TECHNICAL MANUAL
TRANSPORTABILITY GUIDANCE
LIGHTER, AMPHIBIAN AIR-CUSHION VEHICLE, 30-TON PAYLOAD (LACV-30)

This copy is a reprint which includes current pages from Change 1.

HEADQUARTERS, DEPARTMENT OF THE ARMY

DECEMBER 1979

TM 55-1930-218-14
C 1

Change No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 4 *May 1984*

Transportability Guidance
LIGHTER, AMPHIBIAN AIR-CUSHION VEHICLE,
30-TON PAYLOAD (LACV-30)

A change has been made to chapter 4.
TM 55-1930-218-14, 1 Dec 1978, is changed as follows:
1. New or changed material is indicated by a star.
2. Remove old page and insert new page as indicated below:

Remove page	*Insert page*
4-1	4-1

3. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, *United States Army*
Chief of Staff

Official:
ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

TECHNICAL MANUAL
No. 55-1930-218-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC *1 December 1979*

TRANSPORTABILITY GUIDANCE LIGHTER, AMPHIBIAN AIR-CUSHION VEHICLE, 30-TON PAYLOAD (LACV-30)

LIST OF ILLUSTRATIONS

LIST OF TABLES

CHAPTER 1
INTRODUCTION

1-1. Purpose and Scope

a. This manual provides transportability guidance for logistics handling and movement of the Lighter, Amphibian Air-Cushion Vehicle, 30-ton payload, also referred to as the LACV-30 in this manual.

b. The intent of this manual is to give transportation officers and other personnel who are responsible for movement of the LACV-30, or for providing transportation services for its movement, information considered important for safe transport. Included are significant technical and physical characteristics of the LACV-30, as well as safety considerations required for worldwide movement by the various modes of transportation. Where considered appropriate, metric equivalents are given in parentheses following dimensions or other measurements. References are contained in the appendix.

1-2. Reporting of Publication Improvements

Users of this publication are encouraged to recommend changes and submit comments for its improvement. Comments should be prepared on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded to Director, Military Traffic Management Command Transportation Engineering Agency, ATTN: MTT-TRP, PO Box 6276, Newport News, VA 23606 (electrically transmitted messages should be addressed to: DIRMTMCTEA FTEUSTIS VA//MTT-TRP//).

1-3. Safety

Appropriate precautionary measures required during movement of the LACV-30 are contained in chapter 3.

1-4. Definitions of Warnings, Cautions, and Notes

Throughout this manual, warnings, cautions, and notes emphasize important or critical guidance. They are used for the following conditions:

a. *Warning.* An operating procedure or practice that, if not correctly followed, could result in personal injury or loss of life.

b. Caution. An operating procedure or practice that, if not strictly observed, could result in damage to or destruction of equipment.

c. Note. An operating procedure that must be emphasized.

CHAPTER 2
TRANSPORTABILITY DATA

Section I. GENERAL

2-1. Scope
This chapter provides a general description, identification photographs, tabulated transportability characteristics, and data that are necessary for transport of the LACV-30.

2-2. Description
The LACV-30 is a fully amphibious, flatbed, air-cushion vehicle designed to transport military cargo and equipment in support of the logistics-over-the-shore (LOTS) mission. It is powered by two, twin pack, gas turbines using standard aviation kerosene fuel. Left side and overhead views are shown in figures 2-1 and 2-2. The LACV-30, with a basic hull structure of aluminum alloy, can be disassembled for transport by sections, as shown in figure 2-3. Table 2-1 gives dimensions and weight of the major LACV-30 sections.

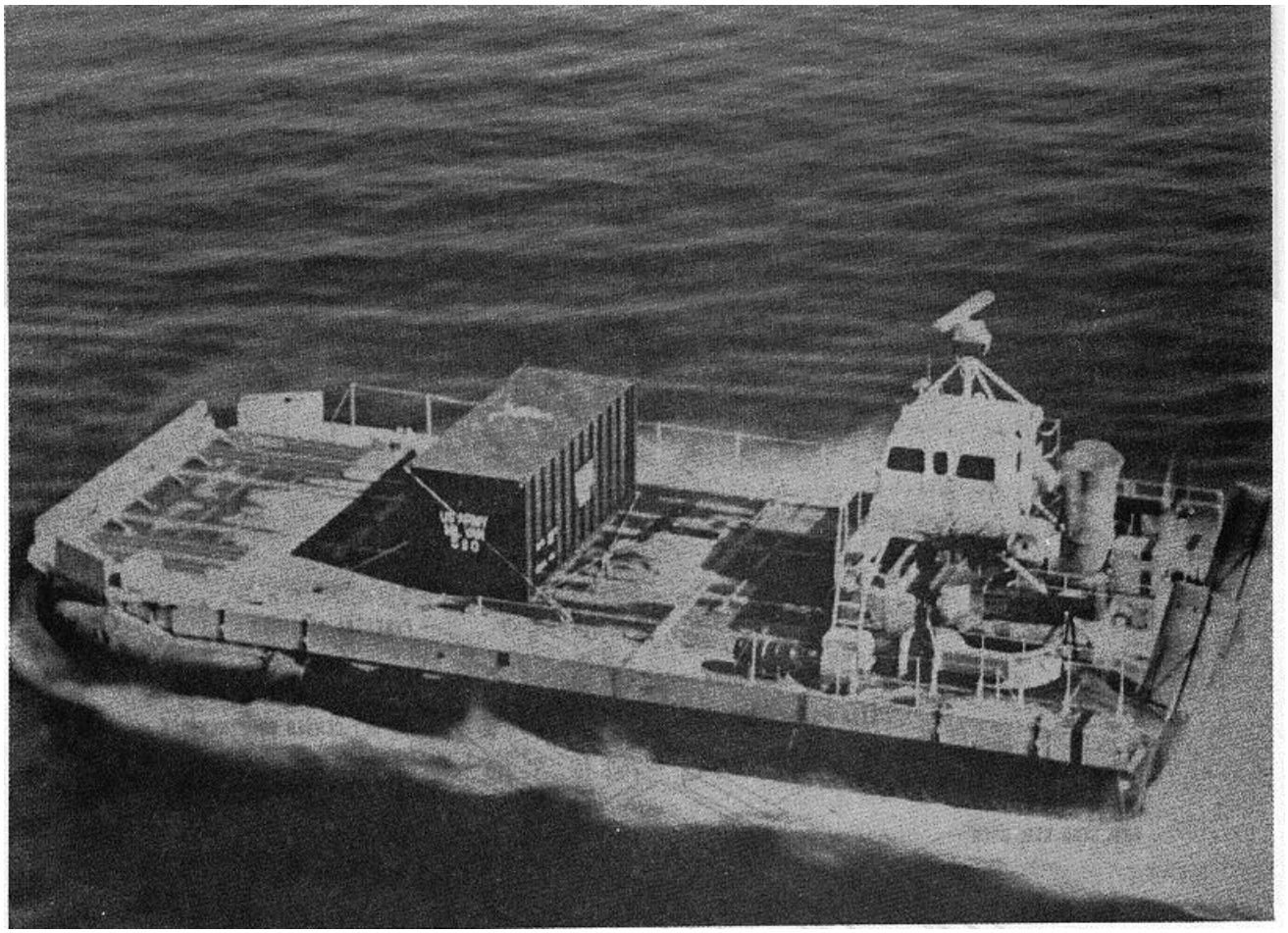

Figure 2-1. LACV-30, left side view.

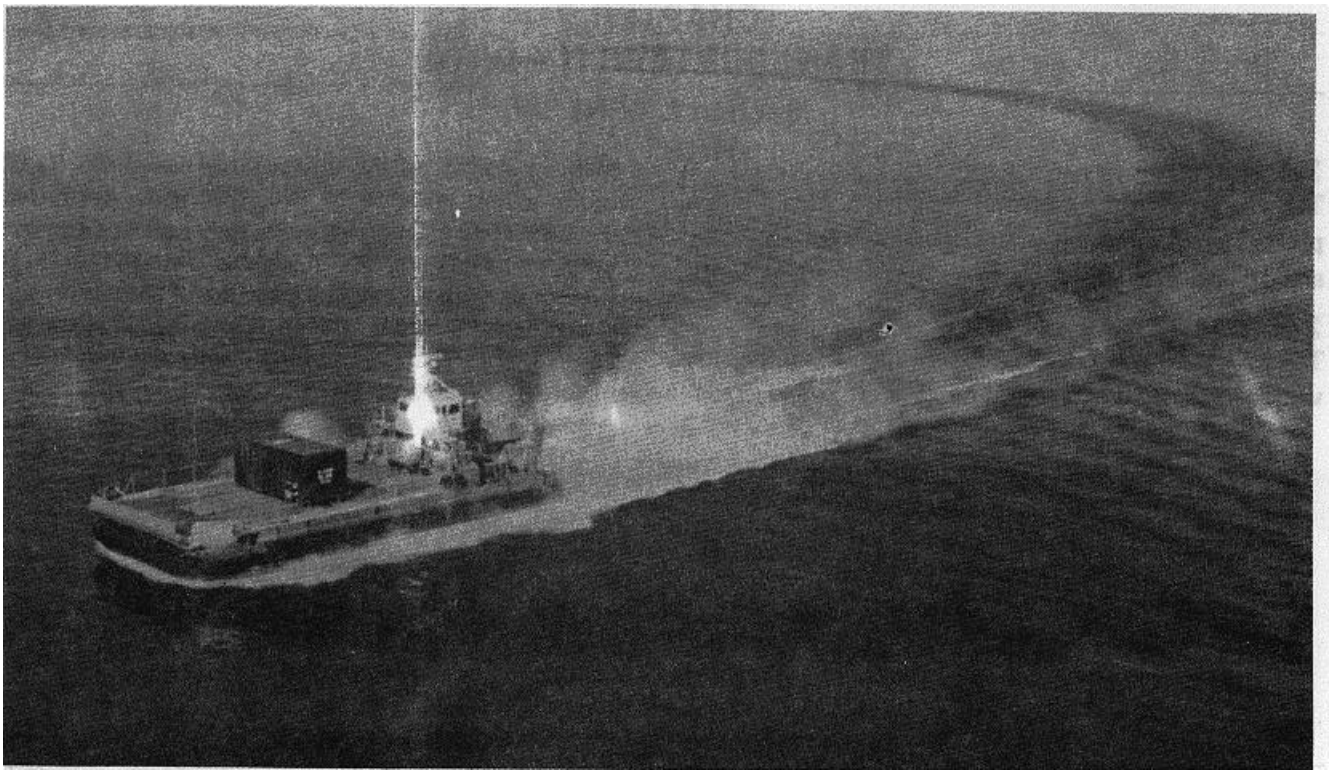

Figure 2-2. LACV-30, overhead view.

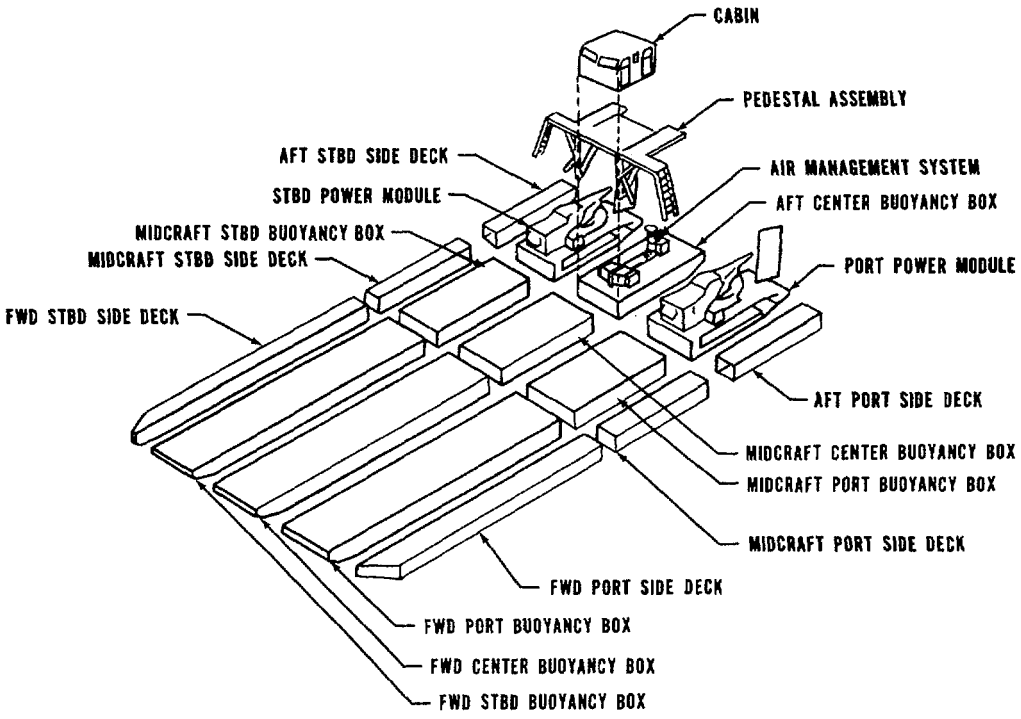

Figure 2-3. L4CV-30, modular construction.

Table 2-1. Dimensions and Weight of the Major LACV-30 Sections Shown in Figure 2-3

Item	Description	No.	Length Feet	Length Meters	Width Feet	Width Meters	Height Feet	Height Meters	Approximate Unit Weights Pounds	Approximate Unit Weights Kilograms
1	Starboard forward buoyancy box	1	40.1	12.2	9.0	2.8	3.1	0.9	5,413	2,455
2	Port forward buoyancy box	1	40.1	12.2	9.0	2.8	3.1	0.9	5,413	2,455
3	Forward center buoyancy box	1	40.1	12.2	8.3	2.5	3.1	0.9	4,663	2,115
4	Starboard forward side deck	1	39.1	11.9	3.4	1.0	3.1	0.9	1,032	468
5	Port forward side deck	1	39.1	11.9	3.4	1.0	3.1	0.9	1,032	468
6	Aft center box, with air rngt sys	1	19.2	5.9	8.3	2.5	8.9	2.7	4,207	1,910
7	Port aft side deck	1	18.3	5.6	3.4	1.0	3.1	0.9	573	261
8	Starboard aft side deck	1	18.3	5.6	3.4	1.0	3.1	0.9	573	261
9	Control cabin and walkways	1	8.0	2.4	9.0	2.7	5.6	1.7	3,300	1,497
10	Power module, less propeller and fin	2	19.5	5.9	8.5	2.6	8.7	2.6	5,166	2,343
11	Control cabin support structure	1	4- x 4-inch x 7-ft Girders (0.10x0.10x2.1m)						600	275
12	Propellers	2	9.0	2.7	9.0	2.7	1.0	0.3	353	160
13	Center rnidcraft buoyancy box	1	11.3	3.4	8.3	2.5	3.1	0.9	1,632	740
14	Starboard rnidcraft buoyancy box	1	11.3	3.4	8.3	2.5	3.1	0.9	1,388	630
15	Por rnidcraft buoyancy box	1	11.3	3.4	8.3	2.5	3.1	0.9	1,388	630
16	Starboard midcraft side deck	1	11.3	3.4	3.4	1.0	3.1	0.9	300	137
17	Port midcraft side deck	1	11.3	3.4	3.4	1.0	3.1	0.9	300	137

Section II. CHARACTERISTICS AND RELATED DATA

2-3. General Transportability Characteristics

Data contained herein are applicable to LACV-30's having the model number (or national stock number (NSN)) shown. LACV-30's having a different model number (or NSN) may have characteristics that will affect the laudability to an extent that the guidance shown in this manual will not apply. Essential LACV-30 data follow:

Model: Bell 7467
NSN: 2305-01-071-6230
LIN: Z38286
Type classification: Standard
Measurements:

Length	918.0 in. (23.24 m)
Width	441.0 in. (11.20 m)
Height	258.0 in. (6.55 m)
Volume	60,444 cu ft (1,710.6 m3)
Weight*	56,354 lb (25,562 kg)

2-4. Elevation Drawings

This section provides a drawing (fig 2-4) that shows the dimensions of a fully assembled LACV-30.

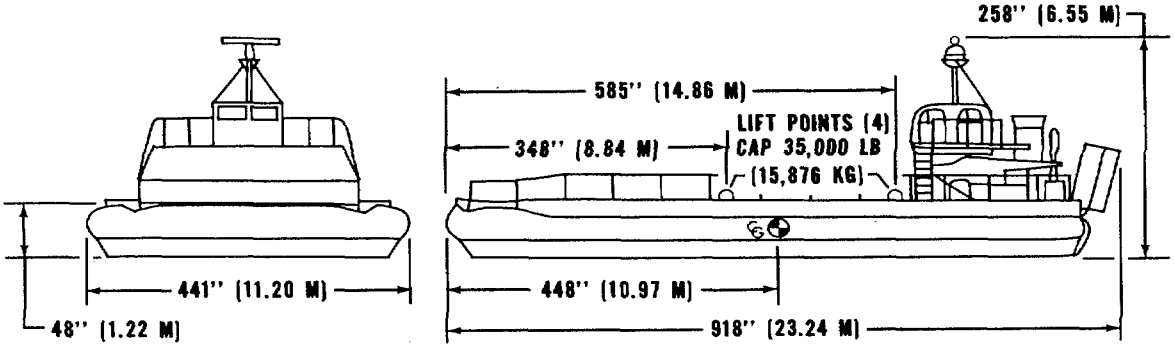

Figure 2-4. LACV-30, side and front elevation.

2-5. Reduced Configuration

Because of the size of the LACV-30, it must be disassembled for transport by all modes except the marine mode.

* Weight may vary by as much as 150 lb (68 kg) due to dirt accumulation.

2-6. Unusual Characteristics

The LACV-30 has no unusual characteristics that would require special attention be given to temperature or humidity variations during exposure to normal transportation environments. However, due to the fragility of the aluminum hull sections and other components, they must

be protected from damage during transport, and the side decks must be shipped in an upright position to allow for moisture drainage. In addition to the standard blocking and tiedown materials, the use of 4-inch-thick styrofoam as protective padding is recommended. Also, when hull sections are to be transported by air, all drain plugs must be removed before shipment. This will ensure that the design pressure of these sections is not exceeded.

2-7. Hazardous and Dangerous Characteristics

The LACV-30 presents no special hazardous or dangerous characteristics during its exposure to normal transportation environments.

NOTE

Those regulations and/or transportation procedures normally associated with vehicles carrying combustible liquid fuels apply: *Code of Federal Regulations,* Title 49; and the Association of American Railroads**,** *Rules Governing the Loading of Commodities on Open-Top Cars and Trailers.*

2-8. Fragility

The LACV-30 is designed so that, when restrained in accordance with the guidance provided in this manual, it can withstand the shocks and vibrations associated with current transportation methods.

2-9. CONUS Freight Classification

Rail and motor freight classification descriptions and item numbers will be determined in accordance with chapter 211, AR 55-355.

CHAPTER 3
SAFETY

3-1. General

General safety considerations and precautions before and during loading operations are as follows:

a. Defuel the LACV-30 before disassembly, and preserve in accordance with applicable operator and maintenance manuals.

b. Caution personnel not to walk under items being lifted.

c. Attach two tag fines to items being lit.

CAUTION

When disassembly of the LACV-30 is required and the possibility of freezing exists, do not store or ship side decks in any position other than the upright position to preclude moisture accumulation and possible freeze damage to the laminated side paneling.

3-2. Specific Safety Requirements

Pertinent safety requirements by individual mode can be found, where applicable, in subsequent chapters.

CHAPTER 4
AIR TRANSPORTABILITY GUIDANCE

4-1. Transport by US Air Force Aircraft

★Due to the time and manpower required, it has been determined that transport by air is not considered logistically practical.

4-2. Transport by US Army Aircraft

Most of the disassembled components of the LACV-30 are too large for internal transport by US Army fixed- or rotary-wing aircraft. Due to the lack of lift points, external transport of the modules by rotary-wing aircraft is not recommended.

CHAPTER 5
HIGHWAY TRANSPORTABILITY GUIDANCE

Section I. GENERAL

5-1. Scope
This chapter provides transportability guidance for highway movement of the disassembled LACV-30. It covers significant technical and physical characteristics and prescribes the material and guidance required to prepare, load, and tie down the components.

5-2. Safety
Safety precautions are listed in chapter 3.

5-3. Preparation
The LACV-30 must be disassembled for transport by semitrailer. Remove and crate the propellers in prop boxes. Remove the radar scanner unit, supports and mast. After removal of the radar mast, particular care must be taken to seal the opening in the top of the control cabin.

NOTE

For highway shipment, the power modules are left attached to their respective rnidcraft buoyancy boxes.

Section II. TRANSPORT BY SEMITRAILERS

5-4. General
a. The LACV-30 components, loaded on semitrailers, can be transported over highways within CONUS with *restrictions.* If the dimensional capacity of the semitrailers is properly utilized, some loads will exceed the 96-inch-width and 162-inch-height restrictions of some states. When loads exceed these limits, special permits, in accordance with AR 55-162, are required. In some cases, circuitous routing may also be required. Legal limitations in oversea areas are identified in *Limits of Motor Vehicle Sizes and Weights,* International Road Federation, 1023 Washington Building, WASH DC 20005.

b. The loads illustrated in figures 5-1 through S-7 are based on the use of low-bed semitrailers with 30-foot-long loading areas and flatbed semitrailers with 40-foot-long decks. The military M270A1, as well as a number of commercial semitrailers, may be used to carry the larger components. Seven semitrailers (three lowbed and four flatbed) are required to transport the disassembled LACV-30 components, including one flatbed semitrailer to transport a MILVAN containing the anchor line box, rudders, life rafts, surf fences, tools, spare parts, POL products, and miscellaneous loose items.

5-5. Loading
a. The components of the LACV-30 can be placed in the tiedown position on semitrailers by either a crane or a forklift equipped with fork extensions. The crane or forklift must have a capacity of at least 4 tons.

b. Position 4-inch-thick styrofoam cushioning on the semitrailer decks so as to protect the fragile components. This cushioning is also required between components when they are stacked.

c. Table 5-1 is the bill of materials required for blocking and tiedown of components and modules, and tables 5-2 through 5-7 provide data concerning the application of materials required for securing the loads.

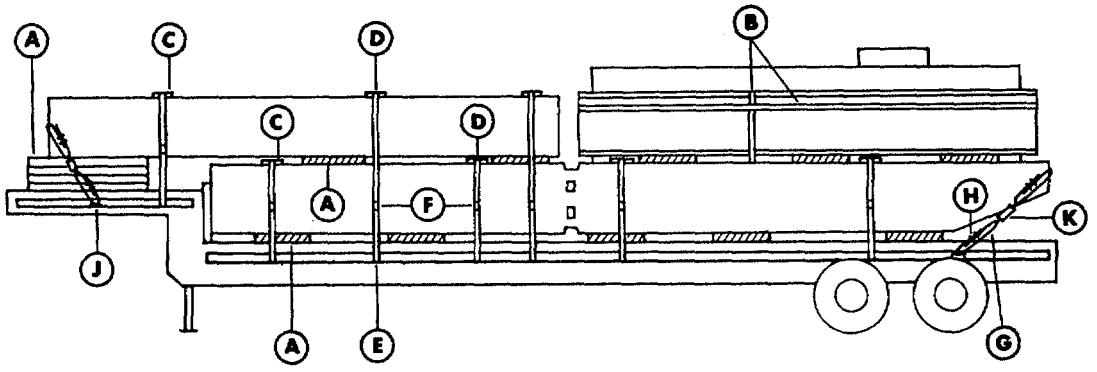

Figure 5-1. Blocking and tiedown of LACV-30 aft center buoyancy box (air management system) with center midcraft buoyancy box, vehicle ramps, and port and starboard aft side decks on low-bed semitrailer.

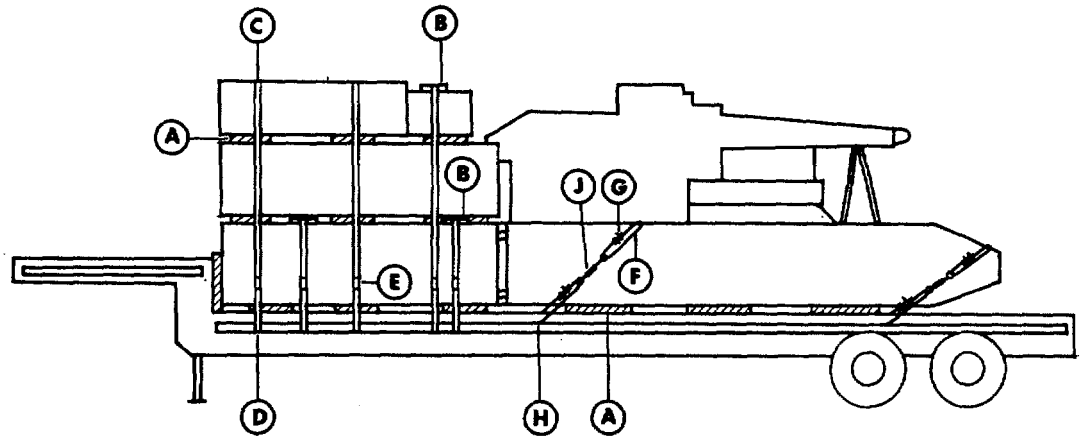

Figure 5-2. Blocking and tiedown of LACV-30 port power module with port midcraft buoyancy box, midcraft port and starboard side decks, ramp approaches, and crated spare lift fan on low-bed semitrailer.

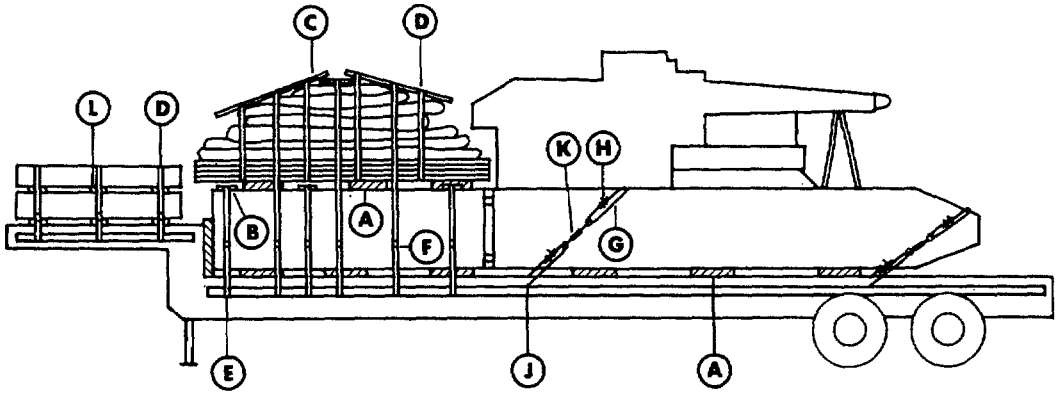

Figure 5-3. Blocking and tiedown of LACV-30 starboard power module with starboard midcraft buoyancy box, four load-spreader pallets with stability trunks, rear trunks and two fenders, and two crated propellers on low-bed semitrailer.

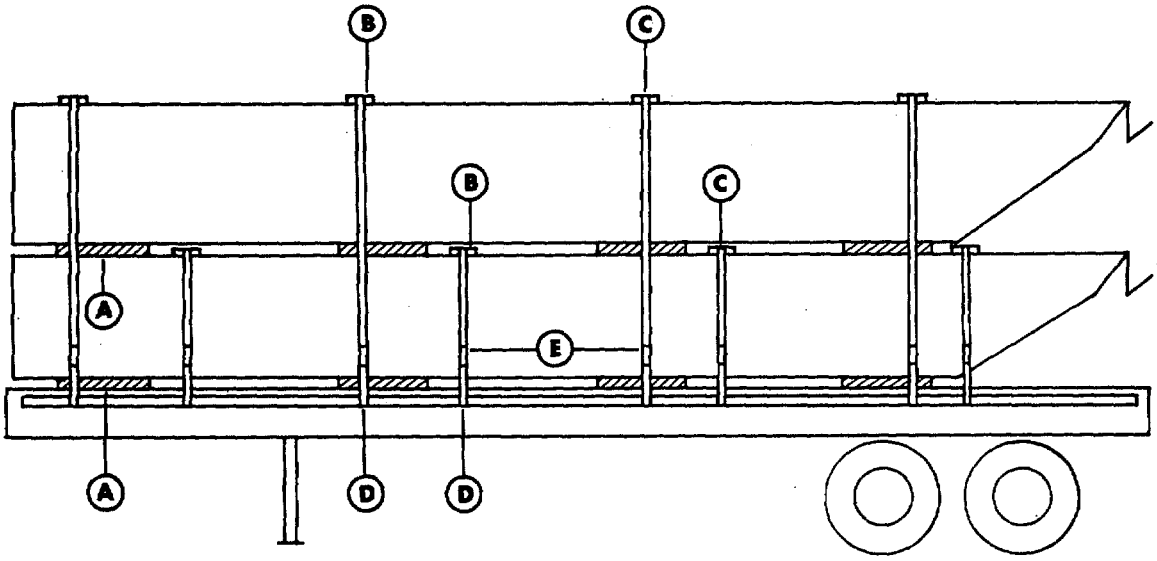

Figure 5-4. Blocking and tiedown of LACV-30 center and port forward buoyancy boxes on flatbed semitrailer.

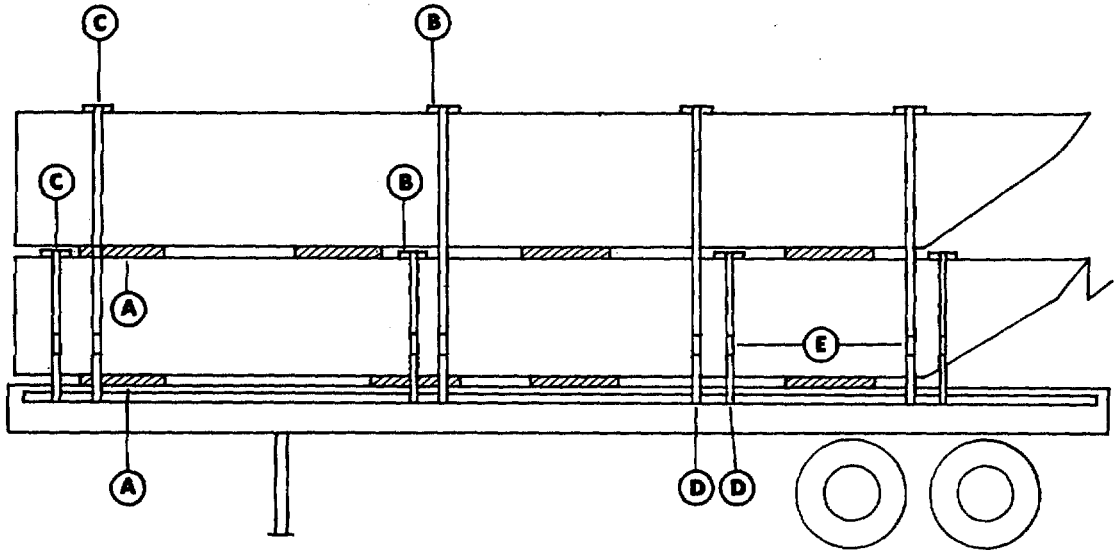

Figure 5-5. Blocking and tiedown of LACV-30 starboard forward buoyancy box, port and starboard forward side decks, and landing pads on flatbed semi-trailer (side view).

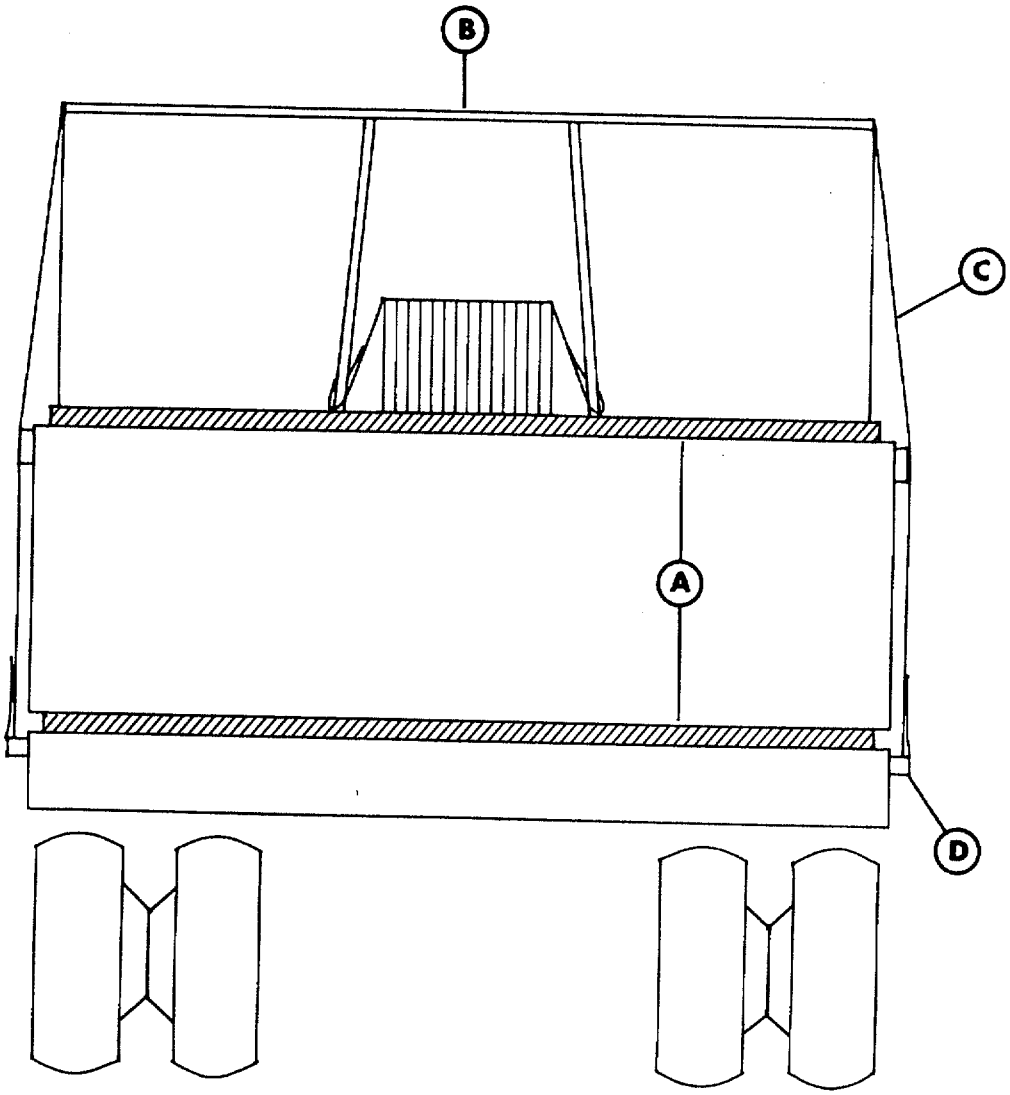

Figure 5-6. Blocking and tiedown of LACY-30 starboard forward buoyancy box, port and starboard forward side decks, and landing pads on flatbed semitrailer (end view).

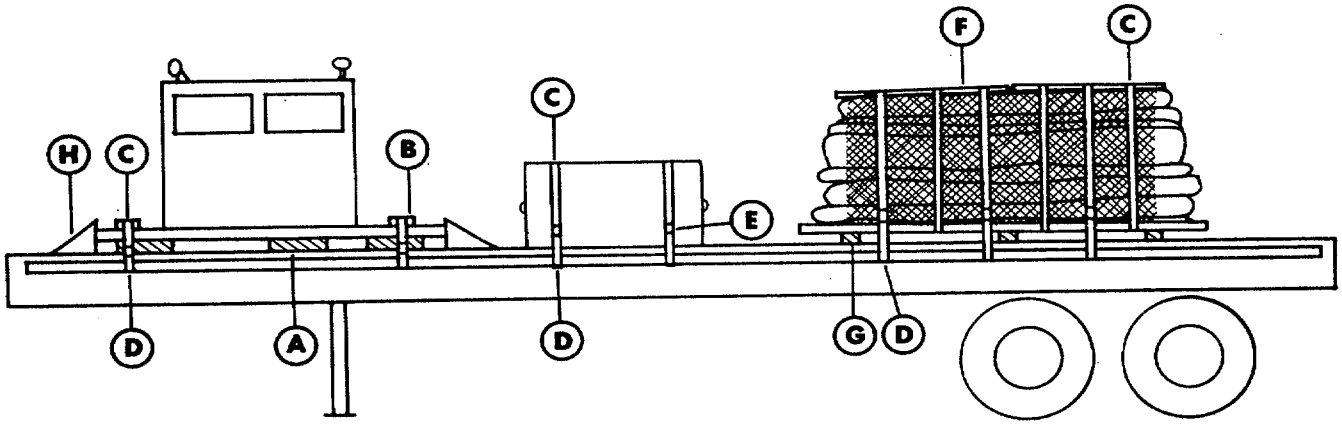

Figure 5-7. Blocking and tiedown of LACV-30 control cabin, bow fenders, and load spreader pallets with peripheral trunk and cargo net on flatbed trailer.

Table 5-1. Bill of Materials for Blocking and Tiedown of LACV-30 Components on Semitrailers

Item	Description	Approx. Quantity
Lumber	Douglas fir, or comparable, straight-grain, free from material defects; Fed Spec MM-L-751H:	
	1-x 4-inch	358 linear ft
	4- x 4-inch	40 linear ft
	6- x 8-inch	3 linear ft
Plywood	1/2-inch x 4- x 8-foot sheets	4
Styrofoam	Beadboard, 4-inch x 4 x 8-foot (may also be supplied in 4-inch x 2- x 8-foot sheets)	55 sheets
Nylon straps	CGU-1/B tiedown device, 20-foot-long, 5,000-lb-capacity, or equal	5
Strapping	Steel, high tension; Fed Spec QQ-S-781H, type I or IV, 1 1/4- x .035-inch	1,170 ft
Seals	Steel strapping; Fed Spec QQ-S-781H, type D	228
Wire rope	6x19 IWRC; improved plow steel; preformed, regular-lay; table X, Fed Spec RR-W-41OC: 3/8-inch	72 ft
Clamps	Wire rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty, or equal; Fed Spec FF- C-450D: 3/8-inch	60
Thimbles	Standard, open-type: 3/8-inch	12
Turnbuckles	Eye-and-eye, galvanized, weldless, drop-forged, 5/8-inch eyes, 12-inch take-up	12
Nails	Common, steel; flathead; bright; table XI-b, Fed Spec FF-N-105B: 40d	20

Table 5-2. Application of Materials for Tiedown of LACY-30 Components in Figure 5-1

Item	No. Required	Application
A		Styrofoam Beadboard, 4-inch x 4- x 8-foot sheets, or 4-inch x 2- x 8-foot sheets. Distribute beneath the sectionalized components to protect the hinge attachment points and to provide separation of the components from the trailer deck. Position between stacked components to protect the hinge attachment points and to provide separation between components. Arrange so that approximately 50 to 60 percent of all bottom surfaces rest on the Styrofoam Beadboard. Position between vehicle ramps and the air management system (AMS) module before instating item B.
B	5	Nylon straps, 2-inch x 20foot. Using three straps, form a complete loop around both vehicle ramps and tighten securely. The remaining two straps are joined. Attach one end to the air management system (AMS) frame underneath one vehicle ramp, pull through the AMS framework across both vehicle ramps, and attach to AMS frame underneath the vehicle ramp on opposite side.
C	21	Strapping boards, 1- x 4-inch x cut-to-length. Position under steel straps (item D) across tops of modules and on sides of modules where straps would otherwise contact modules.
D	7	Steel straps, 11/4- x .035-inch x cut-to-length. Position as shown in figure 5-1. Each strap is fabricated by looping a length of strapping through the stake pocket on each side of the trailer, with a pad (item E) between the strap and the trailer stake pocket. The loops are formed by attaching a seal (item F) at the overlap areas (detail 3, fig 7-10). Overlap the two lengths of strapping at the top of the load, tighten, and seal. All seals must have two pairs of crimps (detail 4, fig 7-10). Secure steel strapping to strapping boards (item C) with staples or nails.
E	14	Pad, 1 14- x .035 x 18-inch steel strap. Position under and seal to item D at each trailer stake pocket (detail 3, fig 7-10).
F	35	Seal, steel strapping. Required for joining strapping at each joint (detail 4, fig 7-10) and for securing each pad C(item E) to strap.

Table 5-2-continued

Item	No. Required	Application
G	8	Wire rope, 3/8-inch. Locate as shown in figure 5-1. Form a complete loop through the trailer stake pocket and one eye of the turnbuckle (item K). Form a complete loop through the tiedown point of the module and the other eye of the turnbuckle. The ends of the wire rope must overlap at least 12 inches. The angle between the tiedown and the trailer deck should be as near to 45 degrees as possible.
H	20	Clamps, 3/8-inch. Secure the ends of the wire rope at the overlap area with two clamps spaced 21/4 inches apart, leaving a minimum of 6 inches from ends of rope. Place one additional clamp to secure thimble (item J) and wire rope together at stake pocket (detail 2, fig 7-10).
	4	Thimble, open-type, 3/8-inch. Place one at bottom of each stake pocket where wire rope passes through (rig 711). Attach thimble to wire rope with one clamp (item H).
K	4	Turnbuckle, 5/8-inch eyes. Tighten turnbuckles until wire-rope loops are taut. Wire-turnbuckles to prevent loosening during transit.

GENERAL INSTRUCTIONS

1. The space between the trailer gooseneck and the bottom of the aft side decks may be used to transport crated spare parts. If this is done, protect the underside of the aft side decks with Styrofoam Beadboard.
2. The space between the vehicle ramps on each side of the AMS module may be used to transport properly secured loose items such as the cabin supports and the handrails. Protect all components with styrofoarn Beadboard.
3. The vehicle ramps are lashed to the AMS with a loop of nylon straps around the entire module. Another nylon strap is paced across the top and secured to the AMS framework on both sides.

Table 5-3. Application of Materials for Tiedown ofLACV-30 Components In Figure 5-2

Item	No. Required	Application
A		Styrofoam Beadboard, 4-inch x 4- x 8-foot sheets, or 4-inch x 2- x 8-foot sheets. Distribute beneath the sectionalized components to protect the hinge attachment points and to provide separation of the components from the trailer deck. Position between stacked components to protect the hinge attachment points and to provide separation between components. Arrange so that approximately 50 to 60 percent of all bottom surfaces rest on the Styrofoam Beadboard.
B	3	Strapping boards, 1 x 4inch x cut to length. Position under the two steel straps (item C) that secure the bottom nodule to the trailer, and under the steel strap that crosses over the ramp extensions.
C	5	Steel straps, 1 1/4- x .035-inch x cut-to-length. Position as shown in figure 5-2. Fabricate as in table 5-2, item D.
D	10	Pad, 1 1/4- x .035- x 18-inch steel strap. Position under and seal to item C at each trailer stake pocket (detail 3, fig 7-10).
E	25	Seal, steel strapping. Required for joining stripping at each joint (detail 4, fig 7-10) and for securing each pad (item D) to strap.
F	8	Wire rope, 3/8-inch. Locate as shown in figure 5-2. Form a complete loop through the trailer stake pocket and one eye of the turnbuckle (item 1). Form a complete loop through the tiedown point of the module and the other eye of the turnbuckle. The ends of the wire rope must overlap at least 12 inches. The angle between the tiedown and the trailer deck should be as near to 45 degrees as possible (detail 2, fig 7-10).
G	20	Clamps, 3/8-inch. Secure the ends of the wire rope at the overlap area with two clamps spaced 21/4 inches part, having a minimum of 6 inches from ends of rope. Place one additional clamp to secure thimble (item H) and wire rope together at stake pocket (detail 2, fig 7-10).
H	4	Thimble, open-type, 3/g-inch. Place one at bottom of each stake pocket where wire rope passes through (fig 7-11). Attach thimble to wire rope with one clamp (item G).
J	4	Turnbuckle, 5/8-inch eyes. Tighten turnbuckle until wire-rope loops are taut, wire-tie turnbuckle to prevent loosening during transit.

GENERAL INSTRUCTIONS

1. The trailer gooseneck may be used to transport crated spare parts.
2. The ladder landings may be placed on a piece of Styrofoam and lashed to the open deck a**rea** underneath the propeller shaft nacelle.

Table 5-4. Application of Materials for Tiedown of LACV-30 Components in Figure 5-3

Item	No. Required	Application
A		Styrofoam Beadboard, 4-inch x 4- x 8-foot sheets, or 4-inch x 2- x 8-foot sheets. Distribute beneath the sectionalized components to protect the hinge attachment points and to provide separation of the components from the trailer deck. Position between stacked components to protect the hinge attachment points and to provide separation between components. Arrange so that approximately 50 to 60 percent of all bottom surfaces rest on the Styrofoam Beadboard.
B	3	Strapping boards, 1- x 4-inch x cut-to-length. Position under the three steel straps (item D) that secure the bottom module to the trailer.
C	2	Plywood, ½-inch x 4- x &-foot. Used as strapping board and to unitize flexible trunks with load spreader pallets.
D	13	Steel straps, 1¼-inch- x .035-inch x cut-to-length. Four strips used to unitize flexible trunks and load-spreader pallets prior to loading on trailer. Position remainder of straps as shown in figure 5-3. Fabricate as in table 5-2, item D.
E	18	Pad,1 1/4- x .035- x 18-inch steel strap. Position under and seal to item D at each stake pocket (detail 3, fig 7-10).
F	50	Seal, steel strapping. Required for joining strapping at each joint (detail 4, fig 7-10) and for -securing each pad (item E) to strap.

Table 5-4.-continued

Item	No. Required	Amount
G	8	Wire rope, 3/8-inch. Locate as shown in figure 5-3. Form a complete loop through the trailer stake pocket and one eye of the turnbuckle (item K). Form a complete loop through the tiedown point of the module and the other eye of the turnbuckle. The ends of the wire rope must overlap at least 12 inches. The angle between the tiedown and the trailer deck should be as near to 45 degrees as possible (detail 2, fig 7-10).
H	20	Clamps, 3/8-inch. Secure the ends of the wire rope at the overlap area with two clamps spaced 2 1/4 inches apart, leaving a minimum of 6 inches from ends of rope. Place one additional clamp to secure thimble (item J) and wire rope together at the stake pocket (detail 2, fig 7-10).
J	4	Thimble, open-type, 3/8-inch. Place one at bottom of each stake pocket where wire rope passes through (fig 7-11). At each thimble to wire rope with one clamp (item H).
K	4	Turnbuckle, 5/8-inch eyes. Tighten turnbuckle until wire-rope loops are taut. Wire-tie turnbuckle to prevent loosening during transit.
L	6	Risers, 4- x 4-inch x 8-foot lumber or similar dunnage. Place under both propeller crates to permit handling by forklift.

Table 5-5. Application of Materials for Tiedown of LACV-30 Components in Figure 5-4

Item	No. Required	Application
A		Styrofoam Beadboard, 4-inch x 4- x 8-foot sheets, or 4-inch x 2- x 8-foot sheets. Distribute beneath the sectionalized components to protect the hinge attachment points and to provide separation of the components from the trailer deck. Position between stacked components to protect the hinge attachment points and to provide separation between components. Arrange so that approximately 50 to 60 percent of aft bottom surfaces rest on the Styrofoam Beadboard.
B	8	Strapping boards, 1- x 4-inch x cut-to4-length. Position under steel straps (item C) across top of modules.
C	8	Steel straps, 1 1/4- x .035-inch x cut-to-length. Position as shown in figure 5-4. Fabricate as in table 5-2, item D.
D	16	Pad, 1 1/4- x .035- x 18-inch steel strap. Position under and seal to steel strap at each trailer stake pocket (detail 3, fig 7-10).
E	40	Seal, steel strapping. Required for joining strapping at each joint (detail 4, fig 7-10) and for securing each pad to strap.

GENERAL INSTRUCTIONS

The LACV-30 craft lifting sings may be secured and transported on top of this load.

Table 5-6. Application of Materials for Tiedown of LACY-30 Components in Figures 5-5 and 5-6

Item	No. Required	Application
A		Styrofoam, Beadboard, 4-inch x 4- x 8-foot sheets, or 4-inch x 2- x &-foot sheets. Distribute as in table 5-3.
B	8	Strapping boards, 1- x 4-inch x cut-to-length. Position under steel straps.
C	8	Steel straps, 1 1/4- x .035-inch x cut-to-length. Position as shown in figure 5-5. Fabricate as in table 5-2, item D.
D	16	Pad, 1 1/4- x .035- x 18-inch steel strap. Position under and seat to steel strap at each trailer stake pocket (detail 3, fig 7-10).
E	40	Seal, steel strapping. Required for joining strapping at each joint (detail 4, fig 7-10) and for securing each pad to strap.

GENERAL INSTRUCTIONS

The space between the port and starboard forward side decks may be used to transport properly secured items such as the landing pads.

Table 5-7. Application of Materials for Tiedown of LACV-30 Components in Figure 5-7

Item No.	Required	Application
A		Styrofoam Beadboard, 4-inch x 4- x 8-foot sheets, or 4-inch x 2- x 8-foot sheets. Distribute under 50 to 60 percent of control cabin with attached walkways.
B	2	Strapping boards, 1- x 4-inch x cut-to-length. Position under steel straps used to tie down control cabin.
C	10	Steel straps, 1 1/4- x .035-inch x cut-to-length. Position as shown in figure 5-7. Fabricate as in table 5-2, item D. Use three straps to unitize peripheral trunk and load-spreader pallets before loading on trailer.
D	14	Pad, 1 1/4- x .035- x 18-inch steel strap. Position under and seal to steel strap at each trailer stake pocket (detail 3, fig 7-10).
E	38	Seal, steel strapping. Required for joining strapping at each joint (detail 4, fig 7-10) and for securing each pad to strap.
F	2	Plywood, 1/2-inch x 4- x 8-foot. Used as strapping board and to unitize peripheral trunk with load-spreader pallets.
G	3	Risers, 4- x 4-inch x 8-foot lumber or similar dunnage. Place under load spreader pallets to permit handling by forklift.
H	4	Chock blocks (detail 1, fig 7-10). Locate two chock blocks against each control cabin walkway. Nail heel of block to trailer deck with three 40d nails, and toenail both sides of block to trailer deck with two 40d nails.

GENERAL INSTRUCTIONS

1. Forward chock blocks not required if control cabin walkway is placed against trailer bullhead.
2. Unused space on trailer may be used for transporting properly secured POL, spare parts, and so forth.

CHAPTER 6
MARINE AND TERMINAL TRANSPORTABILITY GUIDANCE

6-1. Scope
This chapter provides transportability guidance for movement of the operational LACV-30 by oceangoing vessel. It prescribes the materials and guidance required to lift, tiedown, and discharge the LACV-30.

6-2. Safety
a. Remove all cargo before lifting the assembled LACV-30.
b. Secure all loose equipment before lifting.
c. Lift only by the four hoist fittings,.
d. Lift only in a level attitude.
e. Lift slowly out of water.

6-3. Marine Transportability
The LACV-30 is marine transportable under its own power -and as deck cargo on oceangoing break-bulk ships having sufficient clear hatch cover or deck area. It is transportable on the open deck of containerships by the use of specialized shoring, blocking and bracing, or false decking. It is also transportable aboard SEABEE vessels.

6-4. Lifting
a. Correct lifting points on the LACV-30 are the four craft-lift fittings located at deck stations 348 and 585 on the inner splice plate lines. The two craft-lift slings are attached to the hoist fittings by four adapters. The craft-lift slings and the adapters are part of the LACV-30 equipment.

WARNING

Insure that the LACV-30 gross weight is less than80,000 pounds (36,288 kg)

WARNING

The four hoist fittings are the only fittings that may be used to hoist the LACV-30.

b. A lifting diagram is shown in figure 6-1. The LACV-30 must be maintained in the level position during lift. The craft hoisting sling is designed to accomplish this by the use of an adjustable bail. Refer to the contractor's maintenance manual (app) before lifting. The LACV-30 can be lifted by cranes of at least 40-ton capacity.

CAUTION

When a LACV-30 is being lifted out of water, the initial lifting must be done very slowly so that water trapped in the flexible trunk has time to drain out. The correct lifting speed is indicated by the level attitude of the craft. A tendency to hang stern low is an indication that the LACV-30 is being raised too fast. The weight of the water trapped in the trunks is considerable and lifting too fast could result in structural failure.

6-5. Loading
a. Figure 6-2 shows typical tiedown details of a LACV-30 loaded on the open deck of a break-bulk ship. The LACV-30 is oriented athwartship across the hatch, with the forward landing pads resting on the port hatch cover and the aft landing pads resting on the starboard hatch cover. Tables 6-1 and 6-2 lists materials required for tiedown and their application. Tiedown materials must be furnished by the shipper.

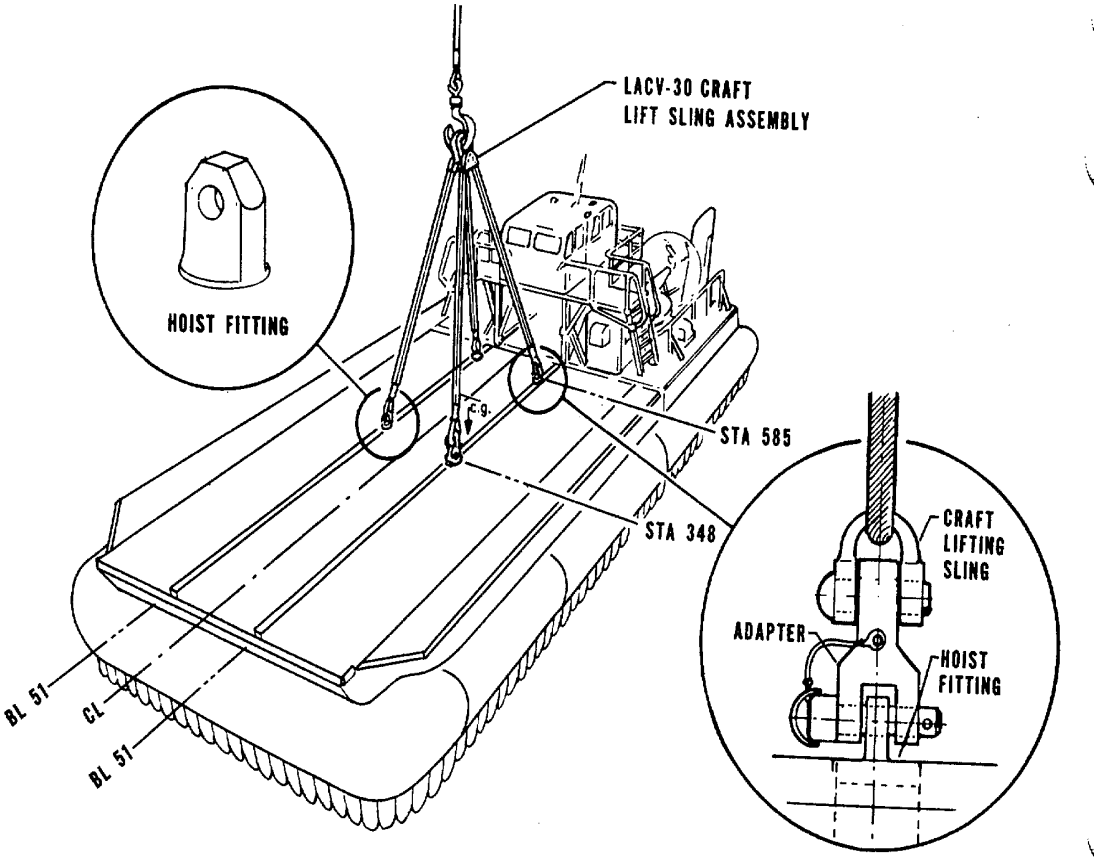

Figure 6-1. Lifting Diagram, LACV-30.

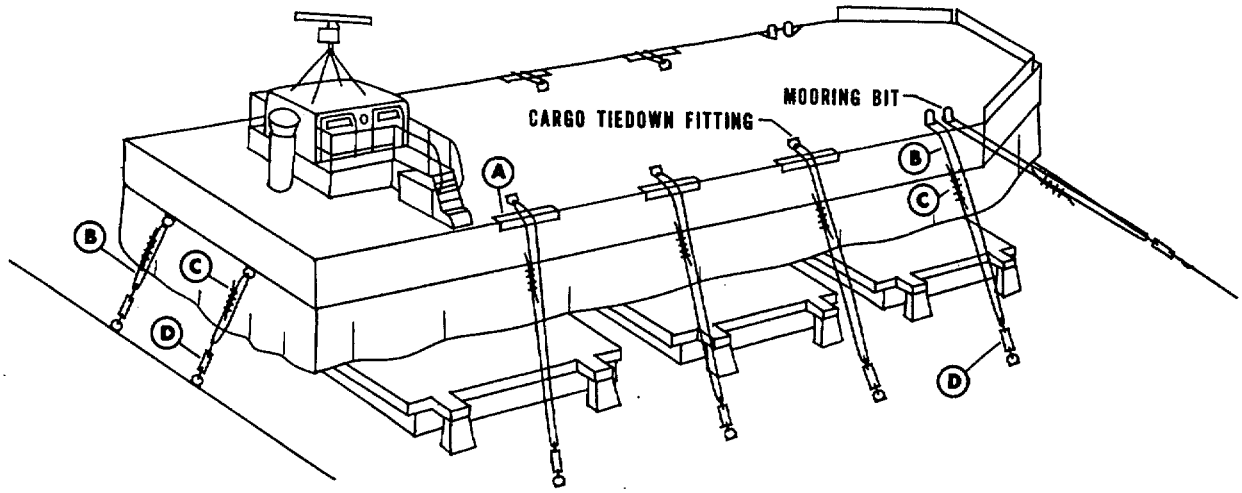

Figure 6-2. Tiedown details, LACV-30 on deck of break-bulk ship.

b. Loading aboard SEABEE vessels requires special handling. An adapter frame furnished by the ship is modified to accept the LACV-30 landing pads. The modified adapter is placed on the SEABEE elevator and submerged. The LACV-30 is floated into the elevator well and over the adapter. The elevator is slowly raised, and a diver assists in proper positioning of the LACV-30 landing pads on the adapter. The elevator is then raised to the upper deck, and the modified adapter and LACV-30 are moved to their designated storage site by the SEABEE transporter.

c. It appears that the LACV-30 can also be deck loaded on LASH and RORO vessels using methods similar to those employed on a break-bulk vessel. Special-purpose ships such as these are equipped with patented lashing gear.

Table 6-1 Bill of Materials for Tiedown of LACV-30 on Deck of Break-Bulk Ship (fig 6-2)

Item	Description	Approximate quantity
Lumber	Douglas fir, or comparable, straight grain, free from material defects; Fed Spec MM-L-751H:	
	2- x 4-inch	12 linear ft
Wute rope	6x19 IWRC; improved plow steel; preferred, regular-lay; table X, Fed Spec RR-W-410C: 5/8-inch	240 ft
Clamps	Wire rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty, or equal; MIL-STD16841: 5/8-inch	48
Turnbuckles	Bye-and-hook, 3/4-inch eye, 18-inch take-up	12

Table 6-2. Application of MatertaIs for Blocking and Tfedown of LACV-30 on Deck of Break-Bulk Ship (Fig 6-2)

Item	No. Required	Application
A	6	Lumber, 2- x 4- x 12-inch. Position under wire rope (item B) as shown in figure 6-2 to protect edge of LACV-30 deck.
B	12	Wire rope, 5/8-inch. Locate as shown in figure 6-2. Form loops from the tiedown points on the LACV-30 through the eye of the turnbuckle. Attach the turnbuckle hook to the appropriate deck padeye.
C	48	Clamp, 5/8-inch. Secure the ends of the wire rope at the overlap area with four clamps spaced 3-1/2 inches apart, leaving a minimum of 6 inches from ends of rope.
D	12	Turnbuckle. Use to tighten and maintain tension on tiedowns

CHAPTER 7
RAIL TRABSPORTABILITY GUIDANCE

Section I. GENERAL

7-1. Scope
This chapter provides transportability guidance for rail movement of the LACV-30, and prescribes the materials and guidance required to prepare, load, and tie down the LACV-30 on open-top flatcars.

7-2. Safety
Safety precautions are listed in chapter 3.

7-3. Preparation
The LACV-30 must be disassembled for transport by rail. Palletize and band the flexible trunks, using plywood or similar material on each side of the pallet to unitize and protect. Remove and crate the propellers, and unitize the load-spreaders and tracks by banding or tieing. Remove the radar scanner unit, supports, and mast. After removal of the radar mast, particular care must be taken to seal the opening in the top of the control cabin.

SECTION II. TRANSPORTATION ON CONUS RAILWAYS

7-4. General
a. The sectionalized LACV-30 can be transported without restriction on the railroads of CONUS, Canada, and Mexico. The largest components are the three forward buoyancy boxes, each being 40.1 feet (12.2 m)long, 9.0 feet (2.8 m) wide, and 3.1 feet (0.9 m) high. The heaviest components are the power (engine) modules attached to the starboard and port rnidcraft buoyancy boxes, weighing 6,554 pounds (2,972.2 kg) each.

NOTE

For rail shipment, the power modules are **le**ft attached to their respective midcraft buoyancy boxes.

b. When loaded in accordance with the guidance contained in this manual, the LACV-30 components will meet line clearances prescribed by the Association of American Railroads (AAR) Rules Governing the Loading of Commodities on Open Top Cars, Section No. 1, Rule 7.

7-5. Number and types of Railcars Required
The loads shown in figures 7-1 through 7-9 are based on the use of three PTTX commercial cushioned-bulkhead flatcars and two general-purpose flatcars. The PTTX flatcars are 60 feet long and 10 feet 6 inches wide. The more sensitive components (control cabin, power modules, and aft center buoyancy box (air management system)) of the LACV-30 must be loaded on bulkhead flatcars with end-of-car cushioning. The other components can be loaded on general-purpose ODX or commercial flatcars with a length of at least 50 feet.

NOTE

TTPX railcars may be furnished in lieu of PTTX cars. Some TTPX railcars have transverse metal risers across the deck. If this type of rail car is used, additional Styrofoam beadboard will be placed between the risers to provide clearance between the risers and the *bottom of* the load.

7-6. Loading

a. The components of the LACV-30 can be-placed in the tiedown position on the railcars by either a crane or a forklift equipped with fork extensions. The crane or forklift must have a capacity of at least 4 tons.

b. Position 4-inch-thick Styrofoam cushioning on the railcar decks so as to protect the fragile components. This cushioning is also required between components when they are stacked.

c. Figures 7-10 and 7-11 are blocking and tiedown detail diagrams for figures 7-1 through 7-9. Table 7-1 is the bill of materials required for blocking and tiedown of components and modules, and table 7-2 through 7-6 provide data concerning the application of materials required for securing the loads.

NOTE

A staggered nailing pattern should be used when lumber or laminating lumber is nailed to the floor of a railcar. The nailing pattern for an upper piece of lumber should be adjusted, as required, so that a nail for that piece will not be driven into or against a nail in the lower piece of lumber.

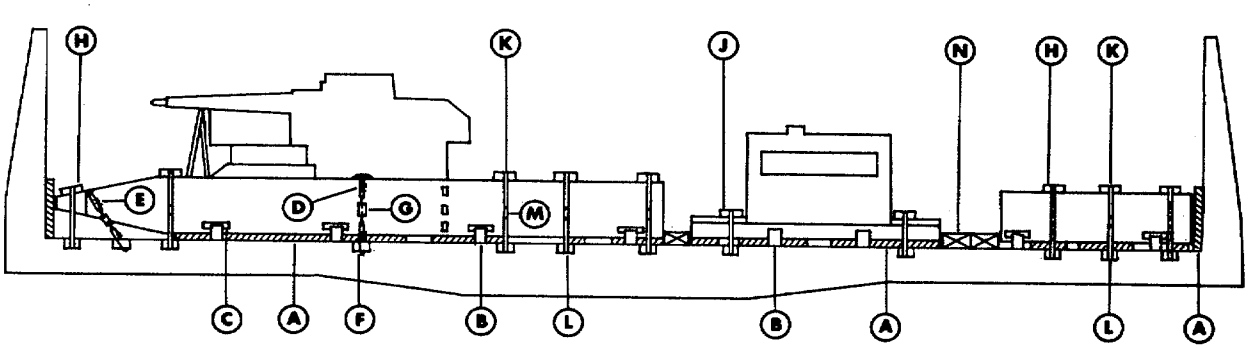

Figure 7-1. Blocking and Tiedown of LACV-30 port power module with port midcraft buoyancy box, control cabin, and port and starboard midcraft side decks on PTTX bulkhead railcar.

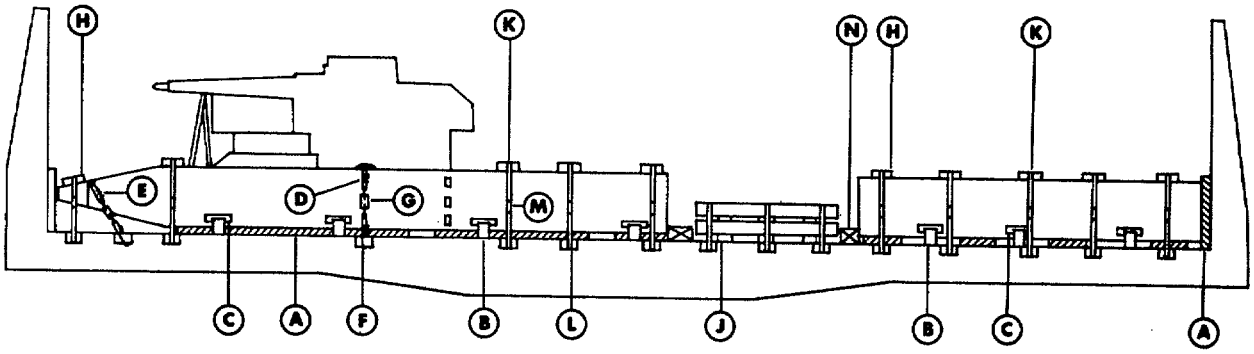

Figure 7-2. Blocking and tiedown of LACV-30 starboard power module with starboard midcraft buoyancy box, two crated propellers, and port and starboard aft side decks on PTTX bulkhead railcar.

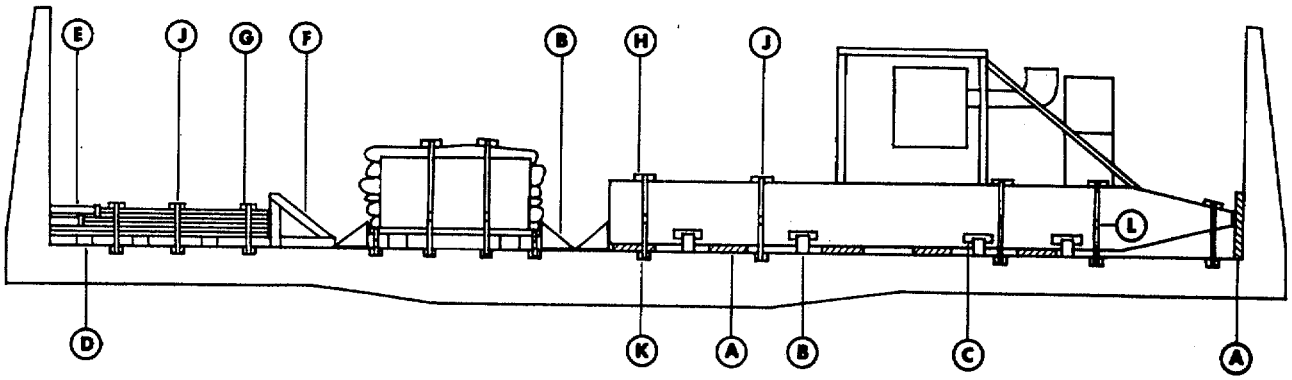

Figure 7-3. Blocking and tiedown of LACV-30 aft center buoyancy box (air. rnanagement system without stack) with center midcraft buoyancy box, four load-spreader pallets, two tracks, and palletized flexible trunk system on PTTX bulkhead railcar

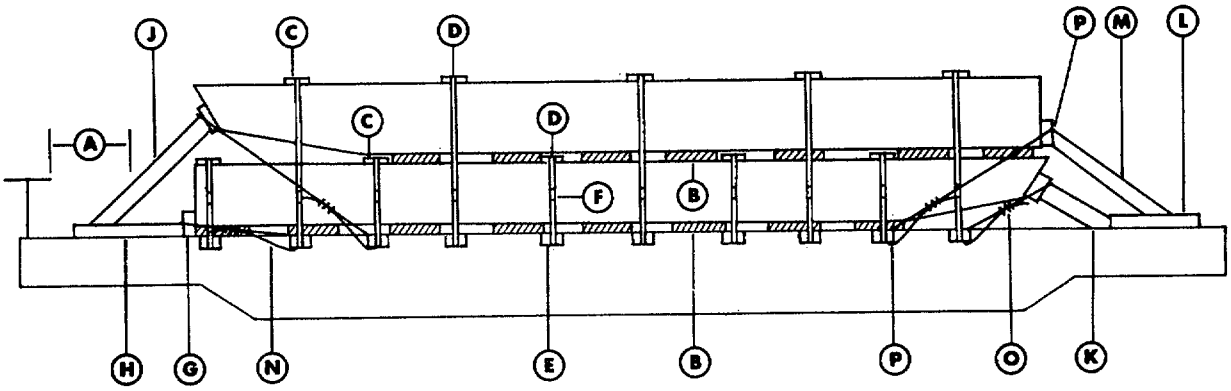

Figure 7-4. Blocking and tiedown of LACV-30 forward center buoyancy box and port forward buoyancy box on CONUS general-purpose flatcar (side view).

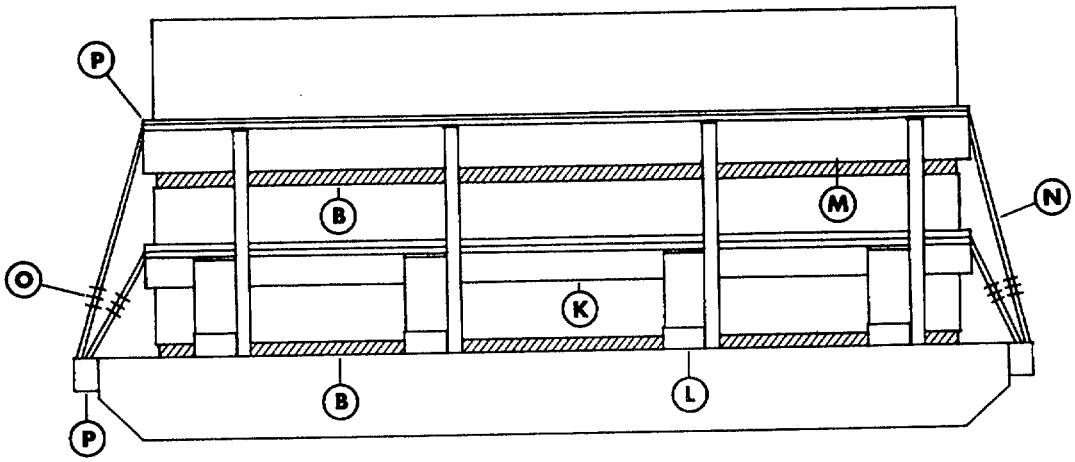

Figure 7-5. Blocking and Tiedown of LACV-30 forward center buoyancy box and port forward buoyancy box on CONUS general-purpose flatcar (end view "A").

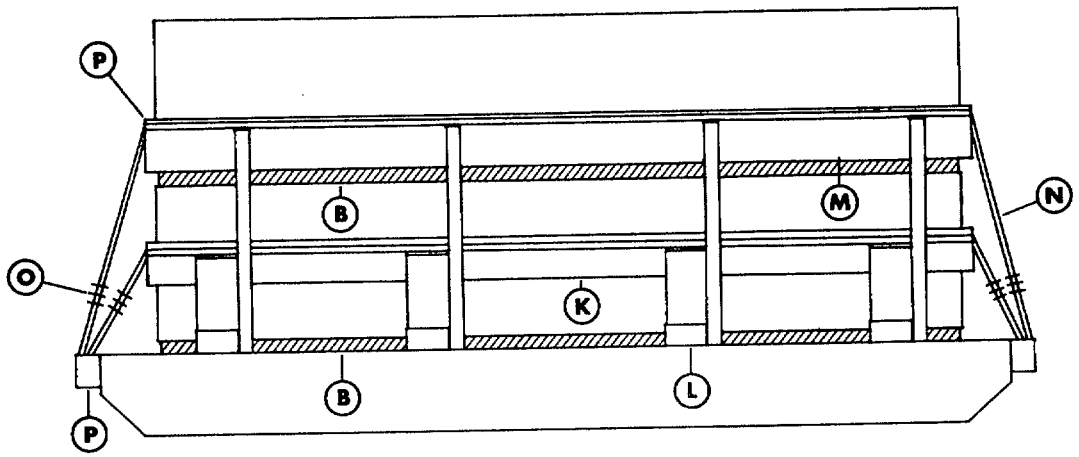

Figure 7-6. Blocking and Tiedown ofLACV-30forward center buoyancy box, and port forward buoyancy box on CONUS general-purpose flat car (end view "B").

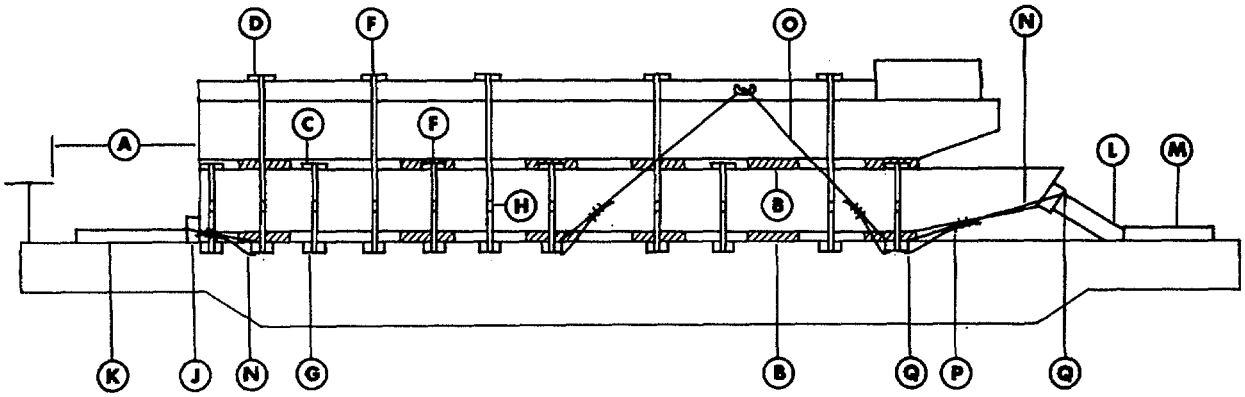

Figure 7-7. Blocking and tiedown of LACV-30starboardforward buoyancy box and port and starboard forward side decks on CONUS general-purpose flatcar (side view).

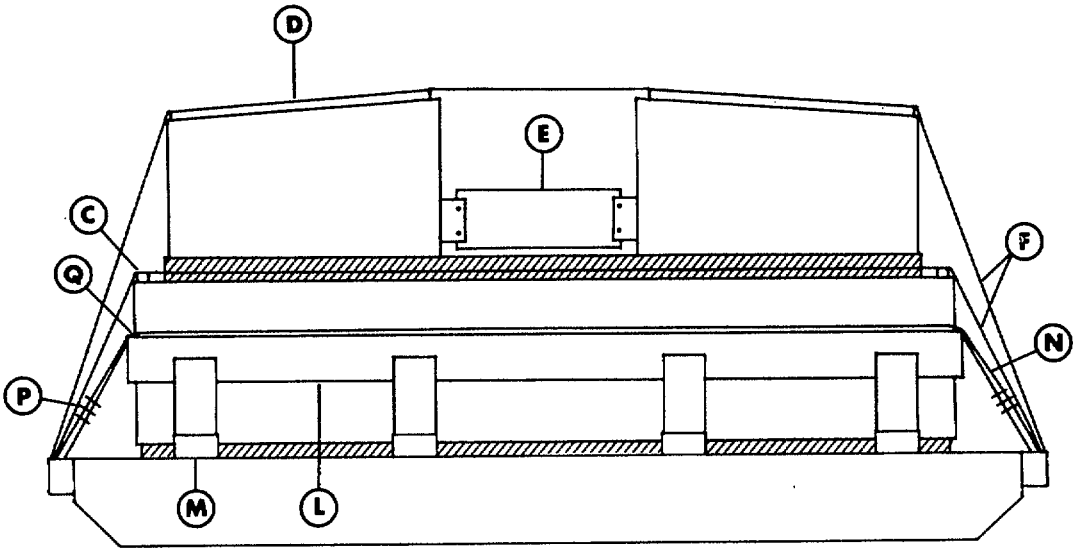

Figure 7-8. Blocking and tiedown of LACV-30 starboard forward buoyancy box and port and starboard forward side decks on CONUS general-purpose flatcar (end view "A").

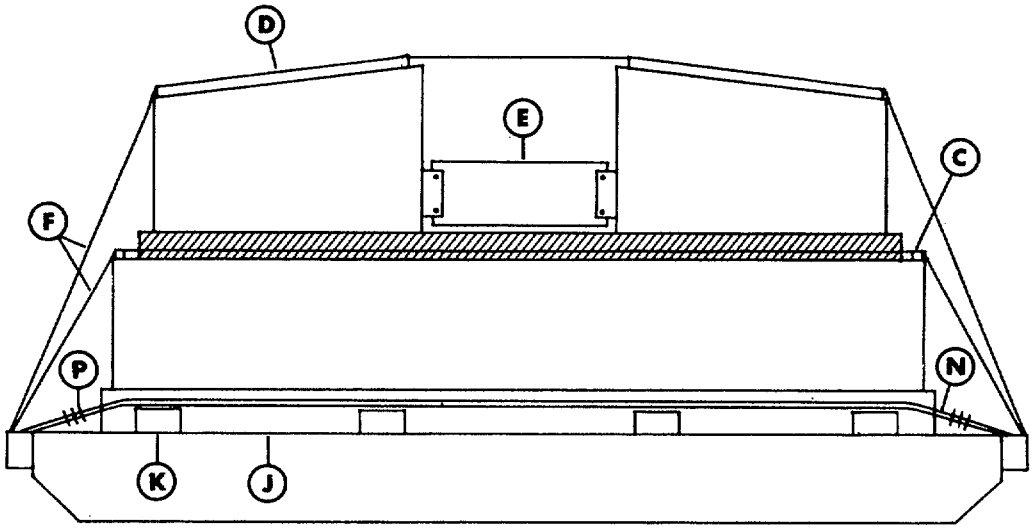

Figure 7-9. Blocking and tiedown of LACV-30 starboard forward buoyancy box and port and starboard forward side decks on CONUS general-purpose flatcar (end view "B").

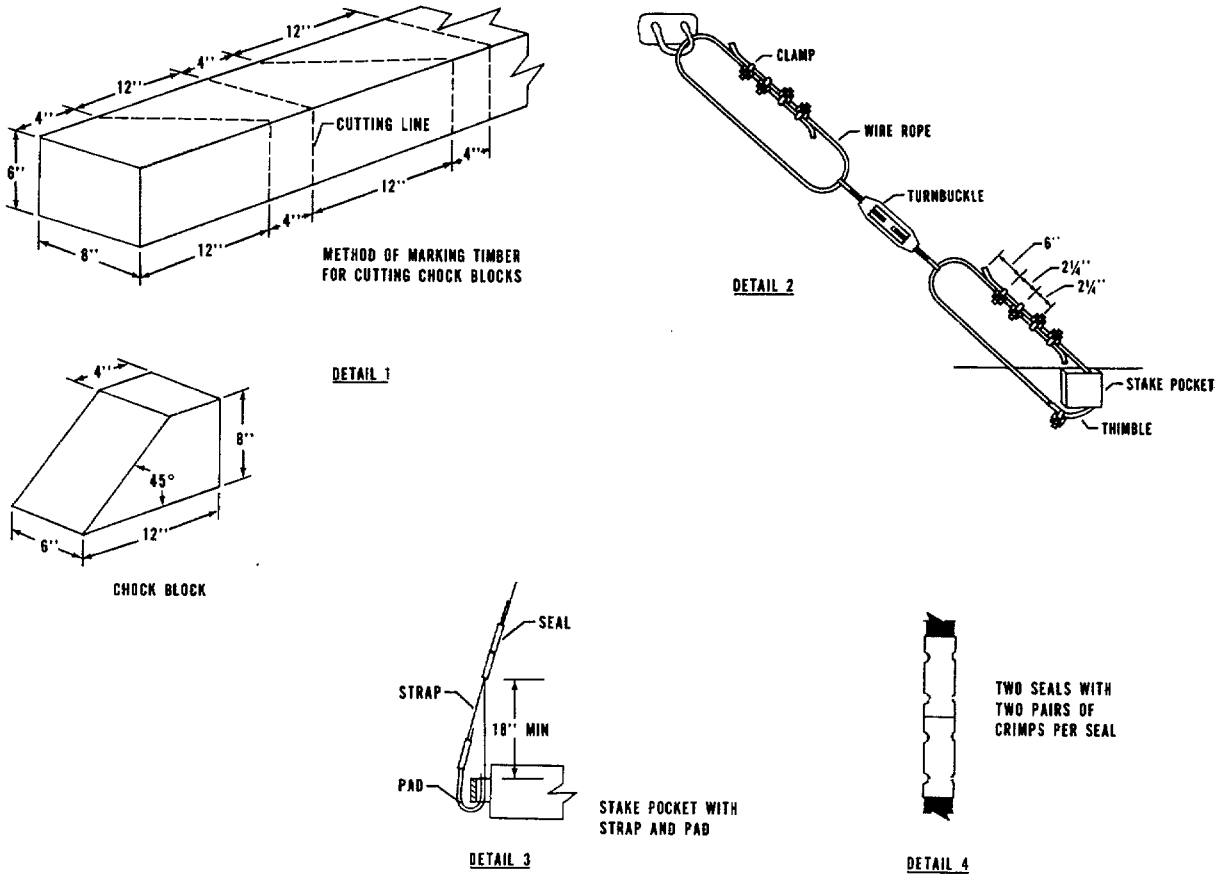

Figure 7-10. Blocking and tiedown details for figures 7-1 through 7-9.

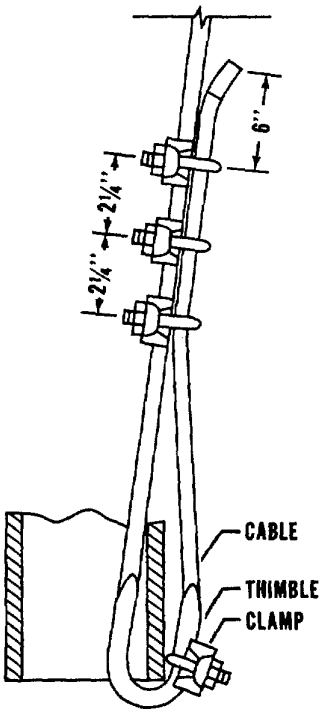

Figure 7-11. Blocking and tiedown details(railcar stake pocket and wire rope loop)

Section III. TRANSPORT ON FORIEGN RAILROADS.

7-7. General

The transportability guidance contained m this section is applicable when the LACV-30 is transported on foreign railways.

*N*OTE

Bulkhead flatcars with end-of-car cushioning probably will not be available in overseas areas. If sensitive components of the LACV-30 we loaded on general-purpose flatcars, special handling will be re-quired by the railroad to prevent damage to components.

The sectionalize LACV-30 can be transported without restriction within European countries complying with the international loading gauge. This also applies to the majority of the countries of the Middle East, South America, Australia, India, and Pakistan. Clearances vary between countries and within a country. Consequently, evaluation of transport capability must be made on an individual basis.

7-8. Transport on European Flatcars

The sectionalized LACV-30 can be transported on a number of European flatcars, provided that the 40.1-foot-long modules are loaded on flatcars that are at least 50 feet long and 9 feet wide. The requirements for loading, blocking, and tiedown are essentially the same as within CONUS.

Table 7-1. Bill of Materials for Blocking and tiedown of LACV-30 Components on Five Railcars

Item	Description	Approximate Quantity
Lumber	Douglas fir, or comparable, straight-grain, free from material defects; Fed Spec MM-L-751H:	
	1-x 4-inch	70 linear ft
	2- x 4-inch	177 linear ft
	2- x 6-inch	56 linear ft
	2- x 8-inch	17 linear ft
	4- x 4-inch	98 linear ft
	4- x 6-inch	32 linear ft
	4- x 8-inch	54 1inear ft

Table 7-1 Continued

Item	Description	Approximate Quantity
	6- x 8-inch	51 linear ft
Plywood	3/4-inch thick	4 square ft
Styrofoam	Beadboard, 4-inch x 4- x 8-foot (may also be supplied in 4-inch x 2- x 8-foot sheets)	55 sheets
Nails	Common, steel; flathead; bright; table XI-b, Fed Spec FT-N-105B: 20d	70
	30d	80
	40d	480
Wire rope	6x19, IWRC; improved plow steel; preformed, regular-lay; table X, Fed Spec RR-W-410C: 3/8 inch	268 ft
Thimbles	Standard, open-type: 3/8-inch	36
Clamps	Wire rope, U-bolt clips, saddled, single-grip, steel, Crosby heavy-duty, or equal; Fed Spec FF-C-450D: 3/8-inch	148
Turnbuckles	Eye-and-eye, galvanized, weldless, dropforged, 5/e-inch eyes, 12-inch takeup	8
Strapping	Steel, high tension; Fed Spec QQ-S-781H, type I or IV, 1 1/4- x .035-inch	1,215 ft
Seals	Steel strapping; Fed Spec QQ-S-781H, type D	410

Table 7-2. Application of Materials for Blocking and Tiedown of LACV-30 Components Shown in Figure 7-1

Item	No. Required	Application
A		Styrofoarn Beadboard, 4-inch x 4- x 8-foot sheets or 4-inch x 2- x 8-foot sheets. Distribute beneath the sectionalized components to protect the hinge attachment points and to provide separation of the components from the railcar deck. Position between all stacked components to protect the hinge attachment points and to provide separation between components. Arrange so that approximately 50 to 60 percent of all bottom surfaces rest on the styrofoam bead-board.
B	16	Chock blocks (detail 1, fig 7- 10). Locate Flat portion of the block against both sides of the components. Space as shown in figure 7-1. Before nailing, install item C. Nail heel of block to car floor with three 40d nails, and toenail both sides of block to car floor with two 40d nails.
C	12	Filler strips. Cut pieces of 2- x 4- x 10-inch lumber and install between the side of the power module with port midcraft buoyancy box and the upper face of the chock blocks. The filler strip serves as a bearing plate for the face of the chock block and prevents pressure from being placed against the flange.
D	8	Wire rope, 3/8-inch. Locate as shown in figure 7-1. Form a complete loop through the railcar stake pocket and one eye of the turnbuckle (item G). Form a complete loop through the tiedown point of the module and the other eye of the turnbuckle. The ends of both loops of the wire rope must overlap at least 15 inches.
E	28	Clamps, 3/8-inch. Secure the ends of the wire rope at the overlap areas with four clamps spaced 21/4 inches apart, leaving a minimum of 6 inches from ends of rope. Place one additional clamp to secure thimble (item F) and wire rope together at stake pocket (detail 2, fig 7-10).
F	4	Thimble, open-type, 3/8-inch. Place one at bottom of each stake pocket where wire rope passes through (detail 2, fig 7-10). Attach thimble to wire rope with one clamp (item E).
G	4	Turnbuckles, 5/8-inch eyes. Tighten turnbuckles until wire rope loops are tensioned enough to cause a slight depression of Styrofoam Beadboard under load. DO NOT OVERTIGHTEN. Wire-tie turnbuckles to prevent loosening during transit.
H	16	Strapping boards, 2- x 4- x 10-inch lumber, beveled to fit top edges of modules. Position under steel straps (item K) to protect flanges and corners of modules.
J	2	Strapping boards, 1- x 4-inch x 10-foot lumber. Position under steel straps (item K) across walkways of cabin module.
K	10	Steel straps, 1 1/4- x .035-inch x cut-to-length. Position as shown in figure 7-1. Each strap is fabricated by looping a length of strapping through the stake pocket on each side of the railcar, with a pad (item L) between the strap and the railcar stake pocket. The loops are formed by attaching two seals (item M), butted together, at least 18 inches above the railcar deck (detail 3, fig 7-10). Overlap the two lengths of strapping at the top of the load, tighten, and join with two seals butted together. All seals at strapping joints must have two pairs of crimps per seal (detail 4, fig 7-10).
L	20	Pad, 1 /4- x .035 x 18-inch steel strap. Position under and seal to item K at each stake pocket (detail 3, ft 7-10).
M	80	Seals, steel strapping. Two seals required for joining strapping at each joint (detail 4, fig 7-10). One seal required for securing each pad (item L) to strap.
N	as required	Bracing. Consists of 2- x 8-inch x cut-to-length lumber. Brace as required between modules to prevent for-and-aft movement. Secure to car deck and to other bracing with 40d nails. Lumber for this requirement not included in table 7-1.

*Table 7-3. Application of Materials for Blocking and Tie*down *of LACV-30 Components Shown* in *Figure 7-2*

Item	No. Required	Application
A		Styrofoam beadboard, 4-inch x 4- x 8-foot sheets, or 4-inch x 2- x 8-foot sheets. Distribute beneath the sectio*nalized* components, except the crated propellers, to protect the hinge attachment points and to provide separation of the components from the railcar deck. Position between all stacked components, except the crated propellers, to protect the hinge attachment points and to provide separation between components. Position between the ends of the port and starboard aft side decks and the railcar bulkhead. Arrange so that approximately 50 to 60 percent of ail bottom surfaces rest on the styrofoam beadboard.

Table 7-3 - Continued

Item	No. required	Application
B	14	Chock blocks (detail 1, fig 7-10). Locate flat portion of the block against both sides of the modules. Spaces shown in figure 7-2. Before nailing, install filer strips (item C). Nail heel of block to car floor with three 40d nails, and toenail both sides of block to car floor with two 40d nails.
C	14	Filler strips. Cut 14 pieces of 2- x 4- x 10-inch lumber and install between the sides of the modules and the upper face of the chock blocks. The filer strips serve as bearing plates for the face of the chock blocks and prevent pressure from being placed against the flange of the module.
D	8	Wire rope, 3/8-inch. Locate as shown in figure 7-2. Form a complete loop through the railcar stake pocket and one eye of the turnbuckle (item G). Form a complete loop through the tiedown point of the module and the other eye of the turnbuckle. The ends of both loops of the wire rope must overlap at least 15 inches.
E	28	Clamps, 3/8-inch. Secure the ends of the wire rope at the overlap area with four clamps spaced 21/4 inches apart, leaving a minimum of 6 inches from ends of rope. Place one additional clamp to secure thimble (item F) and wire rope together at stake pocket (detail 2, fig 7-10).
F	4	Thimble, open-type, 3/8-inch. Place one at bottom of each stake pocket where wire rope passes through (detail 2, fig7-10). Attach thimble to wire rope with one clamp (item E).
G	4	Turnbuckles, 5/8-inch eyes. Tighten the tumbuckles until wire-rope loops are tensioned enough to cause a slight depressing of styrofoarn Beadboard under the load. DO NOT OVERTIGHTEN. Wire-tie turnbuckles to prevent loosening during transit.
H	20	Strapping boards, 2- x 4- x 10-inch lumber, beveled to fit top edges of modules. Position under steel straps (item K) to protect flanges and comers of modules.
J	6	Risers, 2- x 4-inch x 10-foot lumber. Position underneath and between stacked, crated propellers to permit handling by forklift.
K	13	Steel straps, 1 1/4- x .035-inch x cut-to-length. Position as shown in figure 7-2. Each strap is fabricated by looping a length of strapping through the stake pocket on each side of the railcar, with a pad (item L) between the strap and the railcar stake pocket. The loops are formed by attaching two seals (item M), butted together, at least 18 inches above the railcar stake pocket (detail 3, fig 7- 10). Overlap the two lengths of strapping at the top of the load, tighten, and join with two seals (item M) butted together. All seals at strapping joints must have two pairs of crimps per seal (detail 4, fig 7-10).
L	26	Pad, 1 1/4- x .035- x 18-inch steel strap. Position under and seal to item K at each stake pocket (detail 3, fig 7-10).
M	104	Seals, steel strapping. Two seals required for joining strapping at each joint (detail 4, fig 7-10). One seal required for securing each pad (item L) to strap.
N	as required	Bracing. Consists of 2- x 8-inch x cut-to-length lumber. Brace as required between modules to prevent fore-and-aft movement. Secure to car deck and to other bracing with 40d nails. Lumber for this requirement not included in table 7-1.

Table 7-4. Application of Materials for Blocking and Tiedown of LACV-30 Components Shown in Figure 7-3

Item	No. required	Application
A		Styrofoam Beadboard, 4-inch x 4- x 8-foot sheets, or 4-inch x 2- x 8-foot sheets. Distribute beneath the aft center module with midcraft center buoyancy box to protect bottom of the module. Position between aft end of the module and the railcar bulkhead. Arrange so that approximately 50 to 60 percent of the bottom surface of the module rests on styrofoam beadboard.
B	14	Chock blocks (detail 1, fig 7-10). Locate blocks against both sides of the module, spaced as shown in figure 7-3. Place two blocks against the forward end of the midcraft center buoyancy box. Before nailing, install filer strips (item C). Nail heel of block to car floor with three 40d nails, and toenail both sides of block to car floor with two 40d nails. Locate two chock blocks against each end of the pallet holding the flexible trunk system and nail to the car floor as above.
C	10	Filler strips. Cut 10 pieces of 2- x 4- x 10-inch lumber and install between the module and the upper face of the chock blocks. The flier strips serve as bearing plates for the face of the chock blocks and prevent pressure from being placed against the flange of the module.
D	3	Risers, 4- x 4-inch x 6-foot lumber. Position underneath unitized load spreaders and t*racks* to pe*rmi*t handling by forklift.
E	2	Bulkhead blocking. Cut two pieces of 2- x 8- x 48-inch lumber and place on edge against the stair-stepped ends of the stacked and banded load spreaders and tracks. Position two pieces of 4- x 4-inch x cut-to-length lumber between each of the 2- x 8- x 48-inch pieces and the railcar bulkhead. Toenail to the bulkhead and to the 2- x 8- x 48-inch pieces with two 20d nails on each side.
F	2	End braces. Position two pieces of 4- x 4- x 24-inch lumber against the end of the load spreaders, and toenail to the railcar floor with four 40d nails through each end. Position upright pieces of 2- x 8- x 24-inch lumber against the load spreaders and nail to each 4- x 4- x 24-inch piece with four 20d nails. Complete the braces by nailing pieces of 2- x 8-inch x cut-to-4ength lumber to the top of the upright pieces and to the 4- x 4- x 24-inch pieces with four 20d nails at each end.
G	5	Strapping boards, 1- x 4-inch x cut-to-length lumber. Position under steel straps (item J).
H	10	Strapping boards, 2- x 4- x 10-inch lumber, beveled to fit top edges of module. Position under steel straps (item J) to protect flanges and corners of module.
J	12	Steel straps, 1 1/4- x .035-inch x cut-to-length. Position as shown in figure 7-3. Each strap is fabricated by looping a length of strapping through the stake pocket on each side of the railcar, with a pad (item K) between the strap and the

Table 7-4-Continued

Item	No. Required	Application
		railcar stake pocket. The loops are formed by attaching two seals (item L), butted together, at least 18 inches above the stake pocket (detail 3, fig 7-10). Overlap the two lengths of strapping at the top of the load, tighten, and join with two seals (item L) butted together. All seals at strapping joints must have two pairs of crimps per seal (detail 4, fig 7-10).
K	24	Pad, 1 1/4- x .035- x 18-inch steel strap. Position under and seal to item J at each stake pocket (detail 3, fig 7-10).
L	96	Seals, steel strapping. Two seals required for joining strapping at each joint (detail 4, fig 7-10). One seal required for securing each pad (item K) to strap.

Table 7-5. Application of Materials for Blocking and Tiedown ofLACV-30 Components Shown in Figures 7-4, 7-5, and 7-6

Item	No Required	Application
A		Brake-wheel clearance. Minimum clearance required is 6 inches above, in back of, and on both sides of and 4 inches underneath wheel (fig 7-4).
B		Styrofoarn beadboard, 4-inch x 4- x 8-foot sheets, or 4-inch x 2- x 8-foot sheets. Distribute beneath the sectionalized components to protect the hinge and attachment points and to provide separation of the components from the railcar deck. Position between stacked components to protect the hinge attachment points and to provide separation between components. Arrange so that approximately 50 to 60 percent of all bottom surfaces rest on the styrofoam beadboard.
C	20	Strapping boards, 2- x 4- x 10-inch lumber, beveled to fit top edges of modules. Position under steel straps (item D) to protect flanges and comers of modules.
D	10	Steel straps, 1 1/4- x .035-inch x cut-to-length. Position as shown in figure 7-4. Each strap is fabricated by looping a length of strapping through the stake pocket on each side of the raiicar, with a pad (item E) between the strap and the stake pocket. The loops are formed by attaching two seals (item F), butted together, at least 18 inches above the stake pocket (detail 3, fig 7-10). Overlap the two lengths of strapping at the top of the load, tighten, and join with two seals (item F) butted together. All seals at strapping joints must have two pairs of crimps per seal (detail 4, fig 7-10).
E	20	Pad, 1 1/4**-** x .035- x 18-inch steel strap. Position under and seal to item D at each stake pocket (detain 3, fig 7-10).
F	80	Seals, steel strapping. Two seals required for joining strap at each joint (detail 4, fig 7-10). One seal required for securing each pad (item E) to strap.
G	1	Lower end brace, 4- x 8-inch x 9-foot. Stand on 4-inch edge against the end of the bottom module and toenail to the railcar deck with ten 40d nails.
H	4	Backup cleats, 4- x 4-inch x 4-foot. Place against item G and nail to railcar deck with five 30d nails through each.
J	1	Upper end brace. Consists of four pieces of 2- x 6-inch x 7-foot lumber nailed to one piece of 4- x 8-inch x 9-foot lumber. With two 40d nails through each 2- x 6-inch x 7-foot piece. Place the 4- x 8-inch x 9-foot piece against the end of the top module and nail the lower ends of the 2- x 6-inch x 7-foot pieces to the backup cleats (item H) with three 20d nails through each.
K	1	Lower end brace. Consists of four pieces of 4- x 6-inch x 4-foot lumber nailed to one piece of 4- x 8-inch x 9-foot lumber with two 40d nails through each 4- x 6-inch x 4-foot piece. Place the 4- x 8-inch x 9-foot piece against the end of the lower module and toenail the lower ends of the 4- x 6-inch x 4-foot pieces to the railcar deck with two 40d nails through each side of each piece.
L	4	Backup cleats, 4- x 4-inch x 4-foot. Place one against the end of each 4- x 6-inch x 4-foot piece (item K) and nail to the railcar deck with five 30d nails through each.
M	1	Upper end brace. Consists of four pieces of 2- x 6-inch x 7-foot lumber nailed to one piece of 4- x 8-inch x 9-foot lumber with two 40d nails through each 2- x 6-inch x 7-foot piece. Place the 4- x 8-inch x 9-foot piece against the end of the top module and nail the lower ends of the 2- x 6-inch x 7-foot pieces to the backup cleats (item L) with three 20d nails through each.
N	4	Wire rope, 3/8-inch. Locate as shown in figure 7-4. Form a loop through the railcar stake pocket (fig 7-11), pass the wire rope around the end brace, and form a loop through the stake pocket on the opposite side of the railcar. Position the wire rope in the notch of each end brace. Place a thimble (item P) underneath the wire rope at each end of the end brace. The wire rope may be tensioned with an appropriate size come-along mechanical hoist or equal tensioning device.
O	40	Clamps, 3/8-inch. Secure the wire-rope loops with three clamps spaced 21/4 inches apart, leaving a minimum of 6 inches from ends of rope. Place one additional clamp to secure thimble (item P) and wire rope together at stake pocket (fig 7-11).
P	16	Thimble, open-type, 3/8-inch. Place one at bottom of each stake pocket where wire rope passes through (fig 7-11). Attach thimble to wire rope with one clamp (item O). Place one thimble underneath the wire rope at each end of the end braces.

Table 7-6. Application of Materials for Blocking and Tiedown ofLACV-30 Components Shown in *Figures* 7-7, 7-8, *and* 7-9

Item	No. required	Application
A		Brake wheel clearance. Minimum clearance required is 6 inches above, in back of, and on both sides of and 4 inches underneath wheel (fig 7-7)
B		Styrofoam beadboard, 4-inch x 4-x 8-foot sheets, or 4-inch x 2-x 8-foot sheets. Distribute beneath the sectionalized components to protect the hinge and attachment points and to provide separation of the components from the railcar deck. Position between stacked components to provide separation between components. Arrange so that approximately 50 to 60 percent of all bottom surfaces rest on the styrofoam beadboard.

Table 7-6-Continued

Item	No. required	Application
C	12	Strapping boards, 2- x 4- x 10-inch lumber, beveled to fit top edge of bottom module. Position under steel strap (item F) to protect flanges and corners of bottom module.
D	10	Strapping boards, 1- x 4- x 36-inch lumber. Position under steel straps (item F) crossing top modules.
E	3	Plywood, 3/4- x 8- x 24-inch (approximate). Bolt to flanges of side decks at three places to maintain separation.
F	11	Steel straps, 1 1/4- x .035-inch x cut-to-length. Position as shown in figure 7-7. Each strap is fabricated by looping a length of strapping through the stake pocket on each side of the railcar, with a pad (item G) between the strap and the stake pocket. The loops are formed by attaching two seals (item H), butted together, at least 18 inches above the stake pocket (detail 3, fig 7-10). Overlap the two lengths of strapping at the top of the load, tighten, and join with two seals (item H) butted together. All seals at strapping joints must have two pairs of crimps per sea] (detail 4, fig 7-10).
G	22	Pad, 1 1/4- x .035- x 18-inch steel strap. Position under and seal to item F at each stake pocket (detail 3, fig 7-10).
H	88	Seals, steel strapping. Two seals required for joining strap at each joint (detail 4, fig 7-10). One seal required for securing each pad (item G) to strap.
J	1	Lower end brace, 4- x 8-inch x 9-foot. Stand on 4-inch edge against the end of the bottom module and toenail to the railcar deck with ten 40d nails.
K	4	Backup cleats, 4- x 4-inch x 4-foot. Place against item J and nail to railcar deck with five 30d nails through each.
L	1	Lower end brace. Consists of four pieces of 4- x 6-inch x 4-foot lumber nailed to one piece of 4- x 8-inch x 9-foot lumber with two 40d nails through each 4- x 6-inch x 4-foot piece. Place the 4- x 8-inch x 9-foot piece against the end of the lower module and toenail the lower ends of the 4- x 6-inch x 4-foot pieces to the railcar deck with two 40d nails through each side of each piece.
M	4	Backup cleats, 4- x 4-inch x 4-foot. Place one against the end of each 4- x 6-inch x 4-foot piece (item L) and nail to the railcar deck with five 30d nails through each.
N	2	Wire rope, 3/8-inch. Locate as shown in figure 7-7. Form a loop through the railcar stake pocket, (fig 7-11), pass the wire rope around the end brace, and form a loop through the stake pocket on the opposite side of the railcar. Position the wire rope in the notch of each end brace. Place a thimble (item Q) underneath the wire rope at each end of the end brace. The wire rope may be tensioned with an appropriate size come-along mechanical hoist or equal tensioning device.
O	2	Wire rope, 3/8-inch. Form a loop through the railcar stake pocket, loop the wire rope around the side deck mooring bit, then through another stake pocket. The angle between the wire rope and the railcar deck should be as near to 45 degrees as possible. Place a thimble (item Q) on the wire rope where it passes through the stake pocket. Tension as for item N.
P	36	Clamps, 3/8-inch. Secure the wire-rope loops with three clamps spaced 2 1/2 inches apart, leaving a minimum of 6 inches from end of rope (fig 7-11). Place one additional clamp to secure thimble (item Q) and wire rope together at stake pocket.
Q		Thimble, open-type, 3/8-inch. Place one at bottom of each stake pocket where wire rope passes through (fig 7-11). Attach thimble to wire rope with one clamp (item P). Place one thimble underneath the wire rope at each end of the end braces.

APPENDIX
REFERENCES

1. Army Regulations (AR)

55-162 Permits for Oversize, Overweight, or Other Special Military Movements on Public Highways in the United States
55-355 Military Traffic Management Regulation
70-47 Engineering for Transportability
746-1 Color, Marking and Preparation of Equipment for Shipment

2. Army Field Manuals (FM)

55-17 Terminal Operations Specialist's Handbook

3. Other Publications and Sources of Procurement

a. Rail and Highway Shipment

(1) *Code of Federal Regulations,* Title 49-Transportation, Parts 170-179
Available from: Superintendent of Documents US Government Printing Office WASH DC 20402

(2) Association of American Railroads, *Rules Governing the Loading of Commodities on Open-Top Cars and Trailers*
Section No. 1-General Rules
Section No. 6-Rules Governing the Loading of Department of Defense Materiel on Open-Top Cars
Available from: Association of American Railroads, 59 E. Van Buren Street, Chicago, IL 60605

(3) International Road Federation *Limits of Motor Vehicle Sizes and Weights*
Available from: International Road Federation 1023 Washington Building, Washington, DC 20005

b. Water Shipment

Code of Federal Regulations,
Title 46-Shipping, Part 146
Available from: Superintendent of Documents US Government Printing Office, Washington, DC 20402

c. Bell Aerospace Publications

(1) 7467-954001, LACV-30 Operating Manual
(2) 7467-954002-1 *and* -2, LACV-30 Maintenance Manual

By Order of the Secretary of the Army:

E. C. MEYER
General United States Army
Chief of Staff

Official
J. C. PENNINGIDN
Major General, United States Army
The Adjutant General

U.S. GOVERNMENT PRINTING OFFIOE . 1988 - 216-454

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.