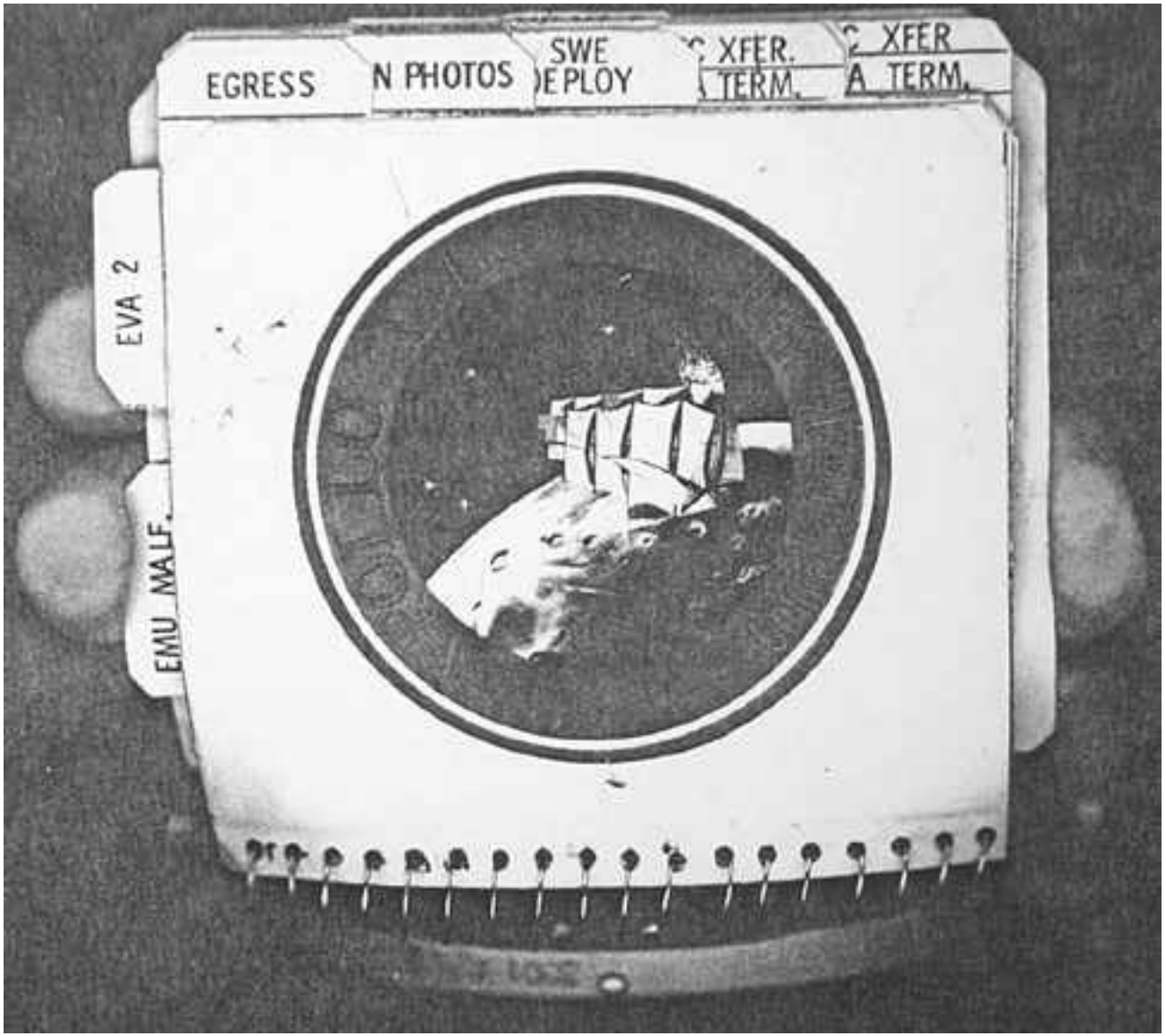
EGRESS
N PHOTOS
SWE
DEPLOY
XFER.
TERM.
XFER
A TERM.
EVA 2
EMU MALF.

APOLLO TWELVE

LUNAR SURFACE PROCEDURES

LPS CUFF CHECKLIST

Prepared by:

J. H. Roberts

Approved by:

C. Conrad, Jr.
Commander

EMU MALF.

EVA 2

CDR - EVA 1

0+10 CDR EGRESS
DEPLOY LEC & MESA

0+18 FAM
MOBILITY & STABILITY
CG SHIFT - FORWARD, BACK, SIDE
DOWNWARD REACH
ARM MOTION
WALKING (BALANCING, BOOT PENETRATION, TRACTION, SOIL SCATTERING AND ADHESION)

✓ LM & REPORT

0+23 CONTINGENCY SAMPLE

EGRESS
N PHOTOS
SWE DEPLOY
C XFER
TERM
C XFER
A TERM

ETB XFER
LMP PHOTO

0+26 ETB TRANSFERS
UNSTOW ETB AND CONTENTS
LOAD ETB - DECAL
EMU ✓
(POSSIBLE TV DEPLOY)

0+40 LMP & CONTINGENCY PHOTO
LMP EGRESS [5, 6, 15, 6]
CONTINGENCY SAMPLE AREA [8, 5, 1]
DEPLOY COLOR CHART ON UNDISTURBED SURFACE
CHART [11, 5, 1] X SUN
[11, 5, 1] DN SUN
PLACE 70 mm ON MESA

0+50 S-BAND DEPLOY
DECALS
EMU ✓

1+01 DEPLOY FLAG

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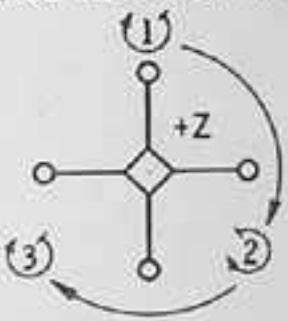
EMU MALF.

1+08 PANORAMA PHOTOS
ATTACH SADDLE BAG TO LMP
ATTACH 70 mm TO EMU
PLACE ALSCC ON SURF. IN DIRECT SUN



1+16 ALSEP OFFLOAD
DECAL
EMU ✓
CARRY HTC TO MESA
PICK UP TONGS AND TV

GEO TRAVERS
PAN PHOTOS
SWE EPLOY
"C" XFER. A TERM.
"C" XFER A TERM.

SYSTEM INTERCON | B XFER P PHOTO

1+36 ALSEP TRAVERSE

CARRY TO TV - ALSEP VIEWING SITE

- TONGS
- SUBPALLET
- TV

ORIENT TV

TRAVERSE TO SITE >300 FT - NOTIFY HOU AT START AND END

EMU ✓

1+48 SYSTEM INTERCONNECT

REMOVE SIDE

EXTRACT CABLE REEL

DEPLOY SIDE LEGS

PARK TONGS BY SUBPALLET

CONNECT CABLE TO C/S

*STOW CARRY BAR

*POSITION PSE STOOL

*TILT PKG 1

*ALIGN PKG 1

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EMU MALF. | EVA 2

1+58 SWE DEPLOY

DECAL

SWE [11, 5, 1] X SUN

EMU ✓

2+01 LSM OFFLOAD

2 B. BOLTS

REMOVE HANDLE BRACKET

LIFT LSM & DEPLOY ROUND HANDLE

✓ CABLE CLEAR OF C/S

2+06 SUNSHIELD DEPLOY

2+14 ANTENNA INSTALLATION

INSTALL ANTENNA MAST, GIMBAL, AND ANTENNA

CHECK ALIGNMENT

COARSE LEVEL

SUN ANGLE — UPDATE

AZIMUTH 16.44 ( )

ELEV. 5.25 ( )

FINE LEVEL & ALIGN

GEO TRAVERSE | CUMENT AMPLE | SWE DEPLOY | C XFER A TERM. | C XFER A TERM.

ALSEP SYSTEM ACTIVATION | INTERCON | ETB XFER | PHOTO

2+25 ALSEP ACTIVATION
REPORT SHORTING AMPS
DEPRESS SHORTING SW
REPORT AMPS ZERO
REQUEST TO TURN ON ASTRO SW 1
EMU ✓

2+30 RETURN TRAVERSE
DISCARD UHT
RETRIEVE TONGS
COLLECT SAMPLES (INCL. SOFTBALL)
EMU ✓

2+47 SRC 1 PACKING
STOW 70 mm IN ETB
STOW HAMMER & EXT. HANDLE ON HTC
STOW TONGS ON HTC
UNSTOW SRC 1
- SCALE
- WEIGH BAGS
- FLAT BAGS (15)
- CORE TUBE/CAP

EMU MALF.

EVA 2

SEAL ORGANIC CONTROL SAMPLE
REMOVE SADDLE BAGS
SCOOP MATERIAL
STOW IN SRC:
- SELECTED SAMPLE BAGS (2)
- CORE TUBE

CLOSE SRC
EMU ✓
COMM CHECK

3+12 LEC TRANSFERS
STOW 70 mm (2) IN ETB
TRANSFER ETB
TRANSFER SRC

3+17 EVA TERMINATION
PLACE SRC 2 IN SUN ON +Y PAD
CLEAN EMU
ATTACH LEC TO PORCH
INGRESS

GEO TRAVERSE | DOCUMENTED CORE SAMPLE | CORE SAMPLE | LEC XFER. | EVA TERM. | C XFER | A TERM.

CDR - EVA 2

0+10 CDR EGRESS
PASS LEC TO LMP

0+13 ETB TRANSFER

0+[illegible] GEOLOGY TRAVERSE PREP
STOW ON HTC
- CONTRAST CHARTS
- EXTENSION HANDLE
- HAMMER
- SMALL SHOVEL
- GNOMON

PLACE SRC 2 ON MESA
ATTACH WEIGH BAG TO SCALE
ATTACH SADDLE BAG TO LMP
(LMP ATTACH PARTS BAG TO CDR)
UNSTOW CUTTING TOOL
(LMP STOW CUTTING TOOL IN BAG)

EVA 2 EGRESS | ALSEP DEYSTEM ACTIVATION INTERCON | TB XFER P PHOTO

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EMU MALF.

STOW ON HTC:

- CORE TUBES/CAPS
- DIXIE CUPS
- GAS SAMPLE CAN
- ENVIRONMENTAL SAMPLE CAN
- FLAT SAMPLE BAGS (15)

STOW SWC BAG ON MESA

SEAL ORGANIC CONTROL SAMPLE

TETHER TONGS

ATTACH 70 mm TO EMU

0:30 TRAVERSE

CARRY:

- TONGS
- GNOMON
- 70 mm
- SMALL SHOVEL
- SURVEYOR PARTS BAG

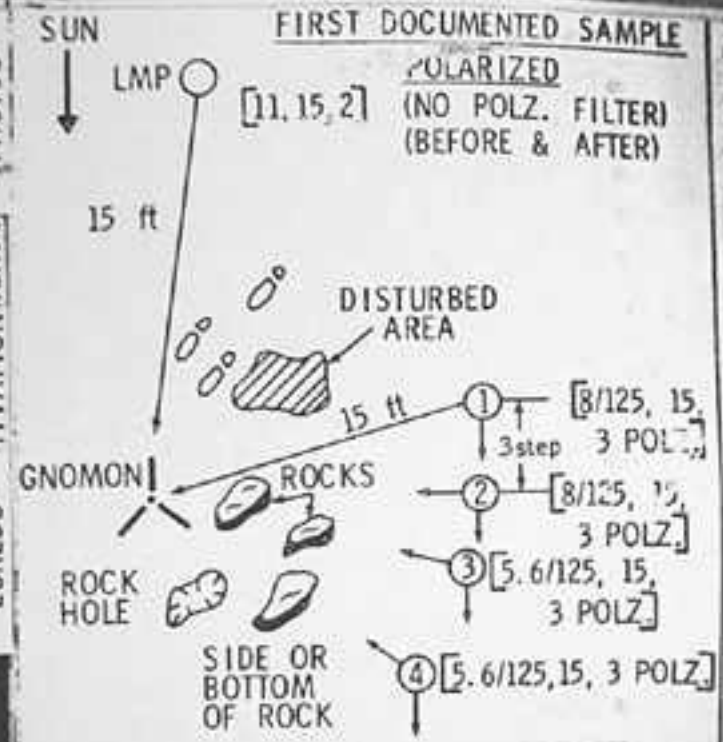
GEO TRAVERSE | DOCUMENTED SAMPLE | CORE SAMPLE | SURVEYOR | TV XFER A TERM.

POLARIZE PHOTOS

ALSEP SYSTEM ACTIVATION TERCO

EVA 2 EGRESS

FIRST DOCUMENTED SAMPLE



EMU MALF.

REPORT:

- START AND END OF TRAVERSE
- LOCATION WRT LM
- PHOTOS OTHER THAN NOMINAL
- SAMPLE BAG NUMBERS

DOCUMENTED SAMPLE

SELECT SAMPLE
PLACE GNOMON UPSUN OF SAMPLE
SAMPLE & GNOMON [8, 5, 2] X SUN
RETRIEVE SAMPLE

EMU MALF. 1 - 3

DOCUMENTED SAMPLE

CORE SAMPLE

URVEYOR

XFER A TERM.

TRAVERSE REQUIREMENTS

DOCUMENTED SAMPLE INCLUDES:

- TOP & BOTTOM OF ROCKS NEAR AND FAR FROM LM
- SOIL NEAR AND FAR
- SOIL UNDER AND NEXT TO A ROCK
- CORE TUBES (2)
- ENVIRON. SAMPLE (LARGE CAN/SOIL)
- GAS SAMPLE (SMALL CAN/ROCK)
- TRENCH SAMPLES (ENVIRO/CORE TUBE)
- TYPES OF MATERIALS
  - FINE GRAIN IGNEOUS ROCKS
  - COARSE GRAIN IGNEOUS ROCKS
  - BRECCIAS
  - FINE MATERIAL
  - GLASS "SPLASH"

EMU MALF.

CORE TUBE SAMPLES (2)

SELECT SAMPLE SITE
PLACE GNOMON UPSUN OF SITE
SAMPLE SITE & GNOMON [8, 5, 2] X SUN

TRENCH SAMPLING (ENVIRO/CORE TUBES)

PLACE GNOMON UPSUN
PHOTO SITE [8, 5, 2] STEREO X SUN
TRENCH ALONG SUNLINE
FILL LARGE CAN WITH SUBSURFACE SOIL
ASSEMBLE CORE TUBE AND HANDLE

GAS ANALYSIS SAMPLE (SMALL CAN/ROCK)

SELECT A SURFACE ROCK FRAGMENT
(FAR FROM LM PLUME)
PLACE GNOMON UPSUN OF FRAGMENT
FRAGMENT & GNOMON [8, 5, 2] X SUN
RETRIEVE FRAGMENT

EMU MALF. 1 - 3 | EMU MALF. (CONT) | CORE SAMPLE | SURVEYOR 'C' XFER 'A' TERM.

EVA 2 EGRESS | SURVEYOR | AVERSE Q'MTS. | OLARIZE PHOTOS

SURVEYOR SITE DOC. SAMPLES

- LUNAR ROCK [8, 5, 1] X SUN
- LAYERED ROCK [8, 5, 1] X SUN
- ROUNDED ROCK IN RAY PATTERNS [8, 5, 1] X SUN

2+00 SURVEYOR ACTIVITIES

STOW SCOOP & CAMERA ON HTC

PERFORM D.P.

LMP ACTIVITY CHECKLIST:

- PHOTO BAY A [11, 15, 1]
- PHOTO TV SECTOR [8, 15, 3]
- PHOTO SCOOP IMPRINTS [8, 5, 2] ST
- PHOTO FOOTPAD 2 PRINTS [8, 5, 2] ST
- DISTURB SURFACE; FOOTPAD 2 AREA
- F/P 2 AREA [8, 5, 2] ST
- PHOTO VERNIER ENG, BAY A [11, 5, 1]
- PHOTO LARGE BOX A [8, 5, 1]

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EMU MALF.

EMU MALF. - 3 | EMU MALF (CONT) - 6 | EMU MALF 10 - 11 | SURVEYOR | C XFER A TERM.

EVA 2 EGRESS | SURVEYOR | RAVERSE EQ'MTS. | QUARIZE PHOTOS

PREFERRED TETHER PARTNER

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EMU MALF.

LMP ACTIVITY (CONT.)

- WIPE - PHOTO LARGE BOX A [8, 5, 1]
- PHOTO SMALL BOX [8, 5, 1]
- WIPE - PHOTO SMALL BOX [8, 5, 1]
- PHOTO BAY B [11, 15, 1]
- PHOTO SOLAR ARRAY [5.6, 15, 1]
- PHOTO FOOTPAD 3 [11, 5, 1]
- PHOTO SCOOP TRENCHES [8, 5, 2] ST
- PHOTO TV MIRROR [8, 5, 1]
- WIPE - PHOTO TV MIRROR [8, 5, 1]

WALK TO TV CAMERA AREA

(LMP REMOVE CUTTER & CAN FROM BAG)

CUT, WITH LMP ASSISTANCE:

- CABLE & PAINTED TUBE SAMPLE
- 2ND TV CAMERA TUBE
- AL TUBE SAMPLE
- TV CAMERA SUPPORT TUBES

EMU MALF. 1 - 3 | EMU MALF. (CONT) - 6 | EMU MALF 10 - 11 | SURVEYOR | C XFER | A TERM.

DISCARD CUTTING TOOL
(LMP LOAD TV CAMERA IN BAG)
COMPLETE GEOLOGY TRAVERSE
REPORT START AND END OF TRAVERSE

2+46 SRC 2 PACKING
(LMP REMOVE PARTS BAG)
PLACE 70 mm IN ETB
REMOVE & EMPTY LMP SADDLE BAG
RETRIEVE SWC
STOW IN SRC 2:
- SWC FOIL/BAG
- CORE TUBES (3)
- ENVIRONMENTAL SAMPLE CAN
- GAS SAMPLE CAN
- DOCUMENTED SAMPLES

CHECK & CLEAN LMP EMU
SEAL SRC 2

EMU MALF.

3+01 LEC TRANSFERS
CHECK 70 mm (2) IN ETB
TRANSFER ETB
TRANSFER SRC 2
TRANSFER SURVEYOR PARTS BAG

3+20 EVA TERMINATION
CLEAN EMU
CLEAR LEC OF ASCENT STAGE
INGRESS
JETTISON EQUIPMENT
CLOSE HATCH
REPRESS CABIN

EMU MALF. 1 - 3
EMU MALF. CONT - 6
EMU MALF. 10 - 11
LEC XFER
EVA TERM.

EMU MALFUNCTIONS

EMU 1: VENT/TONE [P]

FAN OFF/ON
IF FLAG STILL ON AFTER 10 SEC, ACTUATE OPS AND PURGE VLV

EMU 2: PRESS/TONE [O]

ACTUATE OPS
IF FLAG ON, CK. CUFF GAGE, VER. TM; OPS OFF (SEN. FAIL)

EMU 3: O_2/TONE [O]

CK. LOW PGA PRESS OR PLSS O_2 DECREASING
IF LEAK CONFIRMED, ACT. OPS
IF NO LEAK, VER. TM (SEN. FAIL)

EMU 4: H_2O/TONE [A]

VERIFY FEEDWATER OPEN

IF CLOSED: DIV VLV MIN COOL, FEEDWATER OPEN, WAIT 4 MIN.

IF ADD'L COOL REQ'D, ACTUATE OPS AND PURGE VLV

EMU 5: TONE/NO FLAGS

CUFF GAGE: IF <3.4, ACTUATE OPS

IF CUFF GAGE >3.4 & TONE OFF: CYCLE MODE SW MOMENTARILY - NO TONE, NO FAILURE.

IF TONE ON AGAIN:

FAN OFF 5 SEC, VENT FLAG [P] SHOULD COME ON; FAN ON. IF NO FLAG, ACTUATE OPS AND PURGE VLV (FLAG FAIL)

EMU 5: (CONT)

OBSERVE PLSS O_2: IF DECREASING, ACTUATE OPS.

IS FEEDWATER CLOSED: IF CLSD, DIV VLV MIN COOL, FEEDWATER OPEN. AFTER 4 MIN, IF COOL INADEQUATE, ACTUATE OPS AND PURGE VLV.

EMU 6: CUFF GAGE < 3.7 - NO FLAG

ACTUATE OPS: CUFF GAGE SHOULD RISE (EMU LEAK OR REG. SHIFT)

IF NO GAGE RESPONSE, VERIFY TM - OPS OFF (GAGE FAIL)

EMU 7: PLSS O_2 QUANTITY ABNORMAL

CK CUFF GAGE, PRESS FLAG [O] & O_2 FLAG [O]

IF LEAK CONFIRMED, ACTUATE OPS

IF NOT, VERIFY TM (GAGE FAIL)

EMU 8: CUFF GAGE >4.0

IF O_2 FLAG [O], ACTUATE OPS AND PLSS O_2 OFF (PLSS REG FAIL)

IF NOT, VERIFY TM (POSS. GAGE FAIL)

EMU 9: LOSS OF PUMP NOISE

IF NO SIDETONE, ACTUATE OPS AND PURGE VLV (POWER FAIL)

IF SIDETONE OK:

CHECK PUMP ON.

VERIFY TM FOR PUMP CONDITION.

IF ADDITIONAL COOLING REQUIRED, ACTUATE OPS AND PURGE VLV.

EMU 10: COOLING INADEQUATE

VERIFY DIV VLV MAX

ACTUATE GAS TRAP FOR 5 SEC., IF FEASIBLE

AFTER 3 MIN., IF ADDITIONAL COOLING REQUIRED, ACTUATE OPS AND PURGE VLV

EMU 11: LOSS OF VOICE COMMUNICATION

CHECK VOL CONTROLS (WHEEL A, BLADE B)

CYCLE PTT SW - MAIN & MOM

CDR MODE SW TO B, LMP TO A (HAND SIGNALS)

IF NO COMM, CDR TO A, LMP TO B

SOME OF THE LARGE BLOCKS IN SURVEYOR CRATER

SHOW LOCALIZED& SUBTLE EVIDENCE OF GRADED & POSSIBLY RHYTHMIC LAYERING

SOME BLOCKS HAVE CROSS LINE-ATIONS THAT SUGGEST A POLYMETAMORPHIC HISTORY

BEDROCK EXPOSED IN THE BOTTOMS OF CRATERS

THE BEDROCK SURFACE RESEMBLES A MOSAICBRECCIA WITH A CONSISTANT ORGANIZATION TO ITS INTERNAL FABRIC

LARGE BLOCKS OF MICROBRECCIA

THE BLOCKS OF MULTILITHIC MICROBRECCIA CONTAIN LEUCOCRATIC XENOLITHS