Vol. IV 3rd Edition
MANAGEMENT INFORMATION

X.1 MS-I
M. Rosen

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

SECTION I: ADVANCED PROGRAMS

APOLLO EXTENSION SYSTEMS
LESA
MOLAB
LUNAR LOGISTICS
MULTI MISSION MODULES
NUCLEAR ROCKET SYSTEMS
FUTURE PROJECTS OFFICE

SECTION II: RESEARCH AND TECHNOLOGY

RESEARCH PROJECTS LABORATORY
OTHER MSFC RESEARCH ACTIVITIES

JUNE 1965

FOR NASA INTERNAL USE ONLY

MANAGEMENT INFORMATION OFFICE
EXECUTIVE STAFF
MARSHALL SPACE FLIGHT CENTER

National Aeronautics and Space Administration

NASA

MSFC - Form 454 (Revised September 1961)

PREFACE

This document contains copies of management charts and photographs maintained in the Management Information Office of the Executive Staff on Advanced Program and Research and Technology Areas.

To facilitate more extensive use of this document, all classified data has been removed and published in Volume IX.

Some of the charts and photographs in this volume are included in Dr. von Braun's, Dr. Rees' and Mr. Gorman's Management Information Display Consoles. The "Table of Contents" identifies the use of each.

Information for these charts has been furnished the Management Information Office by the various offices and laboratories of MSFC involved in the various Advanced Program and Research and Technology areas.

Charts and pictorial coverage are available in the form of 2 x 2 (35mm) color slides and black and white prints from the Data Bank Library of the Management Information Office, Room P-100 (10th floor), Building 4200. It is recommended that they be used to the maximum extent possible for briefing material in lieu of preparation of special charts.

Comments or suggestions you may have on any of the coverage contained herein should be referred to Mr. Gene Wambeke, E-D, Phone 876-0027.

MANAGEMENT INFORMATION OFFICE
EXECUTIVE STAFF
MARSHALL SPCE FLIGHT CENTER

SCHEDULE FOR PUBLICATION OF MANAGEMENT INFORMATION

Volume No.	Title	1st Edition	2nd Edition	3rd Edition
I	Saturn I and IB	June 64	Oct. 64	April 65
II	Michoud and Mississippi Test Operations	June 64	Oct. 64	April 65
III	Huntsville Facilities	July 64	Nov. 64	May 65
IV	Advanced Programs and Research and Technology	July 64	Nov. 64	May 65
V	Manpower, Financial, and Organization	July 64	Dec. 64	Mar. 65
VI	Saturn V	Aug. 64	Jan. 65	June 65
VII	Facilities - Various Locations and Other Centers	Aug. 64	Jan. 65	July 65
VIII	Engines	Sept. 64	Feb. 65	Aug. 65
IX	Classified Data	Sept. 64	Feb. 65	July 65
X	R & D Operations	Oct. 64	Mar. 65	Sept. 65
XI	U. S. and International Space Programs and Program Schedules	July 65	Jan. 66	July 66

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

CLASSIFIED DATA

The "classified" Nuclear Rocket Systems chart listed below is included in Volume IX along with all other "classified" Management Information Office charts.

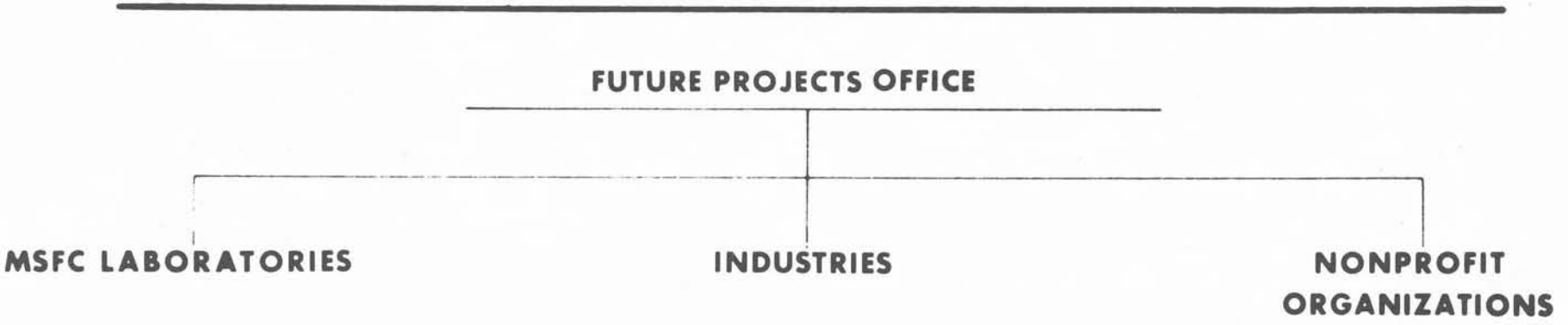
M-CP-D 1512 Nerva Engine

ADVANCED PROGRAMS

RESEARCH AND DEVELOPMENT OPERATIONS

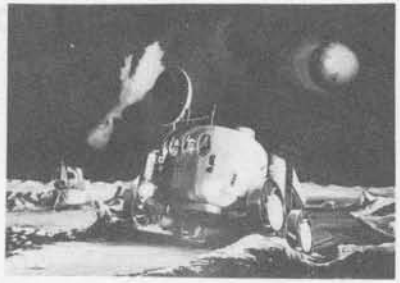
ADVANCED PROGRAMS AND SPACE FLIGHT SYSTEMS

- DEVELOP PLANS FOR THE MODIFICATION AND UTILIZATION OF CURRENTLY AUTHORIZED FLIGHT HARDWARE TO PERFORM MISSIONS BEYOND APOLLO SPACE FLIGHT MISSIONS.
- CONCEIVE AND EVOLVE ADVANCED CONCEPTS FOR FUTURE SPACE TRANSPORTATION SYSTEMS.
- PURSUE THE MORE PROMISING CONCEPTS FROM THE DETERMINATION OF FEASIBILITY TO THE REFINEMENT OF THE CONCEPT FOR PRACTICAL IMPLEMENTATION.

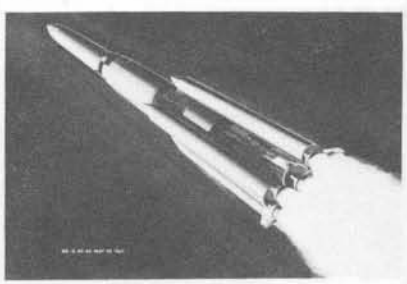


E-D W7400 A

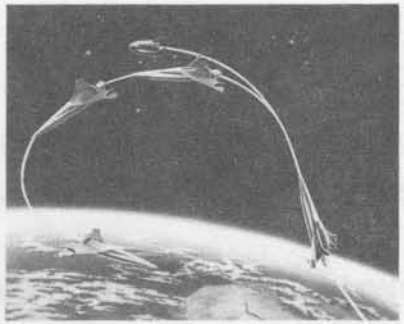
ADVANCED PROGRAMS



LUNAR SYSTEMS

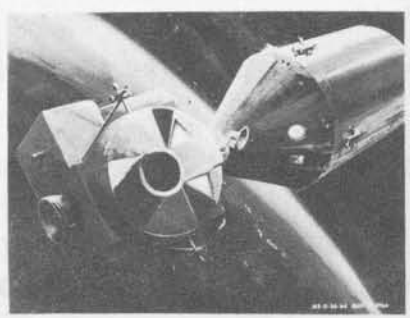


IMPROVED LAUNCH VEHICLES



REUSABLE AEROSPACE SYSTEMS

PLANETARY SYSTEMS

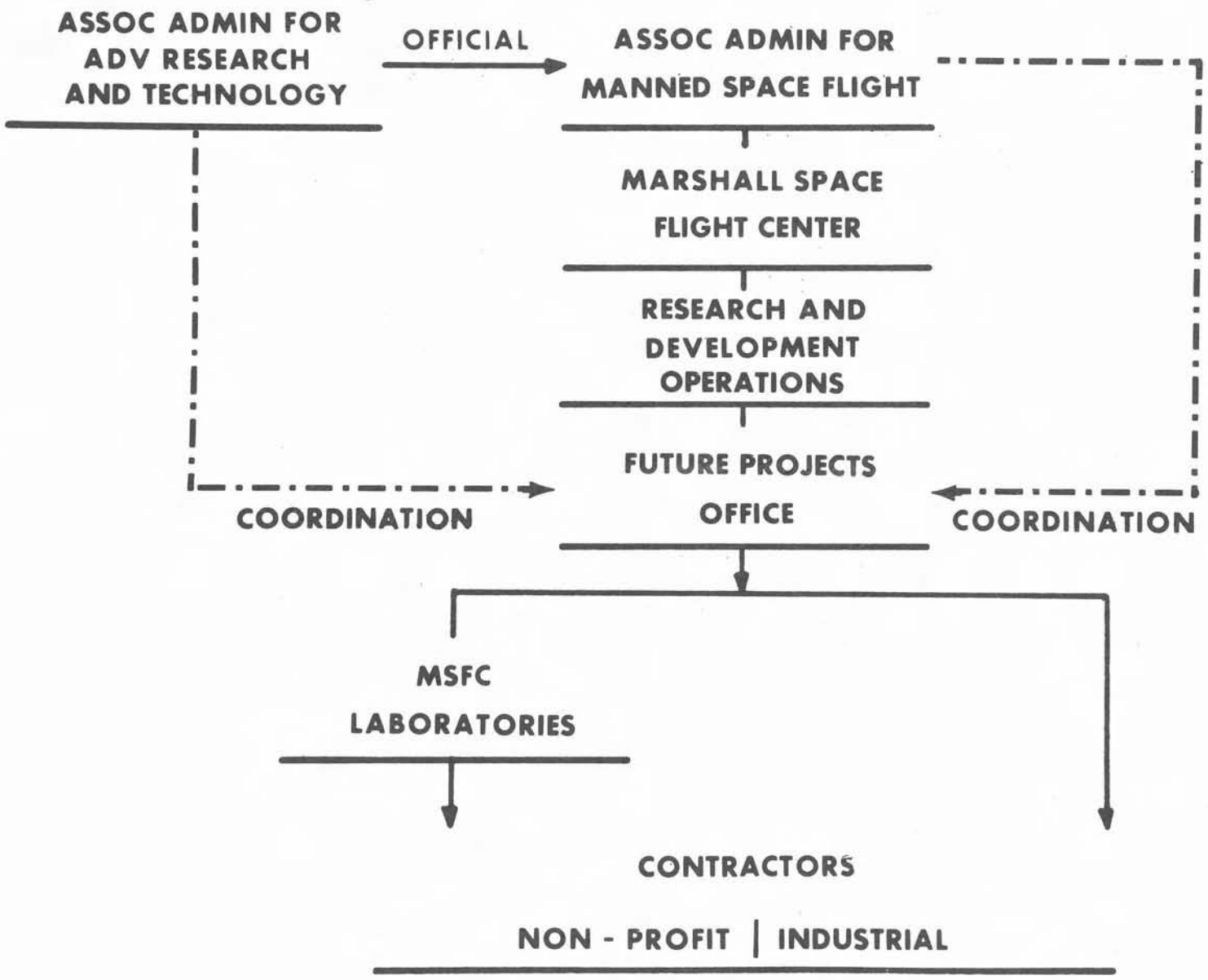


EARTH ORBITAL SYSTEMS

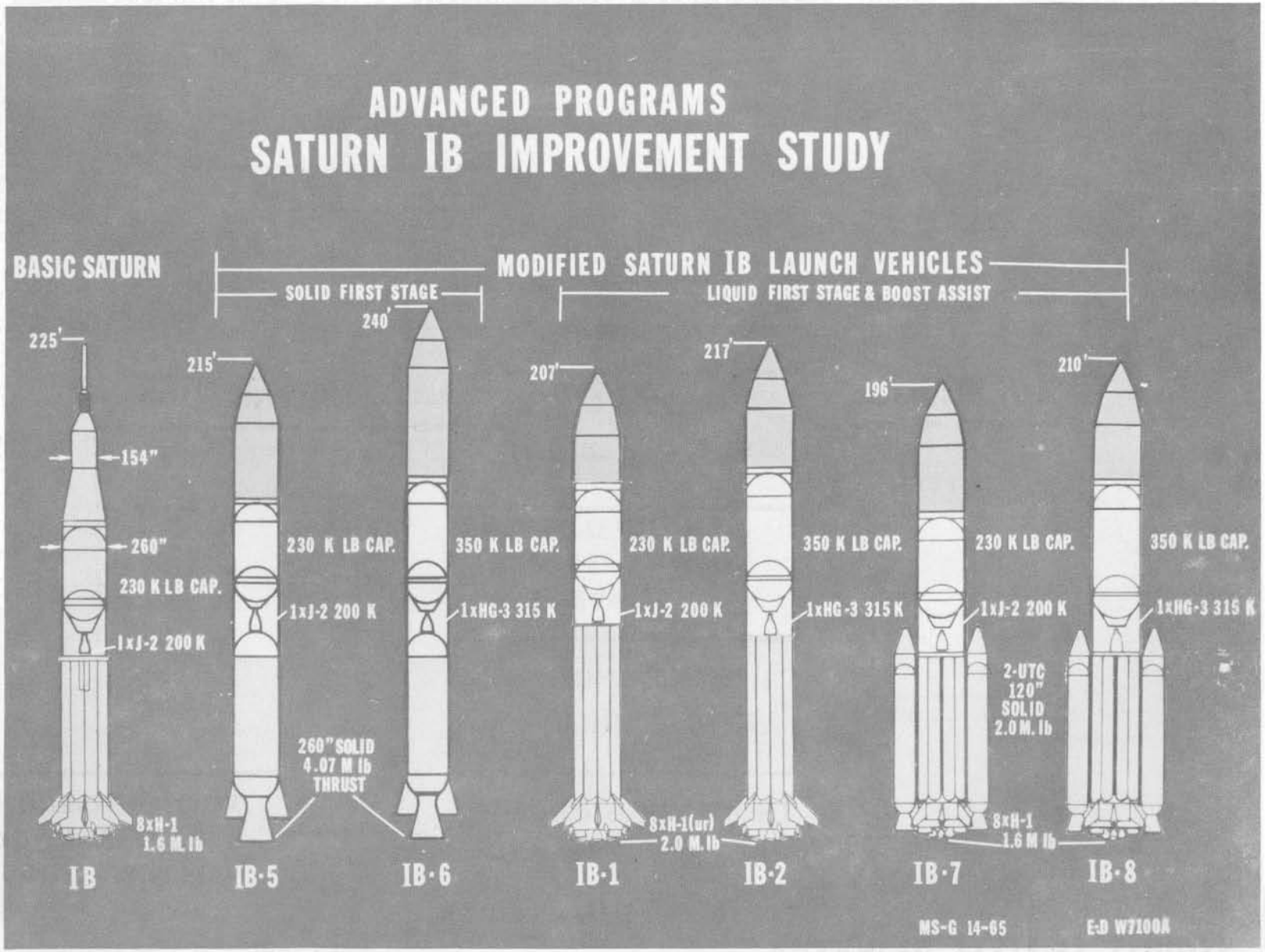
E-D 97134 A

RESEARCH AND DEVELOPMENT OPERATIONS

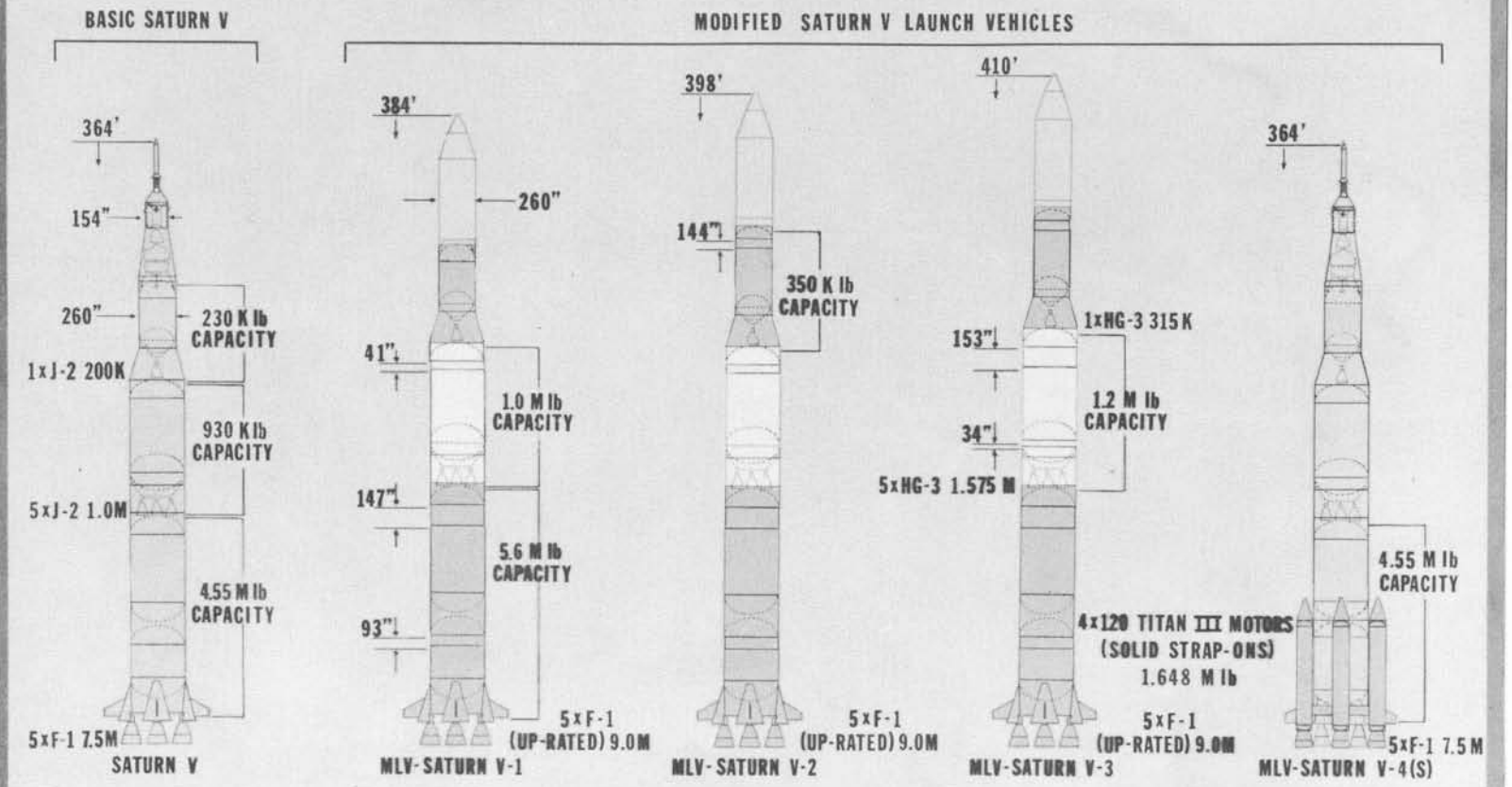
ADVANCED SYSTEMS STUDIES



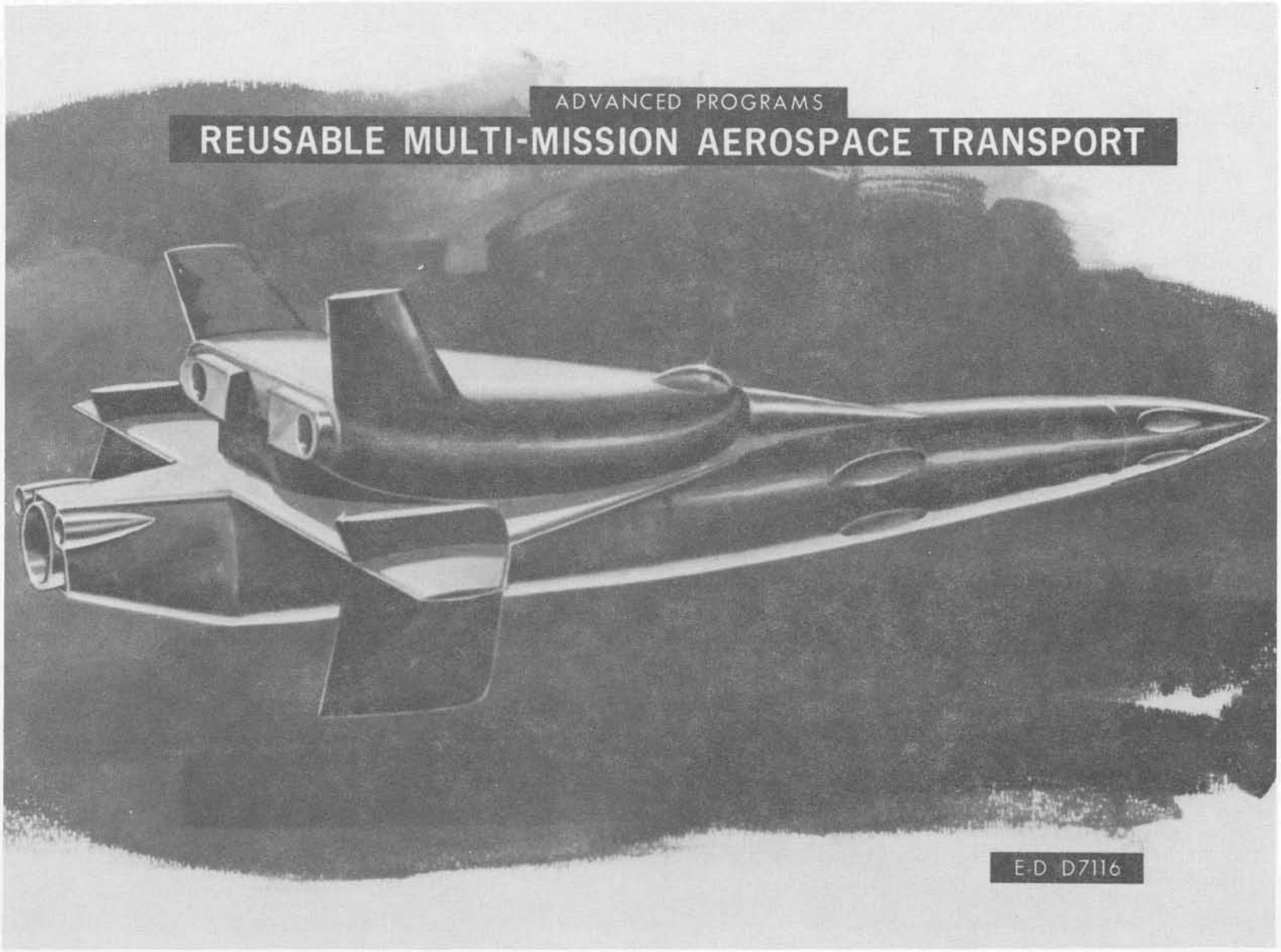
E-D D 1736


ADVANCED PROGRAMS
SATURN IB IMPROVEMENT STUDY
BASIC SATURN
MODIFIED SATURN IB LAUNCH VEHICLES
SOLID FIRST STAGE
LIQUID FIRST STAGE & BOOST ASSIST
225'
154"
260"
230 K LB CAP.
1xJ-2 200 K
8xH-1
1.6 M lb
IB
215'
240'
230 K LB CAP.
350 K LB CAP.
1xJ-2 200 K
1xHG-3 315 K
260" SOLID
4.07 M lb
THRUST
IB-5
IB-6
207'
217'
230 K LB CAP.
350 K LB CAP.
1xJ-2 200 K
1xHG-3 315 K
8xH-1(ur)
2.0 M lb
IB-1
IB-2
196'
210'
230 K LB CAP.
350 K LB CAP.
1xJ-2 200 K
1xHG-3 315 K
2-UTC
120"
SOLID
2.0 M lb
8xH-1
1.6 M lb
IB-7
IB-8
MS-G 14-65
E-D W7100A

ADVANCED PROGRAMS
SATURN V IMPROVEMENT STUDY

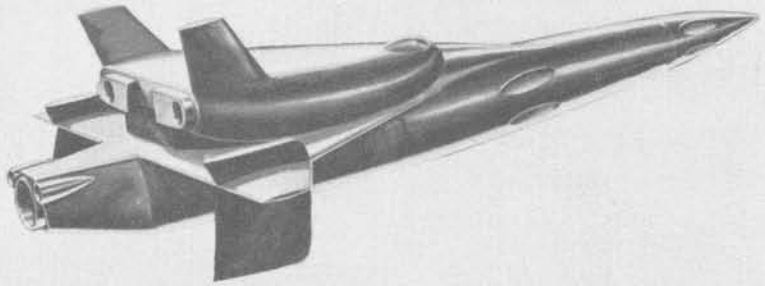


MS-G-17-65 ED W7102A


ADVANCED PROGRAMS
REUSABLE MULTI-MISSION AEROSPACE TRANSPORT
E-D D7116

ADVANCED PROGRAMS

REUSABLE MULTI-MISSION AEROSPACE TRANSPORT



LENGTH-225.0' SPAN-112.0' HEIGHT-53.7'

MISSIONS

- SPACE STATION SUPPORT FOR:
  - ORBITAL PROGRAMS
  - PLANETARY EXPLORATION
  - LUNAR BASE RESUPPLY
- UNMANNED PAYLOAD DELIVERY
- MANNED MILITARY SPACE PROGRAMS

R-FP WHITACRE E-D W7101 A

ADVANCED PROGRAMS

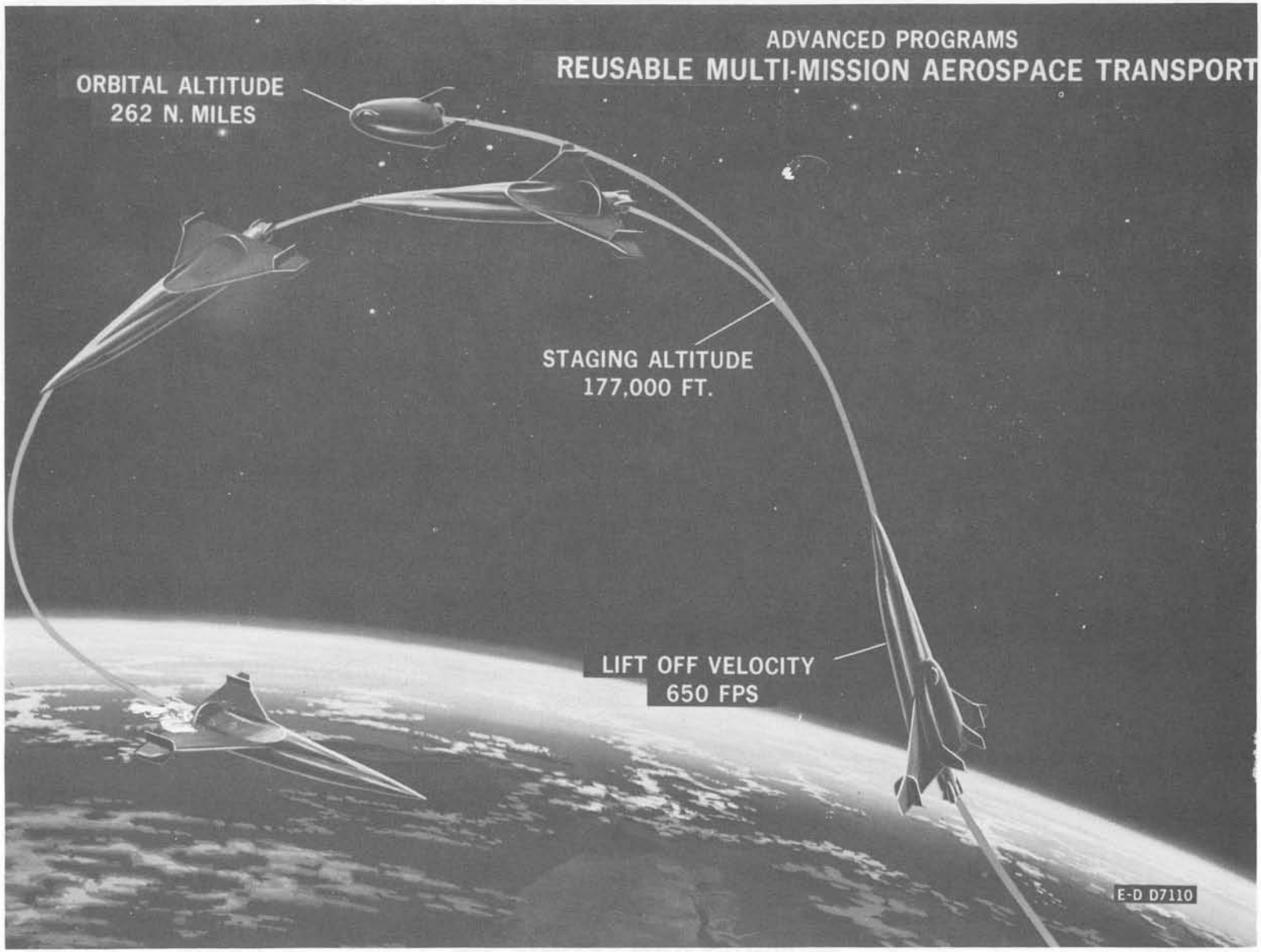
REUSABLE MULTI-MISSION AEROSPACE TRANSPORT

LENGTH-225.0' SPAN-112.0' HEIGHT-53.7'

CHARACTERISTICS

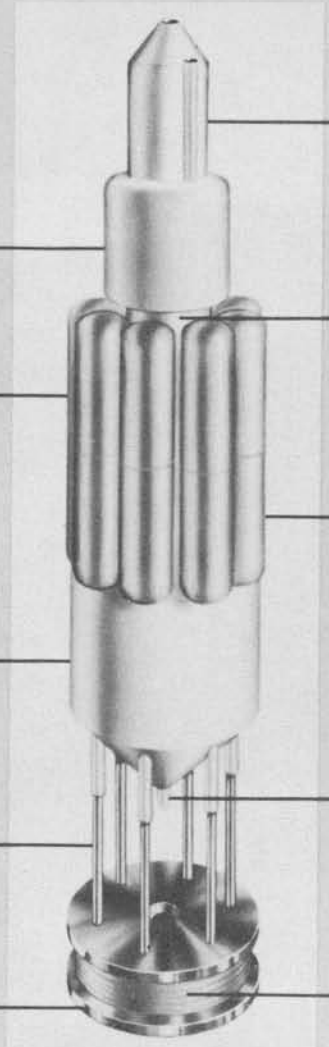
- HORIZONTAL TAKE-OFF
- TWO STAGES TO ORBIT
- HIGH REUSABILITY/ECONOMY
- PAYLOAD:
  - 2 CREW
  - 10 PASSENGERS
  - 3½ TON CARGO
- ENGINES:
  - 1ST STAGE – 1-F-1, 2-H-1, 2-TURBOJET
  - 2ND STAGE – 1-HG-3 TYPE, 2 RL10
- PROPELLANT:
  - 1ST STAGE — LO_2/RP_2
  - 2ND STAGE — LO_2/LH_2
- WEIGHT:
  - LIFT-OFF – 1.72 M LBS.
  - 2ND STAGE/SEPARATION – 280,000 LBS.
- PERFORMANCE:
  - LIFT-OFF VELOCITY ——— 650 FT/SEC
  - STAGING ALTITUDE ——— 177,000 FT
  - STAGING VELOCITY ——— 6,800 FT/SEC
  - ORBITAL ALTITUDE ——— 262 NAU. MILES
  - ORBITAL VELOCITY ——— 25,000 FT/SEC

R-FP WHITACRE E-D W7111 A


ADVANCED PROGRAMS
REUSABLE MULTI-MISSION AEROSPACE TRANSPORT
ORBITAL ALTITUDE
262 N. MILES
STAGING ALTITUDE
177,000 FT.
LIFT OFF VELOCITY
650 FPS
E-D D7110

ADVANCED PROGRAMS

NUCLEAR PULSE SPACE VEHICLE



ESCAPE/COMMAND MODULE

CREW RESIDENCE

SPINE

PAYLOAD, MODULARIZED

PROPELLANT MODULES

ENGINE, FLUIDS AND COOLANTS

DELIVERY SYSTEM

TELESCOPING SHOCK ABSORBERS

PUSHER PLATE

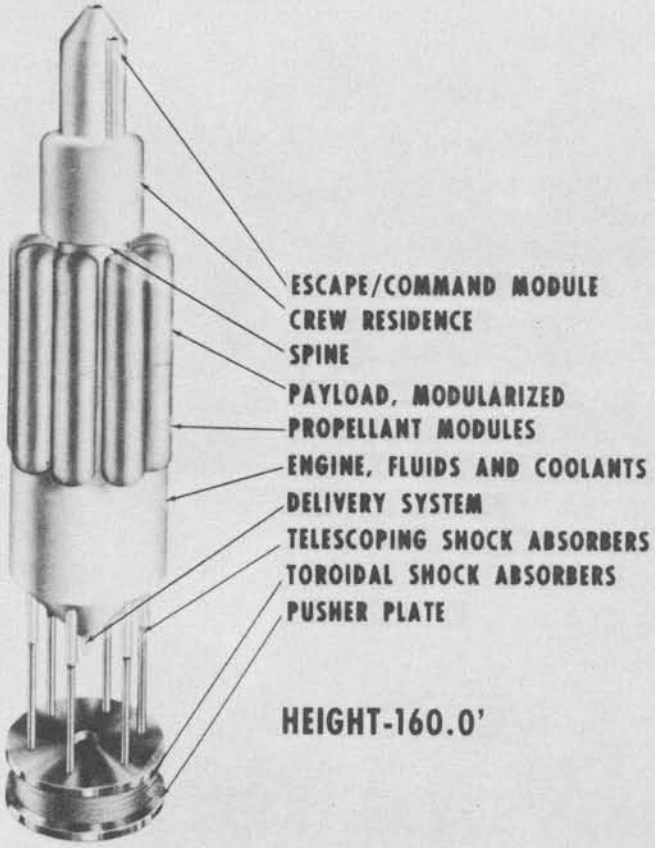
TOROIDAL SHOCK ABSORBERS

E-D D7115

ADVANCED PROGRAMS

NUCLEAR PULSE SPACE VEHICLE

MISSIONS



- LUNAR LOGISTICS

  UTILIZING SATURN V BOOSTERS FOR EARTH ORBITAL DELIVERY

- EARLY MANNED MARTIAN LANDING

  UTILIZING SATURN V AS WELL AS SOLID PROPELLANT BOOSTERS FOR GROUND LAUNCHING

- MARS LOGISTICS

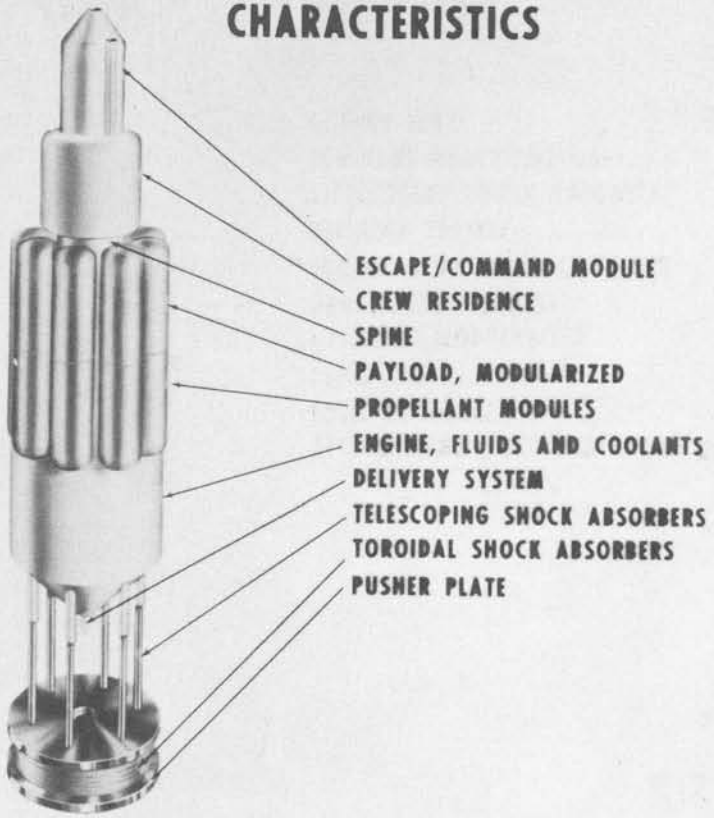
  UTILIZING POST-SATURN AS WELL AS SOLID PROPELLANT BOOSTERS FOR GROUND LAUNCHING

E-D D7104

ADVANCED PROGRAMS

NUCLEAR PULSE SPACE VEHICLE

CHARACTERISTICS



DELIVERED TO EARTH ORBIT INCREMENTALLY BY SATURN V LAUNCH VEHICLES

- VEHICLE
  - WEIGHT 1.5 TO 2.0 M LBS
  - SIZE 33×160 FEET
- ENGINE
  - WEIGHT APPROX 200,000 LBS
  - SIZE 33×70 FEET
  - THRUST APPROX 780,000 LBS
  - SPEC. IMPULSE APPROX 2100 SEC.
  - OPERATION THROUGH MEANS OF EXPLODING NUCLEAR CHARGES, OR PULSE UNITS TO IMPART MOTION-DELIVERED AND DETONATED AT 1-10 SEC. INTERVALS
- PAYLOAD: .4 TO 1.5 M LBS FOR EXAMPLE:
  - 2.0 M LB VEH CAPABLE OF:
    - FERRYING 1.5 M LBS TO MOON
      LANDING 1.3 M LBS ON MOON
    - FERRYING 1.3 M LBS TO MARS
      LANDING 1.0 M LBS ON MARS
    - FERRYING .75 M LBS TO JUP. MOONS
      LANDING .65 M LBS ON JUP. MOONS
- PROBLEM - LIMITED NUCLEAR TEST BAN TREATY HINDERING DESIGN/PERFORMANCE TESTING

E-D D 7113 A


ADVANCED PROGRAMS
MARS FLYBY
USING SATURN V NUCLEAR STAGE
E-D 67112

ADVANCED PROGRAMS

RELATIONSHIP OF FUTURE MISSIONS TO PRESENT PROGRAM

THE APPROVED PROGRAM PROVIDES:

GEMINI, APOLLO, AND SATURN, MANUFACTURE, TEST AND LAUNCH CAPABILITY

1-2 WEEK EARTH ORBITAL FLIGHTS

MANEUVERS AND RENDEZVOUS

LUNAR ORBIT AND LUNAR LANDING

EXTENSION OF PRESENT PROGRAM CAPABILITIES CAN PROVIDE:

1-2 MONTH EARTH ORBITAL FLIGHTS IN POLAR, SYNCHRONOUS , AND ELLIPTICAL ORBITS FOR SCIENTIFIC AND TECHNICAL EXPERIMENTS

RENDEZVOUS, REPAIR, RESCUE, INSPECTION

EXTENDED LUNAR STAY TIME

EXTENSIVE LUNAR MAPPING

UNMANNED PLANETARY EXPLORATION

ADVANCED PROGRAMS WILL REQUIRE MAJOR NEW DEVELOPMENTS TO PROVIDE:

SPACE STATIONS

LUNAR ROVING VEHICLE AND LUNAR BASE

POST SATURN LAUNCH VEHICLES

LIFTING REENTRY VEHICLES

MANNED PLANETARY EXPLORATIONS

OPERATING EXPERIENCE AND TECHNICAL RESOURCES AVAILABLE FROM ONGOING PROGRAM, AND UNDERLYING BASIC AND APPLIED RESEARCH AND ADVANCED TECHNOLOGY EFFORT SUPPORTS ALL PROGRAM PHASES

ADVANCED PROGRAMS

MAJOR CAPABILITIES EXISTING OR UNDER DEVELOPMENT

AERONAUTICS

- R&D HYPERSONIC AIRPLANES
- OPERATIONAL SUPERSONIC MILITARY AIRPLANES
- COMMERCIAL SUPERSONIC AIRPLANES

SPACE APPLICATIONS

- SATELLITE PICTURES OF EARTH WEATHER
- INTERCONTINENTAL COMMUNICATIONS (INCL TV)

UNMANNED EXPLORATION

- NEAR EARTH EXPLORATION
- SOLAR EFFECTS
- PLANETARY AND INTERPLANETARY PROBES
- LUNAR PROBES AND LANDERS

BIOSATELLITE SPACECRAFT

- ORBITAL FLIGHTS (1-30 DAYS)
- RECOVERABLE CAPSULES
- BIOLOGICAL EXPERIMENTS

MANNED OPERATIONS

- MAN IN EARTH ORBIT (1-2 WEEKS)
- MANEUVER AND RENDEZVOUS
- LUNAR ORBITING, LANDING AND RETURN

LAUNCH VEHICLES

- UP TO 125 TONS IN EARTH ORBIT
- OVER 47 TONS TO ESCAPE

TECHNOLOGY

- NUCLEAR AND SOLAR CELL POWER SUPPLIES OF INCREASED POWER
- MORE ACCURATE GUIDANCE AND CONTROL
- INCREASED COMMUNICATIONS CAPABILITY
- LIFE SUPPORT FOR LONG PERIODS
- INCREASED RELIABILITY OF FLIGHT HARDWARE AND CREW SURVIVAL
- MANUFACTURING AND QUALITY CONTROL
- MATERIALS AND STRUCTURES

E-D D7108

ADVANCED PROGRAMS

INTERMEDIATE MISSIONS-EXTENSIONS OF PRESENT CAPABILITIES

AERONAUTICS

- SUPER TRANSPORT
- HYPERSONIC ENGINE DEVELOPMENT
- VERTICAL OR SHORT TAKE-OFF AND LANDING

SPACE APPLICATIONS

- ADVANCED TECHNOLOGY SATELLITES
- DIRECT BROADCAST FM
- COMMUNICATIONS/NAVIGATIONS SATELLITES
- METEOROLOGICAL OBSERVATION TECHNOLOGY

UNMANNED EXPLORATION

- OBSERVATORIES, PIONEERS, EXPLORERS CONT'D
- PLANETARY FLY BY, ORBITERS AND LANDERS

LAUNCH VEHICLES

- SATURN IB/CENTAUR
- SMALL SPACE PROPULSION UNIT

MANNED OPERATIONS

- EARTH ORBIT APPLICATION (1-2 MONTHS)
- RENDEZVOUS, INSPECTION, REPAIR, RESCUE
- LUNAR MAPPING
- EXTENDED STAY ON LUNAR SURFACE (3-14 DAYS)

TECHNOLOGY

- ISOTOPE POWER SUPPLIES (1-2 KW)
- GUIDANCE CONTROL (WITHIN MILES OF POINT ON MARS)
- COMMUNICATIONS (3000 BITS/SEC FROM MARS)
- STABILIZATION
- LIFE SUPPORT (3 MEN, 1-2 MONTHS)
- STERILIZATION
- RELIABILITY
- MANUFACTURING AND MATERIALS
- PROPELLANT STORAGE

E-D D7106

ADVANCED PROGRAMS

LONG-TERM DEVELOPMENT

AERONAUTICS

- HYPERSONIC TRANSPORTS
- REUSABLE MULTI-MISSION AEROSPACE TRANSPORT
- COMMERCIAL VERTICAL OR SHORT TAKE-OFF AND LANDING AIRCRAFT

SPACE APPLICATIONS

- DIRECT TV BROADCAST
- NAVIGATION AND TRAFFIC CONTROL
- CONTINUOUS GLOBAL WEATHER OBSERVATION

MANNED SPACE EXPLORATION

- CONVENTIONAL TAKE-OFF AND LANDING OF SPACE VEHICLES
- FLEXIBLE EARTH ORBITAL OPERATIONS
- LARGE PERMANENT SPACE LAB
- ROVING LUNAR VEHICLES AND LUNAR BASES
- PLANETARY EXPLORATION

UNMANNED SPACE EXPLORATION

- PROBES AND LANDERS TO DISTANT PLANETS
- GALACTIC PROBES

LAUNCH VEHICLES

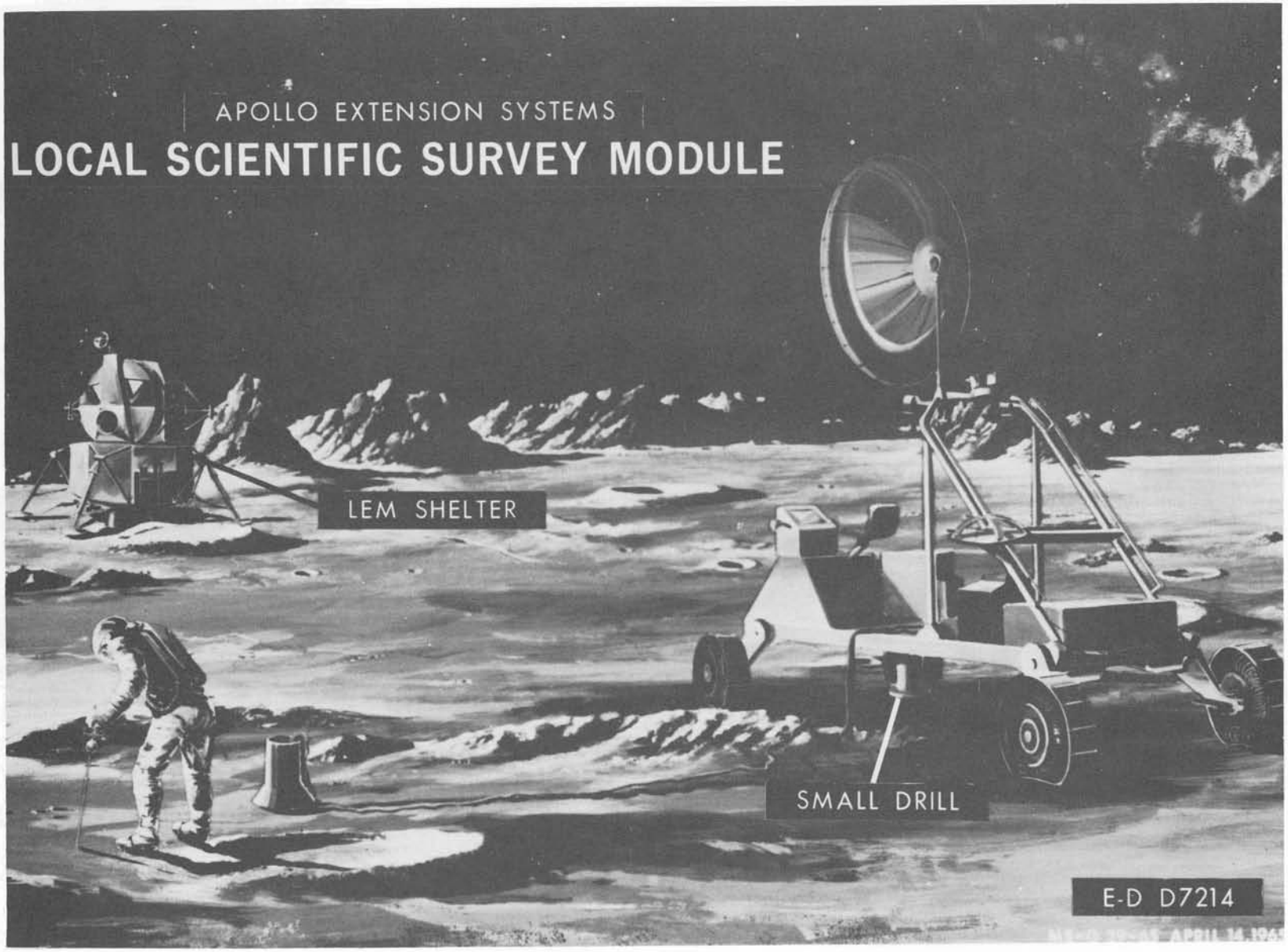
- 1 MILLION POUNDS IN EARTH ORBIT
- NUCLEAR ENGINES
- RECOVERABLE BOOSTERS
- ELECTRIC PROPULSION

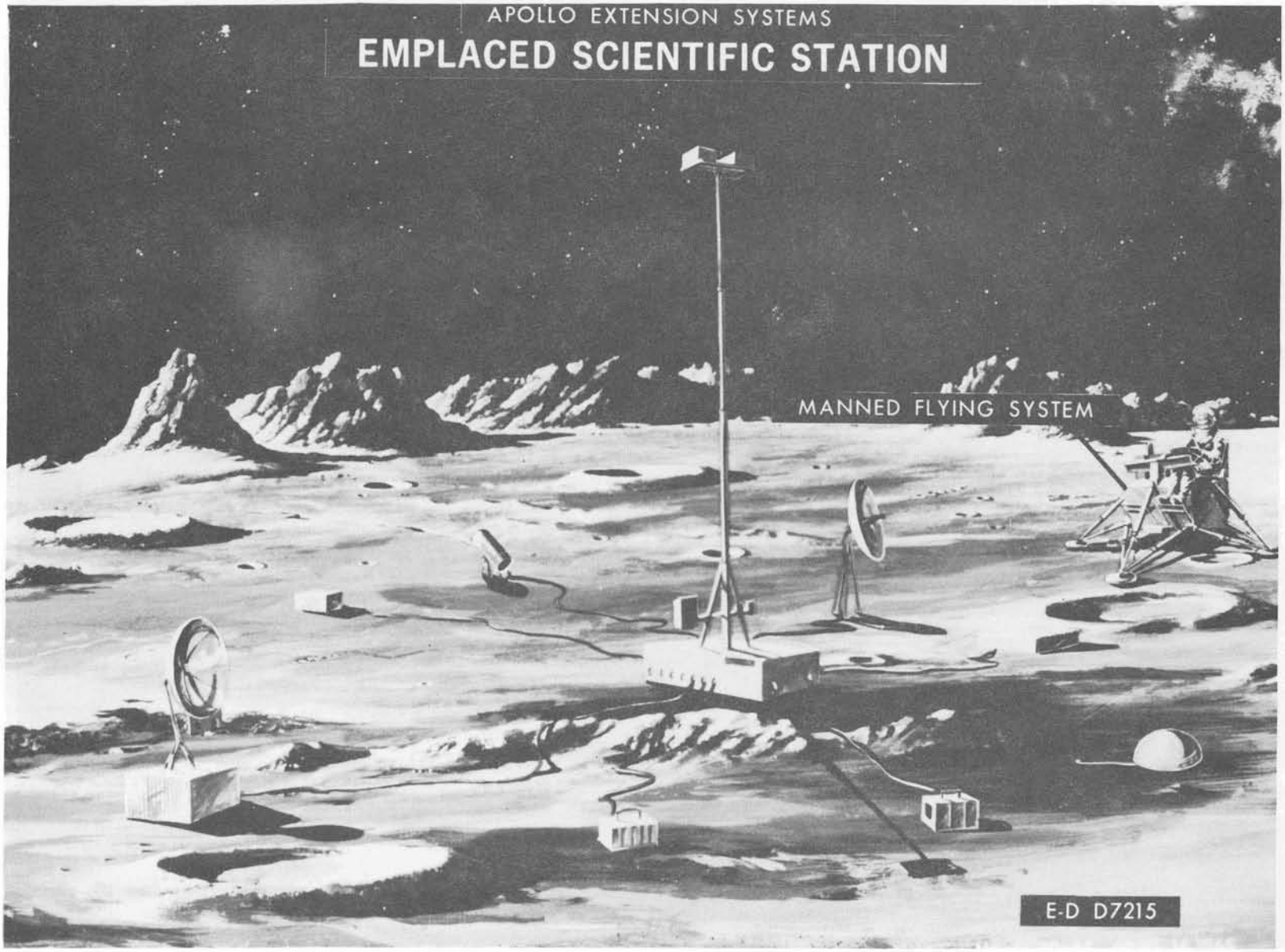
TECHNOLOGY

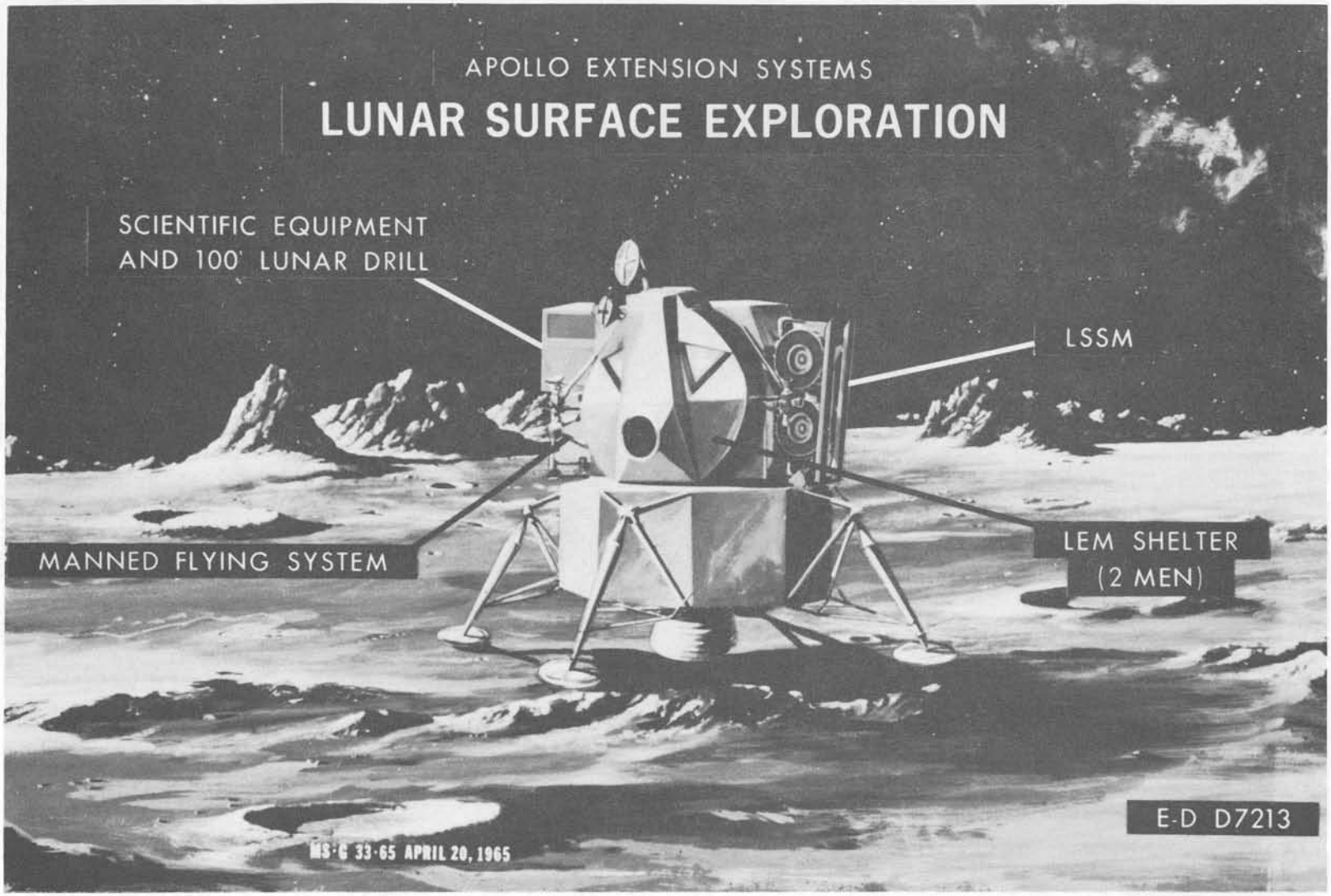
- NUCLEAR AND ISOTOPE POWER SUPPLIES (MEGAWATT)
- GUIDANCE AND CONTROL (CONTROLLED LANDINGS AT DESIRED LOCATIONS ON OTHER PLANETS)
- COMMUNICATIONS (WIDE BAND COMMUNICATIONS WITH PLANETARY VEHICLES)
- STABILIZATION
- PERMANENT LIFE SUPPORT SYSTEMS
- RELIABILITY

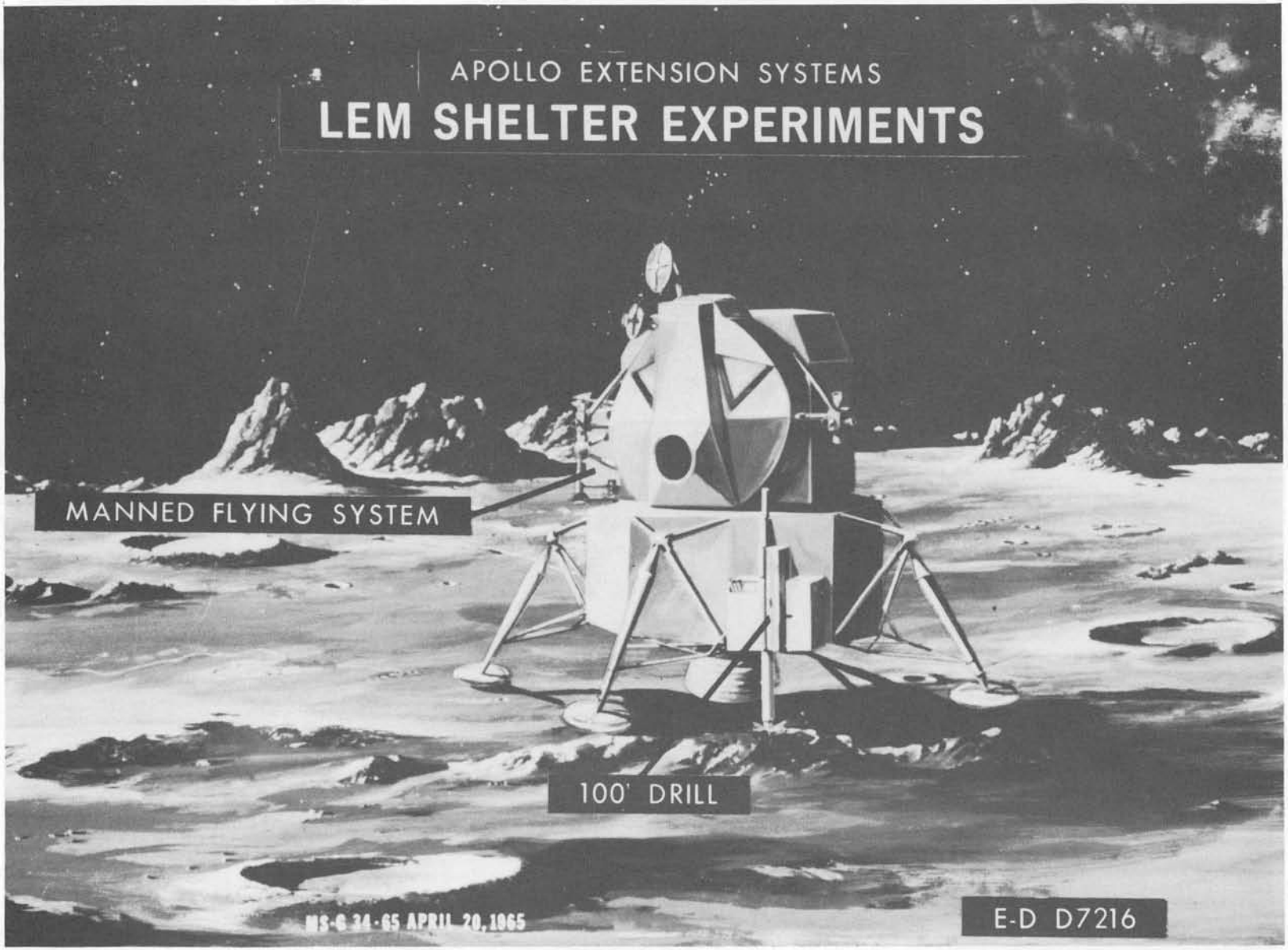
E-D D7109

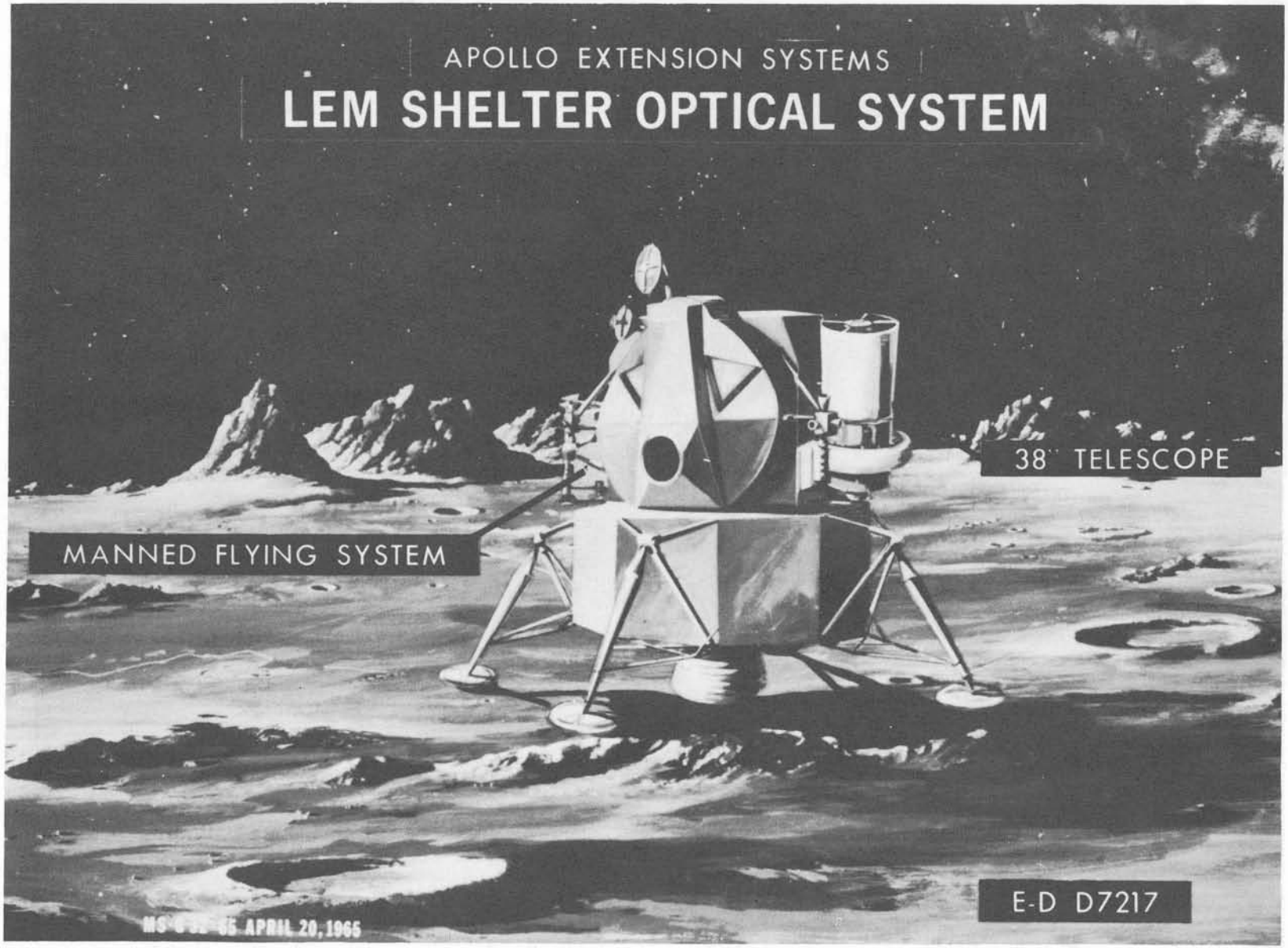
APOLLO EXTENSION SYSTEMS

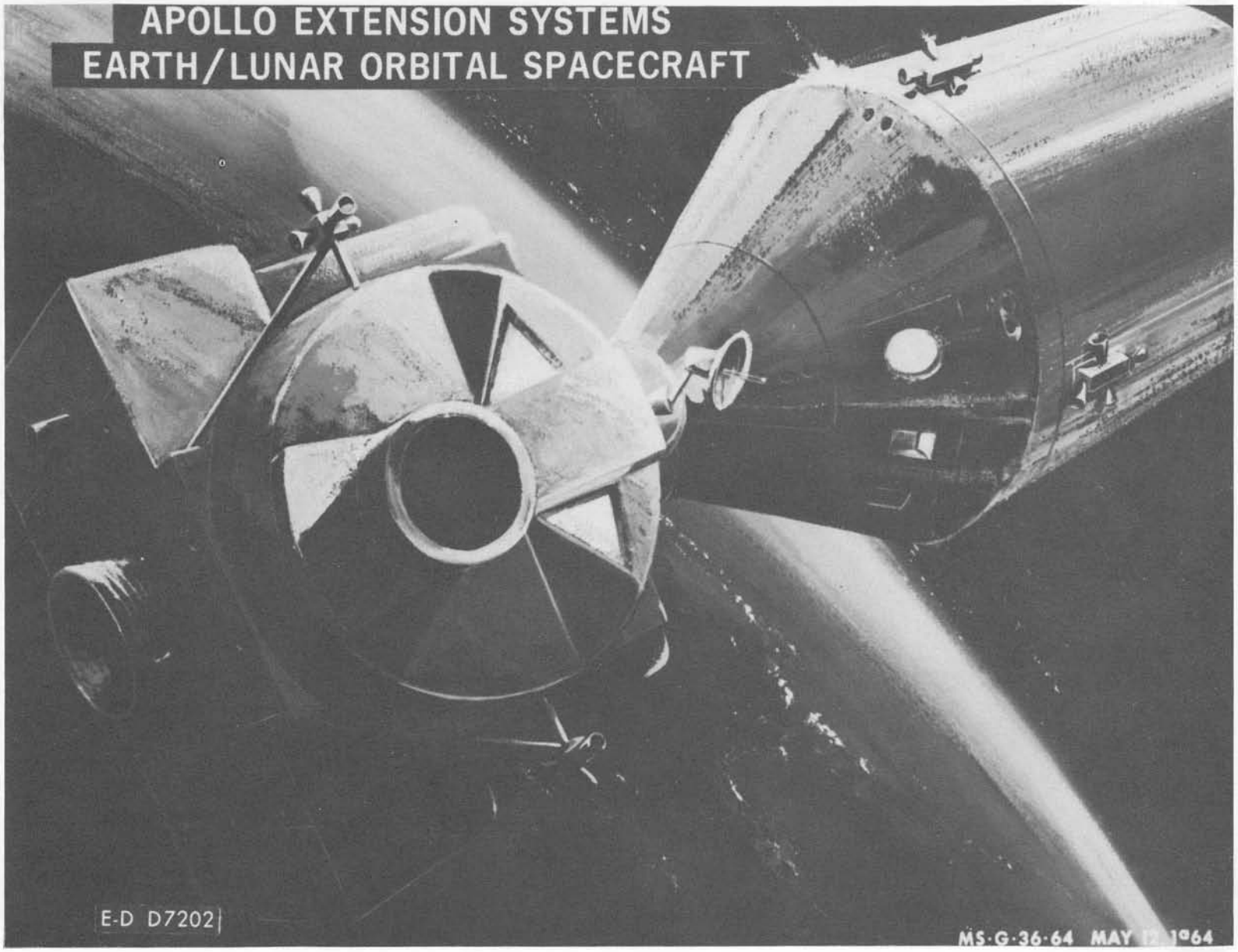

APOLLO EXTENSION SYSTEMS
LOCAL SCIENTIFIC SURVEY MODULE
LEM SHELTER
SMALL DRILL
E-D D7214

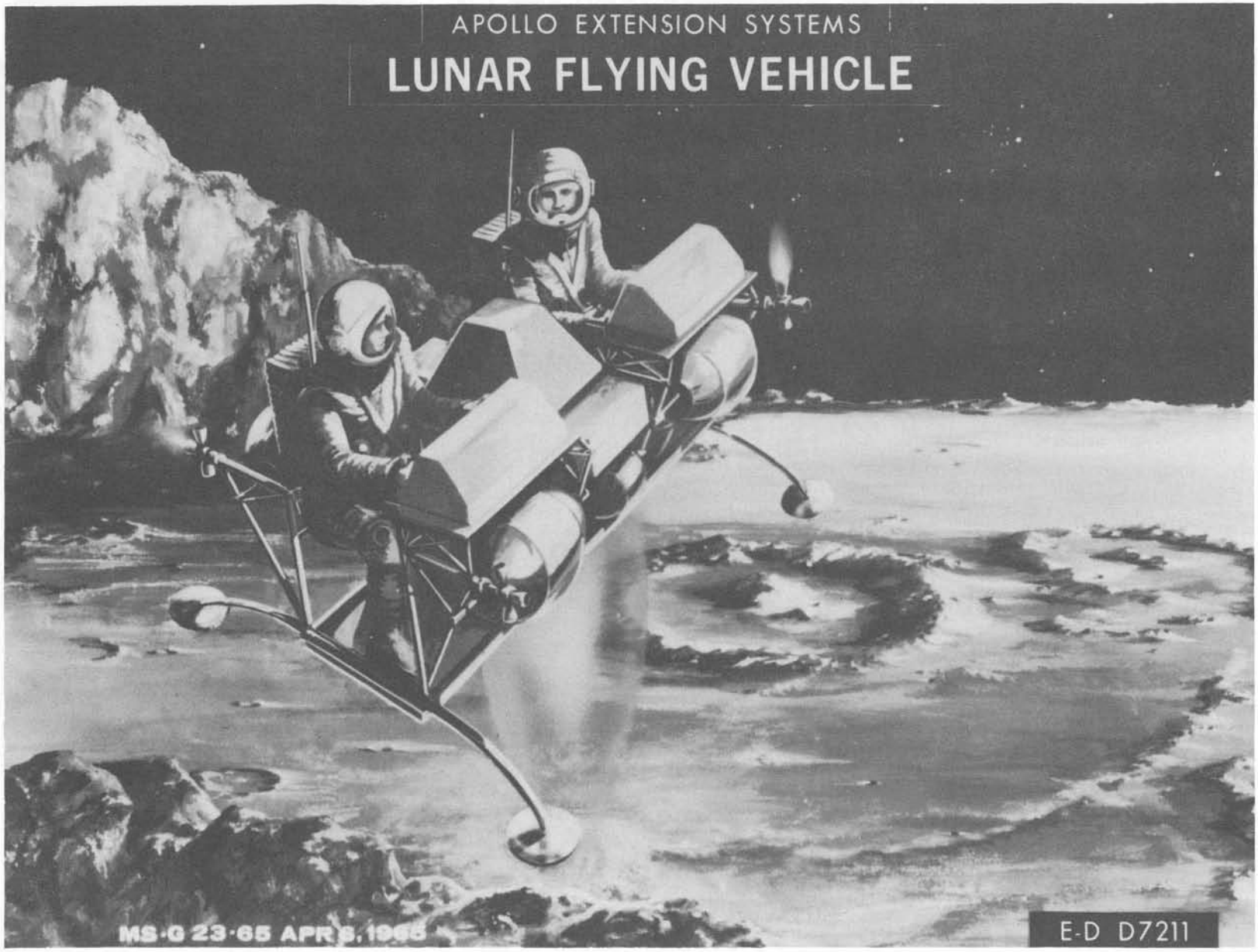

APOLLO EXTENSION SYSTEMS
EMPLACED SCIENTIFIC STATION
MANNED FLYING SYSTEM
E-D D7215

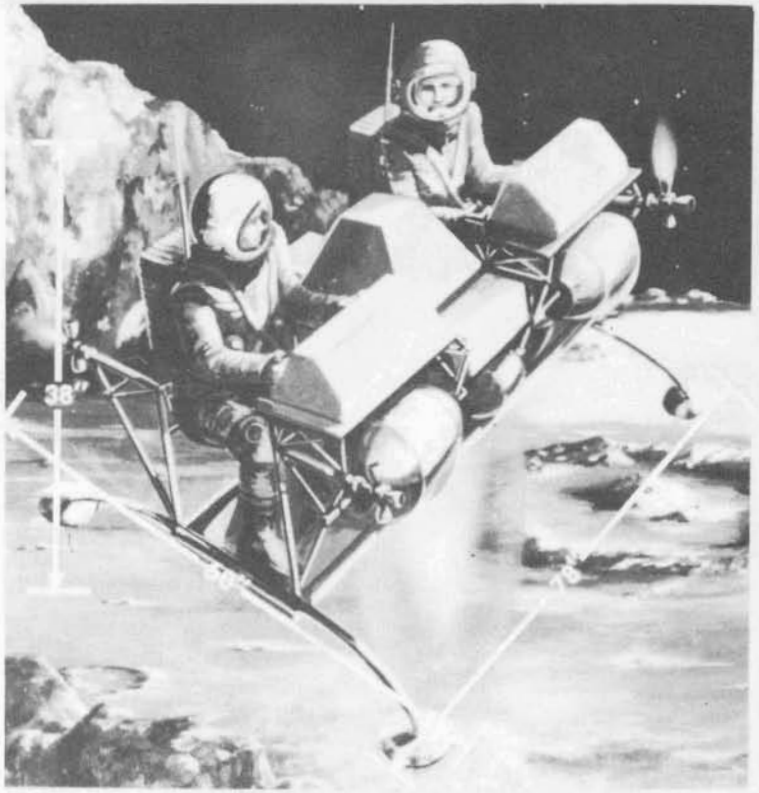

APOLLO EXTENSION SYSTEMS
LUNAR SURFACE EXPLORATION
SCIENTIFIC EQUIPMENT
AND 100' LUNAR DRILL
LSSM
MANNED FLYING SYSTEM
LEM SHELTER
(2 MEN)
E-D D7213
MS-G 33-65 APRIL 20, 1965


APOLLO EXTENSION SYSTEMS
LEM SHELTER EXPERIMENTS
MANNED FLYING SYSTEM
100' DRILL
MS-G-34-65 APRIL 20, 1965
E-D D7216


APOLLO EXTENSION SYSTEMS
LEM SHELTER OPTICAL SYSTEM
38" TELESCOPE
MANNED FLYING SYSTEM
E-D D7217
APRIL 20, 1965


APOLLO EXTENSION SYSTEMS
EARTH/LUNAR ORBITAL SPACECRAFT
E-D D7202
MS-G-36-64 MAY


APOLLO EXTENSION SYSTEMS
LUNAR FLYING VEHICLE
MS-G 23-65 APR 8, 1965
E-D D7211

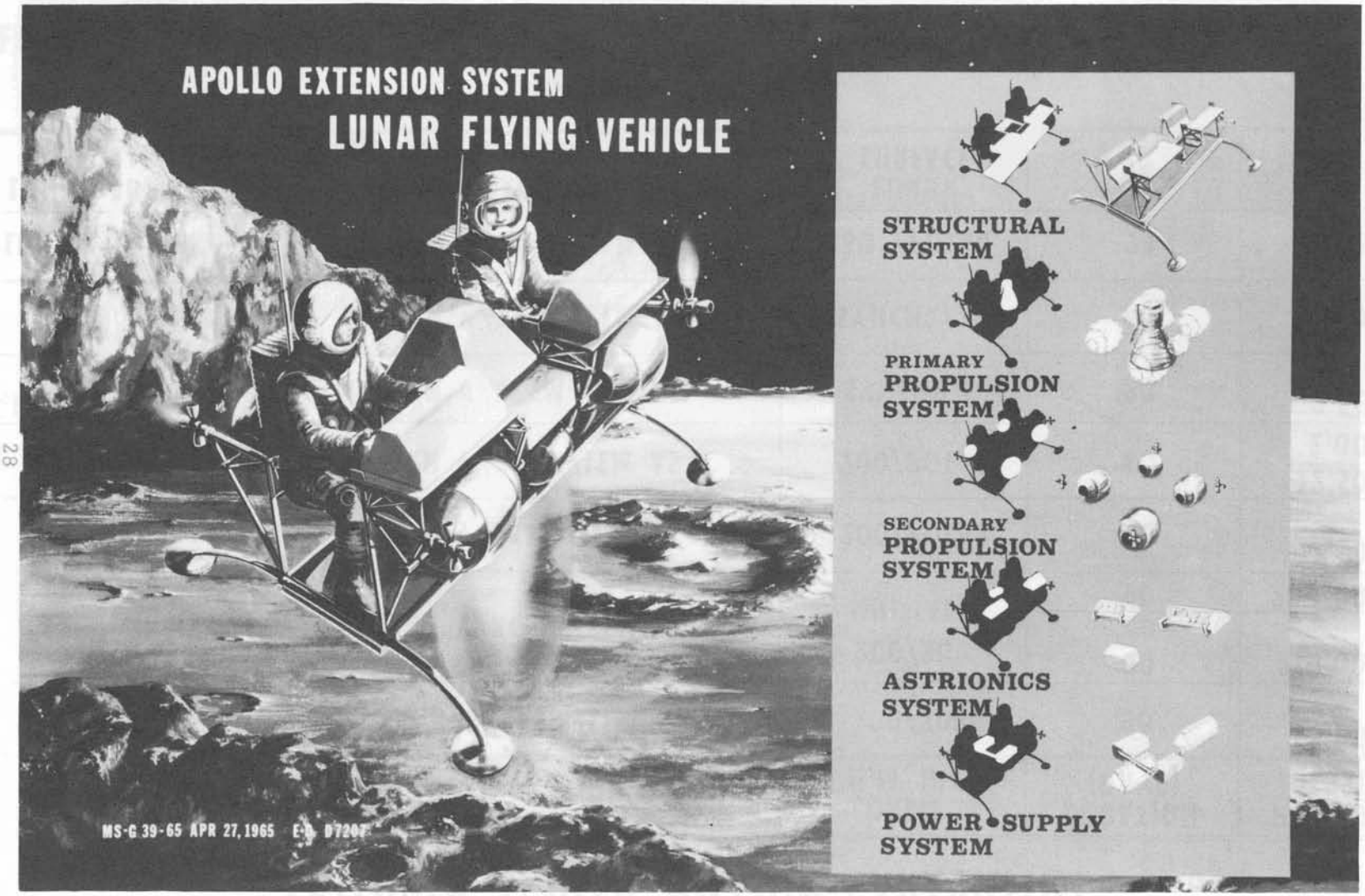


APOLLO EXTENSION SYSTEMS
LUNAR FLYING VEHICLE

CHARACTERISTICS

- WEIGHT- DRY (350-450 LB) (160-200 kg)
  WET (1000-1100 LB) (450-500 kg)
- RANGE- 50 S. MILES (ONE WAY)
  18 S. MILES (ROUND)
- ENGINES- 5×100 LB
- PACKAGE
  SIZE-38''×60''×78'' (1.0×1.5×2.0 m)
- CAPACITY-2 ASTRONAUTS
  OR
  1 ASTRONAUT+250 LB (120 kg)
  SCIENTIFIC EQUIPMENT
- TRAJECTORY-BALLISTIC OR HORIZONTAL HOVER

E-D D 7206 A


APOLLO EXTENSION SYSTEM
LUNAR FLYING VEHICLE
STRUCTURAL SYSTEM
PRIMARY PROPULSION SYSTEM
SECONDARY PROPULSION SYSTEM
ASTRIONICS SYSTEM
POWER SUPPLY SYSTEM
MS-G 39-65 APR 27, 1965

APOLLO EXTENSION SYSTEMS

EXTENDED APOLLO MISSION CAPABILITIES

MISSION	CONFIGURATION	ORBIT N.M. INCL	DURATION (DAYS)	PAYLOAD (LBS)
EARTH ORBIT	SATURN IB/XCSM/LEM AS	200/30°	30	5,000 0
EARTH ORBIT	SATURN V/XCSM/LEM ASP	200/30° (INITIAL)	30	210,000 0
			90	200,000
EARTH ORBIT	SATURN V/XCSM/LEM AS	200/POLAR	30	17,500 0
EARTH ORBIT	SATURN V/XCSM/LEM AS	200/POLAR	60	12,500 2,000
EARTH ORBIT	SATURN V/XCSM/LEM AS	SYNCHR/0°	30	9,500 0
EARTH ORBIT	SATURN V/XCSM/LEM AS	SYNCHR/28°	60	10,000
LUNAR MAPPING	SATURN V/XCSM/LEM ASP	80°/POLAR	28	9,500
LUNAR SURFACE EXPLORATION	SATURN V/XCSM/LEM (DUAL LAUNCH)	LUNAR SURFACE	14	2,500

NOTES: XCSM - APOLLO COMMAND AND SERVICE MODULE WITH ADDITIONAL SUBSYSTEMS AND EXPENDABLES

LEM AS - LEM ASCENT STAGE WITHOUT SUBSYSTEMS, DEPENDENT ON XCMS

LEM ASP - LEM AS PLUS LEM DESCENT STAGE PROPULSION

E-D 07204

APOLLO EXTENSION SYSTEMS

FY 65 FUNDS
(IN MILLIONS)

- **FUNDS RECEIVED**

ADVANCED STUDIES (MSF)	1.700
ADVANCED MANNED MISSIONS SUPPORTING DEV. (MSF)	1.700
MANNED LUNAR SCIENCES (SS&A)	.485
TOTAL	3.885

- **FUNDS COMMITTED/OBLIGATED**

LOCAL SCIENTIFIC SURVEY MODULE	1.000
MOBILITY TEST ARTICLE	.800
SCIENTIFIC EQUIPMENT	1.085
MANNED FLYING SYSTEM	.800
MANNED TASK FACILITY	.060
TOTAL	3.745

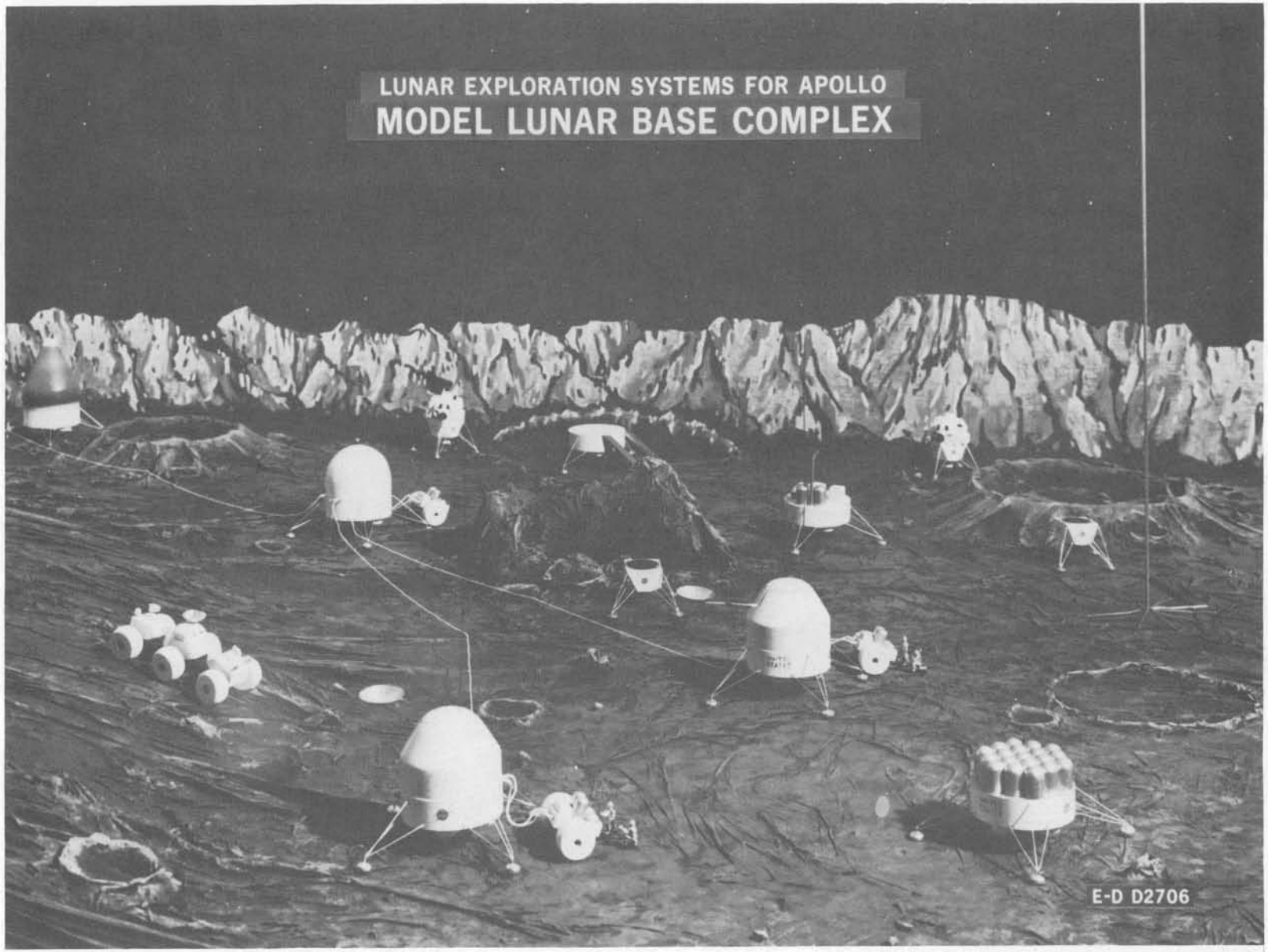
- **UNCOMMITTED FUNDS** .140

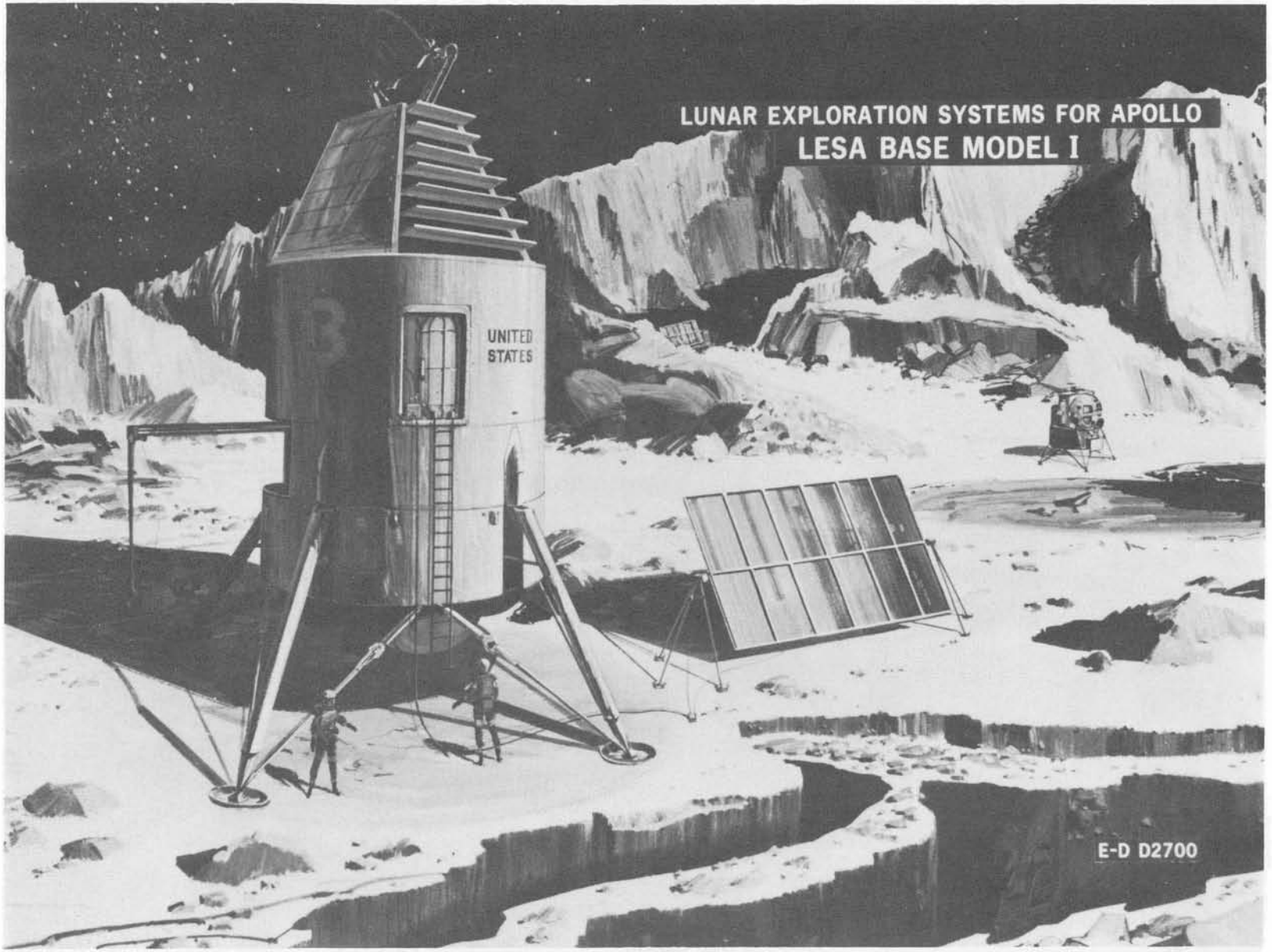
GUYTON R-AERO-S MAY 4, 1965 E-D D 7210

31

LESA

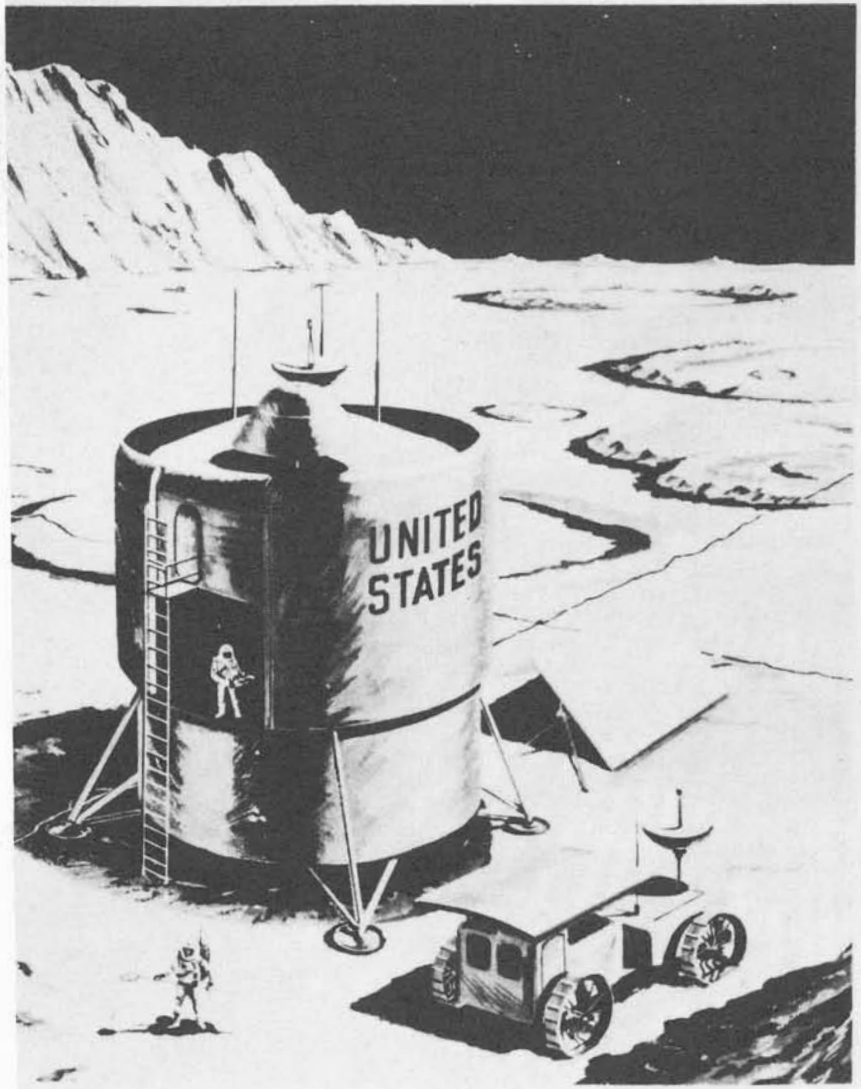
LUNAR EXPLORATION SYSTEMS FOR APOLLO


LUNAR EXPLORATION SYSTEMS FOR APOLLO
MODEL LUNAR BASE COMPLEX
E-D D2706


LUNAR EXPLORATION SYSTEMS FOR APOLLO
LESA BASE MODEL I
UNITED
STATES
E-D D2700

LUNAR EXPLORATION SYSTEMS FOR APOLLO

INITIAL CONCEPTS



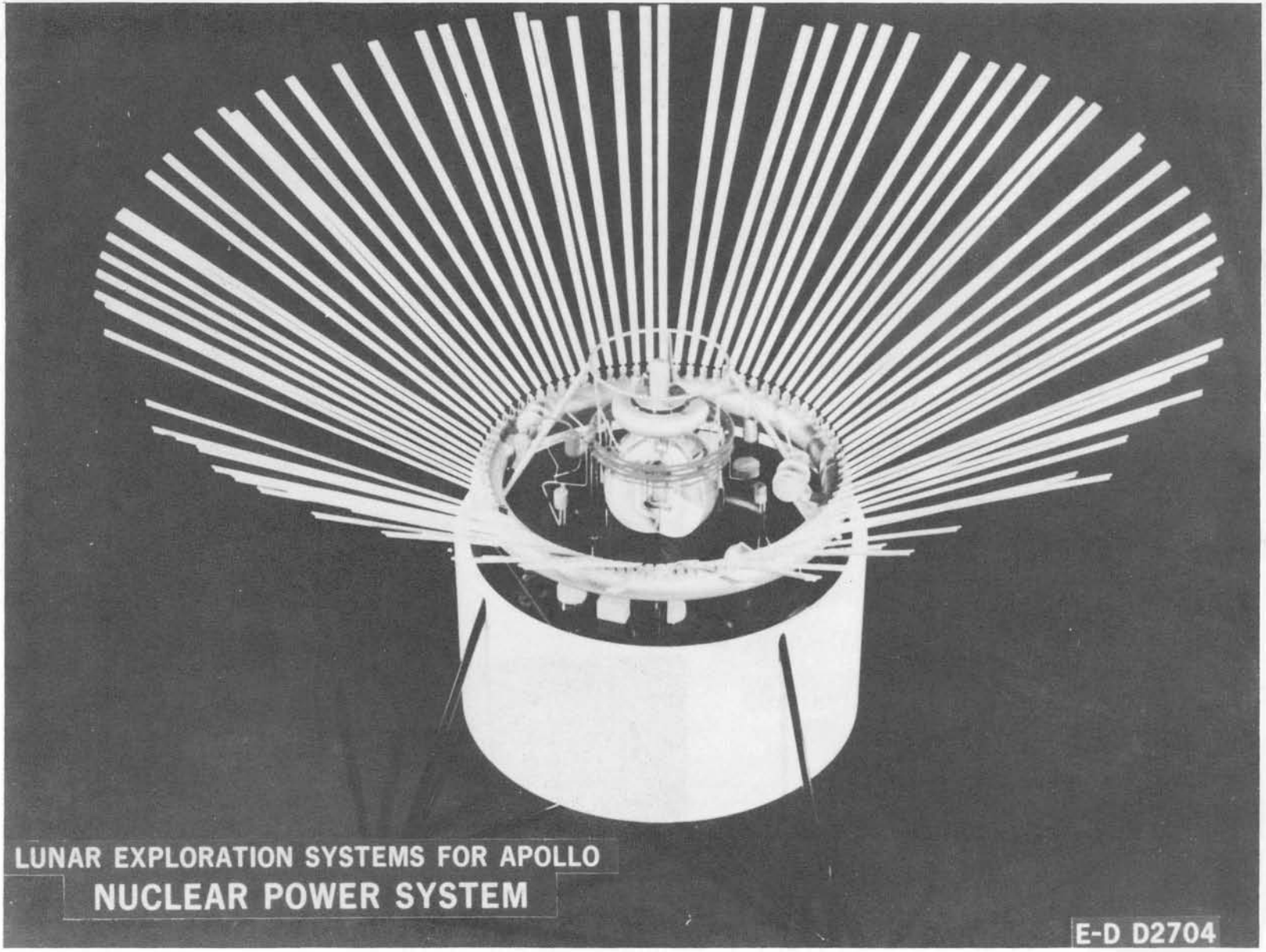
CONSTRAINTS

- SAT V - LLV
- 25,000 LB CARGO CAPABILITY
- 3 MAN LEM
- 1972 EARLY BASE OPERATIONAL

DEVELOPMENTS

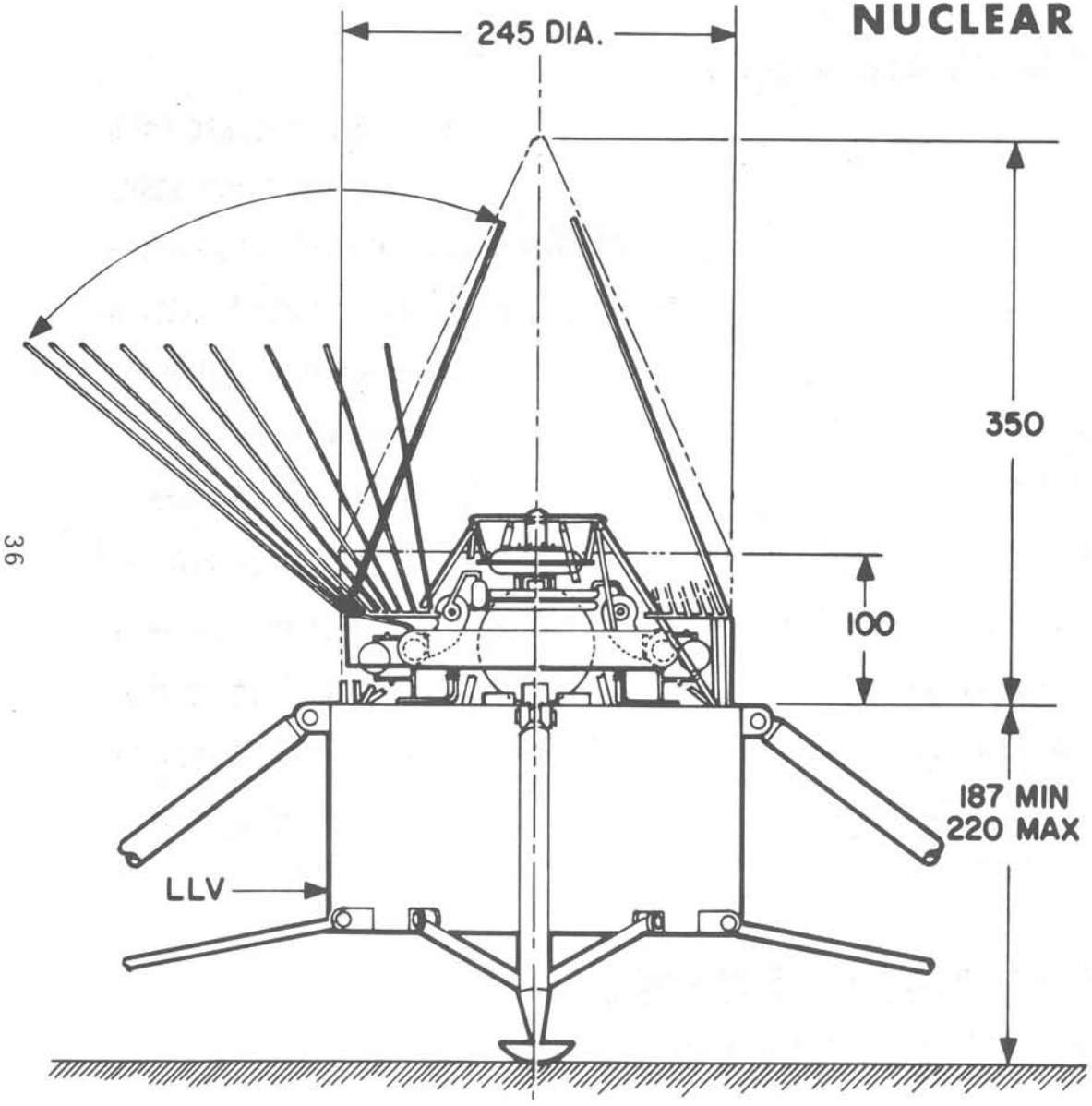
- CHARACTERISTICS OF BASE MODELS
- MODULAR CONCEPTS FOR SUBSYSTEMS
- LUNAR SOIL SHIELDING
- CAISSON SOIL CONTAINMENT
- EVOLUTIONARY SCHEMES FOR BASE DEVELOPMENT.

E-D D2703


LUNAR EXPLORATION SYSTEMS FOR APOLLO
NUCLEAR POWER SYSTEM
E-D D2704

LUNAR EXPLORATION SYSTEMS FOR APOLLO

NUCLEAR POWER SYSTEM



CHARACTERISTICS

- INTEGRAL PLANT
- 50 - 100 KWE
- 10,000 HRS. DESIGN LIFETIME
- UTILIZE SNAP TECHNOLOGY

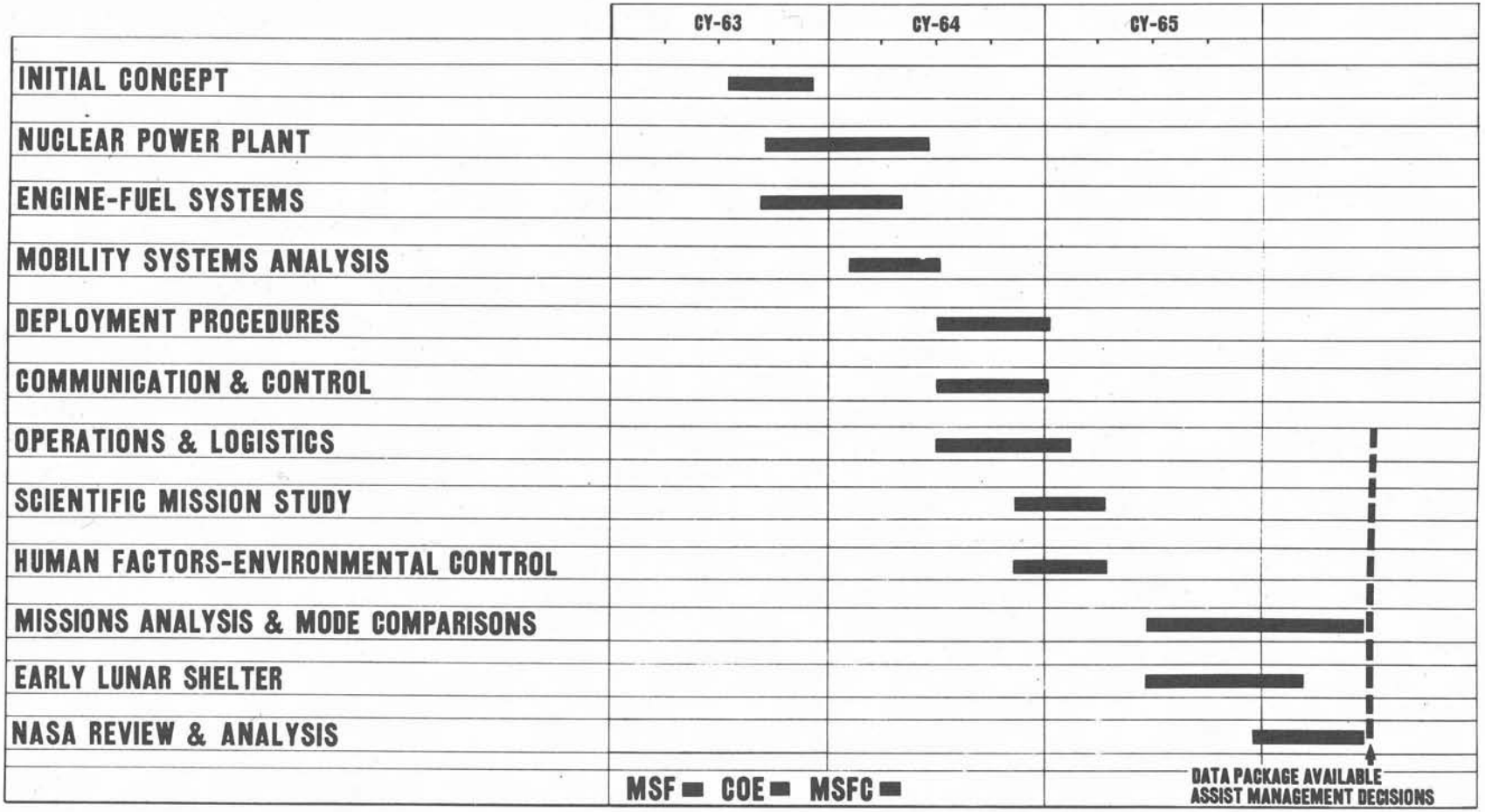
CRITICAL ELEMENTS

- WELL DEFINED REQUIREMENTS
- ADVANCED BASE CONCEPTS DEPENDENT ON NUCLEAR STATION POWER
- EXPECTED READINESS BY MID 1970's.

E-D D2705

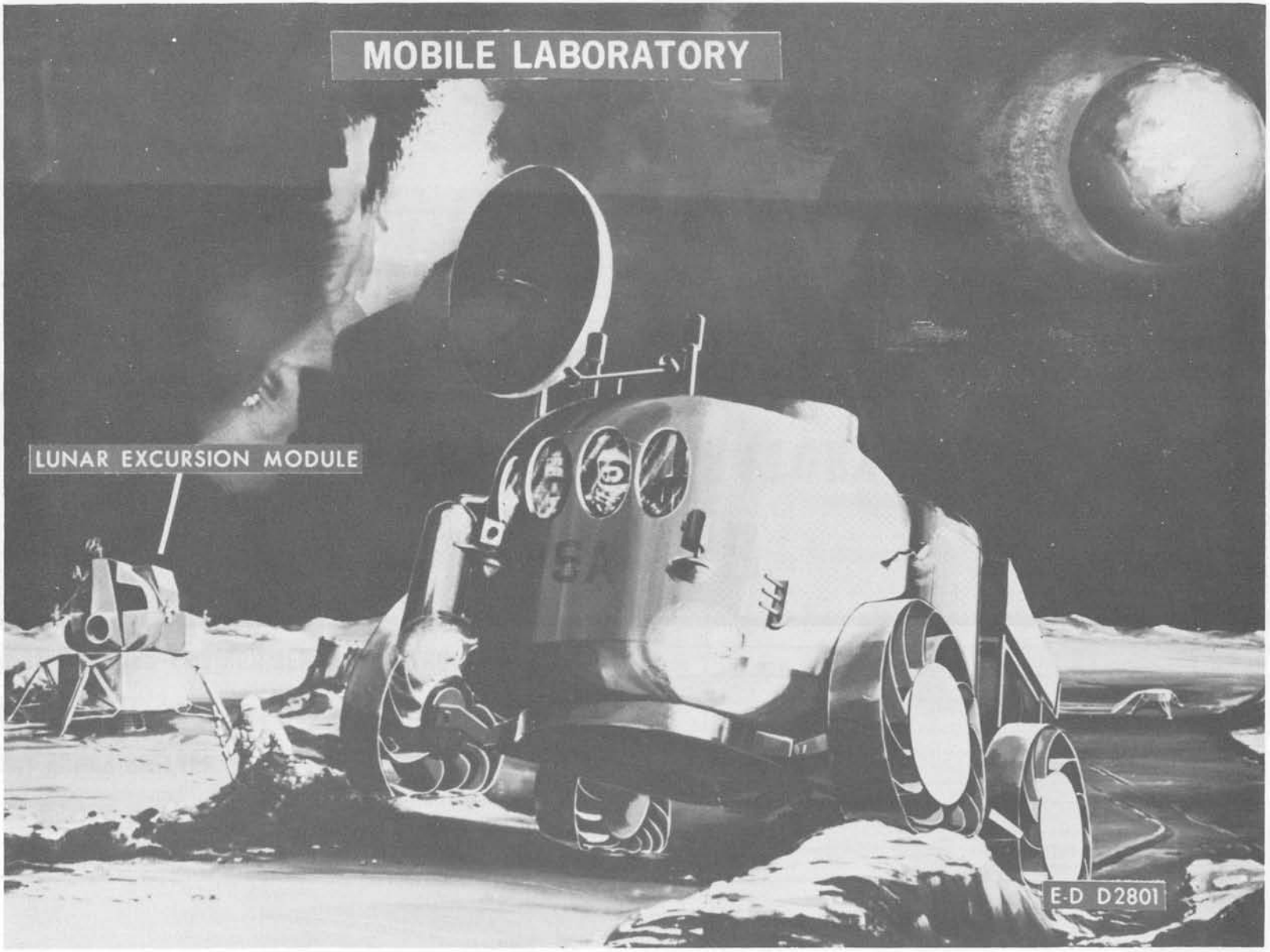
LUNAR EXPLORATION SYSTEMS FOR APOLLO

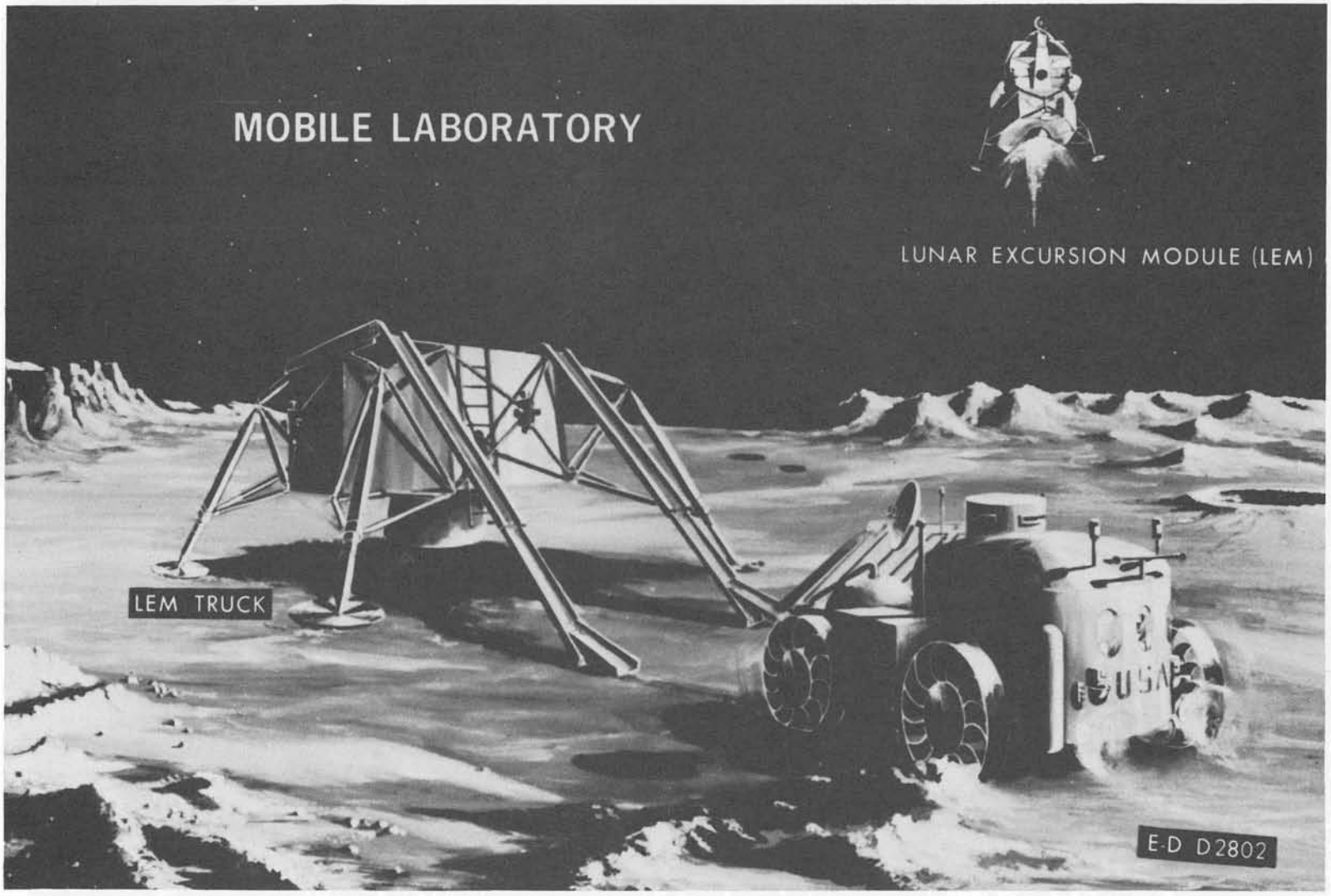
STUDY SCHEDULES



E-D D2702

MOLAB
MOBILE LABORATORY

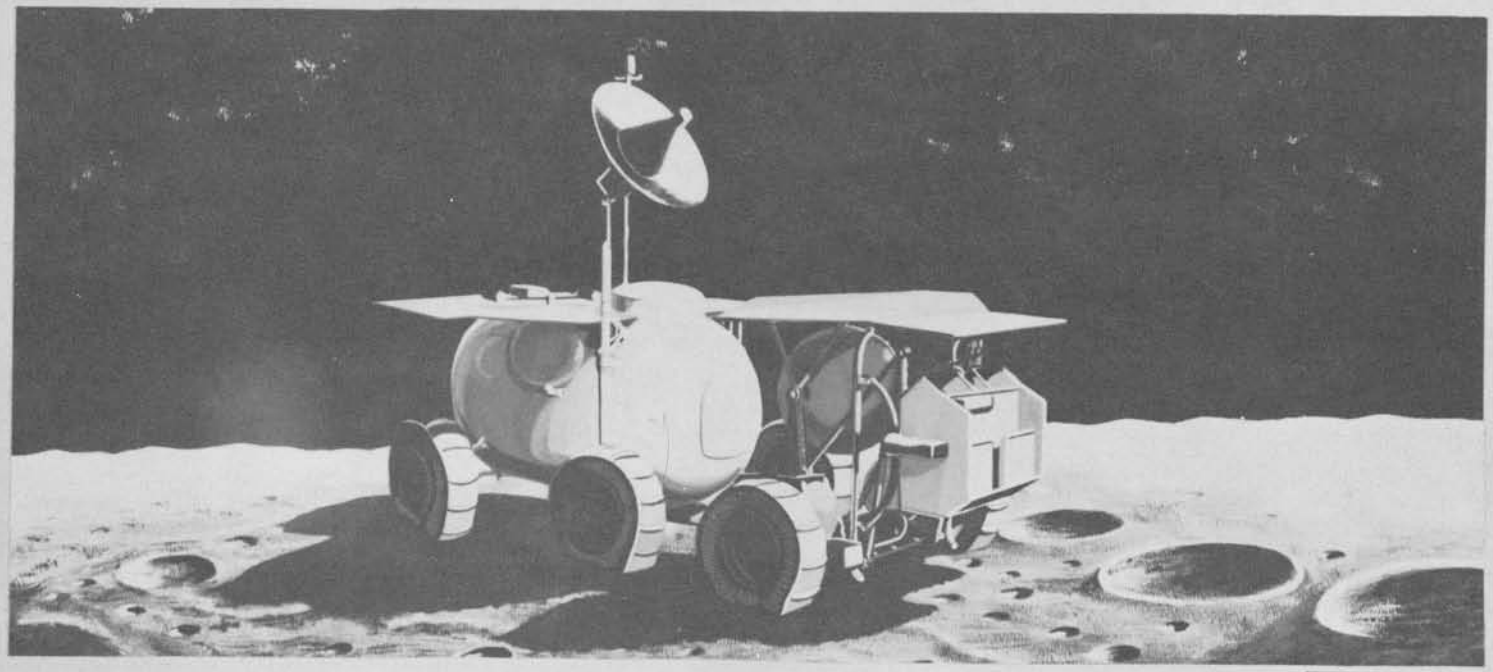

MOBILE LABORATORY
LUNAR EXCURSION MODULE
E-D D2801


MOBILE LABORATORY
LUNAR EXCURSION MODULE (LEM)
LEM TRUCK
E-D D2802

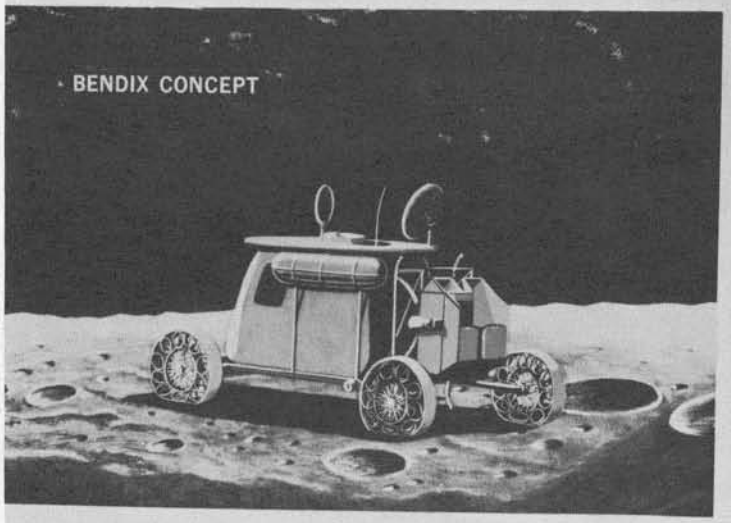
LUNAR MOBILE LABORATORY

MISSIONS

- BASIC SHELTER FOR LIFE SUPPORT AND ENVIRONMENTAL CONTROL SYSTEMS.
- BASIC MODE OF TRANSPORTATION FOR EXTENDED EXPLORATION OF LUNAR SURFACE.



E-D D2803



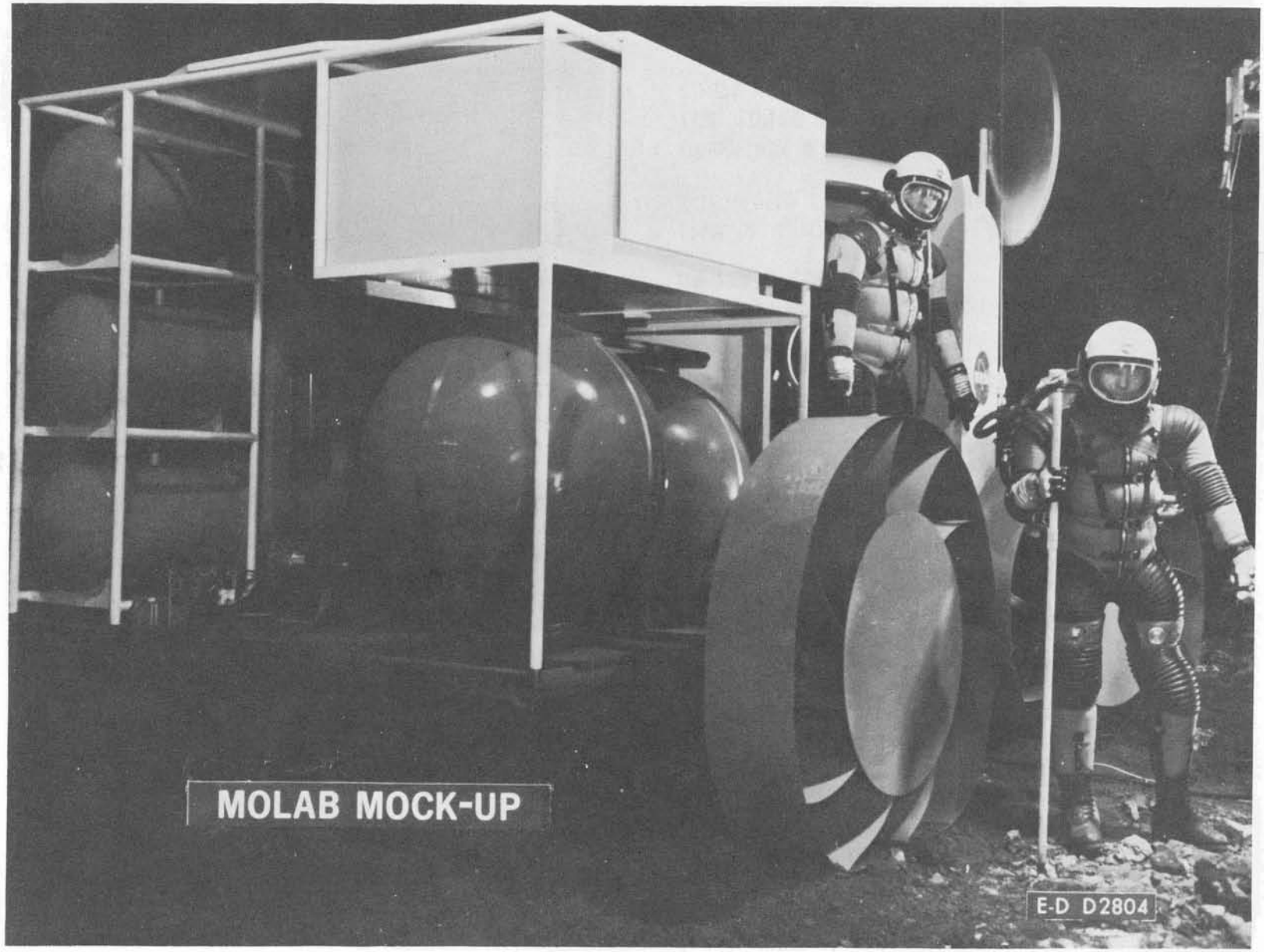
LUNAR MOBILE LABORATORY

CHARACTERISTICS

- WEIGHT — 6,500 LBS (3,000 KG)
- MISSION TIME — 2 EARTH WEEKS
- WHEELS — 4 OR 6
- WHEEL DIA. — 60'' OR 80'' (1.5 OR 2.0 M)
- POWER — FUEL CELL SYSTEM
- RANGE — 300 TO 400 KM
- CAPACITY — 2 ASTRONAUTS AND 750 LBS (360 KG) SCIENTIFIC EQUIPMENT

- MAY BE UNLOADED BY REMOTE CONTROL FROM LEM OR EARTH CONTROL CENTER
- MAY BE UNLOADED MANUALLY IN EVENT OF AUTOMATED SYSTEM FAILURE
- OPERATION MAY BE REMOTELY CONTROLLED FROM LEM, LUNAR SURFACE, LUNAR ORBIT OR EARTH CONTROL CENTER

E-D D2800


MOLAB MOCK-UP
E-D D2804

LUNAR LOGISTICS

LUNAR LOGISTICS SYSTEM

MISSIONS

PLACE UNMANNED PAYLOADS ON THE LUNAR SURFACE PRIOR TO OR AFTER MANNED LANDING

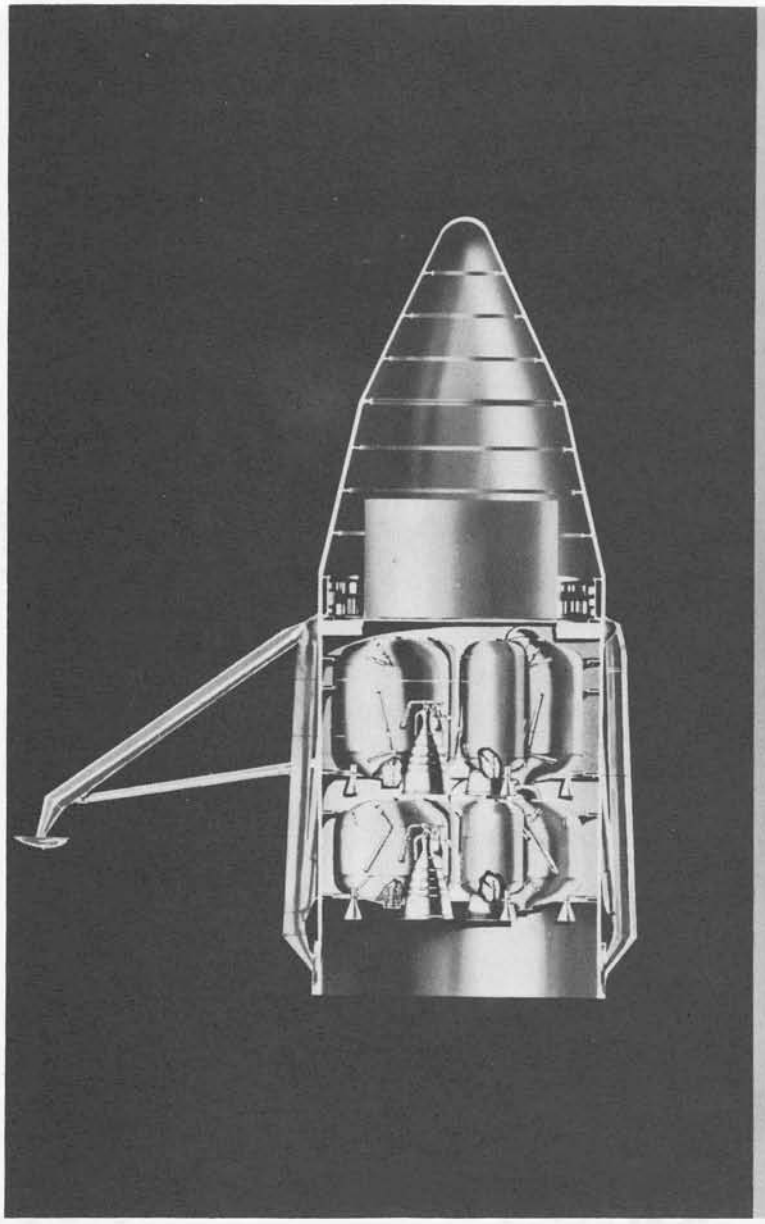
PROVIDE BACK UP TO THE APOLLO PROGRAM

OFFER RESCUE CAPABILITY

LUNAR BASE BUILDUP

REV. C
M MS-G-1-2-63

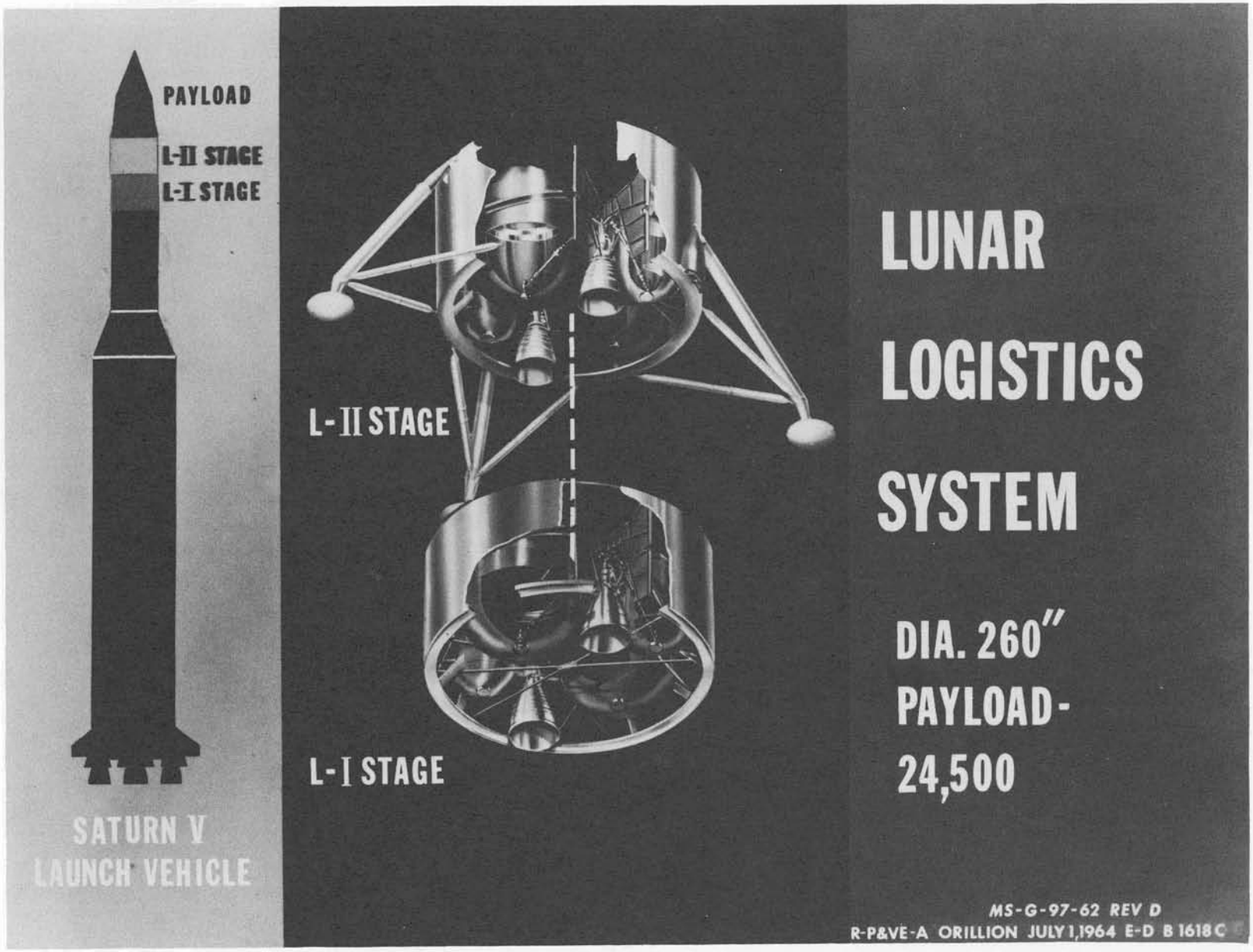
R-P&VE.ORILLION DEC 10.63 EX-D 1600B



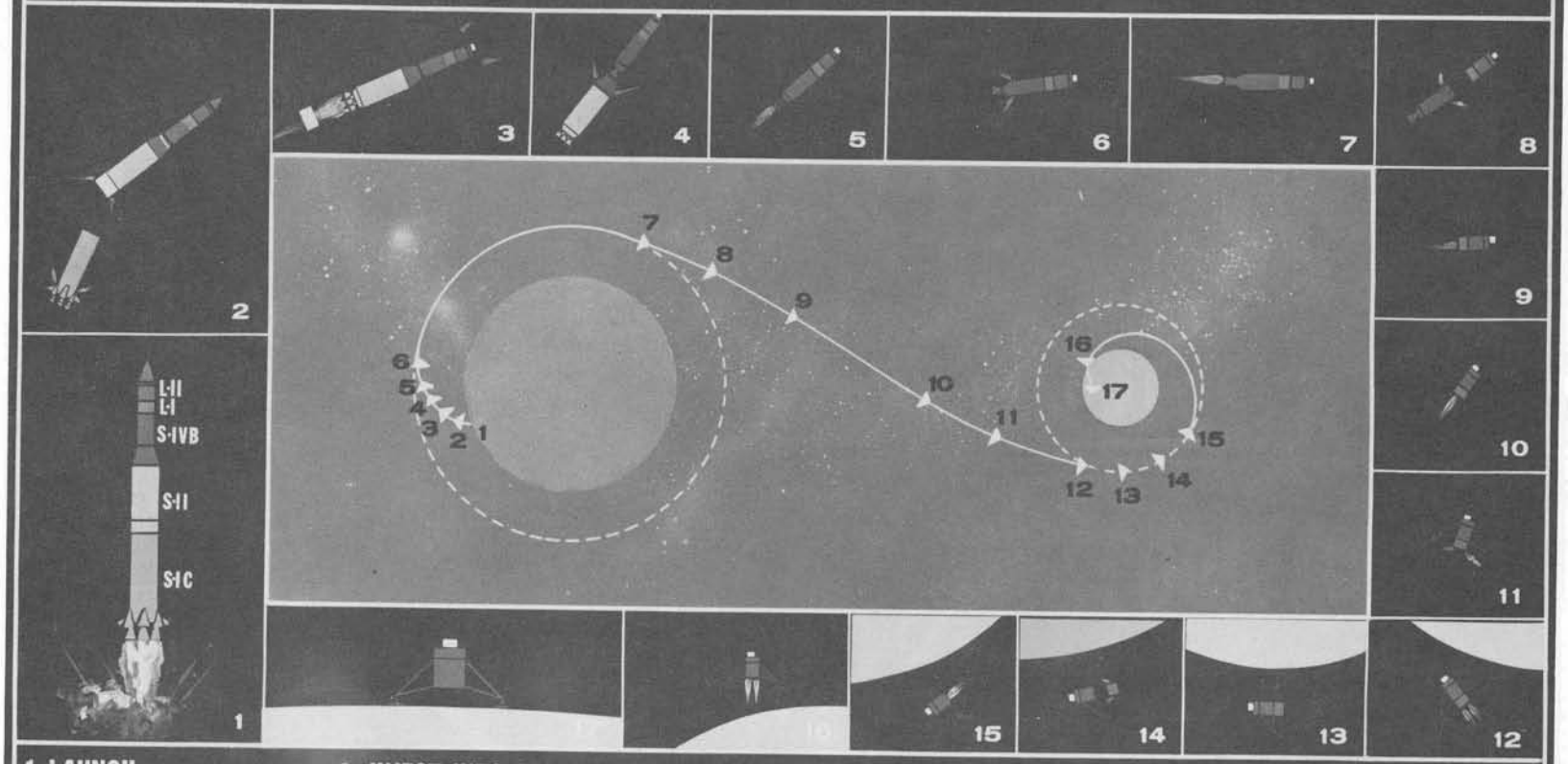
LUNAR LOGISTICS SYSTEM
L-I/ L-II STAGE MISSIONS

- PLACE UNMANNED PAYLOADS ON LUNAR SURFACE
- PROVIDE BACK-UP TO APOLLO PROGRAM
- LUNAR BASE BUILDUP
- OFFER RESCUE CAPABILITY

R-P&VE-A ORILLION JAN 1, 1964 EX-D 16088 REV B MS-G 23-63


PAYLOAD
L-II STAGE
L-I STAGE
SATURN V
LAUNCH VEHICLE
L-II STAGE
L-I STAGE
LUNAR
LOGISTICS
SYSTEM
DIA. 260"
PAYLOAD-
24,500
MS-G-97-62 REV D
R-P&VE-A ORILLION JULY 1,1964 E-D B 1618C

LUNAR LOGISTICS SYSTEM SATURN V MISSION PROFILE

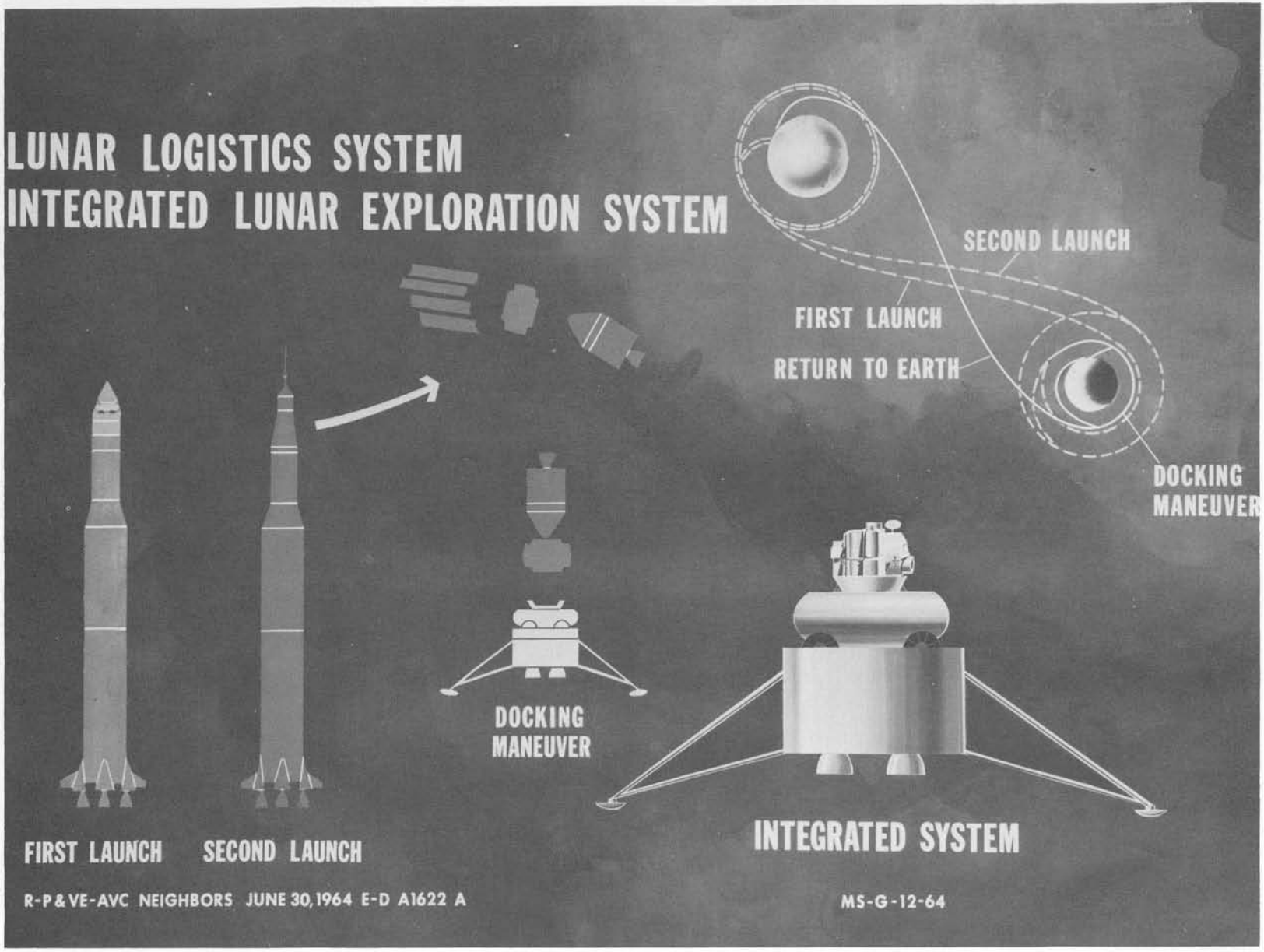


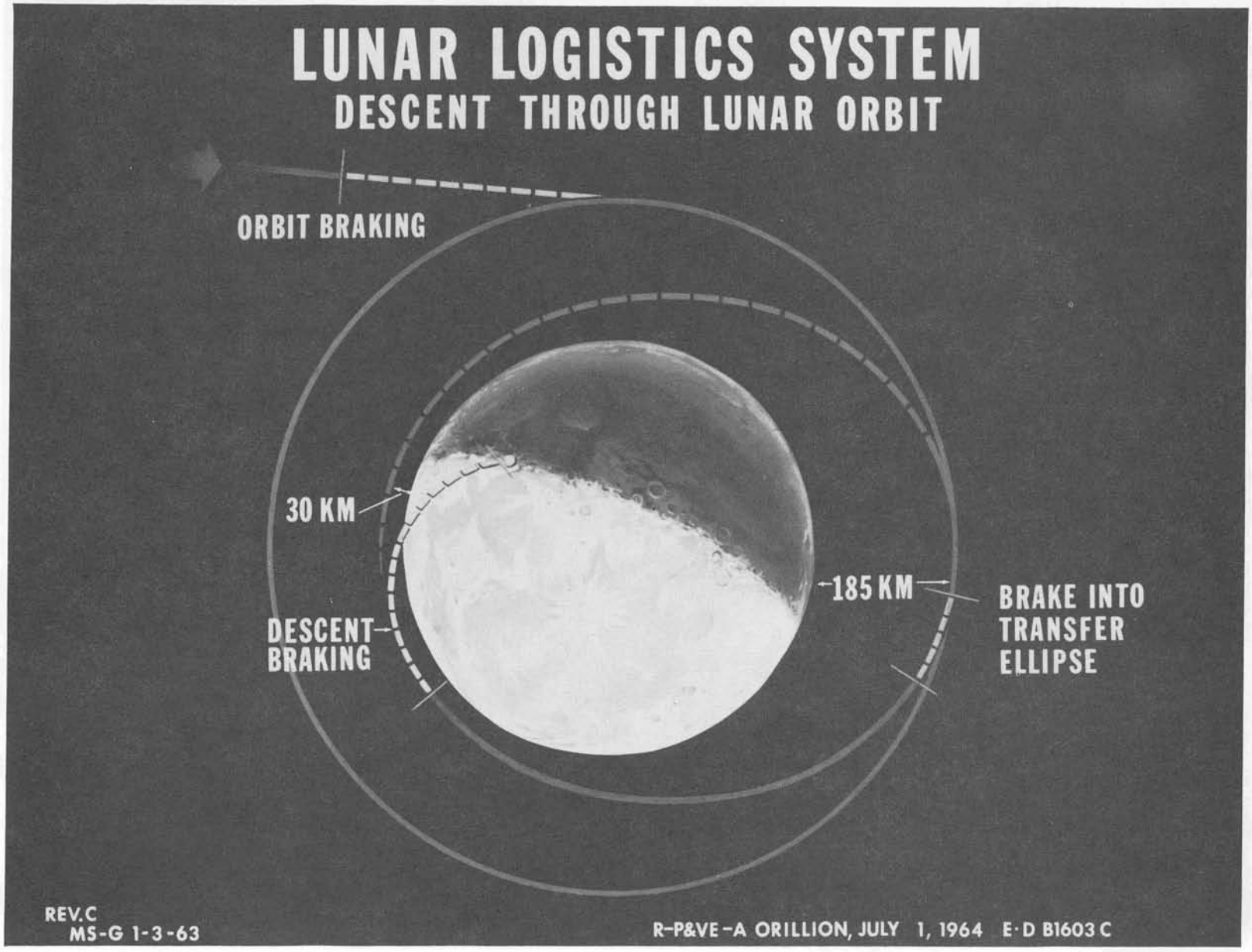
1 LAUNCH
2 S-1C SEPARATION
3 S-II FIRING
4 S-II SEPARATION
5 S-IV FIRING
6 INJECT INTO PARKING ORBIT
7 S-IVB RESTART
8 S-IVB SEPARATION
9 1st MIDCOURSE MANEUVER
10 2nd MIDCOURSE MANEUVER
11 LUNAR ALIGNMENT
12 L-I BRAKE IN LUNAR ORBIT
13 COAST
14 L-I SEPARATION
15 DE-ORBIT KICK (HOHMANN)
16 MAIN BRAKING
17 LAND

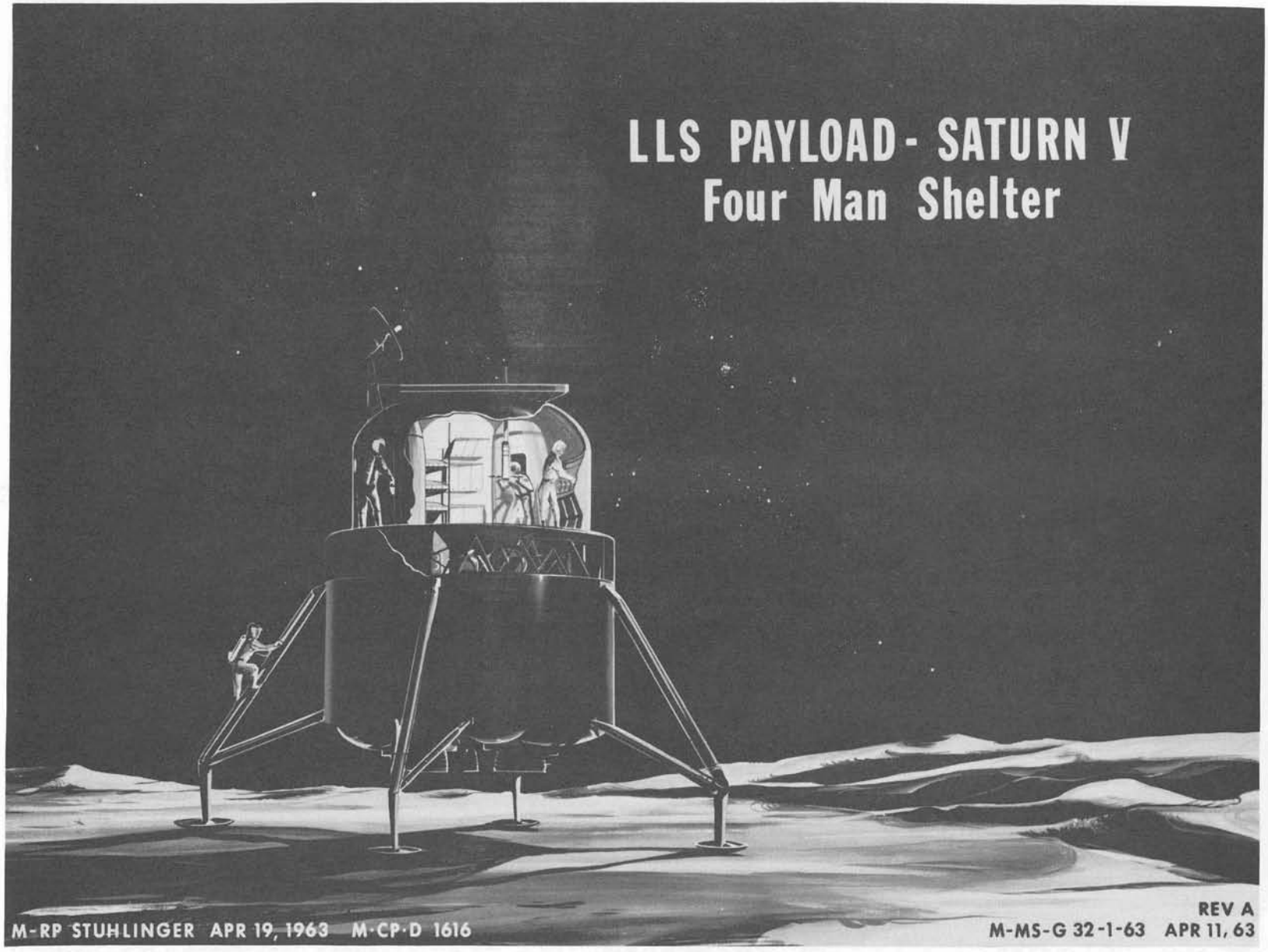
NOTE: COAST PERIODS BETWEEN 8&9, 9&10, 10&11, &13

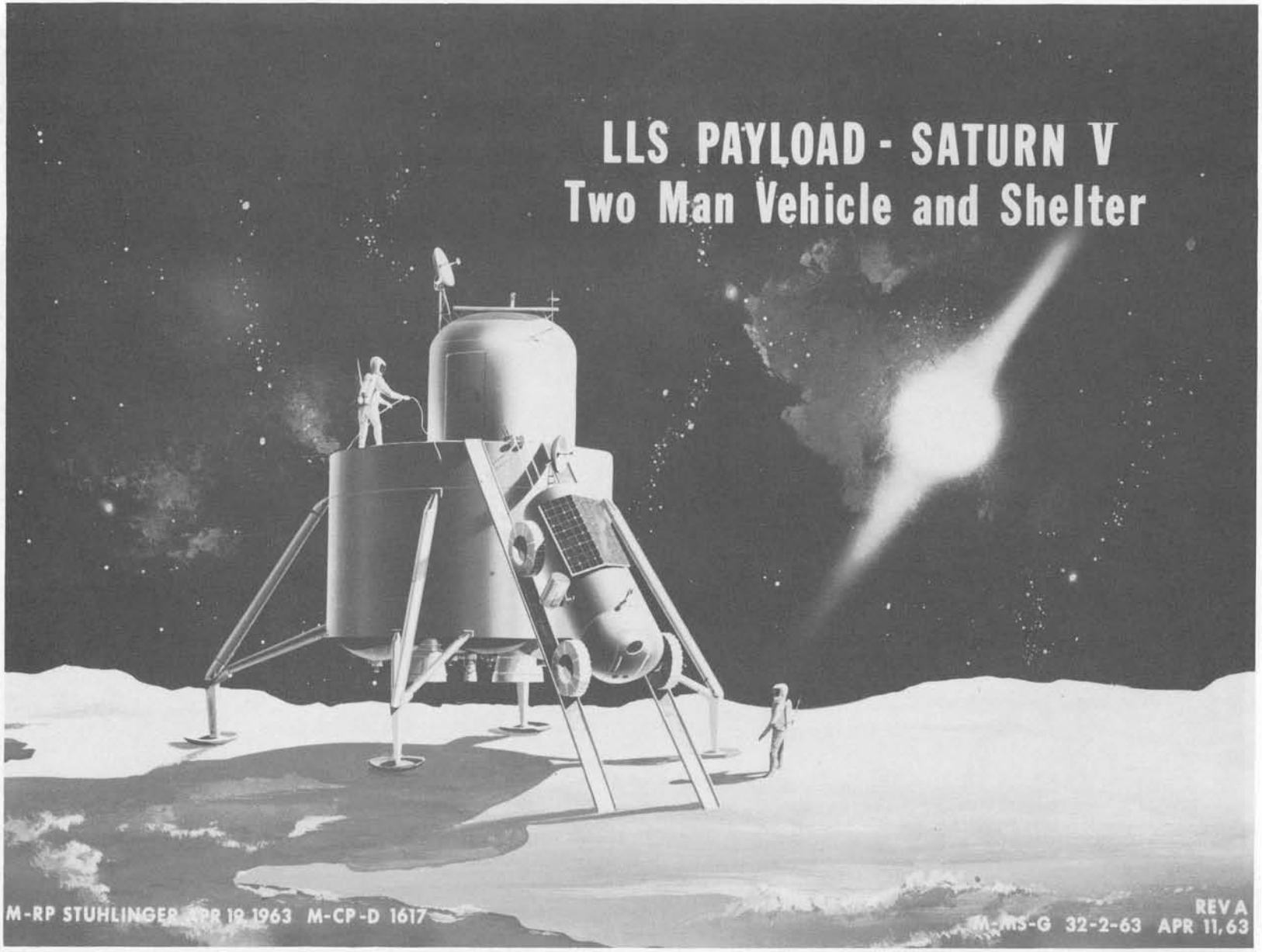
MS-G-101

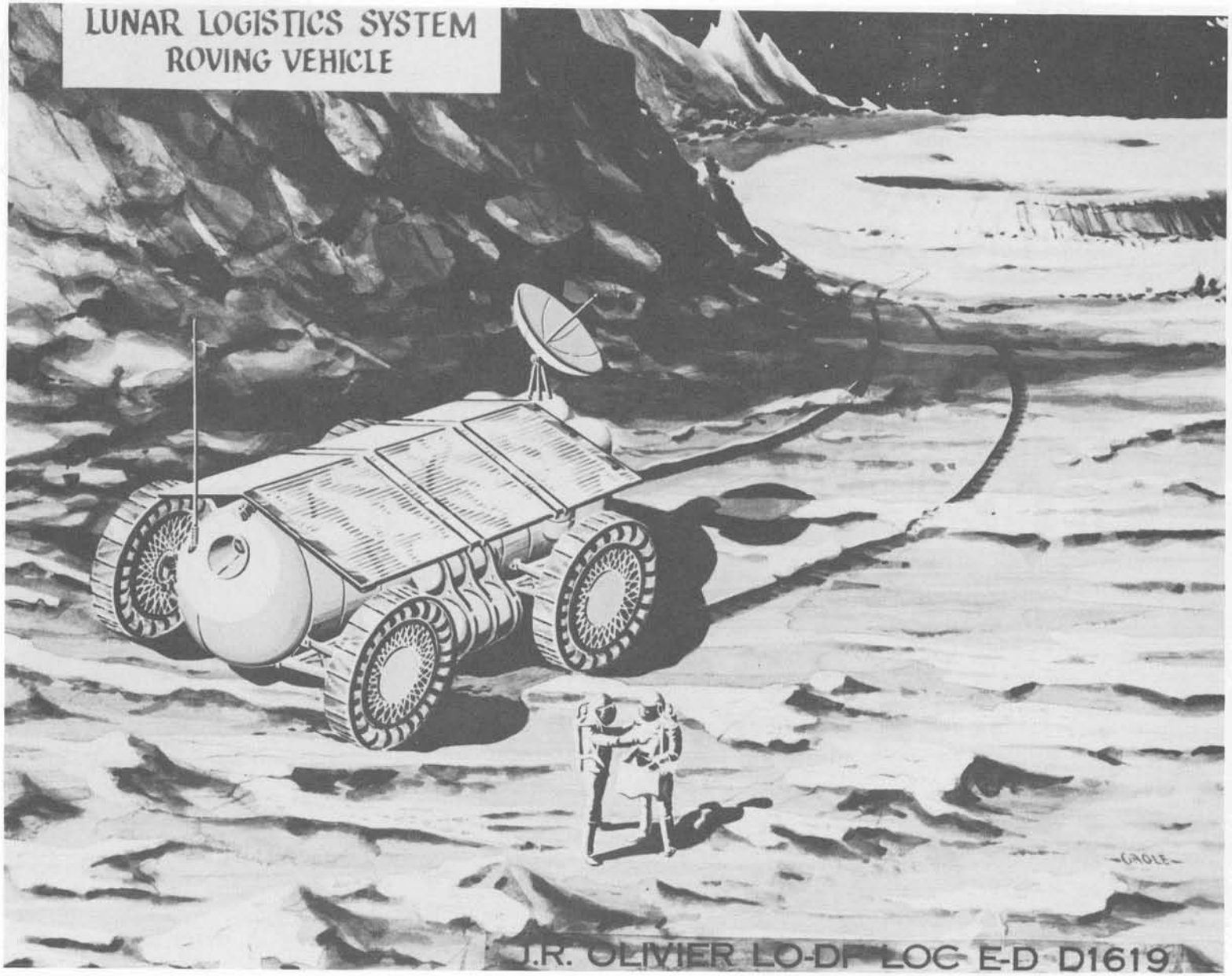
RP & VE-F ORILLION DEC. 1, 1963 EX-D 1620


LUNAR LOGISTICS SYSTEM
INTEGRATED LUNAR EXPLORATION SYSTEM
SECOND LAUNCH
FIRST LAUNCH
RETURN TO EARTH
DOCKING MANEUVER
DOCKING MANEUVER
FIRST LAUNCH
SECOND LAUNCH
INTEGRATED SYSTEM
R-P&VE-AVC NEIGHBORS JUNE 30, 1964 E-D A1622 A
MS-G-12-64

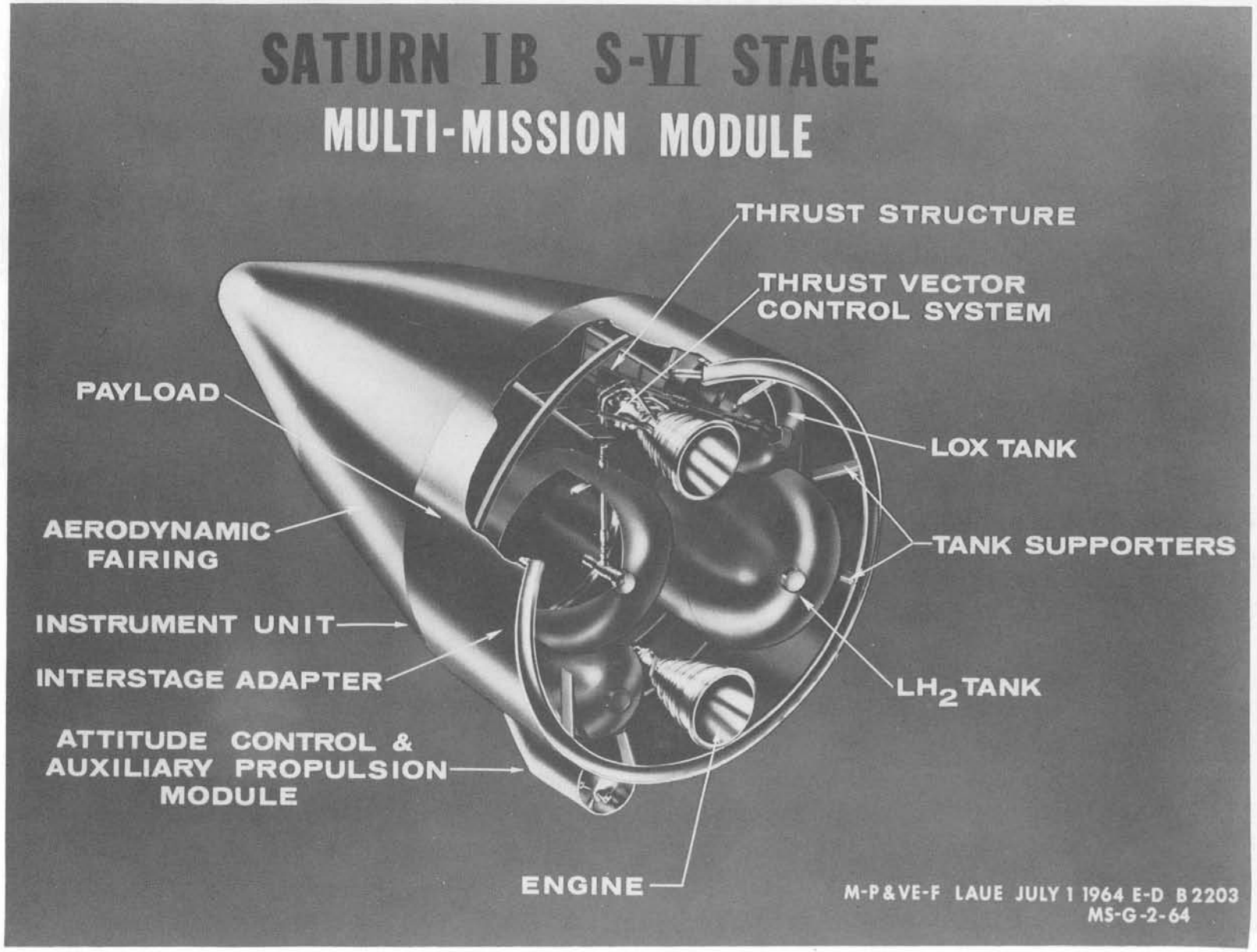

LUNAR LOGISTICS SYSTEM
DESCENT THROUGH LUNAR ORBIT
ORBIT BRAKING
30 KM
DESCENT BRAKING
185 KM
BRAKE INTO TRANSFER ELLIPSE
REV.C
MS-G 1-3-63
R-P&VE-A ORILLION, JULY 1, 1964 E·D B1603 C


LLS PAYLOAD - SATURN V
Four Man Shelter
M-RP STUHLINGER APR 19, 1963 M-CP-D 1616
REV A
M-MS-G 32-1-63 APR 11, 63

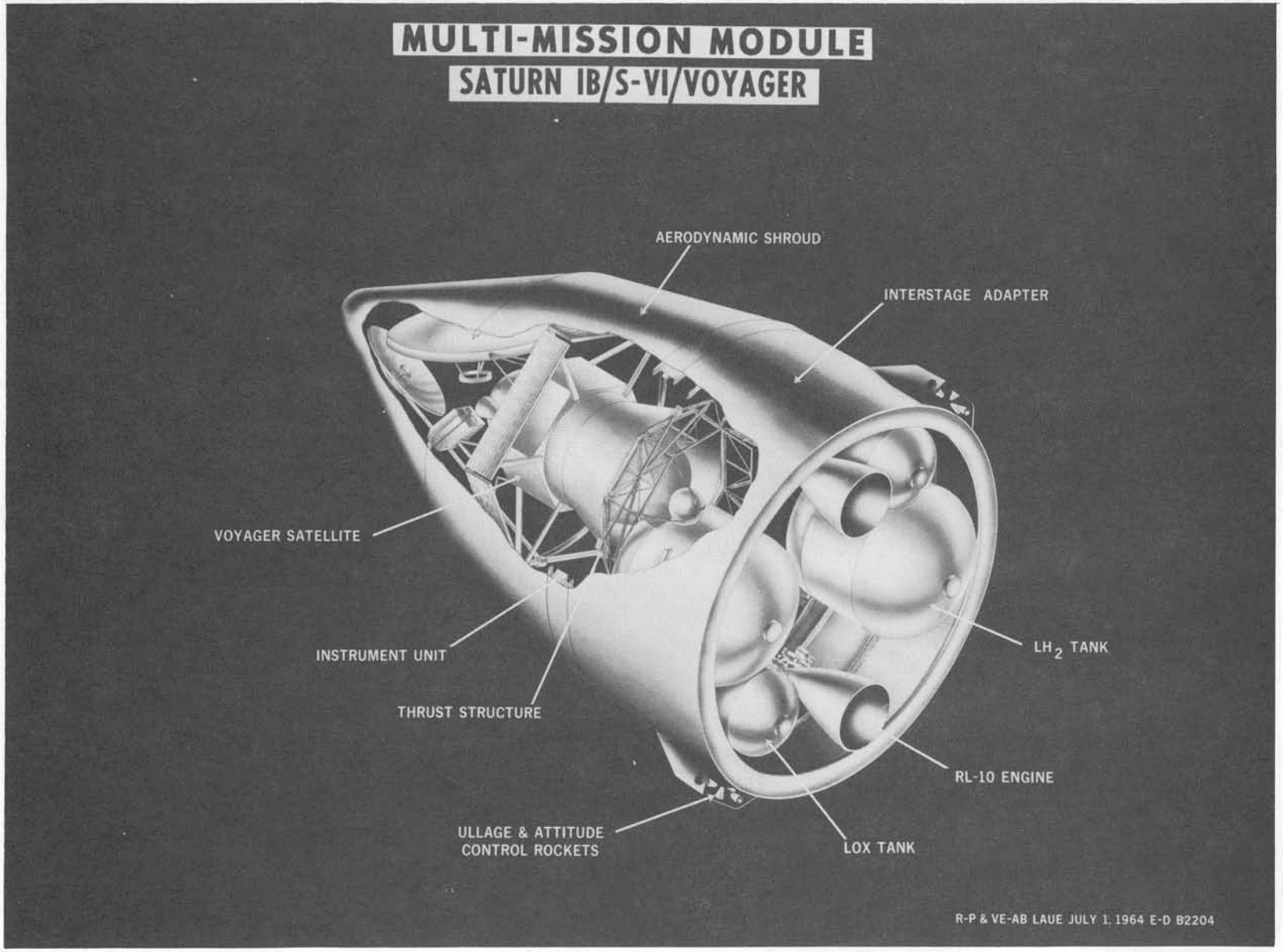

LLS PAYLOAD - SATURN V
Two Man Vehicle and Shelter
M-RP STUHLINGER APR 19 1963 M-CP-D 1617
REV A
M-MS-G 32-2-63 APR 11, 63


LUNAR LOGISTICS SYSTEM
ROVING VEHICLE
GAGLE
J.R. OLIVIER LO-DI LOC E-D D1619

MULTI-MISSION MODULES

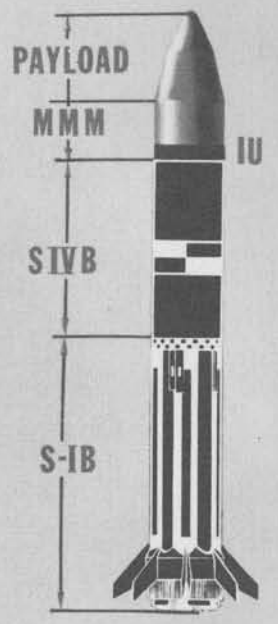

SATURN IB S-VI STAGE
MULTI-MISSION MODULE
THRUST STRUCTURE
THRUST VECTOR CONTROL SYSTEM
PAYLOAD
LOX TANK
AERODYNAMIC FAIRING
TANK SUPPORTERS
INSTRUMENT UNIT
INTERSTAGE ADAPTER
LH_2 TANK
ATTITUDE CONTROL & AUXILIARY PROPULSION MODULE
ENGINE
M-P&VE-F LAUE JULY 1 1964 E-D B 2203
MS-G-2-64

MULTI-MISSION MODULE
SATURN IB/S-VI/VOYAGER



R-P & VE-AB LAUE JULY 1, 1964 E-D B2204

MULTI-MISSION MODULE
SATURN IB/MMM CAPABILITIES



ES-1
P.L. 9,800
* 9,200
Wt = 22,000
APOLLO REENTRY MISSION

S-VI
P.L. 5,600
* 5,100
Wt = 23,300
VOYAGER

ES-10
P.L. 5,800
Wt=23,300
ORBITAL TRANSTAGE

ES-3
P.L. 5,100
Wt= 23,600
SYNCHRONOUS ORBIT

P.L. 17,400

ES-5
Wt=25,900
1st LAUNCH

ES-6
Wt = 9,200
2nd LAUNCH

APOLLO CIRCUMLUNAR MISSION

ES-4
P.L. 9,200
Wt=19,600
GEMINI CIRCUMLUNAR

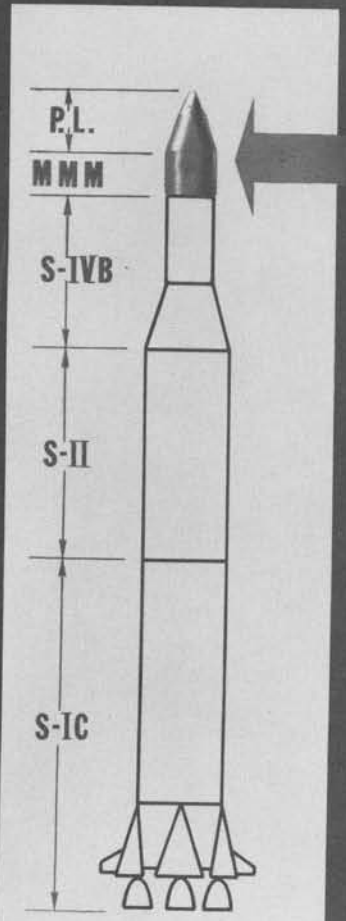
NOTE: Wt=MAIN STAGE PROPELLANT LOADING IN LBS
P.L.=PAYLOAD WT IN LBS ABOVE INSTR. UNIT
* =PAYLOAD WT IN LBS ABOVE PAYLOAD SUPPORT STRUCTURE

REV. H
MS-G 35-1-63

R-P&VE-A ORILLION JULY 1,1964 E-D A 2201

57

MULTI-MISSION MODULE
SATURN V/MMM STAGE CAPABILITIES



P.L. 24,500
Wt=24,900
Wt=18,500

LUNAR
LOGISTIC SYSTEM

P.L. 10,000
Wt=37,600

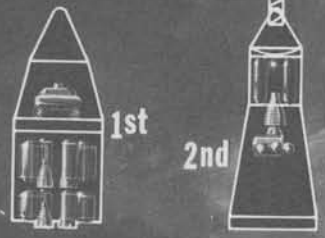
PLANETARY ORBITER

P.L. 28,600
Wt=34,000

HIGH ENERGY

P.L. 216,300
Wt=23,300

TRANSFER
STAGE



INTEGRATED
LUNAR EXPLORATION SYSTEM

P.L.15,400
Wt=33,800

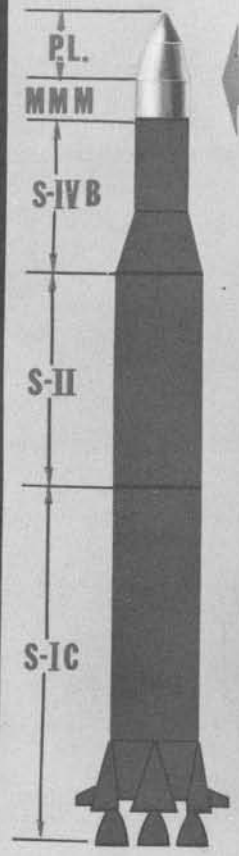
CRYOGENIC
SERVICE MODULE

NOTE: Wt=MAINSTAGE PROPELLANT LOADING IN LBS
P.L.=PAYLOAD Wt. IN LBS ABOVE IU

R-P&VE-A ORILLION JULY 1,1964 E-D A2202

MS-G-13-64 REV.B

MULTI-MISSION MODULE SATURN V/MMM WITH NUCLEAR STAGE CAPABILITIES



P.L. 24,500

L-II Wt=24,900

L-I Wt=18,500

LUNAR LOGISTIC SYSTEM

P.L. 15,400

ES-2 Wt=33,800

CRYOGENIC SERVICE MODULE

P.L. 216,300

Wt=23,300

ES-11

TRANSFER STAGE

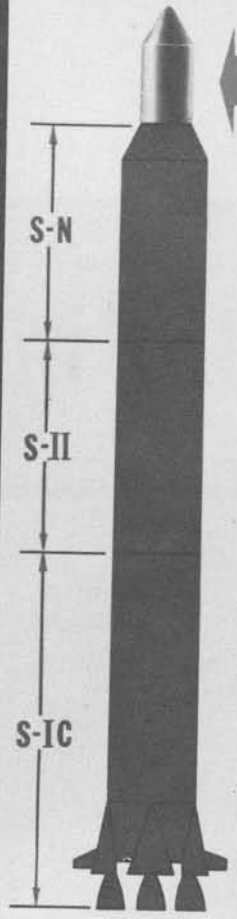
P.L. 28,600

ES-7 Wt=34,000

HIGH ENERGY

NOTE: Wt = MAIN STAGE PROPELLANT LOADING IN LBS
P.L. = PAYLOAD WT IN LBS ABOVE IU

R-P&VE-A ORILLION, JULY 1,1964 E-D B 2200



P.L. 11,400

R-1 Wt=18,500

L-II/N Wt=37,200

L-I/N Wt=27,000

LUNAR RETURN STAGE

P.L. 30,600

L-II/N Wt=30,400

L-I/N Wt=22,300

LUNAR LOGISTIC SYS.

P.L. 10,000

Wt=37,600

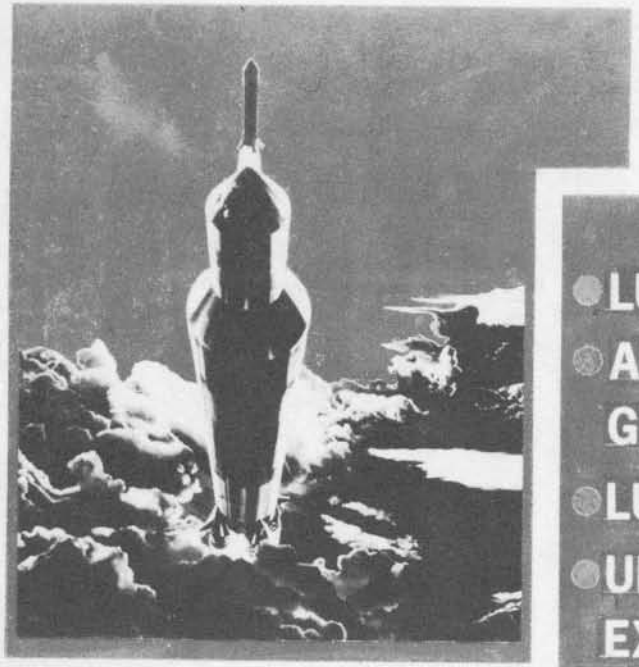
ES-12

PLANETARY ORBITER

MS-G-35-2-63 REV. F

NUCLEAR ROCKET SYSTEMS

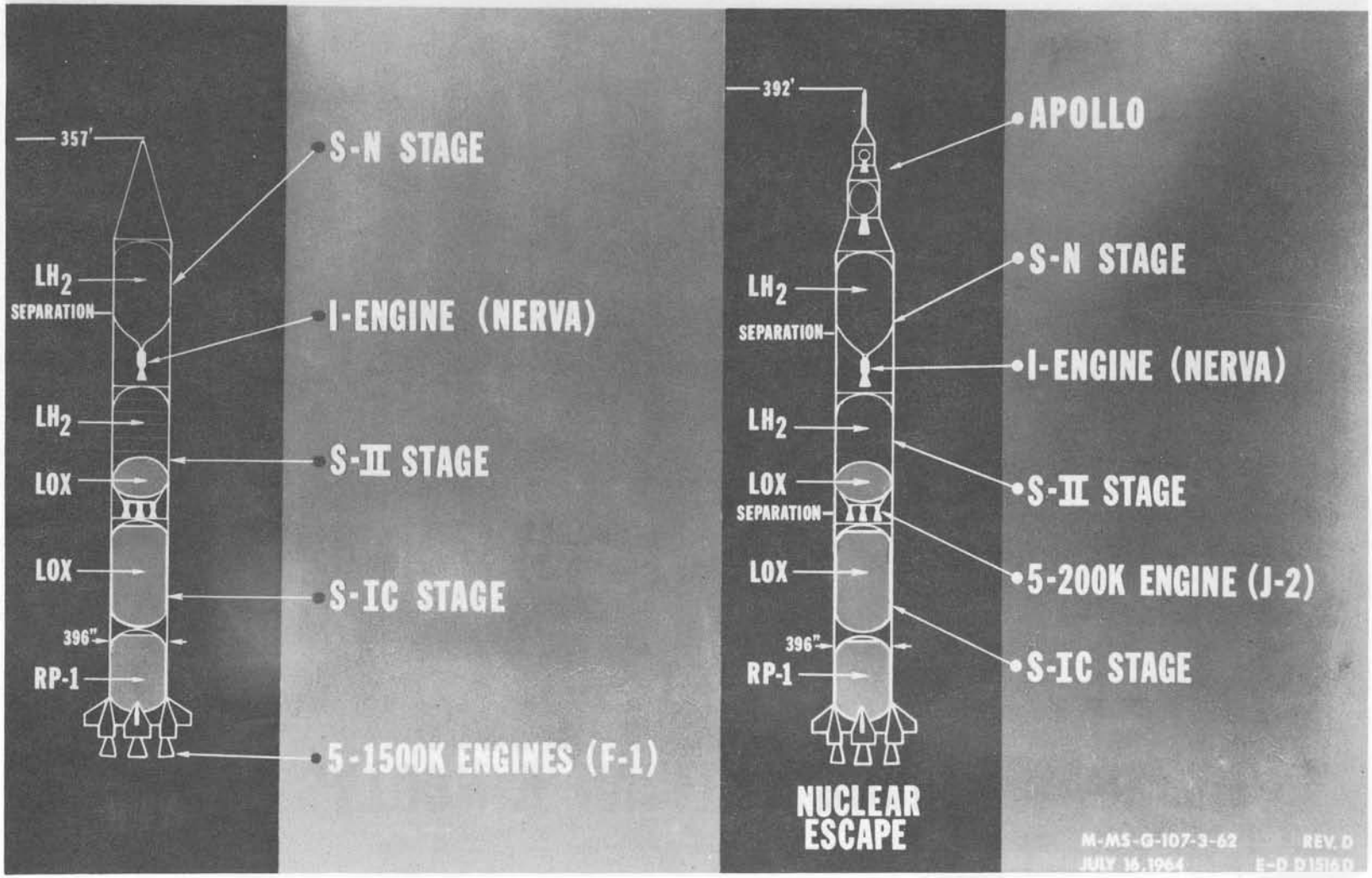
INITIAL SATURN V NUCLEAR ROCKET SYSTEMS POSSIBLE MISSIONS

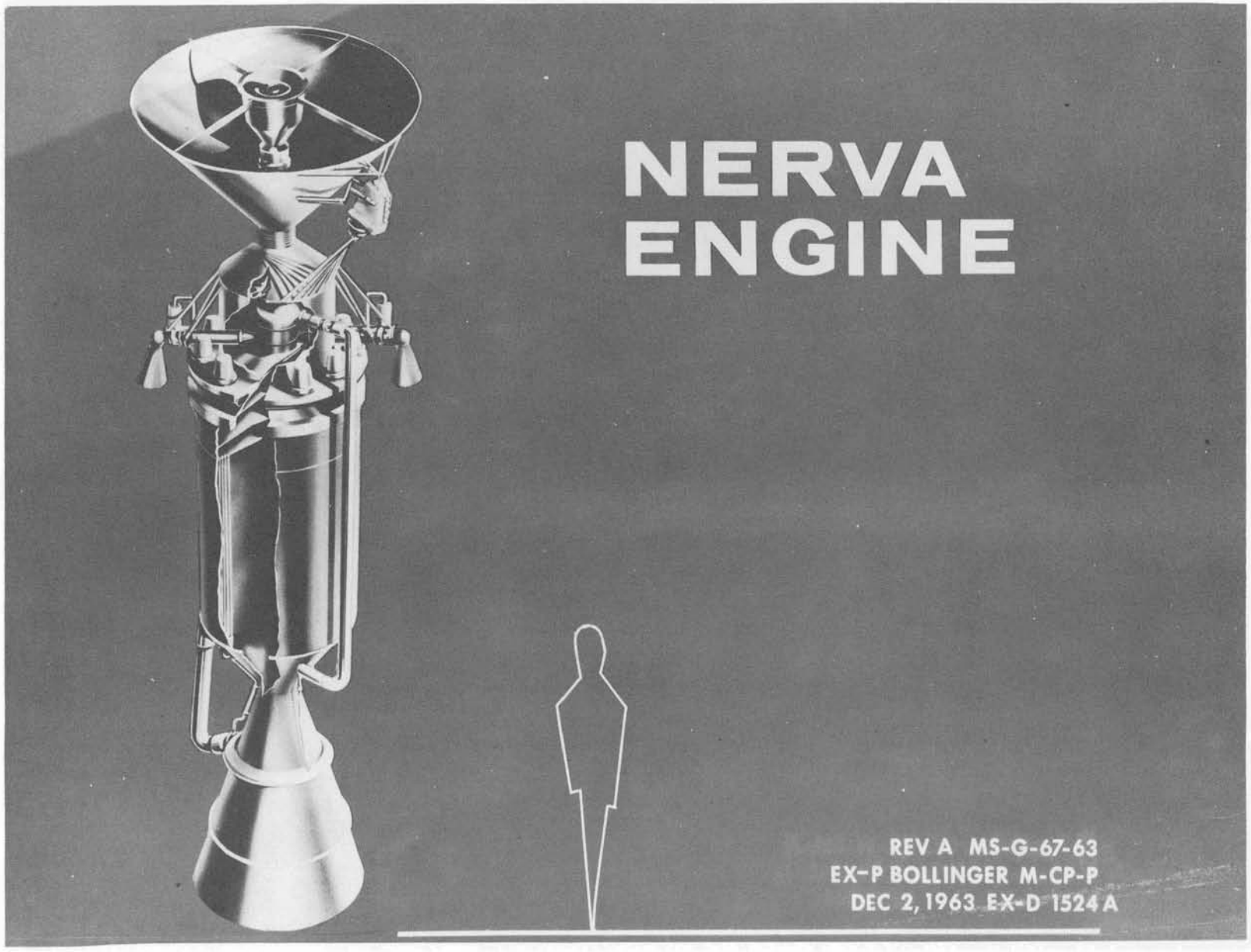


- LUNAR LOGISTICS
- APOLLO/LEM BACKUP AND GROWTH
- LUNAR DIRECT MANNED FLIGHT
- UNMANNED MARS/VENUS EXPLORATION
- DEEP-SPACE PROBES

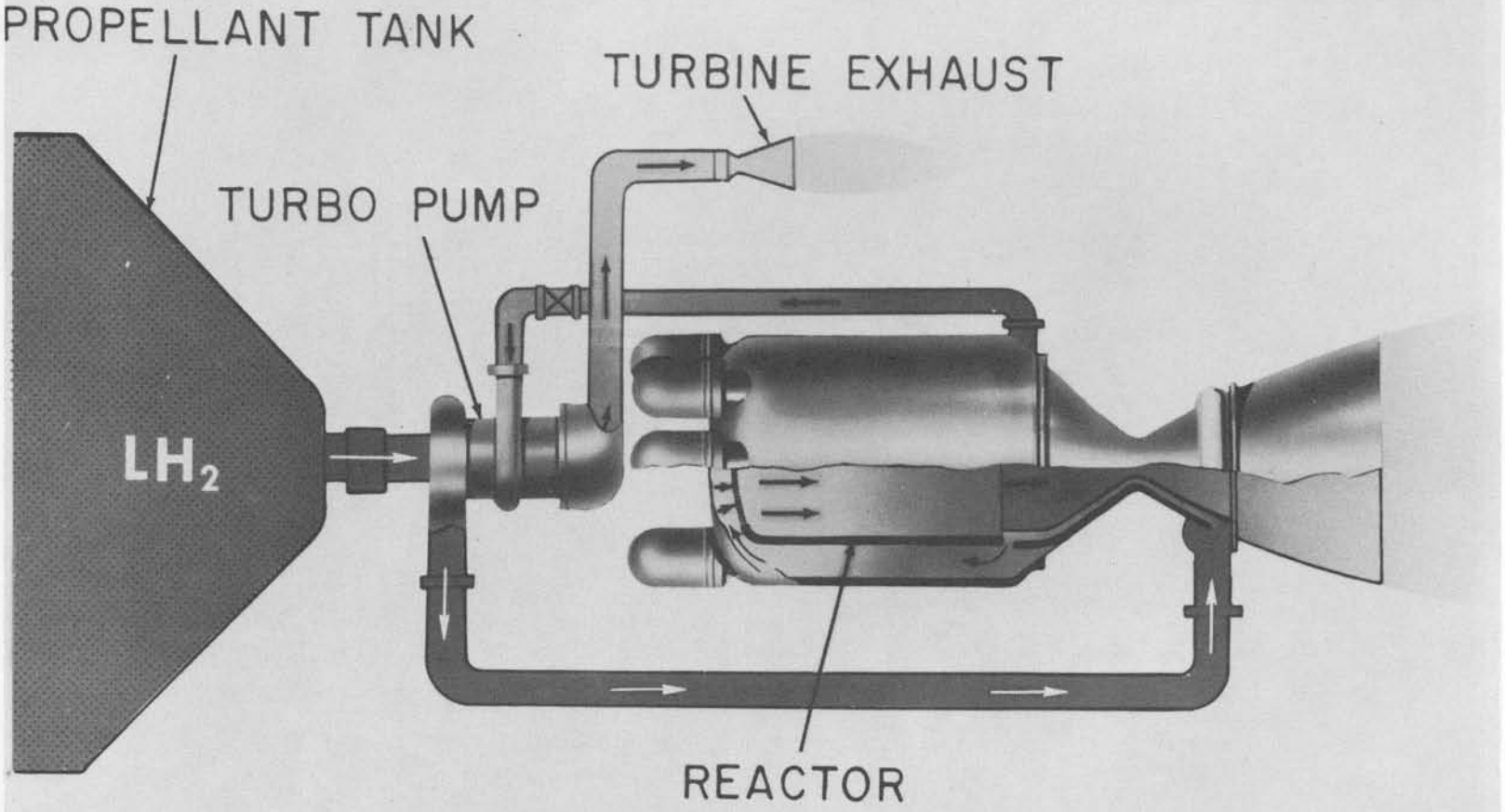
E-D D1505 B

NUCLEAR ROCKET SYSTEMS

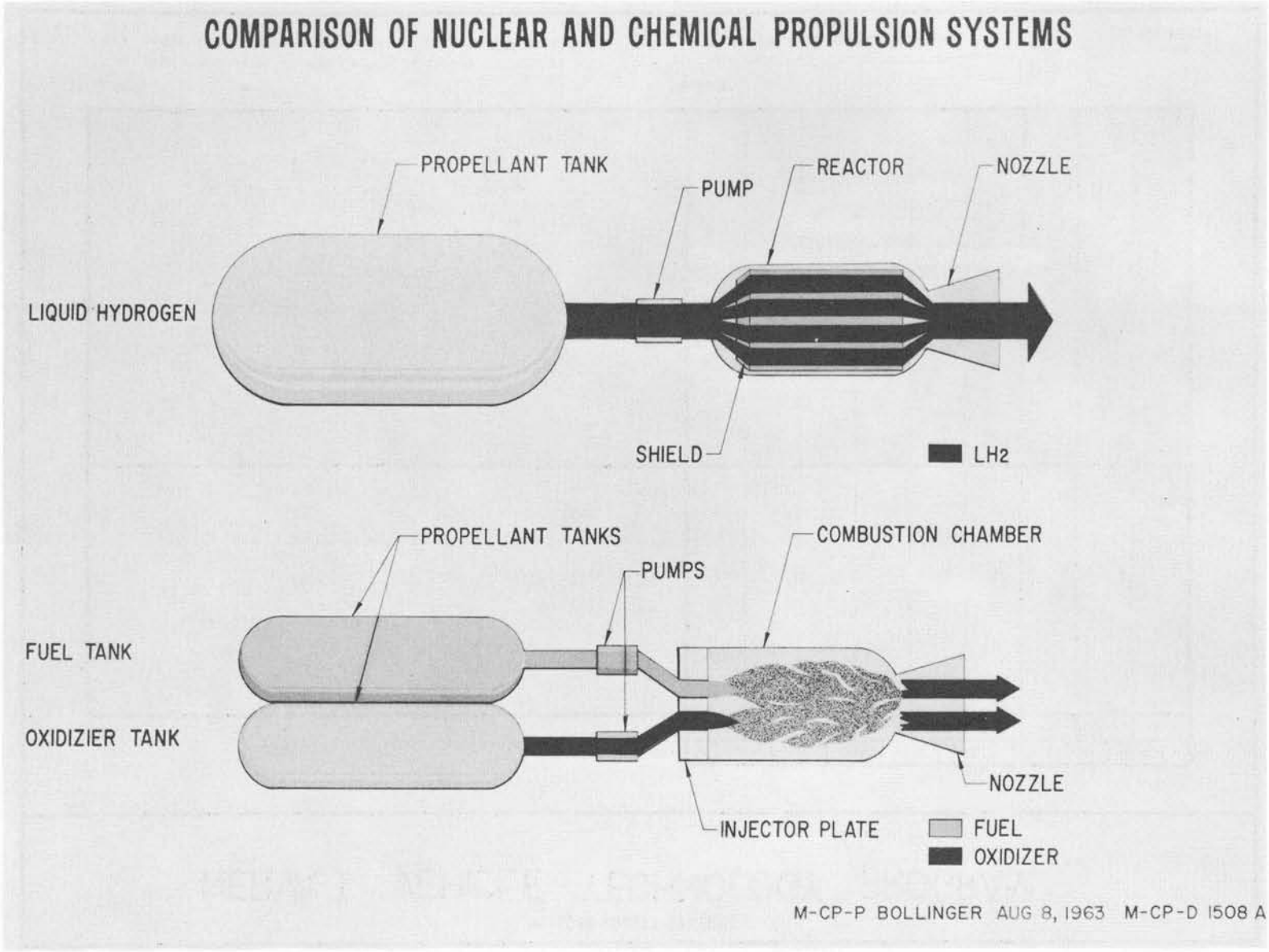



NERVA
ENGINE
REV A MS-G-67-63
EX-P BOLLINGER M-CP-P
DEC 2, 1963 EX-D 1524 A

NERVA ENGINE
HOT BLEED CYCLE

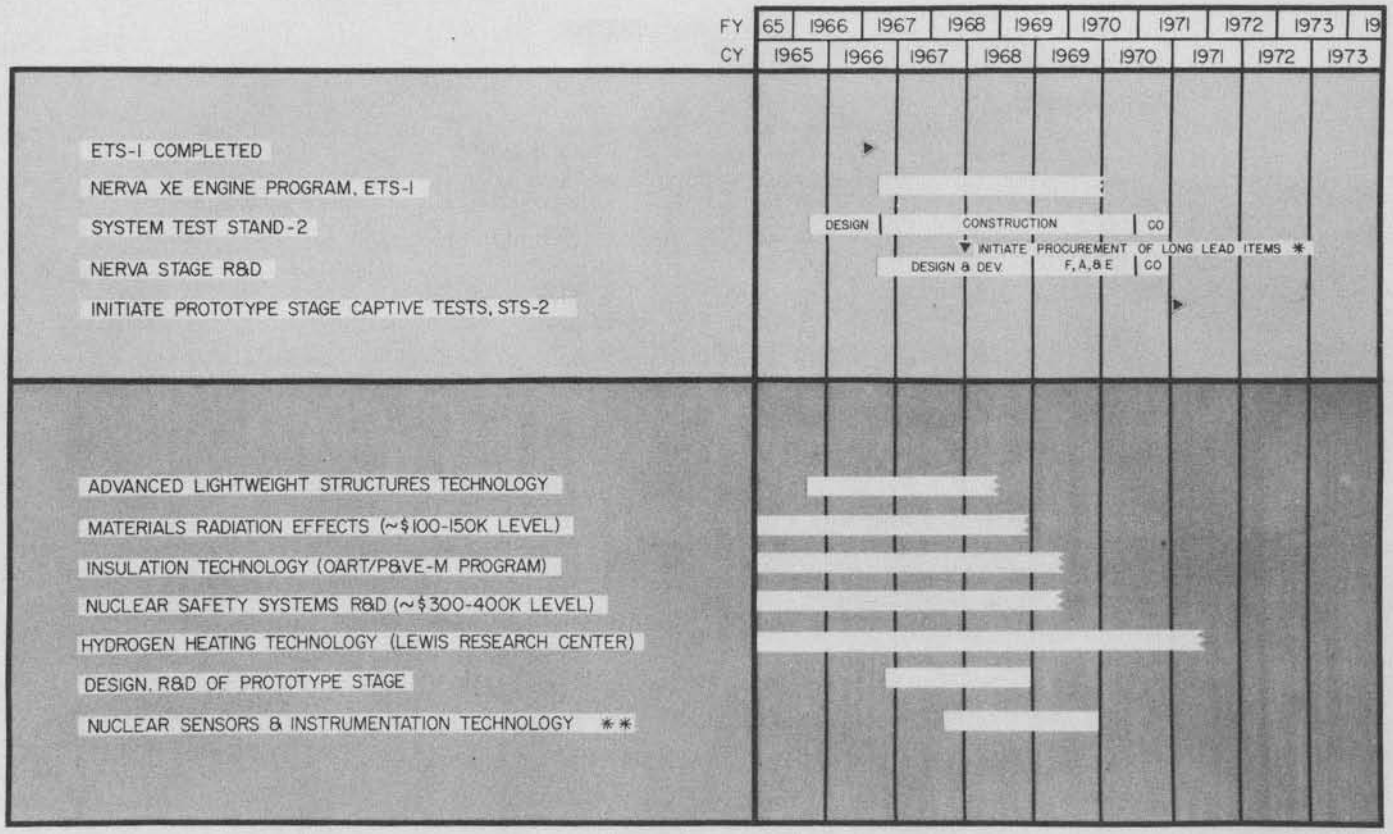


MONTHLY BOLLINGER M-CP-P AUG 8,1963 M-CP-D 1523 M-MS-G 107-43-61 REV.A AUG 12, 1963


COMPARISON OF NUCLEAR AND CHEMICAL PROPULSION SYSTEMS
PROPELLANT TANK
PUMP
REACTOR
NOZZLE
LIQUID HYDROGEN
SHIELD
LH2
PROPELLANT TANKS
PUMPS
COMBUSTION CHAMBER
FUEL TANK
OXIDIZER TANK
NOZZLE
INJECTOR PLATE
FUEL
OXIDIZER
M-CP-P BOLLINGER AUG 8, 1963 M-CP-D 1508 A

NUCLEAR ROCKET SYSTEMS

NERVA I VEHICLE TECHNOLOGY PROGRAM



NOTES:

* STAGE SYSTEMS, VALVES, PLUMBING, ELECTRICAL, ACCESSORIES, ETC

** GEORGIA NUCLEAR LABORATORIES ESTIMATED THIS WAS A TWO YEAR PROGRAM

LEGEND:

CO - CHECK OUT

F, A, & E - FABRICATION, ASSEMBLY, & EQUIPPING

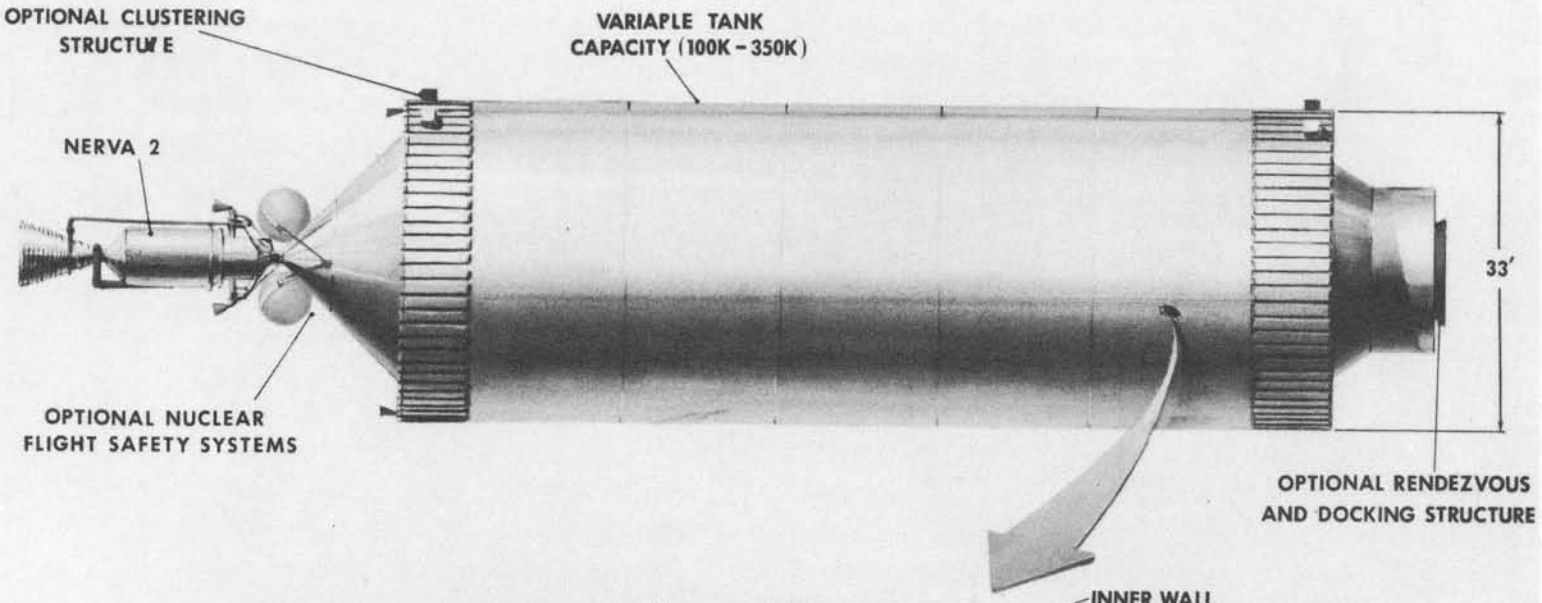
1/4/65

E-D 01531

NUCLEAR ROCKET SYSTEMS

Propulsion Module Concept

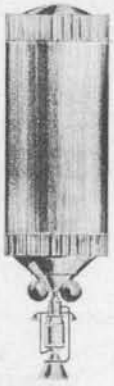
396" TANK DIAMETER, SATURN V COMPATIBLE



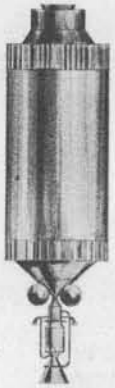
E-D D1532

NUCLEAR ROCKET SYSTEMS

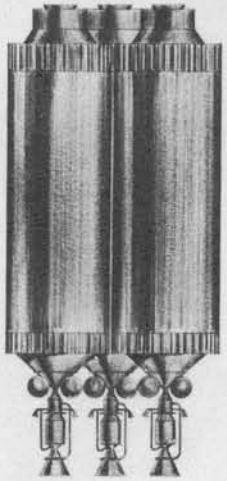
PROPULSION MODULE APPLICATIONS
NERVA 2



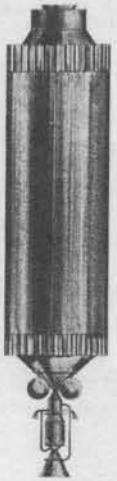
SATURN 3rd STAGE
SUB-ORBIT START



EOR
PROPULSION MODULE



MARS INJECTION SYSTEM



MARS BRAKING OR
DEPARTURE MODULES

LUNAR LOGISTICS
PLANETARY PROBES
SYNCRONOUS-ORBIT LOGISTICS

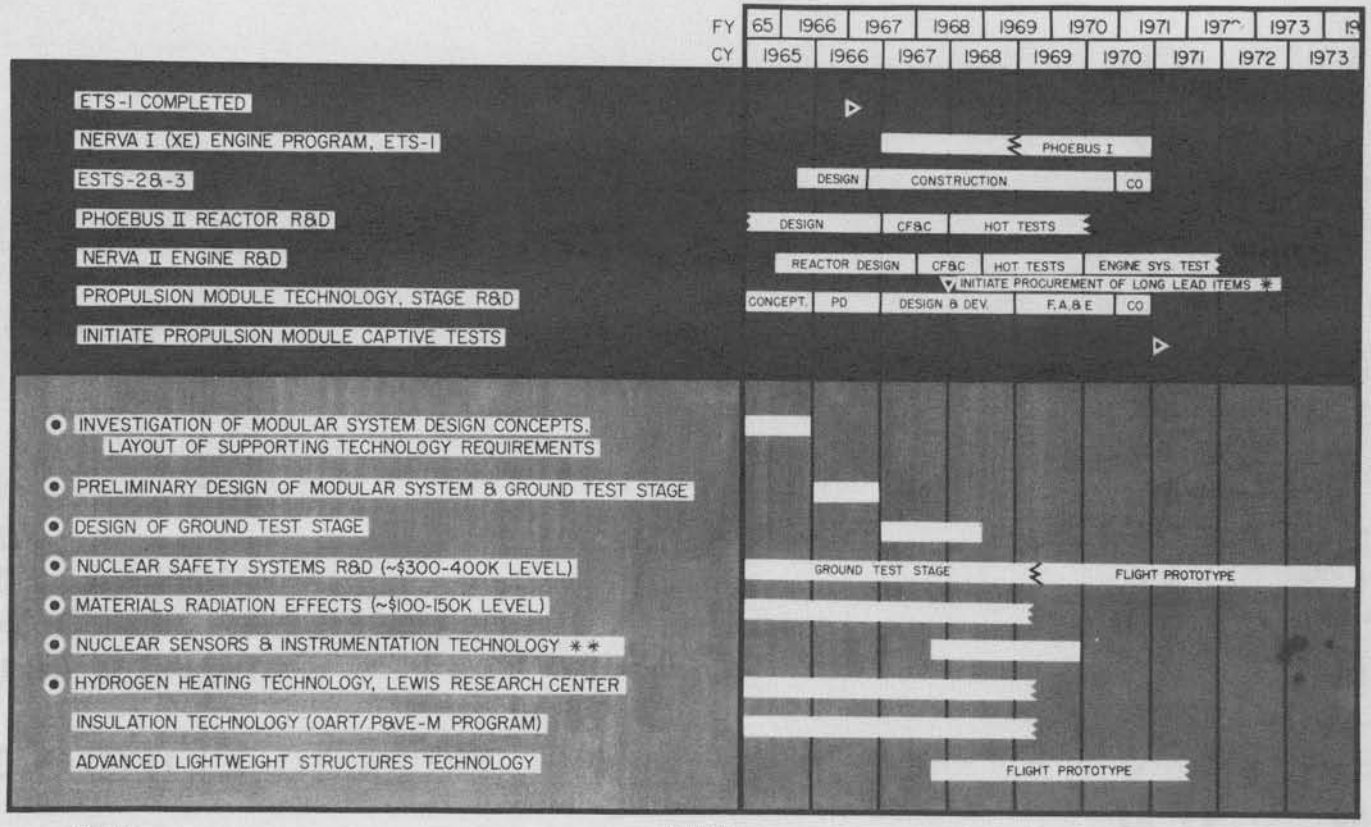
MANNED PLANETARY FLY-BY
HEAVY CIS-LUNAR LOGISTICS

MANNED MARS STOPOVER MISSIONS

E-D 01530

NUCLEAR ROCKET SYSTEMS

NERVA II VEHICLE TECHNOLOGY PROGRAM



NOTES:

* TANK SYSTEM, VALVES, PLUMBING, ELECTRICAL, ACCESSORIES, ETC.

* * GEORGIA NUCLEAR LABORATORIES ESTIMATED THIS WAS A TWO YEAR PROGRAM

LEGEND:

CF&C COLD FLOW & COMPONENTS
F.A.&E FABRICATION, ASSEMBLY, & EQUIPPING
CO CHECK OUT
PD PRELIMINARY DESIGN
NESTA NUCLEAR ENGINE STAGE TEST ASSEMBLY

E-D 01529
1/4/65

ROVER BUDGET SUMMARY

COMBINED NASA & AEC FUNDING - MILLIONS OF DOLLARS

	FY 64	FY 65	FY 66
SUPPORTING RESEARCH & TECHNOLOGY			
REACTOR RESEARCH	27.1	40.1	49.15
ENGINE COMPONENT RESEARCH	7.6	8.3	5.35
VEHICLE TECHNOLOGY	0.8	1.1	1.0
SAFETY	0.5	0.5	0.5
PLUMBROOK SUPPORT			0.6
NERVA	106.0	82.5	80.2
CONSTRUCTION OF FACILITIES	5.1	9.0	*
NUCLEAR ROCKET DEV. STATION (OPERATING)	7.5	8.5	9.7
RIFT	7.5	0	0
KIWI	15.7	1.0	0
GRAND TOTALS	177.8	151.0	146.5
NASA'S % OF TOTAL	46.5%	38.4%	41.6%

* $ 10.0 REQUEST PENDING (BUDGETED SEPARATELY)

R-P&VE-AN JORDAN MAY 13, 1965 E-D D 1528 A

71

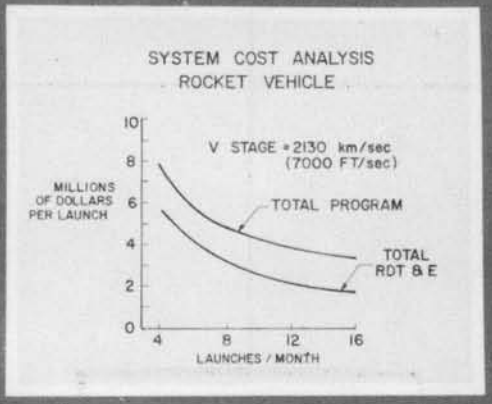
FUTURE PROJECTS OFFICE

FUTURE PROJECTS OFFICE

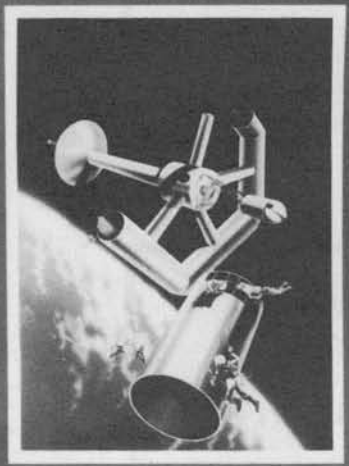
LUNAR SYSTEMS

ADVANCED LAUNCH VEHICLES AND PROPULSION SYSTEMS

PLANETARY SYSTEMS



PROGRAM ANALYSIS

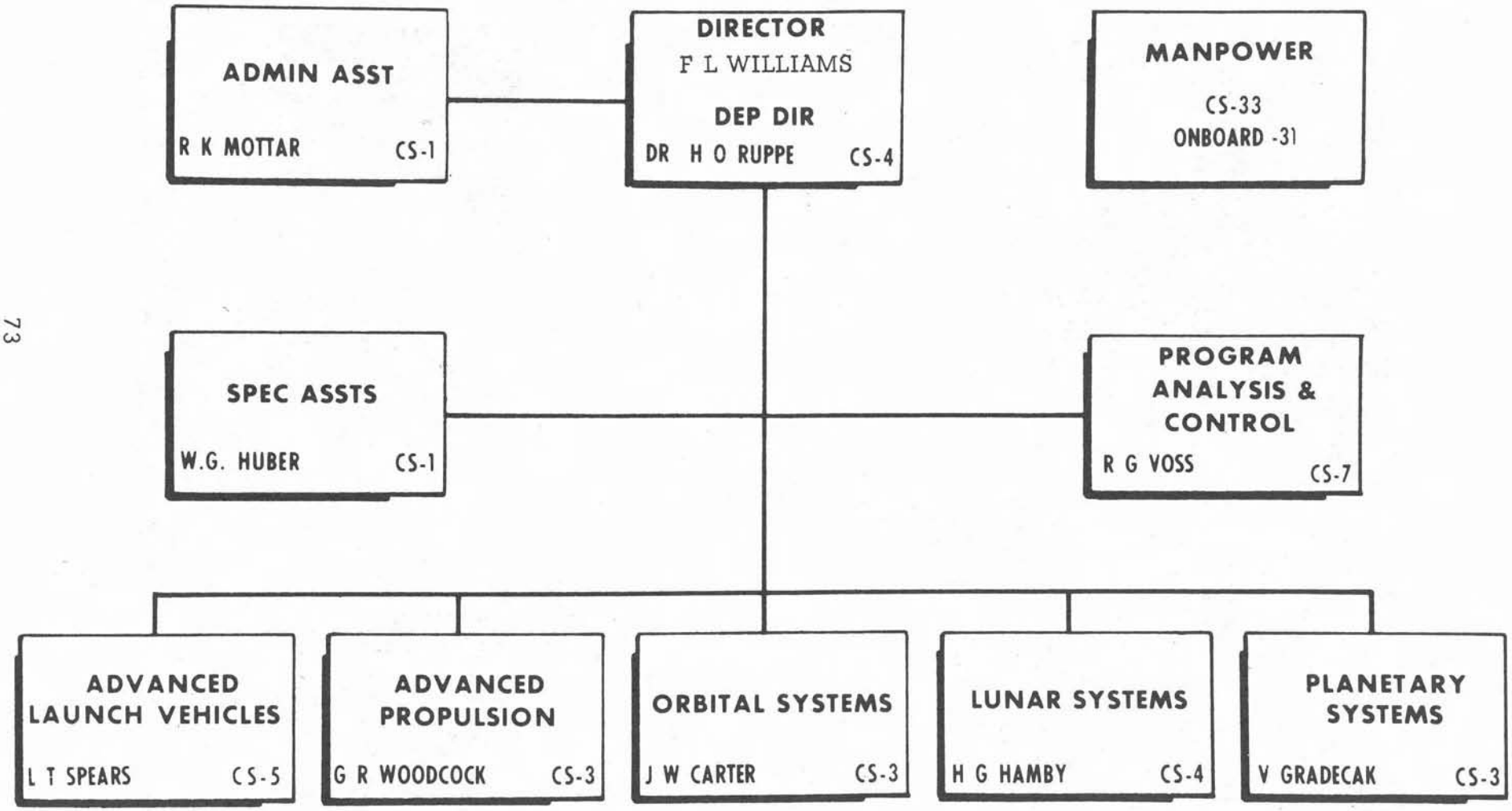


EARTH ORBITAL SYSTEMS

E-D 01737

MSFC FUTURE PROJECTS OFFICE

ORGANIZATION

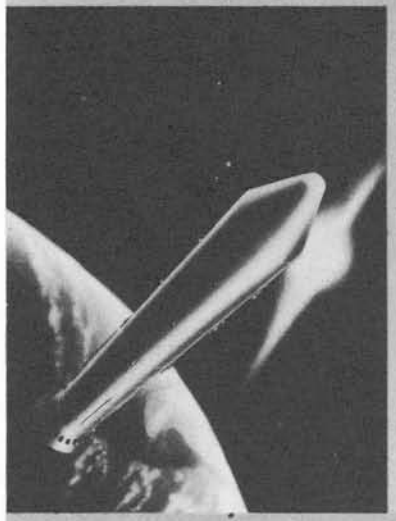


RUTLAND R-FP APRIL 12, 1965 E-D D 7404 A

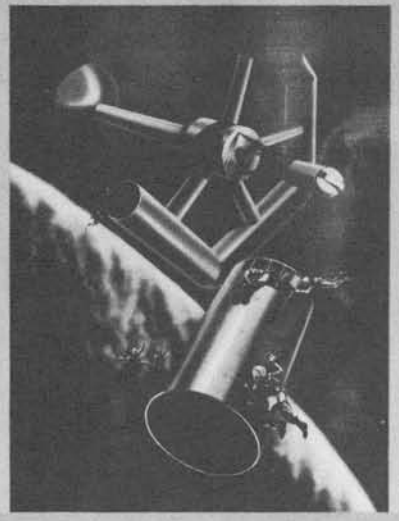
MSFC FUTURE PROJECTS
AREAS OF ACTIVITY

- FEASIBILITY STUDIES
- CONCEPTUAL DESIGN
- PRELIMINARY DESIGN
- SYSTEMS REQUIREMENTS
- CONFIGURATION ANALYSIS AND EVALUATION
- SYSTEMS SELECTION

LAUNCH VEH SYSTEMS

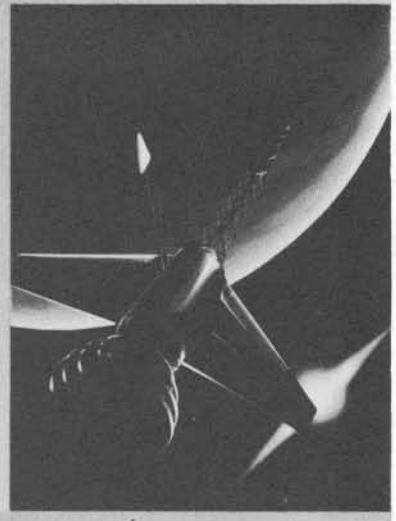


ORBITAL SYSTEMS



LUNAR SYSTEMS

PLANETARY SYSTEMS



MS-G 125-21-62 REV C
MOAK R-FP MAY 1, 1964 EX-D 1700 D

MSFC FUTURE PROJECTS ACTIVITIES

- LAUNCH VEHICLE SYSTEMS:
  - 2nd GENERATION SATURN I AND SATURN V CLASS VEHICLES
  - ADVANCED AND POST SATURN VEHICLES
- ORBITAL SYSTEMS:
  - LOGISTICAL SUPPORT OF ORBITAL SPACE STATIONS
  - ORBITAL OPERATIONS (ASSY, CHECKOUT & MAINTENANCE OF SPACE STATIONS & ORBITAL LAUNCH VEHICLES, ETC.)
  - ORBITAL LAUNCH FACILITY
  - UTILIZATION OF SPENT STAGES
- LUNAR SYSTEMS:
  - LUNAR TRANSPORTATION SYSTEMS-MANNED & CARGO
  - LUNAR BASE LOGISTIC SUPPORT
  - INTEGRATION OF LAUNCH VEHICLES, ORBITAL SYSTEMS, LUNAR SYSTEMS
- PLANETARY SYSTEMS:
  - PLANETARY SPACE VEHICLE REQUIREMENTS
  - PLANETARY MISSIONS LOGISTIC SUPPORT
  - INTEGRATION OF LAUNCH VEHICLES, ORBITAL SYSTEMS, LUNAR SYSTEMS, PLANETARY SYSTEMS
- PROPULSION SYSTEMS:
  - ADVANCED PROPULSION SYSTEM REQUIREMENTS FOR ACTIVITIES ABOVE
  - SOLID PROPULSION SYSTEMS
  - NUCLEAR & ELECTRONIC SYSTEMS
  - REUSABLE PROPULSION SYSTEMS
- OPERATIONS ANALYSIS:
  - DEVELOPMENT & FUNDING PLANS FOR ACTIVITIES ABOVE
  - TRADE OFF STUDIES & SYSTEM SELECTION
  - COST, TIME, RELIABILITY, & INTERRELATIONSHIP STUDIES
  - DEVELOPMENT OF MATHEMATICAL MODELS FOR SYSTEM ANALYSIS

E-D D1707 B

MSFC FUTURE PROJECTS
LAUNCH VEHICLE SYSTEM

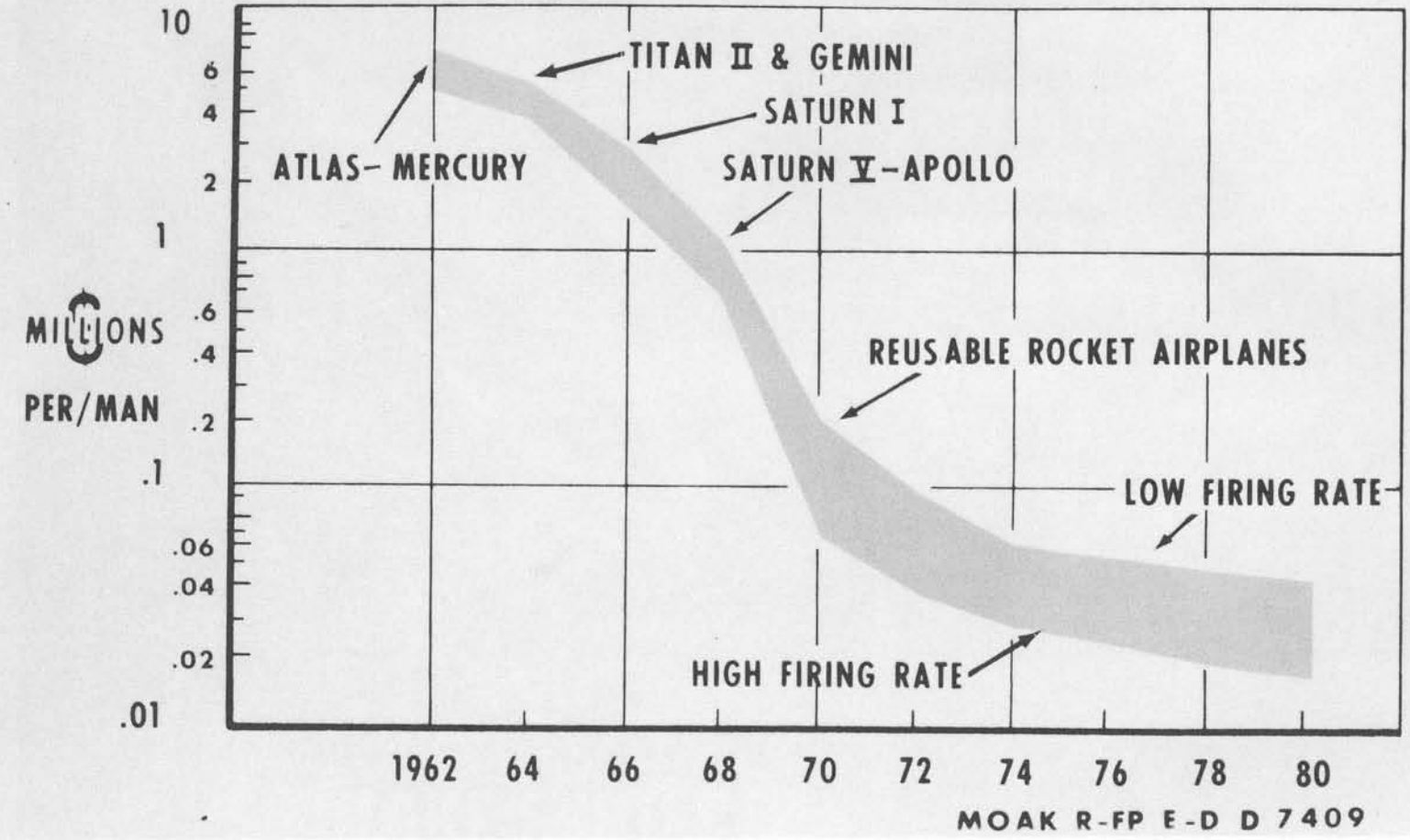
CURRENT AREAS OF ACTIVITY

- 2nd GENERATION SATURN I CLASS VEHICLE
- 2nd GENERATION SATURN V CLASS VEHICLE
- ADVANCED & POST SATURN VEHICLES
- NUCLEAR PROPULSION SYSTEMS FOR PRESENT AND FUTURE LAUNCH VEHICLES
- REUSEABLE ORBITAL FERRY

R-FP MOAK APR 6, 1964 E-D 17015
MS-G 125-22-62
REV. E

FUTURE PROJECTS

ESTIMATED TRENDS FOR EARTH-TO-ORBIT PERSONNEL TRANSPORTATION



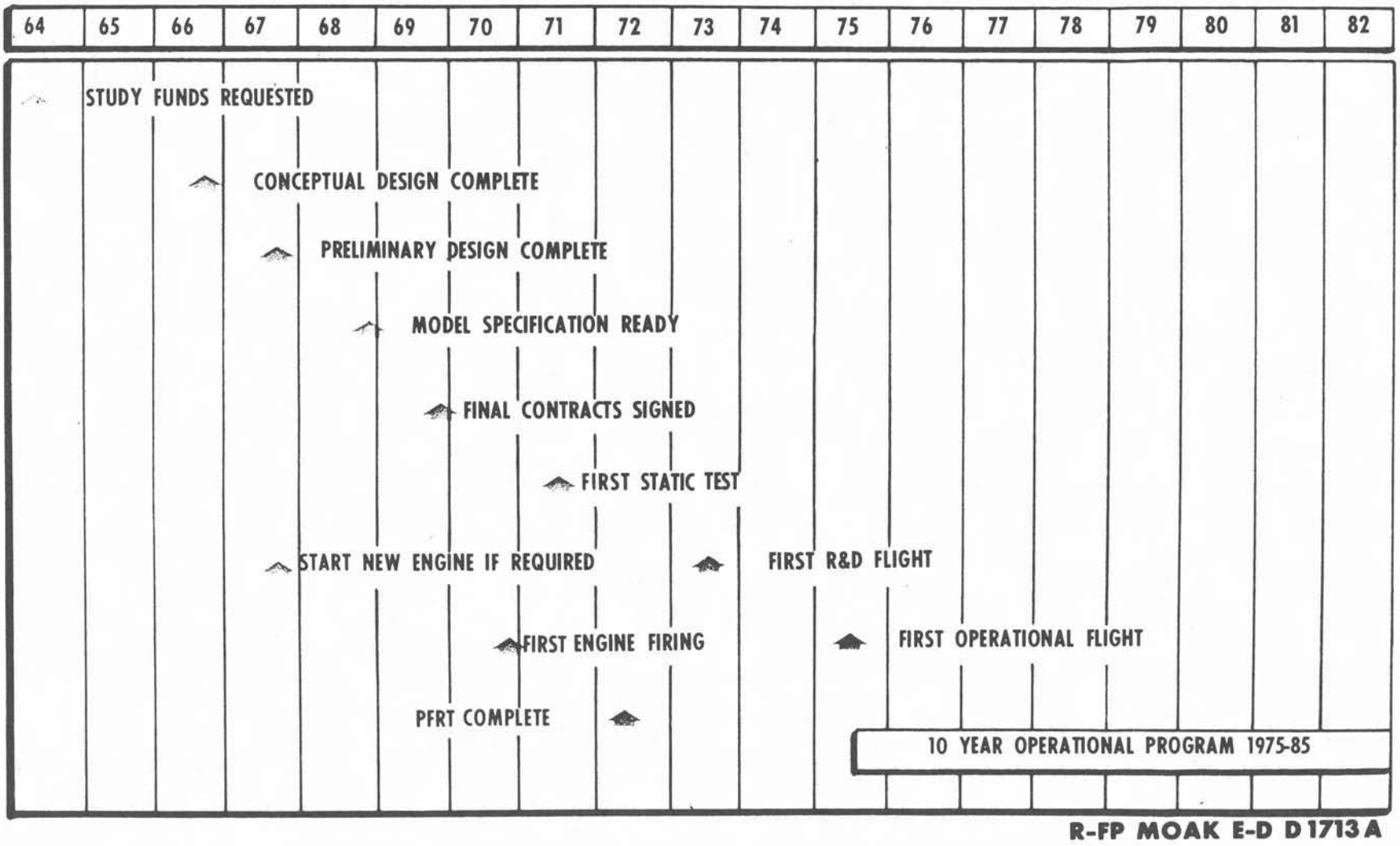
MOAK R-FP E-D D 7409

77

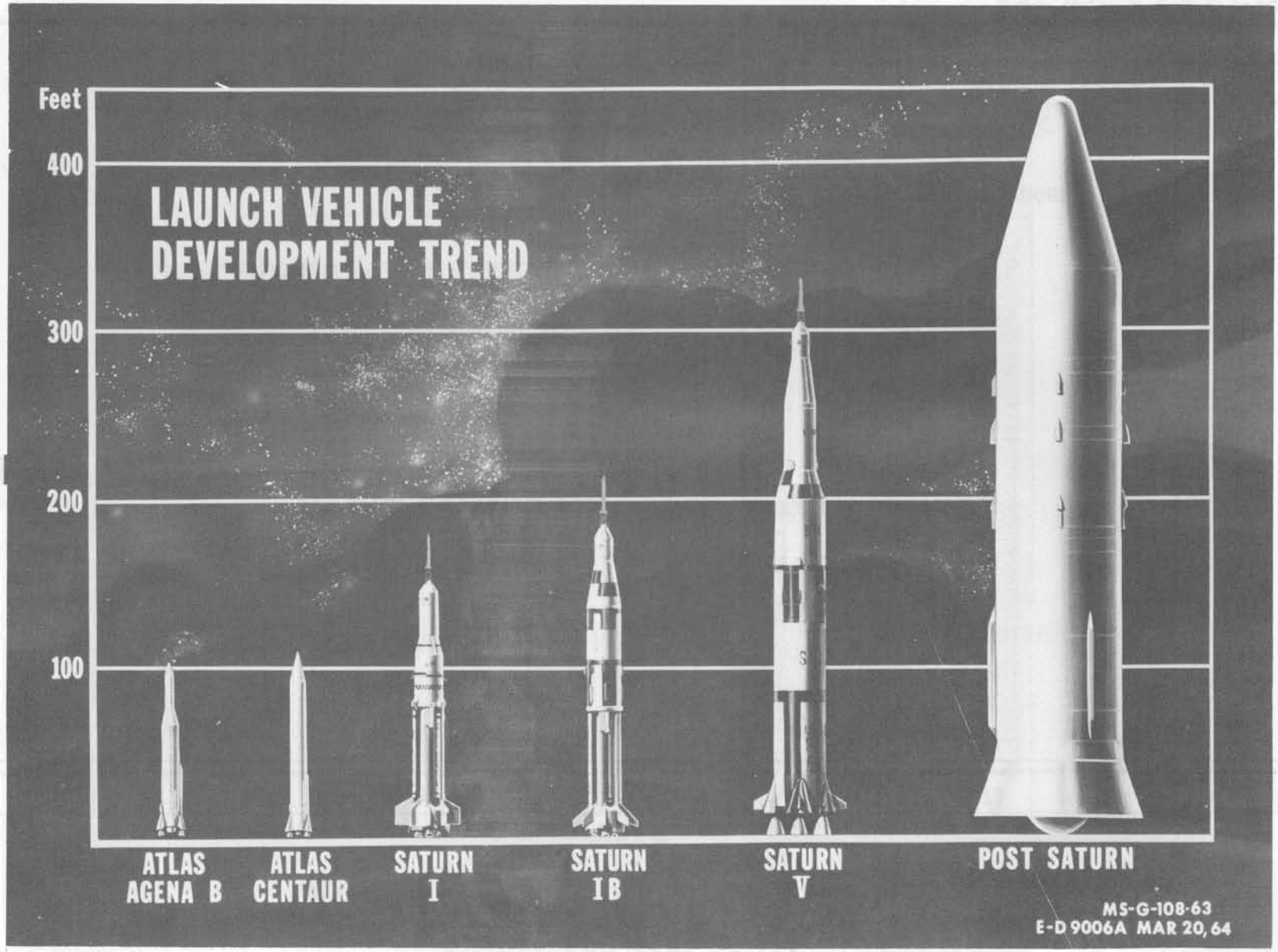
FUTURE PROJECTS OFFICE

LAUNCH VEHICLE PROJECT LEADTIME

CONCEPTION TO GRAVE



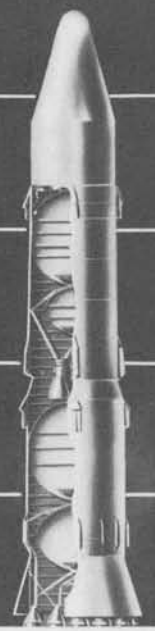
R-FP MOAK E-D D1713A


Feet
400
300
200
100
LAUNCH VEHICLE
DEVELOPMENT TREND
ATLAS
AGENA B
ATLAS
CENTAUR
SATURN
I
SATURN
IB
SATURN
V
POST SATURN
MS-G-108-63
E-D 9006A MAR 20, 64

POST SATURN CONFIGURATIONS CLASS I

PRESENTED AT FIRST CONCEPT EVALUATION

FEET	2 STAGES BOTH EXPENDABLE	2 STAGES BOTH EXPENDABLE
500		
PAYLOAD (LB)	980 K	1,062 K
400		
TOTAL LAUNCH WEIGHT (LB)	25,200 K	33,672 K
300		
NO. OF SECOND STAGE ENGINES	3 M-1	5 M-1
200		
THRUST (LB)	32.4 M	47 M
100		
NO. OF FIRST STAGE ENGINES	18 F-1	4 SOLID

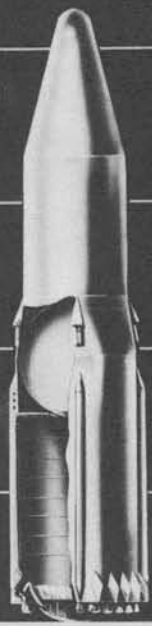


CLASS I CRITERIA ● FLIGHT DEMONSTRATION PHASE IN EARLY 1970'S ● ENGINES UNDER DEVELOPMENT ● EXPENDABLE ● PROGRAM DEFINITION IMMEDIATE

REV C
M-MS-G 76-1-63
MAY 15,1964 SD A1721A

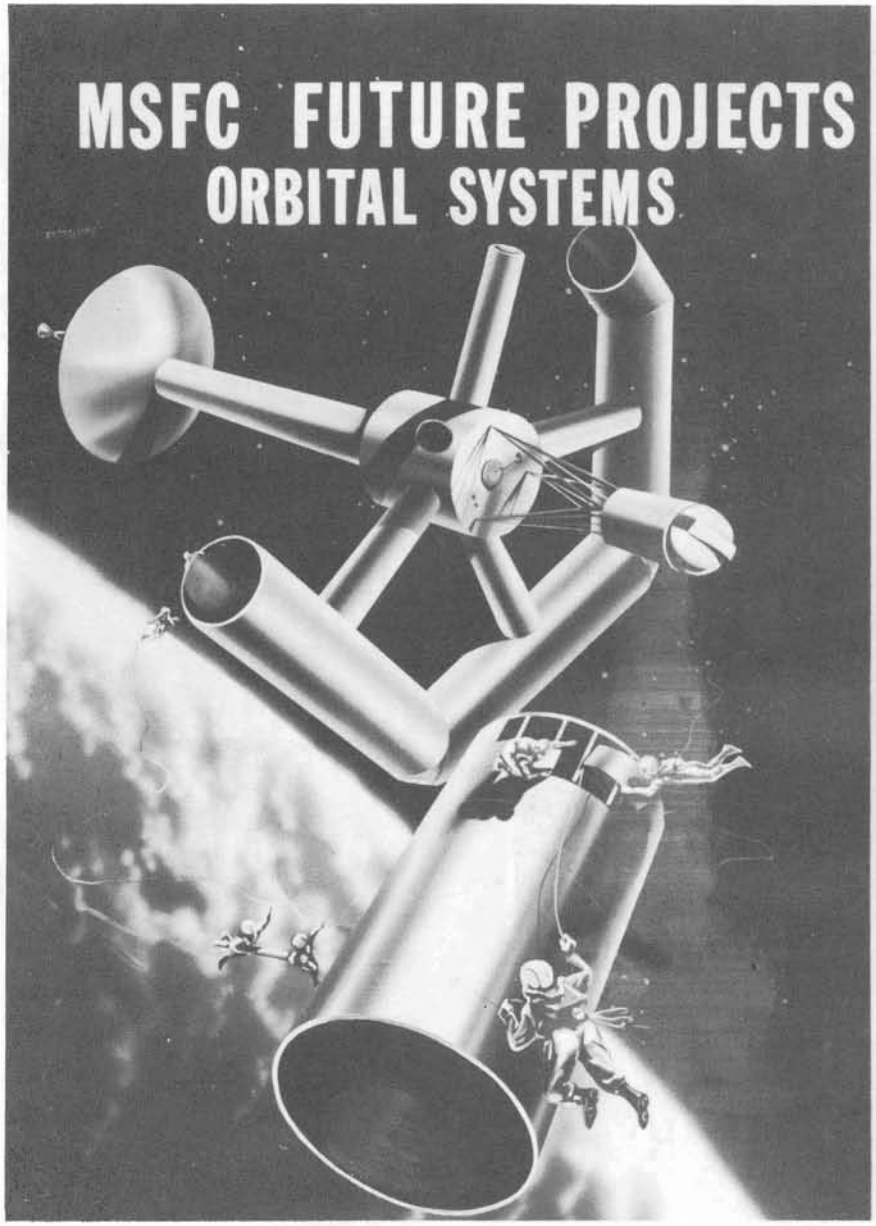
POST-SATURN CONFIGURATIONS CLASS II
PRESENTED AT FIRST CONCEPT EVALUATION

FEET	2 STAGES BOTH EXPENDABLE	2 STAGES 1st RECOVERABLE	1 STAGE VEHICLE EXPENDABLE
PAYLOAD (LB)	1019 K	942 K	1298 K
400 TOTAL LAUNCH WEIGHT (LB)	14.4 M	14.4 M	24 M
300 NO. OF SECOND STAGE ENGINES	2	2	NONE
200 THRUST (LB)	18 M	18 M	30 M
100 NO. OF FIRST STAGE ENGINES	18	18	24



CLASS II CRITERIA ● FLIGHT DEMONSTRATION PHASE IN MIDDLE 1970'S ● NEW ENGINE DEVELOPMENT ● EXPENDABLE/PARTIAL RECOVERY ● CRITICAL TECHNOLOGY VERIFIED IN LESS THAN 2 YEARS

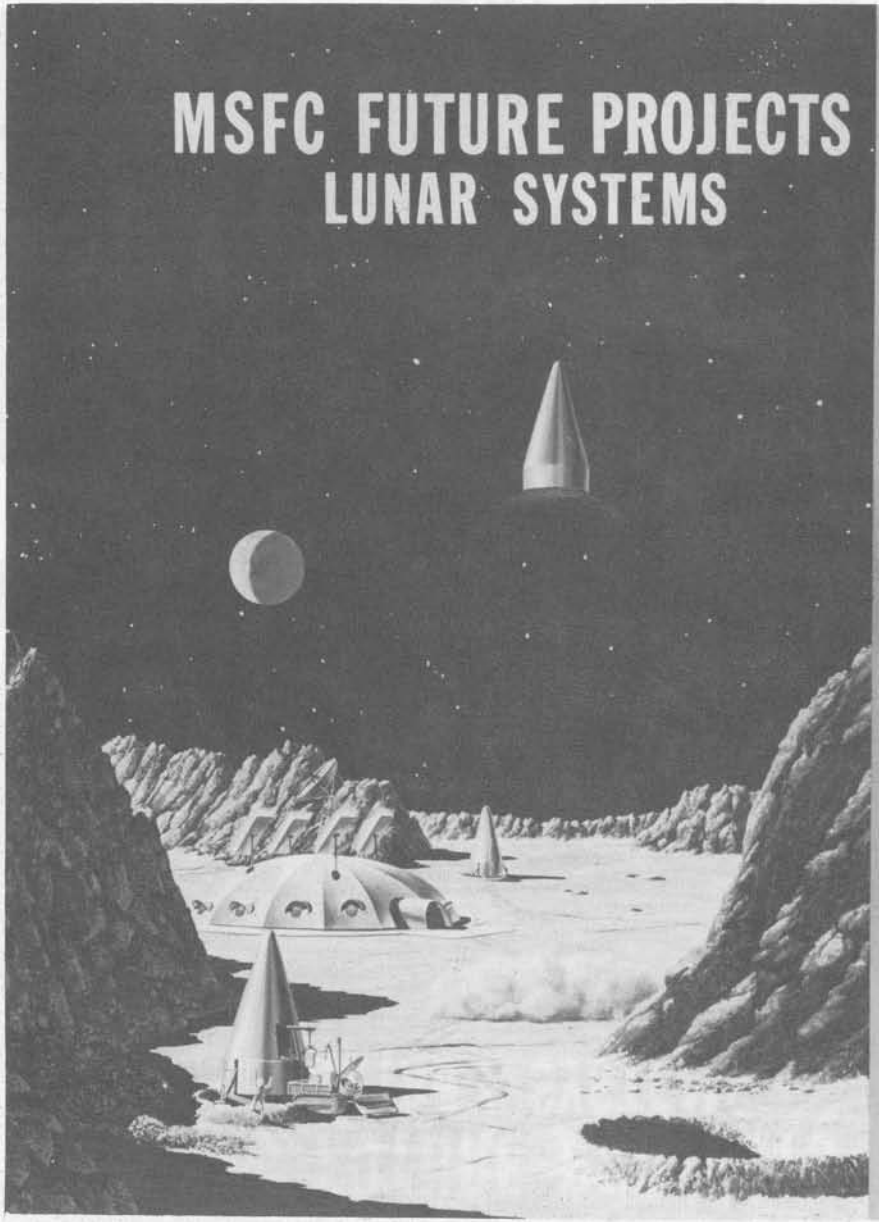
REV C
MS-G 76-2-63
MAY 15, 1964 E-D A1723A



CURRENT AREAS OF ACTIVITY

- LOGISTICAL SUPPORT OF ORBITAL SPACE STATIONS
- ORBITAL OPERATIONS (ASSY, CHECKOUT, ETC.)
- LAUNCH OF ORBITAL DEPARTURE VEHICLES
- UTILIZATION OF SPENT STAGES
- ORBITAL MAINTENANCE (SPACE STATIONS AND ORBITAL LAUNCH VEHICLES)

REV B
MS-G-125-23-62
MOAK R-FP MAR 20, 1964 E-D 1702 B



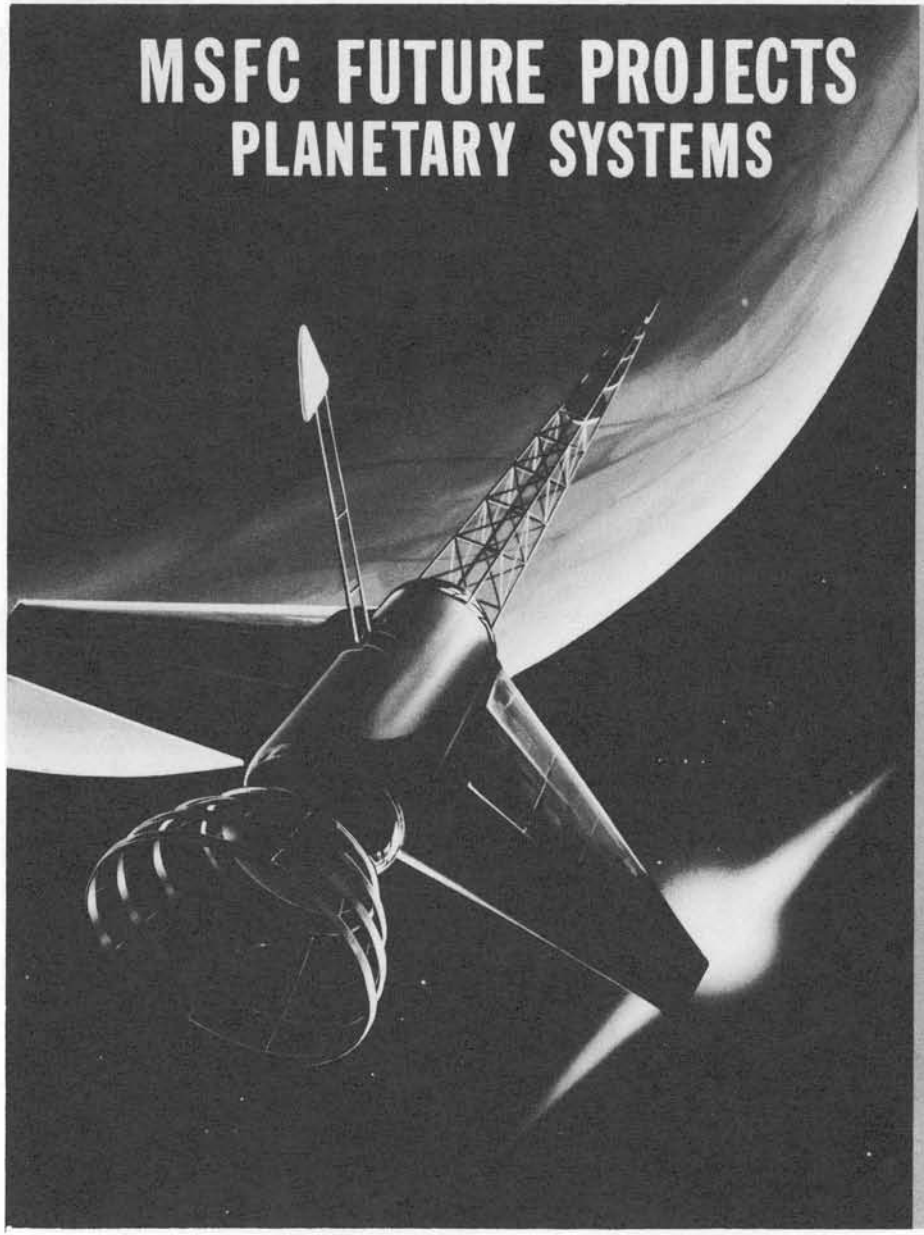
MSFC FUTURE PROJECTS
LUNAR SYSTEMS

CURRENT AREAS OF ACTIVITY

- LUNAR TRANSPORTATION SYSTEMS - MANNED
- LUNAR TRANSPORTATION SYSTEMS - CARGO
- LUNAR BASE LOGISTICS SUPPORT
- INTEGRATION OF LAUNCH VEHICLES, ORBITAL SYSTEMS & LUNAR SYSTEMS
- LUNAR SURFACE ACTIVITIES

MOAK R-FP NOV 15, 1963 EX-D 1703 A
MS-G 125-24-62
REV. A

MSFC FUTURE PROJECTS
PLANETARY SYSTEMS



CURRENT AREAS OF ACTIVITY

- PLANETARY SPACE VEHICLE REQUIREMENTS
- ORBITAL OPERATIONS FOR SPACE SHIPS (ASSEMBLY, CHECKOUT, AND LAUNCH)
- PLANETARY MISSIONS LOGISTIC SUPPORT
- INTEGRATION OF LAUNCH VEHICLES, ORBITAL SYSTEMS, LUNAR SYSTEMS, PLANETARY SYSTEMS

M-MS-G 125-25-62
M-FPO WILLIAMS, M-CP-D 1704 MAR. 14, 63 PERMANENT

MSFC FUTURE PROJECTS OFFICE
ADVANCED SYSTEM STUDIES
BUDGET DISTRIBUTION BY PROGRAM OFFICES
$ THOUSANDS

PROGRAM OFFICE	FY 1961	FY 1962	FY 1963	FY 1964	FY 1965		
					REQUESTED	AUTHORIZED	COMMITTED
OMSF	3,026	2,578	7,020	9,095	* 5,400	3,100	1,340
OART			1,050	835	760	760	660
TOTAL	3,026	2,578	8,070	9,930	6,160	3,860	2,000

* INCLUDES $1,700 FOR AES

R-FP RUTLAND APRIL 12, 1965 E-D D 7405 A

MSFC FUTURE PROJECTS OFFICE
ADVANCED SYSTEM STUDIES — 3 YEAR BUDGET OUTLOOK

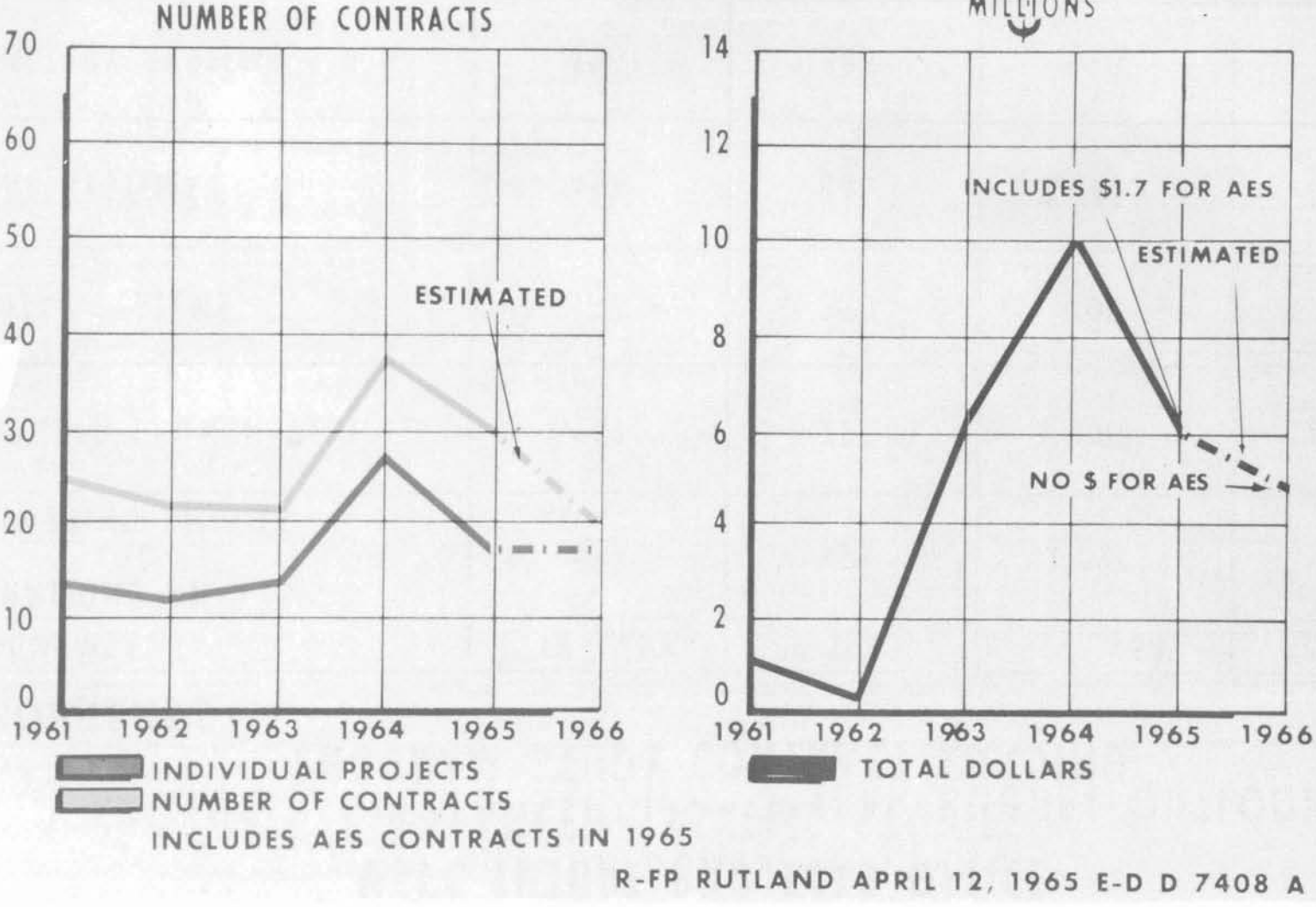
$ MILLIONS

PROGRAM AREA		FY 65	FY 66	FY 67
OPERATING ANALYSIS & SUPPORTING STUDIES	AMOUNT	.15	.25	.5
	NO. OF CONTRACTS	1	3	5
ADVANCED LAUNCH VEHICLES	AMOUNT	2.5	3.01	5.0
	NO. OF CONTRACTS	12	12	15
ORBITAL SYSTEMS	AMOUNT	0	.25	1.0
	NO. OF CONTRACTS	0	1	5
LUNAR SYSTEMS	AMOUNT	2.5	1.5	2.5
	NO. OF CONTRACTS	12	4	8
PLANETARY SYSTEMS	AMOUNT	.25	.82	1.0
	NO. OF CONTRACTS	5	5	5
TOTAL	AMOUNT	5.40*	5.83	10.0
	NO. OF CONTRACTS	30	25	38

* INCLUDES $1.7 FOR AES

R-FP RUTLAND APRIL 12, 1965 E-D D 7406 A

FUTURE PROJECTS OFFICE
STUDY CONTRACT PROGRAM



R-FP RUTLAND APRIL 12, 1965 E-D D 7408 A

MSFC FUTURE PROJECTS OFFICE*
ADVANCED SYSTEMS STUDIES
PROGRAM STUDY CONTRACT FUNDING

$ THOUSANDS

PROGRAMS	FY 1962	FY 1963	FY 1964	FY 1965*
OPERATIONS ANALYSIS AND SUPPORTING STUDIES	253	352	1,025	150
ADVANCED LAUNCH VEHICLES	1,252	5,777	4,900	2,500
ORBITAL SYSTEMS	172	350	700	0
LUNAR SYSTEMS	457	863	2,445	2,500**
PLANETARY SYSTEMS	426	685	860	250
TOTAL	2,560	8,027	9,930	5,400

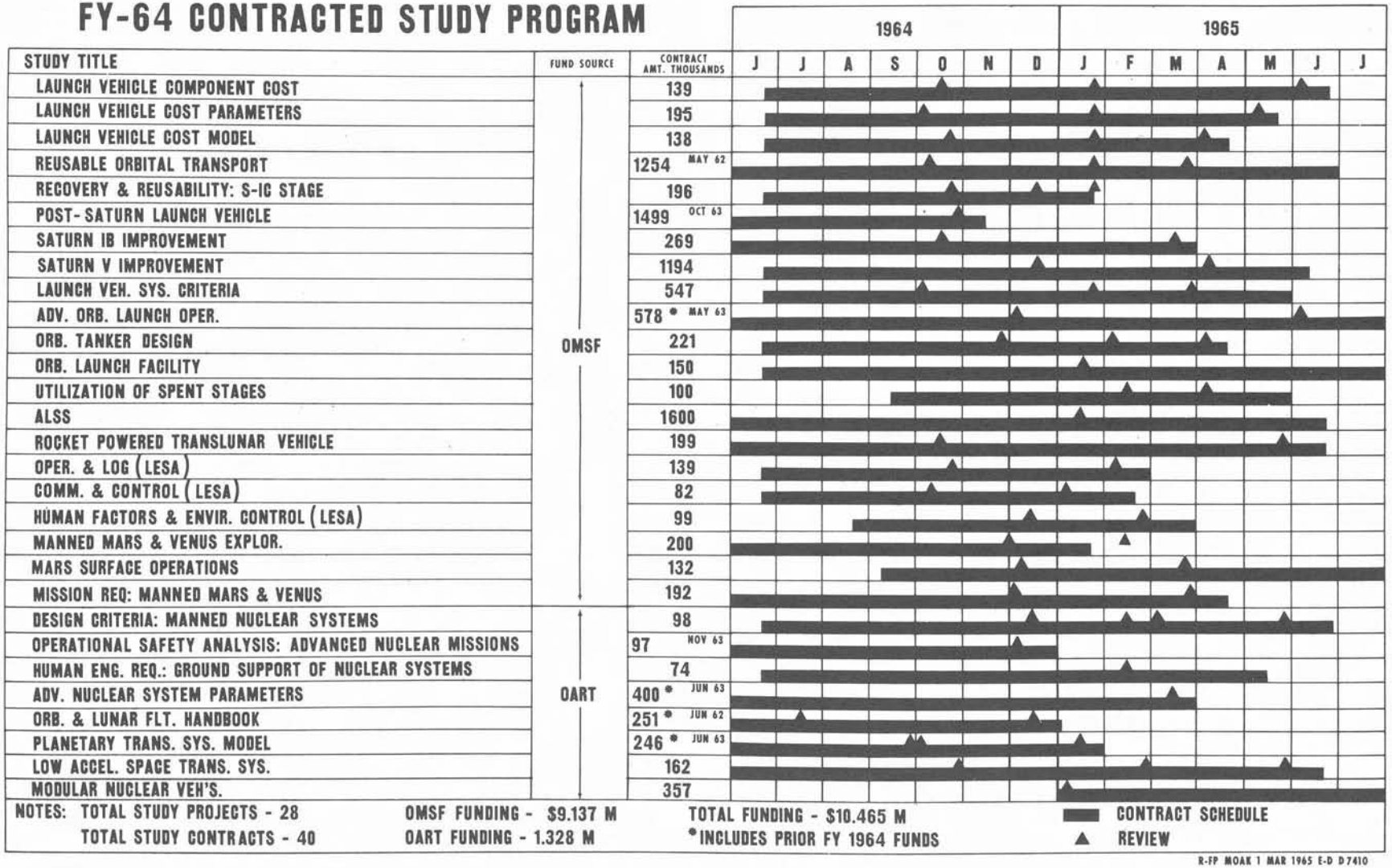
* PRESENT ESTIMATE.

** INCLUDES $1,700 FOR AES

R-FP RUTLAND APRIL 12, 1965 E-D D 7407 A

FUTURE PROJECTS OFFICE

FY-64 CONTRACTED STUDY PROGRAM



STUDY TITLE	FUND SOURCE	CONTRACT AMT. THOUSANDS
LAUNCH VEHICLE COMPONENT COST	OMSF	139
LAUNCH VEHICLE COST PARAMETERS		195
LAUNCH VEHICLE COST MODEL		138
REUSABLE ORBITAL TRANSPORT		1254 MAY 62
RECOVERY & REUSABILITY: S-IC STAGE		196
POST-SATURN LAUNCH VEHICLE		1499 OCT 63
SATURN IB IMPROVEMENT		269
SATURN V IMPROVEMENT		1194
LAUNCH VEH. SYS. CRITERIA		547
ADV. ORB. LAUNCH OPER.		578 * MAY 63
ORB. TANKER DESIGN		221
ORB. LAUNCH FACILITY		150
UTILIZATION OF SPENT STAGES		100
ALSS		1600
ROCKET POWERED TRANSLUNAR VEHICLE		199
OPER. & LOG (LESA)		139
COMM. & CONTROL (LESA)		82
HUMAN FACTORS & ENVIR. CONTROL (LESA)		99
MANNED MARS & VENUS EXPLOR.		200
MARS SURFACE OPERATIONS		132
MISSION REQ: MANNED MARS & VENUS		192
DESIGN CRITERIA: MANNED NUCLEAR SYSTEMS	OART	98
OPERATIONAL SAFETY ANALYSIS: ADVANCED NUCLEAR MISSIONS		97 NOV 63
HUMAN ENG. REQ.: GROUND SUPPORT OF NUCLEAR SYSTEMS		74
ADV. NUCLEAR SYSTEM PARAMETERS		400 * JUN 63
ORB. & LUNAR FLT. HANDBOOK		251 * JUN 62
PLANETARY TRANS. SYS. MODEL		246 * JUN 63
LOW ACCEL. SPACE TRANS. SYS.		162
MODULAR NUCLEAR VEH'S.		357

NOTES: TOTAL STUDY PROJECTS - 28
TOTAL STUDY CONTRACTS - 40

OMSF FUNDING - $9.137 M
OART FUNDING - 1.328 M

TOTAL FUNDING - $10.465 M
*INCLUDES PRIOR FY 1964 FUNDS

CONTRACT SCHEDULE
▲ REVIEW

R-FP MOAK 1 MAR 1965 E-D D7410

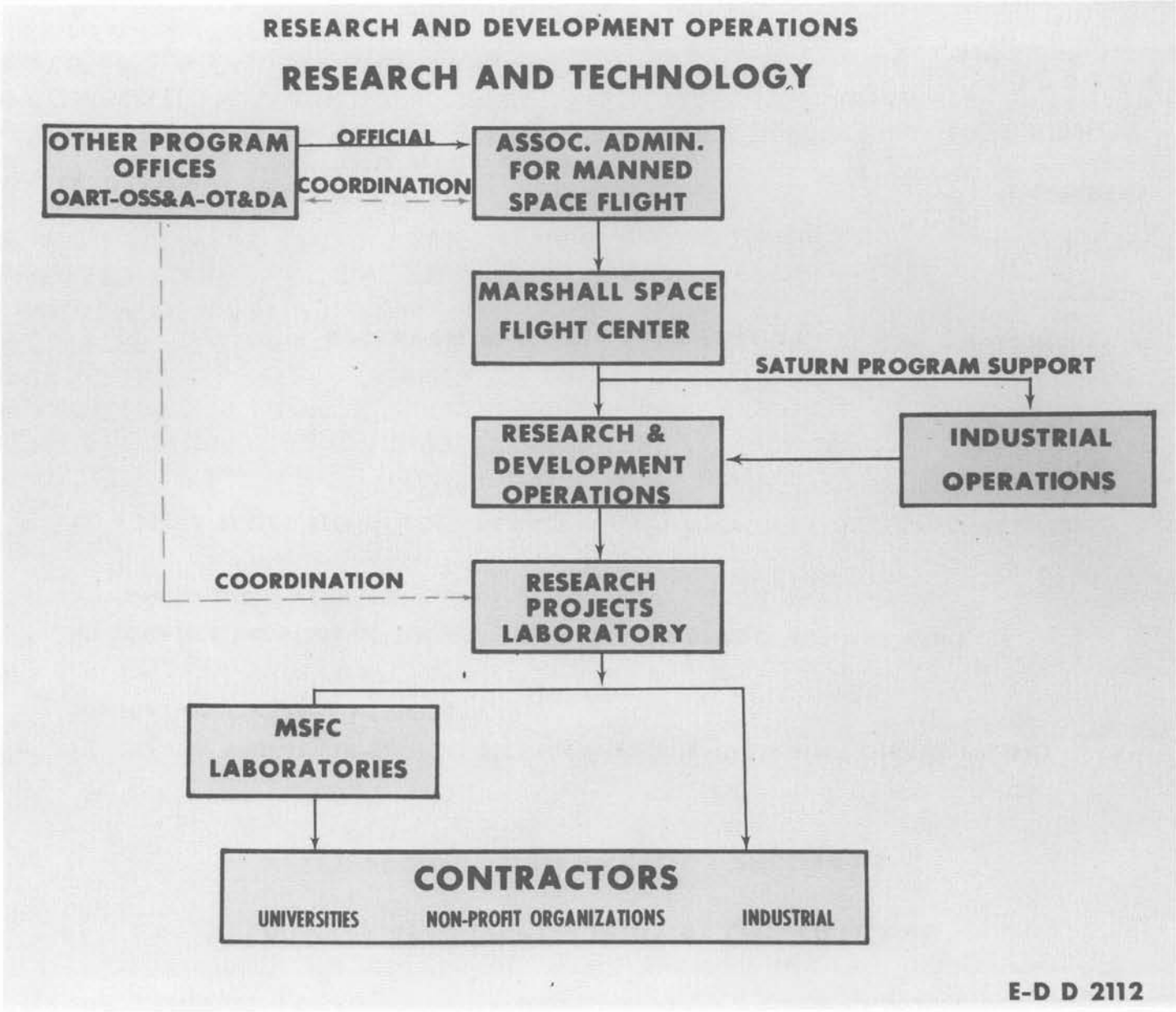
RESEARCH AND TECHNOLOGY

RESEARCH AND DEVELOPMENT OPERATIONS

RESEARCH AND TECHNOLOGY PROGRAMS

- TO IDENTIFY AND SOLVE CRITICAL TECHNICAL PROBLEMS BEARING ON THE PRESENT GENERATION OF SPACE VEHICLES.
- TO ADVANCE THE STATE OF THE ART TO ENABLE THE DEVELOPMENT OF MORE ADVANCED SPACE VEHICLES.
- TO BUILD A BROAD TECHNOLOGICAL BASE FOR THE NATION'S FUTURE SPACE ACTIVITIES.

E-D D 2111 A


RESEARCH AND DEVELOPMENT OPERATIONS
RESEARCH AND TECHNOLOGY
OTHER PROGRAM OFFICES
OART-OSS&A-OT&DA
OFFICIAL
COORDINATION
ASSOC. ADMIN. FOR MANNED SPACE FLIGHT
MARSHALL SPACE FLIGHT CENTER
SATURN PROGRAM SUPPORT
RESEARCH & DEVELOPMENT OPERATIONS
INDUSTRIAL OPERATIONS
COORDINATION
RESEARCH PROJECTS LABORATORY
MSFC LABORATORIES
CONTRACTORS
UNIVERSITIES
NON-PROFIT ORGANIZATIONS
INDUSTRIAL
E-D D 2112

MSFC RESEARCH AND TECHNOLOGY

TYPICAL EXAMPLES

DIRECT SUPPORT OF PROJECTS

- STUDY AND DEVELOPMENT OF ADVANCED ALTERNATE SYSTEMS FOR GSE, GUIDANCE, AND NAVIGATION OF SATURN TYPE VEHICLES
- SEMI-TOROIDAL AND COMMON DOME BULKHEAD MANUFACTURING TECHNOLOGY
- DEVELOPMENT OF ALTERNATE METHODS OF DESIGN AND FABRICATION OF SATURN V VEHICLE STRUCTURES
- ANALYTICAL AND EXPERIMENTAL STUDIES OF IMPROVED PROPULSION SYSTEMS
- ADVANCED TURBOMACHINERY DEVELOPMENT
- ALTERNATE STRUCTURE TO BE USED IN SATURN TYPE VEHICLE

FUTURE GENERATION SPACE SYSTEMS

- APOLLO LOGISTIC SUPPORT SYSTEMS
- REUSABLE ORBITAL TRANSPORT
- POST-SATURN LAUNCH VEHICLES
- CRYOGENIC ORBITAL TANKER STUDIES
- CONCEPT INTEGRATION AND PRELIMINARY DESIGN OF THE LUNAR EXPLORATION SYSTEM FOR APOLLO
- MISSION APPLICATIONS FOR NUCLEAR PULSE PROPULSION
- MANNED MARS AND VENUS MISSION REQUIREMENTS
- FUEL CELL SYSTEMS
- CRYOGENIC GYRO AND ACCELEROMETER
- HUMAN ENGINEERING DESIGN CRITERIA FOR REUSABLE LAUNCH VEHICLES
- COMBUSTION STABILITY CHARACTERISTICS AT HIGH CHAMBER PRESSURE
- SYSTEMS ANALYSIS AND EVALUATION OF THE PLUG MULTICHAMBER CONFIGURATION

E-D D2105D

MSFC RESEARCH & TECHNOLOGY
FUNDING FY 64-66
(THOUSANDS OF DOLLARS)

PROJECT	FY-64	FY-65	FY-66 GUIDELINES
ADVANCED RESEARCH AND TECHNOLOGY	**31,821**	**28,688**	**18,030**
RIFT	6,645	-0-	-0-
NUCLEAR ELECTRIC SYSTEMS	263	290	400
NUCLEAR ROCKET SYSTEMS	176	800	900
NUCLEAR ROCKET PROPULSION	332	485	400
SPACE POWER	1,429	2,000	1,000
SPACE VEHICLE SYSTEMS	3,434	3,226	2,990
ADVANCED STUDIES- SPACE VEHICLES	235	-0-	-0-
PEGASUS PROJECT	9,900	13,690	1,500
ELECTRONICS SYSTEMS	4,644	3,469	4,525
HUMAN FACTORS SYSTEMS	235	220	300
CHEMICAL PROPULSION	3,542	3,000	3,800
RESEARCH PROGRAM	986	916	915
LIQUID AND SOLID PROPELLANT ENGINES	-0-	592	1,300
MANNED SPACE FLIGHT	**27,626**	**25,400**	**30,500**
LAUNCH VEHICLE DEVELOPMENT	14,133	-0-	-0-
PROPULSION TECHNOLOGY	4,270	-0-	-0-
LAUNCH OPERATIONAL SUPPORT DEVELOPMENT	82	-0-	-0-
APOLLO SUPPORTING DEVELOPMENT	-0-	13,500	6,500
ADVANCED MANNED MISSIONS SUPPORTING DEVELOPMENT	-0-	6,500	1,500
ADVANCED STUDIES	9,141	5,400	5,300
AES SUPPORTING DEVELOPMENT	-0-	-0-	17,200
SPACE SCIENCE AND APPLICATIONS	**780**	**828**	**790**
METEOROLOGICAL SYSTEMS	80	120	120
LUNAR AND PLANETARY EXPLORATION -ADV. TECH. DEV.	405	500	600
GEOPHYSICS AND ASTRONOMY	195	20	20
LAUNCH VEHICLE DEVELOPMENT	-0-	153	-0-
MANNED LUNAR SCIENCE	100	-0-	-0-
LUNAR AND PLANETARY EXPLORATION-SCIENCE	-0-	35	50
TRACKING & DATA ACQUISITION	**2,900**	**2,000**	**1,500**
TECHNOLOGY UTILIZATION & POLICY PLANNING	**44**	**75**	**640**
TOTAL	**63,171**	**56,991**	**51,460**

E-R JACKSON APRIL 1, 1965 E-D A 2110 G

MSFC RESEARCH AND TECHNOLOGY

PROJECT MANAGERS

PROJECT NO.	PROJECT	PROJECT MANAGER
	AR&T	
120	NUCLEAR ELECTRIC SYSTEMS	DR. STUHLINGER
121	NUCLEAR ROCKET SYSTEMS	MR. CLINE
122	NUCLEAR ROCKET PROPULSION	MR. CLINE
123	SPACE POWER	DR. STUHLINGER
124	SPACE VEHICLE SYSTEMS	DR. STUHLINGER
125	ELECTRONICS SYSTEMS	DR. STUHLINGER
127	HUMAN FACTORS SYSTEMS	DR. STUHLINGER
128	CHEMICAL PROPULSION	MR. PAUL
129	RESEARCH PROGRAM	DR. STUHLINGER
725	PROJECT PEGASUS	DR. JOHNSON
731	CHEMICAL ROCKET EXPERIMENT ENGINEERING	MR. PAUL
785	ELECTRONICS-ADVANCED STUDIES	DR. STUHLINGER
	MSF	
904	APOLLO SUPPORTING DEVELOPMENT	DR. STUHLINGER
905	APOLLO EXTENSION SYSTEMS SUPPORTING DEVELOPMENT	MR. DE FRIES
908	ADVANCED MANNED MISSIONS SUPPORTING DEVELOPMENT	DR. STUHLINGER
981	ADVANCED STUDIES	DR. KOELLE
	SS&A	
160	METEOROLOGICAL SYSTEMS	DR. STUHLINGER
180	LAUNCH VEHICLE DEVELOPMENT	DR. STUHLINGER
185	LUNAR AND PLANETARY EXPLORATION SCIENCE	DR. STUHLINGER
186	LUNAR & PLANETARY EXPLORATION , ADVANCED TECHNICAL DEVELOPMENT	DR. STUHLINGER
188	GEOPHYSICS & ASTRONOMY	DR. STUHLINGER
866	MANNED SATELLITE SCIENCE	DR. STUHLINGER
867	MANNED LUNAR SCIENCE	DR. STUHLINGER
	OTDA	
150	TRACKING & DATA ACQUISITION	MR. HOBERG
	OTU	
141	IDENTIFICATION & DISSEMINATION	MR. WIGGINS

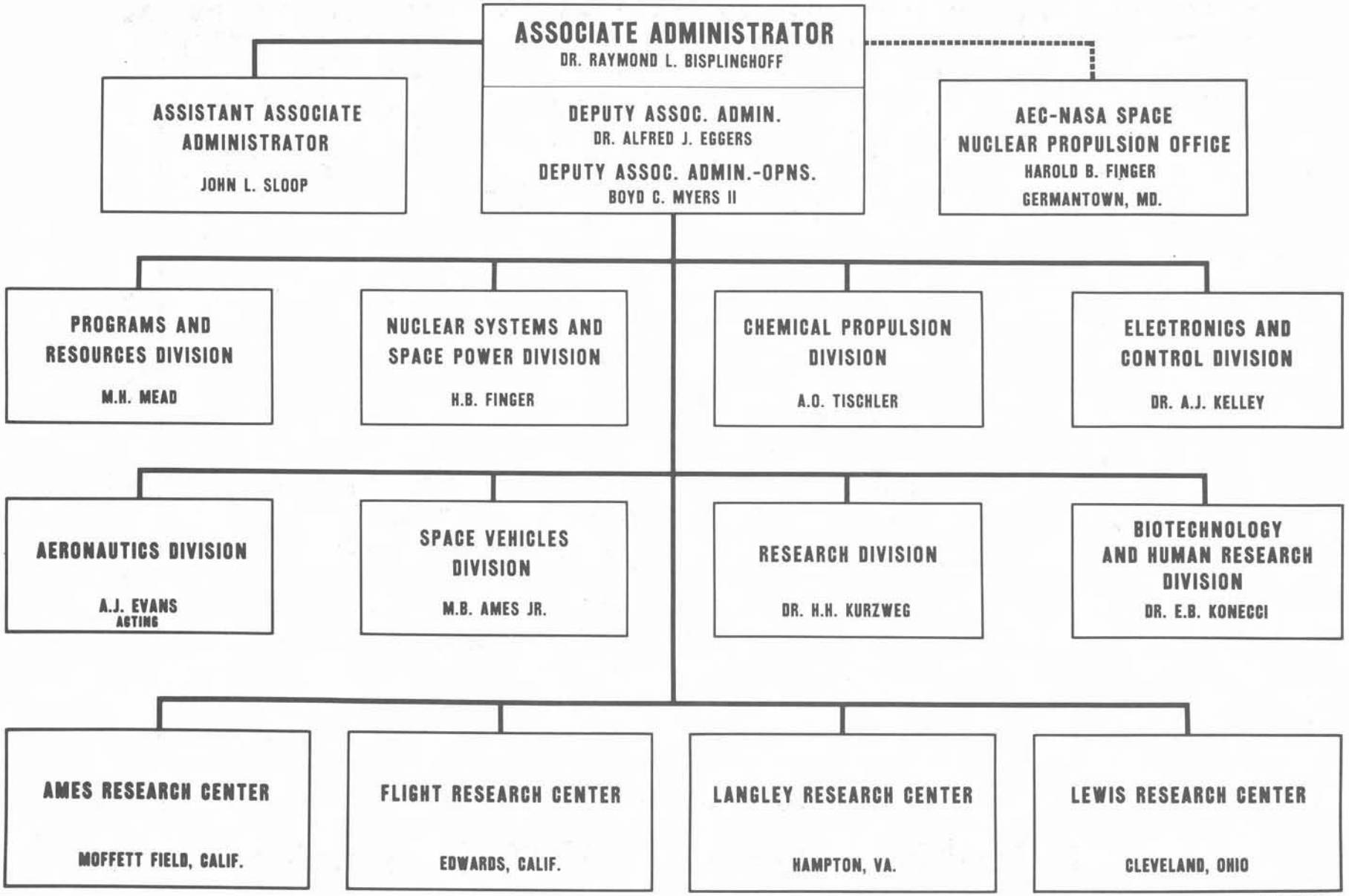
RESEARCH AND TECHNOLOGY

FY 65 STAFFING REQUIREMENTS-ALL PROGRAMS BY FUND SOURCE

SOURCE OF FUNDS	END OF YEAR STRENGTHS		
	PROFESSIONAL	OTHER DIRECT	TOTAL
AR&T	286	76	362
MSF	71	25	96
SS&A	18	14	32
OTDA	4	5	9
TU&PP	11	2	13
TOTAL	390	122	512

E-D B 2102 D

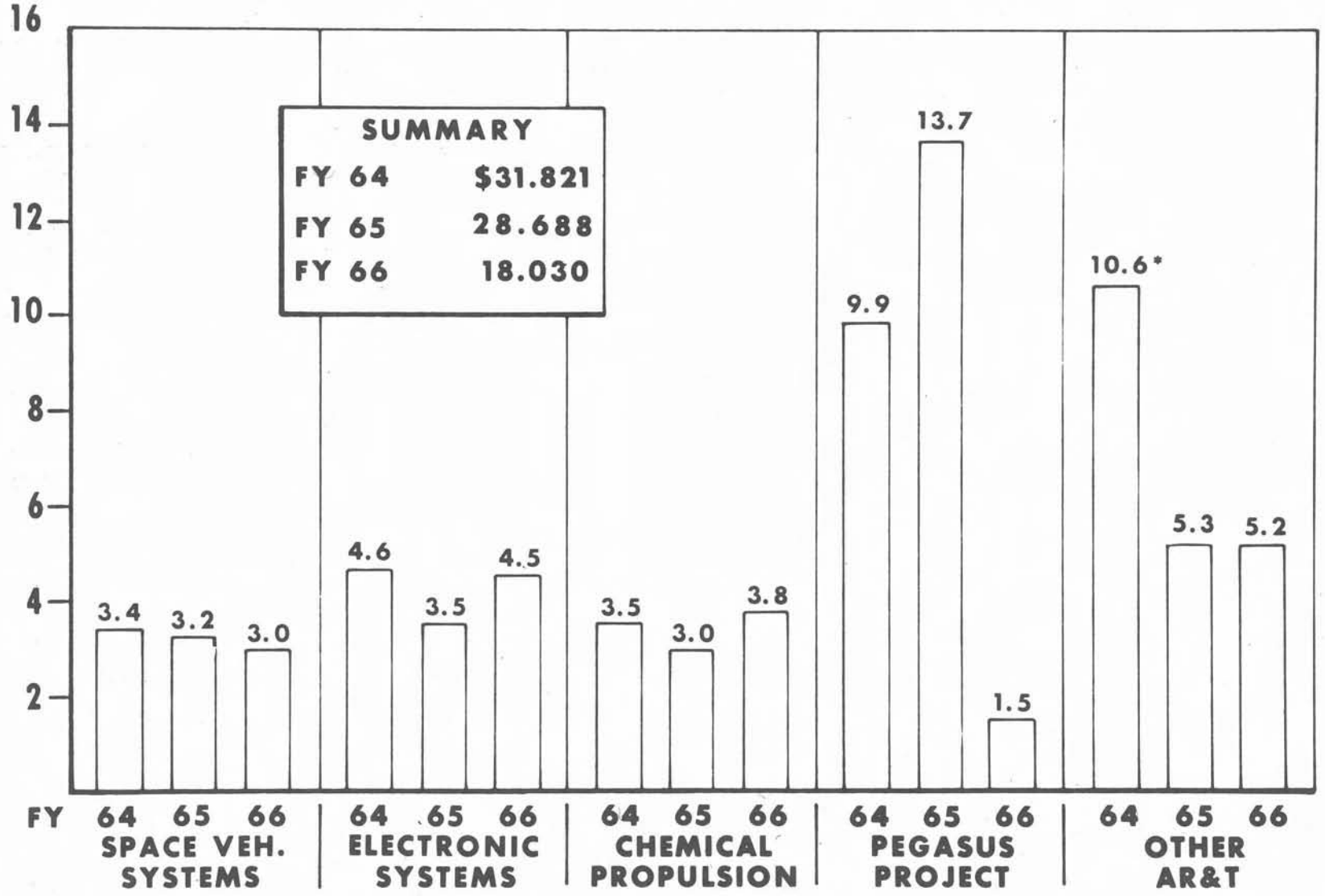
OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY



MSFC FINANCIAL RESOURCES

ADVANCED RESEARCH & TECHNOLOGY PROGRAMS

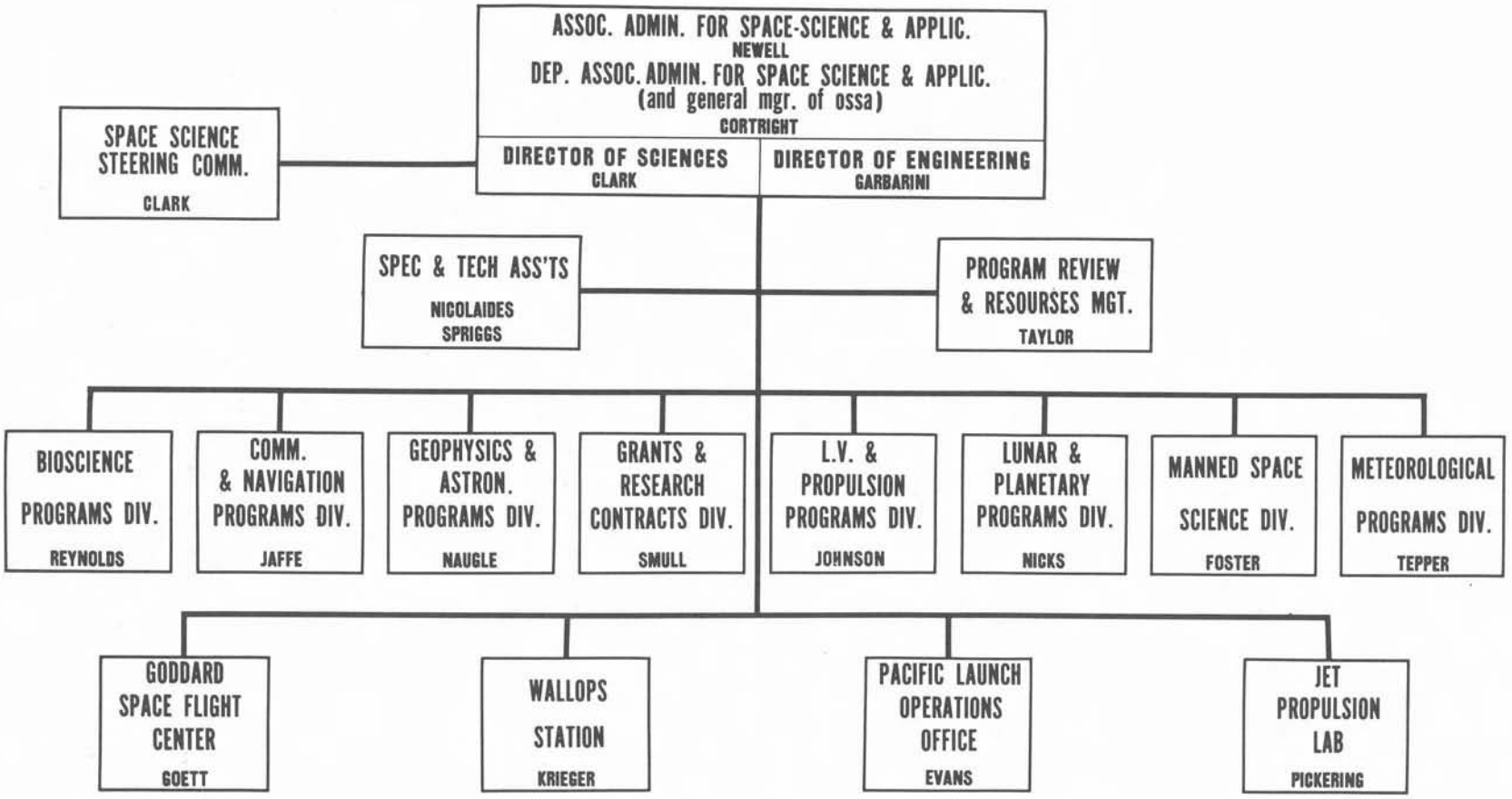
(R&D ONLY - IN MILLIONS OF DOLLARS)



*INCLUDES $6.6 RIFT

E-R JACKSON APRIL 1, 1965 E-D D 664 J

OFFICE OF SPACE SCIENCE AND APPLICATIONS (OSSA)

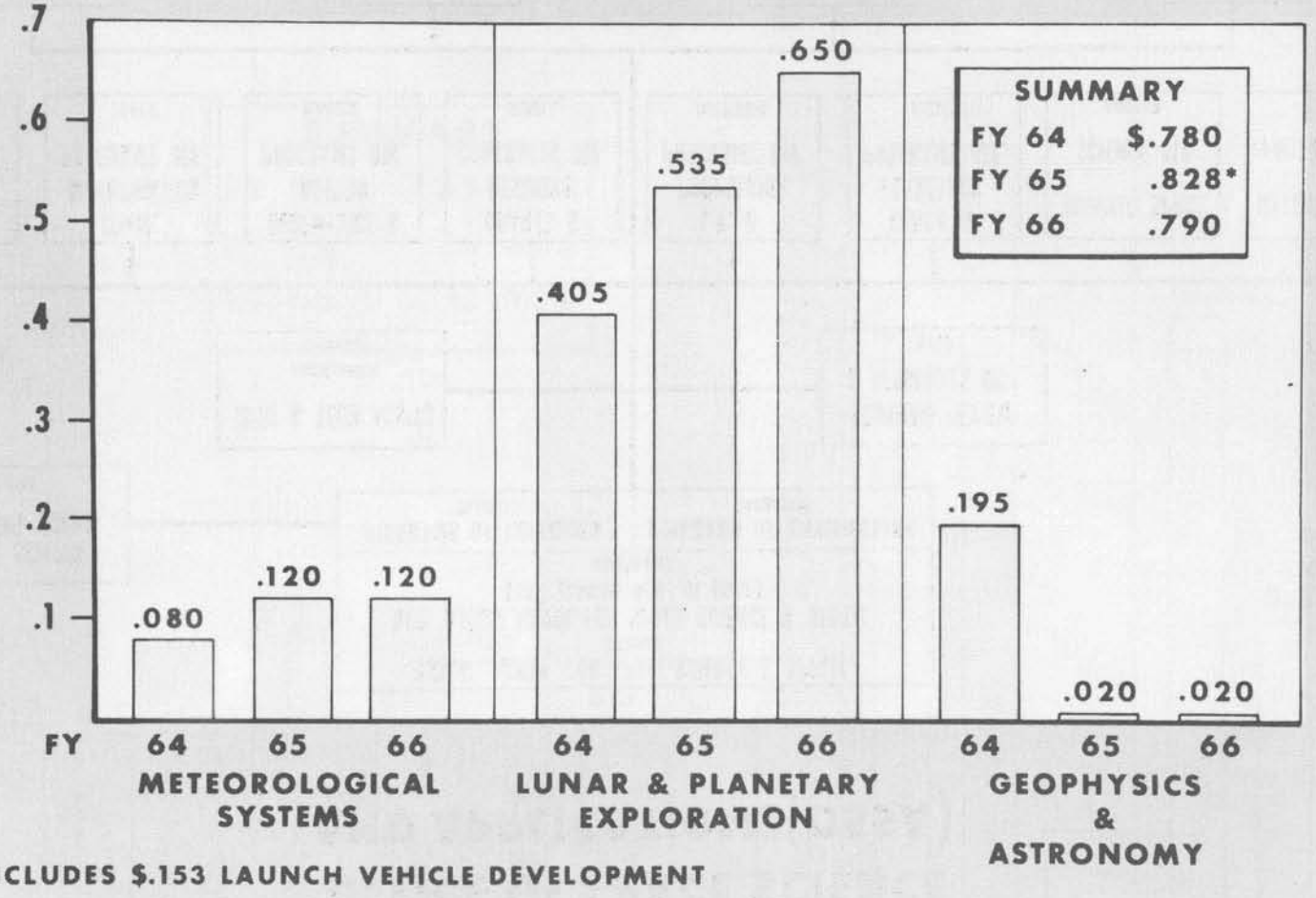


E-D A828 A

MSFC FINANCIAL RESOURCES

SPACE SCIENCE & APPLICATIONS PROGRAMS

(R&D ONLY-IN MILLIONS OF DOLLARS)

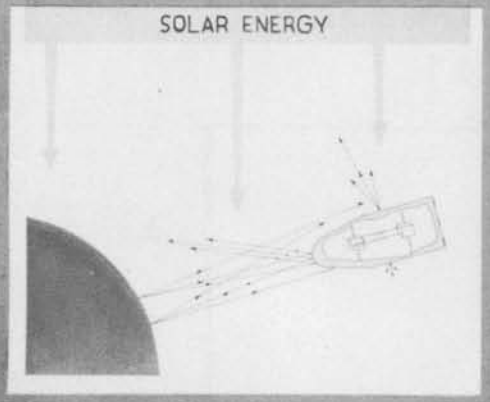


*INCLUDES $.153 LAUNCH VEHICLE DEVELOPMENT

E-R JACKSON FEBRUARY 1, 1965 E-D D 665 I

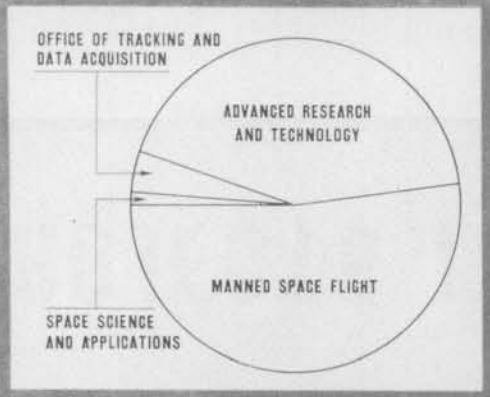
RESEARCH PROJECTS LABORATORY

RESEARCH PROJECTS LABORATORY

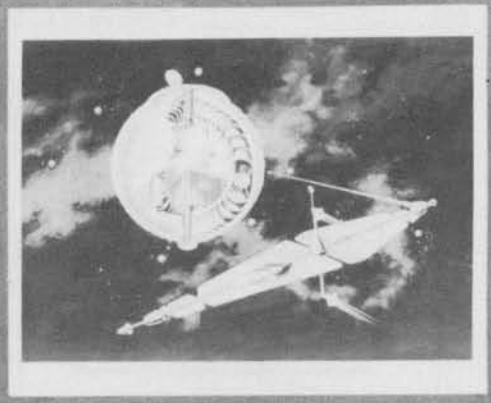


SPACE THERMODYNAMICS

- LUNAR THERMAL PHYSICS
- THERMAL COATINGS
- THERMAL CONTROL
- THERMAL PHYSICS

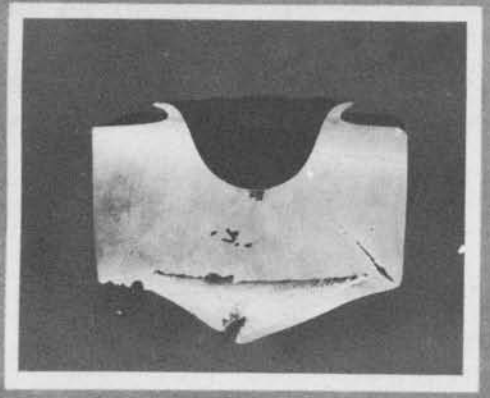


MANAGEMENT OF SUPPORTING RESEARCH AND TECHNOLOGY PROGRAMS



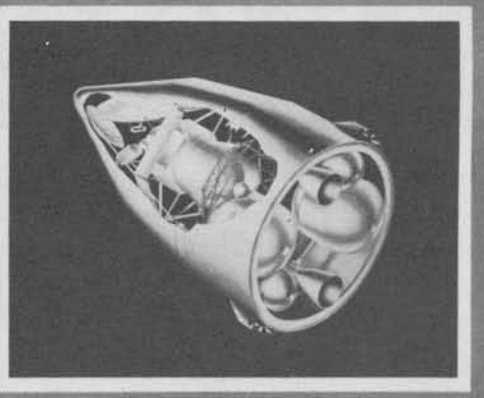
NUCLEAR AND PLASMA PHYSICS

- NUCLEAR RADIATION SHIELDING
- SPACE RADIATION SHIELDING
- ELECTRIC PROPULSION
- SPACE POWER SYSTEMS



SPACE PHYSICS

HYPERVELOCITY IMPACT AND SHOCKWAVE TEST IN ALUMINUM
MICROMETEOROID AND HYPERVELOCITY IMPACT PHYSICS



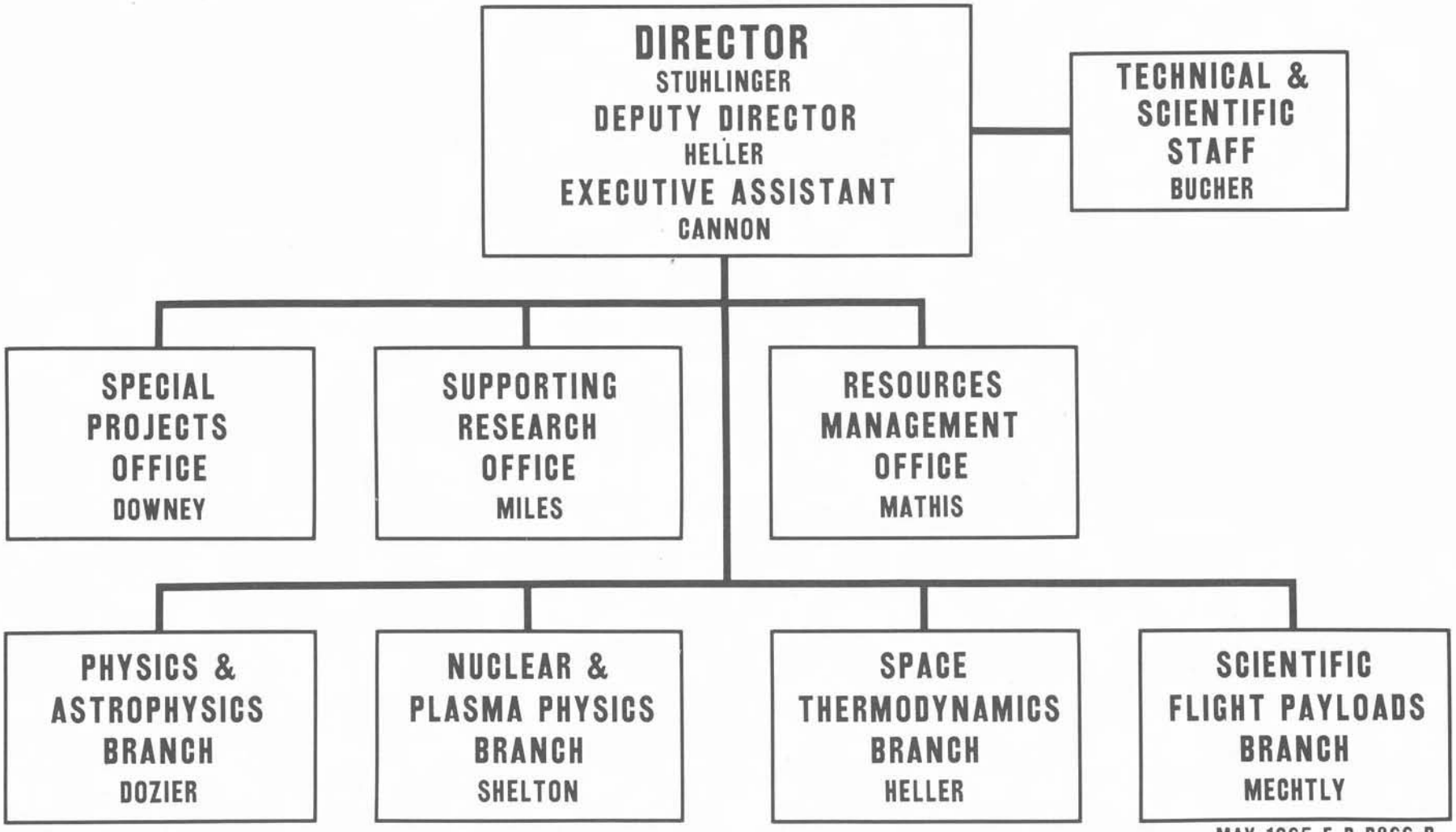
SCIENTIFIC FLIGHT PAYLOADS

CONCEPTUAL DESIGN OF SCIENTIFIC AND TECHNOLOGICAL EXPERIMENTS FOR FLIGHT PAYLOADS

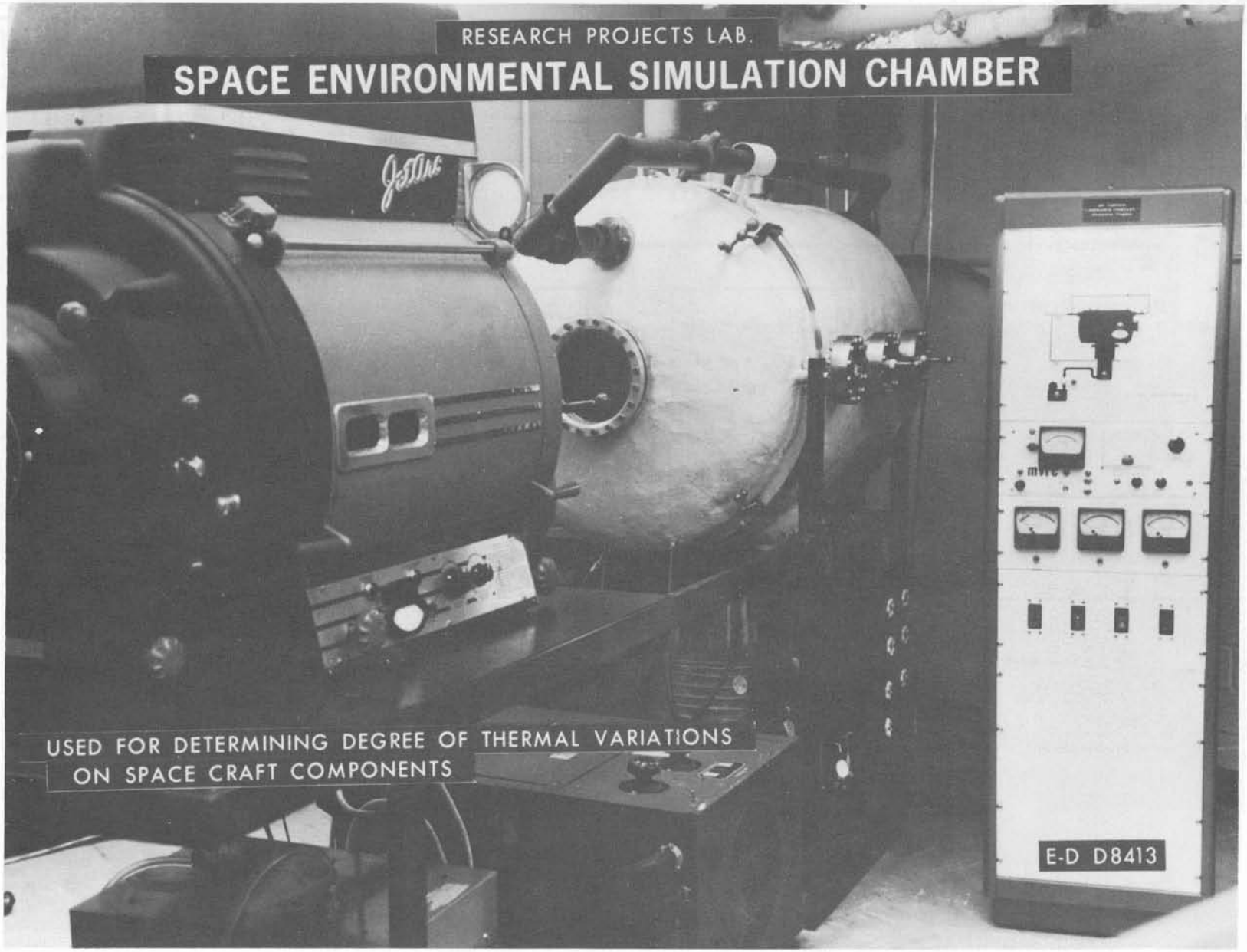
E-0 08402

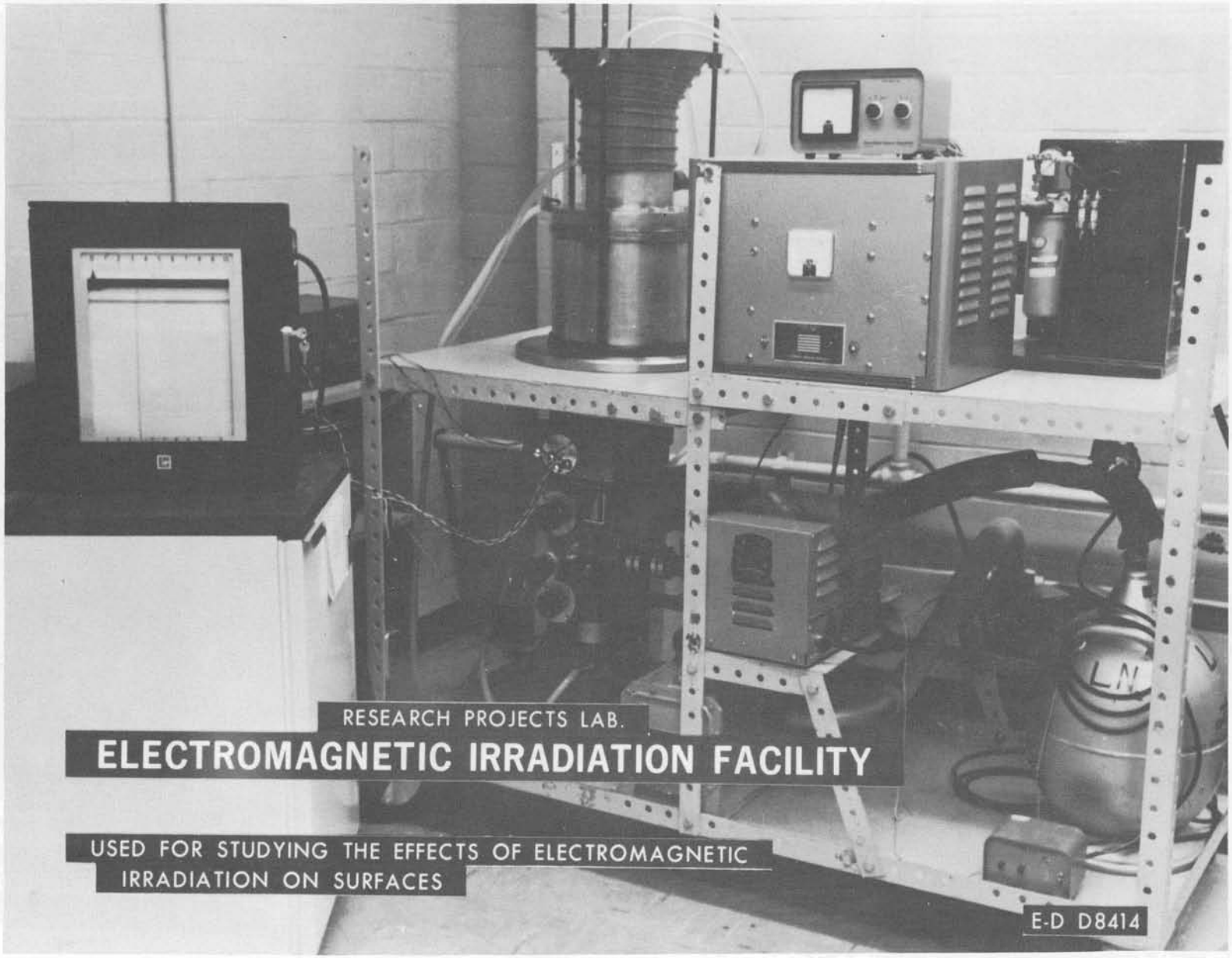
RESEARCH & DEVELOPMENT OPERATIONS

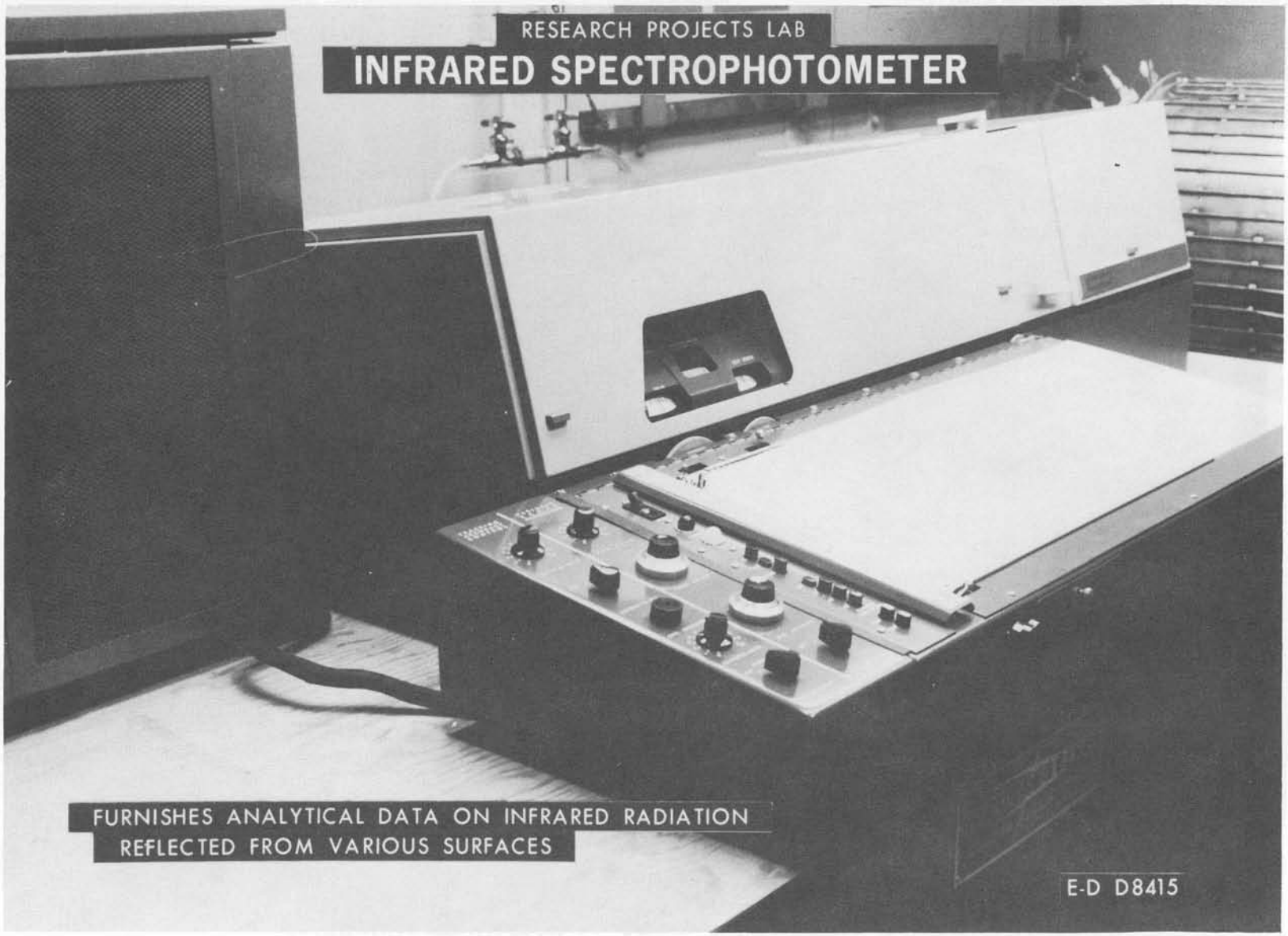
RESEARCH PROJECTS LABORATORY

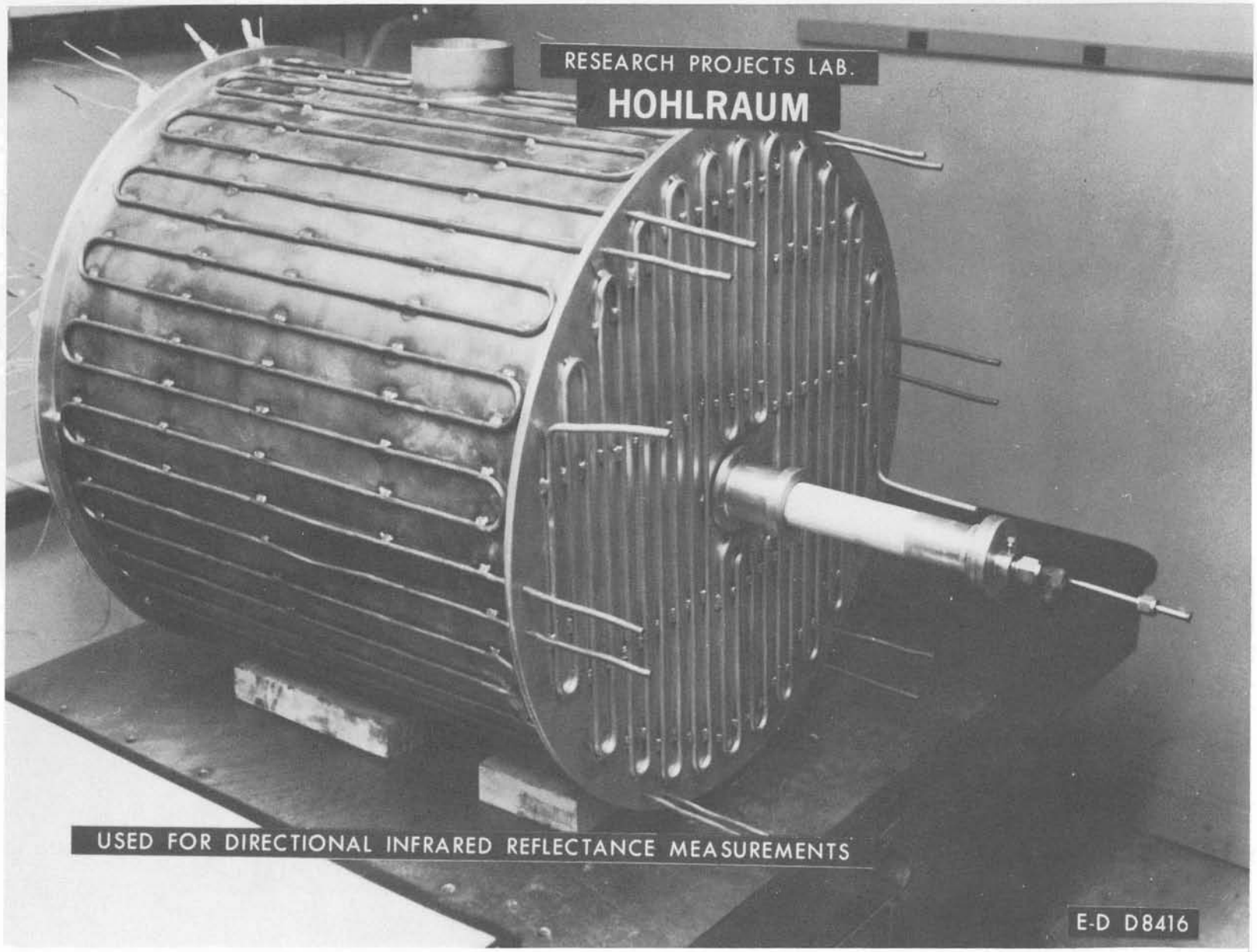


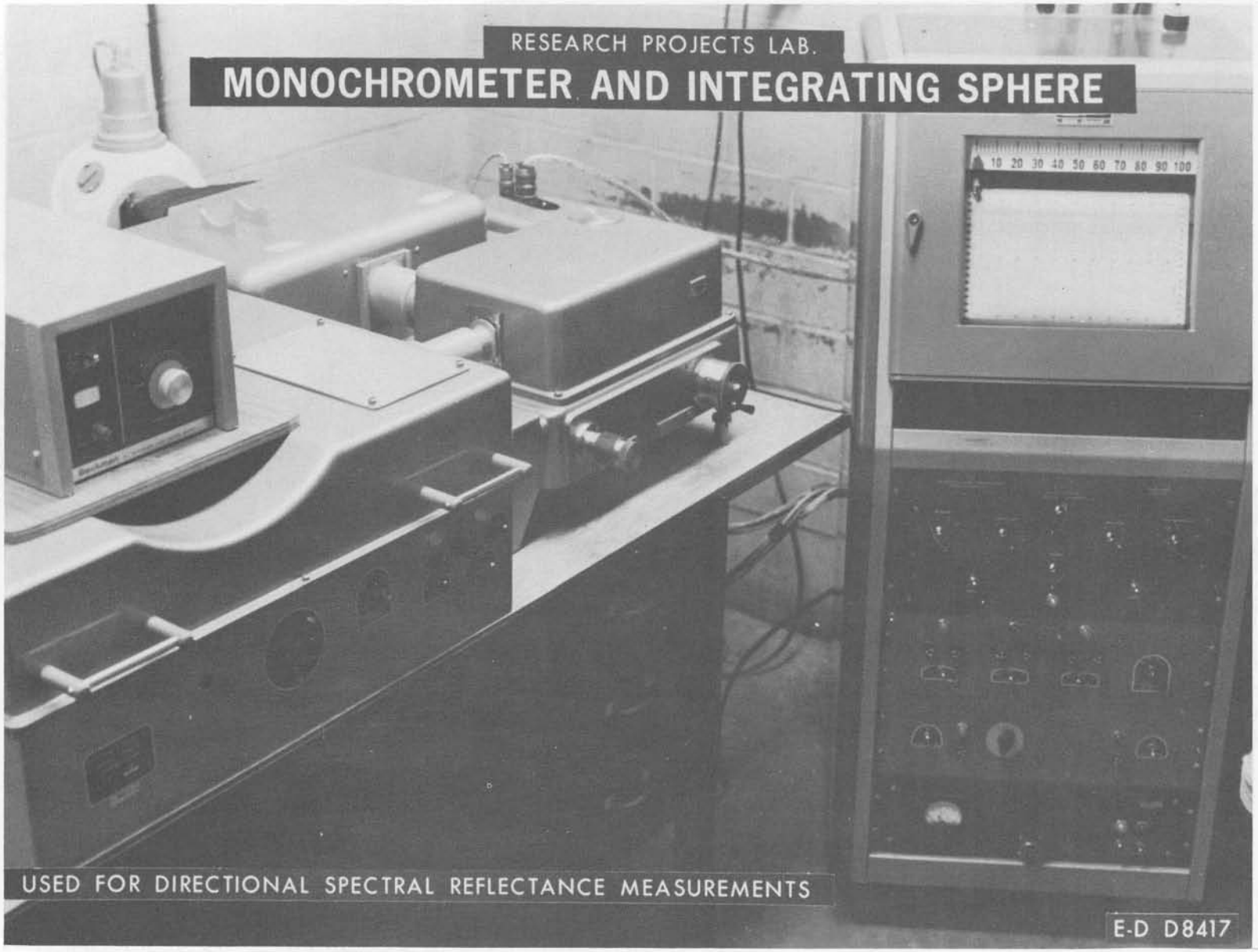
MAY 1965 E-D D866 B

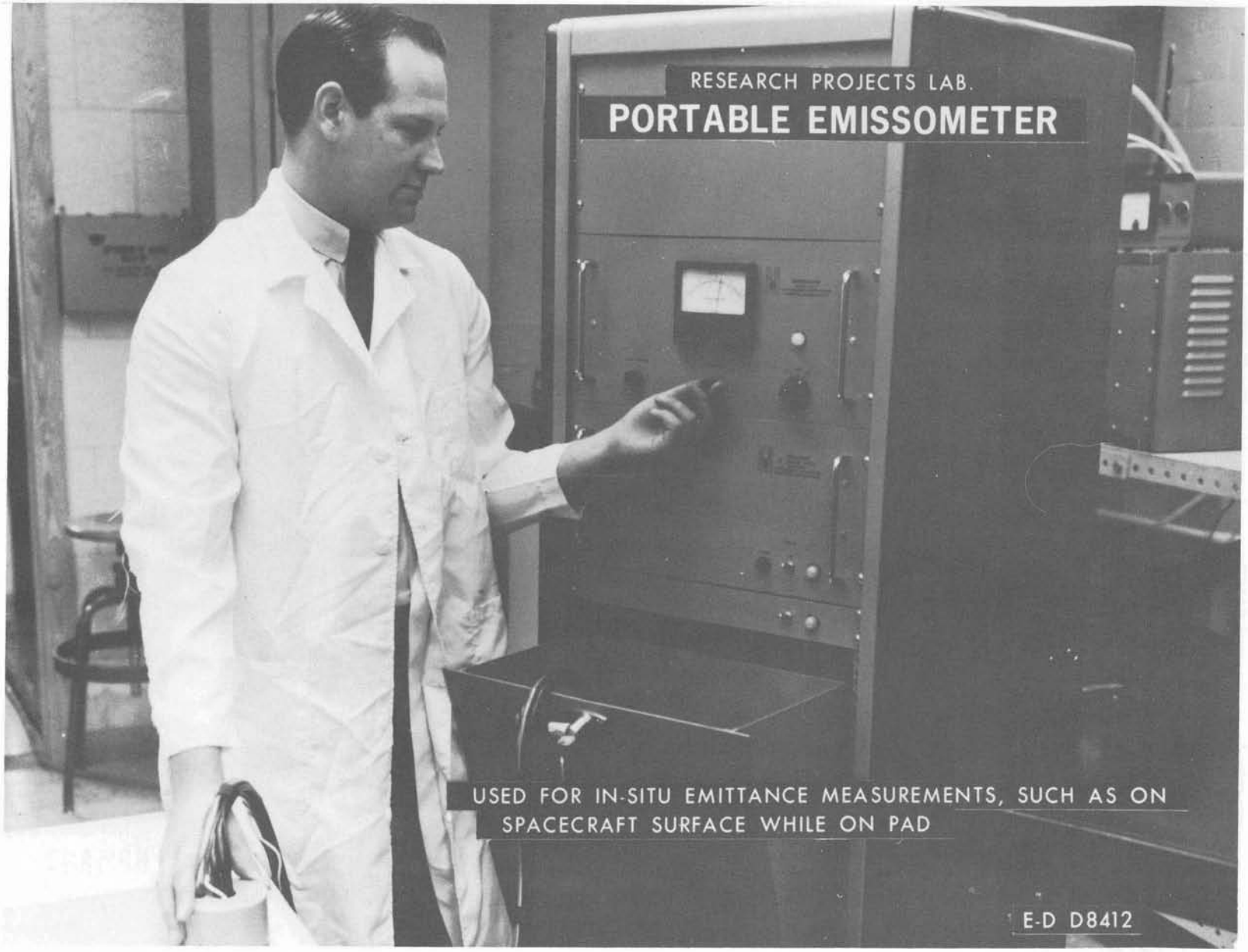

RESEARCH PROJECTS LAB.
SPACE ENVIRONMENTAL SIMULATION CHAMBER
USED FOR DETERMINING DEGREE OF THERMAL VARIATIONS
ON SPACE CRAFT COMPONENTS
E-D D8413

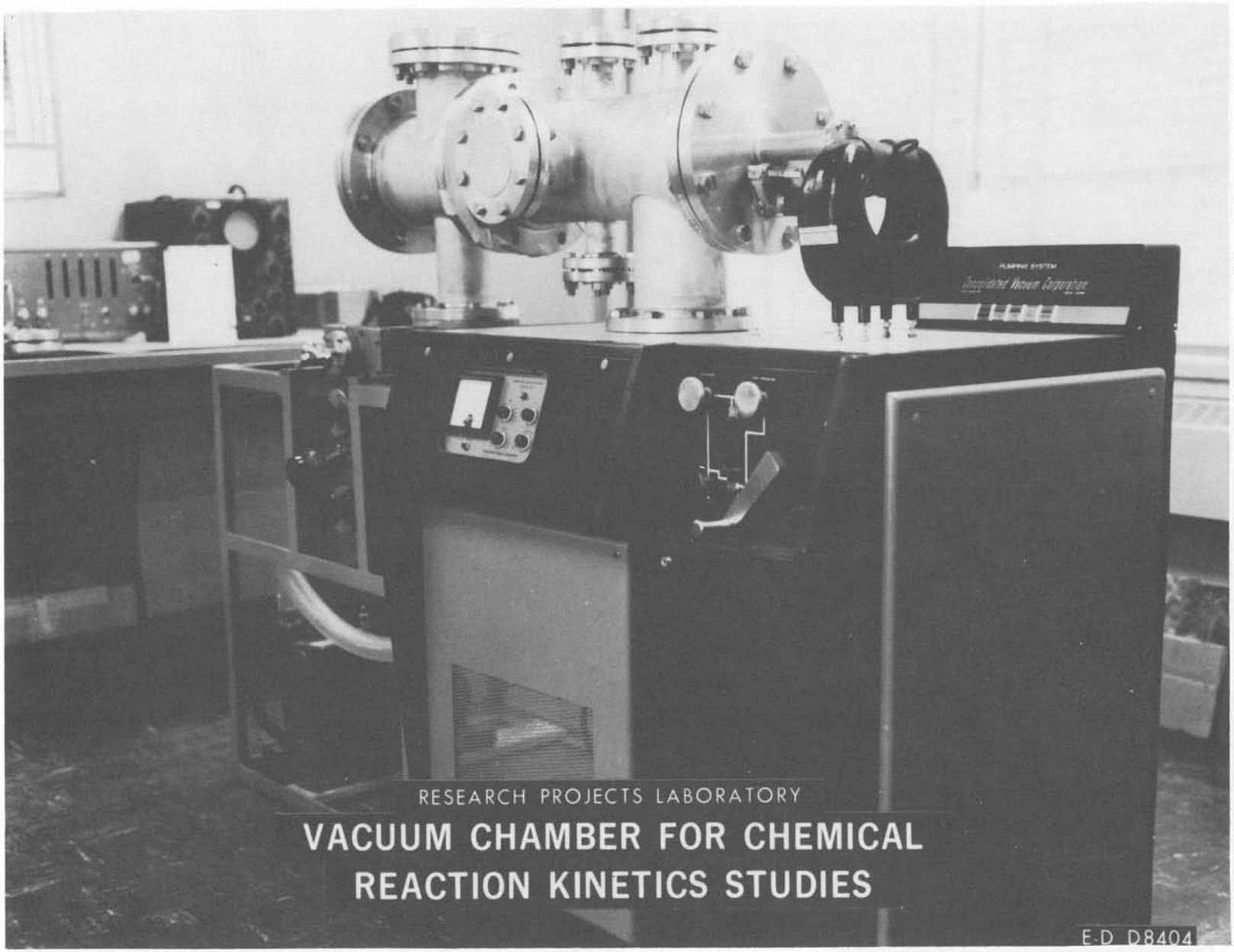

RESEARCH PROJECTS LAB.
ELECTROMAGNETIC IRRADIATION FACILITY
USED FOR STUDYING THE EFFECTS OF ELECTROMAGNETIC IRRADIATION ON SURFACES
E-D D8414

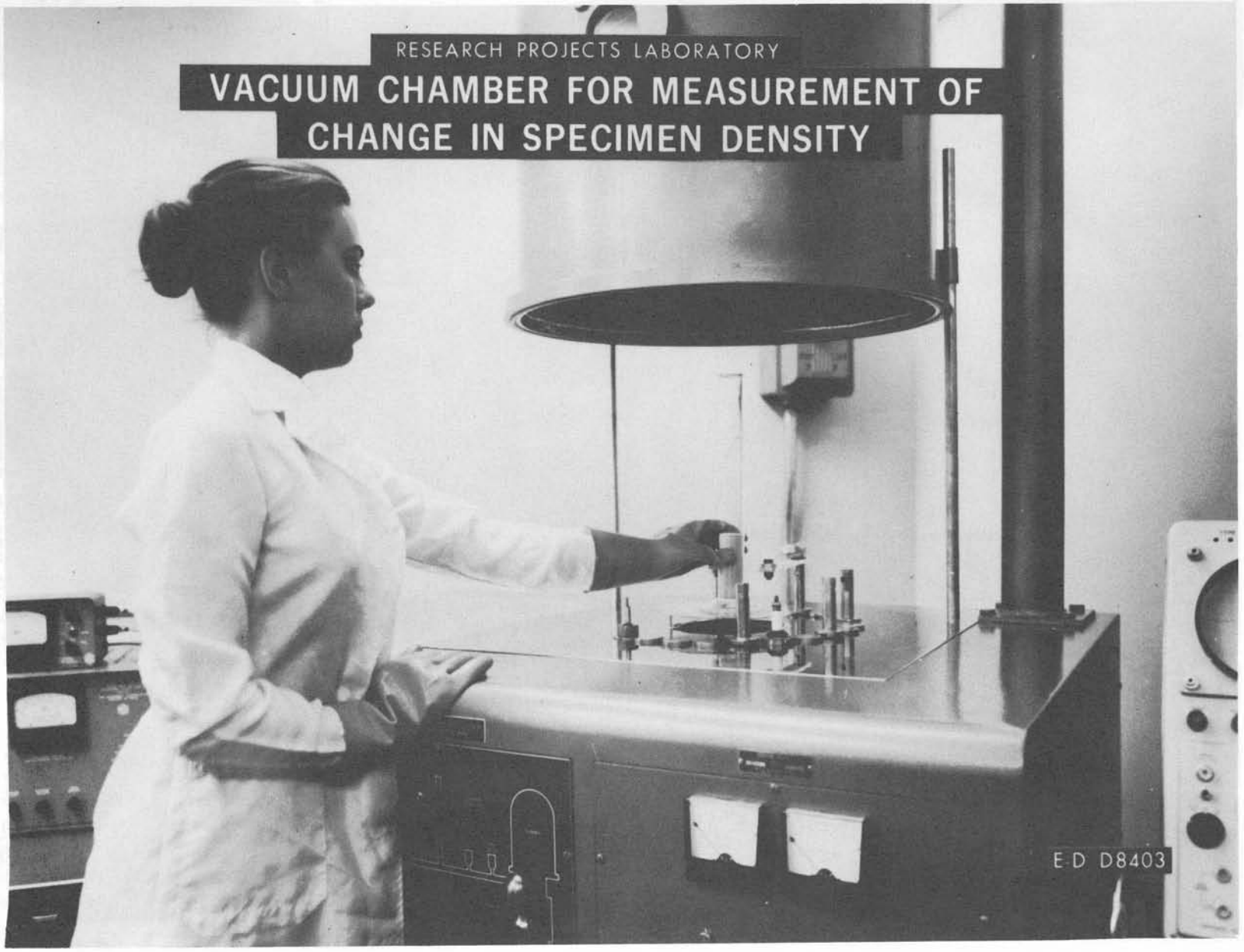

RESEARCH PROJECTS LAB
INFRARED SPECTROPHOTOMETER
FURNISHES ANALYTICAL DATA ON INFRARED RADIATION
REFLECTED FROM VARIOUS SURFACES
E-D D8415

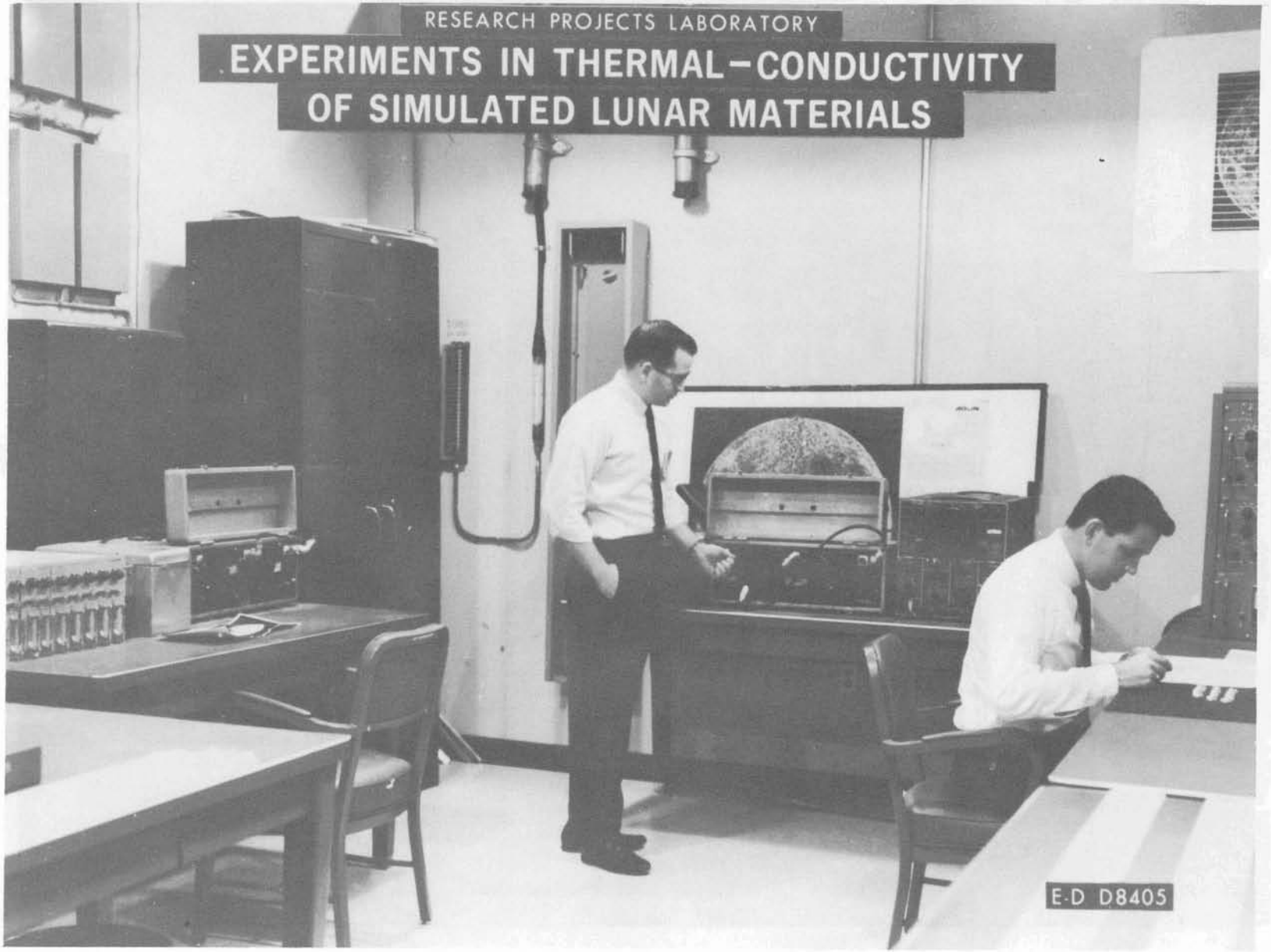

RESEARCH PROJECTS LAB.
HOHLRAUM
USED FOR DIRECTIONAL INFRARED REFLECTANCE MEASUREMENTS
E-D D8416

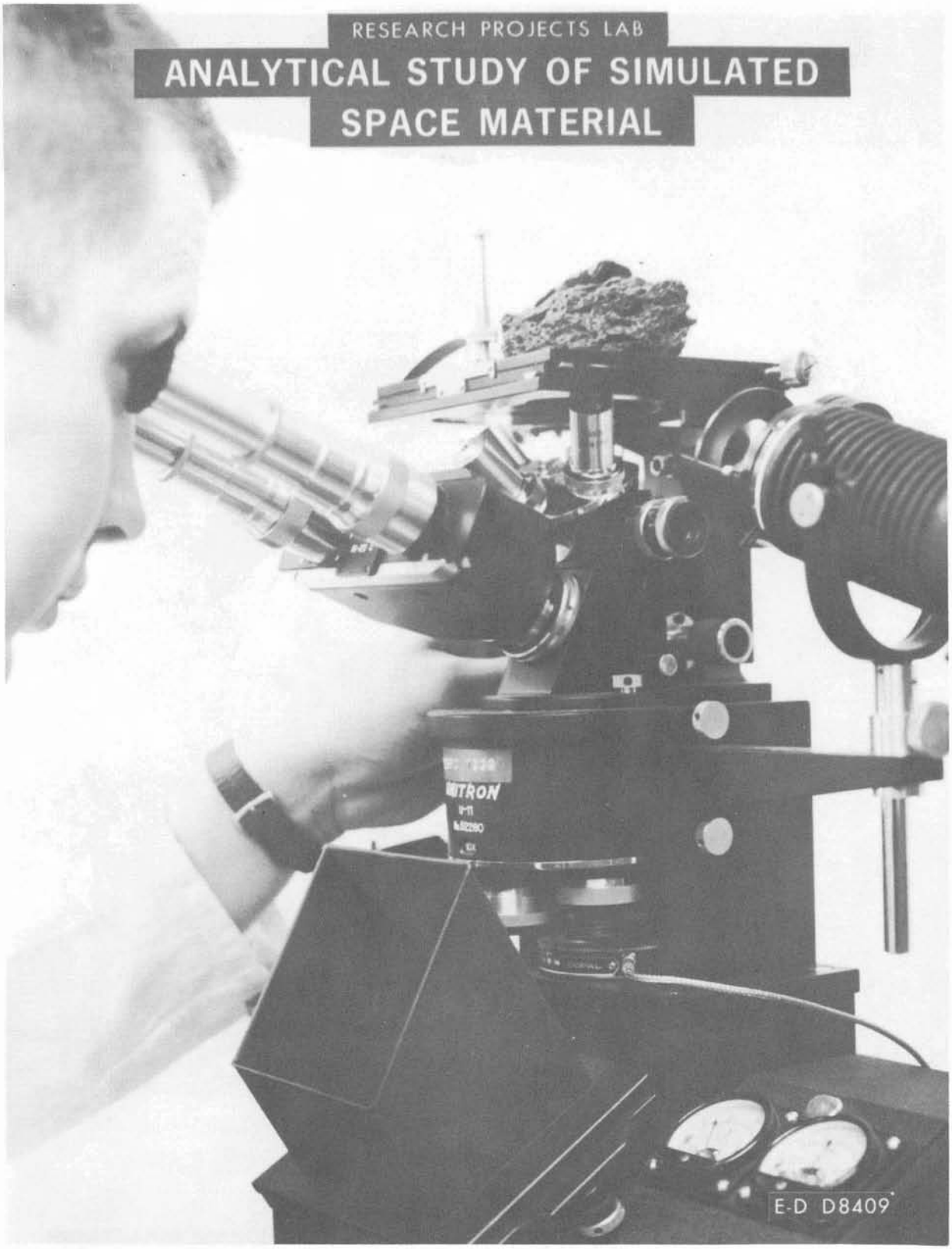

RESEARCH PROJECTS LAB.
MONOCHROMETER AND INTEGRATING SPHERE
10 20 30 40 50 60 70 80 90 100
USED FOR DIRECTIONAL SPECTRAL REFLECTANCE MEASUREMENTS
E-D D8417

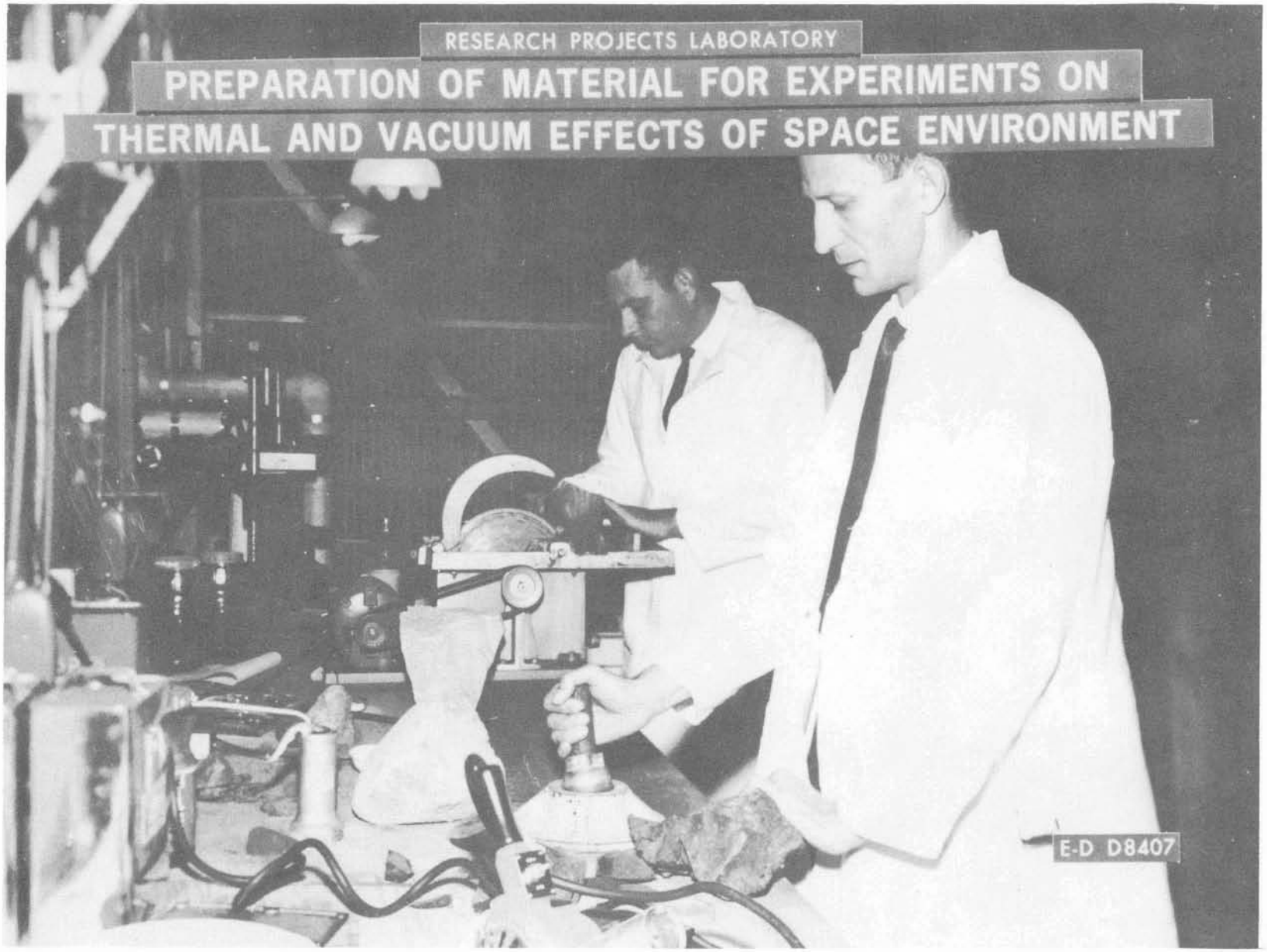

RESEARCH PROJECTS LAB.
PORTABLE EMISSOMETER
USED FOR IN-SITU EMITTANCE MEASUREMENTS, SUCH AS ON SPACECRAFT SURFACE WHILE ON PAD
E-D D8412

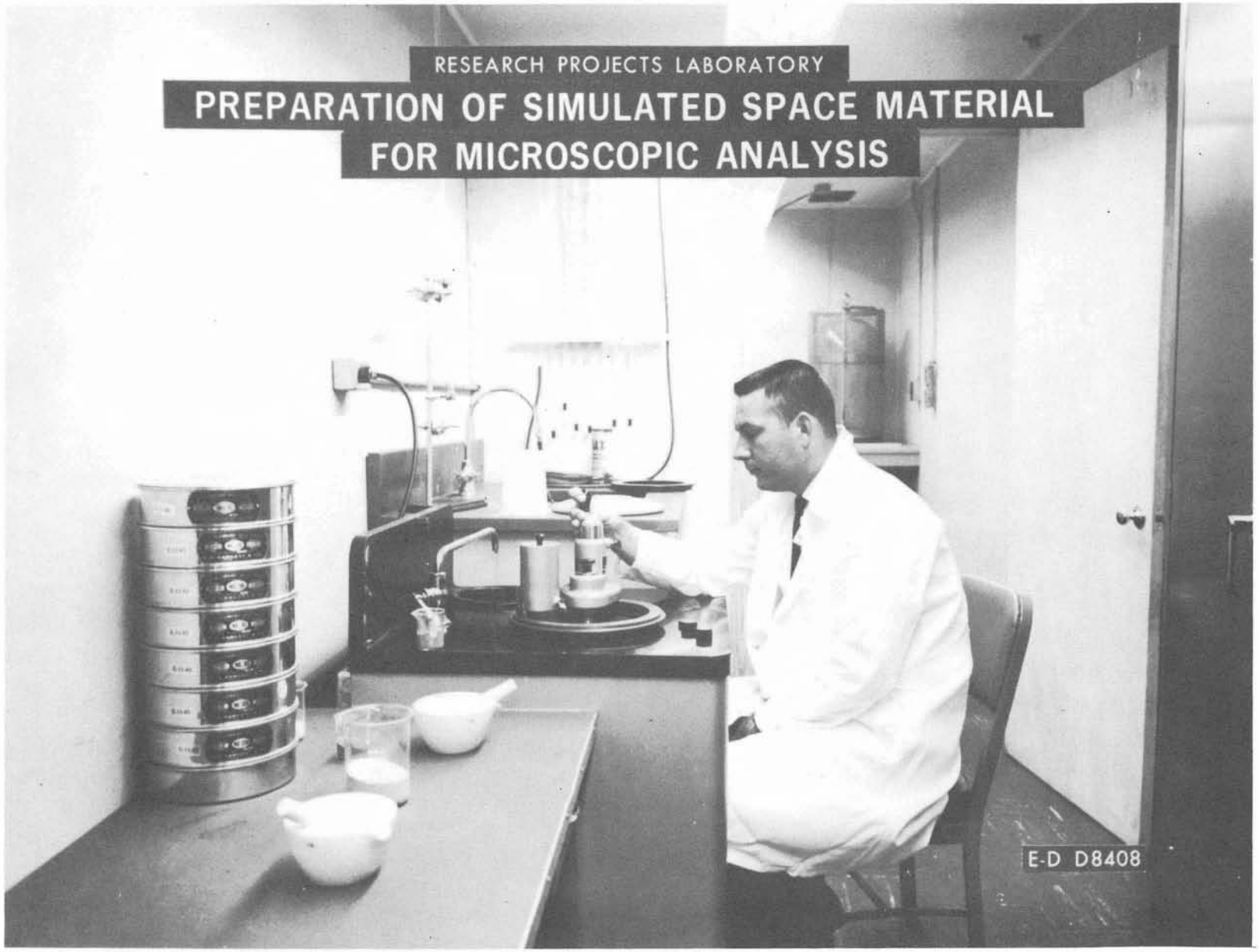

RESEARCH PROJECTS LABORATORY
VACUUM CHAMBER FOR CHEMICAL
REACTION KINETICS STUDIES
E-D D8404

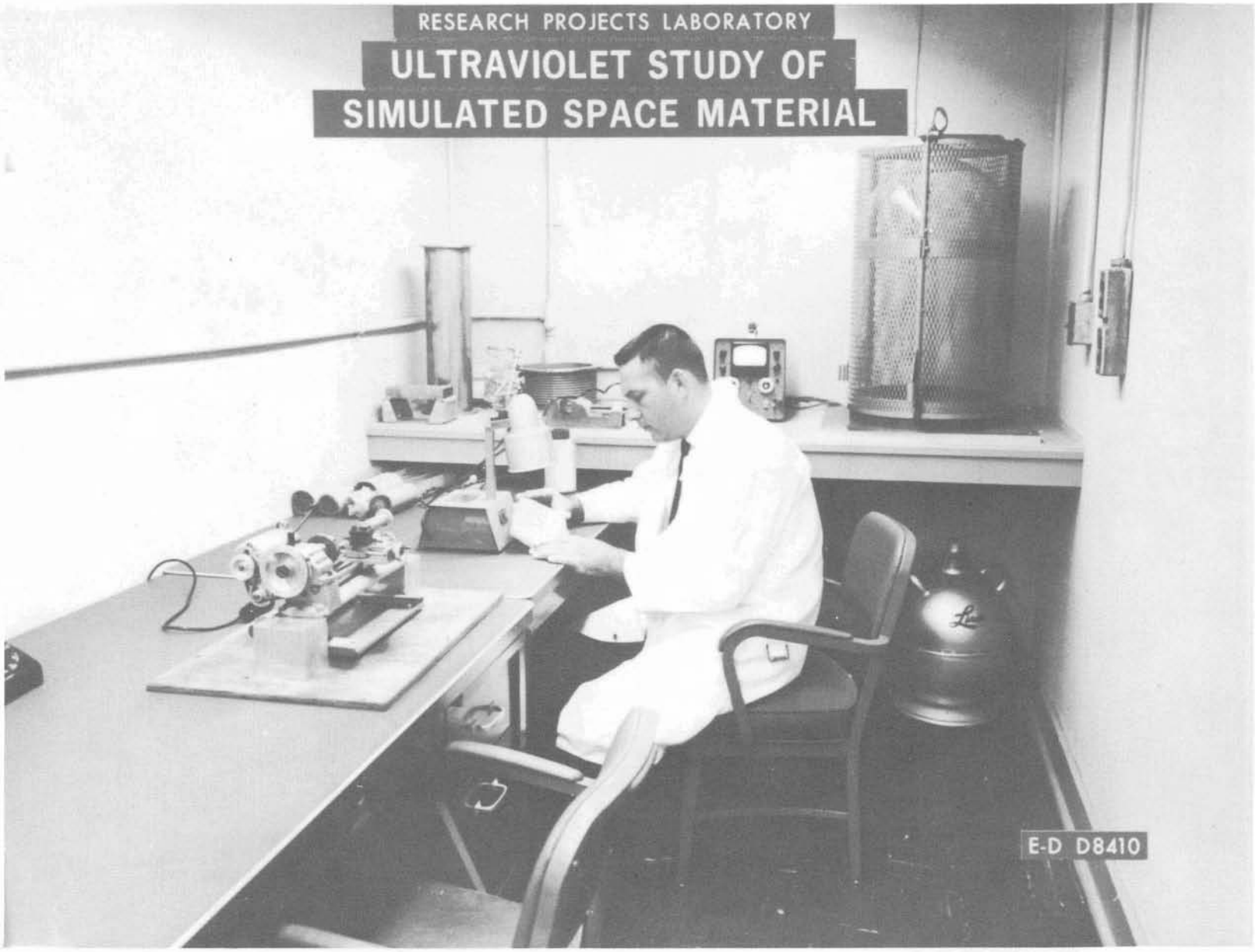

RESEARCH PROJECTS LABORATORY
VACUUM CHAMBER FOR MEASUREMENT OF CHANGE IN SPECIMEN DENSITY
E-D D8403

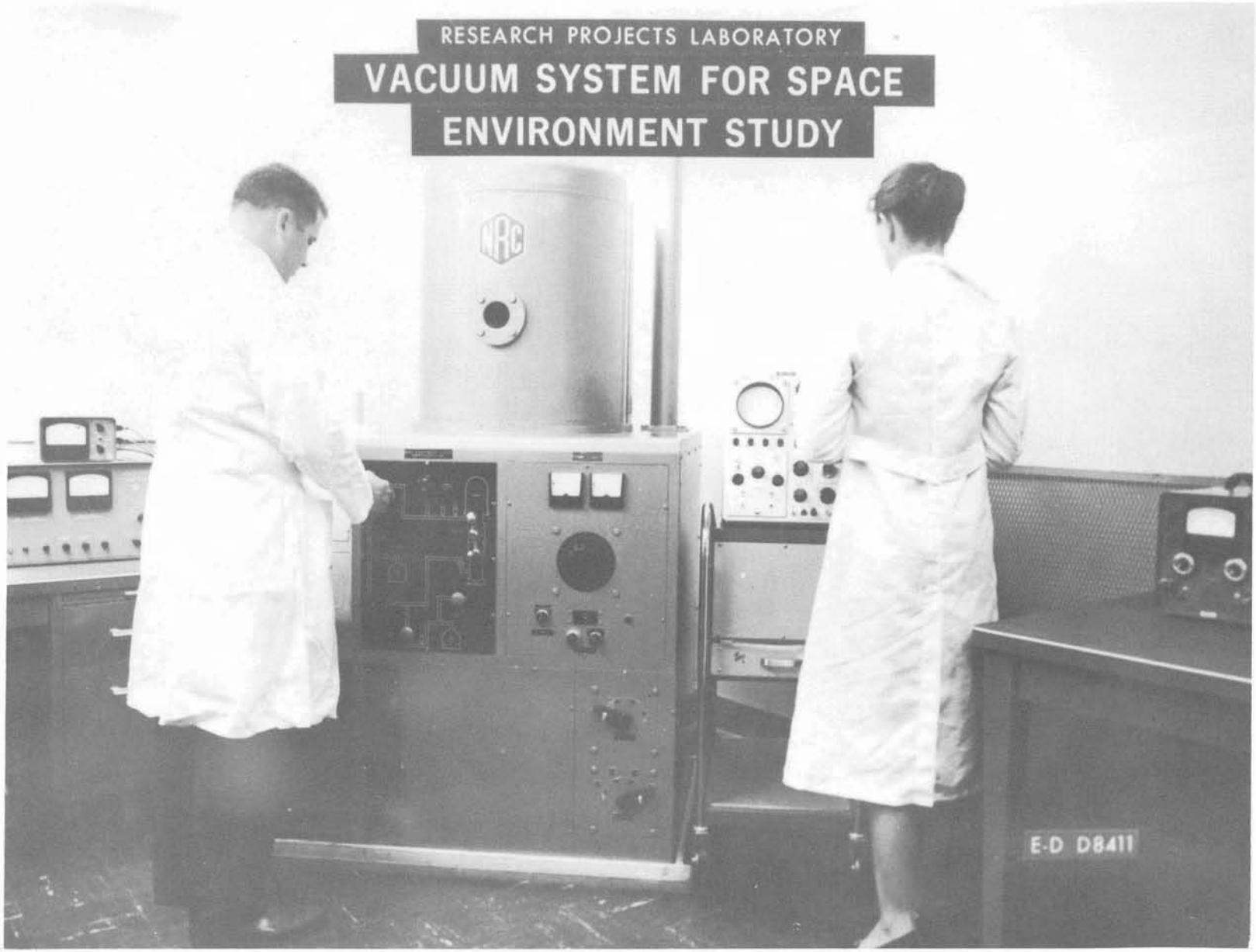

RESEARCH PROJECTS LABORATORY
EXPERIMENTS IN THERMAL-CONDUCTIVITY
OF SIMULATED LUNAR MATERIALS
E-D D8405


RESEARCH PROJECTS LAB
ANALYTICAL STUDY OF SIMULATED SPACE MATERIAL
E-D D8409


RESEARCH PROJECTS LABORATORY
PREPARATION OF MATERIAL FOR EXPERIMENTS ON
THERMAL AND VACUUM EFFECTS OF SPACE ENVIRONMENT
E-D D8407

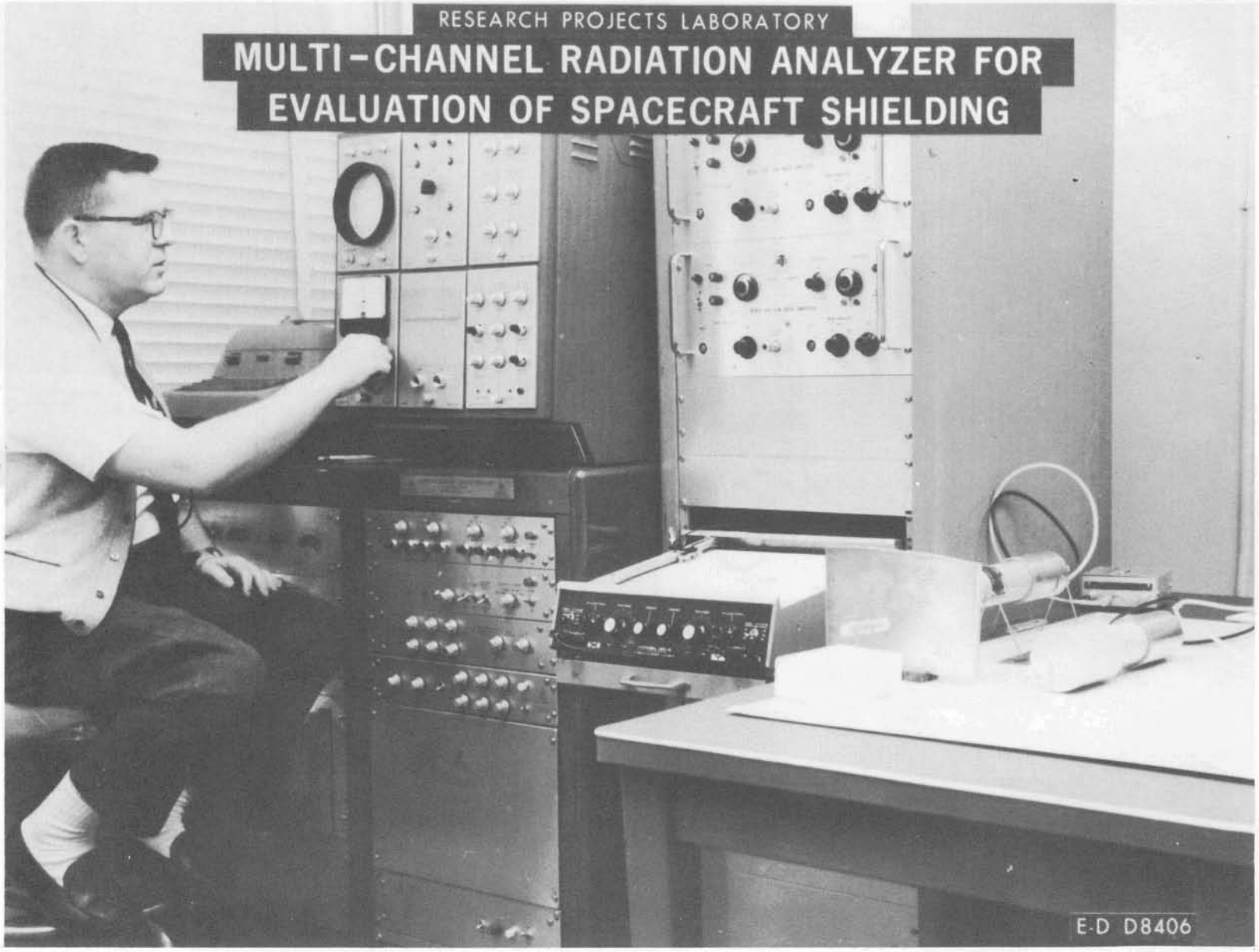

RESEARCH PROJECTS LABORATORY
PREPARATION OF SIMULATED SPACE MATERIAL
FOR MICROSCOPIC ANALYSIS
E-D D8408


RESEARCH PROJECTS LABORATORY
ULTRAVIOLET STUDY OF
SIMULATED SPACE MATERIAL
E-D D8410


RESEARCH PROJECTS LABORATORY
VACUUM SYSTEM FOR SPACE
ENVIRONMENT STUDY
NRC
E-D D8411

RESEARCH PROJECTS LABORATORY

MULTI-CHANNEL RADIATION ANALYZER FOR EVALUATION OF SPACECRAFT SHIELDING



OTHER MSFC RESEARCH ACTIVITIES

MSFC RESEARCH

AREAS OF ACTIVITY

- RADIATION PHYSICS
- THERMAL PHYSICS
- CHEMICAL PROPULSION RESEARCH
- CRYOGENIC TECHNOLOGY
- ELECTRONICS RESEARCH
- CONTROL SYSTEMS
- MANUFACTURING TECHNOLOGY
- MATERIALS AND STRUCTURES
- GROUND TESTING
- QUALITY ASSURANCE AND CHECKOUT
- SPACE ENVIRONMENT
- AERODYNAMICS
- INSTRUMENTATION
- MATHEMATICS AND COMPUTATION
- GUIDANCE CONCEPT
- ASTRODYNAMICS
- ADVANCED TRACKING SYSTEMS
- COMMUNICATION SYSTEMS
- LUNAR PHYSICS
- METEOROID PHYSICS
- ADVANCED PROPULSION
- POWER SYSTEMS

E-D D 6001 A

MSFC RESEARCH PROGRAM MANAGEMENT

MANAGEMENT CENTRALIZED IN ONE RESEARCH PROGRAM OFFICE WITH RESPONSIBILITY TO:

- PLAN, DEVELOP, COORDINATE AND IMPLEMENT MSFC RESEARCH PROGRAMS.
- PREPARE PROGRAM DOCUMENTS AND PRESENT AND JUSTIFY PROGRAMS TO NASA HEADQUARTERS.
- PROVIDE PROGRAM GUIDANCE TO MSFC LABS ON FUNDING, SCHEDULING, AND CONTRACTING.
- ESTABLISH EFFECTIVE VISIBILITY AND PRESENTATION OF RESEARCH ACHIEVEMENTS.
- MAINTAIN LIAISON WITH OTHER GOVERNMENT AGENCIES AND THE SCIENTIFIC COMMUNITY FOR EXCHANGE OF TECHNICAL AND SCIENTIFIC KNOWLEDGE.

E-D W 6000 A

PROJECT SUPER

(SUPPORT PROGRAM FOR EXTRATERRESTRIAL RESEARCH)

AGREEMENT: AIR FORCE/NASA-MAY 1963

PROCEDURES:

- PRELIMINARY MSFC STATEMENT OF WORK SUBMITTED TO PROJECT SUPER COORDINATING BOARD.
- BOARD PREPARES PROPOSAL WITH APPROPRIATE AIR FORCE TECHNICAL ORGANIZATION.
- UPON AIR FORCE ACCEPTANCE FINAL STATEMENT OF WORK IS PREPARED.
- TECHNICAL SUPERVISORS ARE DESIGNATED FOR EACH TASK.

POLICY:

- MSFC REQUIREMENTS CONSIDERED ON A PRIORITY BASIS ADEQUATE TO MAINTAIN APPROVED SCHEDULES WITH NO CHANGES EXCEPT BY MUTUAL AGREEMENT.

FUNDING:

- REIMBURSEMENT REQUIRED ONLY FOR "OUT OF POCKET" COSTS BY AIR FORCE, SUCH AS MATERIALS OR SPECIAL EQUIPMENT.

FY 64 - $123,000

FY 65 (EST) - $150, 000

E-D D 6002

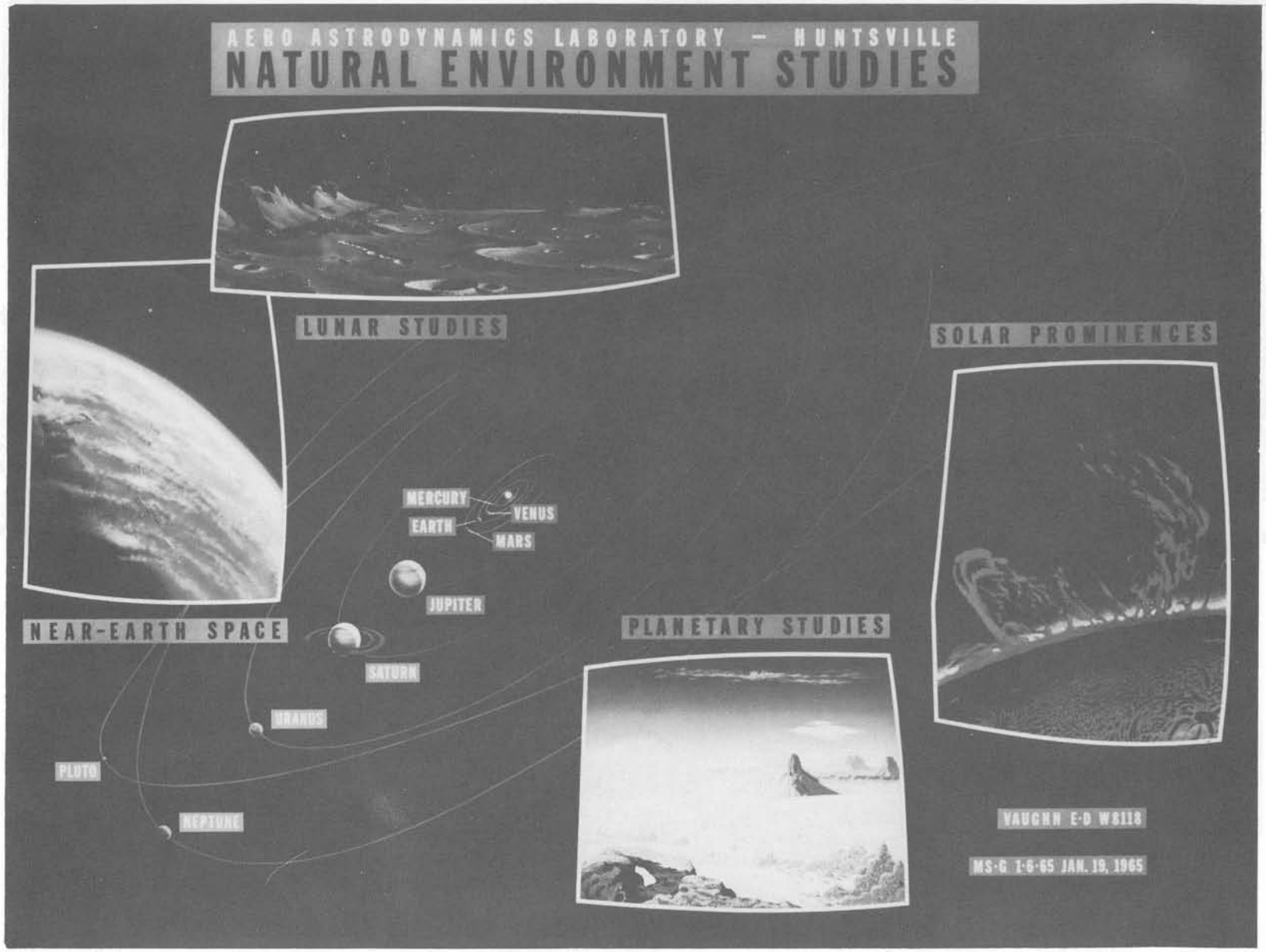
PROJECT SUPER
(SUPPORT PROGRAM FOR EXTRATERRESTRIAL RESEARCH)

WORK AREAS

- HIGH VACUUM ADHESION
- HYPERVELOCITY IMPACT PHYSICS
- SELF SEALANTS
- MEASUREMENTS OF GAS DENSITY BY RADIATION SCATTERING
- CONCEPTUAL DESIGN-COMPONENT AND MODEL TEST FACILITY
- THERMAL CONTROL IN SPACE
- THERMAL MODELS FOR ENVIRONMENTAL TESTING
- THERMAL RADIATION
- THERMAL TESTING TECHNIQUES
- CREW SEATING AND RESTRAINT STUDIES
- VEHICLE SYSTEMS FAILURE ANALYSIS

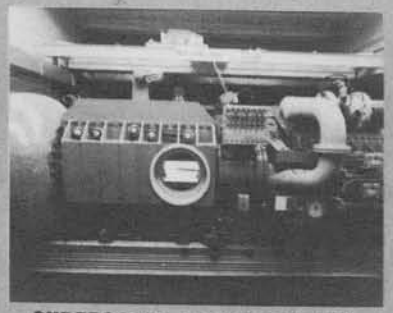
PARTICIPATING AIR FORCE ORGANIZATION

- RESEARCH AND TECHNOLOGY DIVISION, AFSC
- WRIGHT-PATTERSON AIR FORCE BASE (MATERIALS LAB, FLT. DYNAMICS LAB)
- ARNOLD ENGINEERING DEVELOPMENT CENTER
- AIR FORCE CAMBRIDGE RESEARCH LABORATORIES
- SPACE SYSTEMS DIVISION

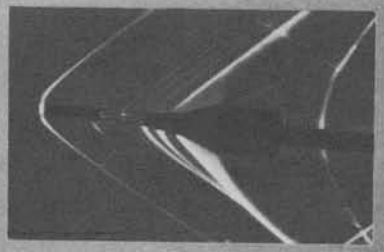

AERO ASTRODYNAMICS LABORATORY – HUNTSVILLE
NATURAL ENVIRONMENT STUDIES
LUNAR STUDIES
SOLAR PROMINENCES
MERCURY
VENUS
EARTH
MARS
JUPITER
NEAR-EARTH SPACE
PLANETARY STUDIES
SATURN
URANUS
PLUTO
NEPTUNE
VAUGHN E-D W8118
MS-G 1-6-65 JAN. 19, 1965

AERO - ASTRODYNAMICS LAB - HUNTSVILLE

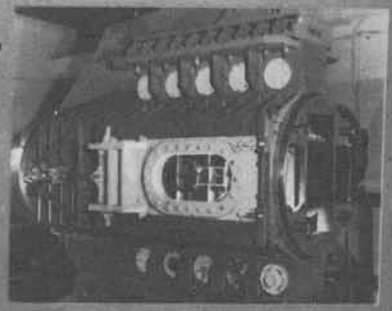
14 INCH TRISONIC-WIND TUNNEL FACILITY



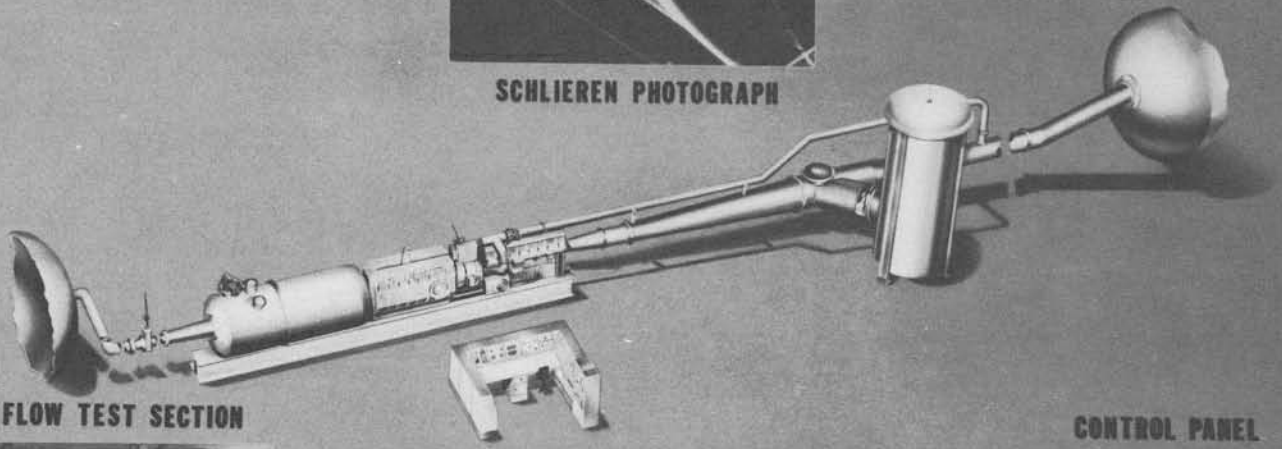
SUPERSONIC TEST SECTION



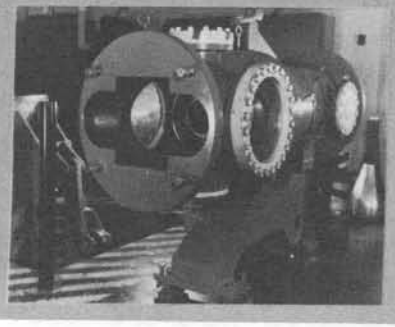
SCHLIEREN PHOTOGRAPH



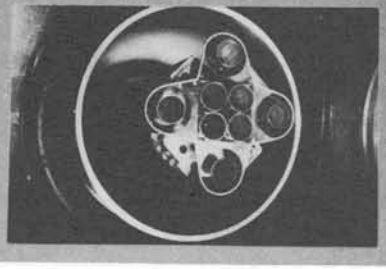
TRANSONIC TEST SECTION



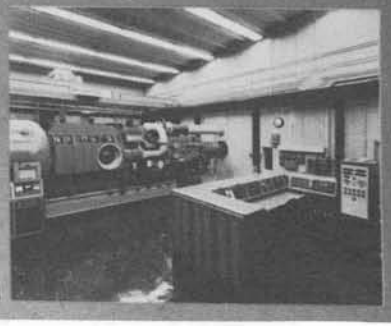
BASE FLOW TEST SECTION



S-I BASE FLOW MODEL

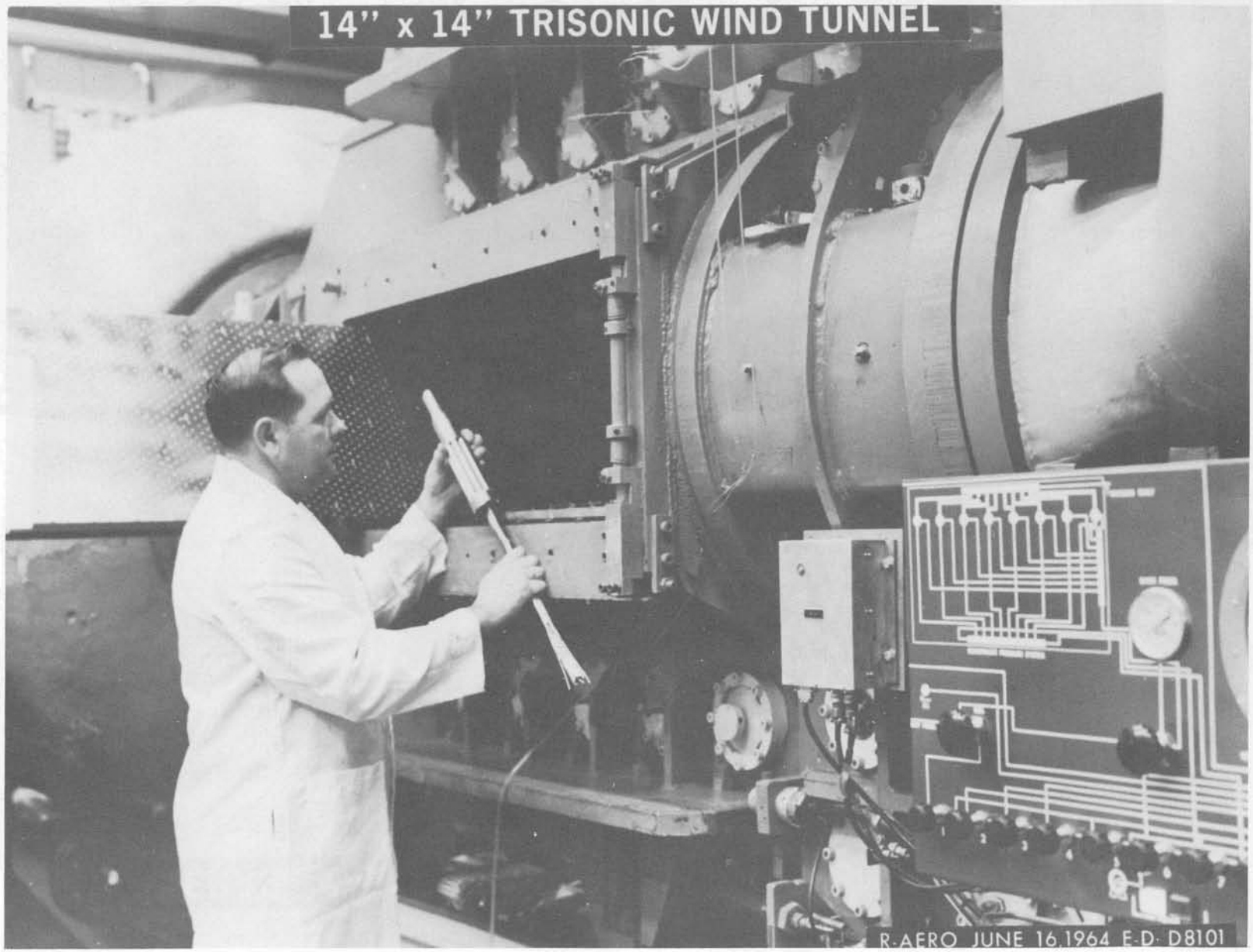


CONTROL PANEL



E-D D 8114


AERO-ASTRODYNAMICS LAB-HUNTSVILLE
OVERALL VIEW 14" x 14" TRISONIC WIND TUNNEL
E-D D8104

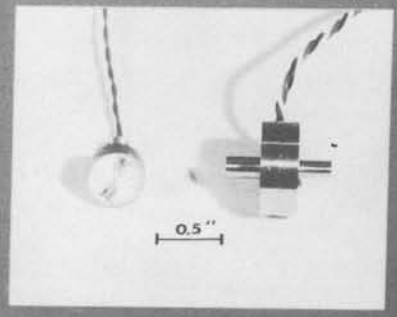

14" x 14" TRISONIC WIND TUNNEL
R-AERO JUNE 16,1964 E-D- D8101


7" x 7" BISONIC WIND TUNNEL
R-AERO JUNE 16,1964 E-D D8100

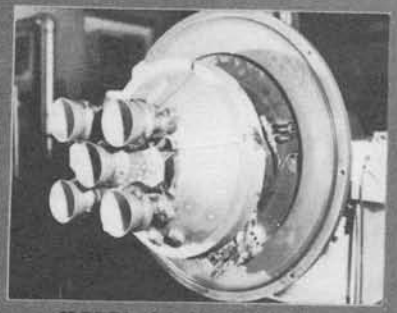
AERO-ASTRODYNAMICS LAB-HUNTSVILLE

IMPULSE BASE FLOW FACILITY

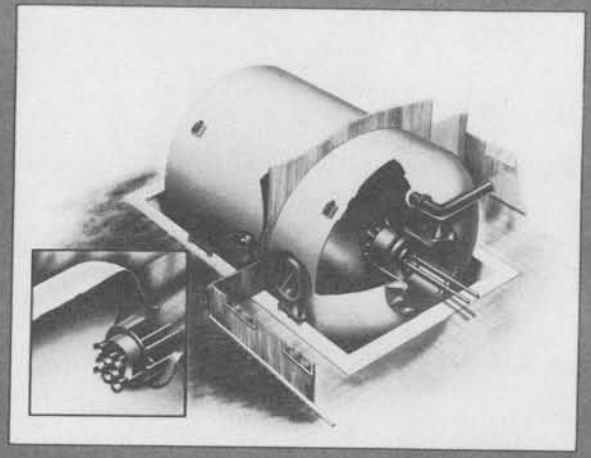
FACILITY LAYOUT



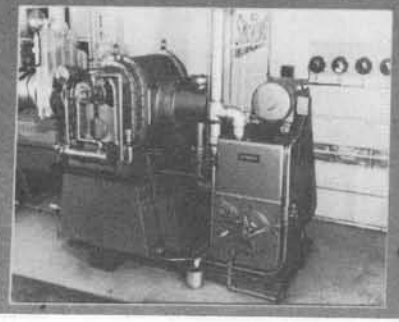
HEAT TRANSFER AND PRESSURE TRANSDUCERS



MODEL OF SATURN V S-II BASE



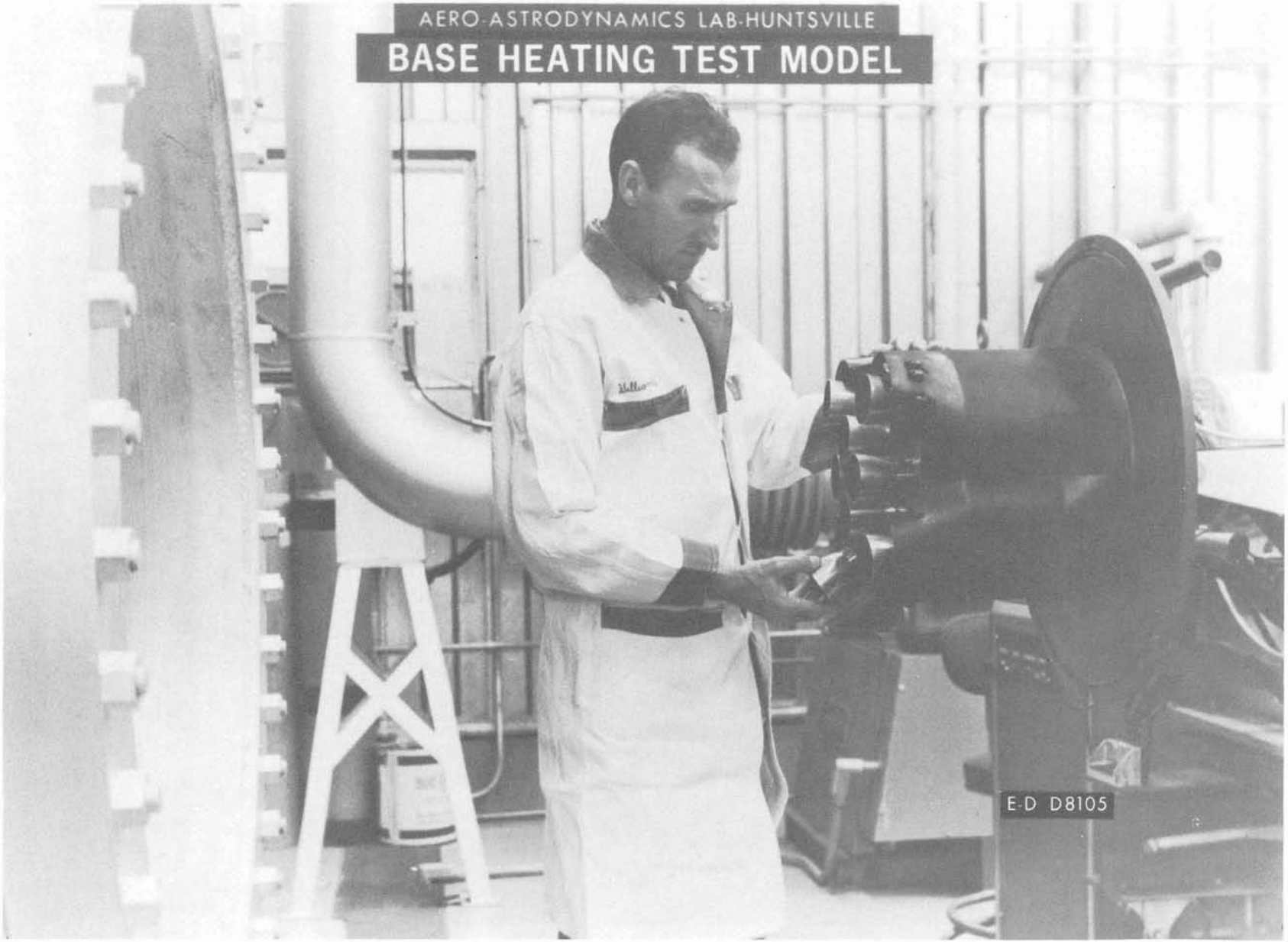
INSTRUMENTATION

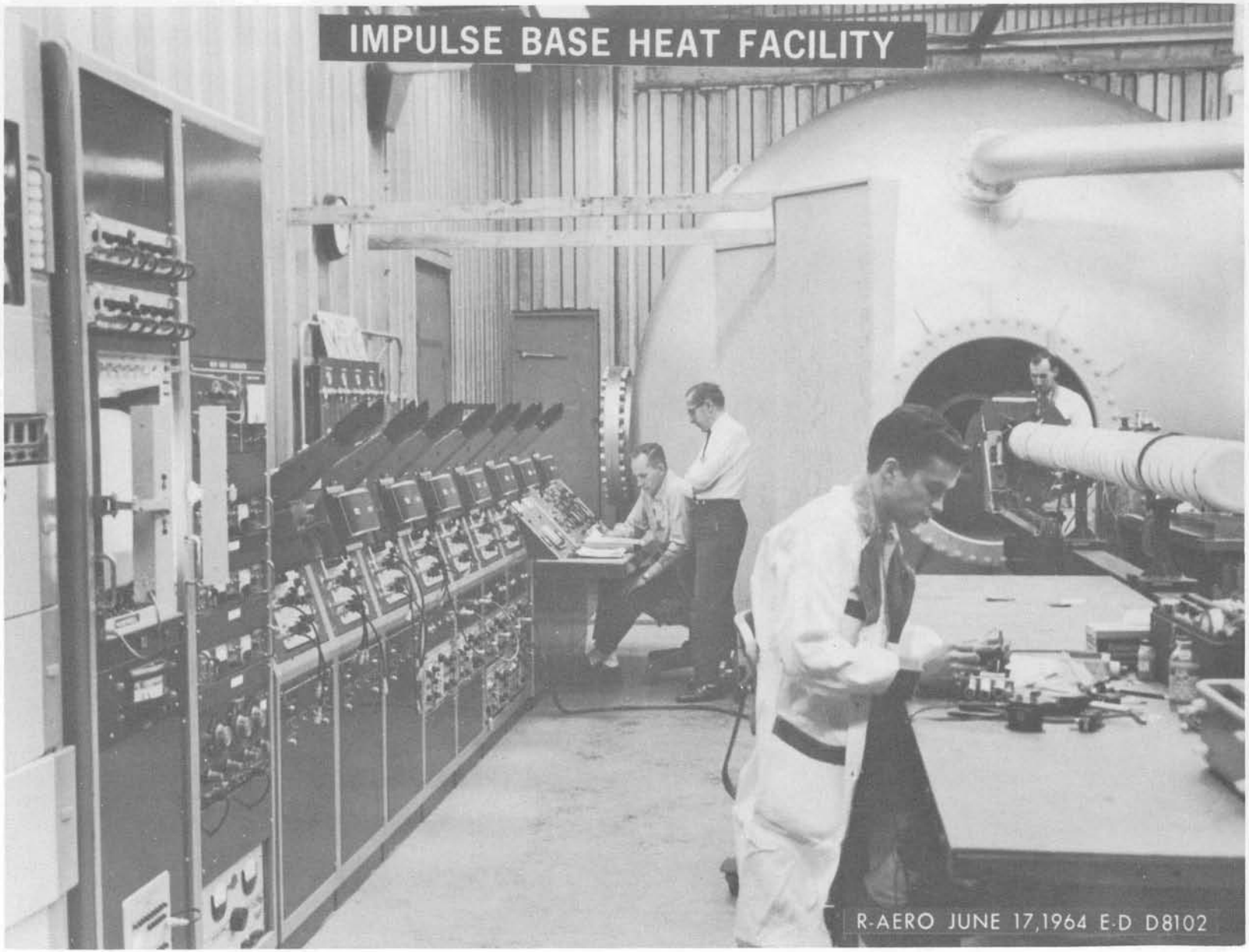


VACUUM PUMPS

CONTROL PANEL

E-D D 8113


AERO-ASTRODYNAMICS LAB-HUNTSVILLE
BASE HEATING TEST MODEL
E-D D8105

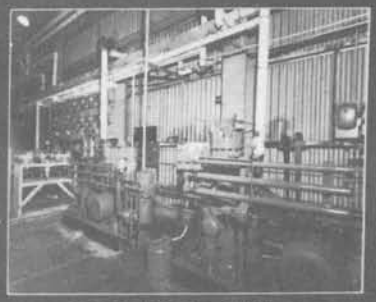

IMPULSE BASE HEAT FACILITY
R-AERO JUNE 17,1964 E-D D8102

AERO-ASTRODYNAMICS LAB - HUNTSVILLE

HYPERSONIC SHOCK TUNNEL FACILITY

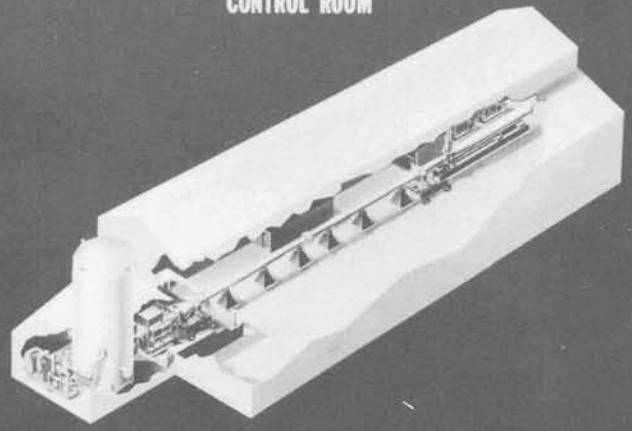
DATA ACQUISITION ROOM

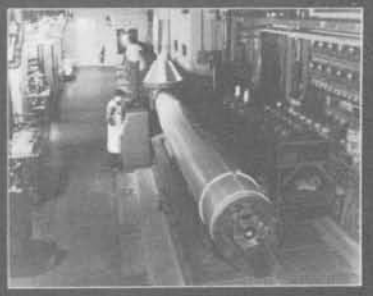
CONTROL ROOM



COMPRESSOR SYSTEM

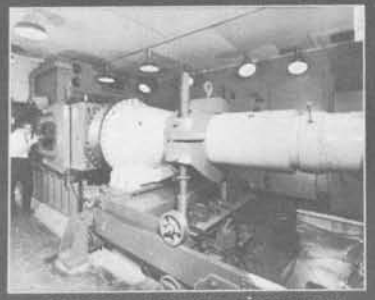
DUMP TANK AND VACUUM SYSTEM





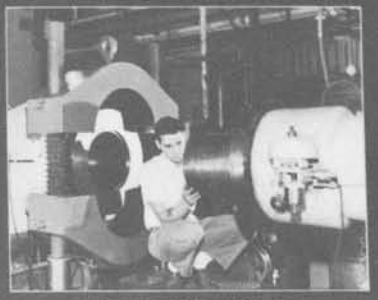
SHOCK TUBES

TEST SECTION

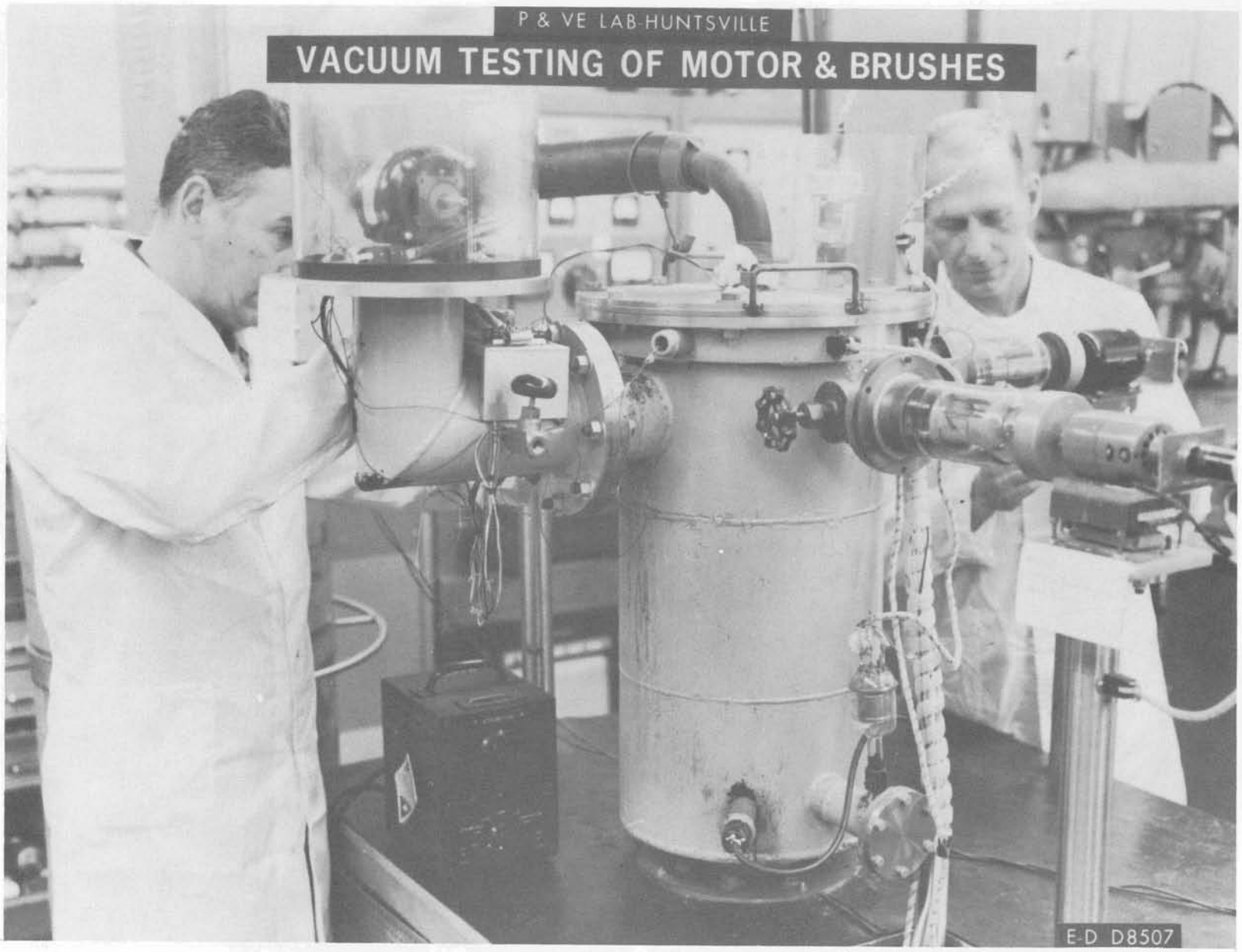


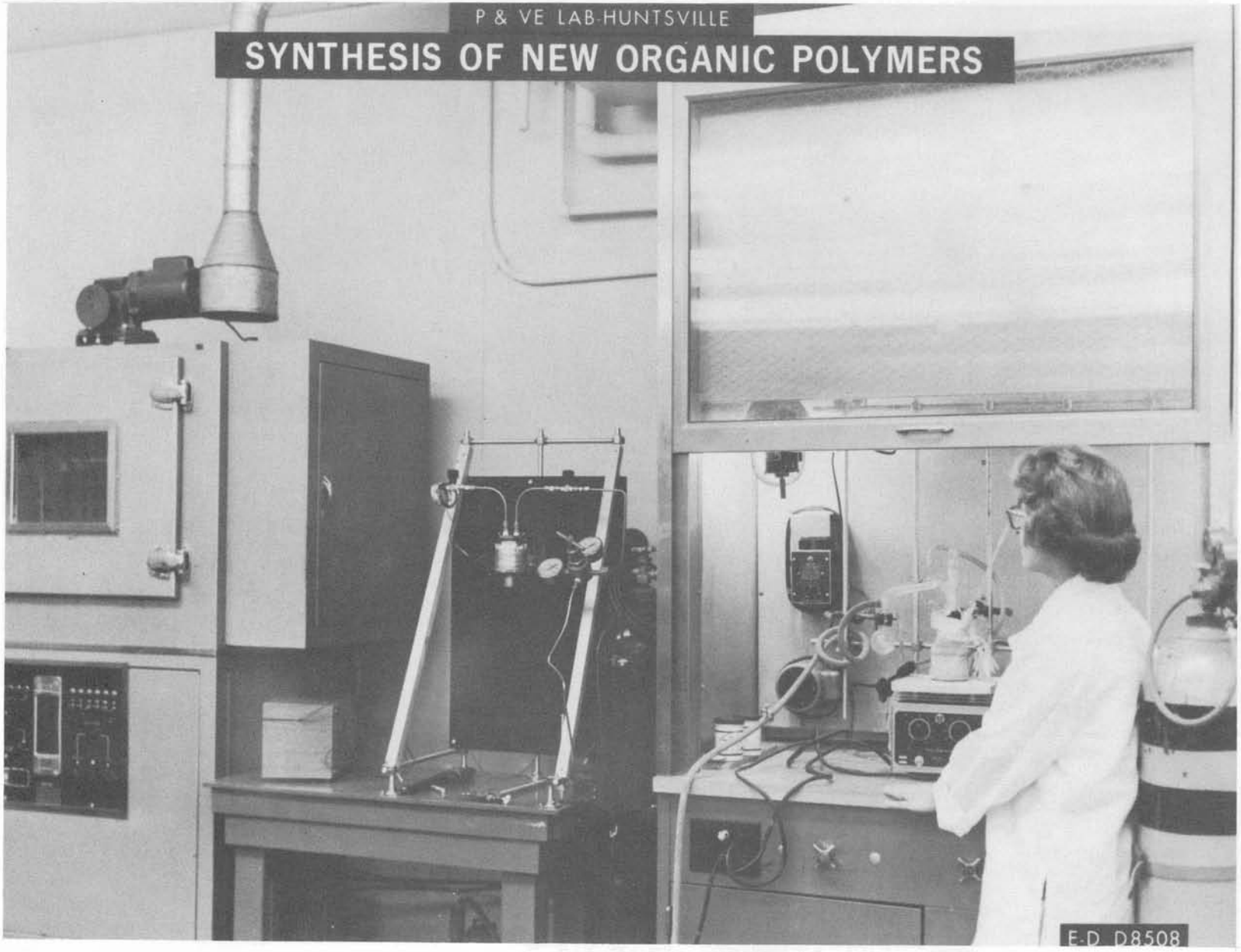
CONICAL NOZZLE ASSEMBLY

E-D D 8115

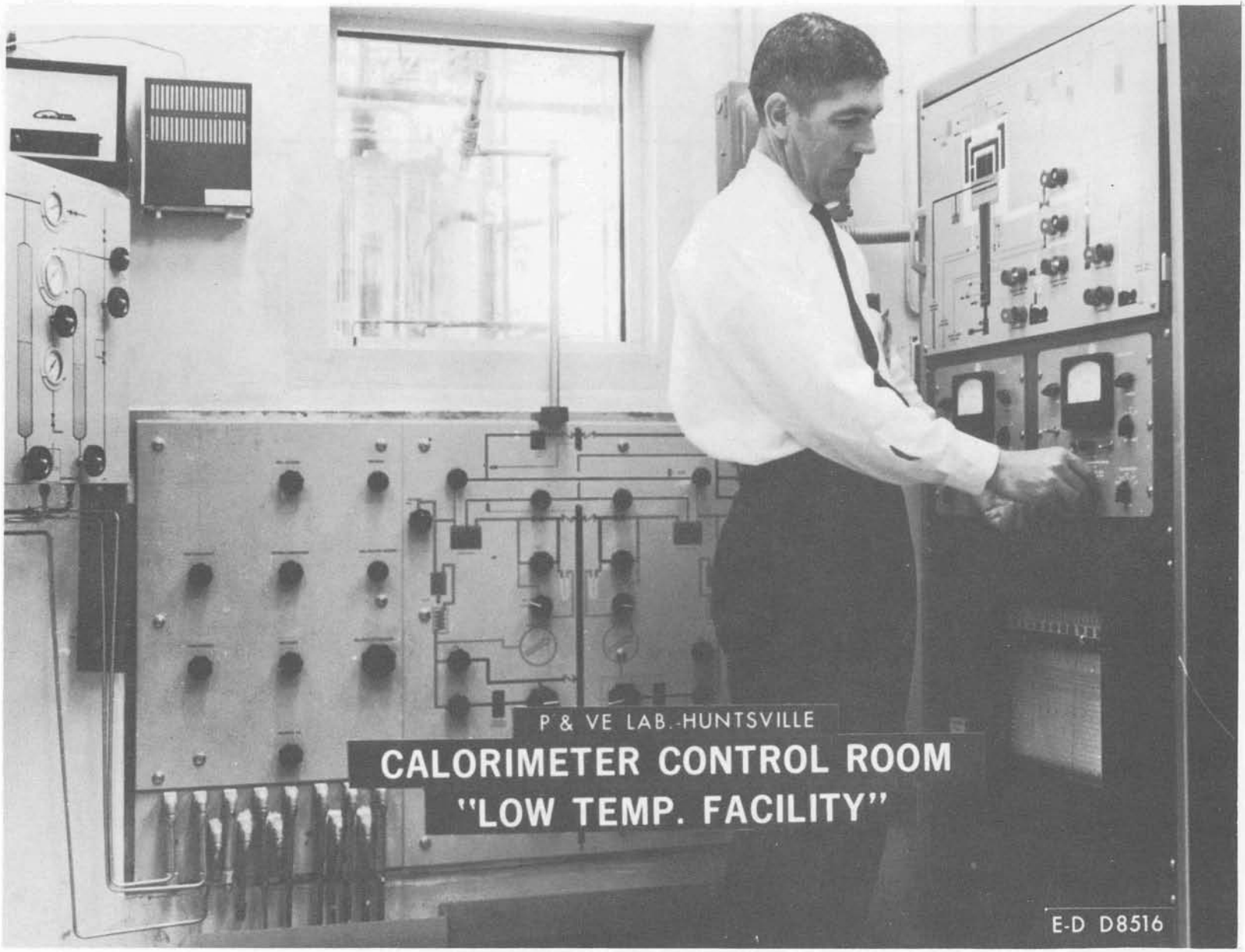


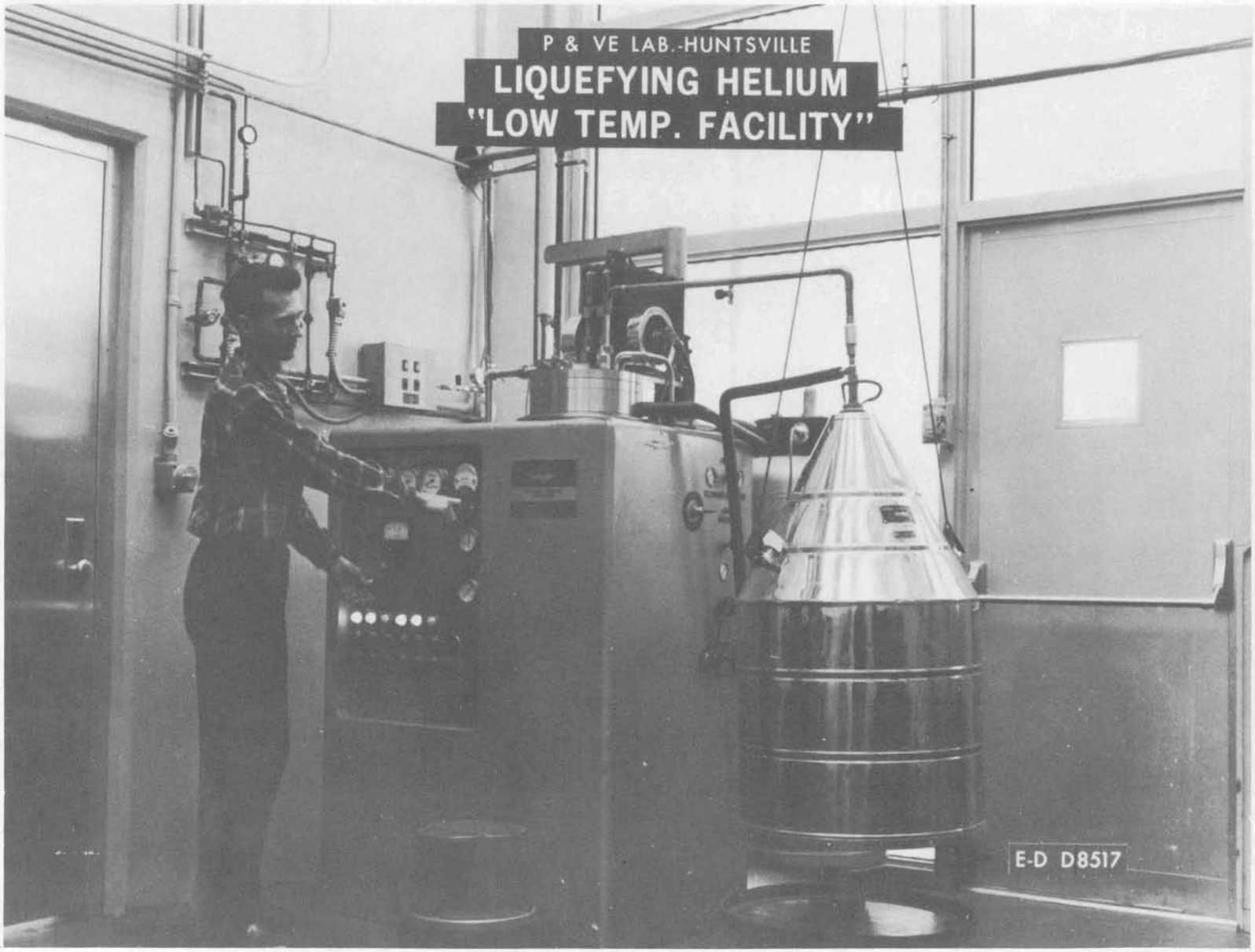
DIAPHRAGM BUCKET ASSEMBLY AREA

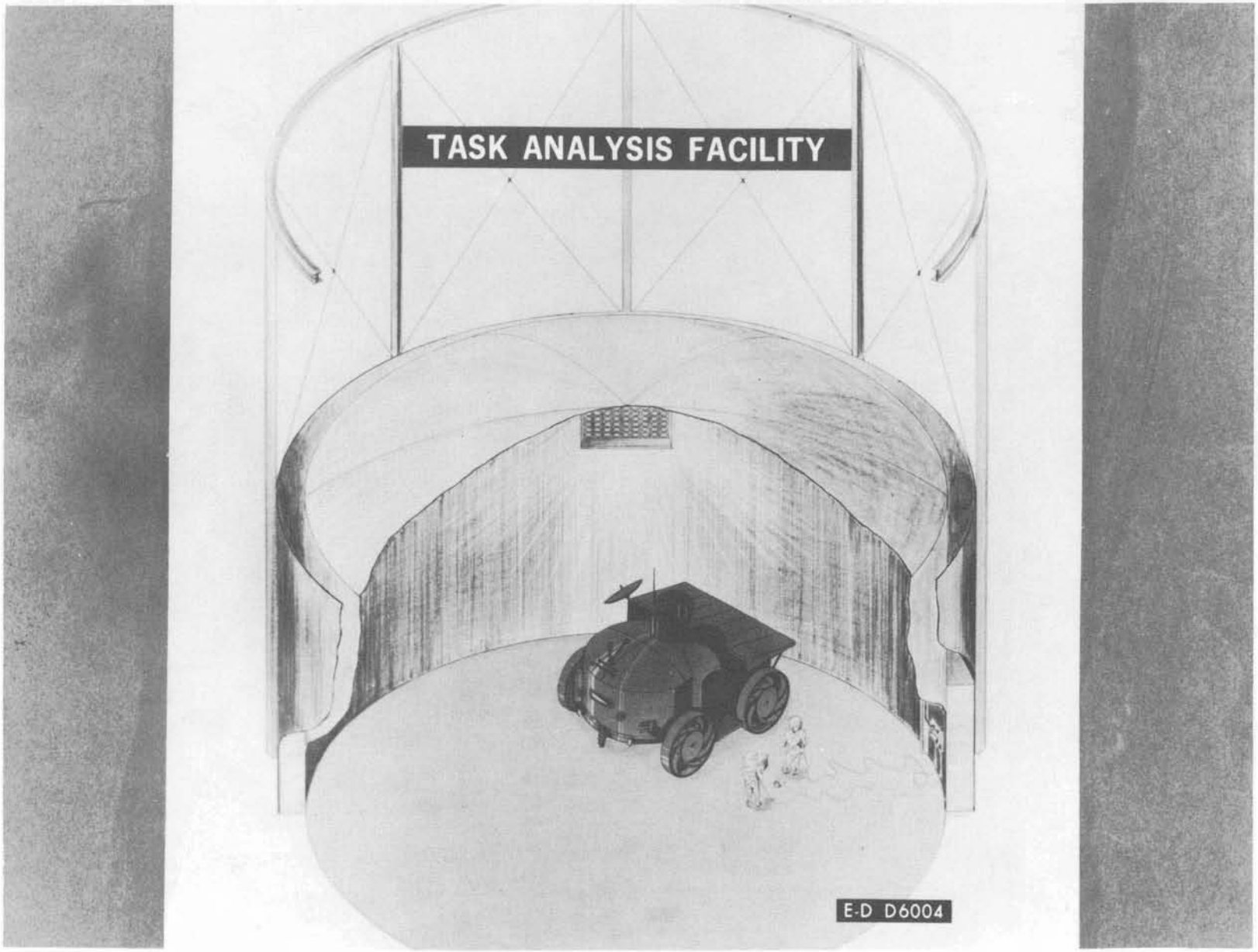

P & VE LAB HUNTSVILLE
VACUUM TESTING OF MOTOR & BRUSHES
E-D D8507

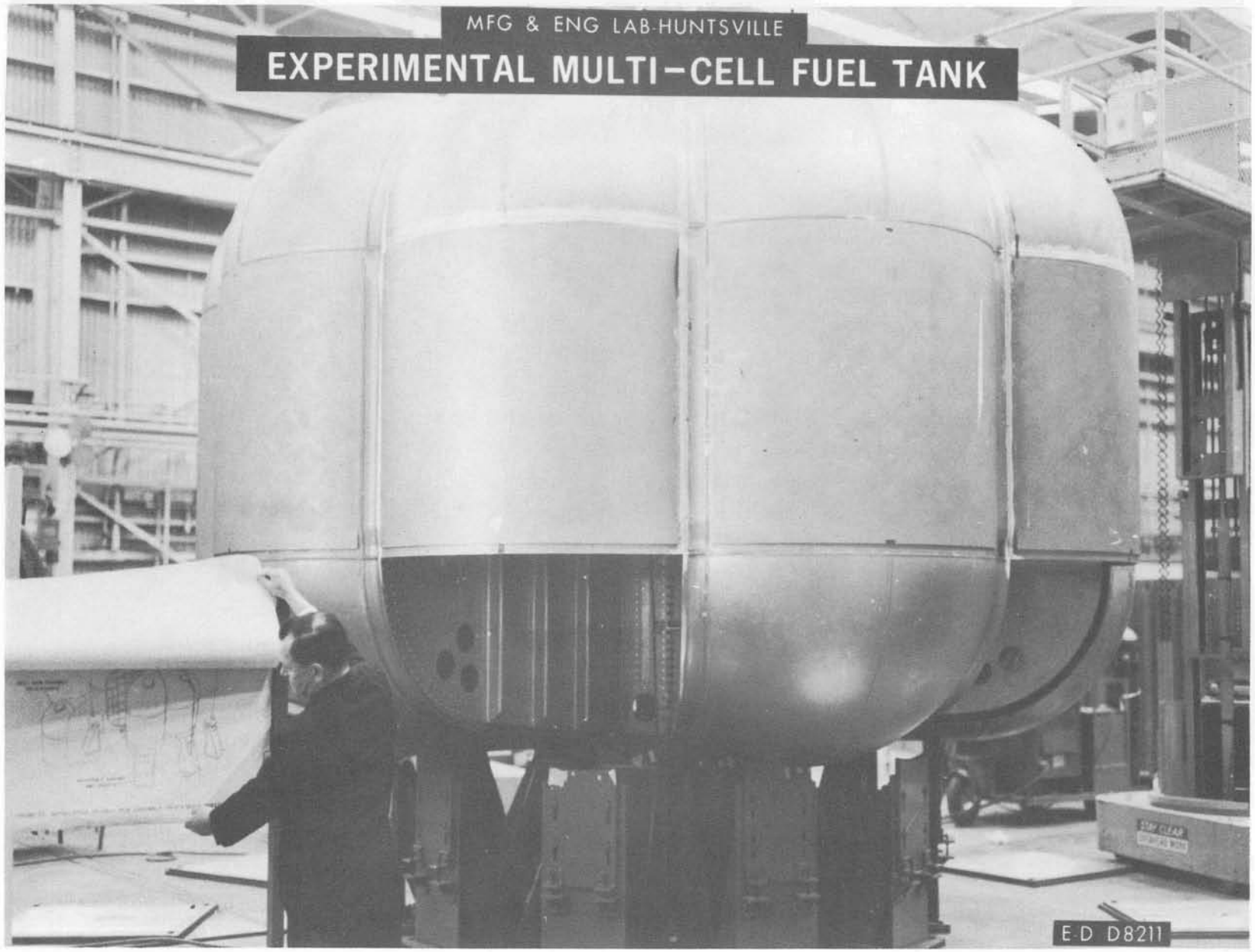

P & VE LAB-HUNTSVILLE
SYNTHESIS OF NEW ORGANIC POLYMERS
E-D D8508

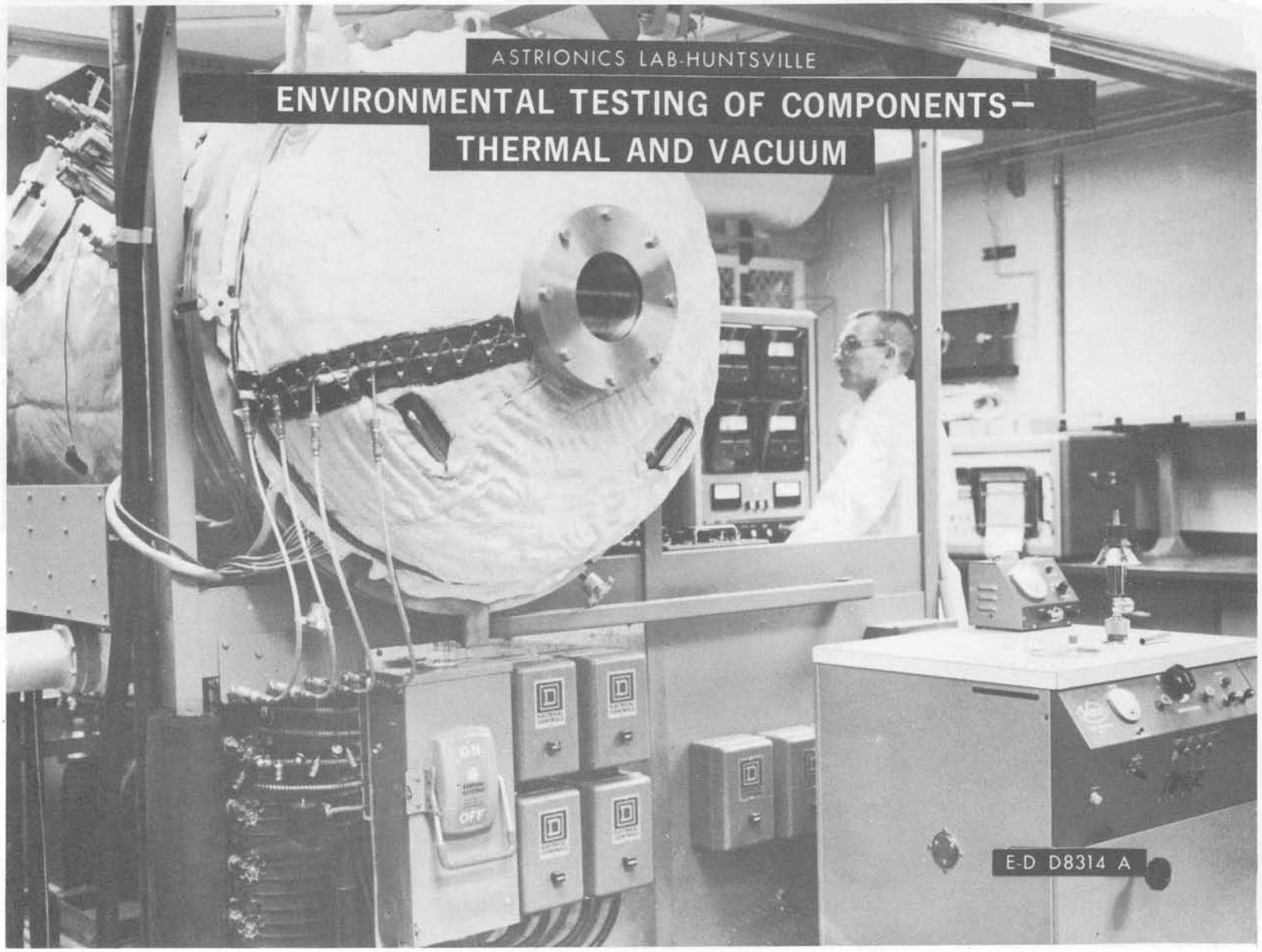

P & VE LAB-HUNTSVILLE
RUBBER & PLASTIC TECHNOLOGY
E-D D8501

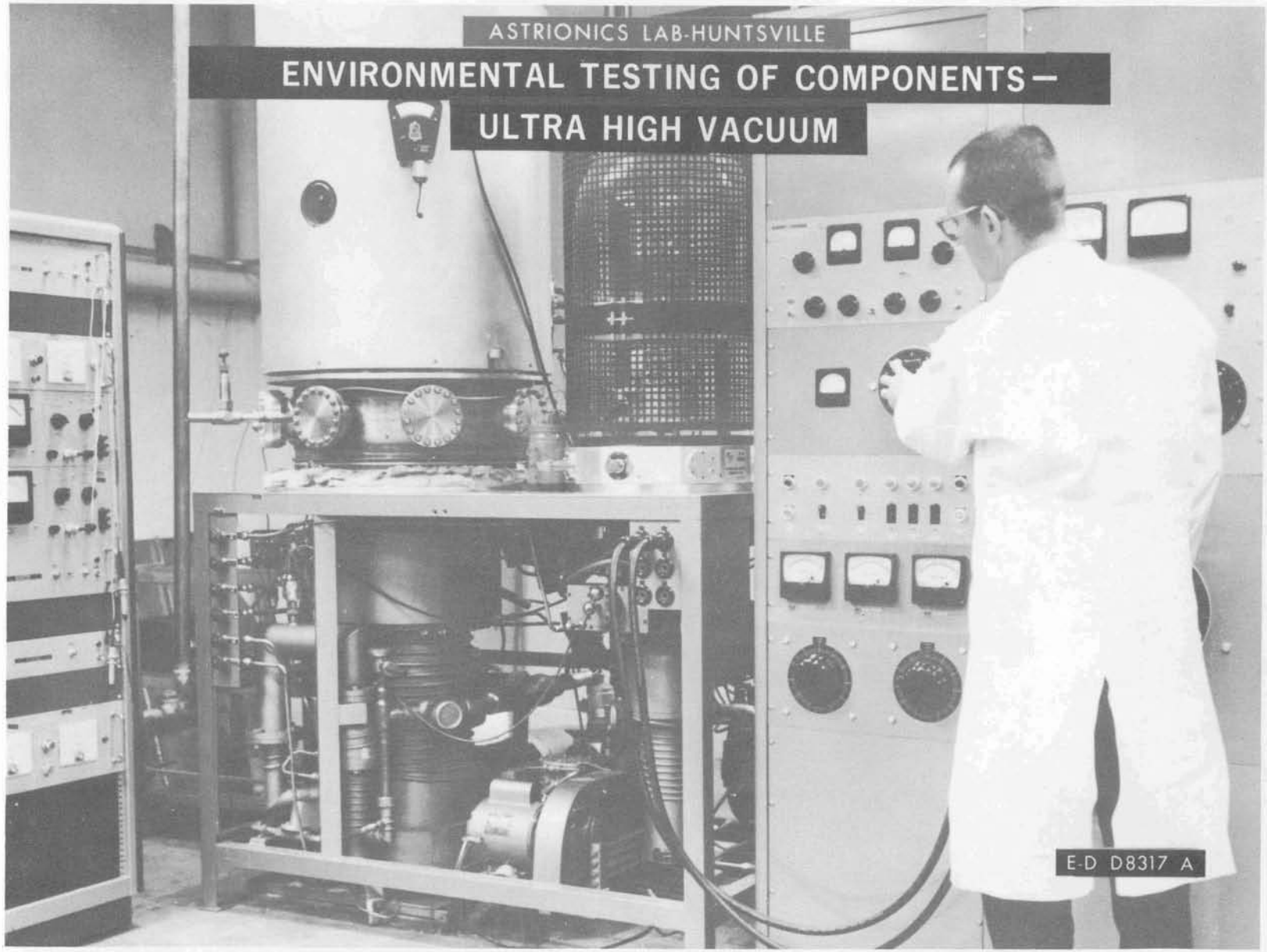

P & VE LAB.-HUNTSVILLE
CALORIMETER CONTROL ROOM
"LOW TEMP. FACILITY"
E-D D8516

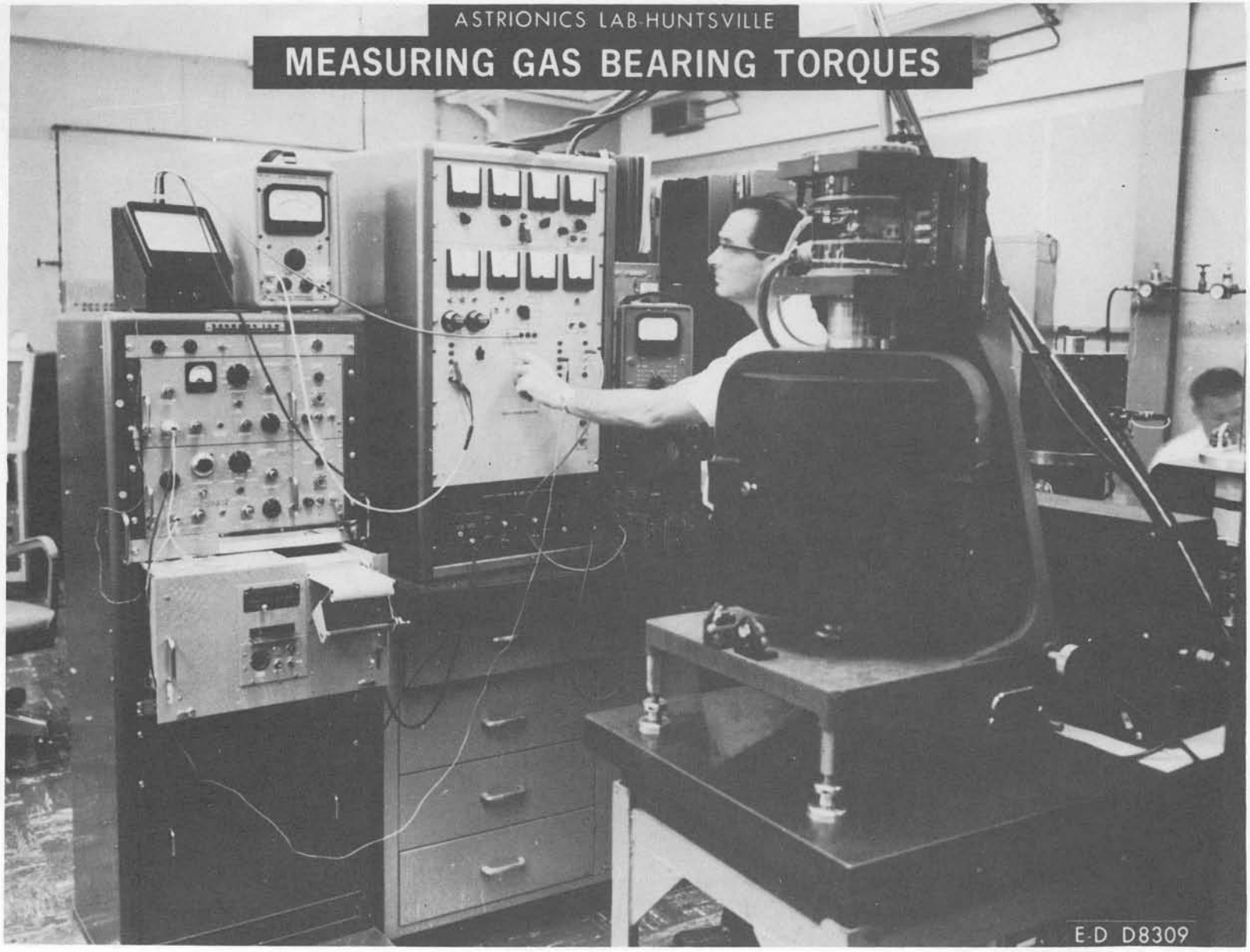

P & VE LAB.-HUNTSVILLE
LIQUEFYING HELIUM
"LOW TEMP. FACILITY"
E-D D8517

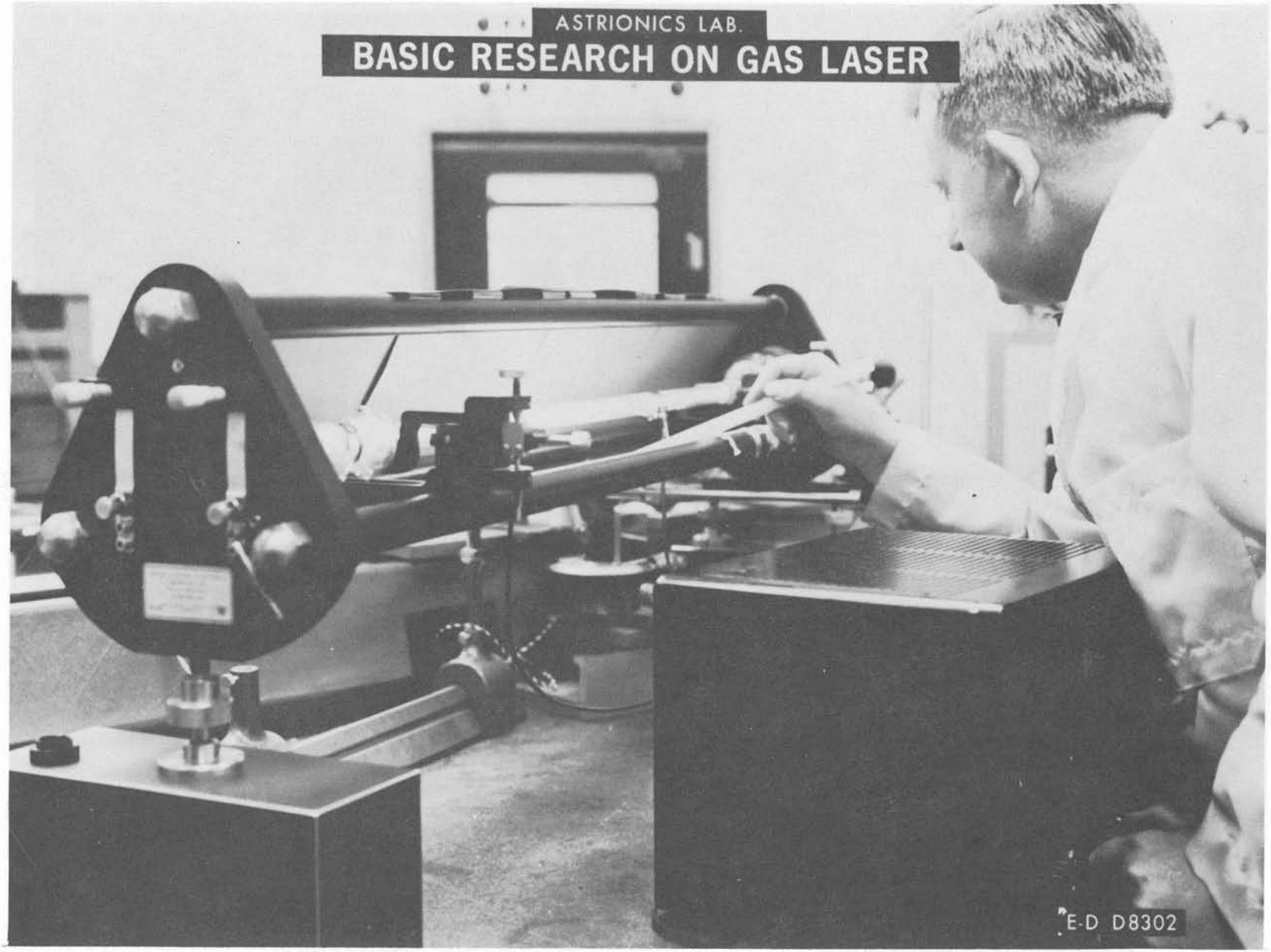

TASK ANALYSIS FACILITY
E-D D6004


MFG & ENG LAB-HUNTSVILLE
EXPERIMENTAL MULTI-CELL FUEL TANK
E-D D8211

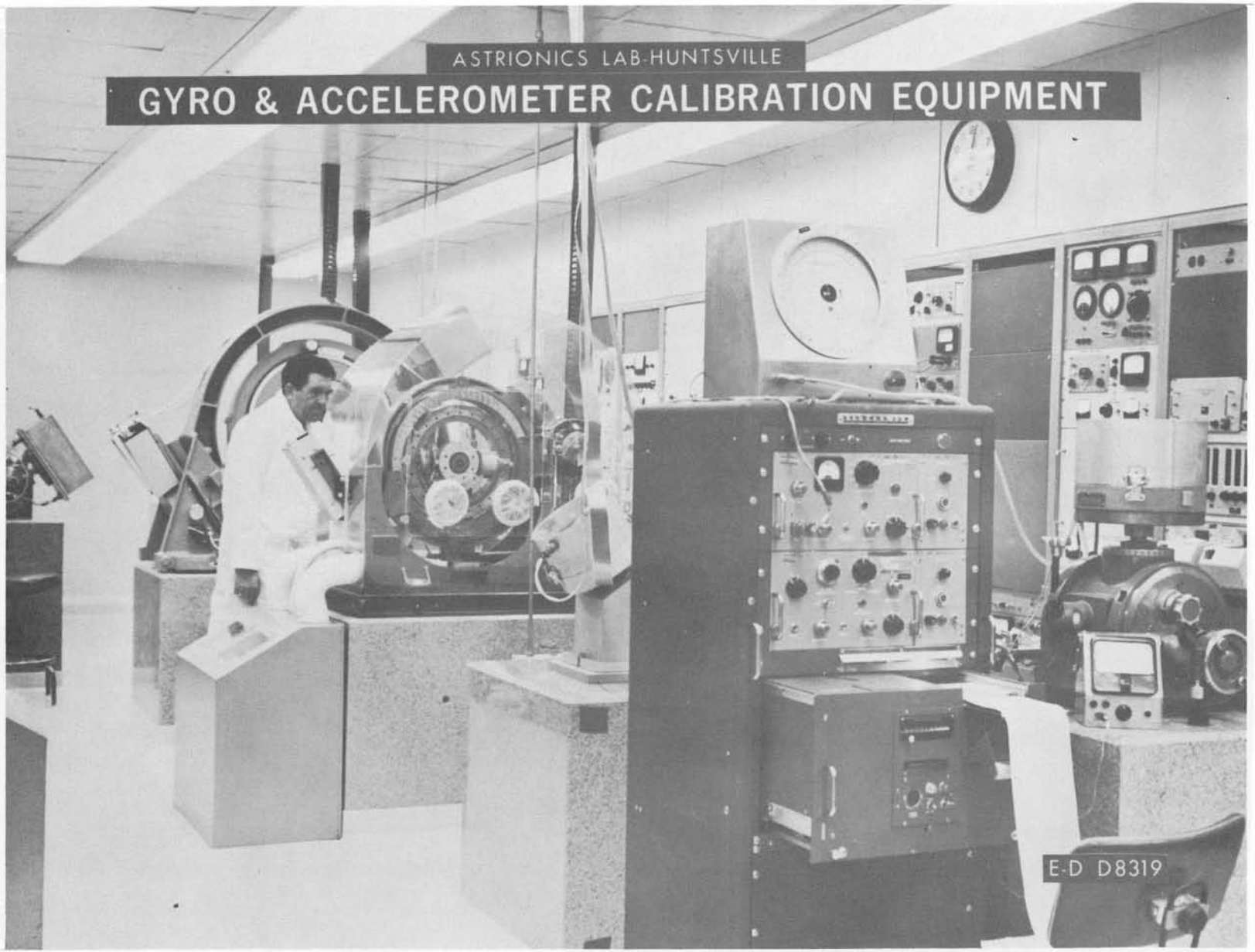

ASTRIONICS LAB-HUNTSVILLE
ENVIRONMENTAL TESTING OF COMPONENTS—
THERMAL AND VACUUM
E-D D8314 A


ASTRIONICS LAB-HUNTSVILLE
ENVIRONMENTAL TESTING OF COMPONENTS—
ULTRA HIGH VACUUM
E-D D8317 A


ASTRIONICS LAB-HUNTSVILLE
MEASURING GAS BEARING TORQUES
E-D D8309


ASTRIONICS LAB.
BASIC RESEARCH ON GAS LASER
E-D D8302

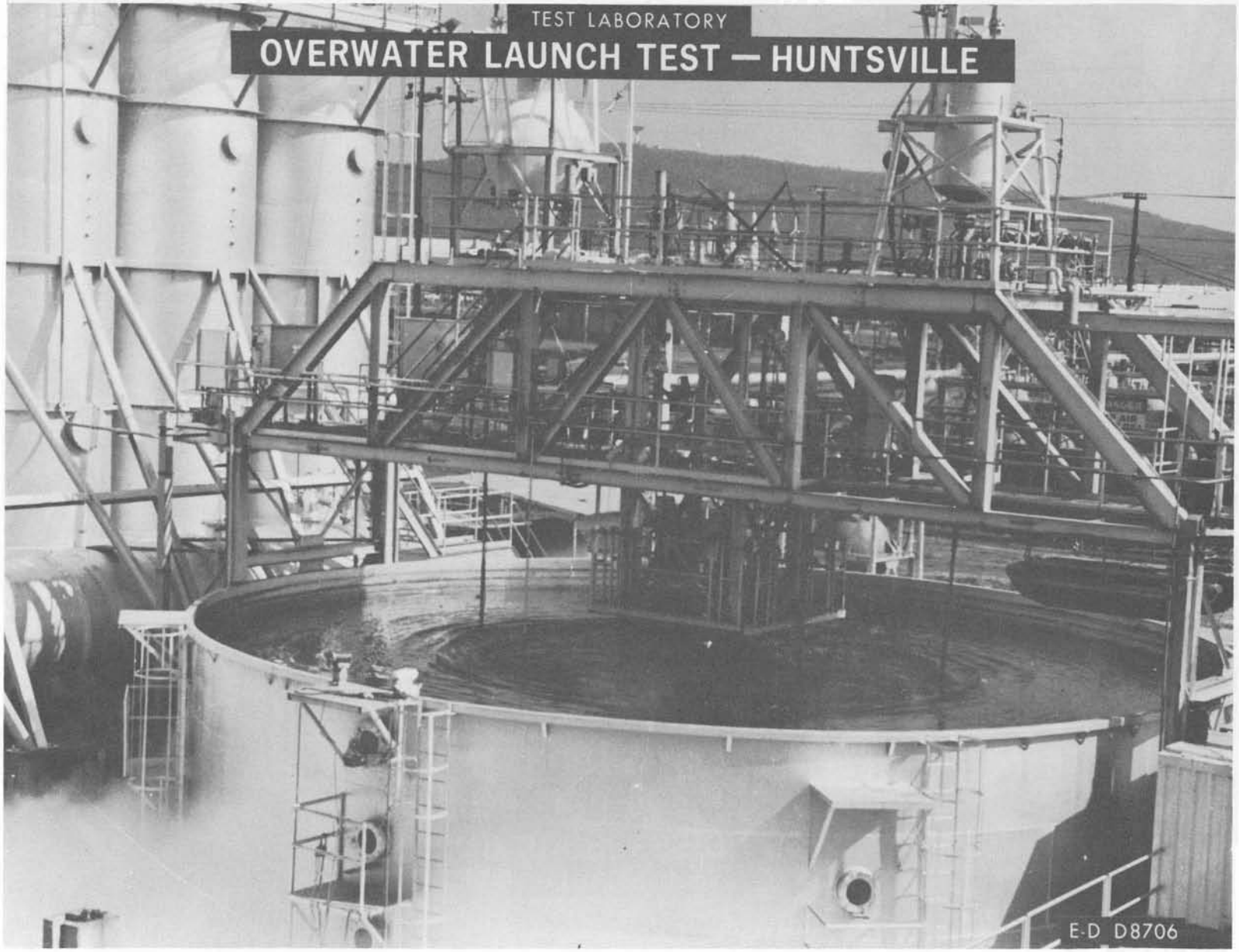

ASTRIONICS LAB-HUNTSVILLE
THREE AXIS GUIDANCE AND CONTROL FLIGHT SIMULATOR
E-D D8324 A


ASTRIONICS LAB-HUNTSVILLE
GYRO & ACCELEROMETER CALIBRATION EQUIPMENT
E-D D8319


QUALITY LAB-HUNTSVILLE
ENVIRONMENTAL SPACE CHAMBER
NRC
NRC
E-D D8610

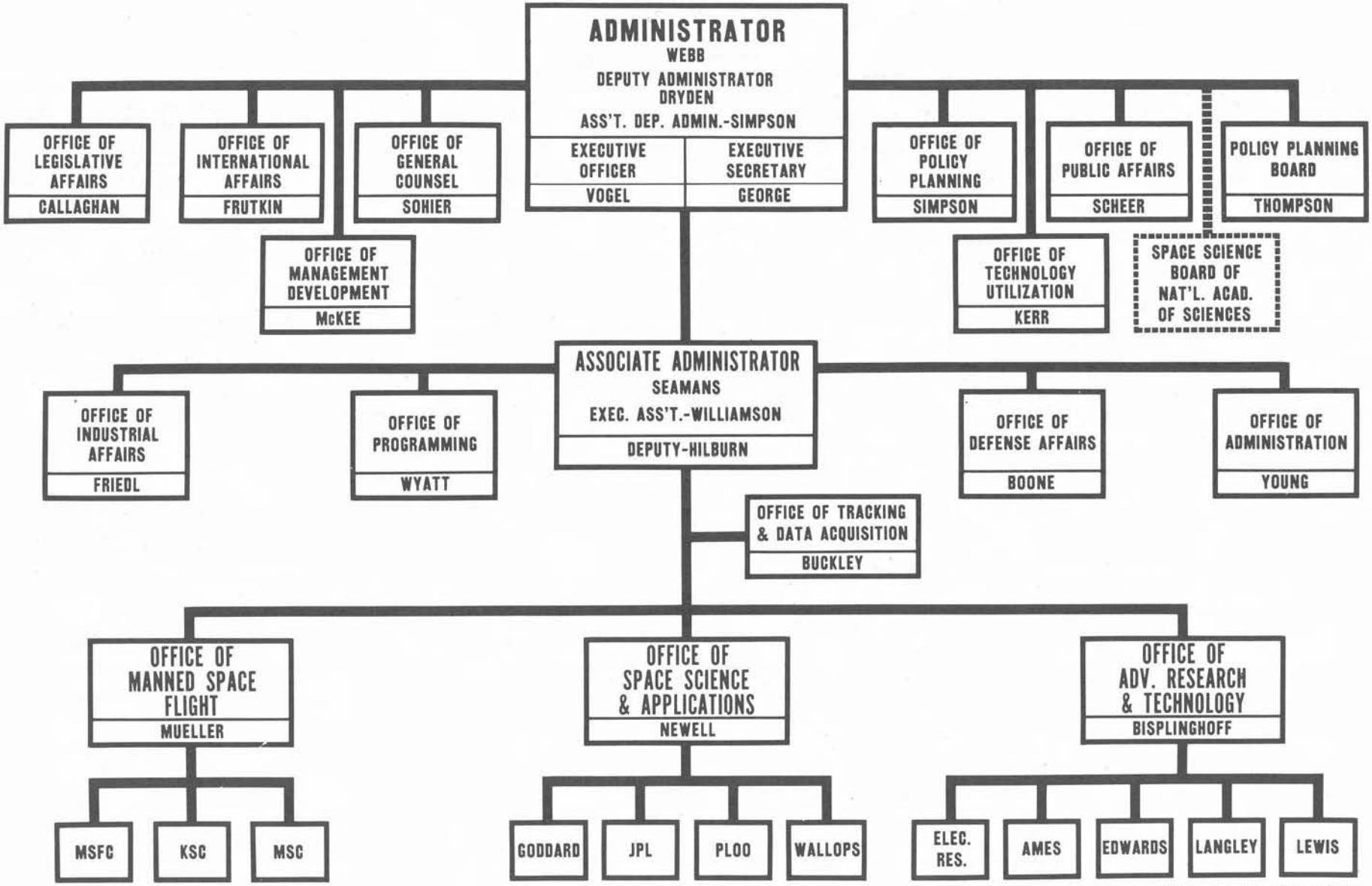

TEST LABORATORY
TESTING 50 lb. STORABLE PROPELLANT
PULSE TYPE ENG.–HUNTSVILLE
E-D D8707


TEST LABORATORY
SOUND SUPPRESSION STUDY
FIRING 5 1:20 SCALE ENGINES
HUNTSVILLE
E-D D8709


TEST LABORATORY
OVERWATER LAUNCH TEST — HUNTSVILLE
E-D D8706

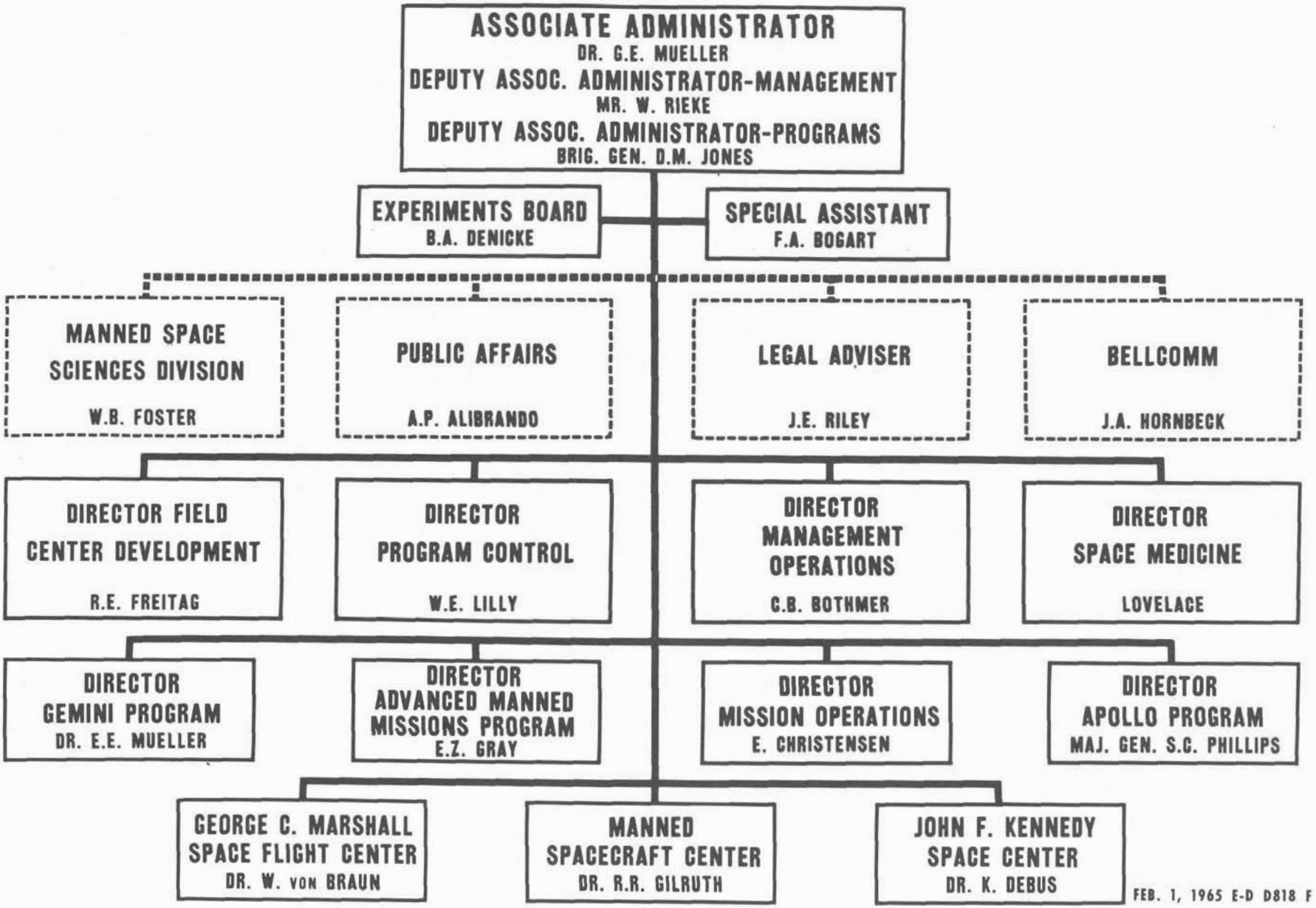
GENERAL

NASA HEADQUARTERS



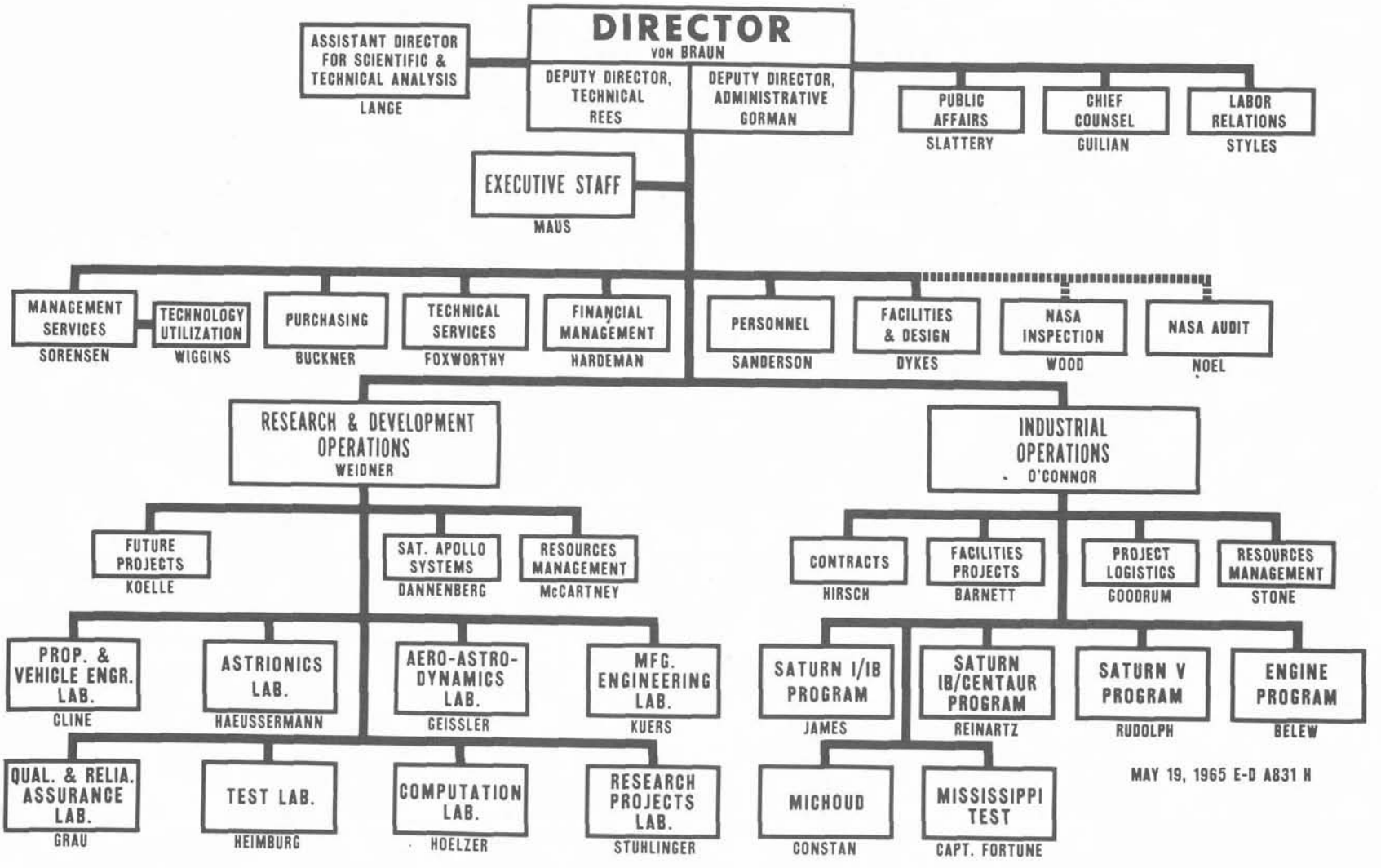
FEB. 1, 1965 E-D B815 G

OFFICE OF MANNED SPACE FLIGHT

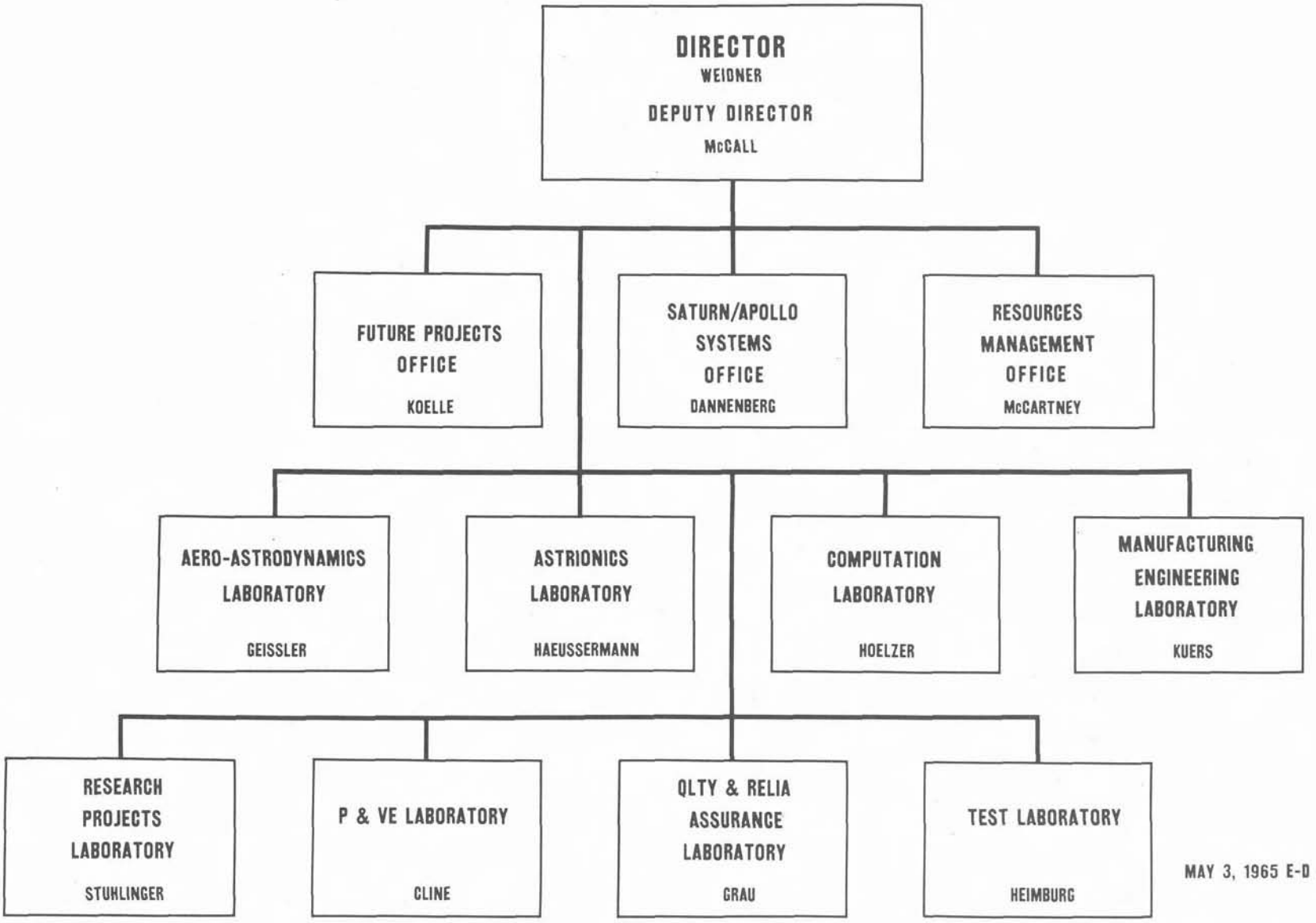


FEB. 1, 1965 E-D D818 F

GEORGE C. MARSHALL SPACE FLIGHT CENTER



RESEARCH AND DEVELOPMENT OPERATIONS



MAY 3, 1965 E-D A853 C

RESEARCH AND DEVELOPMENT OPERATIONS

PRIMARY MISSION:

TO PROVIDE NASA WITH ITS PRIMARY IN-HOUSE TECHNICAL CAPABILITY TO BE USED IN THE CONDUCT OF:

- MAJOR LAUNCH VEHICLE DEVELOPMENT PROGRAMS.
- ADVANCED LAUNCH VEHICLES AND SPACE FLIGHT SYSTEMS PROGRAMS.
- SUPPORTING RESEARCH AND TECHNOLOGY PROGRAMS.

RESEARCH AND DEVELOPMENT OPERATIONS
R&D FUNDING, FY 65
(IN THOUSANDS OF DOLLARS)

MISSION	FUNDING SOURCE	PROGRAM	AMOUNT
LAUNCH VEHICLE DEVELOPMENT $181,797	MANNED SPACE FLIGHT	SATURN I	$ 14,700
		SATURN IB	34,629
		SATURN V	131,623
		ENGINE DEVELOPMENT	845
ADVANCED PROGRAMS $5,620	MANNED SPACE FLIGHT	ADVANCED STUDIES	$ 5,400
	ADVANCED RESEARCH & TECHNOLOGY	HUMAN FACTORS SYSTEMS	220
SUPPORTING RESEARCH & TECHNOLOGY $35,434	MANNED SPACE FLIGHT $18,000	APOLLO SUPPORTING DEVELOPMENT	$ 11,500
		ADVANCED MANNED MISSIONS SUPPORTING DEVELOPMENT	6,500
	SPACE SCIENCE & APPLICATIONS $ 828	GEOPHYSICS AND ASTRONOMY	$ 20
		LUNAR AND PLANETARY EXPLORATION	535
		METEOROLOGICAL SYSTEMS	120
		LAUNCH VEHICLE DEVELOPMENT	153
	ADVANCED RESEARCH & TECHNOLOGY $14,606	RESEARCH PROGRAM	$ 916
		SPACE VEHICLE SYSTEMS	3,054
		ELECTRONICS SYSTEMS	3,469
		NUCLEAR ELECTRIC SYSTEMS	290
		NUCLEAR ROCKET SYSTEMS	800
		NUCLEAR ROCKET PROPULSION	485
		CHEMICAL PROPULSION	3,000
		SPACE POWER	2,000
		SOLID PROPELLANT MOTORS	592
	OT & DA	TRACKING AND DATA ACQUISITION	$ 2,000

TOTAL	$222,851

R-RM APRIL 1, 1965 E-D W 691 E

RESEARCH AND DEVELOPMENT OPERATIONS

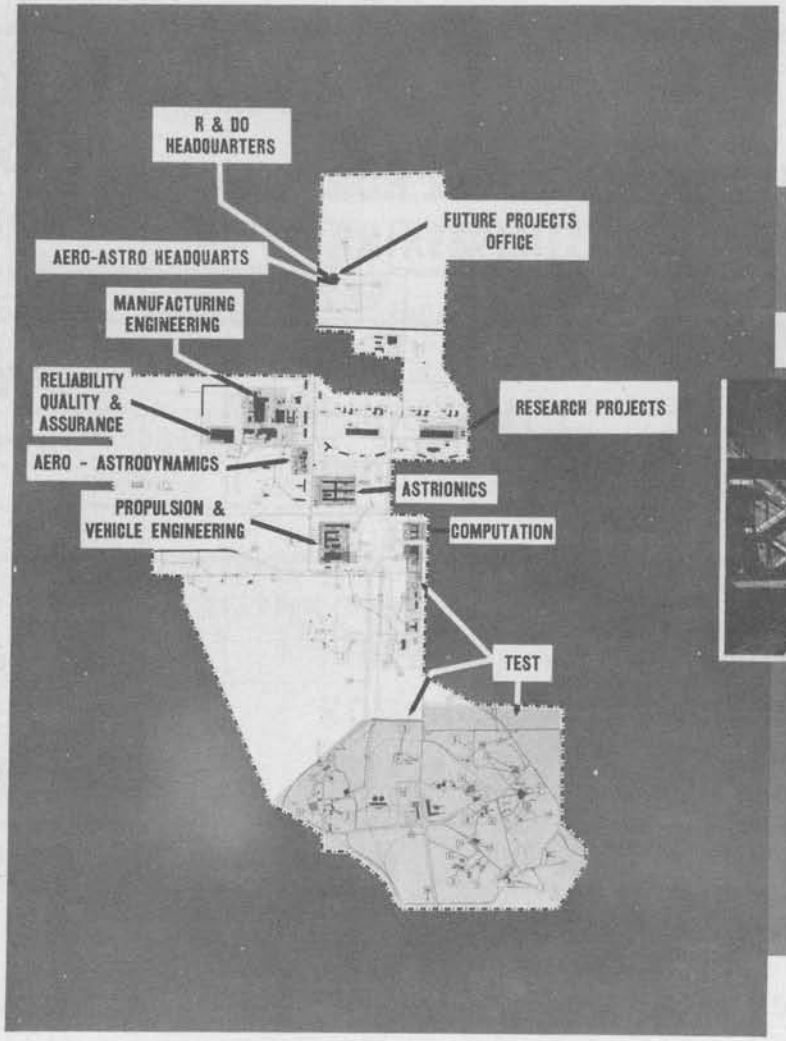
CURRENT R&D CONTRACTS BY MISSION

IN THOUSANDS OF DOLLARS

(CONTRACTS OVER $100,000-INCLUDES PRESENT AND PRIOR FY FUNDING)

MISSION	TYPE OF CONTRACTOR	NO.	VALUE
LAUNCH VEHICLE DEVELOPMENT	UNIVERSITIES	3	$ 492
	NON-PROFIT ORGANIZATIONS	3	814
	INDUSTRY	176	200,468
	TOTAL	182	201,773
ADVANCED PROGRAMS	INDUSTRY	22	6,804
	UNIVERSITIES	1	$ 170
	TOTAL	23	6,974
SUPPORTING RESEARCH & TECHNOLOGY	UNIVERSITIES	4	$ 975
	NON-PROFIT ORGANIZATIONS	6	1,539
	INDUSTRY	73	23,280
	TOTAL	83	$ 25,794
	TOTAL	288	$ 234,541

RESEARCH AND DEVELOPMENT OPERATIONS FACILITIES



REAL PROPERTY & CAPITAL EQUIPMENT 155 MILLION
CONSTRUCTION & PLANNED THRU FY-65 93 MILLION

HIC BUILDING

GREEN MOUNTAIN

E-D A480-162 A

DISTRIBUTION:

NASA Hq-MC	K. Grimm (3)	I-V-DIR	Dr. Rudolph
-MC	B. Moore	I-V-DIR	Dr. Mrazek
-MP-R	P.L. Robinson (2)	I-V-DIR	J. Bramlet
-MS	C.B. Bothmer	I-V-M	E. Bullington
MAR-R	W.J. Willoughby	I-V-DIR	Col. Yarchin
MSC-AAO	R.L. Magin (3)	I-V-P	B.H. Sneed
MAT	J. Disher	I-V-IU	F. Duerr
MSC-ASTD	C. Covington	I-V-SIC	M. Urlaub
MAT	T.J. Ryan	I-V-SIC	H. Hallisey
MSC-RL	W. Davidson (1)	I-V-SII	E.W. Neubert
KSC-K-P	J.P. Robertson (2)	I-V-P	S. Johnston
MSC-EA3	R.B. Merrifield	S-V-IVB	R.E. Godfrey
KSC-K-GT45	A. L. Lavender (2)	I-E	H. Haenisch (2)
NASA-MC	R.W. Thompson	I-E-F	S. Morea
DIR	Dr. von Braun	I-E	L. Belew
DIR	J. Shepherd	I-E-M	P. Watson
DEP-T	Dr. Rees	I-E-J	F. Drummond
DEP-A	H. Gorman	I-E-P	J. Moore
DEP-A	D. Newby	I-E-D	W. Brown
DEP-A	M. Kent	I-E	J. Jackson
DEP-A	C. Huth	I-E-H	T.P. Smith
E-DIR	H. Maus	I-E	J. Thomas
E-DIR	J. Foster	I-E-R	R. Stewart
AST-P	W. Davis	I-E	A. Steinberg
AST-S	Dr. Lange	I-FP-Ch	J. Barnett
I-DIR	Gen. O'Connor	I-FP-E	C.A. Bauer
I-SC-Mgr	S.R. Reinartz	I-FP-P	B.R. Fleming
I-SC-Mgr	J.C. Swearingen	I-FP-I	V.L. Looney
I-SC-M	J. Dew	I-FP-PC	F.N. Willingham
I-I/IB-DIR	Col. James	I-FP-SI	H.P. Lloyd (4)
I-I/IB-M	E.S. Gober	I-FP-SV	A.V. Daly
I-I/IB	M. Johnson	I-FP-S	C. Webb
I-I/IB-SI	A.W. Thompson	I-PL-M	W.L, Kennedy
I-I/IB-SIV	W.A. Ferguson	I-PL-J	H.B. Floyd
I-I/IB-SIVB	J.C. McCulloch	I-PL-P	R.D. Walker (2)
I-I/IB-G	P. Dunlap	I-PL-T	C.O. DeNeen
I-I/IB	Dr. Johnson	I-PL-Ch	J. Goodrum
I-I/IB	W.K. Simmons	I-RM-Ch	J. Stone
I-I/IB	W.C. Cooper	I-RM-P	C. Williams
I-I/IB	J.P. Bates	I-RM-D	J. Daniels (6)
I-I/IB	J.E. Fikes	I-CO-Ch	Col. Hirsch
I-I/IB	F.E. Vreuls	I-MT-Mgr	J. Balch

DISTRIBUTION: (cont)

I-MT-Mgr	H. Auter	R-RP-DIR	Dr. Stuhlinger
I-MT-R	M. Sanders	R-RP-Dir	W. Cannon
I-MT-I	M. Herring	R-RP-C	J.A. Mathis
I-MICH-Mgr	G. Constan	R-RP-J	J.A. Downey
I-MICH-Mgr	J. Stamy	R-RP-N	Dr. Shelton
I-MICH-R	J. Funkhouser	R-RP-P	Dr. Dozier
I-MICH-P	A.O. Frye	R-RP-R	C.G. Miles
F&D-Ch	G.W. Dykes (3)	R-RP-R	D. Arnold
F&D-P	J.R. Lada	R-RP-T	G.B. Heller
F&D-Ch	H.A. Schulze	R-RP-X	E.W. Urban
F&D-P	H. Luehrsen	R-RM	W.F. McCartney
F&D-R	G.H. Wade	R-RM	P. Read
F&D-Ch	P.R. Boyden	R-RM-O	E. Harper
F&D-ED	R.A. Ramsey	R-RM-O	W. Bush
F&D-EC	J.C. Horn	R-AERO-DIR	Dr. Geissler
F&D-S	E.J. Kramer	R-AERO-DIR	O.C. Jean
F&D-MP	A. LaBathe	R-AERO-G	N. Braud
F&D-RR	H.F. Hope	R-AERO-S	P.J. deFries
TS-Ch	D.E. Foxworthy	R-AERO-DAP	J. Cremin
TS-P	S.H. Hobbs	R-AERO-T	Dr. Liu
TS-P	H. Dixon	R-AERO-T	H.I. Murphree
MS-Ch	V.C. Sorensen	R-AERO-R	R.O. Butler
MS-G	C. Loveless	R-AERO-E	Dr. Speer
MS-G	G.W. deBeek	R-ASTR-DIR	Dr. Haeussermann
MS-I	I. Remer	R-ASTR-DIR	H. Kroeger
MS-H	D.S. Akens (2)	R-ASTR-DIR	J. Chase
PER-Ch	A.E. Sanderson	R-ASTR-T	F. Brandner
PER-W	K.M. Lyle	R-ASTR-R	J. Taylor
PER-P	W. Vassil	R-ASTR-M	J. Boehm
PR-Ch	G.G. Buckner	R-ASTR-GST	T. Bolton
FIN-Ch	T.U. Hardeman	R-ASTR-F	H. Hosenthien
FIN-B	L.E. Snyder	R-ASTR-I	O. Hoberg
FIN-D	J.E. Sharkey	R-ASTR-S	L. Richard
M-SSVH	Lt. Col. Newman (2)	R-ASTR-I	J. Powell
R-SA-DIR	K.K. Dannenberg	R-ASTR-N	F. Moore
R-SA	Dr. Kuettner	R-ASTR-DIR	W. Horton
R-SA	Dr. Farish	R-ASTR-A	F. Digesu
R-SA	H.R. Ludewig	R-ASTR-N	H. Fichtner
R-SA	J. Klima	R-ASTR-P	W. Angele
R-SA	E. Butler	R-ASTR-ZS	H. Cordes
R-SA	E.W. King	R-ASTR-G	C. Mandel

DISTRIBUTION (cont)

R-ASTR-U	F. Weber
R-ASTR-M	R.D. Kruidenier
R-COMP-DIR	Dr. Hoelzer
R-COMP-M	R.L. Wesson
R-COMP-M	F. Oliver
R-COMP-A	W.H. Fortenberry
R-COMP-R	C. Prince
R-COMP-D	J.T. Felder
R-FP-DIR	F. Williams
R-FP-DIR	Dr. Ruppe
R-FP	F.P. Huber
R-FP	L.T. Spears
R-FP	G.R. Woodcock
R-FP	W.J. Carter
R-FP	C. Rutland
R-FP	H.G. Hamby
R-FP	V. Gradecak
R-FP	R. Goss
R-ME-DIR	W.R. Kuers
R-ME-ME	R. Schwinghamer
R-ME-A	M.E. Novak
R-ME-P	W.R. Potter
R-ME-R	D.T. Walters
R-ME-M	J.P. Orr
R-ME-D	O.K. Eisenhardt
R-ME-T	W.J. Franklin
R-ME-U	H. Lienau
R-ME-I	C.A. Swanson
R-ME-R	N.C. Milwee
R-P&VE-DIR	F. B. Cline
R-P&VE-DIR	H.R. Palaoro
R-P&VE-US	W. Schulze
R-P&VE-DIR	E.A. Hellebrand
R-P&VE-A	E.E. G oerner
R-P&VE-VMH	A.P. Warren
R-P&VE-AL	S.A. Johns
R-P&VE-M	Dr. Lucas
R-P&VE-M	W. Riehl
R-P&VE-P	H.G. Paul
R-P&VE-S	G.A. Kroll
R-P&VE-D	J.O. Aberg
R-P&VE-RP	E. Brizendine
R-P&VE-XJ	R.F. Griner
R-P&VE-R	C.J. Rieger
R-QUAL-DIR	D. Grau
R-QUAL-O	F.M. Sittason
R-QUAL-DIR	W. Tiller
R-QUAL-AA	R.G. Penny
R-QUAL-J	E.K. Klauss
R-QUAL-OCP	B. Krone
R-QUAL-A	R.M. Henritze
R-QUAL-Q	M. Dyer
R-QUAL-Q	W.L. Brien
R-QUAL-QET	P.B. Schuman
R-QUAL-P	C.O. Brooks
R-QUAL-R	S.E. Smith
R-TEST-DIR	K.L. Heimburg
R-TEST-DIR	B.R. Tessman
R-TEST-DIR	C.W. Mitchell
R-TEST-DIR	W.E. Marsalis
R-TEST-R	K.A. Hill
R-TEST-C	W.L. Grafton
R-TEST-I	Dr. Sieber
R-TEST-S	D.H. Driscoll
R-TEST-A	W. Dodd
R-TEST-M	T.E. Edwards
R-LVO-L	M.C. Williams (7)
R-LVO	J. Cobb
CR	Col. Fellows
PA	B.J. Slattery
PA	V. Smith
PA	E.O. Buckbee
E-DIR	S. Heim
E-DIR-Adm	B. Crider
E-DIR	F.E. Evans
E-P	R. Gunner
E-T	J.A. Bethay
E-S	T.H. Smith
E-D	R.A. Kline
E-A	J.H. Reed
E-R	E.D. Messer
E-R	B.E. Abbott
E-R	R.O. Sparks
E-D	H.A. Benner
E-D	A.B. Tockley
E-D	S. Anderson
E-S	S. Heim

DISTRIBUTION (Cont)

MSFC Resident Managers:

W.K. Gengelbach (4)
R.J. Neuber
H.H. Stevenson
W.E. Johnson
J.C. Bostwick
Col. B. Montgomery
L. Powell
Col. Hall
Ed Weaver
Steve Tyson
A.S. Lyman