50M02416
SEPTEMBER 23. 1968

GEORGE C. MARSHALL SPACE FLIGHT CENTER

APOLLO TELESCOPE MOUNT
SEQUENTIAL FLOW PLAN

PREPARED BY
ASTRIONICS LABORATORY

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA

MSFC FORM 428 (VERTICAL) (AUGUST 1960)

APPLICATION		PART No.	M F	REVISIONS			
NEXT ASSY	USED ON			SYM	DESCRIPTION	DATE	APPROVAL

Eugene H. Cagle

EUGENE H. CAGLE
Engineering Manager for ATM
R-ASTR-DIR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: FRACTIONS DECIMALS ANGLES	ORIGINAL DATE OF DRAWING 9-23-68 ILLUSTRATION U.S. Grammer / CHECKER TRACER / CHECKER ENGINEER / ENGINEER	ATM SEQUENTIAL FLOW PLAN	GEORGE C. MARSHALL SPACE FLIGHT CENTER NATIONAL AERONAUTICS AND SPACE ADMINISTRATION HUNTSVILLE, ALABAMA
MATERIAL	SUBMITTED Eugene H. Cagle		
HEAT TREATMENT	APPROVED DATE 11-25-68 RELEASED BY R-ASTR-VS	SCALE	DWG SIZE A — 50M02416
FINAL PROTECTIVE FINISH		UNIT WT	SHEET 1 OF 125

TABLE OF CONTENTS

SECTION 1

PURPOSE

The purpose of this document is to familiarize ATM personnel with the present concept of sequential flow of the ATM from assembly to launch.

SECTION 2

SCOPE

The content of this document is applicable to NASA organizations, Principal Investigators of the scientific experiments and all contractor personnel participating in the Apollo Telescope Mount Project. This document applies to the ATM Flight Prototype Unit and Flight Unit.

SECTION 3

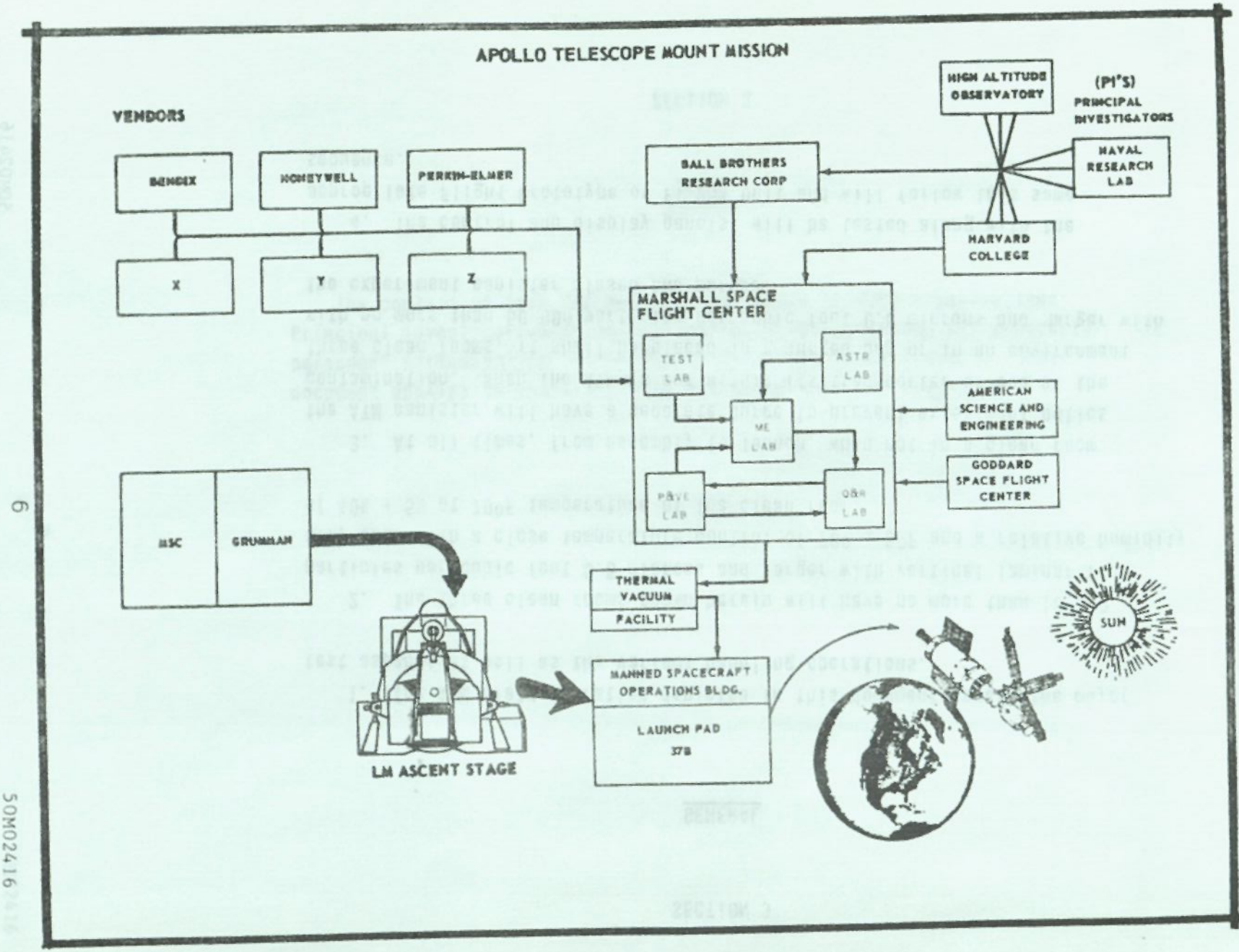
GENERAL

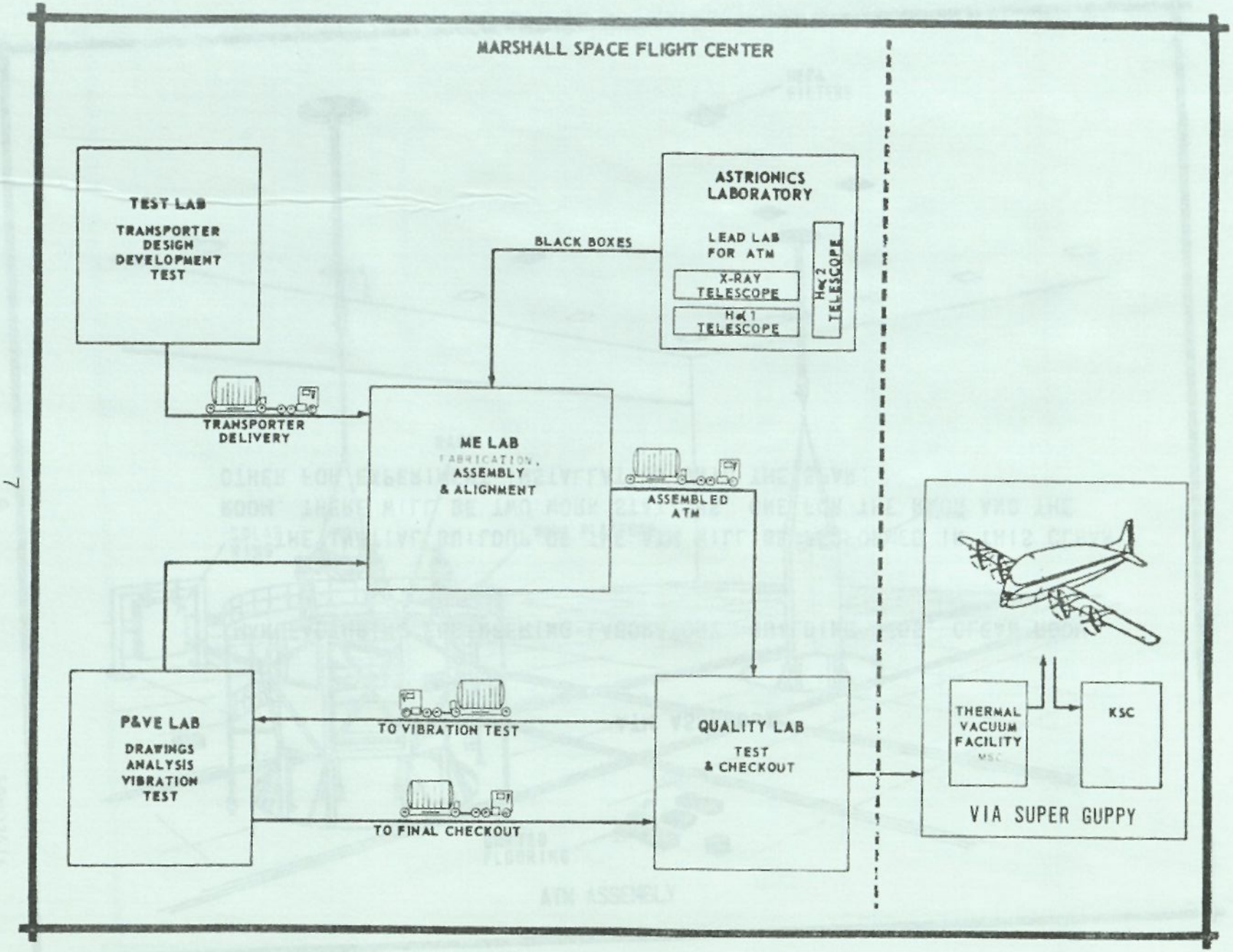
1. The ATM field operation depicted in this document covers the major test aspects as well as the various handling operations.

2. The three clean rooms shown herein will have no more than 10,000 particles per cubic foot 0.5 microns and larger with vertical laminar flow air, each with a close temperature control of 70° ± 5°F and a relative humidity of 40% ± 5% at 70°F temperature of the clean room.

3. At all times, from assembly to launch, when not in a clean room the ATM canister will have a separate purge to prevent experiment optics contamination. When the ATM is not within its transporter or one of the three clean rooms, it shall be placed in a purged bag or in an environment with no more than 50,000 particles per cubic foot 0.5 microns and larger with the experiment canister closed and purged.

4. The control and display panels will be tested along with the appropriate Flight Prototype or Flight Unit and will follow this same sequence.


APOLLO TELESCOPE MOUNT MISSION
VENDORS
BENDIX
HONEYWELL
PERKIN-ELMER
X
Y
Z
HIGH ALTITUDE OBSERVATORY
(PI'S)
PRINCIPAL INVESTIGATORS
BALL BROTHERS RESEARCH CORP
NAVAL RESEARCH LAB
HARVARD COLLEGE
MARSHALL SPACE FLIGHT CENTER
TEST LAB
ASTR LAB
ME LAB
PAVE LAB
OGR LAB
AMERICAN SCIENCE AND ENGINEERING
GODDARD SPACE FLIGHT CENTER
MSC
GRUMMAN
THERMAL VACUUM
FACILITY
MANNED SPACECRAFT OPERATIONS BLDG.
LAUNCH PAD
37B
LM ASCENT STAGE
SUN

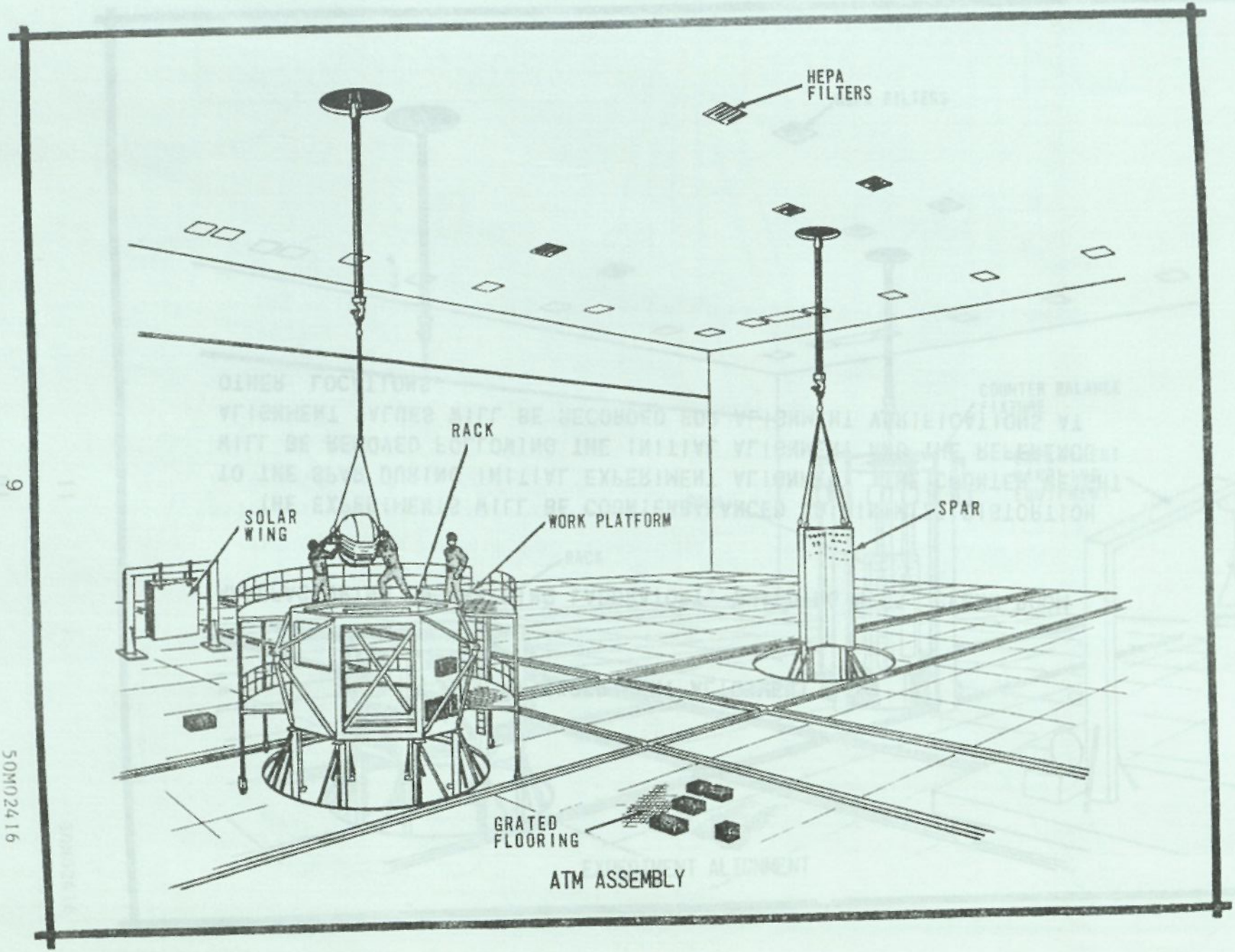

MARSHALL SPACE FLIGHT CENTER
TEST LAB
TRANSPORTER DESIGN DEVELOPMENT TEST
ASTRIONICS LABORATORY
LEAD LAB FOR ATM
X-RAY TELESCOPE
Hα1 TELESCOPE
Hα2 TELESCOPE
BLACK BOXES
TRANSPORTER DELIVERY
ME LAB
FABRICATION, ASSEMBLY & ALIGNMENT
ASSEMBLED ATM
P&VE LAB
DRAWINGS ANALYSIS VIBRATION TEST
TO VIBRATION TEST
TO FINAL CHECKOUT
QUALITY LAB
TEST & CHECKOUT
THERMAL VACUUM FACILITY
MSC
KSC
VIA SUPER GUPPY

50M02416

ATM ASSEMBLY

MANUFACTURING ENGINEERING LABORATORY, BUILDING 4755, CLEAN ROOM

THE INITIAL BUILDUP OF THE ATM WILL BE PERFORMED IN THIS CLEAN ROOM. THERE WILL BE TWO WORK STATIONS, ONE FOR THE RACK AND THE OTHER FOR EXPERIMENT INSTALLATION ONTO THE SPAR.

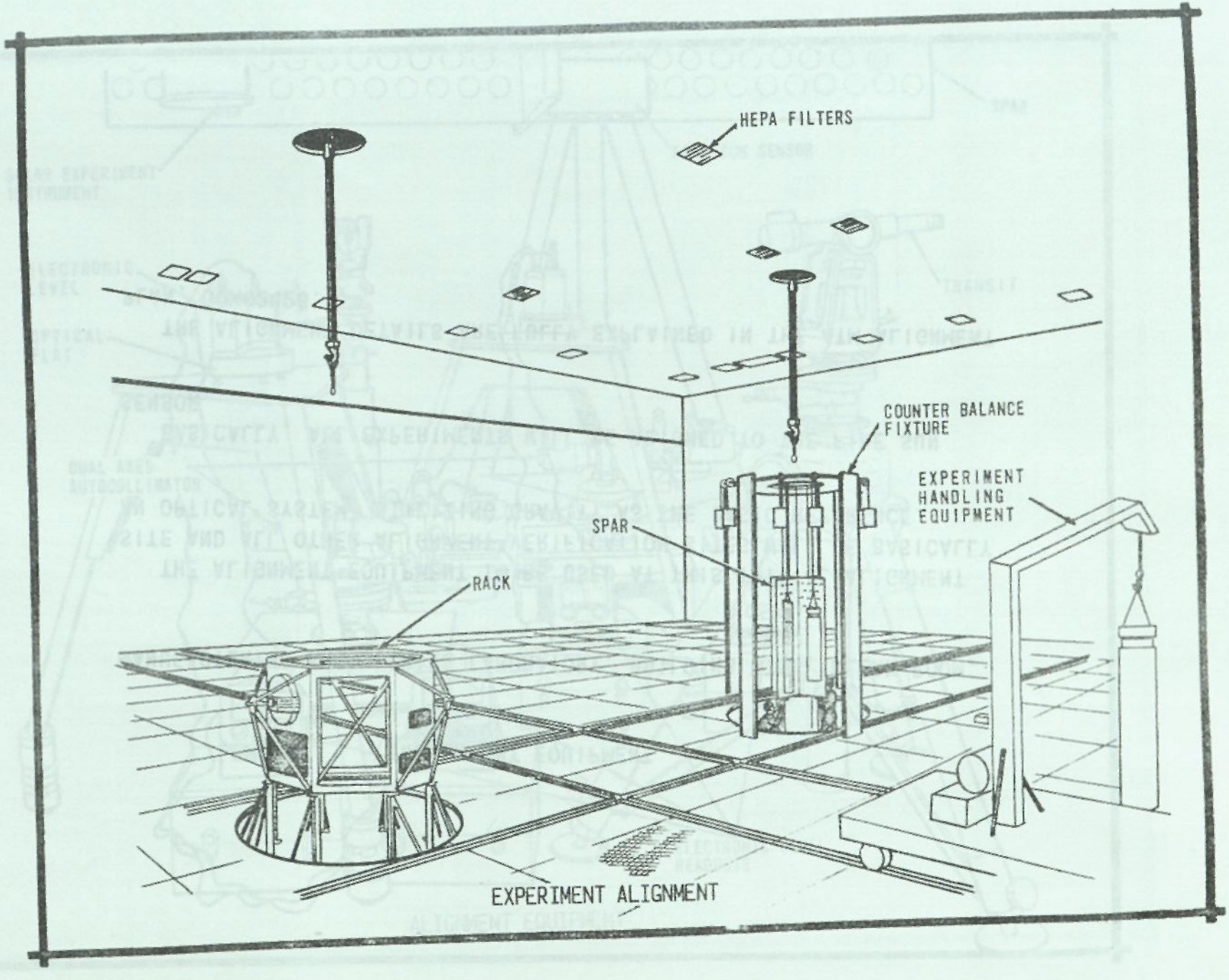


ATM ASSEMBLY

EXPERIMENT ALIGNMENT

MANUFACTURING ENGINEERING LABORATORY, BUILDING 4755, CLEAN ROOM

THE EXPERIMENTS WILL BE COUNTERBALANCED TO MINIMIZE DISTORTION TO THE SPAR DURING INITIAL EXPERIMENT ALIGNMENT. THE COUNTER WEIGHT WILL BE REMOVED FOLLOWING THE INITIAL ALIGNMENT AND THE REFERENCE ALIGNMENT VALUES WILL BE RECORDED FOR ALIGNMENT VERIFICATIONS AT OTHER LOCATIONS.


HEPA FILTERS
COUNTER BALANCE FIXTURE
EXPERIMENT HANDLING EQUIPMENT
SPAR
RACK
EXPERIMENT ALIGNMENT

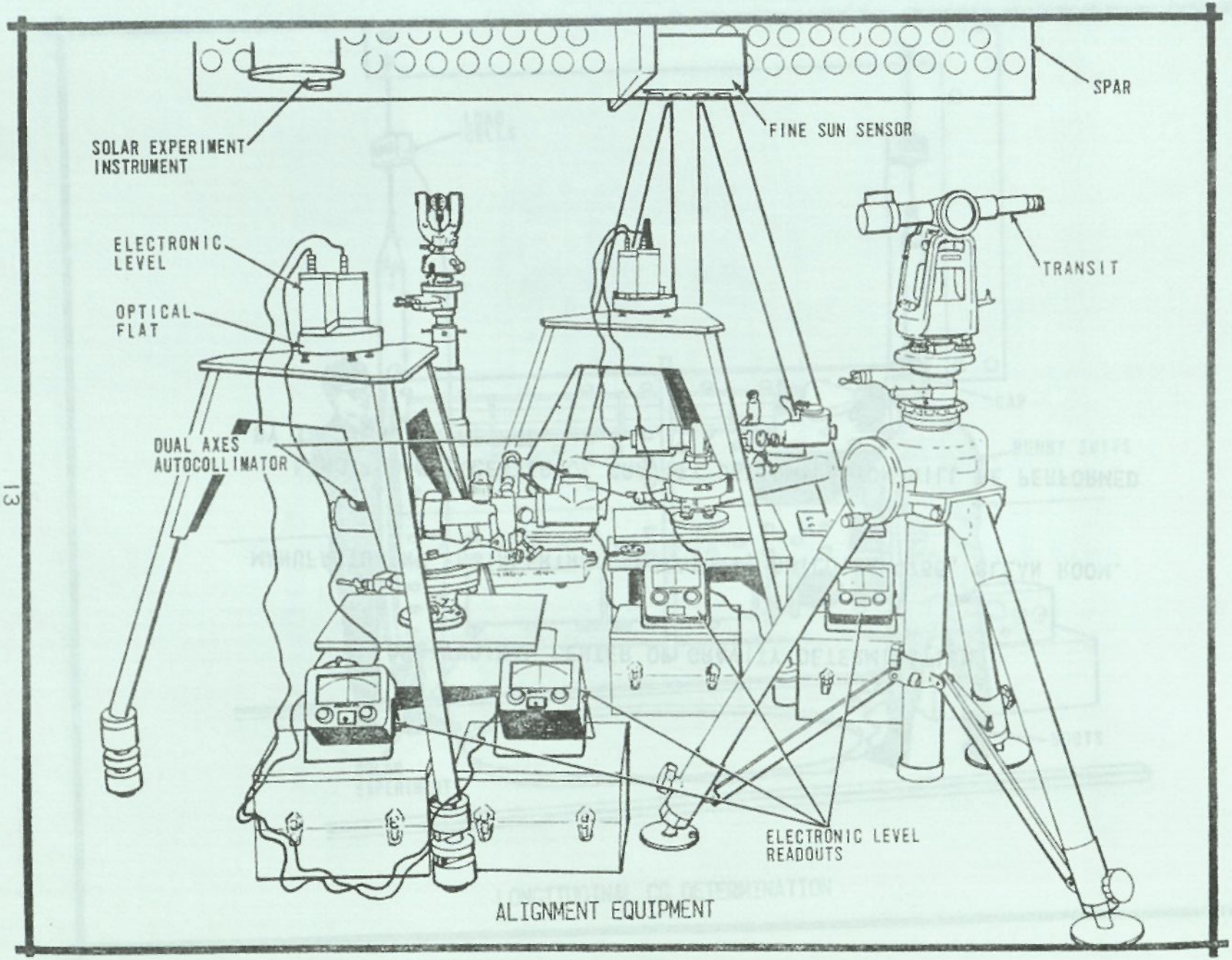
ALIGNMENT EQUIPMENT

MANUFACTURING ENGINEERING LABORATORY, BUILDING 4755, CLEAN ROOM.

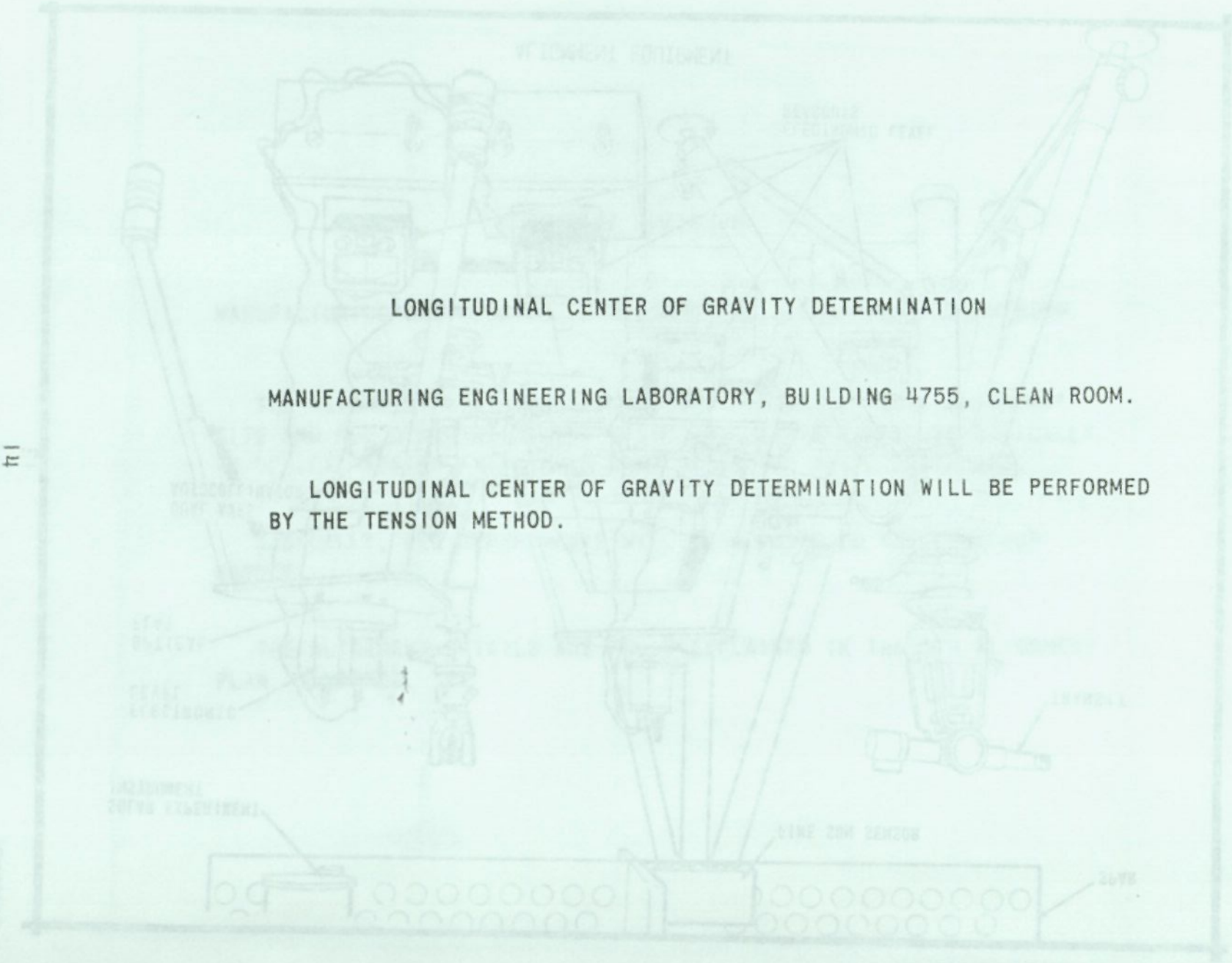
THE ALIGNMENT EQUIPMENT TO BE USED AT THIS INITIAL ALIGNMENT SITE AND ALL OTHER ALIGNMENT VERIFICATION SITES WILL BE BASICALLY AN OPTICAL SYSTEM, UTILIZING GRAVITY AS THE BASIC REFERENCE.

BASICALLY, ALL EXPERIMENTS WILL BE ALIGNED TO THE FINE SUN SENSOR.

THE ALIGNMENT DETAILS ARE FULLY EXPLAINED IN THE ATM ALIGNMENT PLAN, 50M02426.



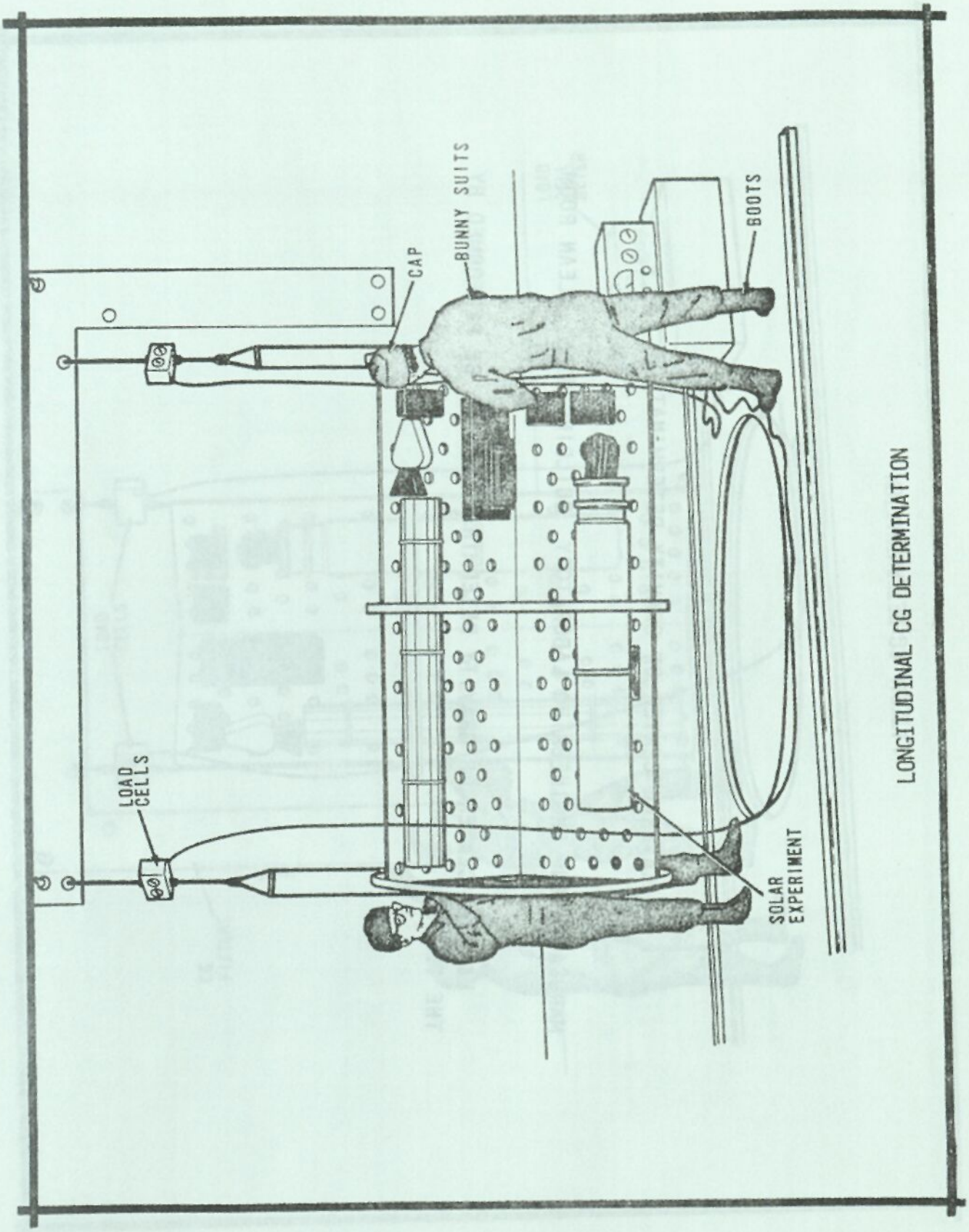
ALIGNMENT EQUIPMENT



LONGITUDINAL CENTER OF GRAVITY DETERMINATION

MANUFACTURING ENGINEERING LABORATORY, BUILDING 4755, CLEAN ROOM.

LONGITUDINAL CENTER OF GRAVITY DETERMINATION WILL BE PERFORMED BY THE TENSION METHOD.

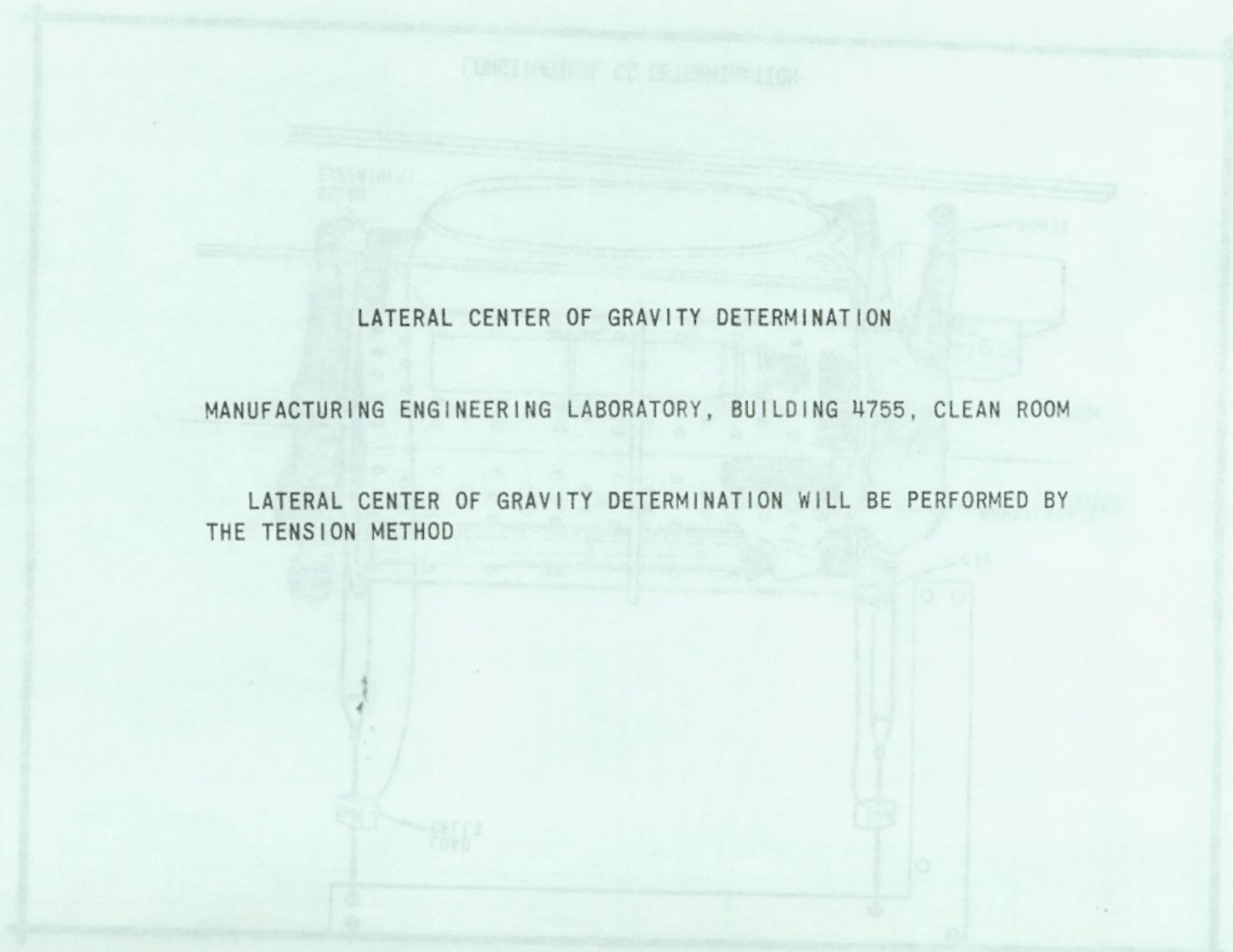


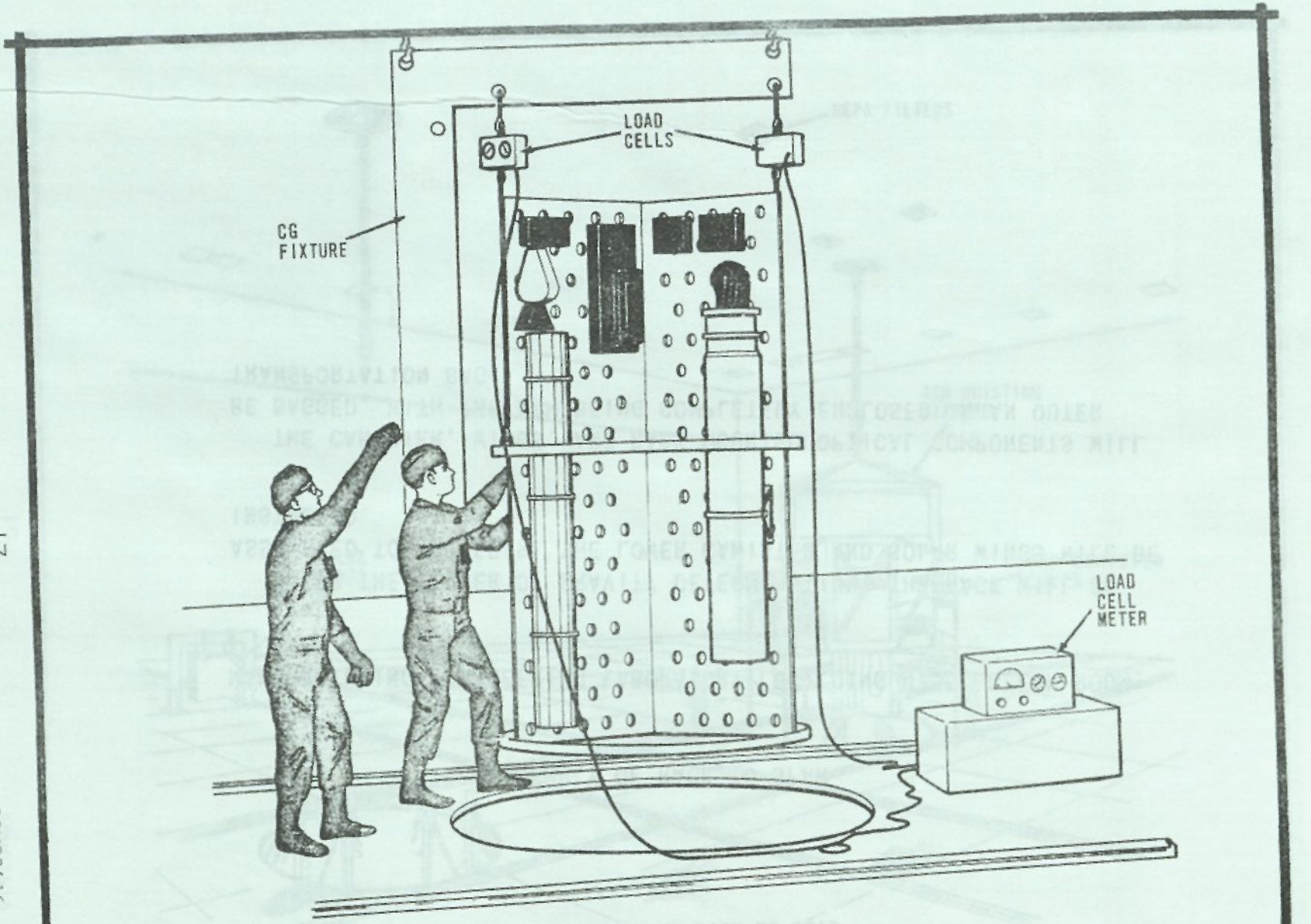
LONGITUDINAL CG DETERMINATION

LATERAL CENTER OF GRAVITY DETERMINATION

MANUFACTURING ENGINEERING LABORATORY, BUILDING 4755, CLEAN ROOM

LATERAL CENTER OF GRAVITY DETERMINATION WILL BE PERFORMED BY THE TENSION METHOD





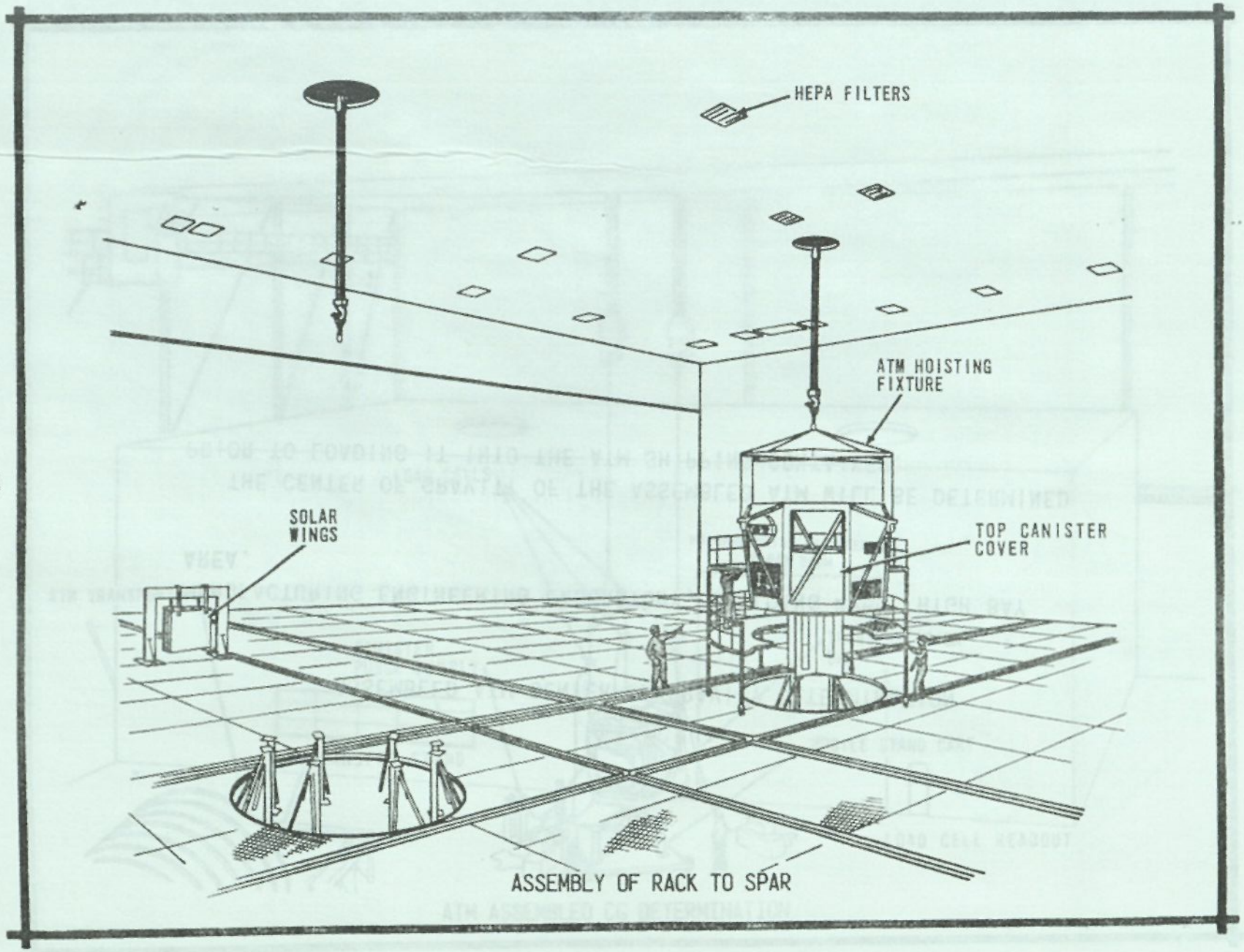
LATERAL CG DETERMINATION

ASSEMBLY OF RACK TO SPAR

MANUFACTURING ENGINEERING LABORATORY, BUILDING 4755, CLEAN ROOM

AFTER THE CENTER OF GRAVITY DETERMINATION, THE RACK WILL BE ASSEMBLED TO THE SPAR. THE LOWER CANISTER AND SOLAR WINGS WILL BE INSTALLED.

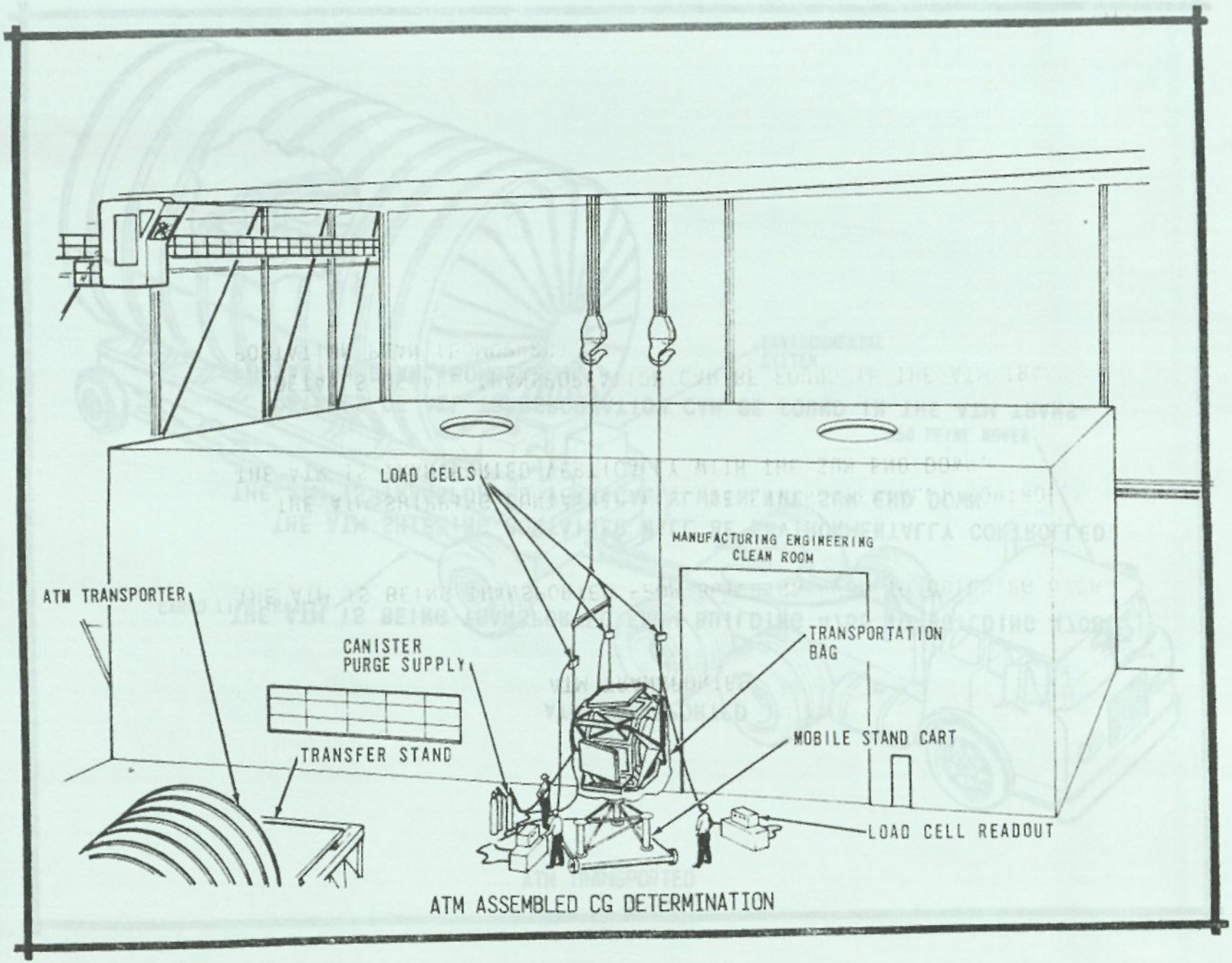
THE CANISTER, WINGS, AND RACK MOUNTED OPTICAL COMPONENTS WILL BE BAGGED, WITH THE ATM BEING COMPLETELY ENCLOSED IN AN OUTER TRANSPORTATION BAG.


HEPA FILTERS
ATM HOISTING FIXTURE
SOLAR WINGS
TOP CANISTER COVER
ASSEMBLY OF RACK TO SPAR

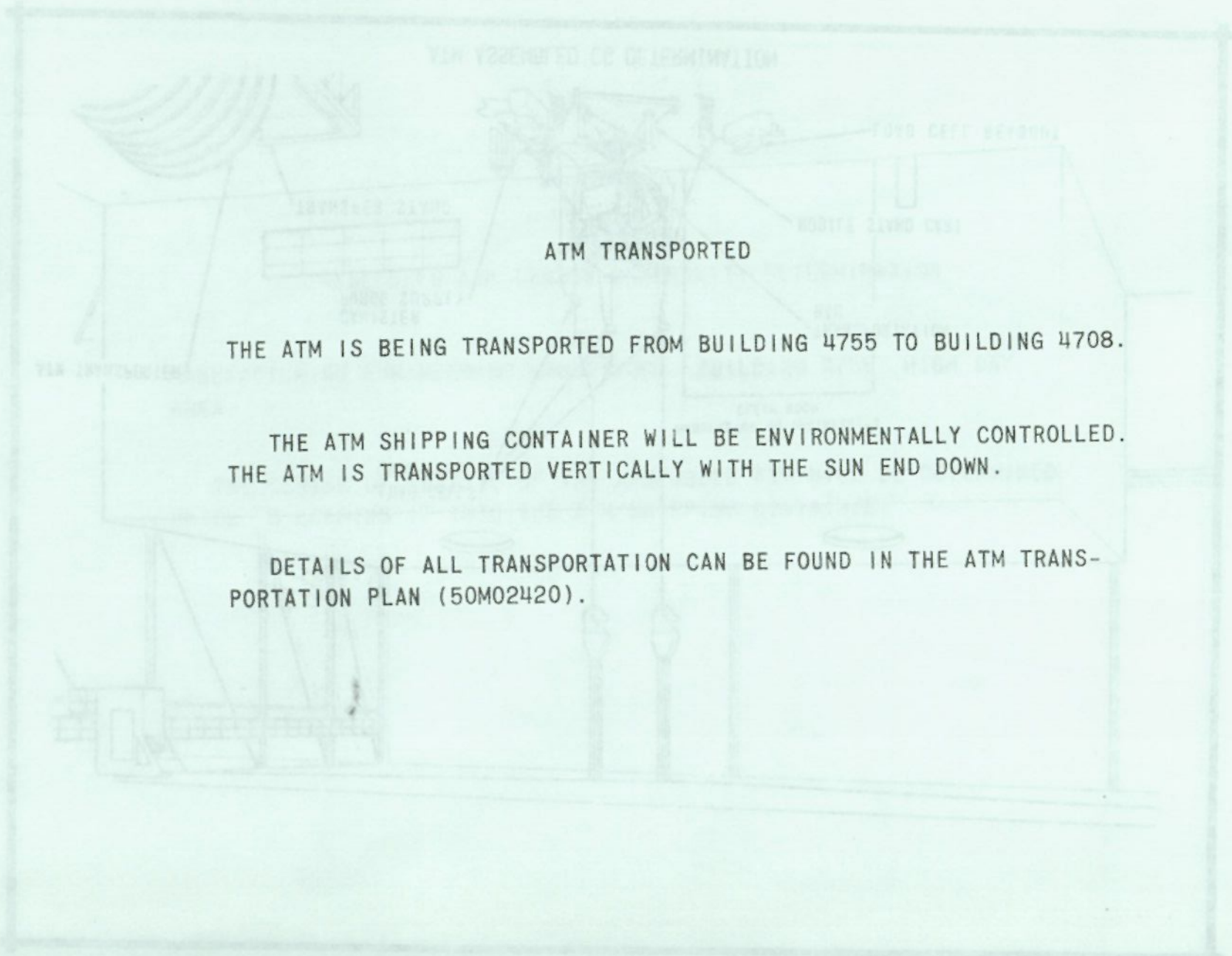
ASSEMBLED ATM CENTER OF GRAVITY DETERMINATION

MANUFACTURING ENGINEERING LABORATORY, BUILDING 4755, HIGH BAY AREA.

THE CENTER OF GRAVITY OF THE ASSEMBLED ATM WILL BE DETERMINED PRIOR TO LOADING IT INTO THE ATM SHIPPING CONTAINER.



ATM ASSEMBLED CG DETERMINATION

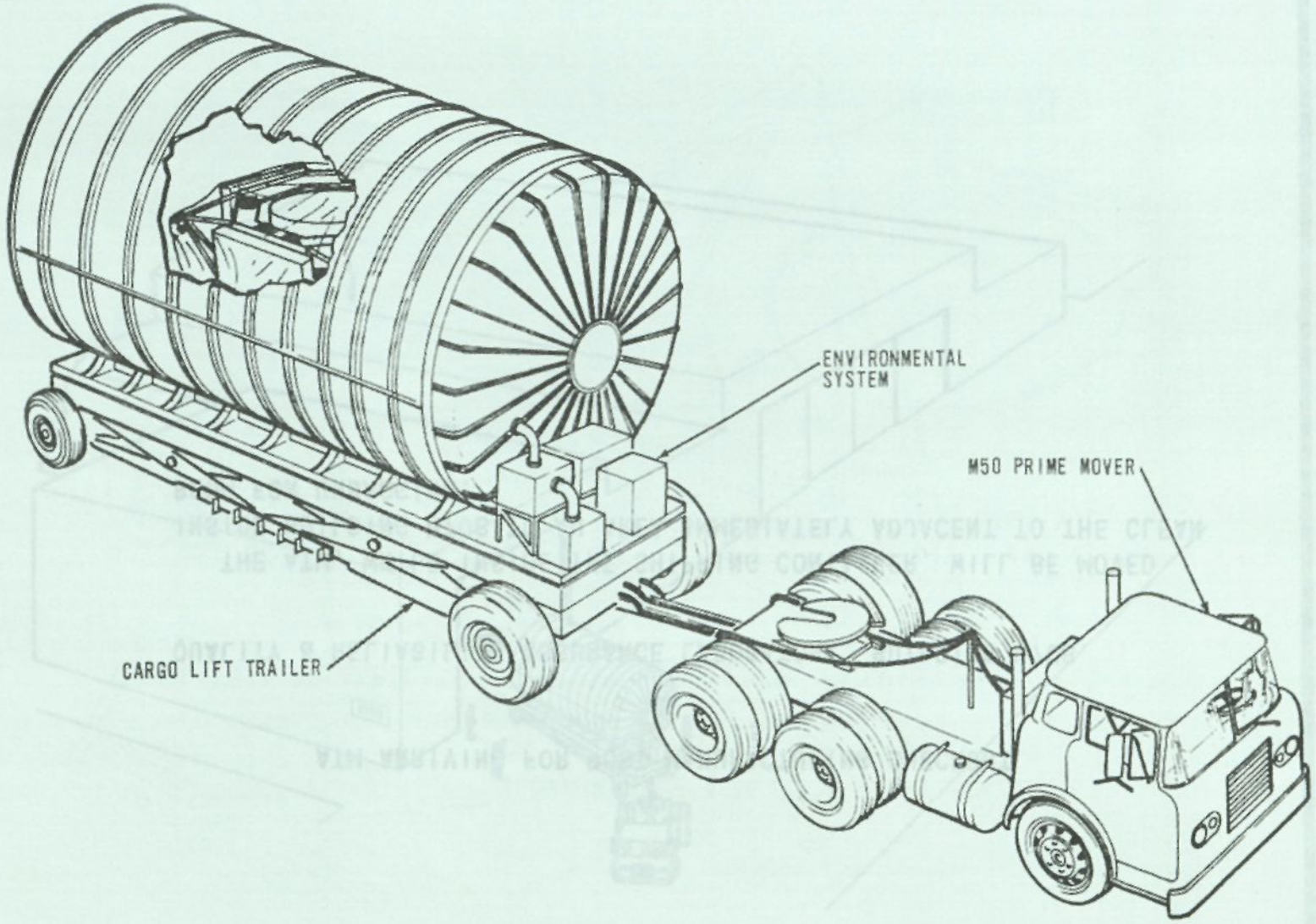


ATM TRANSPORTED

THE ATM IS BEING TRANSPORTED FROM BUILDING 4755 TO BUILDING 4708.

THE ATM SHIPPING CONTAINER WILL BE ENVIRONMENTALLY CONTROLLED. THE ATM IS TRANSPORTED VERTICALLY WITH THE SUN END DOWN.

DETAILS OF ALL TRANSPORTATION CAN BE FOUND IN THE ATM TRANSPORTATION PLAN (50M02420).

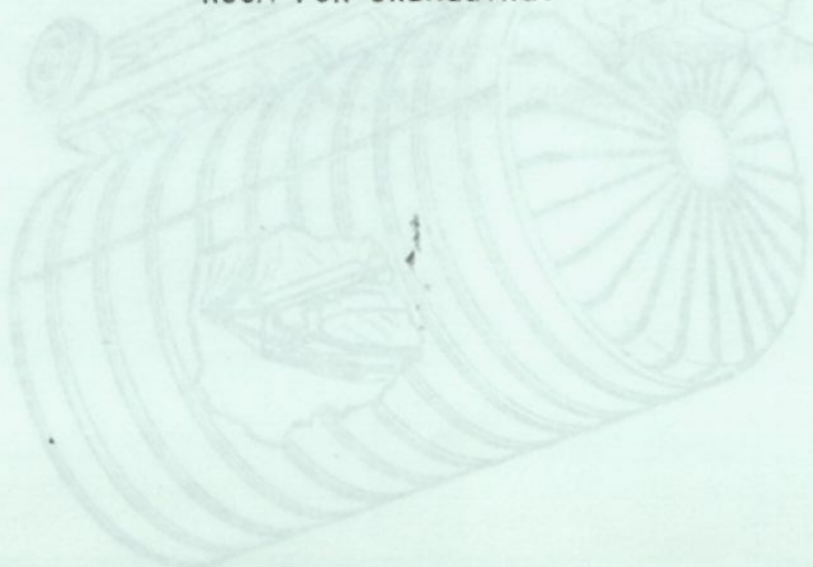


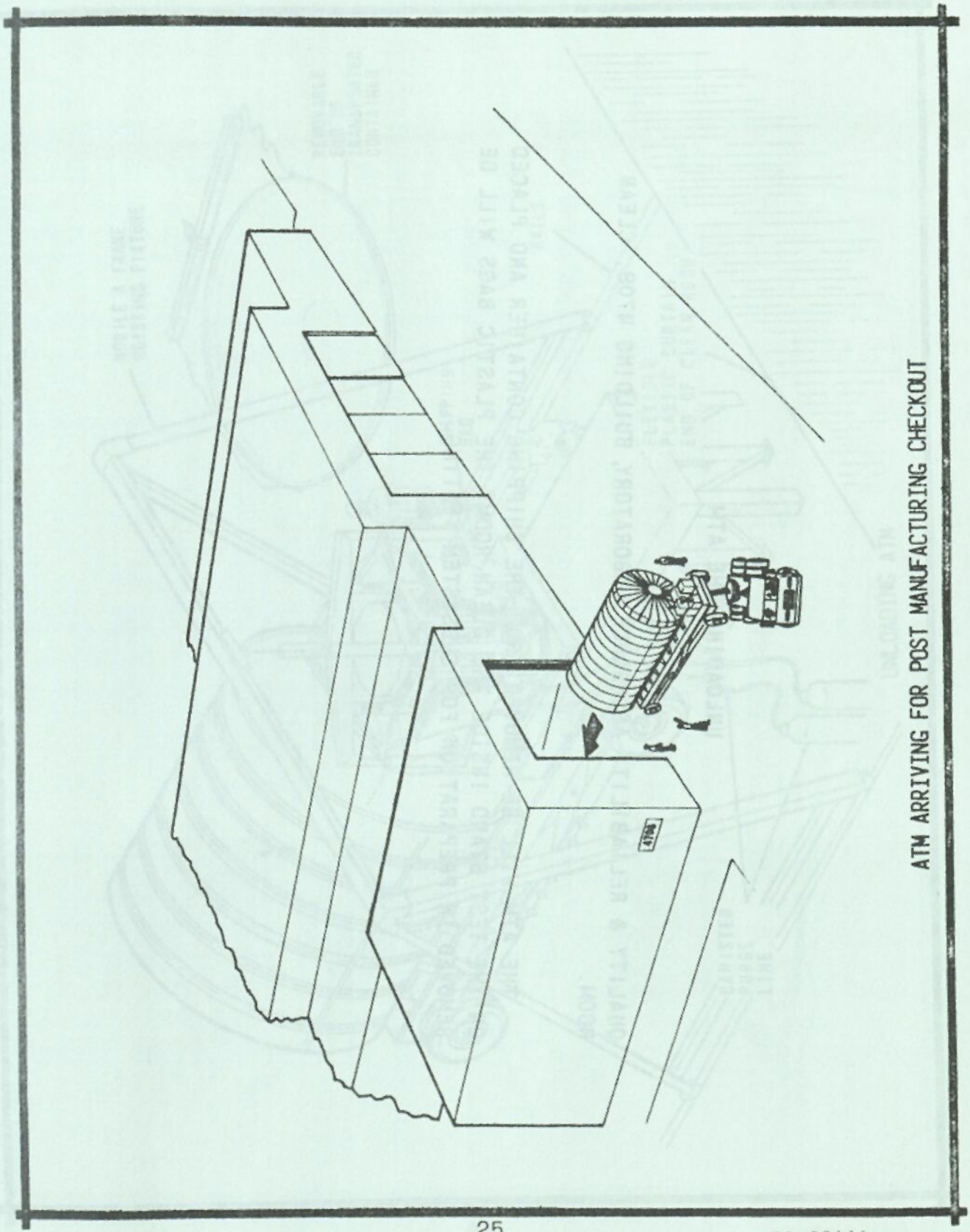
ATM TRANSPORTED

ATM ARRIVING FOR POST MANUFACTURING CHECKOUT

QUALITY & RELIABILITY ASSURANCE LABORATORY, BUILDING 4708.

THE ATM, WHILE INSIDE THE SHIPPING CONTAINER, WILL BE MOVED INSIDE BUILDING 4708 TO AN AREA IMMEDIATELY ADJACENT TO THE CLEAN ROOM FOR UNBAGGING.



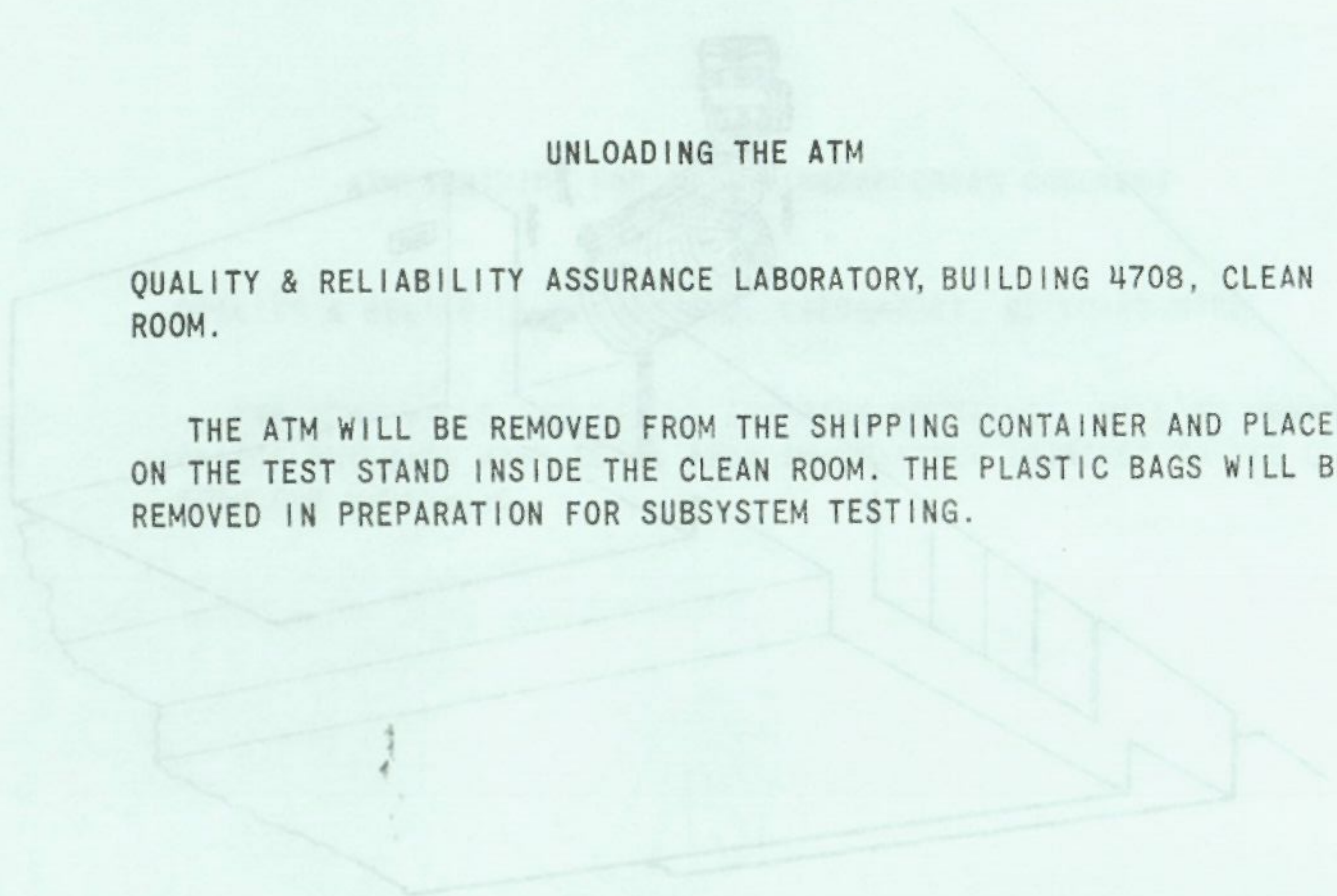


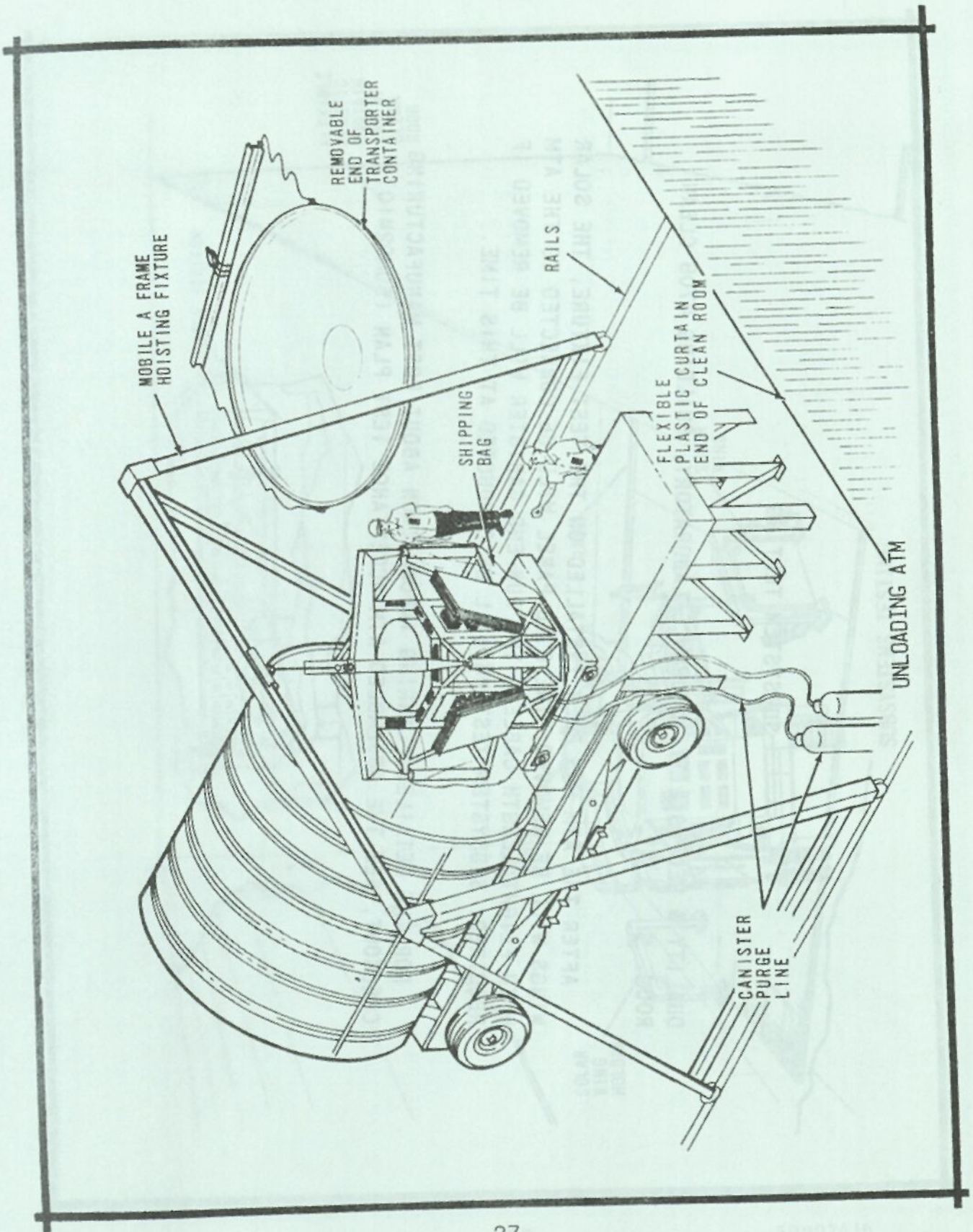
ATM ARRIVING FOR POST MANUFACTURING CHECKOUT

UNLOADING THE ATM

QUALITY & RELIABILITY ASSURANCE LABORATORY, BUILDING 4708, CLEAN ROOM.

THE ATM WILL BE REMOVED FROM THE SHIPPING CONTAINER AND PLACED ON THE TEST STAND INSIDE THE CLEAN ROOM. THE PLASTIC BAGS WILL BE REMOVED IN PREPARATION FOR SUBSYSTEM TESTING.



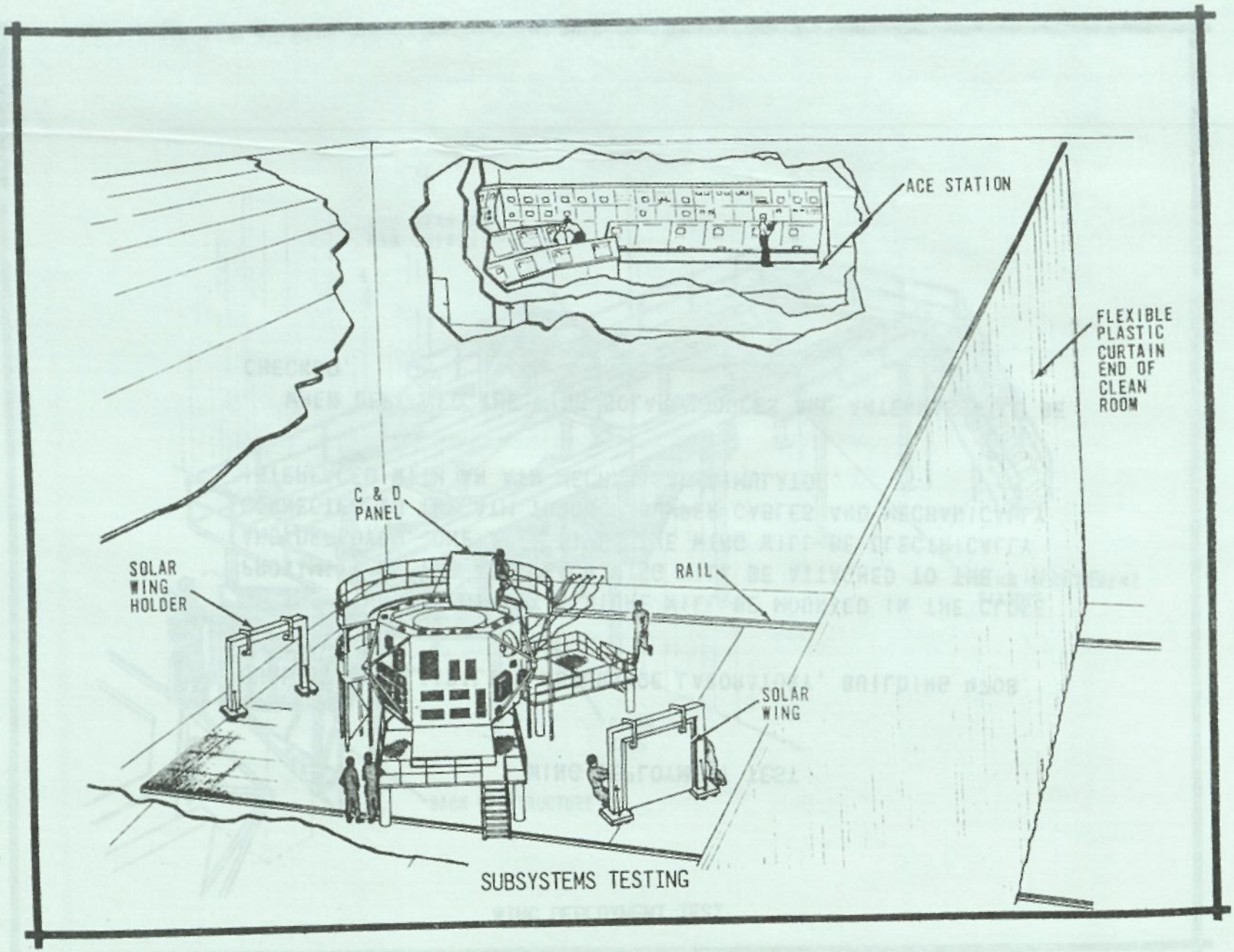

MOBILE A FRAME HOISTING FIXTURE
REMOVABLE END OF TRANSPORTER CONTAINER
RAILS
SHIPPING BAG
FLEXIBLE PLASTIC CURTAIN END OF CLEAN ROOM
UNLOADING ATM
CANISTER PURGE LINE

SUBSYSTEM TESTING

QUALITY & RELIABILITY ASSURANCE LABORATORY, BUILDING 4708 CLEAN ROOM.

AFTER THE ATM HAS BEEN INSTALLED ON THE TEST FIXTURE, THE SOLAR WINGS WILL BE REMOVED. THE C & D PANEL WILL BE CONNECTED TO THE ATM WITH FLIGHT LENGTH CABLES. THE SUN END CANISTER WILL BE REMOVED IF REQUIRED. SUBSYSTEM TESTING WILL BE CONDUCTED AT THIS TIME.

FOR THE DETAILED PLANNING INFORMATION ABOUT POST MANUFACTURING CHECKOUT, SEE THE ASSEMBLED ATM ACCEPTANCE TEST PLAN (50M02410).

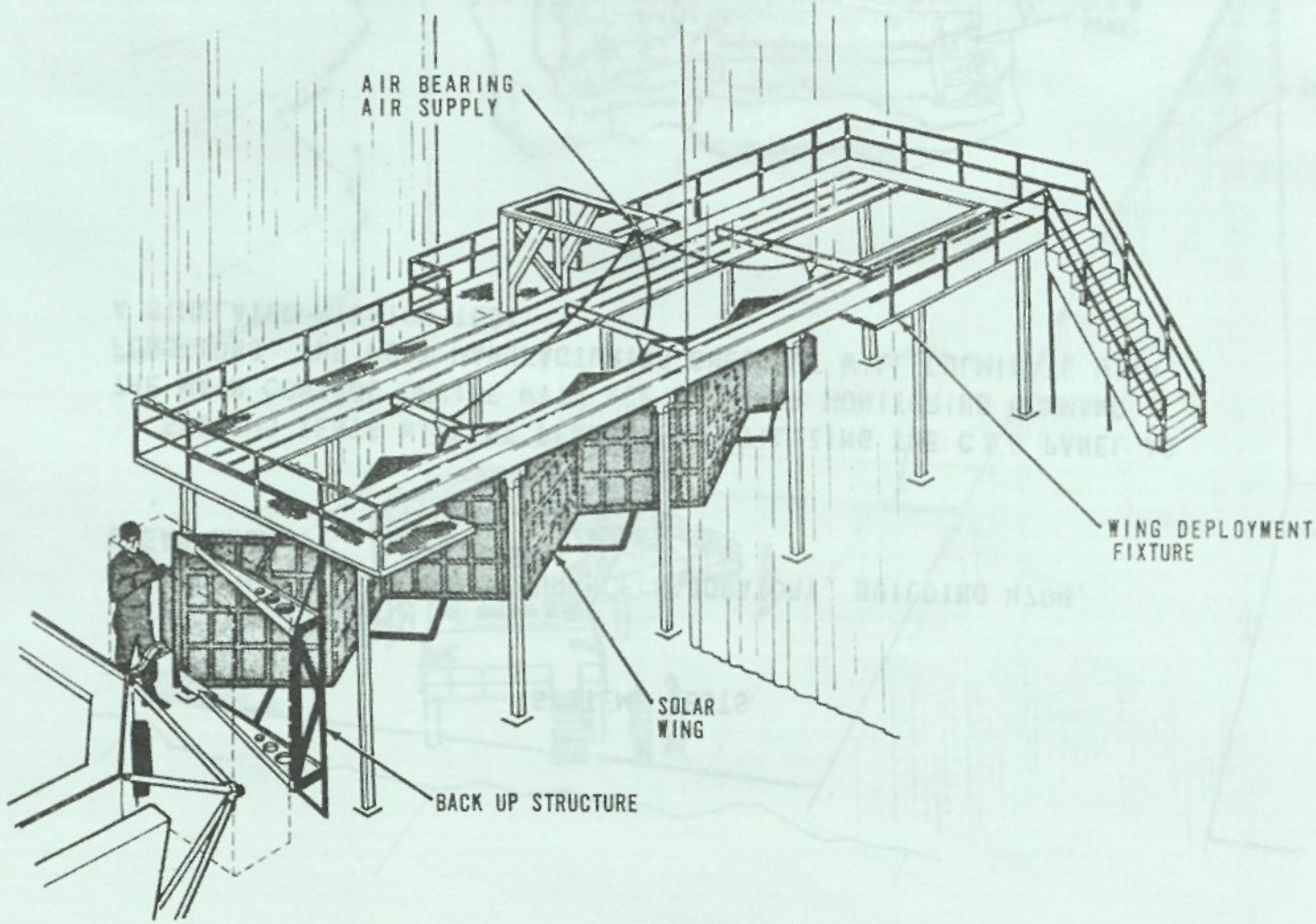

ACE STATION
FLEXIBLE PLASTIC CURTAIN END OF CLEAN ROOM
C & D PANEL
SOLAR WING HOLDER
RAIL
SOLAR WING
SUBSYSTEMS TESTING

WING DEPLOYMENT TEST

QUALITY & RELIABILITY ASSURANCE LABORATORY, BUILDING 4708.

THE WING DEPLOYMENT FIXTURE WILL BE MOUNTED IN THE CLOSE PROXIMITY OF THE ATM. EACH WING WILL BE ATTACHED TO THE FIXTURE AND DEPLOYED, ONE AT A TIME. THE WING WILL BE ELECTRICALLY CONNECTED TO THE ATM THROUGH JUMPER CABLES AND MECHANICALLY INTERFACED WITH AN ATM MECHANICAL SIMULATOR.

WHEN DEPLOYED THE WING SOLAR MODULES AND ANTENNAS WILL BE CHECKED.

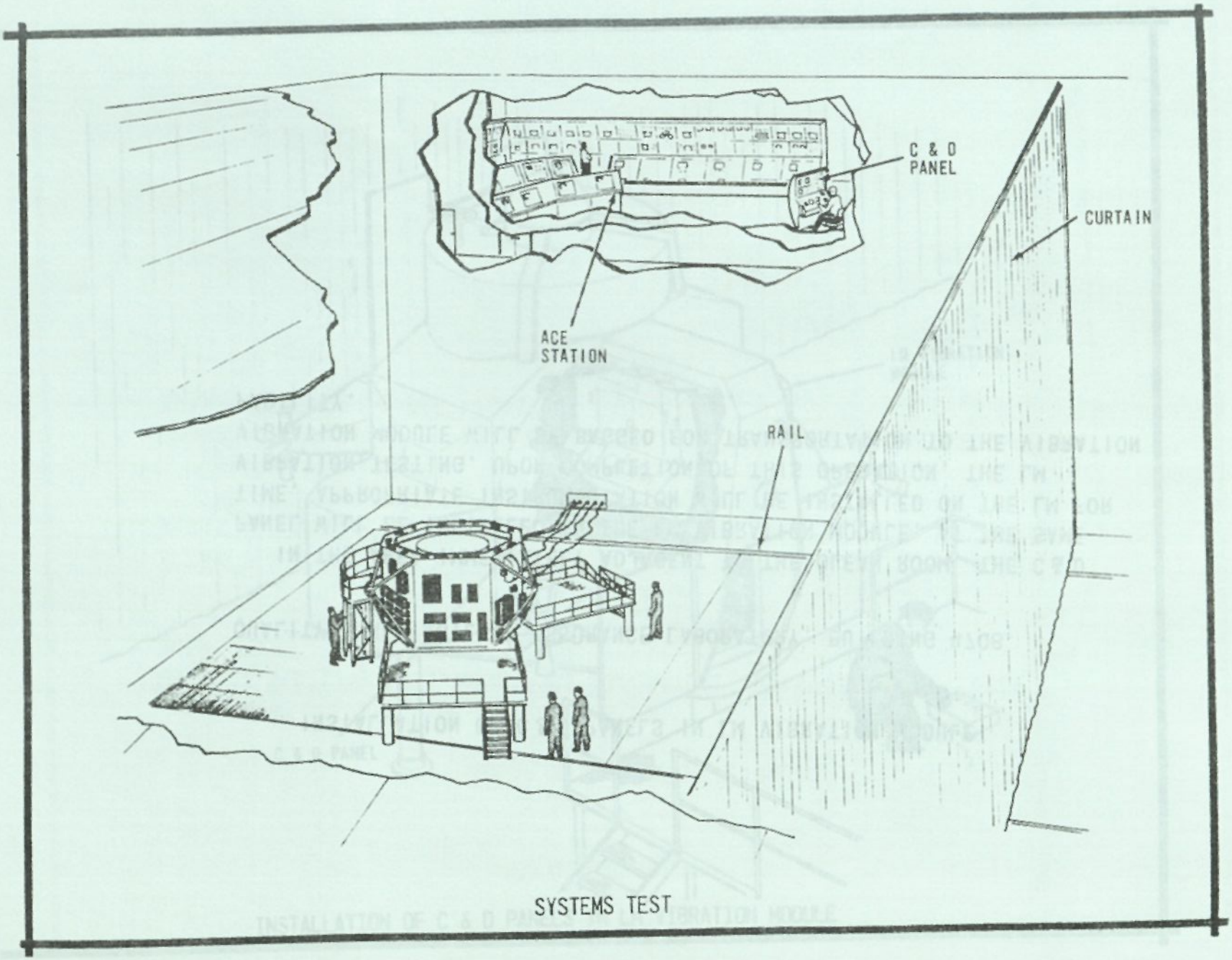


WING DEPLOYMENT TEST

SYSTEMS TESTS

QUALITY & RELIABILITY ASSURANCE LABORATORY, BUILDING 4708, CLEAN ROOM.

SYSTEMS TESTS WILL BE PERFORMED, UTILIZING THE C & D PANEL AS THE MAIN CONTROL DEVICE WITH ACE USED FOR MONITORING COMMAND FUNCTIONS. THE POST MANUFACTURING CHECKOUT WILL CULMINATE WITH A SIMULATED MISSION TEST.

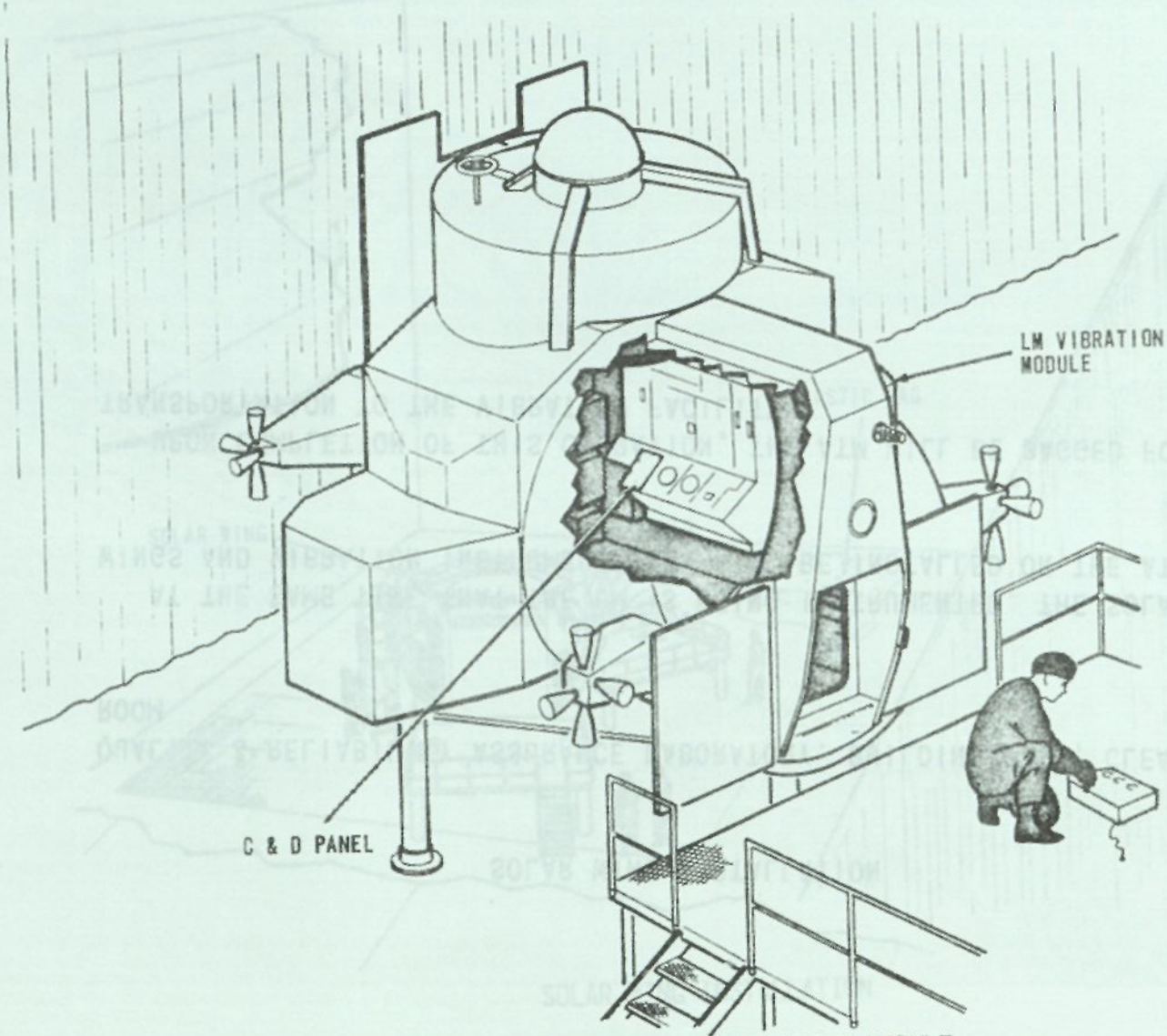


SYSTEMS TEST

INSTALLATION OF C & D PANELS IN LM VIBRATION MODULE

QUALITY & RELIABILITY ASSURANCE LABORATORY, BUILDING 4708.

IN THE AREA IMMEDIATELY ADJACENT TO THE CLEAN ROOM, THE C & D PANEL WILL BE INSTALLED IN THE LM VIBRATION MODULE. AT THE SAME TIME, APPROPRIATE INSTRUMENTATION WILL BE INSTALLED ON THE LM FOR VIBRATION TESTING. UPON COMPLETION OF THIS OPERATION, THE LM VIBRATION MODULE WILL BE BAGGED FOR TRANSPORTATION TO THE VIBRATION FACILITY.



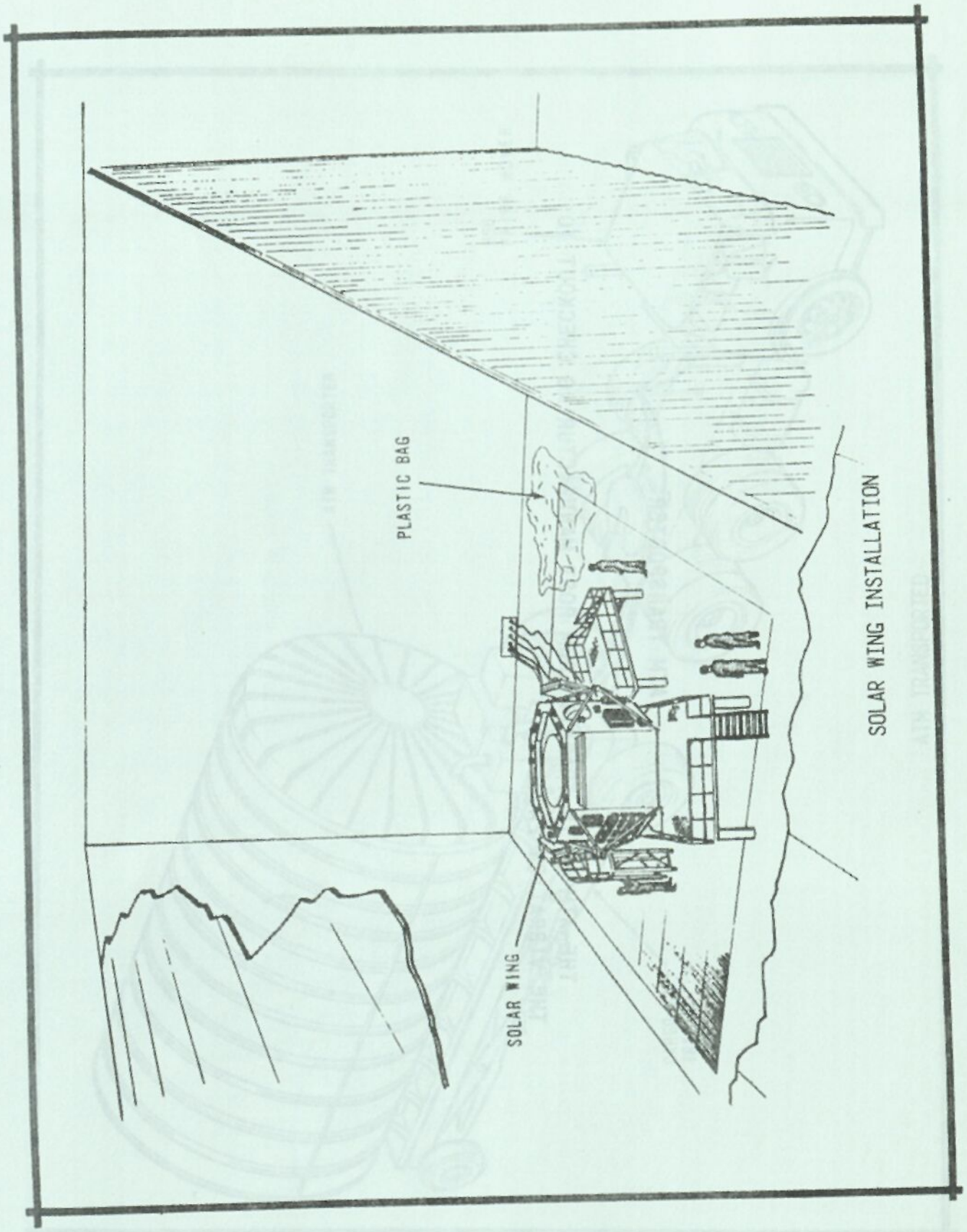
INSTALLATION OF C & D PANELS IN LM VIBRATION MODULE

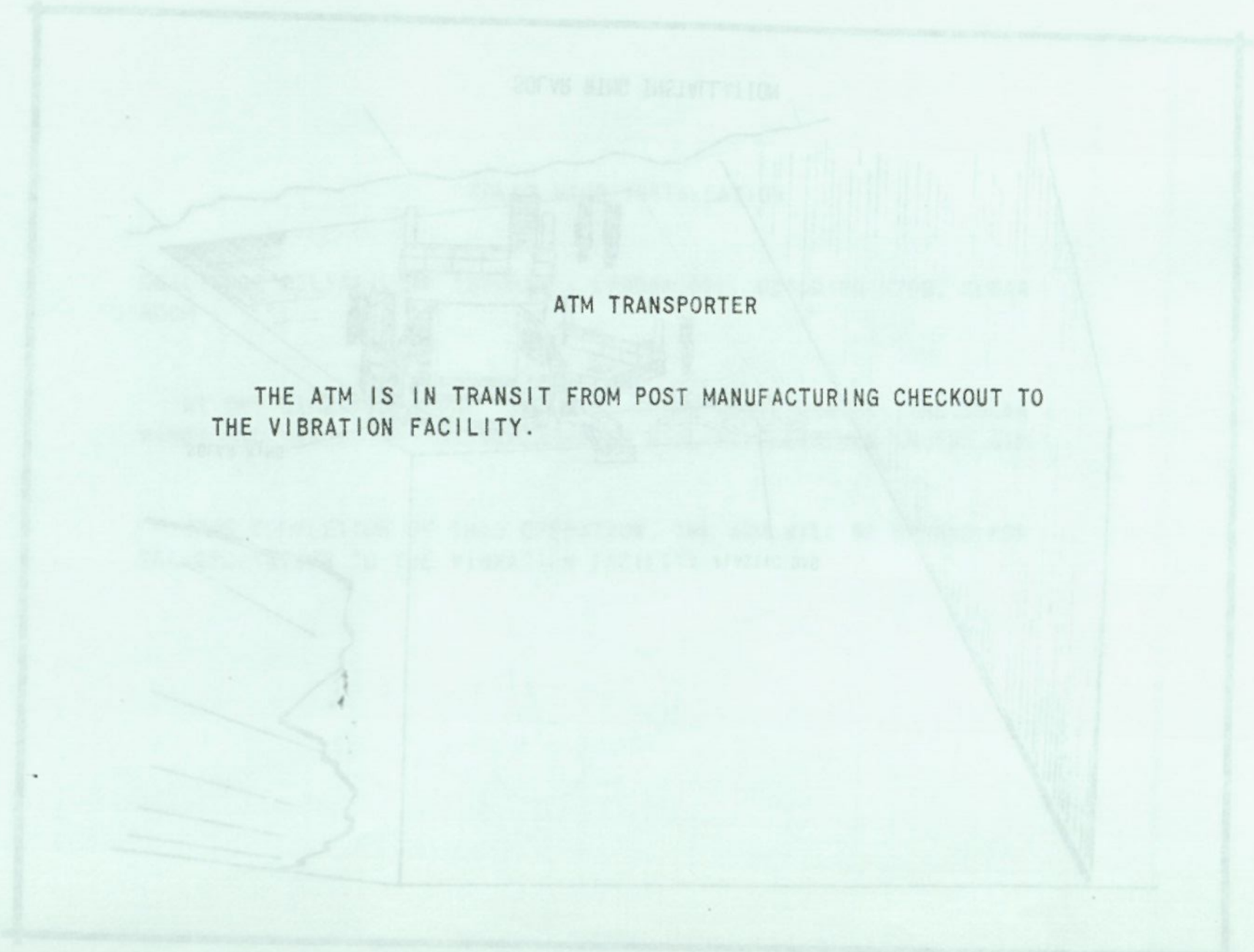
SOLAR WING INSTALLATION

QUALITY & RELIABILITY ASSURANCE LABORATORY, BUILDING 4708, CLEAN ROOM

AT THE SAME TIME THAT THE LM IS BEING INSTRUMENTED, THE SOLAR WINGS AND VIBRATION INSTRUMENTATION WILL BE INSTALLED ON THE ATM.

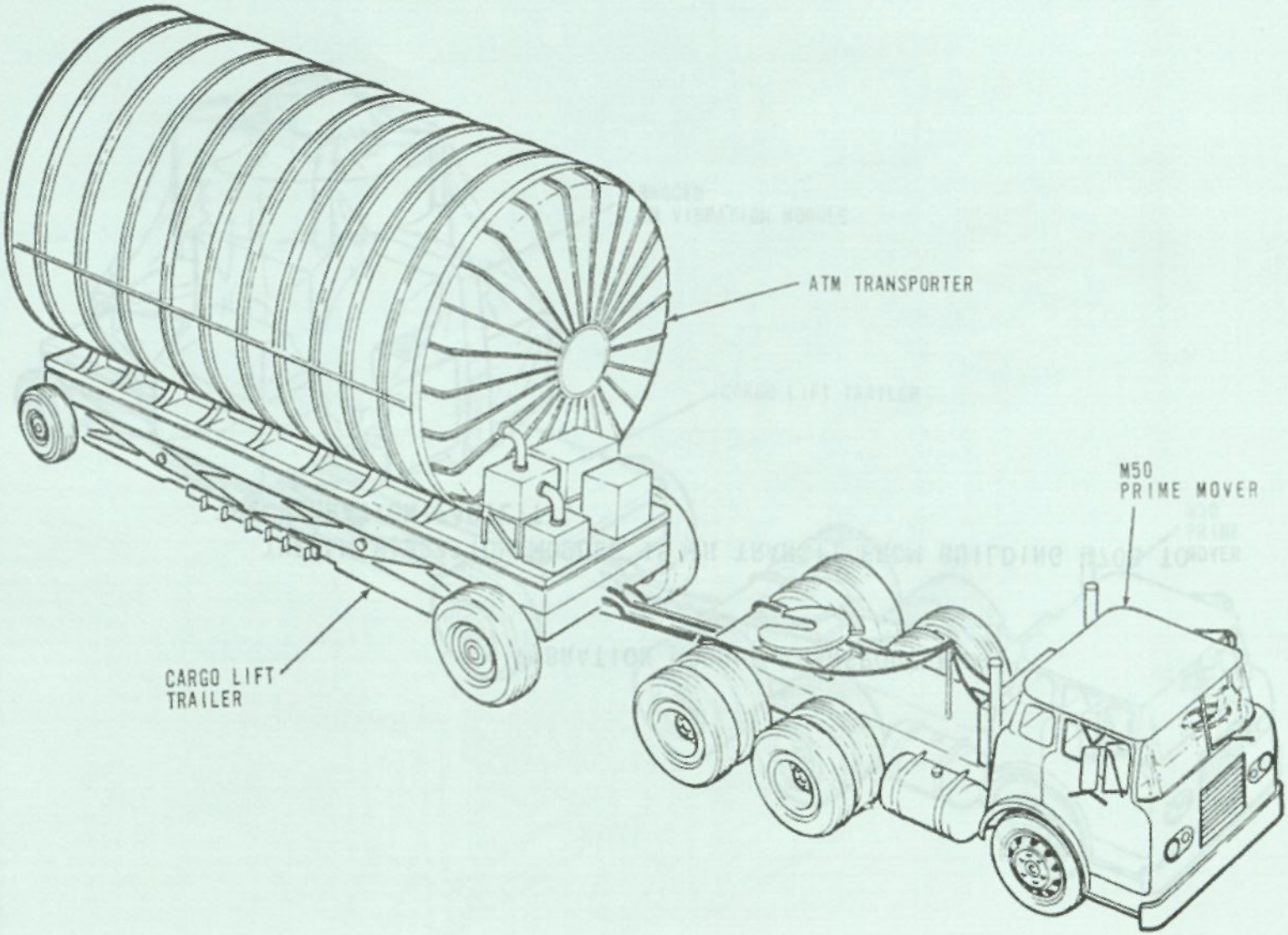
UPON COMPLETION OF THIS OPERATION, THE ATM WILL BE BAGGED FOR TRANSPORTATION TO THE VIBRATION FACILITY.


PLASTIC BAG
SOLAR WING
SOLAR WING INSTALLATION



ATM TRANSPORTER

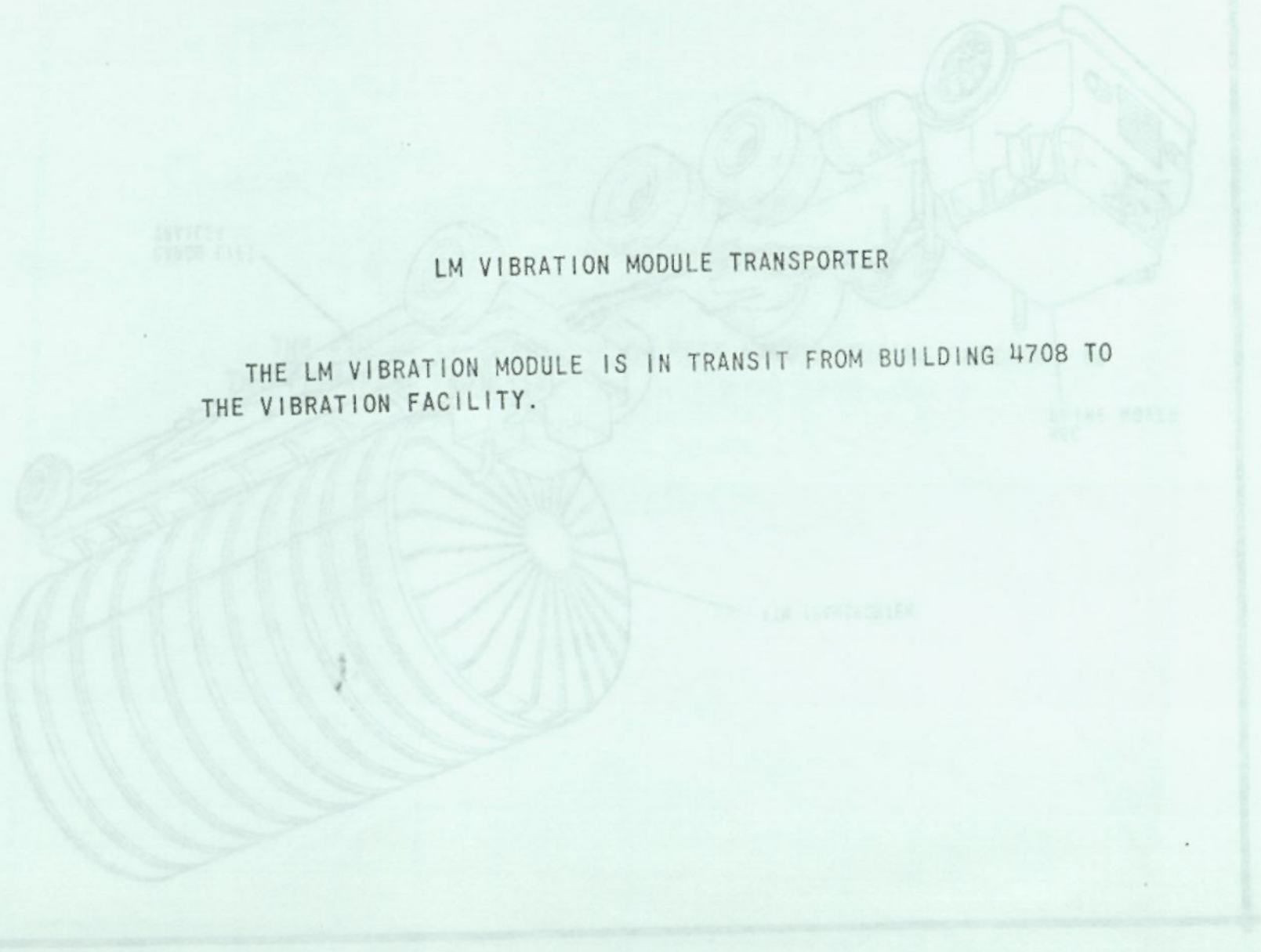
THE ATM IS IN TRANSIT FROM POST MANUFACTURING CHECKOUT TO THE VIBRATION FACILITY.



ATM TRANSPORTED

LM VIBRATION MODULE TRANSPORTER

THE LM VIBRATION MODULE IS IN TRANSIT FROM BUILDING 4708 TO THE VIBRATION FACILITY.



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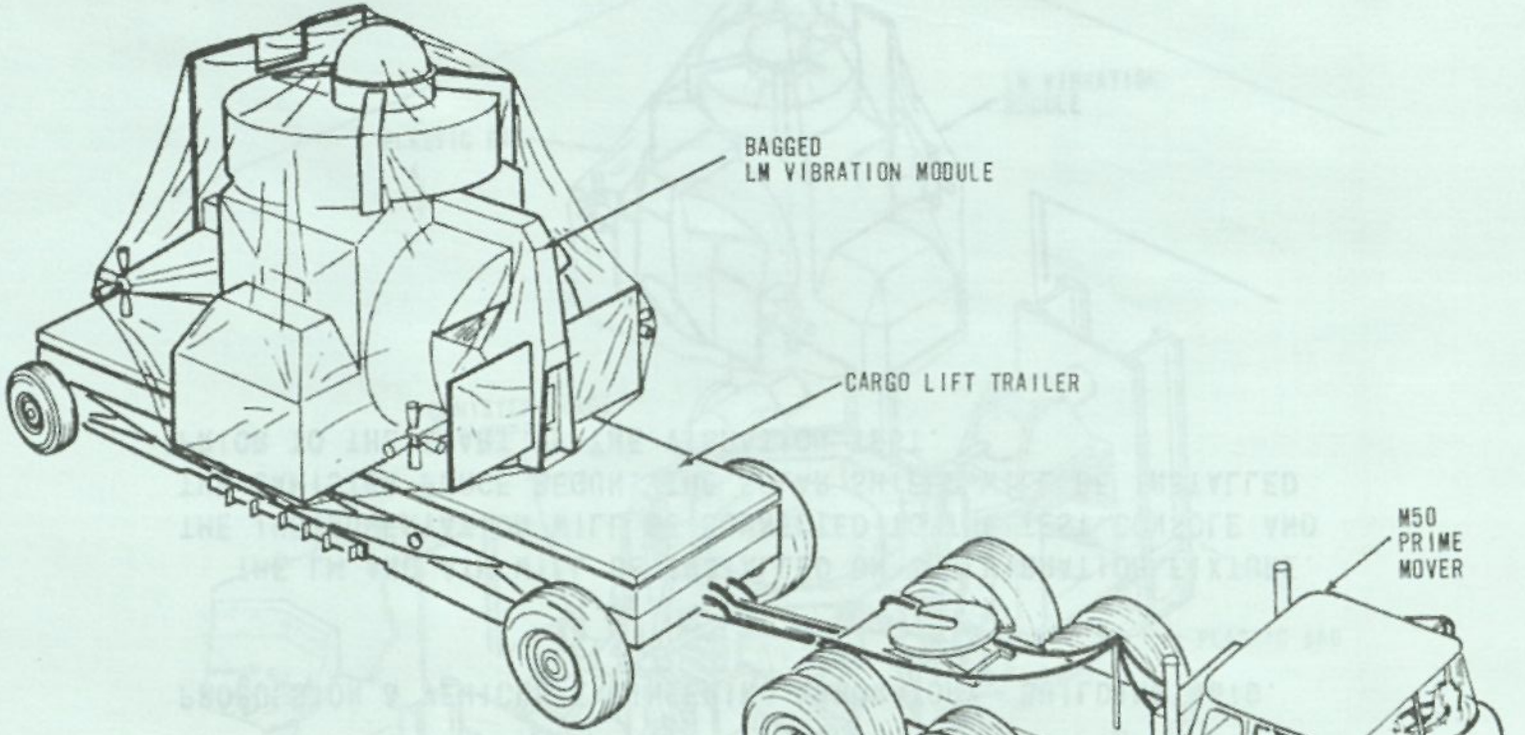
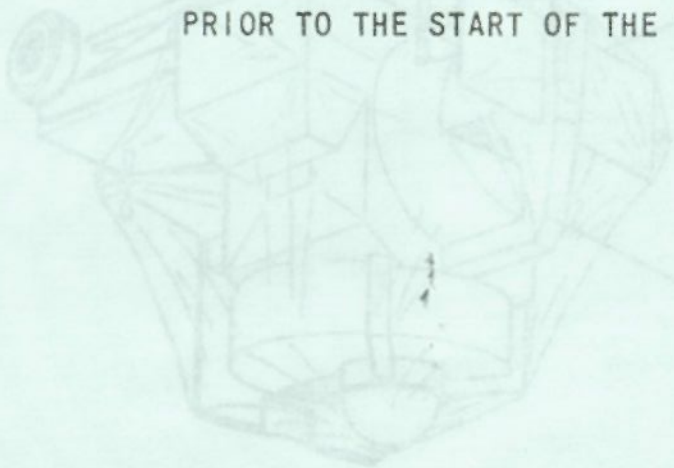


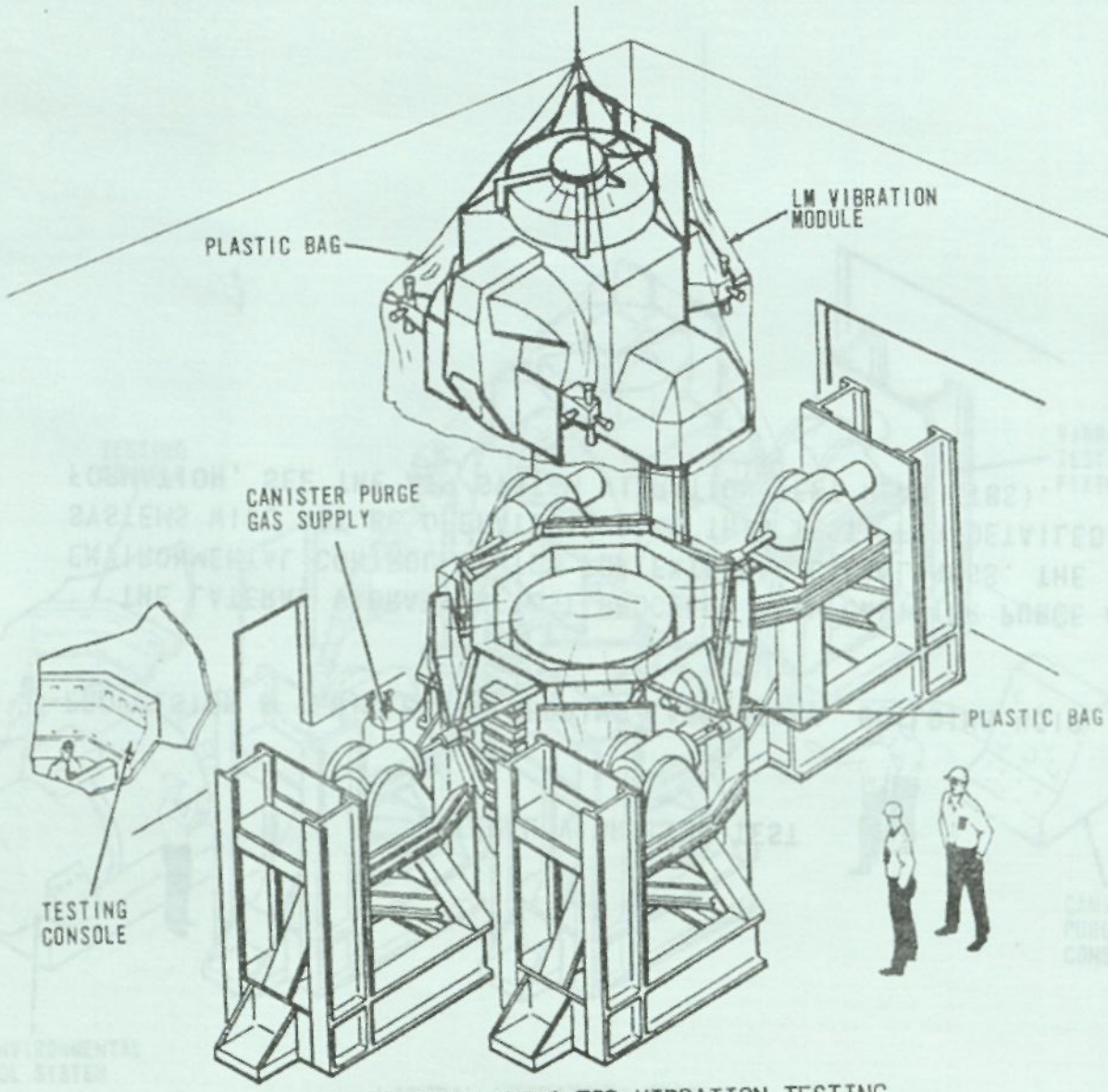
LM VIBRATION MODULE TRANSPORTED

LM & ATM MATING FOR VIBRATION TESTING

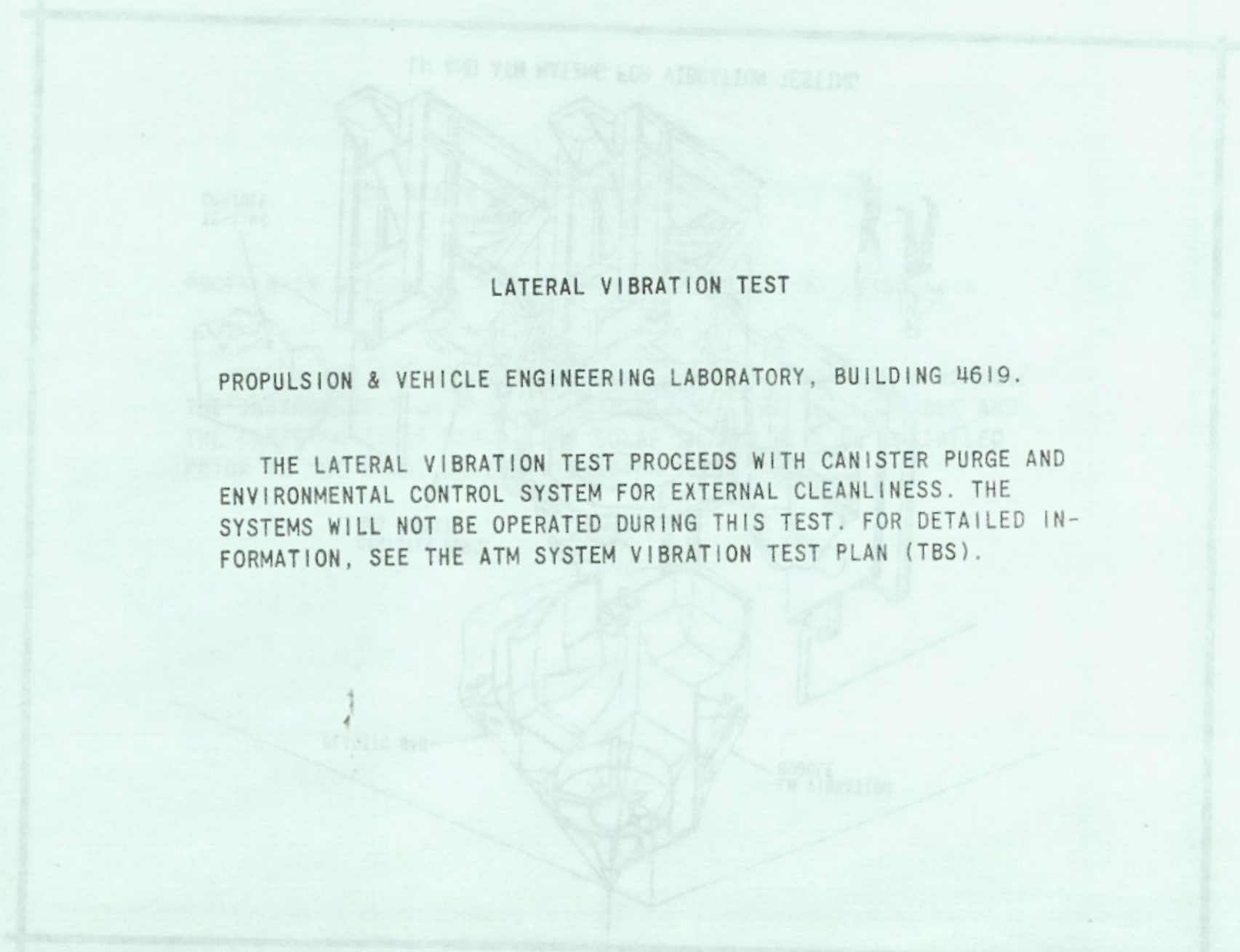
PROPULSION & VEHICLE ENGINEERING LABORATORY, BUILDING 4619.

THE LM AND ATM WILL BE INSTALLED ON THE VIBRATION FIXTURE. THE INSTRUMENTATION WILL BE CONNECTED TO THE TEST CONSOLE AND THE CANISTER PURGE BEGUN. THE SOLAR SHIELD WILL BE INSTALLED PRIOR TO THE START OF THE VIBRATION TEST.





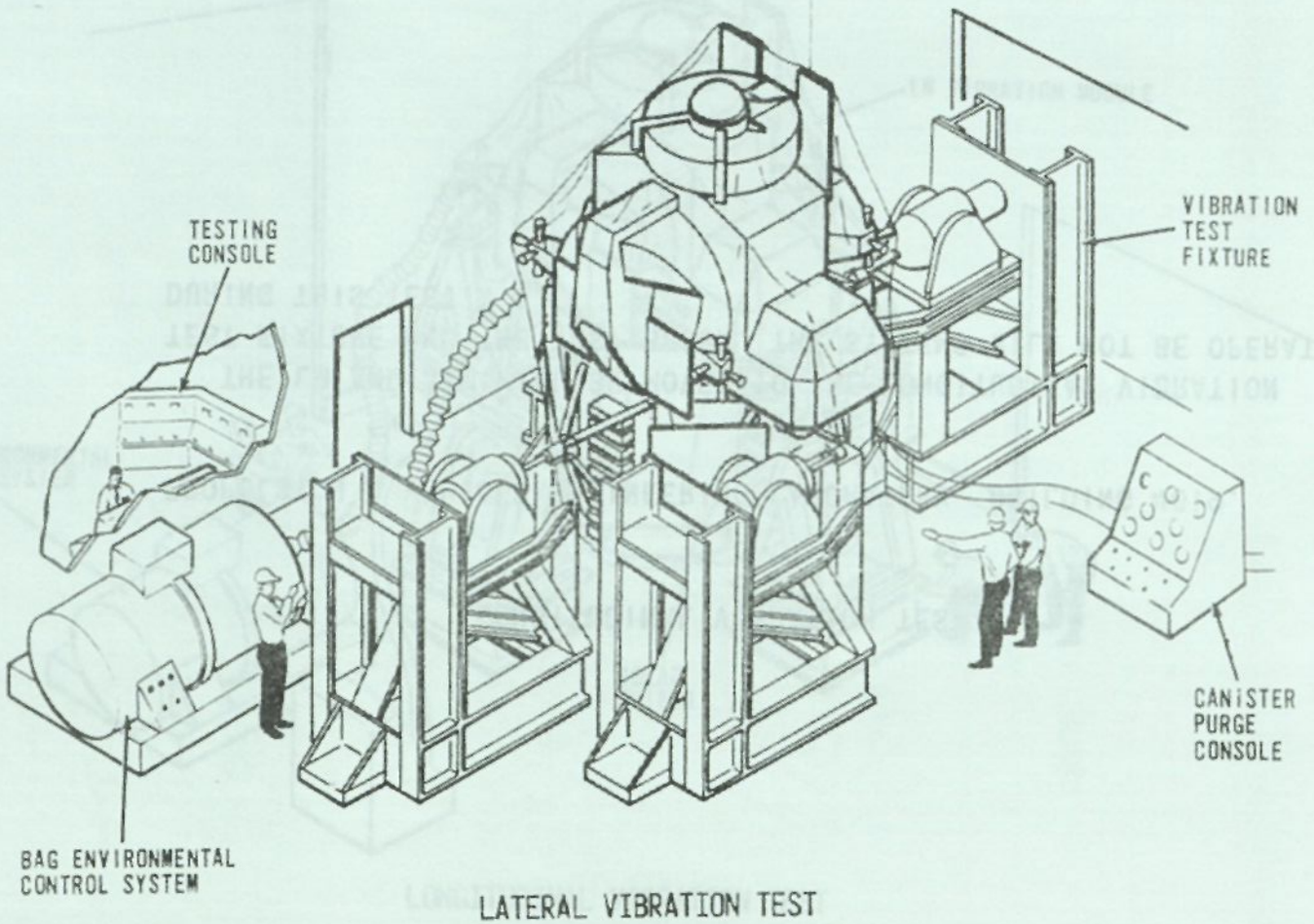
LM AND ATM MATING FOR VIBRATION TESTING



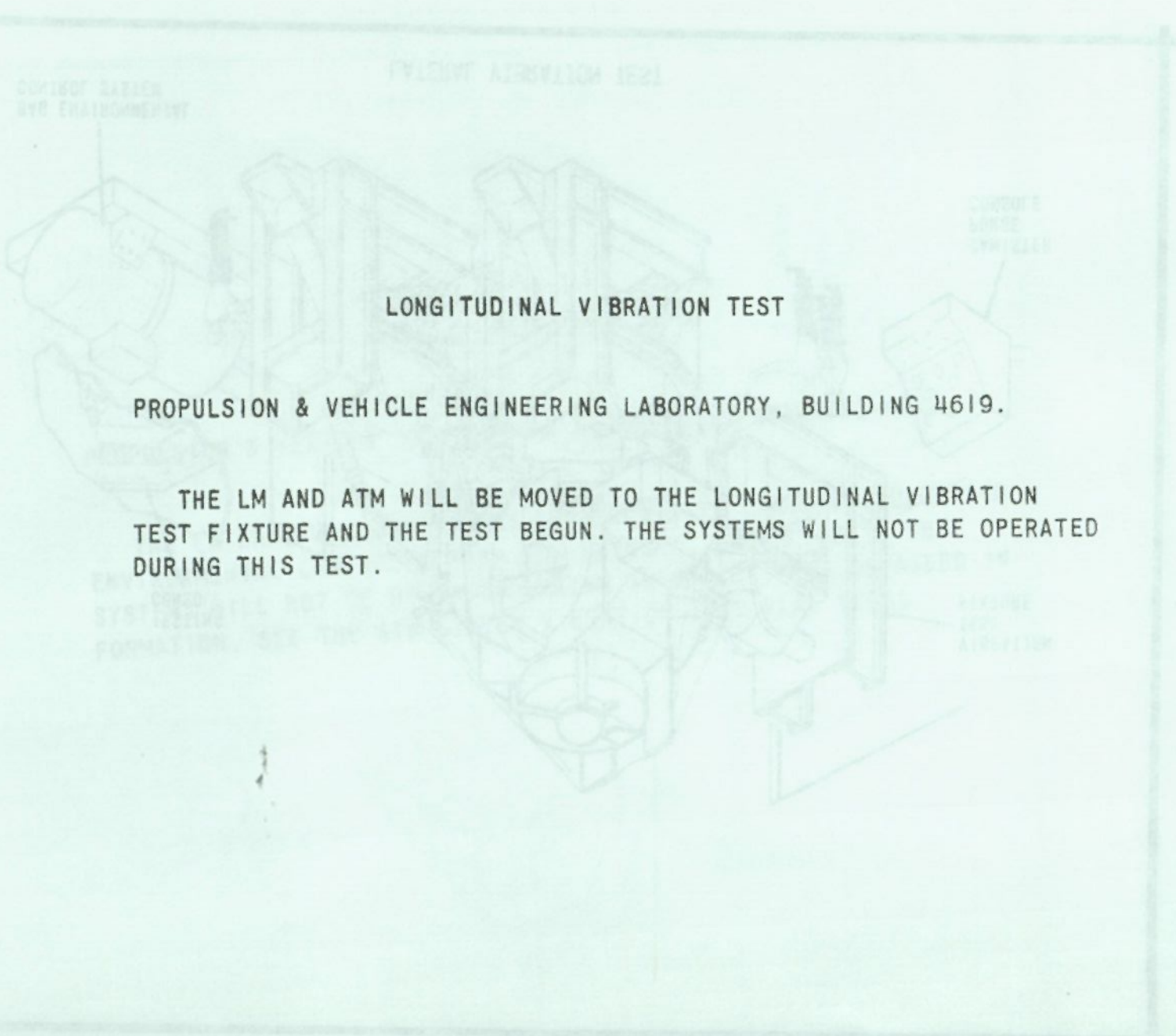
LATERAL VIBRATION TEST

PROPULSION & VEHICLE ENGINEERING LABORATORY, BUILDING 4619.

THE LATERAL VIBRATION TEST PROCEEDS WITH CANISTER PURGE AND ENVIRONMENTAL CONTROL SYSTEM FOR EXTERNAL CLEANLINESS. THE SYSTEMS WILL NOT BE OPERATED DURING THIS TEST. FOR DETAILED INFORMATION, SEE THE ATM SYSTEM VIBRATION TEST PLAN (TBS).



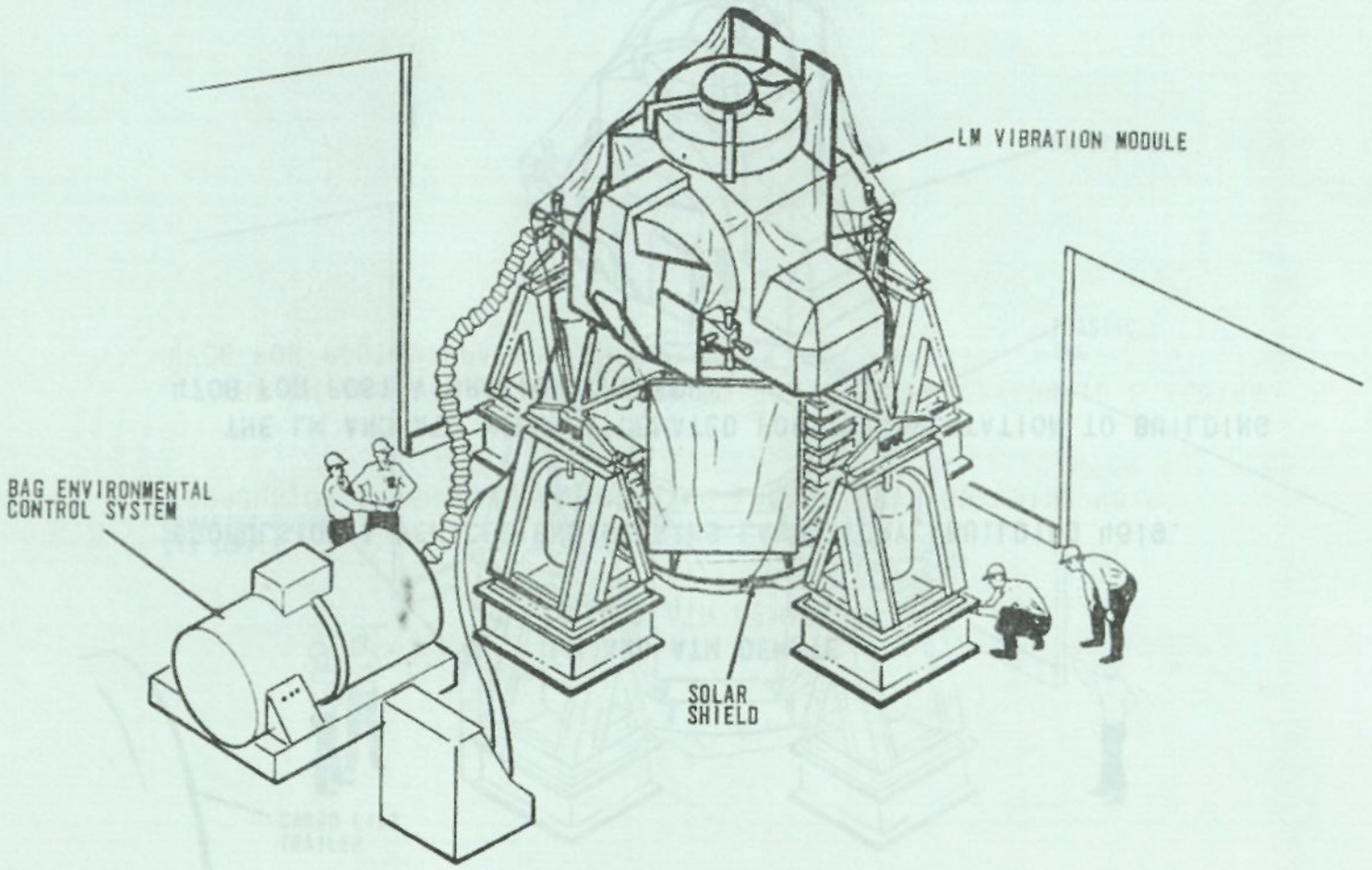
LATERAL VIBRATION TEST



LONGITUDINAL VIBRATION TEST

PROPULSION & VEHICLE ENGINEERING LABORATORY, BUILDING 4619.

THE LM AND ATM WILL BE MOVED TO THE LONGITUDINAL VIBRATION TEST FIXTURE AND THE TEST BEGUN. THE SYSTEMS WILL NOT BE OPERATED DURING THIS TEST.

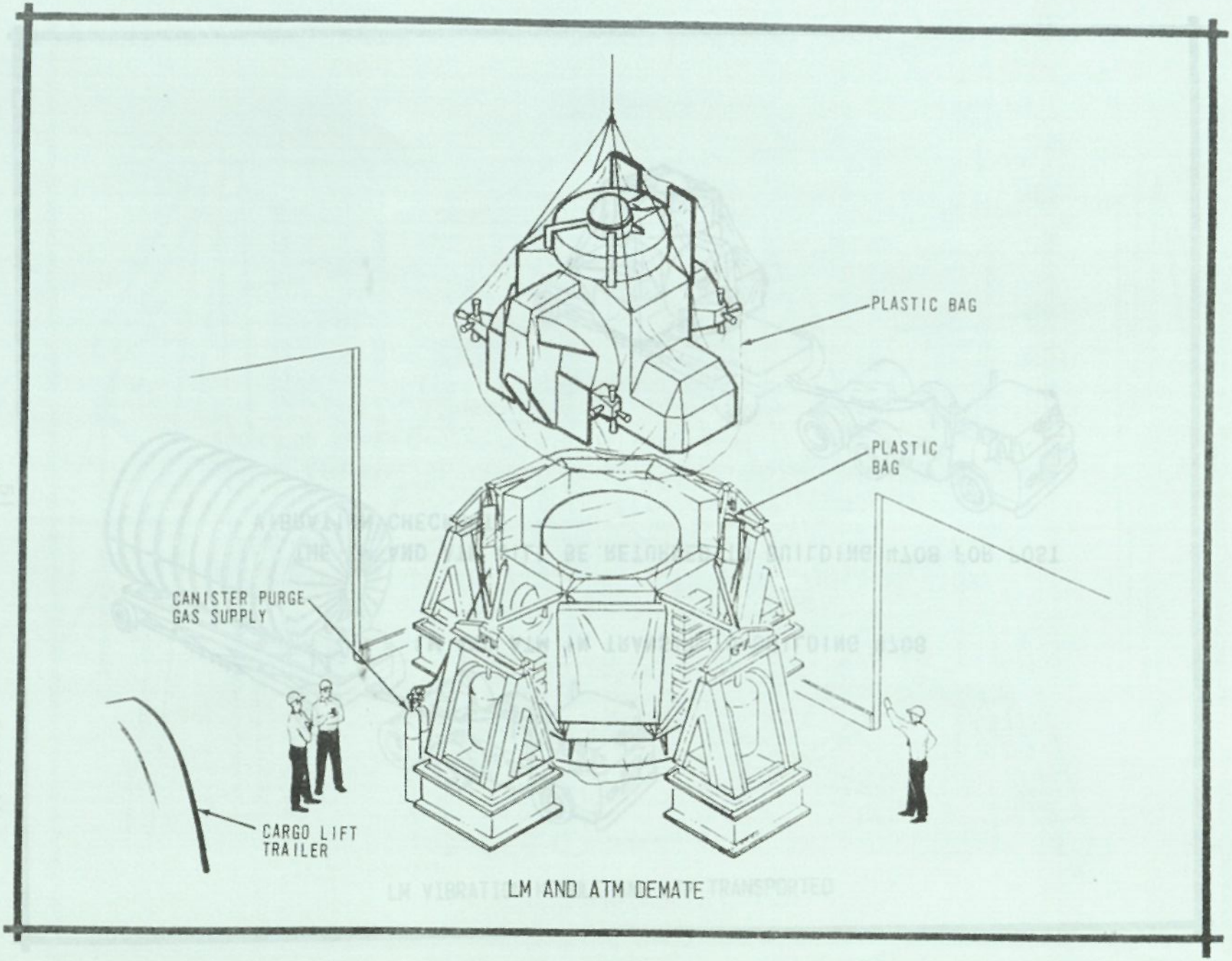


LONGITUDINAL VIBRATION TEST

LM AND ATM DEMATE

PROPULSION & VEHICLE ENGINEERING LABORATORY, BUILDING 4619.

THE LM AND ATM WILL BE DEMATED FOR TRANSPORTATION TO BUILDING 4708 FOR POST VIBRATION CHECKOUT.

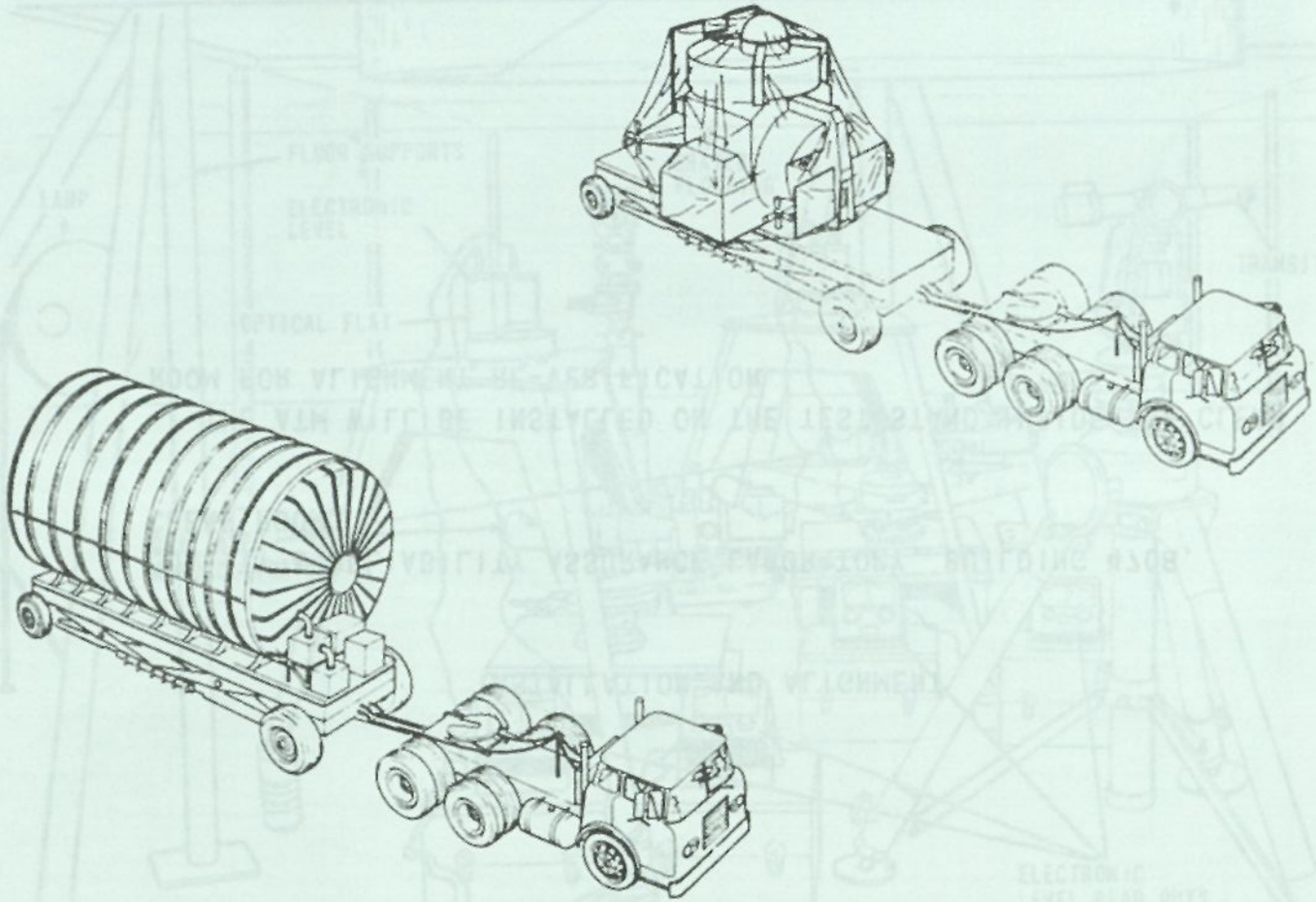


LM AND ATM DEMATE

50M02416 9 6t

LM AND ATM IN TRANSIT TO BUILDING 4708

THE LM AND ATM WILL BE RETURNED TO BUILDING 4708 FOR POST VIBRATION CHECKOUT.

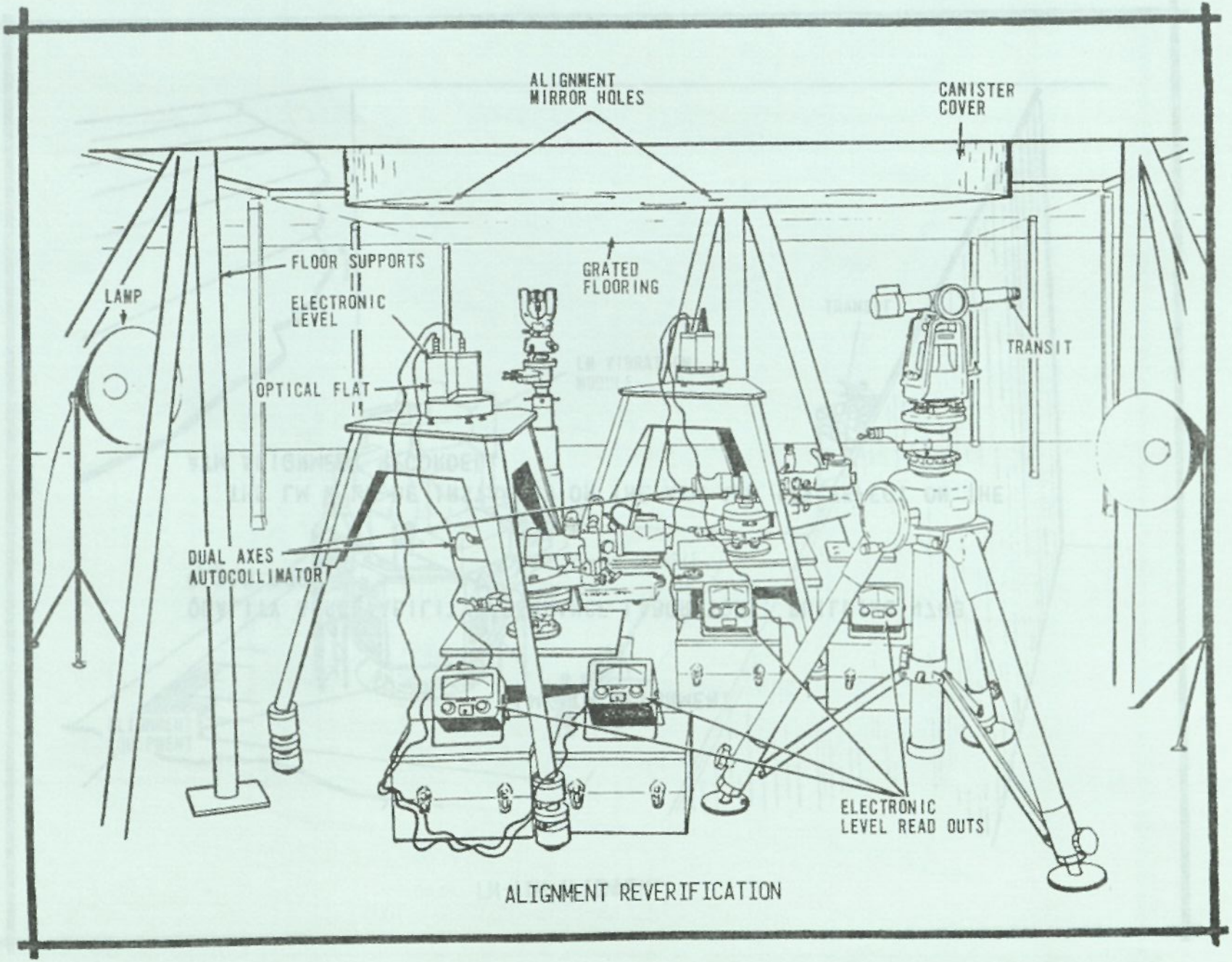


LM VIBRATION MODULE AND ATM TRANSPORTED

INSTALLATION AND ALIGNMENT

QUALITY & RELIABILITY ASSURANCE LABORATORY, BUILDING 4708, CLEAN ROOM.

THE ATM WILL BE INSTALLED ON THE TEST STAND INSIDE THE CLEAN ROOM FOR ALIGNMENT RE-VERIFICATION.

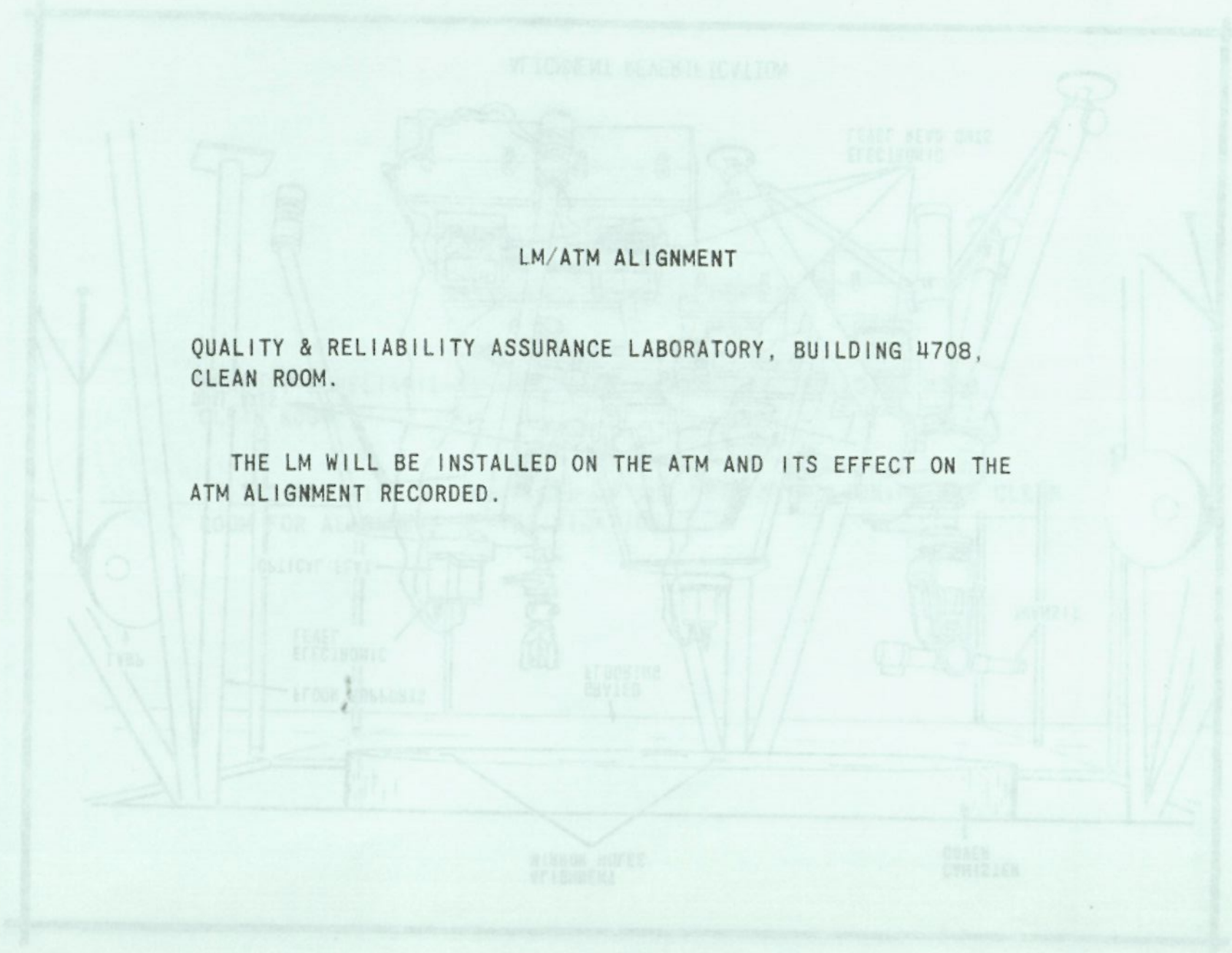


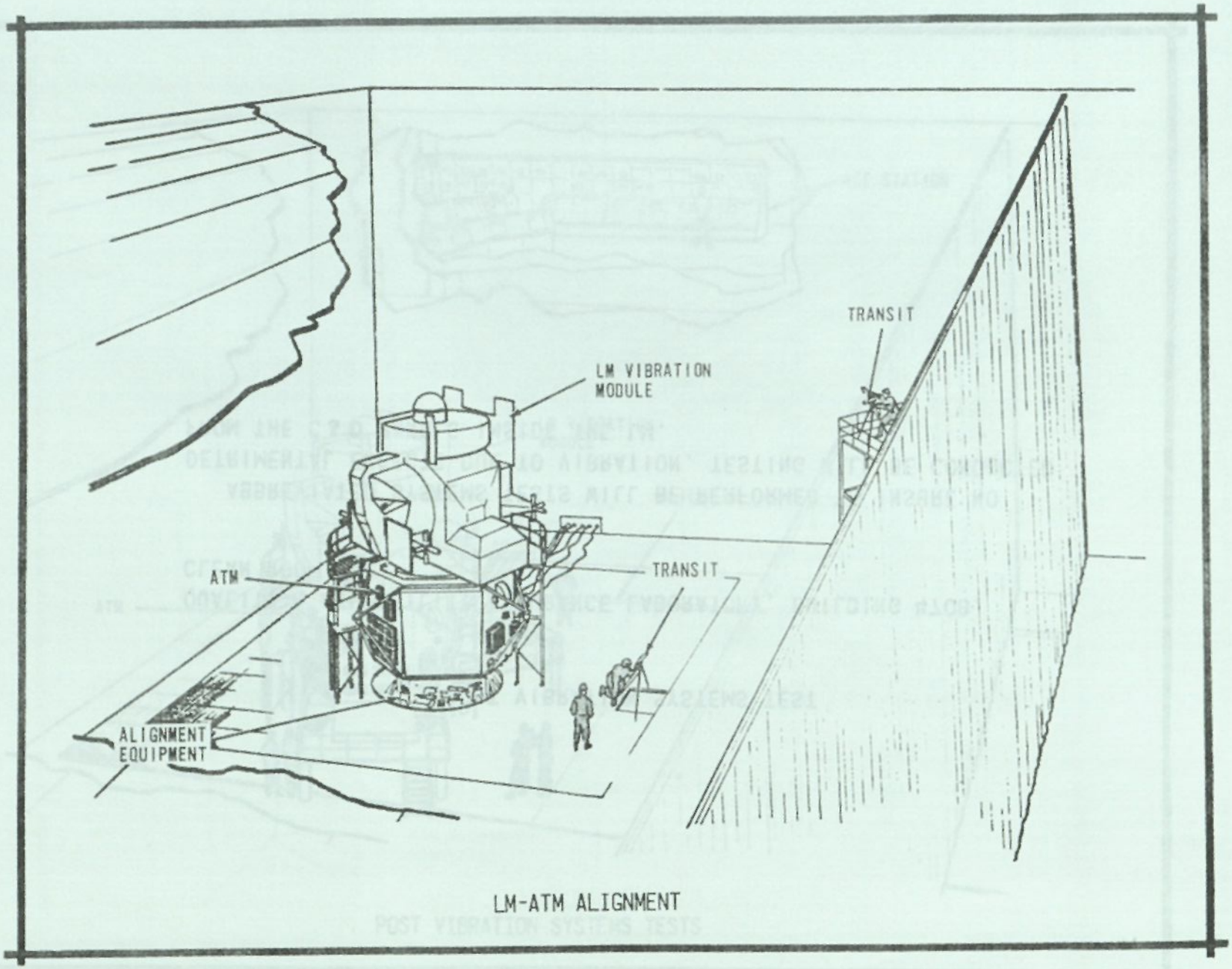
ALIGNMENT REVERIFICATION

LM/ATM ALIGNMENT

QUALITY & RELIABILITY ASSURANCE LABORATORY, BUILDING 4708, CLEAN ROOM.

THE LM WILL BE INSTALLED ON THE ATM AND ITS EFFECT ON THE ATM ALIGNMENT RECORDED.



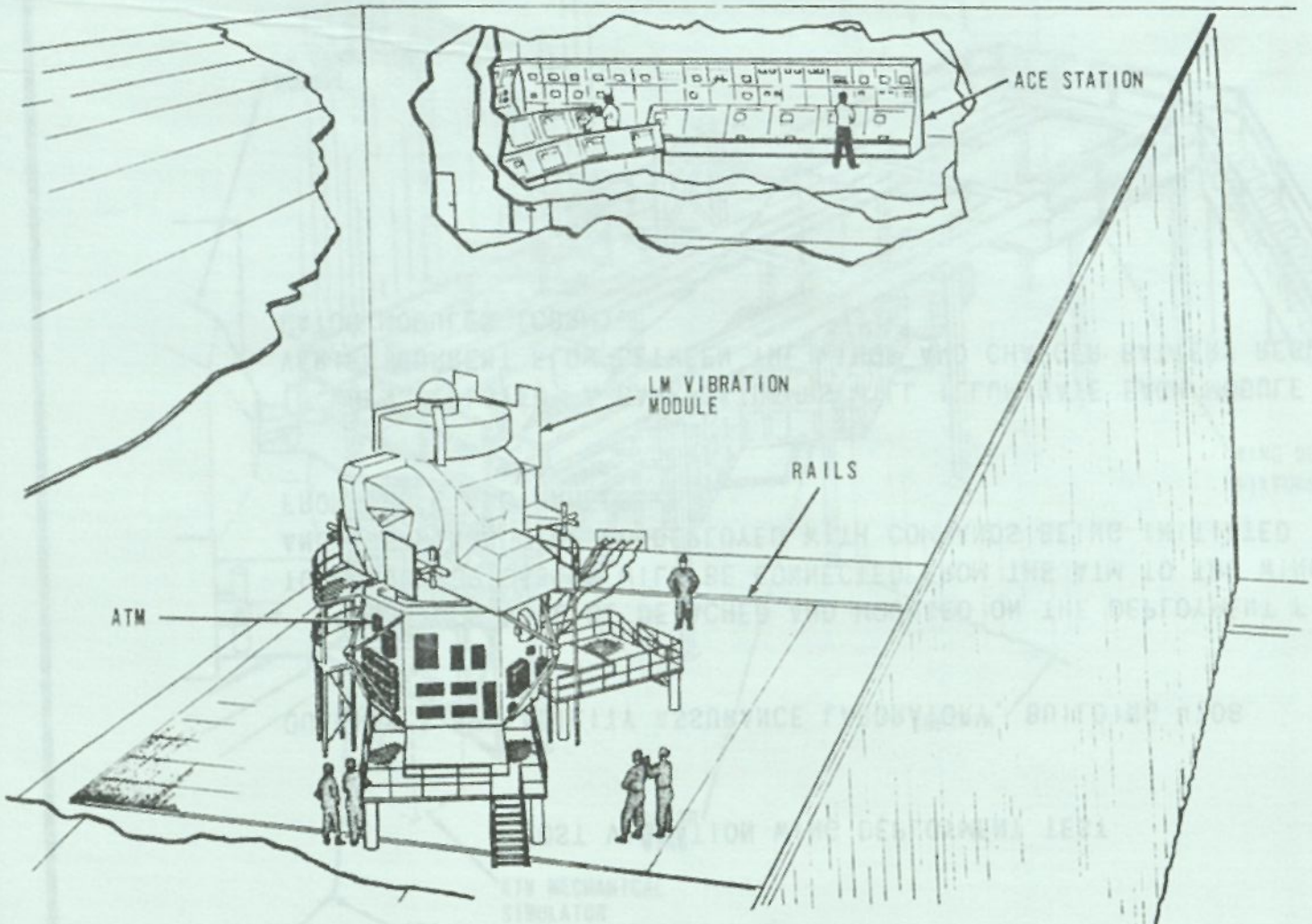


LM-ATM ALIGNMENT

POST VIBRATION SYSTEMS TEST

QUALITY & RELIABILITY ASSURANCE LABORATORY, BUILDING 4708, CLEAN ROOM.

ABBREVIATED SYSTEMS TESTS WILL BE PERFORMED TO INSURE NO DETRIMENTAL EFFECTS DUE TO VIBRATION. TESTING WILL BE CONDUCTED FROM THE C & D PANELS INSIDE THE LM.



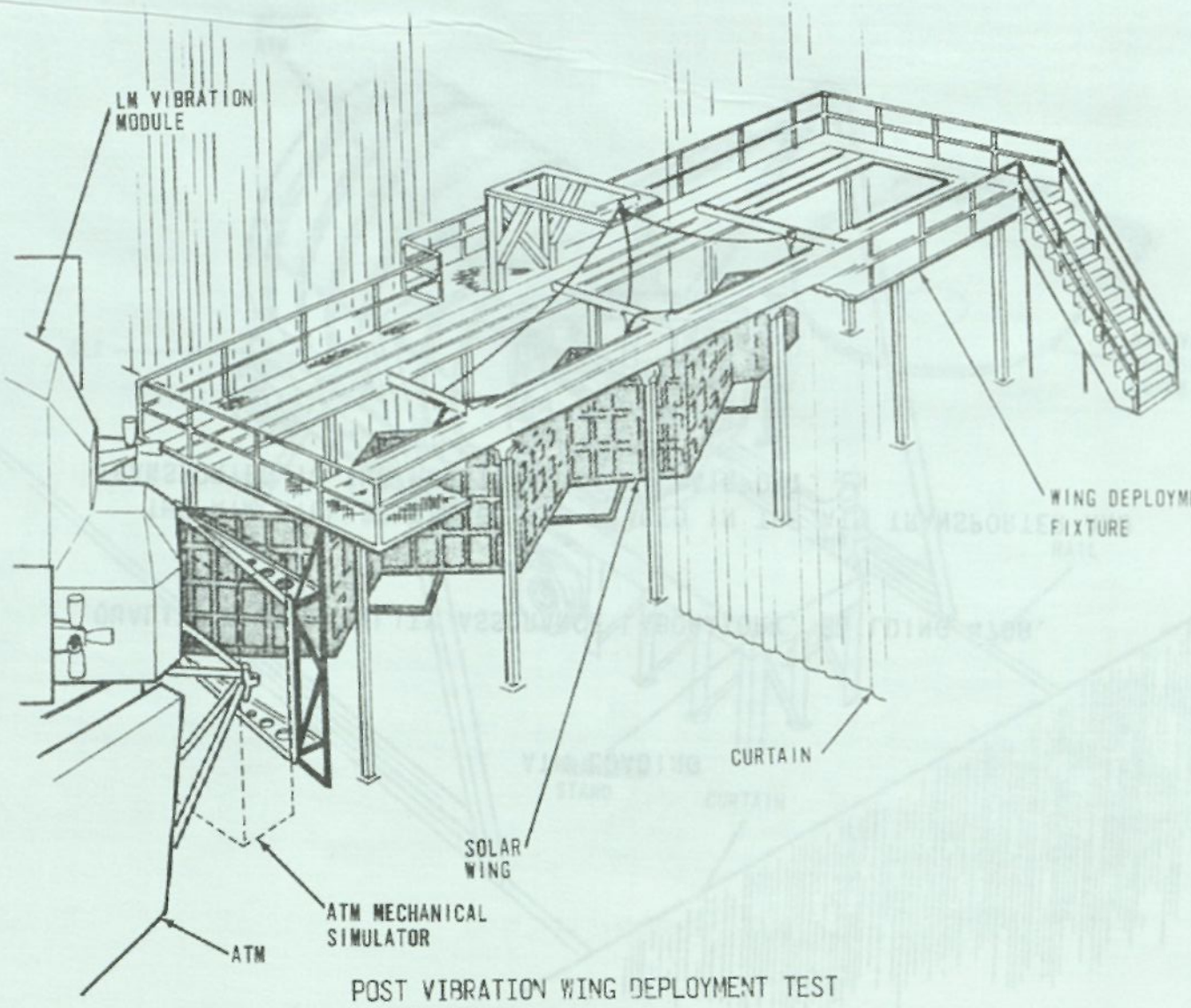
POST VIBRATION SYSTEMS TESTS

POST VIBRATION WING DEPLOYMENT TEST

QUALITY & RELIABILITY ASSURANCE LABORATORY, BUILDING 4708.

THE WINGS WILL BE DETACHED AND MOUNTED ON THE DEPLOYMENT FIXTURE. JUMPER CABLES WILL BE CONNECTED FROM THE ATM TO THE WING AND THE WINGS WILL BE DEPLOYED WITH COMMANDS BEING INITIATED FROM THE C & D PANELS.

WHEN DEPLOYED, A BANK OF LAMPS WILL ILLUMINATE EACH MODULE TO VERIFY CURRENT FLOW BETWEEN THE WINGS AND CHARGER BATTERY REGULATOR MODULES (CBRM).

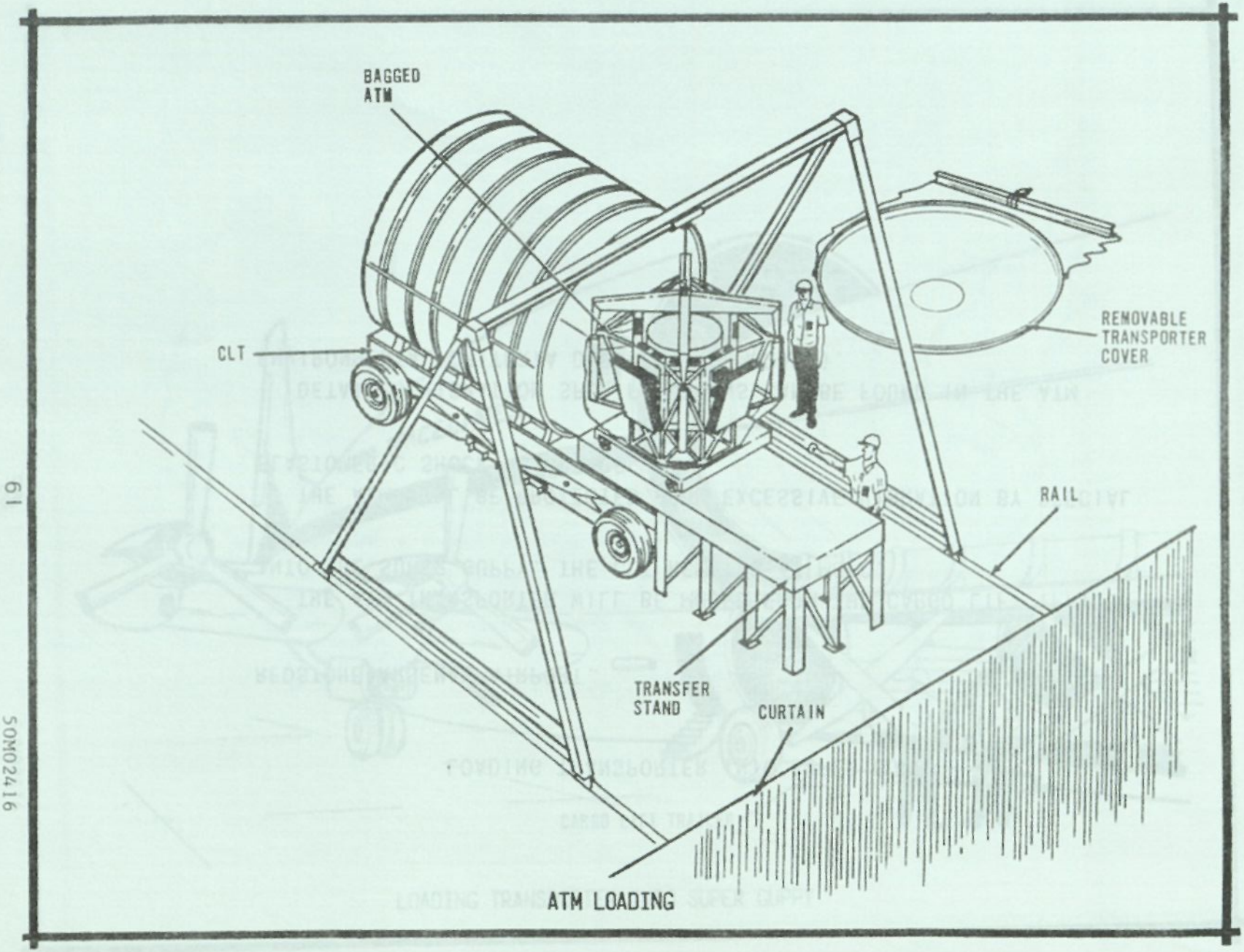


POST VIBRATION WING DEPLOYMENT TEST

ATM LOADING

QUALITY & RELIABILITY ASSURANCE LABORATORY, BUILDING 4708.

THE ATM WILL BE BAGGED AND PLACED IN THE ATM TRANSPORTER AND TRANSPORTED TO THE REDSTONE ARSENAL AIRPORT.



ATM LOADING

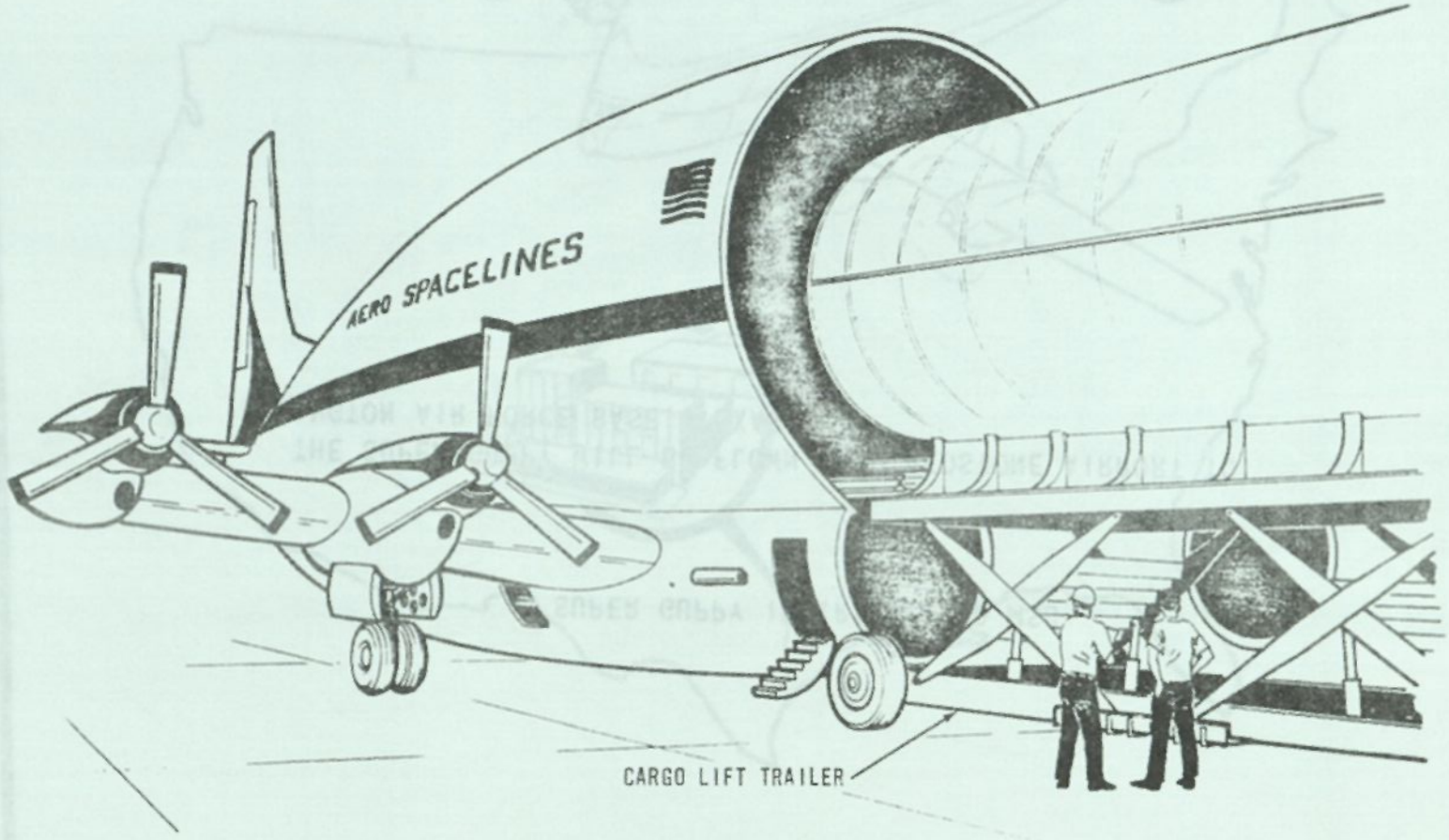
LOADING TRANSPORTER INTO SUPER GUPPY

REDSTONE ARSENAL AIRPORT.

THE ATM TRANSPORTER WILL BE MOVED FROM THE CARGO LIFT TRAILER INTO THE SUPER GUPPY. THE CLT REMAINS AT MSFC.

THE ATM WILL BE PROTECTED FROM EXCESSIVE VIBRATION BY SPECIAL ELASTOMERIC SHOCK ABSORBERS.

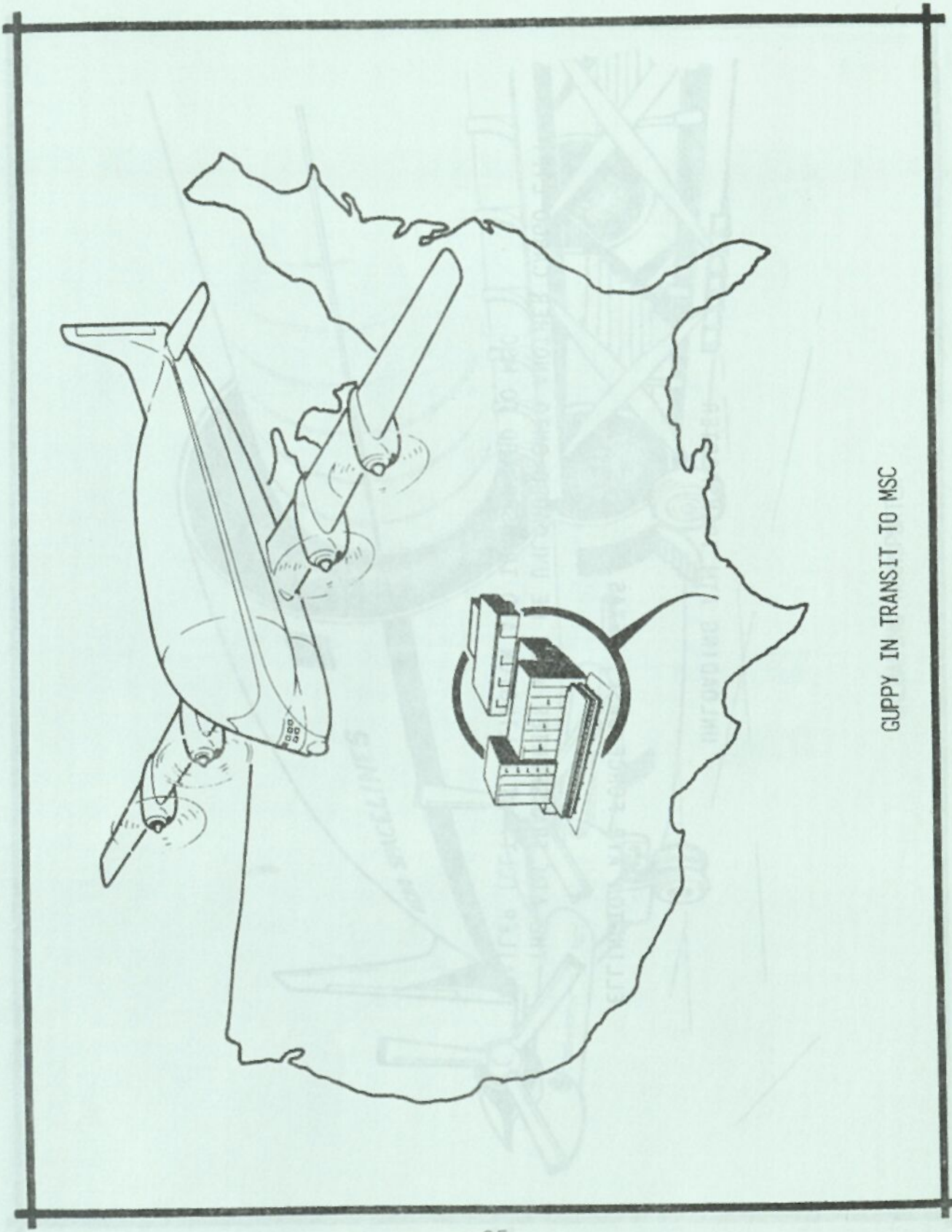
DETAILED VIBRATION SPECIFICATIONS CAN BE FOUND IN THE ATM ENVIRONMENTAL CRITERIA DOCUMENT (50M02408).



LOADING TRANSPORTER INTO SUPER GUPPY

SUPER GUPPY IN TRANSIT TO MSC

THE SUPER GUPPY WILL BE FLOWN FROM REDSTONE AIRPORT TO ELLINGTON AIR FORCE BASE, TEXAS.

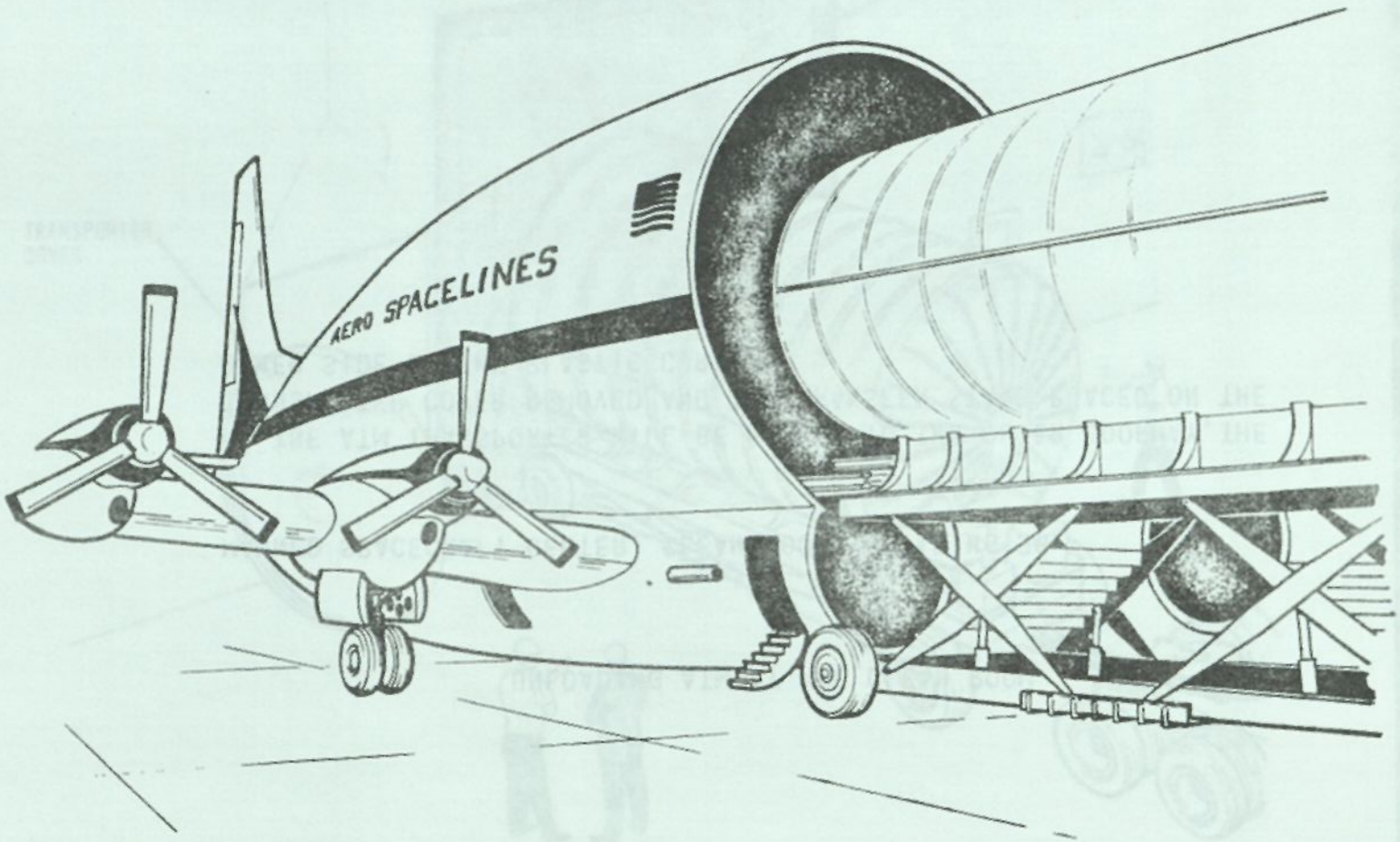


GUPPY IN TRANSIT TO MSC

UNLOADING ATM TRANSPORTER

ELLINGTON AIR FORCE BASE, TEXAS.

THE ATM TRANSPORTER WILL BE UNLOADED ONTO ANOTHER CARGO LIFT TRAILER (CLT) AT ELLINGTON AND TRANSPORTED TO MSC.



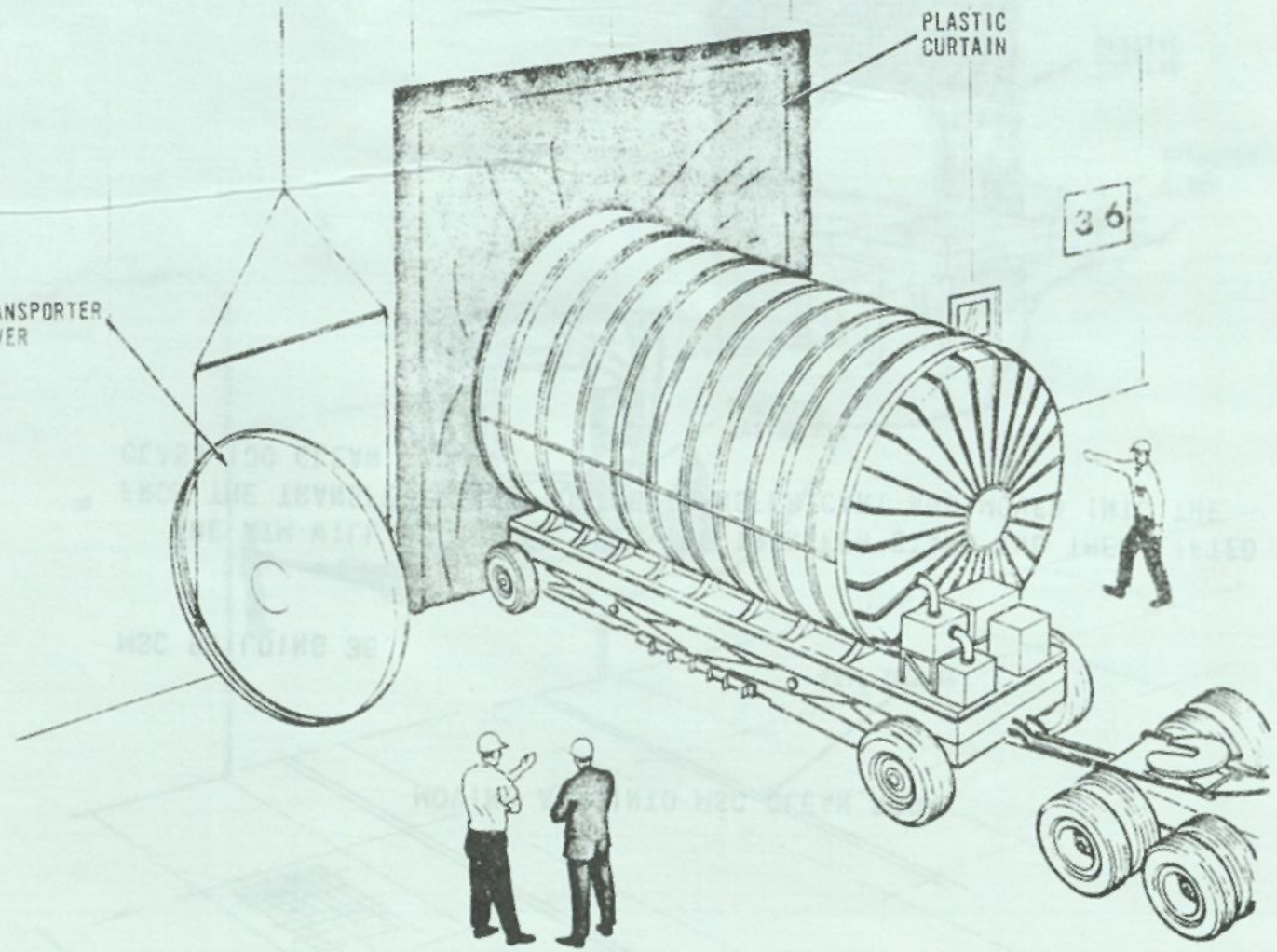
UNLOADING TRANSPORTER

UNLOADING ATM AT MSC CLEAN ROOM

MANNED SPACECRAFT CENTER, CLEAN ROOM, BUILDING 36.

THE ATM TRANSPORTER WILL BE BACKED TO THE OUTER DOORWAY, THE TRANSPORTER COVER REMOVED AND THE TRANSFER STAND PLACED ON THE OTHER SIDE OF THE PLASTIC CURTAIN.

50M02416

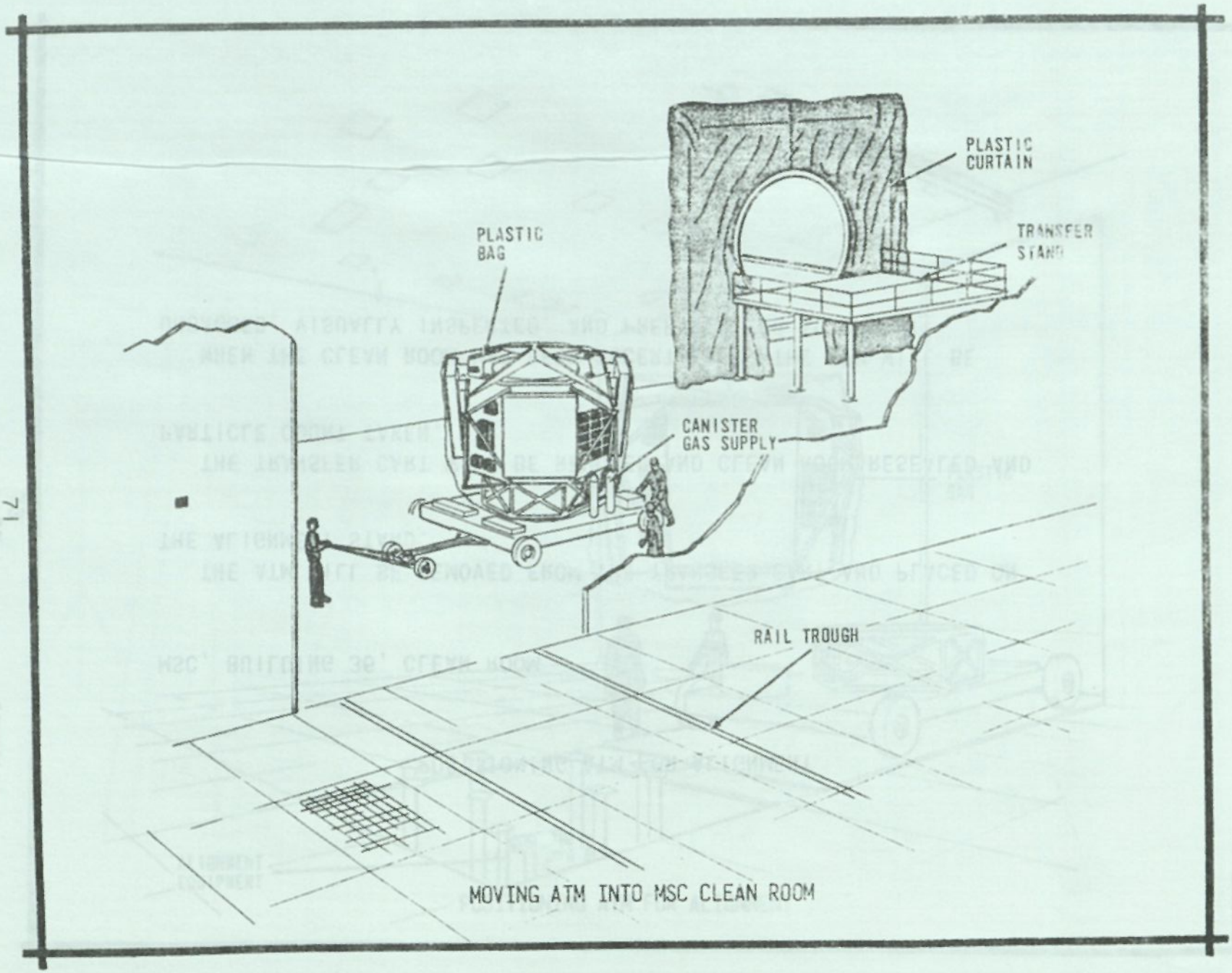


UNLOADING ATM AT MSC CLEAN ROOM

MOVING ATM INTO MSC CLEAN ROOM

MSC BUILDING 36.

THE ATM WILL BE ROLLED ONTO THE TRANSFER STAND AND THEN LIFTED FROM THE TRANSFER STAND TO THE TRANSFER CART AND MOVED INTO THE CLASS 100 CLEAN ROOM.



MOVING ATM INTO MSC CLEAN ROOM

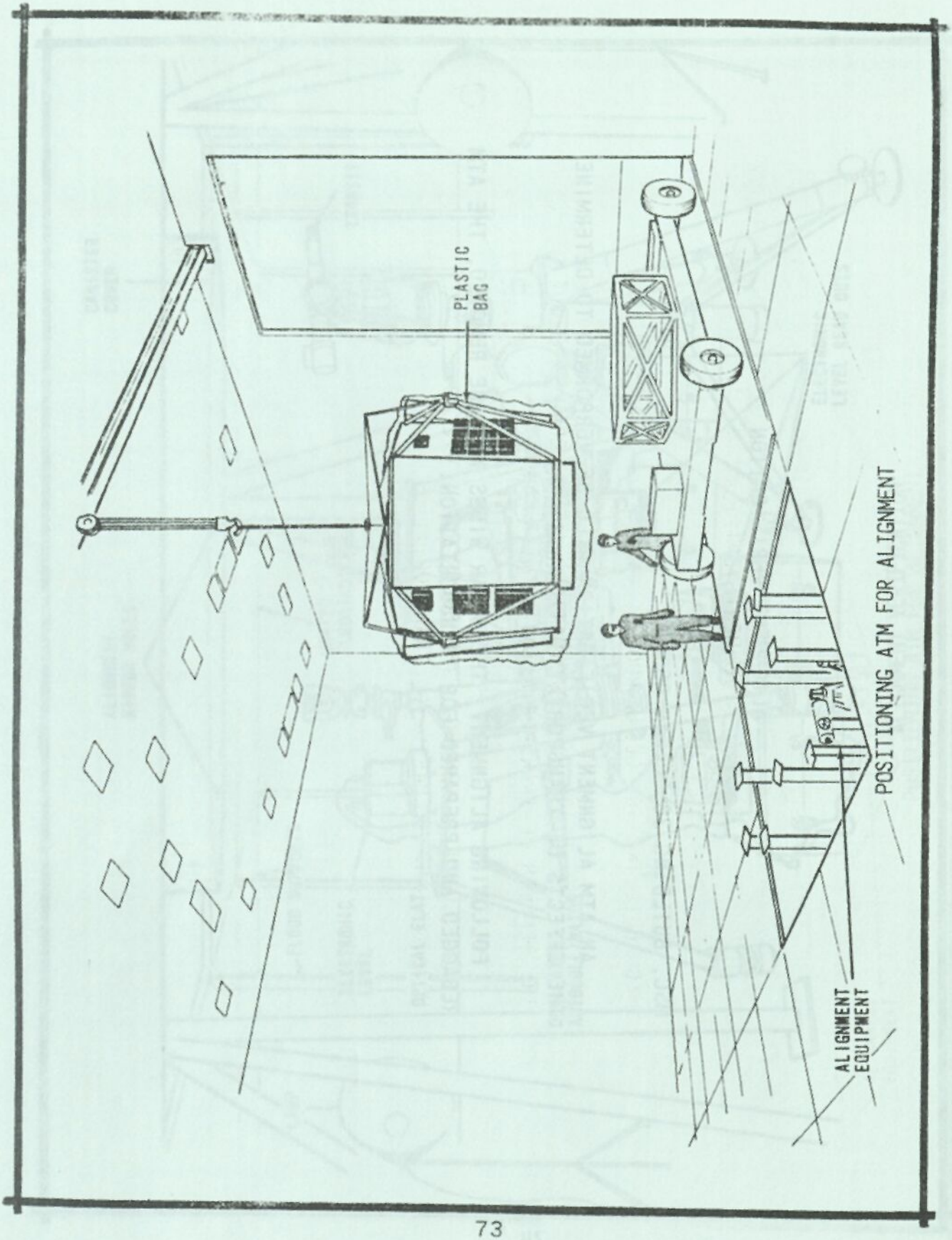
POSITIONING ATM FOR ALIGNMENT

MSC, BUILDING 36, CLEAN ROOM.

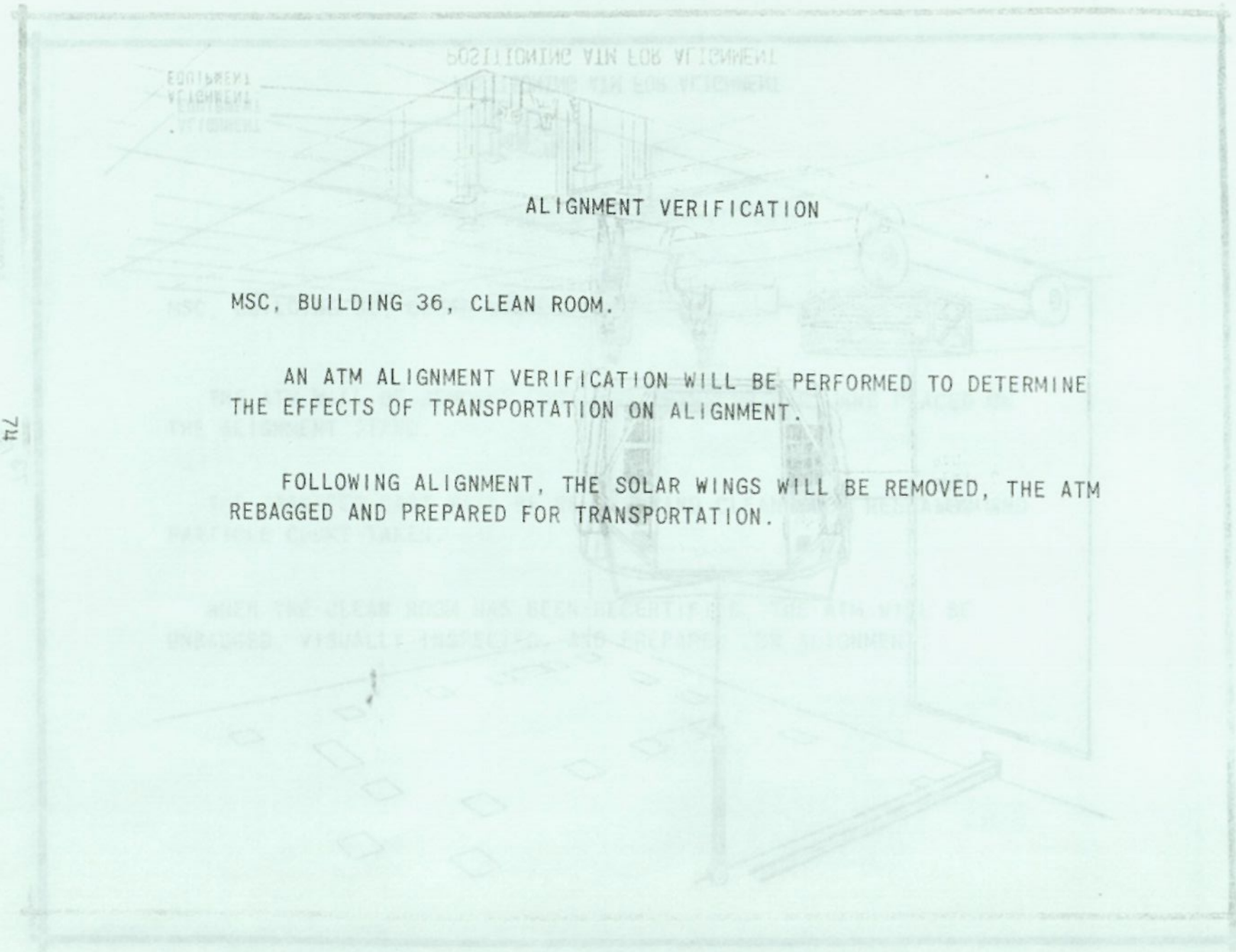
THE ATM WILL BE REMOVED FROM THE TRANSFER CART AND PLACED ON THE ALIGNMENT STAND.

THE TRANSFER CART WILL BE REMOVED AND CLEAN ROOM RESEALED AND PARTICLE COUNT TAKEN.

WHEN THE CLEAN ROOM HAS BEEN RECERTIFIED, THE ATM WILL BE UNBAGGED, VISUALLY INSPECTED, AND PREPARED FOR ALIGNMENT.


PLASTIC BAG
POSITIONING ATM FOR ALIGNMENT
ALIGNMENT EQUIPMENT

50M02416

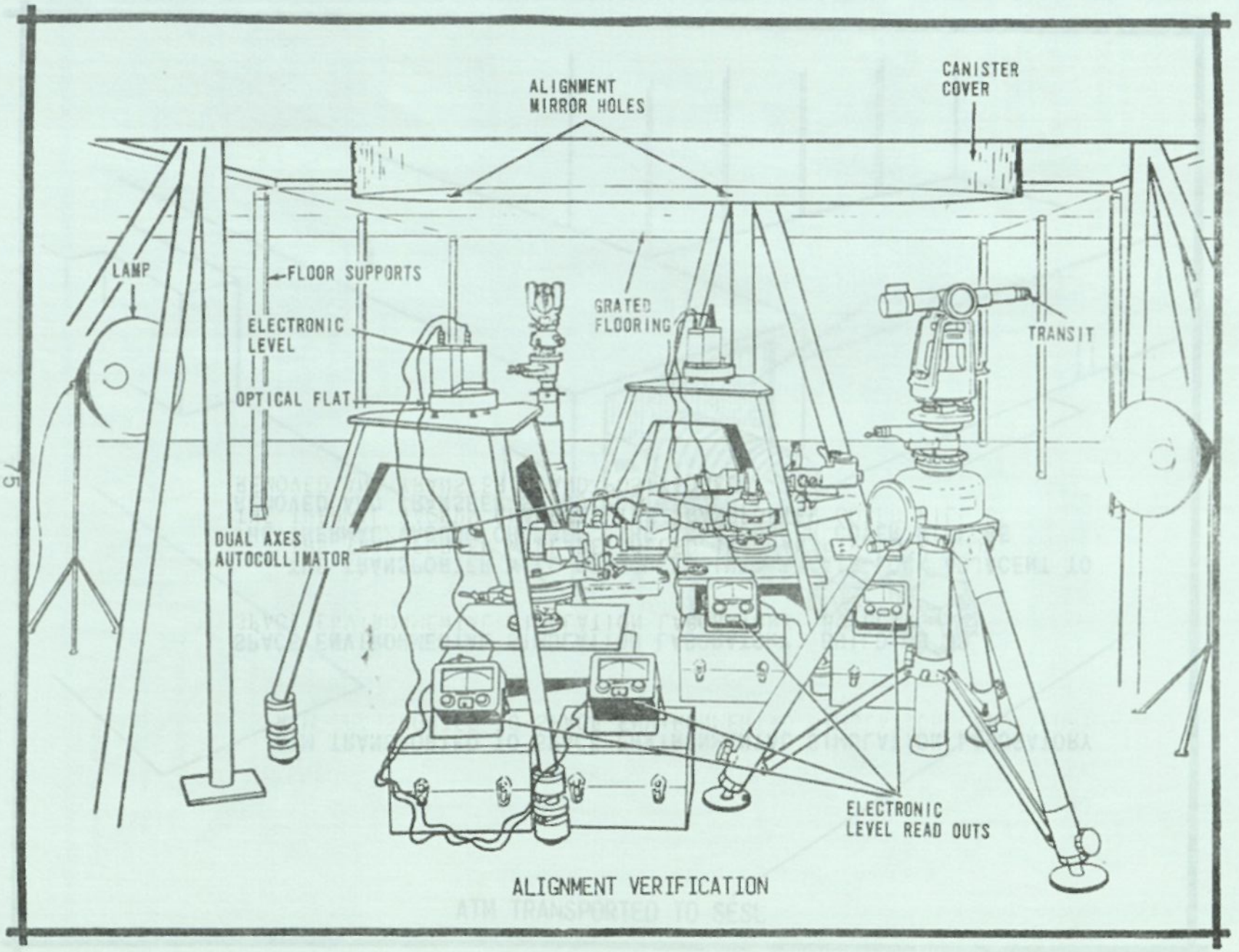


ALIGNMENT VERIFICATION

MSC, BUILDING 36, CLEAN ROOM.

AN ATM ALIGNMENT VERIFICATION WILL BE PERFORMED TO DETERMINE THE EFFECTS OF TRANSPORTATION ON ALIGNMENT.

FOLLOWING ALIGNMENT, THE SOLAR WINGS WILL BE REMOVED, THE ATM REBAGGED AND PREPARED FOR TRANSPORTATION.



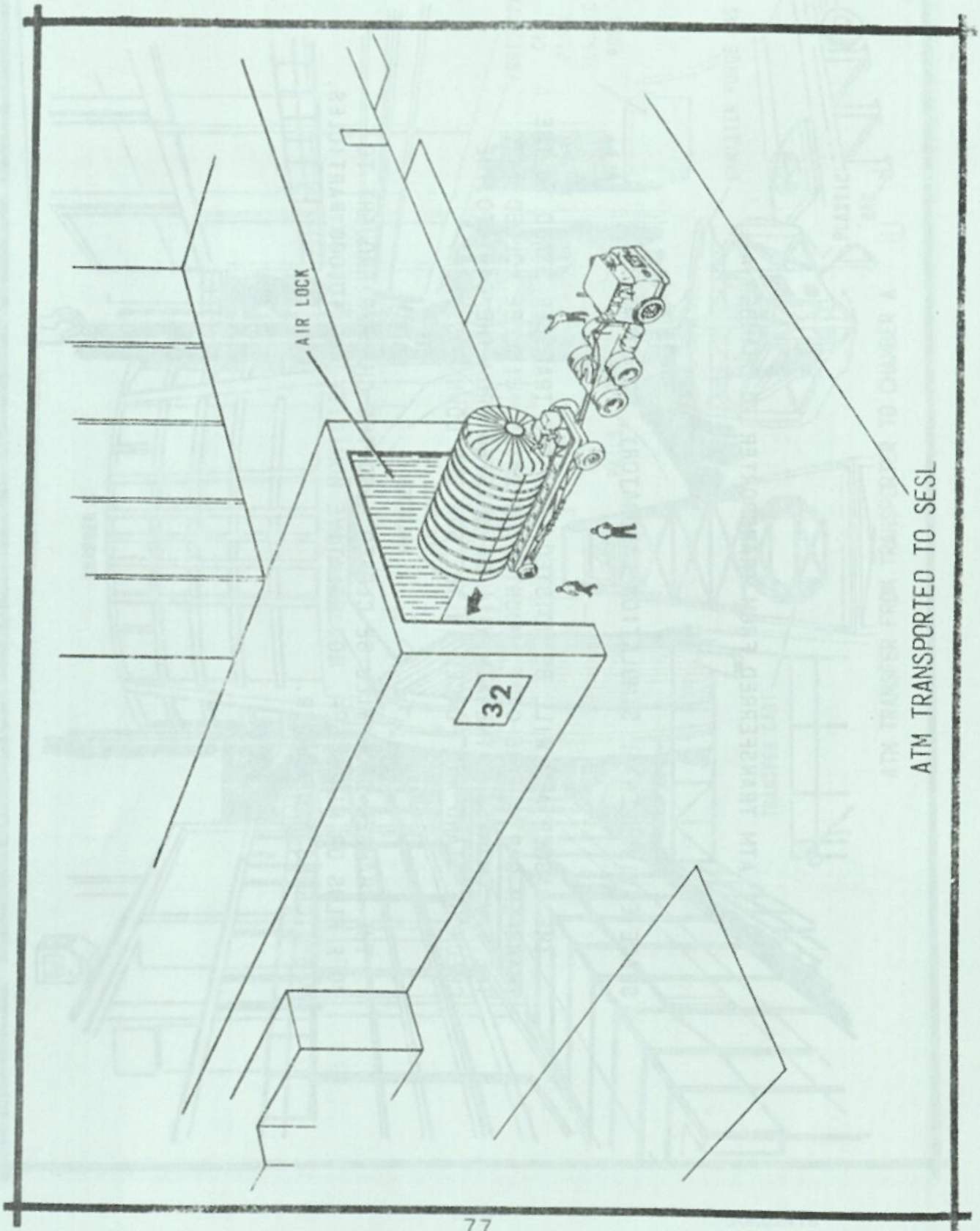
ALIGNMENT VERIFICATION

SOM02416

ATM TRANSPORTED TO SPACE ENVIRONMENTAL SIMULATION LABORATORY

SPACE ENVIRONMENTAL SIMULATION LABORATORY, BUILDING 32.

THE TRANSPORTER WILL BE ROLLED INTO AN AIR-LOCK ADJACENT TO THE THERMAL/VACUUM CHAMBER. THE TRANSPORTER COVER WILL BE REMOVED AND TRANSFER STAND POSITIONED.



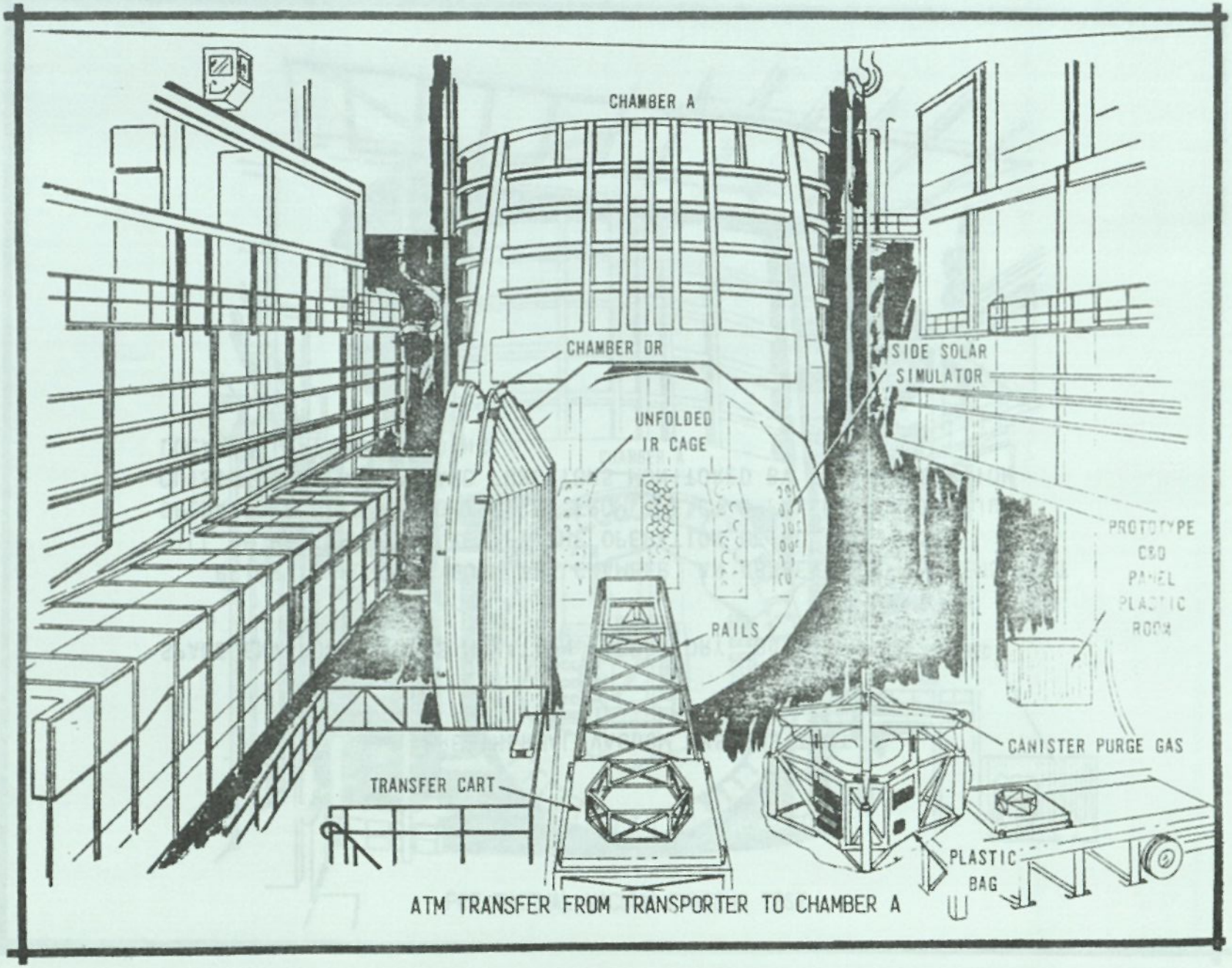
50M02416

ATM TRANSFERRED FROM TRANSPORTER TO CHAMBER A

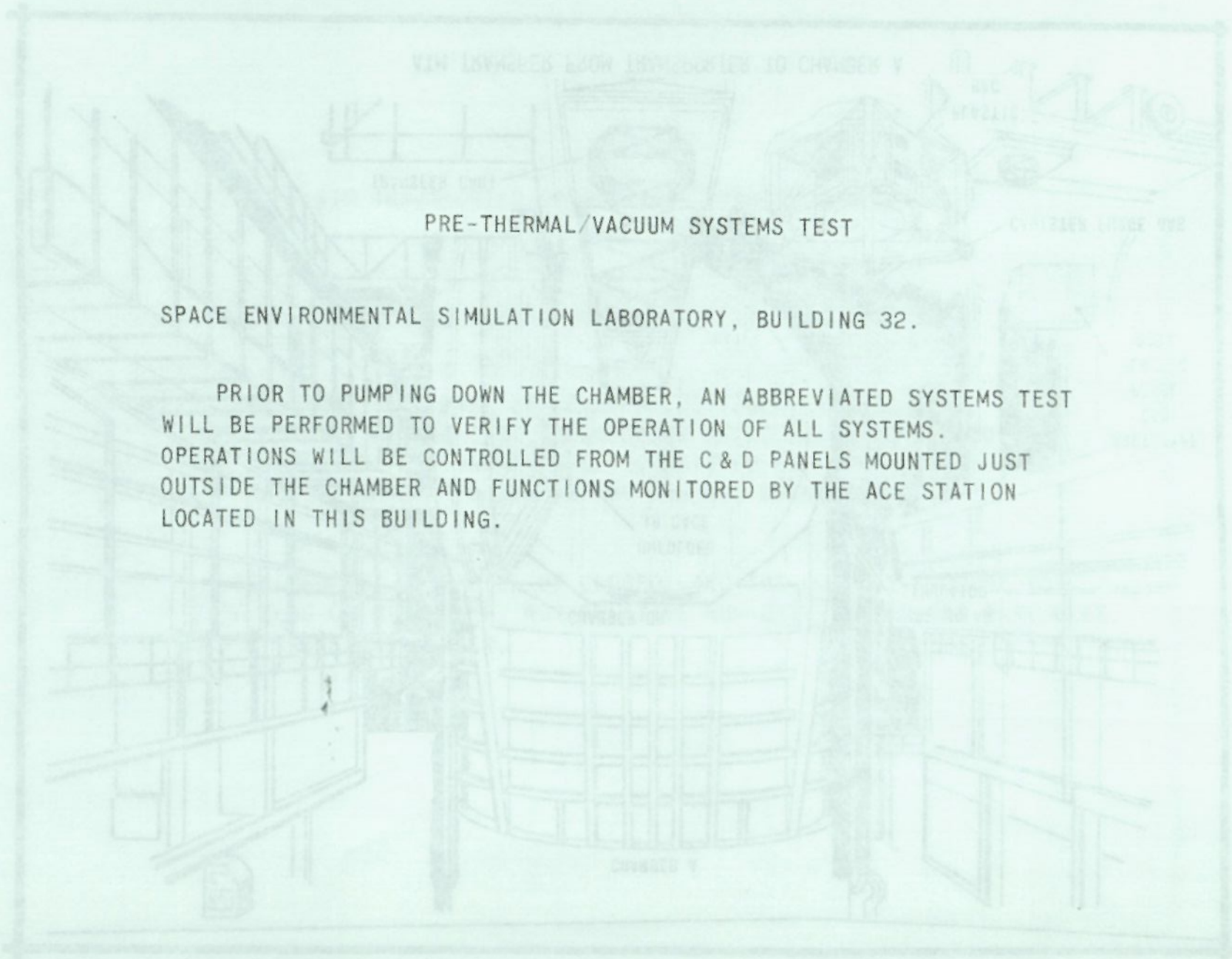
SPACE ENVIRONMENTAL SIMULATION LABORATORY, BUILDING 32.

THE BAGGED ATM WILL BE HOISTED FROM THE TRANSFER STAND TO THE TRANSFER CART. THE CART, MOUNTED ON RAILS, WILL BE ROLLED INTO THE T/V CHAMBER. THE ATM WILL BE HOISTED FROM THE CART TO THE CHECKOUT STAND AND PLACED IN THE SUN END DOWN POSITION.

THE CHAMBER DOOR WILL BE CLOSED, AND THE CHAMBER BROUGHT TO 70^{O}F PLUS OR MINUS 5^{O}F, 40% RELATIVE HUMIDITY AND 10,000 PARTICLES, 0.5 MICRONS AND LARGER.



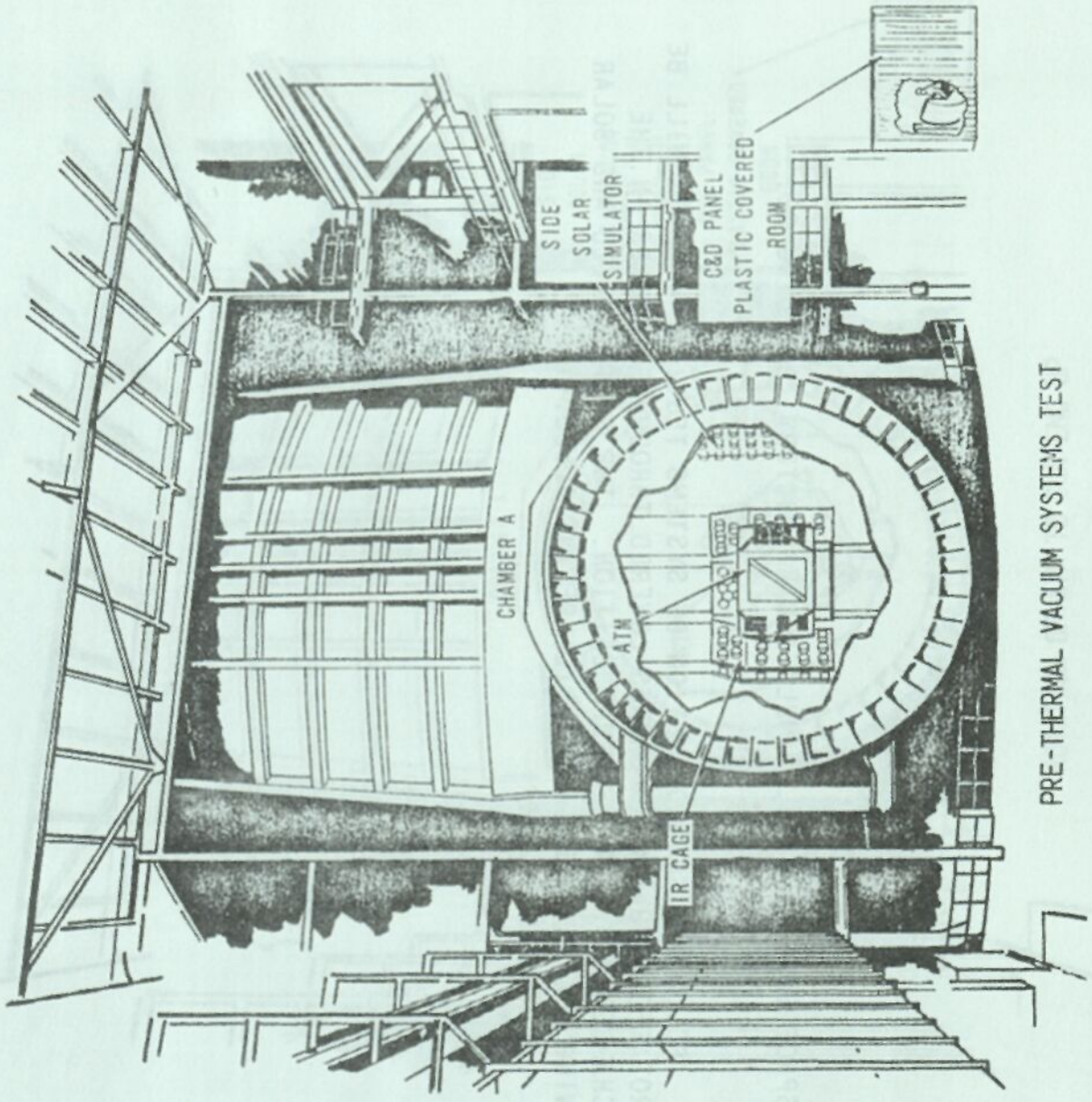
ATM TRANSFER FROM TRANSPORTER TO CHAMBER A



PRE-THERMAL/VACUUM SYSTEMS TEST

SPACE ENVIRONMENTAL SIMULATION LABORATORY, BUILDING 32.

PRIOR TO PUMPING DOWN THE CHAMBER, AN ABBREVIATED SYSTEMS TEST WILL BE PERFORMED TO VERIFY THE OPERATION OF ALL SYSTEMS. OPERATIONS WILL BE CONTROLLED FROM THE C & D PANELS MOUNTED JUST OUTSIDE THE CHAMBER AND FUNCTIONS MONITORED BY THE ACE STATION LOCATED IN THIS BUILDING.



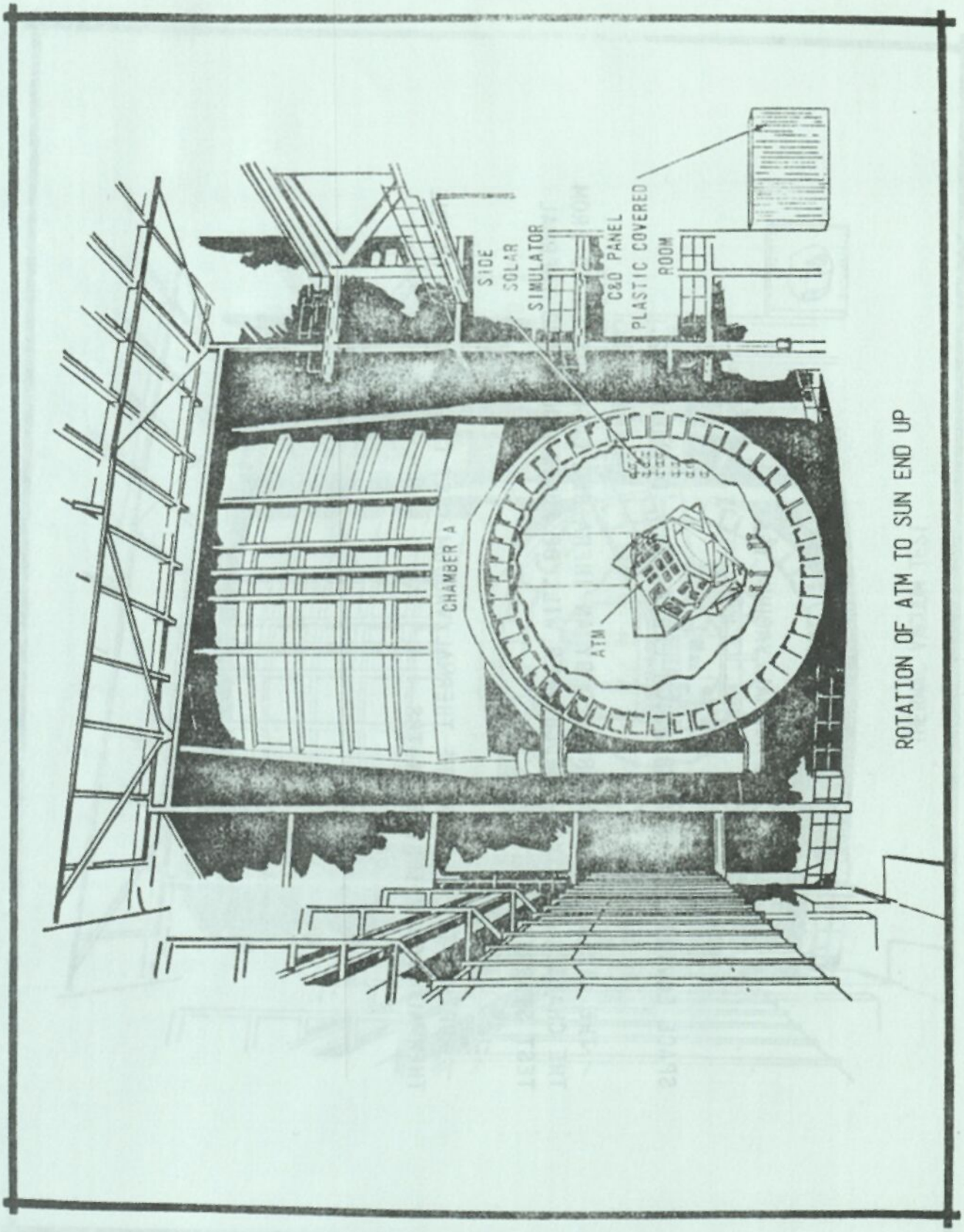
PRE-THERMAL VACUUM SYSTEMS TEST

50M02416

ROTATION OF ATM TO SUN-END UP

SPACE ENVIRONMENTAL SIMULATION LABORATORY, BUILDING 32.

FOLLOWING THE COMPLETION OF SYSTEMS TESTING, THE ATM WILL BE ROTATED BY OVERHEAD CRANES LOWERED THROUGH PORTHOLES IN THE CHAMBER, TO A SUN-END UP POSITION. THE SOLAR SHIELD AND SOLAR WING THERMAL SIMULATORS WILL BE INSTALLED.


SIDE
SOLAR
SIMULATOR
C&D PANEL
PLASTIC COVERED
ROOM
CHAMBER A
ATM
ROTATION OF ATM TO SUN END UP

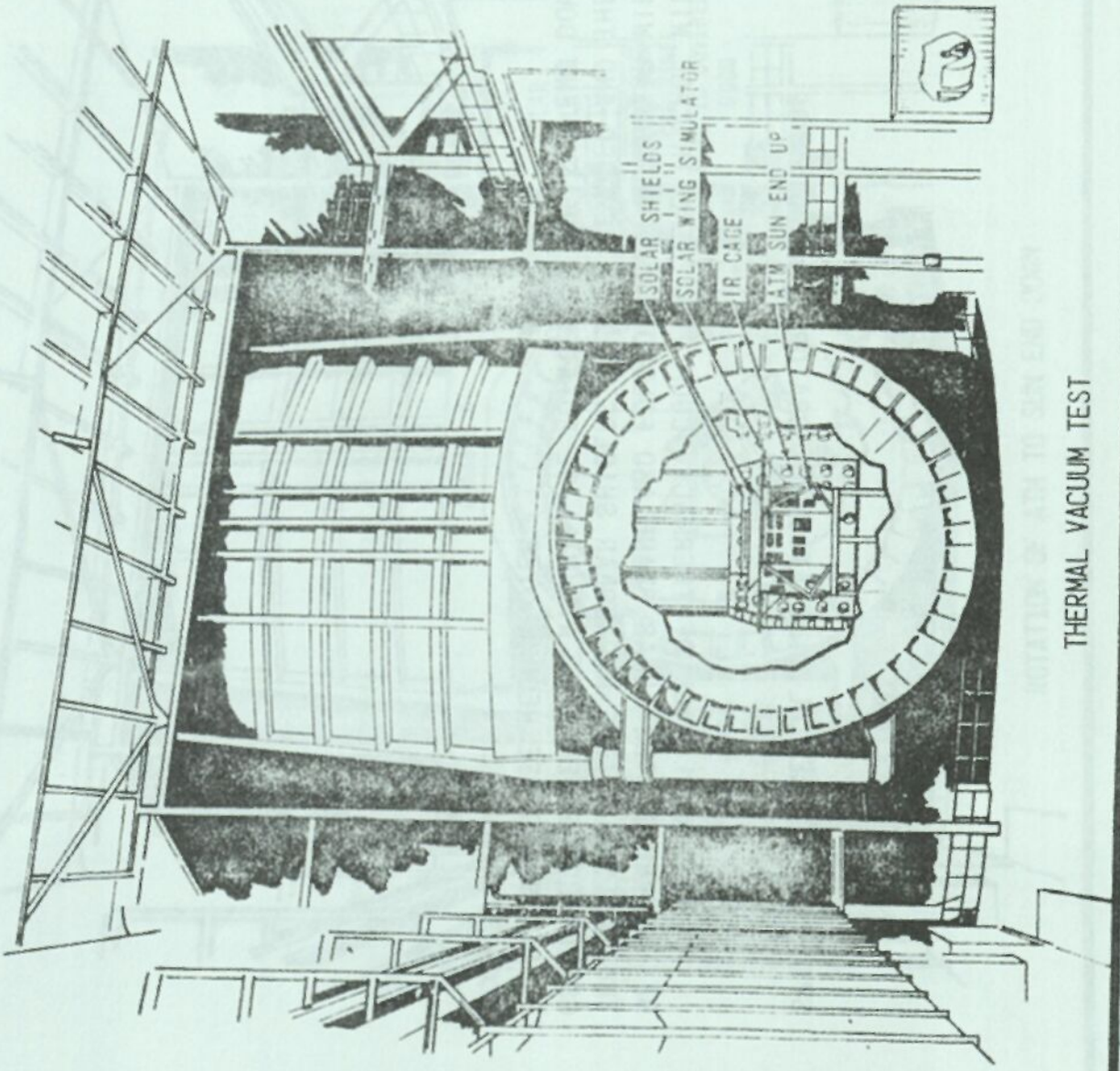
50M02416

THERMAL/VACUUM TEST

SPACE ENVIRONMENTAL SIMULATION LABORATORY, BUILDING 32.

THE ATM WILL BE ENSHROUDED BY AN INFRA-RED CAGE SUSPENDED FROM THE CHAMBER CEILING. THE CHAMBER WILL BE PUMPED DOWN AND THERMAL TEST STARTED.

FURTHER DETAILS OF THE THERMAL/VACUUM TEST CAN BE FOUND IN THE THERMAL VACUUM TEST PLAN TBS.



THERMAL VACUUM TEST

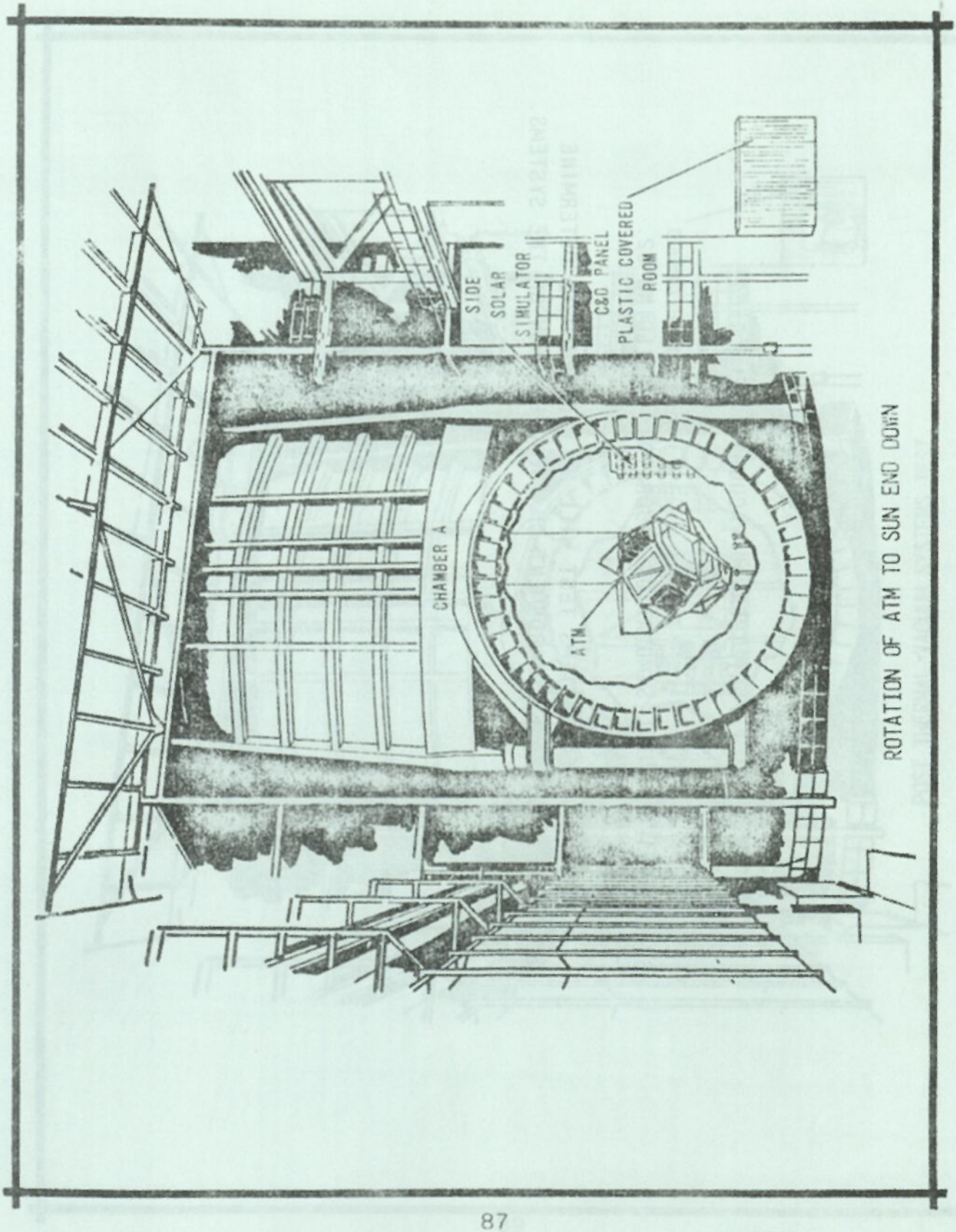
50M02416

ROTATION OF ATM TO SUN-END DOWN

SPACE ENVIRONMENTAL SIMULATION LABORATORY, BUILDING 32.

AT THE COMPLETION OF THERMAL/VACUUM TEST, THE IR CAGE WILL BE LOWERED TO THE LUNAR PLANE AND FOLDED BACK. THE SOLAR WING THERMAL SIMULATORS AND SOLAR SHIELDS WILL BE REMOVED AND THE GSE DISCONNECTED. THE ATM WILL BE ROTATED TO THE SUN END DOWN POSITION AND GSE RECONNECTED.

50M02416

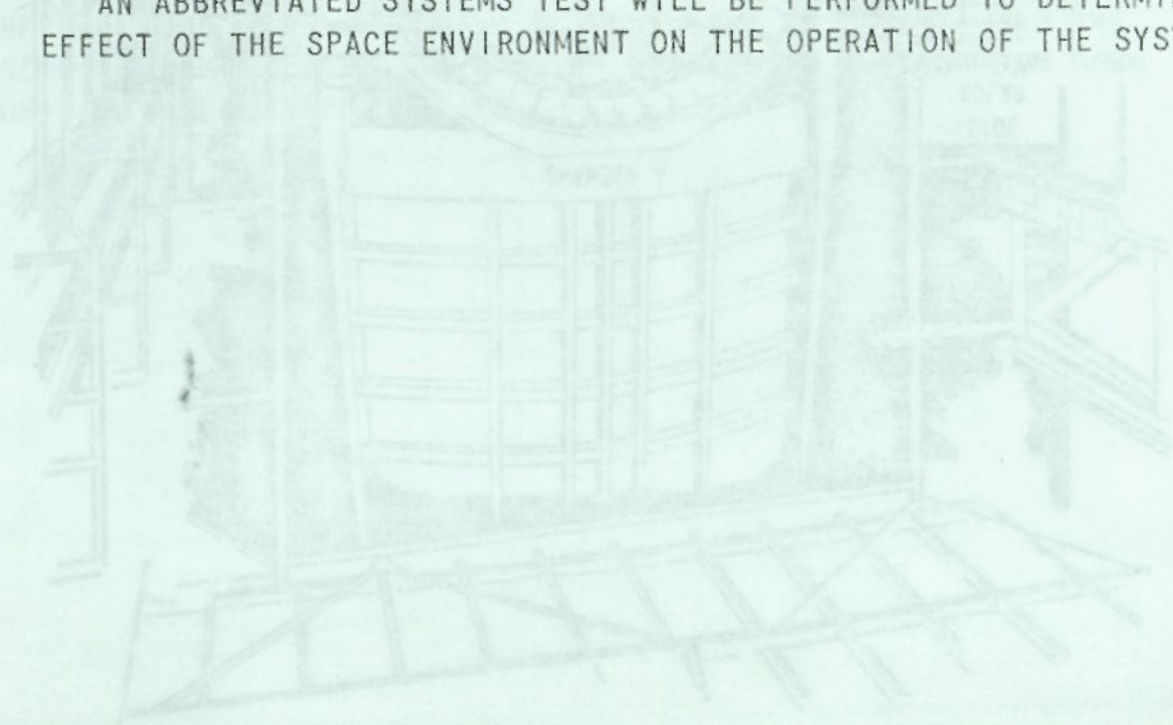

SIDE SOLAR SIMULATOR
C&D PANEL
PLASTIC COVERED ROOM
CHAMBER A
ATM
ROTATION OF ATM TO SUN END DOWN

50M02416

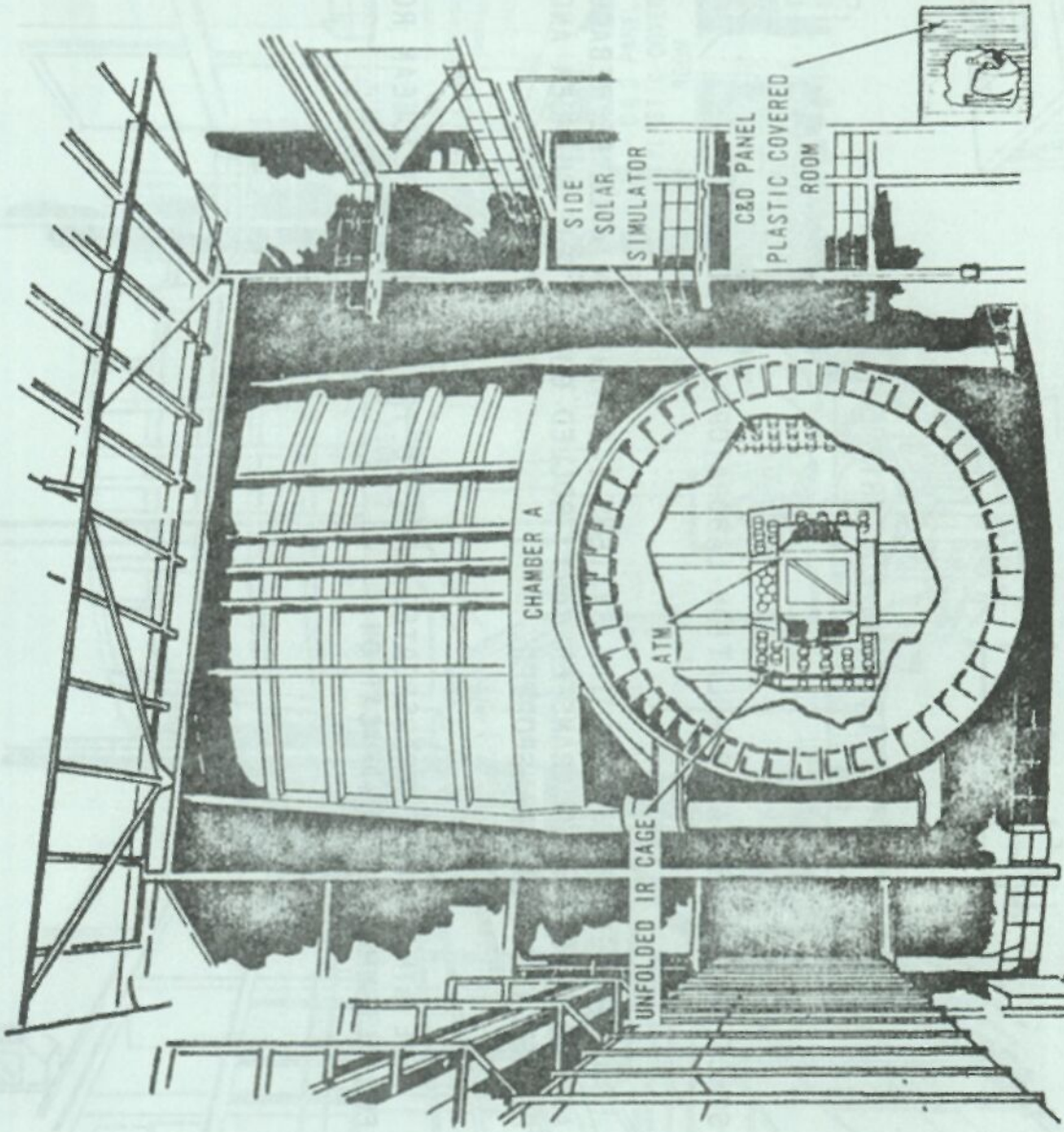
POST THERMAL VACUUM SYSTEMS TEST

SPACE ENVIRONMENTAL SIMULATION LABORATORY, BUILDING 32.

AN ABBREVIATED SYSTEMS TEST WILL BE PERFORMED TO DETERMINE EFFECT OF THE SPACE ENVIRONMENT ON THE OPERATION OF THE SYSTEMS.



50M02416



POST THERMAL VACUUM SYSTEMS TEST

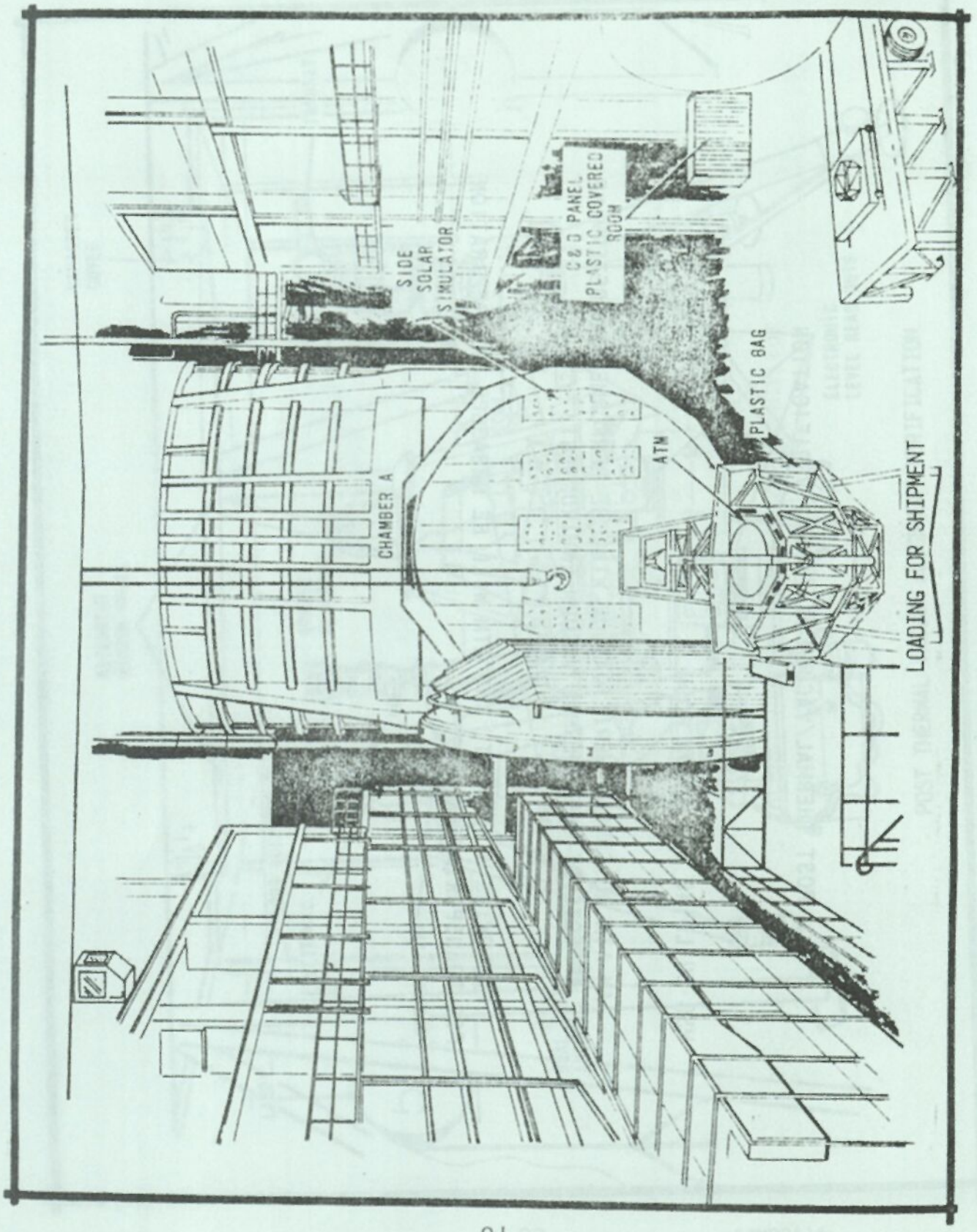
50M02416

LOADING FOR SHIPMENT

SPACE ENVIRONMENTAL SIMULATION LABORATORY, BUILDING 32.

AT THE COMPLETION OF THE SYSTEMS TEST THE ATM WILL BE REBAGGED AND HOISTED TO THE TRANSFER CART, ROLLED OUT OF THE CHAMBER AND PLACED INTO THE TRANSPORTER.

THE ATM WILL BE TRANSPORTED BACK TO THE BUILDING 32 CLEAN ROOM FOR ALIGNMENT REVERIFICATION.


SIDE SOLAR SIMULATOR
C&D PANEL PLASTIC COVERED ROOM
PLASTIC BAG
ATM
CHAMBER A
LOADING FOR SHIPMENT

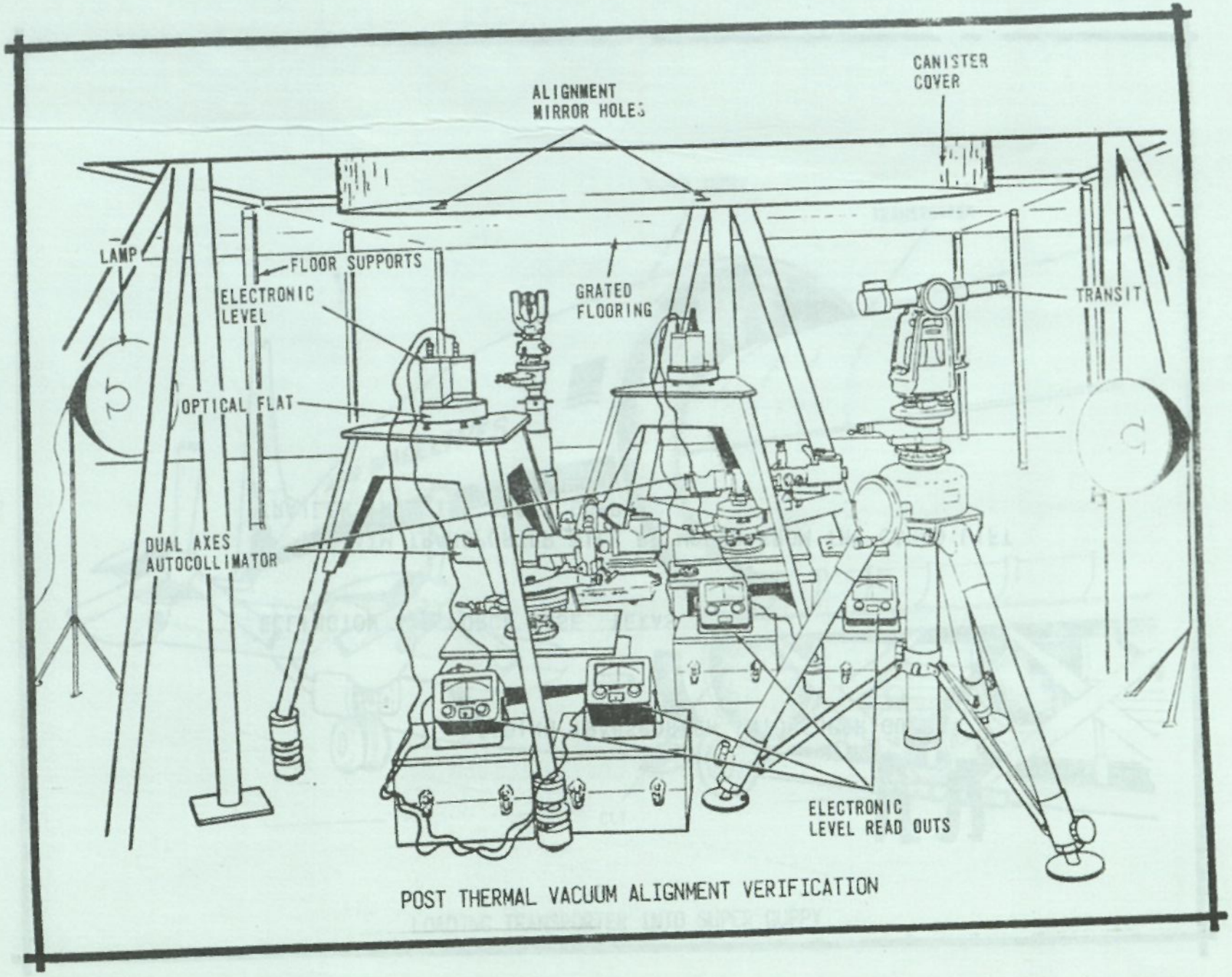
50M02416

POST THERMAL/VACUUM ALIGNMENT VERIFICATION

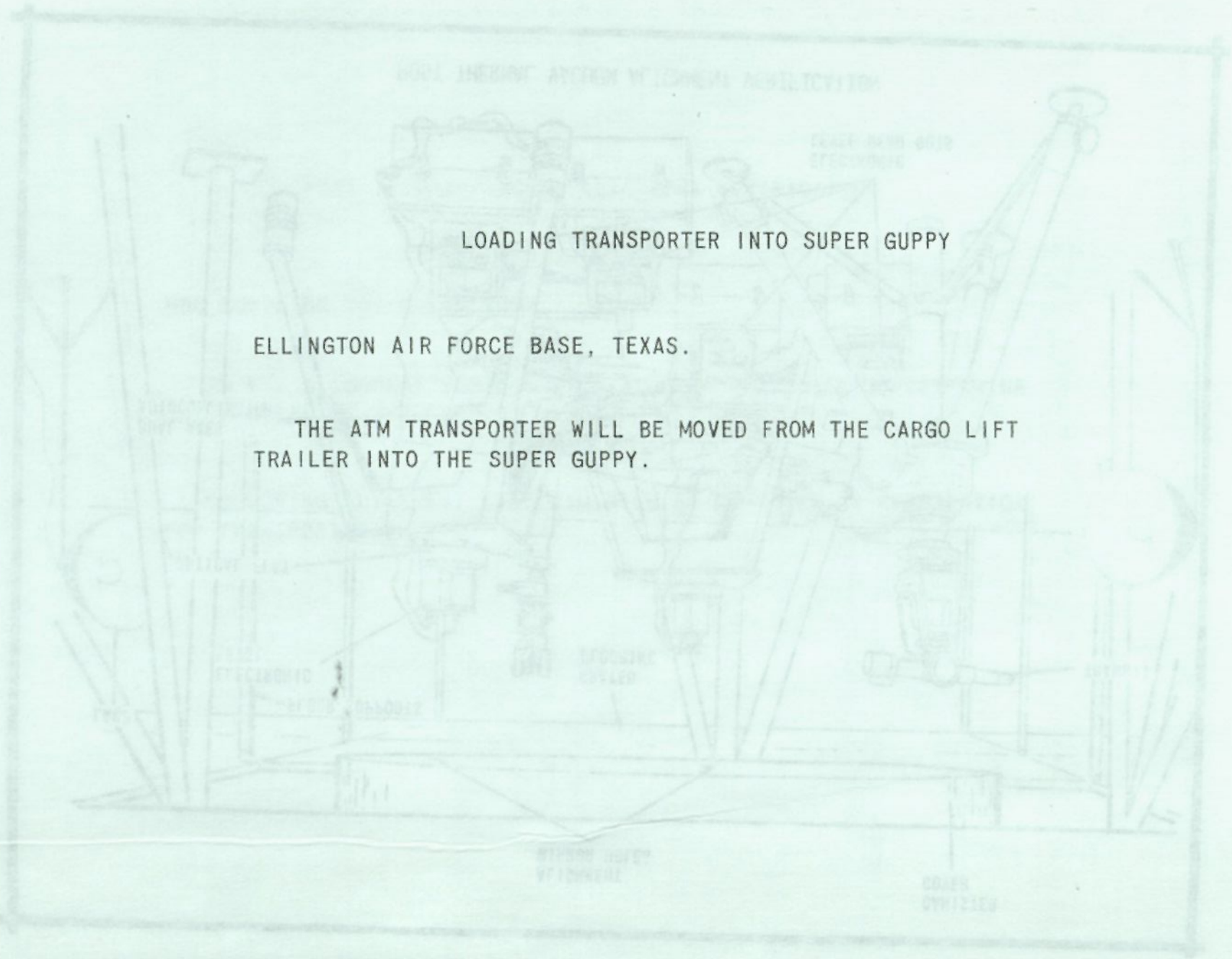
MSC BUILDING 36, CLEAN ROOM.

AN ATM ALIGNMENT VERIFICATION WILL BE PERFORMED TO DETERMINE THE EFFECTS OF THE THERMAL VACUUM ENVIRONMENT.

FOLLOWING ALIGNMENT, THE ATM WILL BE REBAGGED IN PREPARATION FOR TRANSPORTATION.



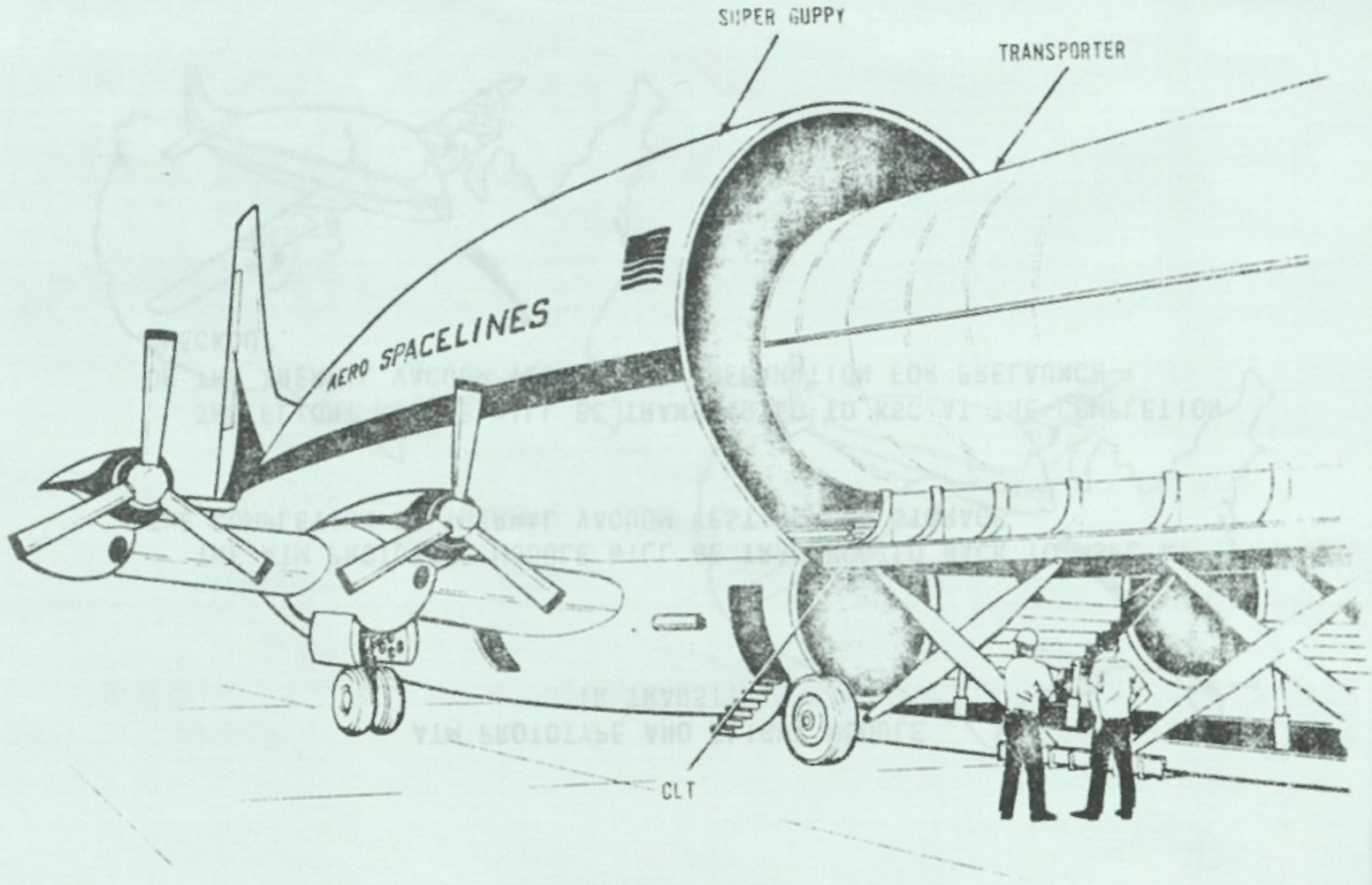
POST THERMAL VACUUM ALIGNMENT VERIFICATION



LOADING TRANSPORTER INTO SUPER GUPPY

ELLINGTON AIR FORCE BASE, TEXAS.

THE ATM TRANSPORTER WILL BE MOVED FROM THE CARGO LIFT TRAILER INTO THE SUPER GUPPY.

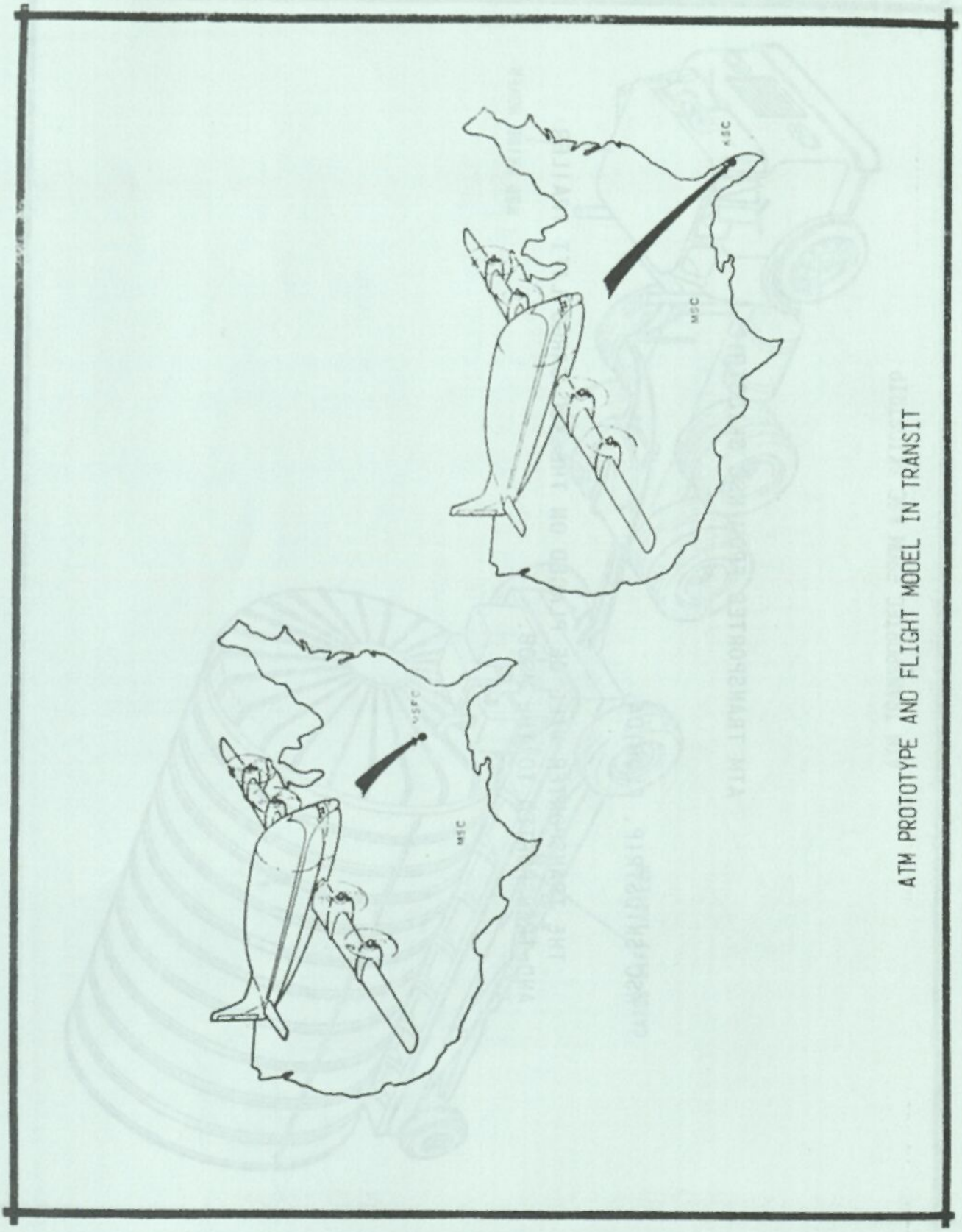


LOADING TRANSPORTER INTO SUPER GUPPY

ATM PROTOTYPE AND FLIGHT MODULE IN TRANSIT

THE ATM PROTOTYPE MODULE WILL BE TRANSPORTED BACK TO MSFC AT THE COMPLETION OF THERMAL VACUUM TESTING FOR STORAGE.

THE FLIGHT MODULE WILL BE TRANSPORTED TO KSC AT THE COMPLETION OF THE THERMAL VACUUM TESTING IN PREPARATION FOR PRELAUNCH CHECKOUT.

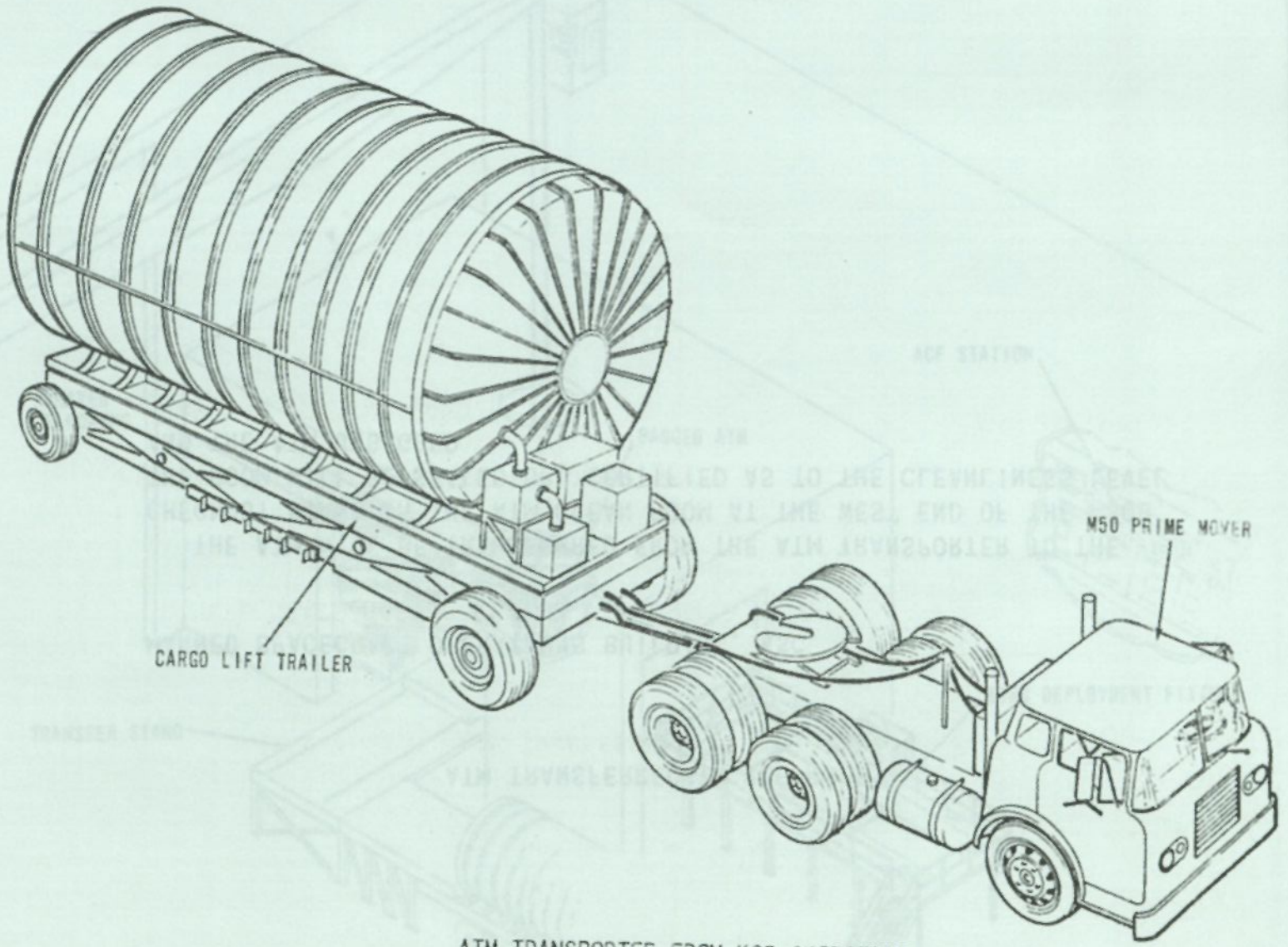


ATM PROTOTYPE AND FLIGHT MODEL IN TRANSIT

ATM TRANSPORTED FROM KSC SKIDSTRIP

KSC SKIDSTRIP, FLORIDA.

THE TRANSPORTER WILL BE PLACED ON THE KSC CARGO LIFT TRAILER AND TRANSPORTED TO THE MSOB.

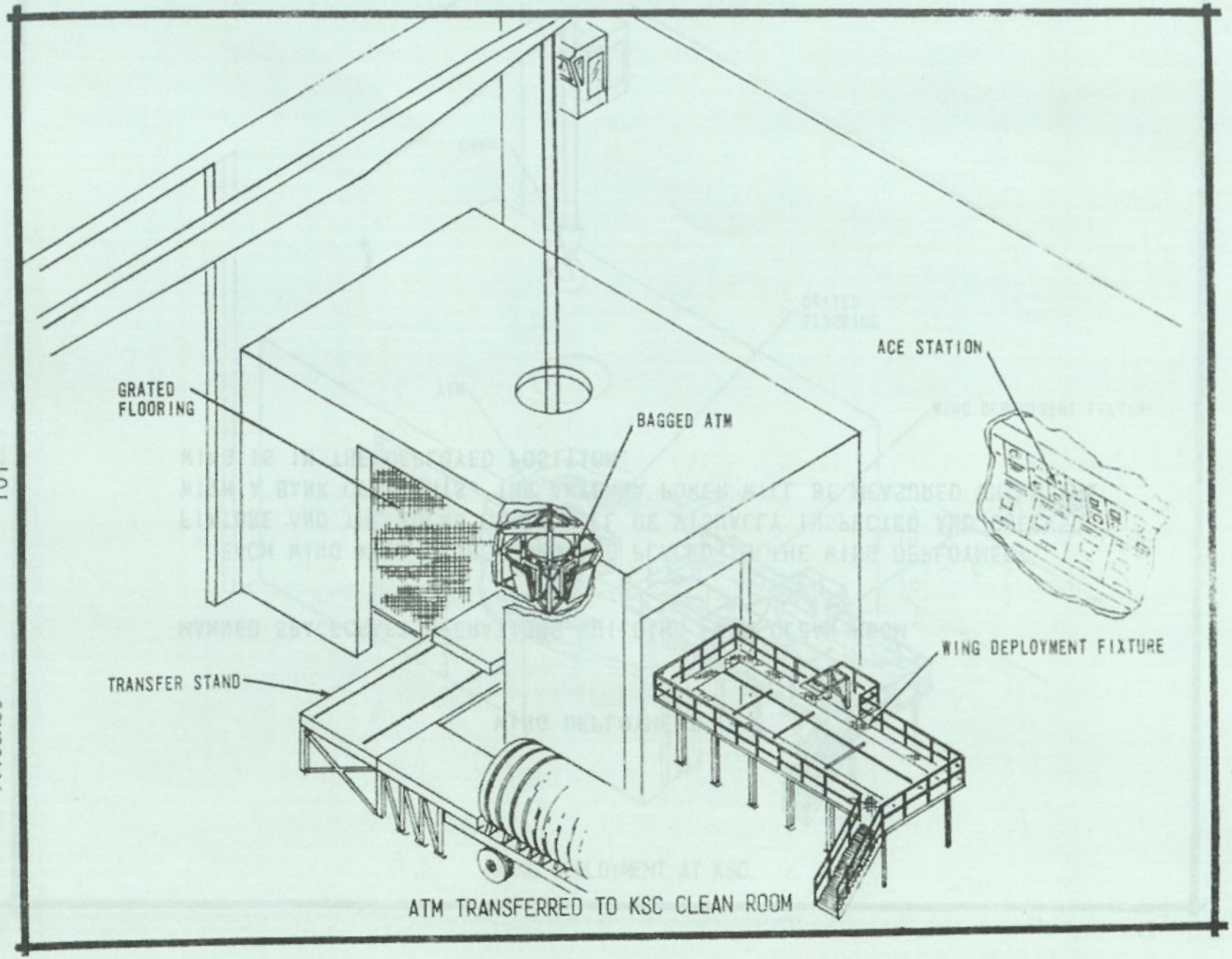


ATM TRANSPORTED FROM KSC SKIDSTRIP

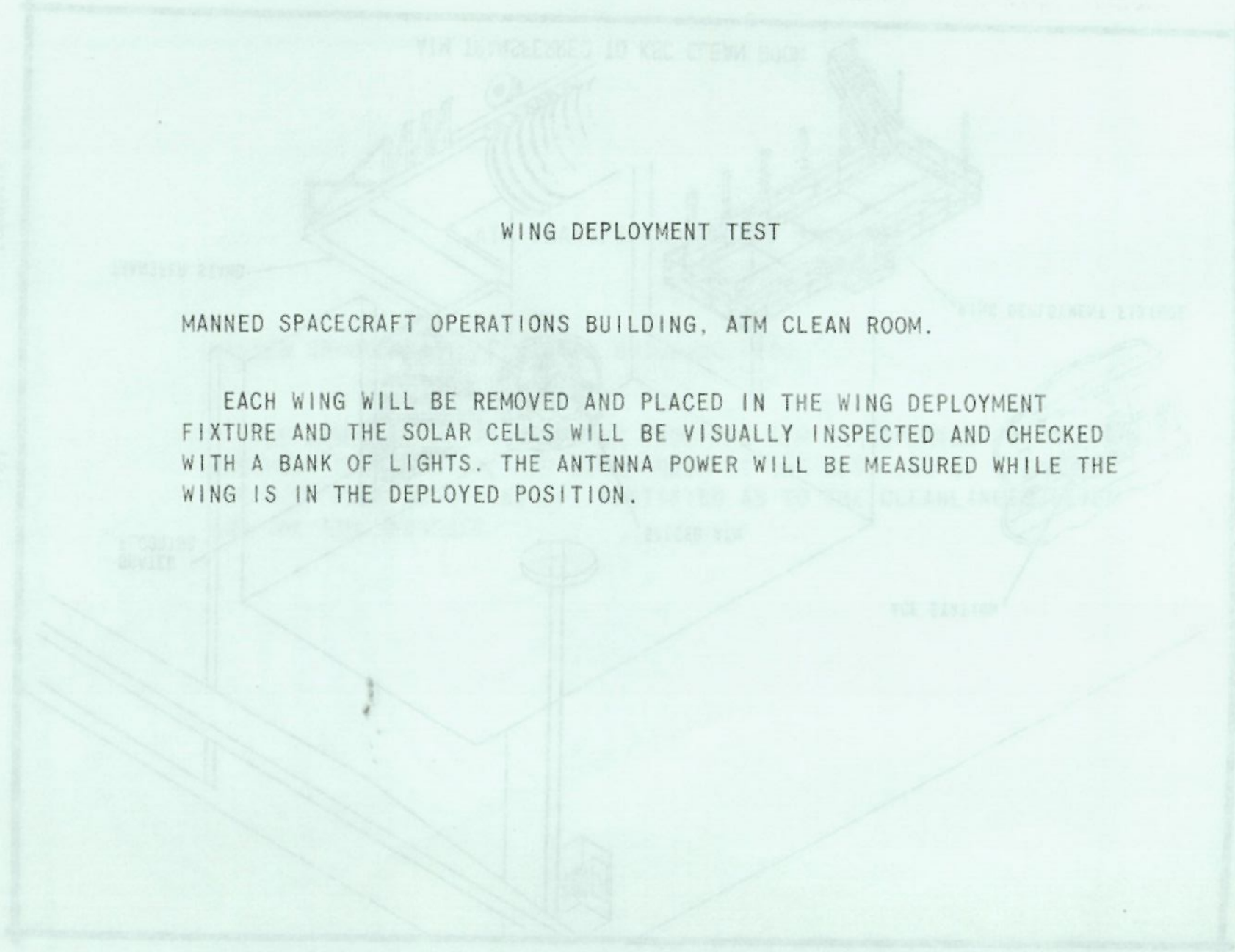
ATM TRANSFERRED TO THE MSOB

MANNED SPACECRAFT OPERATIONS BUILDING, KSC.

THE ATM WILL BE TRANSFERRED FROM THE ATM TRANSPORTER TO THE CHECKOUT STAND IN THE ATM CLEAN ROOM AT THE WEST END OF THE MSOB. THE ROOM WILL BE SEALED UP, CERTIFIED AS TO THE CLEANLINESS LEVEL AND THE ATM UNBAGGED.


GRATED FLOORING
BAGGED ATM
ACE STATION
WING DEPLOYMENT FIXTURE
TRANSFER STAND
ATM TRANSFERRED TO KSC CLEAN ROOM

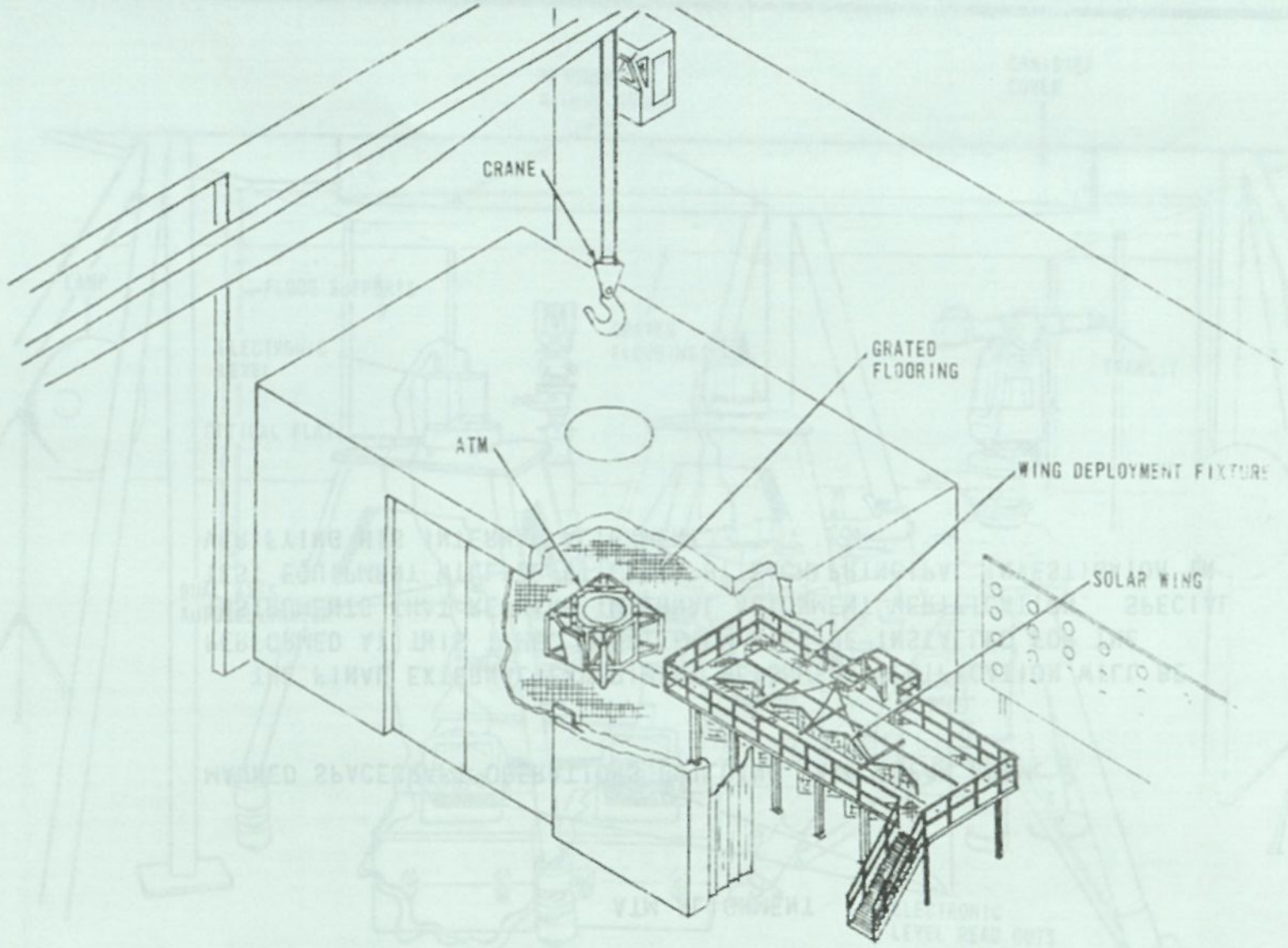
50M02416



WING DEPLOYMENT TEST

MANNED SPACECRAFT OPERATIONS BUILDING, ATM CLEAN ROOM.

EACH WING WILL BE REMOVED AND PLACED IN THE WING DEPLOYMENT FIXTURE AND THE SOLAR CELLS WILL BE VISUALLY INSPECTED AND CHECKED WITH A BANK OF LIGHTS. THE ANTENNA POWER WILL BE MEASURED WHILE THE WING IS IN THE DEPLOYED POSITION.

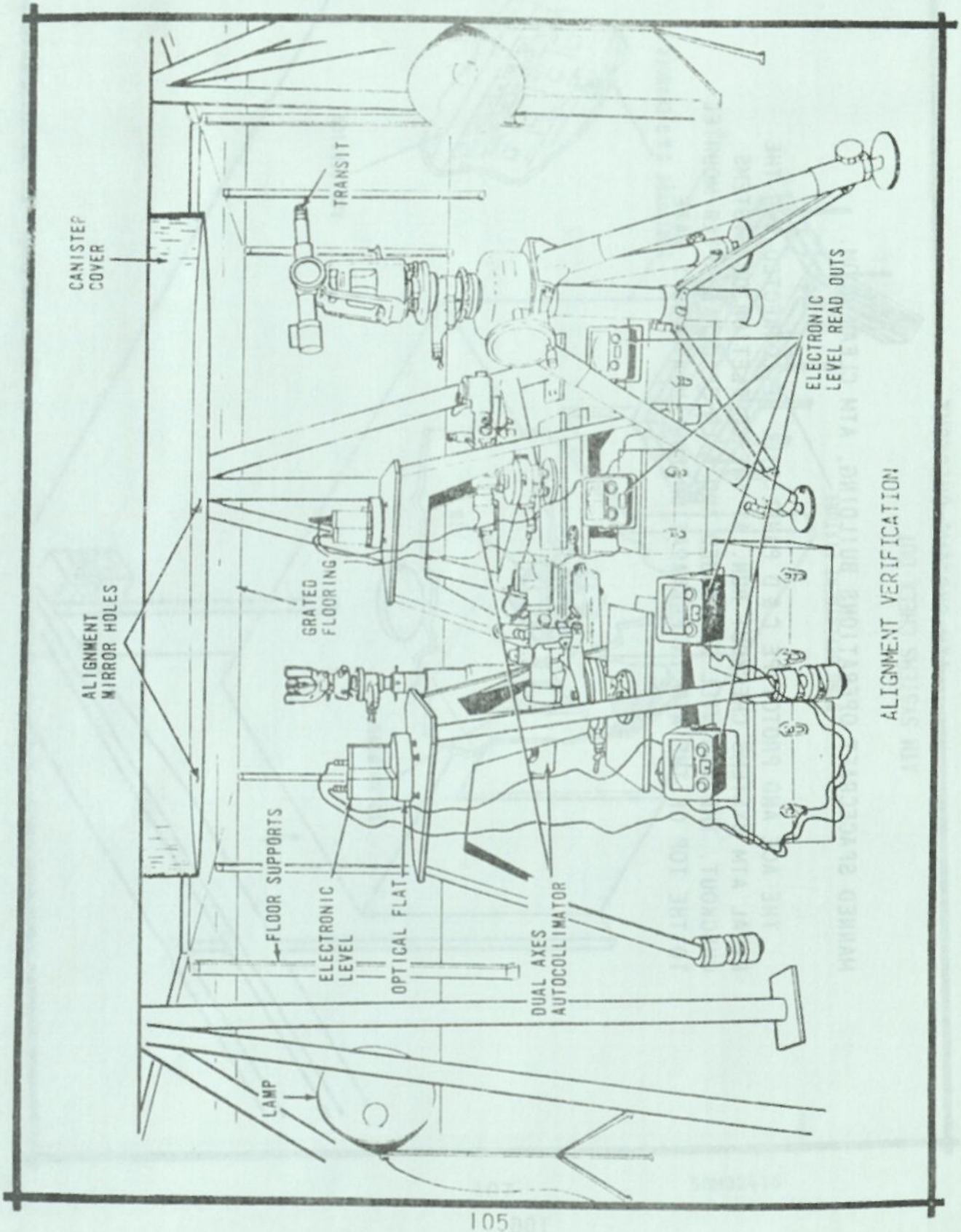


WING DEPLOYMENT AT KSC

ATM ALIGNMENT

MANNED SPACECRAFT OPERATIONS BUILDING, ATM CLEAN ROOM.

THE FINAL EXTERNAL EXPERIMENT ALIGNMENT VERIFICATION WILL BE PERFORMED AT THIS TIME. TEST FILM WILL BE INSTALLED FOR THE INSTRUMENTS THAT REQUIRE INTERNAL ALIGNMENT VERIFICATION. SPECIAL TEST EQUIPMENT WILL BE UTILIZED BY EACH PRINCIPAL INVESTIGATOR IN VERIFYING HIS INTERNAL ALIGNMENT.

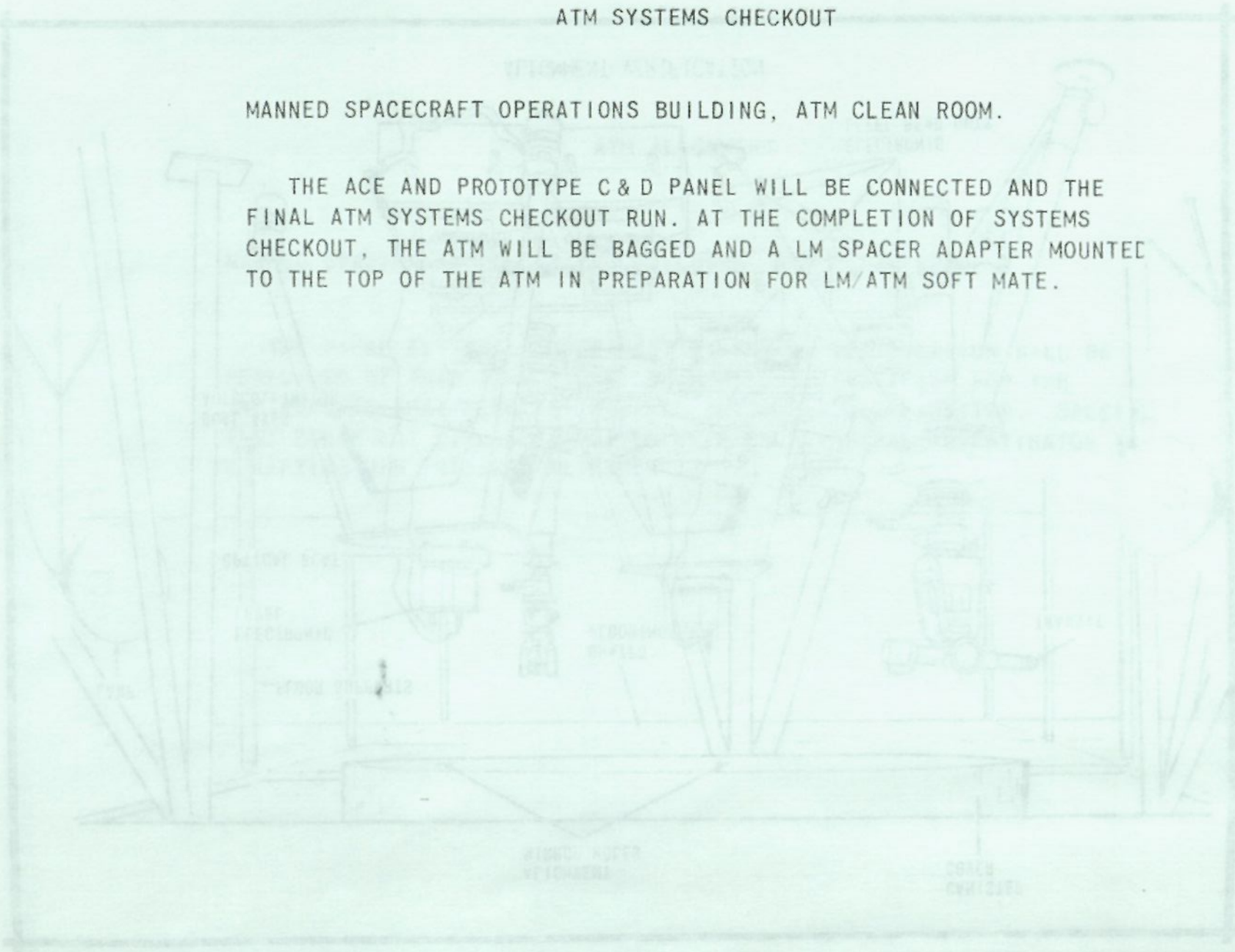

CANISTER COVER
TRANSIT
ELECTRONIC LEVEL READ OUTS
ALIGNMENT MIRROR HOLES
GRATED FLOORING
FLOOR SUPPORTS
ELECTRONIC LEVEL
OPTICAL FLAT
DUAL AXES AUTOCOLLIMATOR
LAMP
ALIGNMENT VERIFICATION

50M02416

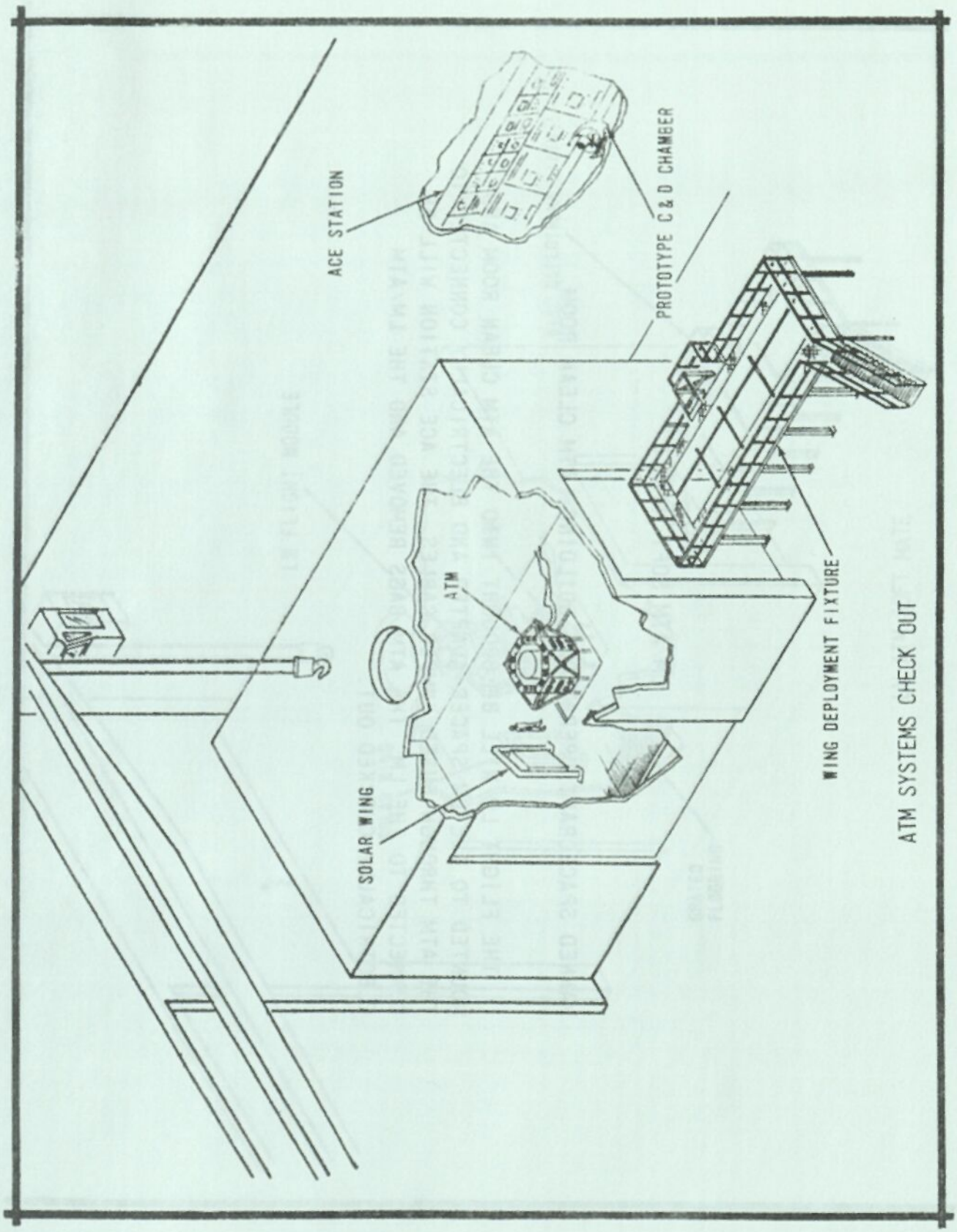
ATM SYSTEMS CHECKOUT

MANNED SPACECRAFT OPERATIONS BUILDING, ATM CLEAN ROOM.

THE ACE AND PROTOTYPE C & D PANEL WILL BE CONNECTED AND THE FINAL ATM SYSTEMS CHECKOUT RUN. AT THE COMPLETION OF SYSTEMS CHECKOUT, THE ATM WILL BE BAGGED AND A LM SPACER ADAPTER MOUNTED TO THE TOP OF THE ATM IN PREPARATION FOR LM/ATM SOFT MATE.



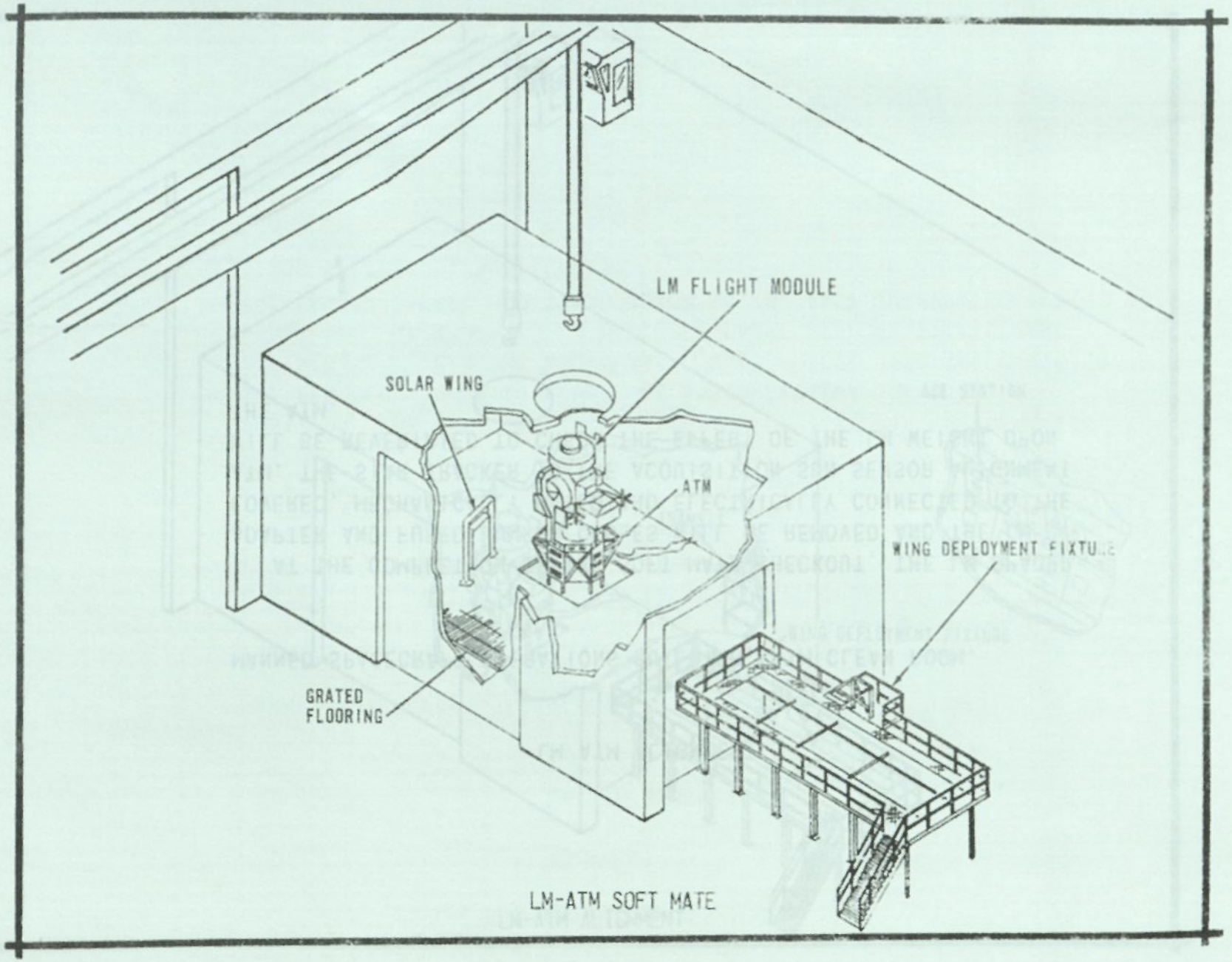
50M02416


ACE STATION
PROTOTYPE C&D CHAMBER
ATM
WING DEPLOYMENT FIXTURE
SOLAR WING
ATM SYSTEMS CHECK OUT

LM/ATM SOFT MATE

MANNED SPACECRAFT OPERATIONS BUILDING, ATM CLEAN ROOM.

THE FLIGHT LM WILL BE BROUGHT INTO THE ATM CLEAN ROOM AND MOUNTED TO THE LM SPACER ADAPTER AND ELECTRICALLY CONNECTED TO THE ATM THROUGH FUSED JUMPER CABLES. THE ACE STATION WILL BE CONNECTED TO THE LM. THE ATM BAGS REMOVED AND THE LM/ATM ELECTRICALLY CHECKED OUT.



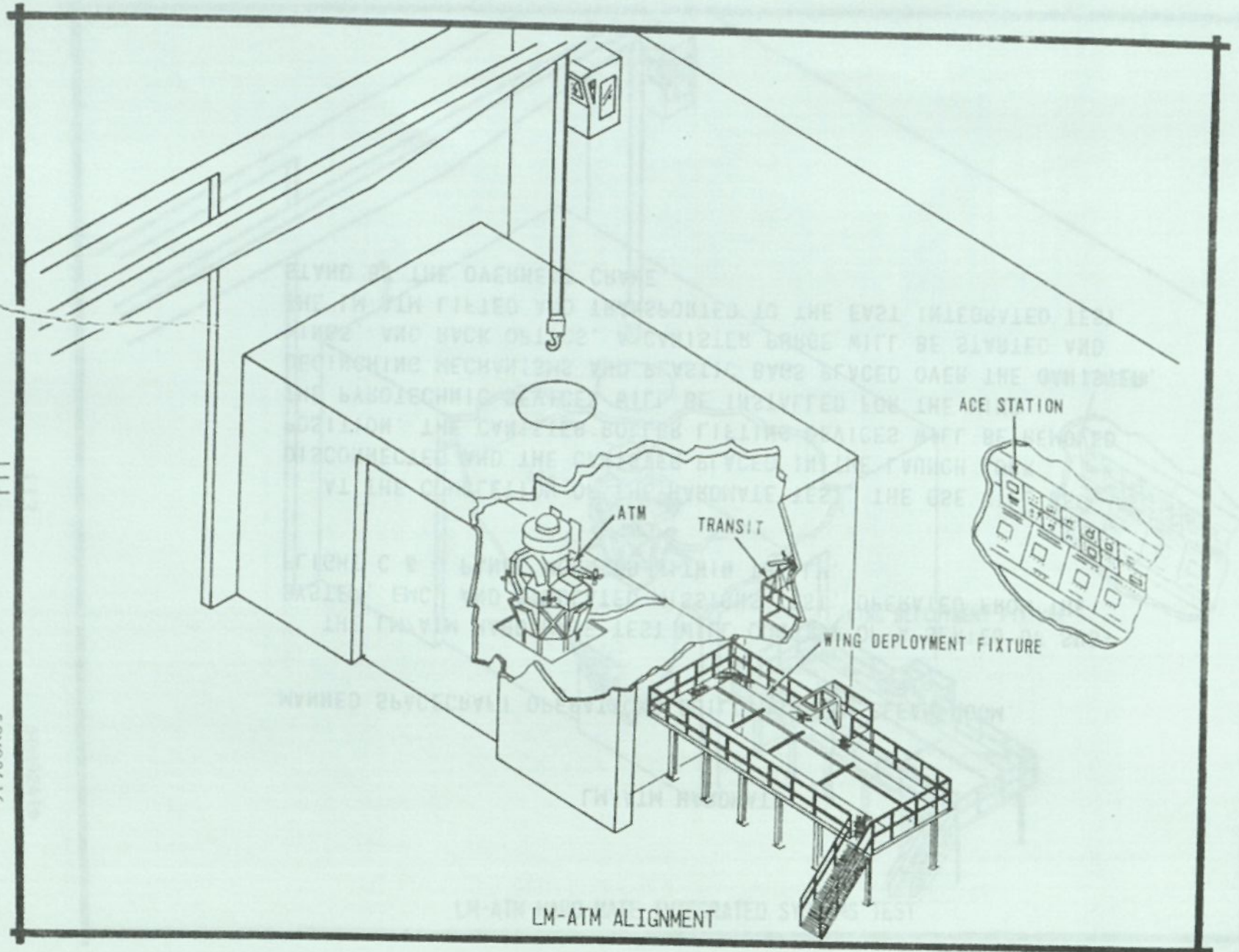
LM-ATM SOFT MATE

50M02416

LM/ATM ALIGNMENT

MANNED SPACECRAFT OPERATIONS BUILDING, ATM CLEAN ROOM.

AT THE COMPLETION OF THE SOFT MATE CHECKOUT, THE LM SPACER ADAPTER AND FUSED JUMPER CABLES WILL BE REMOVED AND THE LM LOWERED, MECHANICALLY MATED AND ELECTRICALLY CONNECTED TO THE ATM. THE STAR TRACKER TO THE ACQUISITION SUN SENSOR ALIGNMENT WILL BE REVERIFIED TO CHECK THE EFFECT OF THE LM WEIGHT UPON THE ATM.



LM-ATM ALIGNMENT

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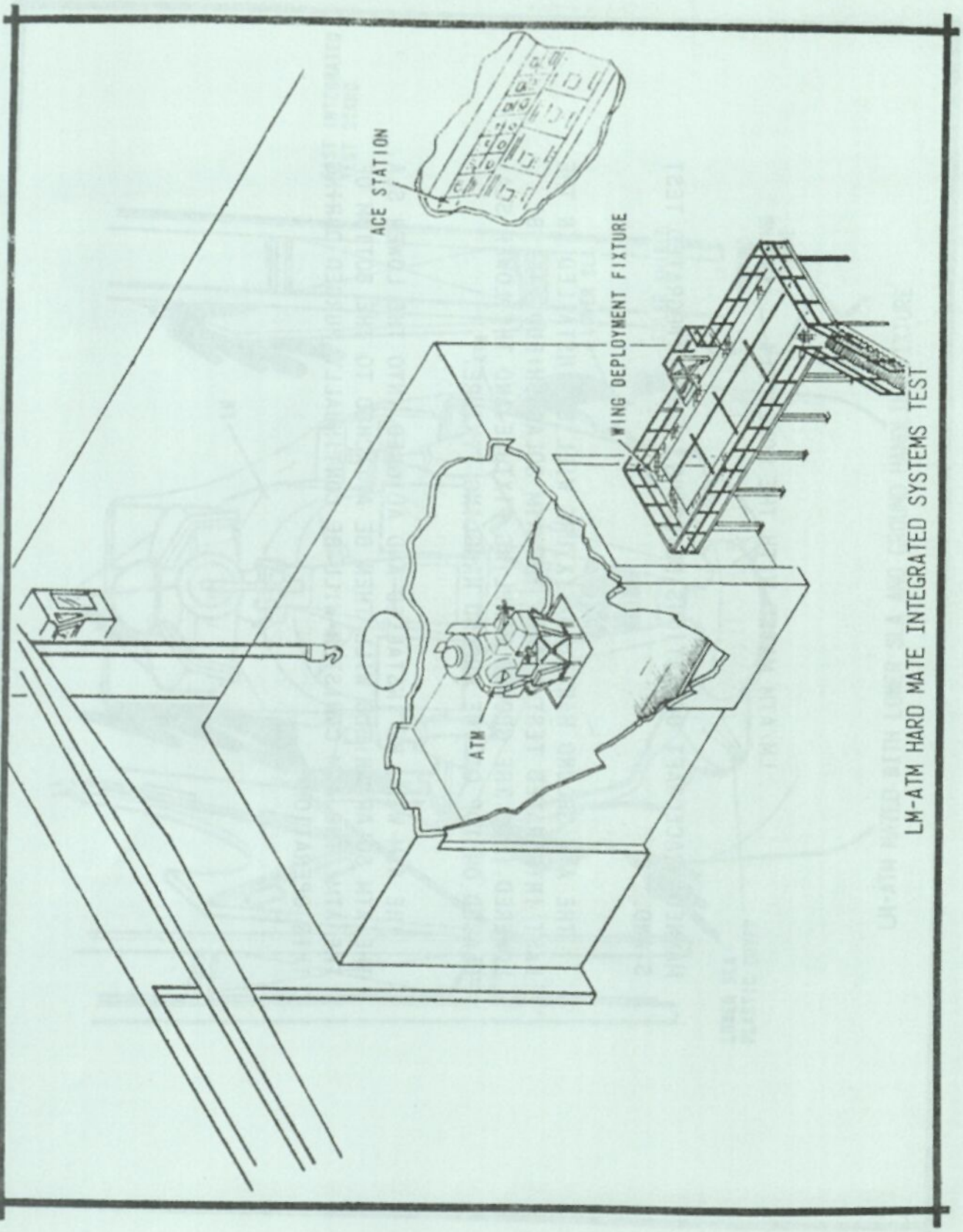
LM/ATM HARDMATE

MANNED SPACECRAFT OPERATIONS BUILDING, ATM CLEAN ROOM.

THE LM/ATM HARD MATE TEST WILL CONSIST OF A SERIES OF SUB-SYSTEM, EMC, AND SIMULATED MISSIONS TEST, OPERATED FROM THE FLIGHT C & D PANEL MOUNTED WITHIN THE LM.

AT THE COMPLETION OF THE HARDMATE TEST, THE GSE WILL BE DISCONNECTED AND THE CANISTER PLACED IN THE LAUNCH LOCK POSITION. THE CANISTER ROLLER LIFTING DEVICES WILL BE REMOVED THE PYROTECHNIC DEVICES WILL BE INSTALLED FOR THE WING DECINCHING MECHANISMS AND PLASTIC BAGS PLACED OVER THE CANISTER, WINGS, AND RACK OPTICS. A CANISTER PURGE WILL BE STARTED AND THE LM/ATM LIFTED AND TRANSPORTED TO THE EAST INTEGRATED TEST STAND BY THE OVERHEAD CRANE.

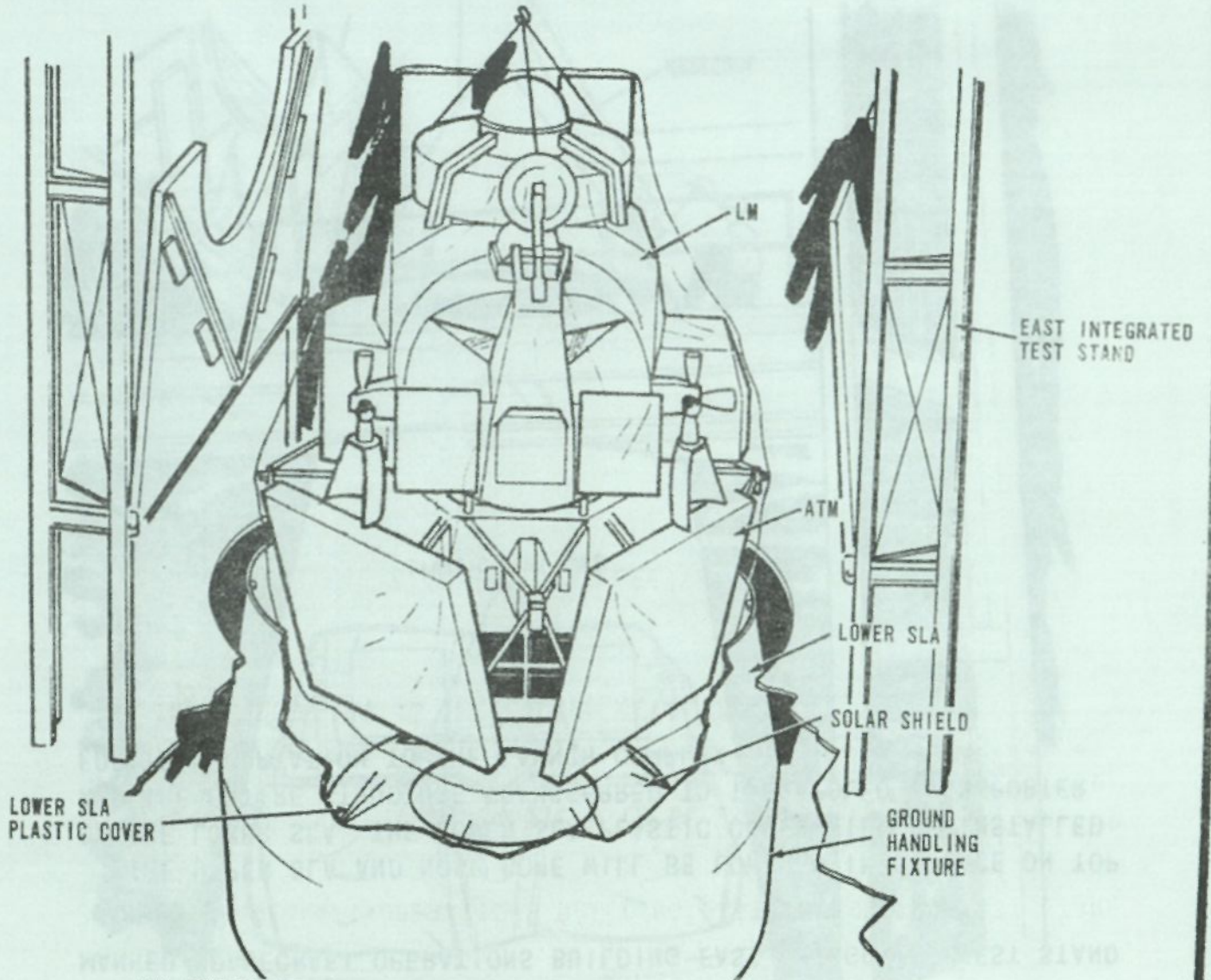

ACE STATION
WING DEPLOYMENT FIXTURE
ATM
LM-ATM HARD MATE INTEGRATED SYSTEMS TEST

LM/ATM MATED WITH THE LOWER SLA

MANNED SPACECRAFT OPERATIONS BUILDING, EAST INTEGRATED TEST STAND.

THE ATM GROUND HANDLING FIXTURE WILL BE INSTALLED IN THE EAST INTEGRATED TEST STAND. THE ATM SOLAR SHIELD WILL BE LOWERED INTO THE GROUND HANDLING FIXTURE AND THE LOWER SLA PLACED ON TOP OF THE GROUND HANDLING FIXTURE.

THE ATM WILL BE INSTALLED AND ALIGNED INTO THE LOWER SLA. THE ATM SOLAR SHIELD WILL THEN BE ATTACHED TO THE BOTTOM OF THE ATM. THE ATM CANISTER WILL BE CONTINUALLY PURGED DURING THIS OPERATION.

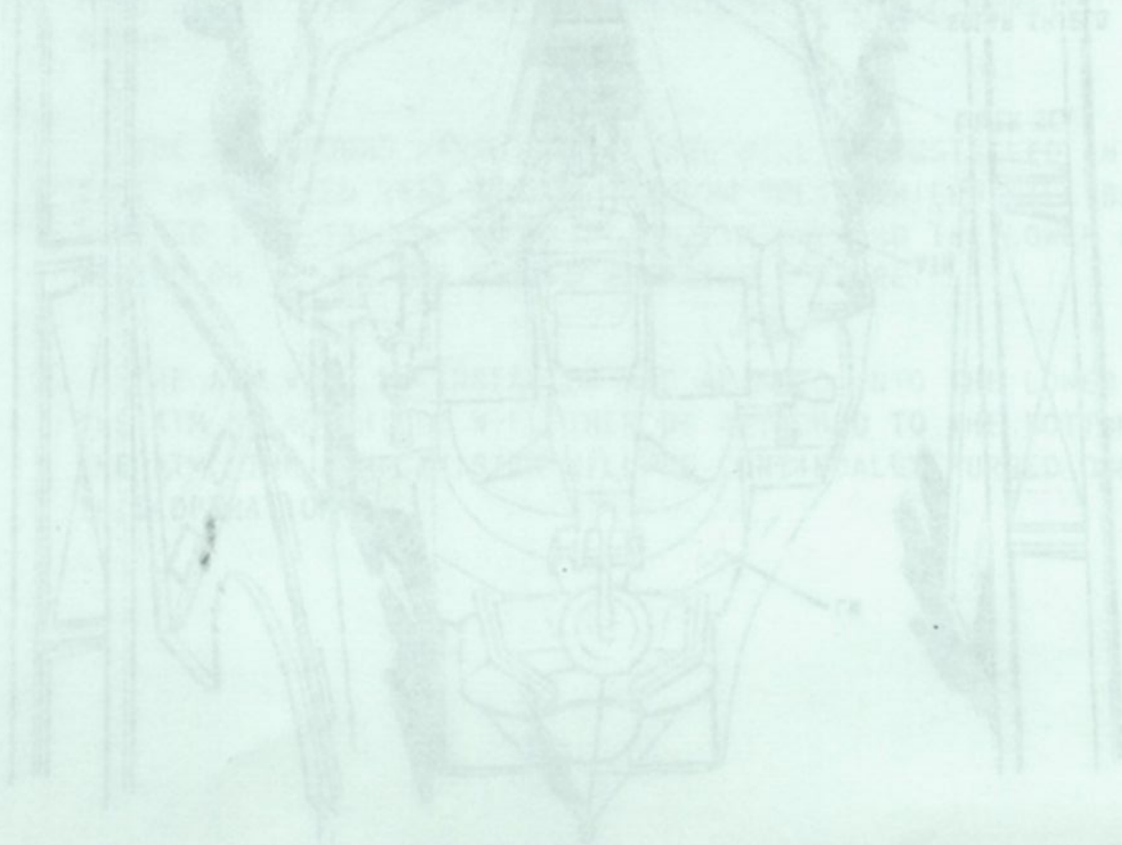


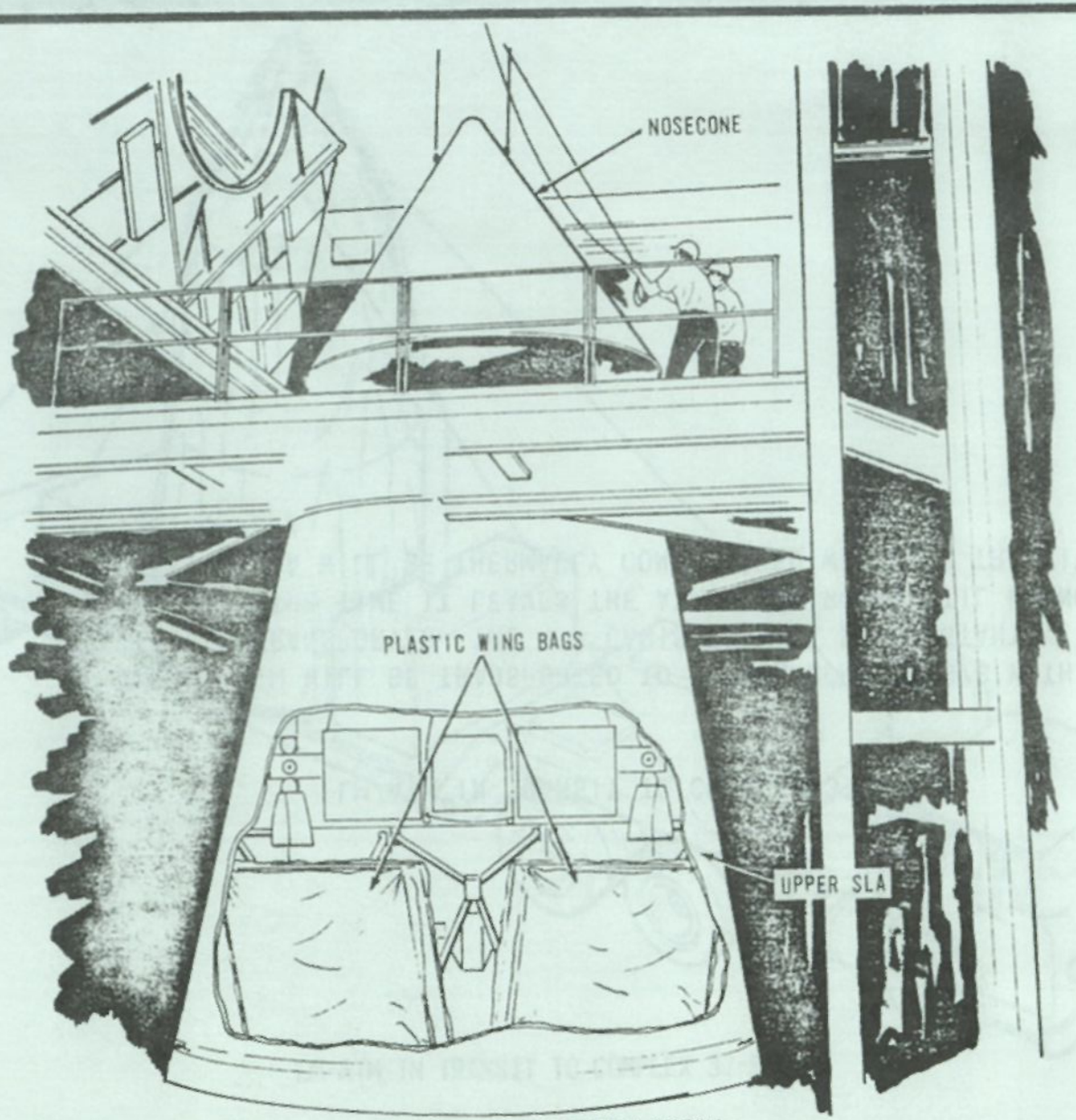
LM-ATM MATED WITH LOWER SLA AND GROUND HANDLING FIXTURE

UPPER SPACECRAFT LUNAR MODULE ADAPTER AND NOSE CONE INSTALLATION

MANNED SPACECRAFT OPERATIONS BUILDING EAST INTEGRATED TEST STAND

THE UPPER SLA AND NOSE CONE WILL BE LOWERED INTO PLACE ON TOP OF THE LOWER SLA. THE LOWER SLA PLASTIC COVER WILL BE INSTALLED AND THE ENTIRE STRUCTURE TRANSFERRED TO THE APOLLO TRANSPORTER FOR TRANSPORTATION TO THE LAUNCH COMPLEX.

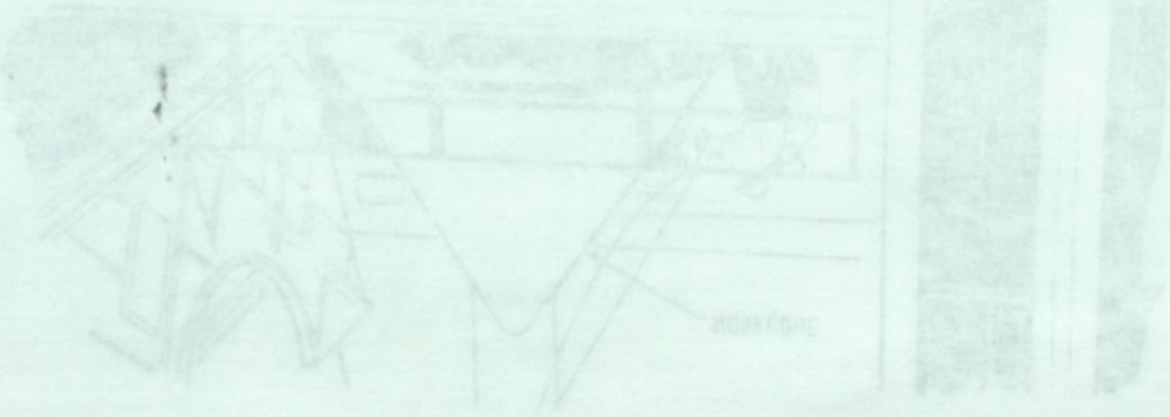


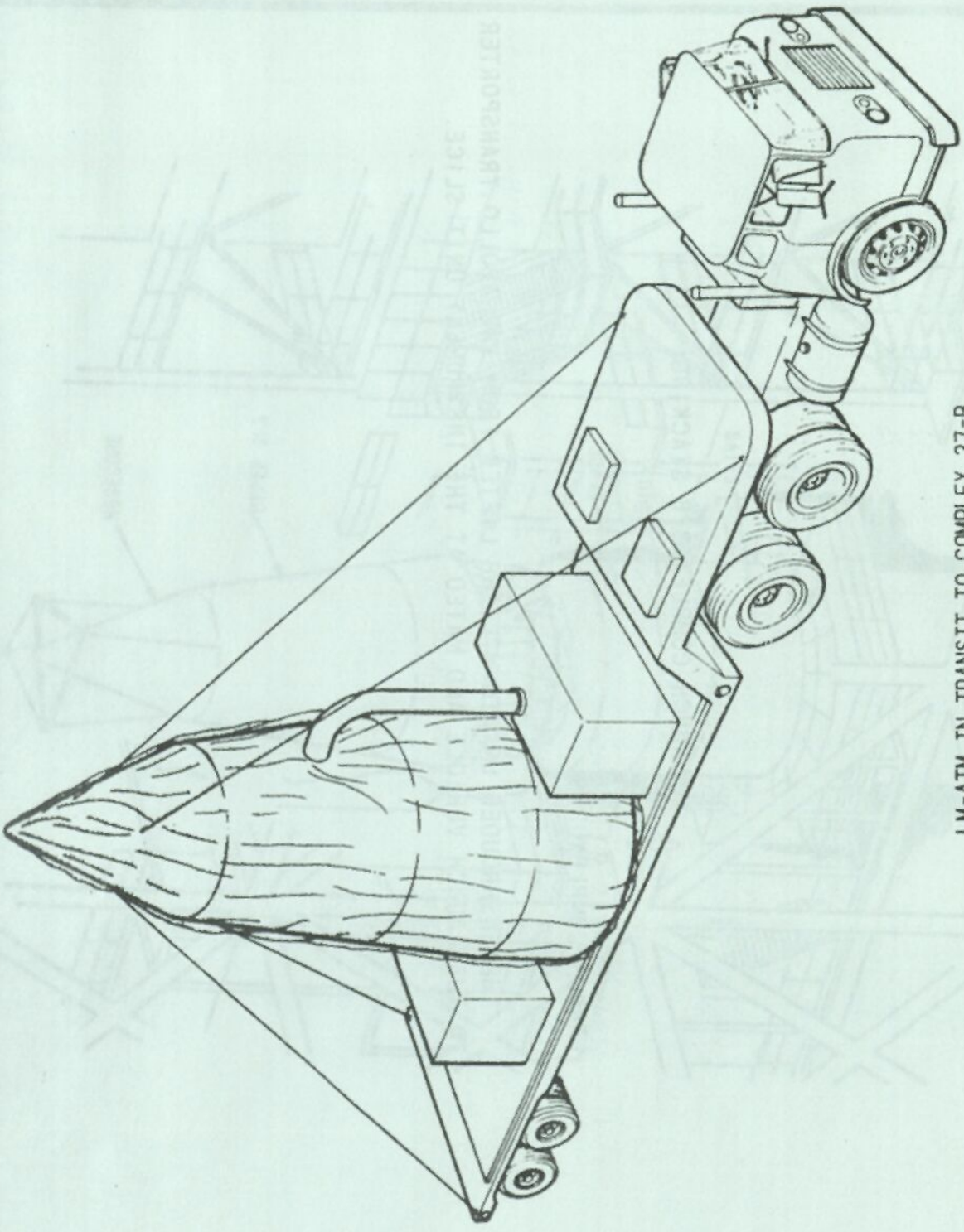


UPPER SLA AND NOSE CONE INSTALLATION

LM/ATM IN TRANSIT TO COMPLEX 37B

THE LM/ATM WILL BE TRANSPORTED TO LAUNCH COMPLEX 37B WITH THE APOLLO TRANSPORTER. THE ATM CANISTER WILL BE CONSTANTLY PURGED FROM THE TIME IT LEAVES THE ATM CLEAN ROOM UNTIL LAUNCH. THE ENTIRE SLA WILL BE THERMALLY CONDITIONED WHILE IN TRANSIT TO THE COMPLEX.





LM-ATM IN TRANSIT TO COMPLEX 37-B

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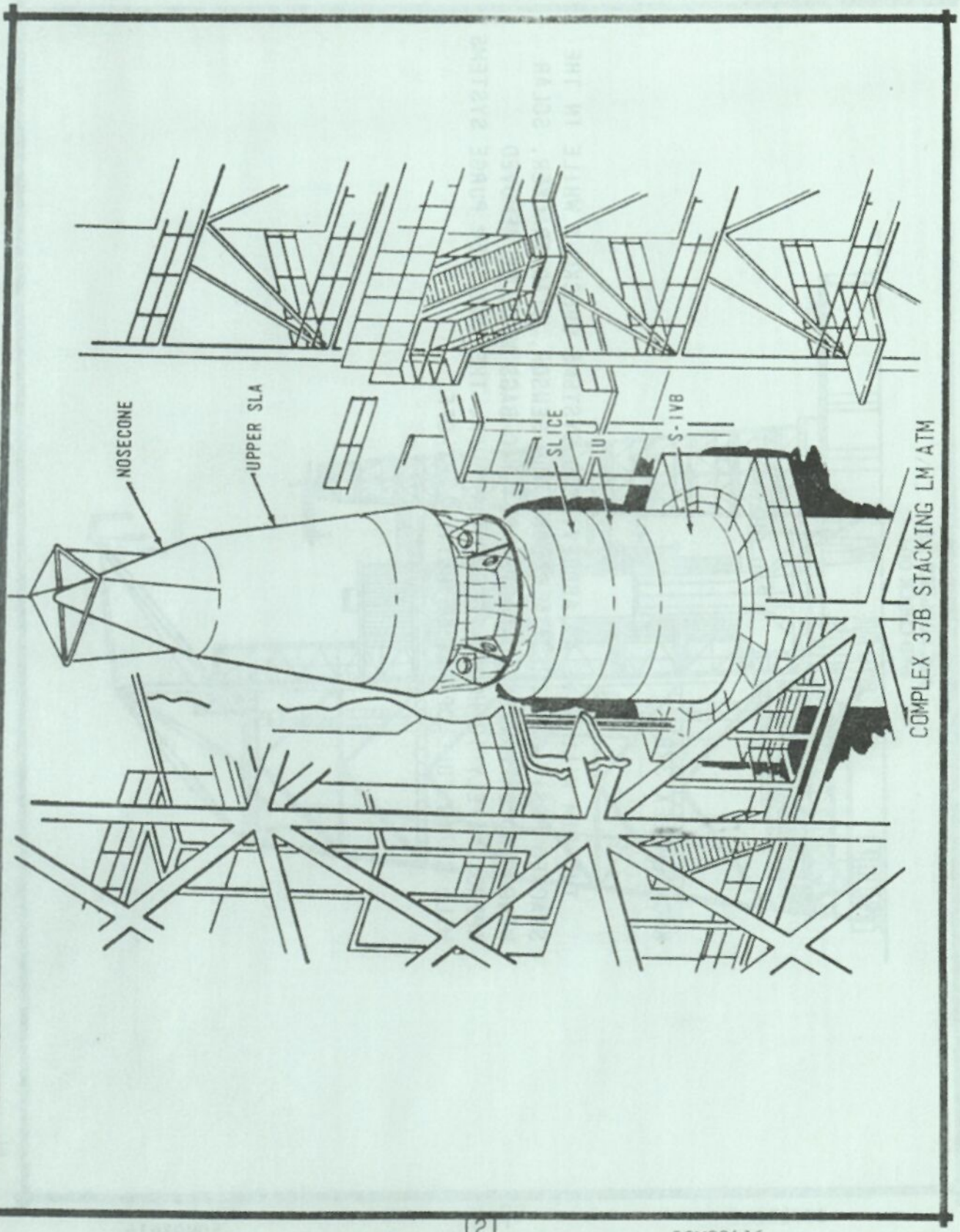
LAUNCH COMPLEX 37B STACKING

LAUNCH COMPLEX 37B

THE ENSHROUDED LM/ATM WILL BE LIFTED FROM THE APOLLO TRANSPORTER TO THE LAUNCH VEHICLE AND MATED AT THE INSTRUMENT UNIT SLICE.


NOSECONE
UPPER SLA
SLICE
IU
S-IVB
COMPLEX 37B STACKING LM ATM

50M02416

PAD CHECKOUT

KSC COMPLEX 37B

THE ATM WILL HAVE AN ABBREVIATED SYSTEMS CHECKOUT WHILE IN THE STACKED POSITION. THE ATM COURSE SUN SENSOR, STAR TRACKER, SOLAR WING, AND EXPERIMENT CANISTER PLASTIC BAGS WILL BE REMOVED APPROXIMATELY 12 HOURS BEFORE LIFT-OFF. THE CANISTER PURGE SYSTEMS WILL BE IN FULL OPERATION UNTIL LIFT-OFF.

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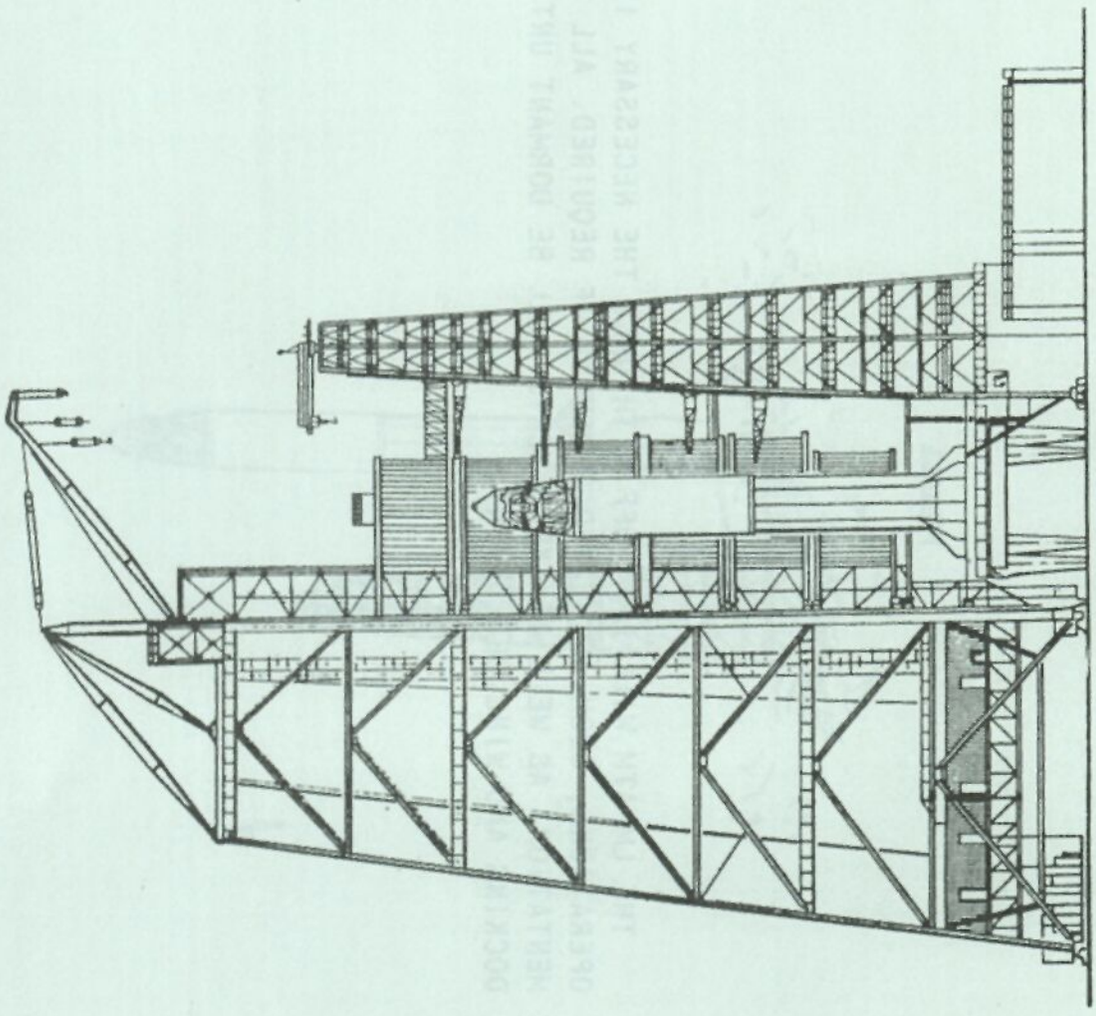

PAD CHECK OUT
KSC COMPLEX 37B

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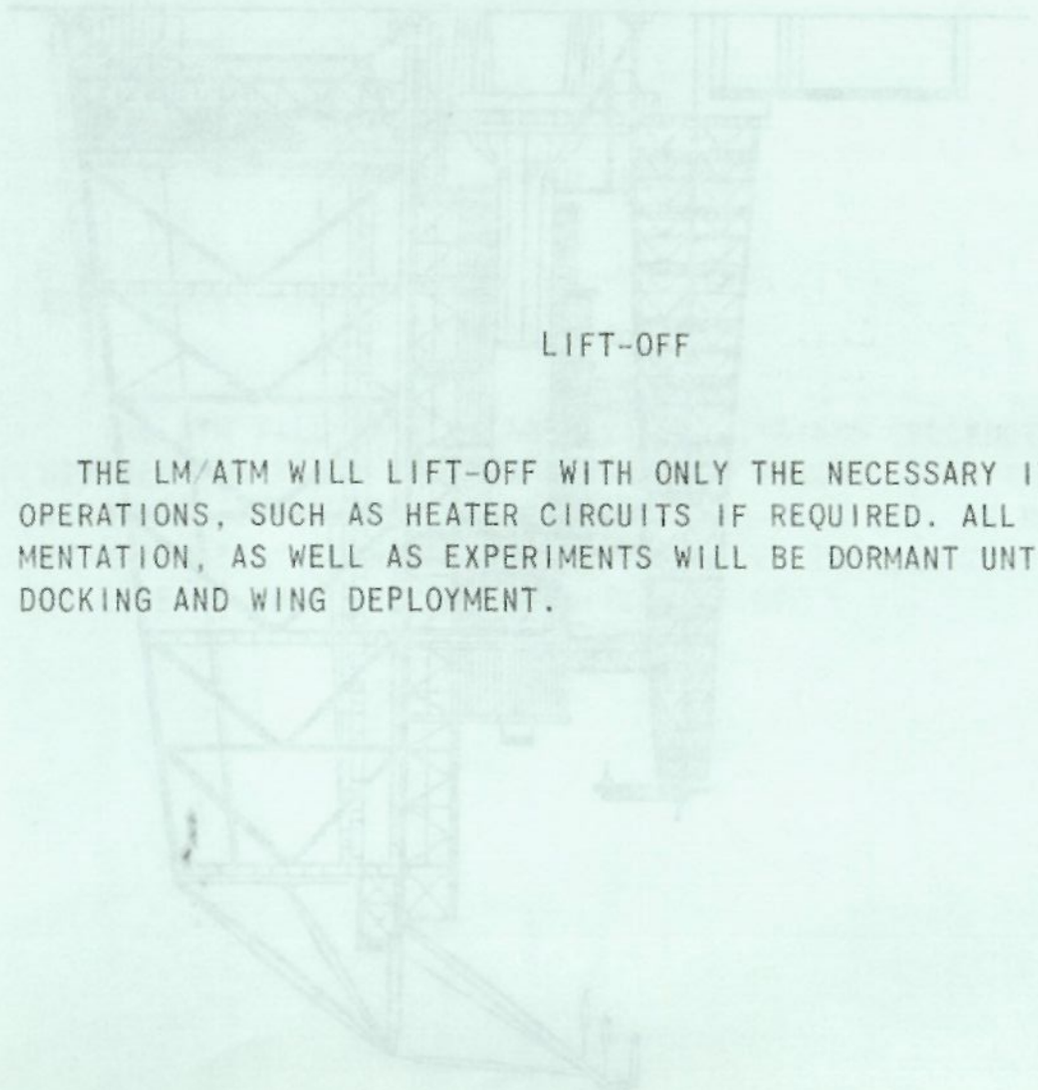

LIFT-OFF

THE LM/ATM WILL LIFT-OFF WITH ONLY THE NECESSARY ITEMS IN OPERATIONS, SUCH AS HEATER CIRCUITS IF REQUIRED. ALL INSTRUMENTATION, AS WELL AS EXPERIMENTS WILL BE DORMANT UNTIL AFTER DOCKING AND WING DEPLOYMENT.

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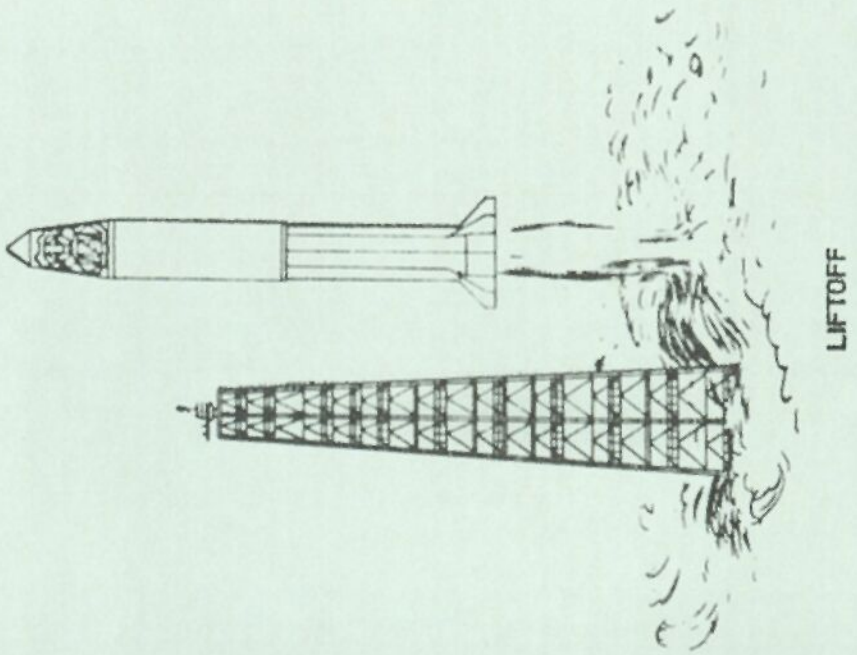
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