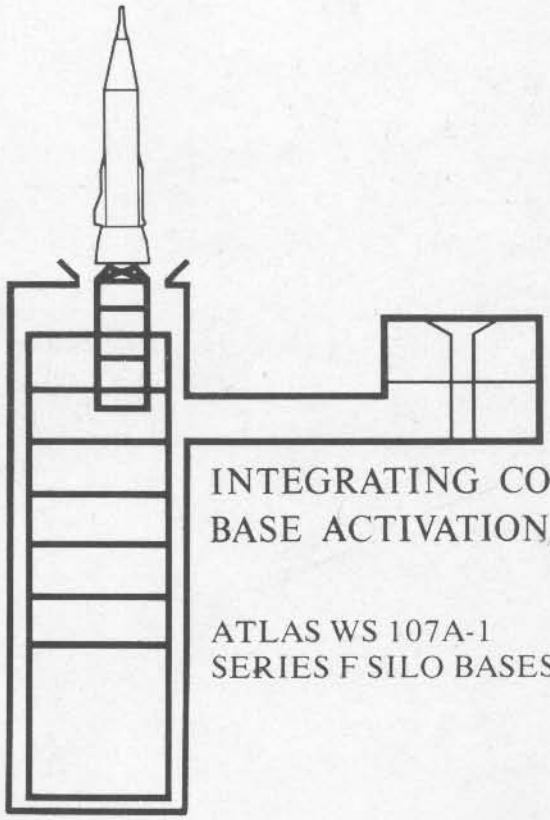
REPORT NO. 600-200

GENERAL DYNAMICS | ASTRONAUTICS, A DIVISION OF GENERAL DYNAMICS CORPORATION



INTEGRATING CONTRACTOR'S BASE ACTIVATION PROJECT MANUAL

ATLAS WS 107A-1
SERIES F SILO BASES

REPORT NO. 600-200

INTEGRATING CONTRACTOR'S BASE ACTIVATION PROJECT MANUAL

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SERIES F SILO BASES

Prepared by

GENERAL DYNAMICS | ASTRONAUTICS
A DIVISION OF GENERAL DYNAMICS CORPORATION
San Diego, California

MARCH 1961

CONTENTS

INTRODUCTION

This manual describes the procedures by which Astronautics Division of General Dynamics Corporation ensures the efficient activation of an Atlas Series F silo missile base.

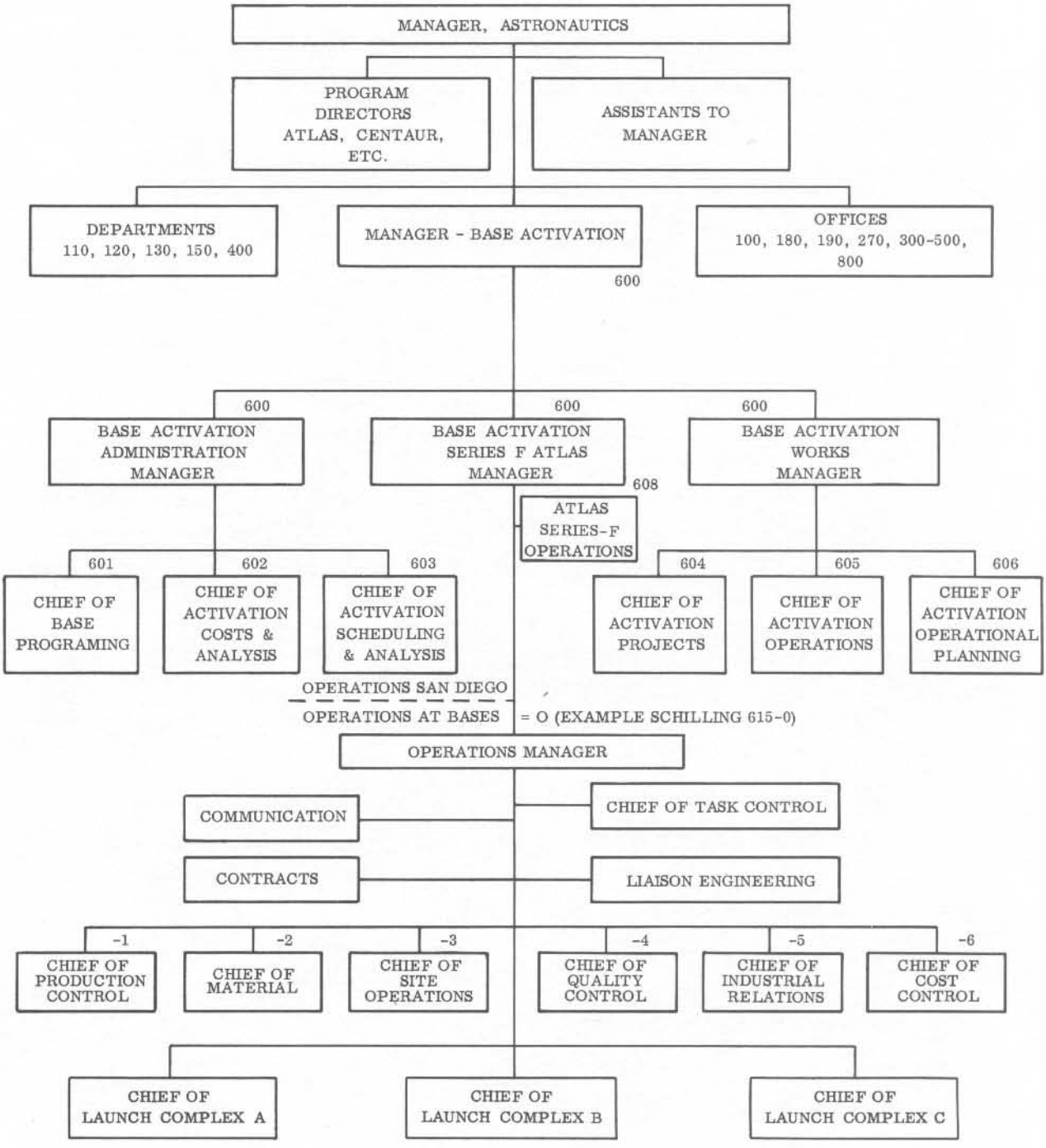
The data herein was derived from portions of the Base Activation Plan developed for the silo bases. Procedures are in accordance with Air Force Contracts 04(647) 455 and 04(647) 557.

I. ORGANIZATIONS AND FUNCTIONS

SERIES F BASE ACTIVATION ORGANIZATION STRUCTURE

The organizational structure of the Base Activation Office and its relationship to other Astronautics offices and departments is shown on the opposite page.

Detailed organization charts and outlines of responsibilities within offices and departments are shown in Base Activation Instructions and in "Astronautics Organization", a publication of the Organization and Systems Department, Industrial Engineering Office.



SERIES F BASE ACTIVATION ORGANIZATION STRUCTURE

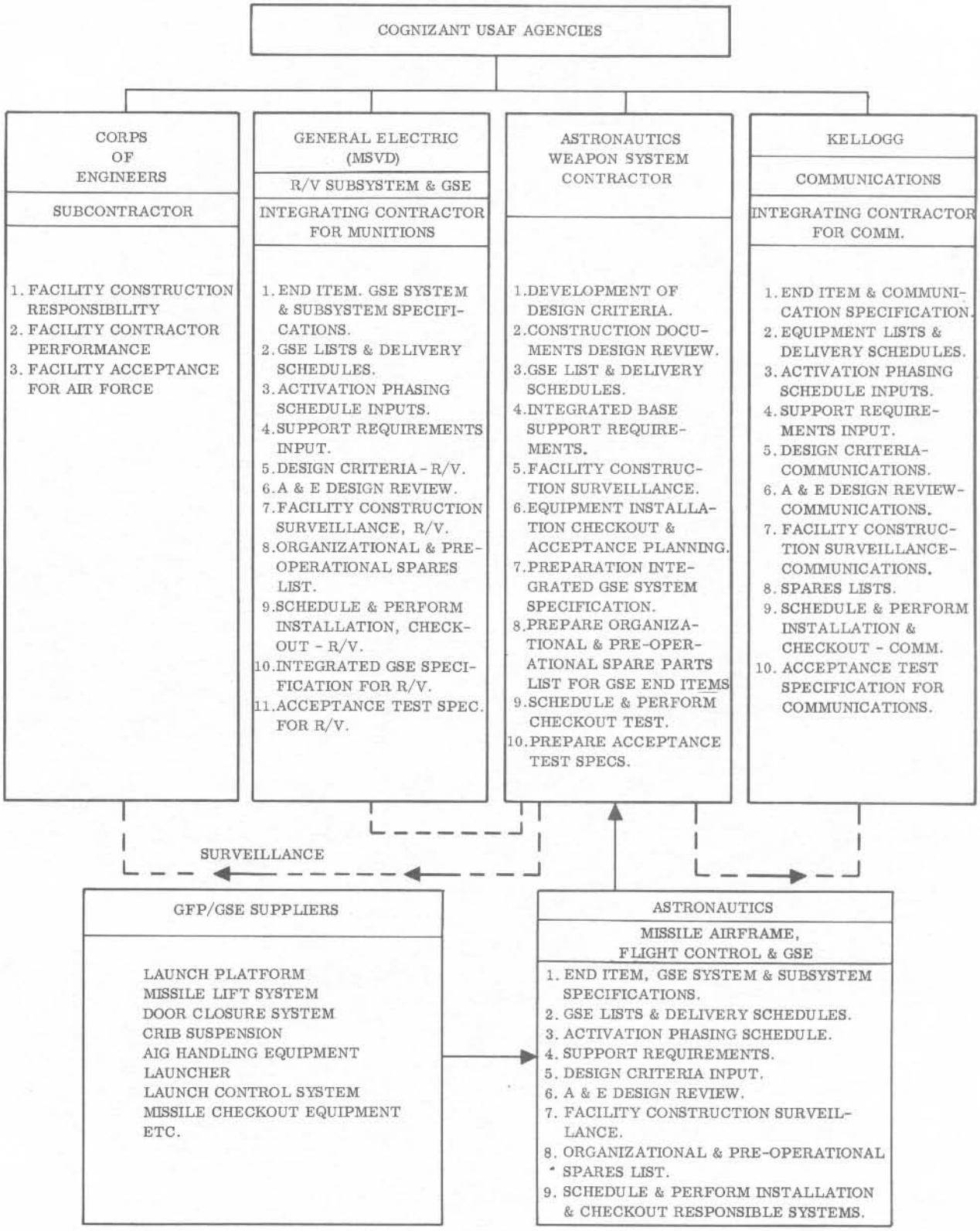
POLICIES AND RESPONSIBILITIES FOR ASTRONAUTICS AND ASSOCIATES

Air Force Ballistic Missile Division Exhibit 60-67 dated December 1960 prescribes the management policies and procedures required to activate the Series F silo bases.

The Air Force has designated as associate contractors: Astronautics, General Electric Missile and Space Vehicle Department (MSVD), and Kellogg Switchboard and Supply Co. Additionally, the Air Force has designated Astronautics as the weapon system contractor in all phases of base activation (except munitions) directly supporting the missile system. Astronautics also acts as integrating contractor in other phases of the over-all base activation task as shown on the opposite page.

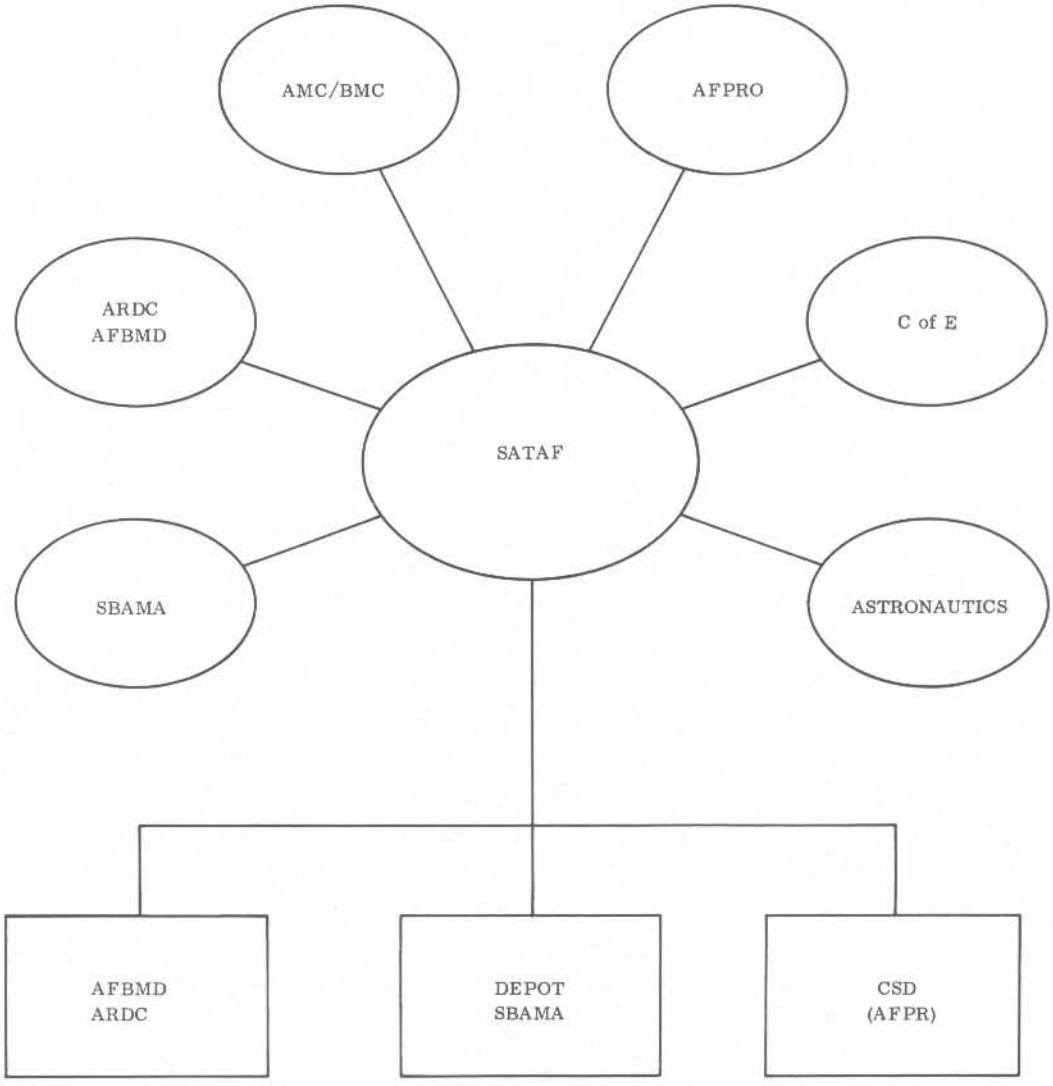
Kellogg acts as the integrating contractor in all activation phases directly supporting the communications function. For munitions, GE-MSVD is the integrating contractor.

In general, the chart on the opposite page displays the task responsibilities of the associate contractor, the responsibilities of Astronautics as weapon system contractor, and the suppliers of major GFP/GSE items.



POLICIES AND RESPONSIBILITIES FOR ASTRONAUTICS AND ASSOCIATES

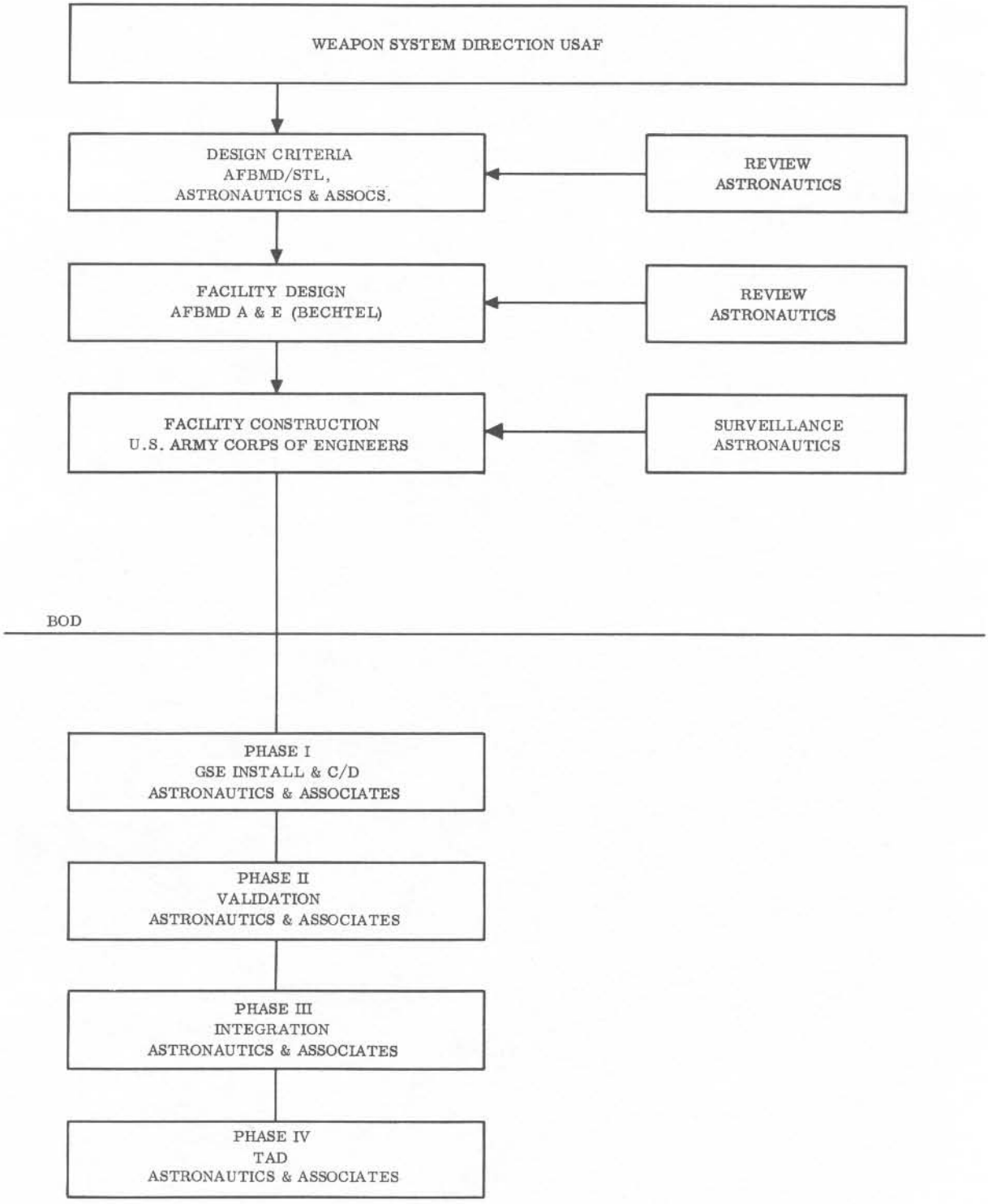
SITE ACTIVATION TASK FORCE
BASE ORGANIZATION



SITE ACTIVATION TASK FORCE
BASE ORGANIZATION

ACTIVATION RESPONSIBILITIES AND SEQUENCE

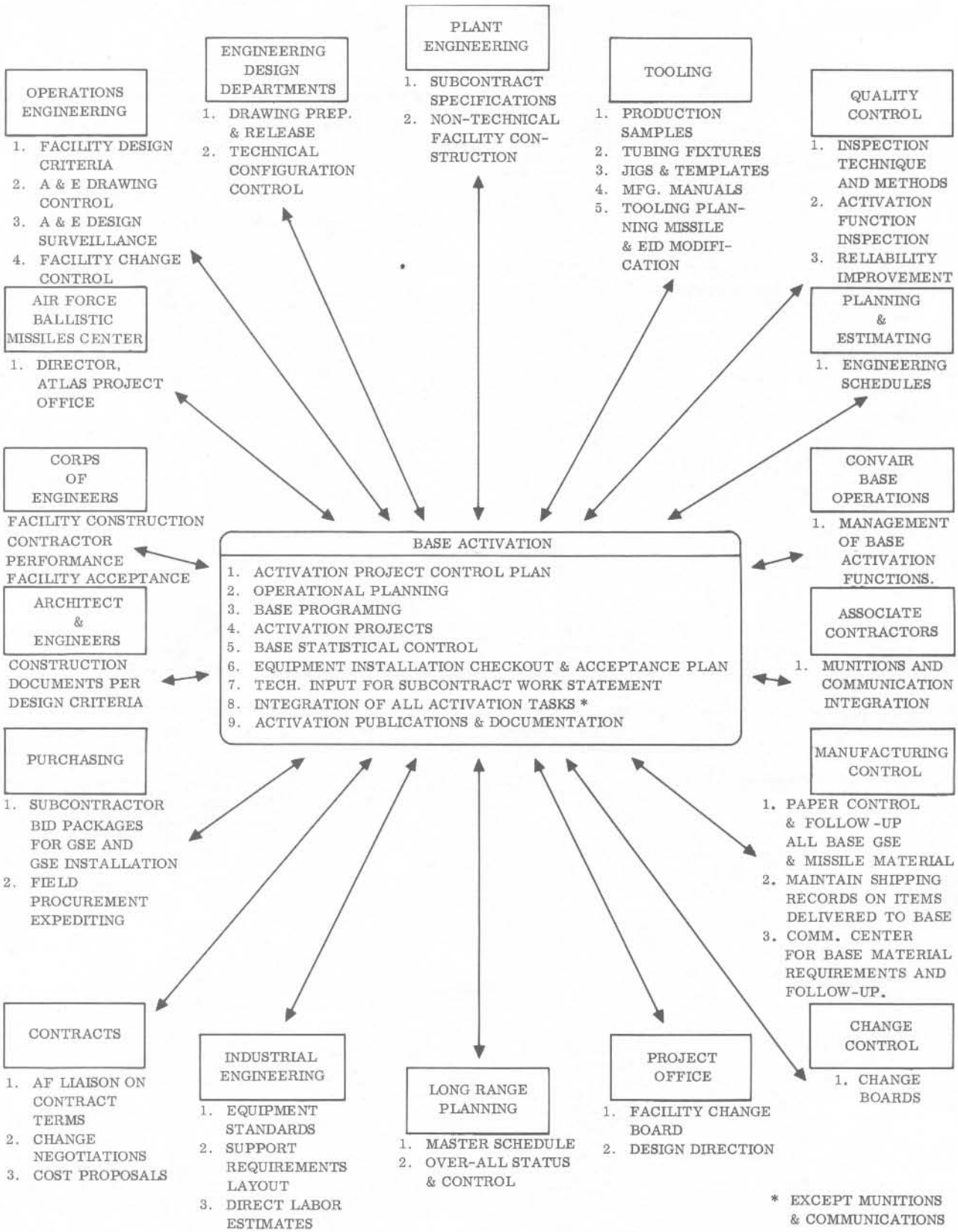
The chart on the opposite page shows the general sequence in which the responsibilities of all agencies are exercised in the over-all task of base activation.



ACTIVATION RESPONSIBILITIES AND SEQUENCE

SILO PROJECT COORDINATION

The activation of silo bases requires inputs from many geographically separated contributors. Effective scheduling and coordination of the separate contributions, plus assurance of consistency in base configuration, is a prime objective of the Weapon System Contractor's Project Control Plan.



SILO PROJECT COORDINATION

II. BASE ACTIVATION PROJECT CONTROL PLAN

PROJECT CONTROL PLAN

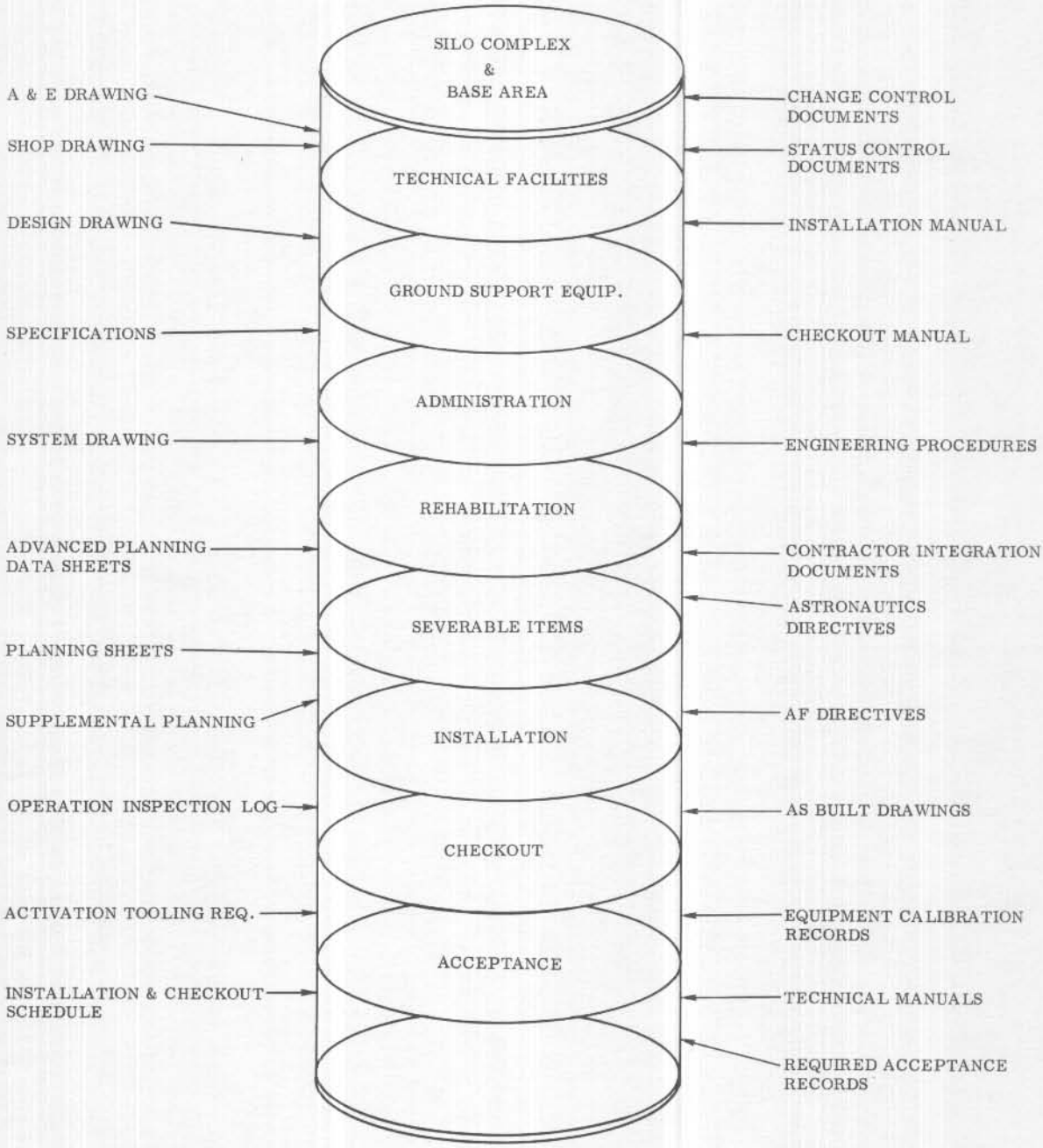
The principal objectives which must be attained to ensure maximum effectiveness of the Atlas Series F silo missile base activation effort are presented on the opposite page.

OBJECTIVES

1. A complete bill of materials for activation.
2. Continuity and coordination of engineering from all sources.
3. Adequate facilities surveillance control prior to BOD.
4. Effective post-BOD GSE installation inspection and checkout control.
5. Total configuration control.
6. An effective and accurate method of status reporting.
7. Complete documentation of the over-all base activation task.
8. Utilization of effective production techniques during activation.
9. Recognition and resolution of problem areas.
10. Means for assuring a high level of reliability.

COMPLETE BILL OF MATERIAL FOR ACTIVATION

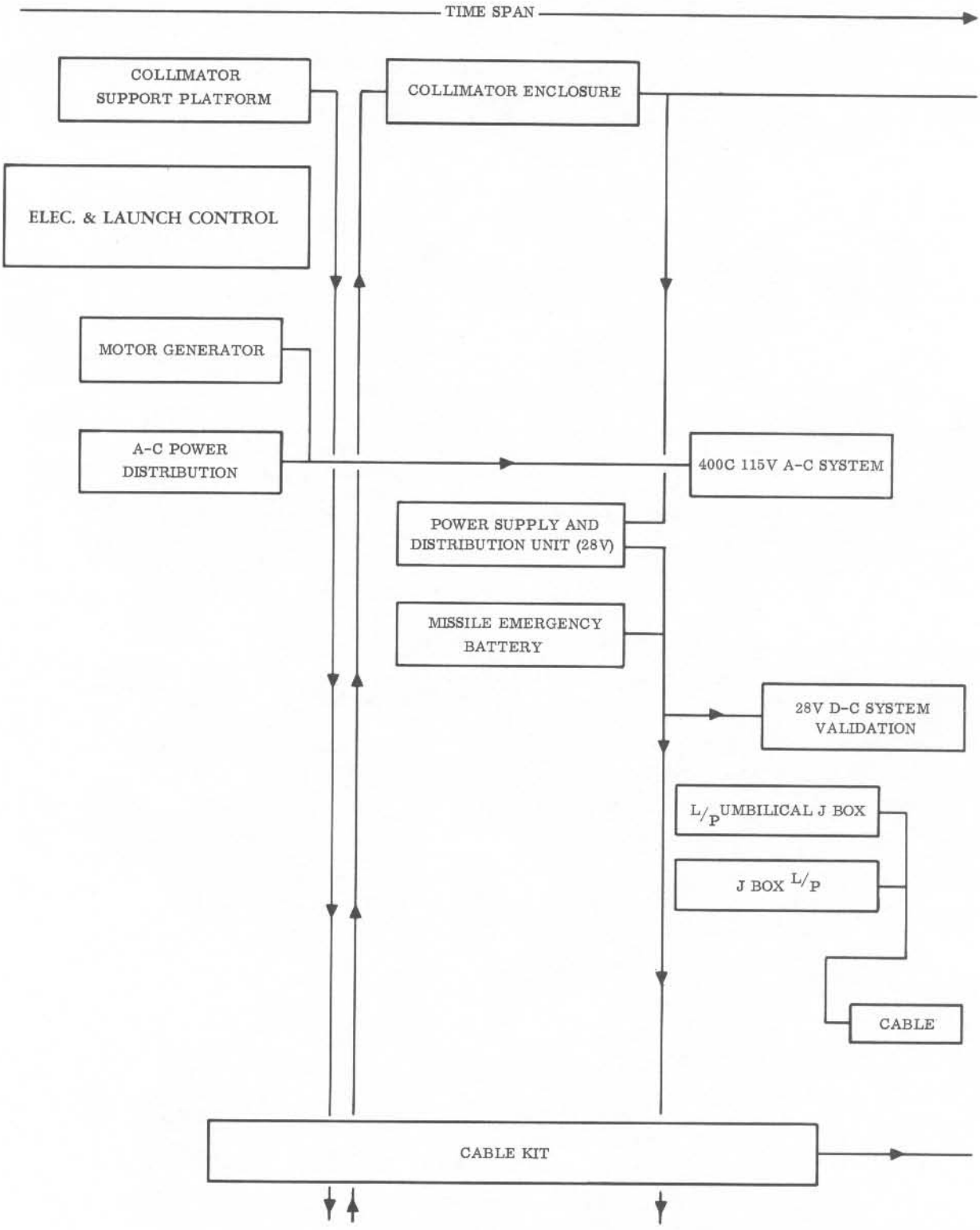
The complexity and magnitude of the Atlas Series F silo missile base activation task requires efficient implementation media to achieve the objectives of the program. A complete "Bill of Material for Activation" is shown on the opposite page.



COMPLETE BILL OF MATERIAL FOR ACTIVATION

INSTALLATION AND CHECKOUT SCHEDULE

The Installation and Checkout (I&C) Schedule shows the sequence and relationship of activation tasks to be accomplished by Astronautics and the associate contractors. This document is the basis for all activation scheduling. Status report data may be entered on the I & C Schedule for comparison of actual progress with scheduled progress. This provides immediate identification of areas which require extra effort.

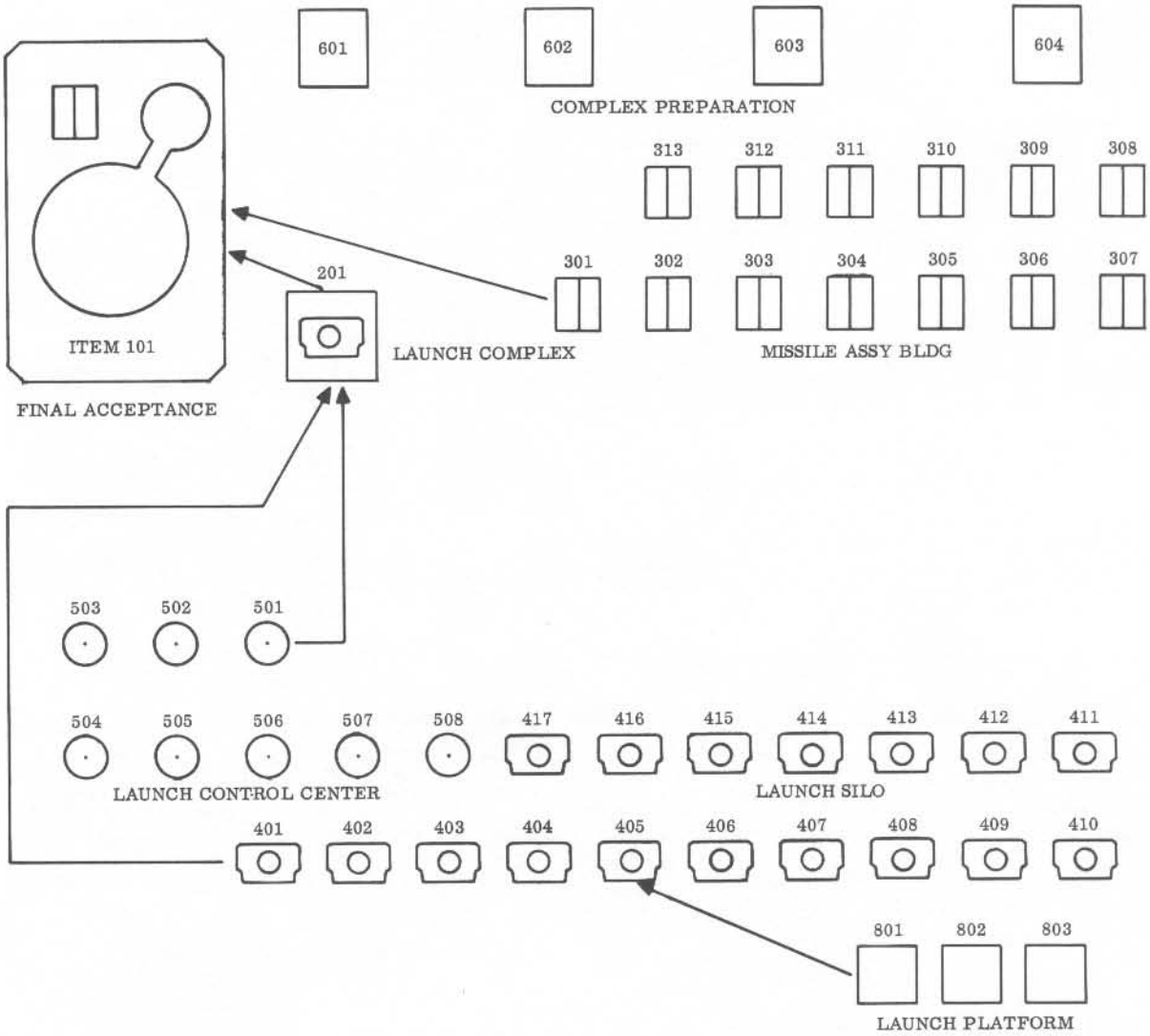


PORTION OF GSE INSTALLATION AND CHECKOUT SCHEDULE

ITEM FLOW

An item, in Base Activation terminology, is an incremental collection of related tasks scheduled to be accomplished in a given time period. Item numbers are used to identify planning cards in the Operational Planning Control System.

Each major area of the base (Administration and Supply Building, Missile Assembly Building, Launch Silo, Launch Control Center, and Complex) is identified by a chronological series of items designed to construct or install and validate the facility and GSE in consecutive increments. After all construction, installation and validation items in an area have been completed, an integration item assembles that area with related completed areas until, by progressive integration of completed items, the final USAF acceptance item for the entire Atlas Series F missile base is signed off. The Base Activation task is then complete.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604
COMPLEX PREPARATION
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ITEM 101
LAUNCH COMPLEX
MISSILE ASSY BLDG
FINAL ACCEPTANCE
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LAUNCH CONTROL CENTER
LAUNCH SILO
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802
803
LAUNCH PLATFORM

ITEM FLOW

FUNCTION NUMBERS

Function numbers are assigned to systems and activities within the scope of the Project Control Plan for purposes of identification. The Series F silo base function numbers are listed on the opposite page.

INTEGRATED FUNCTIONS

01 Launch control
02 480v power
03 Pressurization missile
04 Fuel
05 LO_2
06 GN_2-GO_2 PLS transfer pressure
07 H_e
08 LN_2
09 Communication
10 Missile hydraulics
11 Missile lifting
12 Guidance
13 (R/V) Re-entry vehicle
14 Mobile checkout
15 Launch platform
16 48v d-c
17 Compressed air
18 Pod cooling
19 Diesel power
20 (HVAC) Heating, ventilating & air conditioning
21 Fire protection
22 400 cps a-c (tactical power)
23 Silo hydraulics
24 Detection
25 28v d-c
26 Missile and/or whalebone checkout
27 Thrust section heater
28 Crib suspension
29 Umbilical loop
30 Procedures
31 120/240, single phase, 60 cycle (control voltage)
32 120/208, three phase, lighting distribution
33 Emergency lighting
34 Through 39 unassigned

ASTRONAUTICS OPERATIONS FACILITY FUNCTIONS

40 Shops
41 Motor pool
42 Calibration lab
43 Chemical lab
44 Not used
45 Severable items
46 Through 49 unassigned

BASE SERVICE FUNCTIONS

50 Re-entry vehicle storage
51 Communication

BASE SERVICE FUNCTIONS (Cont.)

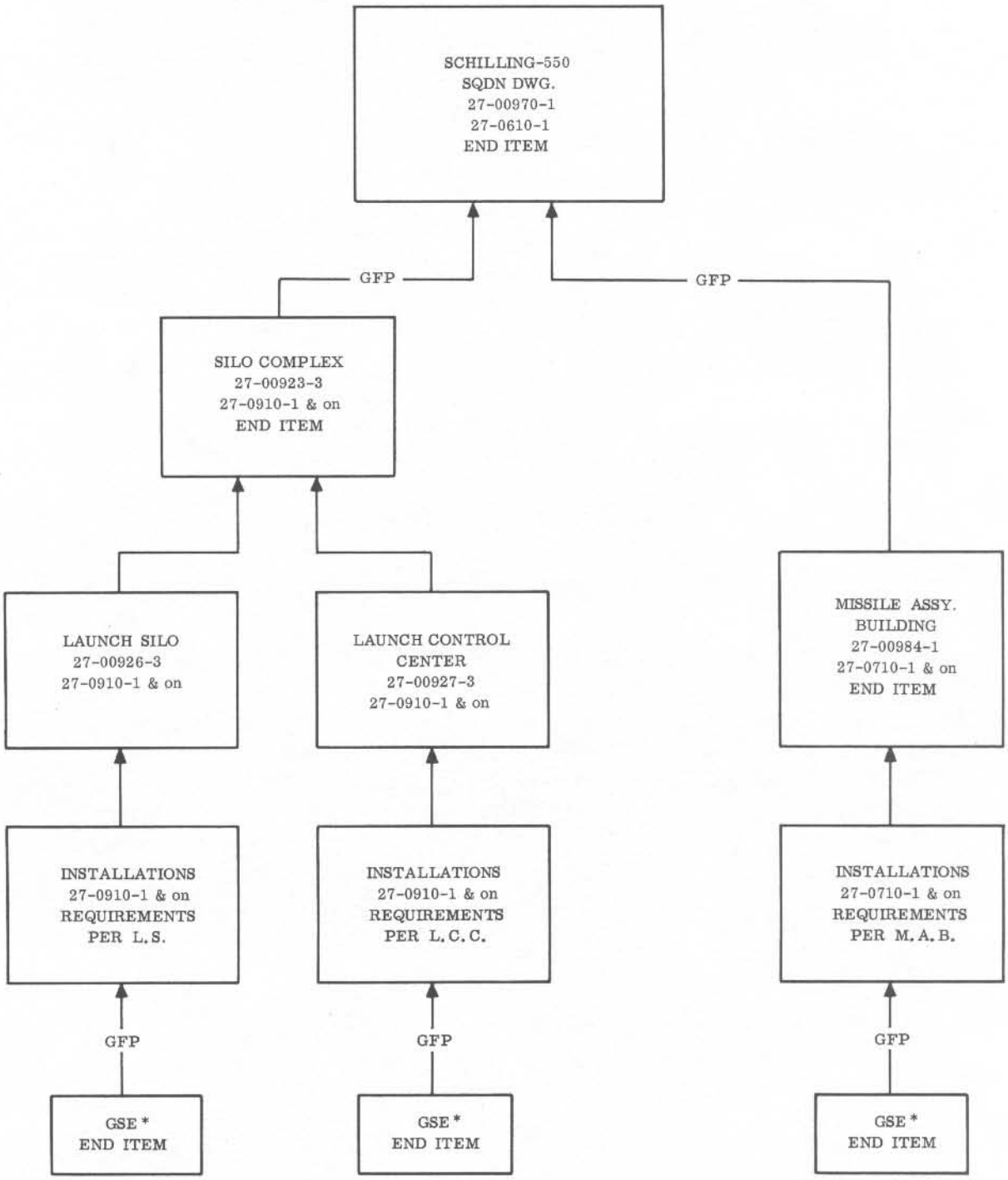
52 Messing
53 Security
54 Post office
55 Reproduction
56 Transportation
57 Hospital
58 Fire protection
59 Maintenance
60 LO_2 plant
61 Through 68 unassigned

NON-INTEGRATED FACILITY FUNCTION

69 MAB crane and hoist
70 Site orientation and layout
71 Easement and access road
72 Grading & earthwork (site)
73 Roads & paving
74 Fencing
75 Utility excavation & trenching
76 Waste water system
77 Facility wiring
78 Surface drainage
79 Grounding system
80 Sanitary waste system
81 Domestic & utility water
82 Cooling water
83 Foundations & floors
84 Embedded hardware
85 Equipment & personnel openings platforms
86 Wall & bldg. sections
87 Process piping supports
88 Blast closures & doors
89 Cable trays & trench covers
90 Elect. fixtures & fittings
91 Plumbing fixtures & fittings
92 Finish grading
93 Landscape & erosion control
94 Suspended structures
95 Surface surveillance & warning
96 Painting & corrosion control
97 Personnel service equipment
98 Demineralized water
99 Rehabilitation

ASTRONAUTICS DRAWING SYSTEM FOR SILO BASES

Basic Astronautics drawing numbers are shown on the opposite page.



* FOR ALLOCATION OF END ITEMS
SEE 27-90047 DOCUMENT.

DRAWING SYSTEM

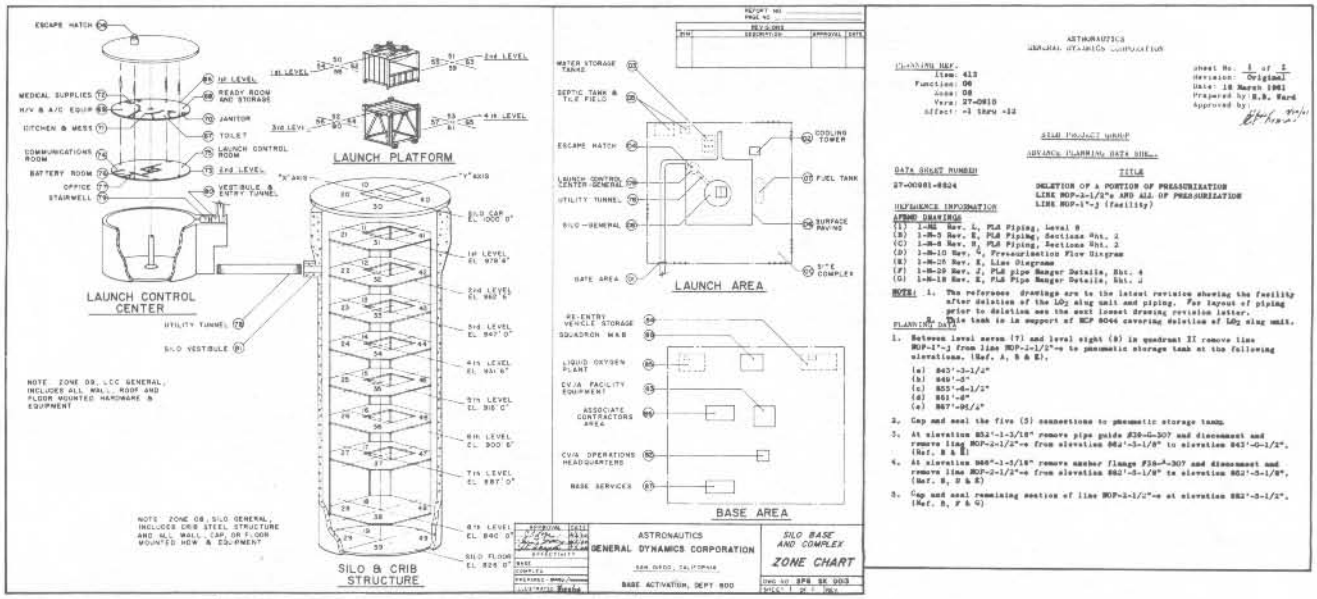
ADVANCE PLANNING ELEMENTS

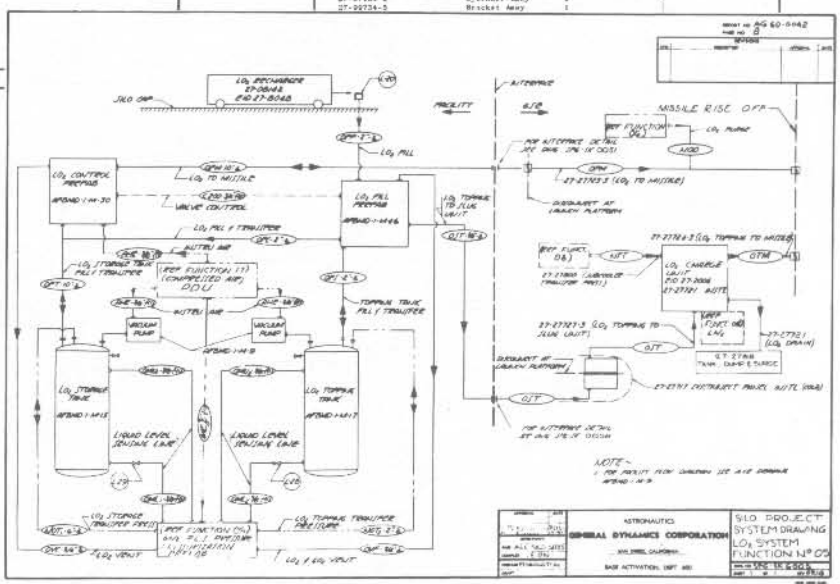
A primary Base Activation task is the assembly of engineering information from all sources and the final conversion of this information into detailed instructions for the installation, checkout and validation of the Series F silo systems.

System drawings, site installation requirements lists and Advance Planning Data Sheets are prepared by Base Activation engineers to define the specific activation tasks related to the original design drawings, specifications and procedures. This information is used in the preparation of the Operational Planning Cards.

System drawings are schematic compilations of facility, GSE, GOE, and GFP components. These are the only drawings which provide a complete picture of the relationship of all components within the system.

Site Installation Requirement Lists (SIRLs) provide detailed information on hardware requirements, packaging and shipping. The SIRL is used by other Astronautics departments, vendors and the customer to prepare documents required to control the flow of materials.





ADVANCE PLANNING ELEMENTS

OPERATIONAL PLANNING

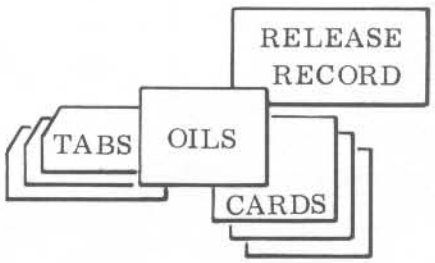
From the Advanced Project Planning documents, Department 606 planners generate the detailed planning paper displayed on the opposite page.

This planning is issued to the base in packages composed of Operation Inspection Logs (OIL), one copy of each Planning Card listed on the OIL, and one IBM tab card for each Planning Card. The tab cards are punched by Department 192 so that machine processing can produce status reports in a variety of formats. A Drawing Release Record covers the package.

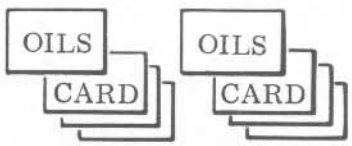
Before the scheduled actual need for detailed planning, one preliminary (reference) copy of the OIL package (less tab cards) is sent to the base. This package assists in preplanning activation task execution and material requirements.

On or before the actual need date, the following are officially released to the base as replacements for the preliminary package:

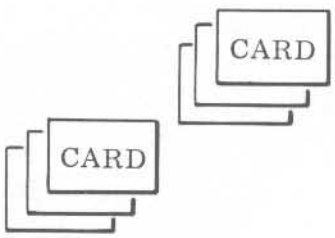
ONE AUTHORIZED OIL PACKAGE



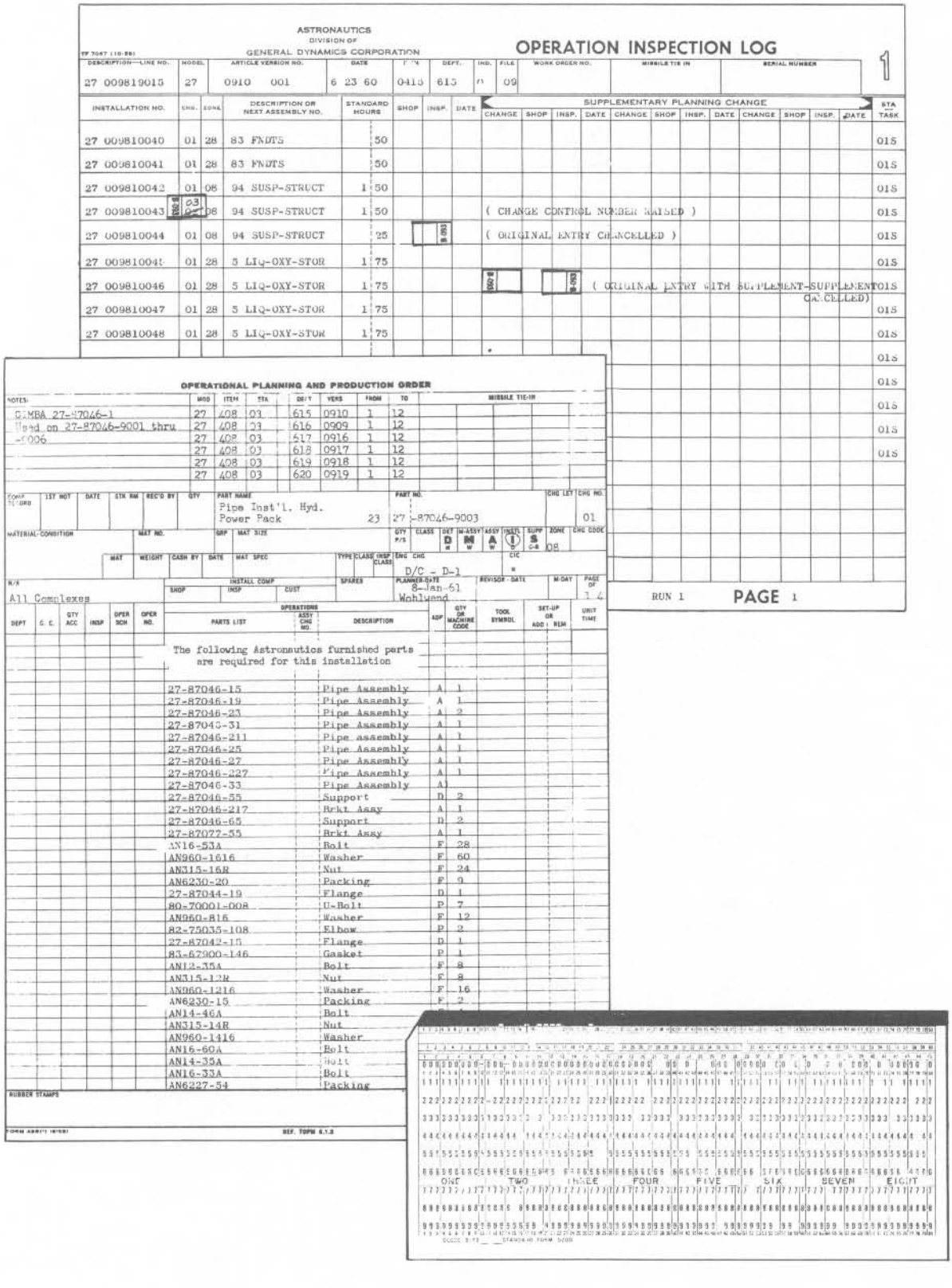
TWO REFERENCE OIL PACKAGES



TWO EXTRA REFERENCE SETS OF PLANNING CARDS



As they become available, the base is supplied with pertinent Engineering Change Summaries (ECS), Drawing Change Summaries (DCS), Planning Summary Sheets, and change data on each authorized Supplemental Planning card.



ASTRONAUTICS
DIVISION OF
GENERAL DYNAMICS CORPORATION

OPERATION INSPECTION LOG

DESCRIPTION—LINE NO.	MODEL	ARTICLE VERSION NO.	DATE	F/M	DEPT.	IND.	FILE	WORK ORDER NO.	MISSILE TIE IN	SERIAL NUMBER
27 009819015	27	0910 001	6 23 60	0415	615	0	09			

INSTALLATION NO.	CHG.	ZONE	DESCRIPTION OR NEXT ASSEMBLY NO.	STANDARD HOURS	SHOP	INSP.	DATE	SUPPLEMENTARY PLANNING CHANGE										STA TASK
								CHANGE	SHOP	INSP.	DATE	CHANGE	SHOP	INSP.	DATE	CHANGE	SHOP	INSP.	DATE	
27 009810040	01	28	83 FNDTS	50														01S
27 009810041	01	28	83 FNDTS	50														01S
27 009810042	01	08	94 SUSP-STRUCT	1 50														01S
27 009810043	03	08	94 SUSP-STRUCT	1 50				(CHANGE CONTROL NUMBER RAISED)										01S
27 009810044	01	08	94 SUSP-STRUCT	25				(ORIGINAL ENTRY CANCELLED)										01S
27 009810045	01	28	5 LIQ-OXY-STOR	1 75														01S
27 009810046	01	28	5 LIQ-OXY-STOR	1 75				(ORIGINAL ENTRY WITH SUPPLEMENT-SUPPLEMENT CANCELLED)										01S
27 009810047	01	28	5 LIQ-OXY-STOR	1 75														01S
27 009810048	01	28	5 LIQ-OXY-STOR	1 75														01S
																		01S
																		01S
																		01S
																		01S
																		01S

RUN 1 **PAGE** 1

OPERATIONAL PLANNING AND PRODUCTION ORDER

NOTES:
CEMBA 27-87046-1
Used on 27-87046-9001 thru -9006

MOD	ITEM	STA	DEPT	VERS	FROM	TO
27	408	03	615	0910	1	12
27	408	03	616	0909	1	12
27	408	03	617	0916	1	12
27	408	03	618	0917	1	12
27	408	03	619	0918	1	12
27	408	03	620	0919	1	12

MISSILE TIE-IN

PART NAME: Pipe Inst'l. Hyd. Power Pack 23
PART NO.: 27-87046-9003
CHG LET: 01
CHG NO.:
QTY P/S:
CLASS:
DET: D
M-ASSY: M
ASSY: A
INSTL: I
SUPP: S
ZONE: 08
CHG CODE:
ENG CHG: D/C - D-1
PLANNER-DATE: 8-Jan-61 Wahlwend
REVISOR - DATE:
M-DAY:
PAGE OF: 1 4
R/S: All Complexes
INSTALL COMP: SHOP / INSP / CUST
SPARES:

DEPT	C. C.	QTY ACC	INSP	OPER SCN	OPER NO.	PARTS LIST	ASSY CHG NO.	DESCRIPTION	ADP	QTY PER MACHINE CODE	TOOL SYMBOL	SET-UP OR ADD'L REM	UNIT TIME
						The following Astronautics furnished parts are required for this installation							
						27-87046-15		Pipe Assembly	A	1			
						27-87046-19		Pipe Assembly	A	1			
						27-87046-23		Pipe Assembly	A	2			
						27-87046-31		Pipe Assembly	A	1			
						27-87046-211		Pipe assembly	A	1			
						27-87046-25		Pipe Assembly	A	1			
						27-87046-27		Pipe Assembly	A	1			
						27-87046-227		Pipe Assembly	A	1			
						27-87046-33		Pipe Assembly	A				
						27-87046-55		Support	D	2			
						27-87046-217		Brkt Assy	A	1			
						27-87046-65		Support	D	2			
						27-87077-55		Brkt Assy	A	1			
						AN16-53A		Bolt	F	28			
						AN960-1616		Washer	F	60			
						AN315-16R		Nut	F	24			
						AN6230-20		Packing	F	9			
						27-87044-19		Flange	D	1			
						80-70001-008		U-Bolt	P	7			
						AN960-816		Washer	F	12			
						82-75035-108		Elbow	P	2			
						27-87042-15		Flange	D	1			
						83-67900-146		Gasket	P	1			
						AN12-35A		Bolt	F	8			
						AN315-12R		Nut	F	8			
						AN960-1216		Washer	F	16			
						AN6230-15		Packing	F	2			
						AN14-46A		Bolt					
						AN315-14R		Nut					
						AN960-1416		Washer					
						AN16-60A		Bolt					
						AN14-35A		Bolt					
						AN16-33A		Bolt					
						AN6227-54		Packing					

RUBBER STAMPS

REF. TOPM 6.1.2

ONE TWO THREE FOUR FIVE SIX SEVEN EIGHT

OPERATIONAL PLANNING

BASE ACTIVATION CHANGE CONTROL

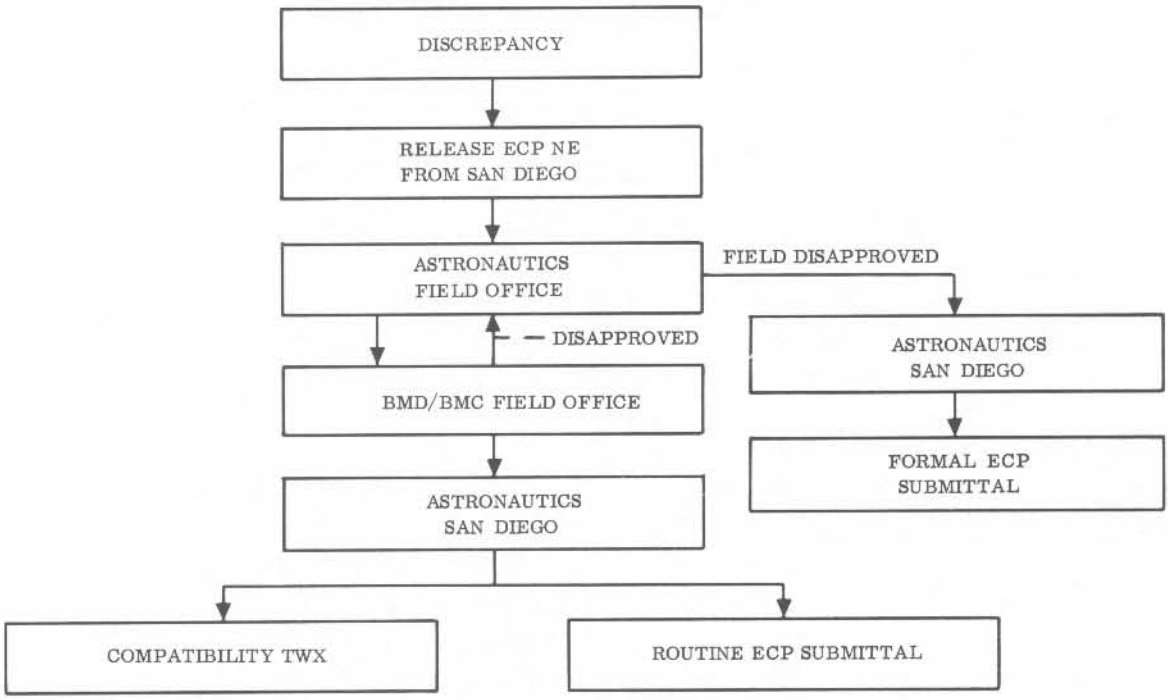
Change control will be exercised by Department 600, using presently established channels. Design revisions (TVAs, EOs, ECPs and GMAs) will, in most cases, cause revisions in activation planning. The changes will be reflected on Project Control Drawings, when required, and on Bills of Material. These changed documents and supplemental planning cards will then be issued to the base to define the new task.

It is the intent of the Project Control Plan that all planning necessary for activation be issued from San Diego. When occasions arise where immediate change requirements must be met by the base, supplemental planning will be issued by the base planning personnel in the form of planning cards. The change will be transmitted immediately to San Diego for official documentation and effectivity review.

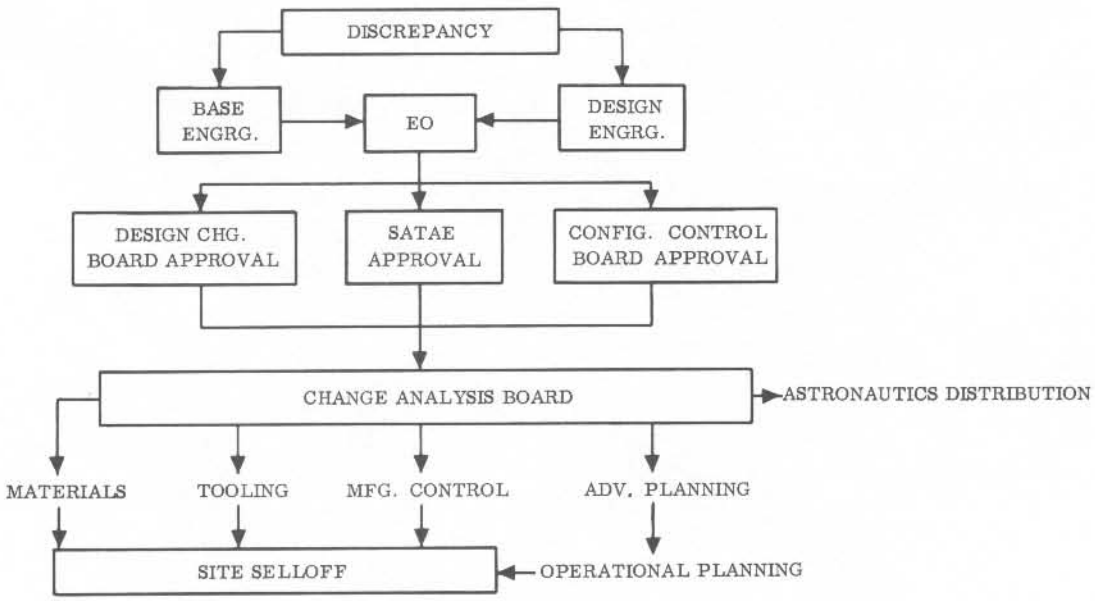
The flow chart on the opposite page indicates the routing of facility and GSE change information.

FACILITY CHANGE CONTROL

COMPATIBILITY ECP FLOW CHART



GSE CHANGE CONTROL



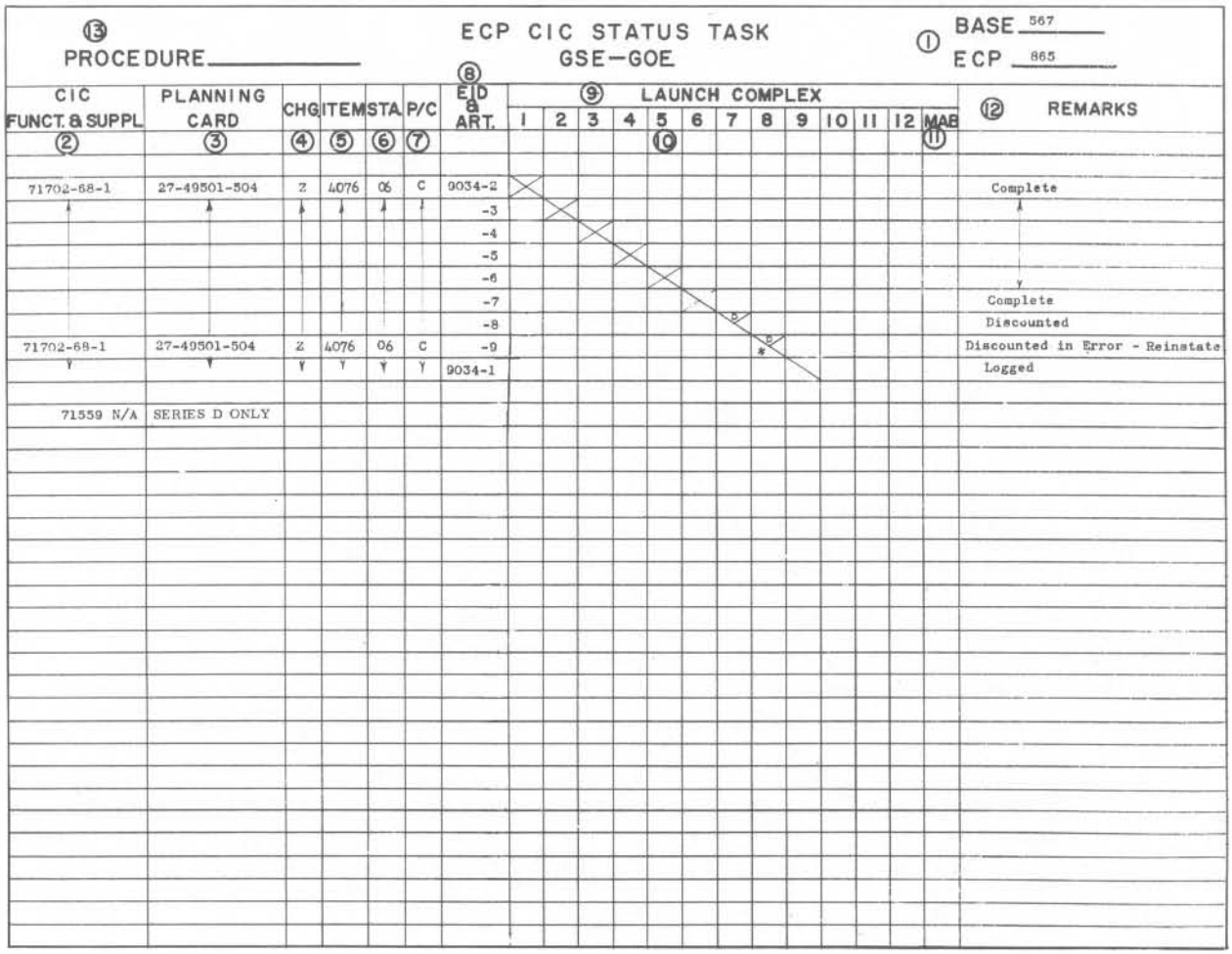
FACILITY AND GSE CHANGE CONTROL

ECP-CIC STATUS AND CONFIGURATION CONTROL

ECP-CIC configuration and status control has been established in accordance with the Atlas Weapon System Configuration Index, AFBMD 60-36. Implementation of this procedure assures compatibility of engineering design, related documents, missile and technical facility hardware installations with the requirements of AFBMD 60-36.

Planning departments at all bases establish and maintain ECP-CIC status and configuration control records and demonstrate configuration control documentation during the installation, checkout and final selloff phases of Base Activation.

ECP-CIC status IBM tab runs are maintained for accountability.



ECP CIC STATUS TASK
GSE–GOE

(13) PROCEDURE _____

(1) BASE 567
ECP 865

(2) CIC FUNCT. & SUPPL	(3) PLANNING CARD	(4) CHG	(5) ITEM	(6) STA	(7) P/C	(8) EID & ART.	(9) LAUNCH COMPLEX 1	2	3	4	5 (10)	6	7	8	9	10	11	12	MAB (11)	(12) REMARKS
71702-68-1	27-49501-504	Z	4076	06	C	9034-2														Complete
						-3														
						-4														
						-5														
						-6														
						-7														Complete
						-8														Discounted
71702-68-1	27-49501-504	Z	4076	06	C	-9														Discounted in Error - Reinstate
						9034-1														Logged
71559 N/A	SERIES D ONLY																			

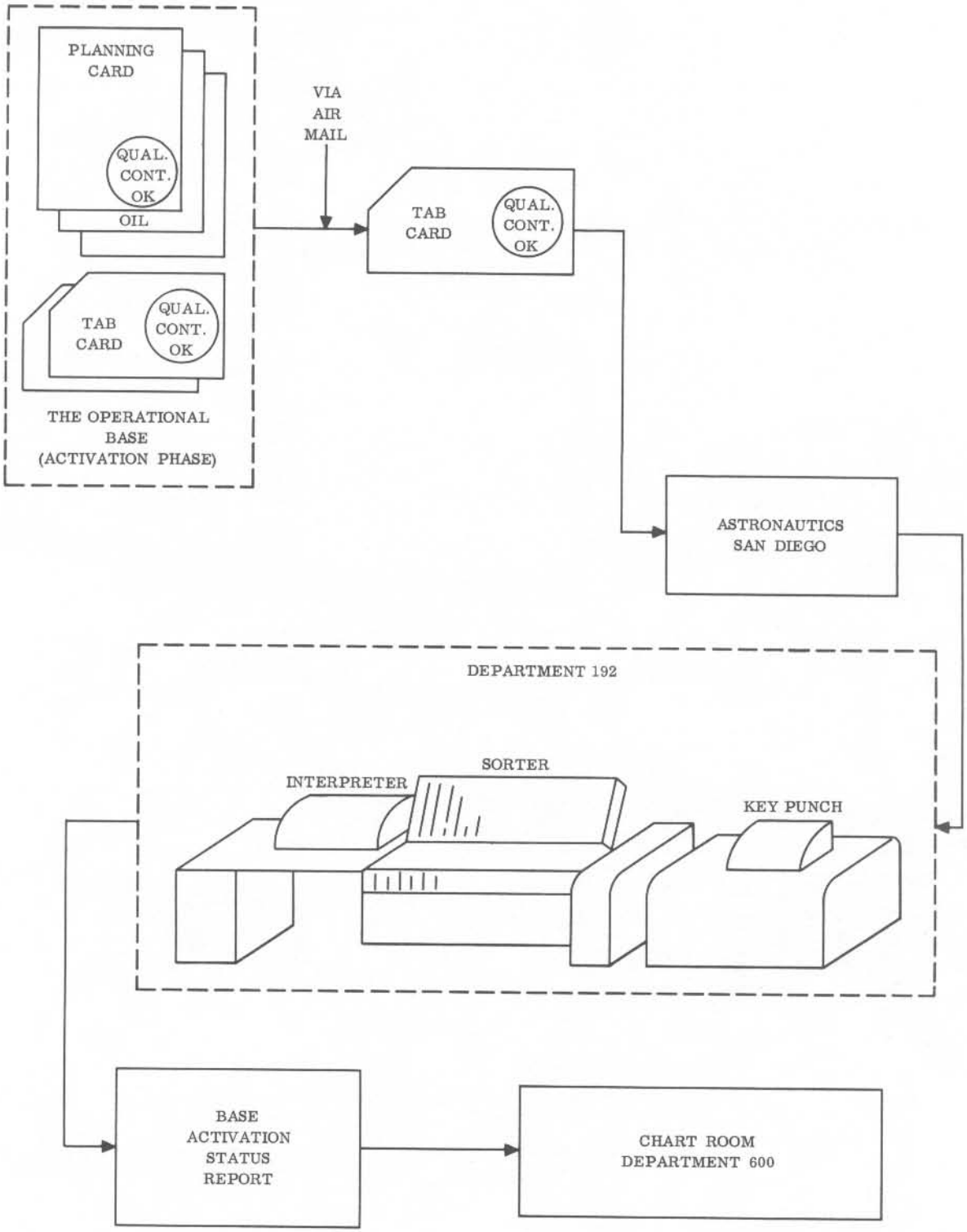
ECP-CIC STATUS TASK

STATUS REPORT CONTROL

Accurate, comprehensive reporting of progress on a continuing cycle is a prime tool for the orderly prosecution of the over-all Base Activation task. The Project Control Plan, by sectionalizing each feature of construction or installation into discrete, logical packages provides the means for reporting progress in specifically described increments.

A generalized representation of the status reporting flow is displayed on the opposite page. As tasks described on the Planning Cards are completed, the authorized cards and the corresponding Status Report tab cards are stamped to record the fact, and the corresponding entry on the OIL also is stamped.

Periodically, all stamped tab cards are sent by mail to Base Activation Department (600) in San Diego. These cards are processed for Department 600 by Data Processing (Department 192). The master deck of tab cards is punched to correspond with the cards received from the base, after which the master deck is used to produce the status report.



STATUS REPORT CONTROL

FULL-SCALE SILO MOCKUP

The Mockup is designed as a "master tool" and is constructed to exact specifications, identical to the operational base silo configuration with respect to location of equipment, simulation of equipment and interconnection location.

The mockup consists of three major units:

1. A 111-ft. tower, comprising levels 1 through 6 with a simulated ground level.

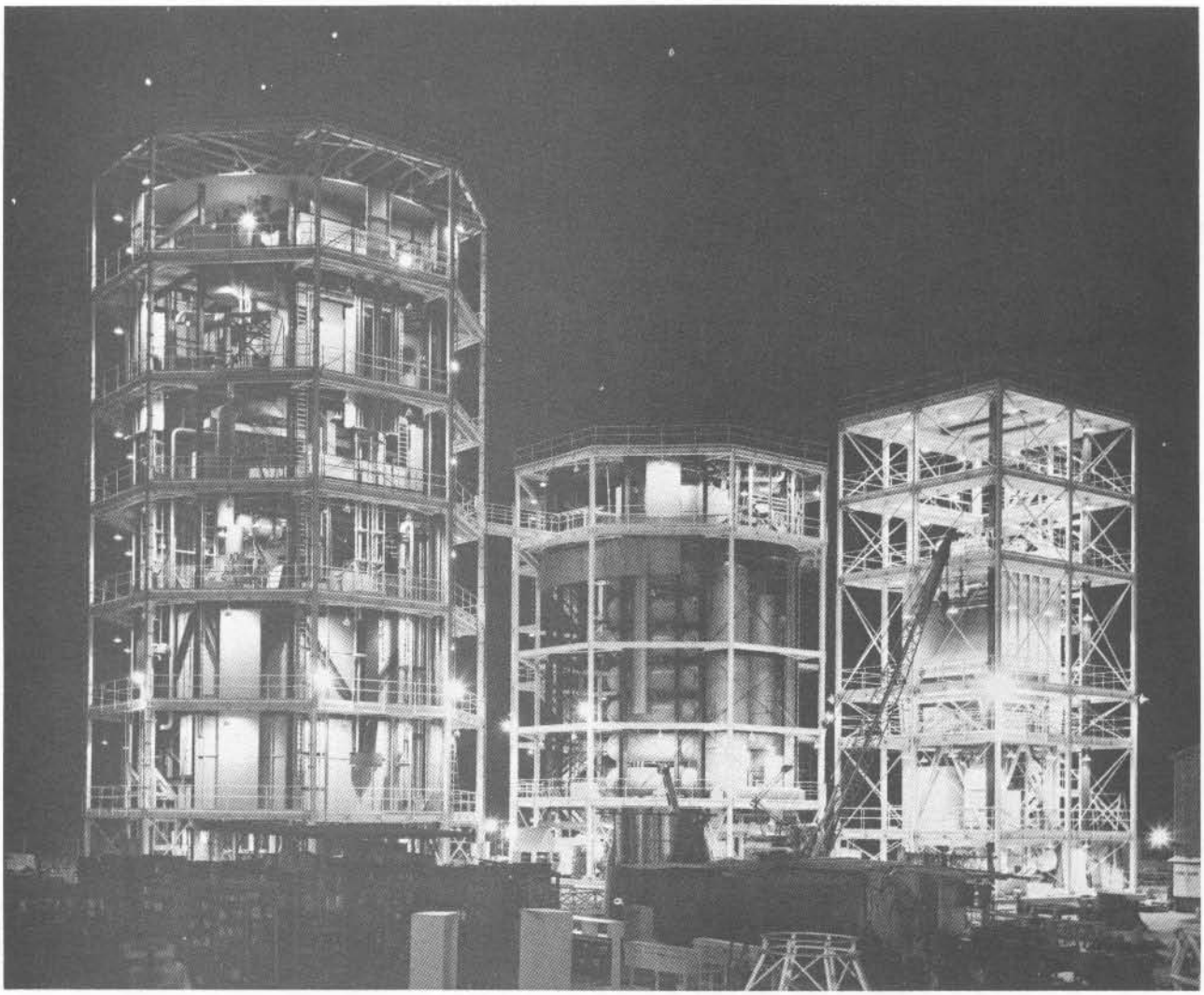
2. A 77-ft. tower, comprising levels 7 and 8.

3. A simulated launch platform.

The purpose of this "master tool" is to provide proofing for all interconnecting installations such as piping, tubing, cabling and ducting as well as gross area of maximum volume occupancy to accurately determine equipment space allocations.

Some of the advantages realized in the construction and installation of the full-scale mockup: The mockup permits early determination of engineering discrepancies, thereby reducing material loss and installation time in the field. It is used extensively as a training tool for Astronautics and Air Force personnel.

The mockup concept permits a more practicable approach to required changes, reduces vendor rework, and permits early determination of requirements for design, manufacturing and proofing of production tooling.



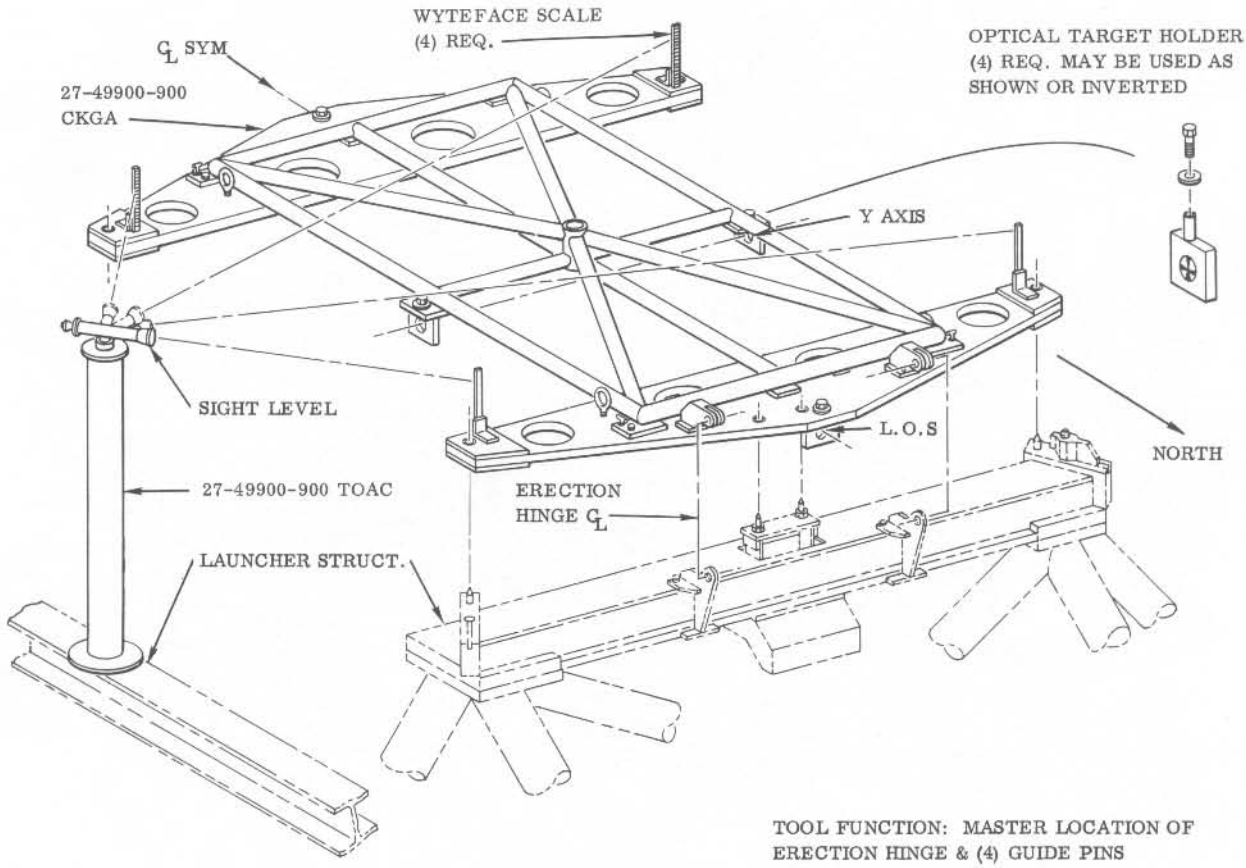
FULL-SCALE SILO MOCKUP

ACTIVATION TOOLING

A large number of special optical and mechanical tools are used in silo Base Activation. Facility and interface surveillance requires the use of special alignment tools. Installation and checkout tools are used in conjunction with installation, checkout, integration and final selloff demonstrations.

Base Activation determines tooling requirements and coordinates the tooling effort.

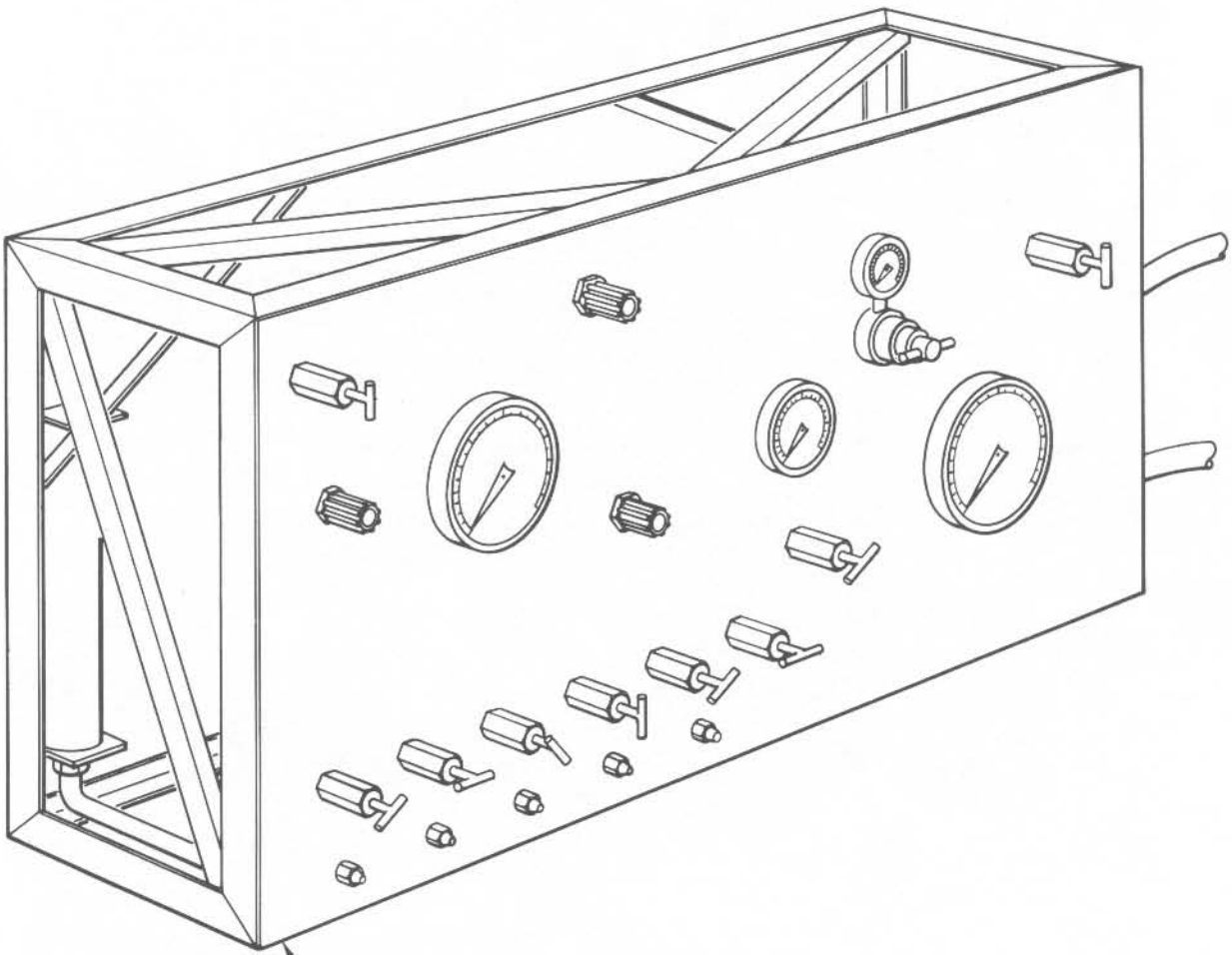
A drawing of the check gage for the silo launcher assembly is shown on the opposite page.



LAUNCHER ASSEMBLY CHECK GAGE

VALIDATION TEST TOOLS

Validation tools or kits are designed and fabricated for use in silo surveillance and checkout. The nitrogen charging unit (NCU) test panel validation kit shown on the opposite page is typical. It contains the valves, gages, pressure regulators and connecting hoses necessary to carry out the specified checkout procedures for the NCU.



NCU TEST PANEL VALIDATION KIT

III. BASE ACTIVATION OPERATIONS CONTROL PLAN

BASE ACTIVATION OPERATIONS CONTROL PLAN

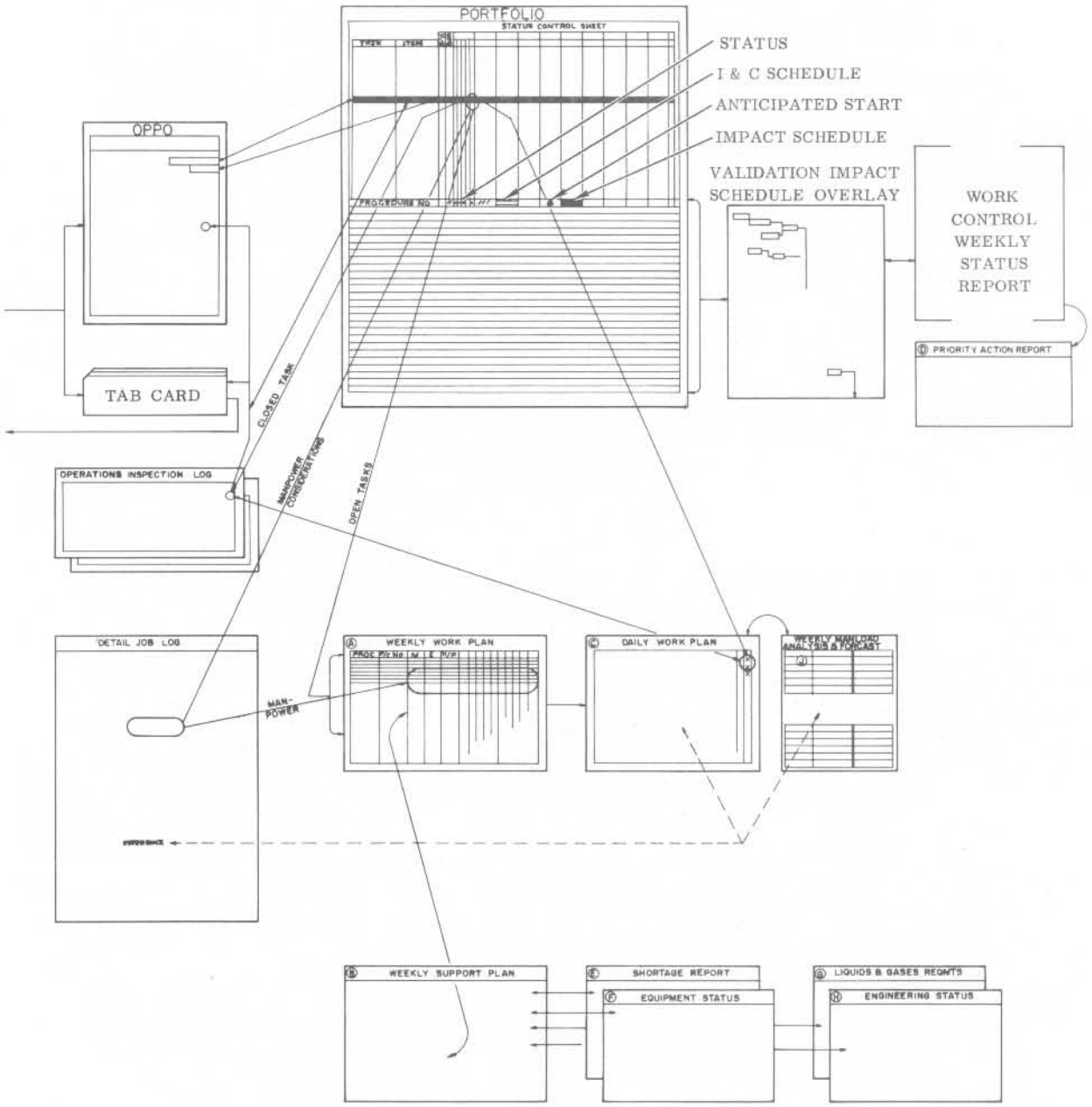
Base Activation Operations Control is a method of work control developed to collate the activation efforts at the three prime levels of responsibility -- complex, base and program. The principal objective in the development has been to provide a complete work plan for use at the complex, so devised that the necessary support from the Astronautics base organization is directly related and that San Diego program support is immediate and formulated upon existing and anticipated conditions.

Operations Control is achieved by the Work Control Plan as the basic control instrument with the organization of the Astronautics base personnel in direct support of the complex activation effort. Base Activation Departments in San Diego acting on Work Control Plan analyses provide the necessary support action as influenced by program objectives and schedules.

The controlling and key factor in activating a launch complex is the ability to perform validations and systems tests satisfactorily and on schedule. The procedures used to accomplish the validation and integration operations prove to the customer that all work, both facility and GSE installations, has been completed satisfactorily. The Work Control Plan, organizes all activation tasks into the logical flow of work which precedes and relates to a particular procedure. The installation tasks are planned and scheduled in relation to a procedure and the procedures are inter-related in critical path and sequence.

The Work Control Plan is packaged for maximum utilization at the complex and is oriented for easy evaluation of priority tasks. Each procedure has a separate work control sheet on which all related planning card information is placed. The work control sheets are positioned in a visible record type-holder in required sequence and critical path order, and a transparant overlay is provided for analysis of schedule priority. A means is provided for quick evaluation of open and sold planning and for status of procedure selloff.

Supporting documents shown on the opposite page are provided for implementation of the Work Control Plan.

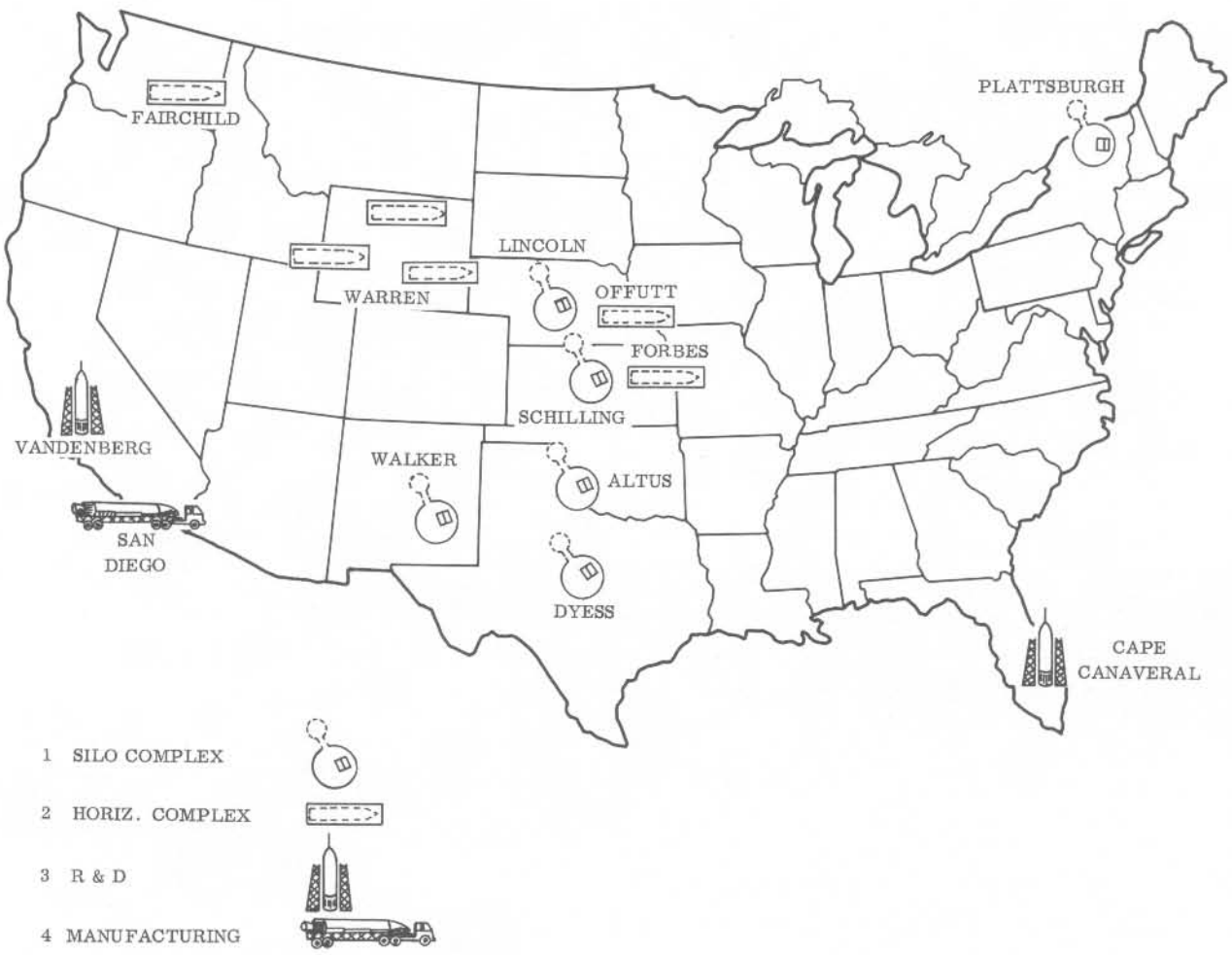


WORK CONTROL OPERATIONS - COMPLEX

IV. BASE DEPLOYMENT AND DESIGN

BASE DEPLOYMENT

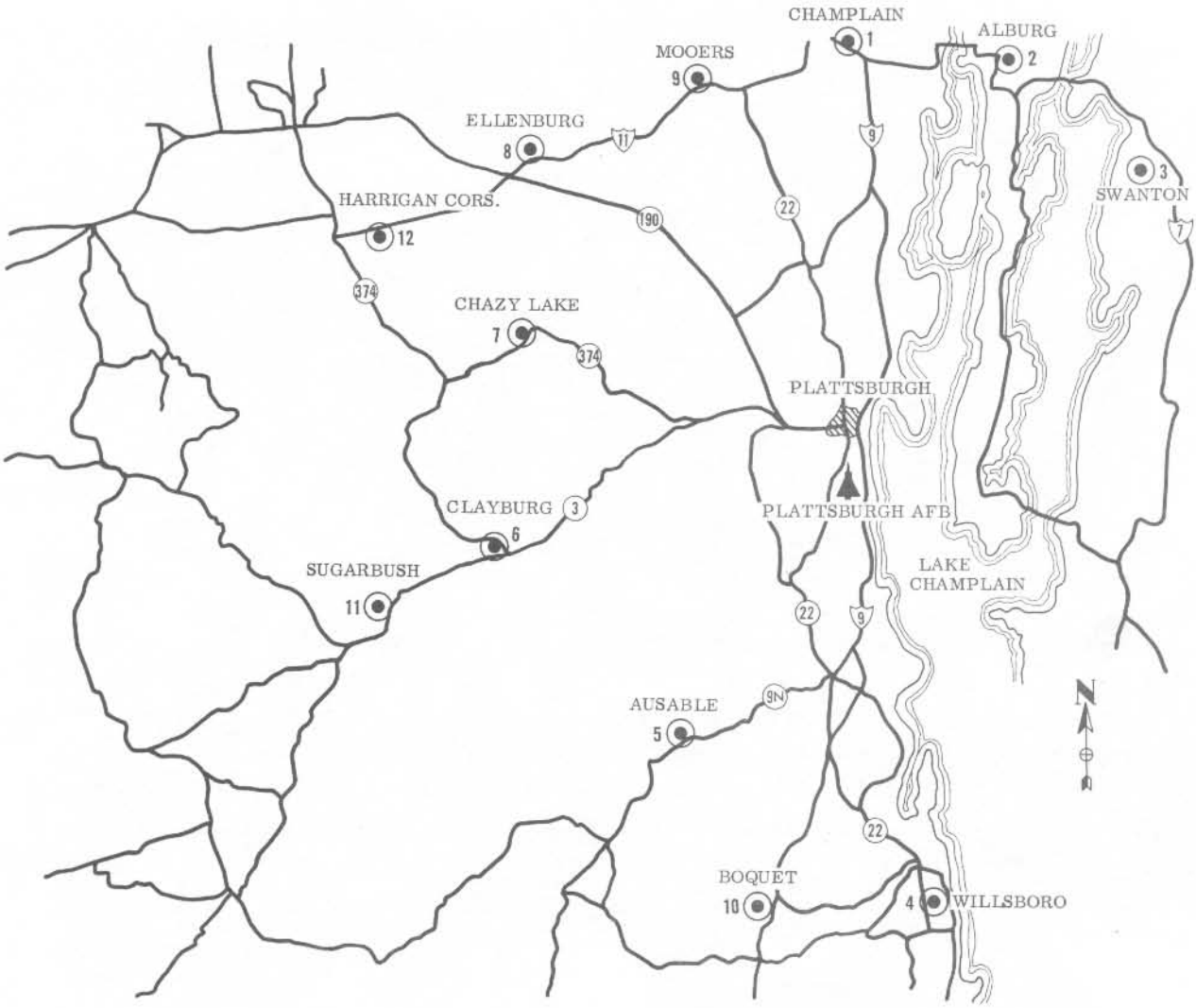
Currently authorized Atlas missile bases are deployed in the general pattern shown on the opposite page. The distances between bases and Base Activation headquarters in San Diego are natural deterrents to good communication. Total compliance with the detailed means and methods of the Project Control Plan provides maximum effectiveness of communication, coordination and control.



BASE DEPLOYMENT

BASE DESIGN PHILOSOPHY

Each silo base consists of 12 launch sites deployed as shown on the accompanying map of Plattsburgh Air Force Base, New York. The first consideration in locating the sites is maximum dispersal for protection against enemy action. Other major considerations are local topographical and geological conditions. Each launch site is operationally independent. All 12 sites are dependent for logistic support on a common Squadron Maintenance Area, and are controlled from a central administration area.



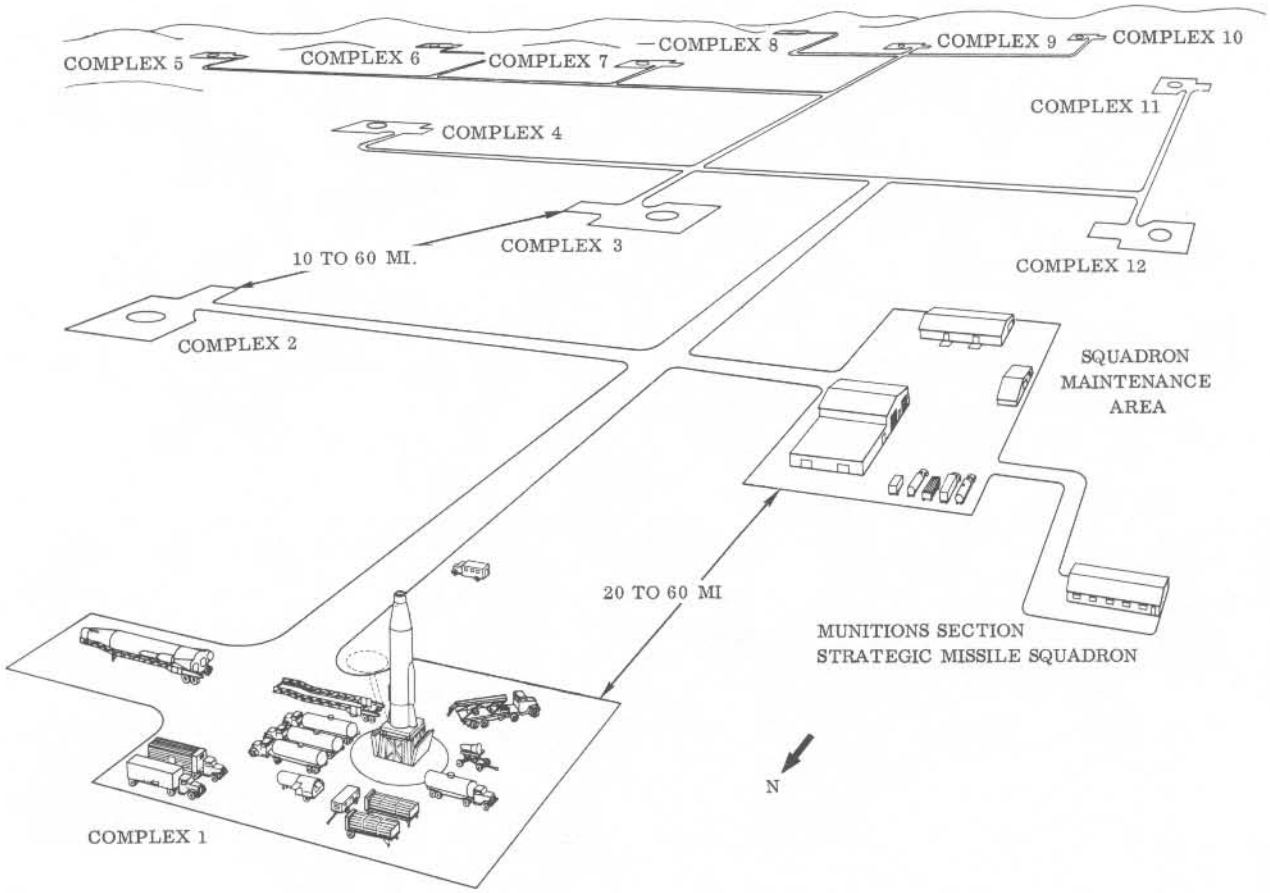
SITE	MILES FROM PLATTSBURGH	POPULATION
	PLATTSBURGH	19,000
1	30 MI.	1,505
2	38 MI.	1,400
3	52 MI.	1,400
4	30 MI.	1,000
5	26 MI.	1,650
6	34 MI.	500
7	32 MI.	300
8	27 MI.	500
9	33 MI.	500
10	28 MI.	100
11	36 MI.	100
12	39 MI.	100

0 10 20 30

SCALE OF MILES

SILO BASE LAYOUT

A typical Series F silo squadron is shown on the opposite page. In the launch-ready configuration, all structures and equipment at a launch complex will be below ground, as at complexes 2 through 12 in the illustration. Only during maintenance operations will equipment be dispersed as shown at Complex 1. The mobile ground support equipment shown is based at the Squadron Maintenance Area and delivered to a launch complex as required.

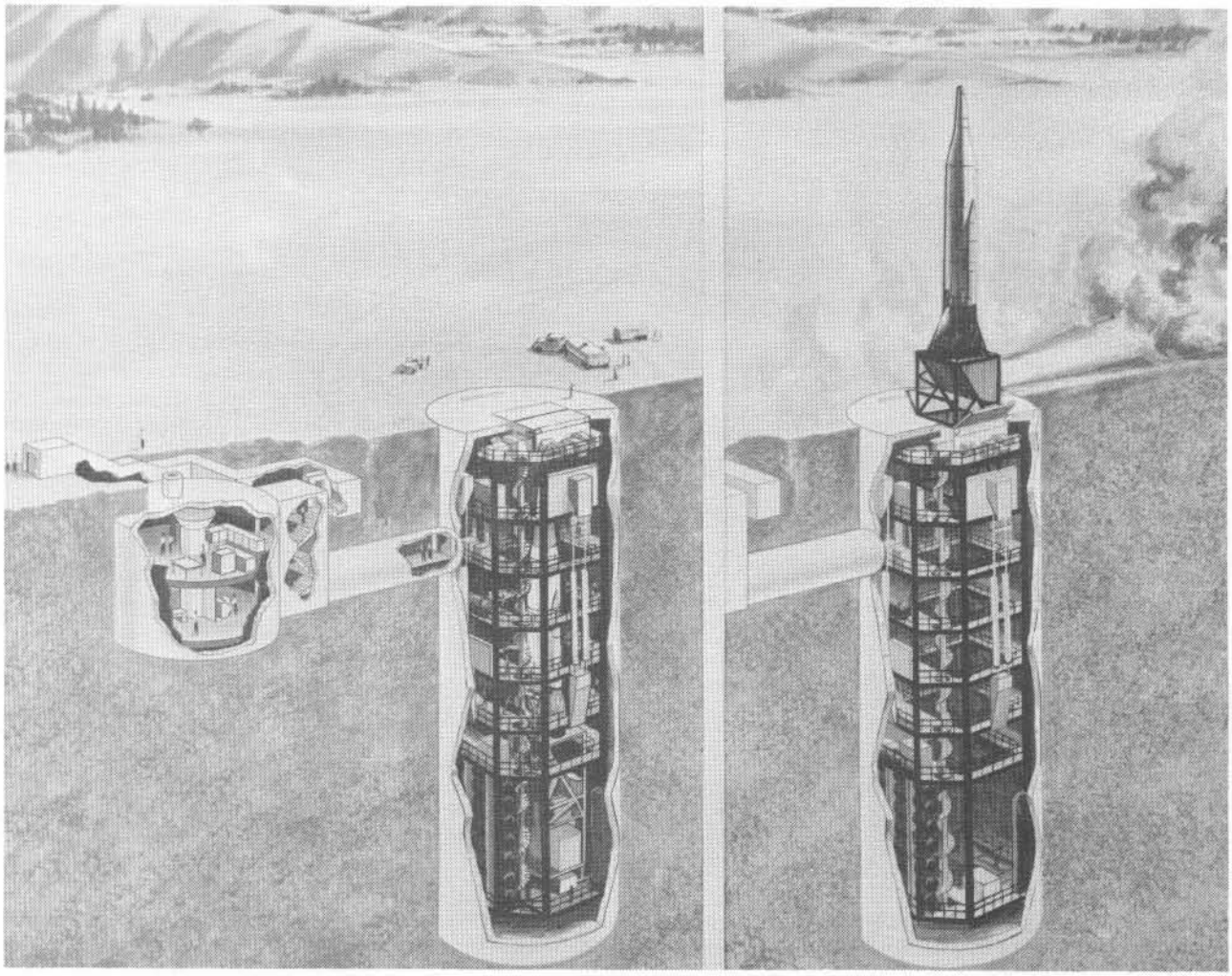


TYPICAL SILO BASE LAYOUT

TYPICAL LAUNCH COMPLEX

A typical launch complex is shown in cutaway on the opposite page. Essentially, the complex consists of two concrete cylinders closed at both ends. Both cylinders are completely below ground level. The larger cylinder, the silo, is over 174 ft. deep and has an inside diameter of about 52 ft. The silo contains an Atlas missile, plus most of the structures, facilities and equipment needed to launch it. The other cylinder, called the launch control center, is approximately 27 ft. deep and is about 40 ft. in diameter. The launch control center contains living quarters and facilities for the launch crew, plus the equipment to monitor the operational readiness of the silo and launch its missile.

The silo and launch control center are connected by a cylindrical tunnel about 54 ft. long and about 8 ft. in diameter. This tunnel serves as a conduit for the launch control cabling, and provides access to the silo. Together, the silo and launch control center form a self-contained combat unit, with food, water and power. In the launch-ready configuration the ground level opening in the silo roof is sealed by blast-proof concrete doors. During a missile launch these doors are opened and the missile is lifted to ground level.

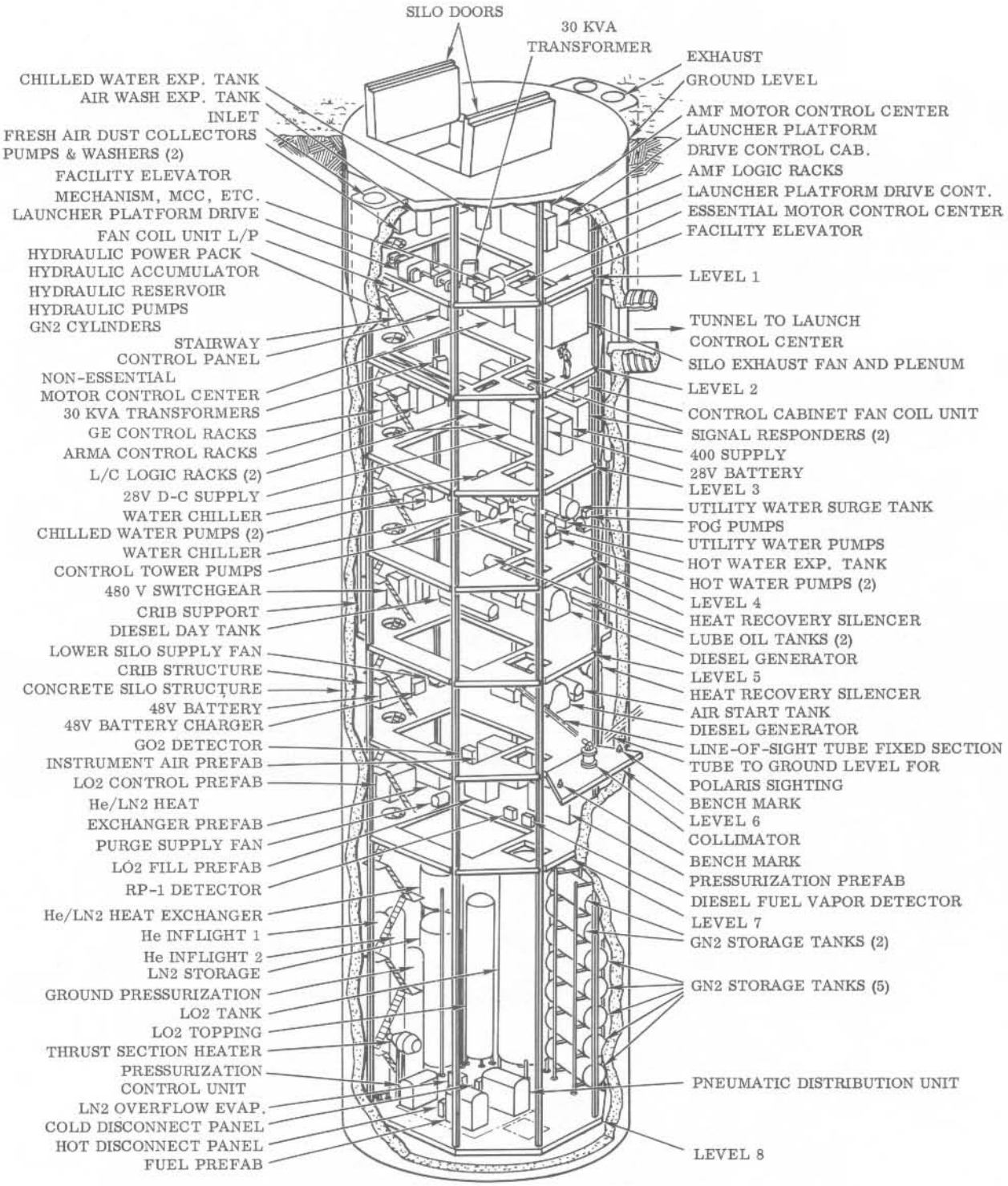


TYPICAL LAUNCH COMPLEX

V. FACILITY AND GROUND SUPPORT EQUIPMENT

SILO

The silo (see opposite page) is an 11-story building situated completely below ground. Its floor, walls and roof, which are of reinforced concrete, form a cylinder measuring over 174 ft. long and about 52 ft. in diameter. Inside this cylinder is a structural steel crib. The crib, which is octagonal in cross-section, contains eight floor levels. On these levels are mounted the storage tanks, machinery, control cabinets and other items of support equipment needed for the Atlas missile that is stored in and launched from the silo. Passing vertically through the levels of the crib are two square shafts. The larger shaft is for the launcher platform, on which the missile is lowered into the silo for storage and raised above ground level for launching. The smaller shaft contains a utility elevator for maintenance personnel and equipment movement. The crib is suspended from the silo walls on spring-loaded shock struts designed to cushion the crib and its contents against the shock of a nuclear blast. In the silo roof, which is flush with ground level, is a square opening sealed by blast-resistant doors. Through this opening, which is aligned with the launcher platform shaft, the missile is lowered into and raised out of the silo. Access to the silo for personnel is through a cylindrical concrete tunnel connected to the launch control center. Except during maintenance, operation of the equipment in the silo is remotely controlled and monitored from the launch control center.

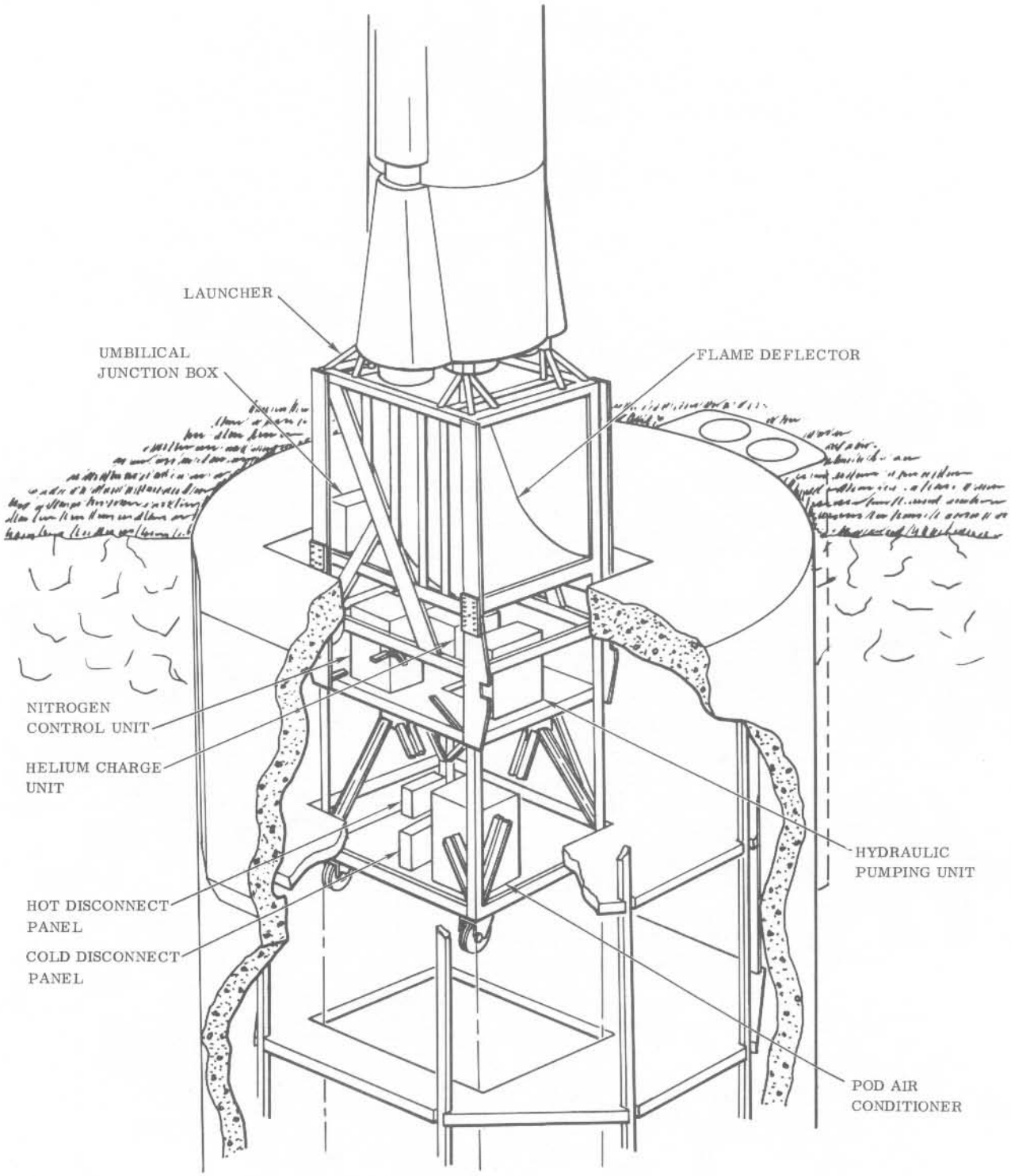

SILO DOORS
30 KVA TRANSFORMER
EXHAUST
GROUND LEVEL
CHILLED WATER EXP. TANK
AIR WASH EXP. TANK
INLET
FRESH AIR DUST COLLECTORS
PUMPS & WASHERS (2)
FACILITY ELEVATOR MECHANISM, MCC, ETC.
LAUNCHER PLATFORM DRIVE
FAN COIL UNIT L/P
HYDRAULIC POWER PACK
HYDRAULIC ACCUMULATOR
HYDRAULIC RESERVOIR
HYDRAULIC PUMPS
GN2 CYLINDERS
STAIRWAY
CONTROL PANEL
NON-ESSENTIAL MOTOR CONTROL CENTER
30 KVA TRANSFORMERS
GE CONTROL RACKS
ARMA CONTROL RACKS
L/C LOGIC RACKS (2)
28V D-C SUPPLY
WATER CHILLER
CHILLED WATER PUMPS (2)
WATER CHILLER
CONTROL TOWER PUMPS
480 V SWITCHGEAR
CRIB SUPPORT
DIESEL DAY TANK
LOWER SILO SUPPLY FAN
CRIB STRUCTURE
CONCRETE SILO STRUCTURE
48V BATTERY
48V BATTERY CHARGER
GO2 DETECTOR
INSTRUMENT AIR PREFAB
LO2 CONTROL PREFAB
He/LN2 HEAT EXCHANGER PREFAB
PURGE SUPPLY FAN
LO2 FILL PREFAB
RP-1 DETECTOR
He/LN2 HEAT EXCHANGER
He INFLIGHT 1
He INFLIGHT 2
LN2 STORAGE
GROUND PRESSURIZATION
LO2 TANK
LO2 TOPPING
THRUST SECTION HEATER
PRESSURIZATION CONTROL UNIT
LN2 OVERFLOW EVAP.
COLD DISCONNECT PANEL
HOT DISCONNECT PANEL
FUEL PREFAB
AMF MOTOR CONTROL CENTER
LAUNCHER PLATFORM
DRIVE CONTROL CAB.
AMF LOGIC RACKS
LAUNCHER PLATFORM DRIVE CONT.
ESSENTIAL MOTOR CONTROL CENTER
FACILITY ELEVATOR
LEVEL 1
TUNNEL TO LAUNCH CONTROL CENTER
SILO EXHAUST FAN AND PLENUM
LEVEL 2
CONTROL CABINET FAN COIL UNIT
SIGNAL RESPONDERS (2)
400 SUPPLY
28V BATTERY
LEVEL 3
UTILITY WATER SURGE TANK
FOG PUMPS
UTILITY WATER PUMPS
HOT WATER EXP. TANK
HOT WATER PUMPS (2)
LEVEL 4
HEAT RECOVERY SILENCER
LUBE OIL TANKS (2)
DIESEL GENERATOR
LEVEL 5
HEAT RECOVERY SILENCER
AIR START TANK
DIESEL GENERATOR
LINE-OF-SIGHT TUBE FIXED SECTION
TUBE TO GROUND LEVEL FOR POLARIS SIGHTING
BENCH MARK
LEVEL 6
COLLIMATOR
BENCH MARK
PRESSURIZATION PREFAB
DIESEL FUEL VAPOR DETECTOR
LEVEL 7
GN2 STORAGE TANKS (2)
GN2 STORAGE TANKS (5)
PNEUMATIC DISTRIBUTION UNIT
LEVEL 8

SILO

LAUNCHER PLATFORM

The launcher platform is an open cage-type, multiple-level elevator on which a missile is lowered into and raised out of the silo. The platform is 16 ft. square and 49 ft. high, and weighs approximately 171,500 lb.

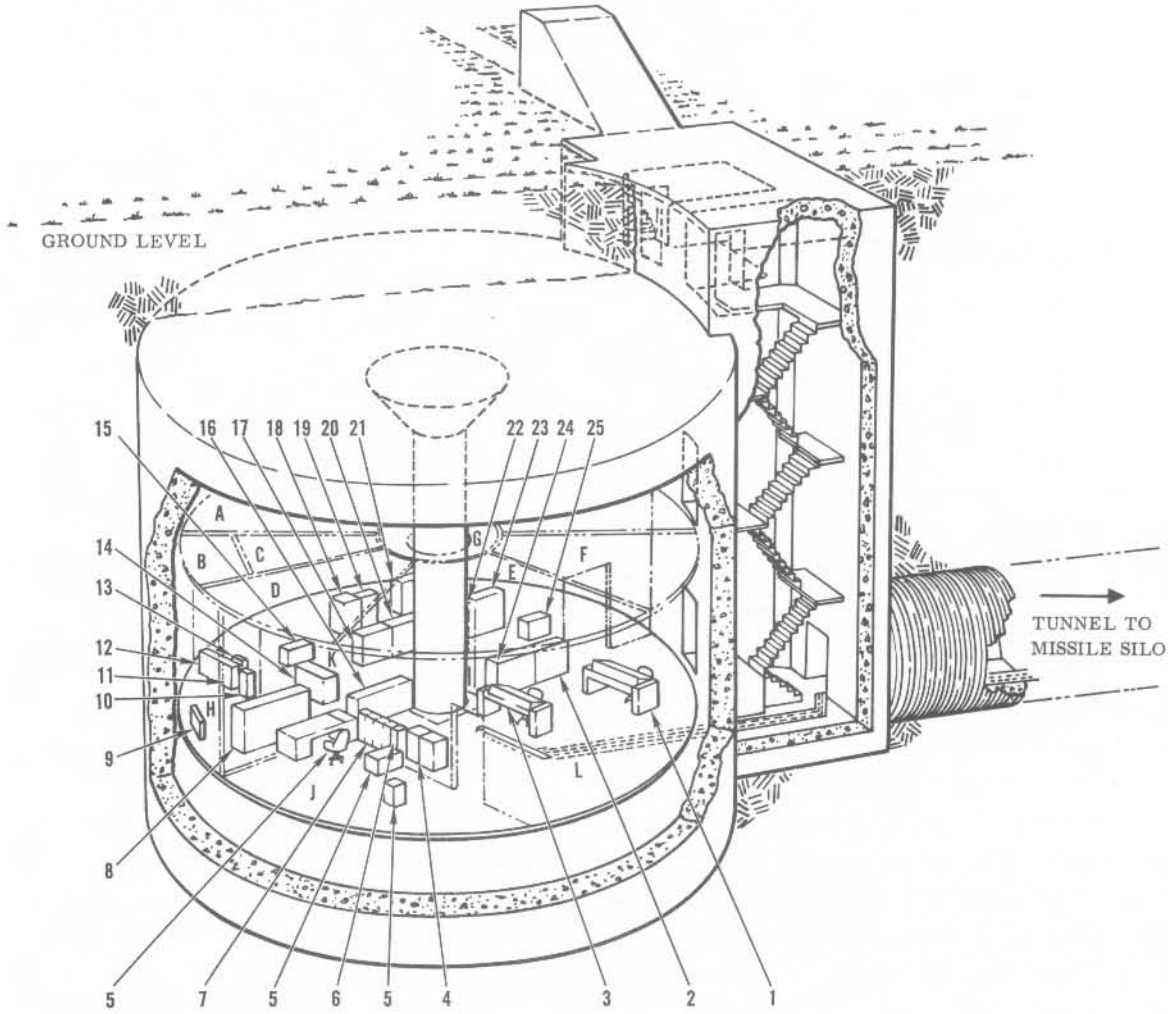
It is suspended on 10 cables within the silo crib. The platform structure consists of four levels. On the first level, which is above ground when the platform is raised, are the missile launcher and flame deflector. The second level holds the launcher platform locking system, which anchors the platform to the silo walls when it is raised, and to the crib structure when it is lowered. The third and fourth levels contain equipment for servicing the missile while the launcher platform is rising during a countdown.



LAUNCHER PLATFORM

LAUNCH CONTROL CENTER

The launch control center is a cylindrical chamber of reinforced concrete about 27 ft. high and about 40 ft. in inside diameter. Built completely below ground, the chamber contains two floor levels supported by an air-cushioned suspension system designed to cushion against the ground shock of a nuclear blast. The rooms on the lower level contain the facility and launch control equipment used by the operating crew of a single launching silo. The rooms on the upper level contain living quarters and facilities for the crew. The launch control center is connected to its silo by a cylindrical concrete tunnel some 54 ft. long and about 8 ft. in inside diameter. Access from ground level to both the launch control center and the tunnel is through a blast-resistant concrete stairwell. Emergency exit can be made through an escape hatch in the launch control center roof.



LAUNCH CONTROL CENTER

AREA KEY

FIRST LEVEL
A READY ROOM & STORAGE
B JANITOR'S ROOM
C MEDICAL SUPPLY ROOM
D TOILET
E KITCHEN & MESS
F POWER DISTRIBUTION ROOM
G HALL
SECOND LEVEL
H BATTERY ROOM
J OFFICE
K COMMUNICATIONS EQUIPMENT ROOM
L LAUNCH CONTROL ROOM

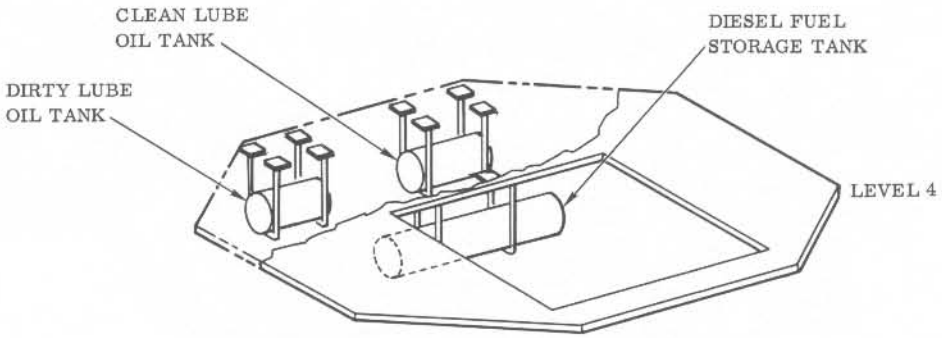
EQUIPMENT KEY

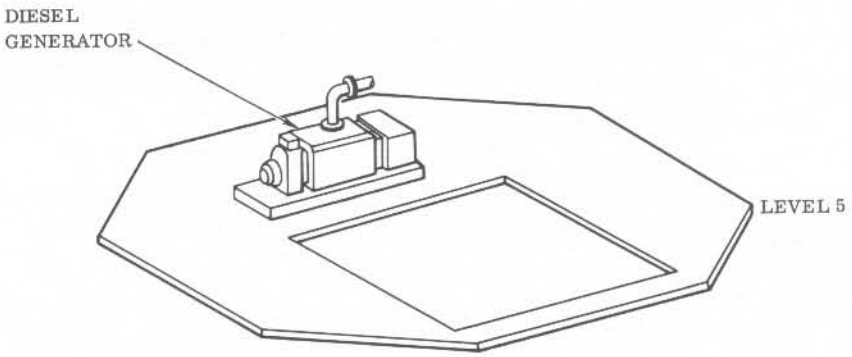
1 ALTERNATE COMMAND CONSOLE (ONE PER SQUADRON)
2 POWER PLANT REMOTE CONTROL PANEL
3 LAUNCH CONTROL CONSOLE
4 TV MONITOR
5 OFFICE EQUIPMENT
6 LIGHTING DISTRIBUTION TRANSFORMER
7 FIRE ALARM PANEL
EXIT & EMERGENCY LIGHTING PANEL
NORMAL LIGHTING PANEL
LIGHTING DISTRIBUTION PANEL
8 BATTERIES & RACK
9 TELEPHONE TERMINAL CABINET
10 CHARGER BAY
11 COMMUNICATION POWER DIST. PANEL
12 PA SYSTEM CABINET
13 COMMUNICATION EQUIP. PANEL "B"
14 MAIN DISTRIBUTION FRAME
15 MISCELLANEOUS TRUNK BAY (DIRECT LINES)
16 MOTOR CONTROL CENTER
17 FINDER CONNECTOR BAY
18 POWER BOARD
19 MISCELLANEOUS RELAY RACK
20 SELECTOR BAY
21 X-TIME CLOCK BAY
22 REGISTER BAY
23 TRANSLATOR BAY
24 FACILITY REMOTE CONTROL PANEL
25 SASS BAY

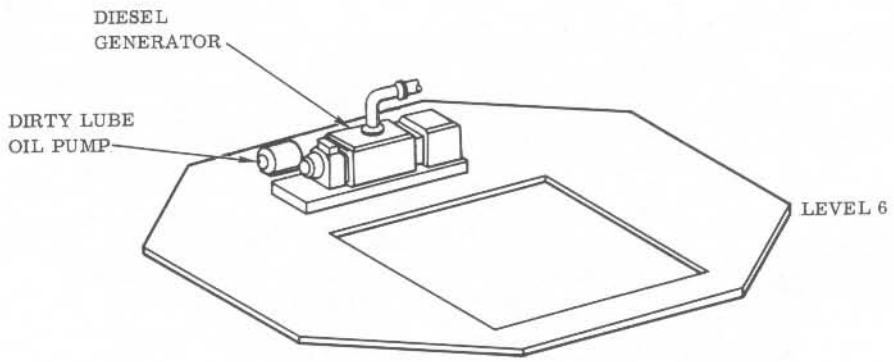
LAUNCH CONTROL CENTER

LUBE OIL AND FUEL OIL SYSTEM

This system stores and distributes the fuel and lubricant required by the two diesel generators that supply facility electrical power for both the silo and the launch control center. The amount of oil stored in this system is a primary determinant of the length of time a launch complex can remain operationally independent.



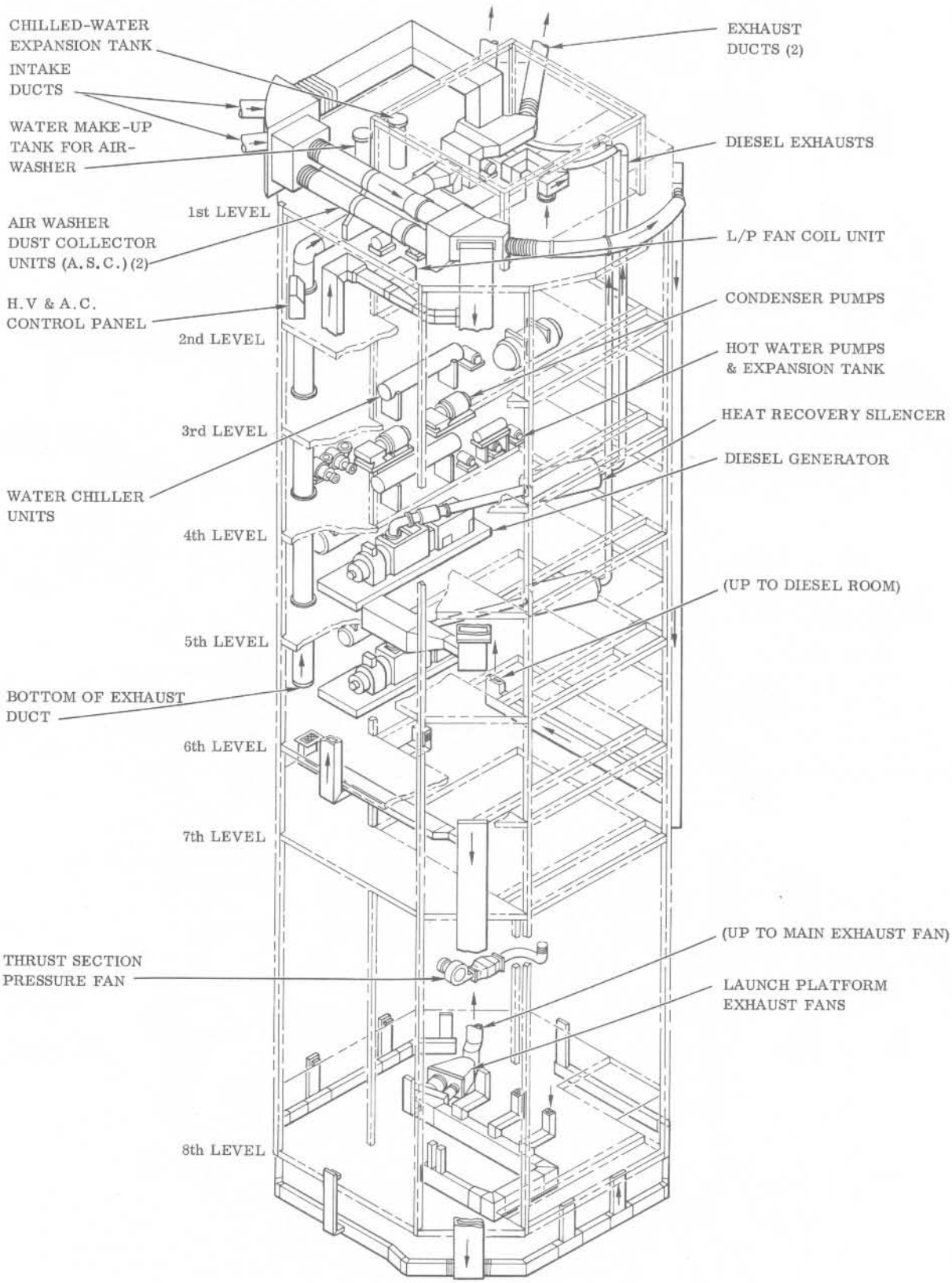




LUBE OIL AND FUEL OIL SYSTEM

HEATING, VENTILATING AND AIR-CONDITIONING SYSTEM

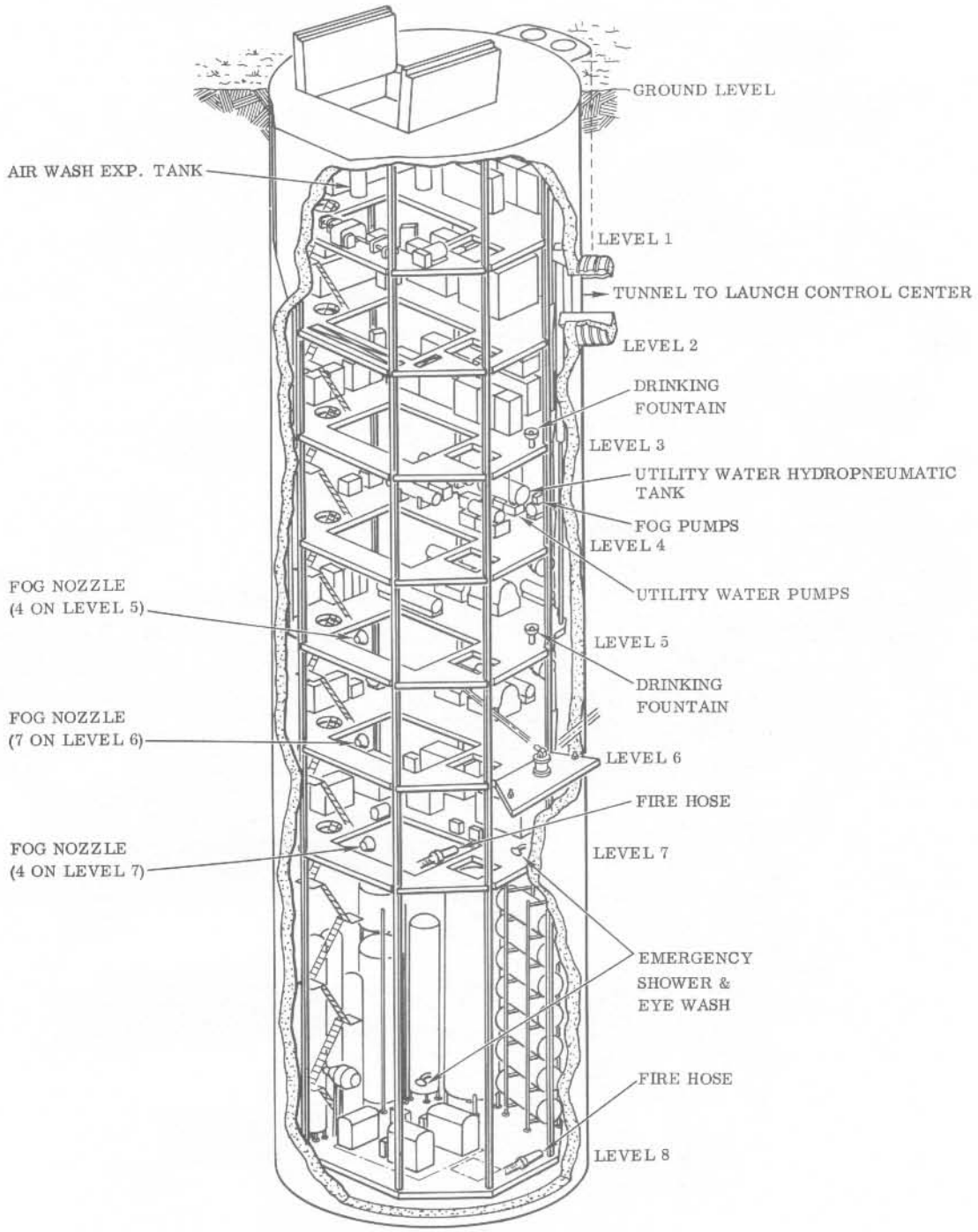
This system continuously pumps a supply of fresh, washed air into the silo, heats or cools the air as required, and distributes it throughout the silo. Part of the system maintains constant temperature inside the shaft that encloses the launcher platform. The system also continuously expels stale air, fumes and vapors from the silo.



HEATING, VENTILATING AND AIR-CONDITIONING SYSTEM

UTILITY WATER SYSTEM

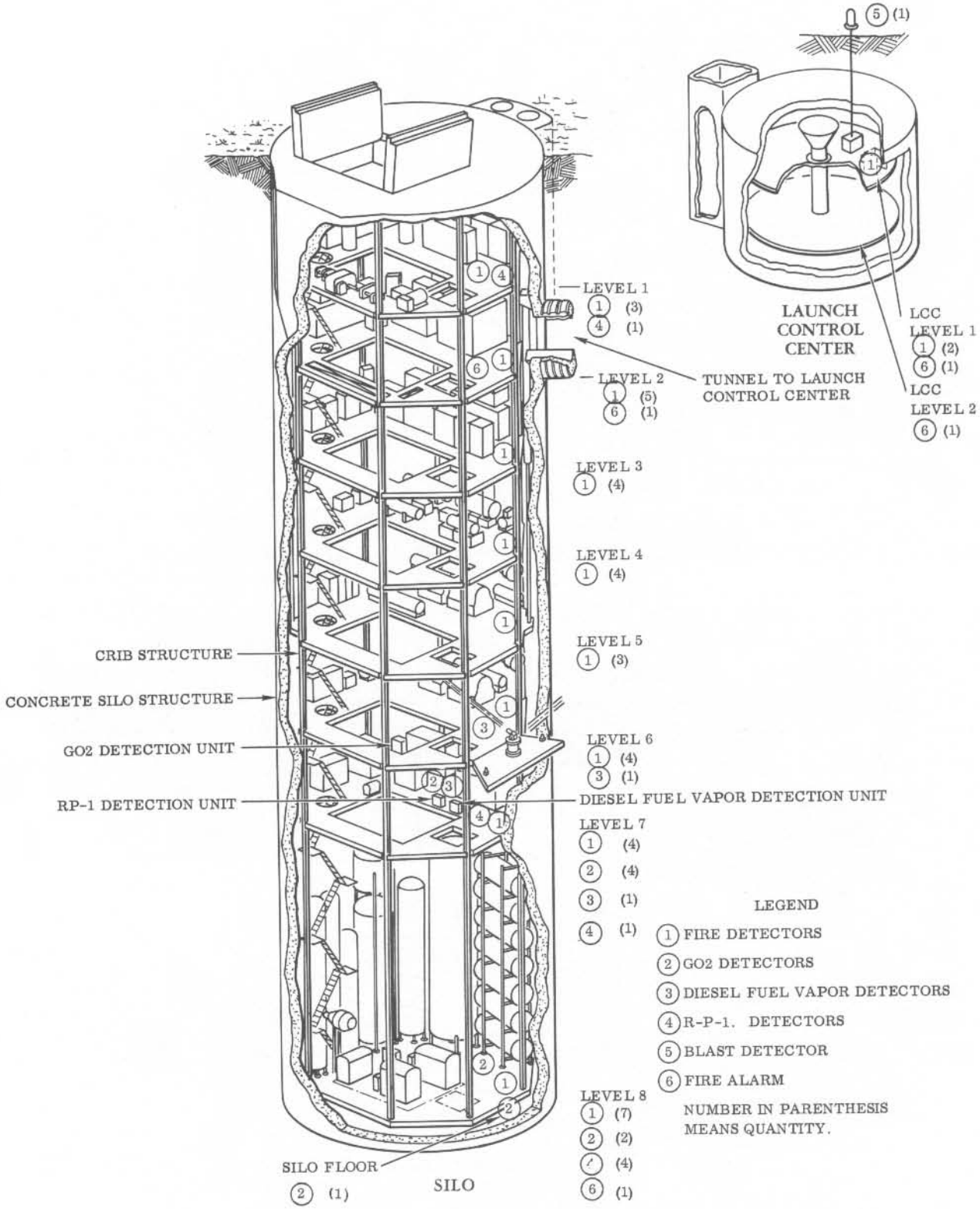
The utility water system provides the water for personnel, fire protection, and the air-conditioning system in both the silo and the launch control center.



UTILITY WATER SYSTEM

DETECTION SYSTEMS

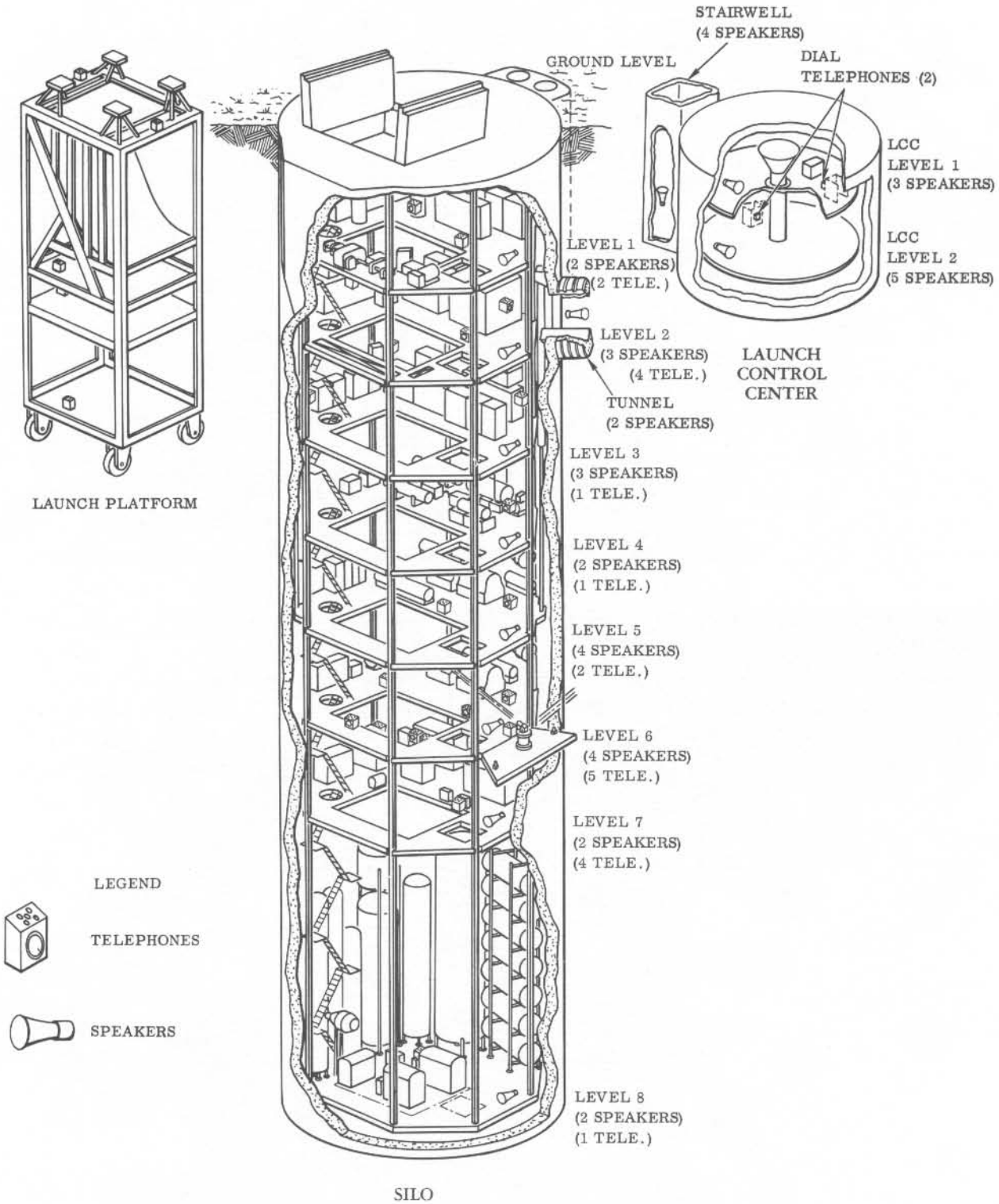
There are five detection systems at each launch complex: the fire alarm system, which detects and provides alarm signals in the event of fire; the gaseous oxygen detection system and the diesel fuel vapor detection system. These systems give both a visual and an audible warning if they detect critical concentrations of gaseous oxygen or diesel fuel vapor in the silo. Another detection system senses the presence of missile fuel vapor in the silo, gives a visual and audible warning, and causes the release of water fog which suppresses the vapor. Fifth is the blast detection system; this system consists primarily of a light-sensitive detector, mounted above ground level at the launch complex, which is sensitive only to high-intensity light, such as the flash of a nuclear explosion. Upon sensing such a flash, the detector sends a signal to a cabinet in the launch control center. This signal closes blast protection doors in the ventilator ducts, and at other passages with openings at ground level, before the blast forces of the explosion.



DETECTION SYSTEMS

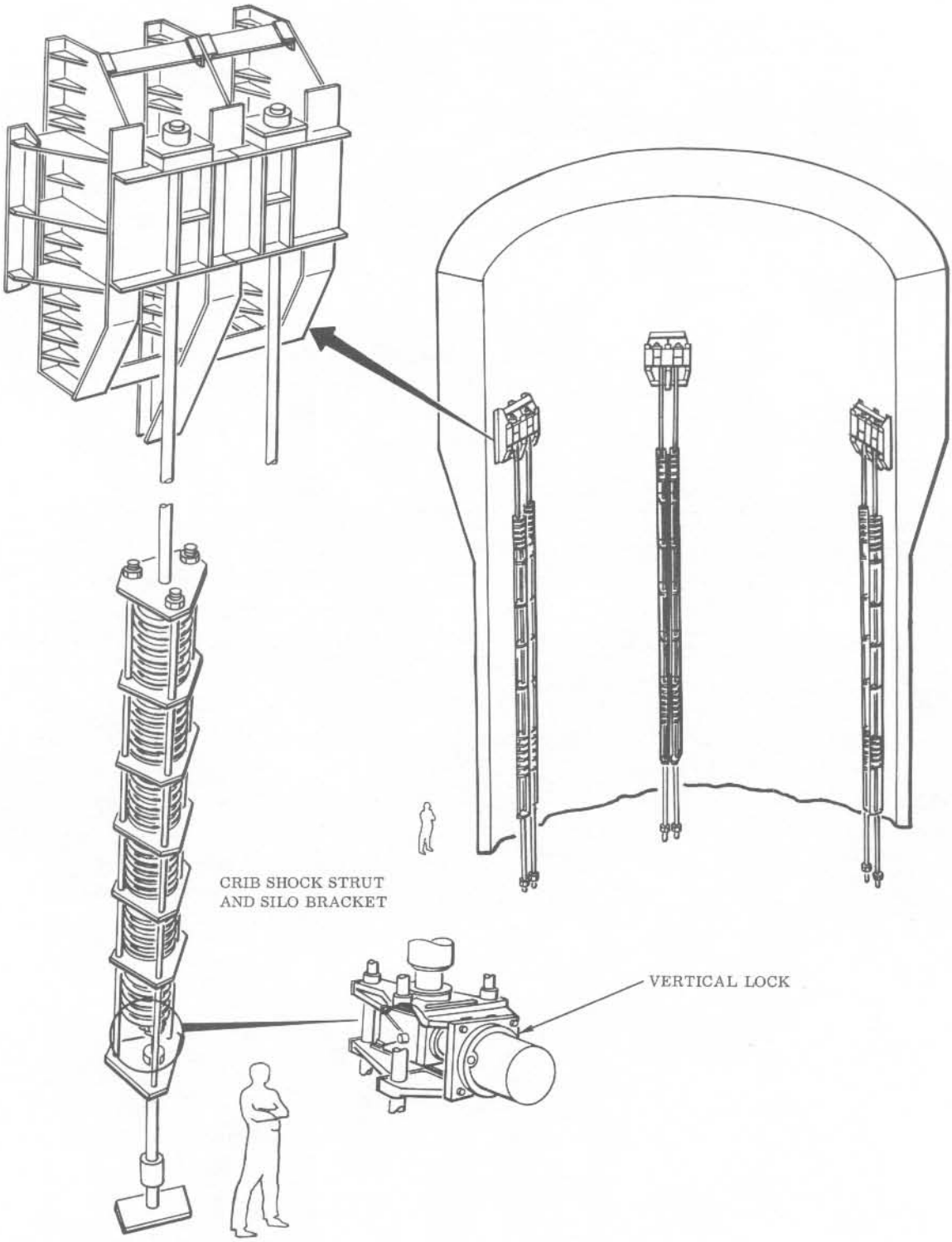
COMMUNICATION SYSTEMS

Each launch complex has a telephone system and a public address system. The telephone system interconnects the launch control center with all entrances to the launch complex and with the eight levels in the silo. Calls can be placed, via the launch control officer's console, from one silo level to another. Public address system inputs from the launch control center reach all areas of the launch complex.


STAIRWELL
(4 SPEAKERS)
GROUND LEVEL
DIAL
TELEPHONES (2)
LCC
LEVEL 1
(3 SPEAKERS)
LCC
LEVEL 2
(5 SPEAKERS)
LEVEL 1
(2 SPEAKERS)
(2 TELE.)
LEVEL 2
(3 SPEAKERS)
(4 TELE.)
LAUNCH
CONTROL
CENTER
TUNNEL
(2 SPEAKERS)
LEVEL 3
(3 SPEAKERS)
(1 TELE.)
LEVEL 4
(2 SPEAKERS)
(1 TELE.)
LEVEL 5
(4 SPEAKERS)
(2 TELE.)
LEVEL 6
(4 SPEAKERS)
(5 TELE.)
LEVEL 7
(2 SPEAKERS)
(4 TELE.)
LEVEL 8
(2 SPEAKERS)
(1 TELE.)
LAUNCH PLATFORM
LEGEND
TELEPHONES
SPEAKERS
SILO

SILO CRIB SUSPENSION SYSTEM

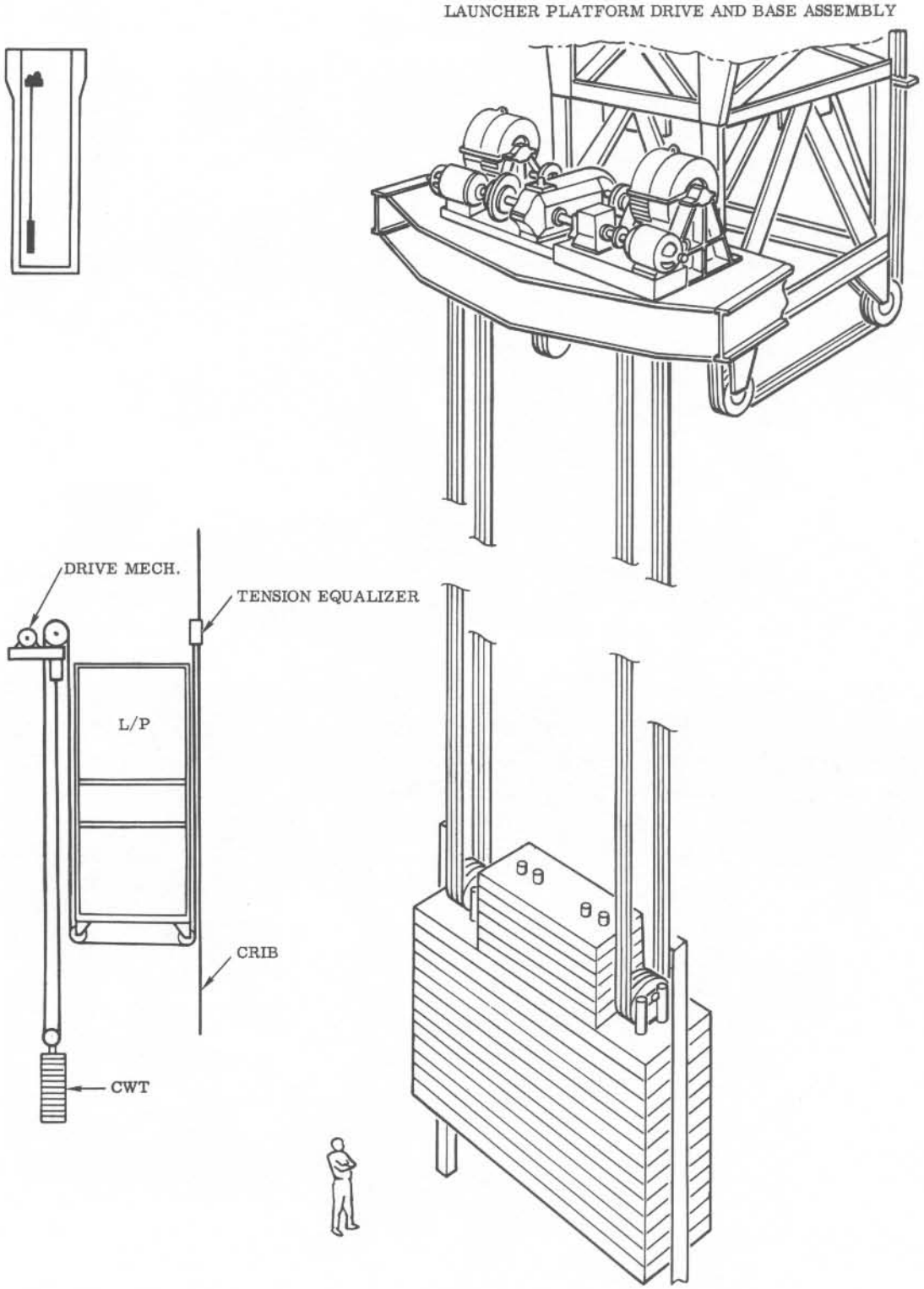
The major components of this system are four wall brackets and four pairs of spring-loaded shock struts. The wall brackets are mounted 90° apart on the silo wall, above the second level of the crib. The upper ends of each pair of shock struts are attached to a wall bracket, and the lower ends are attached to the crib at a point between the fifth and sixth levels. Each shock strut is 60 ft. long and consists of from 5 to 7 sets of concentric springs mounted on a central rod. Spring retainers on the rod transfer equal crib loads of each spring on the strut. The entire weight of the crib structure and its contents, including the launcher platform and missile, is suspended on the struts. Total weight is more than 1,500 tons. The system cushions the missile and its support equipment against the ground shock of a near-miss nuclear blast. Hydraulically actuated locks in the system anchor the crib structure to the silo walls during launcher platform operation.



SILO CRIB SUSPENSION SYSTEM

LAUNCHER PLATFORM DRIVE SYSTEM

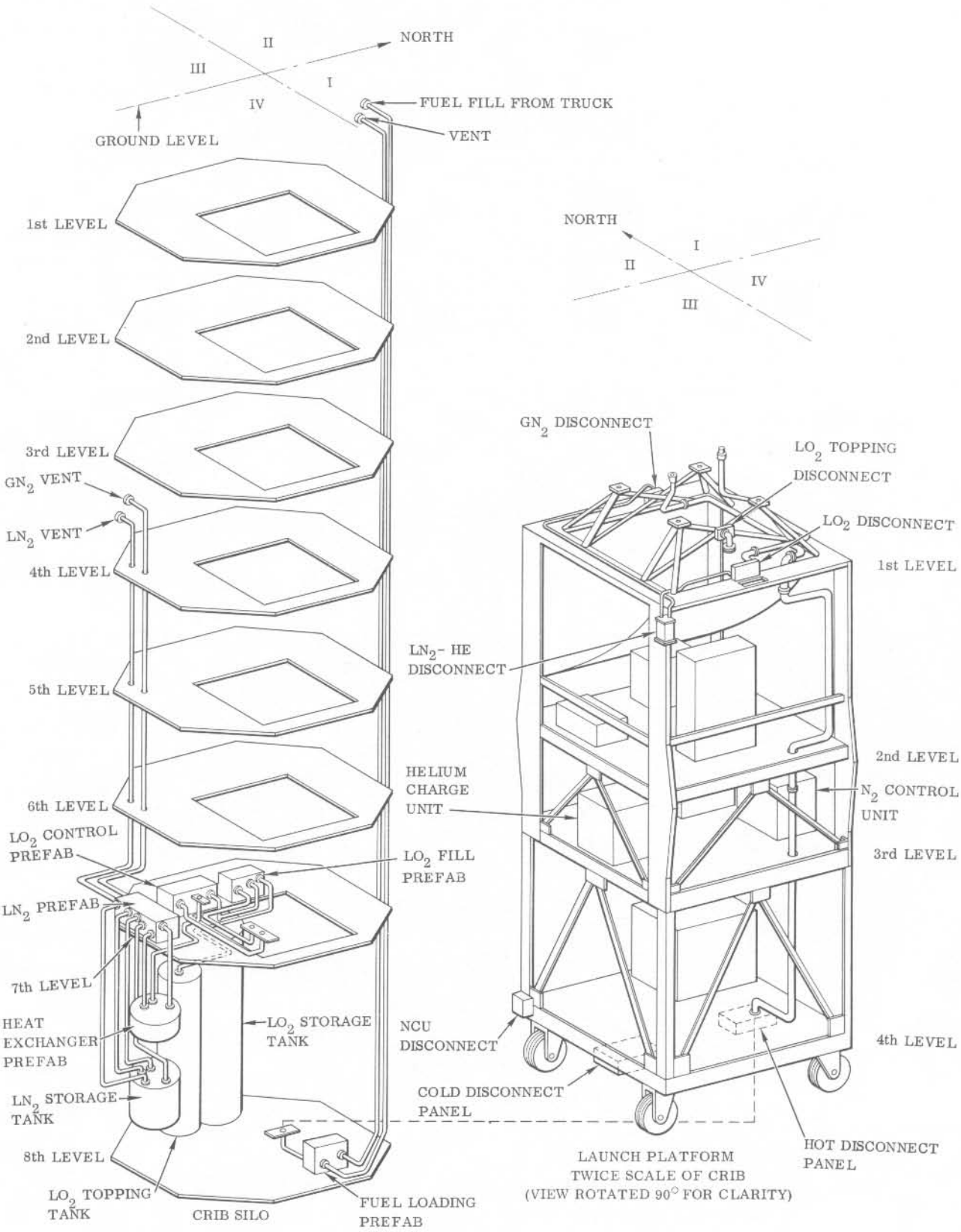
The launcher platform drive system raises and lowers the launcher platform along a set of guide rails attached to the inner sides of the launcher platform shaft structure. The drive system includes a drive mechanism, a launcher platform counterweight, 10 wire ropes, and a tension equalizer. The drive mechanism consists principally of two 125-hp electric motors, two reduction gears and two traction sheaves. The launcher platform counterweight, which has its own shaft and guide rails, is a stack of iron and steel slabs surmounted by two sheaves. The counterweight weighs 536,000 lb. The wire ropes are grouped in two sets of five ropes anchored to crib structure directly below the drive mechanism located on crib level No. 1. The opposite ends are attached to the tension equalizer, a teeter bar assembly anchored to crib structure above level No. 1. This assembly equalizes the tension between the sets of wire ropes.



LAUNCHER PLATFORM DRIVE SYSTEM

PROPELLANT LOADING SYSTEM

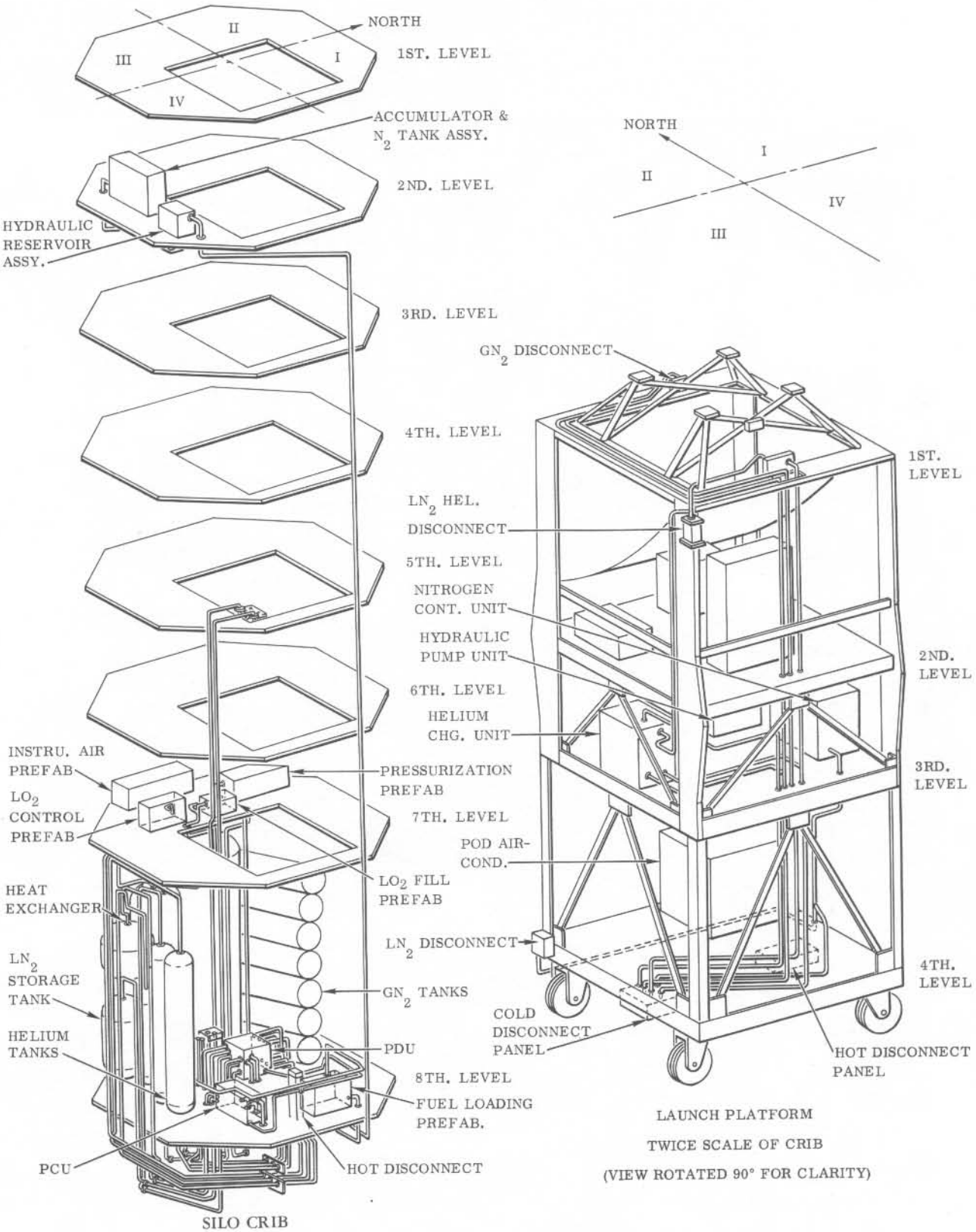
The propellant loading system consists of the silo-mounted storage tanks, control units and tubing which supply fuel and liquid oxygen to the missile (see illustration on opposite page). Fuel is loaded aboard the missile through fill lines connected to a tank truck above ground. The fuel then remains aboard the missile until the missile is launched or replaced. Two Dewar-type tanks in the system store liquid oxygen, which is transferred to the missile during countdown operations.



PROPELLANT LOADING SYSTEM

PNEUMATIC SYSTEM

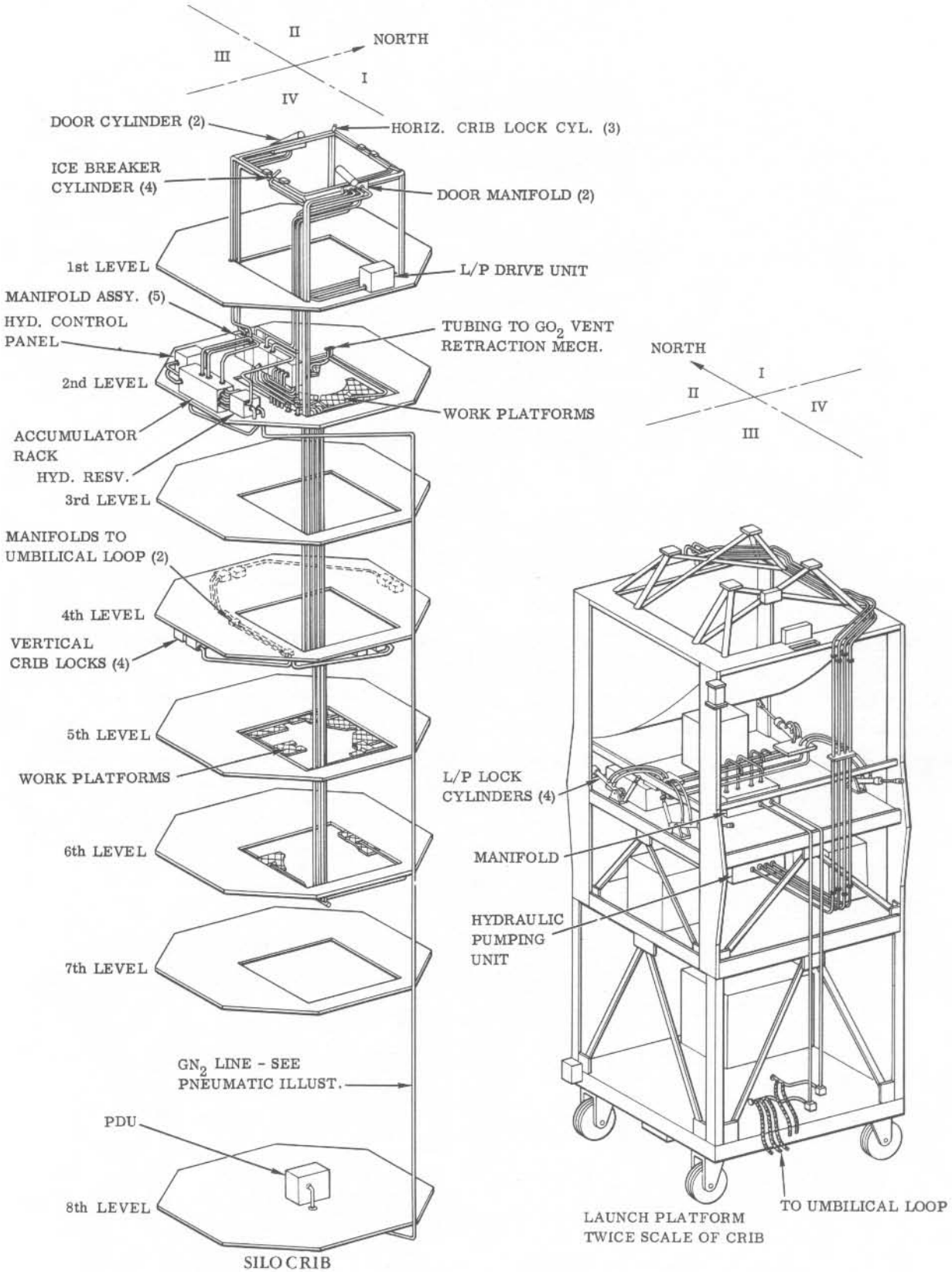
The pneumatic system includes the silo-mounted equipment used in the storage, control and transfer of gases. (See illustration on opposite page.) Gaseous nitrogen handled is used in missile propellant transfer, silo hydraulic equipment operation, and missile maintenance. Helium is used for missile tank pressurization.



PNEUMATIC SYSTEM

HYDRAULIC SYSTEM

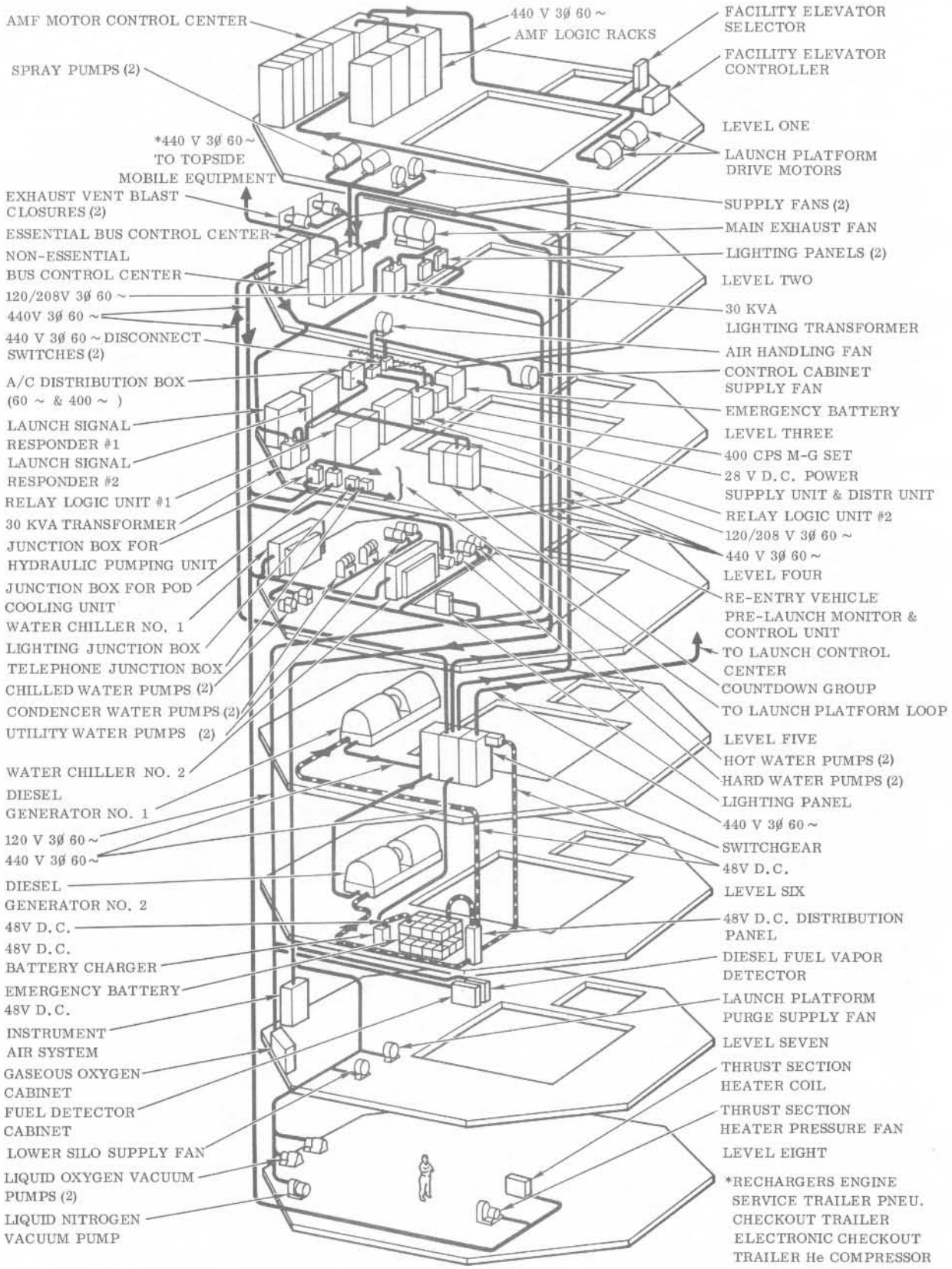
The hydraulic system consists of the silo-mounted control units, reservoirs, pumps, accumulators, lines and actuators needed for operating hydraulically powered equipment. (See illustration on opposite page.) This equipment includes the crib locks, the work platforms, the launcher platform locking mechanism, and the silo overhead doors. Also included is the hydraulic pumping unit on the launcher platform. This unit supplies hydraulic power to the missile during countdown and checkout operations.



HYDRAULIC SYSTEM

SILO ELECTRICAL EQUIPMENT

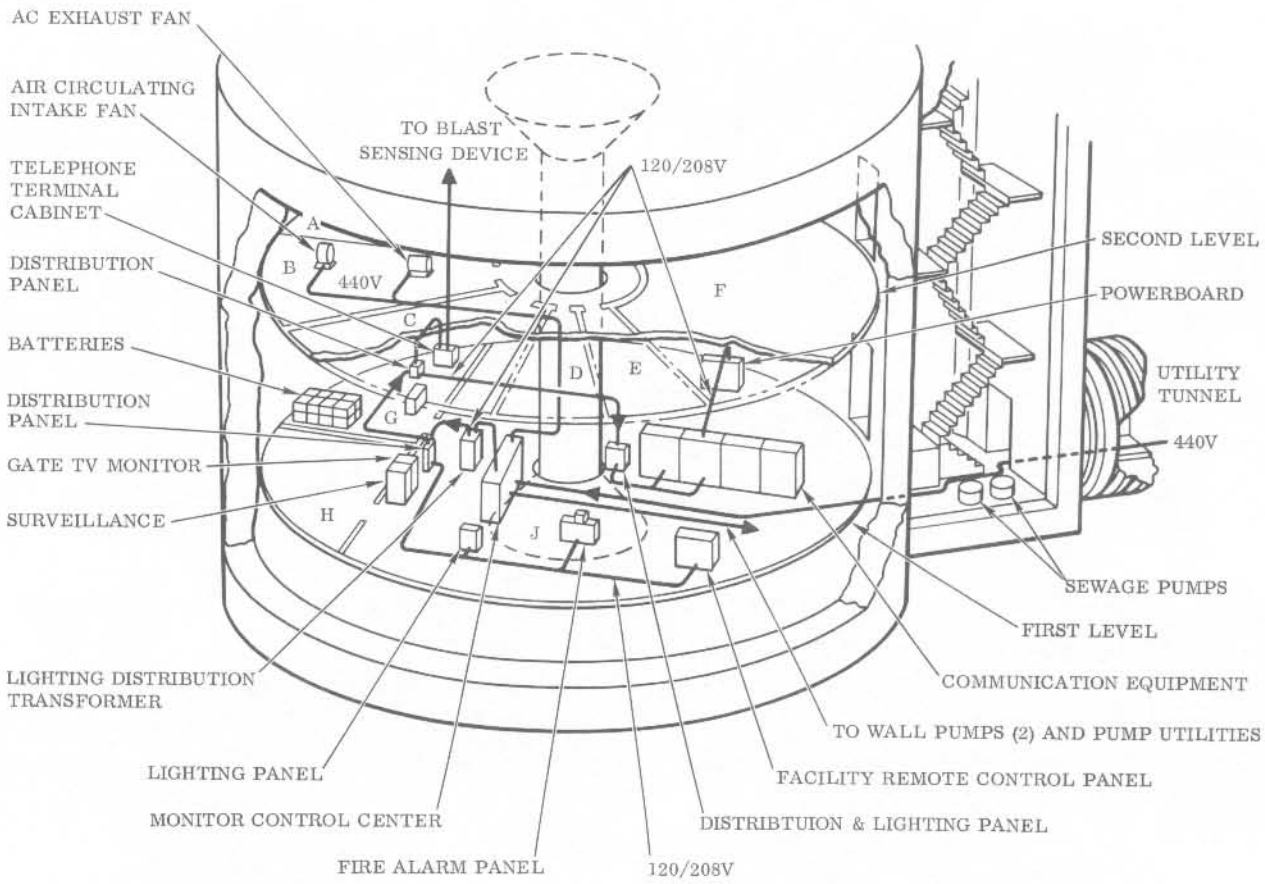
This equipment includes the generators, transformers, rectifiers, batteries, switchgear and cabling needed to make the entire launch complex electrically self-sufficient. Two diesel generators in the silo are the basic source of all electrical power for both the silo and the launch control center. The generators produce 480v 3-phase 60-cycle alternating current. Power is distributed through switchgear to the launch control center and to 480v operating equipment in the silo. This equipment includes pumps and motors, 120/208v transformers, 48v and 28v d-c rectifiers, and a 400-cycle 117v motor generator. Two sets of batteries, charged by rectifiers powered by the diesel generators, provide emergency 48v and 28v d-c power.



SILO ELECTRICAL EQUIPMENT

LAUNCH CONTROL CENTER ELECTRICAL EQUIPMENT

The 440v 3-phase 60-cycle a-c power supply for the launch control center is routed through the utility tunnel that connects the launch control center to the silo. Within the launch control center the power is routed to the 440v equipment, and to a 120/208v transformer. The 120/208v power is routed throughout the launch control center. Emergency power is provided by batteries.

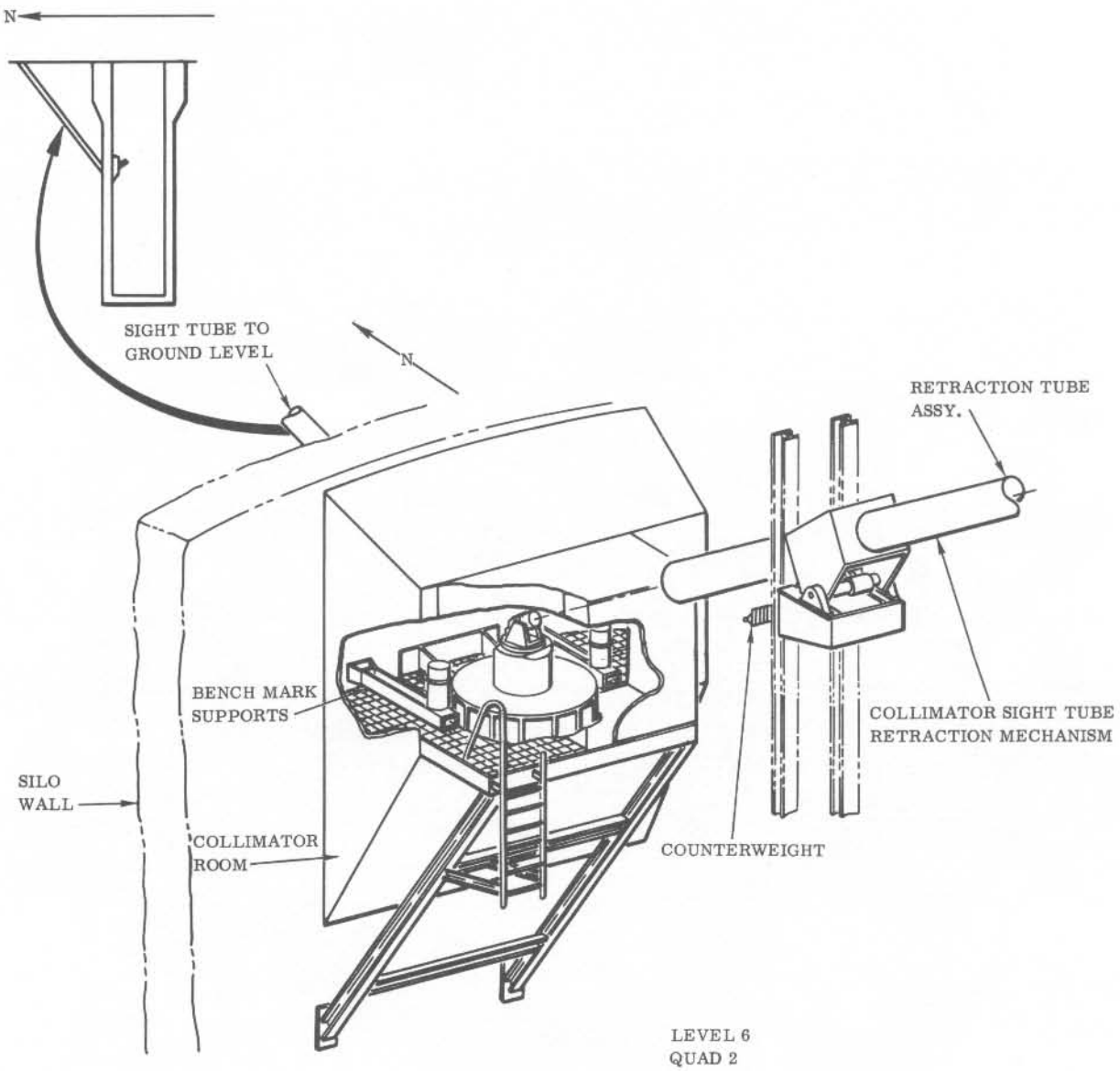


A SUPPLIES
B READY ROOM & STORAGE AREA
C KITCHEN & MESS
D TOILET
E JANITOR
F HEATING, VENTILATING & AIR CONDITIONING EQUIPMENT ROOM
G BAT. ROOM
H OFFICE
J LAUNCH CONTROL ROOM

LAUNCH CONTROL CENTER ELECTRICAL EQUIPMENT

GUIDANCE SYSTEM GSE

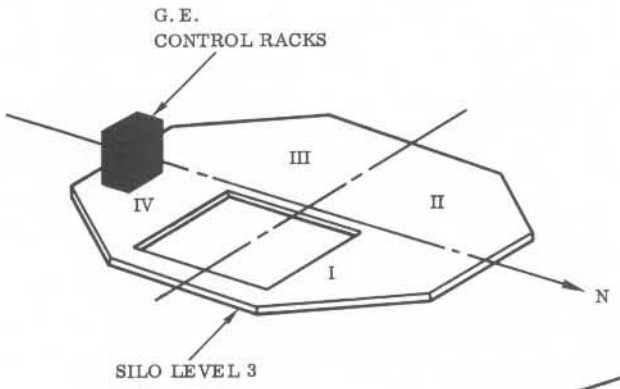
The guidance system GSE includes a collimator room and two sight tubes. The collimator room, an insulated light-tight chamber, is mounted on the north side of the silo wall at crib level No. 6. Inside the chamber are a collimator assembly and two bench marks. A sight tube leads from ground level down to the north side of the collimator room providing a light path between the collimator and the star Polaris. Periodic fixes made on Polaris and the two bench marks keep the collimator in alignment. The other sight tube leads upward from the opposite side of the collimator room to the missile guidance pod. This tube provides a path for an orienting light beam sent from the collimator to the inertial guidance reference platform aboard the missile. The portion of the tube which extends into the launcher platform enclosure is hinged, and swings out of the way when the missile is raised.

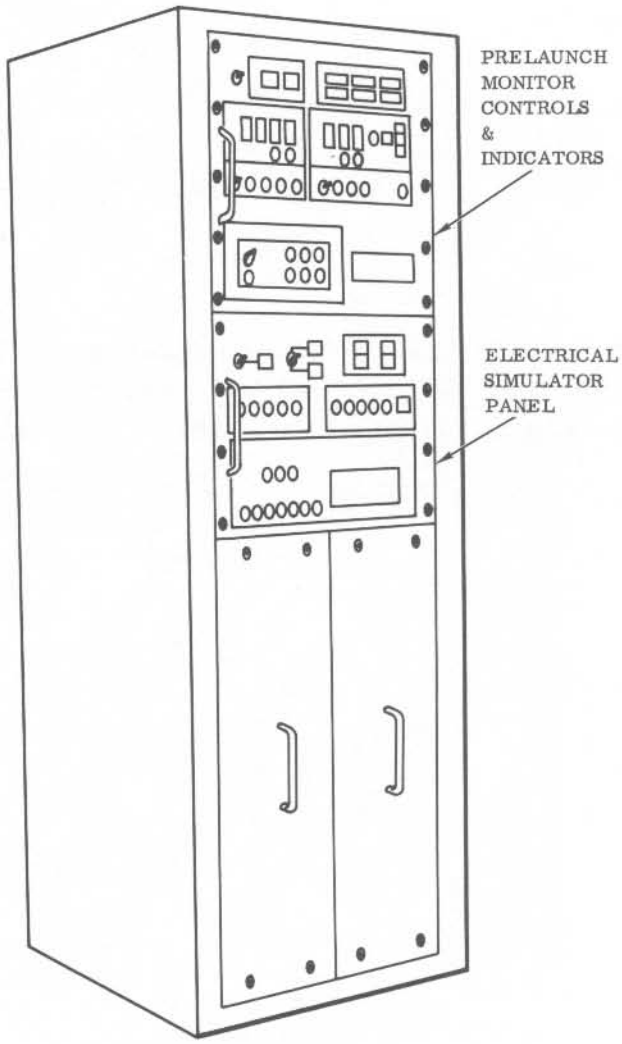


GUIDANCE SYSTEM GSE

RE-ENTRY VEHICLE GSE

The re-entry vehicle GSE consists of the cabinet shown in the accompanying illustration. The logic units in this cabinet simulate the re-entry vehicle during checkout operations and monitor it during standby and countdown activities.

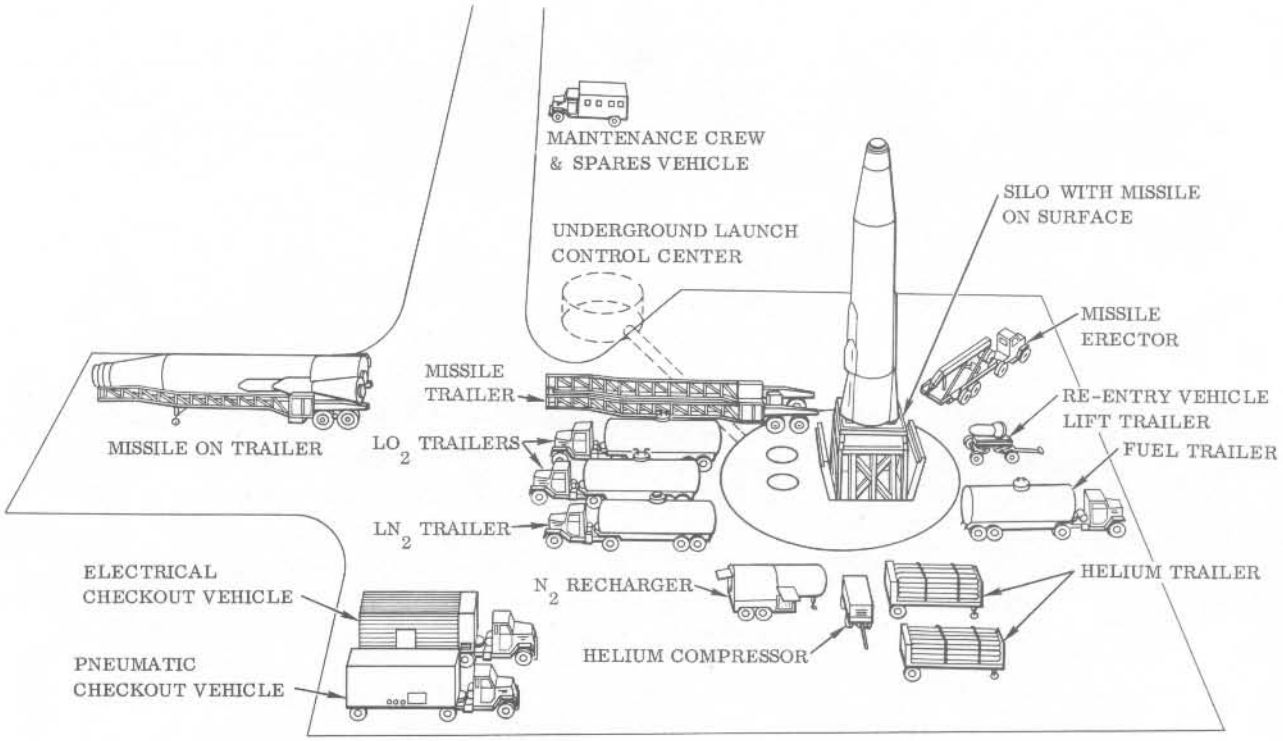




RE-ENTRY VEHICLE GSE

MOBILE GSE

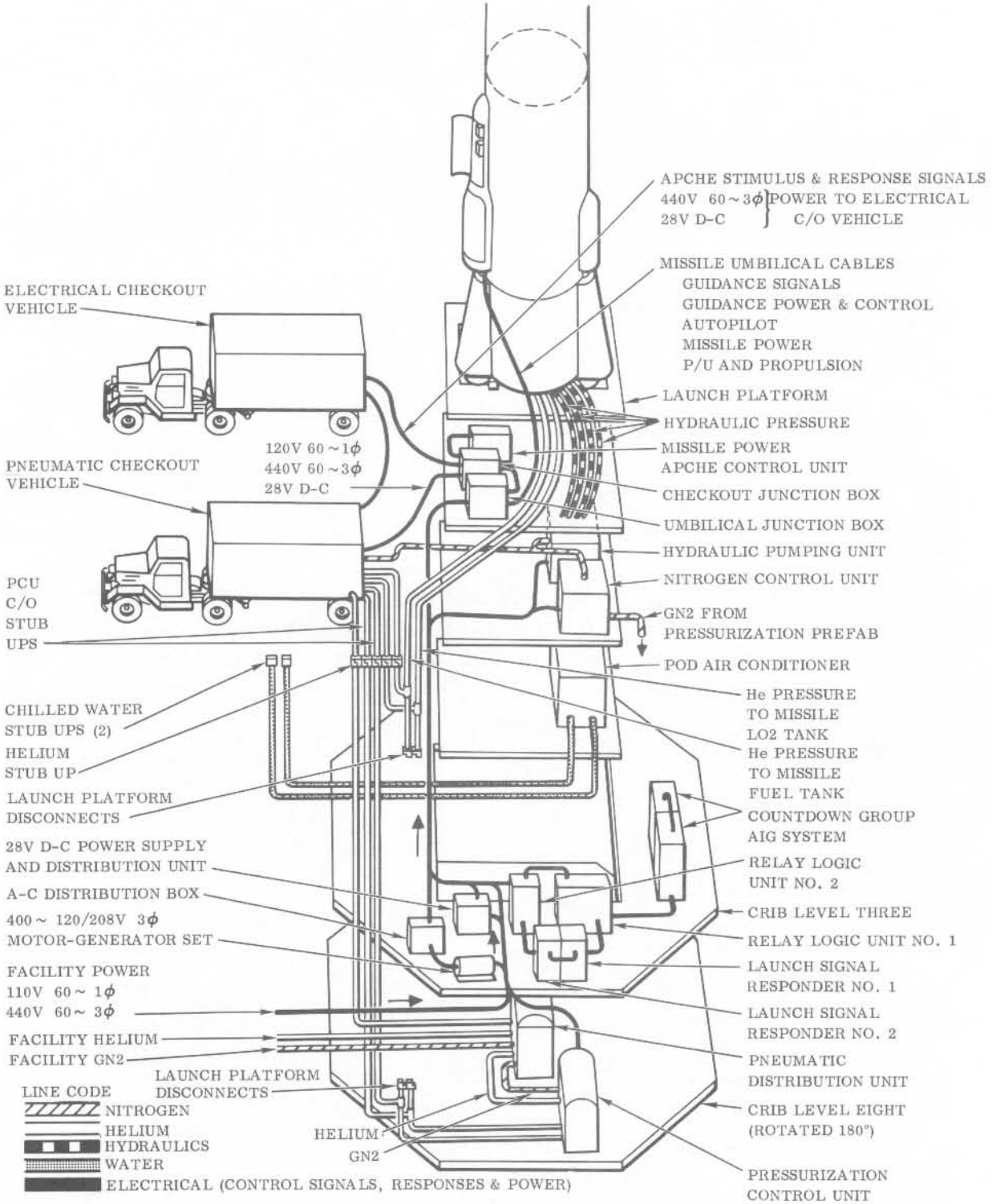
The mobile ground support equipment used at a launch complex consists of the trucks, trailers and handling equipment shown on the opposite page. This equipment is stored at the Squadron Maintenance Area when not in use at the launch complex.


MAINTENANCE CREW
& SPARES VEHICLE
SILO WITH MISSILE
ON SURFACE
UNDERGROUND LAUNCH
CONTROL CENTER
MISSILE
ERECTOR
MISSILE
TRAILER
RE-ENTRY VEHICLE
LIFT TRAILER
MISSILE ON TRAILER
LO_2 TRAILERS
FUEL TRAILER
LN_2 TRAILER
ELECTRICAL
CHECKOUT VEHICLE
N_2 RECHARGER
HELIUM TRAILER
PNEUMATIC
CHECKOUT VEHICLE
HELIUM COMPRESSOR

MOBILE GSE

MISSILE SYSTEMS CHECKOUT AT LAUNCH SITE

Checkouts of the systems aboard a silo-based missile can be performed at the launch complex without removing the missile from the launcher platform. Checkouts are performed using equipment housed in two trailers, which are brought to the launch complex from the Squadron Maintenance Area. One of the trailers, the pneumatic checkout vehicle, contains tanks and other equipment which simulate both normal and abnormal missile tank pressures. The electrical checkout vehicle contains automatic programed checkout equipment which controls and monitors both the pneumatic checkout vehicle and the missileborne systems under test.



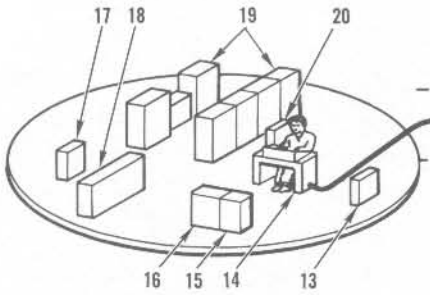
MISSILE SYSTEMS CHECKOUT AT LAUNCH SITE

LAUNCH CONTROL SYSTEM

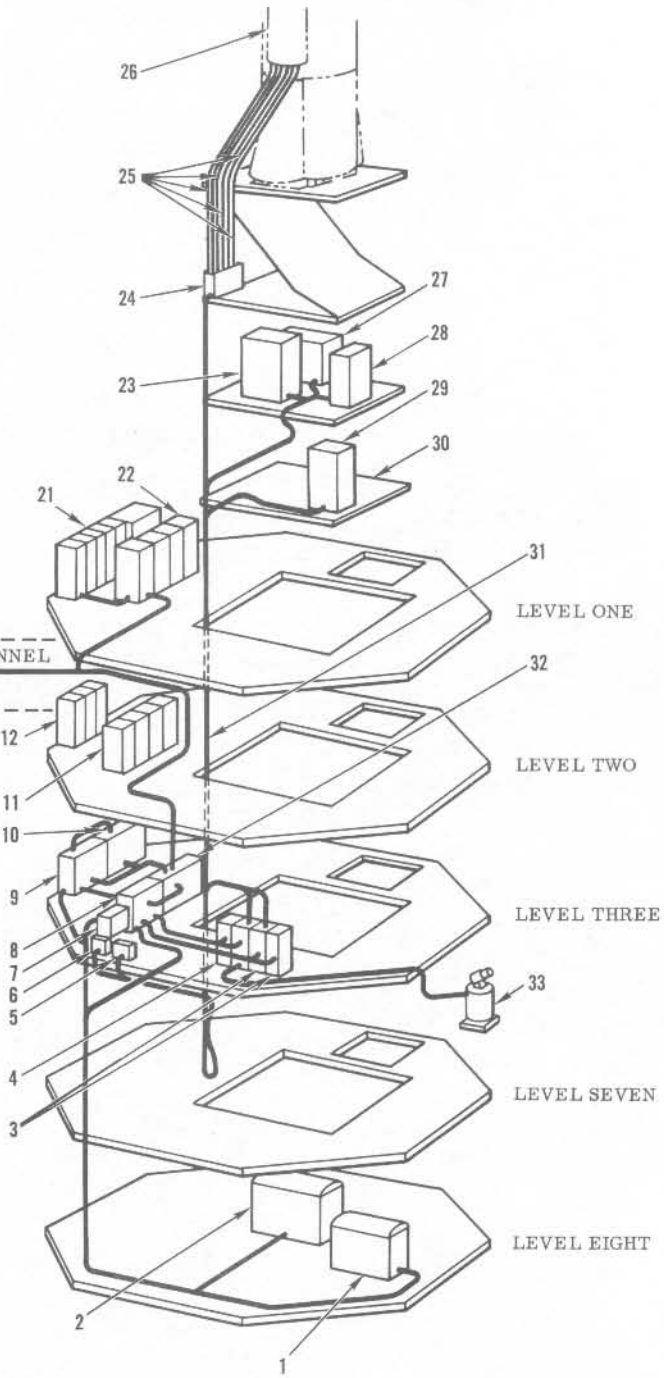
The launch control system consists of control cabinets and cabling in the silo, and a launch control console in the launch control center. This system continuously monitors the countdown readiness of the missile and its ground support equipment and controls and monitors their operation during a countdown.

EQUIPMENT KEY

1 PRESSURIZATION CONTROL UNIT
2 PNEUMATIC DISTRIBUTION UNIT
3 RE-ENTRY VEHICLE PRE-LAUNCH MONITOR & CONTROL GROUP
4 COUNTDOWN GROUP (AIG)
5 JUNCTION BOX FOR POD AIR CONDITIONING UNIT
6 JUNCTION BOX FOR HYDRAULIC PUMPING UNIT
7 FACILITY INTERFACE CABINET
8 RELAY LOGIC UNIT NO. 1
9 LAUNCH SIGNAL RESPONDER NO. 1
10 LAUNCH SIGNAL RESPONDER NO. 2
11 NON-ESSENTIAL BUS CONTROL CENTER
12 ESSENTIAL BUS CONTROL CENTER
13 POWER REMOTE CONTROL PANEL (REF.)
14 LAUNCH CONTROL CONSOLE
15 SURVEILLANCE TV MONITOR (REF.)
16 GATE TV MONITOR (REF.)
17 BATTERY CHARGER (REF.)
18 BATTERIES FOR TELEPHONE SYSTEM (REF.)
19 COMMUNICATION (TELEPHONE) EQUIPMENT (REF.)
20 FACILITY REMOTE CONTROL PANEL (REF.)
21 AMF MOTOR CONTROL CENTER
22 AMF LOGIC RACKS



LAUNCH CONTROL CENTER 2nd LEVEL



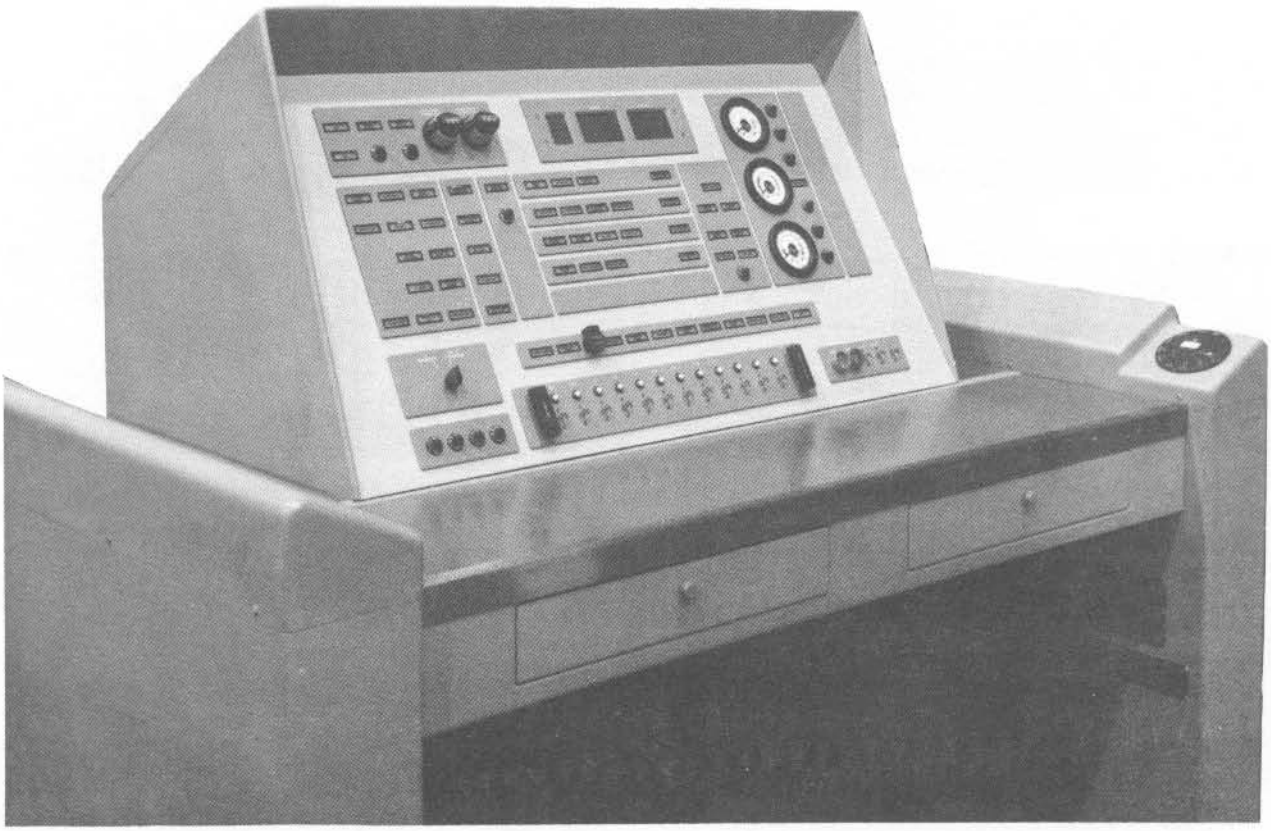
MISSILE SILO

23 NITROGEN CONTROL UNIT
24 UMBILICAL JUNCTION BOX
25 MISSILE UMBILICAL CABLES
GUIDANCE SIGNAL
GUIDANCE POWER & CONTROL
AUTOPILOT
R/V
MISSILE POWER
P/U & PROPULSION
26 MISSILE POD
27 HELIUM CHARGE UNIT
28 HYDRAULIC PUMPING UNIT
29 POD AIR CONDITIONING UNIT
30 LAUNCH PLATFORM
31 CABLE LOOP
32 RELAY LOGIC UNIT NO. 2
33 PLATFORM SENSING ALIGNMENT GROUP

LAUNCH CONTROL SYSTEM

LAUNCH CONTROL CONSOLE

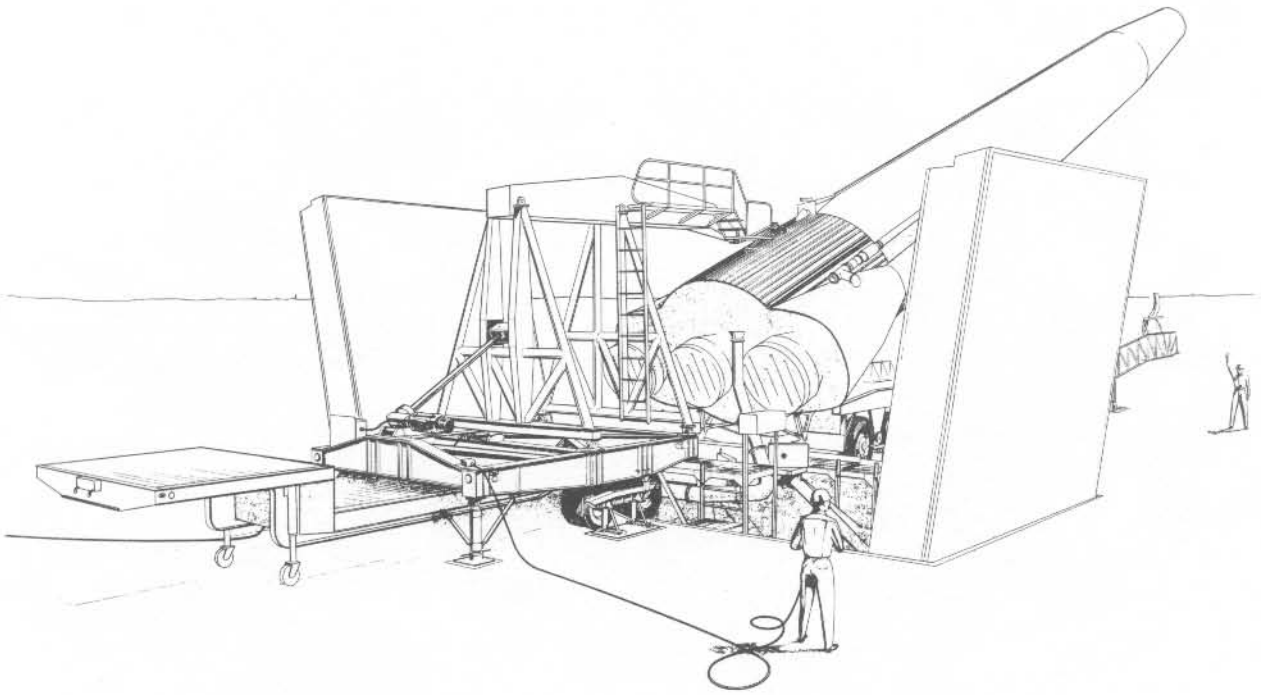
The launch control officer monitors and operates the missile and its ground support equipment from the launch control console located on the lower level of the Launch Control Center (see opposite page). The indicators and controls on the panel show the countdown-ready status of missileborne and silo-mounted systems; pushbuttons are provided for the emergency control of missile tank pressures. In the upper left corner of the panel are guidance system indicators and controls. At the top center of the panel is a digital clock. During a countdown, this clock indicates the time remaining before missile launch. When the ready-for-countdown indicator is green, a countdown can be started by depressing the start button below it. Indicators to the right of this button show the progress of the countdown. When the ready-for-commit indicator turns green, depressing the button to the right of that indicator causes the missile to be raised out of the silo and launched. If a malfunction occurs during a countdown, the sequence can be reversed to the ready-for-countdown point by depressing the start abort button to the right of the precommit indicators. Other controls on the panel include buttons for the launch complex telephone and public address systems.



LAUNCH CONTROL CONSOLE

MISSILE ERECTION SYSTEM

The missile erection system consists of a trailer-mounted erector and four trailer alignment rails. The erector essentially is a walking beam actuated by an electrically driven jackscrew. Before missile erection or removal, the trailer alignment rails are anchored in pairs to steel plates, which are embedded in the silo cap at opposite sides of the launcher platform opening. The missile handling trailer is backed onto one pair of alignment rails, and the erector trailer is backed onto the other pair. With the launcher platform raised to the proper height above ground, one side of the missile thrust section is attached to pivots on the launcher; the other side is attached to a hinged fitting on the walking beam of the erector. Then the erector's jackscrew either retracts the beam for missile erection or extends it for missile removal.



MISSILE ERECTION SYSTEM

VI. GLOSSARY

GLOSSARY

Terms used in this manual are defined below in the sense in which they apply to base activation.

AMC--Air Material Command of the U.S. Air Force, the logistic service agency, which controls the purchase of weapons and other property for the Air Force.

ARDC--The Air Research and Development Command of the U.S. Air Force. The service agency directing the development of Air Force weapon systems.

ASSOCIATE CONTRACTOR--A civilian contracting organization working with Astronautics in the activation of a complete missile base.

BMD--The Ballistic Missile Division of the U.S. Air Force. The service agency directly responsible for and in charge of the Ballistic Missile Program, including the Atlas Program, for which BMD is the Project Office.

BOD (Beneficial Occupancy Date)--The date on which the facility is accepted by the Air Force at which time Astronautics and its associate contractors and subcontractors can commence installing ground support and other equipment.

COMPLEX--A complex is comprised of a silo, launch control center, paving, fences, underground storage tanks, etc., necessary to the protection maintenance and launching of single Atlas Series F missile.

CONFIGURATION--The physical sum of all the component structures, equipment instrumentation, and other property which comprises a complete weapon system.

COORDINATION--The synchronization of two or more parallel but independent actions all of which are needed to accomplish a single thing.

EID--A four-digit numerical representation of the work description of an end item configuration.

END ITEM--A final combination of parts, assemblies and installations comprising a product which is ready for its intended use, either along or in conjunction with other end items.

FACILITY--The structures, machinery, instruments, and equipment built, provided, and installed by the Corps of Engineers' contractors in accordance with architect and engineer drawings and specifications.

FUNCTION--A Base Activation term which is used to define a grouping of components used principally for the same purpose and validated as an individual operational entity. It may define a complete system or only part of a system.

GSE (Ground Support Equipment)--All mobile or installed equipment, instruments, and the like, employed in the weapon system which is neither facility nor missile. (See severable items.)

INSTALLATION & CHECKOUT (I&C) SCHEDULE--A schedule chart showing flow and span time of GSE installation, validation and integration tasks necessary to activate an Atlas missile launch complex.

INSTALLATION--The placement and securing of the item. It does not necessarily mean that the item will be completely hooked up mechanically and electrically unless the planning card so describes it.

INTEGRATION--The action necessary to interconnect two or more functions and check out the resulting configuration.

INTEGRATED FACILITY ITEMS--Facility items which are included in activation functions.

INTERFACE--Within silo systems, any point where facility and GSE installations meet.

ITEM--An incremental collection of work tasks that will be accomplished in a given period of time. In most cases in activation, an item corresponds to an OIL.

JOD (Joint Occupancy Date)--A date (prior to BOD) agreed upon by Astronautics BMD and Corps of Engineers. It allows certain I&C tasks to commence before the facility is completed and accepted by the Air Force.

OIL (Operations Inspection Log)--A document produced by IBM data processing methods, compiling the identifying numbers of the planning cards related to a particular group of work, usually an item.

PLANNING CARD--The paper form used to spell out in detail the operations to be accomplished during activation. References to procedures, drawings, etc., are included.

SEVERABLE ITEMS--Items of property which may be readily moved from one location to another. Examples: desks, hand tools, motor vehicles, laboratory equipment, calibration instruments.

SPECIFICATIONS--The detailed book of specifications prepared under the Corps of Engineers for Facility protions of each base.

SURVEILLANCE PLAN--An instrument wherewith men and material are provided and deployed in such manner as to ensure complex and continuing observation of all phases of work involved in activating an Atlas missile silo launch base.

TAB CARD--A special-paper IBM card with perforations corresponding to coded numbers and letters representing status data, which is extracted from the card by electronic data processing machines. The accumulated data from all cards in a "run" is printed out by the machines in any desired, predetermined form of summation or analysis of project status.

VALIDATION--The action of determining that a system or other prescribed portion of the base can and will serve the purpose for which it was created.

WEAPON SYSTEM CONTRACTOR--The agency accepting over-all responsibility for production of the weapon system. Design criteria, surveillance, coordination, quality control and final selloff are facets of this task. Astronautics is the weapon system contractor for the Atlas weapon system.

GENERAL DYNAMICS | ASTRONAUTICS