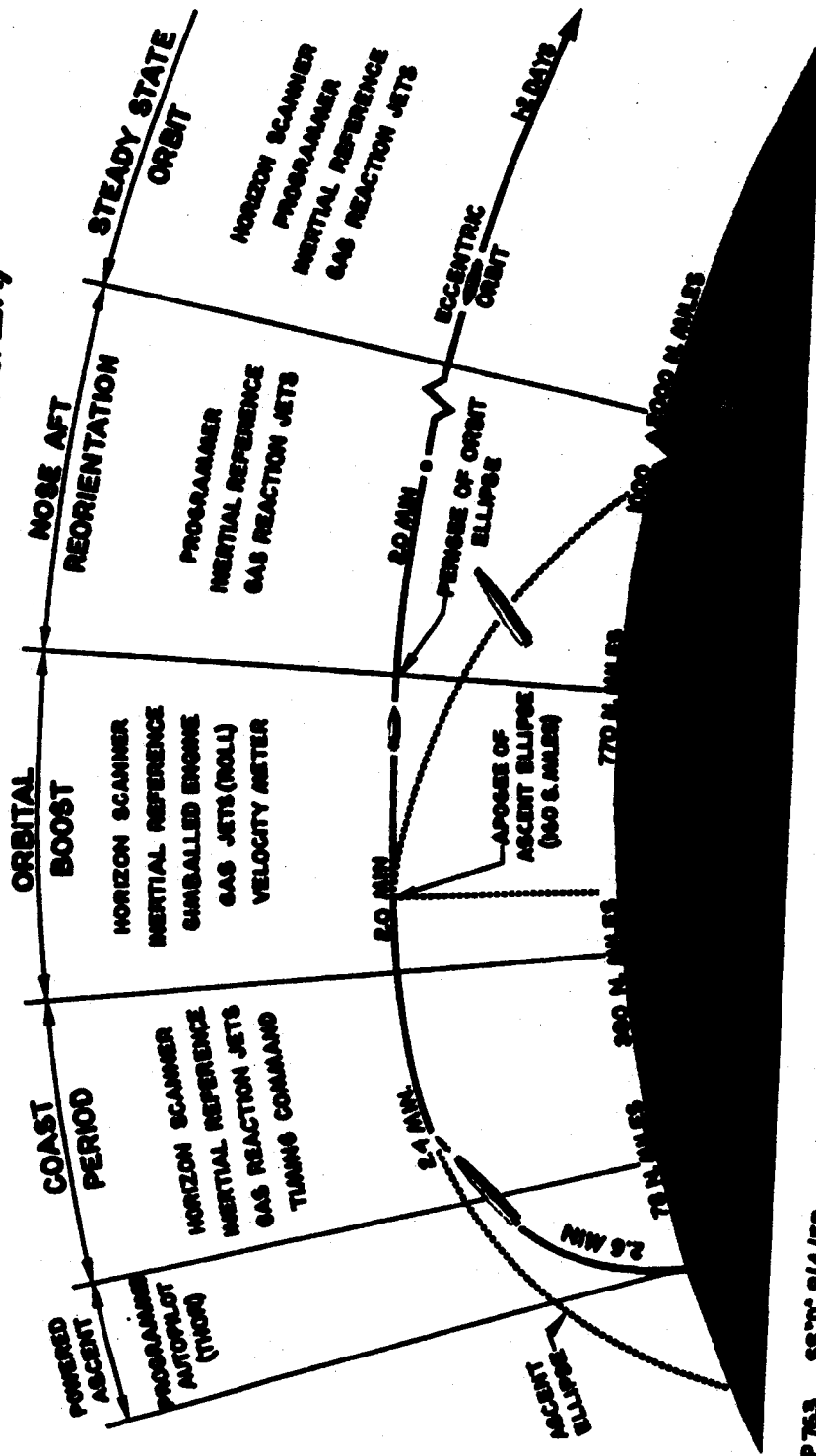
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MISSILE SYSTEMS DIVISION

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# GUIDANCE & CONTROL SYSTEM

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



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P 763 88°D' 8/4/58  
WD-58-05183

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# GUIDANCE & CONTROL SYSTEM

## TYPICAL SENTRY ASCENT (ATLAS-PROG I)

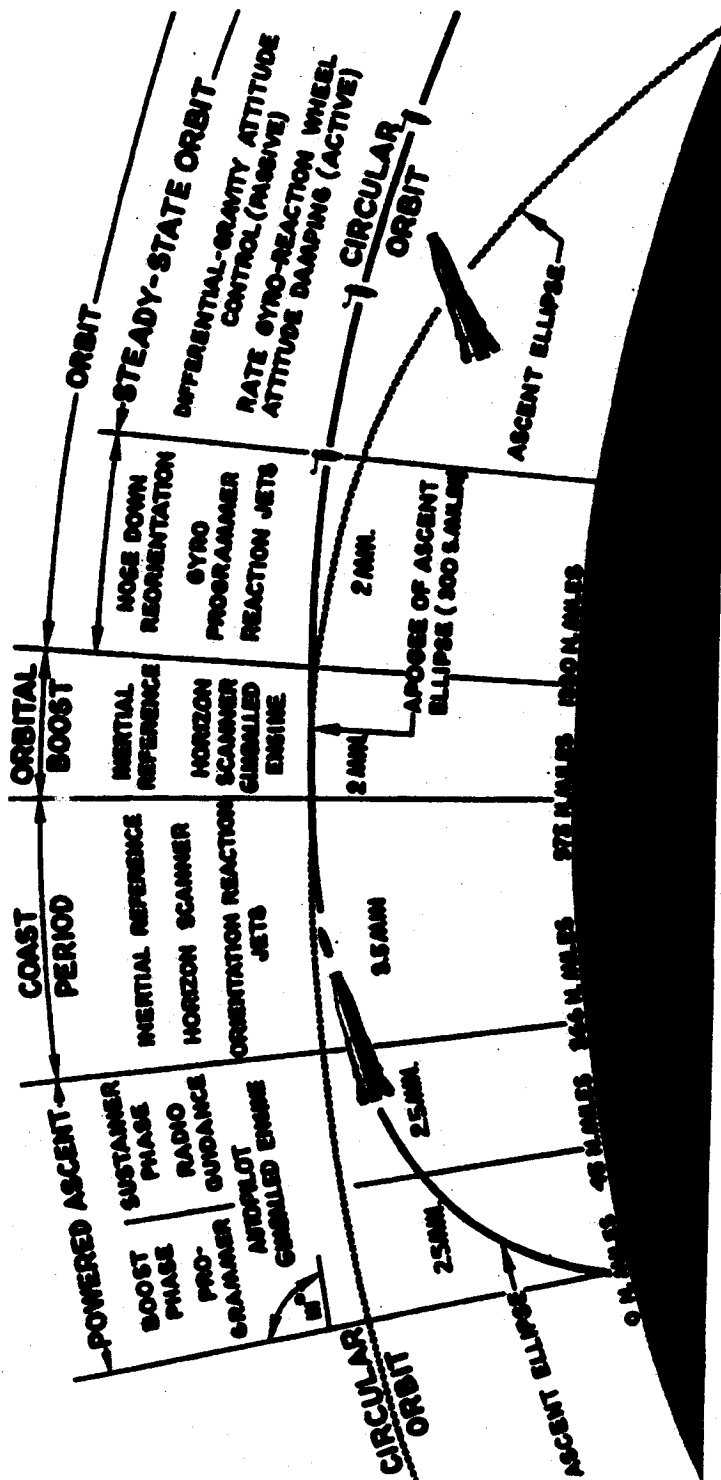
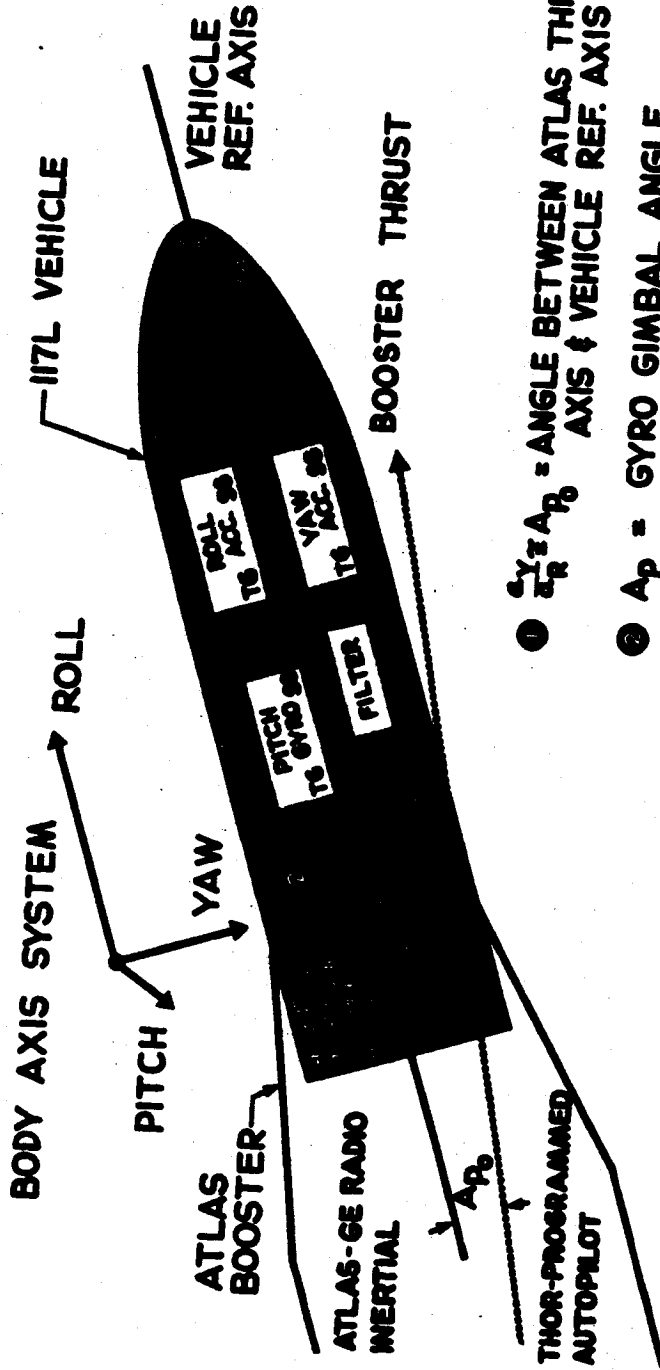


FIG (4) 95'D' 9/4/58  
WD-58-08183

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**SENTRY ASSEMBLY**

**GUIDANCE & CONTROL FUNCTIONING COMPONENTS**

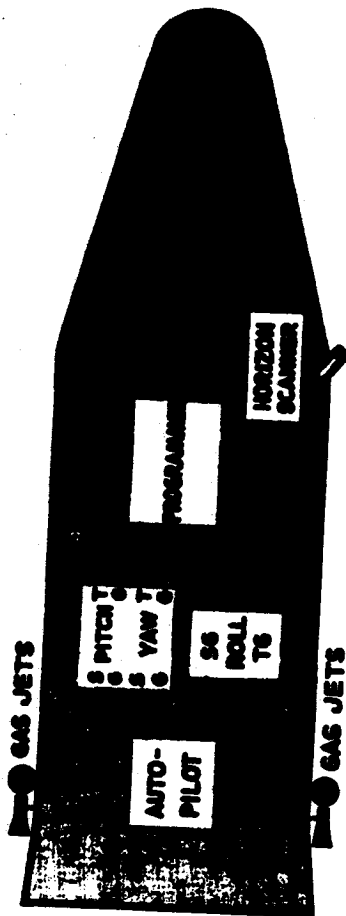


- ①  $\frac{C_y}{C_R} A_p$  = ANGLE BETWEEN ATLAS THRUST AXIS & VEHICLE REF. AXIS
- ②  $A_p$  = GYRO GIMBAL ANGLE

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# 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.

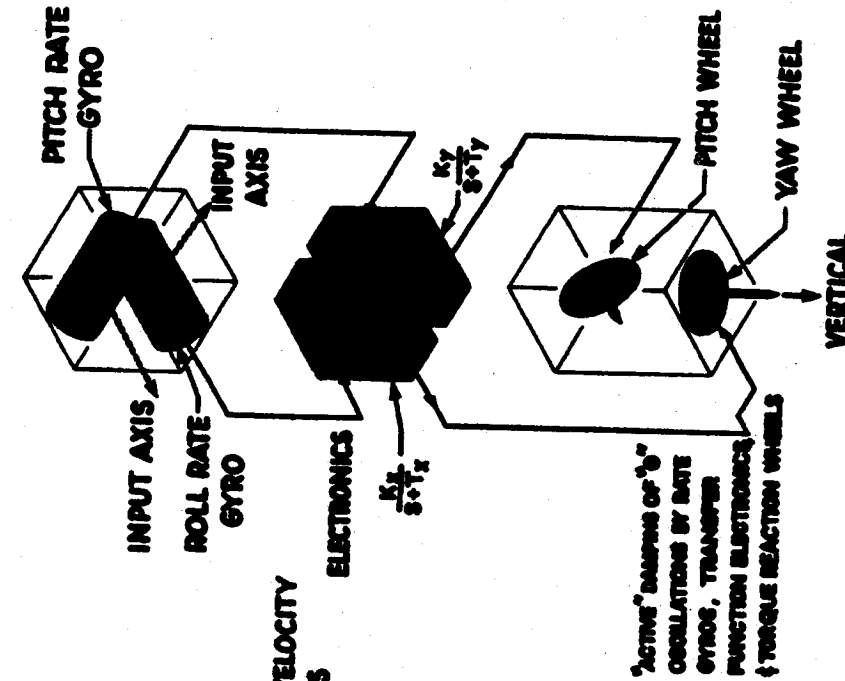
P-700 (1) 55 "D" 7/22/76  
 WD-50-04445

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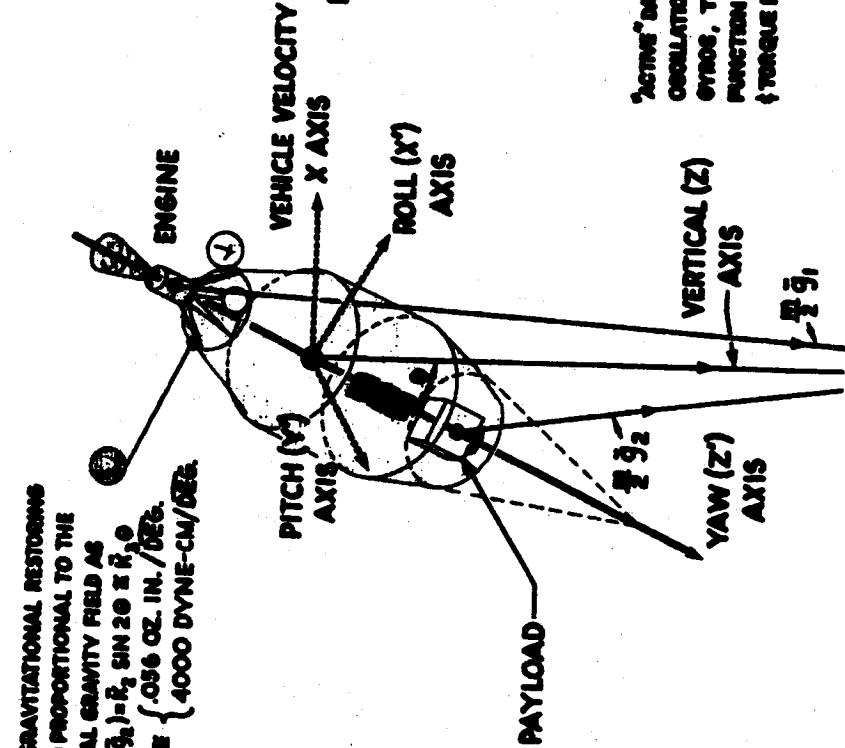
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(PITCH CASE-TYPICAL)

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MISSILE SYSTEMS DIVISION



"PASSIVE" GRAVITATIONAL RESTORING TORQUE (T) PROPORTIONAL TO THE DIFFERENTIAL GRAVITY FIELD AS  $T = \bar{r}_1 - \bar{r}_2$ ,  $X(\bar{g} - \bar{g}_2) = \bar{r}_2 \sin 2\theta \approx \bar{r}_2 \theta$   
 $K_3(\text{PITCH}) \approx \{ .056 \text{ OZ. IN. / DEG.} \}$   
 4000 DYNE-CM/DEG.

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P 16-4(0-4)/0/57  
WD-58-01556

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# WS117L SENTRY VEHICLE WEIGHT

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	PROGRAM IIA(0) LBS.	PROGRAM I(2) LBS.
VEHICLE PAYLOAD (INCLUDES PRIMARY PAYLOAD & A.R. 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 = 100 STATUTE MILES
- (2) UDMH-IRFNA ENGINE & LAUNCHED FROM AFMTC - ATLAS BOOSTED NOM. CIRCULAR ORBIT  
ALTITUDE = 300 STATUTE MILES

P 262 (3) S 7/17/58  
WD-58-044-58

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UNCLASSIFIED SOURCE DATA

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**TECHNICAL SUMMARY**

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	PIONEER	ADVANCED		PIONEER	ADVANCED
FOCAL LENGTH	6"	36"	ELECTRICAL POWER REQUIREMENTS		
LENS SPEED	f2.8	f2.8		PEAK	300 WATTS
DURATION	9 DAYS	30 DAYS	AVERAGE	660 WATT HR/DAY	660 WATT HR/DAY
STRIP ON GROUND - WIDTH	100 ML	17 ML	SCALE ON VEHICLE FILM	1:3,100,000	1:520,000
STRIP ON GROUND - LENGTH	2000 ML AVG.	360 ML INTERMITTENT	RESOLUTION ON GROUND AT LOW (2:1) CONTRAST	100 FT.	20 FT.
AREA COVERED	1.07 X 10 <sup>7</sup> SQ. MI.	8.9 X 10 <sup>5</sup> SQ. MI.			
CAMERA WT. INCLUDES FILM & PROCESSOR	300 LB. 3.4 LB.	400 LB.(EST.) 11.4 LB.			

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

GROUND ENLARGEMENT 53:1 FOR USE

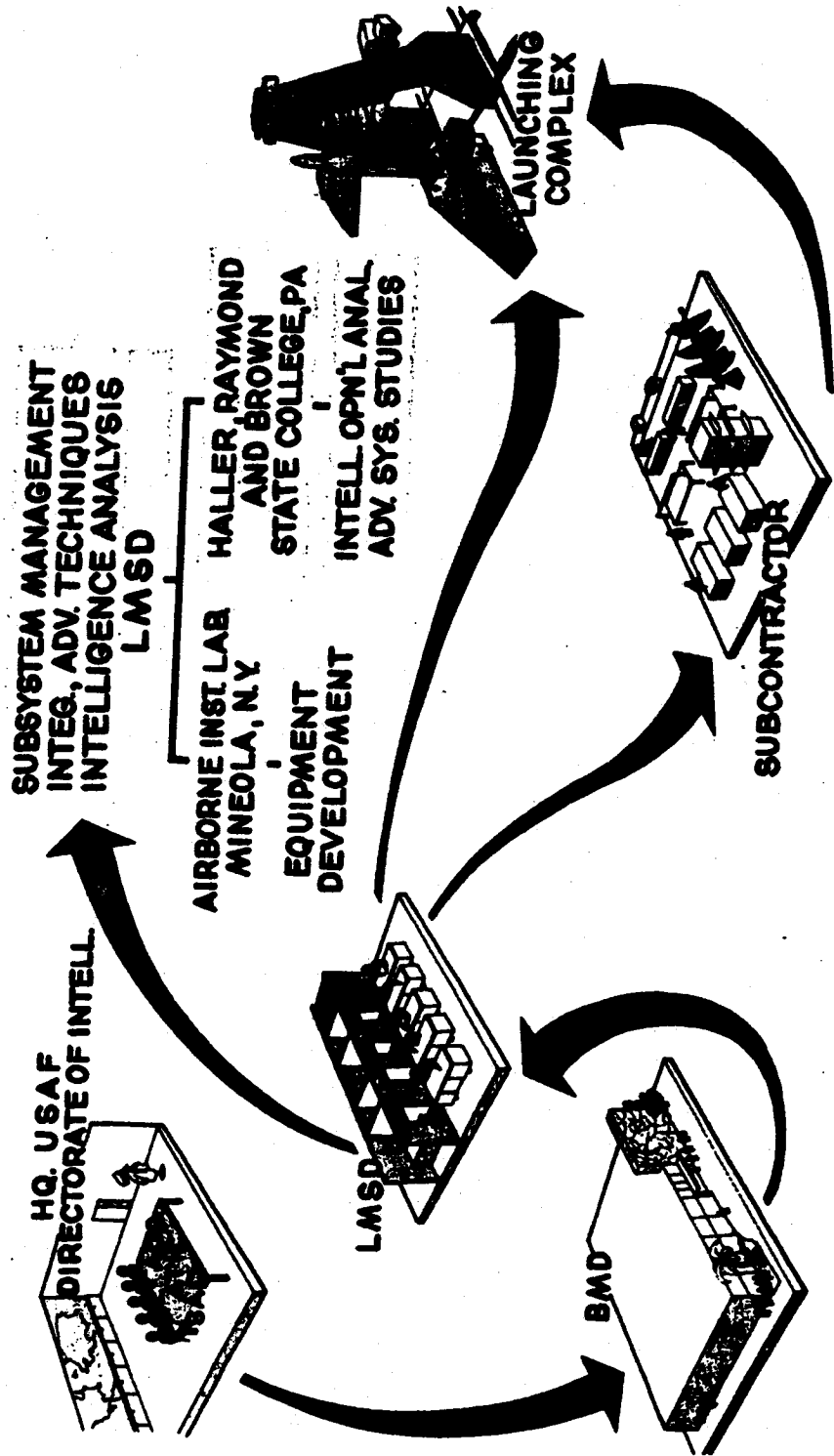
P400 55-1 12/19/57

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LOCKHEED AIRCRAFT CORPORATION  
MISSILE SYSTEMS DIVISION

# WS117L FERRET SUBSYSTEM PROJECT STRUCTURE

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MISSILE SYSTEMS DIVISION

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P175 (4) 6/30/58 SS-F  
WD-58-03453

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CAMOUFLAGED COMPLEX

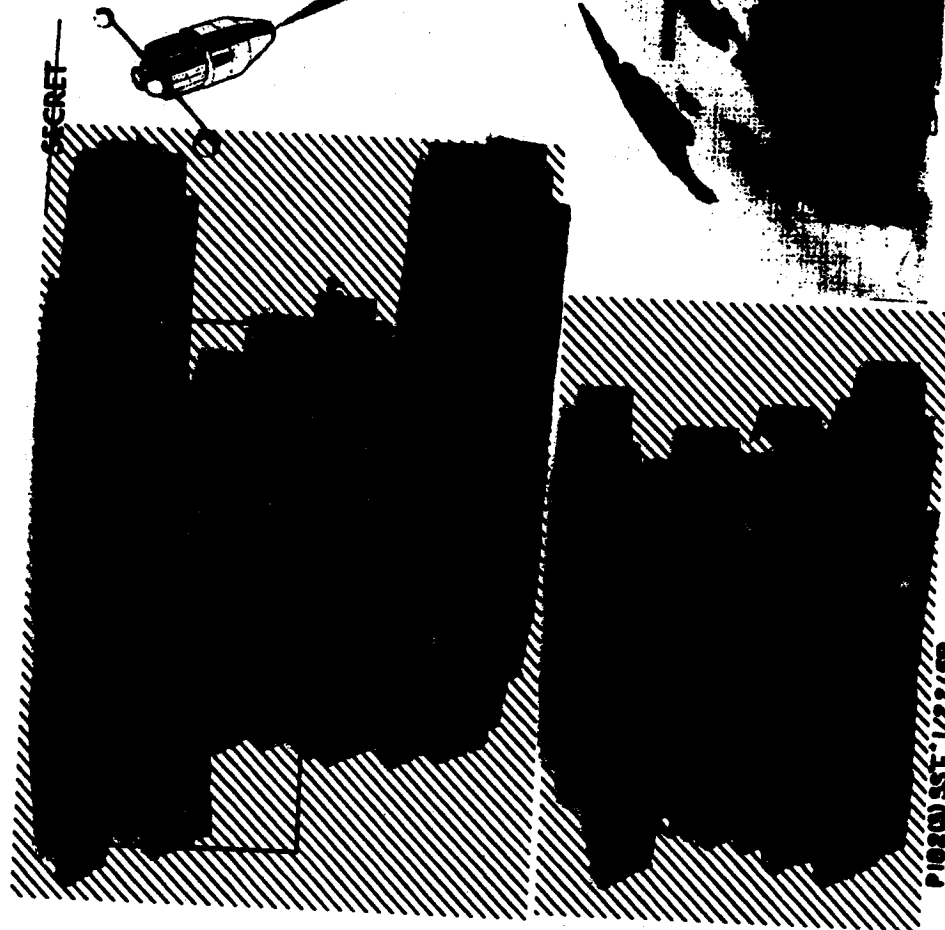


ARCTIC CIRCLE



LOCKHEED AIRCRAFT CORPORATION  
MISSILE SYSTEMS DIVISION

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P1820 SST-1/22/58  
WD-58 00001

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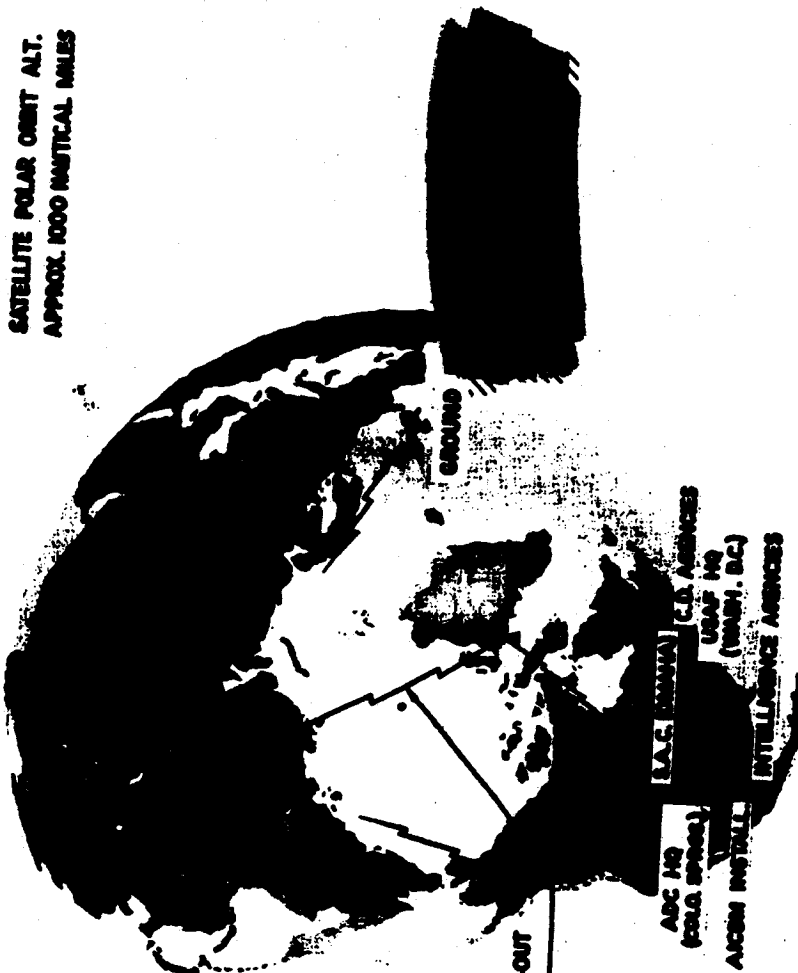
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SATELLITE POLAR ORBIT ALT.  
APPROX. 1000 NAUTICAL MILES



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LOCKHEED AIRCRAFT CORPORATION  
Aircraft Systems Division

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INSTANTANEOUS DIRECT READ-OUT  
TO GROUND STATION

ABC HQ  
(POLA. STATION)

L.A.S. (MIA) (C.I. AGENCIES)

USAF HQ  
(NSA) (D.C.)

INTELLIGENCE AGENCIES

ACCOM INSTALL

FD-40955-0 5/7/50  
WD-50-02843

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# SATELLITE POWER REQM'TS VS. SUPPLY

## POWER REQUIREMENTS

UNIT	WATT HR/DAY
TRANSMITTER	171
RECEIVER	117
DECODER	176
TIMER & PROGRAMMER	120
SUBSYSTEM "G"	180
ATTITUDE DAMPING SYST.	240
YAW STAB. GYRO WHEEL	96
<b>TOTAL REQM'T</b>	<b>1100</b>

## SOLAR POWER SUPPLY

UNIT	WATT HR/DAY
SOLAR CELL OUTPUT	3796
LOSS: DEGRADATION, CONVERSION STORAGE, REGULATION OTHER	2548

**TOTAL USEFUL POWER FOR EQUIP: 1248**

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

PG09 (1) 88 "G" 4/58  
WD-58-094-58

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# ICBM ATTACK ALARM SYSTEM

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## VEHICLE PAYLOAD

### EQUIPMENT

### DESCRIPTION

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

### INFRARED

TRANSMITTER & MODULATORS  
COMMAND RECEIVER  
DECODER

### COMMUNICATIONS

TIMER/PROGRAMMER  
4 QUADRANT RECEIVING ANTENNAS  
TRANSMITTER ANTENNA

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

### AUX. POWER

P620 (1) 956 0/4/58  
WD-88-09455

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MISSILE SYSTEMS DIVISION

# 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-NORTHEAST, NORTHWEST, & SOUTH CENTRAL

- SAME UHF INSTALLATIONS AS PROGRAMS I, II, & III  
(IF VHF IS UTILIZED, ADDITIONAL EQUIPMENT REQUIRED)

### 3. READ OUT STATIONS

- 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.

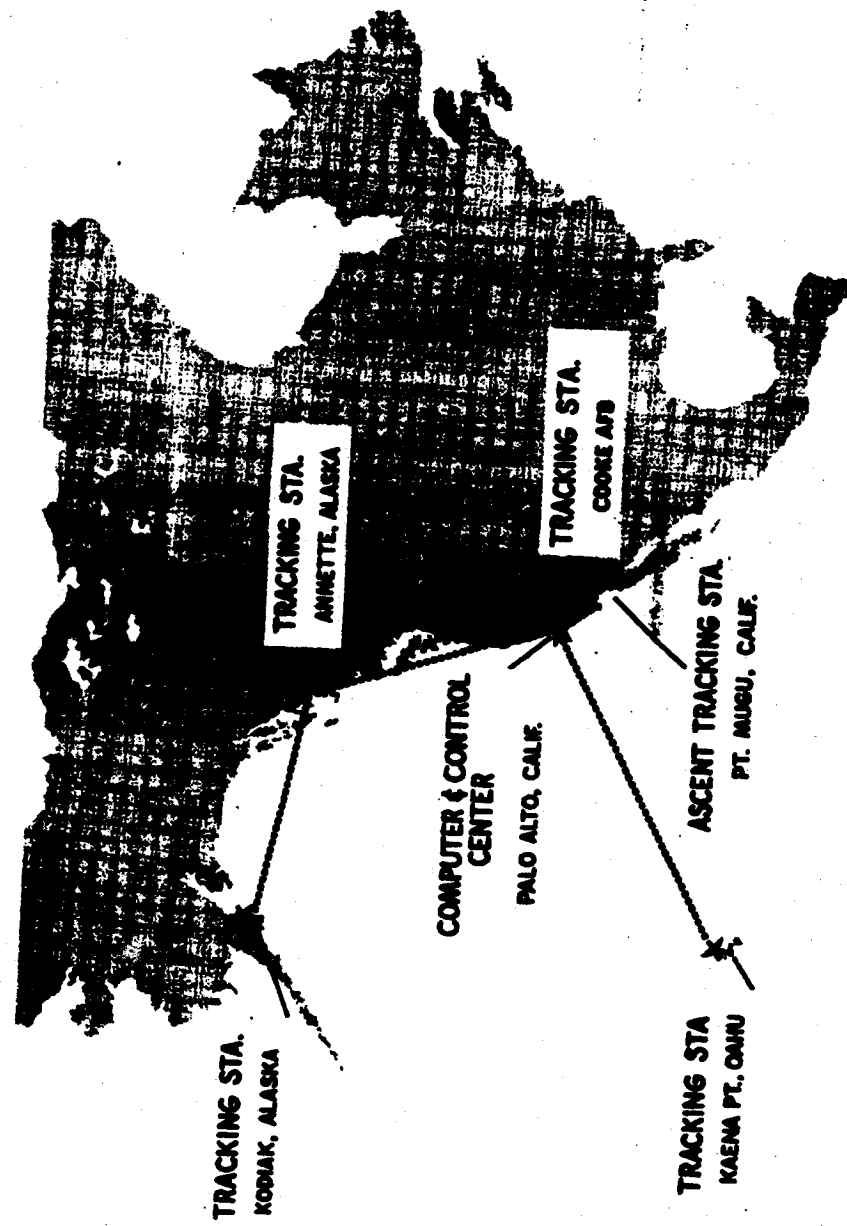
P61701 98'6" 014/53  
WD-58-03455

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MISSILE SYSTEMS DIVISION

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# STATION LOCATIONS (THOR)



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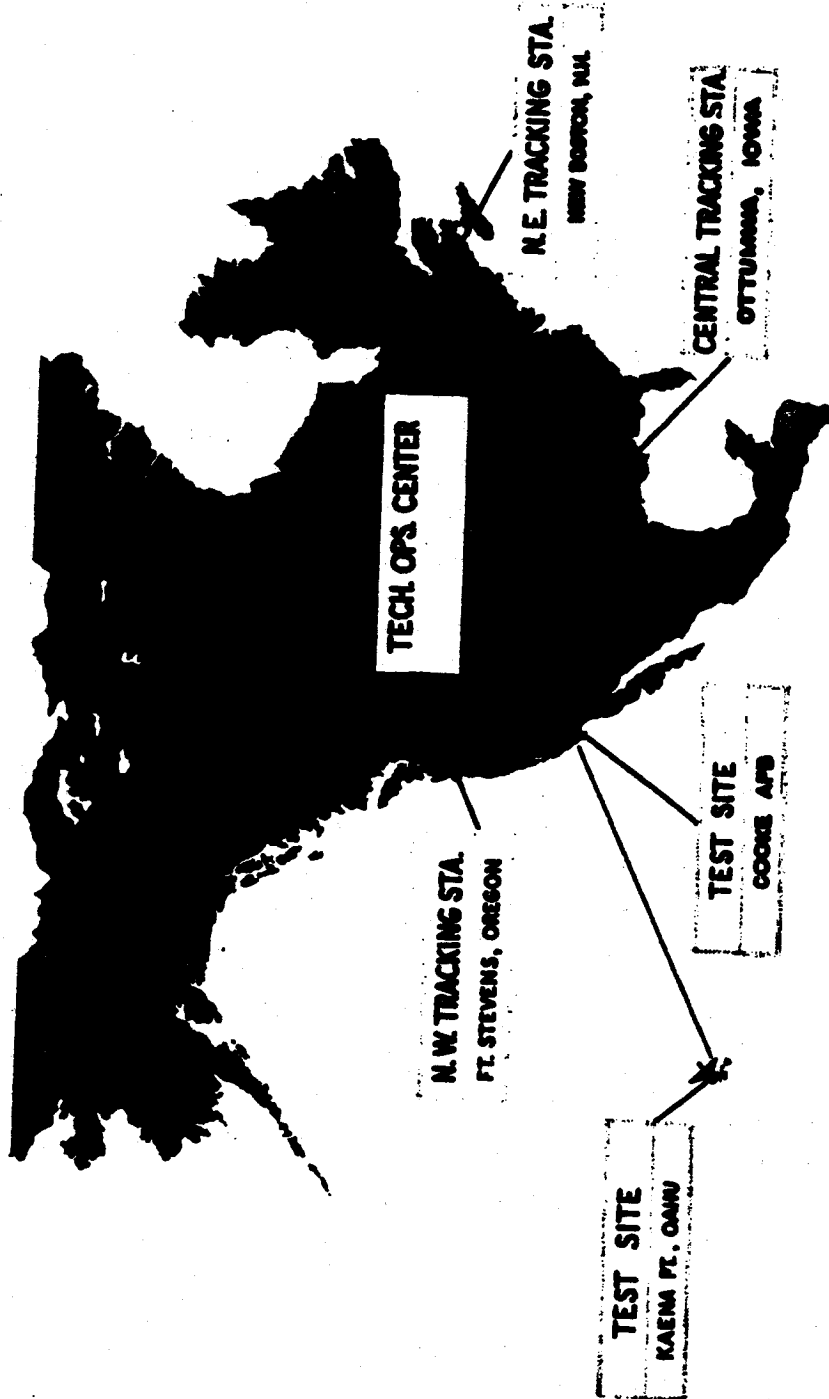
P 890 08 28 74 7/4/78  
WB-28-01115



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# STATION LOCATIONS (ATLAS)



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FORM 87-1 7/8/78  
WD-00-01145

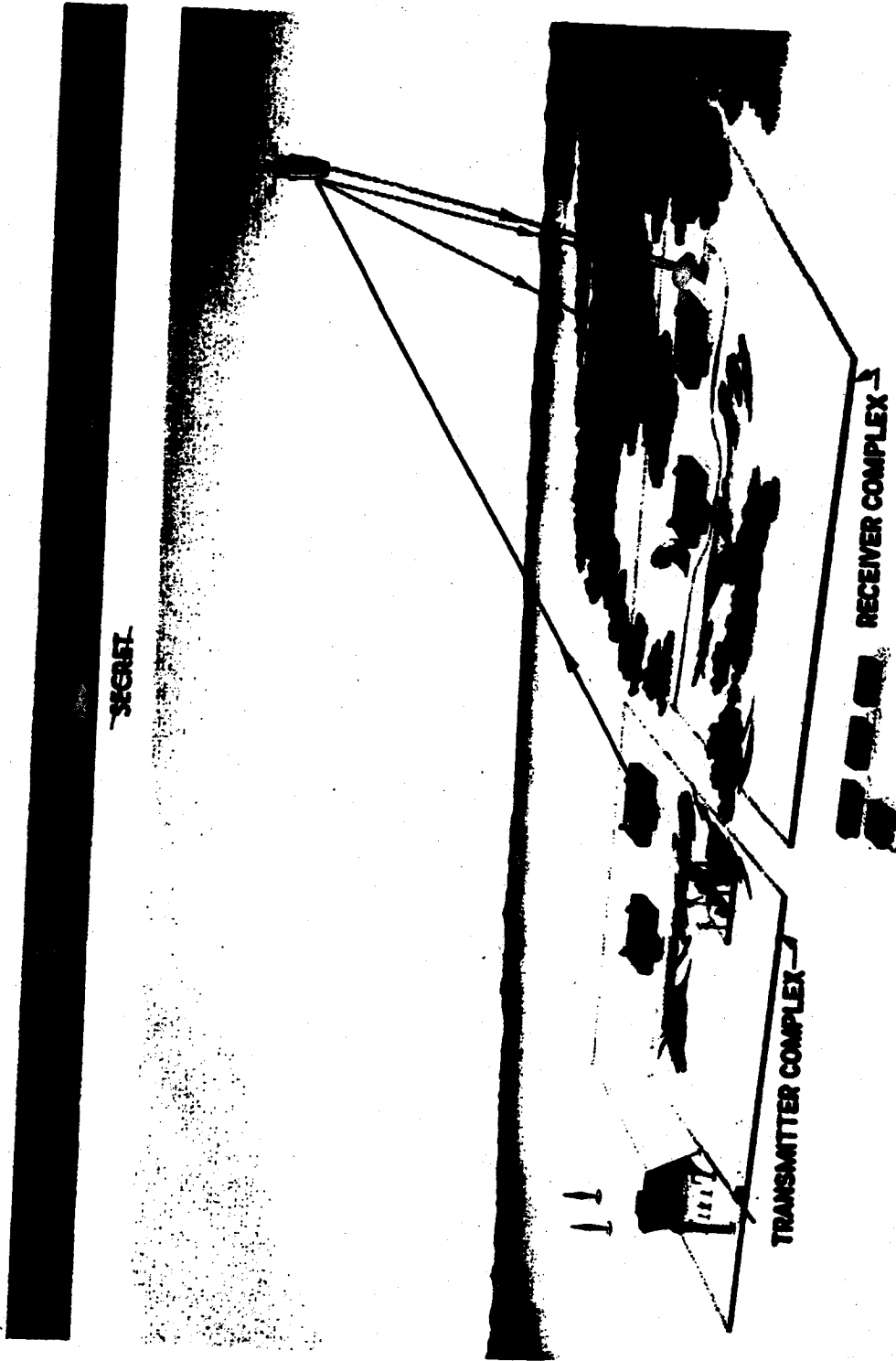
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P 103(2) SS-H 7/10/57

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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

PS40 GDC 5/12/58  
WD-58-02843

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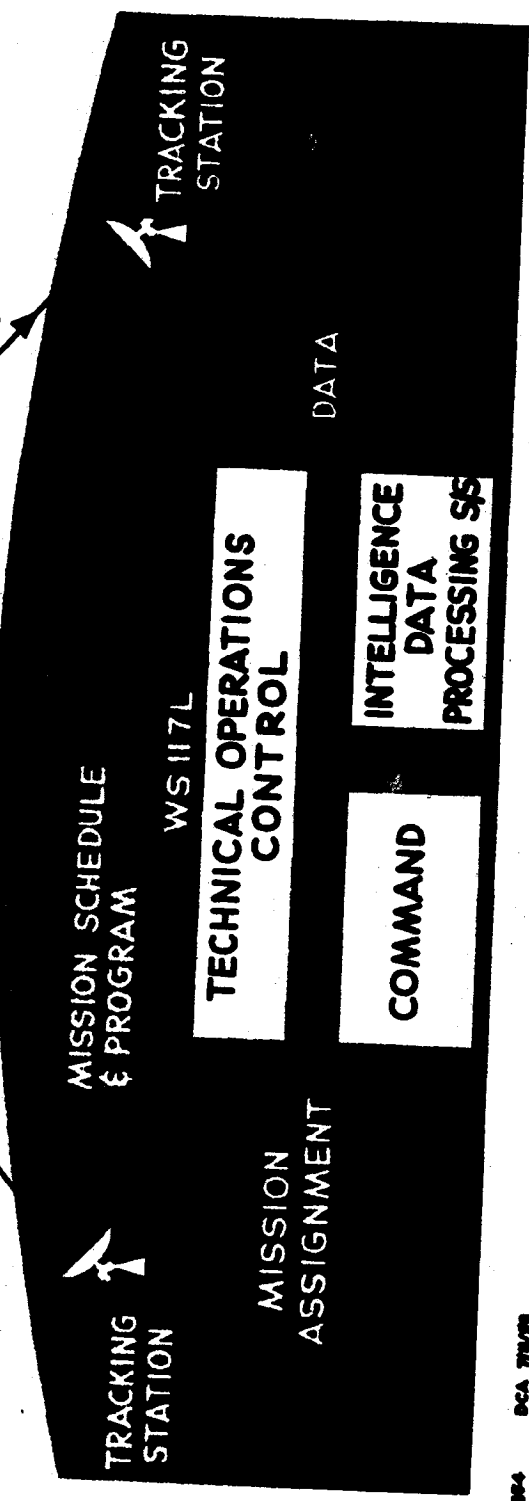
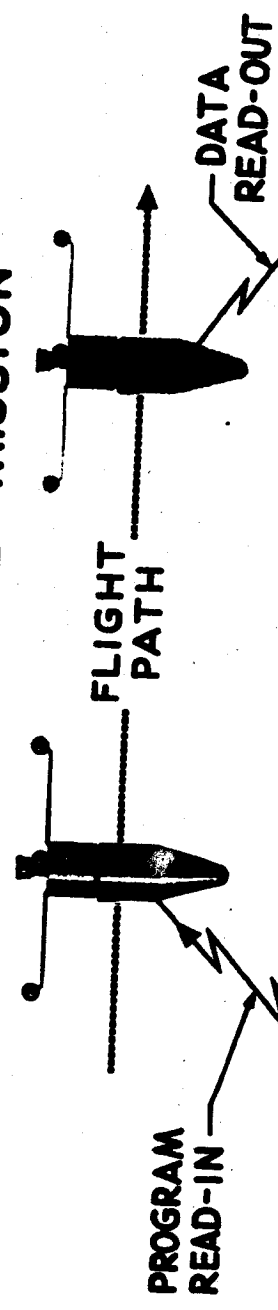
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# RECONNAISSANCE MISSION



P-804 BCA 78/98  
WD-88-04448

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RECONNAISSANCE MISSION

LOCKHEED AIRCRAFT CORPORATION

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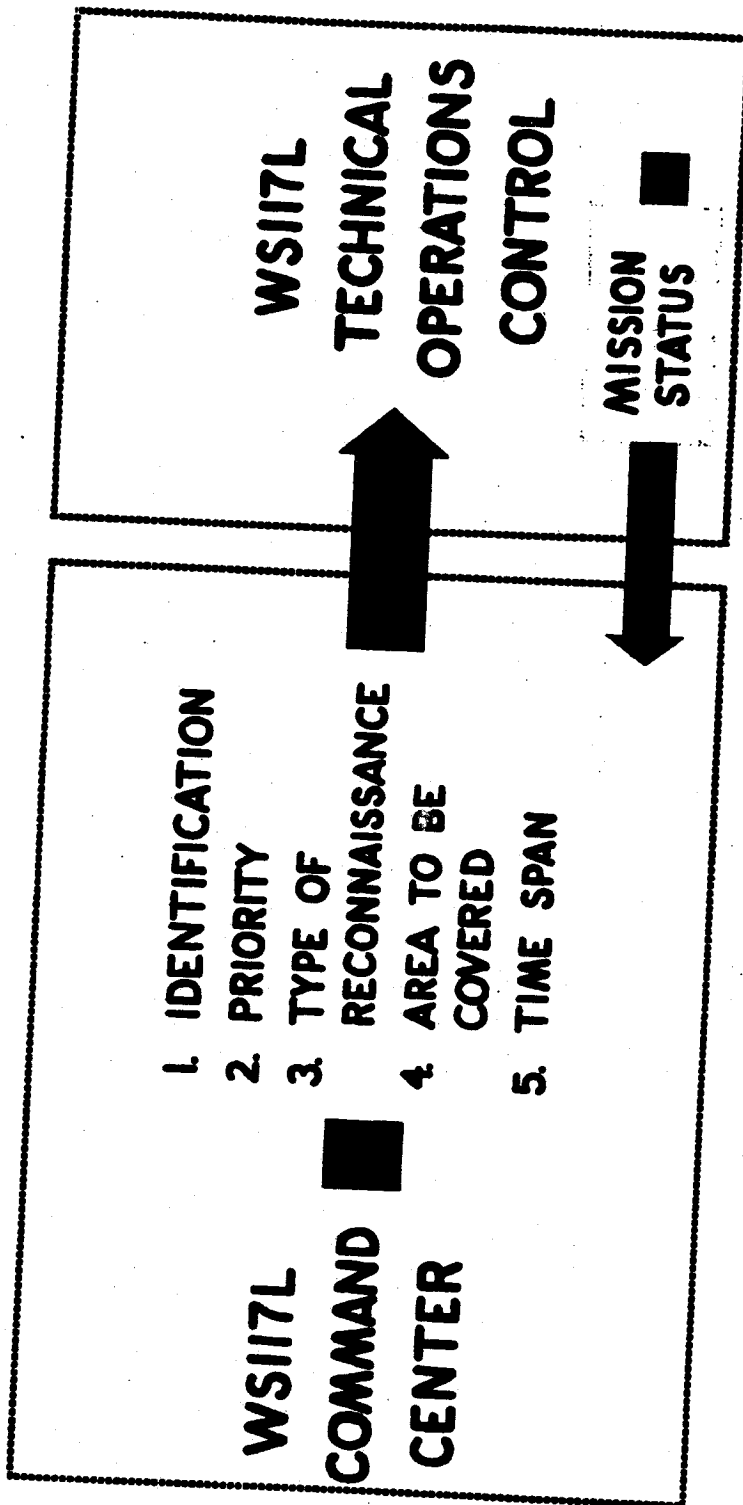
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# RECONNAISSANCE MISSION ASSIGNMENT



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P-893 OCA 7/11/78  
WD-28-04443

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# WS117L DATA CONTROL

## DATA INDEXING

TRACKING DATA 

ATTITUDE 

VEHICLE TIME DRIFT 

DATA

PERFORMANCE DATA

CONTROL

OPERATIONS

~~INTELLIGENCE DATA INDICES~~ 

CALIBRATION DATA

PERFORMANCE STANDARDS

P-662(1) 5 7/22/58  
WD-58-04445

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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 3/2/58  
WD-58-01308

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MISSILE SYSTEMS DIVISION

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# FLIGHT MISSIONS & OBJECTIVES

## PROGRAM II A

FLT	NOM. CIRCULAR ORBIT ENERGY ALTI. S.M.L.	EMPTY WT. ON ORBIT	ATT. PAYLOAD	FUEL	NOZZLE EXP. RATIO	FLI. OBJECTIVES
1	225	1275	VERT.	JP4/IRFNA	14.85:1	PHASE A ENGINEERING TESTS
2	190	1359	"	"	"	PHASE A ENGINEERING TESTS
3 & 4	145 ( $M_0=125$ S.M.L. @ $0.02$ $165^\circ$ 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 ( $M_0=140$ S.M.L. @ $0.02$ $160^\circ$ LAUNCH AZIMUTH)	1649	"	"	"	BIO-MEDICAL EXPERIMENT

PL 91 (9) 8 014/100  
10-20-64445

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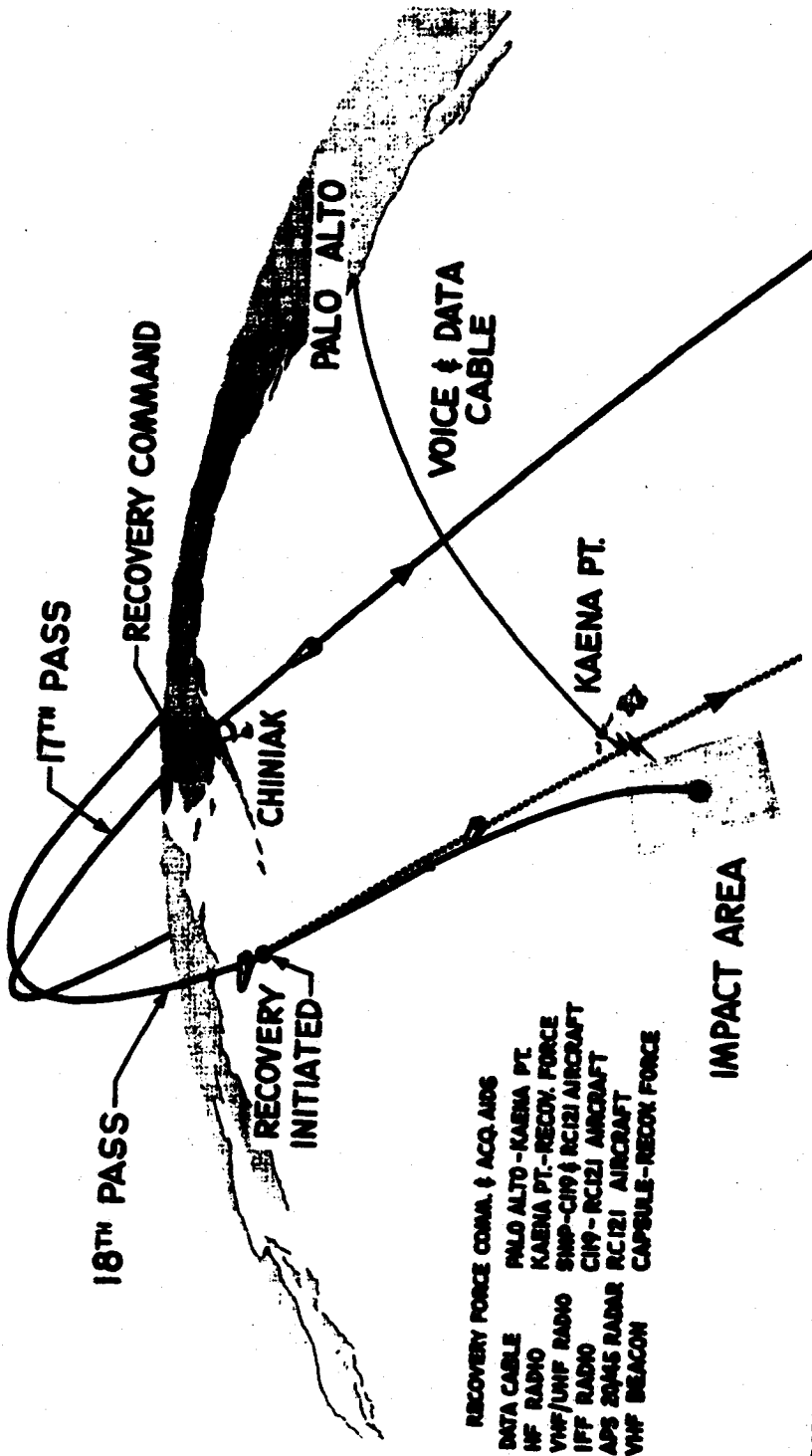


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# WS117L RECOVERY ORBITS

## PROGRAM IIA



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FORM 88-20 7/1/58  
WB-58-04445

LOCKHEED AIRCRAFT CORPORATION

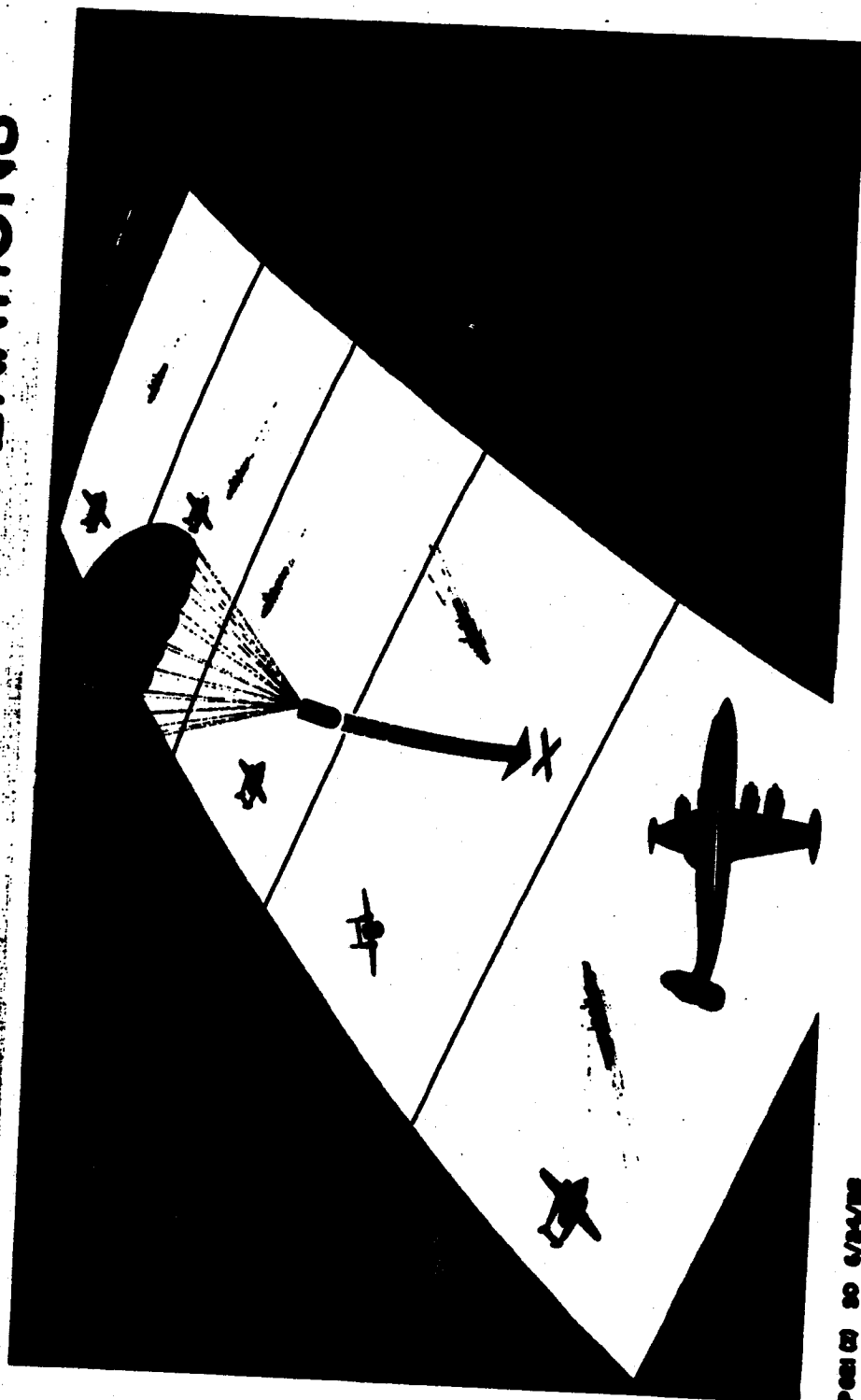
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# SENTRY RECOVERY OPERATIONS



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PERIOD 90 6/24/78  
WP-58-00488

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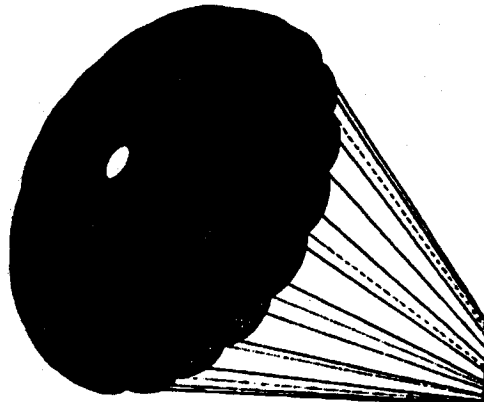
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**PROGRAM IIA**

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P 577 30 6/24/58  
WP-88-08485

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MISSILE SYSTEMS DIVISION

LOCKHEED AIRCRAFT CORPORATION

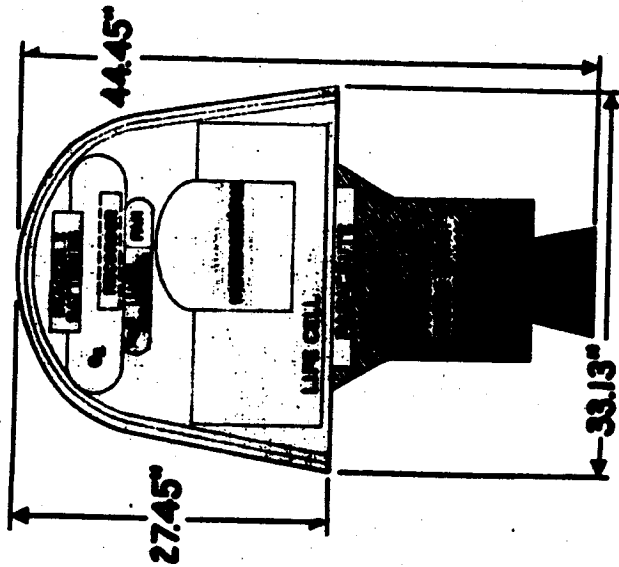
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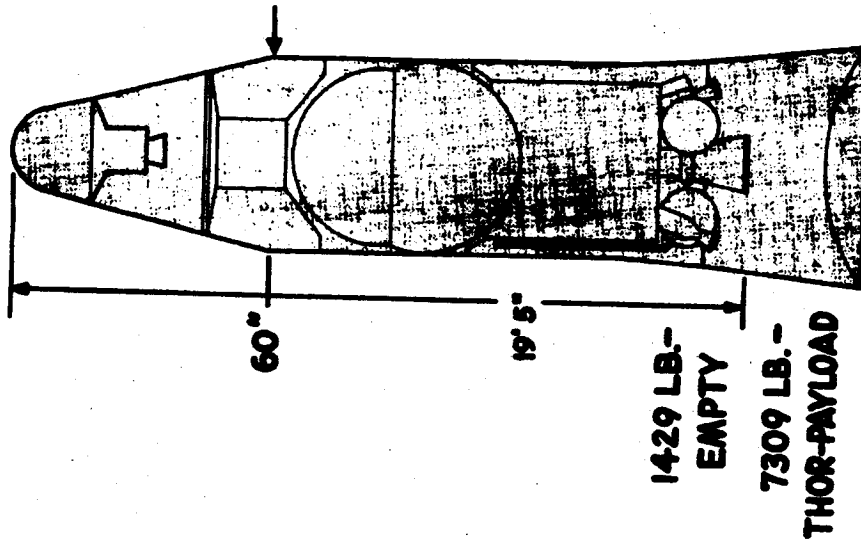
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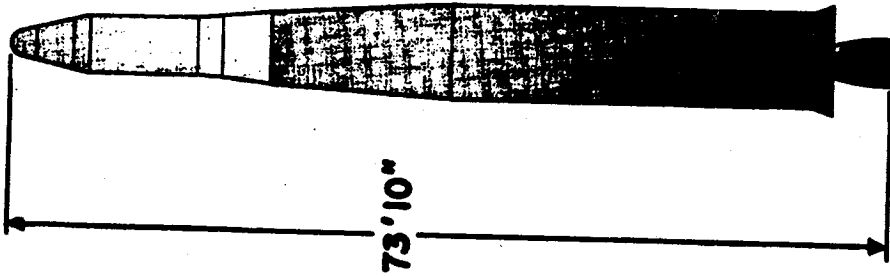
195 LB. - JP4  
279 LB. - UDMH



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PS44036 L. e/3/58  
WD-58-03455

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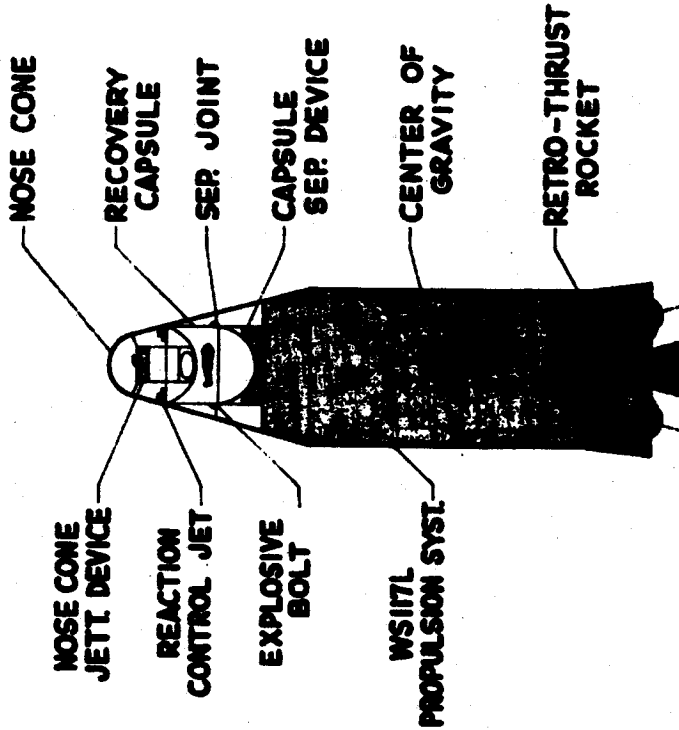
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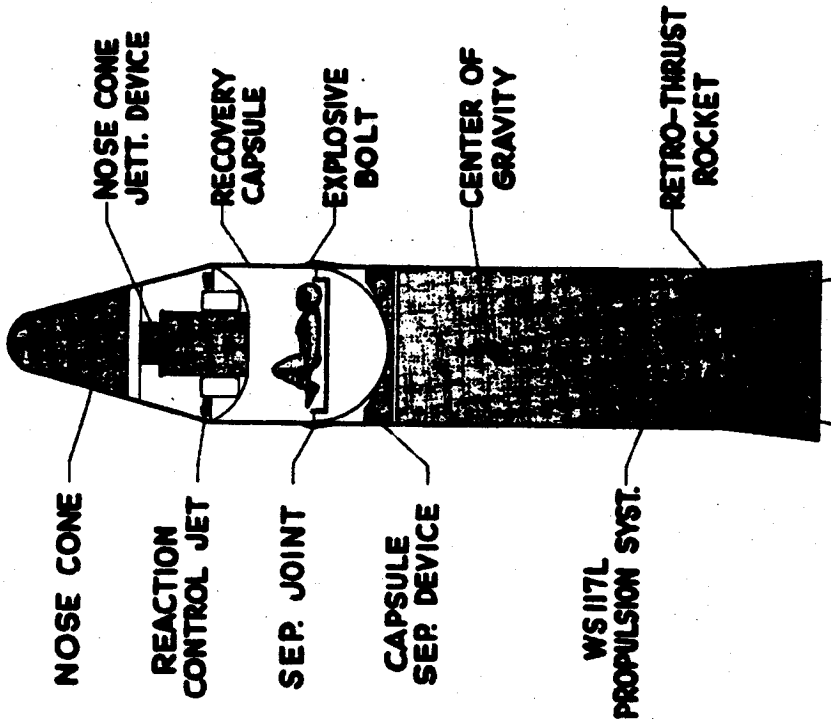
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**SMALL ANIMAL**



LOCKHEED AIRCRAFT CORPORATION  
MISSILE SYSTEMS DIVISION

**MAN**



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P475 5 4/30/58  
WD-58-0275

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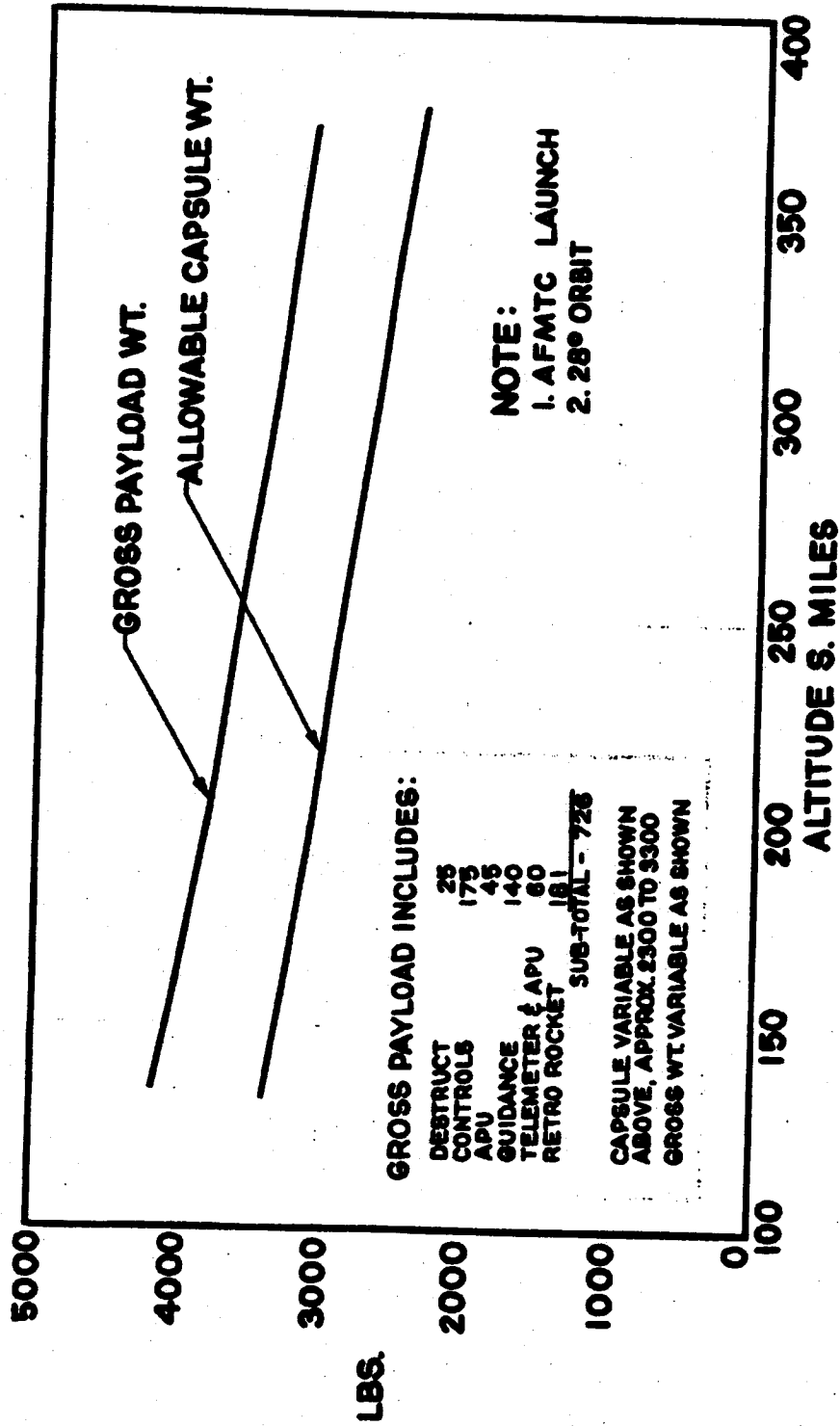
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# PROPOSED MAN IN SPACE PROG.

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PS03 SS'L' 6/9/56  
WD-58-03455

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MEMPHIS, TENNESSEE

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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

P546 5/29/56  
WD-59-02843

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MISSILE SYSTEMS DIVISION

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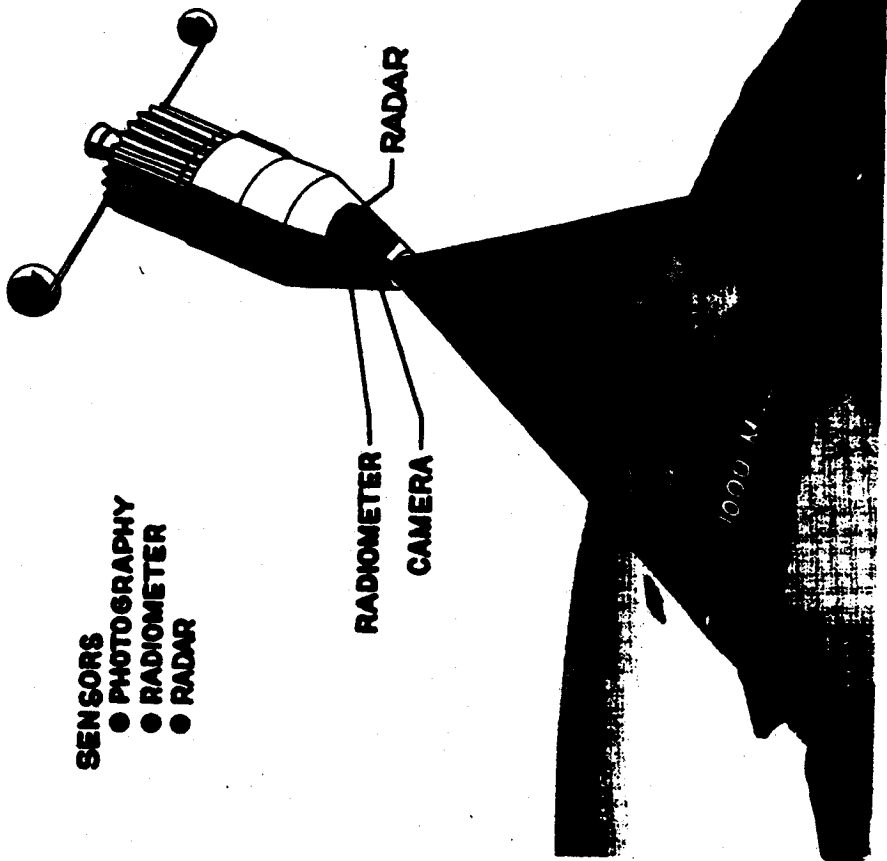
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# SENTRY WEATHER SURVEILLANCE



- SENSORS**
- PHOTOGRAPHY
  - RADIOMETER
  - RADAR

RADIOMETER  
CAMERA  
RADAR



STATUS MOGAK AT WEATHER CENTER

**AFFORDS SYNOPTIC RECORD**

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

P 87666 10/14/67  
WD-88-08103

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ISSUED UNDER STRICT CONTROL



**TYPES OF WEATHER DATA**

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**MILITARY AND DOMESTIC**

**PRESENT METHODS**

**SATELLITE DATA**

**TEMPERATURE**

**VISUAL**

**PRESSURE**

**CLOUDS - SEMI QUANTITATIVE**

**HUMIDITY**

**1. EXISTENCE**

**WIND VELOCITY**

**2. WIND VELOCITY**

**RECENT WEATHER HISTORY**

**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**

P545 5/29/58  
WD-58-02843

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MISSILE SYSTEMS DIVISION

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

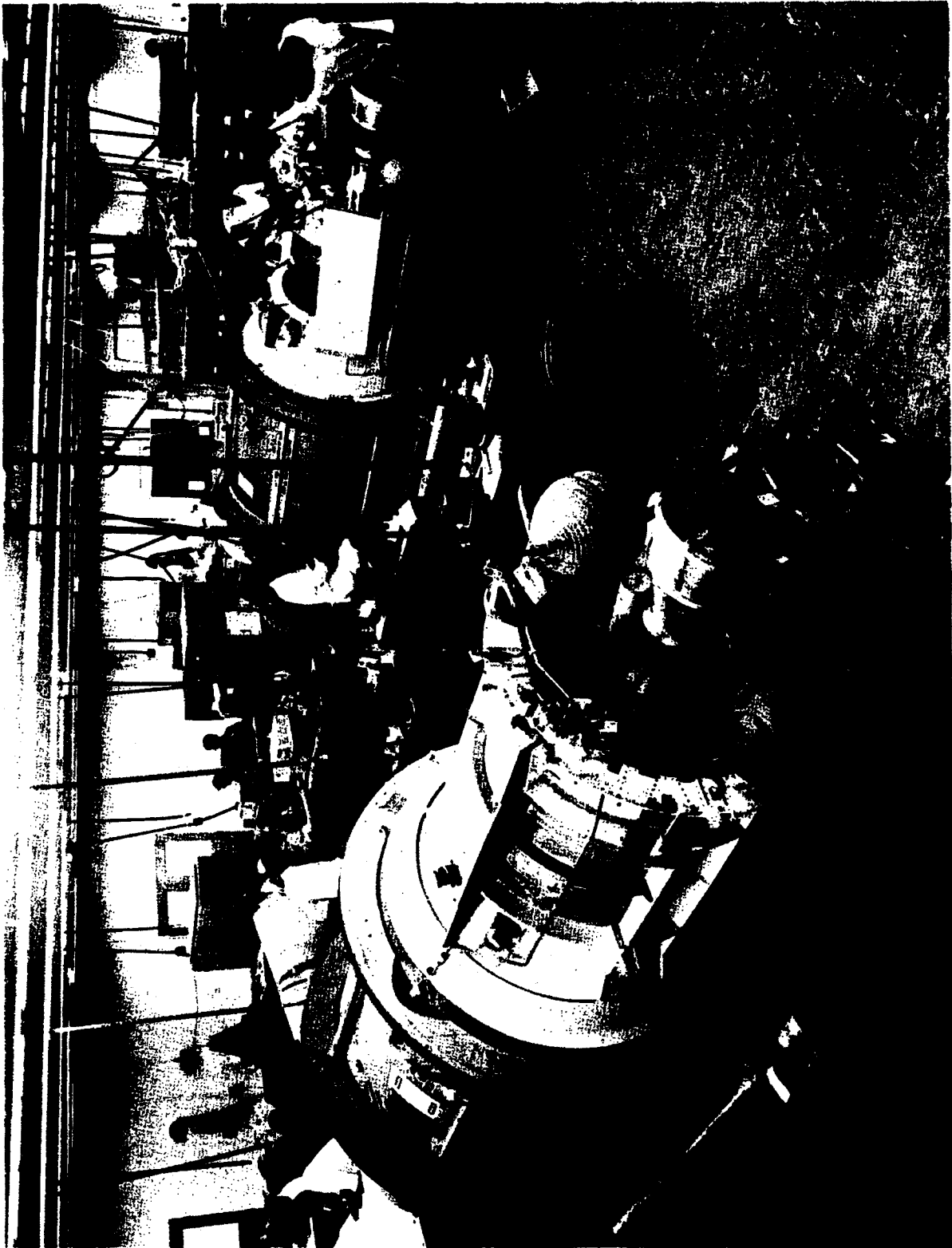
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P2017 FLIGHT TEST VEHICLES NOS. 1 AND 2 IN MOD & CHECKOUT - LMSD PALO ALTO

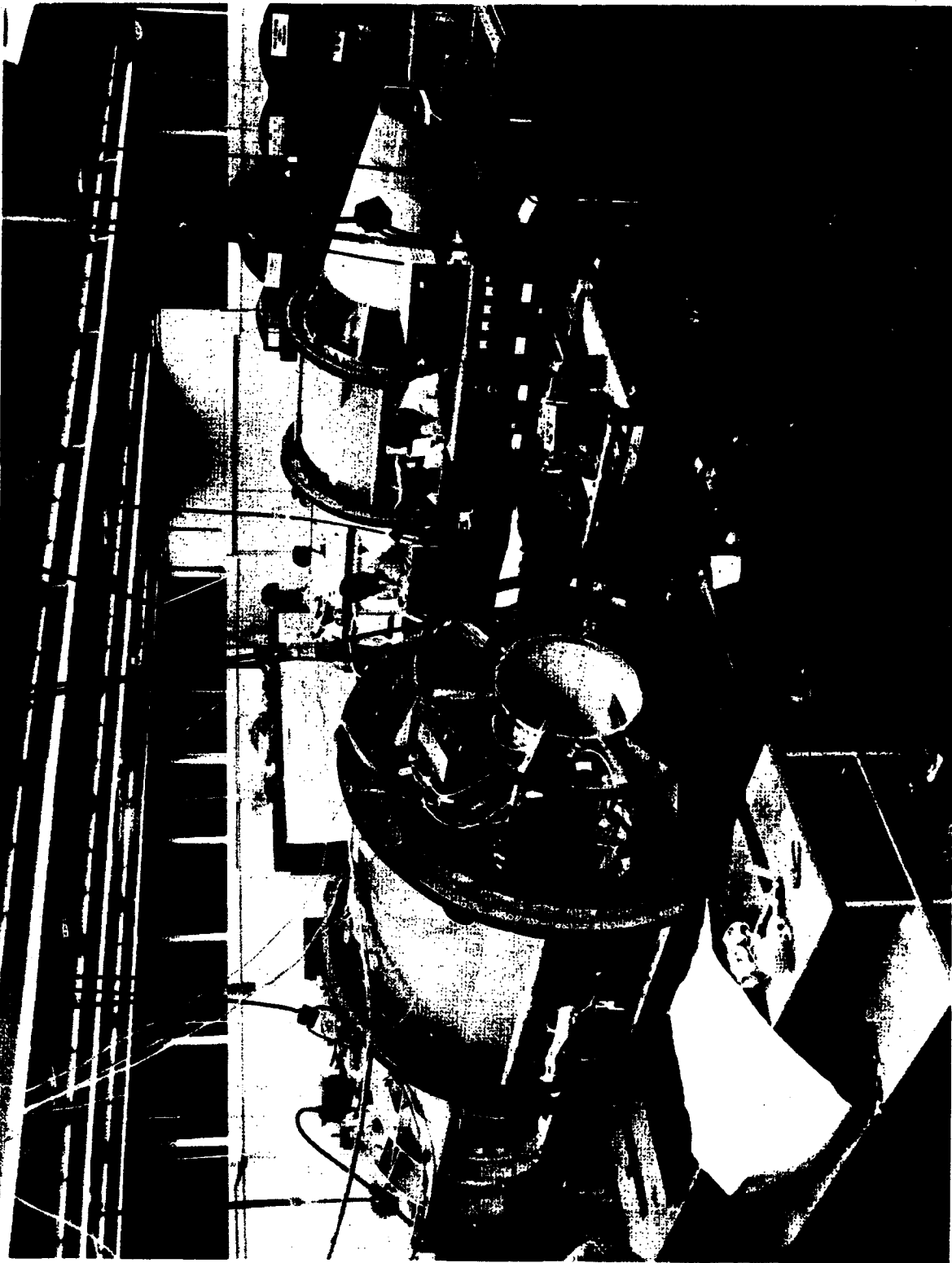
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P3016 FLIGHT TEST VEHICLES NOS. 1 AND 2 IN MOD & CHECKOUT - LMSD PALO ALTO

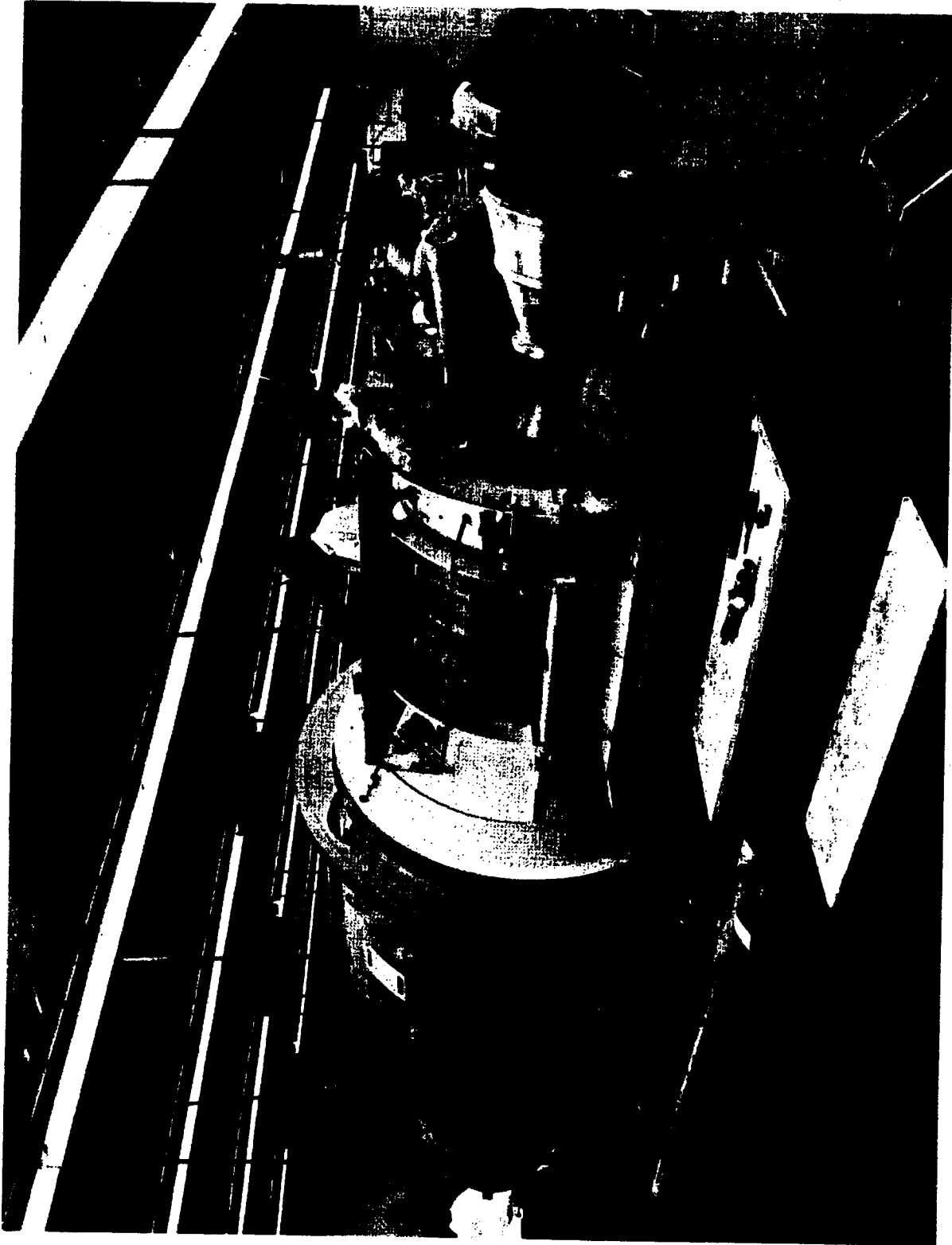
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P2022 FLIGHT TEST VEHICLE NO. 2 IN MOD & CHECKOUT - LMSD PALO ALTO

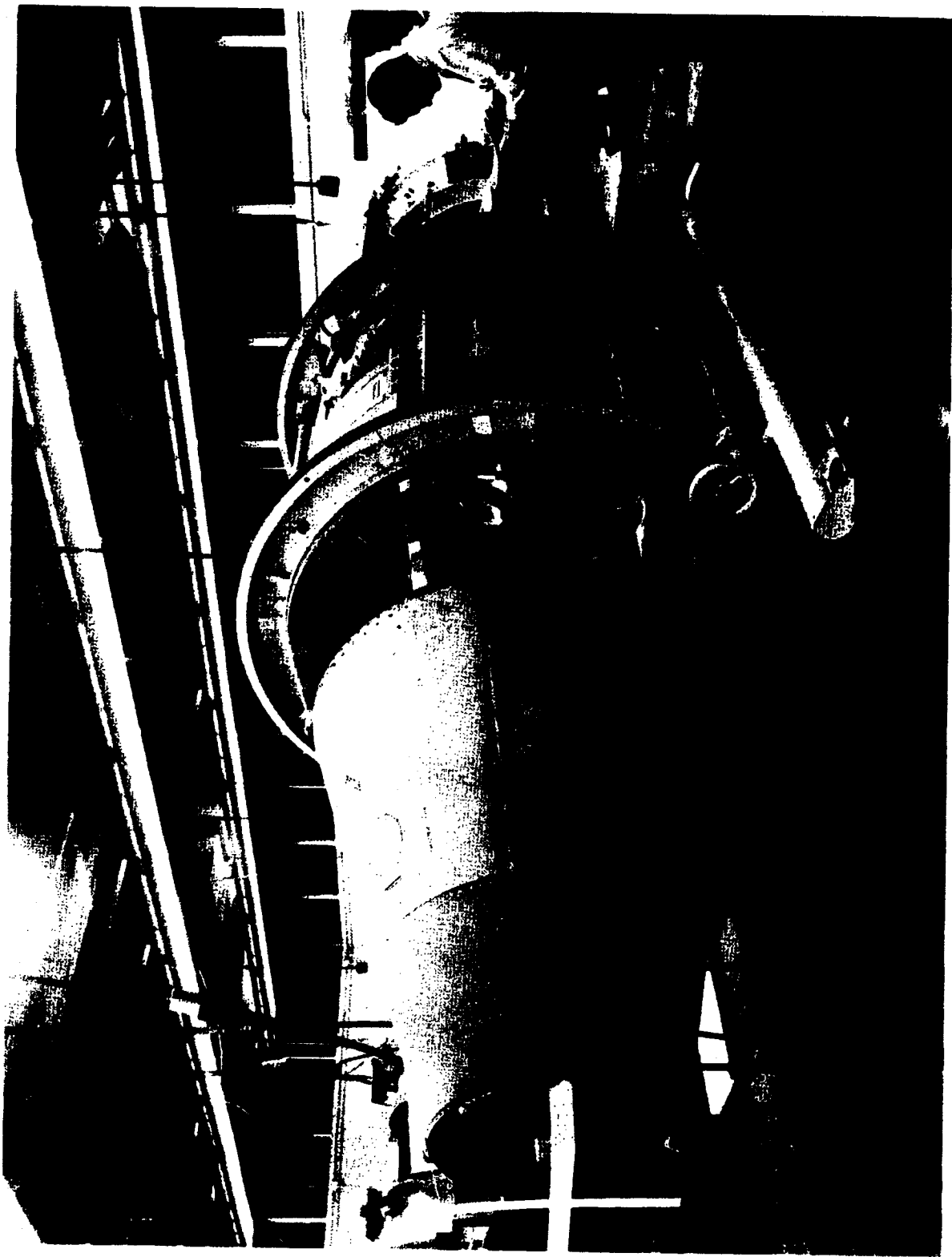
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P3021 FLIGHT TEST VEHICLE NO. 2 IN MOD & CHECKOUT - LMSD PALO ALTO

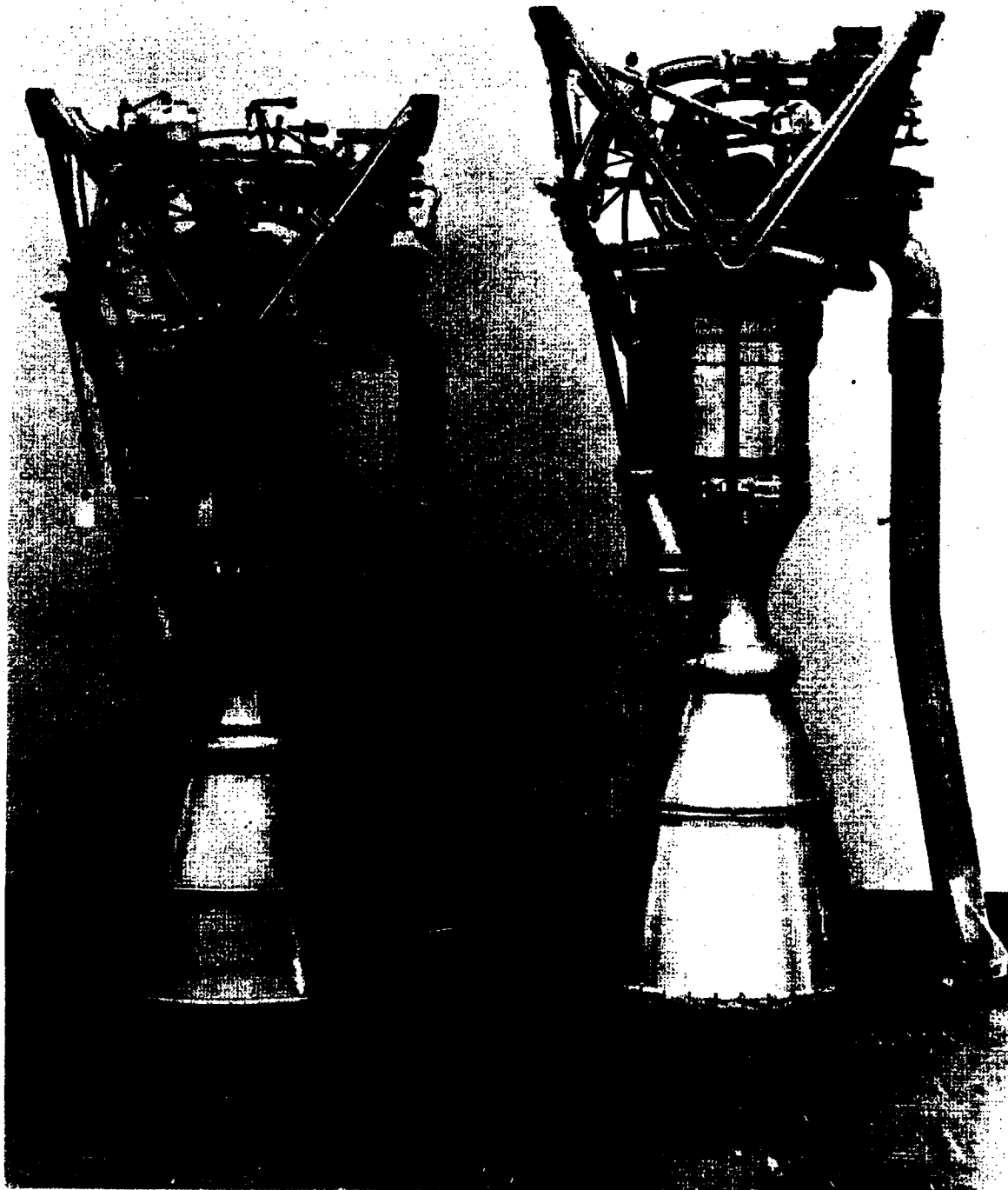
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P 3039 MODEL XLR ENGINES - JP4 (LEFT) AND UDMH

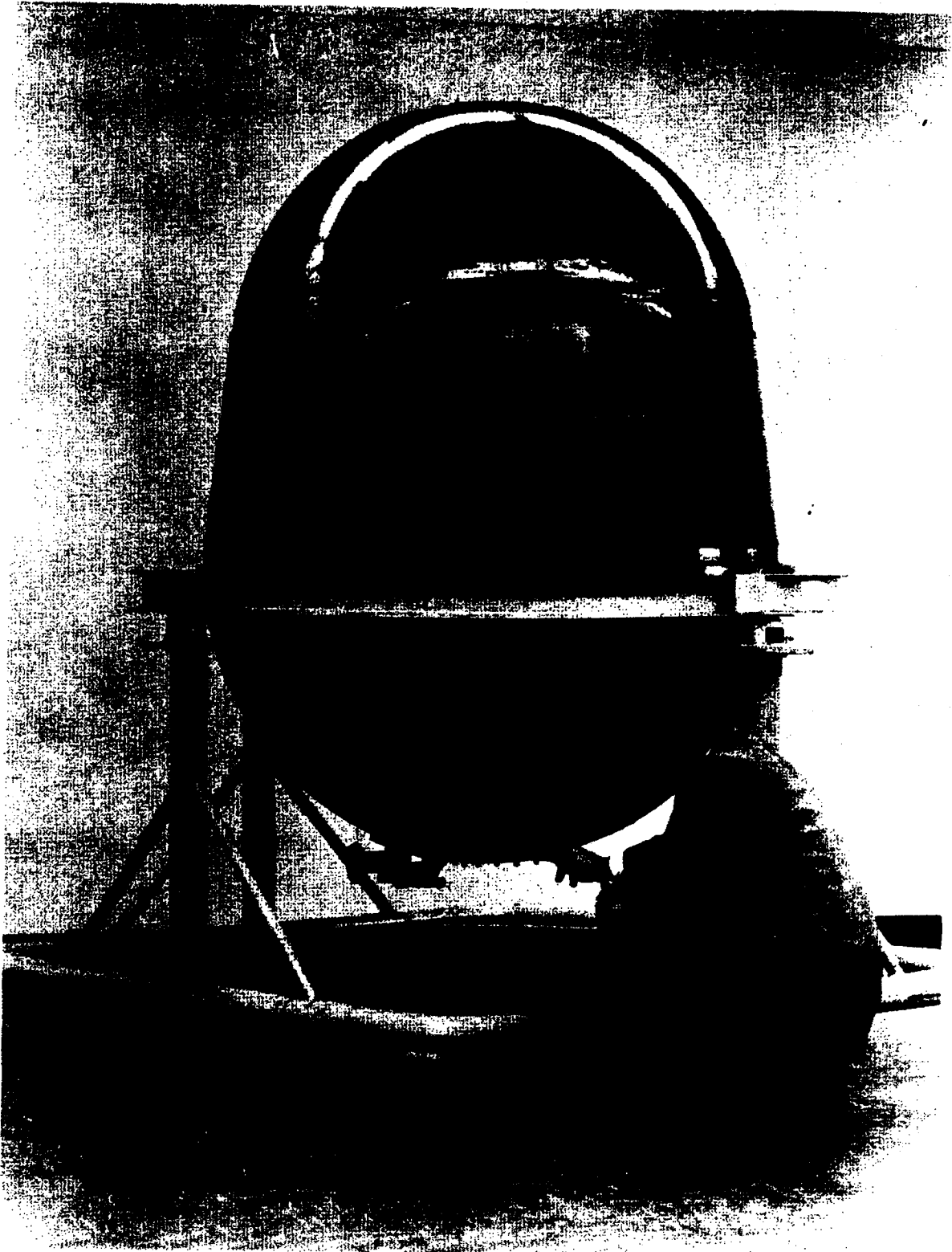
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P3043 UDMH PROPELLANT TANK

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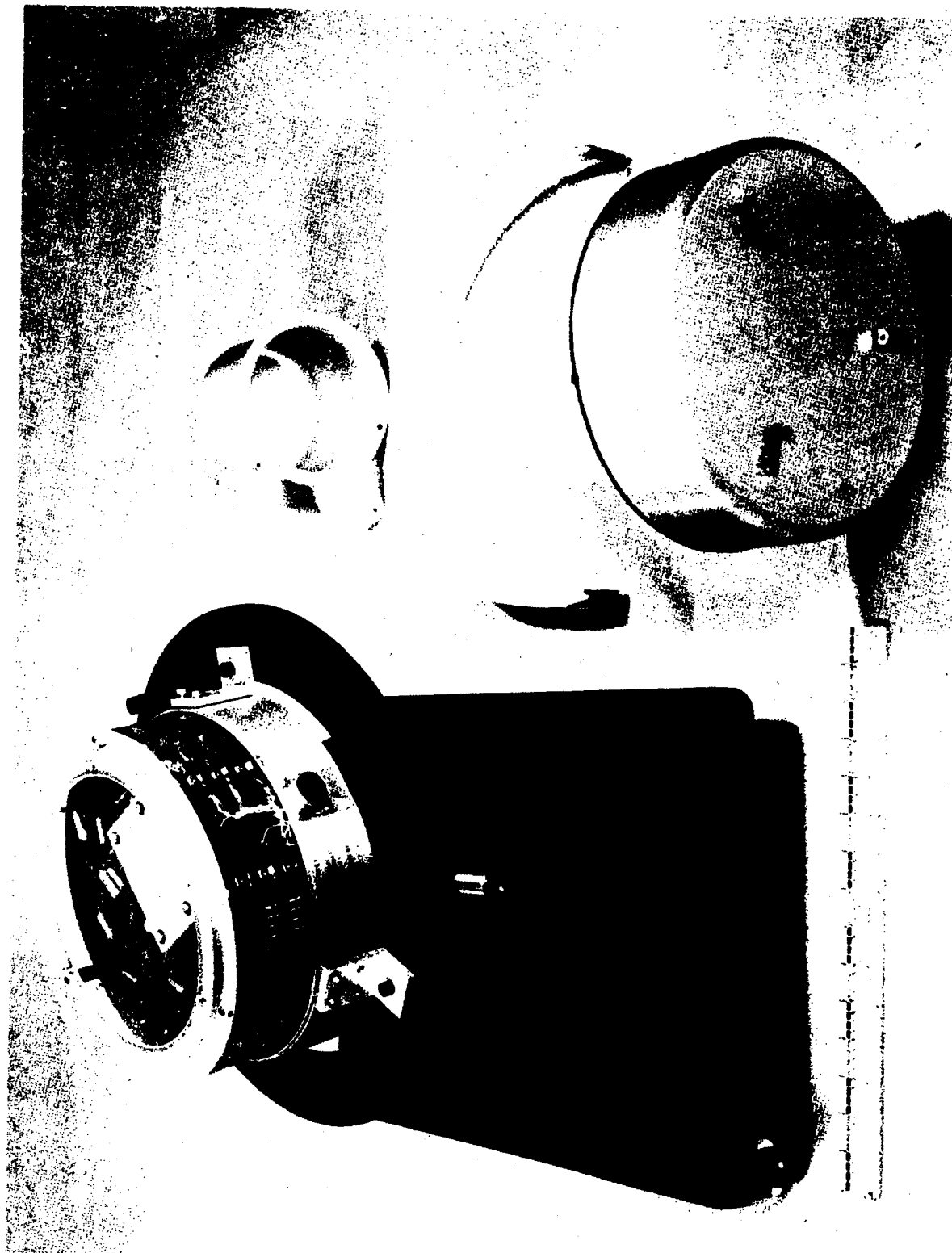
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**P2862 HORIZON SCANNER**

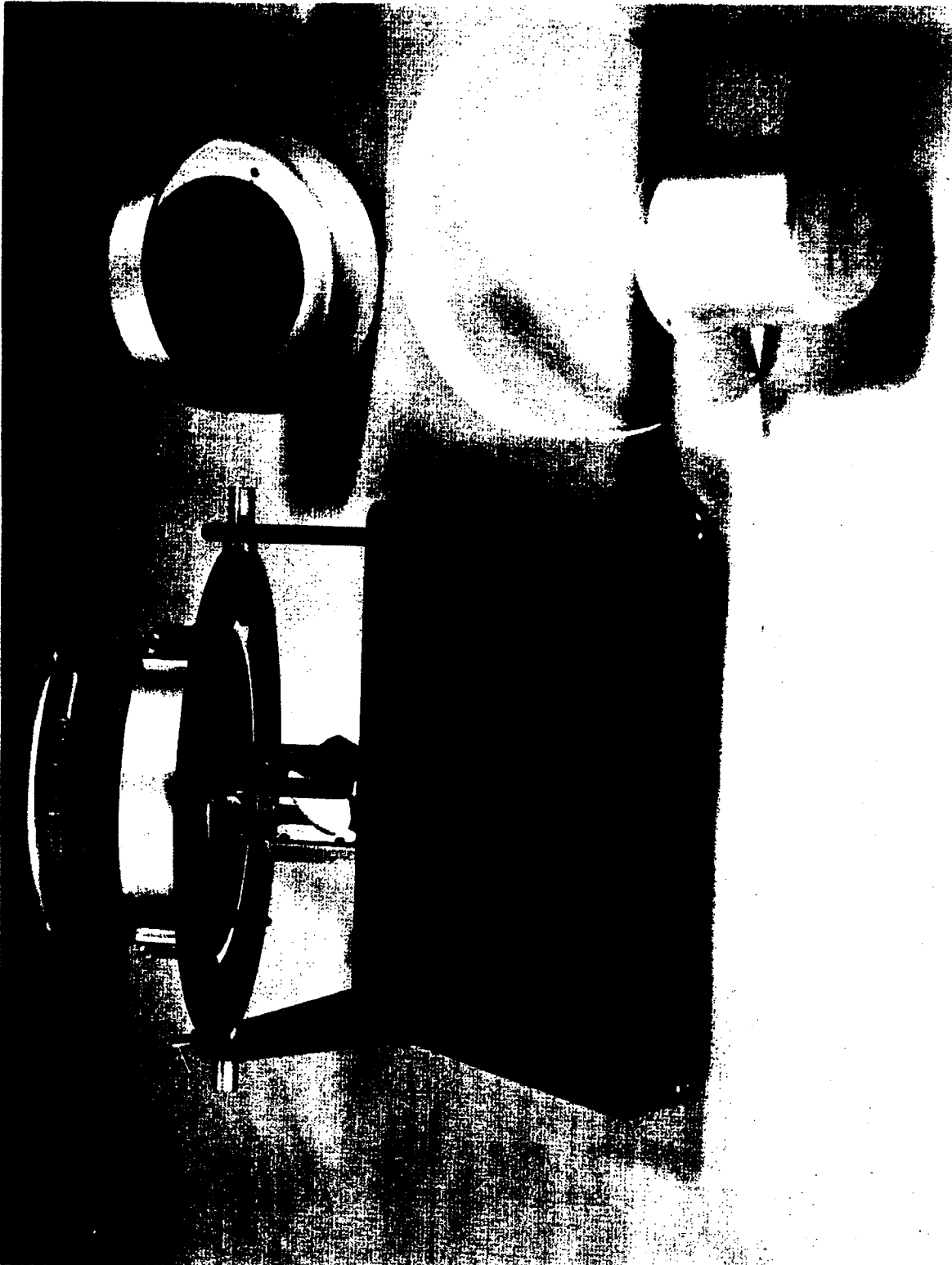
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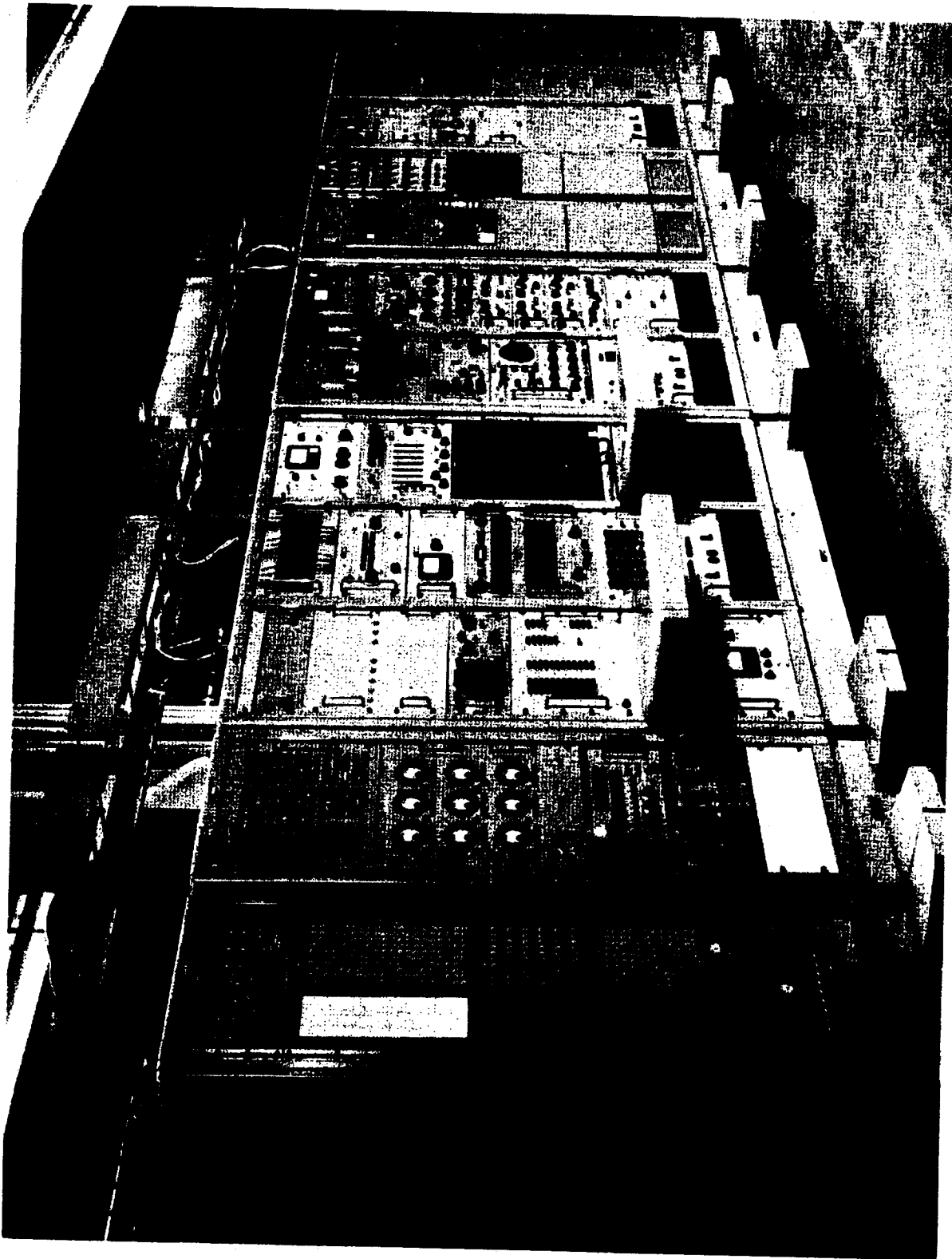
P-2804 HORIZON SCANNER

LOCKHEED AIRCRAFT CORPORATION

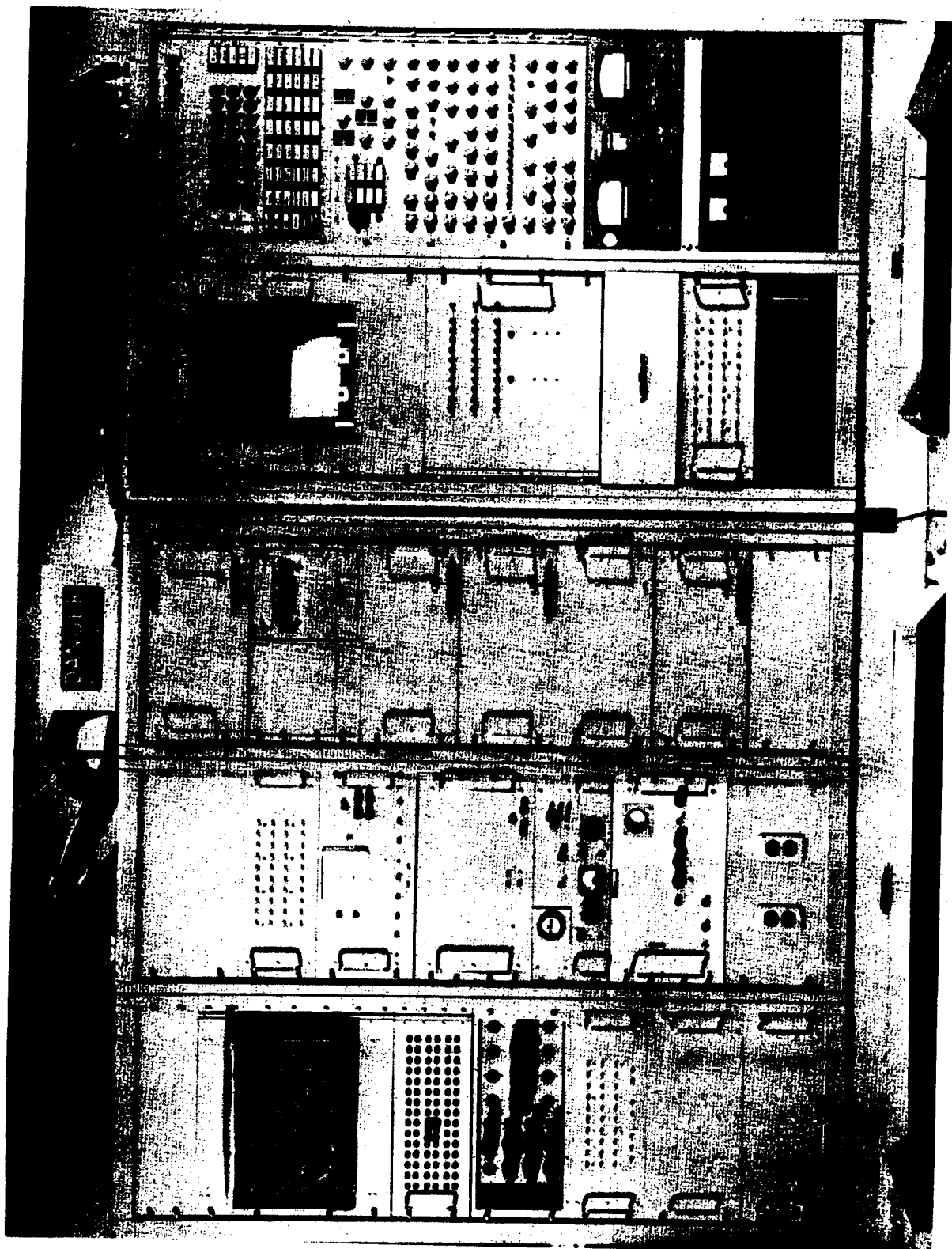
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P3046 SYSTEMS CHECKOUT COMPLEX (EXCLUDING LACE UNIT)



P-3047 LACE UNIT (SYSTEMS CHECKOUT COMPLEX)