

Chapter 4

RADAR EQUIPMENT



AN/TPS-40 RADAR SET

DESCRIPTION: The AN/TPS-40 is a highly mobile, high powered, long range radar set which provides height information on aircraft. Azimuth orientation is provided by either time-sharing control of the AN/TPS-40 among a maximum of four search plan position indicator (PPI) operators, or by control of the range-height indicator (RHI) operator. Height information from the RHI may be supplied to the PPI operators by voice from the RHI operator. However, with some PPI's, height information may be transmitted to the indicator height readout dials. Although normally transmitted in four M-35 trucks, the light weight aluminum construction of the AN/TPS-40 permits airlift by either rotary or fixed wing aircraft. In addition, the AN/TPS-40 is compatible with the AN/MPS-11, and most other search radar sets.

CAPABILITY: The AN/TPS-40 is a single channel radar. Its receivers provide video improvement under weather and jamming environments. Elevation range is from -2° to $+32^{\circ}$, with a maximum range of 200 NM.

FREQUENCY RANGE: Classified

POWER INPUT: 120/208 VAC, 60 Cps, 3 phase, 4 wire, 20 KW.
The AN/TPS-40 may be powered by the EMU-12 400 cycle generator set, bypassing the motor generator portion of the radar set. If the motor generator is used to convert 60 Hz to 400 Hz, a 25 KW input is required.

POWER OUTPUT: Classified

SITING CRITERIA: The AN/TPS-40 should be located within 150 feet of a search radar.

ERECTION TIME: 4.5 hours.

PERSONNEL REQUIRED:
1 each - 30372
2 each - 30352
7 each - 30XXX

<u>MAJOR COMPONENTS:</u>	<u>NOMENCLATURE</u>	<u>COMMON NAME</u>
	OA-3802.....	Antenna group
	PU-372/MPS-16.....	Motor generator
	OA-3805.....	Range-height indicator
	OA-3803.....	Operation Distribution unit

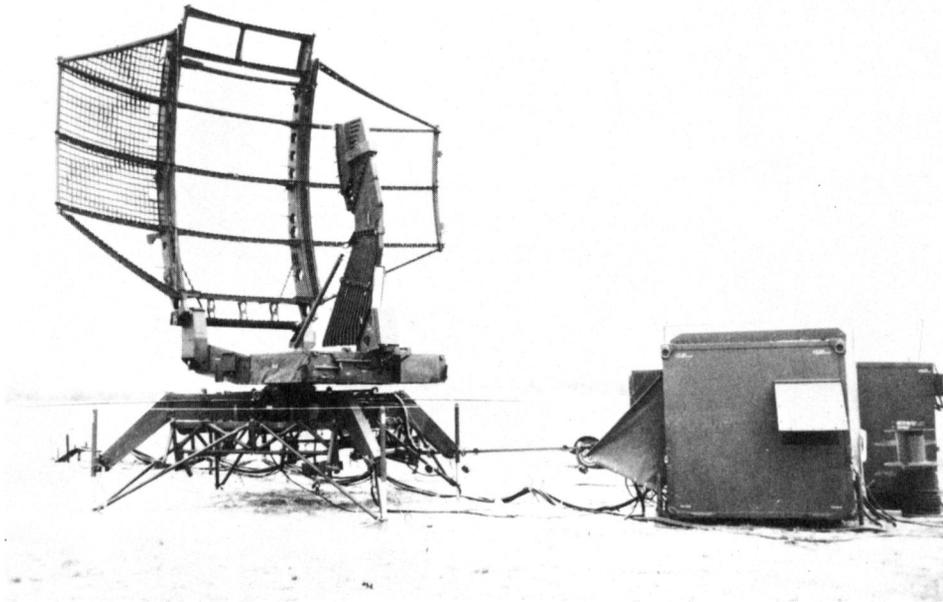
MANUFACTURER: Crosley Division of AVCO Mfg.

COST: \$258,000.00

WEIGHT: 15000 lbs. when palletized

CUBE: 2411 cu. ft.

APPLICABLE TOS: 31P3-2TPS40- series



AN/TPS-43 RADAR SET

DESCRIPTION: Radar Set AN/TPS-43 is a highly mobile ground radar set designed for simultaneous long range search and height finding in a severe weather and/or jamming environment. The radar set is a self-contained data gathering system requiring only 400 Cps primary power input. It has the capability for interfacing with either the CRC/CRP or Operations Center (AN/TSO-61). When in a transit condition the complete radar set is housed in two packages, shelter and antenna pallet. It is deployable by helicopter, transporters, M-35 trucks or C-130 aircraft. The shelter contains all of the electronics equipment with exception of the SIF interrogator AN/TPX-47, which is mounted on the antenna pallet. The AN/TPS-43 utilizes a stacked beam antenna configuration as a means of providing range, height and azimuth information.

CAPABILITY:

Transmitter: Fixed frequency, frequency agility, or MTI frequency agility selection of 16 frequencies.

PRF: 250 pps during normal transmission
278, 250, 227 pps in stagger mode.

Pulse Width: 6.7 microseconds.

3-D Coverage: Height up to 75,000 feet.
Range to 200 nautical miles. Azimuth coverage extends 360 degrees.

FREQUENCY RANGE:

2900 MHz to 3100 MHz

POWER INPUT:

50 KW including the air conditioners.

POWER OUTPUT:

2.8 MW

SITING CRITERIA:

A cleared circular area having a 30 foot radius with the ground slope not to exceed 6 degrees. There should be no obstruction higher than the base of the antenna for a radius of 300 feet.

ERECTION TIME:

1 hour in daylight.
90 minutes at night.

MAJOR COMPONENTS:

NOMENCLATURE	COMMON NAME
OY-20/TPS-43.....	Radar Set Group
OE-48/TPS-43.....	Antenna Group
AN/TPX-47.....	Interrogator Set

MANUFACTURER:

Westinghouse Electric Corp.

COST:

\$300,000.00

WEIGHT:

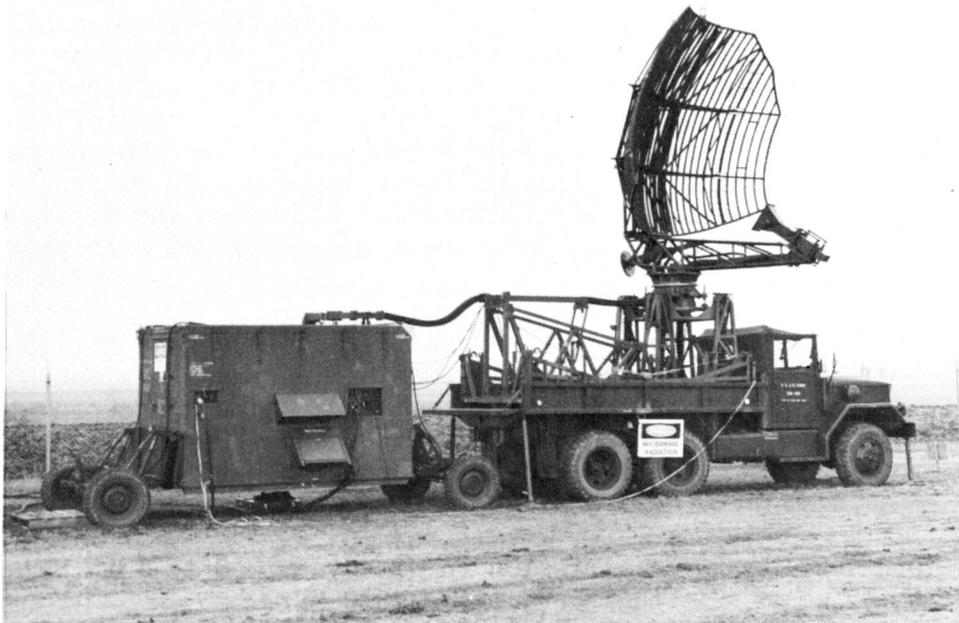
Shelter 3500 lbs.

CUBE:

Shelter approximately 410 cu. ft. Antenna Pallet approx. 606 cu. ft.

APPLICABLE TOs:

31P6-2TPS43 - series



AN/TPS-44 RADAR SET

DESCRIPTION: The AN/TPS-44 Radar Set is a transportable air surveillance radar that is used to locate and identify airborne targets. The set consists of two main packages: An equipment shelter and a foldable palletized antenna. Each package is easily transported by truck, helicopter sling lift, cargo aircraft or on wheeled transporters. The set utilizes solid state circuitry to provide increased system reliability, compact size. The TPS-44 utilizes a search radar that includes two indicator displays: A PPI (Plan Position Indicator) and a range indicator. MTI (Moving Target Indicator) is provided to achieve clarity in high foliage or other fixed clutter areas. VSI (Video Sween Integration) is provided to enhance the system target detection capability for long range operation. The set has remoting capabilities for antenna azimuth position, normal MTI and MTI/Normal Videos, system triggers and communications. In addition, a remote control capability of system performance is provided via a remote control panel. The set also includes SIF (Selective Identification Feature) to help identify aircraft. The receiver utilizes a parametric amplifier to improve radar performance via an improvement in the receiver MDS (Minimum Discernible Signal). Anti-jamming features are included in

the search radar. The equipment shelter houses the indicators, receivers, transmitters, antenna drive servo amplifier and the SIF interrogator and decoder. The units are rack mounted on slides and can be pulled out and tilted for convenient servicing. Extensive use of plug in modules, monitoring of power circuits, and accessible test points provide a high degree of maintainability. The equipment shelter is provided with a 32C-25 Air Conditioning Unit that can either cool or heat the shelter. The foldable palletized antenna contains the antenna reflector, antenna pedestal, antenna elevating mechanism and stabilization outriggers. The antenna folds onto the pallet as a compact, transportable package.

CAPABILITY:

The AN/TPS-44 has a range coverage of 275 nautical miles, with SIF returns extending to 180 nautical miles. Azimuth accuracy, for both normal video and IFF, is 1 degree. Antenna rotation speed is variable from 0-15 RPM.

FREQUENCY RANGE:

Transmission frequency - 1250 to 1350 MHz (tunable); IFF - 1030 MHz.

POWER INPUT:

120± 6/208± 10.4 volts, 400 ± 10 Hz, 3 phase, 4 wire. Total system utilizes 17 KW.

POWER OUTPUT:

Transmitter power output - 1.3 MW peak at 2 KW average; IFF - 1.5 KW peak (min), 2.0KW peak (max).

SITING CRITERIA:

Should be located in a clear zone that does not contain obstructions to interfere with the radiation pattern of the antenna. Within a radius of 30 feet, the site terrain shall not have a grade greater than 10% from level. In addition, there shall be no blockage in the region around the site above 14 degrees of elevation. The TPS-44 shall not be located more than 275 feet from the FACP Operations Central (AN/TSQ-61) and Communications Central (AN/TSC-53). To minimize radiation hazard, the antenna pallet must be sited at the same level or higher than the equipment shelter. The length of the interconnecting waveguide between the antenna pallet and equipment shelter limits the distance between them to no greater than five (5) feet.

ERECTION TIME:

2 hours with a 4 man crew.

PERSONNEL REQUIRED:

4 each 303X2

DIVERSITY:

The AN/TPS-44 Radar Set may be operated in five configurations: 1. With the equipment shelter and antenna pallet both on the ground; 2. With the equipment shelter and antenna pallet both on transporters; 3. With the equipment shelter and antenna pallet both on trucks; 4. With the antenna pallet on a truck and the equipment shelter on a transporter; or 5. With the antenna pallet on a transporter and the equipment shelter on the ground.

MAJOR COMPONENTS:

<u>NOMENCLATURE</u>	<u>COMMON NAME</u>
MX-7828/TPS-44.....	Antenna Pallet
S-400/TPS-44.....	Equipment Shelter
OR-21/TPS-44.....	Receiver Group (1A1)
OT-8/TPS-44.....	Transmitter Group (1A2)
OD-14/TPS-44.....	Indicator Group (1A3)
AN/TPX-48.....-	Interrogator Set (1A4)
SB-3096/TPS-44.....	Power Distribution Group (1A5)
Control Junction Box.....	Junction Box (1A10)

MANUFACTURER:

Cardion Electronics, Inc.

COST:

\$117,835.00

WEIGHT:

Shelter 3922 lbs; Antenna Pallet 4142 lbs.
Total weight 8064 lbs.

CUBE:

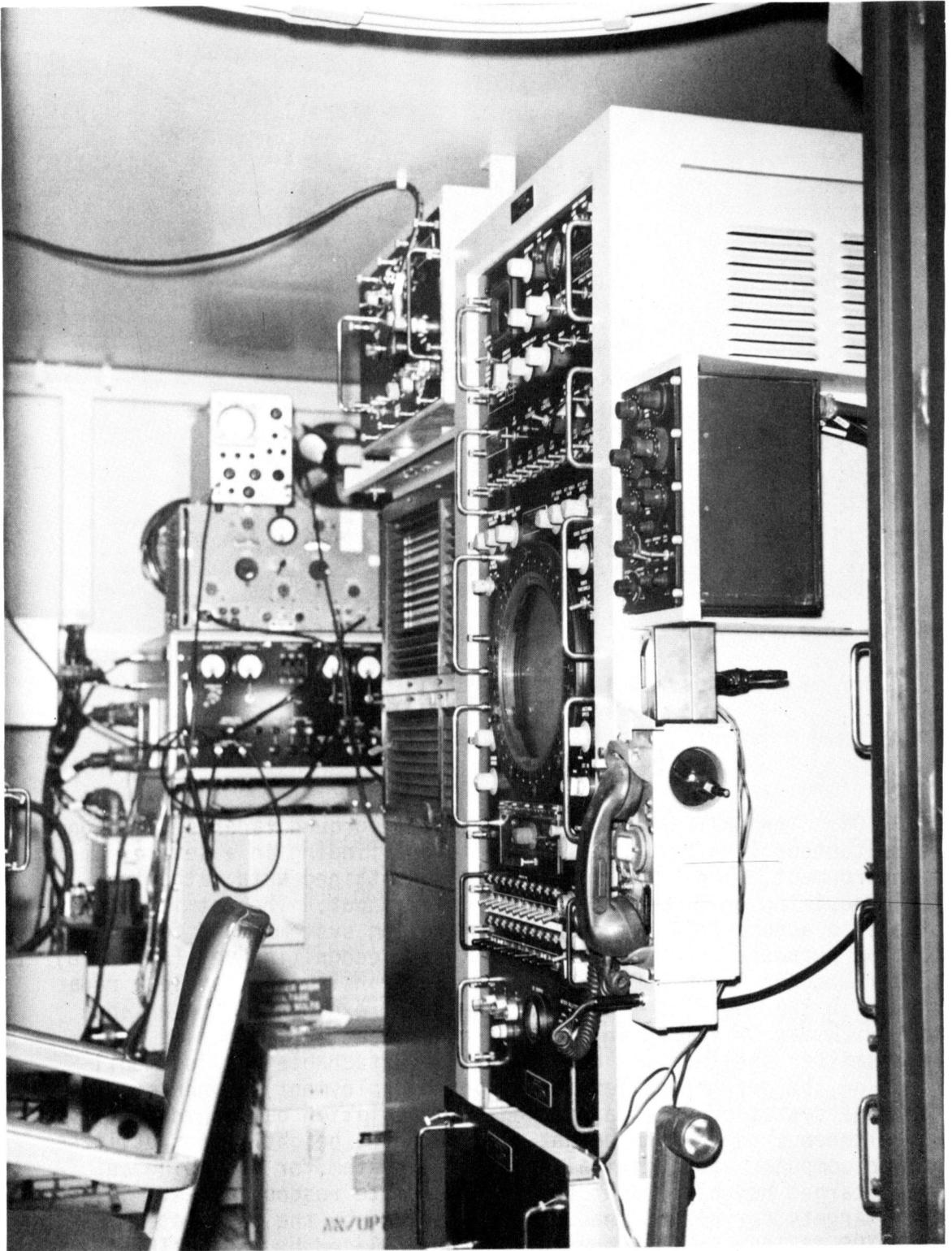
Shelter 462.3 cu. ft., Antenna Pallet 648 cu. ft.

APPLICABLE TOS:

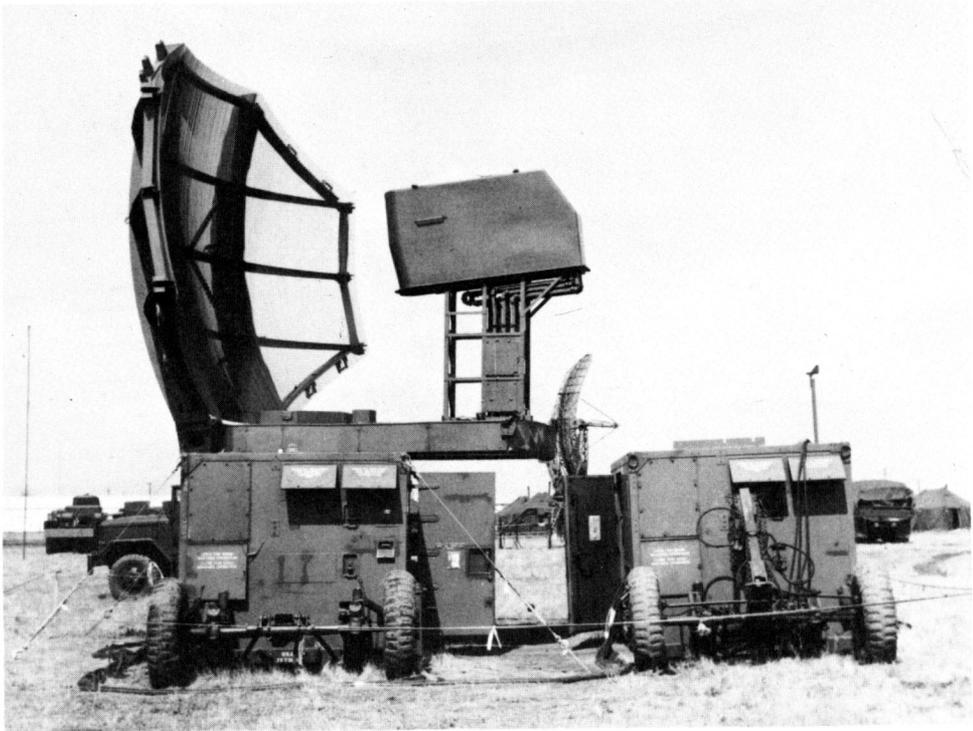
31P4-2APX-1	35E9-102-3
31P4-2APX-2	35E9-102-4
31P4-2APX-3	35E9-102-11

APPLICABLE TOs:

31P4-2APX-4.	35E9-102-13
31P6-2TPS44-2	35E9-102-14
31P6-2TPS44-2A (Secret)	35E9-102-21
31P6-2TPS44-3'	35E9-102-23
31P6-2TPS44-4-	35E9-102-24
31P6-2TPS44-6WC-1	35E9-102-31
31P6-2TPS44-9-	35E9-102-33
31Z1-407-06'	35E9-102-34
35E9-102-1	



Interior View AN/TPS-44 Radar Set



AN/TPS-48 RADAR SET

DESCRIPTION: The AN/TPS-48 is a highly mobile ground radar set designed for simultaneous long range search and height finding in a severe jamming environment. The radar set is a self-contained data gathering system, requiring only 400 Cps primary power input. The set is equally adaptable to automatic and manual data handling systems, and for identification purposes is compatible with Radar Recognition set (AN/UPX-6) and Coder-Decoder Group (GPX-18B). When in transit, the complete radar is housed in two modified type S-280 shelters, except for the antenna system which may be stored in a folded configuration (either on top the transmitter shelter, for deployment via attachable wheeled mobilizers, or on the antenna pallet for airborne deployment). When operational, the antenna system provides a stacked-beam radiation pattern necessary for simultaneous search and height finding. The height system utilizes an analog computer and a digital evaluation system for providing an accurate target height readout to various remote readout units. Selection of targets for height readouts is provided by the associated PPIs. This AN/TPS-48 is a transition radar to be replaced by the AN/TPS-43.

CAPABILITIES:

Range - 242 miles. Receivers - Dicke Fix, Log, Normal, anti-jam, and MTI.

FREQUENCY RANGE: Classified

POWER INPUT: 60 KW without Air Conditioners (Approx 25 KW)

POWER OUTPUT: Classified

SITING CRITERIA: A cleared circular area having a 30 foot radius with the ground slope not to exceed 6 degrees. There should be no obstruction higher than the base of the antenna (approx. 10 feet) for a radius of 300 feet.

ERECTION TIME: 1 hour.

MAJOR COMPONENTS:

<u>NOMENCLATURE</u>	<u>COMMON NAME</u>
OT-4/TPS-48.....	Transmitter group
OR-17/TPS-48.....	Receiver group
AS-2045/TPS-48.....	Antenna
OE-43/TPS-48.....	Antenna pallet
HD-770/TPS-48.....	Electron tube cooler
J-2732/TPS-48.....	Interconnecting box
AS-2132/TPS-48.....-.....	Waveguide horn assembly
CY-6312/TPS-48.....	Cable assembly case

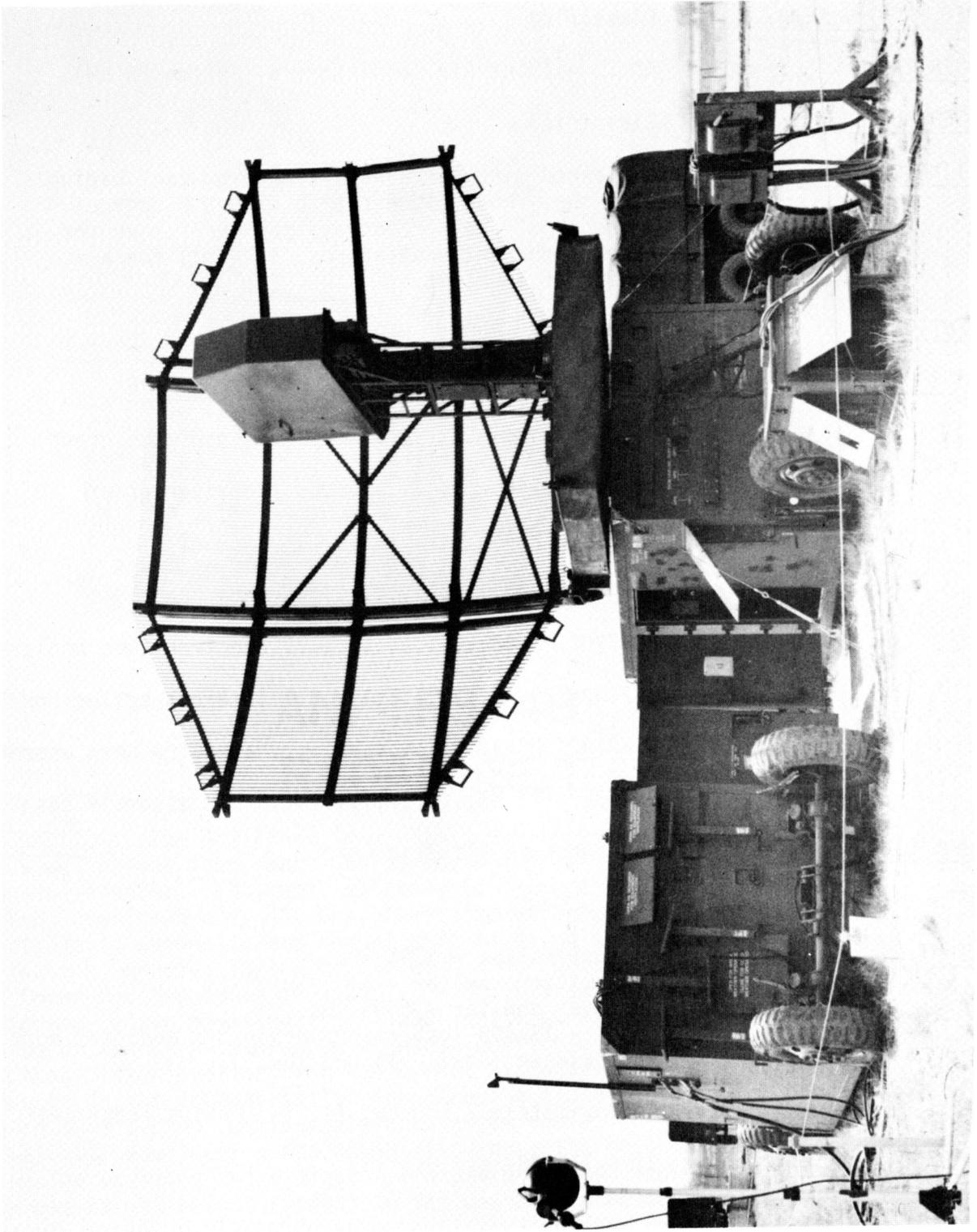
MANUFACTURER: Westinghouse Electric Corp.

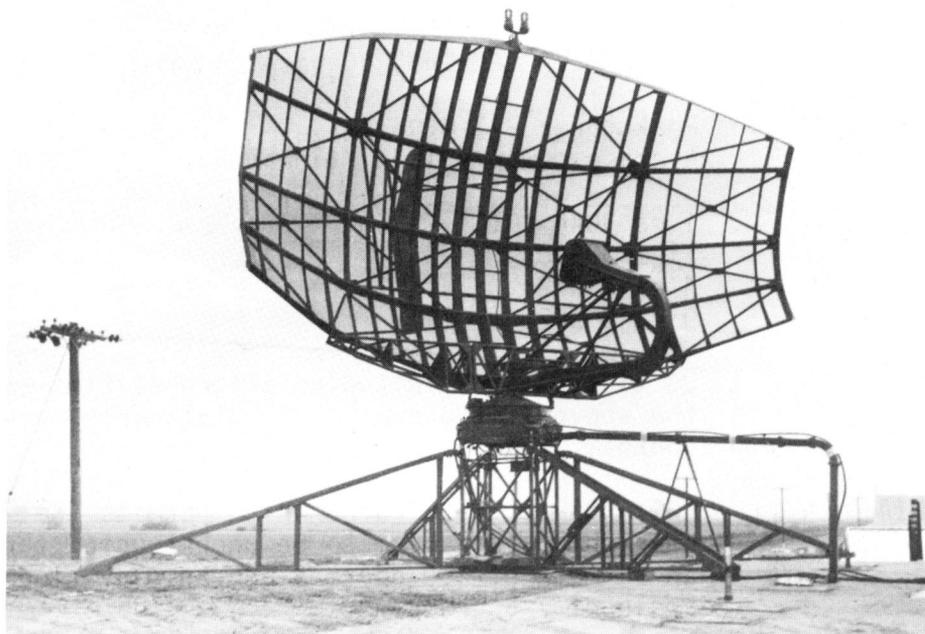
COST: \$300,000.00

WEIGHT: Antenna pallet - 5296 lbs.
 Transmitter shelter - 6192 lbs.
 Receiver shelter - 6005 lbs.
 Total - 17,493 lbs. (minus cable box and feed horn).
 Approximate total - 18,000 lbs.

CUBE: Approximately 2,500 cu. ft. for entire radar set.

APPLICABLE TOs: 31P6-2TPS48- series.





AN/MPS-11 RADAR SET

DESCRIPTION: The AN/MPS-11 Radar Set is a mobile, long-range search radar used as an early warning set. This set is also used as a permanently fixed radar identified as the AN/FPS-8. It is equipped with moving target indication (MTI) of the "Coherent video cancellation" type.

CAPABILITIES:

This radar set is capable of detecting aircraft in any azimuth at maximum ranges of 200 nautical miles and at maximum altitudes of 40,000 feet. It can either be used to sector scan at any azimuth, or for continuous rotation for 360 degrees in both forward or reverse directions. The AN/MPS-11 provides power and video connections for a video mapping unit (e.g. AN/GPA-30); power, video, and antenna connections for identification equipment (e.g., GPX-18/UPX-6); power for telephone communications equipment; and power and trigger for a height finding radar set (e.g., AN/TPS-37 or AN/TPS-40).

FREQUENCY RANGE: 1280 MHz to 1350 MHz

POWER INPUT: 120/208 VAC, 60 Cps, 3 phase, 4 wire, 20 KW

POWER OUTPUT: Peak power - 1 megawatt
Average power - 1.08 Kilowatts.

PERSONNEL REQUIRED: 1 ea 3044 (OIC)
1 ea 30390
4 ea 30372
9 ea 30352

ERECTION TIME: 24 to 48 hours, including alignment time with the above listed number of maintenance personnel.

SITING CRITERIA: 100X 400 ft. level area which permits the line-of-sight search beam to be unobstructed through an azimuth of 360 degrees and an elevation angle of 7 degrees.

MAJOR COMPONENTS: OA-379 Radar Set Group
OA-380 Radar Set Group
OA-405 Antenna Group
OA-412A Power Supply
OA-413 Transmitter Group
OA-416 Radar Set Group
OA-417 Receiver Group
AB-396 Tower
OA-1263 Pulse Generator Group
GPA-126 Plan Position Indicator
V-112 Trailer Van
V-113 Trailer Van

MANUFACTURER: General Electric Co.

COST: \$322,750.00

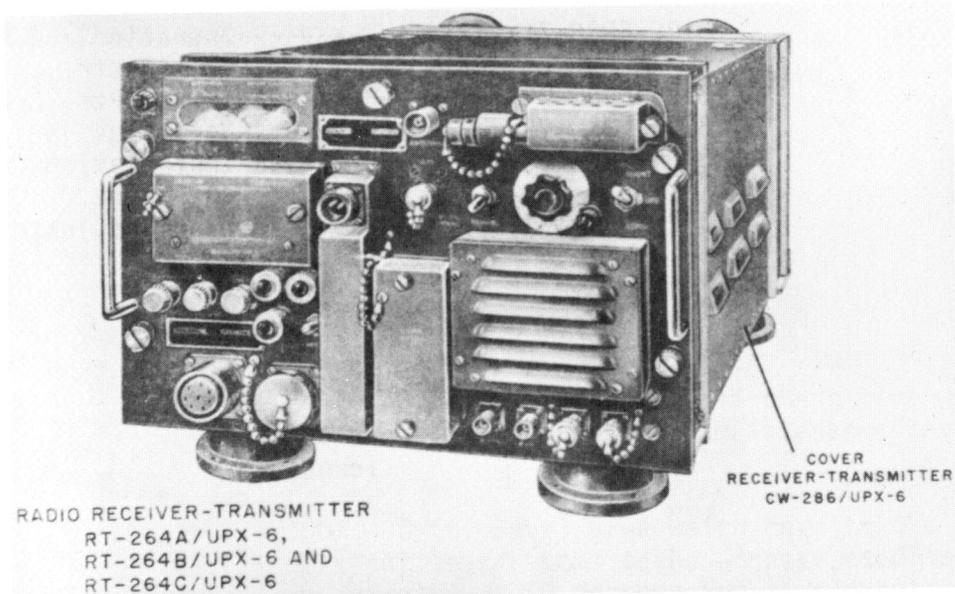
WEIGHT: 79,790 lbs.

CUBE: 7,845 cu. ft.

APPLICABLE TOs: 31P6-FPS8-1-----Operating Instr
31P6-FPS8-2-----Organ. Maint.
31P6-FPS8-3-----Overhaul Inst.
31P6-FPS8-4-----Illus. Pts. Bkdn.
31P6-FPS8-61-----Operating and Service Instr.
31P6-FPS8-64-----Illus. Pts. Bkdn.

APPLICABLE TOs:

31P6-FPS8-71-----Operating and Ser-
vice Instr.
31P6-FPS8-74-----Illus. Pts. Brkdn.
31P6-FPS8-94-----Non-Illus. Pts. Bkdn.
31P6-MPS11-1-----Installation, Operation
and Maint.
31P6-MPS11-57-----Standard Installation
Instr.



AN/UPX-6 RADAR RECOGNITION SET

DESCRIPTION: The AN/UPX-6 is a receiver transmitter designed to operate with other IFF (Identification Friend or Foe) or SIF (Selective Identification Features) equipment as part of an aircraft identification system for an associated radar set. The primary function of the equipment is to transmit and receive coded signals between radar identification equipment and target aircraft within the range of the IFF/SIF system. The receiver and transmitter are tuned by changing operating crystals and by manual screwdriver adjustments adjacent to these crystals. The transmitter is factory aligned for 1020 MHz operation, although its overall tuning range is 990 MHz to 1040 MHz. The receiver is similarly factory aligned (at 1100 MHz), and may be tuned for any frequency between 1080 MHz and 1130 MHz. The AN/UPX-6 is compatible with the following Coder-Decoder Groups: OA-1266, OA-1267, OA-1268, OA-1269, OA-1271, OA-1272, OA-2397, OA-2605, AN/GPA-78 or AN/GPA-64.

CAPABILITY:

The AN/UPX-6 has one tunable channel each for transmission and reception of coded signals in the IFF/SIF system.

FREQUENCY RANGE: Transmitter 990 MHz - 1040 MHz.
Receiver 1080 MHz - 1130 MHz.

POWER INPUT: 120 VAC @ 60 or 400 Cps, 218 watts:

POWER OUTPUT: 1.5 KW.

SITING CRITERIA: Equipment can operate at any fixed or mobile facility.

ERECTION TIME: 30 minutes.

SPECIAL TOOLS: AN/UPM-6B Test Set or AN/UPM-99 Test Set.

PERSONNEL REQUIRED: Three - 303X2

MAJOR COMPONENTS:

<u>NOMENCLATURE</u>	<u>COMMON NAME</u>
RT-264/UPX-6.....	Receiver/Transmitter
CY-1312/UPX-6.....	Electrical Equipment Cabinet.
CR-23/U...-.....	Operating Crystals

MANUFACTURER: Radio Receptor Co.

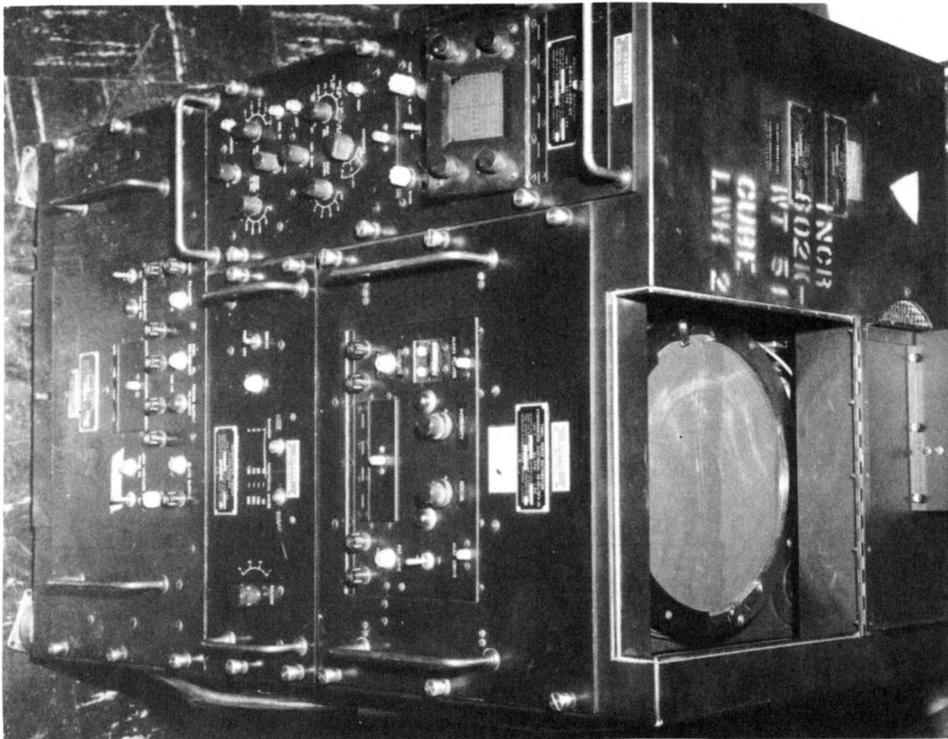
COST: \$2,775.00

WEIGHT: 77 lbs.

CUBE: 2 cu. ft.

APPLICABLE TOS:

31P4-2UPX6-1-----	Operating and Service Instructions
31P4-2UPX-2-----	Maintenance Instr.
31P4-2UPX6-4-----	Illustrated Parts Breakdown.



AN/GPA-30 VIDEO MAPPER

DESCRIPTION: The AN/GPA-30 video mapper electronically reproduces a map by use of photo cells and image intensifiers from an opaque film (with transparent lines) for presentation on the face of a PPI (Plan Position Indicator) or "B" scope. The maps are circular with the radar site at the center. The range of the maps may be from 10 to 350 nautical miles in diameter and may be used to indicate control areas, cities, military installations and nav-aid locations within the operational range. This equipment is compatible with the AN/FPS-3, AN/MPS-7, AN/CPS-6, AN/FPS-8 or AN/MPS-11

CAPABILITY: Accepts trigger and servo data from a single search radar for proper range and azimuth orientation of a single map.

POWER INPUT: 110-130 VAC @ 55-65 Cns, single phase, 7.5 amps.

SITING CRITERIA: NA

ERECTION TIME: 1 hour

PERSONNEL REQUIRED: 2 each 30352

MAJOR COMPONENTS:

NOMENCLATURE

COMMON NAME

SN-149/GPA-30.....Electrical Syn-
chronizer
AM-1133/GPA-30.....Video Amplifier
PP-1218/GPA-30.....Power Supply

MANUFACTURER:

Televisco Corp.

COST:

\$7,715.00

WEIGHT:

515 lbs.

CUBE:

27 cu. ft.

APPLICABLE TOs:

31P1-2GPA30 series.



AN/GPA-126 PLAN POSITION INDICATOR

DESCRIPTION: The GPA 126 is a Plan Position Indicator primarily designed for use with the AN/MPS-11 Radar set. The indicator receives target video information in the form of triggers or pulses and displays a visual representation of the radar echos. It has various positions for other information such as, IFF/SIF, range marks, angle marks and video mapping presentations.

CAPABILITIES:

- a. Range Coverage 50-220 miles in 3 ranges
0-50, 0 - 100, 0 - 220
- b. Azimuth Coverage - 360° or any sector.
- c. Off center operation variable from 50- 150 miles.
- d. Provisions for use of IFF and Video Mapping Equipment.
- e. Delayed sweep variable between 1 and 240 miles.

POWER REQUIRED:

120V, 60 Cps, approx. 2.5 Kw

WEIGHT:

418 lbs.

CUBE:

22 cu. ft.

SITING CRITERIA:

Not designed for out-of-doors operation.
Must have adequate rear ventilation.

COST:

NA

MAJOR COMPONENTS:

IP56A/CPS-6B

APPLICABLE TOs:

31P1-2 GPA 126 - series



AN/UPA - 48

PLAN POSITION INDICATOR

DESCRIPTION: The AN/UPA-48 is a console type plan position indicator (PPI) designed for use with a search radar system. The PPI receives target video information, sweep starting information in the form of triggers, synchro signals, and ancillary inputs such as range marks and IFF/SIF video targets. Using these inputs, the indicator drawer produces a PPI display with the following features: Display off-centering, delayed sweep, variable range control, cursor off-centering, and counter readout of target range strobe, and height and cursor azimuth. The AN/UPA-48 is compatible with any 400 Cps radar system, e.g., AN/TPS-44, AN/TPS-43, and AN/MPS-11 when converted.

CAPABILITY:

Accepts video signals from a single search radar and an associated IFF/SIF system. It furnishes height readouts from associated height finder radar, and generates a cursor for providing GCI orientation.

POWER INPUT:

120 VAC @ 400 Cps, single phase, 800 watts.

SITING CRITERIA:

Locate within operations shelter.

ERECTION TIME:

1 hour.

PERSONNEL REQUIRED:

One 30352.

MAJOR COMPONENTS:

NOMENCLATURE

COMMON NAME

IP-607/UPA-48.....Azimuth Elevation
Range Indicator

PP-3074.....Power Supply

CY-3215.....Indicator Case Group

MANUFACTURER:

Westinghouse Electric Corp. National Corp.

COST:

\$27,000.00

WEIGHT:

375 lbs.

CUBE:

25 cu. ft.

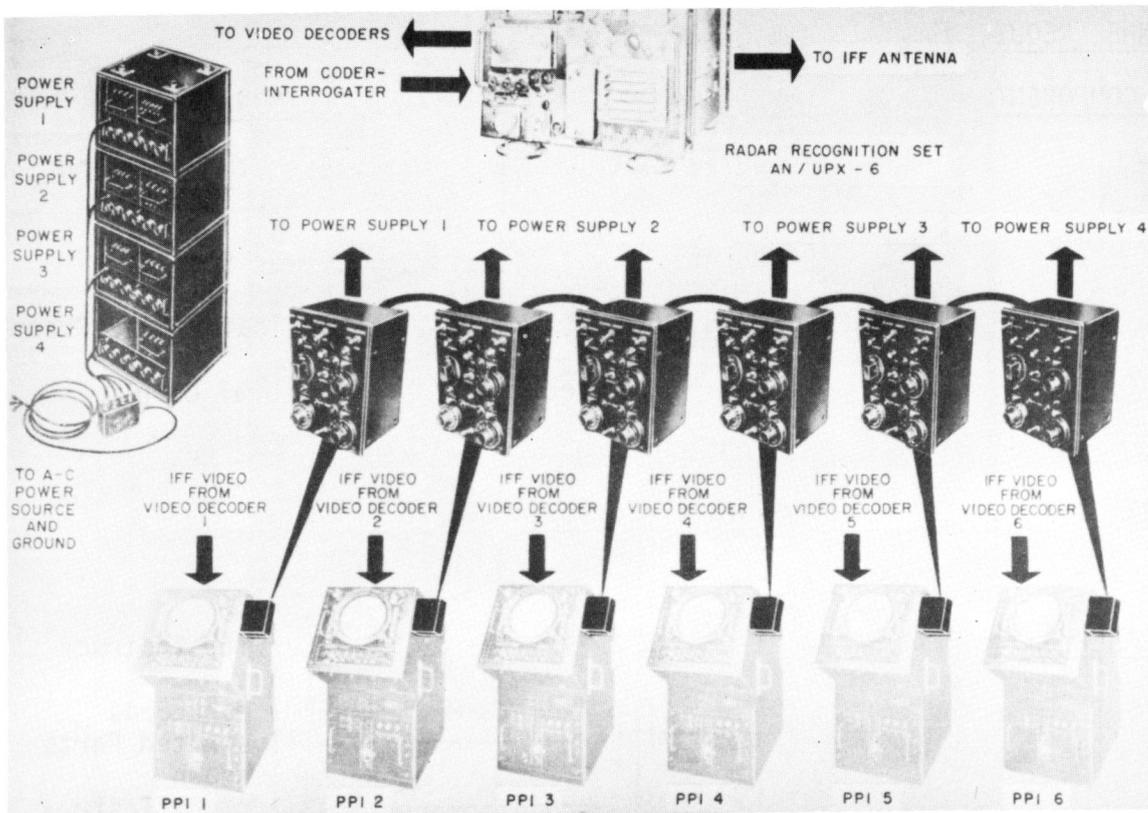
APPLICABLE TOS:

31P1-2UPA48-2-----Service Instruc-
tions.

31P1-2UPA48-6HC-1-----PMI Workcards

31P1-2UPA48-4-----Illustrated Parts
Breakdown

31P1-2UPA48-9-----Alignment Instr.



OA-1272/GPX-18B CODER-DECODER GROUP

DESCRIPTION: The OA-1272/GPX-18B Coder-Decoder groups generate paired-pulse coded interrogations for modulation and transmission by the radar recognition set (AN/UPX-6). When these interrogations are received by an airborne transponder set, a coded reply (code train) is transmitted from the transponder, and received and detected by the receiver portion of the radar recognition set. Thereafter, the code train is sent to the coder-decoder group and compared for correctness with the mode and code requirements. Correct signal replies are then displayed on the radar set Plan Position Indicator (PPI) as target SIF (Selective Identification Features) responses. The OA-1272/GPX-18B in conjunction with the AN/UPX-6 is used with the AN/MPS-11 and AN/TPS-48 radar systems.

CAPABILITY:

Single channel during generation of pulse pairs to UPX-6. Received video is routed to six channels for decoding.

POWER INPUT:

120 VAC @ 60 or 400 Cps, single phase.

SITING CRITERIA: None

ERECTION TIME: OA-1272 - 2 hours

SPECIAL TOOLS: AN/GPM-40A Test Set

PERSONNEL REQUIRED: 3 - 303X2 per group

MAJOR COMPONENTS:

<u>NOMENCLATURE</u>	<u>COMMON NAME</u>
OA-1272/GPX18B:	
PP-2191/GPX.....	Power Supply (4 ea)
KY-275/GPX.....	Video Decoder (6 ea)
KY-274/GPX.....	Coder-Interrogator
C-2738/GPX.....	Coder-Decoder Control (6 ea)

MANUFACTURER: Bell Corp

COST: OA-1272/GPX-18B-----\$14,266.00

WEIGHT: OA-1272/GPX-18B-----264 lbs.

CUBE: OA-1272/GPX-18B-----18.6 cu. ft.

APPLICABLE TOs:

31P4-2GPX-211-----	Opr Instr.
31P4-2GPX-212-----	Service Instr.
31P4-2GPX-213-----	O/H Instr.
31P4-2GPX-214-----	Illus Prts. Brkdn.
31P4-2GPX-226WC-1-----	PMI Workcards
31P4-2GPX-234-----	Illus Prts. Brkdn.
31P4-2GPX-244-----	Illus. Prts. Brkdn. Video Decoder KY-275
31P4-2GPX-264-----	Illus. Parts Brkdn. (Coder-Decoder Control C-2763)
31P4-2GPX18-14-----	Non-Illus. Parts Brkdn. (Radio Inter- rogator AN/GPX-18)



AN/TSQ-61 OPERATIONS CENTRAL

DESCRIPTION: The AN/TSQ-61 is an operations central which provides radar surveillance data by means of two AN/UPA-48 PPI (Plan Position Indicator) scopes and aircraft control (air/ground voice) communications through the AN/TSC-53 van for the Forward Air Control Post (FACP). The operations central also coordinates the FACP operation by communicating with other elements of the Tactical Air Control System. SIF (Selective Identification Features) decoding is provided by KY-364 control boxes which are compatible with AN/TPX-48/TPS-44 and AN/TPX-47/TPS-43. Operations control consists of a group of components housed in a lightweight mobile shelter designed for transport by cargo truck, helicopter, cargo aircraft, transporter or rail. Air conditioning and heating is provided for creature comfort and equipment stability.

CAPABILITIES:

The AN/TSQ-61 contains two GRA-39 remote control heads which are interconnected with the GRC-106/TSC-53 for UHF frequency agility. Similarly, the AN/TSQ-61 contains remote receiver control of the AN/TPS-44

for improving video reception on its two AN/UPA-48 PPIs. Patch panels for compatibility with the AN/TSC-53 and AN/TRC-97, as well as a manual plotting board, is also present in the AN/TSQ-61.

POWER INPUT:

120/208 VAC, 400 Hz, 3 phase, 4 wire (grounded neutral).

SITING CRITERIA:

The AN/TSQ-61 equipment shelter should be located on approximately level terrain with a maximum 10% grade to allow for leveling. The maximum separation distance from the AN/TPS-44 equipment shelter is limited to 275 feet by the length of the interconnecting communications cable.

ERECTION TIME:

1 hour.

PERSONNEL REQUIRED:

2 each 303X0

MAJOR COMPONENTS:

NOMENCLATURE

COMMON NAME

S-388/TSQ-61.....	Shelter, electrical equipment (1 ea)
TA-312/PT.....	Maintenance Telephone Communications.....
Communications.....	Communications
Junction Box.....	Junction Box
AN/GIC-18.....	Operator's keyswitch unit
KY-364/APX.....	Video decoder
PP-4708/TSQ-61.....	Ring generator
Remote Video Control Unit.....	Remote video
MX-7566/TSQ-61.....	Radio monitor unit
O-1409/TSQ-61.....	Range marks generator
C-6476/ARC-51A.....	UHF remote control head
PP-4705/TSQ-61.....	Power supply

MAJOR COMPONENTS

NOMENCLATURE

COMMON NAME

AN/UPA-48A.....Radar indicator
 Power Distribution box.....Same
 PT-488/TSO-61.....Plotting board
 A/E 32C-18.....Air conditioner
 Footswitch.....Footswitch

MANUFACTURER:

National Co., Inc.

COST:

\$50,4700.00

WEIGHT:

4500 lbs.

CUBE:

698 cu. ft.

APPLICABLE TOs:

31P1-2UPA48-series
 31P4-2APX-series
 31S1-2TSQ61-series
 31W1-2GIC18-series
 31W1-2PT-291
 31W1-2PT-292
 31W1-2PT-464
 31W1-2PT-494
 31Z1-406-06
 35EP-118-series





AN/TSQ-91

CRC/CRP

DESCRIPTION:

The CRC/P Operations Center, when integrated with the AN/TPS-43 radar, functions as the major weapons control agency of the TACS by performing all functions of surveillance and weapons control in its assigned area of tactical responsibility. Modular in design, the CRC/P is capable of adjusting to the needs of a given deployment by additions/deletions to the basic set of the following modules: Group Display, Console, Data Processing, Ancillary Equipment, and Air Conditioning.

The console and group display modules are joined together by means of an inflatable shelter to form a single operations room which houses operations personnel, manual display boards, consoles and communications equipment. To this basic complex is added an ancillary equipment, data processing, and air conditioning module to form a minimum configured operation center. Additional console, group display and air conditioning modules are added to conform to the three basic deployment configurations; minimum, intermediate, and maximum. The equipment for the CRP is identical to the CRC, only the manning would vary. The following depicts numbers of modules required in each configuration:

<u>Unique Modules</u>	<u>Min</u>	<u>Int</u>	<u>Max</u>
Console	1	2	3
Group Display	1	2	3
A/C	1	2	2
Ancillary Equipment	1	1	1
Data Processing	1	1	1

In each basic ops center, four consoles and technician stations are arranged on two raised daises, and a four-man table is positioned in front of the console rows. The two remaining consoles are located in the ancillary equipment module. Communications end instruments (TA-720/741, or C-subset) are located at each console, tech table, plotter position, and computer operator station.

Two modes of operation are possible; computer-assisted, in which the HM-4118 computer processes surveillance, computes weapons data and generates console displays; and manual, in which only raw radar data and SIF is displayed. In the computer-assisted mode, automatic SIF tracking and telling of tracks of interest via automatic data link (ADL) are available.

CAPABILITIES:

1. The PPI or console display is a 16" CRT with a 4 1/4" square viewing surface auxillary readout display. The console is 43" high, 33" wide and 36" deep and weighs approximately 290 lbs. The PPI can operate in both the manual and computer assisted mode. In the manual mode, the PPI can display:

- Range marks and radar
- SIF-alerts
- Map videos
- Radar returns

In addition, the range scale and off-set selection can be changed, active and passive SIF radar returns can be decoded; however, auto SIF tracking is not available, range and bearing cursor can be used, and radio/telephone communications remain in operation. In the computer-assisted mode, the computer sorts and distributes data, computes weapons guidance instructions, and alerts operators of critical situations. The console can be operated in seven operation modes plus Test and Manual; they are:

- SSO - Search Scope Operator
- ASO - Air Surveillance Operator
- M&I - Movements and Identification Officer

SD - Senior Director
WAO - Weapons Assignment Officer
WD/ATC - Weapons Director/Air Traffic Controller
ADALO - Air Defense Artillery Liaison Officer

All nine modes are switch selectable at each console. Symbology and background information such as pairing indication, intercept point, off-set point, geography, tactical air bases, flight corridors and FEBA can be displayed on the PPI. Several auxillary readout displays (ARO) can be requested. Among them are:

Auxillary data display
Track information display
Critical class display
Weapons track display
Controlled aircraft display
Alert displays.

2. Secondary Surveillance Radar Processor (SSRP). The SSRP basic task is to control the interrogations of the AN/TPX-47. The composite SIF video is received and processed with the following actions performed:

- a. Serial to parallel extraction and single sweep defruiting for modes 1, 2, 3a, 4 and 5.
- b. Inhibits code overlap (garble) info including "radio out".
- c. Detects emergency replies and generates an alarm at PPI.
- d. Determines proper mode of interrogation.

3. SIF Processor (SIFP). The following lists the functions of the SIFP.

- a. Target detection - automatic detection and measurement of A/C responding to SIF interrogations (excluding mode 4) and transfer data to computer.
- b. Code validation - up to 3 modes per target.
- c. SIF strobe elimination - inhibits false data transfer to computer under jamming or target saturated azimuth section conditions.

4. HM-4118 Computer. The computer is organized into functional modules; each module is frame-mounted and capable of communication with other modules. The Arithmetic Unit/Program Control Unit Processor Module, the Memory Module and the Buffered Input/Output Module form the basic HM-4118. The core storage capacity is 81,920 words with provision for growth up to 131,000 words. Also provisions are made for the addition of a second processor, and expansion of input/output capacity to 16 channels. Data can be input to the HM-4118 via the data entry keyboard and read in by the tape reader from perforated tape. Computer generated output data is

available on punched tape, magnetic tape or transferred to the printer for hard copy. Outlined below is a general description of the operating characteristics:

- a. Operation - parallel arithmetic.
- b. Logic - synchronous, 4 megacycle clock.
- c. Word length - 18 bits.
- d. Memory - one microsecond cycle time.
- e. 18 bit words, 81,920 word storage capacity.
- f. Input/Output - parallel 18 bit word data transfer, 8 bi-directional buffered channels, maximum single channel data transfer rate of 500,000 words per second, up to a maximum of 1,000,000 words per second when two or more channels are operative.
- g. Number representation - sign and absolute magnitude.
- h. Arithmetic organization - all arithmetic computations are performed in fixed point binary.
- i. Double precision - provided for additions, divisions, square root, and multiplications.
- j. Interrupts - 8 special interrupts in addition to one per I/O channel and real time clock interrupts.
- k. Index Registers - 4 banks with 12 under registers each.

5. Computer Programs. The four basic computer programs are: Operational/Recording (ORP), Simulation and Data Reduction (SDRP), Utility and Diagnostic Programs. The function of the CRP is to gather, process, and display data required to update the current air surveillance picture and to support the weapons assignment and control functions. In accomplishing this the ORP also processes and records system exercise data; provides logic and timing control at computer interfaces with all consoles, radar and other peripheral devices. The SDRP prepares input tapes for the on-line program exercise function and reduces air situation data recorded on-line by the ORP. All computer programs are prepared and maintained by the Utility Program and the off-line Diagnostic Program provides the means for computer maintenance personnel to perform fault isolation.

POWER INPUT: 120/208 VAC, 400 Hz, 3 Phase

SITING CRITERIA:

Prior to a CRC/P deployment, a preliminary evaluation of the proposed site should be made using a topographical map. The evaluation is

accomplished utilizing the equipment siting criteria as specified in applicable T.O.'s and the CRC/CRP Facility Manual. The following siting factors should be considered:

- RF transmission paths
- Geographical and topographical features
- Safety
- Equipment load bearing and leveling restrictions
- Environmental considerations, weather, etc.

<u>ERECTION TIME:</u>	Min	Int	Max
(Spec)	1.5 hrs	2.3 hrs	2.7 hrs
Personnel	25	30	39
<u>PERSONNEL REQUIREMENTS:</u>	Min	Int	Max
(T.O.)	15	28	43

MAJOR COMPONENTS: Typical equipment contained in the modules is as follows:

Console Module (OA 8446/TSQ-91(V))

- 4 consoles and console electronics
- 4 technician tables
- Communications equipment - nonsecure
- G/A, secure and non-secure telephone, mechanical
- Provisions for G/A ciphony
- Data Distribution Group
- Secondary Surveillance Radar Processor
- Pulse and video distributor
- Radar azimuth converter

Group Display Module (AN/TSA-34)

- 3 panel plotting board
- Power distribution bay
- Communications patch bay
- Weather teletype
- Guard table
- Supply cabinet and safe
- Rifle and clothing rack

Data Processing Module (OA 8450/TSQ-91(V))

- HM-4118 Computer
- Punch tape reader
- Systems status panel
- Magnetic tape synchronizer
- Operator station, keyboard printer punch

ADL buffer
Video mapper (3 maps display)
SIF processor

Ancillary Equipment Module (OA 8447/TSQ-91(V))

2 consoles and associated communications
Voice recorder
Display buffer
PPI symbol generator
ARO symbol generator
Common display control
Data distribution group
ADL modems
Maintenance table

Air Conditioning Module (AN/TSA-35)

4 5-ton environmental control units (GFE) and appropriate ducting.

MANUFACTURER: Hughes Aircraft Company

COST: \$2,734,000.00 (maximum configuration)

WEIGHT: Varies by module and configuration

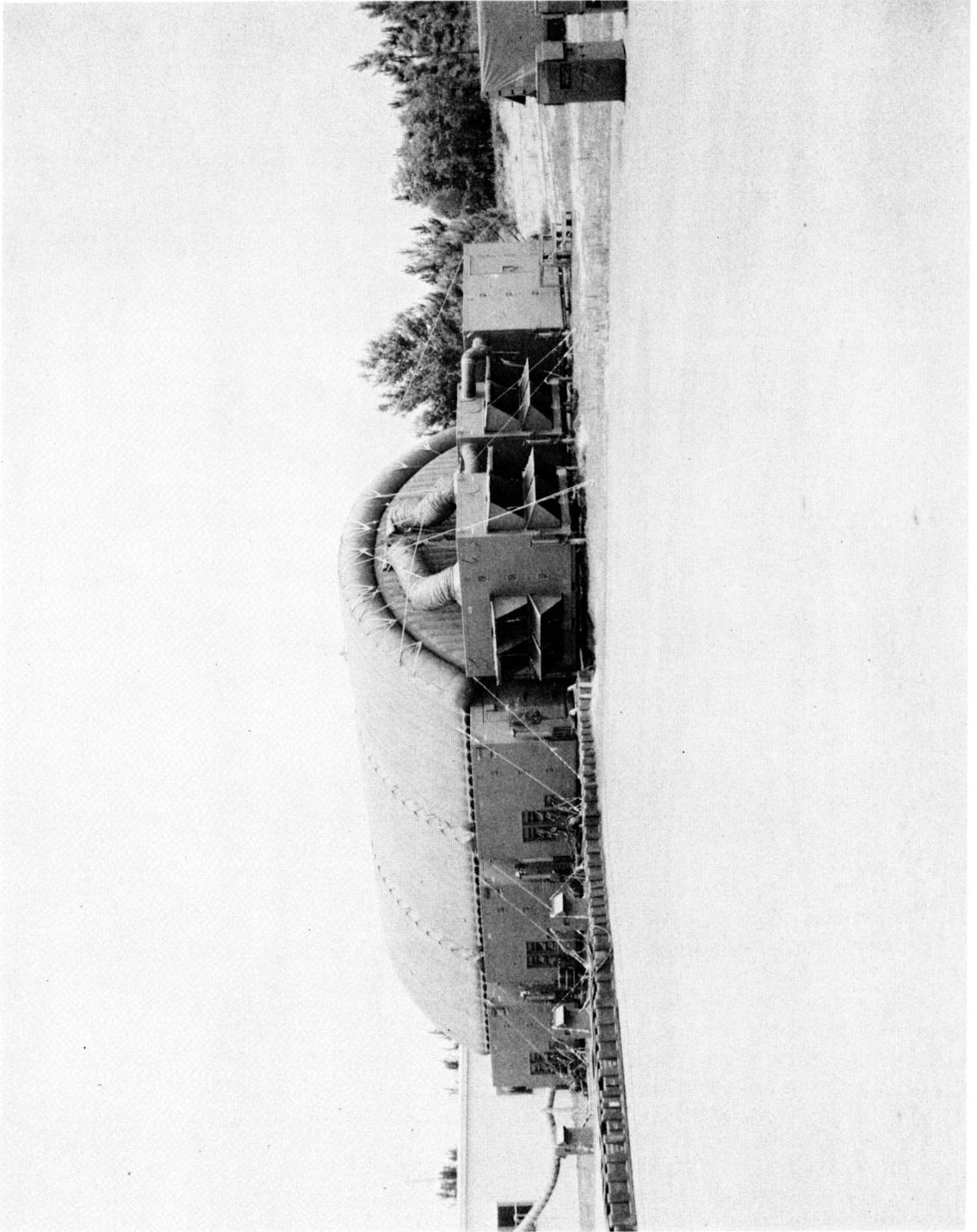
Group display	6,500 lbs
Console	6,185
Data Processing	5,430
Ancillary Equipment	5,222
Air Conditioning	5,775

CUBE: All modules approximately 740 cu ft, or 156"x87"x94".

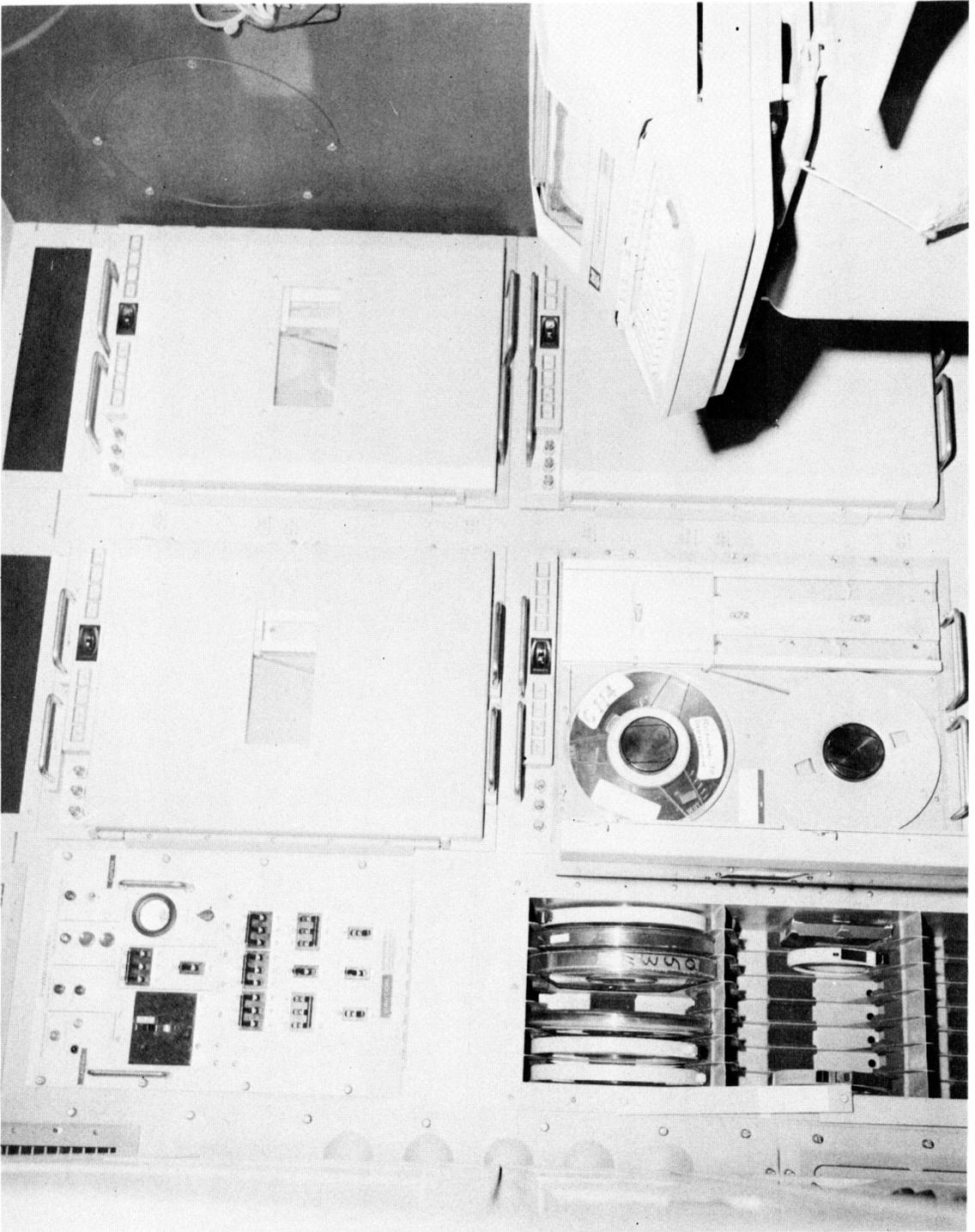
APPLICABLE TOs: 31Z3-182-12



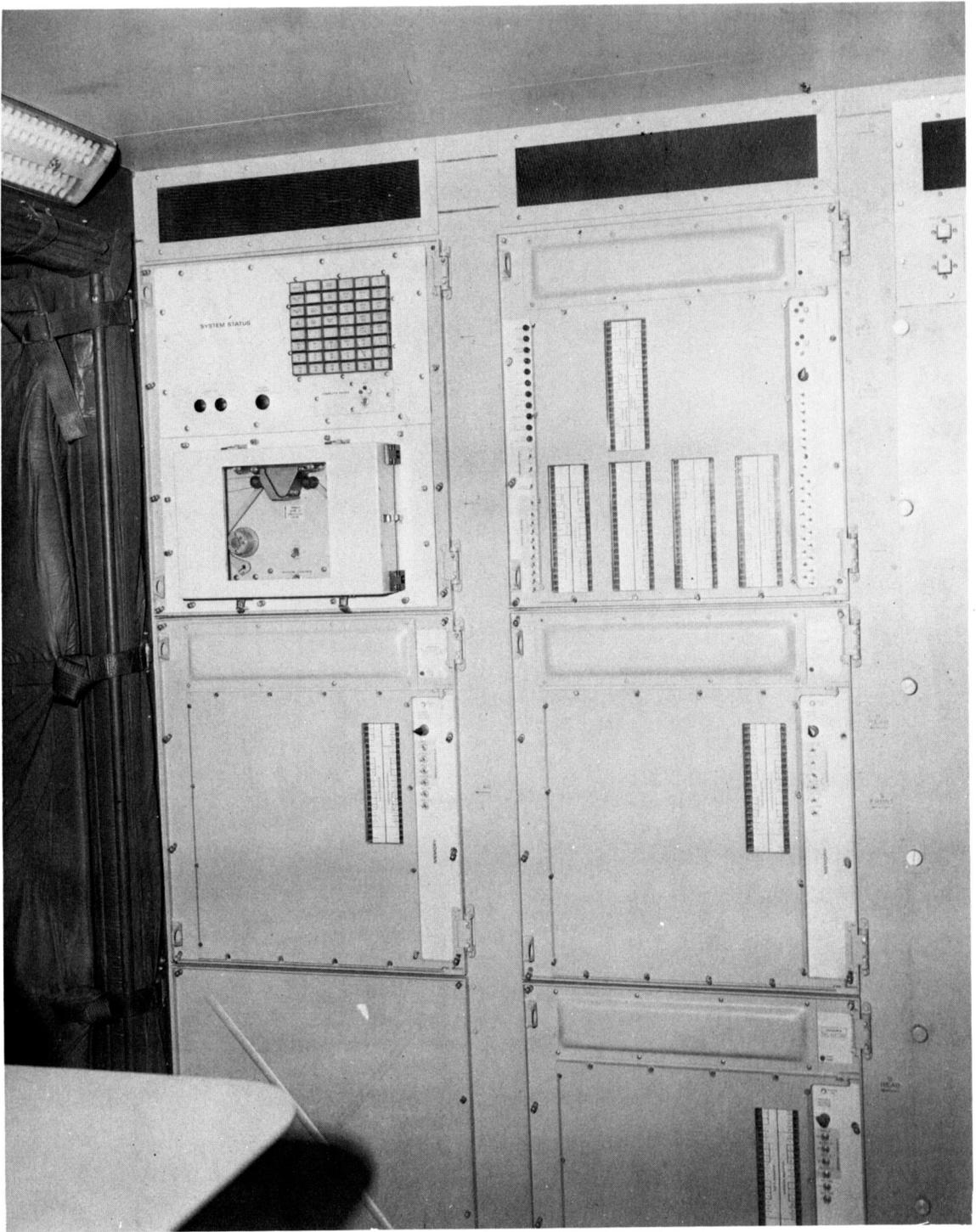
Interior View of AN/TSQ-91



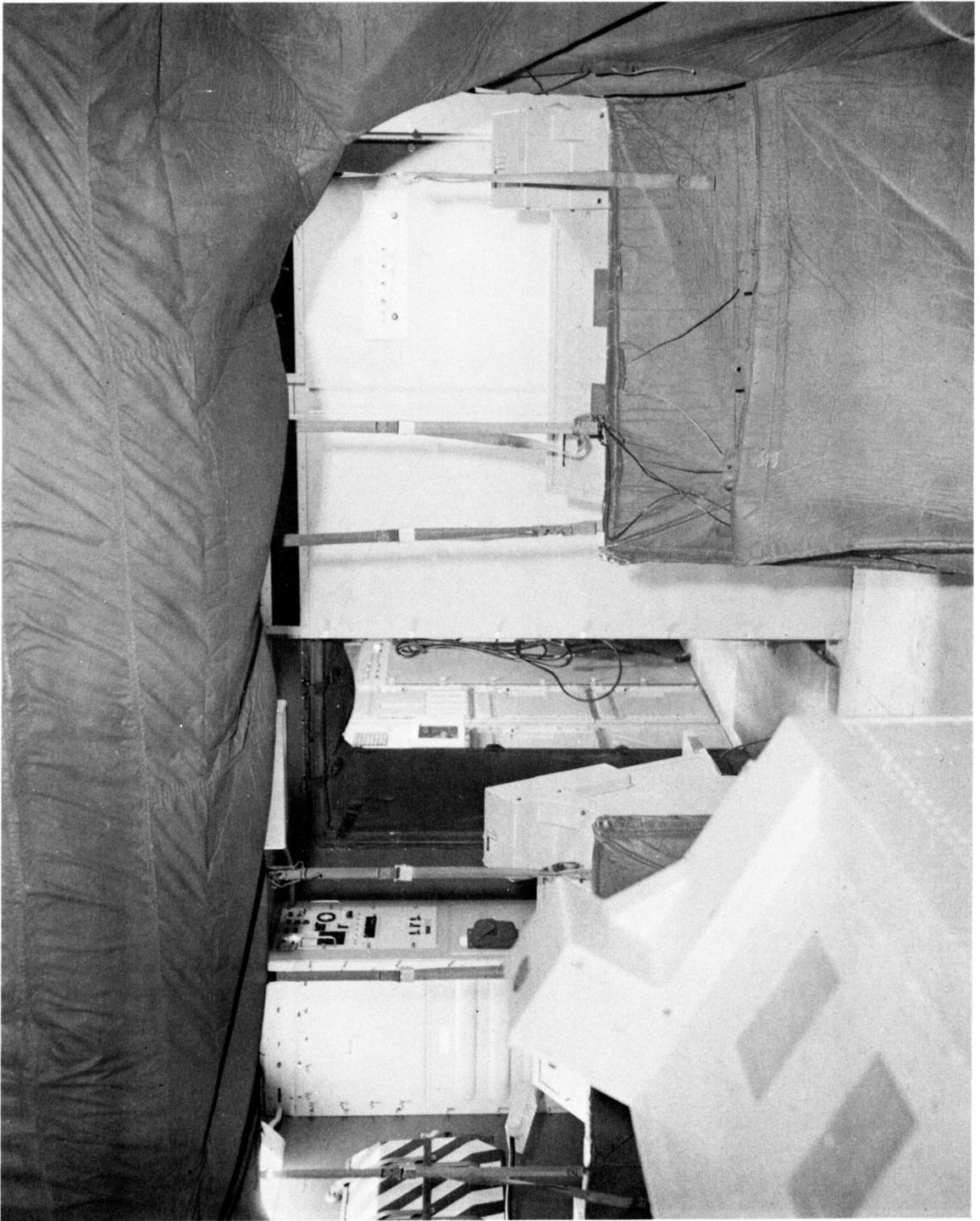
Deployed AN/TSQ-91



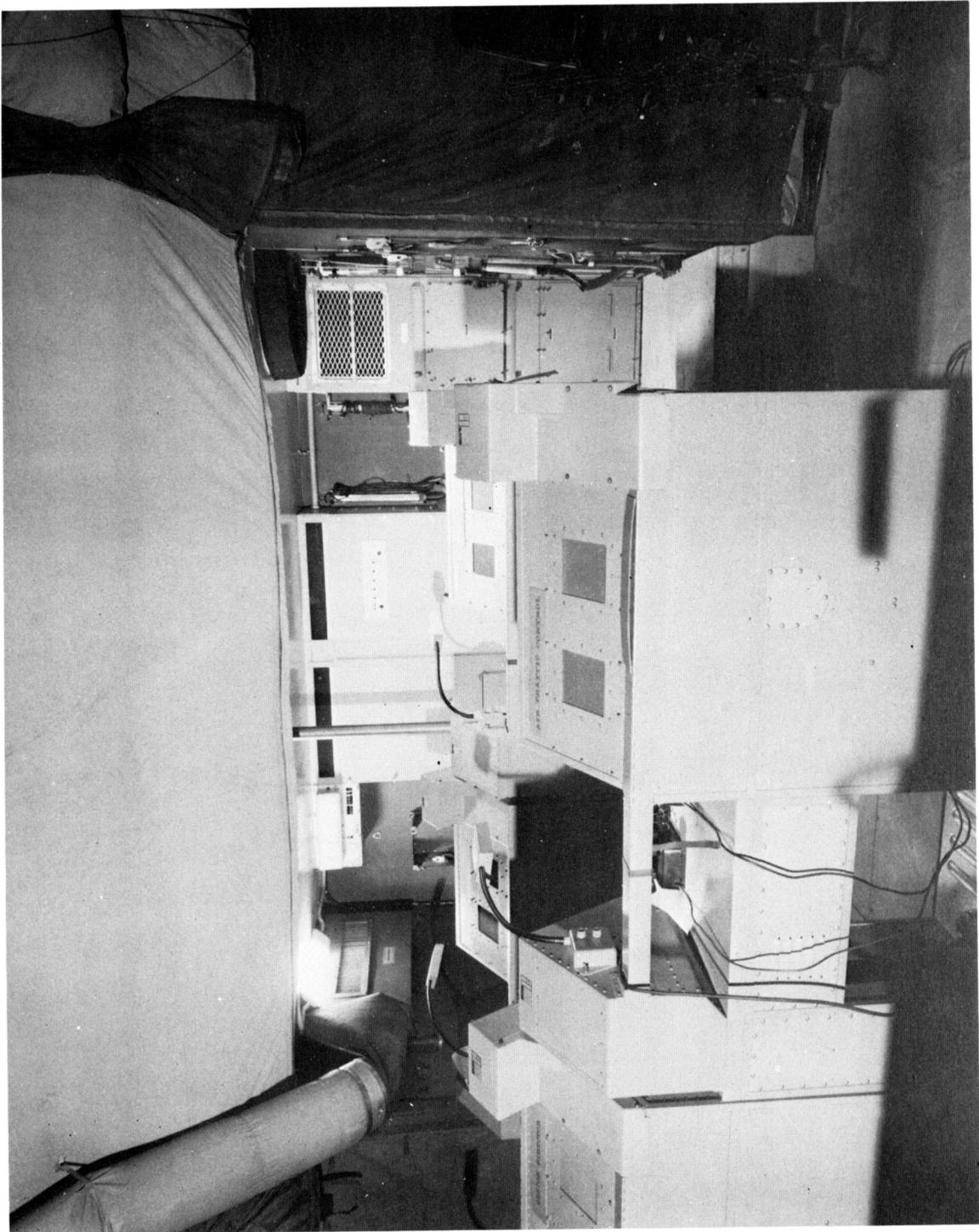
AN/TSQ-91 Data Processing Module



AN/TSQ-91 HM 4118 Computer



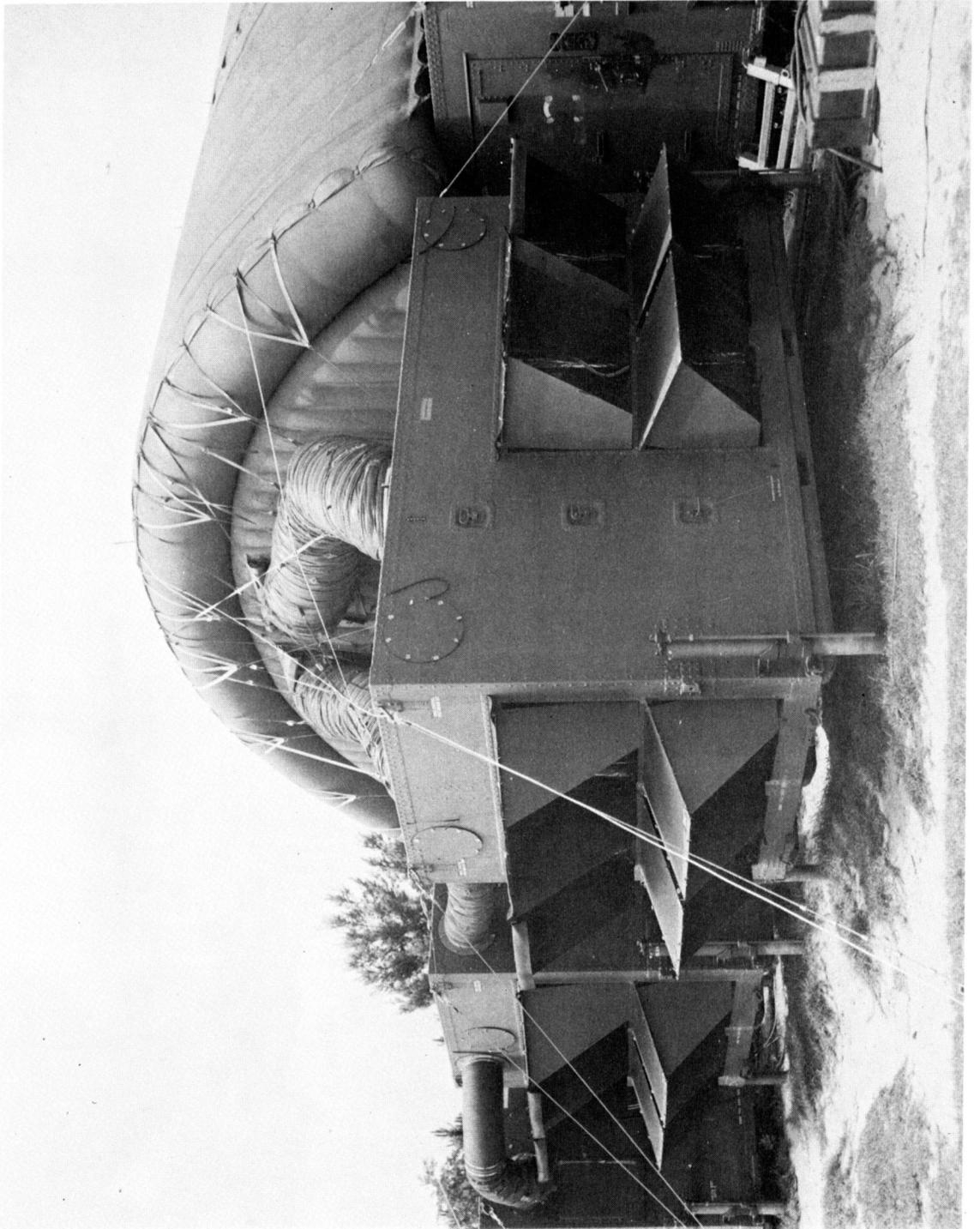
AN/TSQ-91 Ancillary Equipment Module



AN/TSQ-91 Console Module



AN/TSQ-91 Group Display Module



AN/TSQ-91 TSA-35 Air Conditioning Module



AN/TSQ-92 OPERATIONS CENTRAL (TACC)

DESCRIPTION:

The TACC is the command action arm of the Tactical Air Control System. Necessary facilities are provided to perform the Current Operations and Current Plans functions of the Air Force Component Command Post (AFCCP). Unlike the CRC/CRP, the TACC is essentially a manual operation; it consists of desk positions, manually posted plotting displays and communications equipment necessary to support personnel in the accomplishment of the Tactical Air Control Mission.

Like the CRC/CRP the TACC is modular in design; capable of adjusting to the needs of a given deployment by a building-block approach to the basic set of the following modules: Group Display, Furnishings, and Air Conditioning. The Group Display and Furnishings modules are joined together by extending the external shelter side walls to serve as floor and attaching the inflatable shelter. Essentially, the furnishings module is the only unique module from the CRC/CRP in the sense that the A/C Module and Group Display Module are interchangeable. The TACC is deployable in three basic configurations; minimum, when Current Ops and Current Plans are

housed under one shelter, medium/maximum, when Current Ops and Current Plans divisions are collocated, but housed in separate shelters. The following depicts the number of modules required in each configuration:

<u>Module</u>	<u>Current Ops and Plans</u>	<u>Current Ops</u>	<u>Current Plans</u>
	<u>Min</u>	<u>Med/Max</u>	<u>Med/Max</u>
Group Display	2	2	2
Furnishings	2	2	2
Air Conditioning	1	1	1

CAPABILITIES:

The TACC is designed with sufficient flexibility and modularity to operate in conjunction with the highest ground force field command responsible for planning and directing daily combat operations. Normally, this may be expected to range from division (and smaller size forces) up to a field army.

The functions of the TACC at any of the force levels are essentially the same, however, the scope and volume of required activities vary to a considerable extent. In a situation where enemy air is a major concern or in which the military/political objectives are attainable through decisive or predominate air actions alone, the TACC functional requirements are much more extensive. Thus, the TACC deployment configuration must be compatible to plan and direct the entire spectrum of offensive and defensive air operations. This represents a necessary variable to associate the TACC position configuration to "force level" alone, i.e., minimum, medium, or maximum. The various TACC configurations can support, but are not limited to the following force levels:

<u>Configuration</u>	<u>Air Force Level</u>	<u>Ground Force</u>
Minimum 1 shelter*	3 Tac Ftr Sq 1 Comp Recce Flt 1 Air Refuel Flt 1 Tac Airlift Sq	1 Division
Medium 2 shelters**	9 Tac Ftr Sq 1 Comp Recce Sq 1 Air Refuel Sq 4 Tac Airlift Sq	1 Corps

* Plans and Operations share the same facility.

** Plans and Operations functions each have a dedicated facility. Medium and maximum accommodations differ only in the use of furnishings and the number of manned positions.

<u>Configuration</u>	<u>Air Force Level</u>	<u>Ground Force</u>
Maximum 2 shelters**	24 Tac Ftr Sq 2 Comp Recce Sq 2 Air Refuel Sq 8 Tac Airlift Sq	1 Field Army

** Plans and Operations functions each have a dedicated facility. Medium and maximum accommodations differ only in the use of furnishings and the number of manned positions.

POWER INPUT: 120/208 VAC, 400 Hz, 3 Phase.

SITING CRITERIA:

Prior to a TACC deployment, a preliminary evaluation of the proposed site should be made using a topographical map. The evaluation is accomplished utilizing the equipment siting criteria as specified in applicable T.O.'s and the TACC Facility Manual. The following siting factors should be considered:

- RF transmission paths
- Geographical and topographical features
- Safety
- Equipment load bearing and leveling restrictions
- Environmental consideration, weather, etc.

ERECTION TIME:

	<u>Min</u>	<u>Med/Max</u>
(Spec)	2 hrs	3 hrs
Personnel	25	25

PERSONNEL REQUIREMENTS:

	<u>Min</u>	<u>Med</u>	<u>Max</u>
Plans	24	37	36
Ops	22	33	40

MAJOR COMPONENTS:

Group Display Module (AN/TSA-34). The Group Display Module is connected (electronically, mechanically, and physically) to the Furnishings Module. It contains plotting boards, power distribution bay, comm patch bay, weather teletype, guard table, supply cabinet, safe, and rifle and clothing racks.

Furnishings Module (OA-8448/TSQ-92(V)). The Furnishings Module contains, as fixed equipment in the tactical mode, the fragmentary order teletype equipment and fixed air conditioning ducting. Power is distributed to the Furnishings Module by the power distribution panel of the Group Display Module. The outer foldout panel can be converted into a helilift pallet. The Furnishings Module functions as an area for preparation of fragmentary orders in the tactical mode. There are storage racks located on the walls for books and equipment.

Air Conditioning Module (AN/TSA-35). The A/C Module contains four, 5-ton environmental control units (GFE) and appropriate ducting.

MANUFACTURER: Hughes Aircraft Company

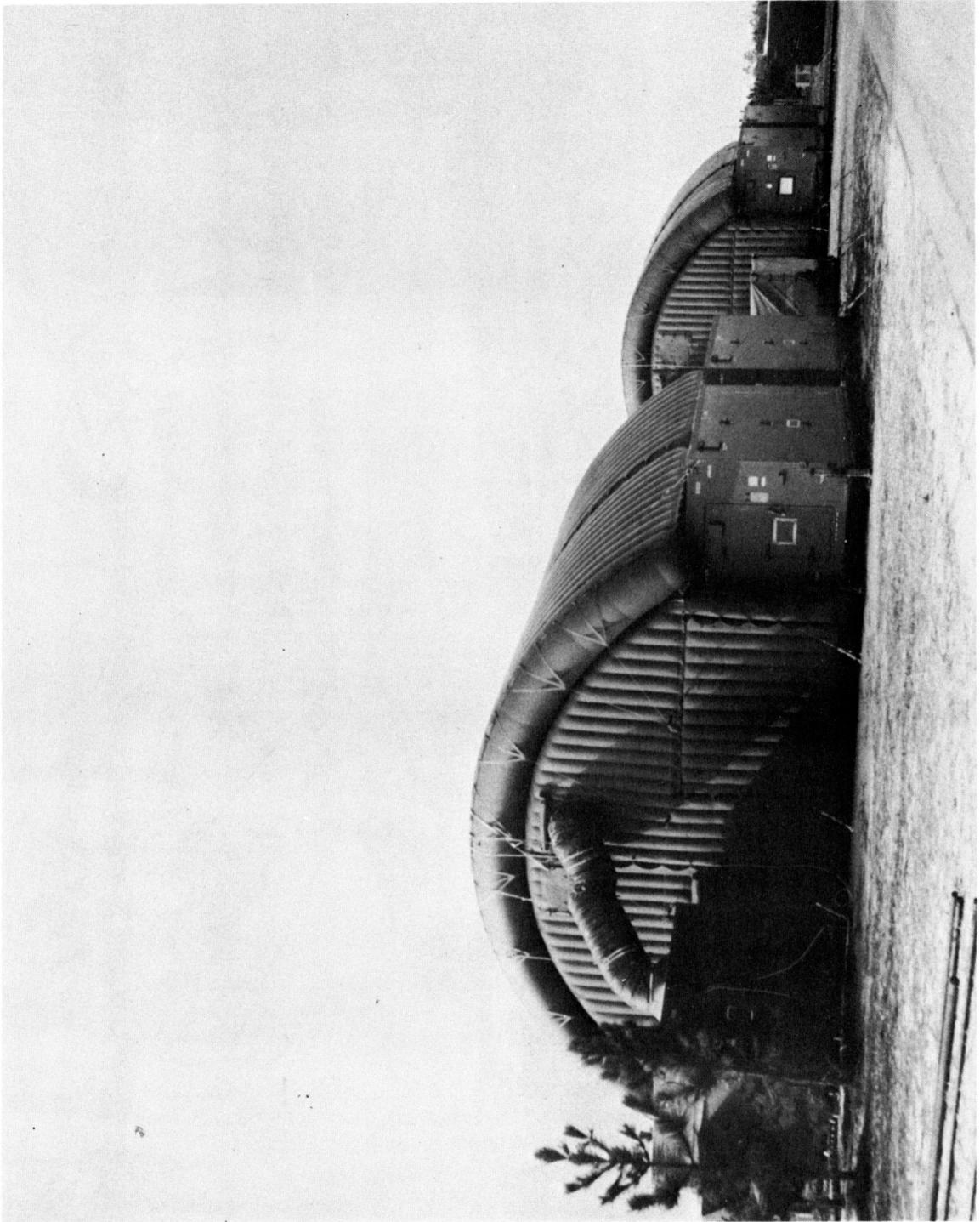
COST: \$1,320,000.00 (maximum configuration)

WEIGHT: Varies by module and configuration.

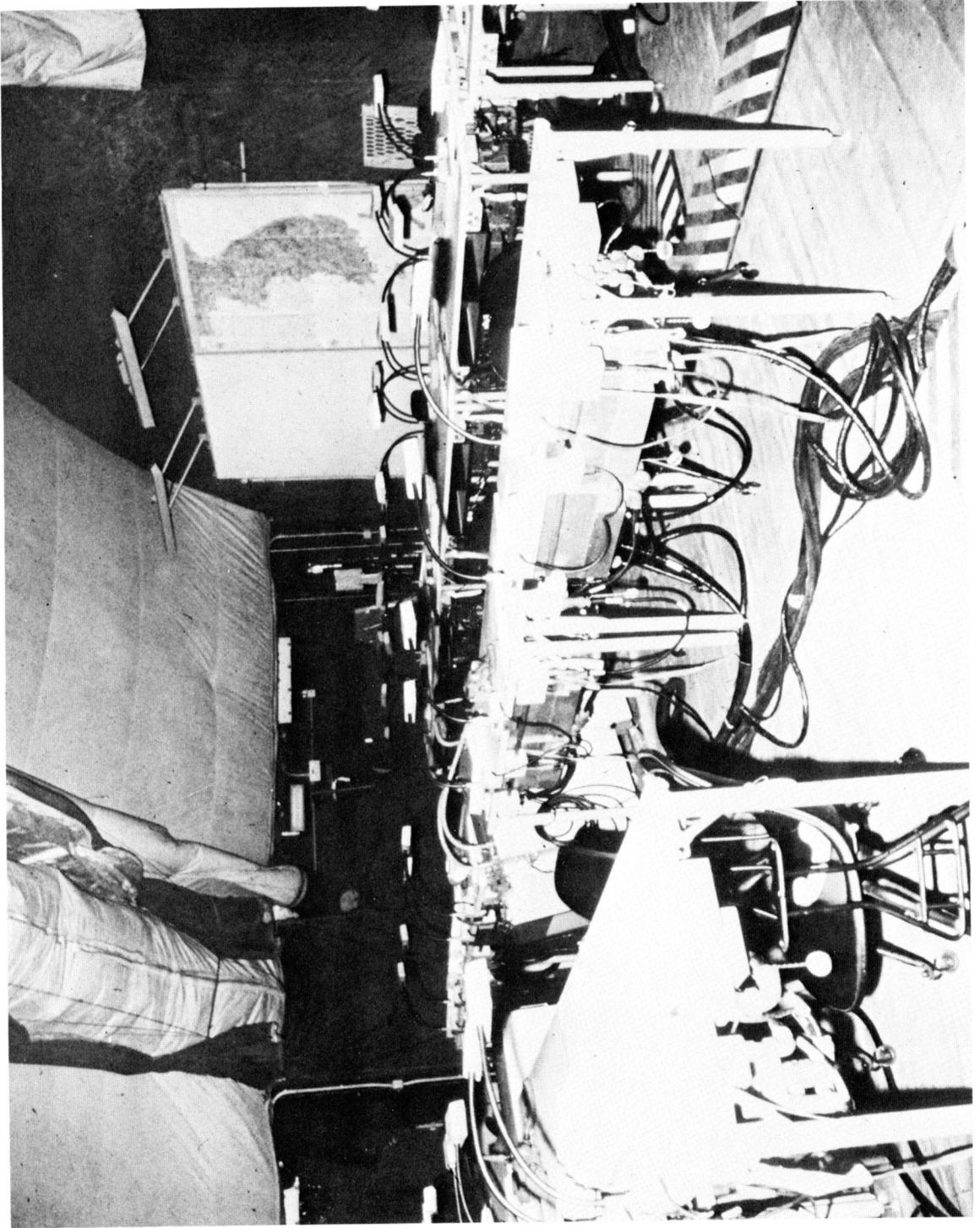
Group Display	6500 lbs
Furnishings	4980
A/C	5775

CUBE: All modules approximately 740 cu ft, or 156"x87"x94".

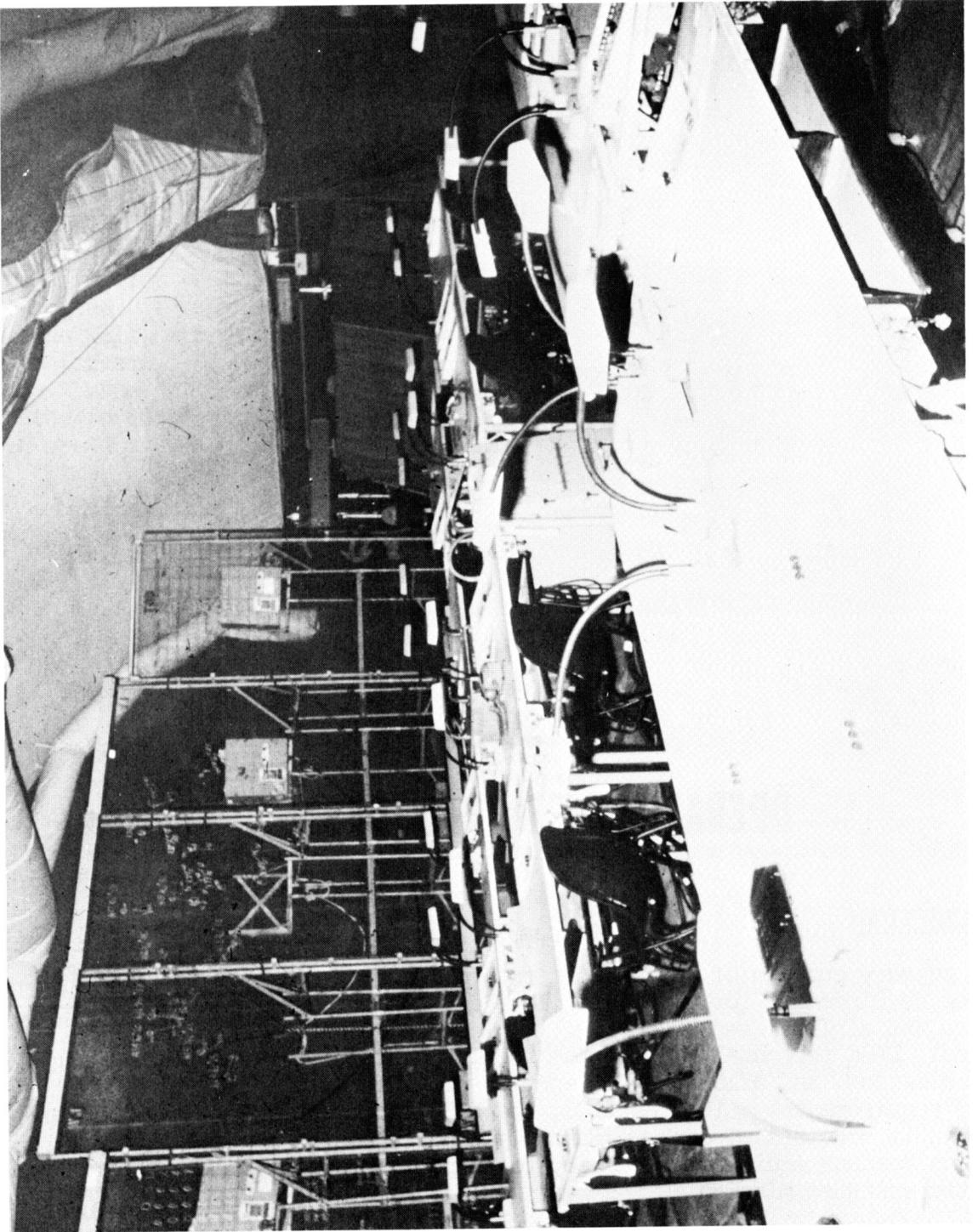
APPLICABLE TOs: 31Z3-184-12



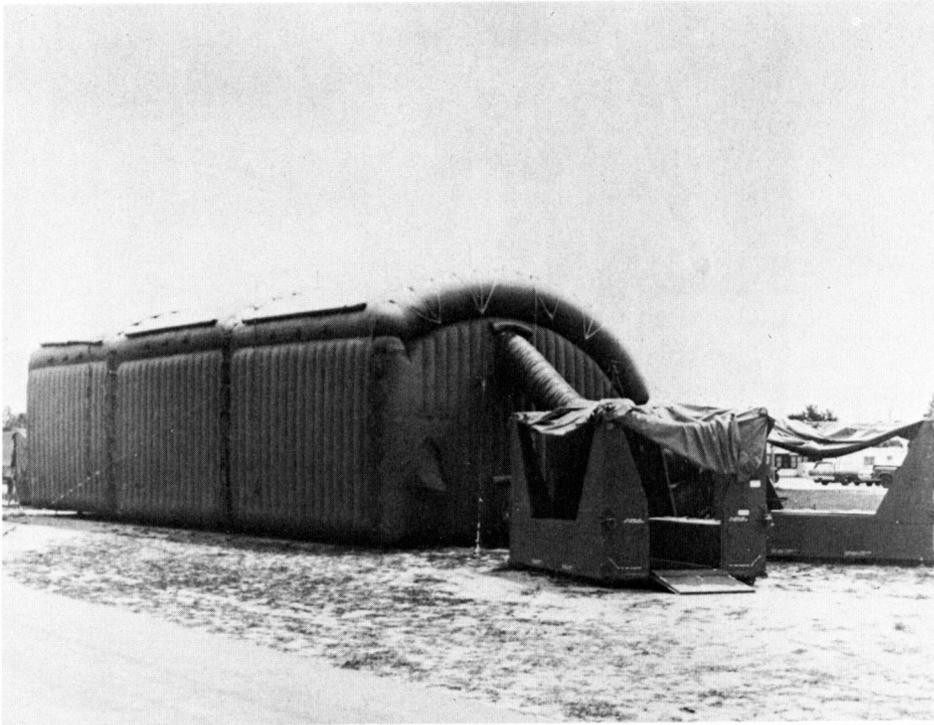
Deployed AN/TSQ-92



Interior View of AN/TSQ-92



Interior View of AN/TSQ-92



AN/TSQ-93

OPERATIONS CENTRAL (DASC)

DESCRIPTION:

The primary purpose of the DASC is to provide fast reaction to ground force requirements for immediate close air support, tactical reconnaissance and airlift needs. Working in close coordination with Army personnel, DASC personnel provide the focal point for information exchange, coordination, and allocation of sorties provided by the TACC to fulfill Army requirements. Like the TACC, the DASC is essentially a manual operation; it consists of desk positions, manually posted map displays and communications equipment necessary to support personnel in their performance of the assigned mission.

Modular in design, the DASC is comprised of three unique modules; the Operations Module, Air Conditioning Module, and the Communications Center. The capacity of work is proportional to the deployment configurations, i.e., alternate, minimum, and medium. The following depicts the number of modules required in each configuration:

<u>Module</u>	<u>Alt</u>	<u>Min</u>	<u>Med</u>
Operations	1	1	2
Comm Center	0	1	1
A/C	1	2	3

CAPABILITIES:

The size of a DASC deployment is dependent primarily upon the force level supported. The highest ground force level conducting daily combat operations will be provided a DASC. Since this can vary from a single division (or smaller operation) to a field army, the size can vary considerably. Usually the functions of the element do not change with a change in the force level supported. The various DASC configurations can support, but are not limited to the following force levels:

<u>Configuration</u>	<u>Air Force Level</u>	<u>Ground Force</u>
Minimum	3 Tac Ftr Sq 1 Comp Recce Flt 1 Tac Airlift Sq 1 Air Refuel Flt	1 Division
Medium	9 Tac Ftr Sq 1 Comp Recce Sq 4 Tac Airlift Sq 1 Air Refuel Sq	1 Corps

Alternate: The alternate configuration provides a leap-frog capability for rapid movements. The minimum configuration requires the addition of one communications module.

POWER INPUT: 120/208 VAC, 400 Hz, 3 Phase.

SITING CRITERIA: Prior to a DASC deployment, a preliminary evaluation of the proposed site should be made using a topographical map. The evaluation is accomplished utilizing the equipment siting criteria as specified in applicable T.O.'s and the DASC Facility Manual. The following siting factors should be considered:

- RF transmission paths
- Geographical and topographical features
- Safety
- Equipment load bearing and leveling restrictions
- Environmental considerations, weather, etc.

<u>ERECTION TIME:</u>	<u>Alt</u>	<u>Min</u>	<u>Med</u>
(Spec)	37 min	45 min	56 min
Personnel	7	12	20

<u>PERSONNEL REQUIREMENTS:</u>	<u>Alt</u>	<u>Min</u>	<u>Med</u>
	12	10	24

MAJOR COMPONENTS:

Communications Module. (OA 8451/TSQ-93(V)) The module is used to accomplish interconnection of the transmission media to the Operations Module. It handles teletype and voice communications and also includes technical control (analogous to TSC-62) equipment. The equipment provides the following functional capabilities: telephone switching, secure and non-secure teletype and telephone communications, and, as mentioned above, technical control capability.

Operations Module. (OA 8452/TSQ-93(V)) The Operations Module will normally be mated (electrically, mechanically, and physically) to the Communications Module. The Operations shelter will contain radio and telephone patching equipment through which the operational positions are provided secure and nonsecure telephone and ground-to-air radio service. The module will also be provided with display boards for plotting and posting tactical situations.

Air Conditioning Module. (AN/TSA-35) The A/C Module contains one 5-ton environmental control unit (GFE) and appropriate ducting.

MANUFACTURER: Hughes Aircraft Company.

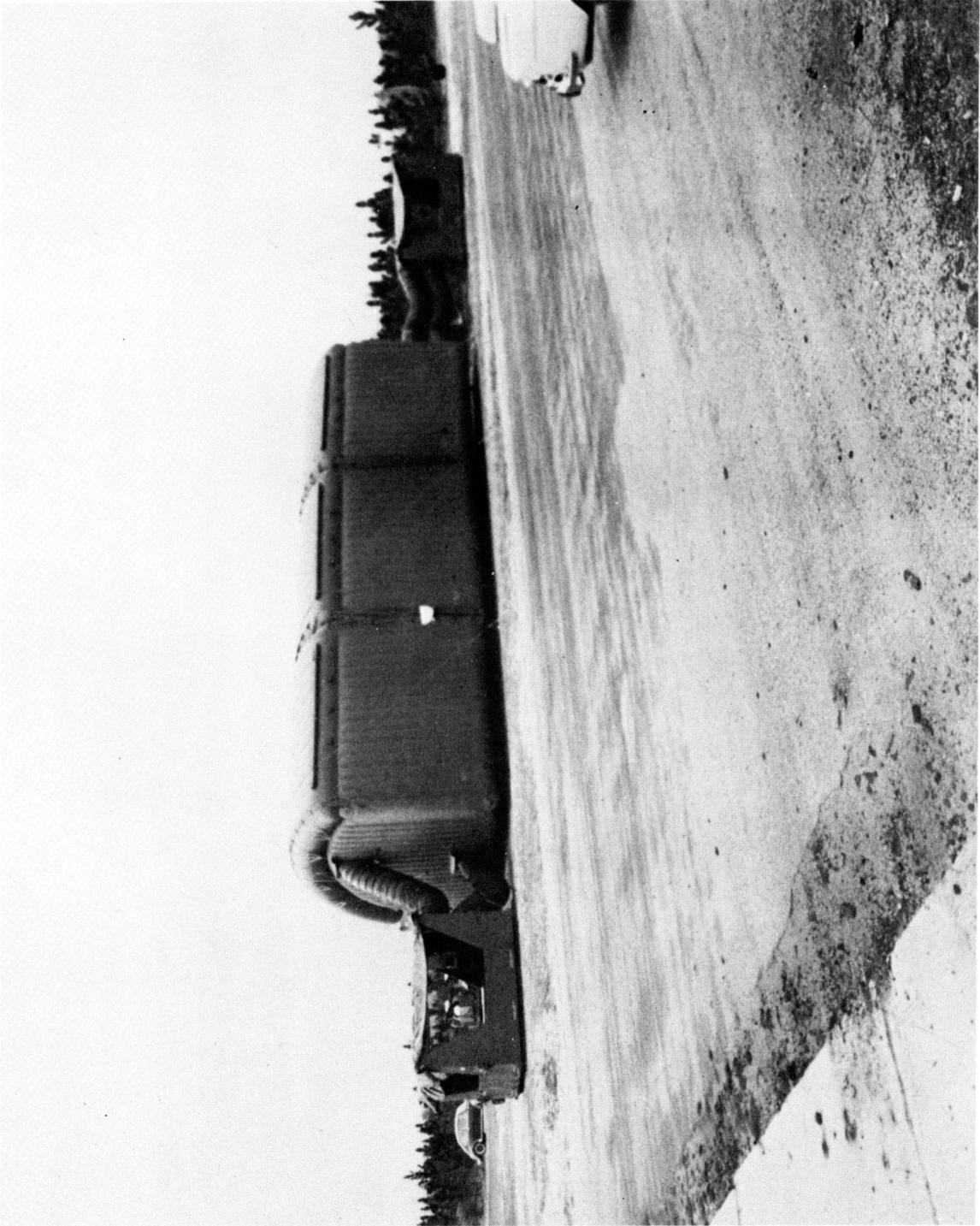
COST: \$620,000.00 (medium configuration).

WEIGHT: Varies by module and configuration.

Operations	5700 lbs
Comm Center	5090
A/C	4620

CUBE: All modules approximately 740 cu ft, or 156"x87"x94"

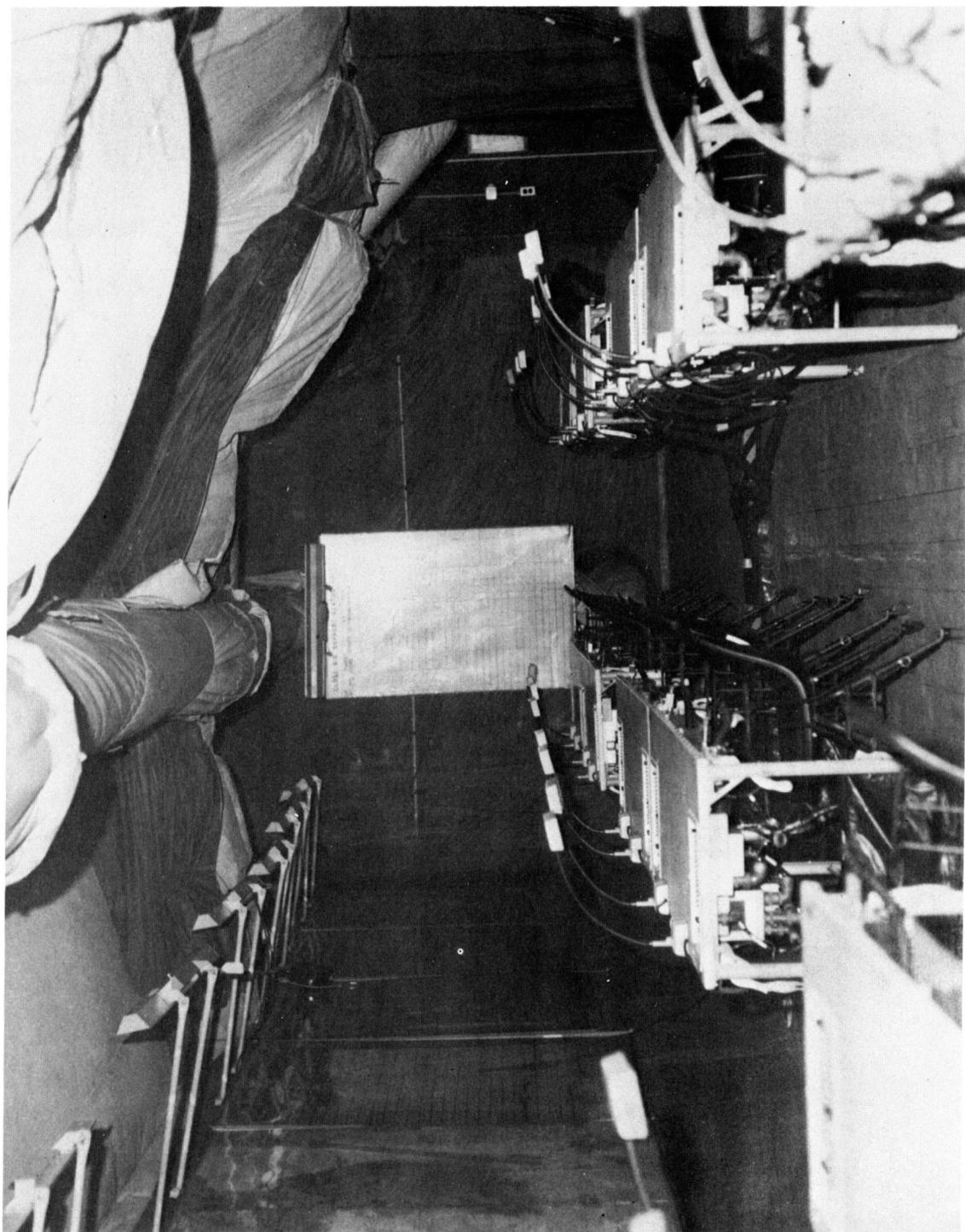
APPLICABLE TOs: 31Z3-181-12



Deployed AN/TSQ-93



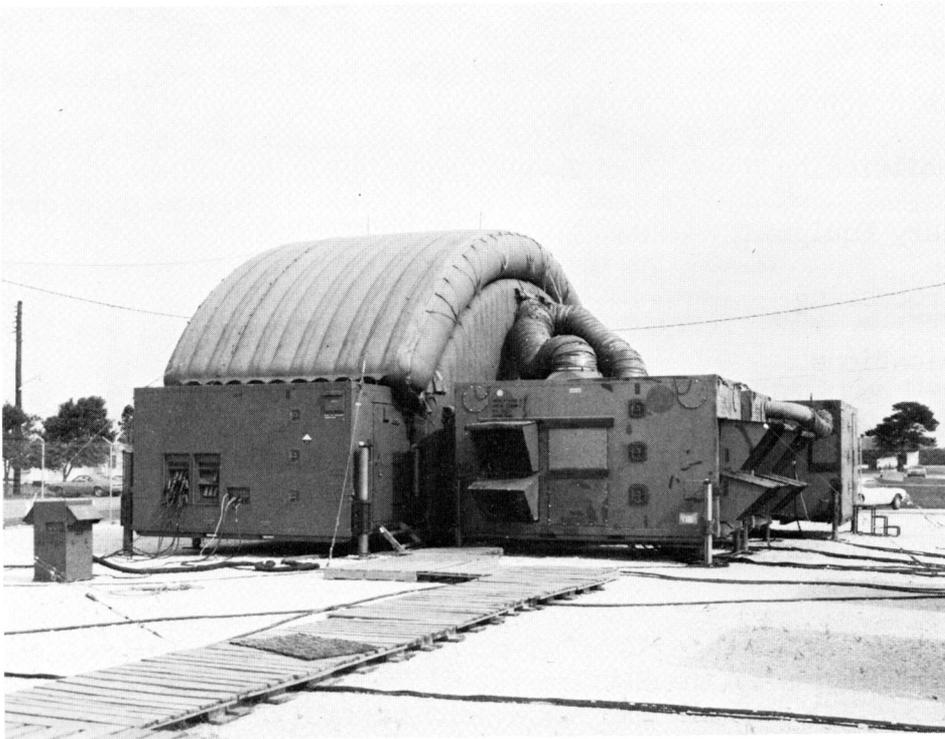
Interior View of AN/TSQ-93



Interior View of AN/TSQ-93



AN/TSQ-93 Teletype Position



SRP

SENSOR REPORTING POST

DESCRIPTION:

The Sensor Reporting Post (SRP) is an air/road transportable facility which operates in conjunction with the 407L Tactical Air Control System and may be set up in any worldwide environment. The SRP transmits and receives data from an Airborne Relay Platform (ARP). The data is stored, processed, and displayed for analysis by operators and then relayed to the TACS. A detailed description of the SRP facility may be found in TO 31S1-2TYC-6-2-A, classified SECRET.

The SRP facility is normally deployed in one standard configuration to include two radio relay facilities commonly called "orbits". The site equipment receives data from the ARP and relays this information to the AN/TSQ-91(V) assessment facility. The standard deployment configuration is depicted below:

<u>Module</u>	<u>Number</u>
Group Display	1
Console	1
Air Conditioning	2
Ancillary Equipment	1
Data Processing	1
Communications	1
Comm A/C	1
Comm Relay (Orbit)	2
Radio (Orbit)	2

CAPABILITIES:

Specific capabilities of the SRP are classified and are described in the above reference TO and the SRP supplement to TACM 55-44.

POWER INPUT: 120/208 VAC, 400 Hz, 3 Phase

SITING CRITERIA:

Prior to an SRP deployment, a preliminary evaluation of the proposed site should be made using a topographical map. The evaluation is accomplished utilizing the equipment siting criteria as specified in applicable TOs. The following siting factors should be considered:

- RF transmission paths
- Geographical and topographical features
- Safety
- Equipment load bearing and leveling restrictions
- Environmental considerations, weather, etc.

ERECTION TIME:

	<u>AN/TSQ-91(V)</u>	<u>AN/TSQ-93(V)</u>
Time	1.5 hours	37 minutes
Personnel	25	7

NOTE: The pacing factor for total SRP activation is the Orbit site. Orbit site erection times are not available at this time.

<u>PERSONNEL REQUIREMENTS:</u>	<u>AN/TSQ-91(V)</u>	<u>AN/TSQ-93(V)</u>
	16	7

MAJOR COMPONENTS:

Communications Module (OA 8451/TSQ-93(V)). Same as DASC.

Air Conditioning Module (AN/TSA-35). Same as DASC.

Console Module (OA 8446/TSQ-91(V)). Same as CRC/CRP.

Group Display Module (AN/TSA-34). Same as CRC/CRP.

Ancillary Equipment Module (OA 8447/TSQ-91(V)). Same as CRC/CRP.

Data Processing Module (OA 8450/TSQ-91(V)). Essentially the same as the CRC/CRP Data Processing Module, but includes expanded memory capacity and a line printer synchronizer which provides the interface between the HM 4118 computer and the line printer (GFE).

Air Conditioning Module (AN/TSA-35). Same as CRC/CRP.

Communications Relay Module (AN/TRC-164). The Comm Relay Module functions as the interface between the Radio Module and the Assessment Facility. This module processes all incoming data (down-link) into a format which can be used by the data processor and formats all commands from the operations central console (up-link) into a format which can be used by the ARP. A third function of the module is a self-test capability which allows for off-line checkout of the Comm Relay Module.

Radio Module (AN/TRC-165). The Radio Module recovers data from a down-link RF carrier signal, generates a modulated up-link signal, provides servo drive outputs to the antenna as a function of specific inputs, and provides support functions for checkout and tests.

MANUFACTURER: Hughes Aircraft Company (407L Modules).

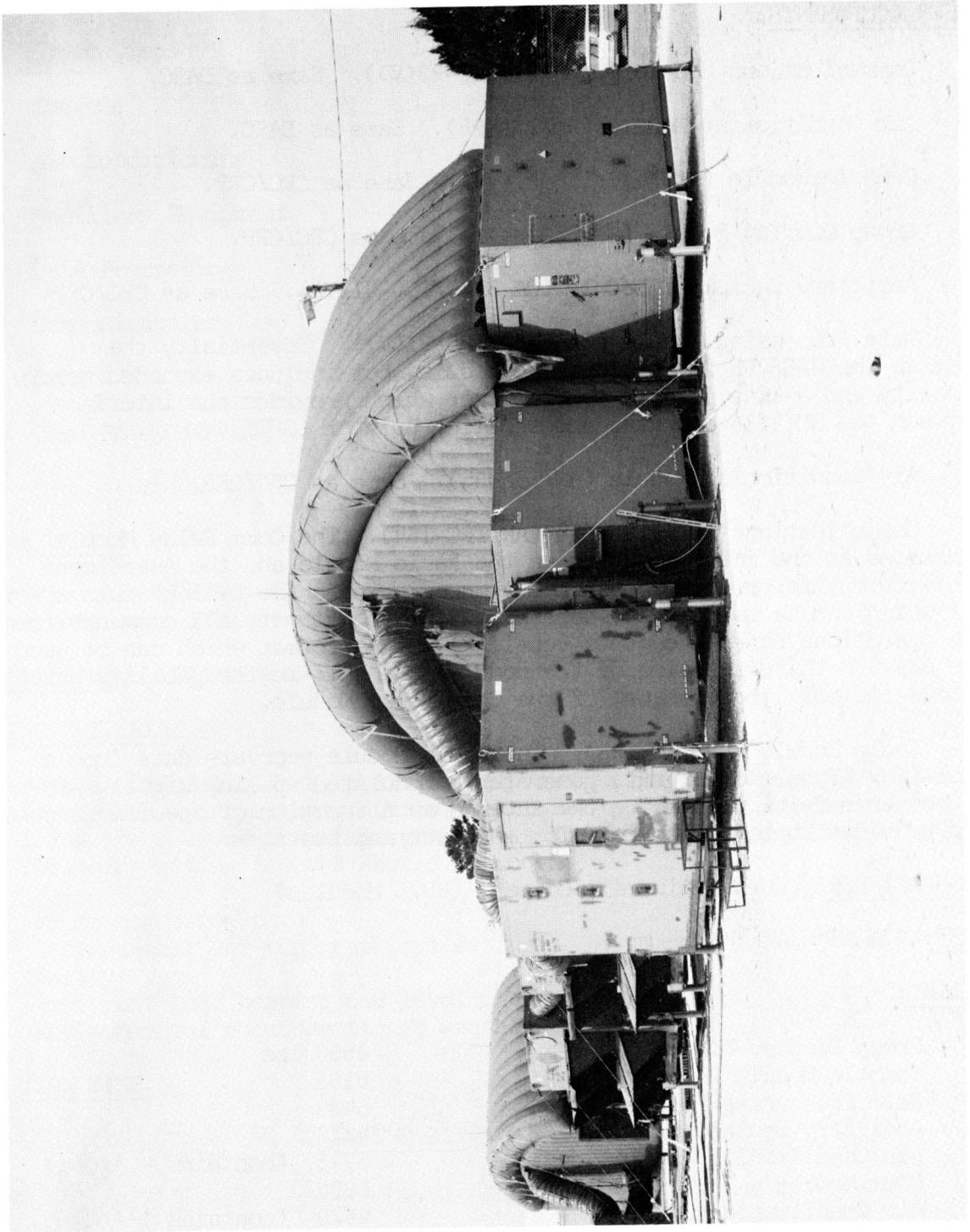
COST: \$38,000,000.00

WEIGHT:

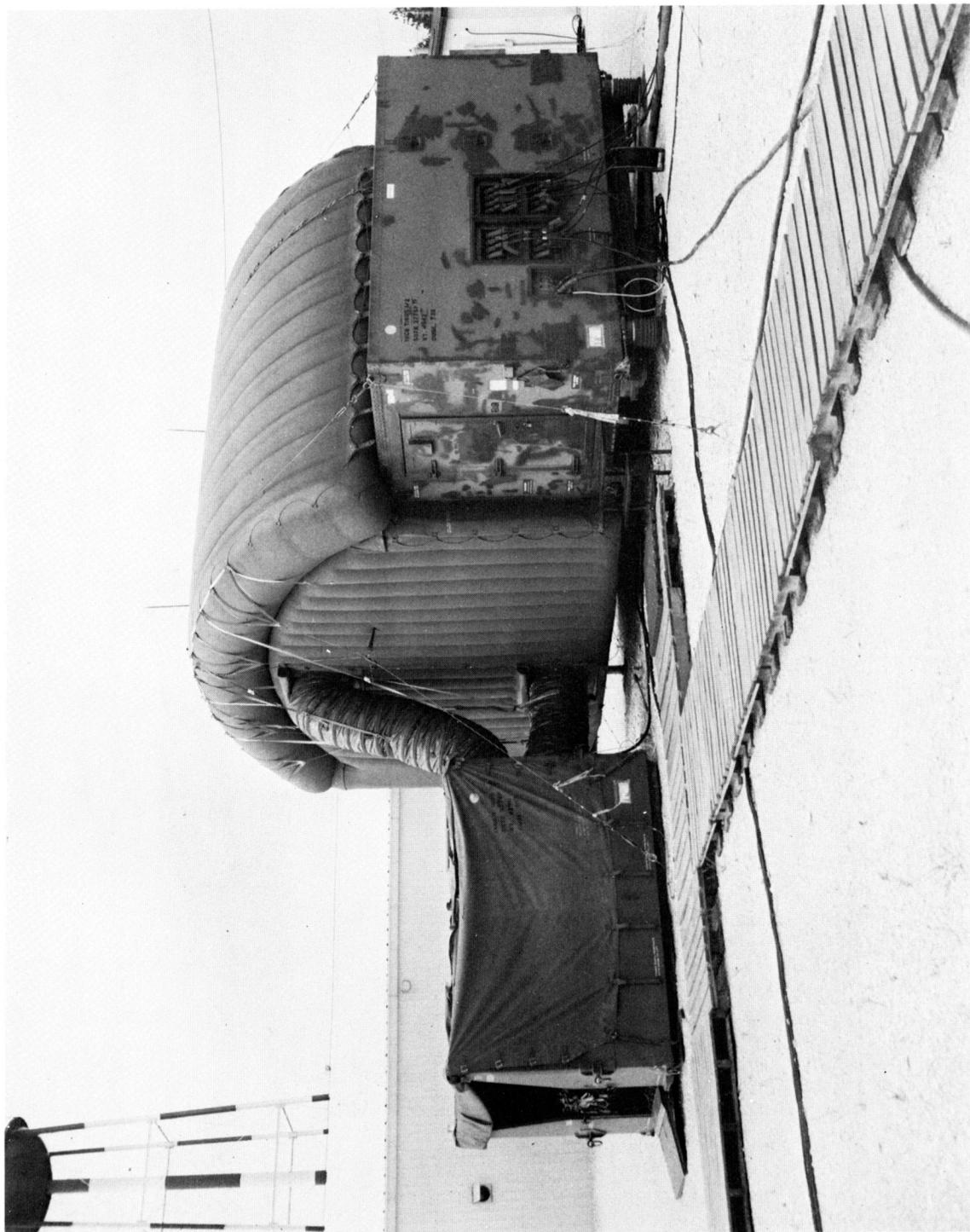
Group Display Module	6500 lbs
Console Module	6185
Data Processing Module	5430
Ancillary Equipment Module	5222
Air Conditioning Module	5775 (contains 4 A/C's)
Comm Module	5090
Air Conditioning Module	4620 (contains 1 A/C)
Comm Relay (Orbit)	4718
Radio Module (Orbit)	4941

CUBE: All modules approximately 740 cu ft, or 156"x87"x94".

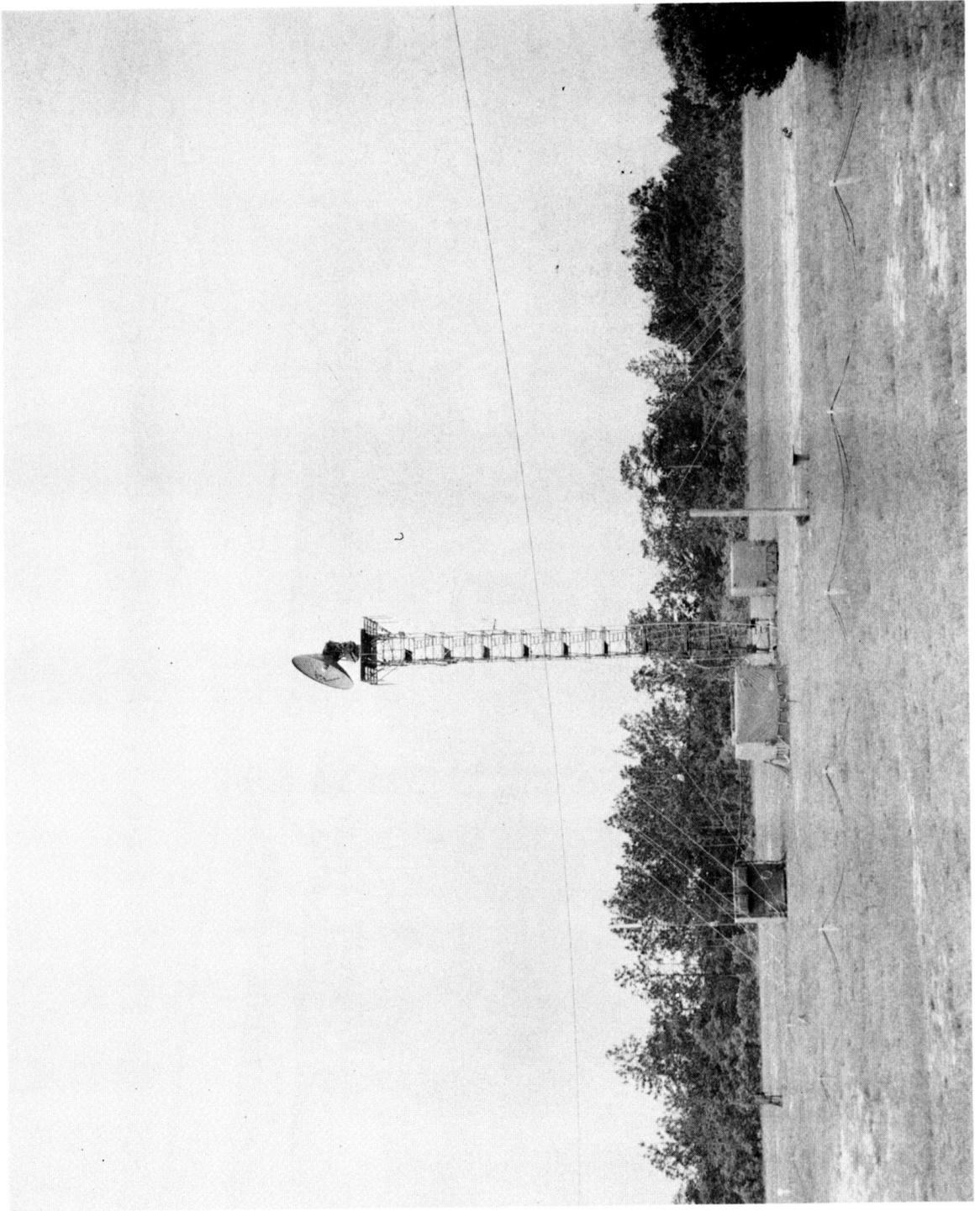
APPLICABLE TOs: 31S1-2TYC-6-2-A (S).



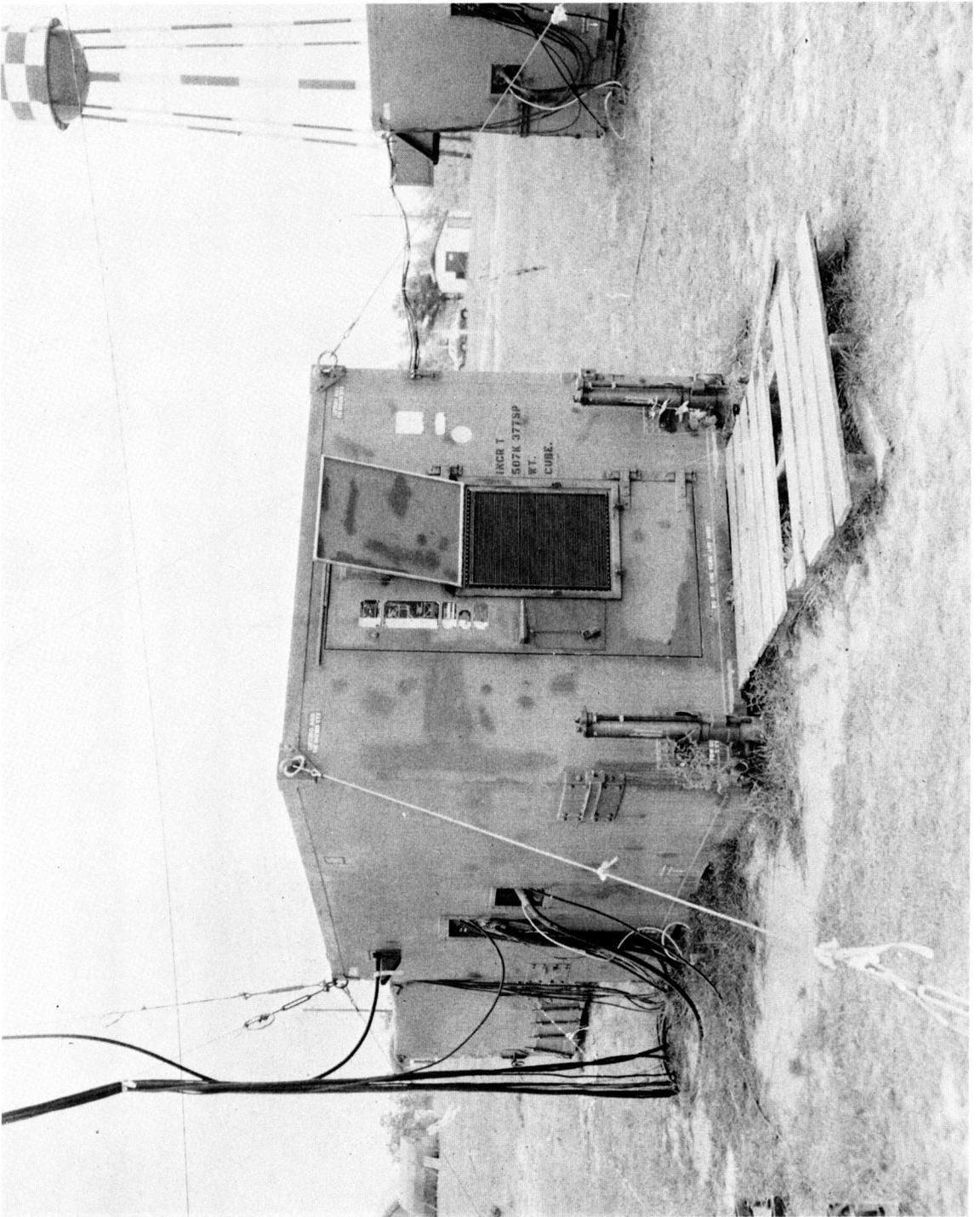
SRP Assessment Facility



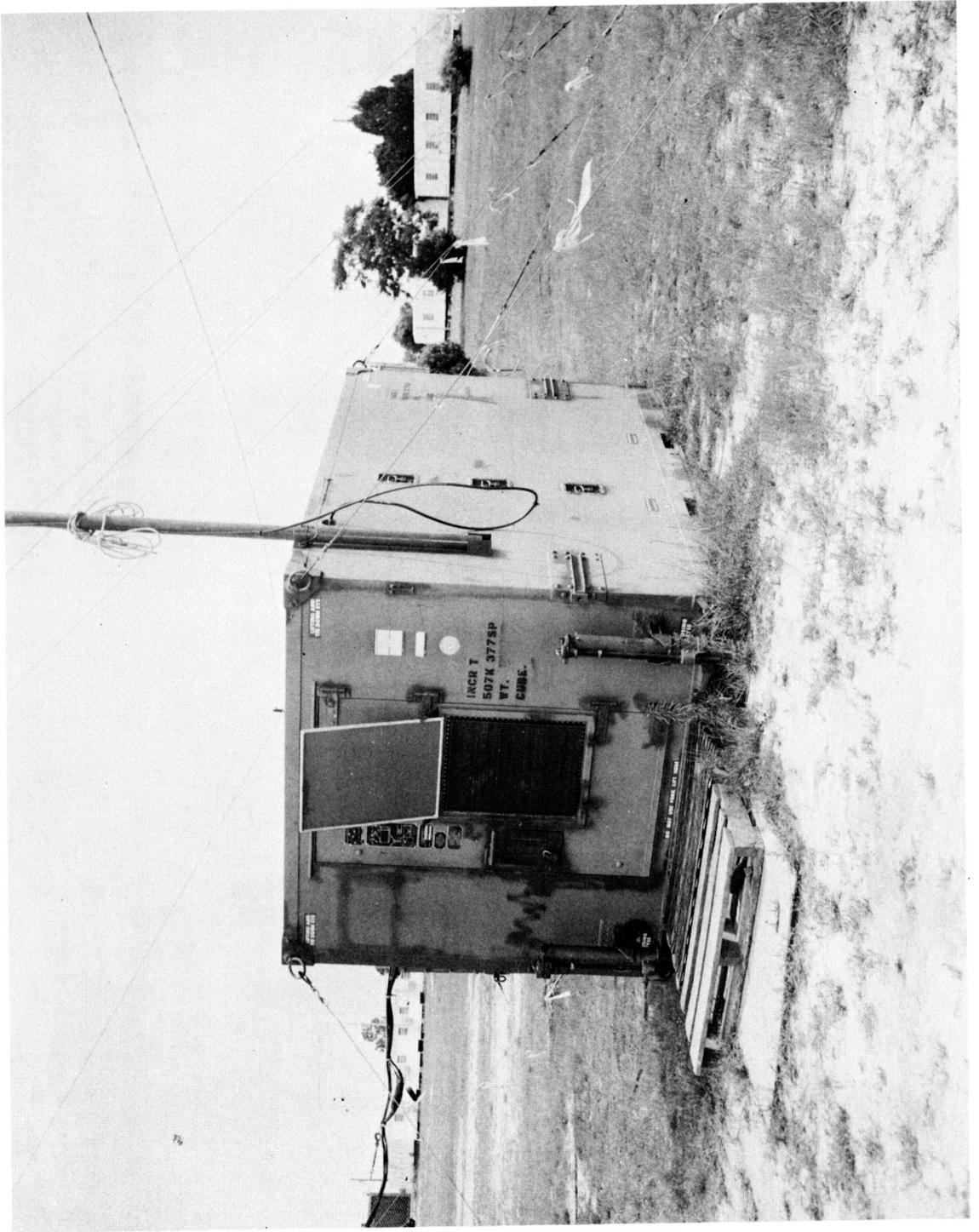
SRP Communications Module



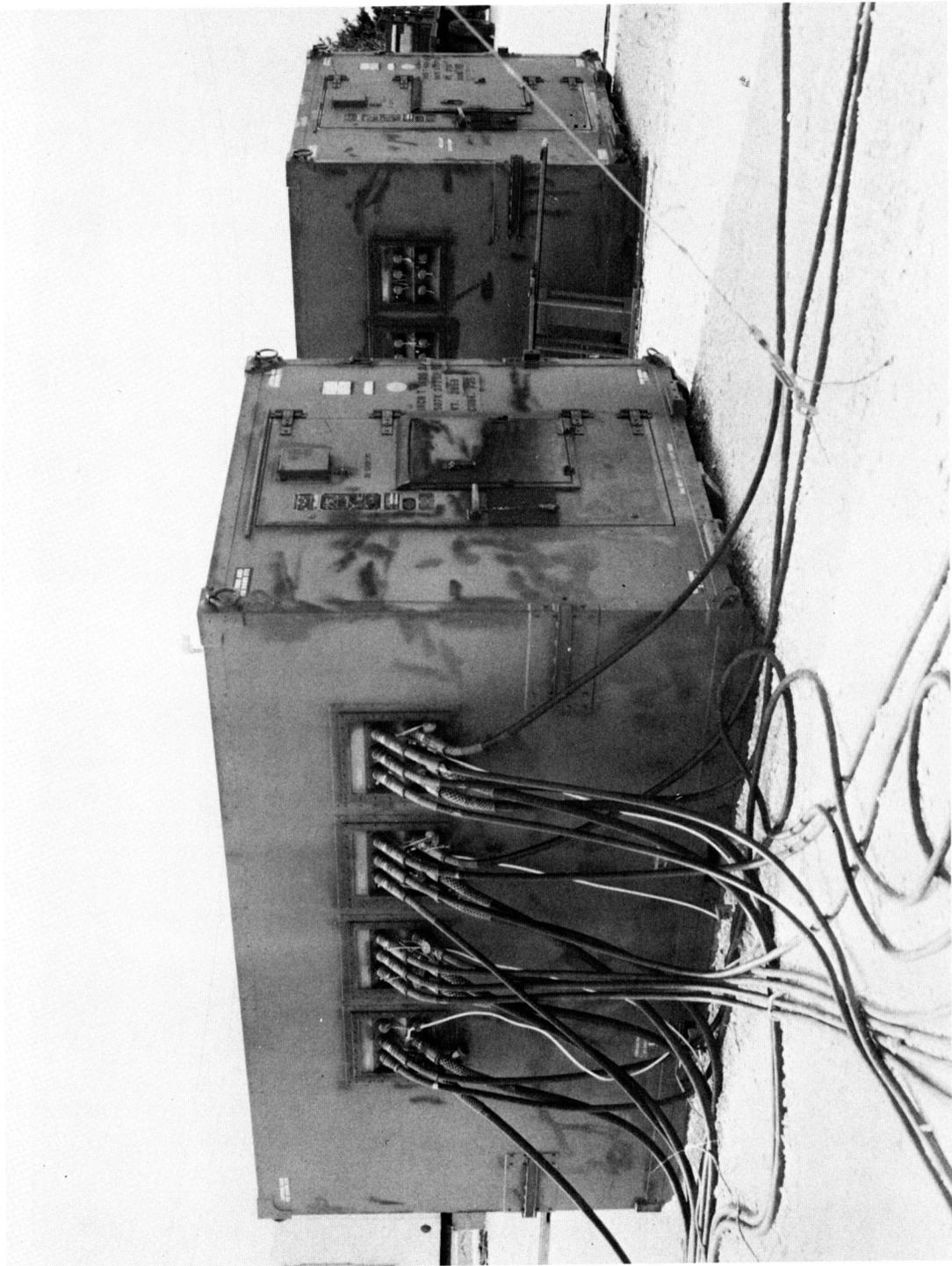
SRP Orbit Site



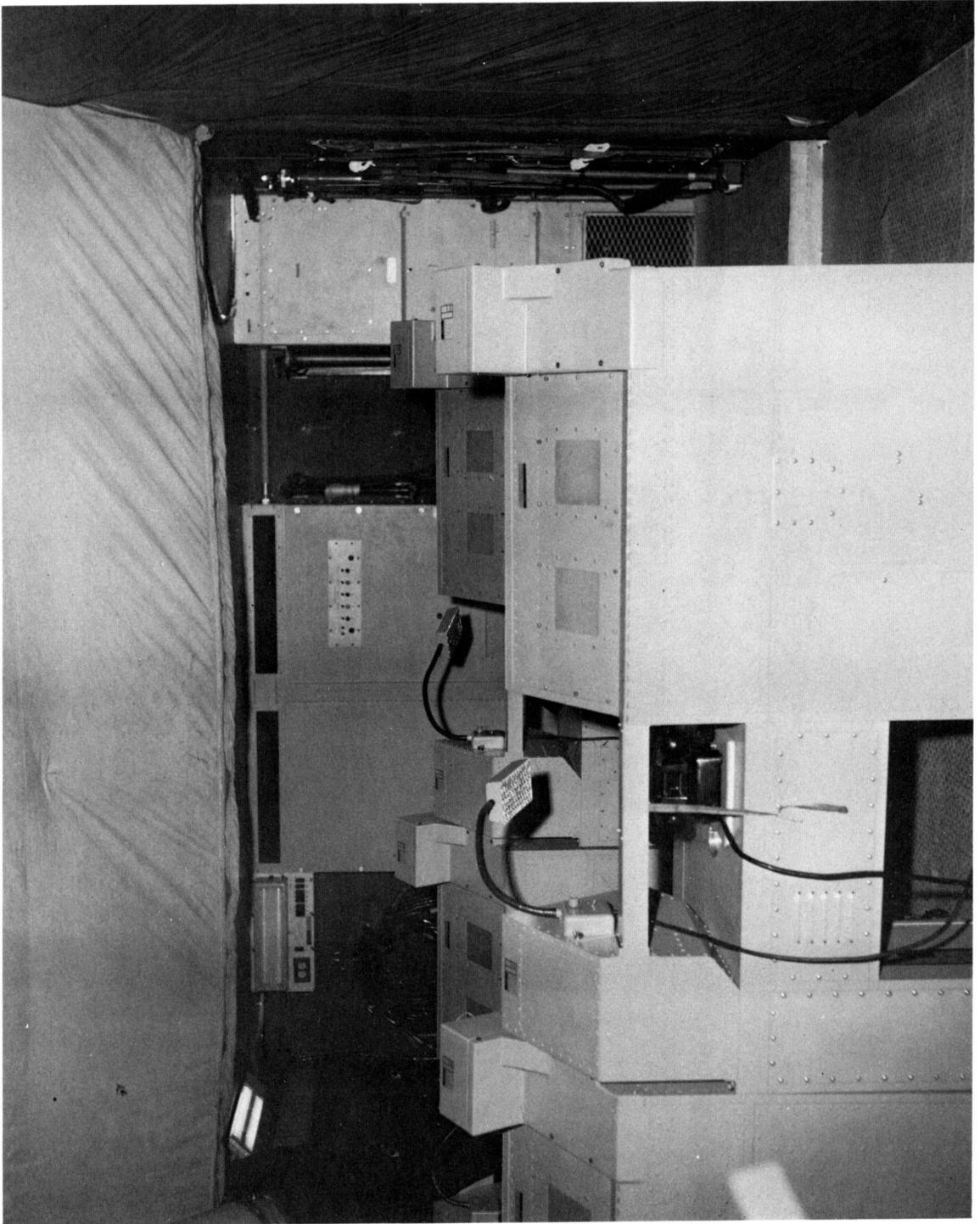
Radio Module (AN/TRC-165)



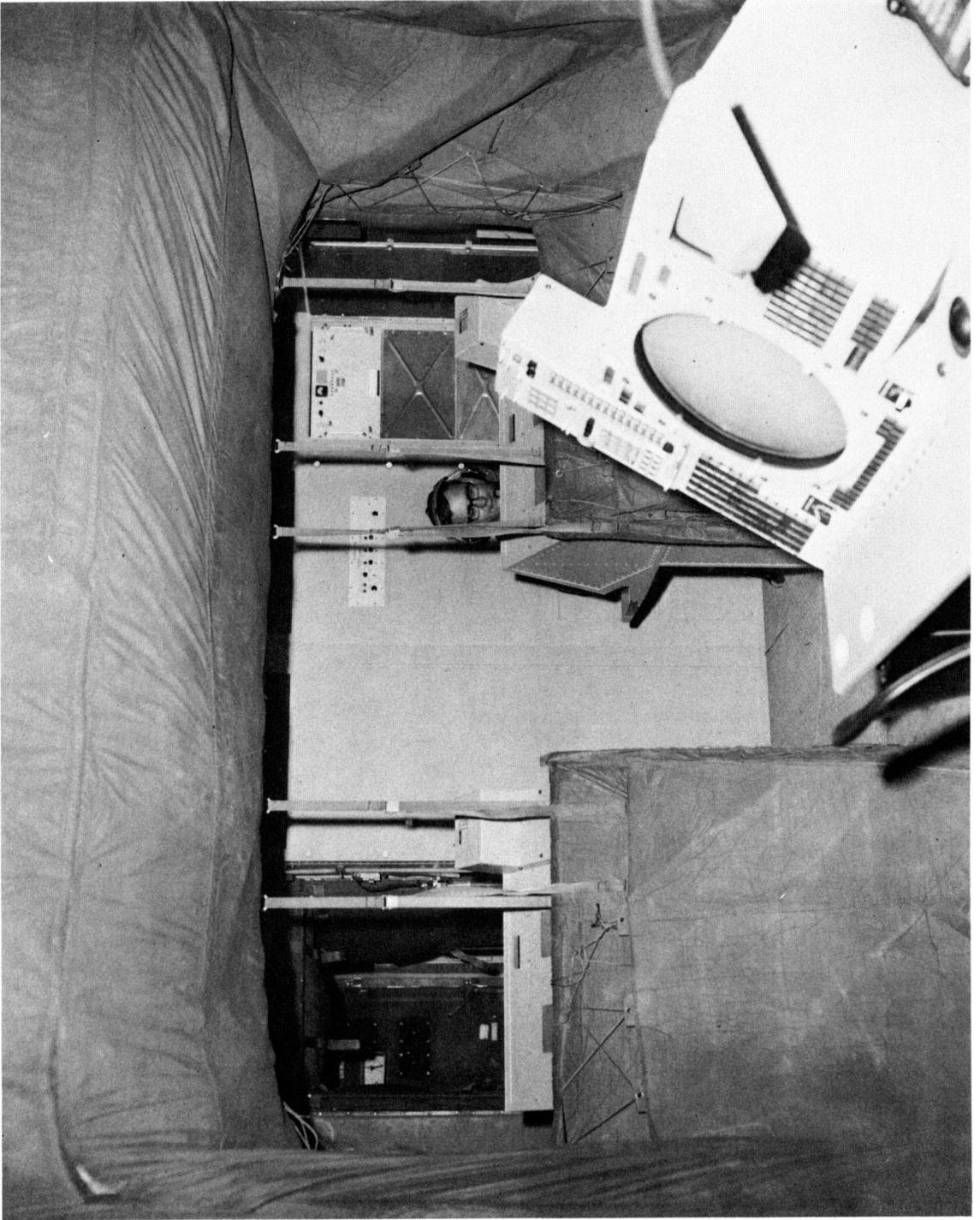
Communications Relay Module (AN/TRC-164)



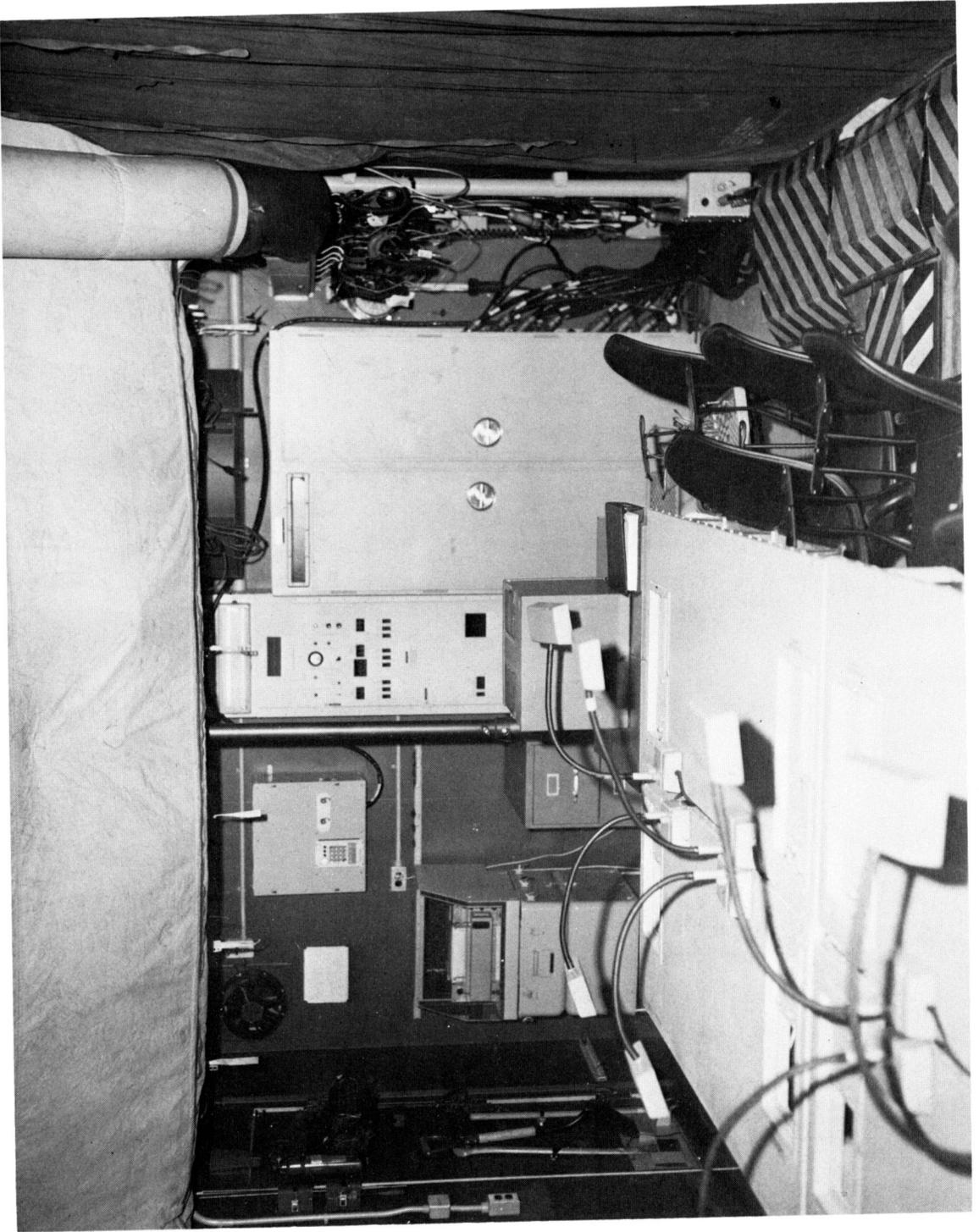
SRP Furnishings/Cargo Module



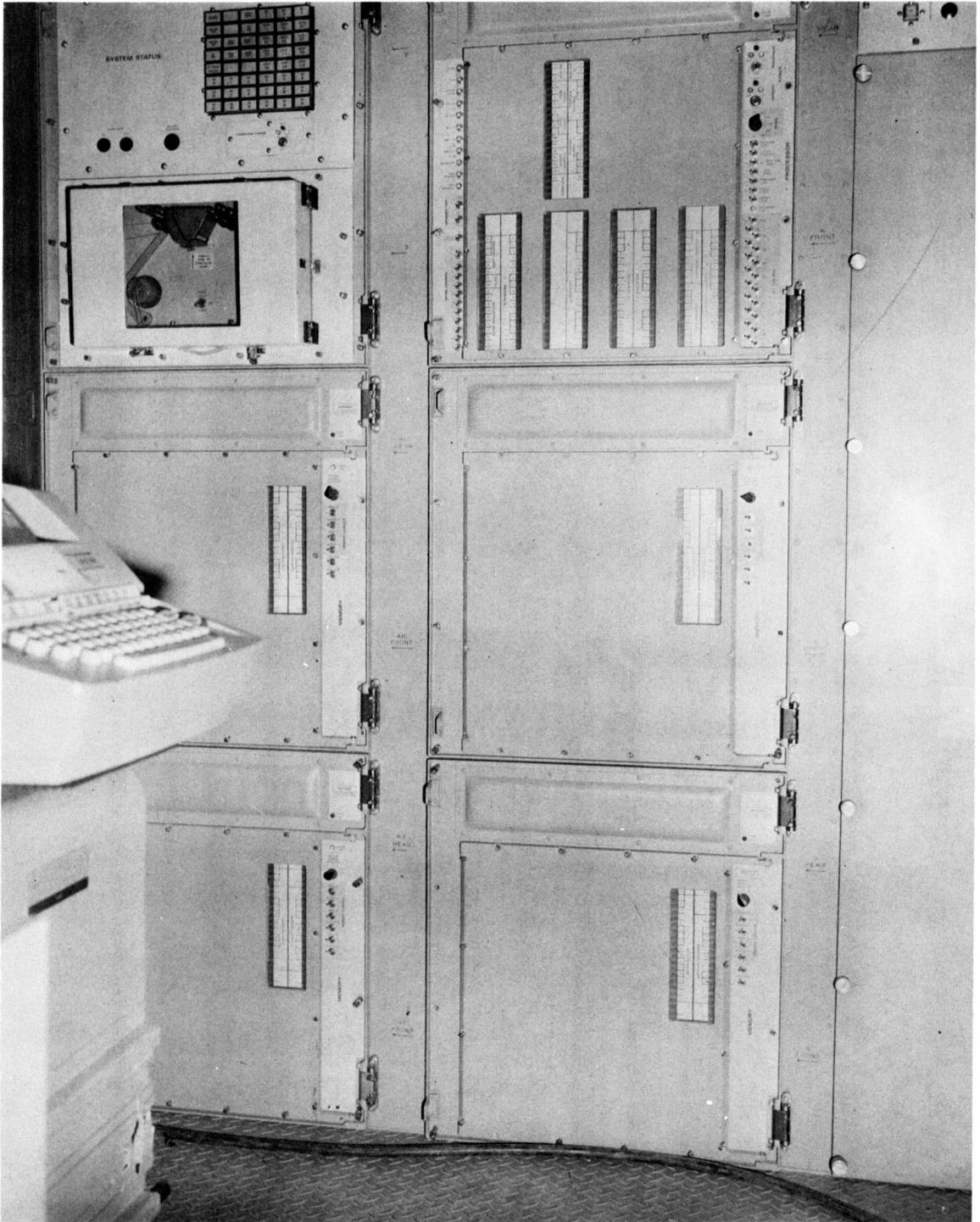
SRP Console Module



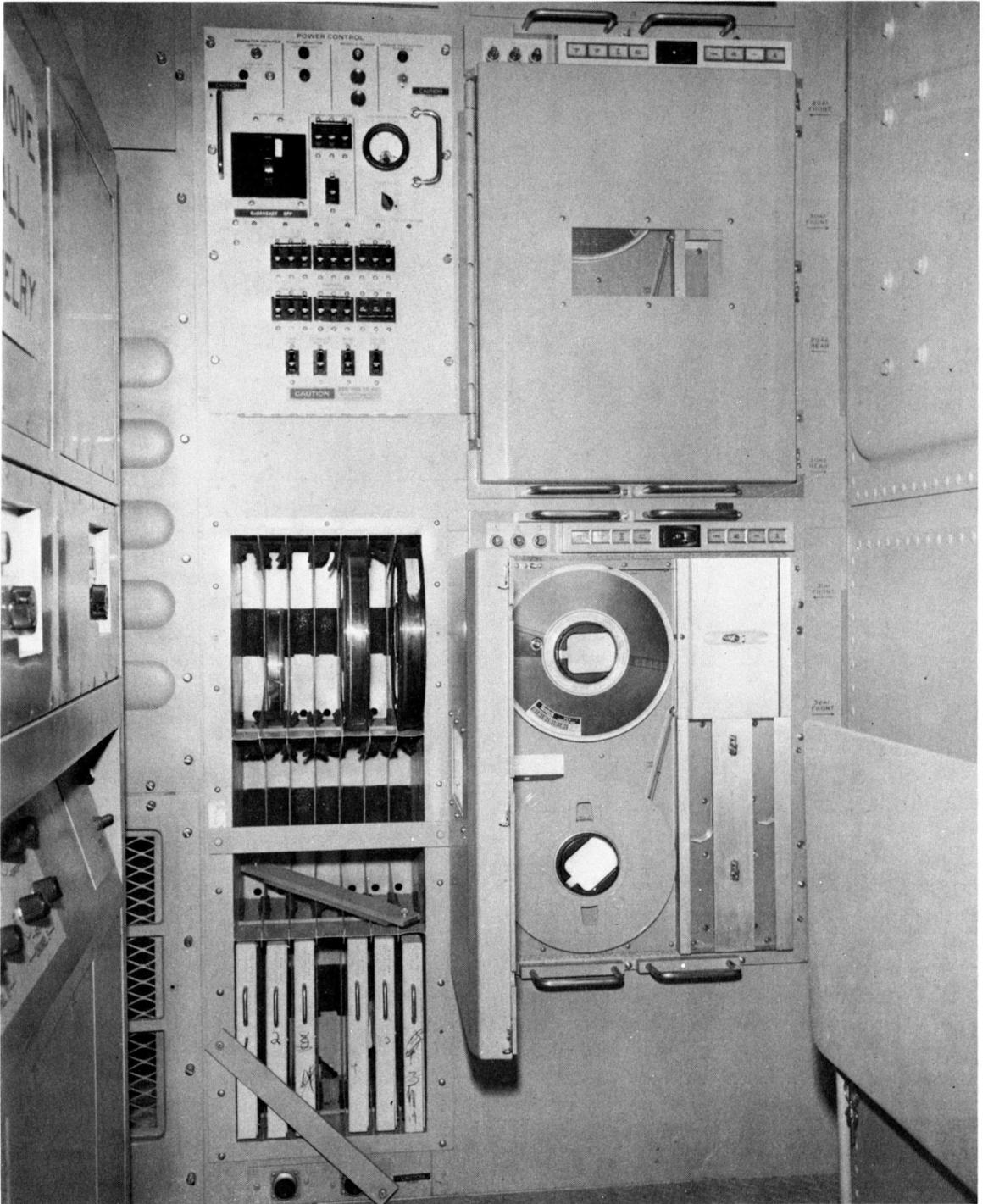
SRP Ancillary Equipment Module



SRP Group Display Module



SRP HM 4118 Computer



SRP Data Processing Module