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VANDENBERG AIR FORCE BASE
PAD 75-1-1 .

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Prepared by
SYSTEMS OPERATIONS PLANNING
61-31
SATELLITE SYSTEMS OPERATIONS

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LOCKHEED MISSILES & SPACE COMPANY

FOREWORD

The Preliminary Countdown Manual for VAFB Pad 75-1-1 has been prepared and published by Lockheed Missiles and Space Company under AF Contract AF 04(647)-592. This document has been prepared in collaboration with members of the NASA Program Flight Test Working Group and the Canadian Defense Research Telecommunications Establishment.

This is a preliminary document. The final launch countdown manual will be published ~~by LMSC (VAFB)~~ under the direction of the NASA Program Flight Test Working Group.

CONTENTS

ILLUSTRATIONS

TABLES

GENERAL INFORMATION

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PERSONNEL

Symbol	Title
BTL/ANT	BTL Antenna Operator
BTL/CAM	BTL Camera Operator
BTL/GGCO	BTL Ground Guidance Console Operator
BTL/MON	BTL Monitor Console
BTL/RA	BTL Radar Operator
BTL/RCO	BTL RIME Checkout Operator
BTL/RNG	BTL Range Console Operator
CCO	Camera Console Operator
CSO	Complex Safety Officer
CST	Complex Safety Technician
D/BE	Douglas Blockhouse Electrical Technician
D/EET	Douglas Electrical Equipment Trailer
D/FC	Douglas Facilities (Fuel Counter) Console
D/GEA	Douglas Ground Equipment Advisor
D/GSE	Douglas Ground Support Electronics Advisor
D/HL	Douglas High Lift
D/IEA	Douglas Instrumentation Electronics Advisor
D/I&F	Douglas Instrumentation and Facilities Console
D/INSP	Douglas Inspection
D/LCDR	Douglas Launch Conductor
D/LMC	Douglas Launch Monitor Console
D/MA	Douglas Mechanical Section Advisor
D/MECH	Douglas Mechanical Technician
D/PC	Douglas Pad Control
D/PE	Douglas Pad Electrical Technician
D/PA	Douglas Propulsion Advisor
D/PPE	Douglas Pad Propulsion Engineer

PERSONNEL (Continued)

Symbol	Title
D/PROJ	Douglas Project Engineer
D/PT	Douglas Pad Talker
D/SAFE	Douglas Safety Engineer
GG/COMP	Ground Guidance Computer Operator
L/AS	Lockheed Acid Set
L/BE	Lockheed Blockhouse Electrician
L/DO	Lockheed Documentation
L/EC	Lockheed Electrical Console
L/ET	Lockheed Electrical Trailer
L/ET-C	Lockheed Electrical Trailer - Subsystem C
L/ET-D	Lockheed Electrical Trailer - Subsystem D
L/ET-H	Lockheed Electrical Trailer - Subsystem H
L/FS	Lockheed Fuel Set
L/GC-A	Lockheed Guidance Console - A
L/GC-B	Lockheed Guidance Console - B (Recorder)
L/AGE-A	Lockheed AGE Advisor
L/LC	Lockheed Launch Console
L/LCC	Lockheed Launch Coordinator Console
L/LCDR	Lockheed Launch Conductor
L/MAB	Lockheed Missile Assembly Building
L/PC	Lockheed Pad Chief
L/PP-A	Lockheed Propulsion Advisor
L/PPC	Lockheed Propellant Console
L/PNC	Lockheed Pneumatic Console
L/PNS	Lockheed Pneumatic Set
L/RC	Lockheed Recorder Console
L/RFC	Lockheed RF Console
L/SAFE	Lockheed Safety Engineer
L/T	Lockheed Technician

PERSONNEL (Continued)

Symbol	Title
L/TMC	Lockheed Telemetry Monitor Console
L/TRACK	Lockheed Tracking Station
PMR/TRACK	Pacific Missile Range Tracking Station
MFSO	Missile Flight Safety Officer
N/LOCC	NASA Launch Operations Control Center
N/TD	NASA Test Director
N/SC	NASA Spacecraft Coordinator
N/SLC	NASA Spacecraft Launch Conductor
N/LTM	NASA Laboratory Telemetry Station
N/MAB	NASA Missile Assembly Building
N/MD	NASA Mission Director
N/PM	NASA Project Manager
N/RUEB	NASA Range Users Engineering Building
OCM	Operations and Control Monitor
O&C	Operations and Control Console
RFCO	Range Facility Control Officer
R/NAAR	Rocketdyne NAA Representative
SSD/LC	Air Force Space Systems Division Launch Controller
TKR	Talker
TRO	Tape Recorder Operator
VCC	Vandenberg Control Center
WOB	Blockhouse Weather Observer

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GLOSSARY

A	Amber Light
AC	Alternating Current
ACCEL	Accelerometer
ADJ	Adjust
AFSSD	Air Force Space Systems Division
AGC	Automatic Gain Control
AMPL	Amplifier
APPROX	Approximately
APS	Auxiliary Power Supply
AUTO	Automatic
AUX	Auxiliary
BAT	Battery
BECO	Booster Engine Cutoff
BE	Booster Engine
BKHS	Blockhouse
BLDG	Building
CALIB	Calibration
C/O	Checkout
CH	Channel
CK	Check
CKTBKR	Circuit Breaker
COMP	Compartment
CONN	Connection
CYL	Cylinder
DC	Direct Current
DISP	Displacement
DIST	Distributor
ELEC	Electric

GLOSSARY (Continued)

EMER	Emergency
ENG	Engine
EQUIP	Equipment
EXT	External
^{o}F	Degrees Fahrenheit
FCS	Flight Control System
FM/FM	Frequency Modulation
FIL	Filament
FIN	Finish
FREQ	Frequency
G	Green Light
GEN	Generator
GN_2	Nitrogen (Gaseous)
GO_2	Oxygen (Gaseous)
GRND	Ground
GUID	Guidance
HE	Helium
H/S	Horizon Sensor
HTR	Heater
HYD	Hydraulic
IGN	Igniter
IGN DET	Ignition Detector
IF	Intermediate Frequency
IN	Inch
INST	Instrumentation
INT	Internal
INTG	Integrator
Lb	Pounds
LN_2	Liquid Nitrogen
LMT	Launch Mount
LOD	Launch Operations Directorate
LO_2	Oxygen (Liquid)

GLOSSARY (Continued)

LRP	Limited Radiation Period - That Period When All Radiation Equipment, With an Average of 10KW, or Peak Power of 250KW or Higher, Will be Off or Beamed Away From The Launch Emplacement
LT	Light
MAX	Maximum
MFSO	Missile Flight Safety Officer
MIN	Minimum or Minutes
MM	Millimeter
MOD	Model
MON	Monitor
MSL	Missile
MV	Millivolt
NEG	Negative
NTSO	NASA Test Support Office
N_2	Nitrogen Gas
OBS	Observer
OSC	Oscillograph
PAM	Pulse Amplitude Modulation
PA	Public Address
P&E	Propellants and Explosives
PCU	Pressurization Control Unit
PLCM	Propellant Loading Control Monitor
PLCU	Propellant Loading Control Unit
PNEU	Pneumatic
PNL	Panel
POS	Position
POT	Potentiometer
PREP	Preparation
PRESS	Pressure
PROG	Program
PROP	Propulsion
PSI	Pounds Per Square Inch

GLOSSARY (Continued)

PSIG	Pounds Per Square Inch Gage
PSIA	Pounds Per Square Inch Absolute
PSD	Pad Safety Officer
PWR	Power
PYR	Pitch-Yaw-Roll
QUAD	Quadrant
R	Red Light
REG	Regulator
RDY	Ready
RECT	Rectifiers
REF	Reference
REG	Regulated
RF	Radio Frequency
RS	Range Safety
RSC	Range Safety Command
RX	Receiver
S&A	Safe & Arm
SEC	Second
SEL	Selector
SEQ	Sequence
SIG	Signal
SPC	Stored Program Command
SPS	Secondary Propulsion System
STOR	Storage
SW	Switch
SYS	System
TC	Test Conductor
TEMP	Temperature
TLM	Telemetry
TLR	Trailer
TP	Test Panel
TS	Test Stand

GLOSSARY (Continued)

TU	Transfer Unit
TV	Television
TX	Transmitter
UHF	Ultra High Frequency
UNREG	Unregulative
V	Volt
VCO	Voltage Controlled Oscillator
VERLORT	Very Long Range Tracking
VHF	Very High Frequency
VLV	Valve
ΔV	Velocity To Be Gained
W	White Light
Y	Yellow Light

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COMPLEX LIGHTS

1. GREEN: All Clear. Smoking in authorized areas only.
2. AMBER: Approach with caution, only those personnel required for current operation permitted in affected area. Smoking in authorized areas only.
3. STEADY RED: Hazardous test underway. All personnel clear area immediately. No smoking in area denoted by red light, road blocks set up. Re-entry into test area only on approval of pad safety officer.

NOTE 1. The warning light at the blockhouse will display the most severe condition existing at any of the complex areas, test stand, LO_2 area, or fuel area.

NOTE 2. Personnel not assigned to the complex, entering the area in any but a green condition must check in with the test conductor or assistant, or the stand talker.

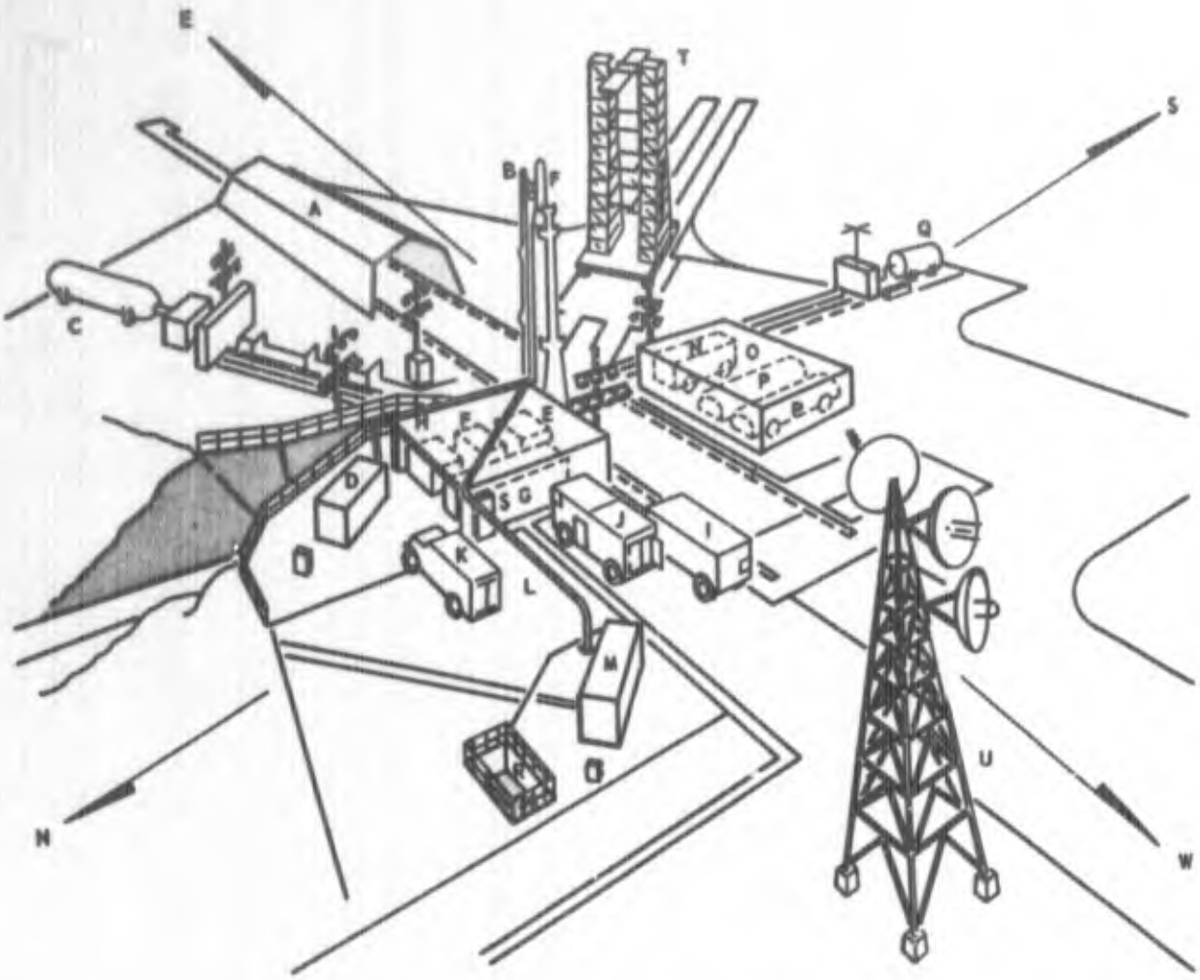
4. FLASHING RED: Emergency evacuation.

COMPLEX SIREN

1. CONTINUOUS: Emergency evacuation
2. ONE 3-SECOND BLAST: Test starting in 10 minutes
3. THREE 1-SECOND BLASTS: Immediate test

COMPLEX RADIATION

1. LIMITED RADIATION PERIOD (LRD): 10 kw average power or 250 kw peak power beamed at pad



LAUNCH PAD I OF COMPLEX 75-1 VAFB

GENERAL ARRANGEMENT

A. SHELTER
B. UMBILICAL MAST
C. OXYGEN STORAGE (DAC)
D. ACID TRANSFER SET (LMSC)
E. POWER UNIT (DAC)
F. HYDRAULIC UNIT (DAC)
G. ELECTRICAL EQUIPMENT TRAILER (DAC)
H. AIR CONDITIONER (DAC)
I. CHECKOUT TRAILER (DAC)
J. PAD ELECTRICAL TRAILER (LMSC)
K. TYPE 50 A/C (LMSC)
L. LOCATION OF H_2 & FREON TRAILERS (LMSC)
M. FUEL TRANSFER SET (LMSC)
N. HYDRO-PNEUMATIC TRAILER (DAC)
O. HI-PRESS STORAGE TANK (DAC)
P. N_2 CASCADE (DAC)
Q. FUEL TANK (DAC)
R. EXIST VALVE PIT, WATER SYSTEM
S. PNEUMATIC CABINET
T. GANTRY
U. RF ANTENNA TOWER

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Figure A Complex 75-1 Launch Pad

A

Figure B Map of Vandenberg Air Force Base

B

ECHO (A-12) INTEGRATED TASK OUTLINE

Task No.	Task Duration (Minutes) (Countdown Time)	Task	Real-Time Duration (Minutes)
1	400-390	Range Countdown Initiation	10
2	390-375	Battery Charging	15
3	390-330	Agena Electronics Warmup	60
4	390-370	Agena TLM Beacon Check	20
5	390-360	Destruct Checks	30
6	360-320	BTL Checks	40
7	330-270	Agena Guidance and Flight Control Checkout	60
8	270-230	Connect Agena Pyrotechnics and Destruct Initiator	40
9	270-230	Connect DM-21 Destruct	40
10	230-200	Countdown Evaluation	30
11	200-185	Gantry Removal Preparations	15
12	200-185	Agena Test Plug Removal	15
13	200-185	Spacecraft Test Plug Removal	15
14	185-170	Agena RF Antenna Switch Checks	15
15	185-170	Gantry Removal	15
16	170-100	Agena Tanking	70
17	100- 80	Secure Agena Propellant Transfer Sets	20
18	80- 60	Spacecraft Verification	20
19	80- 60	Agena RF Verification	20
20	80- 60	Agena Pressurization	20
21	60- 12	Countdown Evaluation	50
22	12- 0	Terminal Countdown	10
	0	Liftoff	

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ECHO (A-12) MILESTONE COUNTDOWN

Time		Activity
T-400-390	Task 1:	Begin Countdown Initiation Ready for Launch Countdown All Personnel Man Stations
T-390-375	Task 2:	Begin Battery Charging; Complete Approximately T-270 Verify Range Readiness
T-390-330	Task 3:	Begin Agena B Electronics Warmup Perform External Power Checks Perform Telemetry Confidence Checks Perform Guidance and Flight Control Gyro System Setups Perform Gyro Spin Motor Test Agena B Electronics Warmup Complete (Approximately T-330)
T-390-370	Task 4:	Begin Agena B Telemetry and Beacon Checks Telemetry Reception Evaluation Integrated TM System Confidence Checks Agena B Telemetry Checks Complete (Approximately T-370)
T-390-360	Task 5:	Begin Destruct Checks Check Remote Arming System of Range Safety Equipment Destruct Checks Complete (Approximately T-360)
T-360-320	Task 6:	Begin BTL Guidance Phasing and Range RF Checks Perform Range Beacon Interrogation Checks Perform Telemetry Reception Checks with Range Perform BTL Polarity and Phasing Checks BTL Guidance Phasing and Range RF Checks Complete (Approximately T-320)

ECHO (A-12) MILESTONE COUNTDOWN (Continued)

Time		Activity
T-330-270	Task 7:	Begin Agena B Guidance and Flight Control Checkout
		TM ON (all links)
		Perform Horizon Sensor Test
		Perform Integration Test
		Perform Timer Motor Test
		Perform Gyro Output Test (Pitch, Yaw and Roll)
		Perform Hydraulic Servo Command Test (Pitch and Yaw)
		Perform Gyro Drift Test
		TM OFF (all links)
		Agena B Guidance and Flight Control Checkout Complete (Approximately T-270)
T-270-230	Task 8:	Begin Agena B Pyrotechnics and Destruct Initiator Connection
		Begin No Switching and Limited Radiation Period
		Remove Destruct Simulators
		Install Destruct Package
		Perform Voltage Checks (MV)
		Remove Safety Pin
		Install Destruct Package Fairings
		Agena B Pyrotechnics and Destruct Initiator Connection
		Complete (Approximately T-230)
T-270-230	Task 9:	Begin DM-21 Destruct Connection
		Perform Liftoff Check
		Perform Stray Voltage Checks Left and Right S&A Mechanism
		Connect and Safety Wire to Left and Right S&A Mechanism
		Connect Prima Cord Tubes
		Limited Radiation Period Ended
		DM-21 Destruct Connection Complete (Approximately T-230)
T-230-200	Task 10:	Begin Countdown Evaluation
		Complete Countdown Evaluation (Approximately T-200)
T-200-185	Task 11:	Begin Gantry Removal Preps
		Perform Final Preparation Before Tower Removal

ECHO (A-12) MILESTONE COUNTDOWN (Continued)

Time		Activity
		Gantry Removal Preparations Complete (Approximately T-185)
T-200-185	Task 12:	Begin S/C Test Plug Removal and RF Checks Remove S/C Agena Interface Harness Turn on TM and Perform Payload Evaluation Checks Remove CIP 26 Test Plug S/C Test Plug Removal Complete (Approximately T-185)
T-200-185	Task 13:	Begin Agena B Test Plug Removal Remove Test Plugs: Install Access Door Pressurize Missile Bottles and Control Manifold System Agena Test Plug Removal Complete (Approximately T-185)
T-185-170	Task 14:	Begin Agena B RF Antenna Switching Checks Verify Range Reception TLM Transmitting Link Number 1 Perform Range Readouts C-Band Beacon Verify Proper Beacon Receiver and Transmitter Indications Agena B RF Antenna Switching Checks Complete (Approximately T-170)
T-185-170	Task 15:	Begin Gantry Removal Open Platforms Secure all Water Lines and Communications Remove Gantry Turn Off Gantry Power Gantry Removal Complete (Approximately T-170)
T-170-100	Task 16:	Begin Agena Tanking Area Condition RED Begin 10% Agena Stage Tanking 10% Agena Stage Tanking Complete Begin Agena UDMH Tanking; Agena UDMH Tanking Complete (10 Min) Begin Agena IRFNA (Acid) Tanking; Agena IRFNA Tanking Complete (10 Min) Perform Propellant Tank Leak Checks Agena Stage Tanking Complete (Approximately T-100)
T-100-80	Task 17:	Begin Securing Agena Propellant Transfer Sets

ECHO (A-12) MILESTONE COUNTDOWN (Continued)

Time		Activity
		Perform Pump Switching Checks Pressurize Missile Bottles (NH-24) All Personnel Clear Pad Area Agena Propellant Transfer Sets Securing Complete (Approximately T-80)
T-80-60	Task 18:	Begin Spacecraft Verification Check Reports S/C Battery Status Spacecraft Verification Checks Complete (Approximately T-60)
T-80-60	Task 19:	Begin Agena B RF Verification Check Confirm GO Status of Agena RF Systems Verify Agena RF Systems Ready for Launch
T-80-60	Task 20:	Begin Agena B Pressurization Pressurize Propellant Tanks to Regulator Lockup Pressure Pressurize Helium Spheres Agena Pressurization Complete (Approximately T-60)
T-60-12	Task 21:	Begin (Final) Countdown Evaluation Verify BTL Antenna and Guidance Systems Checks Completed Verify DM-21 Status (Ready) Varify Agena B Status (Ready) Verify Spacecraft Status (Ready) Ready for Terminal Count Countdown Evaluation Complete (Approximately T-10)
T-12-0	Task 22:	Begin Terminal Count
T-11 Min. 30 Sec		Phase I Turn on Ext. Power & Hydraulics First Stage T/M and Command Receiver ON
T-11 Min.		Phase II Begin Guidance Open Loop Checks
T-10 Min.		Phase III Guidance Loop Check Complete Agena T/M and Beacon ON Begin DM-21 Booster Tanking
T-7 Min.		Phase IV 100% Fuel Loaded

ECHO (A-12) MILESTONE COUNTDOWN (Continued)

Time	Activity
	Phase V
T-3 min	First-Stage T/M and Command Destruct On Internal Power
T-2 min 30 sec	Agena on Internal Power Calibrate T/M Cal +, Cal 1/2, Cal 0
T-1 min 45 sec	Arm Destruct Umbilical Enable ON BTL Guidance Ready Checks Hi-Speed Recorders ON Status Checks
T-90 sec	Clear to Launch Main LO_2 Top Pressure "OK" for Launch
T-12 sec	Propellant Transfer Complete
T-2 sec	Engine Sequence Start
T-0	Liftoff Phase V Complete

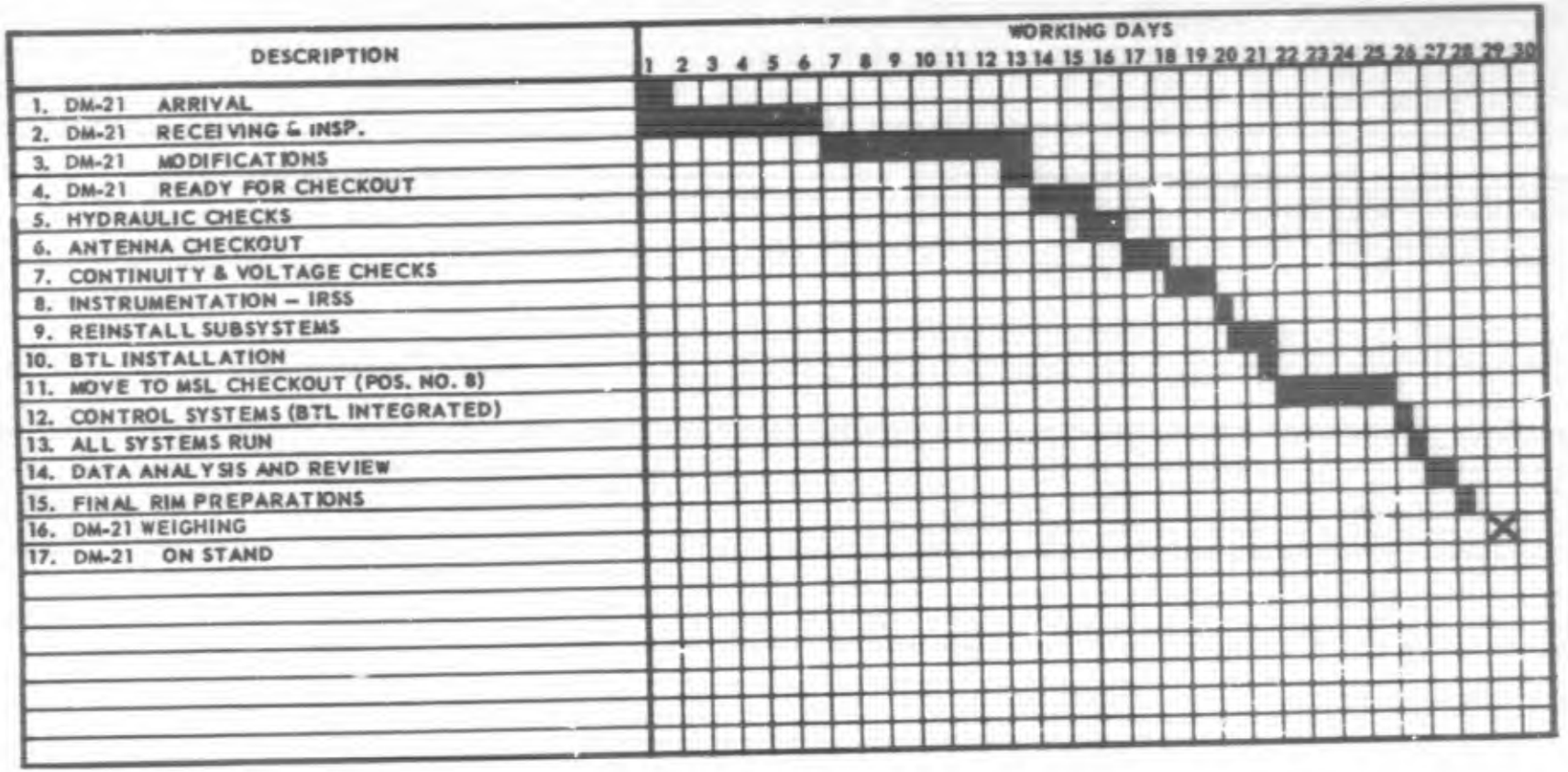

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Figure 1-1 Preliminary PMR Missile Assembly Building Operations Schedule (A-12)

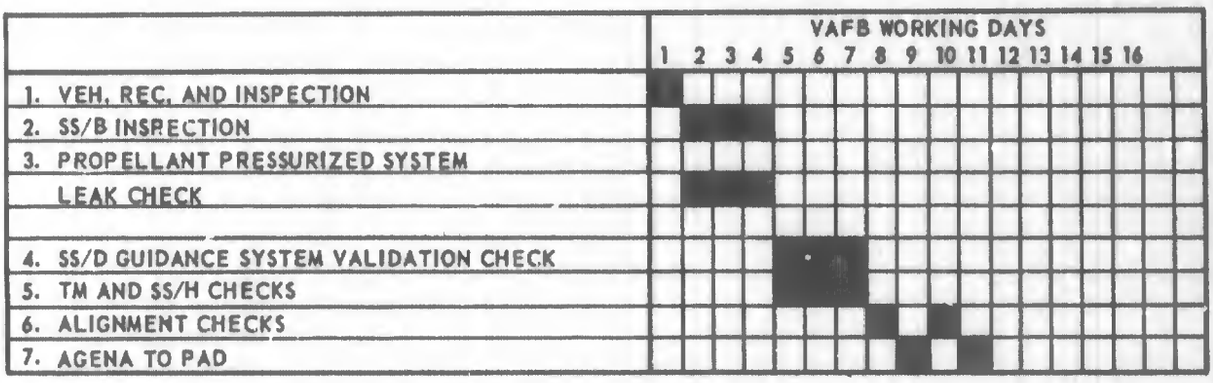


Figure 1-2 Agena B Checkout in MAB (A-12)

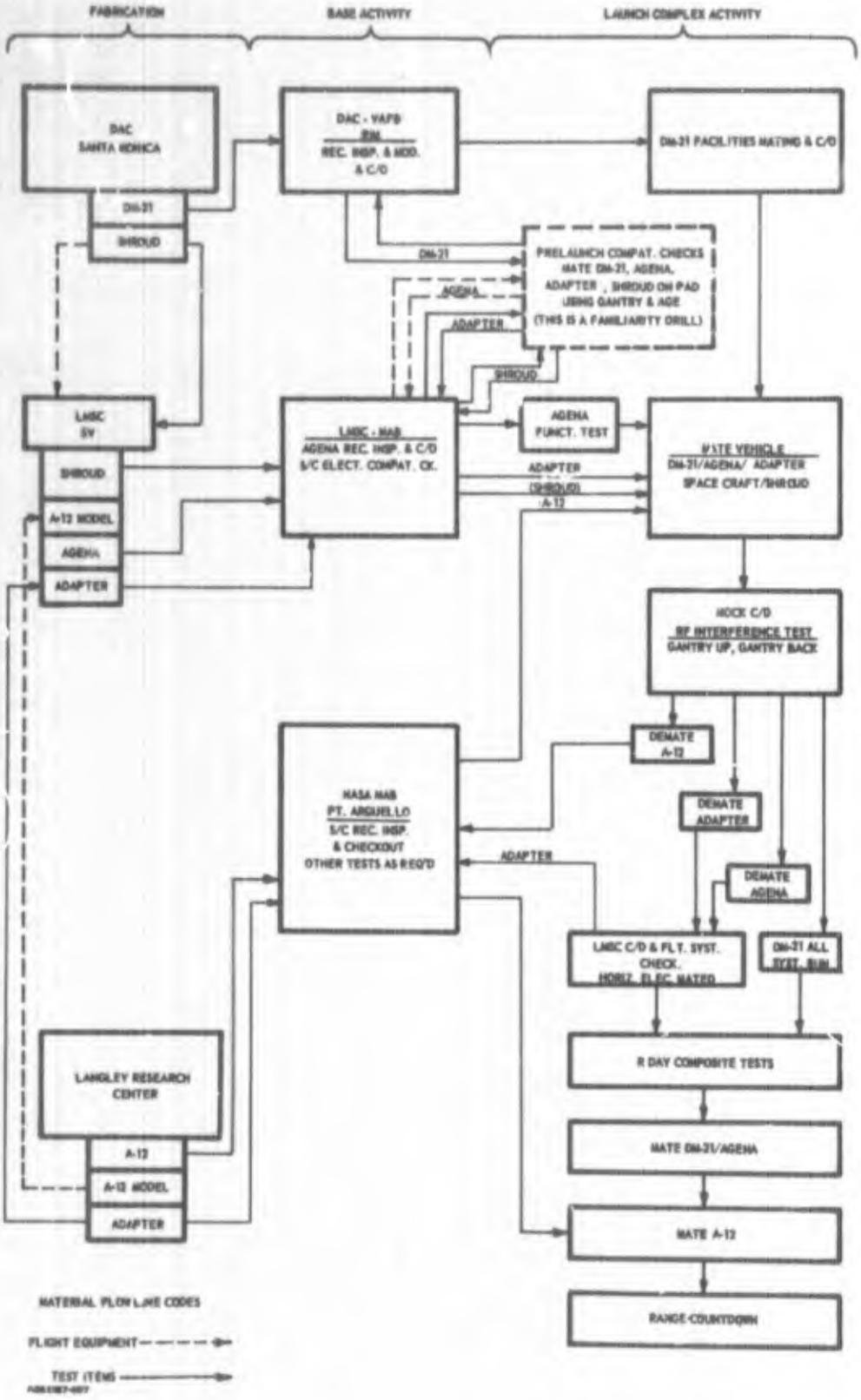
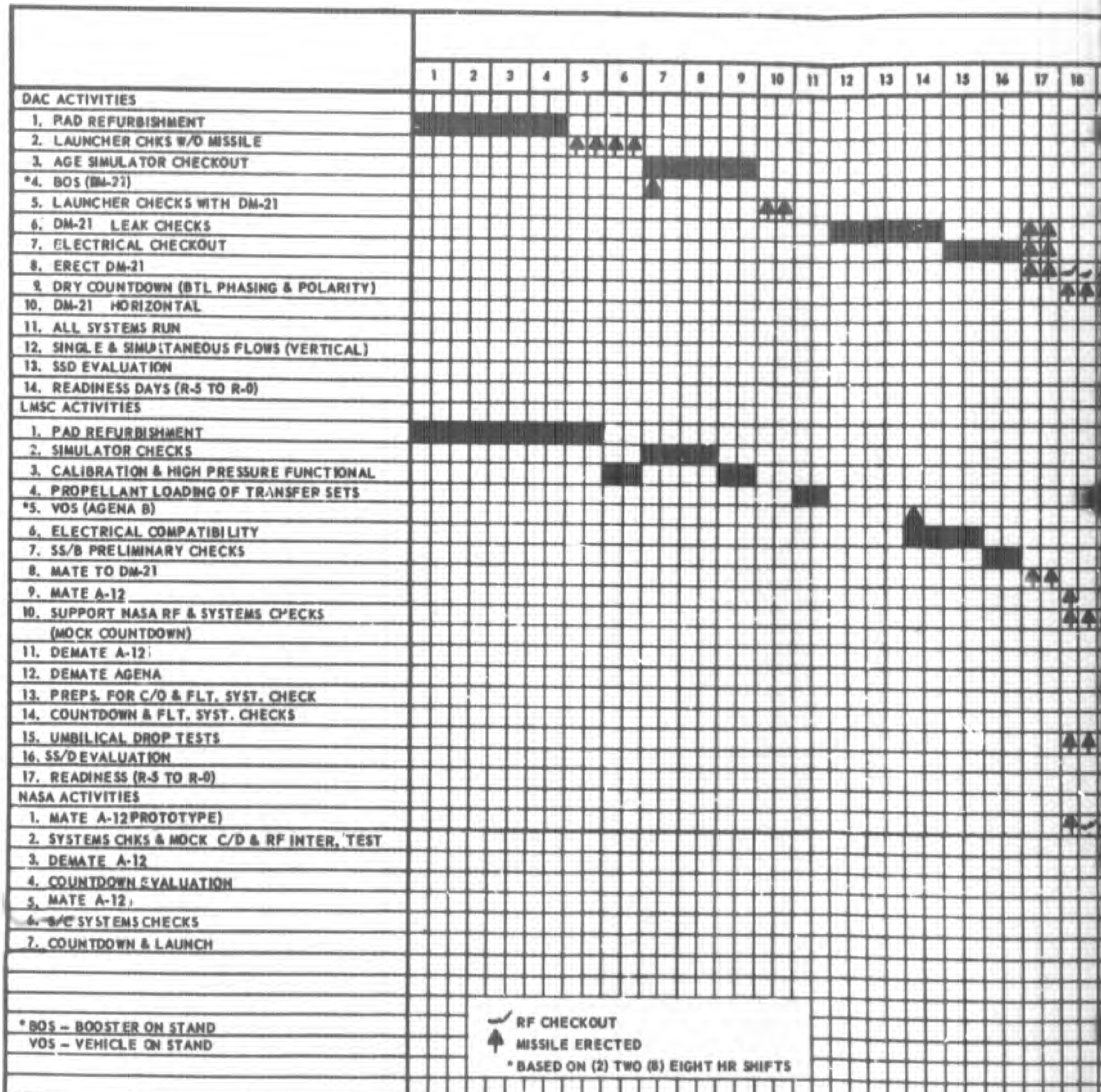


Figure 1-3 Operations Flow Diagram (A-12)



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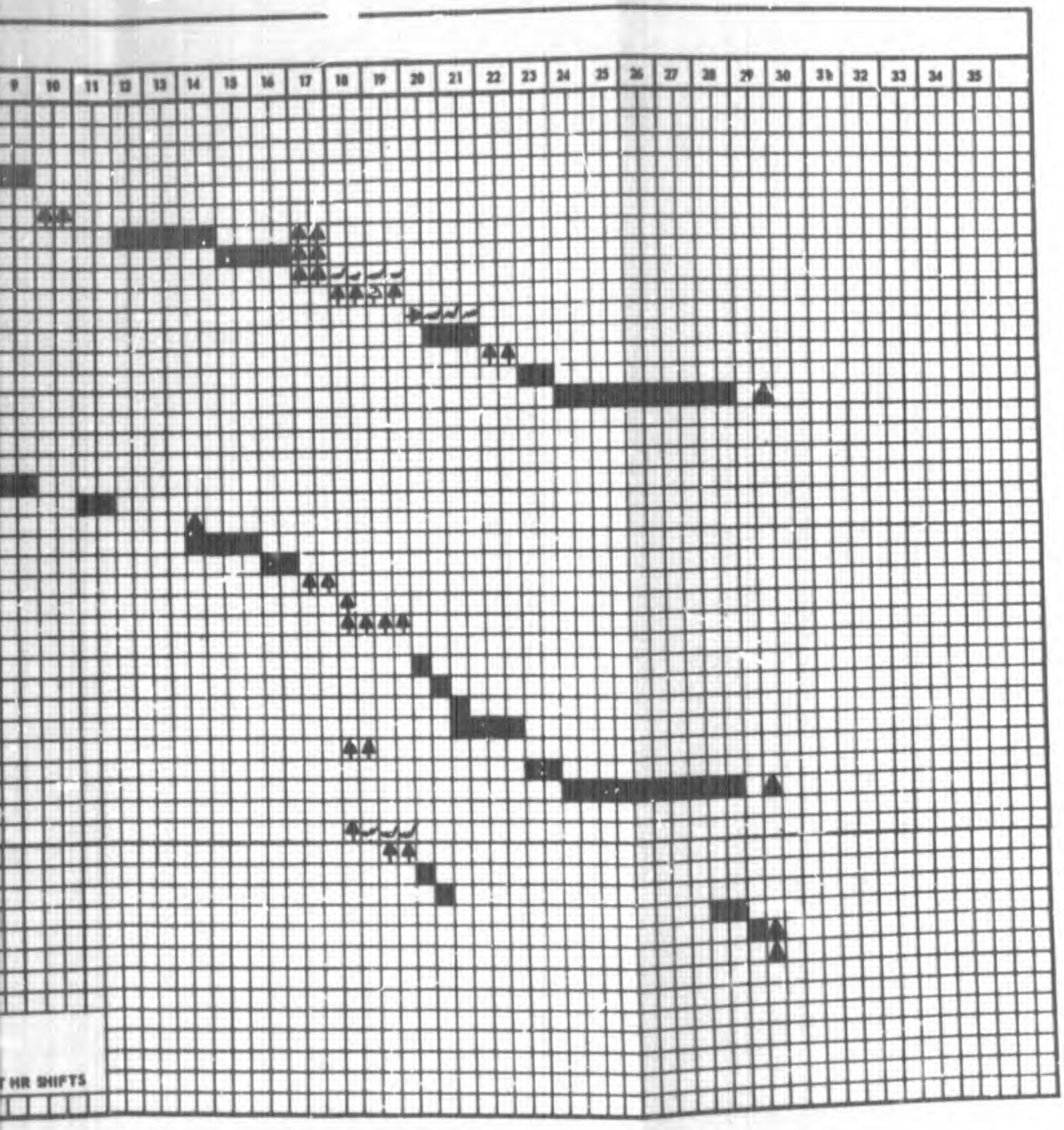


Figure 1-4 Preliminary PMR Launch Operations Schedule (A-12)

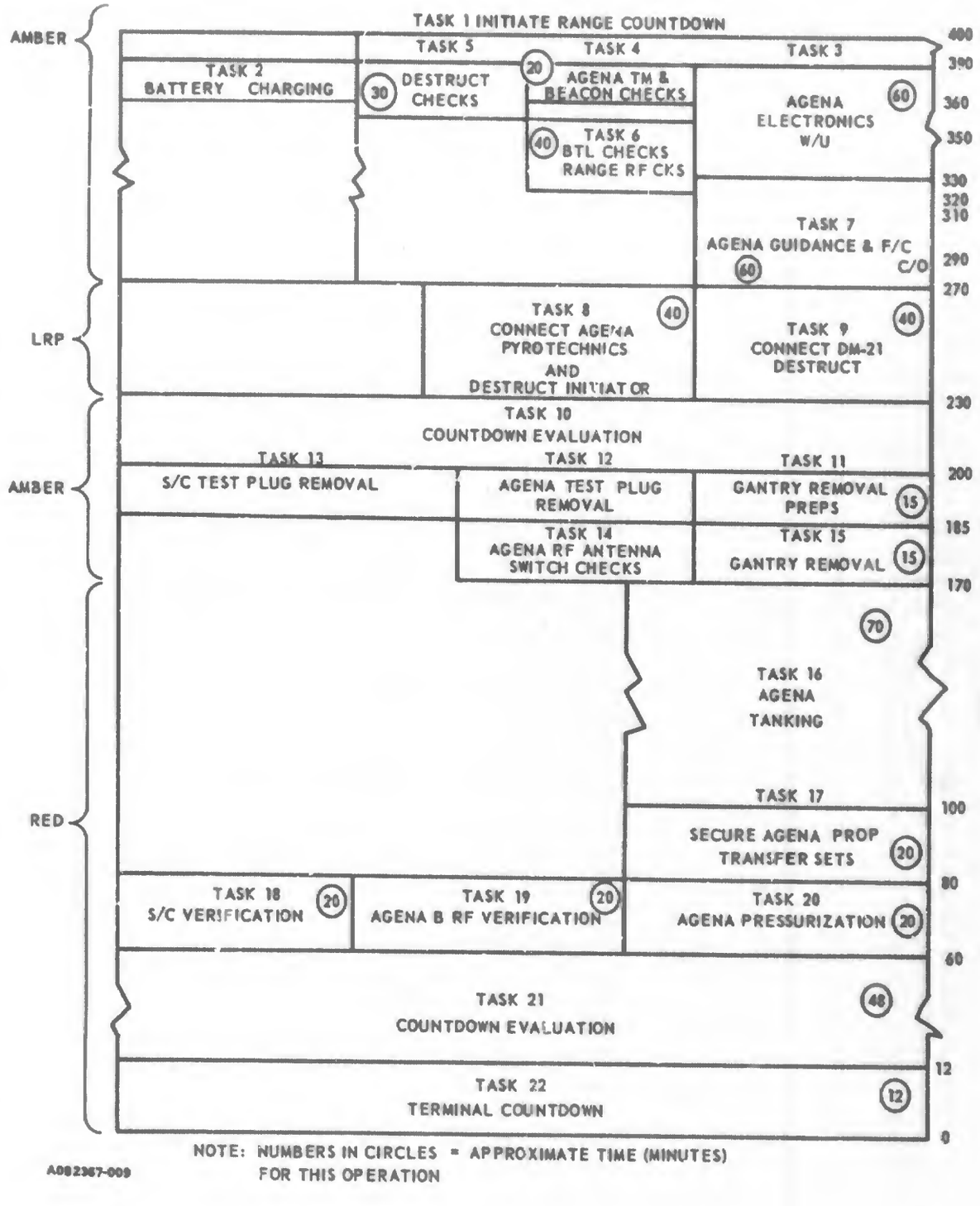


Figure 1-5 Task Alignment Chart (A-12)

Table 1-1

A-12 AND AGENA B R-DAY CHECKOUT SEQUENCE

Type of Test or Exercise	Test Duration
R-5 Day	
1. Pneumatic Test	3 hr
2. Hydraulic Servicing	2 hr
3. Guidance and Flight Control	
A. Engine Gimbaling	4 hr
B. Engine Electrical Continuity Check	
4. Engine Functional and Leak Check	7 hr
R-4 Day	
1. Pressurization System Relief and Check Valve Tests	6 hr
2. Propellant Press. System Functional Test	
3. Engine Servicing	2 hr
4. Fusitor Checks	45 min
5. Connect and Safety Wire Electrical Plugs	2 hr
6. Vehicle Preparation and Cleanup	3 hr
R-3 Day	
1. Install Pre-Mate Pyrotechnics and Turbine Starter	3 hr
2. Pre-Mate Inspection	4 hr
3. Physical Mate Agena To DM-21	4 hr
4. Erect, Install P-900 P-100 Umbilical Plugs	
A. Adjust Separation Rails and Rollers	4 hr
B. RF and TM Evaluation Checks	
C. Umbilical Drop Checks	1 hr
5. Lower Missile	
R-2 Day	
1. Post Mate Pyrotechnic Installation and Install Fairings	6 hr
2. Electrical Destruct Checks (Destruct Simulator Installed)	2 hr

Table 1-1 (Continued)

Type of Test or Exercise	Completed by:	Test Duration
R-2 Day (Continued)		
3. Forward Compartment Inspection A. Check Safety Wiring All Plugs B. Final Wrap-up		4 hr
4. Install Primary Battery		2 hr
5. Shroud Halves on Platform		1 hr
R-1 Day (Start 2100 hrs or T-31 hrs)		
1. DM-21 Erection	2130	30 min
2. Gantry Installation	2230	1 hr
3. Hoist Spacecraft and Install 4. Spacecraft Checkout 5. Install Shroud 6. Air Conditioning (ON)	0430	8 hr
7. Electrically Connect Primary Batteries	0630	2 hr
8. Install Access Doors	0830	2 hr
9. Readiness Meeting	0900	
10. Initiate Range Countdown (Start 2120 hrs or T-400 min.)		

Table 1-2

DOUGLAS R-DAY CHECKOUT SEQUENCE (A-12)
* (All Times Are Approximate)

Type of Test or Exercise	Test Duration
R-5 Day	
1. Communications System Check	1 hr
2. Television System Test	1 hr
3. Padwater System -- Checkout Exercise	1 hr
4. Propellant Transfer System Quantities Chk.	30 min
5. Propellant Sampling	30 min
6. Heaters Check	30 min
7. Check Turbo Pump Torque	30 min
8. Emergency Breathing Air Check	1 hr
9. Vehicle Bottle Check VLV Check Vehicle Lox Tank Vent VLV Check	1 hr
10. Hydro-Mechanical Checks	1 hr
11. Power Pack Checkout	1 hr
12. Launcher Transporter Missile Combination and Launcher Area Checks	1 hr
13. Inspection of Transducer Plumbing	1 hr
14. Eng. Reg. Setting and MSL Transducer Chks	2 hr
15. GSE Reg. and VLV Set-up Procedure	1 hr
R-4 Day	
1. Vehicle Erection and Dry Countdown 2. Liftoff Test to Blockhouse, And LMSC	4 hr
3. Engine Servicing Procedure	3 hr
4. Lubricating Gimbal Bearings	2 hr
5. Vehicle Lowering Procedure	45 min
6. Vehicle Electrical Inspection	45 hr 15 min
R-3 Day LMSC Support. No Scheduled Activity	

* 0700 to 1000

Table 1-2 (Continued)

Type of Test or Exercise	Test Duration
R-2 Day	
1. BTL MBGE and DAC Instrumentation Syst. C/O	1 hr
2. Checkout of BTL MSL-Borne Guidance Equip.	1 hr
3. All-Systems Run (Airborne Electronics)	4 hr
4. Umbilical Mast Checks	2 hr
5. Visual Inspection of Launch Mount	1 hr
R-1 Day	
1. Vehicle Erection and Gantry Instl.	3 hr (non interference)
2. Vehicle Check List	1 hr
3. Free Standing Wall Removal	2 hr
4. Checkout and Instl. of Igniters and Ignition Detector Links	2 hr
5. Vehicle and Engine Section	1 hr 30 min
6. Vehicle Checkout Trailer Set Up	1 hr
7. Propellant Transfer System Valve Setup	2 hr
8. Electrical Equipment Set Up	2 hr

* 0700 to 1000

S-27 INTEGRATED TASK OUTLINE

Task No.	C/D Time Task Duration, Minutes	Task	Real-Time Duration, Minutes
1	640-630	Range Countdown Initiation	10
2	630-390	Spacecraft RF Checks	240
3	390-270	Shroud Installation and Battery Charging	120
4	390-330	Agena B Electronic Warmup	60
5	390-370	Agena B TLM Checks	20
6	390-360	Destruct Checks	30
7	360-320	BTL Checks and Range RF Checks	40
8	330-305	Agena B Guidance and Flight Control C/O	25
9	270-230	Connect DM-21 Destruct	40
10	270-230	Connect Agena B Pyrotechnics and Destruct Initiator	40
11	230-200	Countdown Evaluation	30
12	200-185	Gantry Removal Preparations	15
13	200-185	S/C Test Plug Removal and RF Checks	15
14	200-185	Agena B Test Plug Removal	15
15	185-170	Agena B RF Antenna Switch Checks	15
16	185-170	Gantry Removal	15
17	170-100	Agena B Propellant Tanking	70
18	100-80	Secure Agena B Propellant Transfer Sets	20
19	80-60	Spacecraft RF Verification	20
20	80-60	Agena B RF Verification	20
21	80-60	Agena B Pressurization	20
22	60-12	Countdown Evaluation	50
23	12-0	Terminal Countdown	10
	0	Liftoff	

S-27 MILESTONE COUNTDOWN

Time		Activity
T-640-630	Task 1:	Begin Countdown Initiation Ready for Launch Countdown All Personnel Man Stations
T-630-390	Task 2:	Begin Spacecraft Payload Checkout and RF Checks
T-630-600		Communications Check, Umbilical Connect
T-600-570		Converter Test With Data Transmission to Telemetry Station; Overall Ground Systems Calibrations; Complete Check of Main 1/4 Watt Telemetry System.
T-570-550		Checkout of Particle Counter Experiment With Data Transmission Via 1/4 Watt TM
T-550-540		Main 2 Watt Telemetry Checkout.
T-540-530		Spare 2 Watt Telemetry Checkout.
T-530-520		Spare 1/4 Watt Telemetry Checkout.
T-520-500		VHF Receiver Checkout Via 2 Watt TM Using Auxiliary Signal Generator on Gantry, Auxiliary Antenna Ejection Unit Checkout.
T-500-470		Sounding Receiver Checkout Via Both Telemetry Using An Auxiliary Signal Generator Connected
T-470-450		Main Sounding Transmitter Checkout.
T-450-430		Spacecraft Electronics Systems Turn-On Beacon Transmitter Checks.
T-430-420		Battery Sequence Switching Checked With Data Transmissions Via 1/4 Watt Telemetry
T-420-400		Solar Cell PAM Simulated Light Source Checks With Data Transmission Via 1/4 Watt Telemetry
T-400-390		Final Inspection (Visual) Battery Charging
T-390		Spacecraft Checkout Complete
T-390-270	Task 3:	Begin Shroud Installation and Battery Charging; Perform Electrical and Mechanical Compatibility Checks; Install Explosive Bolts and

S-27 MILESTONE COUNTDOWN (Continued)

Time		Activity
		Marmon Clamp; Perform Temperature and Humidity Checks; Shroud Installation Complete (Approximately T-270).
T-390-270	Task 4:	Verify Range Readiness Begin Agena B Electronics Warmup Perform External Power Checks Perform Telemetry Confidence Checks Perform Guidance and Flight Control Gyro System Setups Perform Gyro Spin Motor Test Agena B Electronics Warmup Complete (Approximately T-330)
T-390-370	Task 5:	Begin Agena B Telemetry and Beacon Checks. Telemetry Reception Evaluation Integrated TM System Confidence Checks Agena B Telemetry Checks Complete (Approximately T-370)
T-390-360	Task 6:	Begin Destruct Checks Check Remote Arming of Range Safety Equipment Destruct Checks Complete (Approximately T-360)
T-360-320	Task 7:	Begin BTL Guidance Phasing and Range RF Checks Perform Range Beacon Interrogation Checks Perform Telemetry Reception Checks with Range Perform BTL Polarity and Phasing Checks BTL Guidance Phasing and Range RF Checks Complete (Approximately T-320)
T-330-305	Task 8:	Begin Agena B Guidance and Flight Control Checkout TM ON (all links) Perform Horizon Sensor Test Perform Integration Test Perform Timer Motor Test Perform Gyro Output Test (Pitch, Yaw and Roll) Perform Hydraulic Servo Command Test (Pitch and Yaw) Perform Gyro Drift Test TM OFF (all links) Agena B Guidance and Flight Control Checkout Complete (Approximately T-305)

S-27 MILESTONE COUNTDOWN (Continued)

Time		Activity
T-270-230	Task 9:	Begin Agena B Pyrotechnics and Destruct Initiator Connection Begin No Switching and Limited Radiation Period Remove Destruct Simulators Install Destruct Package Perform Voltage Checks (MV) Remove Safety Pin Install Destruct Package Fairings Agena B Pyrotechnics and Destruct Initiator Connection Complete (Approximately T-230)
T-270-230	Task 10:	Begin DM-21 Destruct Connection Perform Liftoff Check Perform Stray Voltage Checks Left and Right S&A Mechanism Connect and Safety Wire to Left and Right S&A Mechanism Connect Prima-Cord Tubes Limited Radiation Period Ended DM-21 Destruct Connection Complete (Approximately T-230)
T-230-200	Task 11:	Begin Countdown Evaluation Complete Countdown Evaluation (Approximately T-200)
T-200-185	Task 12:	Begin Gantry Removal Preps Perform Final Preparations Before Tower Removal Gantry Removal Preparations Complete (Approximately T-185)
T-200-185	Task 13:	Begin S/C Test Plug Removal and RF Checks Remove S/C Agena Interface Harness Turn On TM and Perform Payload Evaluation Checks Turn On S/C Beacon Perform Payload Beacon Function Checks Remove CIP 26 Test Plug Turn Off S/C Beacon S/C Test Plug Removal Complete (Approximately T-185)
T-200-185	Task 14:	Begin Agena B Test Plug Removal Remove Test Plugs; Install Access Door Pressurize Missile Bottles and Control Manifold System

S-27 MILESTONE COUNTDOWN (Continued)

Time		Activity
		Agena Test Plug Removal Complete (Approximately T-185)
T-185-170	Task 15:	Begin Agena B RF Antenna Switching Checks Verify Range Reception TLM Transmitting Link Number 1, Link Number 2, Link Number 3, Link Number 4 Perform Range Readouts C-Band Beacon Verify Proper Beacon Receiver and Transmitter Indications Agena B RF Antenna Switching Checks Complete (Approximately T-170)
T-185-170	Task 16:	Begin Gentry Removal Open Platforms Secure all Water Lines and Communications Remove Gantry Turn Off Gantry Power Gantry Removal Complete (Approximately T-170)
T-170-100	Task 17:	Begin Agena Tanking Area Condition RED Begin 10% Agena Stage Tanking 10% Agena Stage Tanking Complete Begin Agena UDMH Tanking; Agena UDMH Tanking Complete (10 Min) Begin Agena IRFNA (Acid) Tanking; Agena IRFNA Tanking Complete (10 Min) Perform Propellant Tank Leak Checks Agena Stage Tanking Complete (Approximately T-100)
T-100-80	Task 18:	Begin Securing Agena Propellant Transfer Sets Perform Pump Switching Checks Pressurize Missile Bottles (NH-24) All Personnel Clear Pad Area Agena Propellant Transfer Sets Securing Complete (Approximately T-80)
'-80-60	Task 19:	Begin Spacecraft RF Verification Check Perform 40 Sec Interrogation Checks Evaluate Beacon Report S/C Battery Status Spacecraft RF Verification Checks Complete (Approximately T-60)

S-27 MILESTONE COUNTDOWN (Continued)

Time		Activity
T-80-60	Task 20:	Begin Agena B RF Verification Check Confirm GO Status of Agena RF Systems Verify Agena RF Systems Ready For Launch
T-80-60	Task 21:	Begin Agena B Pressurization Pressurize Propellant Tanks to Regulator Lockup Pressure
		Pressurize Helium Spheres Agena Pressurization Complete (Approximately T-60)
T-60-12	Task 22:	Begin (Final) Countdown Evaluation Verify BTL Antenna and Guidance Systems Checks Completed Verify DM-21 Status (Ready) Verify Agena B Status (Ready) Verify Spacecraft Status (Ready) Ready For Terminal Count Countdown Evaluation Complete (Approximately T-10)
T-12-0	Task 23:	Begin Terminal Count
T-11 min 30 sec		Phase I
		Turn on Ext. Power and Hydraulics First Stage T/M and Command Receivers ON
T-11 min		Phase II
		Begin Guidance Open Loop Checks
T-10 min		Phase III
		Guidance Loop Checks Complete Agena T/M and Beacon ON Begin DM-21 Booster Tanking
T-7 min		Phase IV
		100% Fuel Loaded
T-3 min		Phase V
		First Stage T/M and Command Destruct On Internal Power
T-2 min 30 sec		Agena on Internal Power Calibrate T/M Cal +, Cal 1/2, Cal 0 S/C T/M Number 2 ON

S-27 MILESTONE COUNTDOWN (Continued)

Time	Activity
T-1 min 45 sec	Arm Destruct Umbilical Enable ON BTL Guidance Ready Checks Hi-Speed Recorders ON Status Checks
T-90 sec	Clear to Launch Main LO_2 Top Pressure "OK" for Launch
T-12 sec	Propellant Transfer Complete
T-2 sec	Engine Sequence Start
T-0	Liftoff Phase V Complete

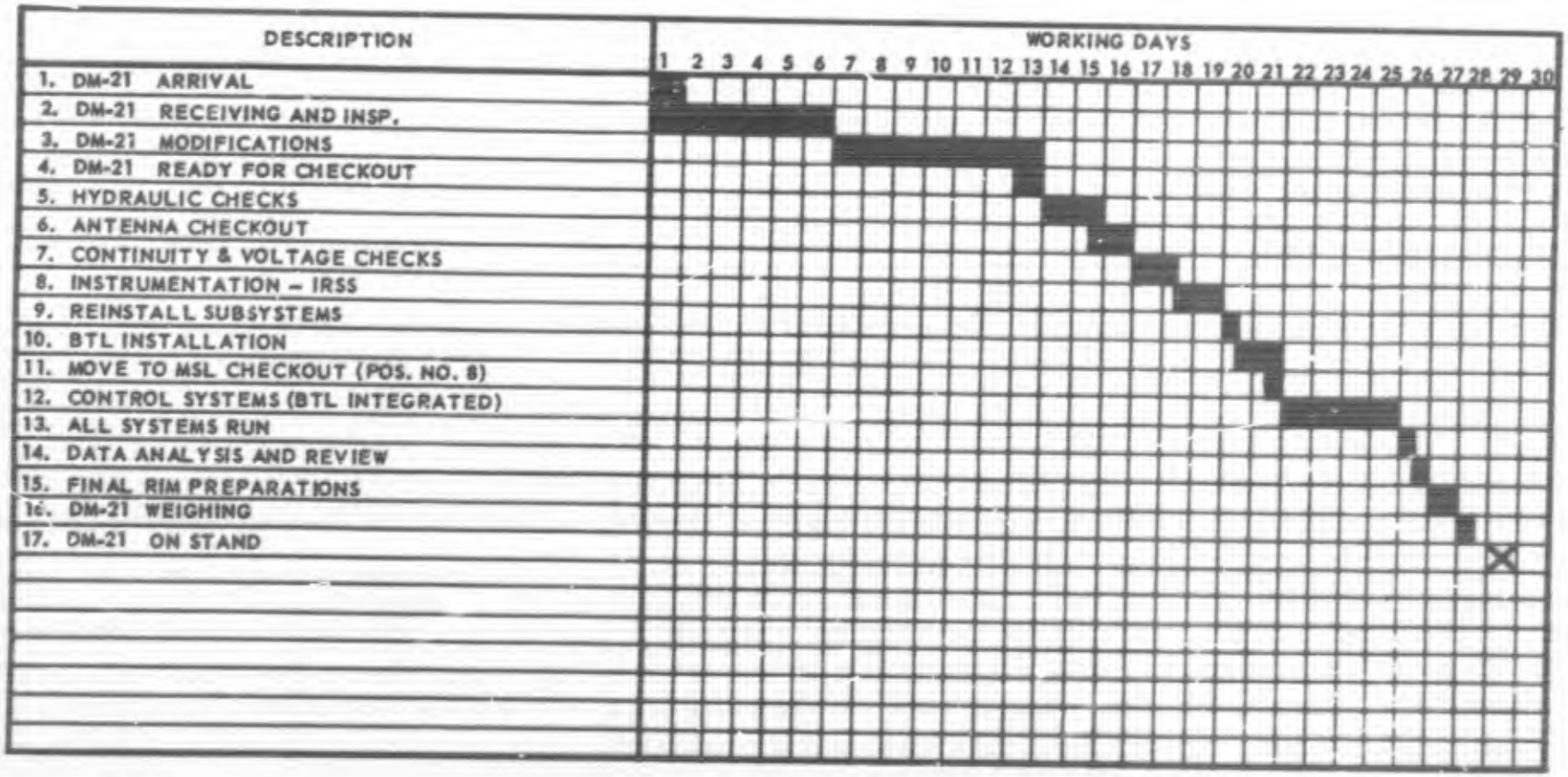


Figure 2-1 Preliminary PMR Missile Assembly Building Operation Schedule

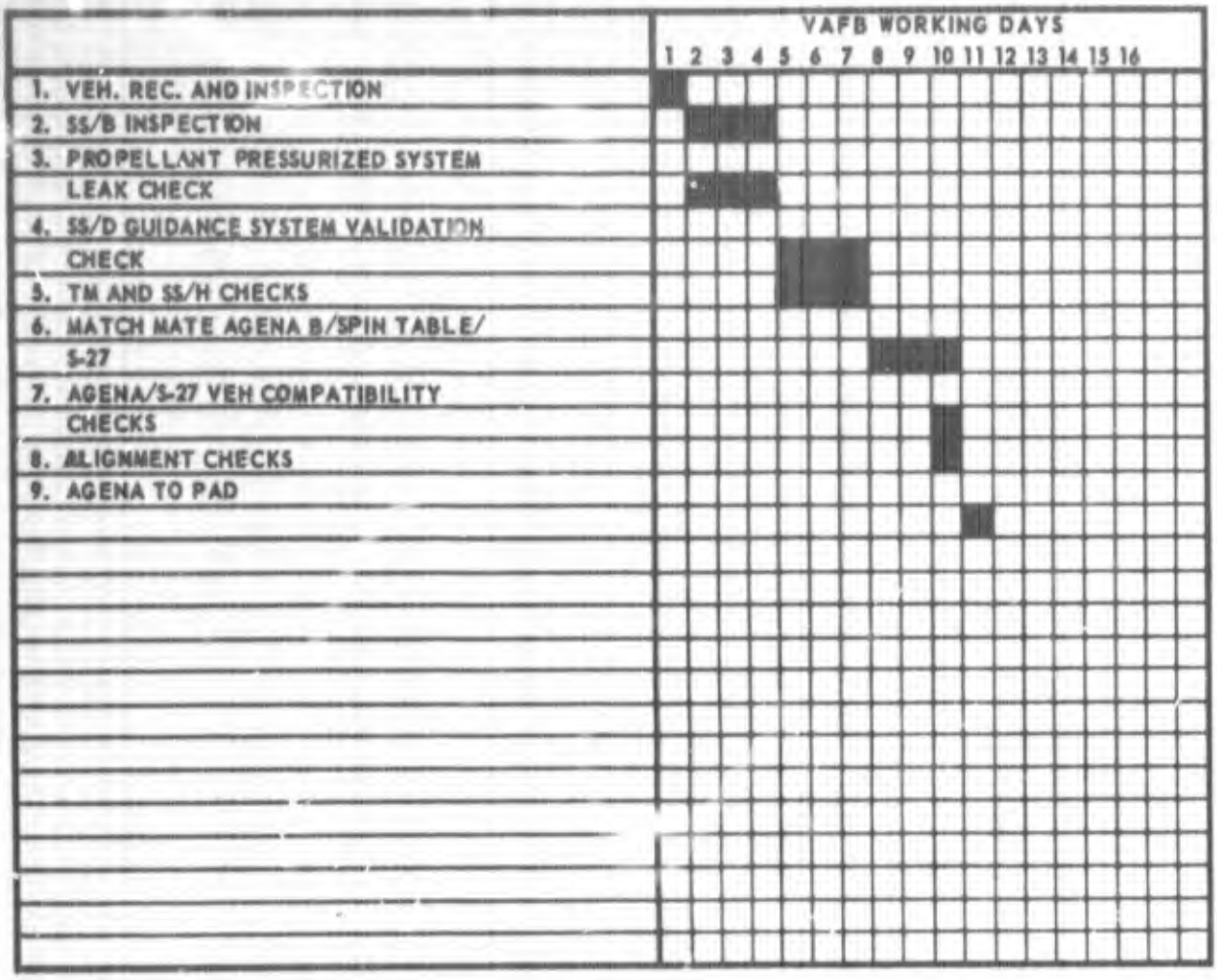


Figure 2-2 Agena B Checkout in MAB (S-27)

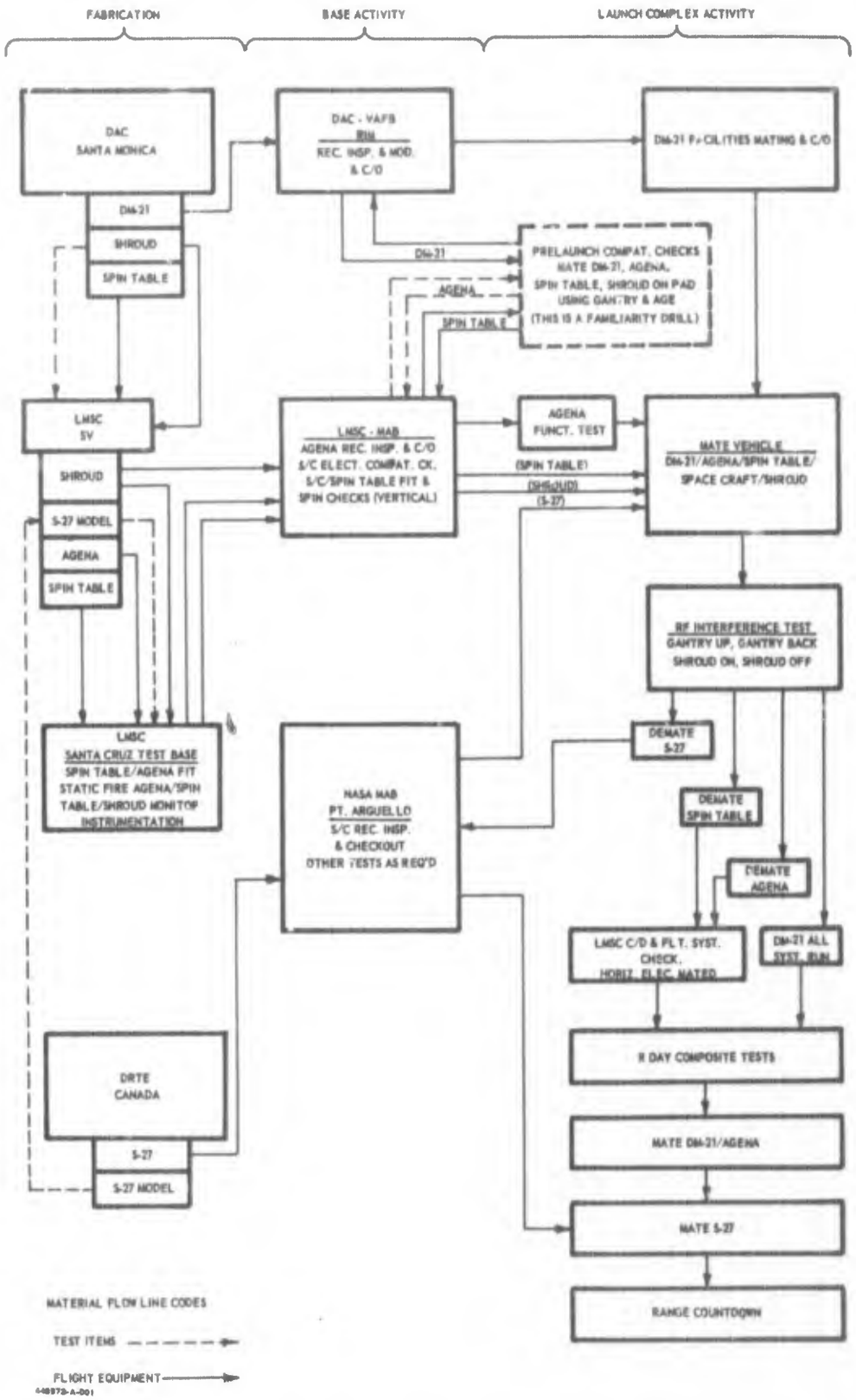
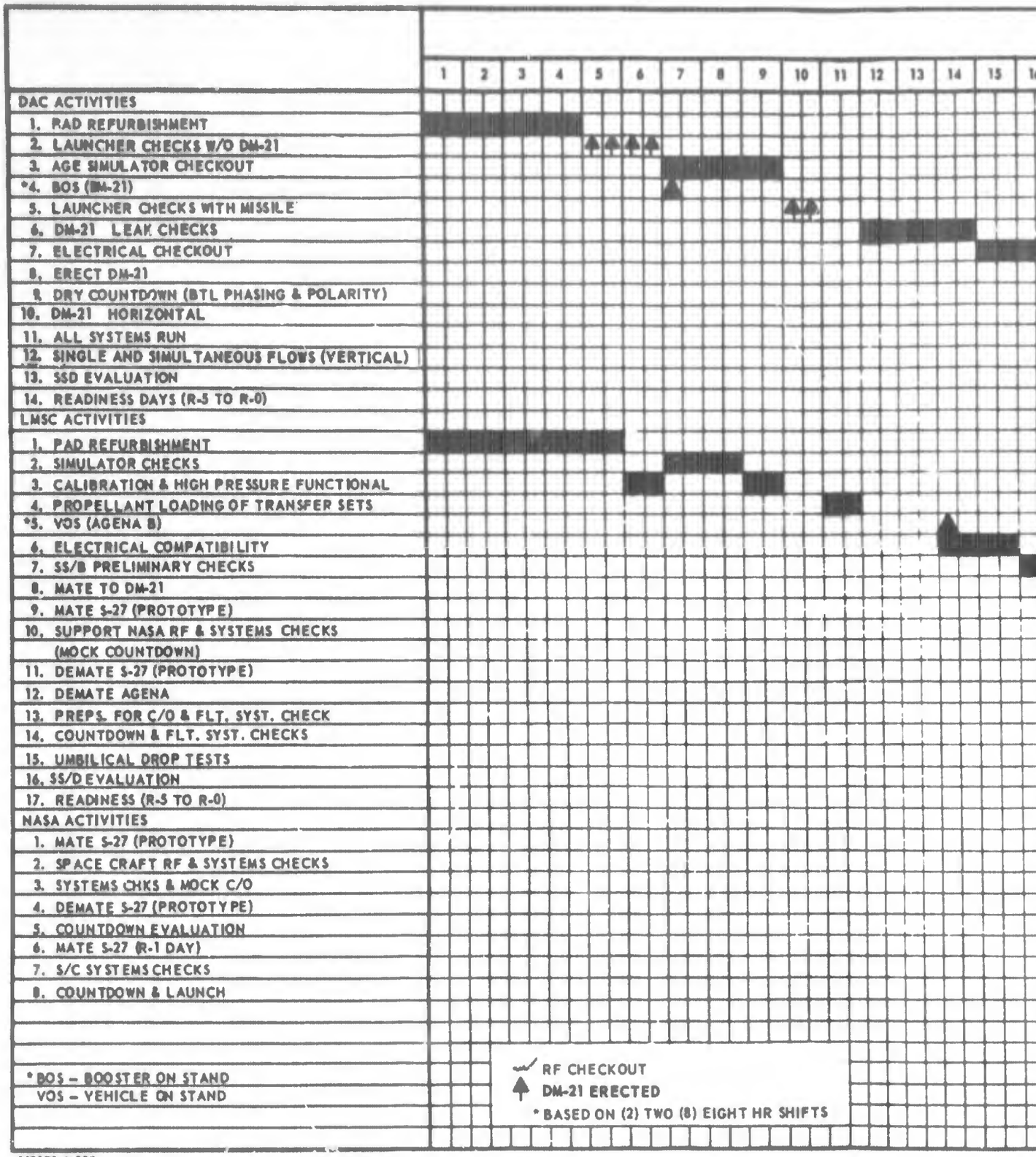


Figure 2-3 Operations Flow Diagram (S-27)


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
DAC ACTIVITIES
1. PAD REFURBISHMENT
2. LAUNCHER CHECKS W/O DM-21
3. AGE SIMULATOR CHECKOUT
*4. BOS (DM-21)
5. LAUNCHER CHECKS WITH MISSILE
6. DM-21 LEAK CHECKS
7. ELECTRICAL CHECKOUT
8. ERECT DM-21
9. DRY COUNTDOWN (BTL PHASING & POLARITY)
10. DM-21 HORIZONTAL
11. ALL SYSTEMS RUN
12. SINGLE AND SIMULTANEOUS FLOWS (VERTICAL)
13. SSD EVALUATION
14. READINESS DAYS (R-5 TO R-0)
LMSC ACTIVITIES
1. PAD REFURBISHMENT
2. SIMULATOR CHECKS
3. CALIBRATION & HIGH PRESSURE FUNCTIONAL
4. PROPELLANT LOADING OF TRANSFER SETS
*5. VOS (AGENA B)
6. ELECTRICAL COMPATIBILITY
7. SS/B PRELIMINARY CHECKS
8. MATE TO DM-21
9. MATE S-27 (PROTOTYPE)
10. SUPPORT NASA RF & SYSTEMS CHECKS (MOCK COUNTDOWN)
11. DEMATE S-27 (PROTOTYPE)
12. DEMATE AGENA
13. PREPS. FOR C/O & FLT. SYST. CHECK
14. COUNTDOWN & FLT. SYST. CHECKS
15. UMBILICAL DROP TESTS
16. SS/D EVALUATION
17. READINESS (R-5 TO R-0)
NASA ACTIVITIES
1. MATE S-27 (PROTOTYPE)
2. SPACE CRAFT RF & SYSTEMS CHECKS
3. SYSTEMS CHKS & MOCK C/O
4. DEMATE S-27 (PROTOTYPE)
5. COUNTDOWN EVALUATION
6. MATE S-27 (R-1 DAY)
7. S/C SYSTEMS CHECKS
8. COUNTDOWN & LAUNCH
RF CHECKOUT
DM-21 ERECTED
* BASED ON (2) TWO (8) EIGHT HR SHIFTS
* BOS – BOOSTER ON STAND
VOS – VEHICLE ON STAND

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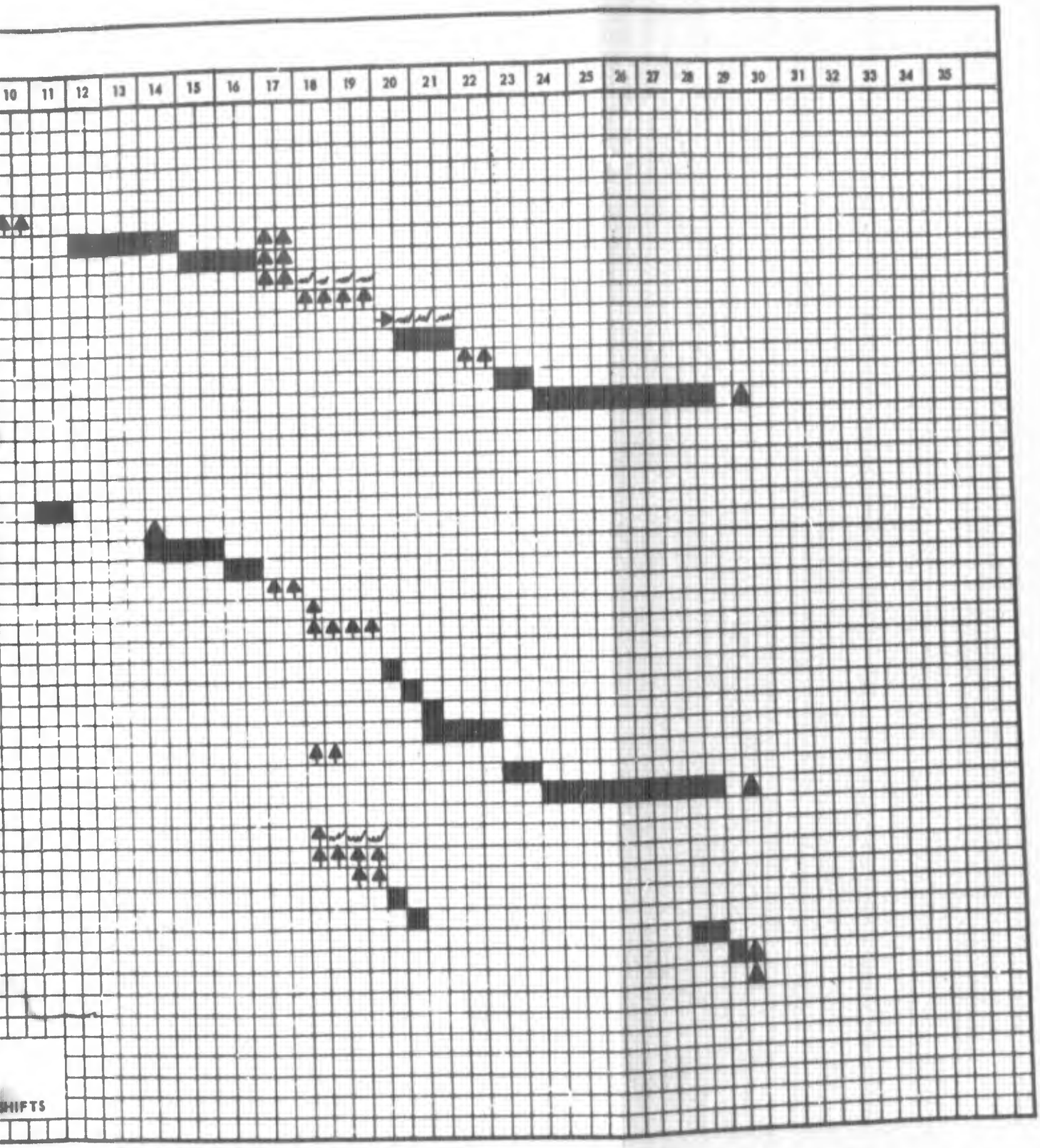

Figure 2-4 Preliminary PMR Launch Operations Schedule (S-27)

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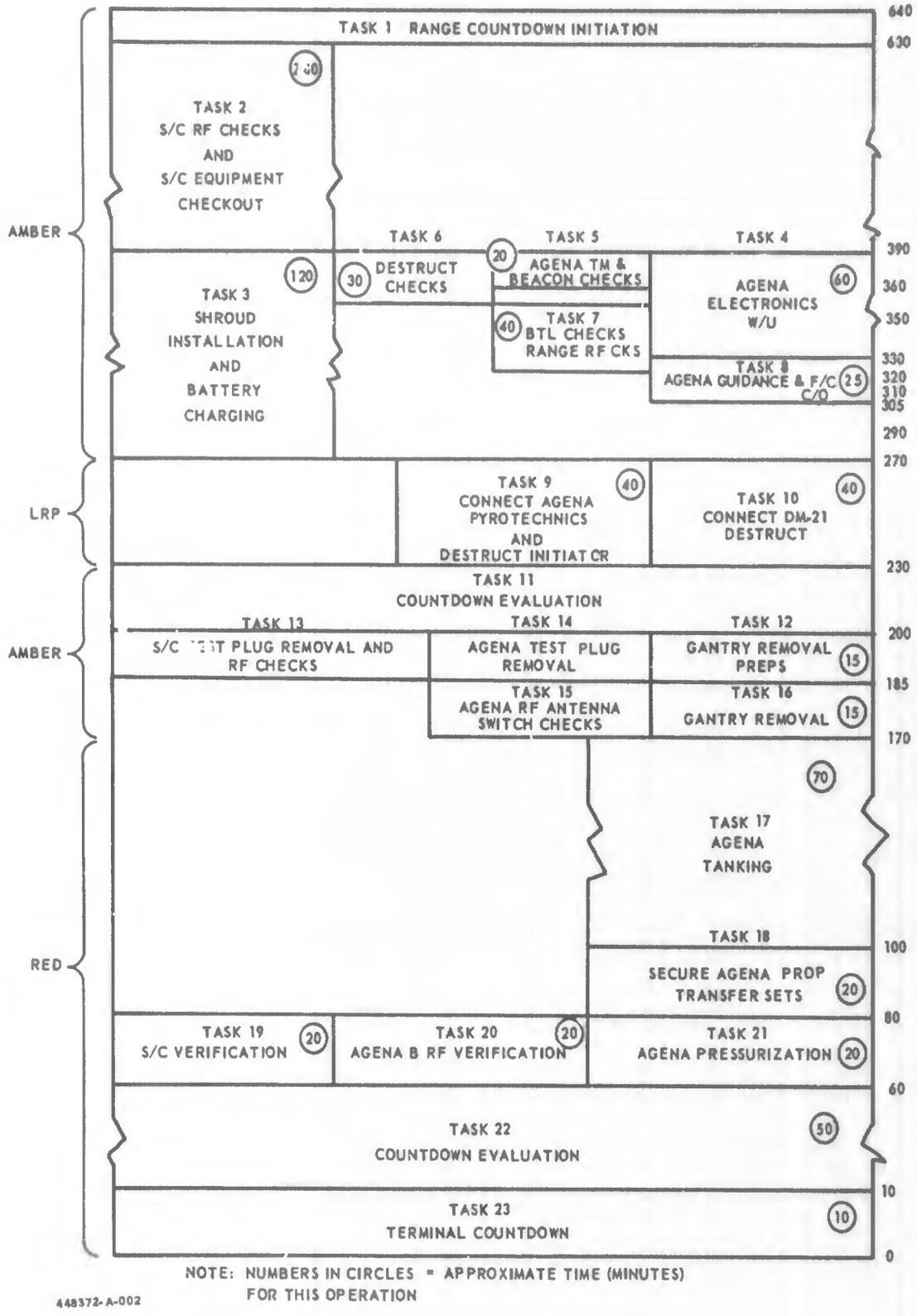

Figure 2-5 Task Alignment Chart (S-27)

Table 2-1

S-27 AND AGENA B R-DAY CHECKOUT SEQUENCE

Type of Test or Exercise	Test Duration
R-5 Day	
1. Pneumatic Test	3 hr
2. Hydraulic Servicing	2 hr
3. Guidance and Flight Control	
A. Engine Gimbaling	4 hr
B. Engine Electrical Continuity Check	
4. Engine Functional and Leak Check	7 hr
R-4 Day	
1. Pressurization System Relief and Check Valve Tests	6 hr
2. Propellant Press. System Functional Test	
3. Engine Servicing	2 hr
4. Fusitor Checks	45 min
5. Connect and Safety Wire Electrical Plugs	2 hr
6. Vehicle Preparation and Cleanup	3 hr
R-3 Day	
1. Install Pre-Mate Pyrotechnics and Turbine Starter	3 hr
2. Pre-Mate Inspection	4 hr
3. Physical Mate Agena To DM-21	4 hr
4. Erect, Install P-900 P-100 Umbilical Plugs	
A. Adjust Separation Rails and Rollers	4 hr
B. RF and TM Evaluation Checks	
C. Umbilical Drop Checks	1 hr
5. Lower Vehicle	
R-2 Day	
1. Post Mate Pyrotechnic Installation and Install Fairings	6 hr
2. Electrical Destruct Checks (Destruct Simulator Installed)	2 hr

Table 2-1 (Continued)

Type of Test or Exercise	Test Duration
R-2 Day (Continued)	
3. Forward Compartment Inspection A. Check Safety Wiring All Plugs B. Final Wrap-up	4 hr
4. Install Primary Battery	2 hr
5. Shroud Halves On Platform	1 hr
R-1 Day	
1. Vehicle Erection	30 min
2. Cantry Installation	
3. Hoist Spintable and Install 4. Hoist Spacecraft and Install 5. Air Conditioning (ON) 6. Conduct Alignments	4 hr
7. Spacecraft RF Checks 8. Spacecraft Checkout	2 hr 30 min
9. Install Sec. Programmer	2 hr
10. Electrically Connect Primary Batteries	2 hr
11. Install Access Doors	2 hr
12. Initiate Range Countdown	

Table 2-2

DOUGLAS R-DAY CHECKOUT SEQUENCE (S-27)
*(All Times Are Approximate)

Type of Test or Exercise	Test Duration
R-5 Day	
1. Communications System Check	1 hr
2. Television System Test	1 hr
3. Padwater System – Checkout Exericse	1 hr
4. Propellant Transfer System Quantities Chk.	30 min
5. Propellant Sampling	30 min
6. Heaters Check	30 min
7. Check Turbo Pump Torque	30 min
8. Emergency Breathing Air Check	1 hr
9. Vehicle Bottle Check VLV Check Vehicle Lox Tank Vent VLV Check	1 hr
10. Hydro-Mechanical Checks	1 hr
11. Power Pack Checkout	1 hr
12. Launcher Transporter Vehicle Combination and Launcher Area Checks	1 hr
13. Inspection of Transducer Plumbing	1 hr
14. Eng. Reg. Setting and MSL Transducer Chks	2 hr
15. GSE Reg. and VLV Set-up Procedure	1 hr
R-4 Day	
1. Vehicle Erection and Dry Countdown 2. Liftoff Test to Blockhouse, and LMSC	4 hr
3. Engine Servicing Procedure	3 hr
4. Lubricating Gimbal Bearings	2 hr
5. Vehicle Lowering Procedure	45 min
6. Vehicle Electrical Inspection	45 hr 15 min
R-3 Day LMSC Support. No Scheduled Activity	

*0700 to 1000

Table 2-2 (Continued)

Type of Test or Exercise	Test Duration
R-2 Day	
1. BTL MBGE and DAC Instrumentation Syst. C/O	1 hr
2. Checkout of BTL MSL-Borne Guidance Equip.	1 hr
3. All-Systems Run (Airborne Electronics)	4 hr
4. Umbilical Mast Checks	2 hr
5. Visual Inspection of Launch Mount	1 hr
R-1 Day	
1. Vehicle Erection and Gantry Installation	3 hr (non-interference)
2. Vehicle Check List	1 hr
3. Free Standing Wall Removal	2 hr
4. Checkout and Instl. of Igniters and Ignition Detector Links	2 hr
5. Vehicle and Engine Section	1 hr 30 min
6. Vehicle Checkout Trailer Set Up	1 hr
7. Propellant Transfer System Valve Setup	2 hr
8. Electrical Equipment Set Up	2 hr