

#49

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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.

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LMSD-6134

**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	
1430	Break	J. J. Knopow
		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	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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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
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P171(3)	WS117L Ground Traces of 83 ⁰ 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

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

P164(1) Steady-State Orbital Control System

P262(3) WS117L Satellite Vehicle Weight Analysis

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P609(1) ICBM Attack Alarm System
- Satellite Power Requirements vs. Supply

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- Vehicle Payload

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- Operational Ground Base Requirements

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- 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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ADVANCED RECONNAISSANCE VEHICLE

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MILITARY AIRCRAFT DIVISION

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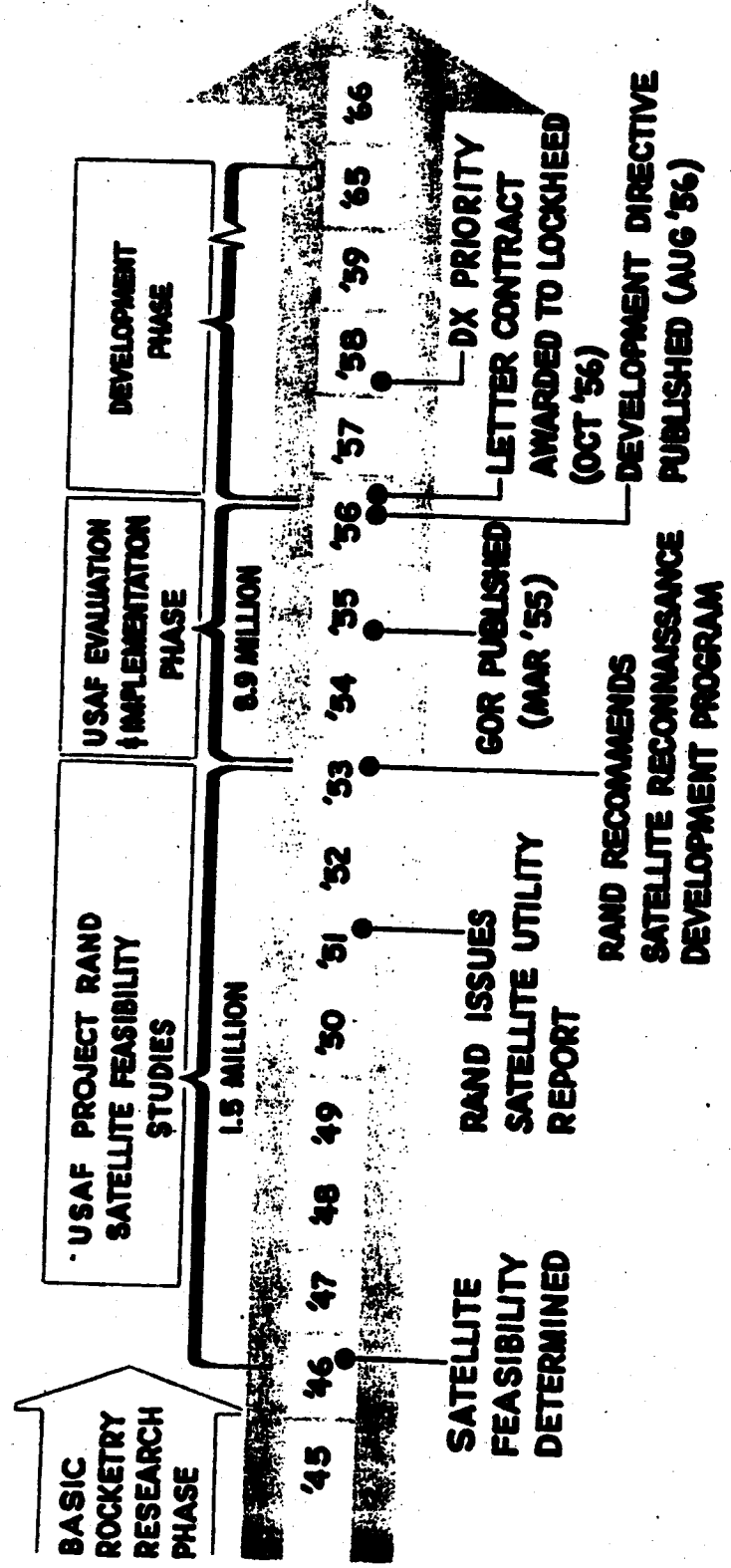
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MISSILE SYSTEMS DIVISION

ADVANCED RECONNAISSANCE SYSTEM EVOLUTION

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MEMBER PRATT & WHITNEY GROUP

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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

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

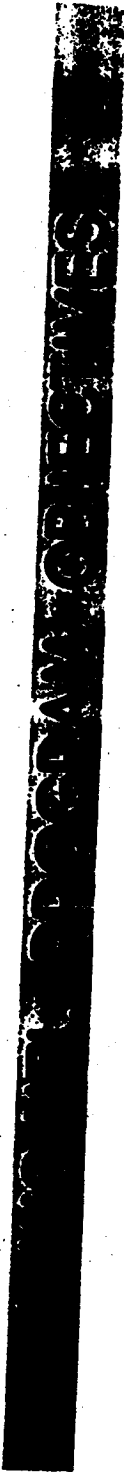
* OPEN SKY NATIONAL
OBJECTIVES

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UNCLASSIFIED



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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 N. LAT. ALTITUDE TEST RECONNAISSANCE PAYLOAD AND GENERAL SYSTEM OPERATIONS
 - PROVIDE SMALL SCALE PHOTOGRAPHIC COVERAGE OF USSR SATELLITE-BORNE FILM PROCESSING, VIDEO TRANSMISSION OF PHOTO IMAGES @ 1,100 MILE PHOTO STRIP PER PASS AVERAGE
 - 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 50-10,000 MCS SPECTRUM RECEIVE AND MEASURE BASIC SIGNAL PARAMETERS; 30-100 MILE LOCATION ACCURACY
 - 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: 50-10,000 MCS
 - 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
- III. PIONEER FERRET RECONNAISSANCE
- IV. ADVANCED VISUAL RECONNAISSANCE
- V. ADVANCED FERRET RECONNAISSANCE
- VI. VISUAL SURVEILLANCE
- VII. INFRARED SURVEILLANCE
- VIII. FERRET SURVEILLANCE
 - PROVIDE SATELLITE SYSTEM TO FURNISH INSTANTANEOUS WARNING OF AN ICBM ATTACK
 - LATER SATELLITE SYSTEM TO PROVIDE PRECISION AICM DETECTION - PREDICTION DATA
 - SIMILAR TO PROGRAM V, BUT USING:
 - MULTIPLE FUNCTIONS AND FLEXIBILITY
 - EMPLOYS MULTIPLE VEHICLES
 - LONG DURATION POWER SUPPLY
 - IMMINENCE OF HOSTILITIES WARNING

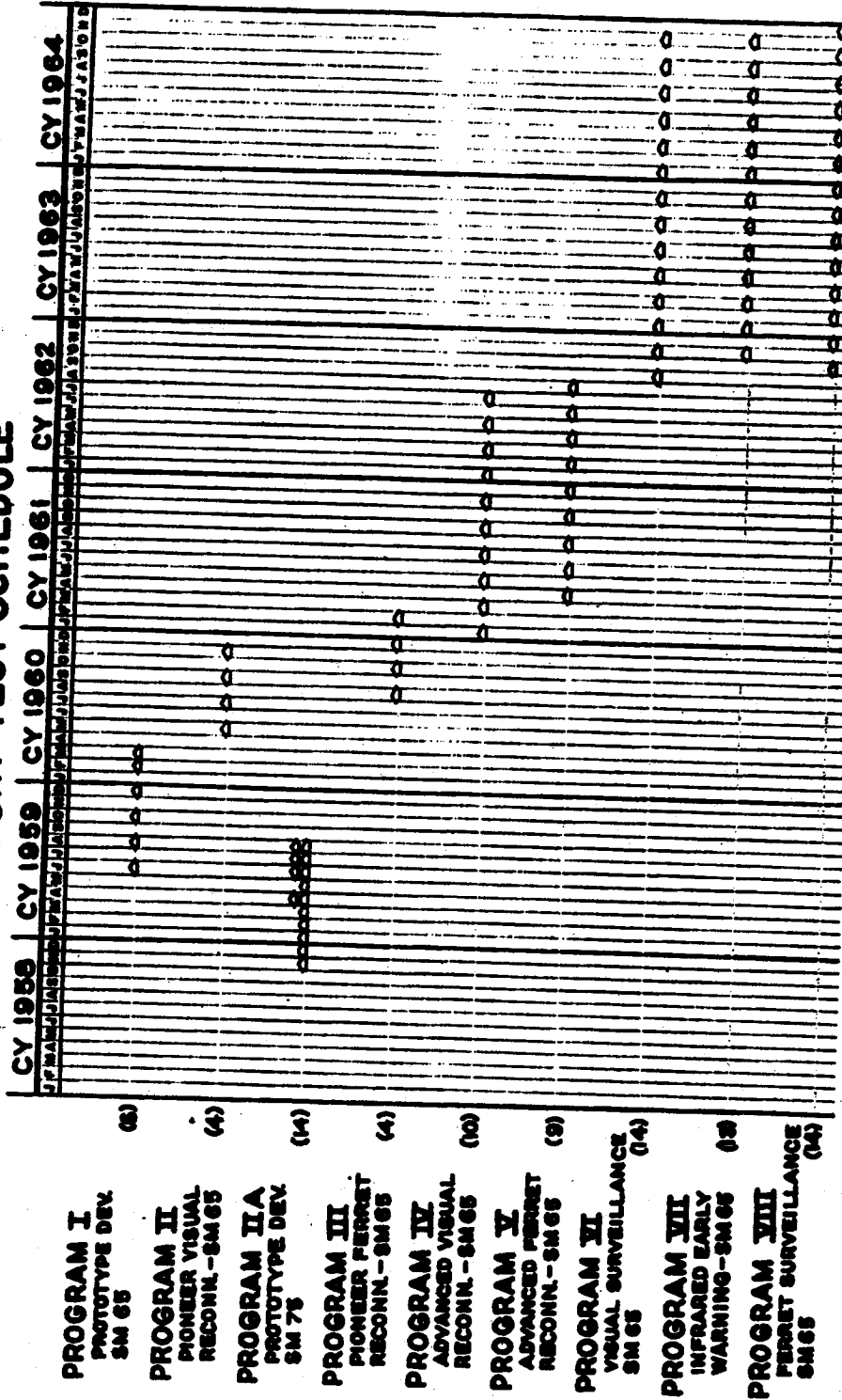
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FLIGHT TEST SCHEDULE



WS 117L STATEMENT OF WORK, AFB MO. 16 APRIL 1958
 AS AMENDED 7 JULY 1960
 LOCKHEED AIRCRAFT CORPORATION
 MISSILE SYSTEMS DIVISION

P 257 (8)-6/23/58
 WD-58-02843

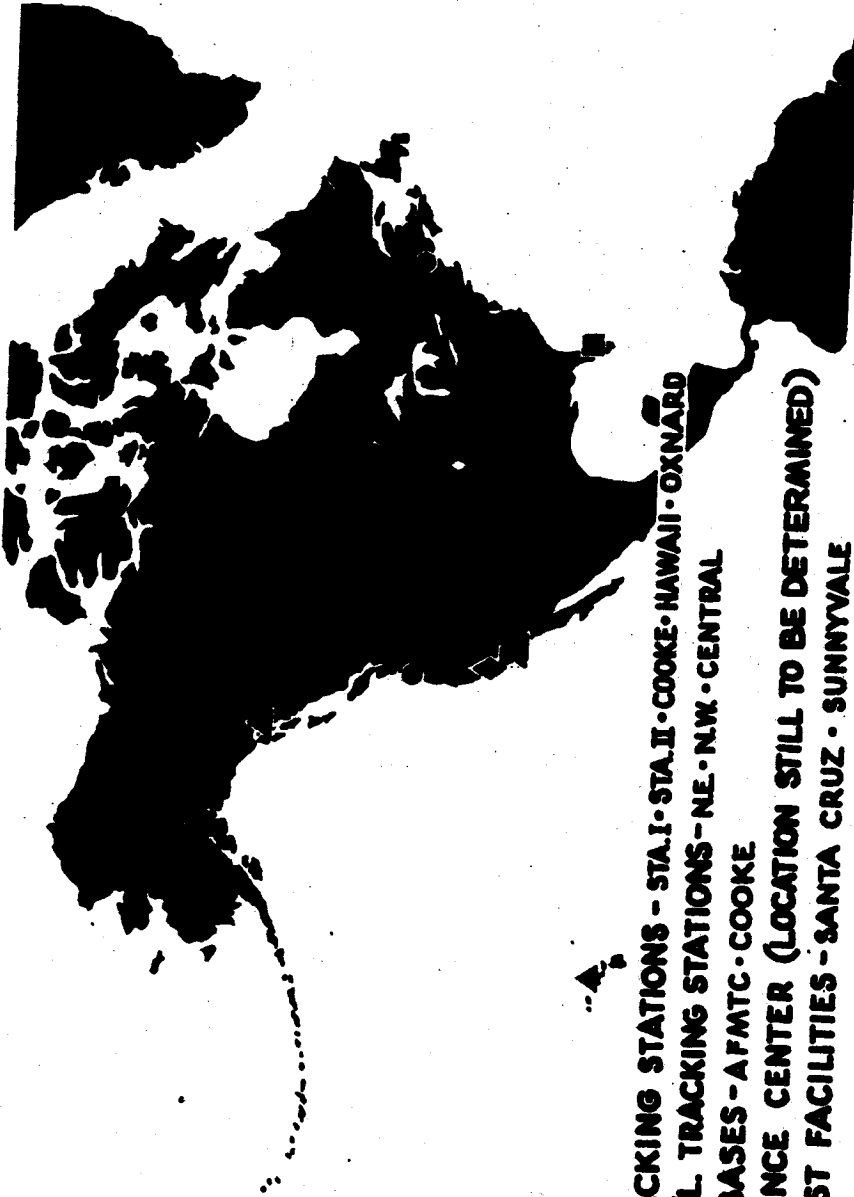
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SENTRY FACILITIES



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) 80 5/2/58
WD - 86 - 02843

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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

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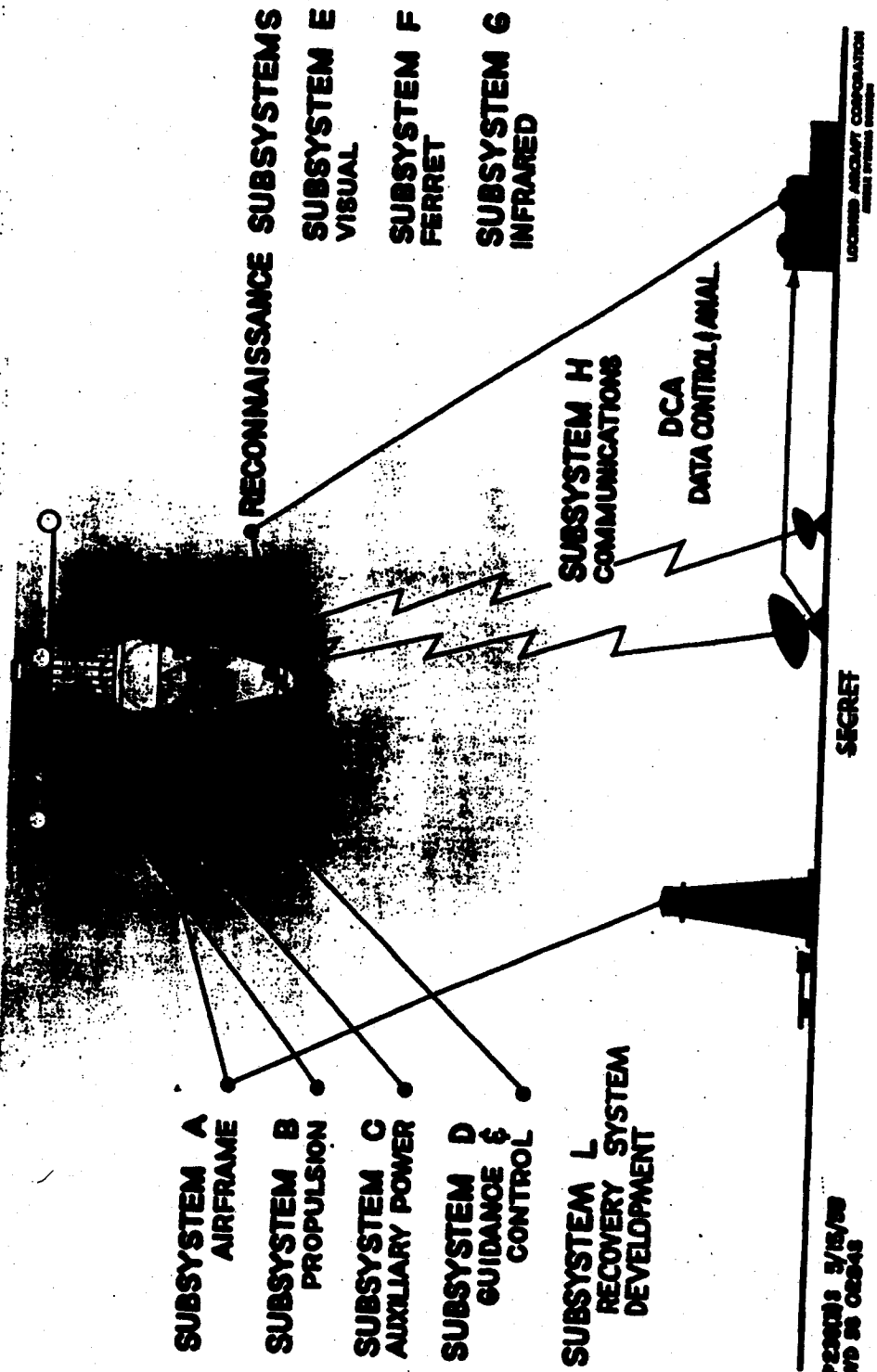
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THE SENTRY SUBSYSTEMS

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FORM 31/32/33
WD 28 02845

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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

- SONYTONE CORP.
- EAGLE-PICHER CO.
- ENGINEERED MAGNETICS
- HOFFMAN ELECTRONICS CORP.
- BEECHCRAFT 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 SYE.
- SPICA INC.
- AMPEX CORP.

FERRET

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

INFRARED RECONN.

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

GROUND-SPACE COMM.

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

TEST MGMT & OPERATIONS

- AEROJET-GENERAL CORP.
- RALPH M. 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-78)
- CONVAIR AERONAUTICS (SM-65)

GUIDANCE & CONTROL

- INSTRUMENTATION LAB., MIT
- GENERAL ELECTRIC CO.

AUXILIARY POWER

- THE MARTIN CO.
- ATOMICS INTERNATIONAL

DATA PROCESSING

- RAMO-WOOLRIDGE CORP.

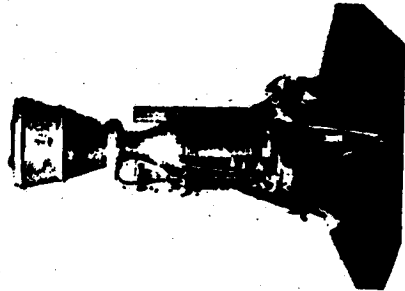
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MISSILE SYSTEMS DIVISION

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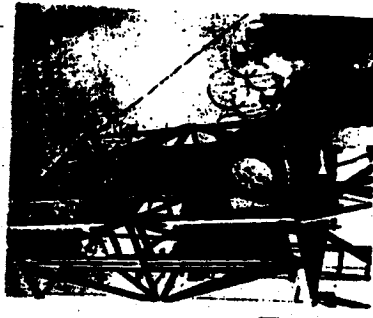
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BELL ENGINE

LOCKHEED AIRCRAFT CORPORATION
GENERAL INVESTIGATIVE DIVISION

FUNCTIONAL
MOCK UP



AIRFRAME

PROPULSION
CHECK OUT



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MOCK UP



P566 S 6/9/58
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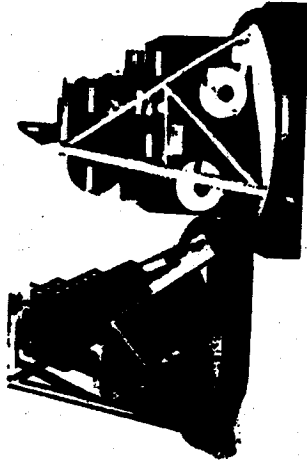
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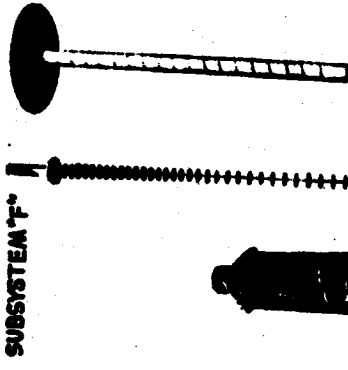


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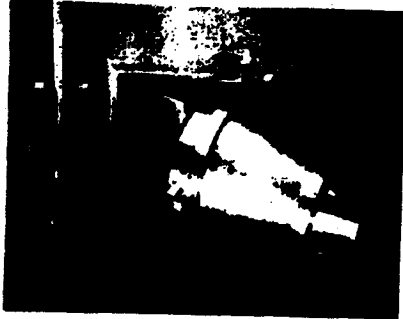


SUBSYSTEM 'E'

SUBSYSTEM 'F'



SUBSYSTEM 'G'



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P567 S 6/3/58
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ENGINE THRUST
CHAMBER FLUSHING



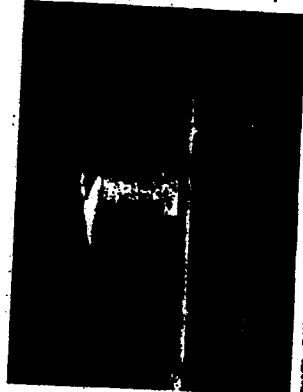
FUEL TRUCK



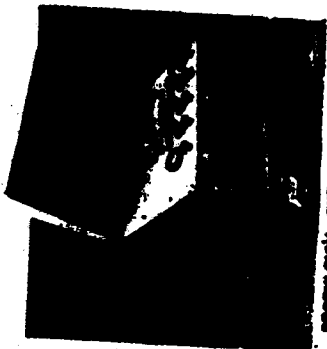
ENGINE FLUSHING TRAILER



FUEL DUMP TRAILER



FUEL DUMP TRAILER



PROPPELLANT CONTROL CONSOLE
MOUNTED BELL UNIT



UBM LOADER

AGS TRAILER AND
FLUSHING TRUCK
LOCKHEED AIRCRAFT CORPORATION
MARIETTA, GEORGIA

P. 568 GSE 6/3/58
WD-58-02458

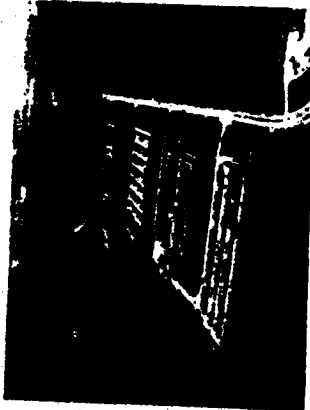
MISSILES



VAN NUYS
AIRFRAME FABRICATION



SUNNYVALE
COMPONENT ASSEMBLY



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



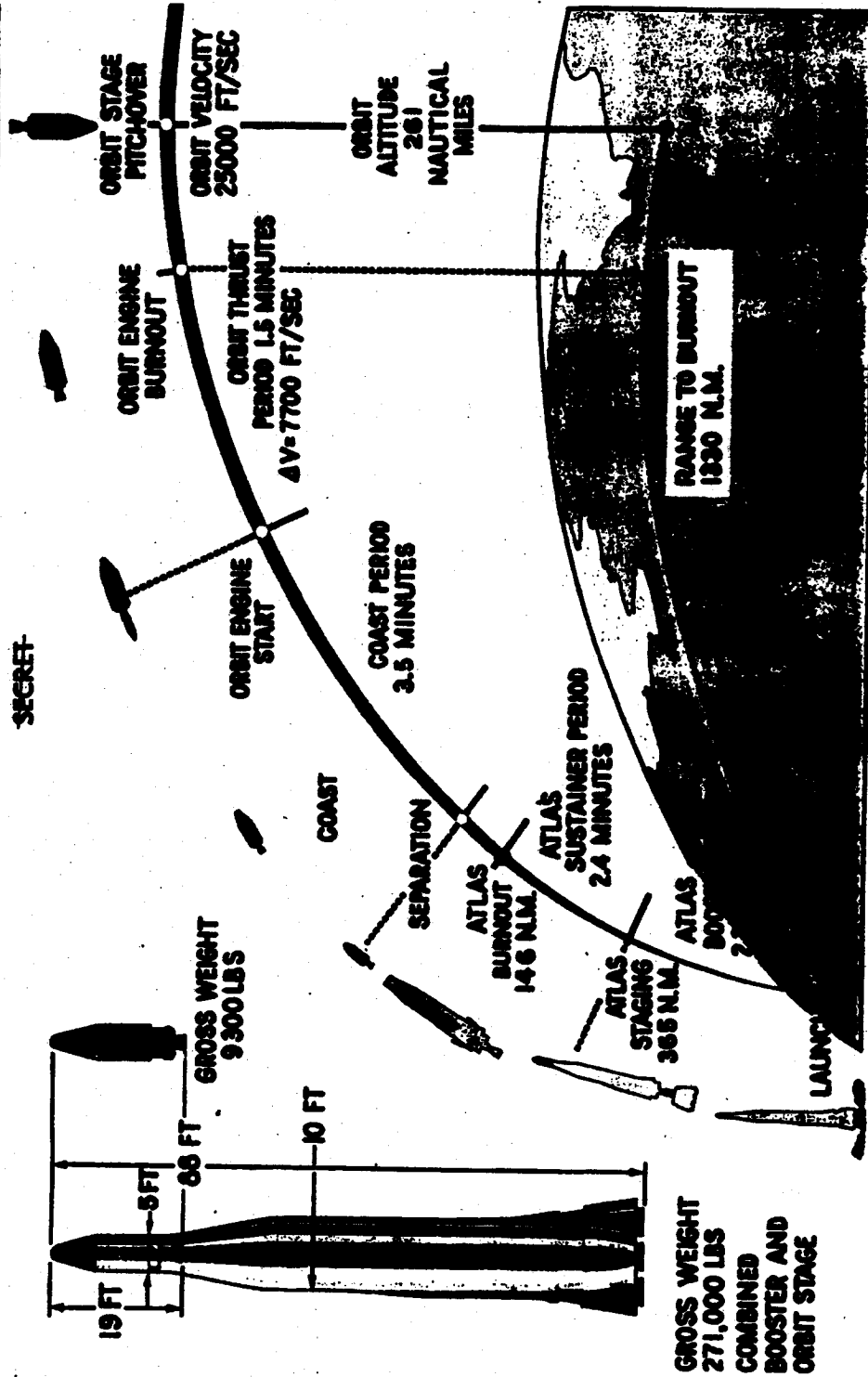
SANTA CRUZ
HAZARDOUS TEST FACILITY

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

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MISSILE SYSTEMS DIVISION

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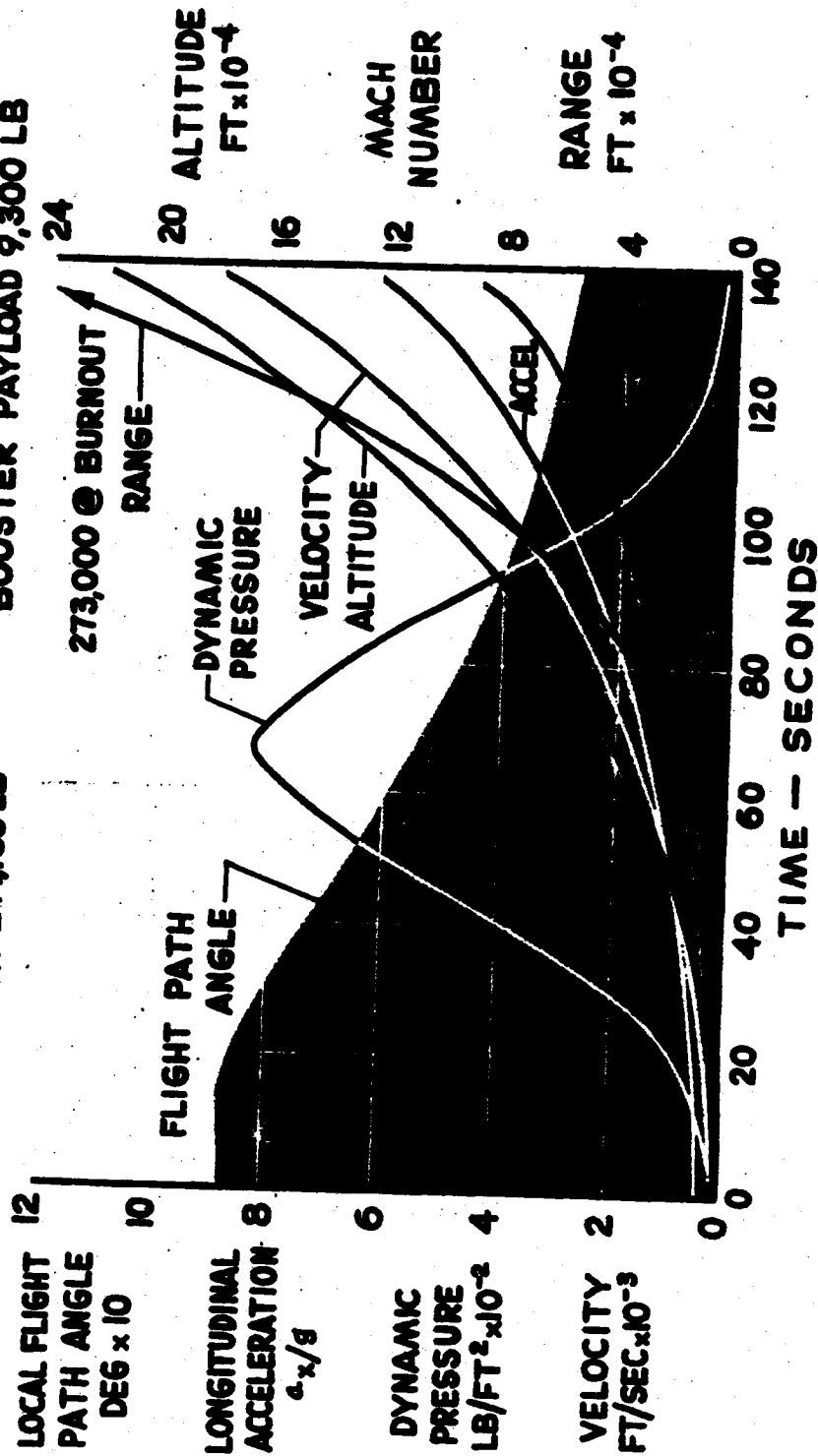
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BOOSTER STAGE

GROSS WT @ LAUNCH 271163 LB BOOSTER PAYLOAD 9,300 LB

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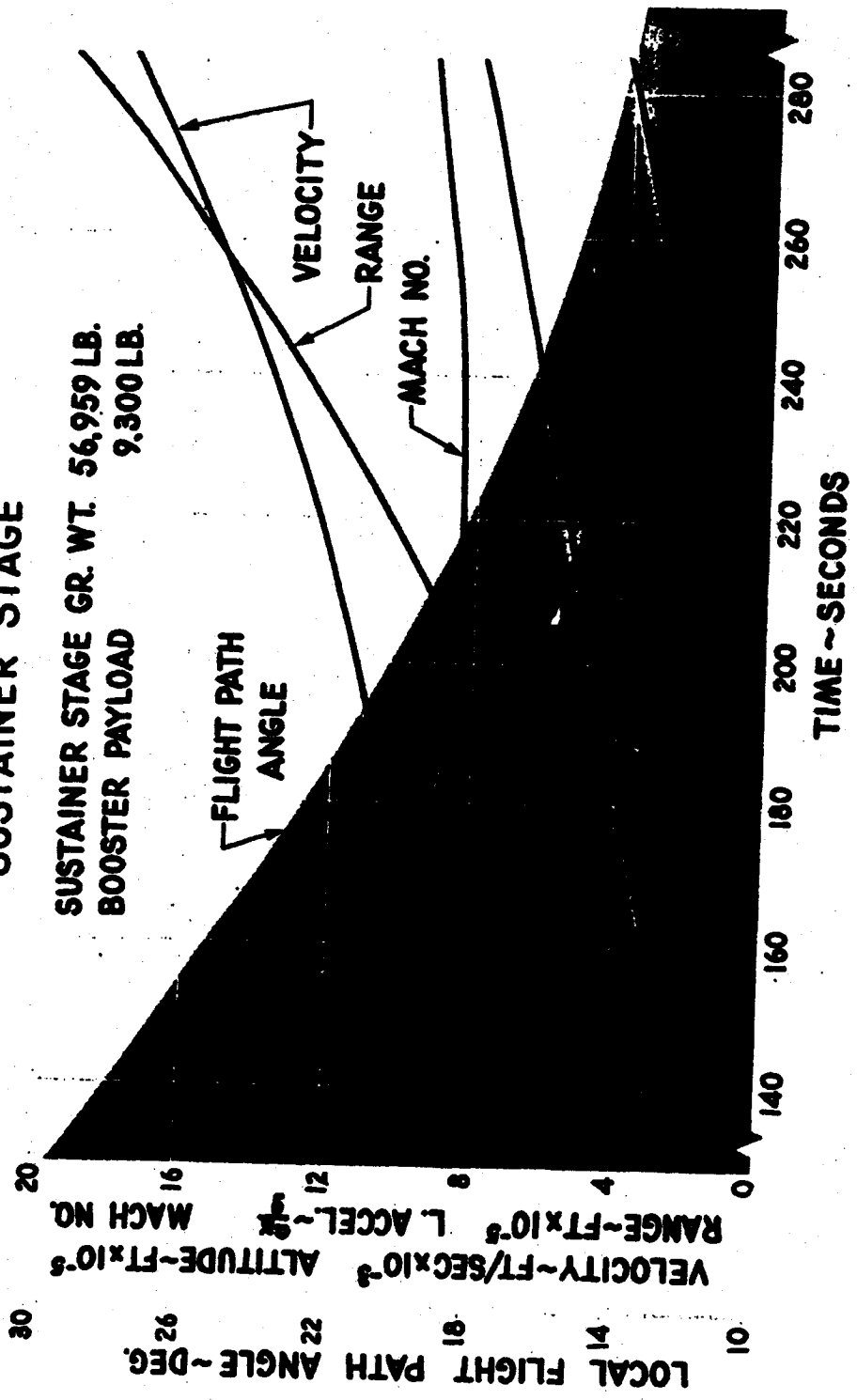
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MILWAUKEE, WISCONSIN

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~~LOCKHEED DESIGN DRAWINGS~~

SUSTAINER STAGE

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



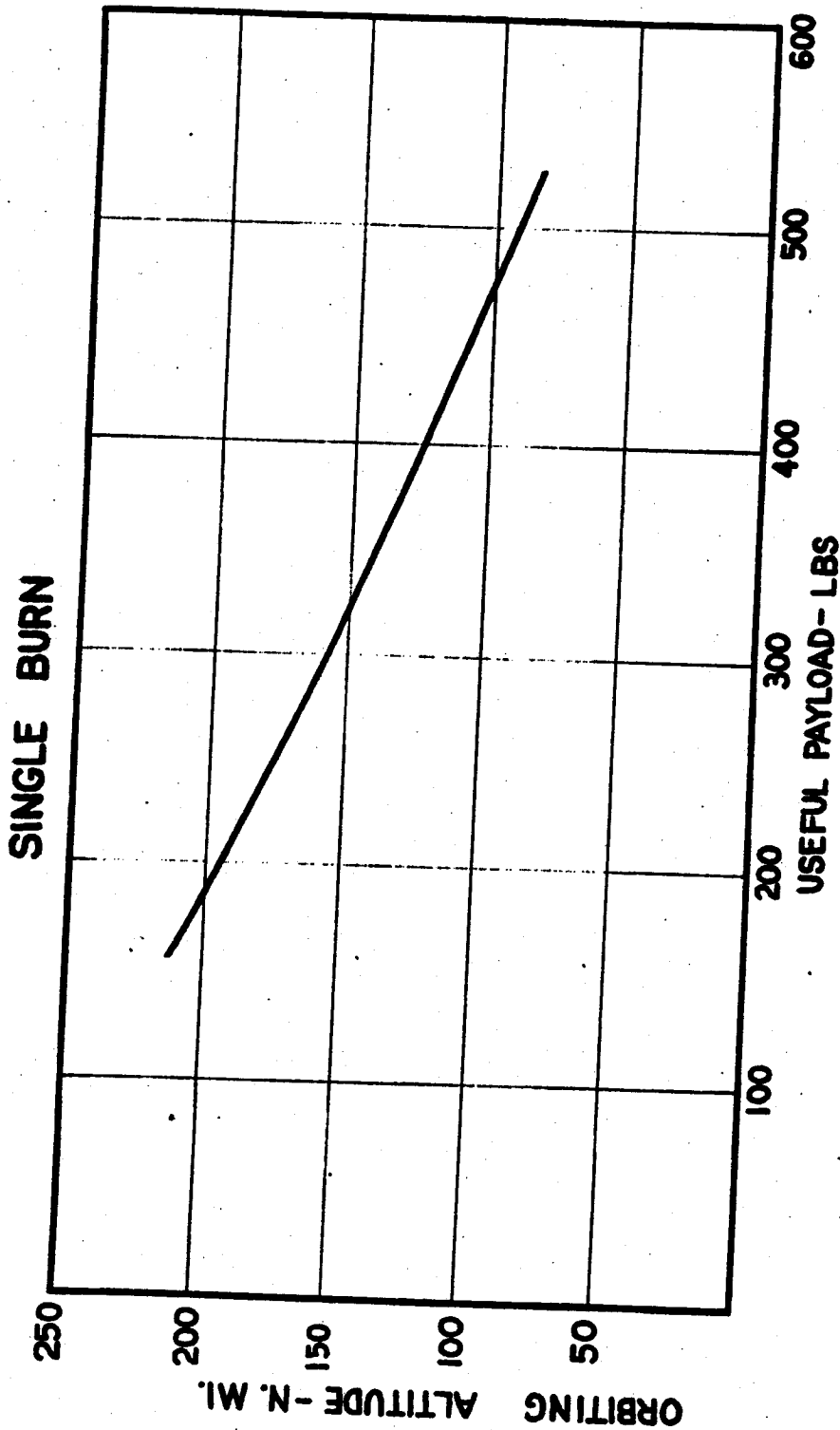
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ALTITUDE VS. PAYLOAD-SENTRY/THOR



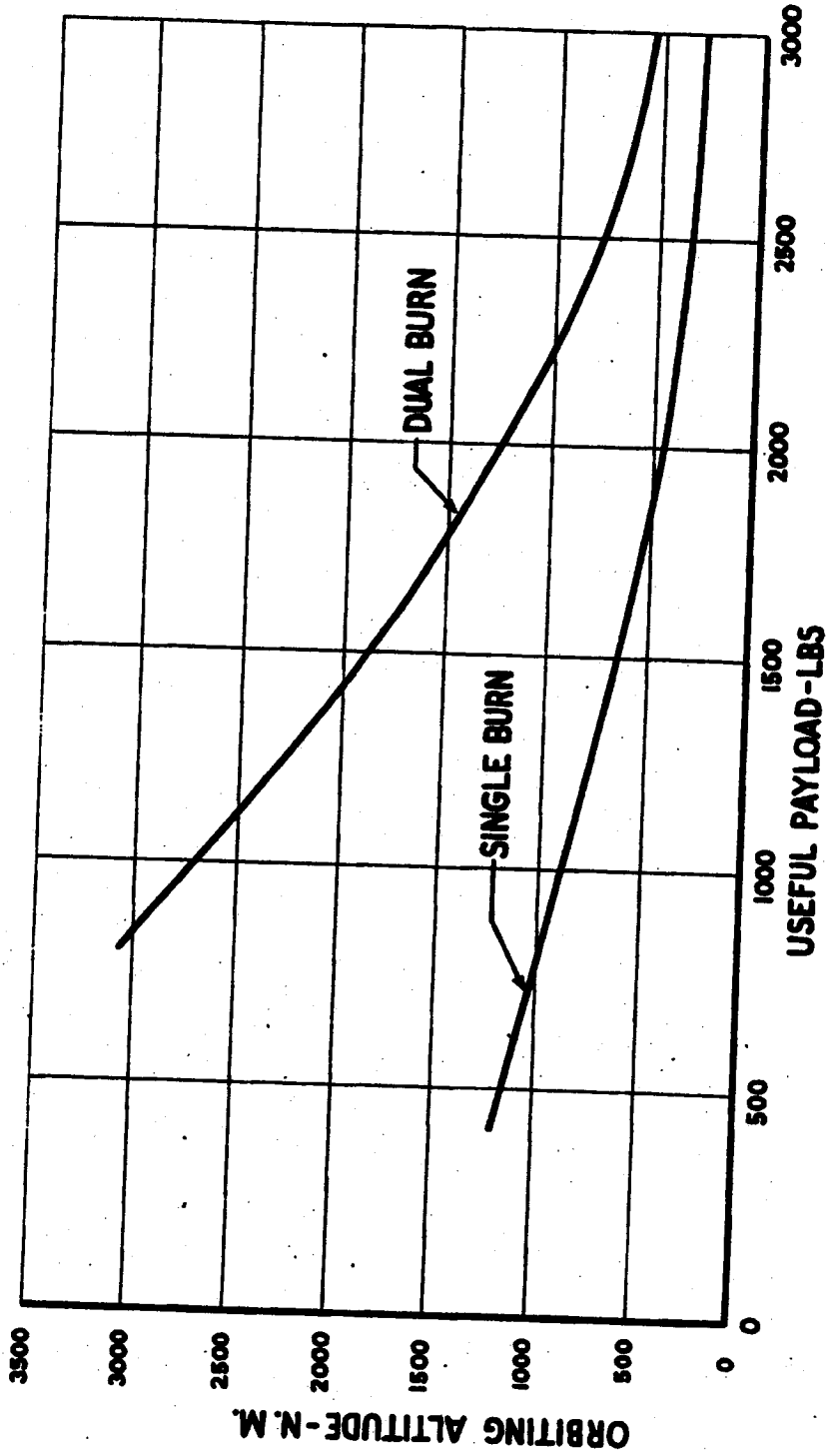
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ALTITUDE VS PAYLOAD-SENTRY/ATLAS



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VISUAL RECONNAISSANCE MODEL

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ENGINE GIMBAL LIMITS 5°
SQUARE PATTERN

ENGINE - BELL AIRCRAFT
THRUST 15,000 LB ALT
I_{sp} 263 SEC.

NOZZLE EXPANSION RATIO 15:1
N₂ GAS STORAGE FLASK
3000 PSI

ATTITUDE ROLL AND
REORIENTATION CONTROL
GAS JETS (6)

AUXILIARY POWER
SOURCE (BATTERIES)

FUEL TANK
JP-4 60 PSI

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

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.)

CAMERA LENS SHIELD

NOSE (JETTISONS)

REMOVABLE NOSE FAIRING

P232 (2) SGA 5/20/58
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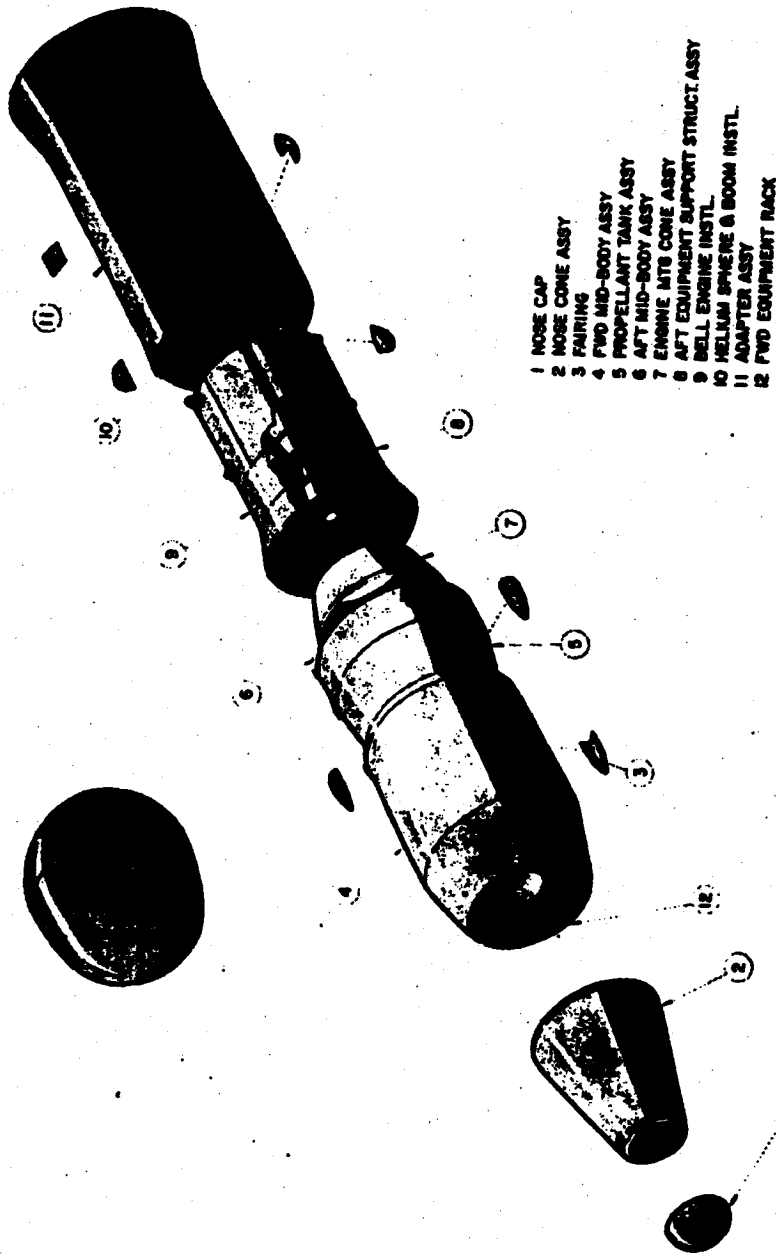
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ANN ARBOR, MICHIGAN

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LOCKHEED AIRCRAFT CORPORATION
Missile Division

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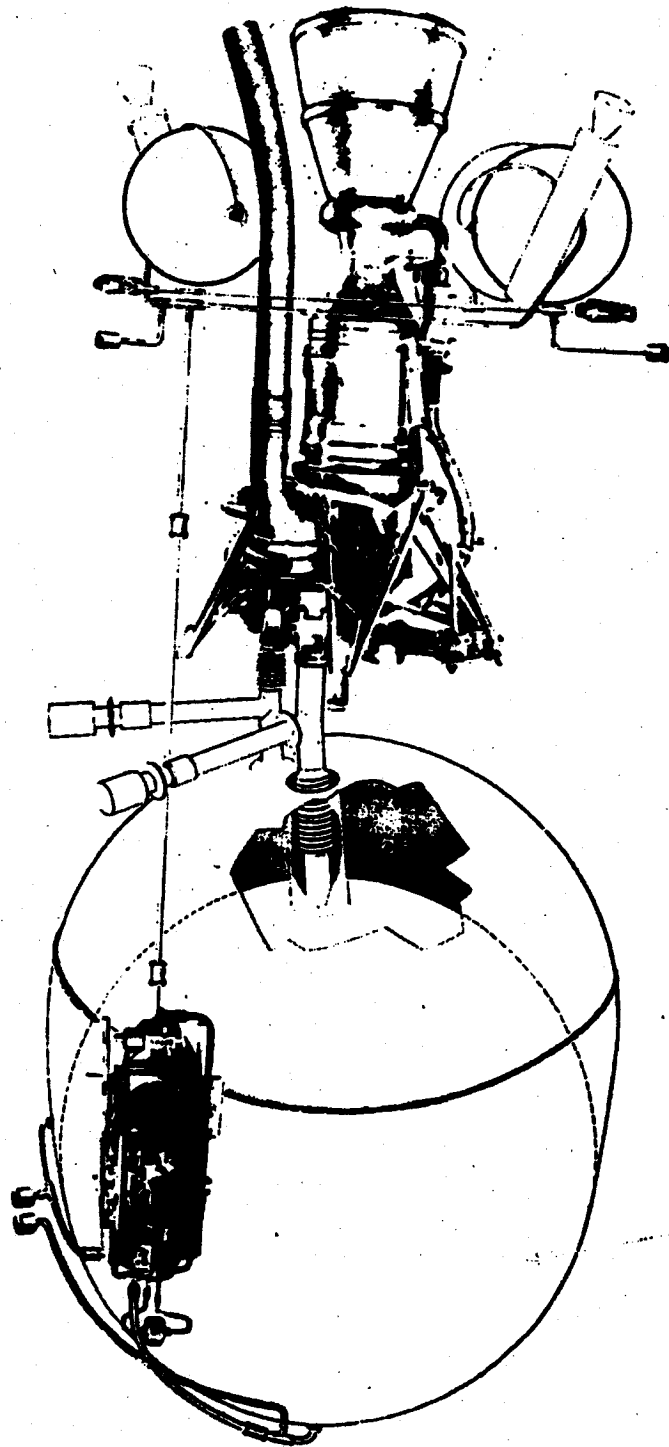
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MISSILE SYSTEMS DIVISION

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ULLAGE ROCKETS

CONTROL JETS
NITROGEN SUPPLY

JP4

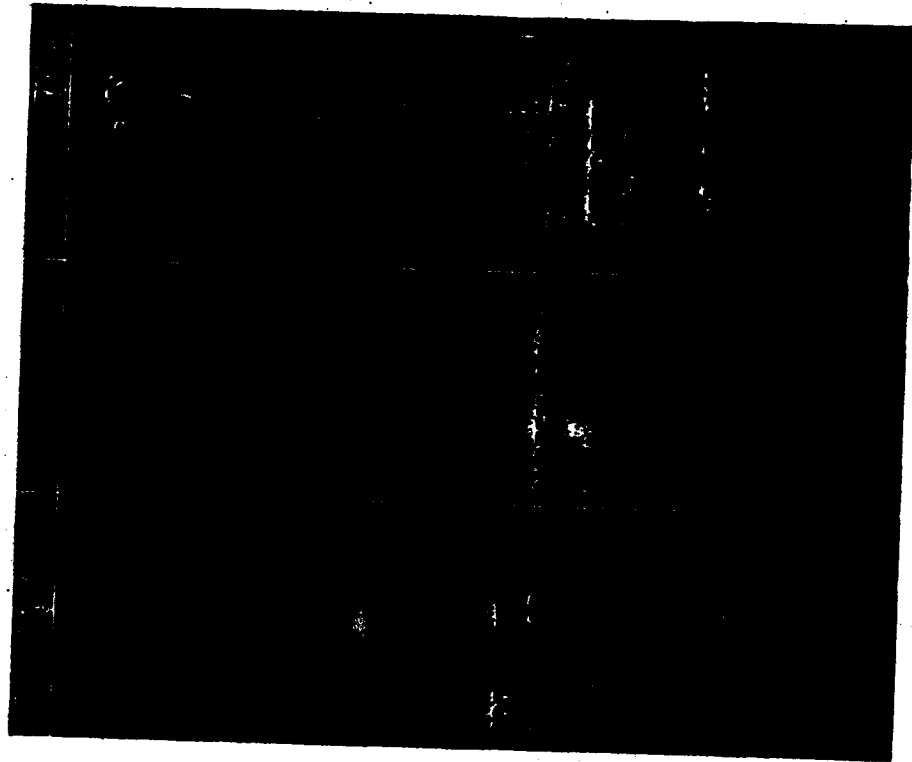
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WD-58-01286

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



LOCKHEED AIRCRAFT CORPORATION
Missile Systems Division

P 315 (A) 88 "C" 3/13/76

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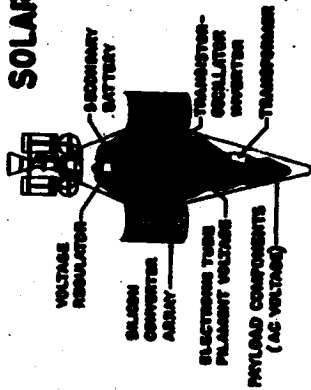
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ADVANCED AIRBORNE POWER SOURCES

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SOLAR



CHARACTERISTICS

- (1) 10% CONVERSION EFFICIENCY (10-12 WATTS/FT²)
- (2) NICKEL-CADMIUM SECONDARY BATTERY OF 10 WATT-HRS/LB ~2500 CYCLE LIFE
- (3) POWER SYSTEM LIFE LIMITED BY BATTERY AND/OR METEORIC BURNON
- (4) TWILIGHT ORBIT ADVANTAGES: CONSTANT IRRADIATION AT NORMAL INCIDENCE, NO HELIO-TROPIC/CORNER CALLS (MAKING MANEUVERING EASIER EFFICIENCY

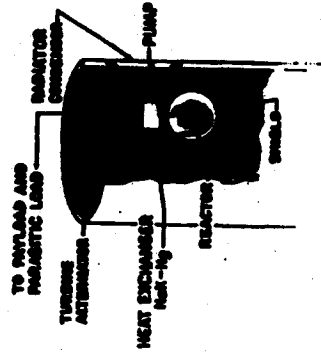
TWILIGHT ORBIT



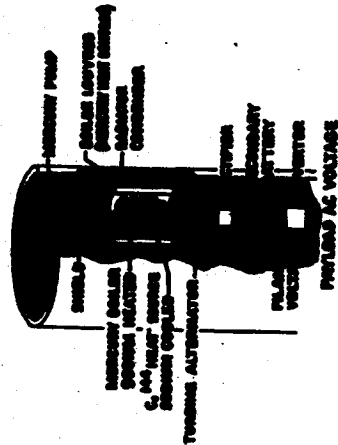
NUCLEAR REACTOR

CHARACTERISTICS

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



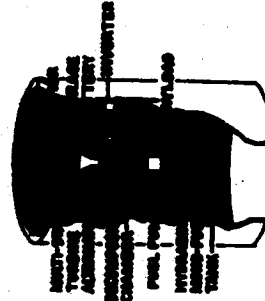
ISOTOPE



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 BURNING 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 SCENTRICITY CONTROL
- (3) POWER LEVEL EASILY CONTROLLABLE

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SECRET

LOCKHEED AIRCRAFT CORPORATION
MISSILE SYSTEMS DIVISION

