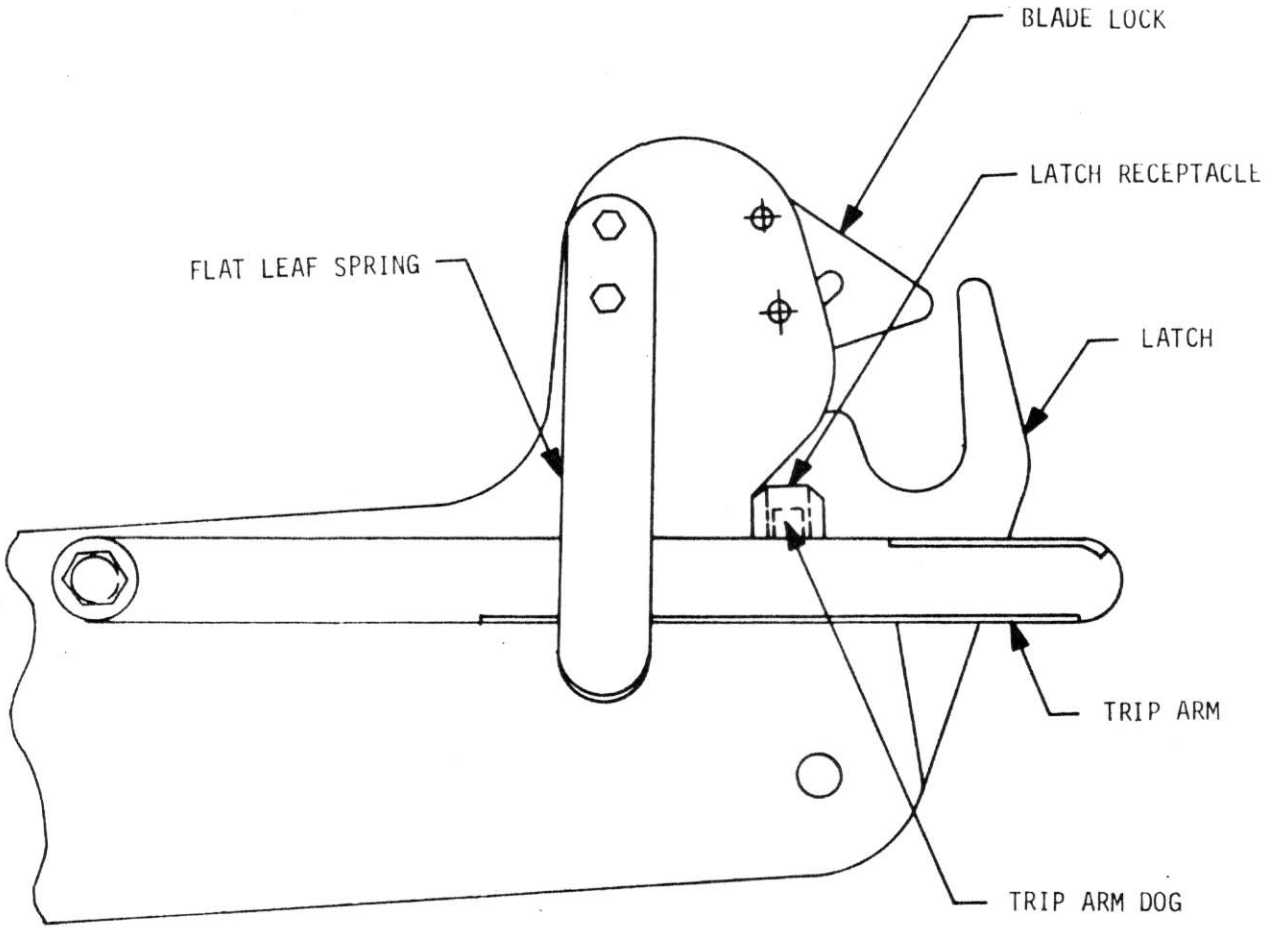


NOTE: LEFT SIDE SUPPORT ARM SHOWN. RIGHT SIDE SUPPORT ARM IS MIRROR IMAGE.

FIGURE 2-1 SUPPORT ARM LATCH MECHANISMS LATCHED CONFIGURATION

NOTE: DOUBLE BRAKED REEL DEPLOYMENT TAPE SIMILAR TO CENTER BRAKED REEL TAPE BUT STOWED ON RIGHT SIDE OF VEHICLE

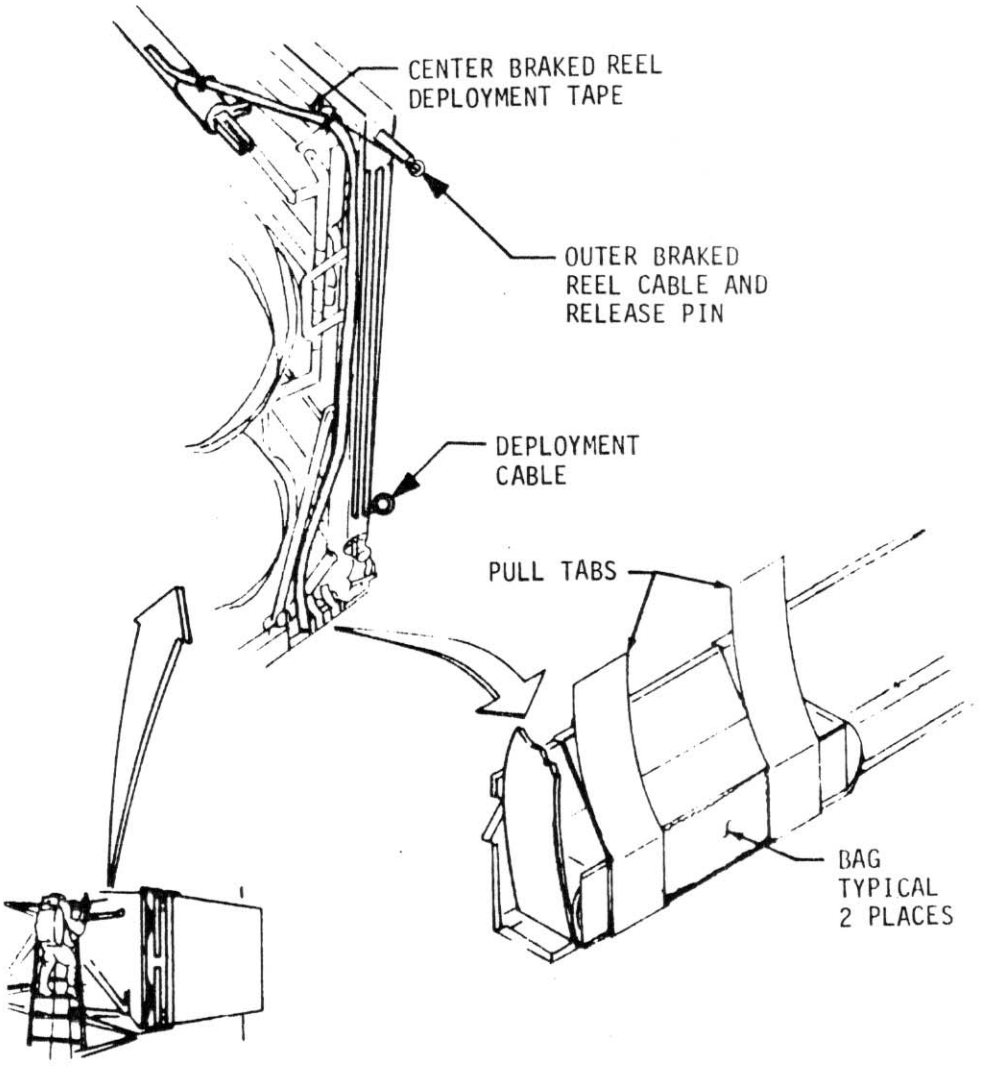


FIGURE 2-2 LRV DEPLOYMENT TAPES AND CABLES

STA/STEP	PROCEDURE	REMARKS
2.1	(Continued)	in to limited space between LRV and LM landing leg.
	f. Release deployment cable from teflon clips on left side of LRV center chassis and deploy cable to maximum length and at 45° angle from Quad I toward descent ladder.	
	g. Release double braked reel operating tape stowed in nylon bag attached to lower right support arm by velcro tape. Place tape in convenient location for future access.	
	h. Ascend LM ladder.	
	i. Inspect D-handle and bellcranks to verify there are no obstructions preventing operation.	Figure 1-41.
	j. Inspect cable assembly connecting D-handle and bellcrank to ensure there is no fouling that would prevent operation.	
	CAUTION During and subsequent to deployment D-handle operation, both crewmen should remain out of the LRV deployment envelope.	Figure 2-3.
	k. Pull LRV deployment D-handle. Verify LRV moves outward from LM about 4 degrees.	Figure 2-4.
	NOTE: If push-off rod fails to rotate LRV about 4° outward from LM quadrant, deployment cable may be pulled to initiate LRV movement.	First 5 to 6 inches of travel releases lower release pins, lower half of apex fittings may fall away immediately or during deployment rotation. The last segment of travel releases the upper pin. As the upper release pin is pulled, LRV rotates out of LM about 4 degrees.

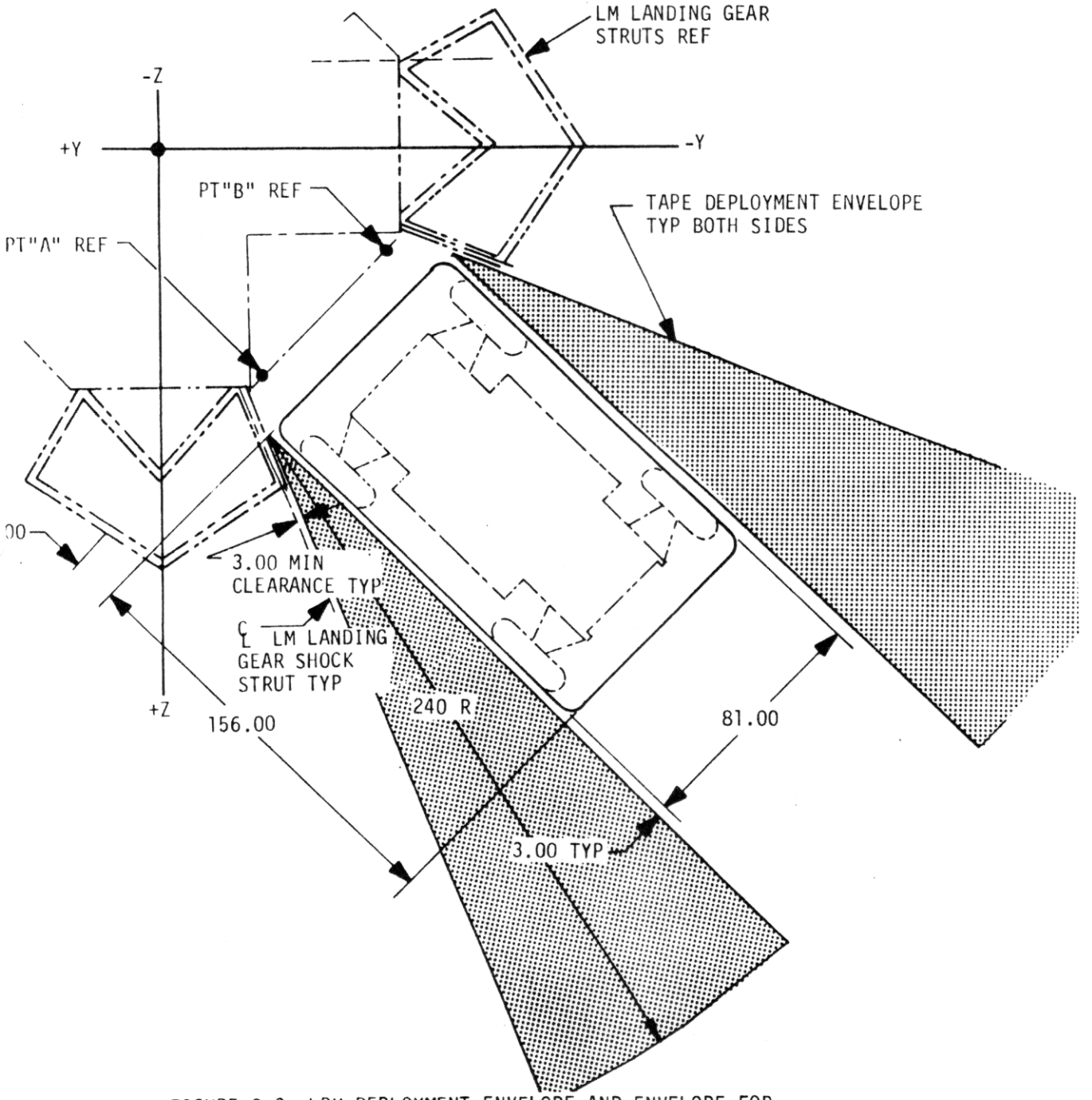


FIGURE 2-3 LRV DEPLOYMENT ENVELOPE AND ENVELOPE FOR DEPLOYMENT TAPE OPERATION

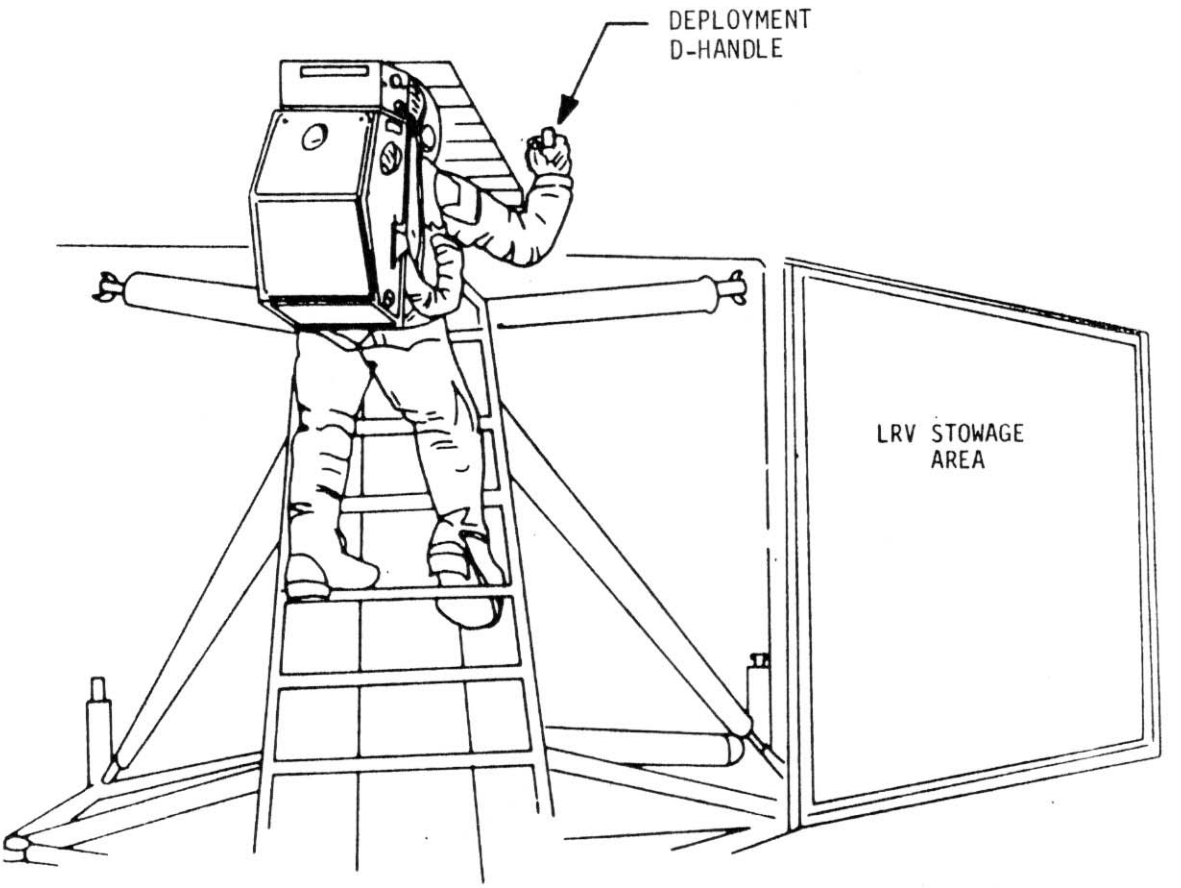
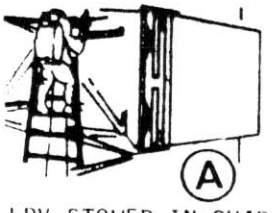


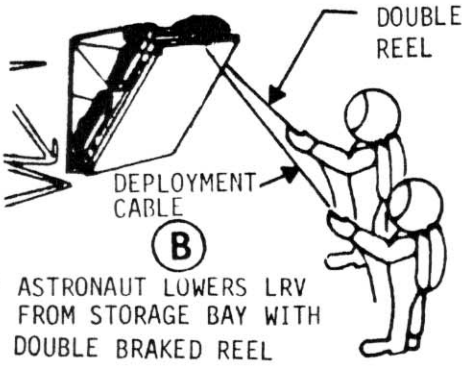
FIGURE 2-4 CREWMAN POSITIONED TO DEPLOY LRV

STA/STEP	PROCEDURE	REMARKS
2.1	(Continued)	
l.	Descend LM ladder. Grasp deployment cable and monitor deployment activity.	Crewman operating deployment cable should keep slack out of double braked reel cables.
m.	Other crewman pulls double braked reel tape at right side of vehicle. Verify LRV rotates outward from LM (Figure 2-5, View B). NOTE: Crewman should remain within defined envelopes for deployment tape operation (Figure 2-3) to ensure that deployment tapes do not contact sensitive LM components.	For first 15 degrees of rotation LRV rotates on apex fittings, thereafter apex fittings lift off spools and rotation point shifts to walking hinge. Lower telescopic tubes ratchet engage at 35 degrees rotation.
n.	Continue to pull double braked reel tape (figure 2-5, View C). When vehicle rotates outboard to about 45 degrees, verify that: (1) Aft chassis unfolds and locks in position. (2) Rear wheels unfold and tethered rear wheel struts fall free. (3) Forward chassis is released from console post and returns to 35 degree position. NOTE: If either aft or forward chassis latch pins fail to pull automatically, deployment cable may be pulled to accomplish pin release.	At about 45 degrees the 45° cable tightens, pulling the forward and aft chassis latch pins at the console post mount on the center chassis. The aft chassis and wheels fully deploy and the forward chassis returns to the 35° position.
o.	Continue to pull double braked reel tape (Figure 2-5, View D). Verify that: (1) Center/aft chassis rotates until rear wheels contact lunar surface. (2) Rear wheels slide on surface permitting center/aft chassis to move away from LM.	At about 73 degrees, the cam on forward sides of center chassis strikes latch lock arm, forces arm down out of retaining spring and unlocks latch.



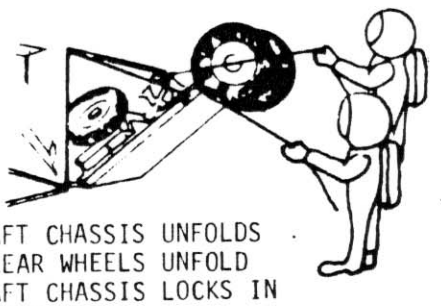
(A)

- LRV STOWED IN QUADRANT
- ASTRONAUT REMOVES INSULATION BLANKET, OPERATING TAPES
- ASTRONAUT REMOTELY INITIATES AND EXECUTES DEPLOYMENT



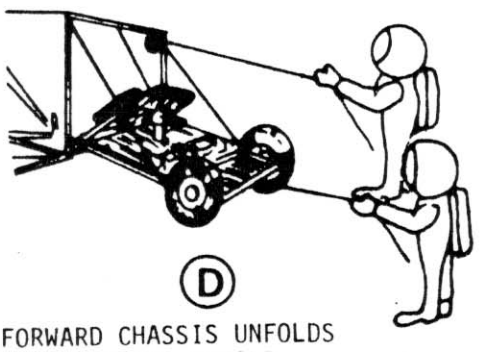
(B)

- ASTRONAUT LOWERS LRV FROM STORAGE BAY WITH DOUBLE BRAKED REEL



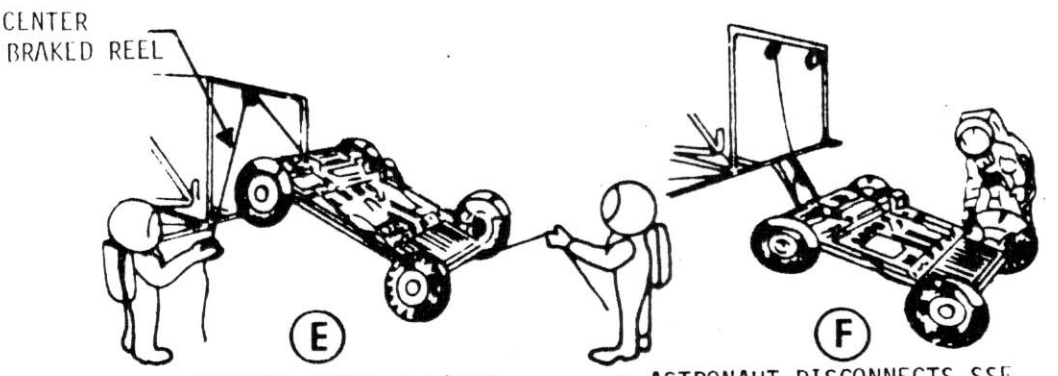
- AFT CHASSIS UNFOLDS
- REAR WHEELS UNFOLD
- AFT CHASSIS LOCKS IN POSITION

(C)



(D)

- FORWARD CHASSIS UNFOLDS
- FRONT WHEELS UNFOLD



(E)

- FORWARD CHASSIS LOCKS IN POSITION. ASTRONAUT LOWERS LRV TO SURFACE WITH CENTER BRAKED REEL

(F)

- ASTRONAUT DISCONNECTS SSE
- ASTRONAUT UNFOLDS SEATS, FOOTRESTS, (FINAL STOP)

FIGURE 2-5 LRV DEPLOYMENT SEQUENCE

STA/STEP	PROCEDURE	REMARKS
2.1	(Continued)	
	NOTE: If wheels fail to slide, deployment cable may be pulled to permit center/aft chassis to move away from LM.	
p.	Continue to pull double braked reel tape (Figure 2-5, View D). Verify that: (1) Forward chassis continues to unfold and locks in position. (2) Forward wheels unfold. (3) Outer braked reel cables are slack. (4) 45° cable again becomes taut.	Forward wheel lock strut pins release and forward wheels deploy as the angle between the forward and center chassis approaches 170 degrees. (The 45 degree cable again becomes taut).
q.	Release double braked reel tape and at chassis RR grasp outer braked reel cable in right hand and remove cable pin P8 (Figure 2-6) with left hand.	At this time the forward and aft chassis sections are deployed and locked to the center chassis. All wheels are deployed. The forward chassis is held up by the telescopic tube assembly and the 45 degree cable.
r.	Discard cable and pin outside work area.	
s.	At chassis LR grasp outer braked reel cable in left hand and remove cable pin P1.	Figure 2-6.
t.	Discard cable and pin outside work area.	
u.	Pull center braked reel tape (Figure 2-5, View E). Verify that forward chassis lowers until all wheels contact lunar surface and support vehicle weight and 45° cable is slack.	This tape was previously stowed over a LM landing strut for convenient access.
	NOTE: If wheels fail to slide, deployment cable may be pulled to move LRV away from LM.	Using deployment cable to pull the LRV, with parking brake

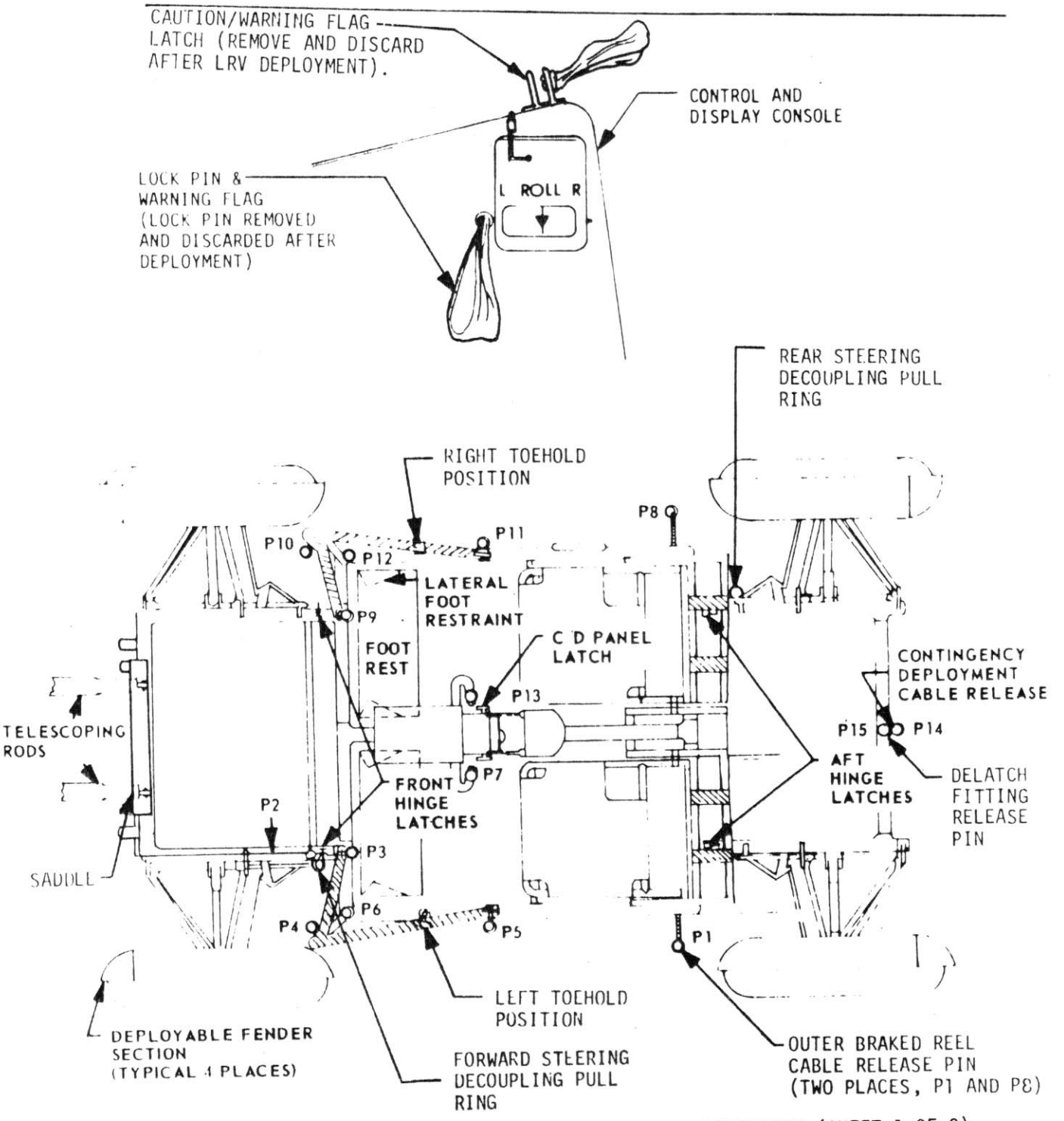


FIGURE 2-6 LRV DEPLOYMENT HARDWARE AND STEERING RING LOCATIONS (SHEET 1 OF 2)

NOTE: LEFT SIDE TRIPOD ASSEMBLY SHOWN. RIGHT SIDE PULL PIN NUMBERS SHOWN IN PARENTHESIS

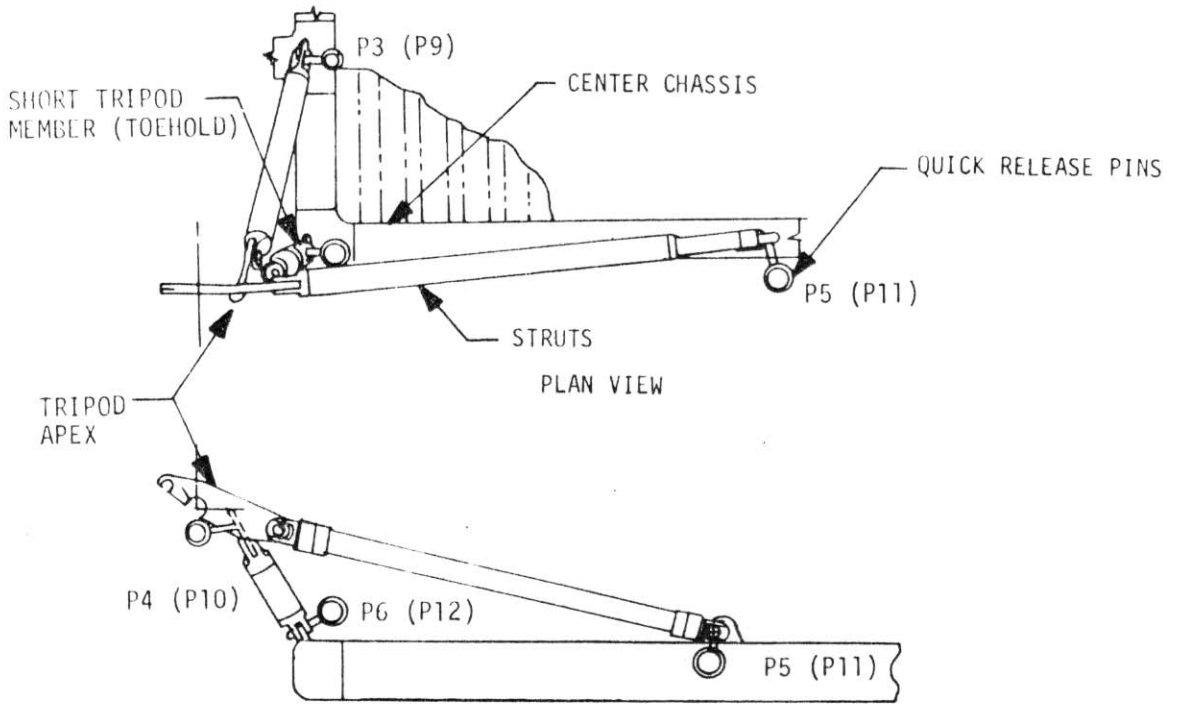
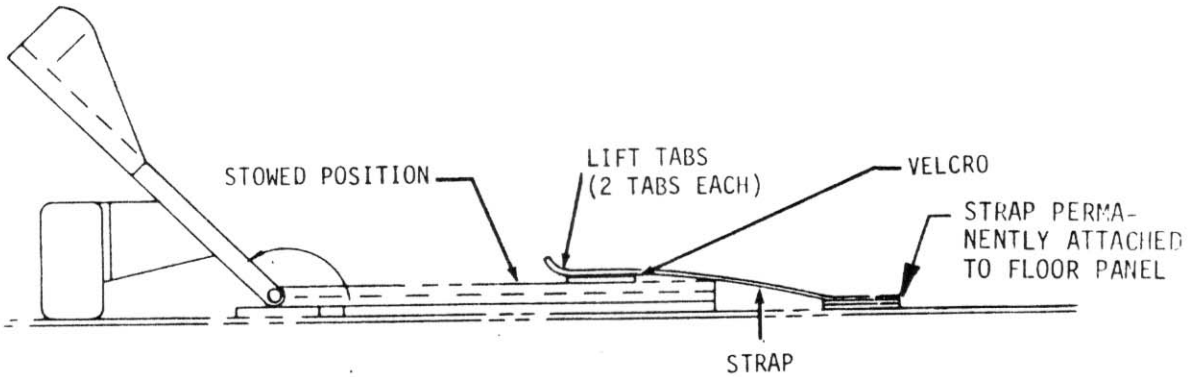


FIGURE 2-6 LRV DEPLOYMENT HARDWARE LOCATIONS (SHEET 2 OF 2)

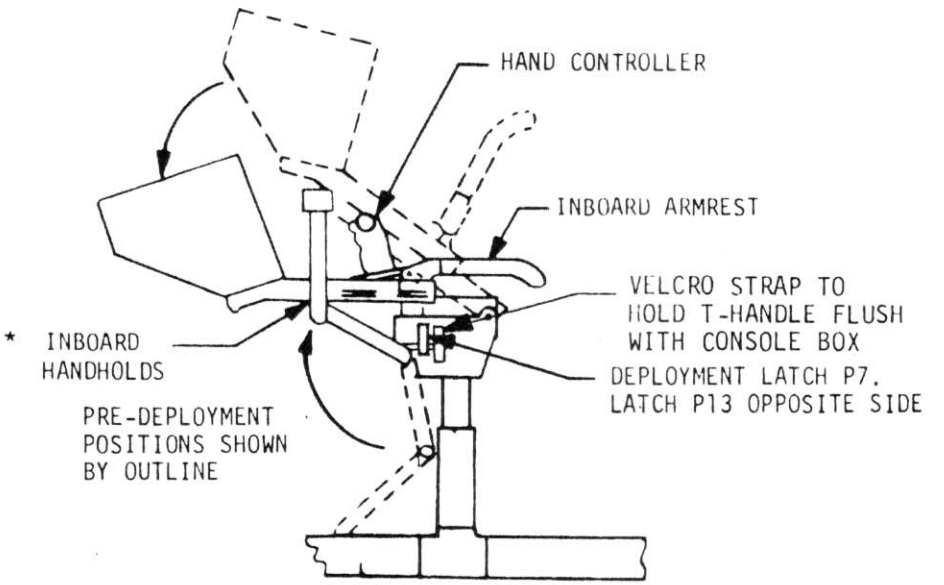
STA/STEP	PROCEDURE	REMARKS
2.1	(Continued)	engaged and wheel struts tethered, should be kept to a minimum.
	v. Coil deployment cable and remove cable release pin P14 and chassis delatch fitting pin P15. Discard cable and deployment hardware outside of work area.	Figure 2-6. When pin P14 is pulled, deployment cable and rear wheel tethers fall free of vehicle. When pin P15 is pulled, delatch fitting will either fall to surface or be retained in pinless fitting. If retained, pull fitting free at clevis and discard fitting.
	w. Deploy RF fender extension.	
	x. Verify both hinge pins flush at RF hinge.	If hinge pir is not flush, tap pin with toehold subsequently removed in step ab. Verify pin is latched by pressing down on chassis.
	y. Remove pins P9 and P10 from right tripod and discard clear of deployment area.	Figure 2-6.
	z. Grasp tripod apex with right hand and remove pin P11 with left hand.	
	aa. Discard tripod main members and pin clear of deployment area.	
	ab. Grasp remaining short tripod member in right hand, remove pin P12 with left hand, and discard pin clear of deployment area.	

STA/STEP	PROCEDURE	REMARKS
2.1	(Continued)	
ac.	Remove short tripod member and insert tripod member in right toehold position or stow in underseat stowage bag.	If short tripod member is installed in toehold position, end with hook should be outboard with hook pointing forward. This is also used as wheel decoupling tool.
ad.	Pull right footrest lift tabs.	Figure 2-7. Tabs pull free of footrests but remain attached to the floor panel.
ae.	Rotate footrest upward and forward and lock into position.	
af.	Release velcro tiedown strap (if necessary), pull out right C/D console "T" handle Pi3 with left hand and turn 90° CW.	Figure 2-8.
ag.	Release right seat belt from stowage position and stow in temporary location.	Figure 2-9.
ah.	Rotate right seat to stable overcenter position.	
ai.	Rotate legs to full upright position.	
aj.	Attach forward seat legs velcro strap to outboard handhold.	
ak.	Verify underseat stowage bag erects.	
al.	Pull seat pan frame forward to engage front legs.	
am.	Verify all seat latches latched.	
an.	Verify both hinge pins flush at RR hinge.	If hinge pin is not flush, tap pin with toehold. Verify pin is latched by pressing down on chassis.



SIDE VIEW

FIGURE 2-7 FOOT REST DEPLOYMENT



* 1G TRAINER INBOARD HANDHOLD CANNOT BE FOLDED DOWN TO SIMULATE PRE-DEPLOYMENT POSITION DUE TO CABLE RUNS FROM CONSOLE.

FIGURE 2-8 CONTROL AND DISPLAY CONSOLE DEPLOYMENT

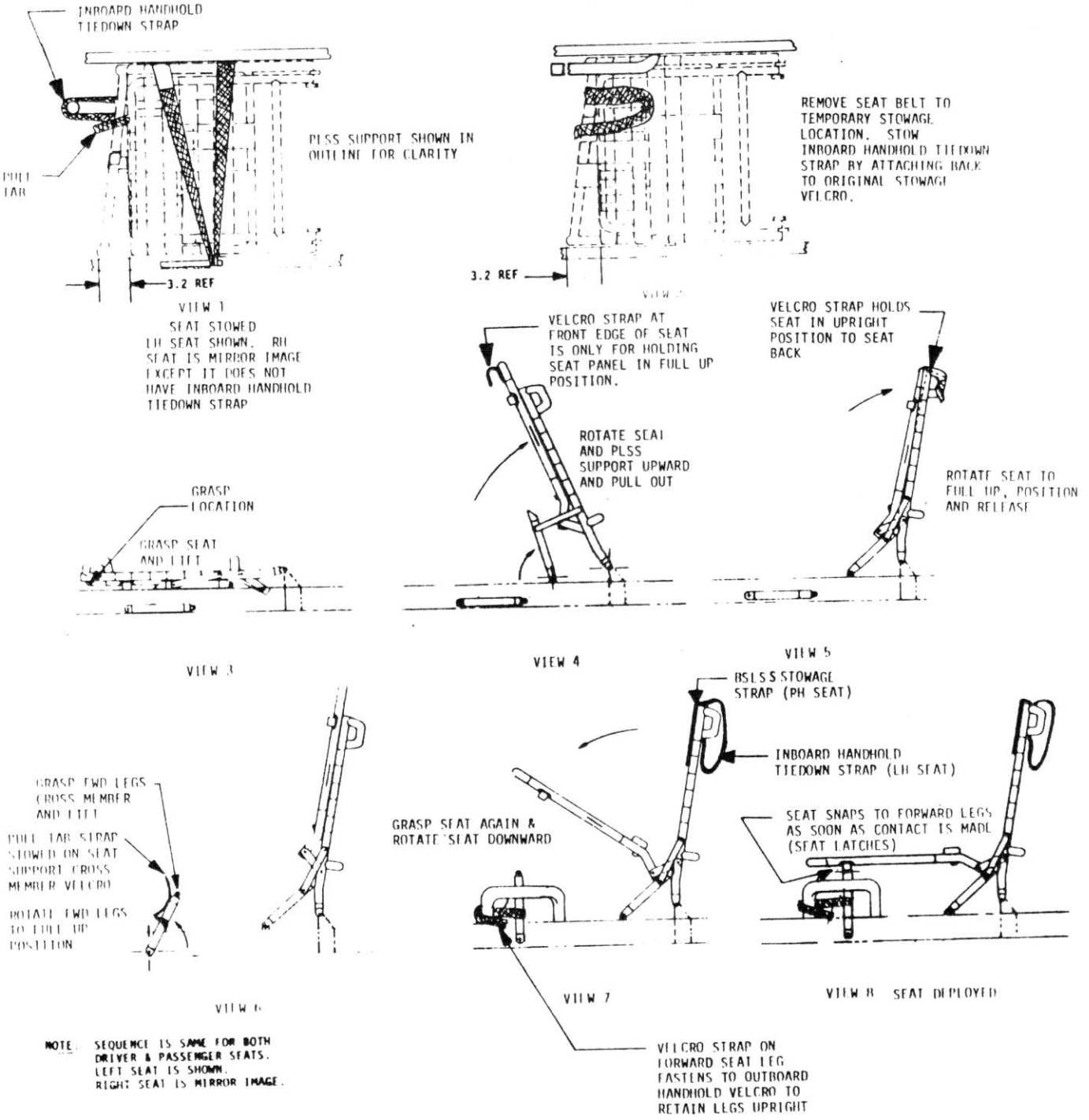


FIGURE 2-9 SEAT AND PLSS SUPPORT DEPLOYMENT SEQUENCE

STA/STEP	PROCEDURE	REMARKS
2.1	(Continued)	on chassis.
ao.	Visually verify the rear steering decoupling pull ring seal has not been broken.	Figure 2-6. If pull ring tiedown seal is broken and subsequent steering check using hand controller indicates steering is engaged, disregard broken seal. If hand controller check indicates steering is not engaged, recouple steering.
ap.	Deploy RR fender extension.	
aq.	Deploy LR fender extension.	
ar.	Verify both hinge pins flush at LR hinge.	If hinge pin is not flush, tap pin with toehold. Verify pin is latched by pressing down on chassis.
as.	Release inboard handhold velcro tiedown strap.	Figure 2-9, View 1.
at.	Release seat belt from seat stowage position and place in temporary storage position.	Figure 2-9, View 2.
au.	Rotate seat to stable overcenter position.	
av.	Rotate legs to full upright position.	
aw.	Attach forward seat legs velcro strap to outboard handhold.	
ax.	Verify underseat stowage bag erects.	
ay.	Pull seat pan frame forward to engage front legs.	

STA/STEP	PROCEDURE	REMARKS
2.1	(Continued)	
az.	Verify all seat latches latched.	
ba.	Stow inboard handhold tiedown strap by making loop behind seat and attaching end of strap to velcro patch on top of seat back.	
bb.	Fold inboard armrest down.	To prevent interference with hand controller armrest must be folded down to extent possible at this point.
bc.	Support console with left hand, with right hand release velcro tiedown strap (if required), pull out left C/D console "T" handle P7 and turn 90° CW.	
bd.	With right hand rotate inboard handhold to locked position while rotating console downward with left hand.	
be.	Rotate "T" handle P7 90° CW with right hand, fold "T" handle flush with console box and secure in position with velcro strap.	"T" handle should "snap-in", lock and fold down flush with console box.
bf.	Remove attitude indicator lock pin and discard.	Figure 2-6.
bg.	Remove C&W flag lock pin and discard.	
bh.	Pull pins P3 and P4 and discard clear of work area.	
bi.	Grasp tripod apex with left hand and pull pin P5.	
bj.	Discard pins and apex members clear of work area.	
bk.	Grasp short tripod member in left hand and pull pin P6 with right hand, and discard pin clear of deployment area.	

STA/STEP	PROCEDURE	REMARKS
bl.	Remove short tripod member and use hooked end to pull cable P2.	Figure 2-6. Tool hook interfaces with cable area color coded gold. Deflection of cable releases telescoping rods saddle and forward wheel strut tethers.
bm.	Visually verify that telescoping rods saddle falls away from LRV.	
bn.	Either insert short tripod member in left toehold position or stow in underseat stowage bag.	Figure 2-6. If short tripod member is installed in toehold position, end with hook should be outboard with hook pointing forward. This is also used as wheel decoupling tool.
bo.	Pull left footrest lift tabs.	Tabs pull free of footrests, but remain attached to floor panel.
bq.	Rotate footrest upward and forward and lock into position.	
br.	Verify both hinge pins flush at LF hinge.	
bs.	Deploy LF fender extension.	
bt.	Verify battery no. 1 and SPU dust covers closed and secured to velcro patch.	
bu.	Verify the forward steering decoupling pull ring seal has not been broken.	Figure 2-6. If seal is broken and subsequent steering check using hand controller indicates steering is engaged, disregard broken seal. If hand controller check indicates steering is

STA/STEP	PROCEDURE	REMARKS
2.1	(Continued)	not engaged, center wheels in neutral steer, verify forward steering lock and continue mission using rear steering only.
bv.	Move to right side of vehicle and verify battery no. 2 dust cover closed and secured to velcro patch.	
bw.	At right side of LRV rotate right "T" handle P13 90° CW, fold "T" handle flush with console box and secure in position with velcro strap.	"T" handle should snap-in, lock and fold down flush with the console box.

STA/STEP	PROCEDURE	REMARKS
2.2	LRV POST DEPLOYMENT CHECKOUT AND DRIVE TO MESA	
a.	Verify hand controller in parking brake and neutral throttle position and reverse inhibit switch is on (pushed down).	Crewman stands along side the vehicle.
b.	Verify switches and circuit breakers in pre-launch positions as follows: NAV POWER Circuit Breaker - Open GYRO TORQUING Switch - OFF System RESET Switch - OFF AUX Circuit Breaker - Open BUS A, B, C, D, Circuit Breakers - Open + 15 DC PRIM and SEC Circuit Breakers - Open ∓ 15 DC Switch - OFF MOTOR TEMP Switch - FORWARD BATTERY Switch - AMPS PWM SELECT Switch - BOTH STEERING FORWARD and REAR Circuit Breakers - Open STEERING FORWARD and REAR Switches - OFF DRIVE POWER LF, RF, LR, RR Circuit Breakers - Open DRIVE POWER LF, RF, LR, RR Switches - OFF DRIVE ENABLE LF, RF, LR, RR Switches - OFF	Figure 2-11. Crewman stands along side vehicle.
c.	Manually move the LRV away from the LM. (See remarks for LRV configuration for this operation).	Crew may manually move LRV away from LM prior to powerup; the hand controller should be placed in neutral throttle position and parking brake released. With a crewman standing on either side of vehicle outboard handholds may be used to lift, move, and tow LRV to any desired location.

STA/STEP	PROCEDURE	REMARKS
2.2	(Continued)	Lunar weight of LRV at this point would be approximately 85 lbs. Hand controller is placed in neutral throttle position and brake disengaged to permit wheels to roll.
	d. Set parking brake.	Crewman stands along side vehicle, and should exercise care not to move vehicle while setting brake.
	e. Ingress left seat, fasten seat belt and initiate subsequent power up steps.	Figure 2-1C.
	f. BUS A, BUS B, BUS C, BUS D Circuit Breakers - Close.	
	g. BATTERY Switch - VOLTS x 1/2.	
	h. Report BAT 1 and BAT 2 VOLTS indications.	
	i. BATTERY Switch - AMPS.	
	j. Report BAT 1 and BAT 2 temp (°F) indications.	
	k. Report BAT 1 and BAT 2 AMP-HR indications.	
	l. Report BAT 1 and BAT 2 AMPS indications.	
	m. ± 15 VDC PRIM and SEC Circuit Breakers - Close.	
	n. STEERING FORWARD AND REAR Circuit Breakers - Close.	
	o. DRIVE POWER LF, RF, LR, RR Circuit Breakers - Close.	

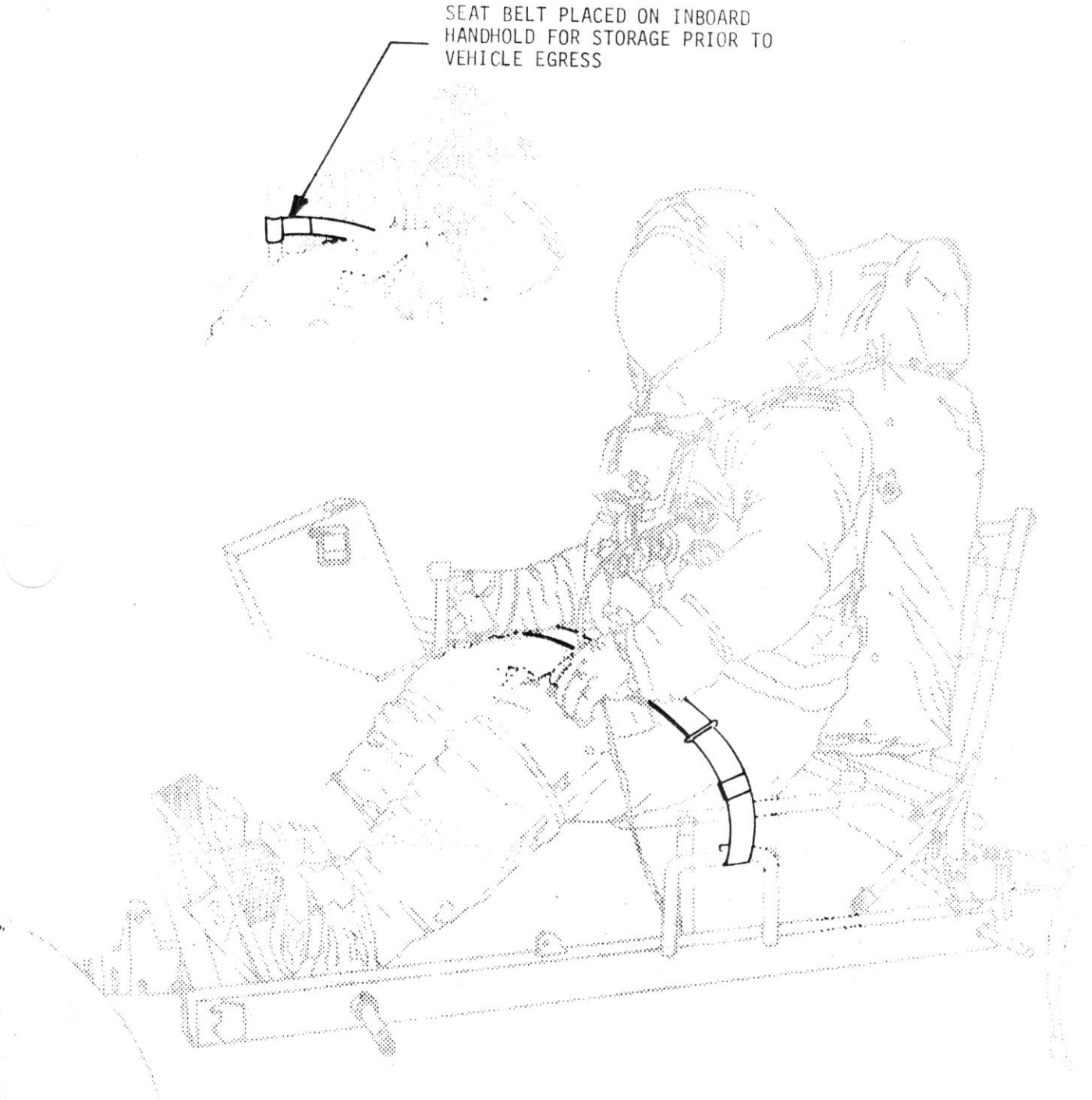


FIGURE 2-10 CREW POSITION

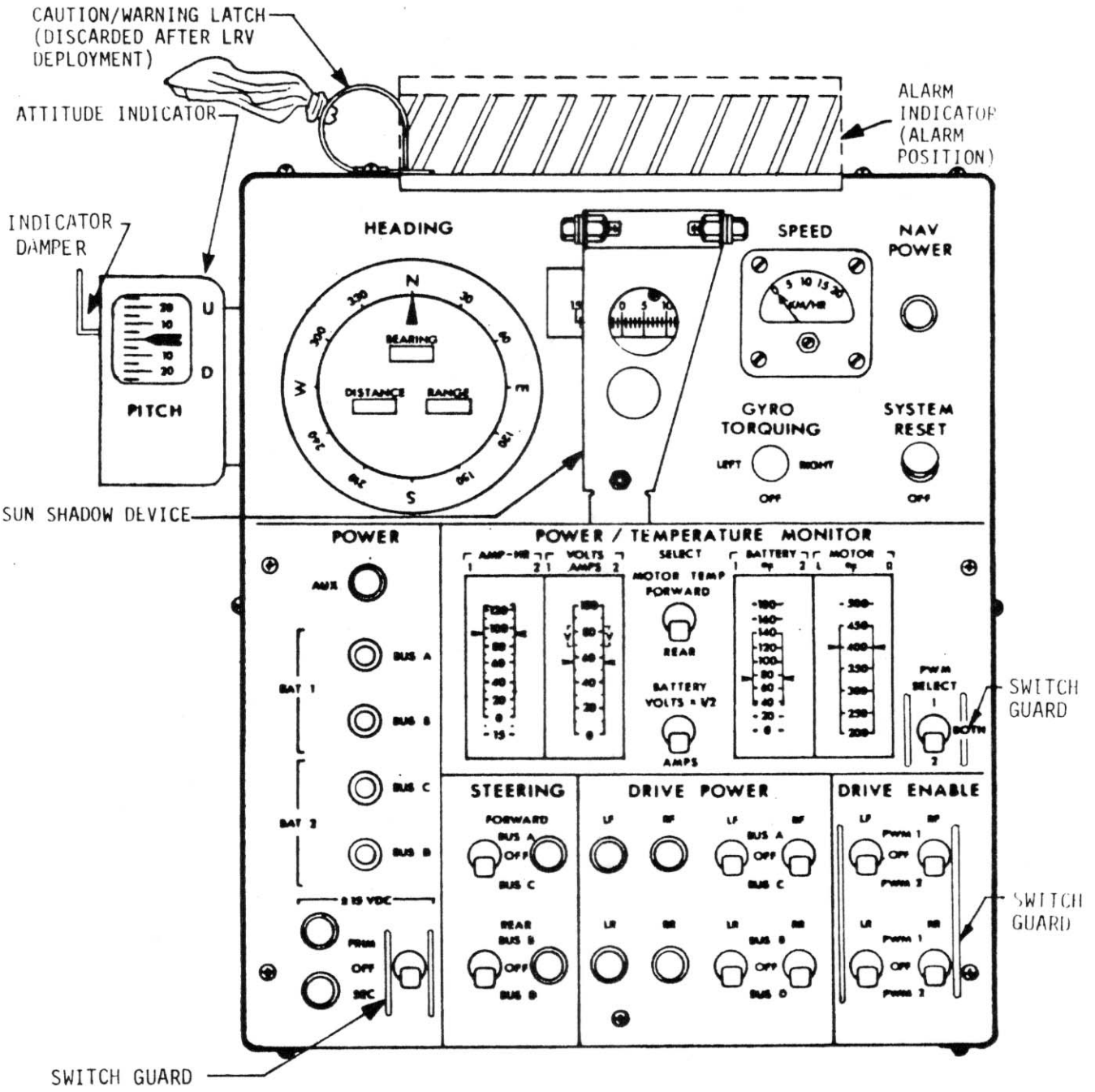


FIGURE 2-11 CONTROL AND DISPLAY CONSOLE

STA/STEP	PROCEDURE	REMARKS
2.2	(Continued)	
p.	DRIVE ENABLE LF and RF Switches - PWM 2.	
q.	DRIVE ENABLE LR and RR Switches - PWM 1.	
r.	± 15 VDC Switch - SEC.	
s.	STEERING FORWARD Switch - BUS C.	Forward steering operates from Battery No. 2.
t.	STEERING REAR Switch - BUS B.	Rear steering operates from Battery No. 1.
	CAUTION The hand controller should be in park brake position and the drive enable switches must be set to an active PWM prior to setting any drive power switch to an energized bus. If the drive power switch is turned on and the corresponding drive enable switch is not selected to an active PWM, then full power will be applied to the corresponding drive motor when the hand controller is released from brake position. Should this condition occur the hand controller should be immediately returned to park brake position.	The PWM select switch determines which PWM is active. The hand controller was verified set in park brake position in step 2.2.d. The PWM select switch was verified in "BOTH" position in step 2.2.b. The drive enable switches were set to active PWM positions in steps 2.2.p and 2.2.q.
u.	DRIVE POWER LF Switch - BUS C.	Front wheels operate from Battery No. 2.
v.	DRIVE POWER RF Switch - BUS C.	
w.	DRIVE POWER LR Switch - BUS B.	Rear wheels operate from Battery No. 1.

STA/STEP	PROCEDURE	REMARKS
2.2	(Continued)	
x.	DRIVE POWER RR Switch - BUS B.	
y.	Release parking brake.	
z.	Hand Controller reverse inhibit switch - UP position. NOTE: The LRV driver may now back away from LM. LRV driver should request other crewman to direct and monitor any backing operations from an off-vehicle position.	
aa.	Stop LRV and set parking brake. Reset reverse inhibit switch (push switch down).	
ab.	Release parking brake and drive to MESA area for equipment loading.	To the extent possible driver should verify steering, speed control and braking during this brief drive. The off-vehicle crewman should verify all four wheels rotating (not sliding).
ac.	Stop LRV and set hand controller in parking brake position; Neutral throttle.	Parking brake should always be set prior to vehicle egress by either crewman.
ad.	Perform LRV partial power down as follows: DRIVE POWER Switches (4) - OFF. STEERING Switches (2) - OFF. ± 15 VDC Switch - OFF.	Turning off drive power, steering, and ± 15 VDC switches ensures that a failure in the DCE will not apply power to any vehicle motor thereby precluding any unnecessary power drain.

STA/STEP	PROCEDURE	REMARKS
2.2	(Continued)	
	NOTE: The above step 2.2.ad assumes that payload loading and first LRV traverse will follow in order. Should crew rest period be scheduled subsequent to step 2.2.ae and prior to first LRV sortie, then Bus A, B, C, and D circuit breakers should be opened.	
ae.	Release and stow seat belt and egress vehicle.	

STA/STEP	PROCEDURE	REMARKS
2.3	PAYLOAD LOADING	
2.3.1	LCRU Installation	
a.	Place LCRU support post locks in the up position.	Figure 2-12. LRV arrives on lunar surface with LCRU support posts installed in LRV support tubes on forward chassis and with LRV/LCRU power cable connected to LRV auxiliary connector.
b.	Disconnect GCTA connector from LRV dummy connectors.	Figure 2-12.
	NOTES 1. Do not disconnect LCRU power cable from LRV auxiliary connector. Dust contamination could occur if this connector is disconnected. 2. Do not allow GCTA connector of cable to fall to lunar surface. 3. Do not place payload on battery cover.	
c.	Remove dummy connector from LRV GCTA receptacle and discard.	
d.	Remove LCRU from its LM stowage position and place onto LRV forward chassis LCRU support posts.	Figure 2-13.
e.	When LCRU is bottomed against support posts, position support post locks in horizontal position to secure LCRU.	
f.	Verify LRV AUX power circuit breaker - Open.	

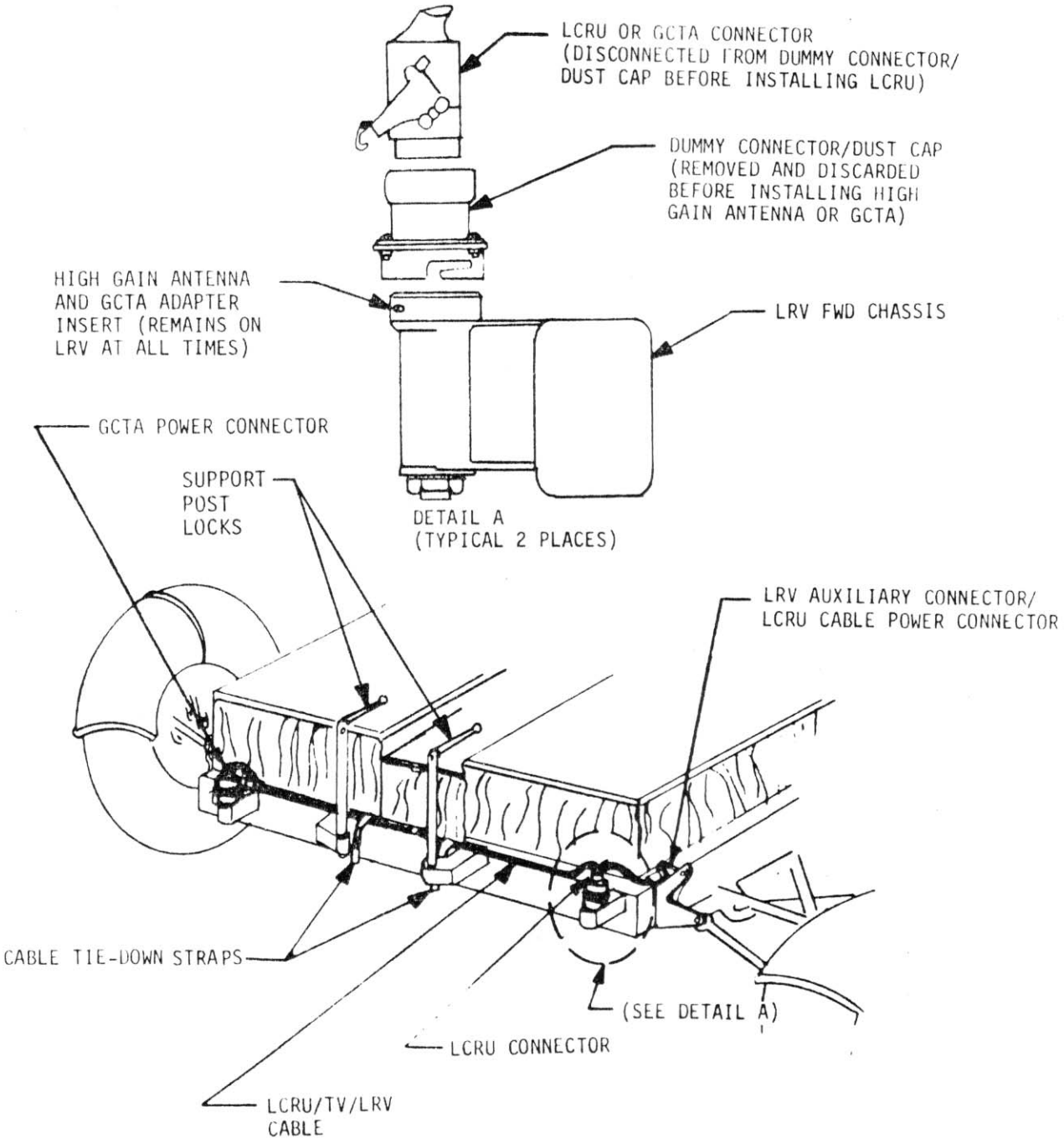


FIGURE 2-12 LCRU/TV/LRV CABLE STOWAGE

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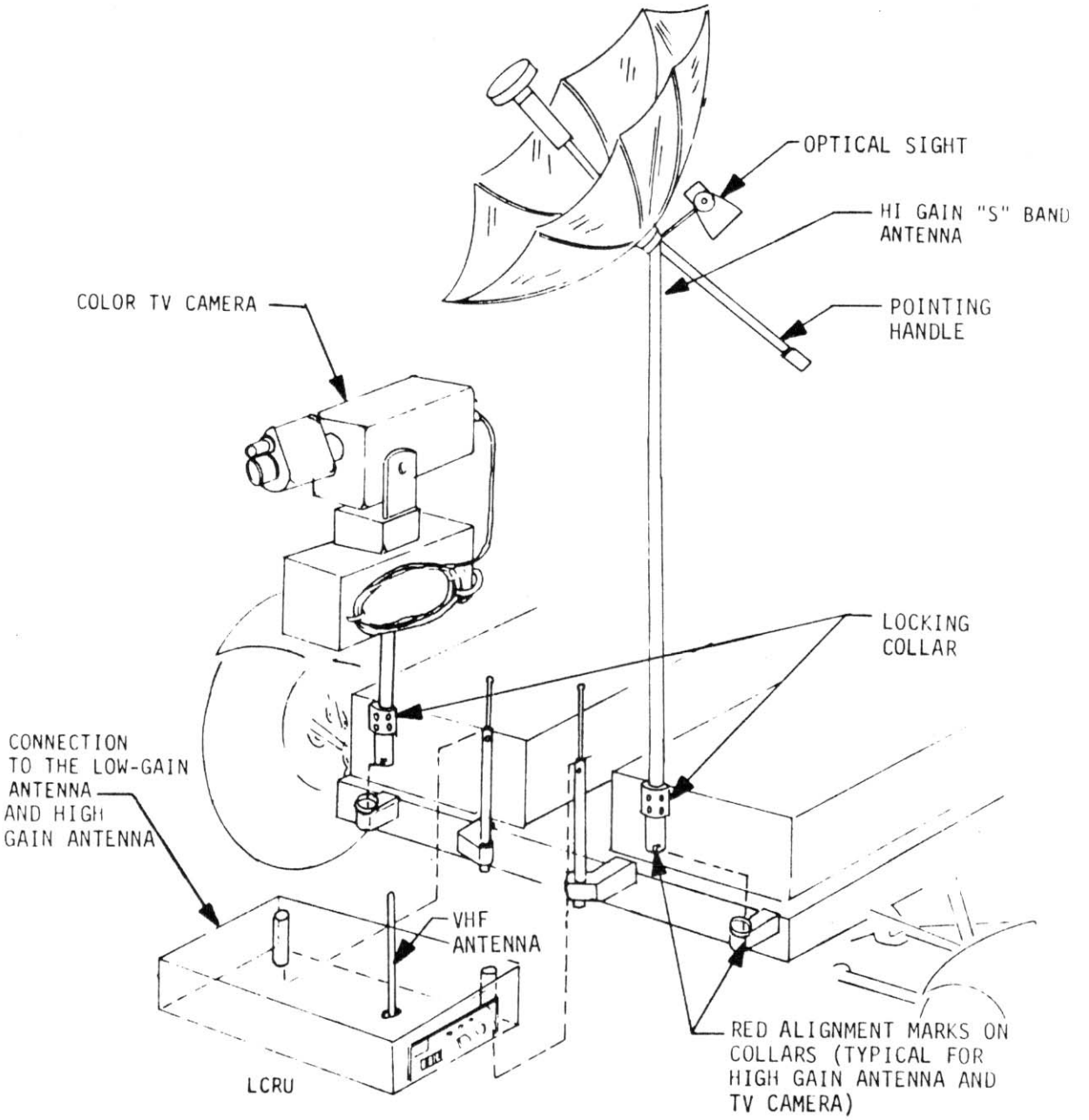

FIGURE 2-13 LCRU, HIGH GAIN ANTENNA, TV CAMERA INSTALLATION

STA/STEP	PROCEDURE	REMARKS
2.3 .1	(Continued)	
g.	Disconnect LCRU power connector from LRV dummy connector and connect to LCRU.	
h.	Cover connector with thermal boot.	
i.	Remove dummy connector from LRV HGA receptacle and discard.	
2.3.2	GCTA Installation	Figure 2-13.
a.	At MESA, pull GCTA control unit pip pin release cable. **CAUTION** Do not strike GCTA control unit mirror surfaces on MESA.	
b.	Remove GCTA control unit and support staff from MESA.	
c.	Unfold GCTA support staff. Verify staff locked. **CAUTION** If GCTA staff is not properly locked, it could fall on LCRU and cause severe LCRU radiator damage.	
d.	With connector receptacles inboard, insert GCTA staff into mounting receptacle on right front corner of LRV.	
e.	Rotate staff to assure engagement of staff anti-rotational pins.	
f.	GCTA staff bayonet collar - Lock (CW).	Alignment marks are provided on GCTA staff locking collar.