

United States Army Warfighting Center
Fort Rucker, Alabama
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STUDENT HANDOUT

TITLE: CH-47D CARGO HANDLING SYSTEMS

FILE NUMBER: 011-2115-3

PROPONENT FOR THIS STUDENT HANDOUT IS:

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CH-47D CARGO HANDLING SYSTEMS

STUDENT HANDOUT

TERMINAL LEARNING OBJECTIVE (TLO):

Action: Describe components, operational characteristics, functions, limitations and emergency procedures of the CH-47D cargo handling system.

Conditions: In a classroom, given a CH-47 Hydraulic System Trainer, CH-47 Utility Hydraulic System Trainer, and a student handout.

Standards: Correctly answer in writing, without reference, four of six questions pertaining to components, operational characteristics, limitations, functions, and emergency procedures of the CH-47D Cargo Handling System, In Accordance With (IAW) TM 1-1520-240-10 and the student handout.

Safety Requirements: None.

Risk Assessment Level: Low.

Environmental Considerations: None.

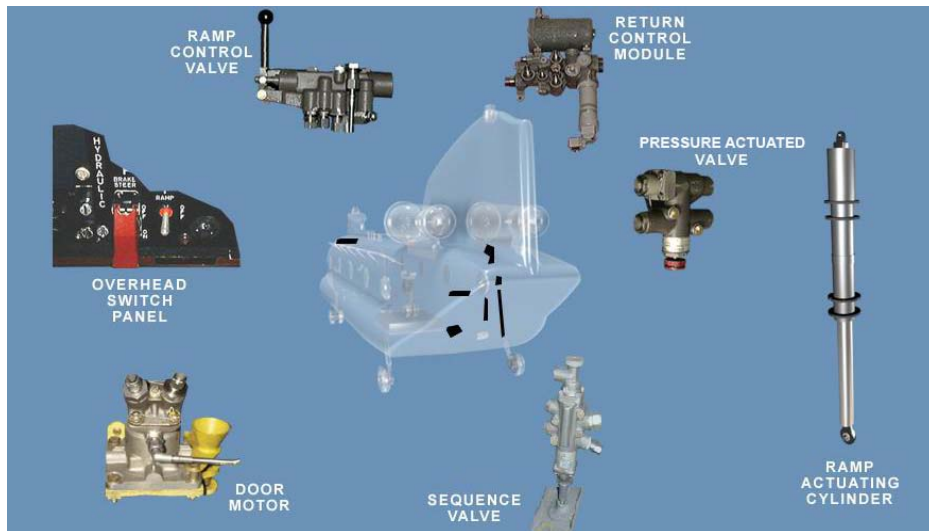
Evaluation: Each student will be evaluated on this block of instruction during the first written examination. This will be a criterion type examination requiring a GO on each scored unit. You will have 90 minutes for the exam.

1. **Learning Step/Activity 1 – Describe the components, operational characteristics, functions, emergency procedures, and limitations of the Cargo Ramp/Door.**
 - a. Cargo ramp/door.

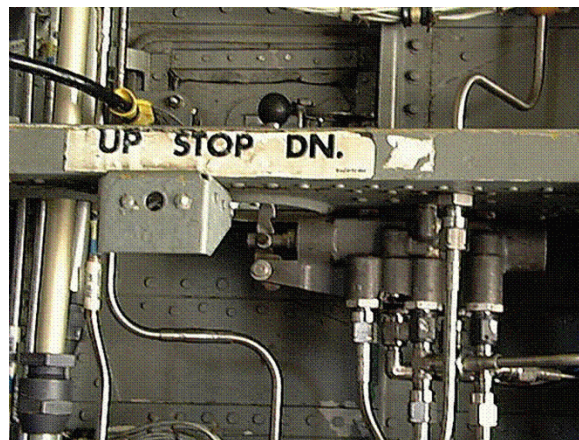


- (1) Ramp.
 - (a) Provides a means of quickly loading or unloading cargo/passengers.

- (b) May be used for additional cargo space when positioned level with the floor.
 - 1) The ramp is not to be opened below floor level for takeoff and landing.
 - 2) Weight limitation – 3,000 pounds.
- (c) Hydraulically operated by the utility hydraulic system.
- (2) Cargo door.
 - (a) Provides closure.
 - (b) Automatically sequences to extend and retract.
 - (c) Jettisonable to provide an emergency exit.
- (3) Components.

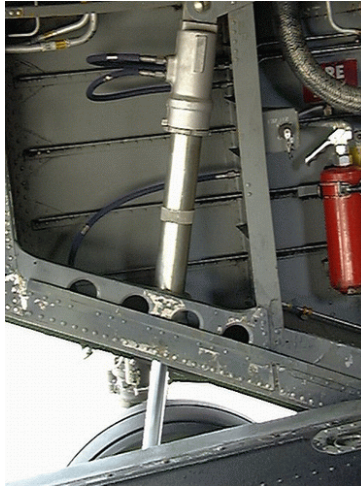


- (a) Ramp control valve.



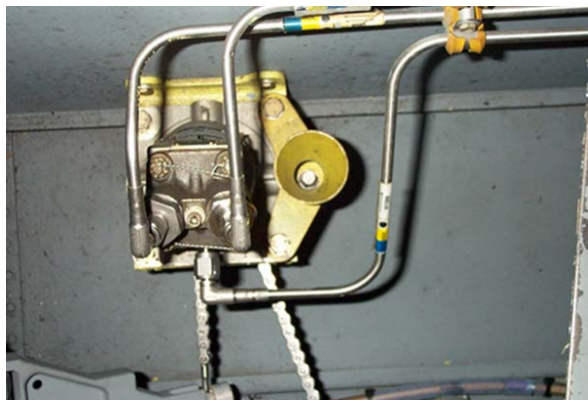
- 1) Location – Right side of aft cargo compartment.
- 2) Positions – UP, STOP, and DN (down).
- 3) Ramp may be stopped at any position between full up and full down.

(b) Actuating cylinders.



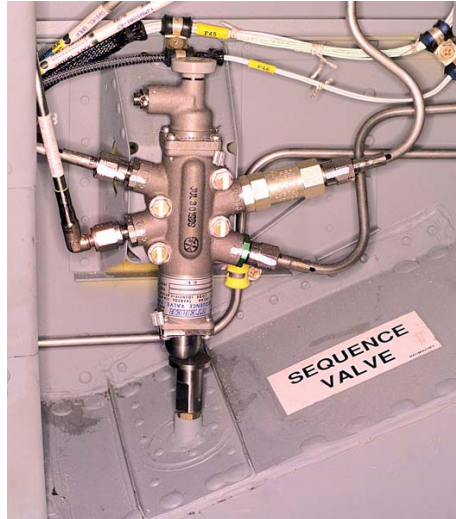
- 1) Located on each side of ramp.
- 2) Hydraulically powers the ramp up.
- 3) Internal mechanical locks.
 - a) Prevent accidental opening.
 - b) Provides the only locking mechanism for keeping the ramp closed.
 - c) Hydraulically unlocked.

(c) Cargo door actuator motor.



- 1) Located inside the ramp.
- 2) Reversible to extend or retract the door.
- 3) Controlled by the sequence valve.

(d) Sequence valve.



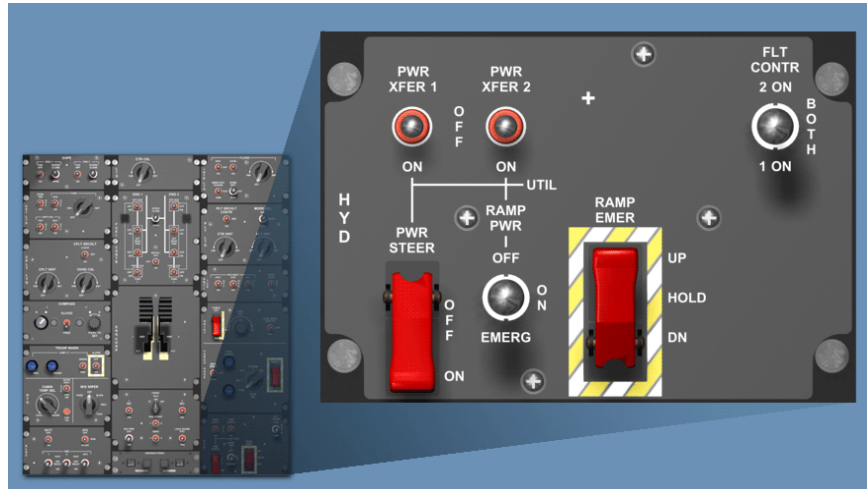
- 1) Mechanically operated by the ramp.
- 2) Sequences the extension/retraction of the cargo door.
- 3) May be locked in position to keep the door retracted (open).
 - a) Do not press the valve plunger unless the ramp is down.
 - b) Do not unlock unless the ramp is down.

(e) Pressure Actuated valve.

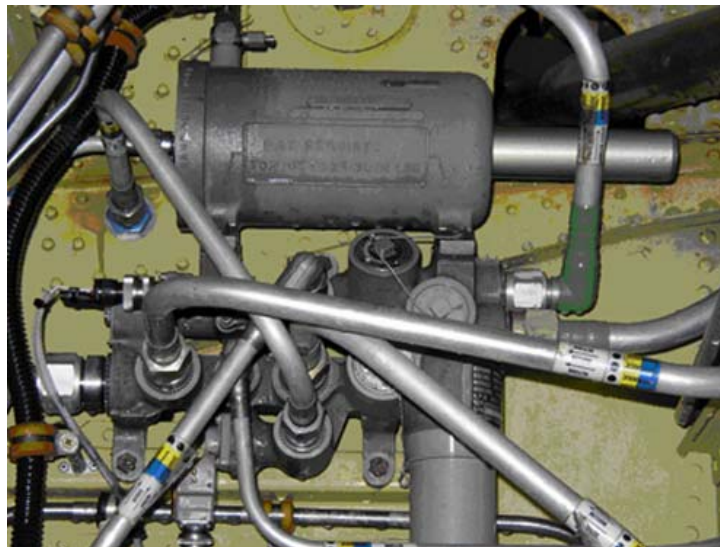


- 1) Stops the ramp operation while the door is extending or retracting.
- 2) Red plunger provides manual override. Use only if the ramp fails to operate normally.

(f) RAMP PWR switch.



- 1) Located on the overhead hydraulics panel. Three positions labeled ON, OFF, and EMER.
- 2) ON position (normal) opens the isolation valve in the pressure control module allowing pressure to operate the ramp system.
- 3) OFF position closes the isolation valve to prevent loss of fluid if a leak occurs.
- 4) EMER, electrical power is supplied to the RAMP EMER switch, allowing the ramp and cargo door to be opened or closed from the cockpit.



- b. The utility return control module transfer cylinder hold the additional fluid for the ramp actuators as the ramp is moved up and down.
- c. To operate the ramp using the auxiliary power unit (APU) start accumulator pressure, **open the EMERG UTIL PRESS valve.**



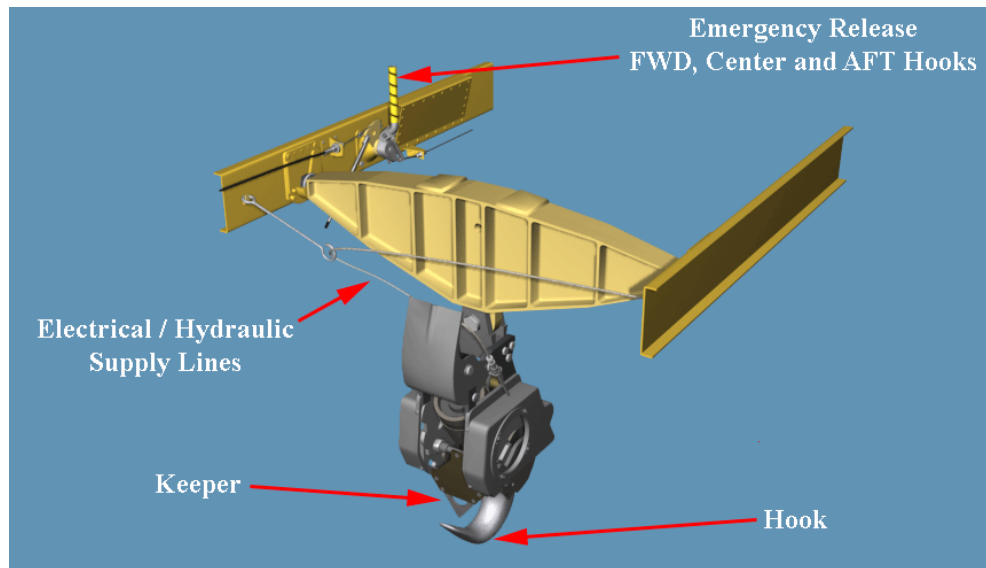
2. Learning Step/Activity 2 – Describe the components, limitations, emergency procedures and operational characteristics of the Triple Cargo Hook System.

- a. Triple cargo hook system.



- (1) Structural load limit in pounds.
 - (a) Center hook – **26,000.**

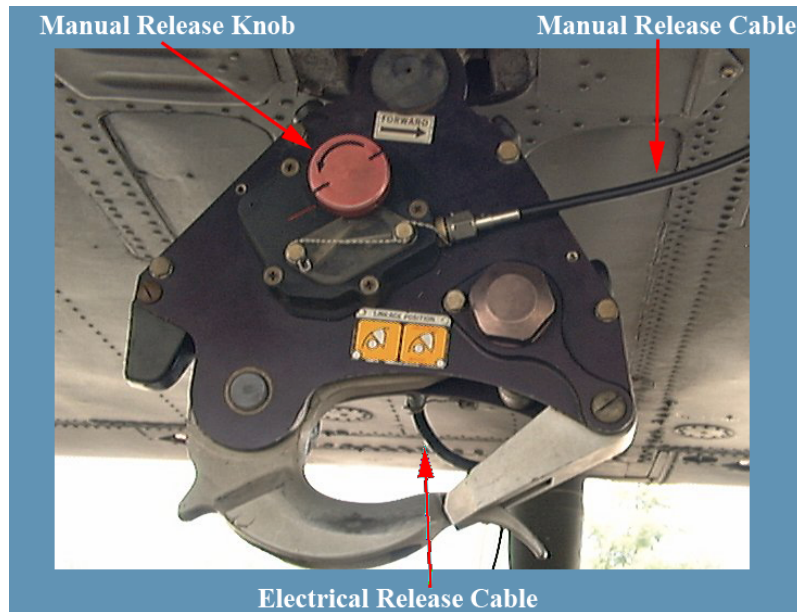
- (b) Forward hook – **17,000**.
 - (c) Aft hook – **17,000**.
 - (d) Tandem rigging fwd and aft hooks – **25,000**.
- (2) Airspeed limitations with external loads refer to the operator's manual.
Pg: 5-5-1
- (3) Center cargo hook.



- (a) Located in the rescue hatch. It can swing fwd, aft, and laterally.
- (b) Hydraulic pressure for normal release is controlled electrically.
- (c) Air charge is stored in the hook.
 - 1) Minimum – 2,000 psi.
 - 2) Air charge closes the hook after it has been hydraulically opened.
 - 3) Holds the hook closed.
 - 4) Emergency release is by the cargo hook emergency release switch (EMERG REL ALL).
- (d) Manual release.
 - 1) Manual release lever in rescue hatch.
 - 2) A –13 entry is required if the hook is manually opened with a load on it.
 - 3) Hook must be manually closed.

(e) If the hook is opened with a load suspended, it will spring back and up, possibly into the cargo compartment.

(4) Forward and aft cargo hooks.



(a) Stops allow the hooks to swing approximately –

- 1) Eighty degrees between full forward and full aft.
- 2) Fifty degrees between full left and full right.

(b) Water tight seals are provided for water operations.

(c) Knurled knob on the hook allows it to be opened by personnel on the ground.

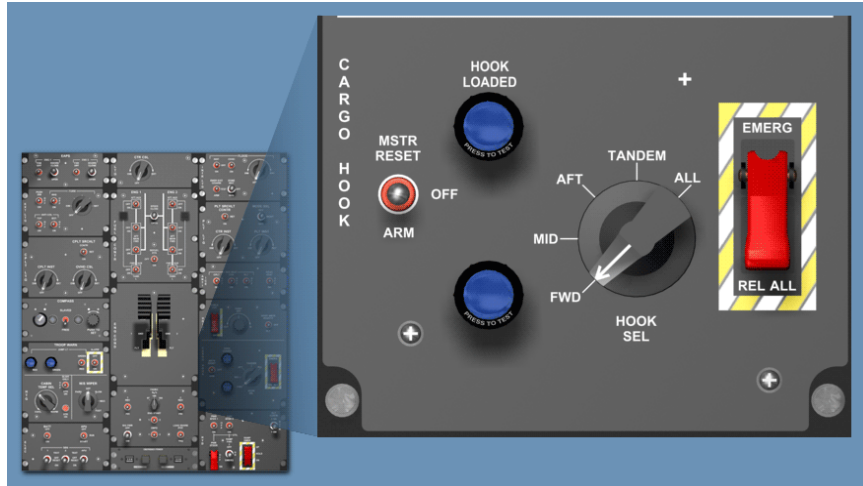
(d) Solenoid for electrical release - normal and emergency.

(e) Manual release lever in rescue hatch.

(f) Hook is closed by spring pressure after opening.

(g) A hook load of 18 – 22 pounds is required to open.

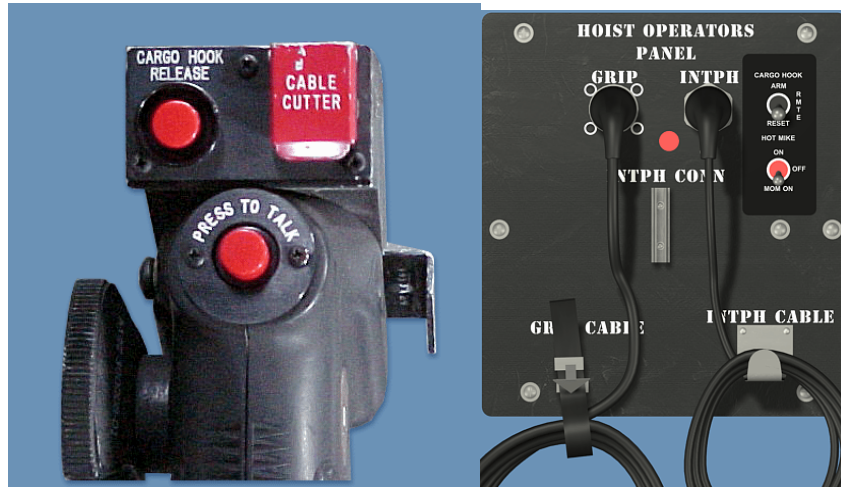
b. CARGO HOOK controls located on overhead panel.



- (1) MSTR (master) switch.
 - (a) OFF.
 - 1) Removes electrical power from the normal release switches.
 - 2) Closes the center hook.
 - (b) ARM. Electrical power is connected to the –
 - 1) CARGO HOOK REL switch on each cyclic.
 - 2) CARGO HOOK ARM switch on the hoist operator's control panel.
 - (c) RESET. Turns off the FWD and AFT HOOK OPEN caution lights.
- (2) HOOK SELECT switch.
 - (a) Five position rotary switch.
 - (b) The switch position determines which hook(s) will open when the hook release switch is pressed.
- (3) Hook loaded advisory lights.
 - (a) For forward and aft hooks only.
 - (b) Illuminate when the hook load exceeds about 150 pounds.
 - (c) Activated by sensors in the forward and aft hooks.
- (4) Electrical power for normal release is supplied by the No.2 DC bus.

- (5) Emergency cargo hook release switch (red guarded).
 - (a) Labeled EMERG REL ALL.
 - (b) Opens all cargo hooks regardless of other switch positions.
 - (c) Forward and aft hooks are opened electrically.
 - (d) Center hook is opened by the air charge.
 - (e) Electrical power is from the ESSENTIAL bus.

c. Hoist operator's control panel.



- (1) Panel is activated when MASTER switch is at ARM.
- (2) ARM – Energizes the cargo hook release switch on the winch control grip.
- (3) RMTE (remote) – De-energizes the cargo hook release switch on the winch control grip.
- (4) RESET – Turns off the FWD and AFT HOOK OPEN caution lights.

d. Caution lights on master caution panel.



- (1) Cargo HOOK OPEN lights for each hook.
 - (a) Indicates that the respective hook has opened.
 - (b) Turn the lights off by-
 - 1) Placing the CARGO HOOK MASTER switch to RESET.
 - 2) Placing the CARGO HOOK switch on the hoist operator's panel to RESET.
- (2) DUAL HOOK FAULT light.
 - (a) Indicates the loss of electrical release capability (normal and emergency) for forward and aft hooks.
 - (b) Forward and aft hooks must be opened manually.

e. Jettisoning external cargo (emergency procedures). **Pg: 9-2-1.**



WARNING: If a DUAL HOOK FAULT caution exists, normal and emergency release capability for the forward and aft hook may be lost. Use the manual emergency release system only.

NOTE: The instructor will explain the current -10 procedure

Primary Method:

CARGO HOOK EMERG switch — REL ALL.

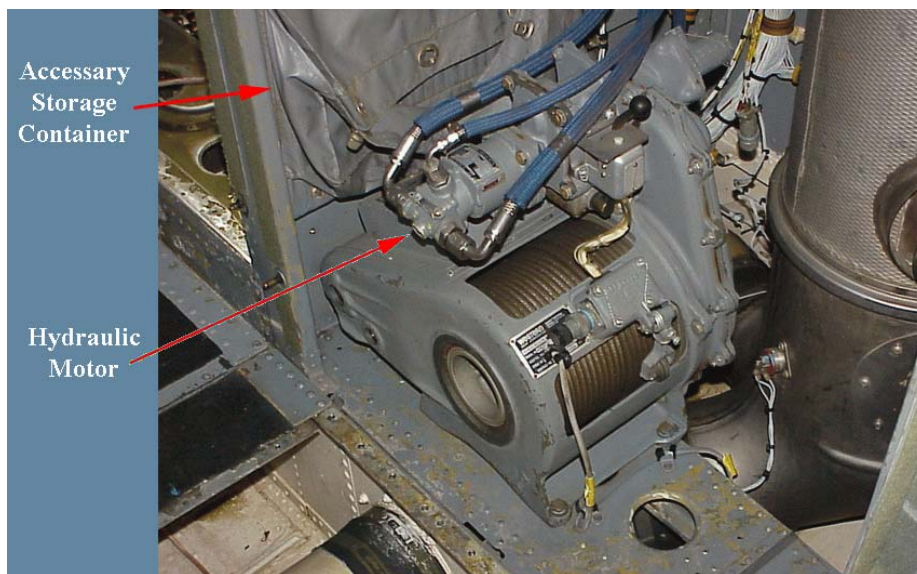
Alternate Method:

Forward, center and aft hook release lever — Pull aft.

NOTE: If the forward and/or aft hooks did not open because of sling slack, apply a slight amount of thrust to load the hook(s) and force open.

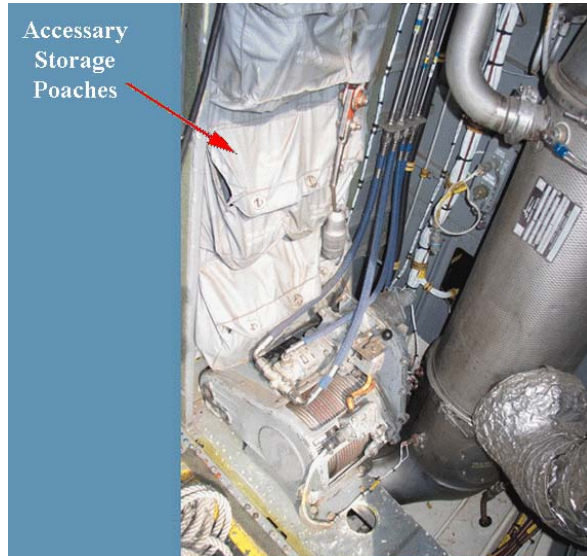
3. Learning Step/Activity 3 – Describe the components, limitations, and operation of the Cargo Winch/Rescue Hoist System.

- a. Cargo winch and rescue hoist system.

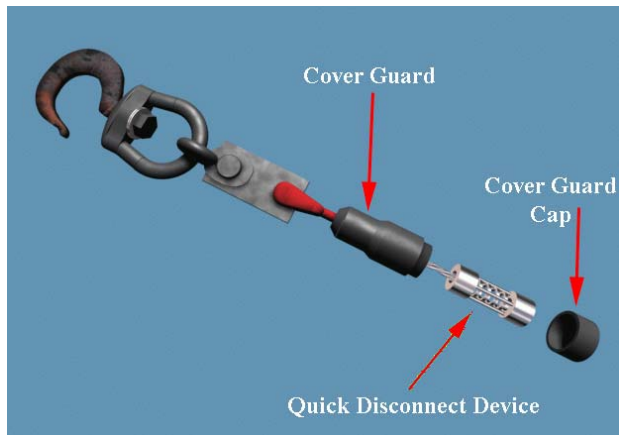


- (1) Purpose.
 - (a) Cargo –To aid loading and off loading cargo through the ramp.
 - (b) Rescue –To hoist light loads through the rescue hatch while the helicopter is hovering.
- (2) Description.
 - (a) The winch is located in the heater closet.
 - (b) Hydraulic motor drives the winch using utility hydraulic system pressure.

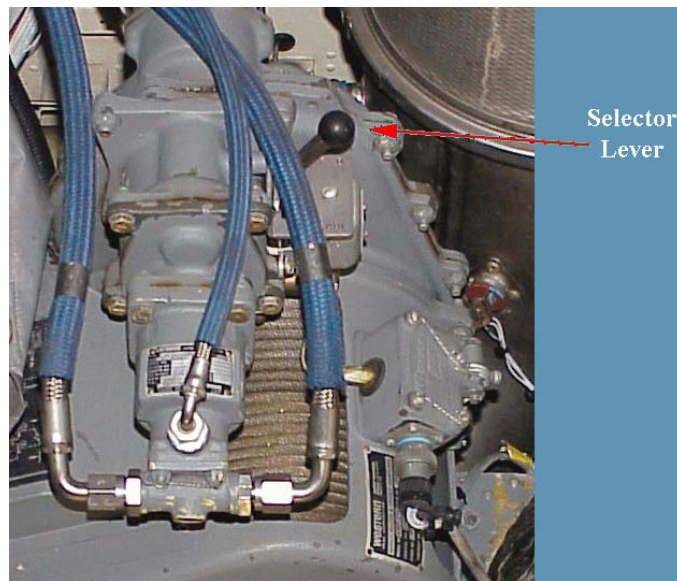
- (c) Mechanical brake holds the cable drum when hydraulic pressure is removed.
- (d) Cable length is 150 feet long.
- (e) Accessories are provided and stored in heater closet.



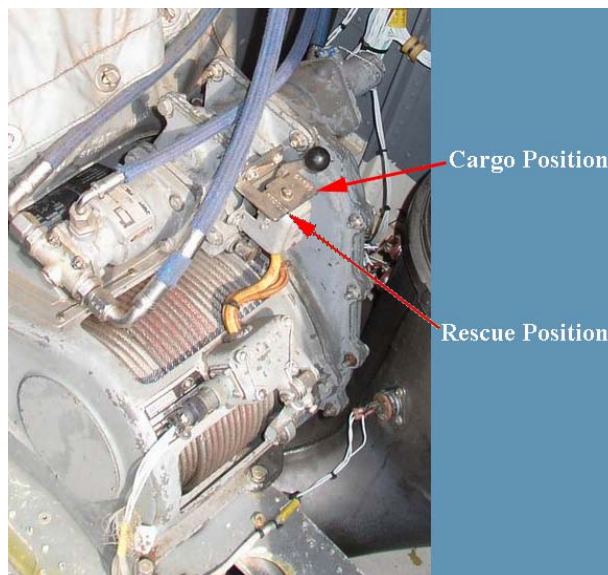
- (f) Cable/hook quick disconnect must have cover guard installed.



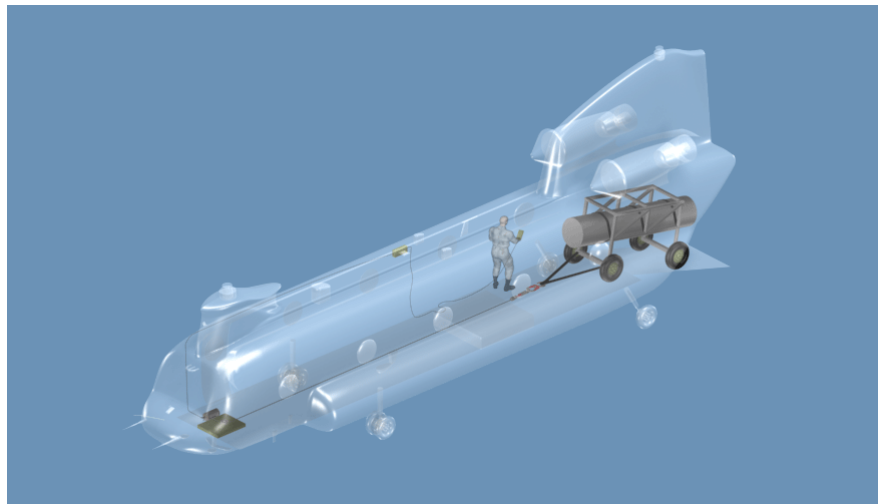
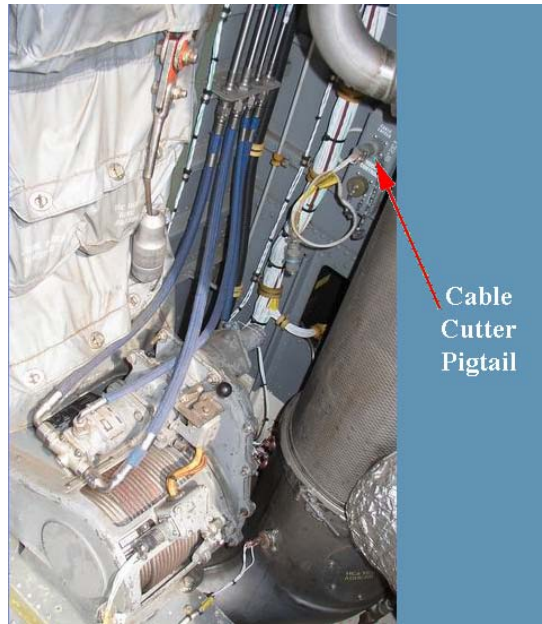
- (g) Selector lever is used to select the mode of operation, RESCUE or CARGO.



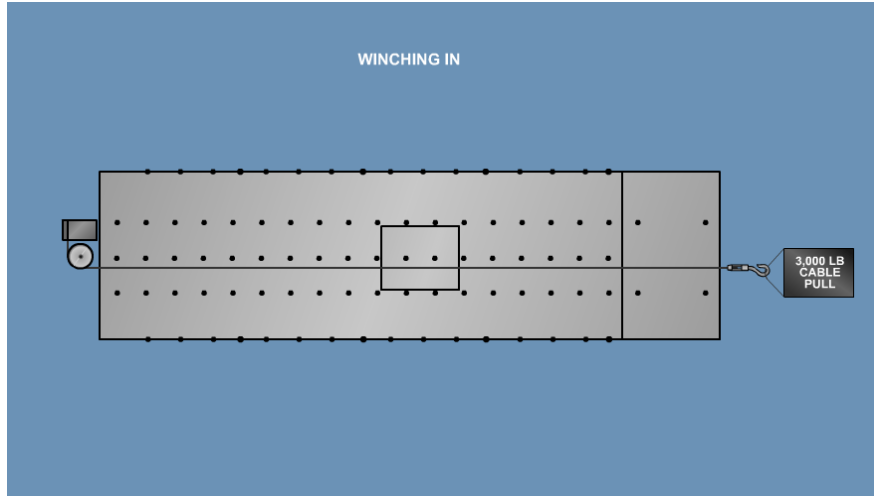
- (3) Normal operation.
- (a) Electrical power required for control is from the No.1 DC bus.
- (b) CARGO mode is for loading and off loading internal cargo.



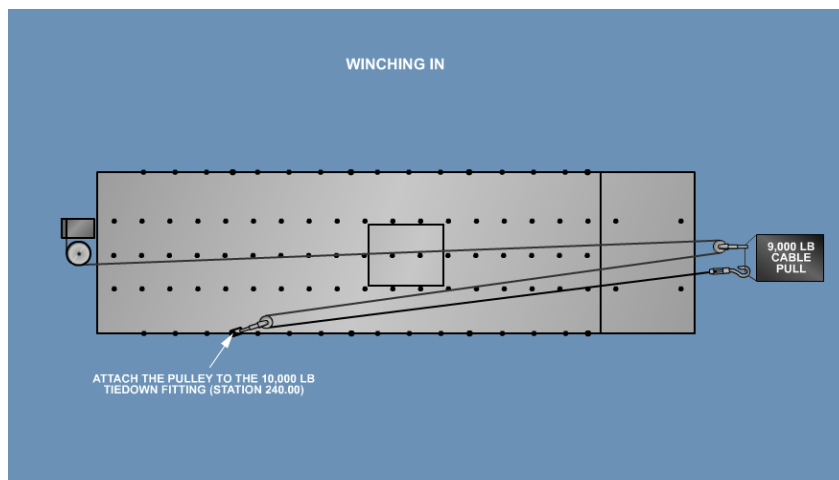
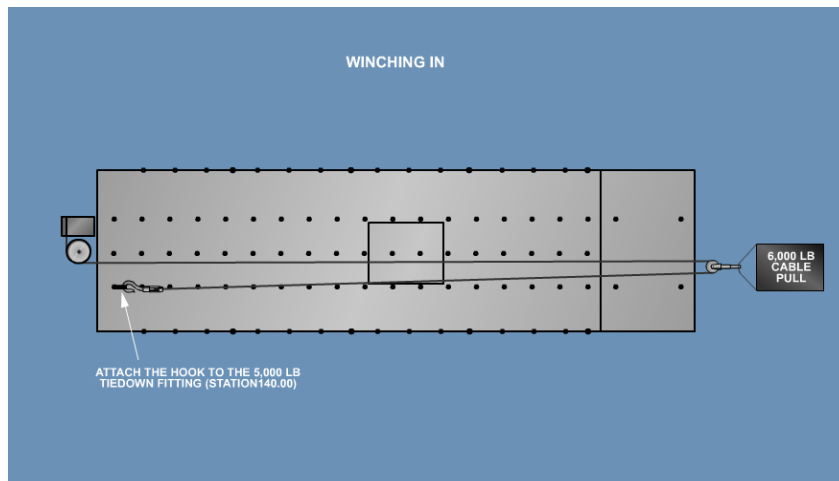
- 1) Selector lever –Select CARGO position.
- 2) Cable cutter arming device (pig tail) must be installed in the heater closet.

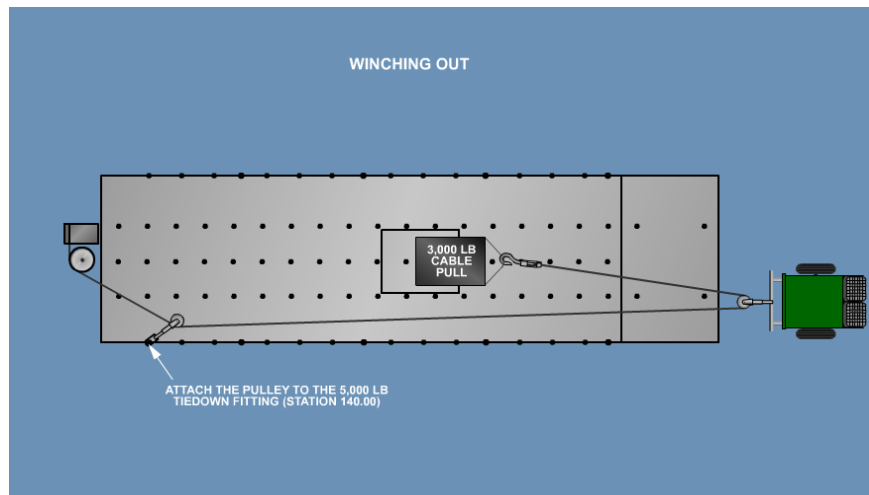
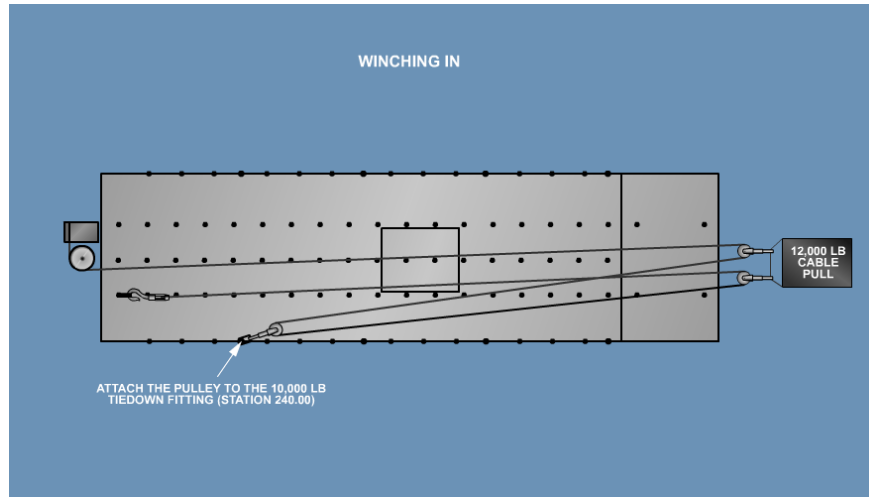


- 3) Maximum load.
 - a) Single line pull – 3,000 pounds.



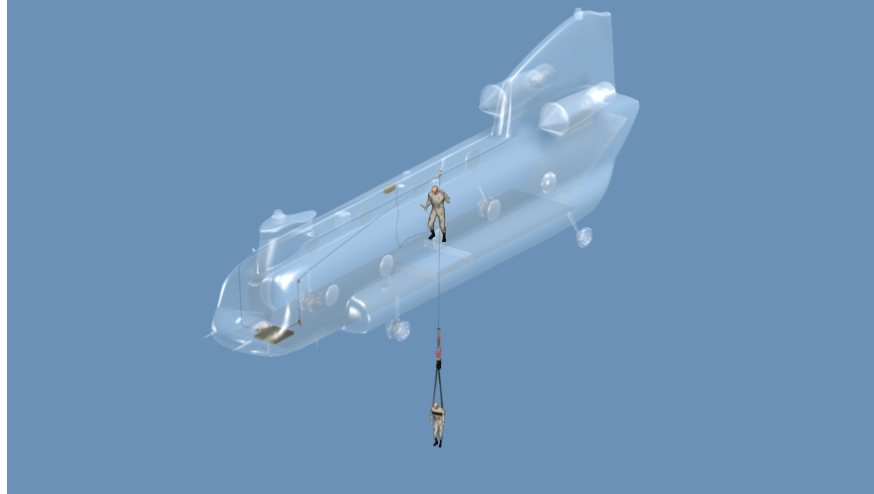
b) Additional pulleys – 12,000 pounds.





OPERATOR'S MANUAL CAUTION: Do not exceed 3,000 pounds single line pull. Overload will result in the winch overload switch actuating to stop the winch. **Pg: 4-3-8.**

- 4) Reel in speed, single line pull is 0 to 20 feet per minute.
- 5) Remove slack from cable before applying a full load.
- 6) Limit switches – IN and OUT.
- 7) Provide slack in the cable after the load is secured.



- (c) RESCUE mode is used for hoisting light loads through the rescue hatch.

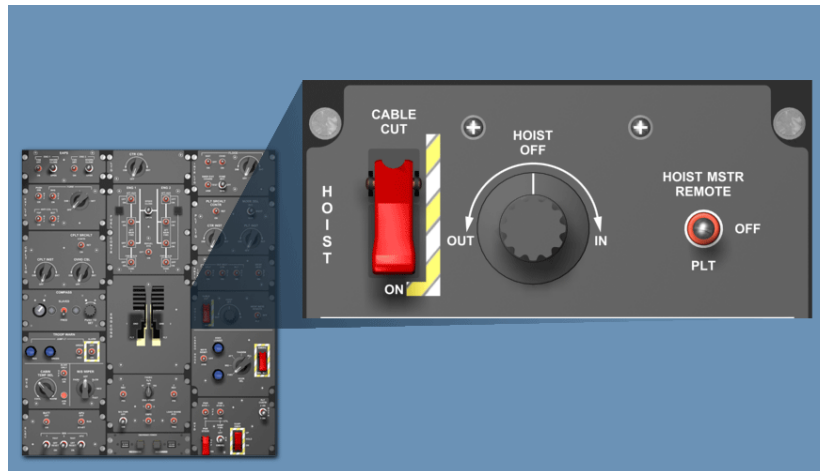
OPERATOR'S MANUAL WARNING: To prevent dangerous electrical shock to personnel being hoisted, the cable must touch the ground or water prior to contacting personnel. **Pg: 4-3-13.**

- 1) Cargo hook must be removed.
- 2) Selector lever – select RESCUE position.
- 3) Structural load limit is 600 pounds maximum.
- 4) Reel in speed is 0 to 100 feet per minute.
- 5) In limit switch.



- 6) The cable cutter device must be installed above the center rescue hatch.

(d) Hoist controls.



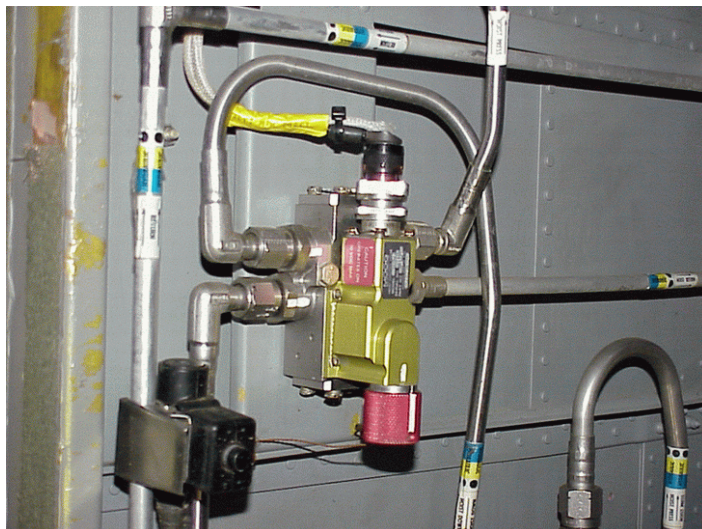
1) Cockpit.

- a) HOIST MASTER switch determines operator selection.
- b) Rotary control switch (in/out).
- c) Cable cutter switch.

2) Hoist operator's panel – hoist control GRIP.



b. Emergency operation when electrical power is not available.



- (1) Break the shear wire on the winch control valve.



- (2) Push in the plunger on the winch shutoff valve and rotate to lock the valve open.
- (3) Rotate the knurled knob on the control valve to control IN/OUT operation.
- (4) Return the knob to center detent (OFF) to stop the winch.

OPERATOR'S MANUAL CAUTION: When the winch is operated in the emergency mode, the cable limit switches are disabled. **Pg: 4-3-9.**

Appendix C - Practical Exercises and Solutions

CH-47D CARGO HANDLING SYSTEM

PRACTICAL EXERCISE

NOTE: This practical exercise covers the instruction you received in this handout. Completion is optional, but strongly encouraged!

1. What must you do to use APU start accumulator pressure to operate the ramp?
2. What must you do to cause the ramp to raise or lower if it fails to operate normally?
3. What is the maximum amount that the ramp may be lowered for takeoff or landings?
4. Where must the ramp control valve be positioned prior to and after the RAMP PWR switch is placed to OFF?
5. Where must the ramp be positioned prior to changing the position of the sequence valve?
6. How must loads on the forward and aft cargo hooks be released if the dual hook fault light is on?
7. When should the cargo hook EMERG REL ALL switch be used to open the cargo hooks?
8. What is the primary method of jettisoning external cargo?
9. What is the minimum air charge for the center cargo hook?
10. What action is required to extinguish the cargo hook open caution light?
11. The hook loaded advisory light comes on when _____ is on the hook?
12. What is the maximum weight for the winch when hoisting loads through the rescue hatch?
13. What caution must be observed when operating the cargo winch in the emergency mode?
14. The winch cable must be allowed to touch the ground or water prior to _____?
15. How is the ramp kept closed (up) and locked?

CARGO HANDLING SYSTEM
PRACTICAL EXERCISE SOLUTIONS

1. Open the EMER UTIL PRESS valve.
2. Press the red button on the pressure actuated valve.
3. Floor level.
4. Stop.
5. Lowered (open).
6. Manually.
7. To jettison external cargo in an emergency.
8. EMER REL ALL switch.
9. 2,000 psi.
10. Place the master switch to RESET.
11. 150 pounds.
12. 600 pounds.
13. Cable limit switches are inoperative.
14. Touching personnel.
15. Mechanical Locks.

