

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TM 10-500-70

DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER

TO 13C7-39-1

AIRDROP OF SUPPLIES AND EQUIPMENT

RIGGING DRY BULK MATERIALS AND POTABLE WATER FOR FREE DROP



**DEPARTMENTS OF THE ARMY AND THE AIR FORCE
NOVEMBER 1967**

TECHNICAL MANUAL
No. 10-500-70
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WASHINGTON, D.C., 2 November 1967

**AIRDROP OF SUPPLIES AND EQUIPMENT
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POTABLE WATER FOR FREE DROP**

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*This manual supersedes TM 10-500-70/TO 13C7-39-1, 16 January 1963.

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CHAPTER 1 GENERAL

1. Scope

This manual specifies the equipment and procedures necessary to package and rig dry bulk materials and potable water for free drop from O-1E (Bird Dog), U-6A (Beaver), and U-1A (Otter) Army aircraft or suitable Air Force aircraft.

2. Special Considerations

a. Dry Bulk Materials. Recommended drop altitudes are from 100 to 500 feet. The desired airspeed is the minimum safe flight airspeed for individual aircraft.

b. Potable Water. Recommended drop altitudes are from 50 to 250 feet at airspeeds from zero to 130 knots; however, bundles may be dropped at altitudes up to 500 feet at airspeeds not exceeding 150 knots with slight decrease in recoverability.

3. Preparing Dry Bulk Materials

Burlap sand bags are used as containers for free drop of dry bulk materials such as flour, rice, and beans. Prepare each container as follows:

a. Place three burlap sand bags one inside the other.

b. Fill inner bag at least two-thirds but no more than three-fourths full, and securely tie the inner bag closed at filled level as shown in figure 1.

c. Allow space in outer bags for expansion upon ground impact, and securely tie each of the outer bags closed with 80-pound cotton webbing.

4. Preparing Potable Water

Procedures for the preparation of the various water containers are given in chapter 3.

5. References

References applicable to material and procedures described herein are listed in the appendix.

6. Recommended Changes

Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded direct to the Commandant, U.S. Army Quartermaster School, ATTN: AHBFQS-AR-T, Fort Lee, Va. 23801.

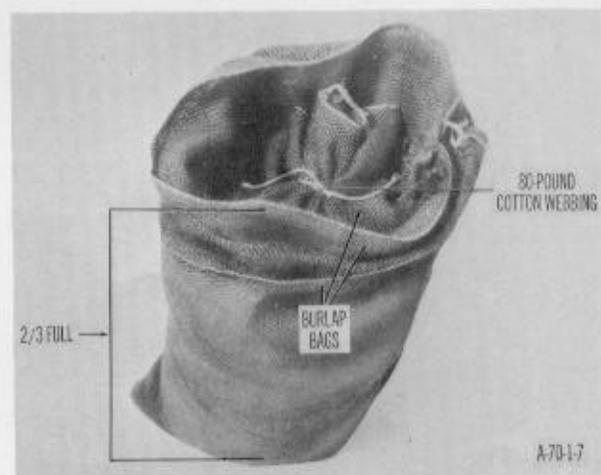


Figure 1. Inner bag tied.

CHAPTER 2

RIGGING DRY BULK MATERIAL FOR FREE DROP

Section I. CARGO DOOR DELIVERY FROM U-1A AIRCRAFT

7. General

The aircraft must be prepared in accordance with TM 10-500-6. A plywood skid not exceeding 36 inches in width or 48 inches in length is used with each load for ease of movement on the conveyors.

8. Constructing Skid

Use 1/2- or 3/4-inch plywood to construct a skid as shown in A, figure 2. The type III nylon cord ties must be long enough to encircle the load.

9. Rigging Bags on Skid

Position first layer of bags on skid as shown in B, figure 2. Alternate successive layers of bags (fig. 3). Complete preparation of load as shown in figure 3 and as follows:

a. Modify static line to prevent breakaway by attaching the retainer strap to breakaway

static line with the connector link. Tape the connector link (fig. 3).

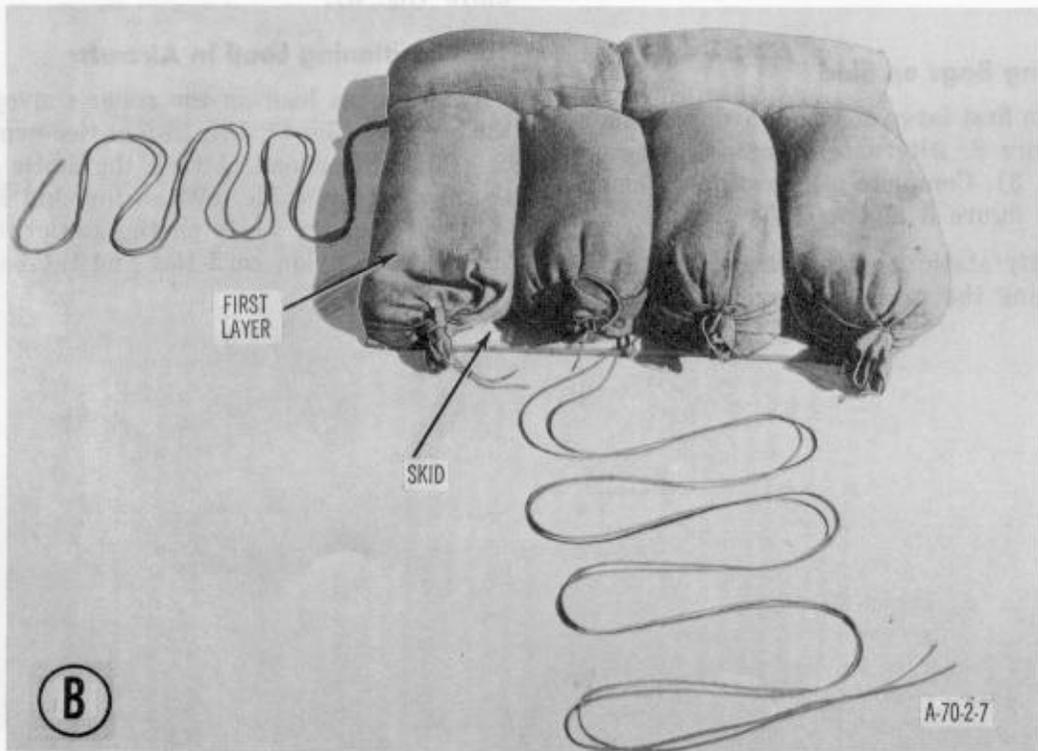
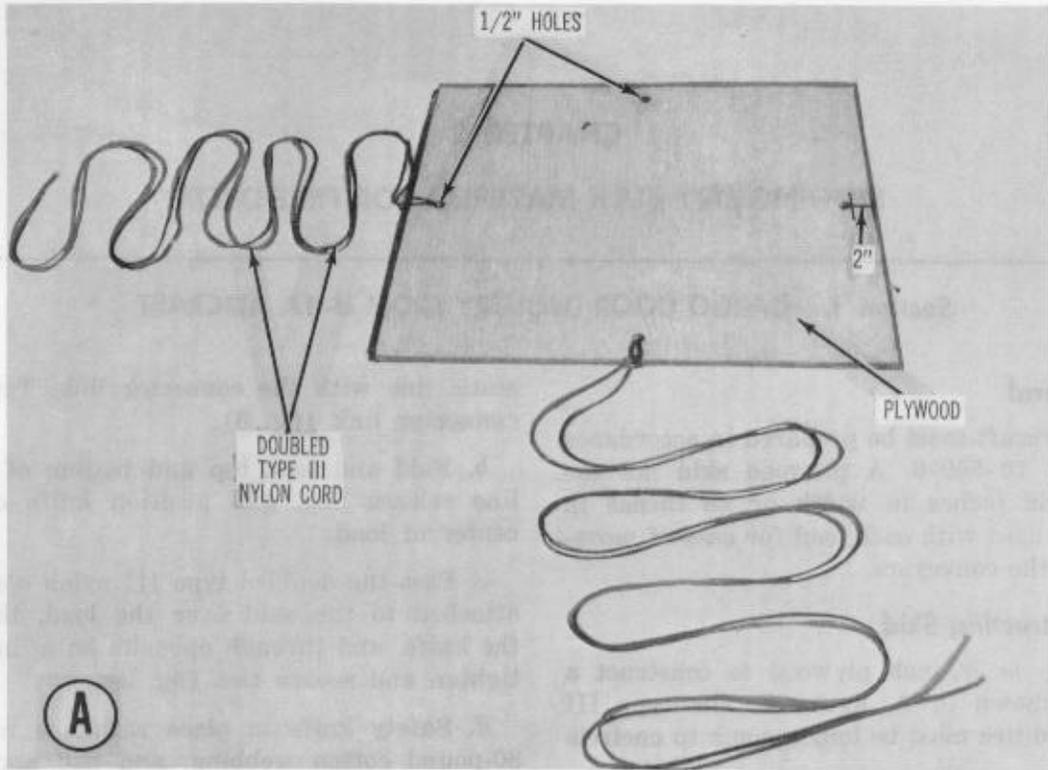
b. Fold and tape top and bottom of static line release line, and position knife on top center of load.

c. Pass the doubled type III nylon cord ties attached to the skid over the load, through the knife, and through opposite holes in skid; tighten and secure ties (fig. 3).

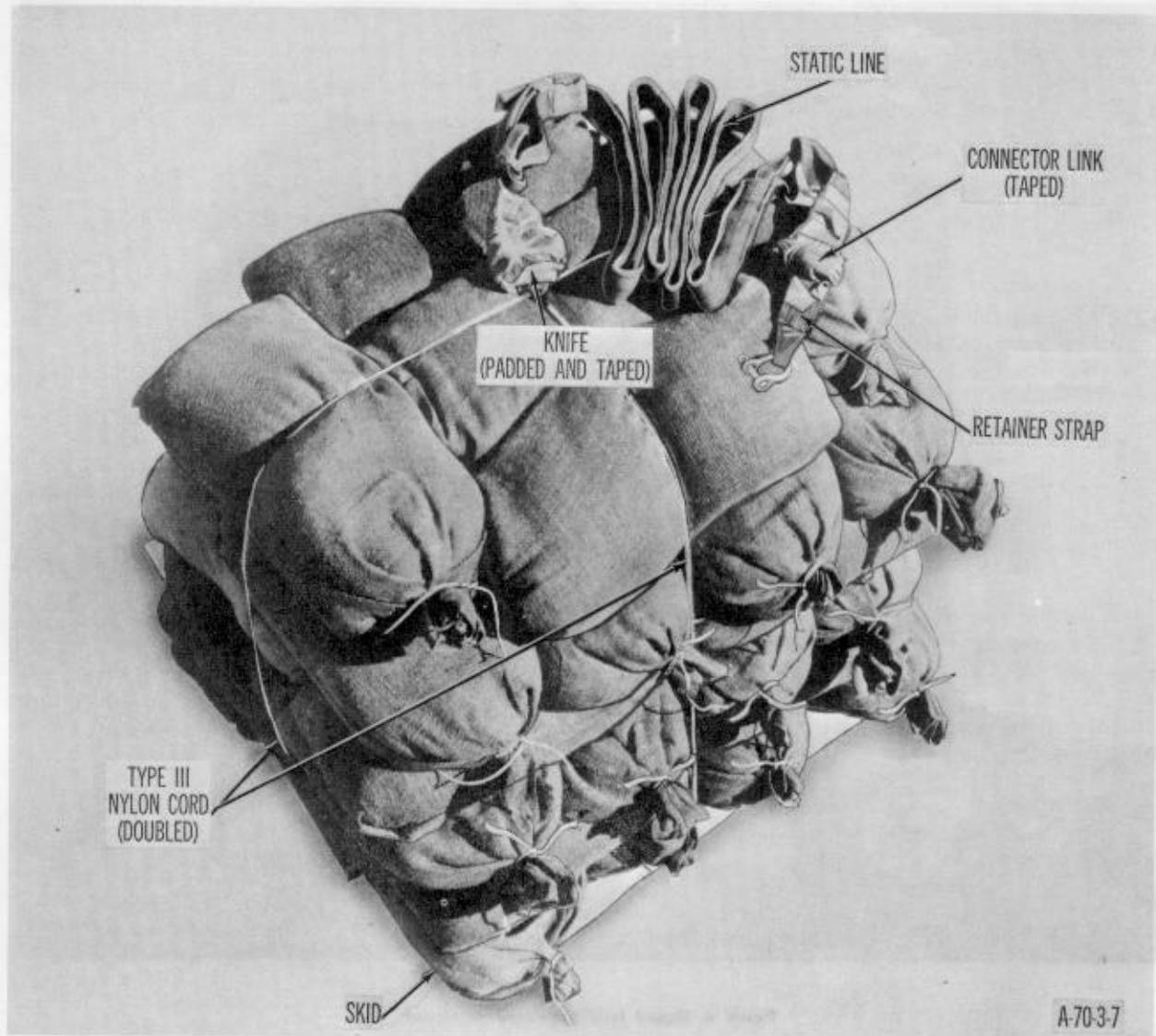
d. Safety knife in place with one turn of 80-pound cotton webbing, and pad and tape knife (fig. 3).

10. Positioning Load in Aircraft

Position the load on the roller conveyors in the aircraft (fig. 4). Use 15-foot tiedown straps to restrain the load. Attach the static line to the anchor line cable. (When the skid is manually ejected, the knife on the static line cuts the type III nylon cord ties and the bags fall individually.)



A—Construction details for skid
B—First layer of bags positioned on skid
Figure 2. Rigging bags on skid.



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Figure 3. Completely rigged load for cargo door delivery.



Figure 4. Rigged load positioned in aircraft.

11. Equipment Required

Equipment required to rig dry bulk materials on a skid for cargo door delivery from U-1A aircraft is listed in table 1.

Table 1. Equipment Required.

Federal Stock No.	Part No.	* Item
5610-285-4744	-----	Bag, sand, burlap
8135-558-0823	-----	Cushioning Material, packaging, cellulose.
4020-240-2146	-----	Cord, nylon, type III, 550-lb.
NSN	-----	Plywood, 1/2- or 3/4-in.
1670-473-5115	QM 11-1-134	Static Line, cargo parachute, breakaway type w/release knife and clevis.
8135-266-5016	-----	Tape, adhesive, 2-in.
8305-268-2411	-----	Webbing, cotton, 80-lb.

* Required quantities must be computed.

Section II. MANUAL EJECTION OF INDIVIDUAL BAGS

12. General

The aircraft must be prepared in accordance with current directives to allow manual ejection of individual bags from aircraft doors.

13. Positioning and Securing Load in Aircraft

Stack bags in door of aircraft, and securely restrain the load with 15-foot tiedown straps as shown in figure 5. After removing the tie-

down straps, the bags are manually ejected through the aircraft cargo door.

14. Equipment Required

Equipment required to rig individual bags for manual ejection is as follows:

- a. Bag, sand, burlap (FSN 5610-285-4744).
- b. Webbing, cotton, 80-lb. (FSN 8305-268-2411).



Figure 5. Manual ejection load secured in U-6A (Beaver).

Section III. WING LOADS FOR O-1E AND U-6A AIRCRAFT

15. General

Preparation of aircraft and load limitations must be in accordance with TM 10-500-6. Wing loads are released by the pilot.

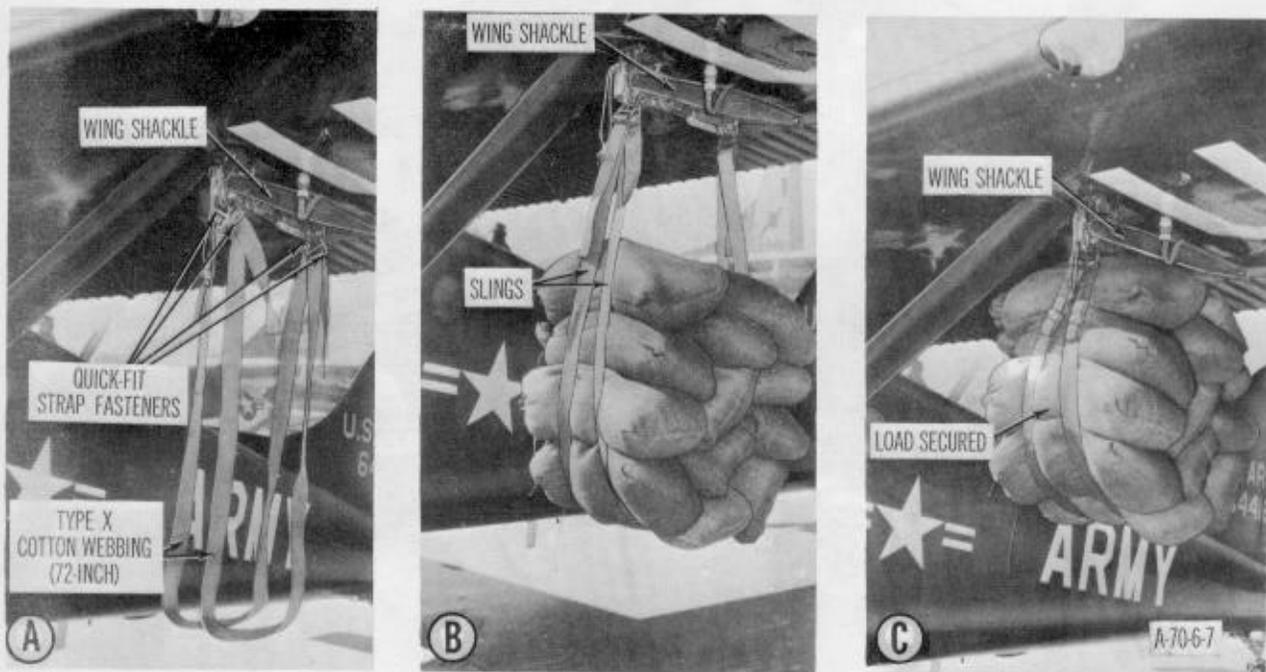
16. Attaching Wing Loads

Two shackle attaching straps are required for each wing load; each shackle attaching strap consists of a 72-inch length of type X cotton webbing with a quick-fit strap fastener installed on each end. Attach the quick-fit strap fasteners of both straps in wing shackle according to procedures in TM 10-500-6 and as shown in A, figure 6. Position bags in slings formed by straps as shown in B, figure 6; and secure the load as shown in C, figure 6 by pulling free ends of straps while lifting bags. Fold and tape excess straps.

17. Equipment Required

Equipment required to rig dry bulk material as wing loads is as follows:

- a. Bag, sand, burlap (FSN 5610-285-4744).
- b. Fastener, strap, cargo tiedown, quick-fit (FSN 1670-360-0340).
- c. Tape, adhesive, 2-in. (FSN 8132-266-5016).
- d. Webbing, cotton, 80-lb. (FSN 8305-268-2411).
- e. Webbing, cotton warp, type X (FSN 8305-260-2571).



A—Slings attached to wing shackle
 B—Bags positioned in slings
 C—Load secured

Figure 6. Installing wing load.

Section IV. GRAVITY DROP

18. General

Gravity drop loads are ejected from the ramp of cargo aircraft equipped with conveyors. The aircraft limitations determine the skid size for each load.

19. Preparing Skid

Construct the required size skid (A, fig. 7) by using $\frac{1}{2}$ - or $\frac{3}{4}$ -inch plywood for the base and 2- by 4-inch lumber for stringers and spacer blocks. Tie four A-7A straps to stringers at one end of skid with half hitches, and attach four 60-inch nylon webbing straps (shear straps) to stringers at opposite end of skid as shown in A, figure 7. Center a cargo cover or cotton duck cloth large enough to cover load on the prepared skid as shown in B, figure 7.

20. Rigging Bags on Skid

Position bags on cover as shown in C, figure 7. Fold cover over bags, and secure load to skid as follows:

- a. Place a release knife on each 60-inch nylon webbing strap attached to the skid.
- b. Fasten free ends of nylon webbing straps to fasteners on A-7A straps (fig. 8).
- c. Position a cargo platform clevis on load as shown in figure 8.

21. Attaching Pilot Chute

Attach a cargo-type pilot chute as follows:

- a. Attach pilot chute connector link to a

9-foot sling (2-loop) (deployment line), and attach free end of the 9-foot sling to the cargo platform clevis. Fold and tape excess sling (fig. 8).

- b. Pass a 60-inch nylon webbing strap (shear strap) through inside and outside release knives on right side of load and through right side of clevis; secure strap with attached fastener (fig. 8).

- c. In the same manner, attach a second 60-inch nylon webbing strap (shear strap) to left side (fig. 8).

- d. Tape knives and straps in place as shown in figure 8.

- e. Center pilot chute on load, and safety pilot chute to inside A-7A straps with ticket No. 5 cotton thread.

22. Installing Skid Retaining Web

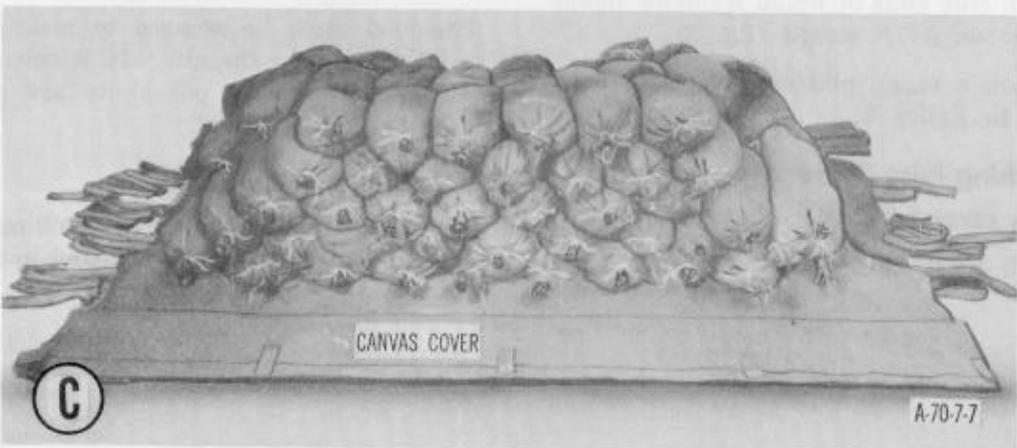
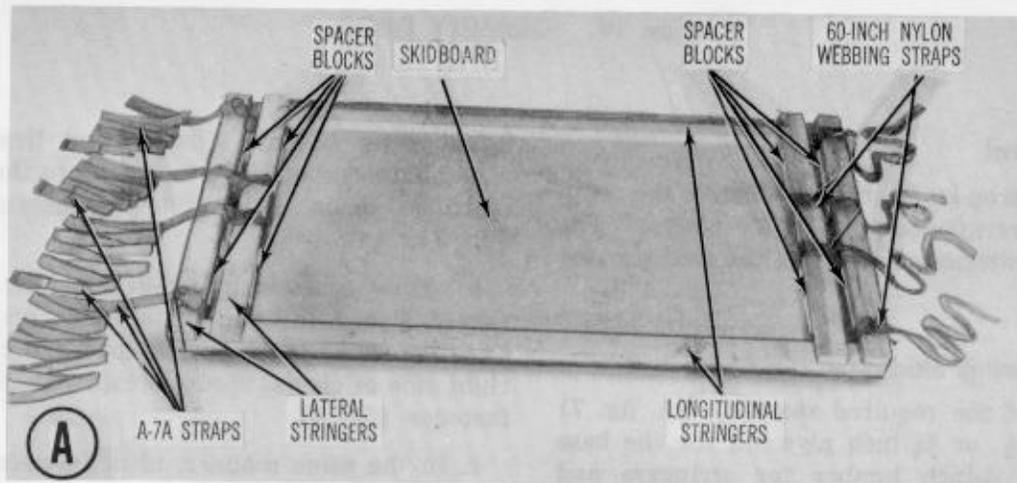
Install the skid retaining web by passing one end of a 120-inch connector strap around end stringer of skid, through loop in opposite end, and attaching free end on cargo platform clevis bolt (fig. 8). Fold and tape excess strap.

23. Securing Load in Aircraft

The load must be secured to meet the restraint criteria for the aircraft. A release gate assembly and release parachute are used to release the load in flight.

24. Equipment Required

Equipment required to rig dry bulk materials on a skid for gravity drop is listed in table 2.



A—Prepared skid
B—Cover positioned on skid
C—Bags stacked on cover
Figure 7. Rigging load for gravity drop.

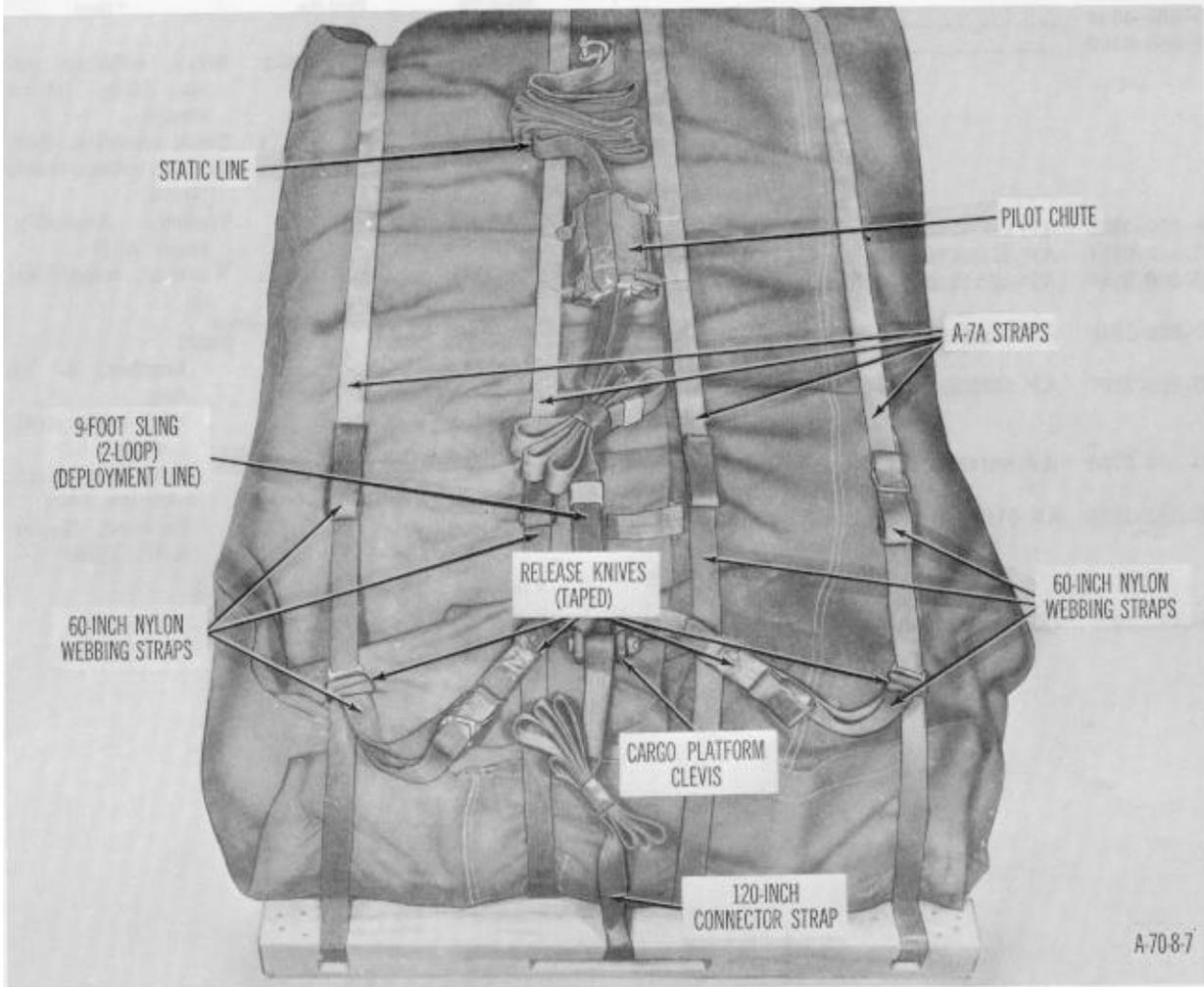


Figure 8. Completely rigged gravity drop load.

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Table 2. Equipment Required.

<i>Federal Stock No.</i>	<i>Part No.</i>	<i>* Item</i>	<i>Federal Stock No.</i>	<i>Part No.</i>	<i>* Item</i>
5610-285-4744	-----	Bag, sand, burlap	1670-368-7486	AF 51C6109-1	Strap, webbing, nylon, 60-in. (shear strap).
1670-360-0300	-----	Clevis Assembly, cargo platform.	8135-266-5016	-----	Tape, adhesive, 2-in.
		Cover, cargo (Cloth, cotton duck, 72-in., FSN 8305-170-5879, may be used.):	8310-194-4065	-----	Thread, cotton, ticket No. 5
1670-360-0323	AF 51C6175	end	1670-687-9919	51 B6169-6	Tiedown Assembly, cargo A/D
1670-360-0324	AF 51C6174	side	8305-268-2411	-----	Webbing, cotton, 80-lb.
1670-360-0369	AF 48A7313	Knife, release, cargo platform.			
1670-052-1548	AF 61A4312	Parachute, cargo extraction, 15-ft.			
1670-216-7297	AF 53E6803-1	Pilot Chute, cargo-type, 5-ft. 8-in. dia.	NSN		
1670-753-3790	AF 63J4261-4	Sling, cargo, A/D, 9-ft. (2-loop).	NSN		
1670-251-1153	AF 51C6716	Sling, cargo, A/D, 500-lb. capacity, 188-in long, type A-7A.	5315-010-4659	-----	Lumber, 2- by 4-in.
1670-738-5879	QM 11-1-527-2	Strap, connector, 120-in.	5315-164-5121	-----	Nail, wire, steel, common, 8d
			NSN	-----	Nail, wire, steel, common, 20d
					Plywood, 1/2- or 3/4-in. thick

* Required quantities must be computed.

CHAPTER 3

RIGGING POTABLE WATER FOR FREE DROP

Section I. RIGGING 24 ONE-QUART PLASTIC CANTEENS

25. General

The 24 one-quart plastic canteens are rigged inside two cardboard containers with honeycomb between the inner and outer containers. When filled with six gallons of water, the unriggered canteens weigh 54 pounds.

26. Preparation of Inner Container

a. Expand the 30-inch long inner cardboard container, and close one end by folding end flaps. Seal closed end with 3-inch tape; make certain that tape extends at least 6 inches down sides of container.

b. Expand cardboard separator assembly.

27. Packaging Canteens

Check canteens to make certain that caps are tightly sealed. Package canteens as follows:

a. Position inner container, and insert four canteens as shown in figure 9.

b. Insert cardboard separator into container until first row of separators is inside. Place four canteens in second row of separators, and insert separator assembly until canteens are inside the container (A, fig. 10). Continue to place canteens into separator assembly and to

insert separator until the entire separator assembly and to insert separator until the entire separator assembly is inside the container (B, fig. 10).

c. Position filled container with open end up, close end flaps, and seal container with 3-inch tape. Make certain that tape extends at least 6 inches down sides of container.

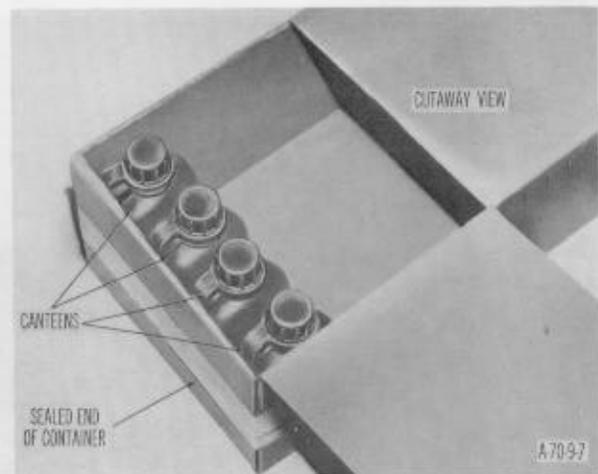
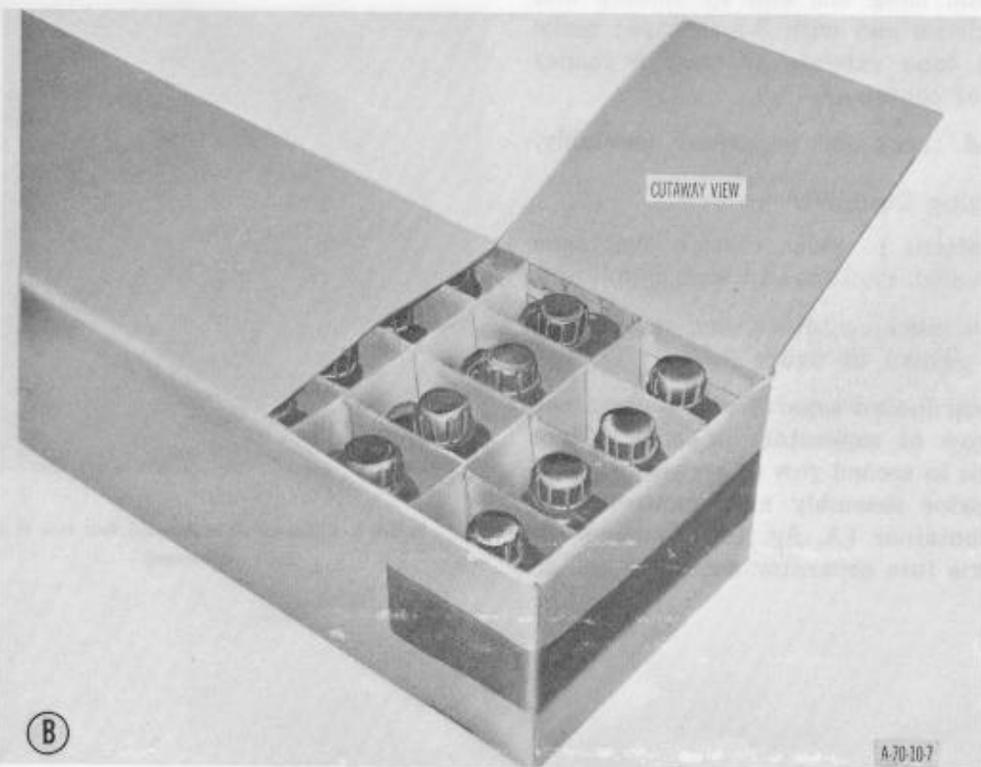
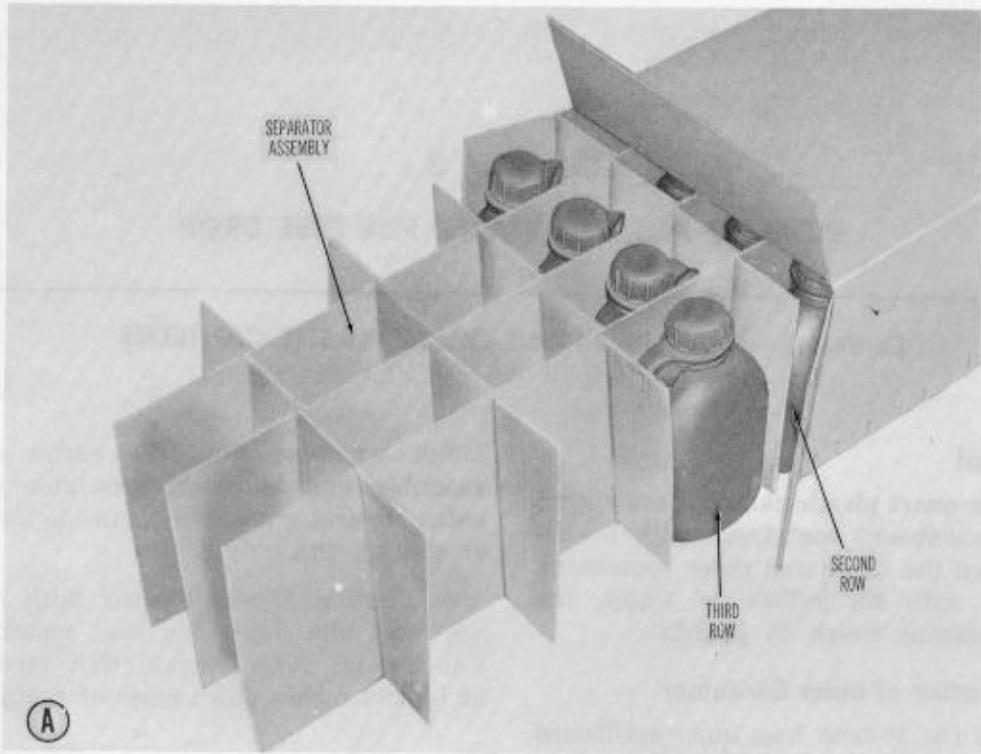
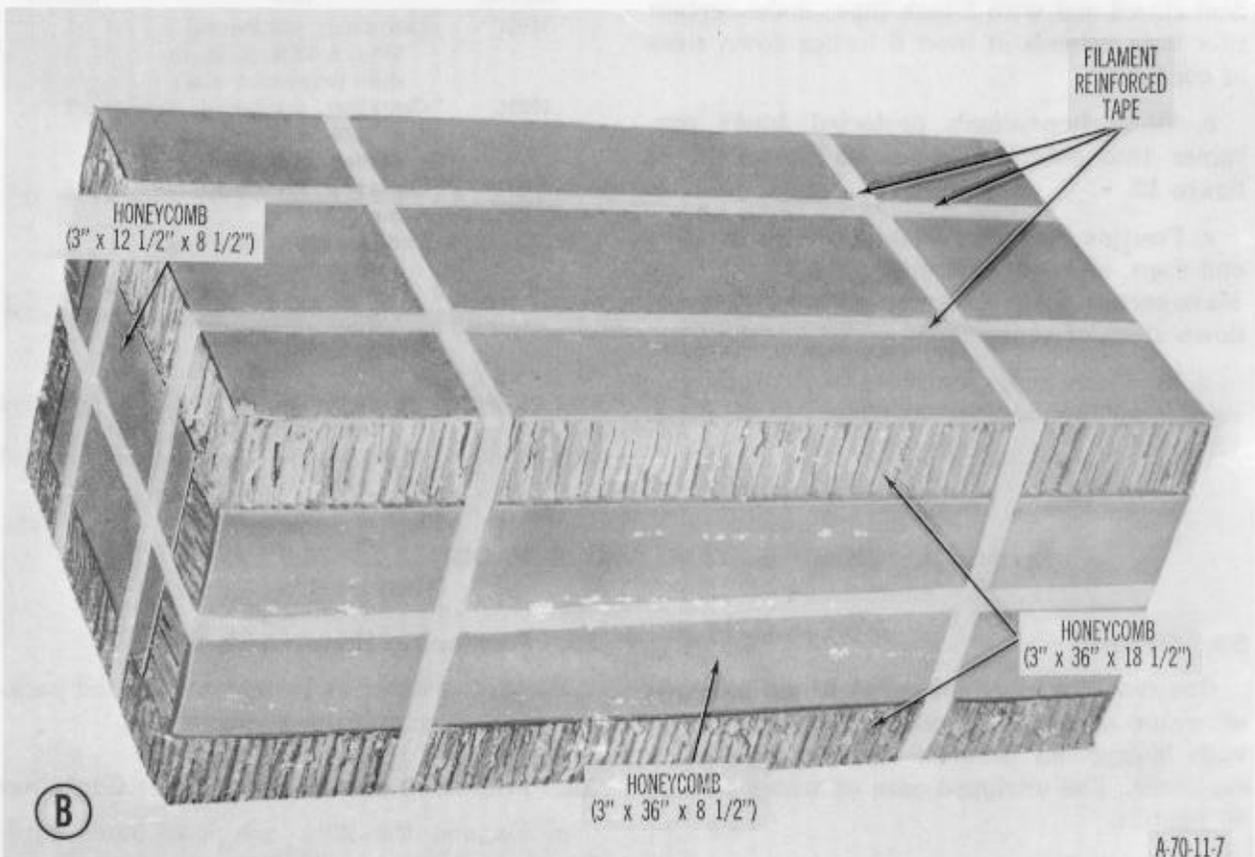
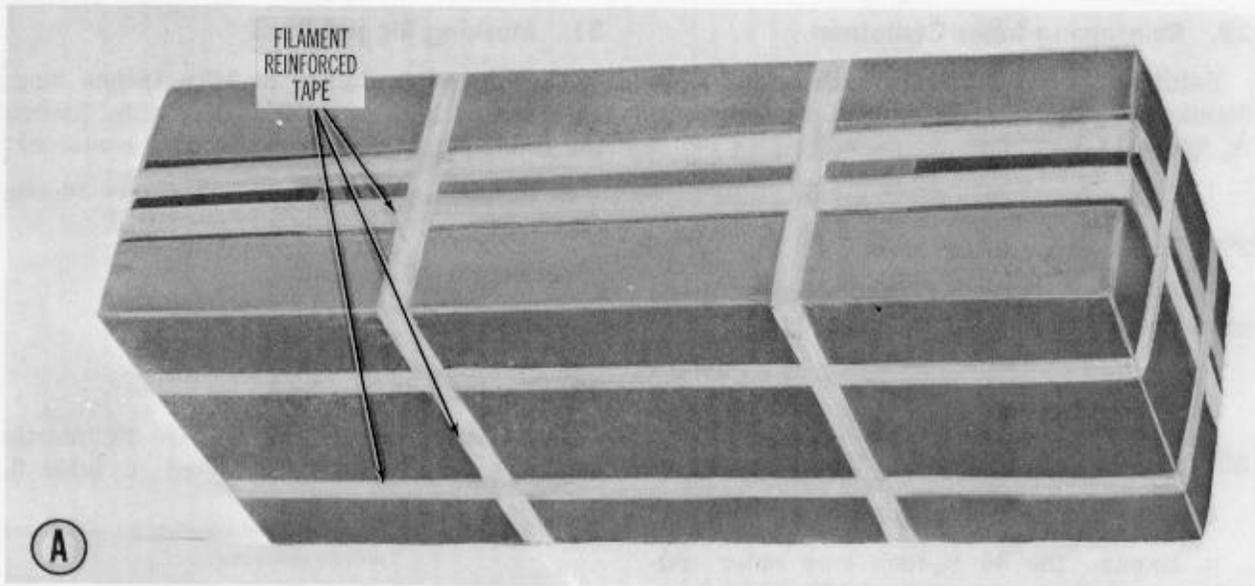


Figure 9. Cutaway view showing first row of canteens positioned.



A—Method for inserting separator and canteens
B—Filled separator assembly completely inserted

Figure 10. Properly packed inner container.



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- A—Container reinforced with tape
- B—Honeycomb secured to inner container

Figure 11. Inner container prepared.

28. Reinforcing Inner Container

Reinforce inner container with 1-inch wide filament reinforced tape applied as shown in A, figure 11.

29. Positioning Honeycomb

Position and secure honeycomb around inner container as shown in B, figure 11.

30. Preparing and Packing Outer Container

Prepare and pack outer container as follows:

a. Expand the 36 1/2-inch long outer container, and close one end by folding end flaps. Seal closed end with 3-inch tape; make certain that tape extends at least 6 inches down sides of container.

b. Slide honeycomb protected inner container into outer container as shown in A, figure 12.

c. Position container with open end up, close end flaps, and seal container with 3-inch tape. Make certain that tape extends at least 6 inches down sides of container.

d. Reinforce outer container with 1-inch wide reinforced tape applied as shown in B, figure 12.

31. Marking Rigged Load

The rigged container is 36 1/2 inches long, 15 1/4 inches high, and 19 inches wide. Stencil the following information on outer container:

a. Water, Drinking in 24—1 Quart Plastic Canteens.

b. Weight 66 pounds.

c. Cube 8.3.

32. Equipment Required

Equipment required to prepare 24 plastic canteens for free drop is listed in table 3.

Table 3. Equipment required for rigging 24 one-quart plastic canteens

Federal Stock No.	Item	Quantity
NSN	Container, cardboard, 36 1/2 x 18 7/8 x 15 inches (expanded size)	1
NSN	Container, cardboard, 30 x 12 1/2 x 8 5/8 inches (expanded size)	1
NSN	Separator assembly, cardboard	1
1670-753-3928	Pad, energy dissipating, honecomb:	
	3- by 36- by 8 1/2 in.	2
	3- by 36- by 18 1/4-in.	2
	3- by 12 1/2- by 8 1/2-in.	2
8135-290-8036	Tape, filament reinforced, 1-in. wide.	As required
8135-663-3738	Tape, adhesive, 3-in.	As required

Section II. RIGGING TWENTY-FOUR 16-OUNCE ZIP-TOP CANS

33. General

One case (twenty-four cans) of zip-top cans of water is rigged in a cardboard container with honeycomb between the case and outer container. The unrigged case of water weighs 29 pounds.

34. Reinforcing Packing Case

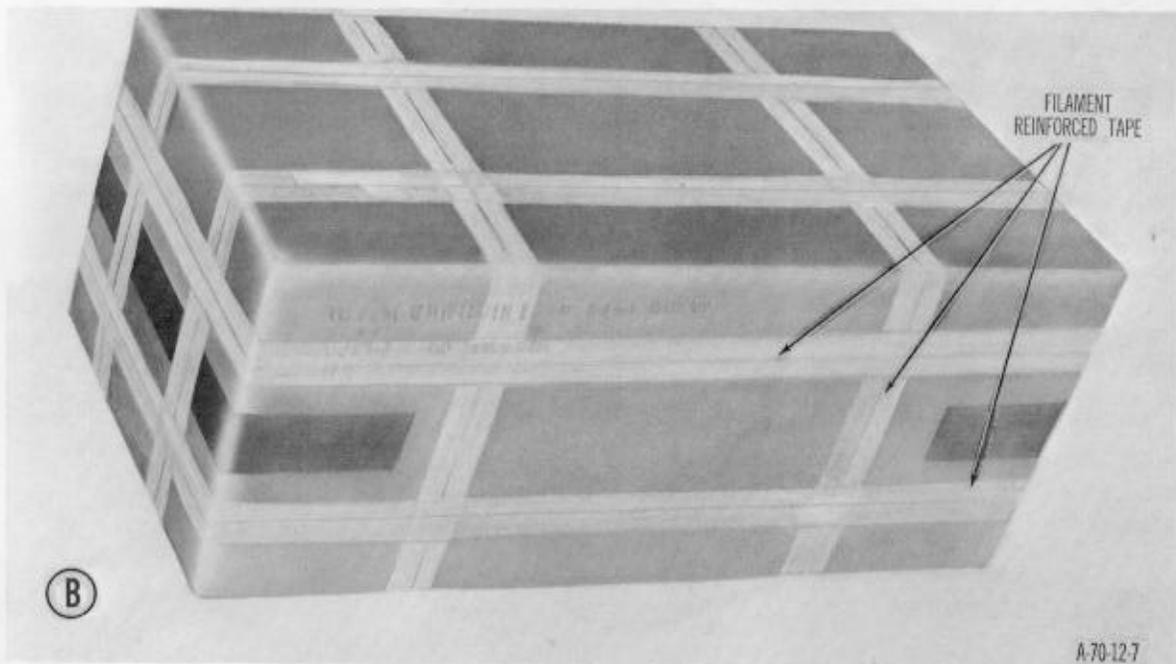
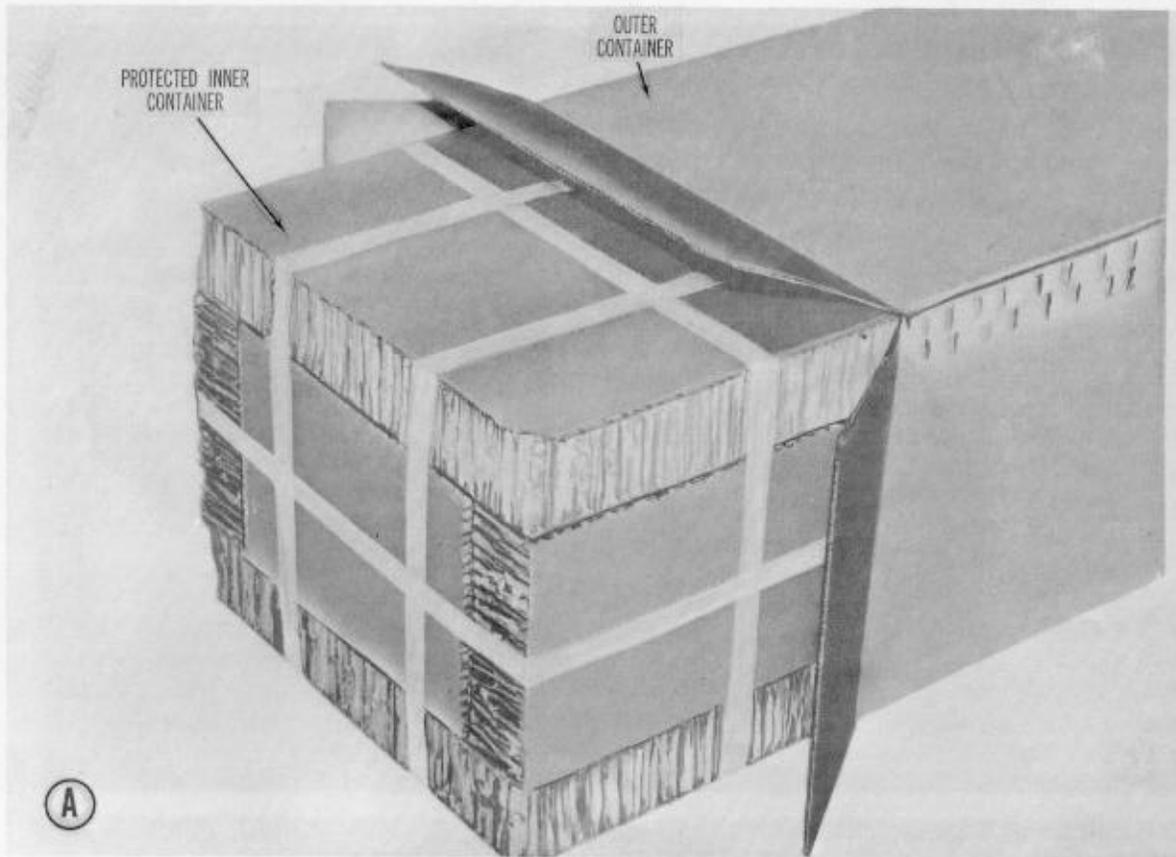
Reinforce the packing case with 1-inch filament reinforced tape applied as shown in A, figure 13.

35. Positioning Honeycomb

Position and secure honeycomb around packing case as shown in B, figure 13.

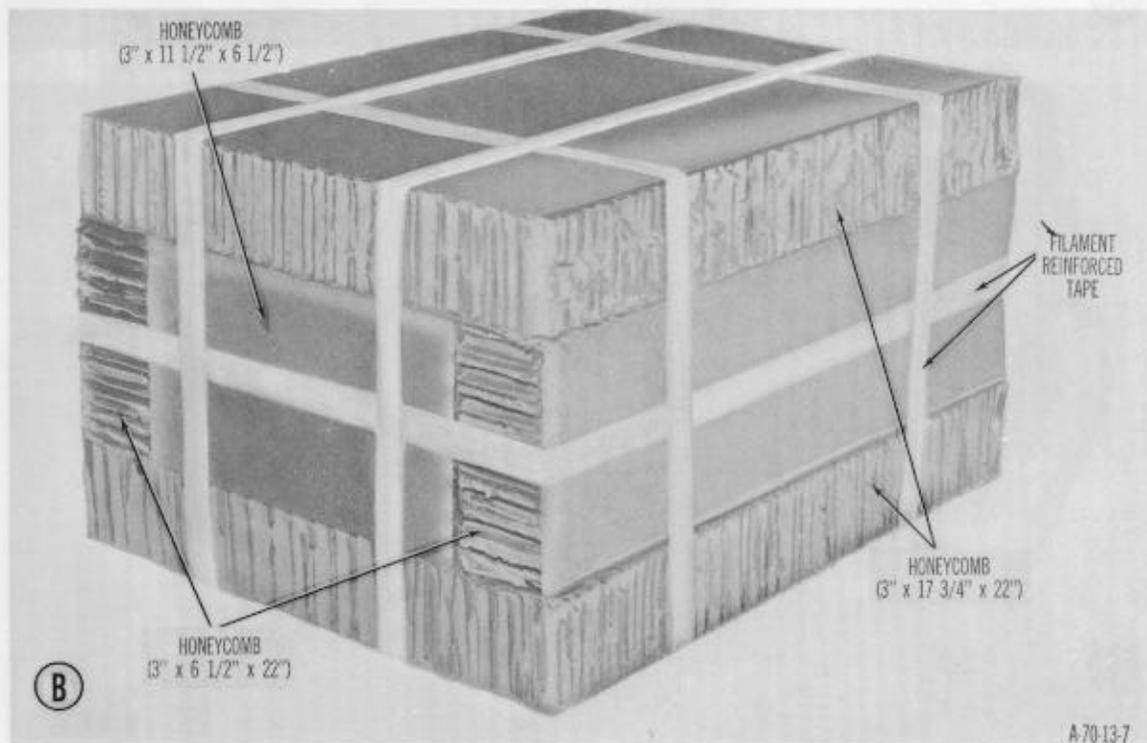
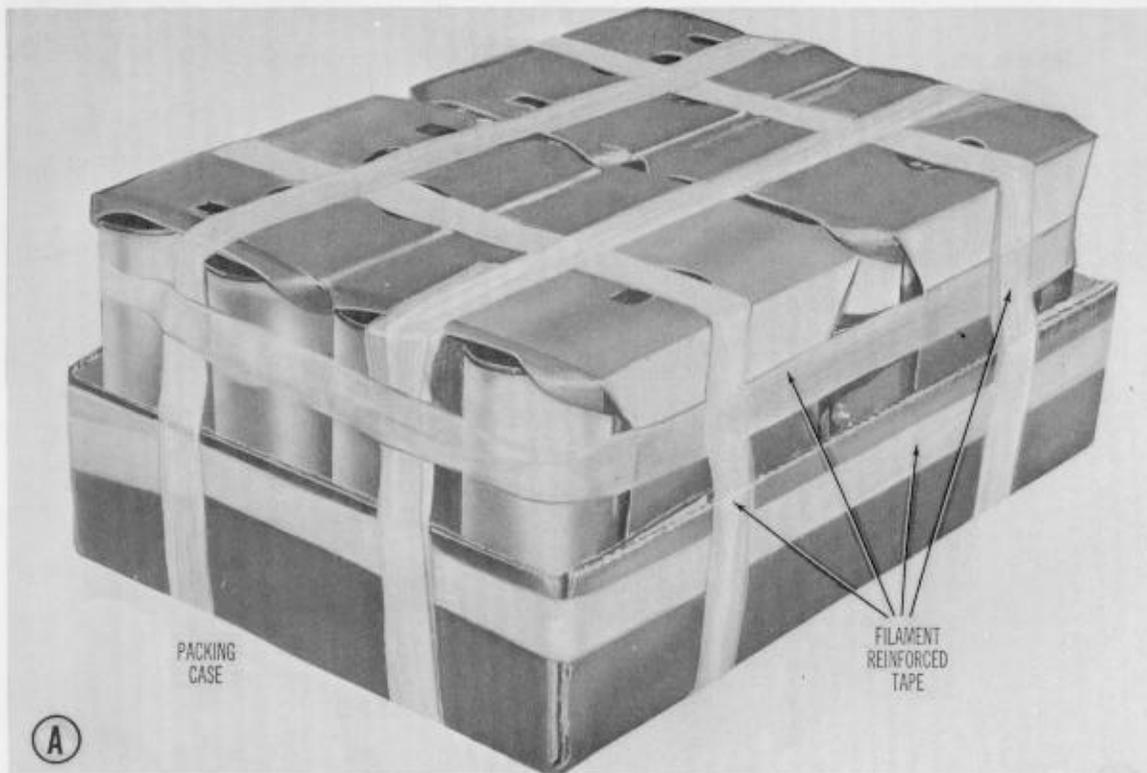
36. Preparing and Packing Outer Container

a. Expand the 22 1/4-inch long outer cardboard container, and close one end of the container by folding end flaps. Seal closed end with 3-inch tape; make certain that tape extends at least 6 inches down sides of container.



A—Inner container inserted in outer container
B—Reinforcing tape applied to outer container

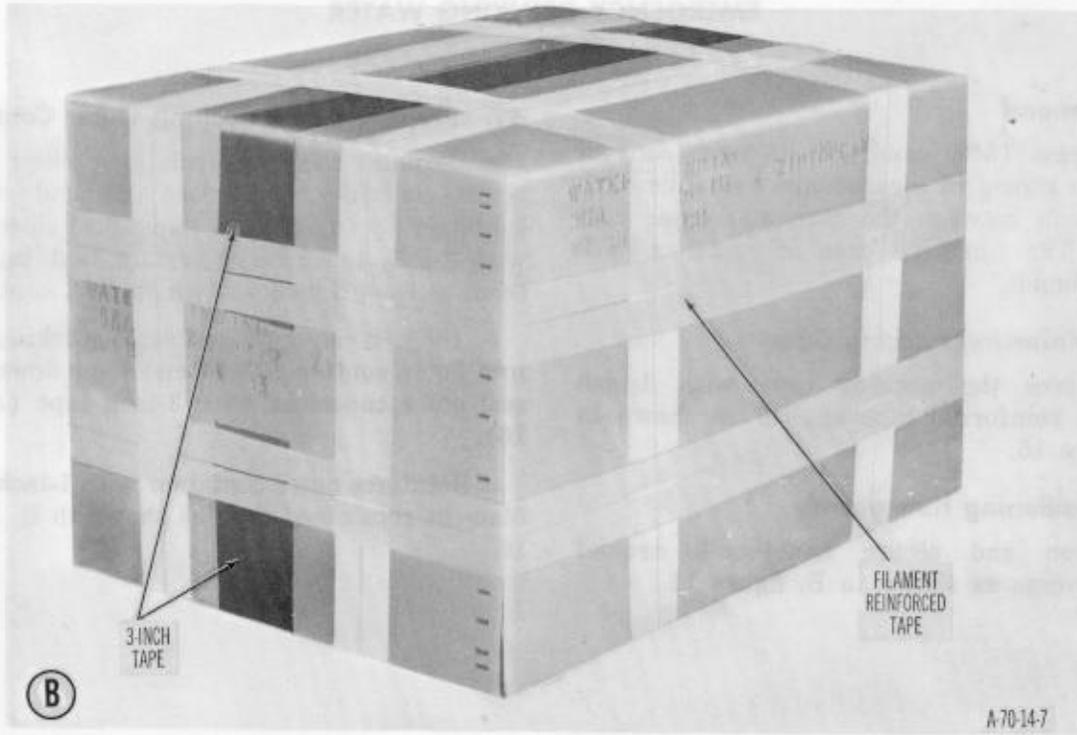
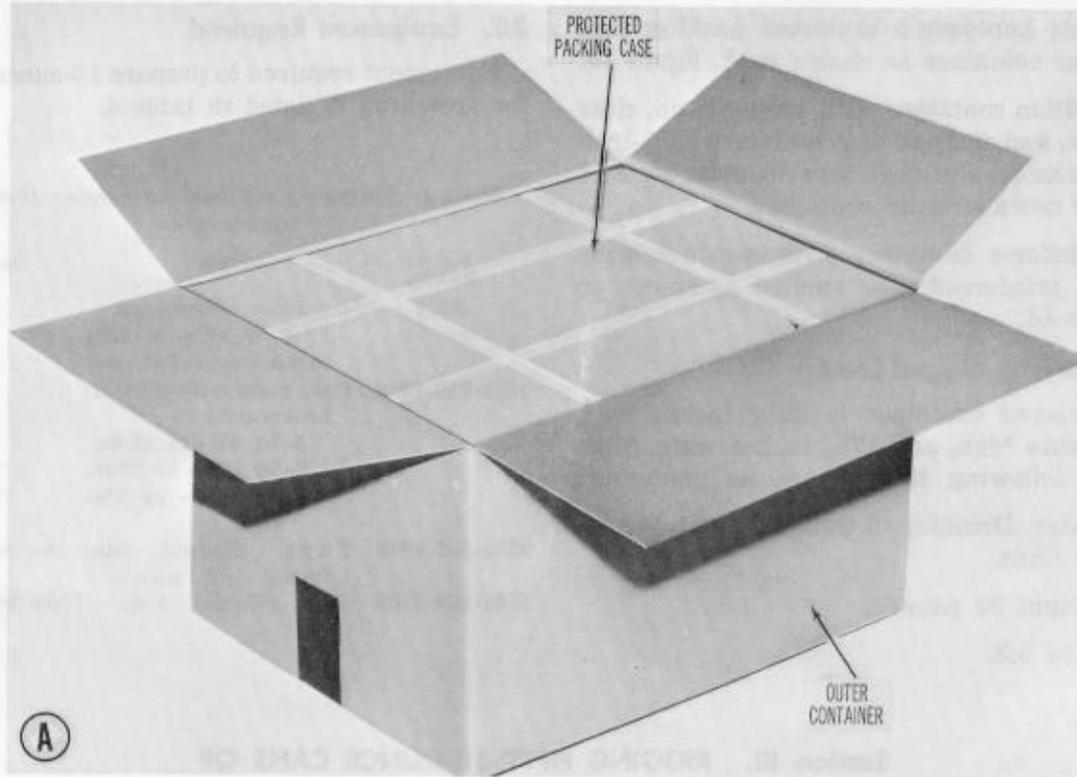
Figure 12. Completely rigged container.



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A—Packing case reinforced with tape
B—Honeycomb secured to packing case

Figure 13. Packing case prepared.



A—Packing case inserted in container
B—Reinforcing tape applied to container.

Figure 14. Completely rigged container.

b. Slide honeycomb protected packing case into outer container as shown in A, figure 14.

c. Position container with open end up, close end flaps, and seal end of container with 3-inch tape. Make certain that tape extends at least 6 inches down sides of container.

d. Reinforce container with one-inch wide filament reinforced tape applied as shown in B, figure 14.

37. Marking Rigged Load

The rigged container is 22¼ inches long, 13¾ inches high, and 17¾ inches wide. Stencil the following information on container:

a. Water, Drinking, 3 Gallons, in 24—16 oz. Zip-Top Cans.

b. Weight 39 pounds.

c. Cube 3.2.

38. Equipment Required

Equipment required to prepare 16-ounce cans for free drop is listed in table 4.

Table 4. Equipment required for rigging 16-ounce zip-top cans

Federal Stock No.	Item	Quantity
NSN	Container, cardboard, 22¼ x 17½ x 13¾ inches (expanded size)	1
1670-753-3928	Pad, energy dissipating, honeycomb:	
	3- by 6½- by 22-in.	2
	3- by 17¾- by 22-in.	2
	3- by 11½- by 6½-in.	2
8135-290-8036	Tape, filament reinforced, 1-in. wide	As required
8135-663-3738	Tape, adhesive, 3-in.	As required

Section III. RIGGING FIFTY 10-OUNCE CANS OF EMERGENCY DRINKING WATER

39. General

One case (fifty cans) of 10-ounce cans of water is rigged in a cardboard container with honeycomb between the case and outer container. The unrigged case of water weighs 44.25 pounds.

40. Reinforcing Packing Case

Reinforce the packing case with 1-inch filament reinforced tape applied as shown in A, figure 15.

41. Positioning Honeycomb

Position and secure honeycomb around packing case as shown in B, figure 15.

42. Preparing and Packing Outer Container

a. Expand the 21½-inch long outer cardboard container, and close one end of the container by folding end flaps. Seal closed end with 3-inch tape; make certain that tape extends at least 6 inches down sides of container.

b. Slide honeycomb protected packing case into outer container, fold end flaps down, and seal outer container with 3-inch tape (A, fig. 16).

c. Reinforce outer container with 1-inch wide filament reinforced tape as shown in B, figure 16.

43. Marking Rigged Load

The rigged load is 21½ inches long, 17½ inches high, and 21½ inches wide. Stencil the following information on outer container:

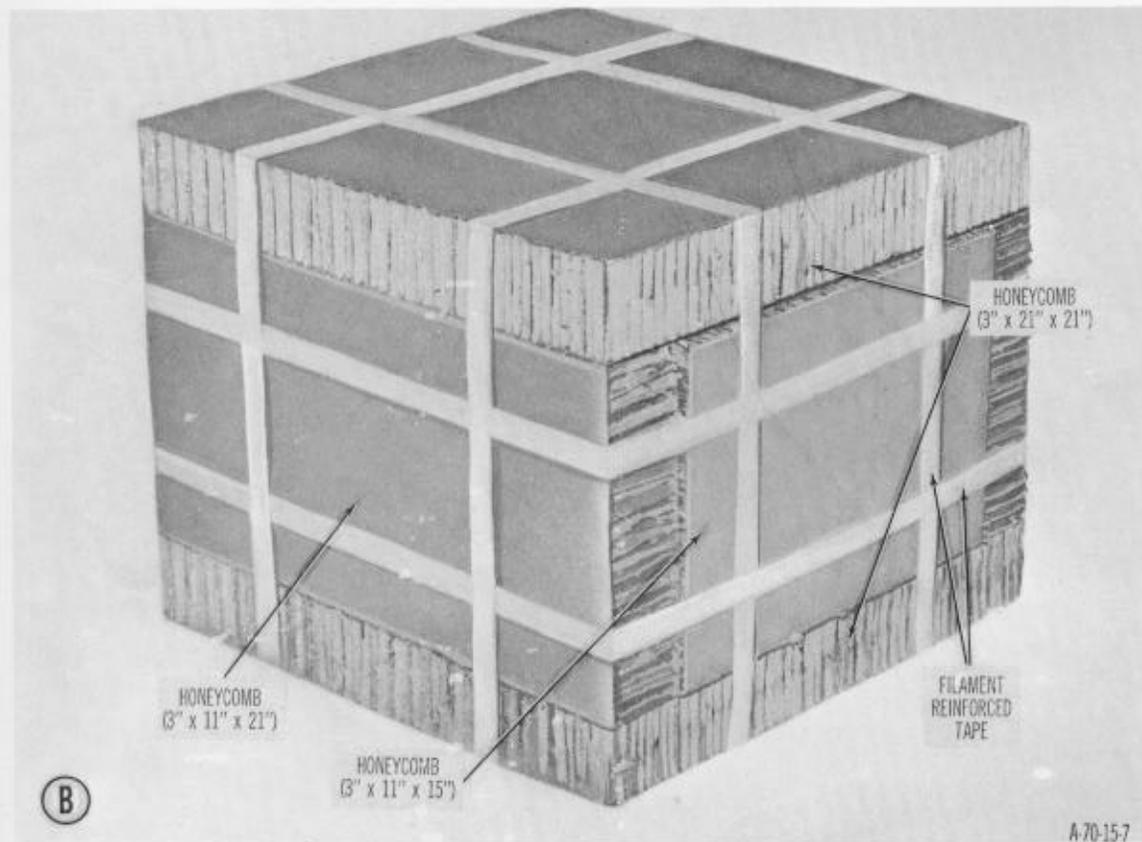
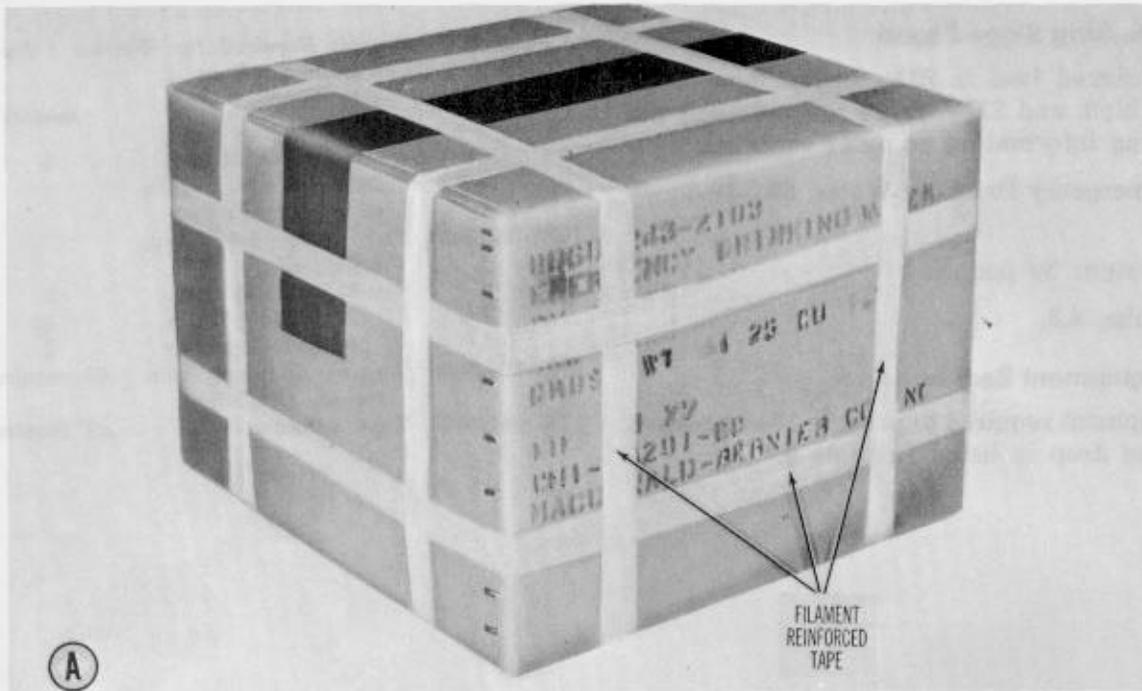
- a. Emergency Drinking Water, 50—10-ounce cans.
- b. Weight 59 pounds.
- c. Cube, 4.3.

44. Equipment Required

Equipment required to prepare 10-ounce cans for free drop is listed in table 5.

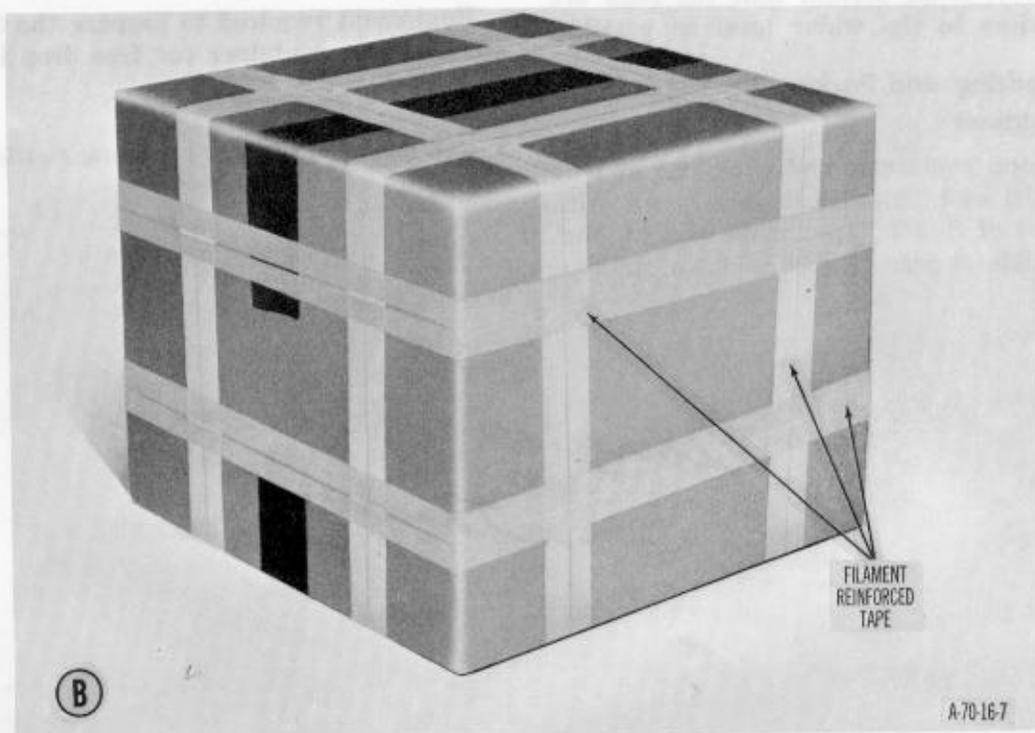
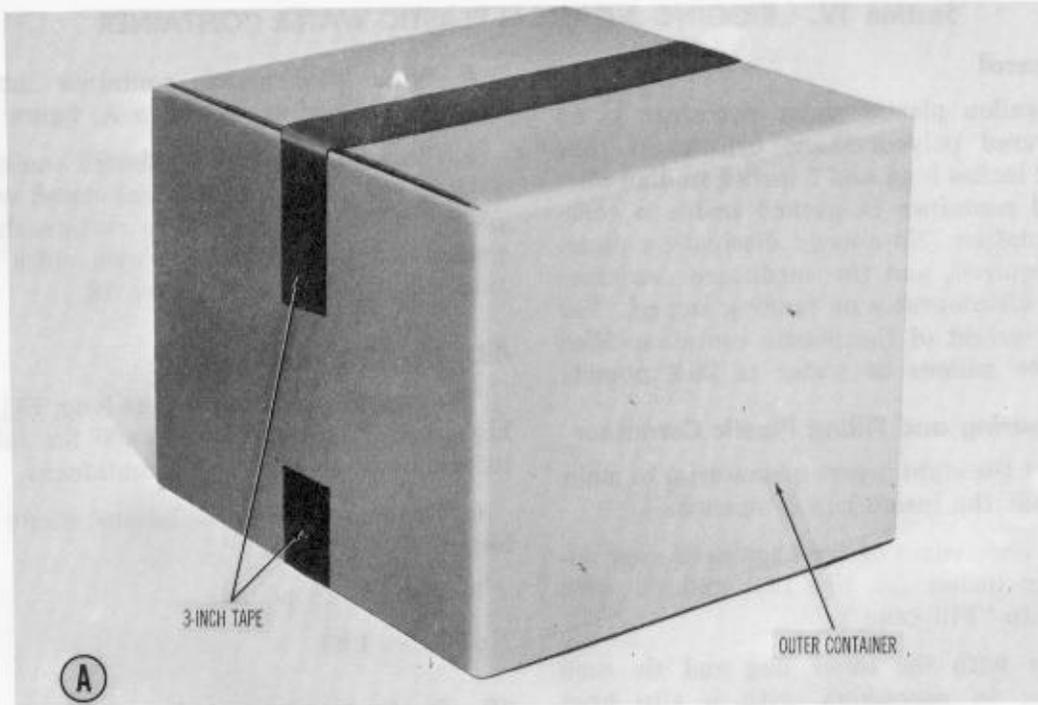
Table 5. Equipment Required for Rigging Fifty 10-Ounce Cans

<i>Federal Stock No.</i>	<i>Item</i>	<i>Quantity</i>
NSN	Container, cardboard, 21¼ x 21¼ x 17 inches (expanded size)	1
1670-753-3928	Pad, energy dissipating, honeycomb:	
	3- by 21- by 11-in.	2
	3- by 21- by 21-in.	2
	3- by 11- by 15-in.	2
8135-290-8036	Tape, filament reinforced, 1-in. wide.	As required
8135-663-3738	Tape, adhesive, 3-in.	As required



A—Packing case reinforced with tape
B—Honeycomb secured to packing case

Figure 15. Packing case prepared.



A—Outer case properly sealed
B—Reinforcing tape applied to container

Figure 16. Completely rigged container.

Section IV. RIGGING 3-GALLON PLASTIC WATER CONTAINER

45. General

The 3-gallon plastic water container is an eight layered polyurethane cylindrical tube that is 52 inches long and 5 inches in diameter. The filled container is packed inside a cardboard container. No energy dissipating material is required, and the cardboard container normally disintegrates on landing impact. The unrigged weight of the plastic container filled with three gallons of water is 26.8 pounds.

46. Preparing and Filling Plastic Container

- a. Count the eight layers of material to make certain that the inside bag is opened.
- b. Fold open edges of the bags back approximately six inches (A, fig. 17), and fill with water up to "Fill Line."
- c. Start with the inner bag and tie each bag closed in succession with a slip knot (B, fig. 17). Make certain that the bags are tied as close to the water level as possible.

47. Preparing and Packing Cardboard Container

- a. Expand container, and close one end by folding the end flaps. Seal closed end with two pieces of 3-inch tape; make certain that tape extends at least 6 inches down sides of container.

b. Slide filled plastic container into cardboard container as shown in A, figure 18.

c. Close open end of cardboard container by folding the end flaps, and seal closed with two pieces of 3-inch tape. Make certain that tape extends at least 6 inches down sides of container as shown in B, figure 18.

48. Marking Rigged Load

The rigged load is 41 inches long, 5 3/4 inches high, and 6 inches wide. Stencil the following information on cardboard container:

- a. Water, Drinking, 3-Gallons single plastic bag.
- b. Weight, 28 pounds.
- c. Cube, 1.09.

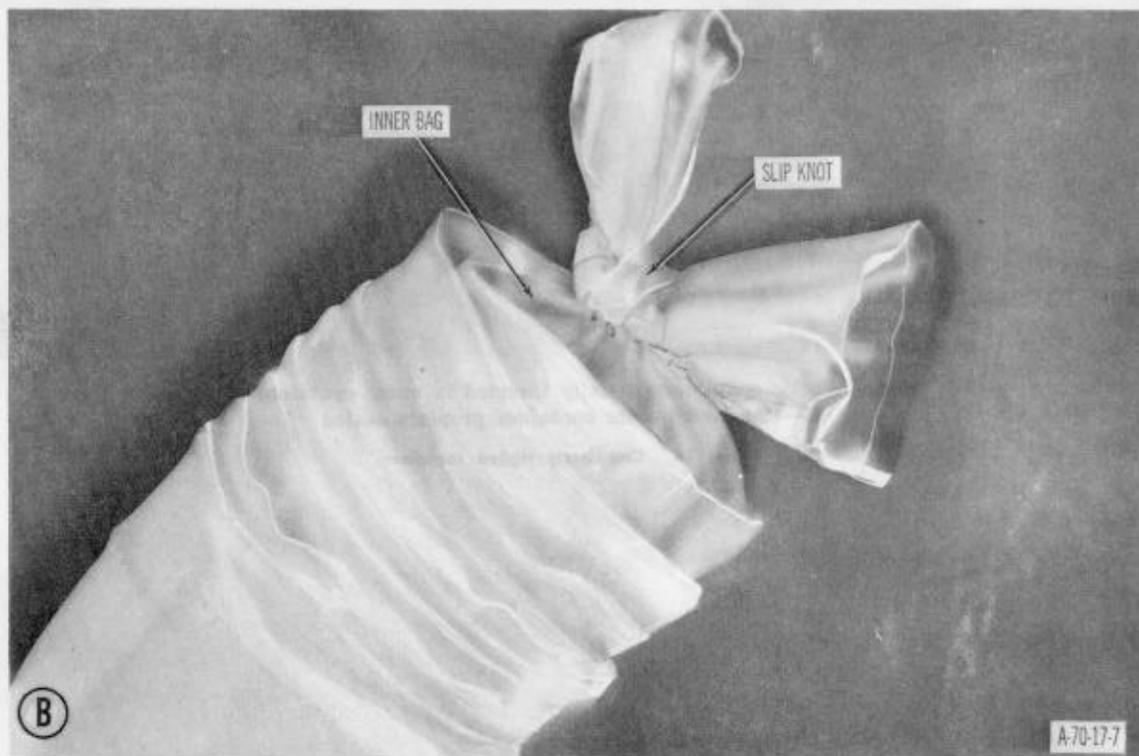
49. Equipment Required

Equipment required to prepare the 3-gallon plastic water container for free drop is listed in table 6.

Table 6. Equipment required for rigging 3-gallon plastic water container

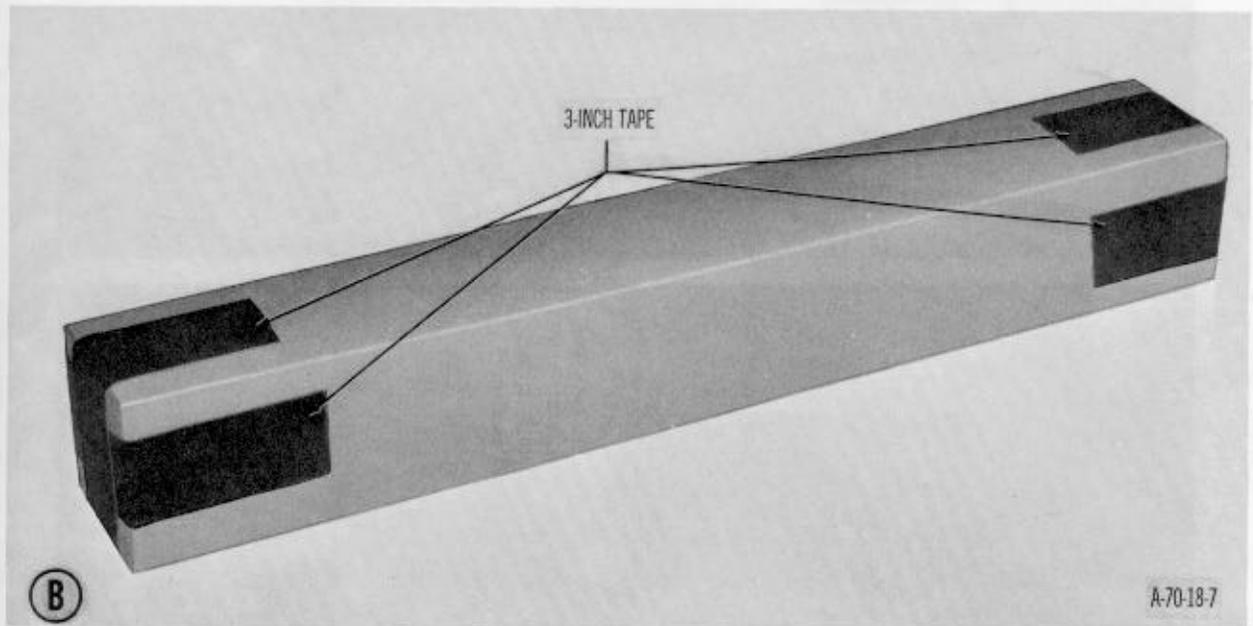
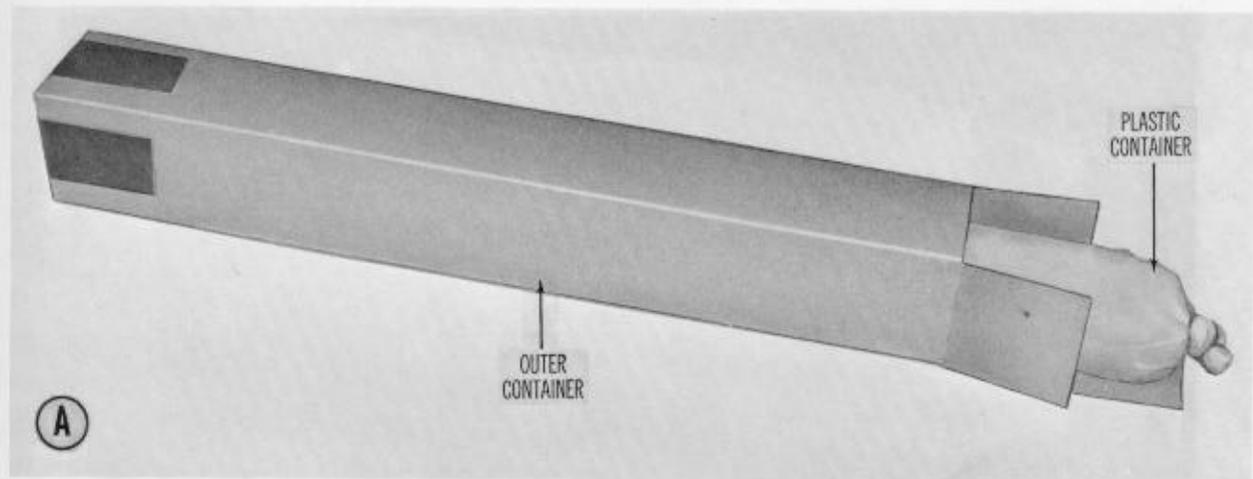
Federal Stock No.	Item	Quantity
NSN	Container, cardboard, 41 x 5 3/4 x 6 inches	1
8135-663-3738	Tape, adhesive, 3-in.	As required

*Inspector General
 removed to initial*



A—Open ends of bags folded back
B—Inner bag tied

Figure 17. Inner bag properly filled and closed.



A—Plastic container partially inserted in outer container
B—Cardboard outer container properly sealed

Figure 18. Completely rigged container.

**APPENDIX
REFERENCES**

TM 10-500/TO 13C7-1-5
TM 10-500-6
TM 57-210

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Airdrop of Supplies and Equipment From Army Aircraft.
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29-512 (2)
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54-12 (2)
54-22 (2)

NG: State AG (2).

USAR: TOE Units—31-105 (4); 10-407 (2); 10-417 (4).

For explanation of abbreviations used, see AR 320-50.

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514th Troop Carrier Wg

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For explanation of abbreviations used, see AFM 11-2 for Air Force distribution.