

TIR # 729-S-0018(S)

JUNE 5, 1970

# LUNAR ROVING VEHICLE

CREW EQUIPMENT STOWAGE METHODS  
AND LOCATION

PREPARED BY

**GENERAL  ELECTRIC**

APOLLO SYSTEMS

HOUSTON PROGRAMS

ITEM NO.	NOMENCLATURE	UNIT WEIGHT LBS.	QUANTITY	LRY STOWAGE ZONE CODE	LM-10 STOWAGE LIST ITEM NO.	LM-10 STOWAGE LOCATION		
						AS	DS	AREA
-	ALHTC (WITH TOOLS)	20.7						
1	ALHTC (TOOL CARRIER)	(10.2)	1	A4	G4035		✓	MESA
2	CAP AND BRACKET ASSY. CORE TUBE	(0.7)	1	A4			✓	MESA (SRC)
3	DISPENSER, 35-BAG	(1.6)	1	A4			✓	MESA (SRC)
4	GNOMON	(0.6)	1	A4	G4035.3		✓	MESA
5	HAMMER	(2.8)	1	A4	G4035.1		✓	MESA
6	HANDLE, EXTENSION	(1.3)	1	A4	G4008		✓	MESA
7	SCOOP, SMALL	(0.4)	1	A4	G4035.4		✓	MESA
8	SCRIBE/BRUSH/LENS	(0.5)	1	A4	G4035.5		✓	MESA
9	STAFF/CAMERA MOUNT	(0.8)	1	A4	G4035.6		✓	MESA
10	TUBES, CORE	(0.6)	3	A4			✓	MESA (SRC)
11	ANTENNA, HIGH GAIN	+6.6	1	F3	E1002		✓	MESA
12	ANTENNA, LOW GAIN	2.5	1	C3	E1002		✓	MESA
13	BAGS, WEIGH	0.6	4	L1(STOW)/A10&EQ(USE)	G4018		✓	MESA (SRC)
14	BRUSH, LUNAR DUST	1.4	1	L3	B1045		✓	MESA
15	CAMERA, CLOSE-UP STEREO	10.7	1	A1F	T80		✓	MESA (T80)
16	CAMERA SYSTEM, 16 MM DAC	8.9	1	C4		✓		T80
17	MAGAZINE, 16 MM	(1.0)	2	C4/R3B-E	A0101.1	✓		RHSSC
-	CAMERA SYSTEM, LGEC	9.3						
18	BRACKET, RCU	*(0.8)	1	C2	T80		✓	MESA
19	COVER, LGEC MAGAZINE	1.8	1	R1	G4030		✓	MESA
20	LGEC (CAMERA)	(6.0)	1	C2	G4021		✓	MESA
21	MAGAZINE, LGEC	(2.5)	2	C2/R1	G4024		✓	MESA
-	CAMERA SYSTEM, 70 MM	7.6						
22	BRACKET, RCU	(0.6)	1	C1	B1001.1	✓		RHSSC
23	CAMERA, 70 MM	(3.1)	1	C1	A1015	✓		RHSSC
24	HANDLE	(0.5)	1	C1	A1028	✓		RHSSC
25	LENS, 60 MM	(1.8)	1	C1	A1016	✓		RHSSC
26	MAGAZINE, 70 MM	(1.4)	2	C1/R2	A0108.1	✓		RHSSC
27	TRIGGER	(0.2)	1	C1	A1027	✓		RHSSC
28	CONTAINER, SPECIAL ENVIRONMENT SAMPLE (SESC)	1.0	1	R3A			✓	MESA (SRC)
29	DISPENSER, 15-BAG	0.2	1	G5 OR C6				T80
30	DRILL, APOLLO LUNAR SURFACE	17.1	1	A2A	G4002.2		✓	SEQ BAY
31	CAPS AND RETAINERS, CORE STEM	0.15	2 (PKGS)	A2E/A2F				
32	STEMS, CORE	0.45	6	A2C(EMPTY)/A.2(FULL)				
33	BIT, CORE	0.1	1	A2C				
34	TREADLE	2.7	1	A2B				
35	WRENCH, DRILL STRING	0.4	2	A2D	G4028		✓	SEQ BAY
36	LCRU	+54.0	1	F1	E1002		✓	MESA
37	LINE, LUNAR SAFETY, W/BAG	1.3	1	R3F	B1041/B1047		✓	MESA
38	MAGNETOMETER, HAND-HELD	*10.1	1	A1A/A1B/A1C			✓	T80
39	MAPS, LUNAR SURFACE			T80	A0114.13	✓		FLIGHT DATA FILE
40	SCOOP, LARGE	1.3	1	T80	G4007		✓	MESA
41	TONGS	*1.0	2	C7(LEFT)/C8(RIGHT)	G4035.2		✓	MESA
42	TOOL, TRENCHING	2.1	1	A1G	G4029		✓	MESA
43	TV SYSTEM, LM COLOR	*13.6	1	F2	E1001		✓	MESA
44	AZ-EL UNIT	*7.0	1	F2			✓	MESA
45	UMBILICAL, BUDDY SYSTEM, W/BAG	10.9	1	A5	B1052/B1053	✓		+Z27 BULKHEAD

\*ESTIMATED WEIGHT

LUNAR ROVING VEHICLE (LRV)  
STOWAGE CONCEPTS

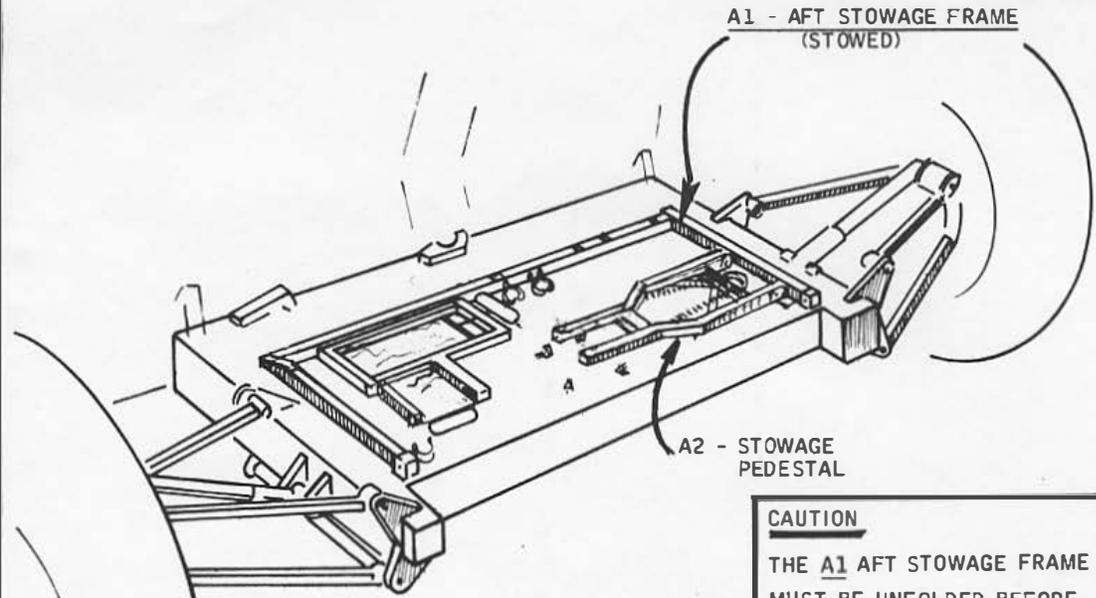
The Lunar Roving Vehicle (LRV) will provide the astronauts with increased capability for exploration of the lunar surface after landing of the Lunar Module. Particularly, the LRV will allow the astronauts to range further and faster, thus utilizing the expendables of the crew's Portable Life Support Systems more for "active sample taking" rather than in "walking of the traverses."

The LRV must serve not only as a "taxi" for the astronauts, but also as a "truck" to carry the crew equipment, tools and experimental equipment required for the planned traverses of the lunar surface. Due to the reduced gravity on the lunar surface, this "trucking" becomes a more complex design problem for a lunar surface vehicle. The stowed equipment has more "bounce" on the lunar surface than it would have in an earth environment. As a result, methods for restraint, containment and support are required for all stowed equipment on the LRV.

This handbook illustrates proposed methods for stowing equipment on the LRV. Equipment items to be stowed on the LRV and their related data are listed for reference on the left-hand facing page 1. "Stowage areas" on the vehicle have been coded for ease of reference. The right-hand foldout (page 25) identifies all the coded area designations and related stowed items. The stowage concepts for the unique stowage areas are illustrated in detail on the following pages that are arranged alphanumerically by area codes:

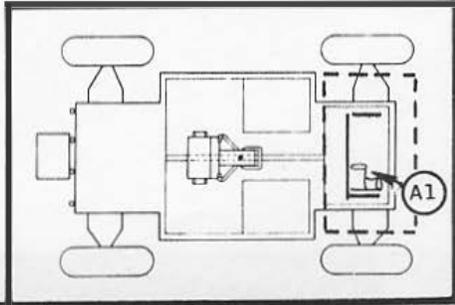
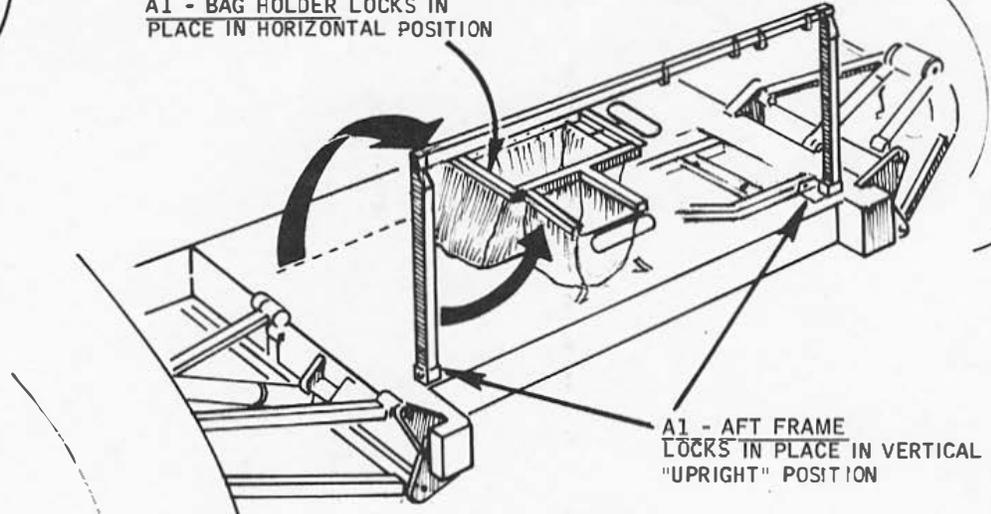
<u>CODES</u>		<u>GENERAL AREA DESCRIPTIONS</u>
A's	=	Vehicle Areas Aft of Seats
C's	=	Console Areas
F's	=	Forward Vehicle Areas
R's	=	Areas Under Right Seat
L's	=	Areas Under Left Seat

A1  
STOWAGE FRAME



**CAUTION**  
THE A1 AFT STOWAGE FRAME  
MUST BE UNFOLDED BEFORE  
UNFOLDING THE A2 STOWAGE  
PEDESTAL.

A1 - BAG HOLDER LOCKS IN  
PLACE IN HORIZONTAL POSITION



A1A LUNAR  
 A1B SURFACE  
 A1C MAGNETOMETER

A1A  
 LSM ELECT. PKG.

A1B  
 LSM REEL

NOTE: PKG. SITS IN BAG AT  
 A 15° TILT FOR EASIER  
 READING BY ASTRONAUT.

BAG HANDLES  
 ARE SPRING  
 LOADED

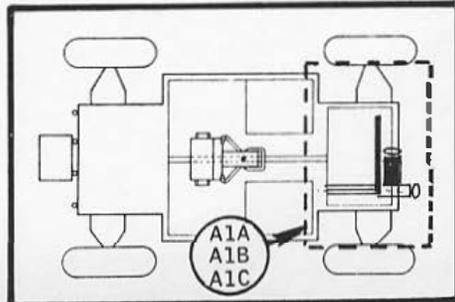
A1C  
 LSM  
 TRIPOD  
 AND  
 SENSOR

AFT TRIPOD  
 BRACKET  
 (FOLDS FORWARD  
 TO STOW)

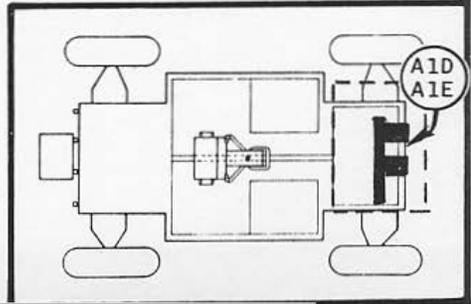
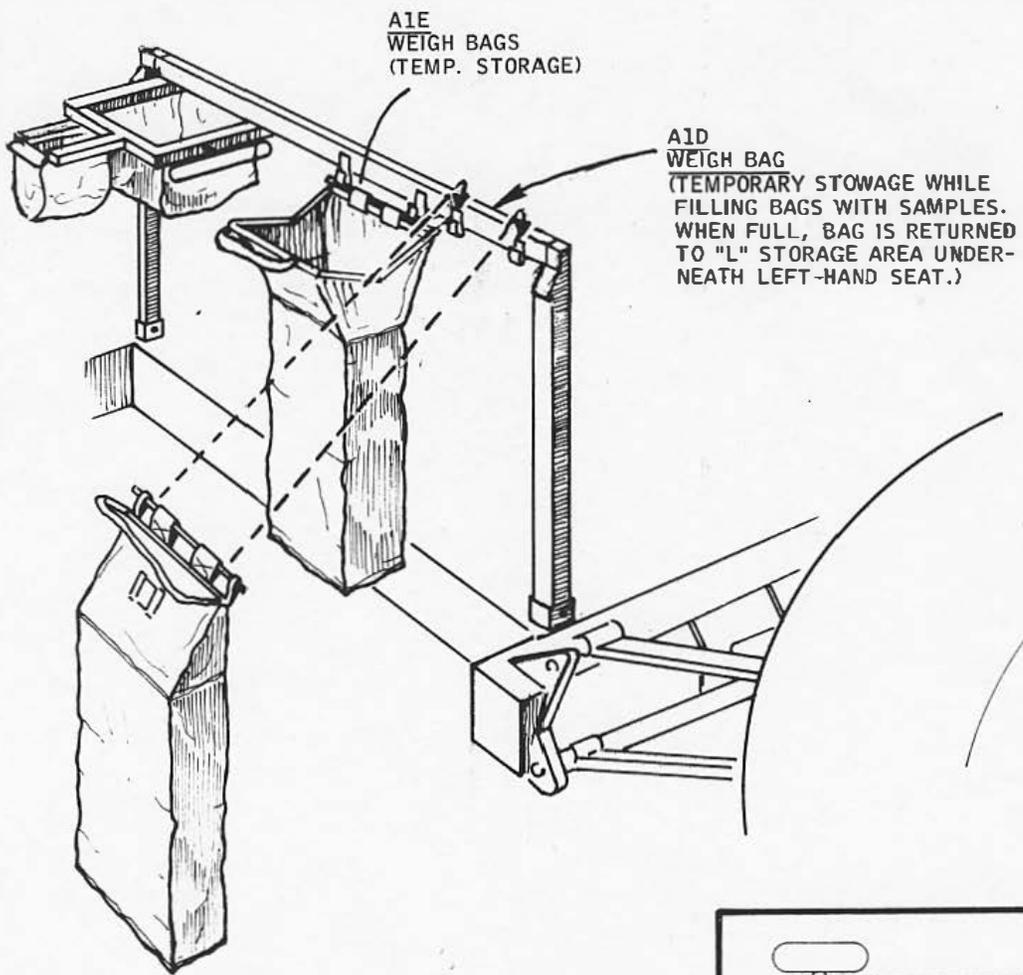
TRIPOD  
 BRACKET  
 (FOLDS TO  
 AFT POSITION  
 TO STOW)

A1C  
 (TRIPOD STORAGE AREA)

AFT



A1D WEIGH BAG  
A1E (TEMP. STOW.)



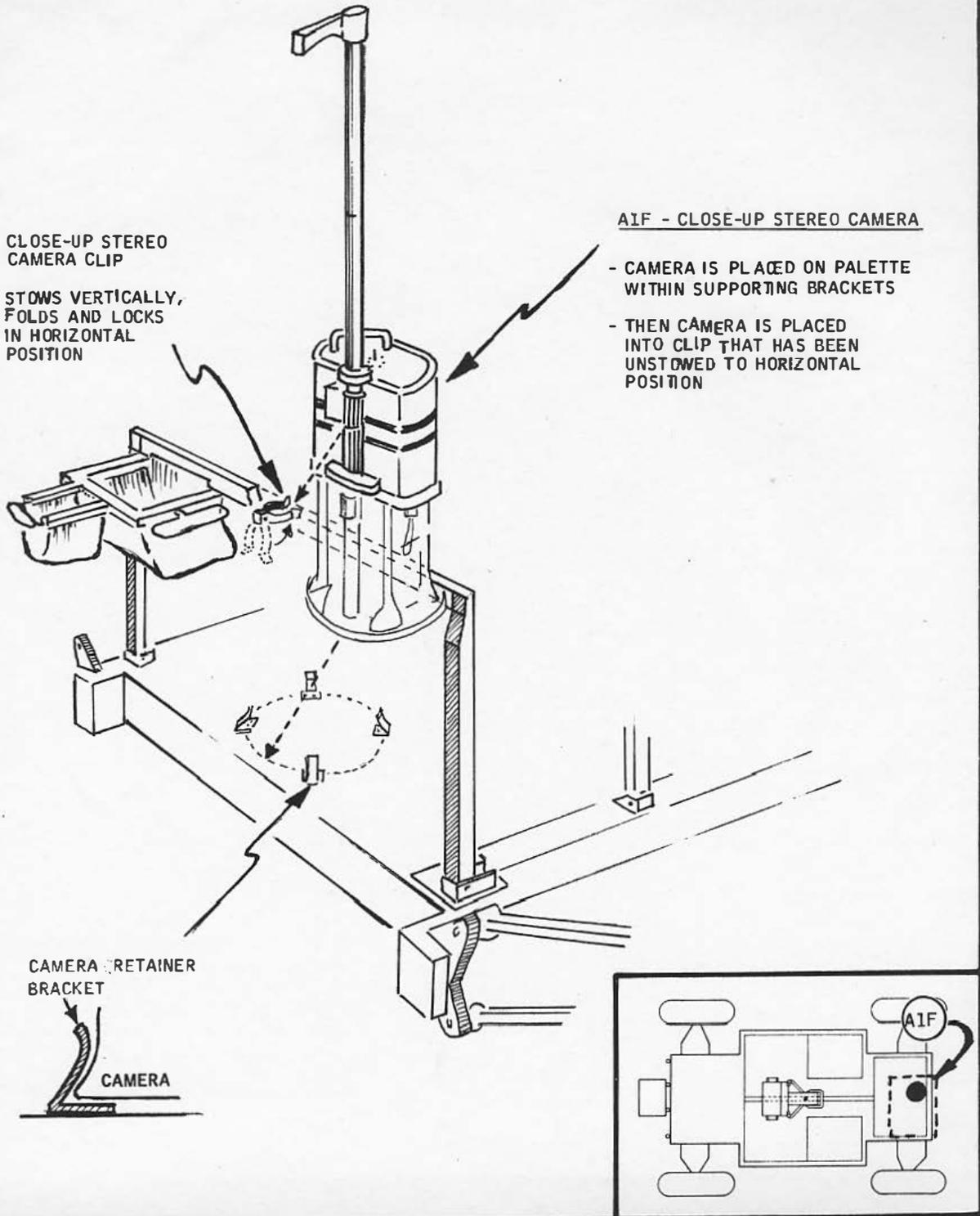
CLOSE-UP  
AIF STEREO  
CAMERA

CLOSE-UP STEREO  
CAMERA CLIP

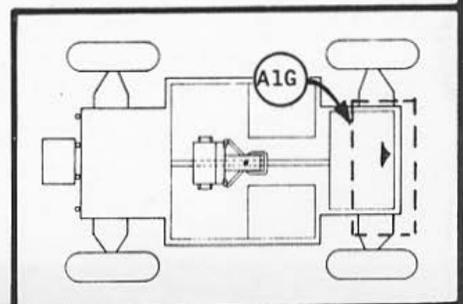
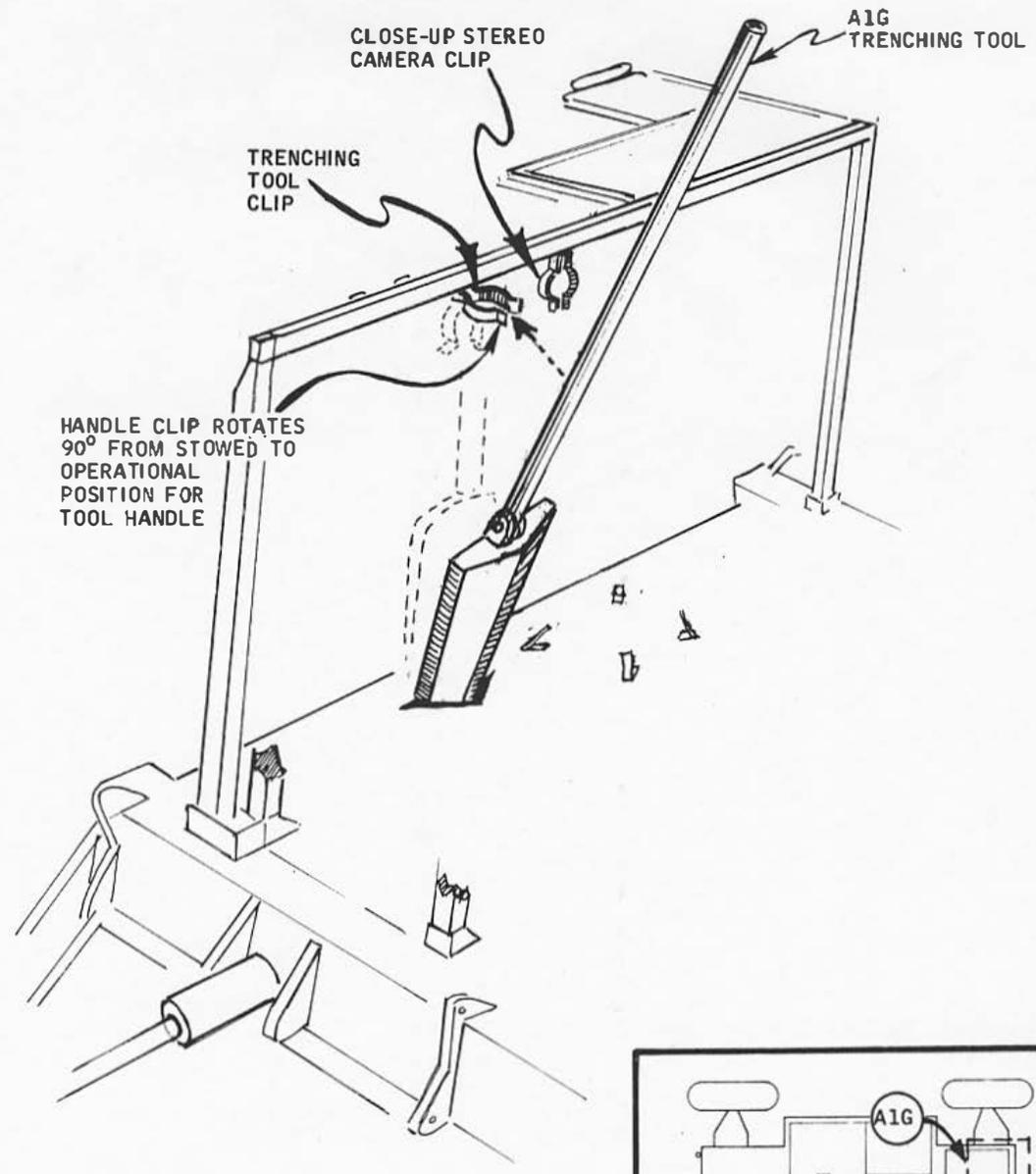
STOWS VERTICALLY,  
FOLDS AND LOCKS  
IN HORIZONTAL  
POSITION

AIF - CLOSE-UP STEREO CAMERA

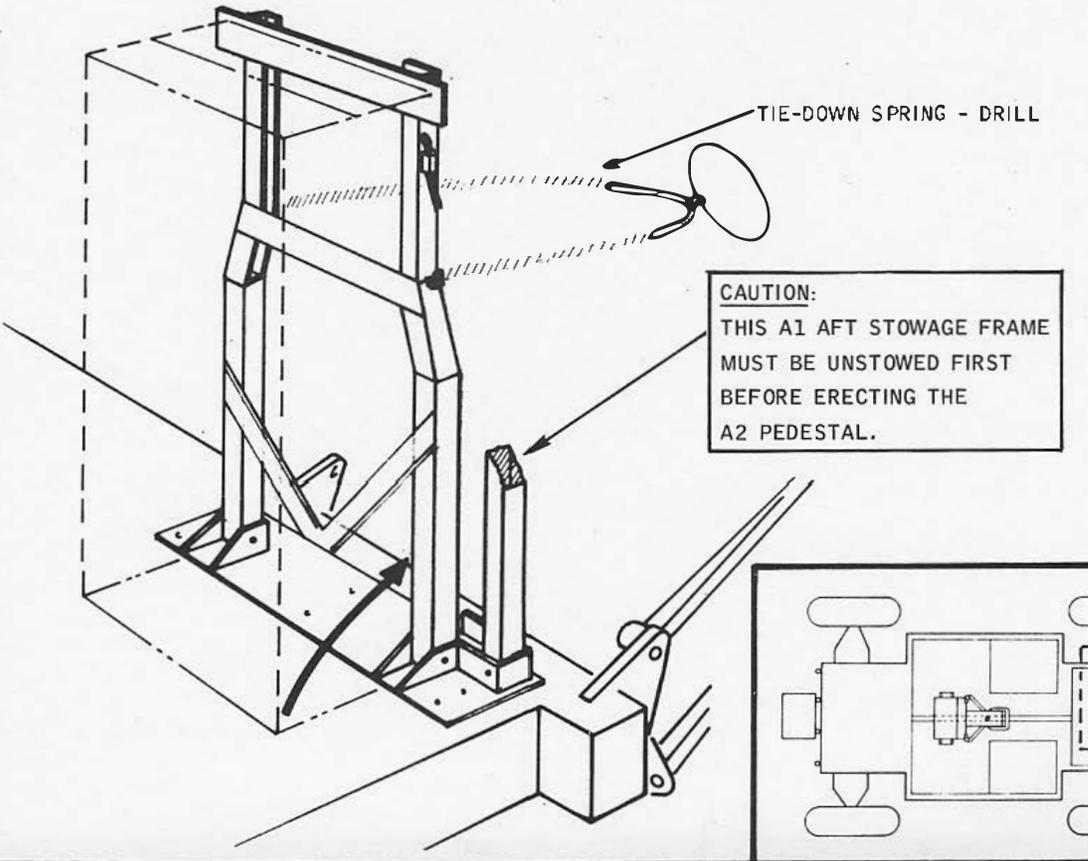
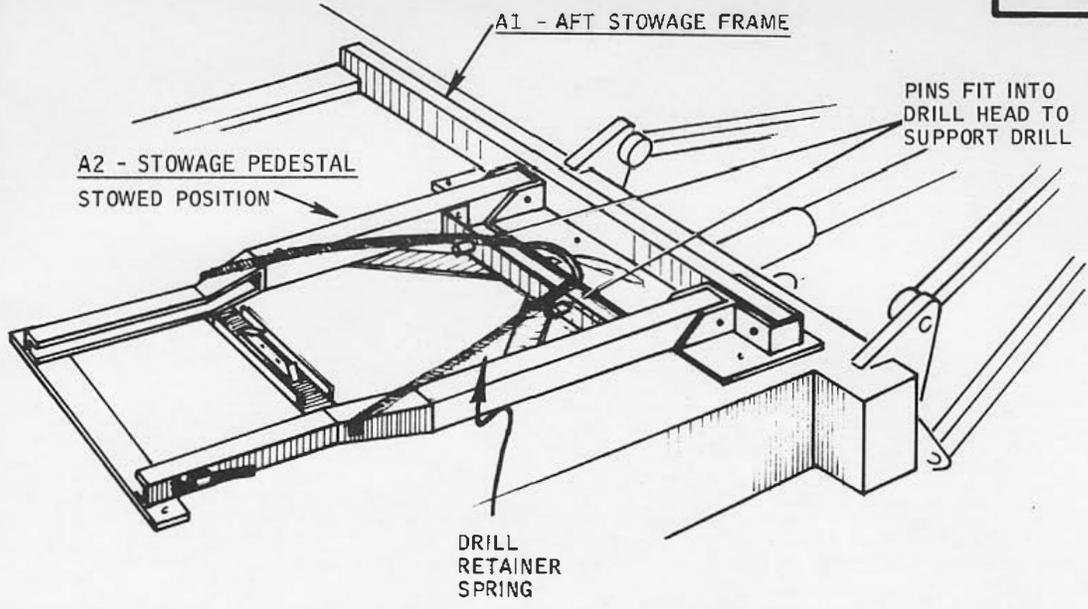
- CAMERA IS PLACED ON PALETTE  
WITHIN SUPPORTING BRACKETS
- THEN CAMERA IS PLACED  
INTO CLIP THAT HAS BEEN  
UNSTOWED TO HORIZONTAL  
POSITION



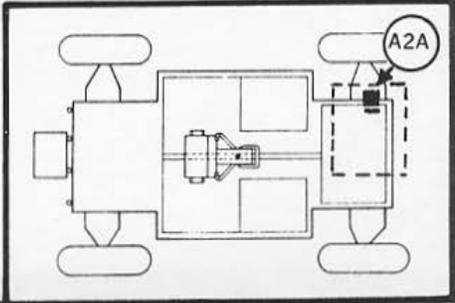
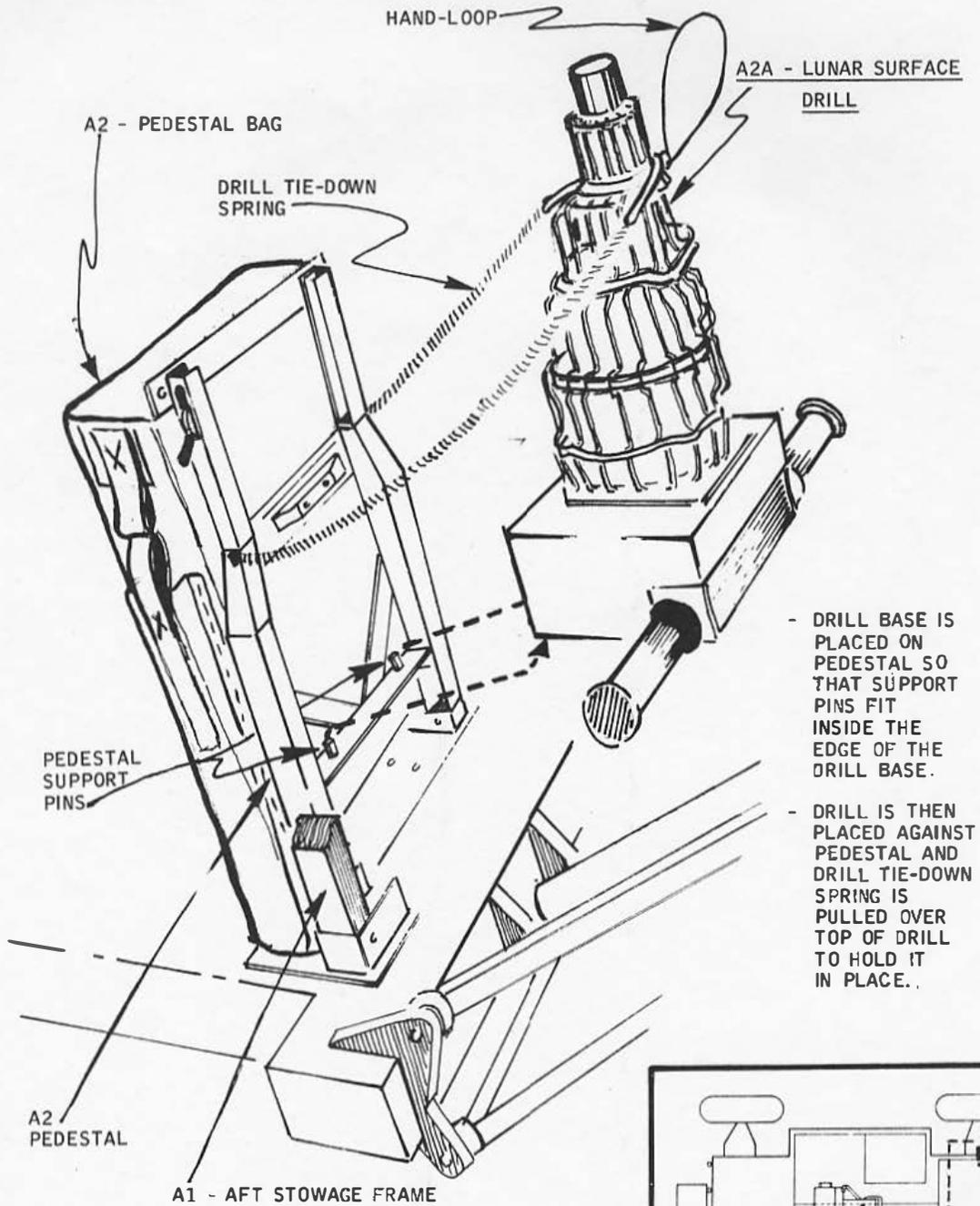
A1G  
TRENCHING  
TOOL



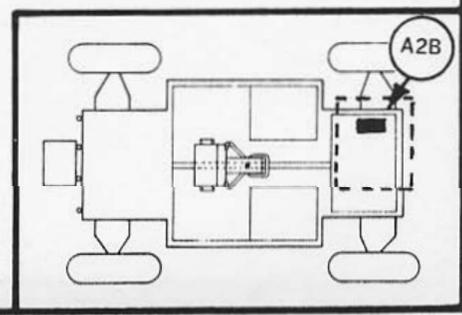
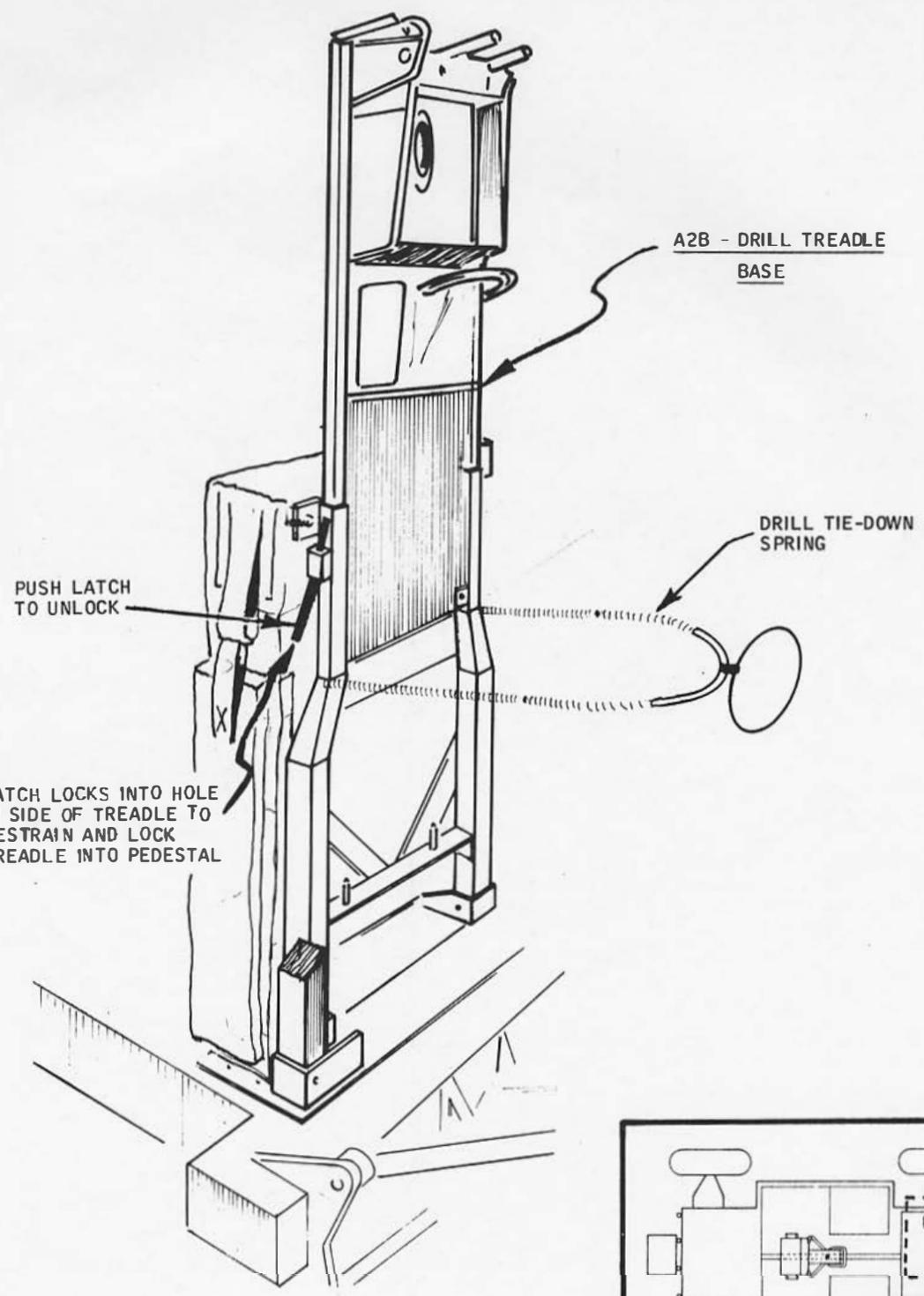
A2 STOWAGE PEDESTAL



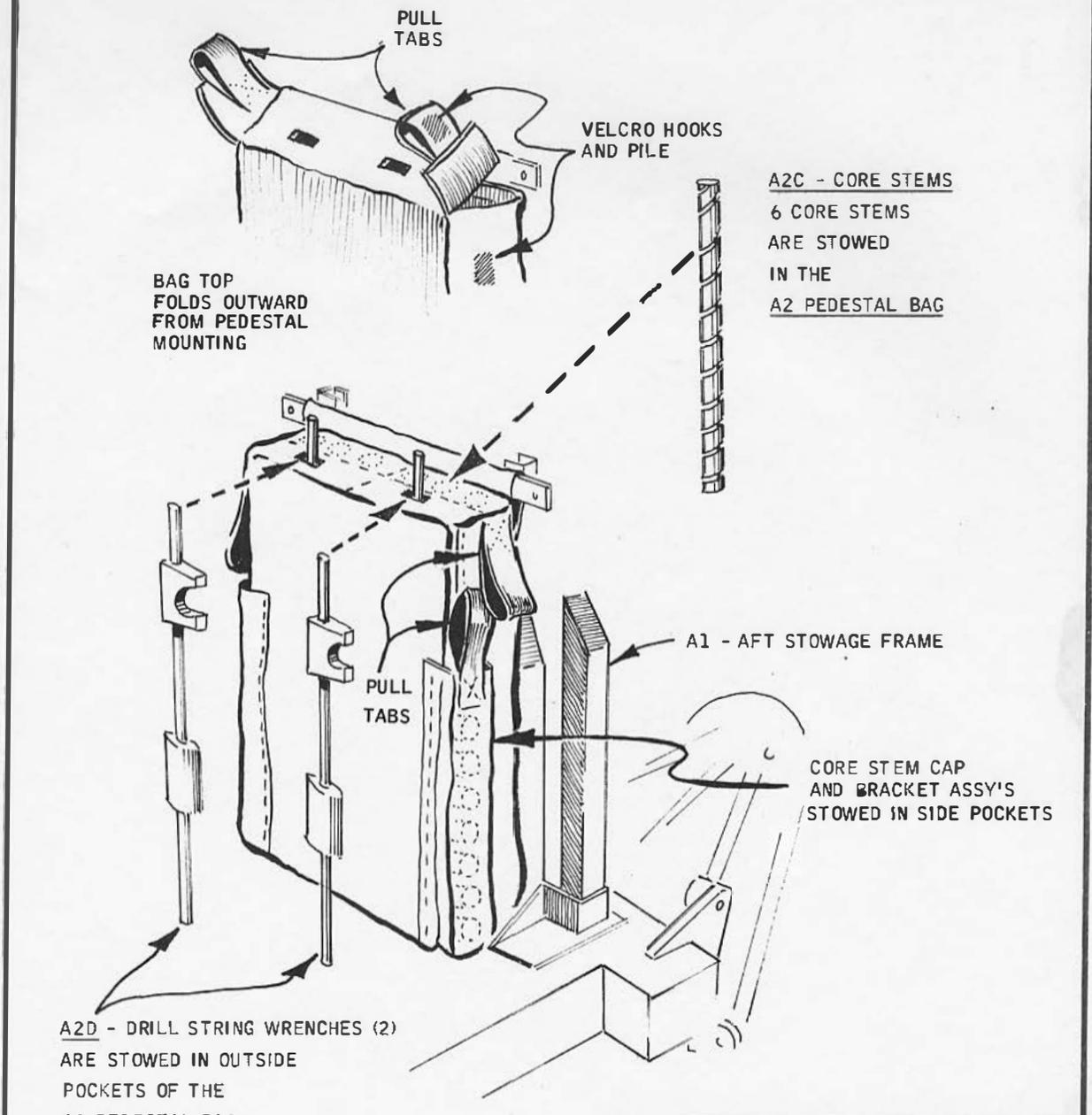
A2A LUNAR SURFACE DRILL



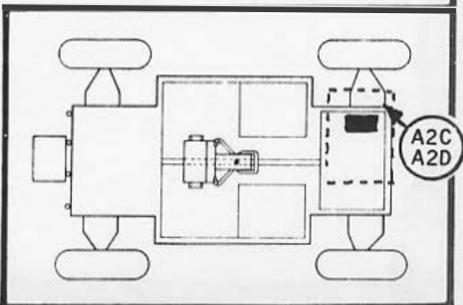
A2B DRILL TREADLE BASE



**A2C CORE STEMS  
DRILL STRING  
A2D WRENCH**

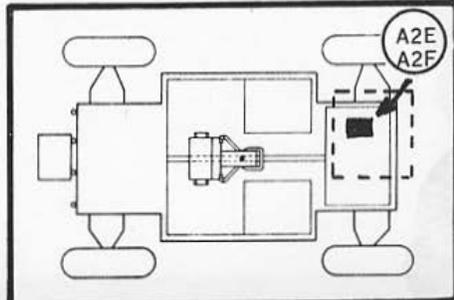
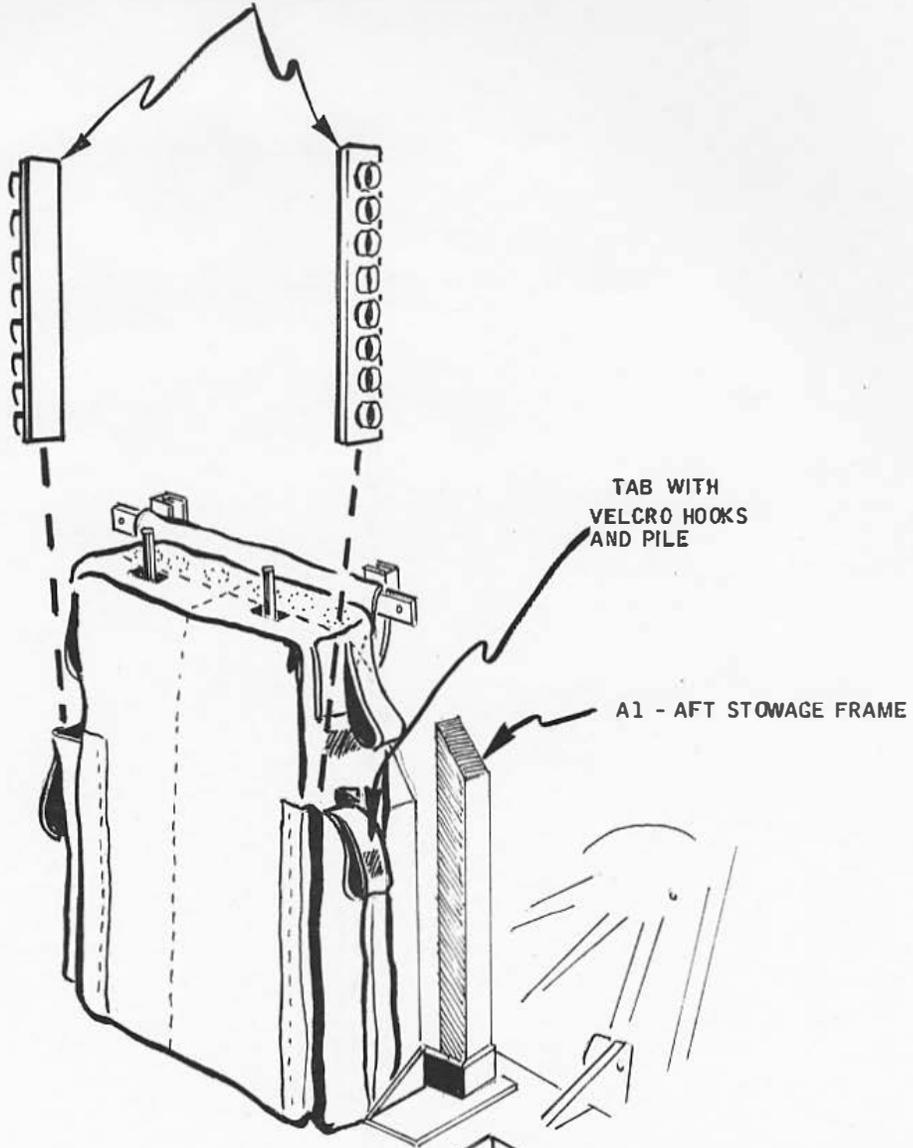


WRENCHES PROTRUDE THRU HOLES IN BAG COVER

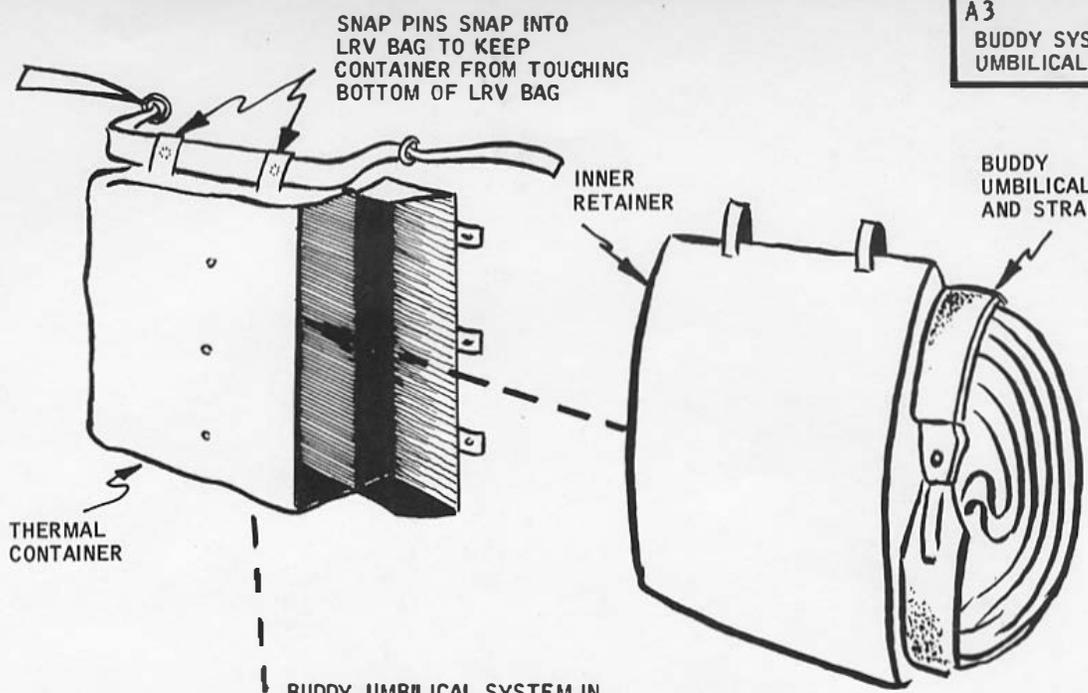


A2E, A2F  
CORE STEM CAP  
AND BRACKET ASSY'S

A2E, A2F  
CORE STEM CAP AND  
BRACKET ASSEMBLY

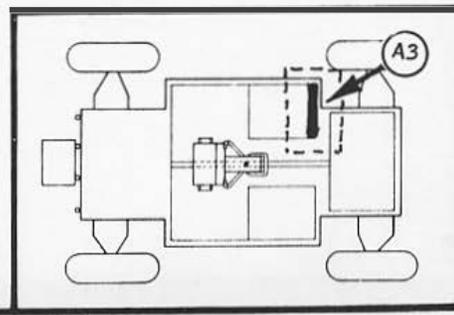
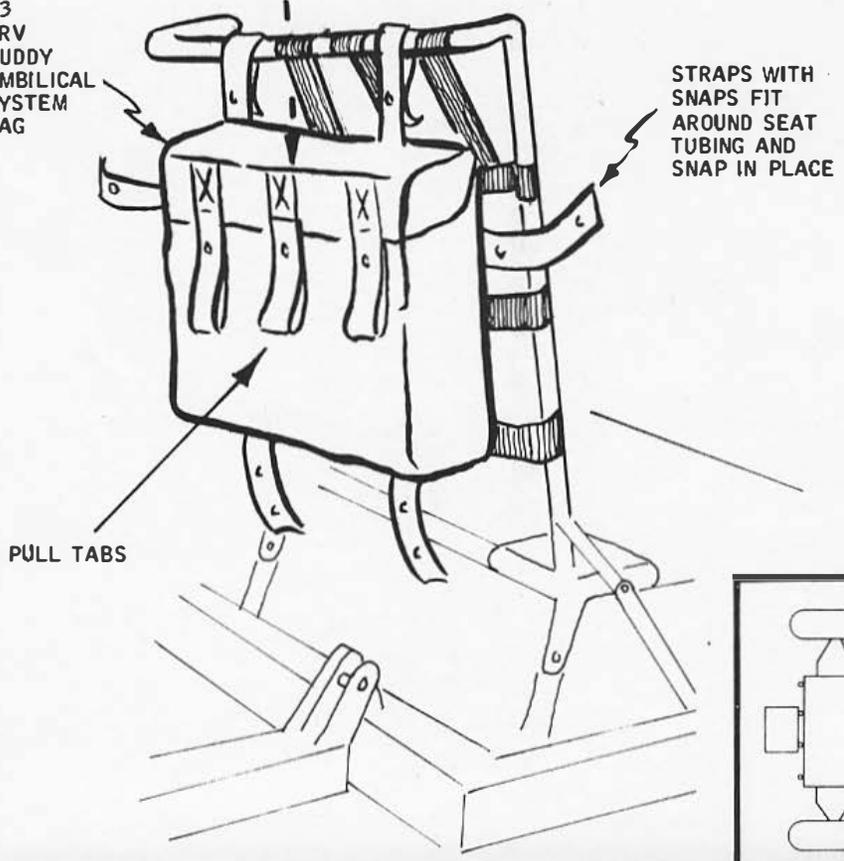


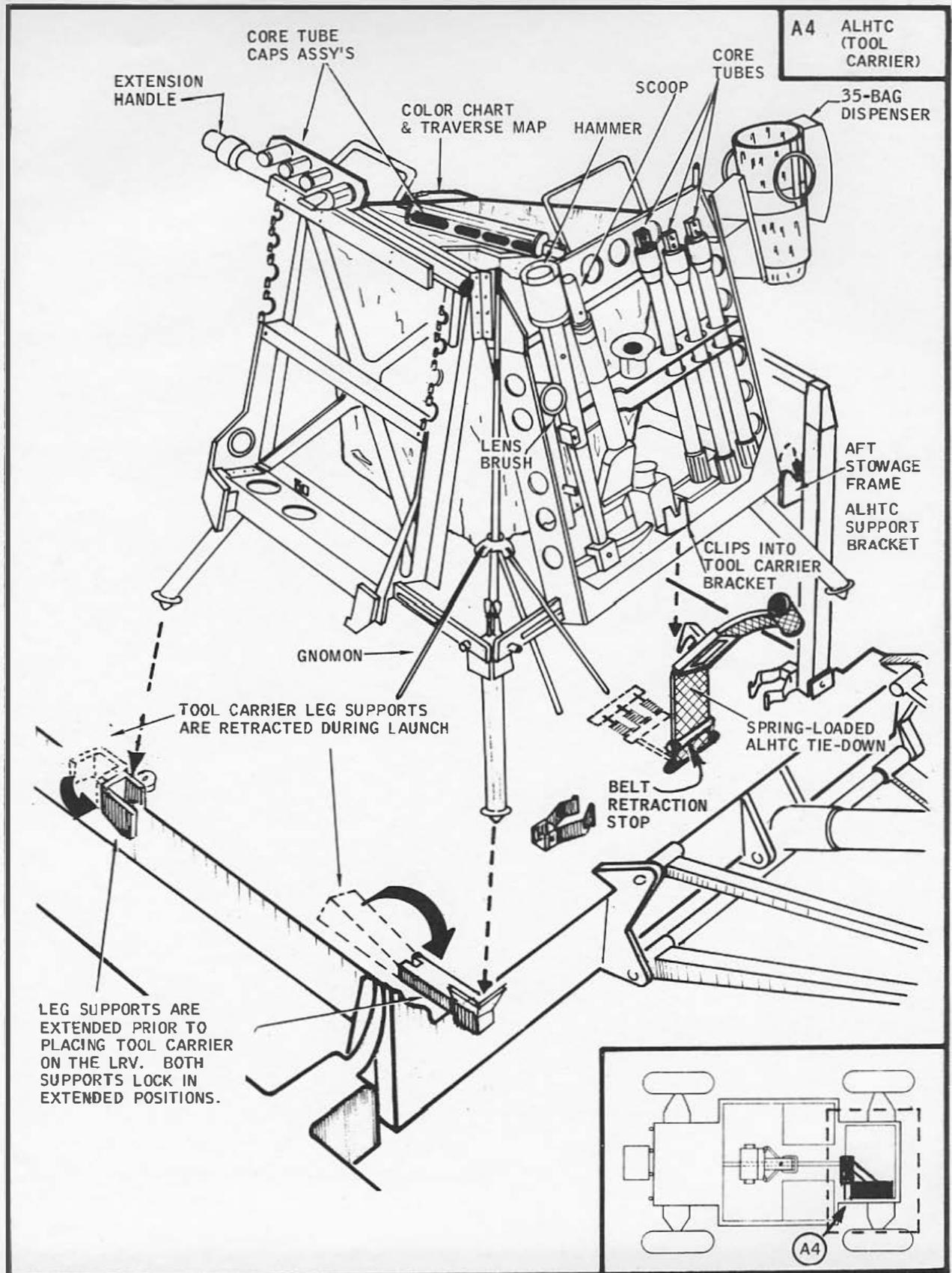
**A3  
BUDDY SYSTEM  
UMBILICAL**



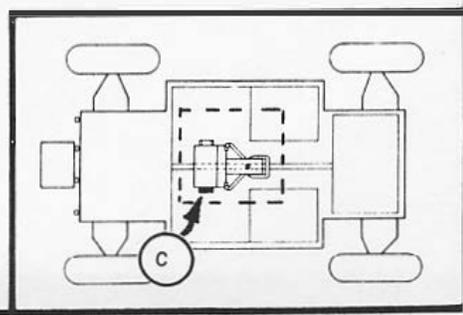
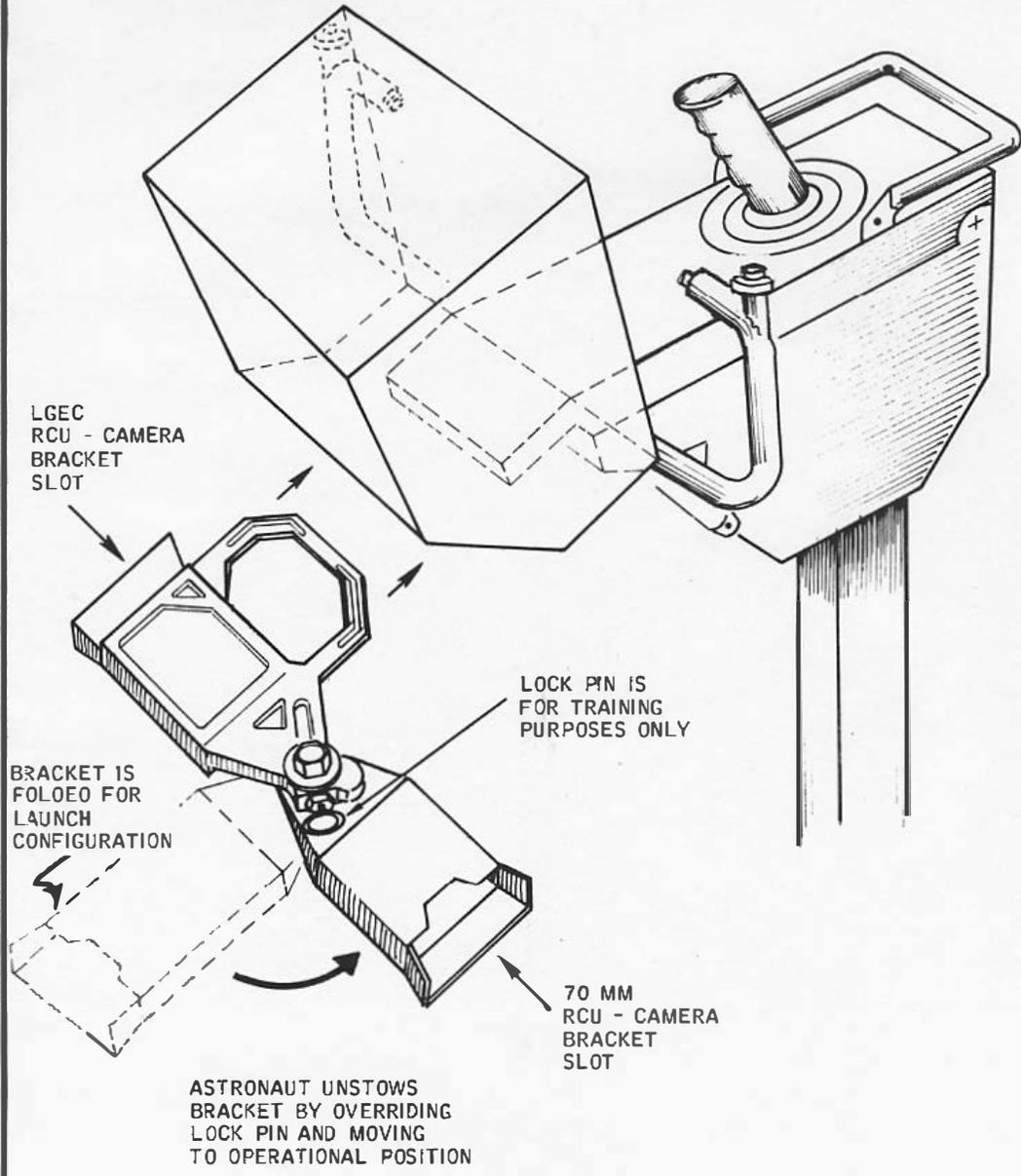
BUDDY UMBILICAL SYSTEM IN THERMAL CONTAINER FITS INTO LRV BAG ON BACK OF RIGHT SEAT

**A3  
LRV  
BUDDY  
UMBILICAL  
SYSTEM  
BAG**

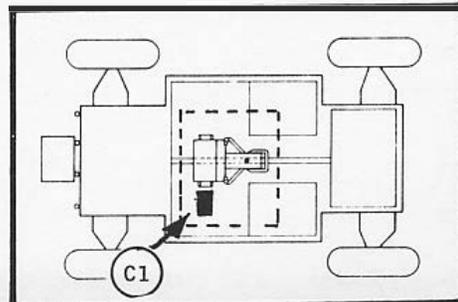
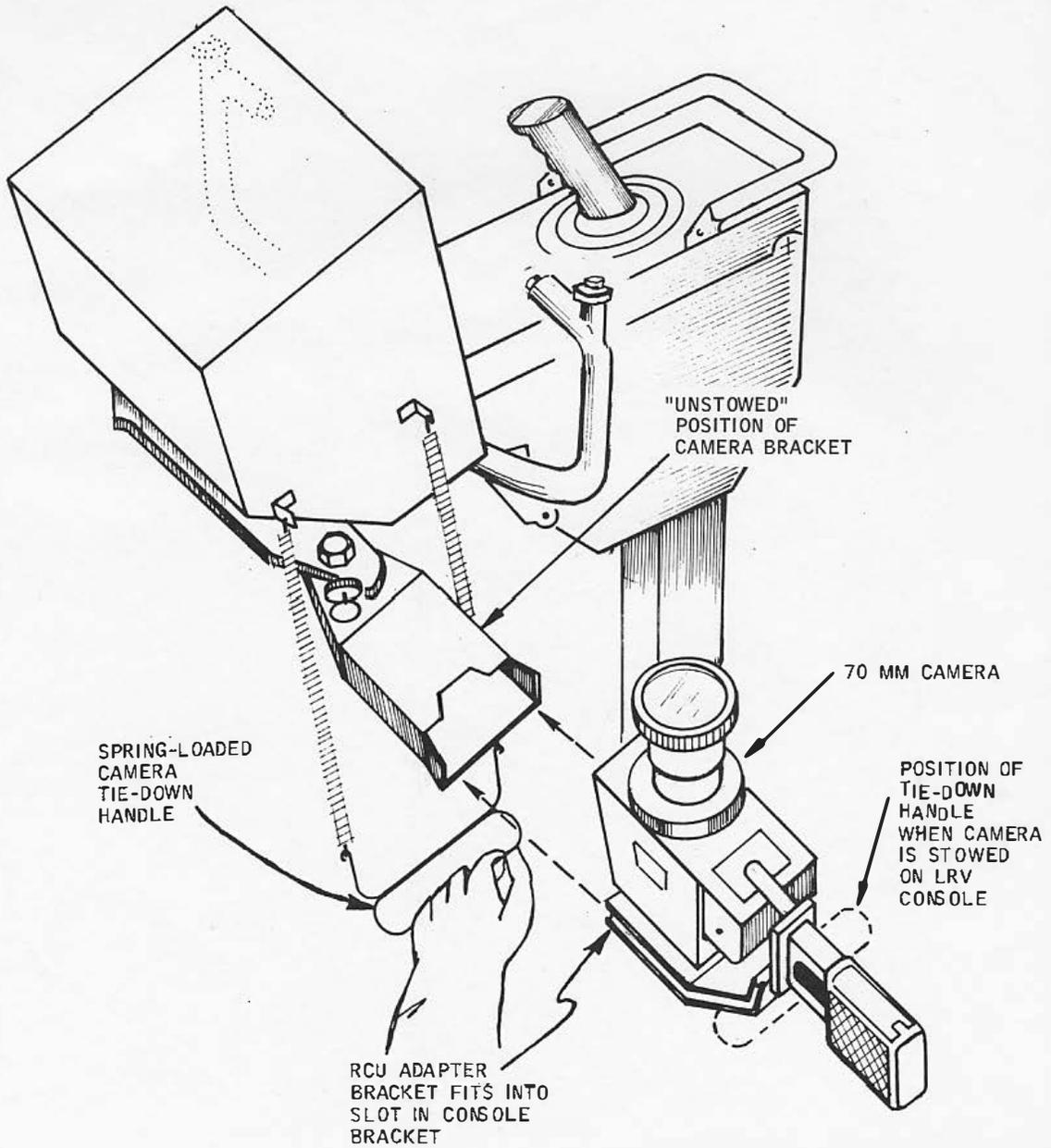




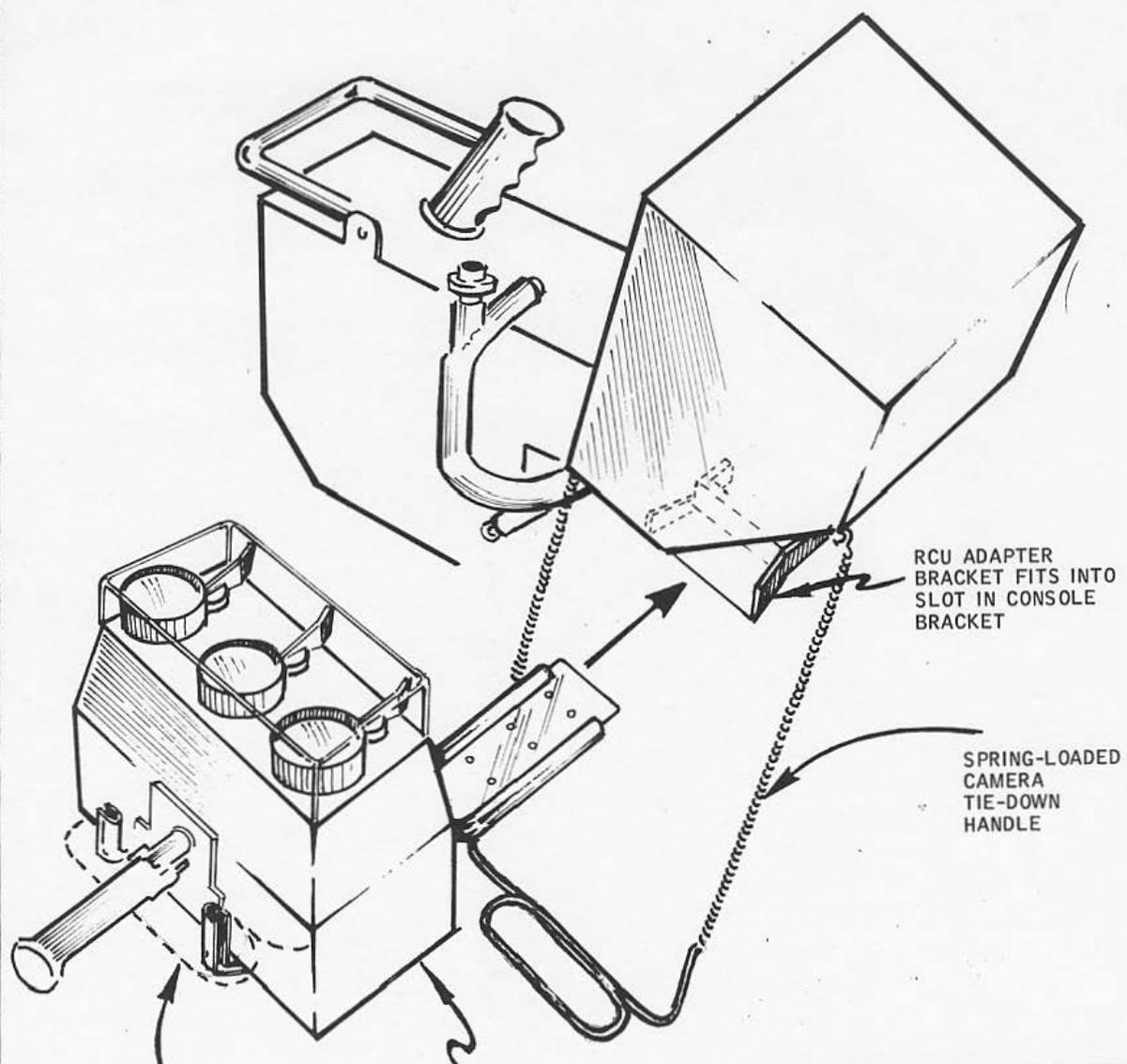
**C**  
CONSOLE  
BRACKET



C1 70 MM  
CAMERA



C2 LGEC CAMERA

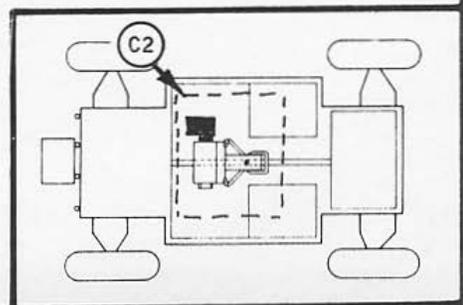


RCU ADAPTER BRACKET FITS INTO SLOT IN CONSOLE BRACKET

SPRING-LOADED CAMERA TIE-DOWN HANDLE

POSITION OF TIE-DOWN HANDLE WHEN CAMERA IS STOWED ON LRV CONSOLE

C2 - LGEC CAMERA



C3  
16 MM DATA ACQUISITION  
CAMERA

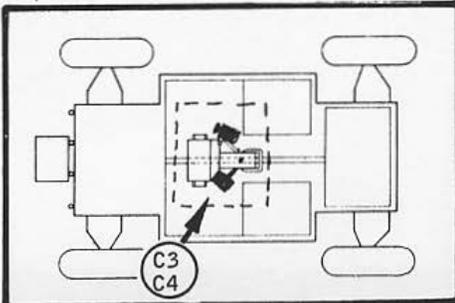
C3 LOW GAIN ANT  
C4 16 MM DAC

C4  
LOW GAIN  
ANTENNA

**NOTE:**  
THE CAMERA AND  
ANTENNA MAY BE  
INTERCHANGED BETWEEN  
C3 AND C4 STOWAGE  
POSITIONS ON HANDLES,  
IF REQUIRED, FOR  
BETTER LINE OF SIGHT  
COMMUNICATIONS

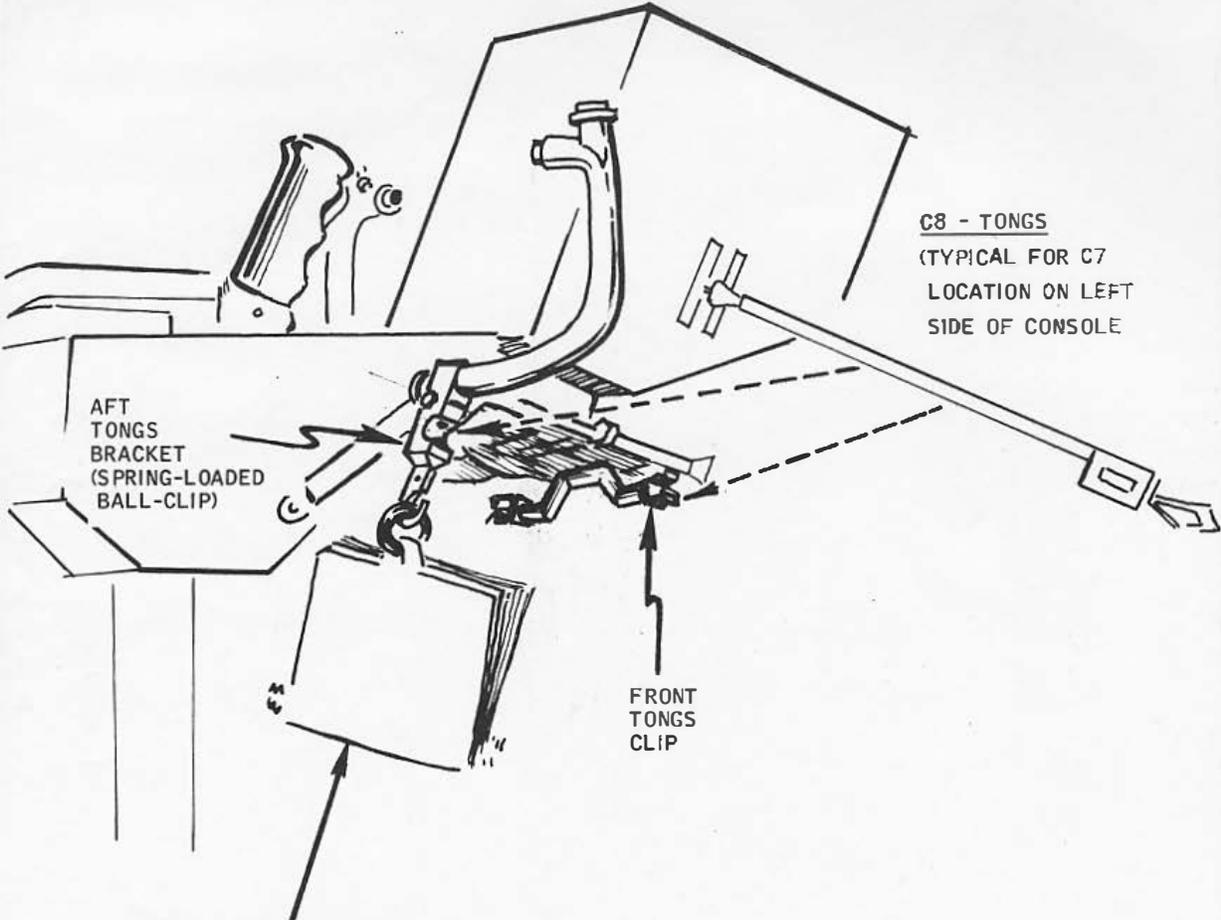
TO ROTATE AZIMUTH  
SETTING, GRASP HANDLE,  
PUSH DOWN TO UNLOCK,  
TURN TO DESIRED SETTING  
AND RELEASE. STAFF LOCKS  
IN LAST POSITION.

PUSH BUTTON  
TO RELEASE AND/OR  
REMOVE STAFF  
FROM HANDHOLD



C5, C6 - 15-BAG DISP.

C7, C8 - TONGS

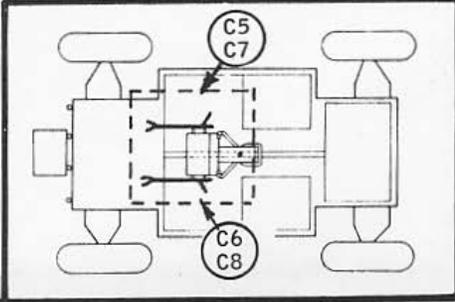


C8 - TONGS  
(TYPICAL FOR C7  
LOCATION ON LEFT  
SIDE OF CONSOLE)

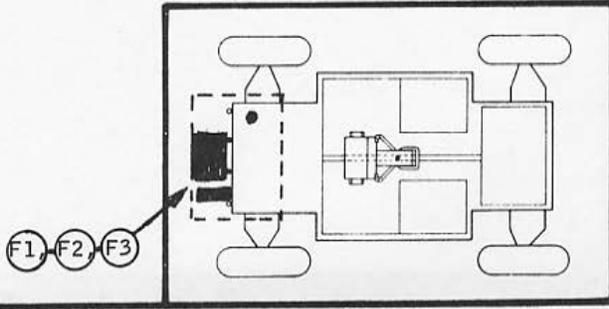
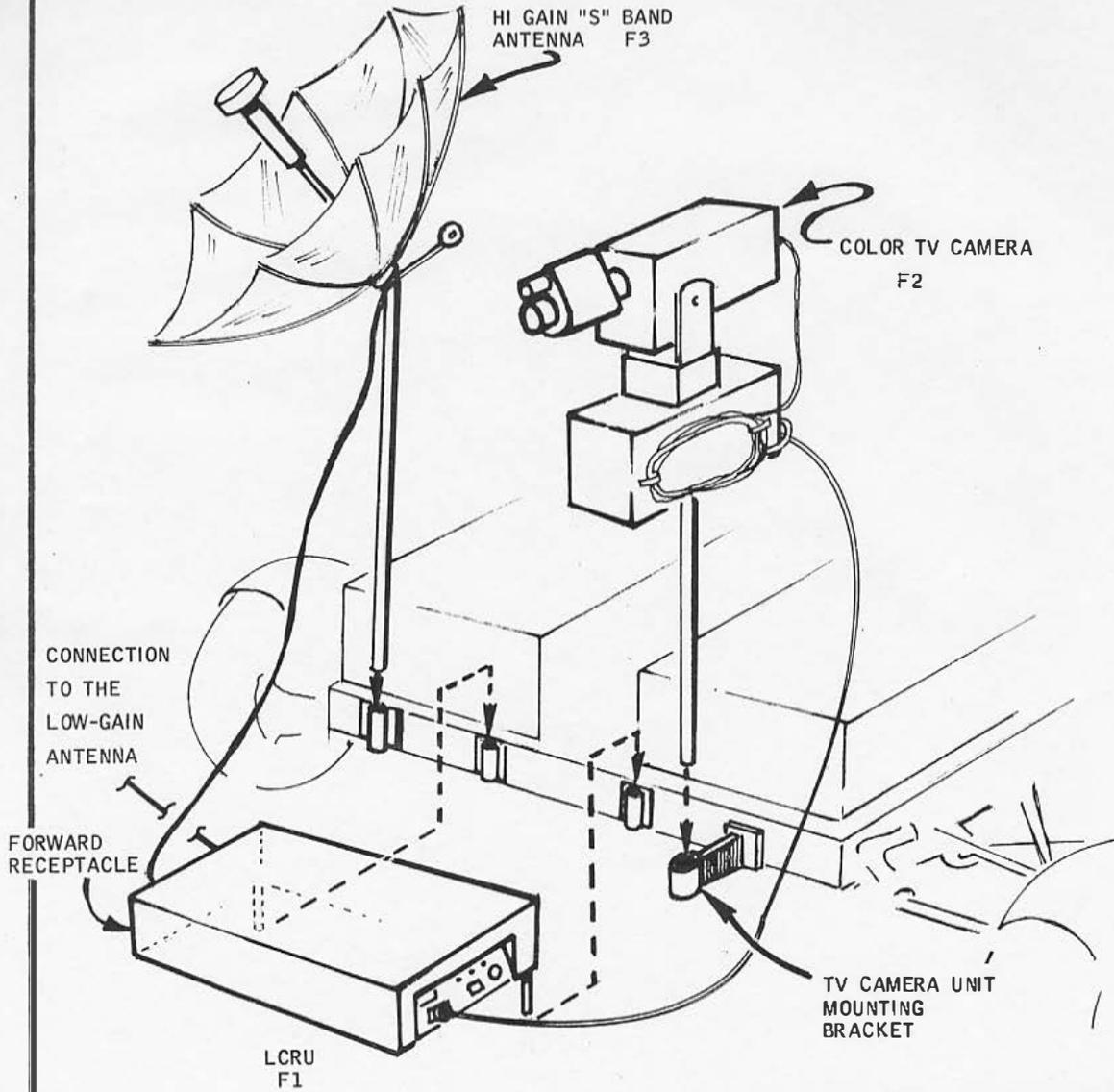
AFT  
TONGS  
BRACKET  
(SPRING-LOADED  
BALL-CLIP)

FRONT  
TONGS  
CLIP

C5 - 15-BAG DISPENSER  
(ALSO TYPICAL FOR C6 LOCATION)  
ON LEFT SIDE OF CONSOLE

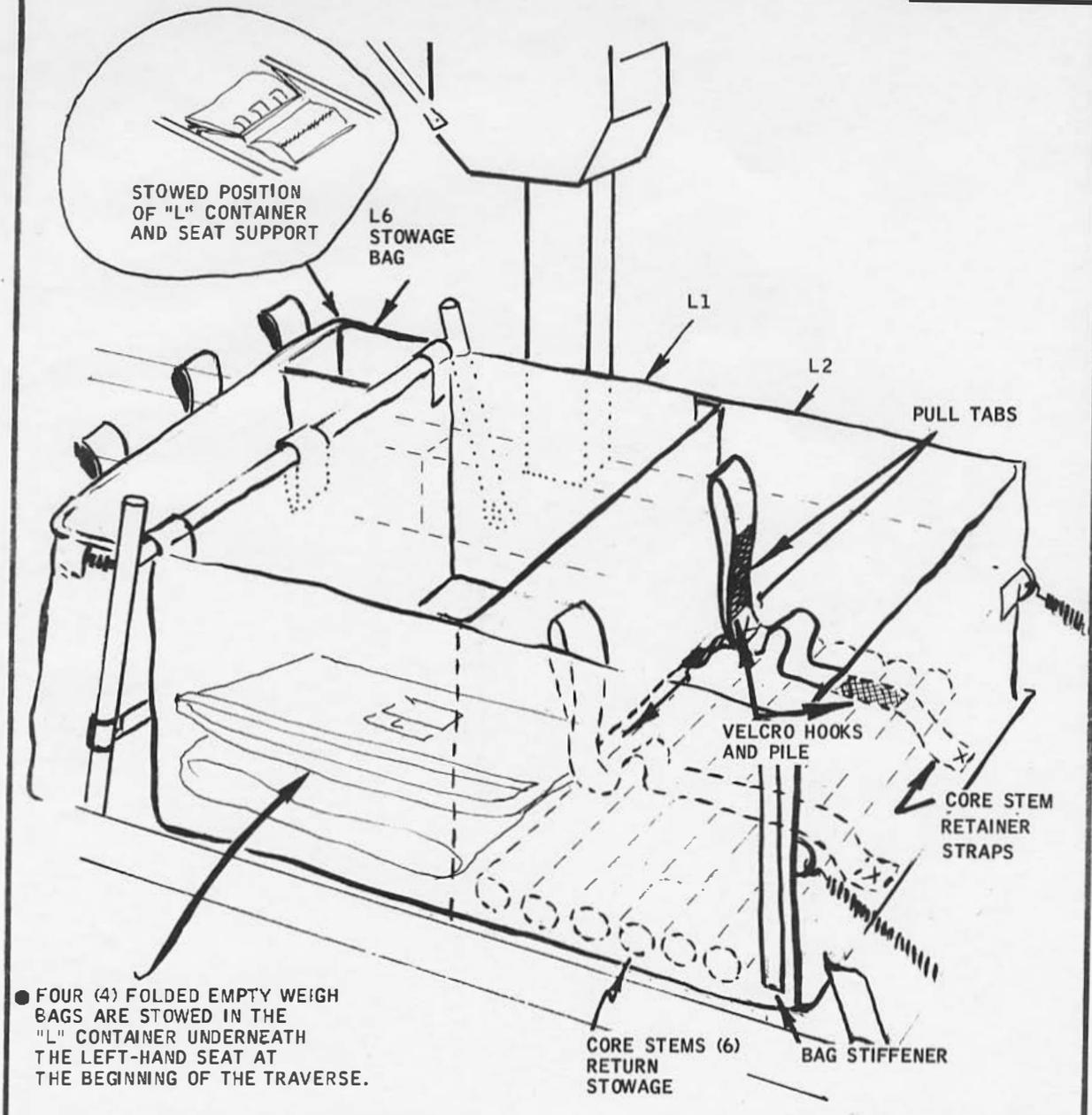


- F1 - LCRU
- F2 - COLOR TV CAMERA
- F3 - HIGH GAIN "S" BAND ANTENNA

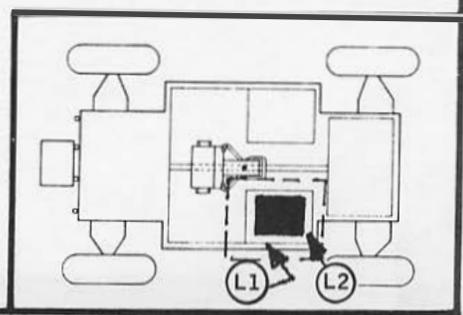


L1 - WEIGH BAGS

L2 - CORE STEMS

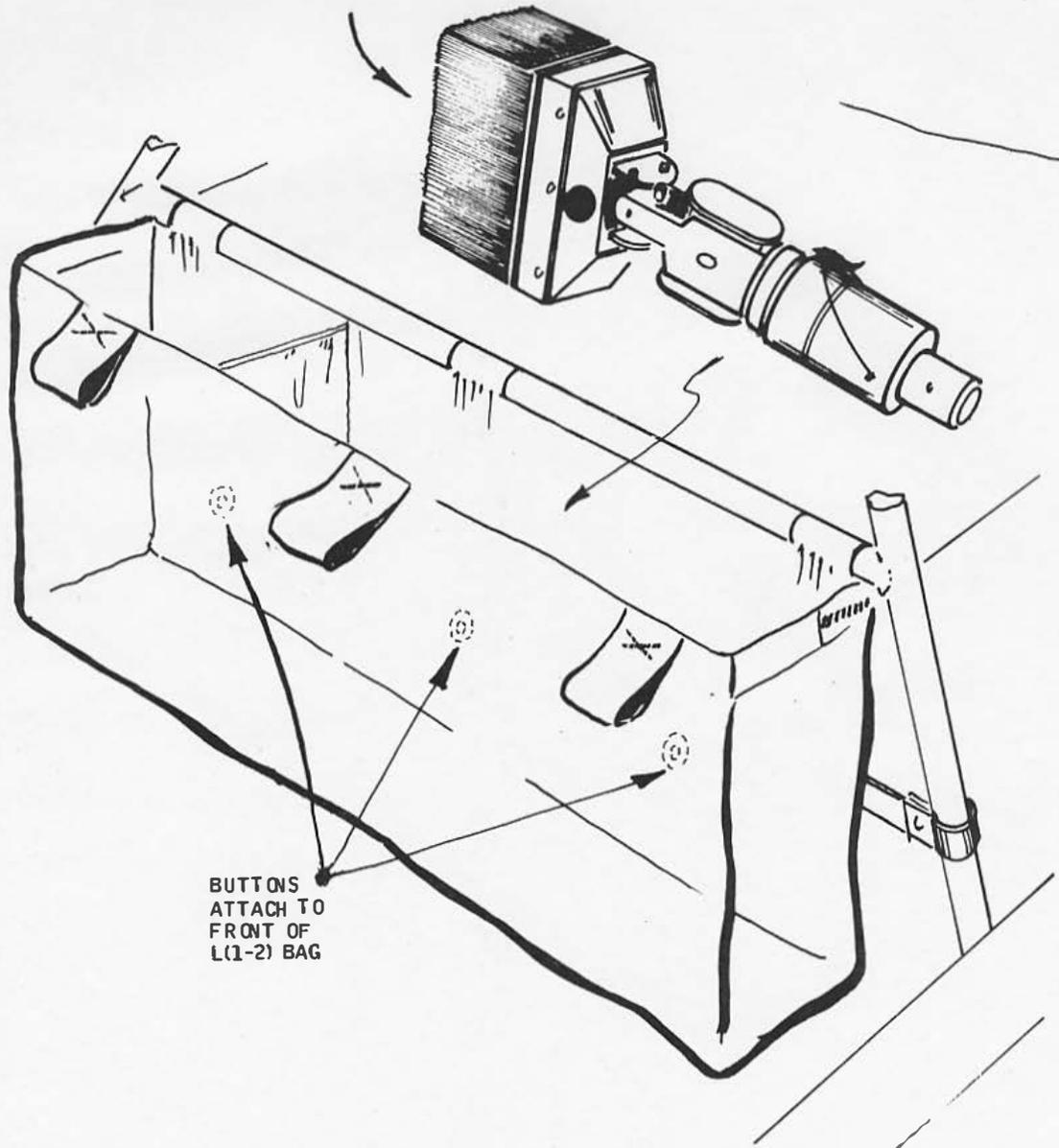


- FOUR (4) FOLDED EMPTY WEIGH BAGS ARE STOWED IN THE "L" CONTAINER UNDERNEATH THE LEFT-HAND SEAT AT THE BEGINNING OF THE TRAVERSE.
- TEMPORARY STOWAGE OF THE WEIGH BAGS IS ON THE AFT STOWAGE FRAME (A1D, A1E) DURING SAMPLE COLLECTION.
- FILLED BAGS ARE RETURNED TO THIS "L" AREA AFTER SAMPLE COLLECTION FOR RETURN STOWAGE AND TRANSPORT TO THE LM.

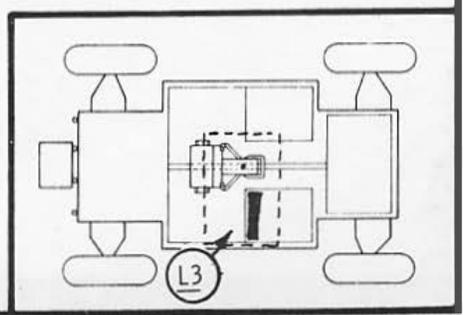


L3 LUNAR DUST BRUSH  
L4 (MISC.)

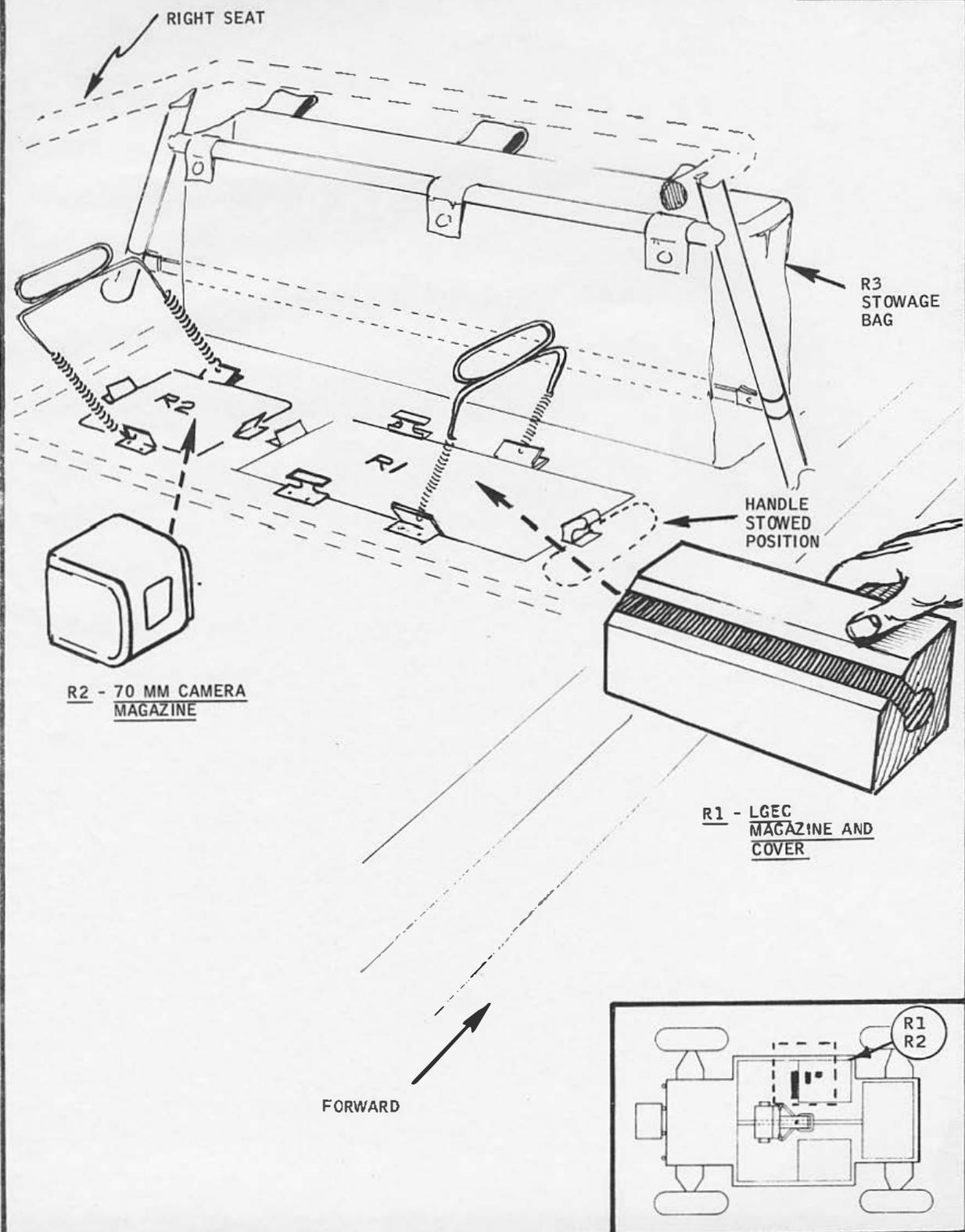
LUNAR DUST BRUSH



BUTTONS ATTACH TO FRONT OF L(1-2) BAG



R1 - LGEC MAG.  
R2 - 70 MM MAG.



**R3 RIGHT SEAT FORWARD STOWAGE BAG**

R3A - SESC

- R3A - SESC
- R3B-E - 16 MM MAG.
- R3F - LUNAR SAFETY LINE
- R3G - (TBD)

R3B - R3E  
16 MM MAGAZINE  
STOWAGE

