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TECHNICAL MANUAL

ENGINE SHIPPING INSTRUCTIONS

(ATOS)

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CHAPTER 1

INTRODUCTION

1.1 PURPOSE.

1.2 This technical order provides information and instructions for handling and shipping of Air Force engines. Because of the variations in engines and shipping devices some of the information in this manual is general in nature. When general instructions are given, the intent shall be fulfilled. Lack of specific details shall not constitute authority or permission to deviate from the intent of any instructions. Total compliance with these instructions shall be mandatory upon activities which have physical custody of the engine. The procedures outlined here are based on actual practices which have proved to be both practical and necessary in the protection of propulsion systems.

1.3 APPLICATION.

1.3.1 This technical order applies to all Air Force activities and contractors shipping Air Force engines. Only those devices listed in section III are authorized for shipment of engines without express written permission of the Engine Inventory Management at the responsible ALC.

1.3.2 Airlift trailers, stands and dollies shall be used for air shipment of engines when available. When not available, or as circumstances require, metal or FRP containers may be used. Shipments of metal containers will be allowed after preservation of the fuel system and the container is pressurized in accordance with engine handbooks, TO 2J-1-18 or TO 2R-1-11.

1.4 PERTINENT DIRECTIVES.

The following directives are important for the proper shipping of Air Force engines.

TO 2J-1-18	Corrosion Control of Jet Engines
TO 2R-1-11	Corrosion Control of Reciprocating Engines
AFR 71-4	Packaging and Handling of Dangerous Materials for Transportation by Military Aircraft
AFR 71-13	Packaging Improvement Report
AFR 75-1	Functions and Responsibilities of Transportation Activities
AFM 75-1	Transportation of Materiel
AFM 75-2	Military Traffic Management Regulations
AFR 75-18	Reporting of Transportation Discrepancies in Shipment

Military standards are referenced throughout this technical order.

1.5 MOVEMENT PLANNING GUIDE.

NOTE

The Transportation Officer should notify trucking companies when ordering trailers that only wood beds are acceptable as the Air Force has no available means of tying down to metal beds, trailers, or trucks.

1.5.1 Many facets must be considered in the selection of the mode of transportation to be used. Some of these are: weather, availability of preferred mode and carrier, distance, required delivery date (RDD), etc. Each shipment will have its own peculiarities, e.g., type of package, dimensions, freight, etc. Shipping activities must therefore plan and manage each and every shipment on its individual requirements. The standard transit time for aircraft jet engines moving within the CONUS is four (4) days. One exception is the required delivery date as reflected in RDD block of shipping document (DD FORM 1348-1), and is a factor to be considered in determining mode selection. This capability provides transportation an area of selection between shipping a specific engine on either an expedited or routine basis and at the same time effect delivery service to satisfy requirements of user or Specialized Repair Activity (SRA). It behooves each and every traffic manager to select a mode and carrier that can and does meet or exceed this criteria. Use of two drivers in conjunction with "exclusive use of

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vehicle” is authorized when an RDD dictates same. The pertinent Military Traffic Management Command (MTMC) agency must be informed of these requirements and decisions. You will challenge MTMC if their routings do not satisfy your requirements and in cases where carrier availability is a problem, alternate carriers should be requested.

1.6 SURFACE TRANSIT GUIDE.

1.6.1 The following transit times are based on an average. Weather, adverse road conditions, and highway traffic congestion are taken into consideration.

1.6.1.1 Class “A” Carriers.

1.6.1.1.1 Less than truck load (LTL) - Calculate approximately 300 miles per day maximum. This will be reduced when routes transit metropolitan areas and gateway terminals.

1.6.1.1.2 Truck load (TL) - Will normally insure expedited movement from carrier’s terminal but not necessarily reduced overall transit time unless exclusive use of vehicle is requested. This enables a serialized seal to be affixed and prevents delay at gateway points, but does not guarantee more than 500 miles transit daily.

1.6.1.2 Heavy Haulers Specialized Carriers.

1.6.1.2.1 Less than truck load (LTL) - This mode, with exceptions, can be beneficial from both a monetary and transit time viewpoint. Often a particular carrier will be “dead heading” equipment from point “A” to point “B” and an engine can be destined to a point enroute or at the terminus. Bills of lading shall be annotated “TENDERED AS AN LTL” to insure proper charges are affixed by the carrier.

1.6.1.2.2 Truck (TL) - This mode normally affords the most expeditious surface transportation. Two drivers with sleeper accommodations will normally insure eight to nine hundred miles transit each twenty-four hours.

1.6.1.2.3 Expedited service obviously is more costly than normal LTL rates. Each movement must therefore be considered on its own merits. The minimum cost mode should be selected that will deliver aircraft engines to the consignee by delivery date or UMMIPS. Note mileage chart ([Figure 1-1](#)).

TYPE AIRCRAFT	*DOOR DIMENSIONS			*CABIN DIMENSIONS				
	WIDE		HIGH	LONG	WIDE	HIGH		
C54	65"	X	93"	595	X	92	X	102
C97	171"	X	91"	762	X	102	X	96
C118	123"	X	75"	816	X	104	X	93
C121	104"	X	74"	984	X	120	X	84
C123	109"	X	75"	444	X	109	X	75
C124	135"	X	138"	882	X	135	X	138
C130	123"	X	109"	492	X	122	X	109
C135	115"	X	78"	858	X	127	X	84
**C141	123"	X	109"	840	X	122	X	109
CL-44	136"	X	80"	1008	X	136	X	80
C-5A	FWD 228"	X	161"	1453	X	228	X	161
C-5A	AFT 228"	X	134"	1453	X	228	X	161
DC7	78"	X	124"	816	X	93	X	104
DC9	136"	X	81"	822	X	114	X	81
L188	140"	X	80"	825	X	78	X	87
L100	123"	X	109"	584	X	120	X	111
C-17A	216"	X	177"	1016	X	216	X	158

NOTE

This chart can be used as a guide to determine the type engine that can be loaded on various types of cargo aircraft. Dimensions will vary slightly within "TYPE OF AIRCRAFT" due to model.

*Door and Cabin dimensions are reduced in height by four inches on all aircraft equipped with the 463L system.

**This height reduced to 106" by AFT pressure door latches when truck bed loading.

Figure 1-2. Aircraft Dimensions

CHAPTER 2 RESPONSIBILITIES

2.1 SHIPPING AND RECEIVING ACTIVITIES.

Responsibility for compliance with the technical order rests with the shipping and receiving activities in accordance with Department of Transportation regulations and AFR 75-1.

NOTE

The Transportation Officer should notify trucking companies when ordering trailers that only wood beds are acceptable as the Air Force has no available means of tying down to metal beds, trailers, or trucks.

2.1.1 The transportation officer of the shipping activity has the authority and responsibility to inspect and reject any vehicle which is considered unsatisfactory for engine shipment. This responsibility includes condition of transporting vehicle, proper loading, blocking, bracing, and documenting to prevent engine damage and assure expeditious delivery to ultimate consignee.

2.1.2 The transportation officer will reject any engine which has not been properly prepared for shipment in accordance with AFR 71-4, TO 2J-1-18, TO 2R-1-11, or NAVAIR 15-02-500.

2.1.3 Shipments reviewed intransit or terminating shall be visually inspected at each ON/OFF loading terminal for damage or unsatisfactory condition. Any damage or unsatisfactory conditions noted will be reported in accordance with AFR 71-13 or AFR 75-18.

2.1.4 In the event a trailer mounted engine is found leaking during air transit the engine will be removed from the aircraft at next destination and properly prepared in accordance with TO 2J-1-18. The engine will then be placed back into the transportation cycle for completion of shipment to primary destination.

NOTE

A DD FORM 6 will be prepared in accordance with AFR 71-13.

2.1.5 Shipments reviewed in transit or terminating shall be visually inspected at each ON/OFF loading terminal for damage or unsatisfactory condition. Any damage or unsatisfactory conditions noted will be reported in accordance with AFR 71-13 or AFR 75-18. Engines being received at terminating points, which are covered by plastic cover, will be inspected for damage prior to off loading from carriers equipment. To insure a thorough inspection is accomplished, removal of plastic cover is required, also for photographs if damage is detected. Damage detected should be noted on carrier's delivery document while facts are current and available.

2.1.6 Upon completion of inspection, engine will be rewrapped to comply with instructions contained in [Chapter 4](#), paragraph [4.1.2](#).

2.2 RECOMMENDED TECHNICAL ORDER CHANGES.

Recommendations for amendments to this technical order should be forwarded to Oklahoma City ALC/LPARP on AFTO FORM 22, TECHNICAL ORDER SYSTEM PUBLICATION IMPROVEMENT REPORT AND REPLY, in accordance with TO 00-5-1. To maintain this technical order current and adequate it shall be the responsibility of the prime shipping device item manager to review and update it as follows:

2.2.1 Addition of new equipment.

2.2.2 Changes in national stock number, part number, dimensions or special instructions concerning equipment.

2.2.3 Deletion of obsolete or discontinued equipment.

CHAPTER 3 ENGINE SHIPPING DEVICES

3.1 GENERAL INFORMATION.

This section lists the different types of shipping devices. Each engine has been listed along with its appropriate shipping device, national stock number (NSN) and part number (PN). Dimensions, weights, and shipping codes have also been listed where appropriate. Gross weights include engine, shipping device, adapters, plugs, required desiccant and preservation when used. Dimensions are stated to the nearest full inch. The weights indicated herein are average for the item named and it is possible that some variance will be noted. Therefore, all engines tendered for air shipment should be weighed before being released. Report significant differences in accordance with [Table 3-1](#), page 3-2.

3.2 SHIPMENT CENTER OF GRAVITY (CENTER OF BALANCE).

3.2.1 Marking of center of gravity (center of balance) will be in accordance with MIL-STD-129.

3.2.2 The center of gravity (center of balance) of a loaded wooden, FRP, or metal engine container is that location along the length of the container at which the container will balance on a fulcrum placed under and at right angles to the length of the container. The container may be placed on a single cross roller and moved until a balance point is reached.

3.2.3 The following formula shall be used for determining the center of gravity (center of balance) for aircraft engines mounted on trailers being shipped via aircraft.

3.2.3.1 Weight loaded trailer.

3.2.3.2 Weight both rear wheels.

3.2.3.3 Measure wheel base hub to hub.

3.2.3.4 Use formula per [Figure 3-1](#).

VEHICLE C.G. FORMULA:

$$\frac{A. \text{ REAR AXLE WEIGHT} \times \text{WHEEL BASE}}{\text{VEHICLE GROSS WEIGHT}} = \text{VEHICLE C.G. IN INCHES AFT OF FRONT AXLE}$$

Figure 3-1. Vehicle Center of Gravity Formula

Table 3-1. Trailers

Engine	National Stock Number	Part Number	Dimensions (Less Draw Bar)	Engine Weight	Device Weight	Gross Weight	Shipping Code*
a. Description. Cargo to be transported is basically comprised of aircraft engines and their shipping devices listed below.							
b. Configuration. Approximate characteristics of Oklahoma City ALC prime engines most frequently shipped:							
F101-GE-102	1740-00-713-5908	107640	185.5x58 1/2x99	4824	740	5564	SA
	1740-00-580-0494	105722	140x73x74	4135	980	5115	SA
F108	1740-01-127-4954	STC90856-1	170x67x97	4672	3200	7872	SA
F110-GE-100	1740-00-713-5908	107640	18.5x58.5x99	3865	740	4705	SA
F110-GE-129	1740-00-713-5908	107640	18.5x58.5x99	3980	740	4780	SA
F117PW-100	1740-01-457-9975	TT90-F-503	322x96x60	11500	2700	25200	SA
J-57-19W	1740-00-516-7930	100315	156x59x74	3970	690	4660	SA
	1740-00-713-5908						
	1740-00-554-1667	104624	157x73x74	3970	930	4900	SA
	1740-00-580-0494	105722	156x73x74	3970	860	4830	SA
J-57-21 23	1740-00-516-7930	100315	168x59x74	4615	690	5305	SA
	1740-00-713-5908	107640	168x59x74	4615	840	5455	SA
	1740-00-554-1667	104624	168x73x74	4615	930	5545	SA
	1740-00-580-0494	105722	168x73x74	4615	860	5475	SA
J-57-29	1740-00-516-7930						
	1740-00-713-5908	107640	156x59x74	3820	840	4660	SA

Table 3-1. Trailers - Continued

Engine	National Stock Number	Part Number	Dimensions (Less Draw Bar)	Engine Weight	Device Weight	Gross Weight	Shipping Code*
	1740-00-554-1667	104624	156x73x74	3820	930	4750	SA
	1740-00-580-0494	105722	156x73x74	3820	860	4680	SA
J-57-43WB	1740-00-516-7930	100315	156x59x74	3770	690	4460	SA
	1740-00-713-5908	107640	156x59x74	3770	840	4610	SA
	1740-00-554-1667	104624	156x73x74	3770	930	4700	SA
	1740-00-580-0494	105722	156x73x74	3770	860	4630	SA
J-57-55	1740-00-516-7930	100315	156x59x74	5259	690	5949	SA
	1740-00-713-5908	107640	156x59x74	5259	840	6099	SA
	1740-00-554-1667	104624	156x73x74	5259	930	6189	SA
	1740-00-580-0494	105722	156x73x74	5259	860	6119	SA
J-57-59	1740-00-516-7930	100315	156x59x74	4364	690	5054	SA
	1740-00-713-5908	107640	156x59x74	4364	840	5204	SA
	1740-00-554-1667	104624	156x73x74	4364	930	5294	SA
	1740-00-580-0494	105722	156x73x74	4364	860	5224	SA
J-57	1740-00-713-5908	107640	152x59x74	5155	825	5980	SA
J-79	1740-00-713-5908	107640	132x59x74	3150	880	4030	SA
	1740-00-516-7930	100315	132x59x74	3150	730	3880	SA

Table 3-1. Trailers - Continued

Engine	National Stock Number	Part Number	Dimensions (Less Draw Bar)	Engine Weight	Device Weight	Gross Weight	Shipping Code*
	1740-00-554-1667	104624	132x73x74	3150	970	4120	SA
	1740-00-580-0494	105744	132x73x74	3150	900	4050	SA
TF30	1740-00-580-0494	105722	140x73x74	4135	980	5115	SA
	1740-00-554-1667	104624	140x73x74	4135	1050	5185	SA
	1740-00-516-7930	100315	140x59x74	4135	810	4945	SA
	1740-00-713-5908	107640	140x59x74	4135	960	5095	SA
TF33-P3/P5/P9/P103/P102/P105	1740-00-554-1667	104624	140x73x85	4300	1150	5450	SA
	1740-00-580-0494	105722	140x73x85	4300	1080	5380	SA
TF33-P7 P100	1740-00-554-1667	104624	140x73x85	4750	1150	5900	SA
	1740-00-580-0494	105722	140x73x85	4750	1080	5830	SA
TF41	1740-00-516-7930	100315	132x59x82	3190	970	4160	SA
	1740-00-713-5908	107640	132x59x82	3190	1120	4310	SA
T58-3/5	1740-00-690-5284	103238	32x44x61	335	450	785	SA
T65-7-7A	1740-00-713-5908	107640	132x44x61	712	750	1462	SA
c. Configuration. Approximate characteristics of San Antonio ALC prime engines most frequently shipped:							
F100-PW-220		107640	215x59x87	3085	1479	4564	SA
F100-100	1740-00-713-5908	107640	215x59x87	3085	1479	4564	SA
F100-200	1740-00-713-5908	107640	215x59x87	3085	1479	4564	SA

Table 3-1. Trailers - Continued

Engine	National Stock Number	Part Number	Dimensions (Less Draw Bar)	Engine Weight	Device Weight	Gross Weight	Shipping Code*
T56	1740-00-713-5908	107640	132x59x74	1326	900	2226	SA
	1740-00-516-7930	100315	132x59x74	1326	750	2076	SA
T56	1740-00-718-1579	404190-1		1326	750	2076	SA
		-3		1326	750	2076	SA
J60	1740-00-690-5284	107238	132x44x61	460	450	910	SA
J65	1740-00-516-7929	100334	132x59x40	2690	500	3190	SA
TF34	1740-00-554-1667	3010	132x35x73	1443	1480	2923	SA
TF34	1740-00-713-5908	3000A	152x40x58 1/2	1443	1510	2953	SA
F100	1740-00-516-7930	100315	212x59x87	3085	1329	4414	SA
	1740-00-554-1667	104624	212x73x87	3085	1569	4654	SA
	1740-00-580-0494	105722	212x73x87	3085	1499	4584	SA
	1740-00-713-5908	107640	212x59x87	3085	1479	4564	SA
	1730-01-038-1371	ETU-100/E	73-x48x58	3085	650	3735	SA
F100-100	1740-00-713-5908	107640	212x59x87	3085	1479	4564	SA
F100-200	1740-00-713-5408	107640	212x59x87	3085	1479	4564	SA
F110-GE-100	1730-NCD-177309	ETU-114/E	90x48x56	3965	1020	4985	SA
F110-GE-129	1730-NCD-177309	ETU-114/E	90x48x56	3980	1020	5010	SA
TF39	1740-00-488-9469	UA533560-2	301x111x115	7260	12040	19300	SA

Table 3-1. Trailers - Continued

Engine	National Stock Number	Part Number	Dimensions (Less Draw Bar)	Engine Weight	Device Weight	Gross Weight	Shipping Code*
	1740-00-602-6365	4S30031-101A	255x110x114	7260	9180	16440	SA
T700	1740-00-435-7818	22142					
*SHIPPING CODE							
A. Suitable for air shipment or on-base movement only.							
S. Suitable for surface shipment or on-base movement only.							
SA. Suitable for surface or air shipment or on-base movement.							
Trailer Interchangeability:							
F100 Engines: -100 -200		1740-00-713-5908 - 1740-00-516-7930					
All J57 Engines:		1740-00-516-7930 - 1740-00-713-5908					
All TF30-TF33 Engines:		1740-00-554-1667 - 1740-00-580-0494					
All TF41-TF41A1 Engines:		1740-00-516-7930 - 1740-00-713-5908					
All J75:		Only 1740-00-713-5908					
All T700:		1730-00-435-7818					
F107-WR-101	8145-01-125-1478AN	11214-5310-1	35.25x27.0x57.0	156	140	296	
F107-WR-400	8145-01-125-1473AN	11214-5310-2	35.25x27.0x57.0	148	142	290	
F112-WR-100	8145-01-206-9889AN	11214-6792-1	31.5x31.0x43.0	276	134	410	
J35-35	8145-00-390-5568	600	125x66x70	1782	2090	3872	
J47-25	8145-00-308-4814	508E667	138x53x58	2365	1775	4140	
J47-27	8145-00-308-4814	508E667	138x53x58	2475	1775	4250	
J52-3	8145-00-680-2321	P13721	194x62x74	2189	3800	5989	
J57-13	8145-00-587-2431	P12888	194x62x73	5069	3800	8869	
J57-19	8145-00-587-2431	P12888	194x62x73	3970	3800	7770	

Table 3-1. Trailers - Continued

Engine	National Stock Number	Part Number	Dimensions (Less Draw Bar)	Engine Weight	Device Weight	Gross Weight	Shipping Code*
J57-21	8145-00-587-2431	P12888	194x62x73	4615	3800	8415	
J57-23	8145-00-587-2431	P12888	194x62x73	4615	3800	8415	
J57-29	8145-00-587-2431	P12888	194x62x73	3820	3800	7620	
J57-43	8145-00-587-2431	P12888	194x62x73	3770	3800	7570	
J57-53	8145-00-587-2431	P12888	194x62x73	5089	3800	8889	
J57-55	8145-00-587-2431	P12888	194x62x73	5259	3800	9059	
J57-59W	8145-00-587-2431	P12888	194x62x73	4320	3800	8120	
J57-59	8145-00-587-2431	P12888	194x62x73	4364	3800	8164	
J60 ALL	8145-00-845-7668	P24984	96x48x54	460	905	1365	
J65 ALL	8145-00-390-5574	419194	133x59x65	2690	2100	4790	
J69-25	8145-00-292-9642	565081-1	74x40x43	380	686	1066	
J71-11, A13	8145-00-597-5772	6800032	200x64x75	4000	2725	6725	
	8145-00-598-7848	673862	232x64x75	4000	5150	9150	
T700	8145-01-059-5689AN	8145CON004-1					
T700-GE-700	8145-00-772-7870		25x47		423		
Engine	National Stock Number	Part Number	Dimension	Engine Weight	Device Weight	Gross Weight	Shipping Code*

Table 3-1. Trailers - Continued

Engine	National Stock Number	Part Number	Dimensions (Less Draw Bar)	Engine Weight	Device Weight	Gross Weight	Shipping Code*
J75-19	8145-00-664-9558	P11784	214x70x79	5155	5056	10211	
J75-19A/B	8145-00-626-3681	P13327	214x70x79	730	5056	5786	
J75-17	8145-00-664-9558	P11784	214x70x79	5155	5056	10211	
J57-17A/B	8145-00-626-3681	P13327	214x70x79	730	5056	5786	
J79-11	8145-00-785-4808	7036R41G4	170x64x65	3150	2880	6030	
J79-11	8145-00-590-4854	105R200G4	170x64x65	3150	2880	6030	
J79-15	8145-00-785-4811	105R200G4	170x62x75	3150	2900	6050	
Engine	National Stock Number	Part Number	Dimension (Less Draw Bar)	Engine Weight	Device Weight	Gross Weight	Shipping Code*
J85-5, 13	8145-00-044-8858	6999T14G01	70x42x46	448	610	1058	
J85-5, 13	8145-00-929-9454	37E501460	66x40x44	484	859	1058	
J85-5, 13	8145-00-994-3823	37E501460	66x40x44	448	859	1058	
J85-5	8145-00-988-3676	5999T20G02	117x40x41	584	275	859	
J85-7	8145-00-994-3822	37E501460	66x40x44	428	610	1038	
J85-17,17A	8115-00-251-9495	G001 6999T03G01	64x40x46	428	610	1038	
J85-17	8145-00-005-8744		60x41x41	428	200	628	
J85-21	8145-00-032-6705	6999T27	73x40x45	520	700	1220	

Table 3-1. Trailers - Continued

Engine	National Stock Number	Part Number	Dimensions (Less Draw Bar)	Engine Weight	Device Weight	Gross Weight	Shipping Code*
		G01					
J100CA100	8145-00-146-3829	7140235	74x40x43	430	705	1135	
T53-L13	8145-00-772-7870	8115CONO24-3	75x40x43	550	657	1207	
T56 ALL	8145-00-550-7451	6800201	176x51x61	1326	259	1585	
T56 ALL	8145-00-661-2972	6800302	39x22x16	548	343	891	
	8145-00-887-1949	6900399-25	44x40x40	548	402	950	
		0-09650-23					
T56 ALL	8115-00-526-2868	6800084	39x22x16	60	170	230	
TORQUEMETER							
T56-7, 9	8115-00-663-9802	6800083	111x46x50	1240	383	2624	
	8145-00-687-8110	6800216	111x46x50	1240	383	2624	
	8145-00-839-8418	6854347	126x52x61	1240	1545	2785	
	8145-00-888-3698	6800444	126x52x61	1240	1545	2785	
T56-9	8115-00-049-5204	6800087	111x46x50	1123	1500	2623	
T56-15	8145-00-839-8418	6854347	126x52x61	1326	1545	2871	
T56-15	8145-00-888-3698	6800444	126x52x61	1326	1545	2871	
T400-CP400	8145-00-465-6474	3018391	68x34x50	708	600	1308	
T400-GB400	8145-00-465-6373	3018392	52x36x33	450	350	800	
T76	8145-00-832-9706	869440-1	64x46x45	322	345	667	

Table 3-1. Trailers - Continued

Engine	National Stock Number	Part Number	Dimensions (Less Draw Bar)	Engine Weight	Device Weight	Gross Weight	Shipping Code*
TF39 RAW	8145-00-860-3622	9409M99	104x44x58	7260			
		VK193-0487					
		CD45A263					
TF39	8145-00-990-5307	4S90002-103A		7350			
BUILT-UP							
10-360 SERIES	8145-00-871-8557	SK1118, SK2100	60x42x46	450	500	950	
F100 INLET FAN	8145-00-394-6566PT	P50363	55x55x43	338	842	1180	
F100 INLET FAN	8145-01-116-9588PT	100975	53x53x43	338	477	815	
F100 CORE	8145-00-394-2056PT	P49167	101x61x65	1085	1874	2959	
F100 CORE	8145-01-116-9587PT	100766	100x62x63	1085	1387	2472	
F100 TURBINE	8145-00-394-6561PT	P49136	92x46x57	343	1045	1388	
F100 TURBINE	8145-01-116-9590PT	100999	92x47x48	343	676	1019	
F100 AUGMENTER	8145-00-394-6562PT	P49735	115x61x69	453	1590	2043	
F100 AUGMENTER	8145-01-116-9589PT	100987	114x62x67	453	1230	1683	
F100 GEAR BOX	8145-00-394-6673PT	P48226	35x33x25	78	187	265	
F100 GEAR BOX	8145-01-116-9586PT	100959	39x37x29	78	183	261	
T-56 COMP MODULE	8145-01-204-7393AS	23037010	53x38x46	416	440	855	
T56 TURB MODULE	2835-01-243-3721	6870436	32x33x43	405	225	630	

Table 3-2. Adapters

ENGINE	TYPE ADAPTER/ WEIGHT	TYPE TRAILER/WEIGHT	ENGINE WEIGHT/GROSS WEIGHT
TF30P3	NSN 1740 00 103 0870YZ/230#	NSN 1740 00 580 0494/750 #	4135/5115
TF30P7	NSN 1740 00 103 0870YZ/230#	NSN 1740 00 580 0494/750 #	4135/5115
TF30P9	NSN 1740 00 103 0870YZ/230#	NSN 1740 00 580 0494/750 #	4135/5115
TF30P100 TF33P3	NSN 1740 00 689 4115PQ/230#	NSN 1740 00 580 0494/750#	4135/5115
TF33P5	NSN 1740 00 911 1026/330#	NSN 1740 00 554 1667/820 #	4300/5450
TF33P7	NSN 1740 00 911 1026/330#	NSN 1740 00 580 0494/750 #	4750/5830
TF33P9	NSN 1740 00 911 1026/330#	NSN 1740 00 580 0494/750 #	4300/5380
TF33P100A	NSN 1740 00 911 1026/340#	NSN 1740 00 580 0494/750 #	4750/5840
TF41A1	NSN 1730 00 708 7948CN/390#	NSN 1740 00 713 5908/730 #	3190/4310
J57-19W	NSN 1730 00 589 9464/110#	NSN 1740 00 713 5908/730 #	3970/4810
J57-21	NSN 1730 00 573 5114/105#	NSN 1740 00 516 7930/580 #	4615/5300
J57-29WA	NSN 1730 00 589 9464/110#	NSN 1740 00 713 5908/750 #	3820/4680
J57-43WB	NSN 1730 00 589 9464/110#	NSN 1740 00 713 5908/750 #	3770/4630
J57-19	NSN 1730 00 657 1179/95#	NSN 1740 00 713 5908/750 #	5155/6000
J75-19W	NSN 1730 00 657 1179/95#	NSN 1740 00 713 5908/750 #	5155/6000
TF-34	NSN 4920 00 591 6975/780#	NSN 1740 00 713 5908/750 #	1443/2973
T-56	NSN 1730 00 238 8019/262#	NSN 1740 00 690 5184/750 #	1326/2338
J-60	NSN 1740 00 854 5972/226# NSN 1740 00 854 5973/16#	NSN 1740 00 690 5298/450 #	460/1136
J-65	NSN 1730 00 573 5115/133#	NSN 1740 00 516 7929/500 #	2690/3323
F100-PW-220	NSN 8145 01 050 5188PT/802#	NSN 1740 00 713 5908/740#	3085/4564
F-100	NSN 8145 01 050 5188PT/802#	NSN 1740 00 713 5908/740 #	3085/4627
F101-GE-102 21C7082G01	NSN 1740 01 166 1127/641# NSN 1740 01 108 3495	NSN 1740 00 713 5908/ 740#	4824/6205
F110-GE-100	NSN 1740 01 189 4164/765#	NSN 1740 00 713 5908/740	3965/5470
F110-GE-129	NSN 1740 01 189 4164/765#	NSN 1740 00 713 5908/740	3980/5470

Table 3-3. Shipping Device Weights

	<u>TRAILERS</u>	<u>STOCK NUMBER</u>	<u>WEIGHT</u>
300 Mod to		1740 00 516 7930	580=
3000E		1740 00 713 5908	730=
3010		1740 00 554 1667	820=
3030		1740 00 580 0494	750=
	<u>ADAPTERS</u>		
TF30		1740 00 103 0870YZ	230#
		1740 00 689 4415PQ	
TF33		1740 00 911 1026	330#
TF33 P100		1740 01 008 4348	330#
TF33 P102		1730-00-485-8615	330#
TF34		4920 00 591 6975	780#
TF41		1730 00 706 7948CN	390#
T56		1730 00 238 8019	262#
J57-19/2/9/43WB/59		1730 00 589 9464	110#
		1730 00 626 5691	190#
J57-13/21/23/55		1730 00 573 5114	105#
J60		1740 00 854 5972	226#
		1740 00 854 5973	16#
J65		1730 00 573 5115	113#
J75		1730 00 657 1179	95#
J79		1730 00 657 1178	150#
F100		8145 01 050 5188PT	802#
	<u>ENGINE</u>	<u>CONTAINER</u>	<u>STOCK NUMBER</u>
T58-3		37D400176P101	8145 00 859 0549
		5999T21G01	8145 00 988 3679
T58-5		37D400176G002	8145 00 928 4859
T64-7/7A		5999T05G01	8145 00 111 5843
		5999T05G02	8145 00 901 6327
T400-401/402		PK1361	8145 00 486 0245
T53-11/13		8115CON024-3	8145 00 772 7870
F200-23A Fiberglass		100975	8145 01 116 9588PT
Metal		P50363	8145 00 394 6566PT
F200-23B Fiberglass		P49167	8145 01 116 9597PT
Metal			8145 00 396 2056PT
F200-23C Fiberglass		100999	8145 01 116 9590PT
Metal		P49136	8145 00 394 5561PT
F200-23F Fiberglass		100987	8145 01 116 9589PT
Metal		P49735	8145 00 394 6562PT
F200-23G Fiberglass		100959	8145 01 116 9586PT
Metal		P48226	8145 00 394 6673PT
F200-23H Fiberglass		P50689	8145 01 035 1387PT

CHAPTER 4 PREPARATION AND INSPECTION

4.1 GENERAL INFORMATION.

4.1.1 This section provides information and instructions for the protection, preparation and inspection of Air Force engines for shipment. Preservation procedures are prescribed in TO 2J-1-18, TO 2R-1-11, and appropriate engine handbooks.

4.1.2 Engines designated for surface shipment shall be prepared for 1 to 180 days storage and engines designated for air shipment shall be prepared for over 180 days storage in accordance with TO 2J-1-18 or TO 2R-1-11.

NOTE

Extreme caution must be exercised to insure that all engines are drained of residual fuel and all drains are sealed. Flight safety of aircraft is seriously affected by drainage or residual fluids during shipment.

4.1.3 TF33 Engine. Position engine with large fan section to rear of trailer.

4.1.4 TF41 Engine. Position engine with top yoke frame member on front of trailer.

NOTE

Jet engines are not authorized for rail shipment unless approved by Item Manager and DSPP office at prime ALC. Approved for rail shipment is sometimes granted for engines being transported for salvage or other considerations to warrant rail movement.

4.2 REQUIRED DOCUMENTS AND ENTRIES.

4.2.1 Verify engine is prepared for shipment with the following entry made in the REMARKS section of the Consolidated Engine Management System (CEMS) A295, automated history program database:

Engine prepared for shipment in accordance with TO 2J-1-18, date, inspectors name and/or stamp.

4.2.2 Engines designated for airlift will require certification on DD FORM 1387-2 that the engines have been prepared and packaged in accordance with the applicable technical order and all certification requirements of AFR 71-4 have been accomplished. Certification of proper preparation, packaging, and marking is generally accomplished by transportation personnel. These individuals are authorized in writing to accomplish the DD FORM 1387-2 by virtue of attending a DoD hazardous materiel school. No person may perform duties and responsibilities for preparing and certifying engines unless he has satisfactorily completed that training.

NOTE

Above requirements do not apply to maintenance technicians.

4.2.3 Engines prepared for shipment on trailers, trucks, stands or dollies shall be tagged with AFTO FORM 81 or identified with the following markings on the wrapping on each side of the engine in two-inch high letters using red ink conforming to Federal Specification TT-I-558:

4.2.4

CAUTION

DELICATE AIRCRAFT ENGINE.
HANDLE WITH CARE DURING MOVEMENT/LOADING/OFF LOADING.

TO 00-85-20

When shipment of an engine is made on a stand, skid, trailer or in a container, the shipping device(s) will be listed on a DD FORM 1348-1 and accountability will be transferred to the accountable officer at destination. If an activity receives a trailer, stand, skid or adapter on a DD FORM 250 from a contractor, the receiving activity will handwrite a DD FORM 1348-1 for input to the base accountable record and pick up accountability for the trailer, stand, skid or adapter.

4.2.5 The shipment of any aircraft engine requiring air ride equipment for surface movement will be identified by annotating the supplemental information block of DD FORM 1387-2 to read "Surface via air ride vehicle required in accordance with TO 00-85-20."

4.3 PREPARATION FOR SHIPMENT.

The following sections will define procedures and policy depending upon what device is used and the mode of shipment selected for transporting engines. Special instructions for the T76 engine are also included.

4.4 SHIPMENTS ON TRANSPORTATION TRAILERS, SKIDS OR DOLLIES.

CAUTION

Under no circumstances should standard commercial hardware be used to fasten the engine support brackets to the engine or trailer. Use of lower strength hardware than specified could cause serious engine damage during shipment and handling.

NOTE

- Engine trailers shall be inspected prior to movement of engine for bent tie rods, tire condition and correct PSI, all locking pins in place, tow bar condition and check of front axle for cracks, broken welds and alignment. Adapter assemblies such as used on TF41 engines shall be stenciled: **DO NOT REMOVE WHILE ENGINE IS BEING TRANSPORTED.** Use red paint conforming to Federal Specification TTOP-37C or equivalent. The letters shall be one inch if room permits; if not, paint the letters at least 3/4 of the surface size being painted. Removal of this equipment while in transit has resulted in engines being damaged. All engine openings will be closed in accordance with section IV, TO 2J-1-18.
- Shipping of engines using transition or installation equipment adapters are prohibited. Only transportation adapters with tie down provisions for surface shipment are permissible.
- The Transportation Officer should notify trucking companies when ordering trailers that only wood beds are acceptable as the Air Force has no available means of tying down to metal beds, trailers, or trucks.

4.4.1 Engines mounted on trailers, trucks, stands or dollies shall be protected from the elements and foreign matter by a cover or shroud. The cover or shroud will be designed and/or installed in such a manner that it will also serve as a leakage receptacle which will trap any residual fluid leakage from the engine. Barrier material will be placed on the engine at necessary points to prevent the engine cover or shroud from tearing on sharp protrusions. (Optional material which can be used in MA4050, NSN 9330-01-308-5153.)

NOTE

Since it is virtually impossible to eliminate seepage from preserved engines, it has become necessary to include an absorbent material under the engine wrap next to engine to absorb fluid leakage. The material to be used is T-500, NSN 9330-01-334-3304. This will eliminate air aborts as a result of leakage during airlift (TO 2J-1-18, section VIII).

4.4.1.1 All unpurged engines on trailers will have a first wrap of conductive material such as MIL-B-81705, type II, NSN 9330-00-113-9438 (500 foot roll), or MIL-P-82646 (not stocklisted). This will replace L-P-378 that is most commonly used as the first wrap. Additional wraps and barriers will continue as at present.

CAUTION

We emphasize that the use of conductive wrap on unpurged engines is to minimize the risk of ignition. Under no circumstances is this a substitute for properly purging engines.

4.4.1.2 Covers of shrouds will be installed on trailer mounted engines in the following preferred order:

4.4.1.2.1 Flexible environmental control containers, conforming to MIL-C-9959 (reusable) (Figure 4-2) or MIL-C-58104 (AV).

4.4.1.2.2 Shroud type covers. Materials suitable for shrouding engines are 0.004 inch (4MIL) polyethylene (specification MIL-P-3803) and vinyl coating glass fibre laminated material (open weave) or equivalent (Figure 4-3). Shroud type covers are the least preferred methods of protecting engines and use of the shroud will be limited to shipments where inside or covered storage/transport provides a degree of environmental control beyond that offered by the shroud. Shrouds are not intended for use as engine storage containers and shall be restricted in use from 45 to 180 days.

4.4.2 Engines prepared for air shipment.

4.4.2.1 Engines for air shipment will be purged in accordance with TO 2J-1-18 or TO 2R-1-11.

4.4.2.2 Airlift, whenever feasible, will be the preferred mode of transportation for trailer mounted engines.

4.4.2.3 See Chapter 6 for additional instructions on tiedowns.

4.4.3 Engines prepared for truck shipment.

4.4.3.1 Engines for truck shipment will have their fuel systems purged in accordance with TO 2J-1-18 or TO 2R-1-11.

4.4.3.2 Truck shipments of engines mounted on airlift trailers will be tied down as follows:

4.4.3.2.1 Position trailer parallel with truck bed. Recommend towbar faces aft for ease of off loading.

4.4.3.2.2 Apply brakes.

4.4.3.2.3 Be sure rail clamps on roller adapters are tight (Table 4-2).

4.4.3.2.4 Position tiedown chains or cables to avoid contact with each other, parts of the engine, or trailer to prevent chafing.

4.4.3.2.5 Maintain lowest or smallest possible angle between floor and tiedown chain, 45° or less.

4.4.3.2.6 Position wood chocks in accordance with Chapter 6.

4.4.3.3 Engines on dollies will not have the wheels raised permitting the dolly frame to rest on the floor.

4.4.3.4 Engines shipped on open type carrier equipment shall be covered with tarpaulins which will protect the engines from the weather elements. The tarps will be installed and fastened in a manner which will prevent vibrations and flapping during movement.

NOTE

T58 engines may be shipped on trailers with QEC kit installed.

4.4.3.5 Trailer mounted engines will not be shipped on “Hot Shot” equipment (pickup vehicles with fifth wheel gooseneck type hook-up), pulling a mini trailer. Pickup vehicles with improved commercial type truck and trailer hook-ups are acceptable.

NOTE

Fragile external components will be protected from damage due to tarpaulins by the use of fiberboard blocks, rigid plastic foams, wood, etc.

4.4.4 Rail and ocean transportation of trailer mounted engines is prohibited.

NOTE

- Special designated calibration engines and correlation kits will be transported on surface by air ride tractors and air ride trailers.
- TF41 Gold Plate Engine with tail pipe attached and installed on shipping and test adapter, part number 6872766, may be shipped via surface or air.

4.4.5

CAUTION

- Pneumatic suspension (air ride) is a suspension system that utilizes air bags and does not have springs (see [Figure 4-3](#)). Failure to comply with this requirement may result in damage to engine bearings and other vital engine components.
- When preparing the F108 engine for surface shipment, ensure no tie downs cross over any portion of the cradle and shock mount assembly. Any tie down attached to or which passes over cradle and shock mount would eliminate shock dampening feature and result in engine bearing damage.

All Air Force jet engines, which are transported on Air Force 3000 or 4000 series trailers (48 inch rail “fly away”) during “off base” surface transportation, will require air ride tractor and trailer. Any engine which utilizes a special trailer, such as the ETU-111E (F108 engine), will require air ride shipment. Transportation cans/containers which have shock or spring protection included will not require air ride equipment.

4.5 SHIPMENTS IN ENGINE CONTAINERS (STEEL, REUSABLE).

[Table 4-1](#) lists container pressure changes which will occur due to temperature variations. The pressure-versus-temperature table should be used during leak checks to correlate pressure changes resulting from temperature variations.

4.5.1 General.

4.5.1.1 Canned engine movement is authorized when transportation trailers are not available or the circumstances warrant shipment in a container.

4.5.1.2 Engine fuel systems must be purged in accordance with TO 2J-1-18 or TO 2R-1-11 prior to being containerized.

4.5.1.3 Containers will be pressurized with dry nitrogen in accordance with TO 2J-1-18.

4.5.1.4 Prior to shipment the container will be pressure checked to ascertain if it is inerted.

NOTE

Containers that were not designed for pressurization will not be used for air shipment.

4.5.1.5 Procedure for pressure checking metal engine container: The engine cans will be checked by transportation personnel for pressure within 24 hours of shipment or trans-shipment using a low-pressure air gauge such as NSN 4910-00-800-8899; cans which have less than 1 psig or do not meet [Table 4-1](#) will be turned over to maintenance for processing in accordance with TO 2J-1-18 or TO 2R-1-11.

4.5.2 Engines prepared for air shipment. No special procedures or tiedown instructions are required for air shipments in containers other than to insure preservation and pressurization procedures in TO 2J-1-18 or TO 2R-1-11 are complied with.

4.5.3 Engines prepared for truck shipment. Engines transported by trucks in metal containers will be tied down the same as [Figure 6-7](#) and [Figure 6-8](#) in accordance with [Chapter 6](#). Specialized carrier equipment (i.e., low-boy or drop well trailers) is authorized for transporting full engine containers double-decked and when proper tiedown procedures are applied.

4.5.4 Preparation for rail shipment. Engines are authorized for rail shipment when installed in metal containers and prepared as follows:

4.5.4.1 Wood skids blocked at each end by nailing a 2 x 4 block (or larger) to the deck with 20 penny nails. A second set of blocks (2 x 4) will be nailed on top of the first set of blocks. Blocks will be a minimum of 18 inches long.

4.5.4.2 Containers will have a minimum of two each steel bands, two inches wide, over the top of the containers. Strapping will conform to QQ-S-781, type 1, class A, [Figure 6-7](#) and [Figure 6-8](#).

4.5.4.3 Anchor plates, NSN 5340-00-252-3014 or NSN 5340-00-252-3015, as applicable, will be used to secure strapping to deck as required. Plates shall be secured to deck with gimlet points, round head screws, NSN 5306-00-307-7685.

4.5.5 Preparation for ocean shipment. Engines to be shipped via ocean transportation shall be prepared in complete containers. Skids, trailers, dollies or stands shall not be used for shipment of aircraft engines via ocean transportation.

4.5.6 Accident engines and/or engines designated for TDRs.

4.5.6.1 Engines removed from aircraft involved in accidents, wherein engine failure or malfunction was known or suspected to be a factor in the accident, require special handling and shall be prepared for shipment in accordance with applicable containers used in shipping accident engines or accessories for priority disassembly and inspection. A red band eight inches wide will be brush or spray painted horizontally around the container, immediately above the opening flange. Accessory containers will have the band painted where convenient. Upon removal of the accident engine or accessory, the red band will be obliterated immediately and necessary painting accomplished to return container to original finish.

Table 4-1. Container Temperature vs. Nitrogen Pressure

TEMPERATURE PRESSURE			TEMPERATURE PRESSURE		
°C	°F	PSIG	°C	°F	PSIG
60.0°	140°	7.6	4.4°	40°	3.9
54.4	130	7.3	-1.1	30°	3.5
48.9	120	6.9	-6.7	20°	3.2
43.3	110	6.5	-12.2	10°	2.8
37.8	100	6.1	-17.8	0°	2.4
32.3	90	5.8	-23.3	-10°	2.0
26.7	80	5.4	-18.9	-20°	1.7
21.1	70	5.0	-34.4	-30°	1.3
15.6	60	4.6			
10.0	50	4.3			

NOTE

A plus and/or minus of 1.0 psig is permissible for transportation check point acceptability.

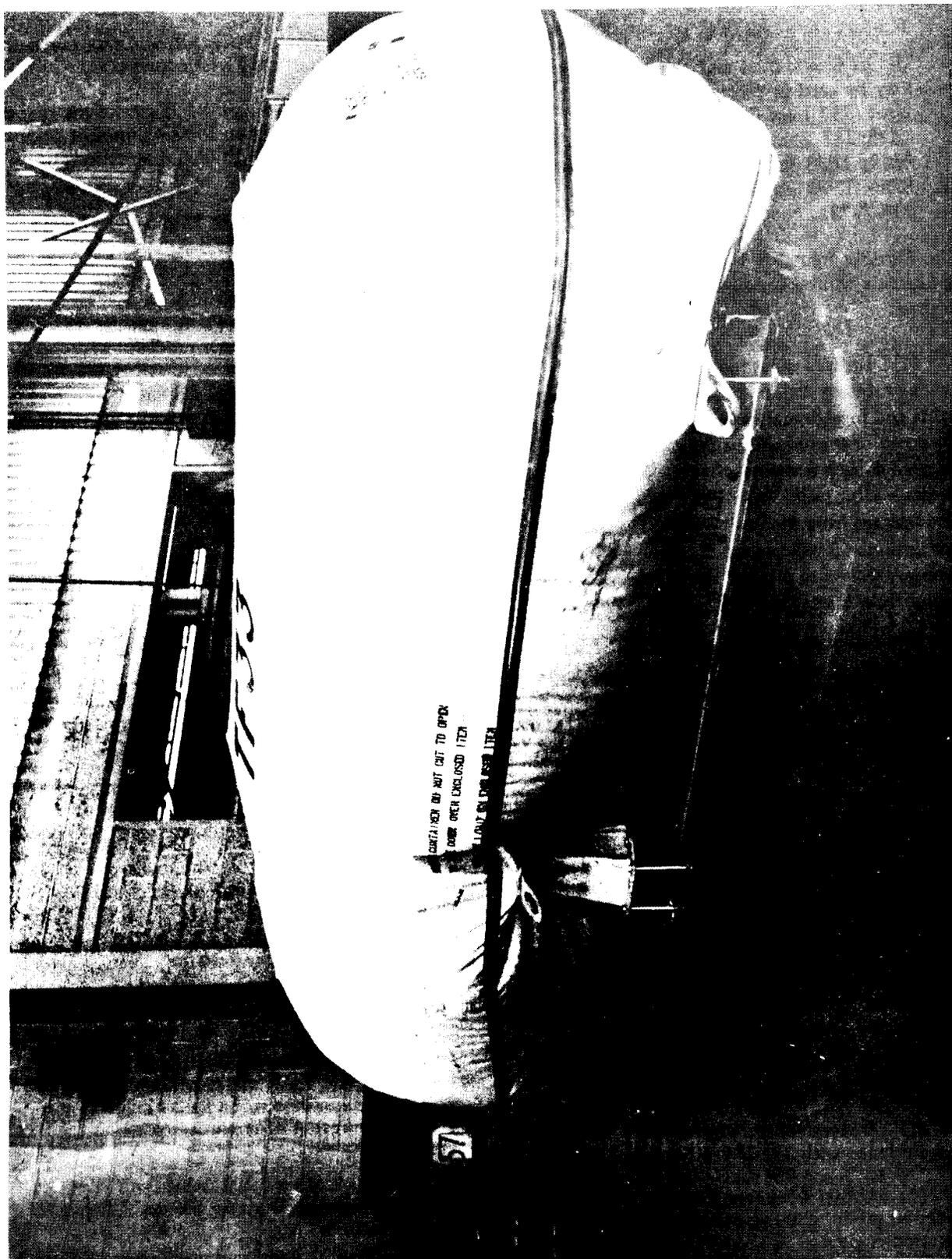


Figure 4-1. Engine in a Flexible Environmental Container

4.5.6.2 For engines which do not have metal containers, a fully serviceable environmental container will be used. A conspicuous form of identification marking will be used to distinguish an accident TDR engine.

NOTE

- The aft engine transportation yoke (strong back) (NSN 4920-00-960-4678) is equipped with mooring rings which are satisfactory for mooring aft end of engine during shipment. Front of engine will be moored by looping restraining chains around forward cradle adapter blocks adjacent to trailer rails. Pass chain through opening between upper end of cradle (part number 1C5277-1G1) and support assembly (part number 1C5277-3G1) (TO 35DA3-6-20-1, figure 10-2). Insure chain is routed under turnbuckle (part number 1C5277-3P19). Opposite end of chains should then be secured to aircraft decking directly forward of engine.
- To support mission requirements of AAC forward operating locations for air transport of fully equipped and tested J79 engines for requirements to support the AAC assigned F-4F aircraft undergoing programmed depot maintenance (PDM) the 4100 rail system on 3000 series trailers, with multipurpose adapter assemblies (NSN 4920-00-960-4676) and transportation yokes (strong backs) (NSN 4920-00-960-4678) may be used whenever airlift is required of J79 engines with afterburners and quick engine change (QEC) kits installed.

4.5.7

CAUTION

Unless specified in applicable engine technical manuals, when tightening the flange bolts, work at first on one side, then on the other and apply less than full torque in working around the flange the first time. The use of grease or oil as an additional sealant should be avoided as permanent damage to the rubber flange seal will result.

Attach a suitable sling to the lifting eye in the top section of the container method "LIFT HERE" and lower the top section in place on the lower section with the aid of two long drift pins, one at each end of the cover. Install the closure bolts and draw down evenly. The final torque will be determined by torque values established for the bolts used ([Table 4-2](#)).

4.6 SHIPMENTS IN ENGINE MODULE CONTAINERS (STEEL AND FIBERGLASS REINFORCED PLASTIC (FRP), REUSABLE).

Pressurization requirements apply only to containers for built-up engines which may contain residual fuel. As all fuel is removed from engine modules during the disassembly process, pressurization requirements do not apply to steel and FRP engine model containers.

4.6.1 General.

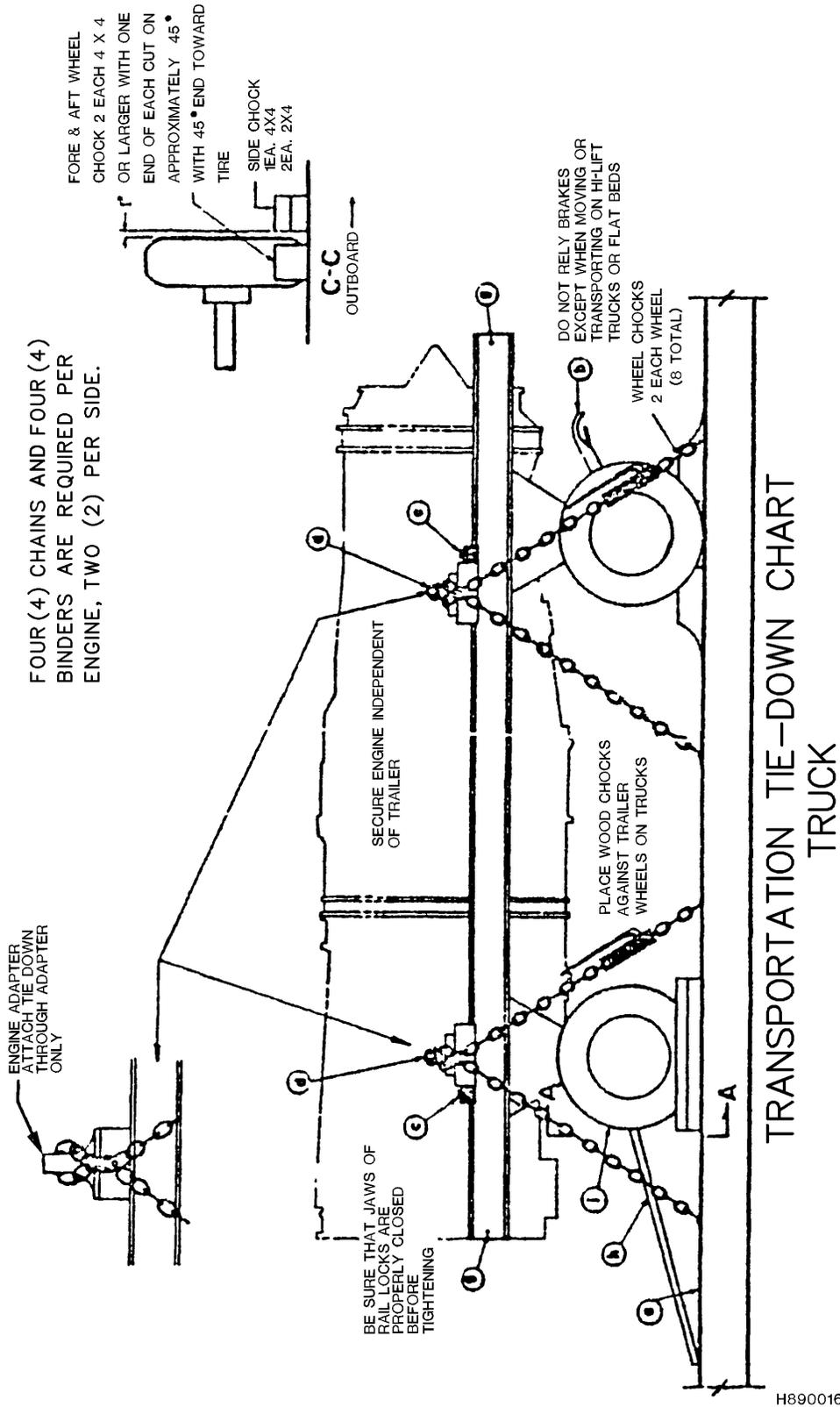
4.6.1.1 Engine module containers are not designed to be pressurized containers. The containers will be at or near zero pressure because the relief valves will immediately release any build-up of pressure or vacuum.

4.6.1.2 On first loading of the engine module into the container or after a major repair of the container, a slight pressurization (maximum 0.75 PSI) with air may be warranted. The purpose of the pressurization would be to determine the overall seal integrity of the container.

4.6.1.3 The preparation of engine modules for shipment by the various transportation modes is the same as that required for built-up engines, except that the pressurization requirements of TO 2J-1-18 do not apply.

4.7 SHIPMENTS IN WOOD BOXES.

Wood boxes are not recommended and should be used only when other types of shipping devices are not available. When used, they shall comply with MIL-C-4116 and TO 2J-1-18.



FOUR (4) CHAINS AND FOUR (4) BINDERS ARE REQUIRED PER ENGINE, TWO (2) PER SIDE.

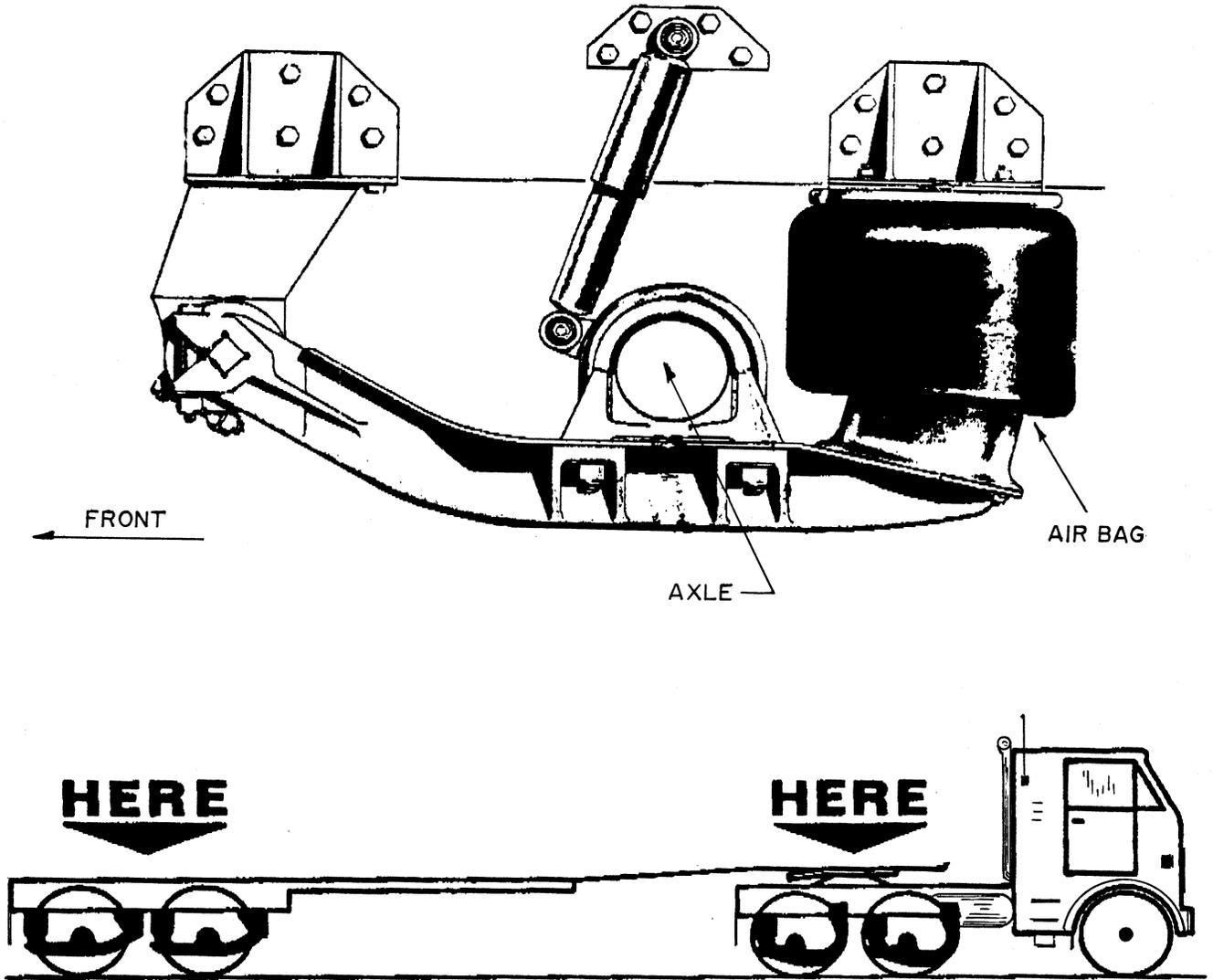
Figure 4-2. Tie Down Diagram for Airlift Trailers Transported on Trucks

Table 4-2. Recommended Torque Values for Container, Trailer and Adapter Bolts

Bolt or Nut Size	Torque Value/Inch-Pounds
8-36	12-15
10-32	20-25
1/4-28	50-70
5/16-24	100-140
3/8-24	160-190
7/16-20	450-500
1/2-20	480-690
9/16-18	800-1000
5/8-18	1100-1300
3/4-16	2300-2500
7/8-14	2500-3000
1-14	3700-5500
1-1/8-12	5000-7000
1-1/4-12	9000-11000
8-32	12-15
10-24	20-25
1/4-20	40-50
5/16-18	80-90
3/8-16	160-185
7/16-14	235-255
1/2-13	400-480
9/16-12	500-700
5/8-11	700-900
3/4-10	1150-1600
7/8-9	2200-3000

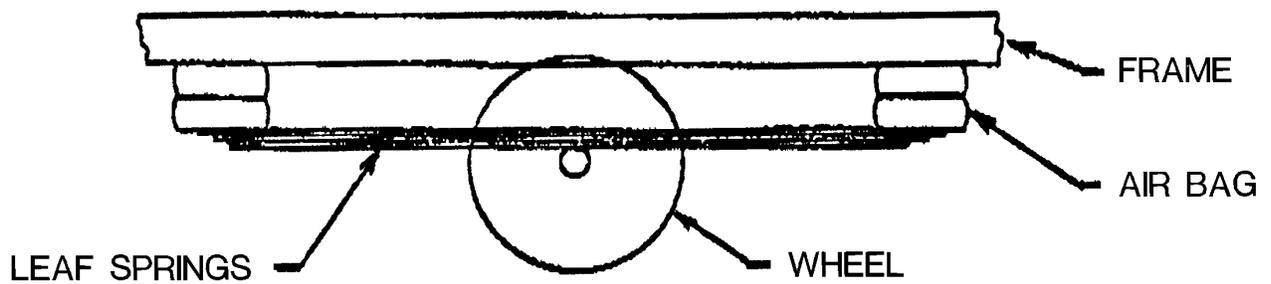
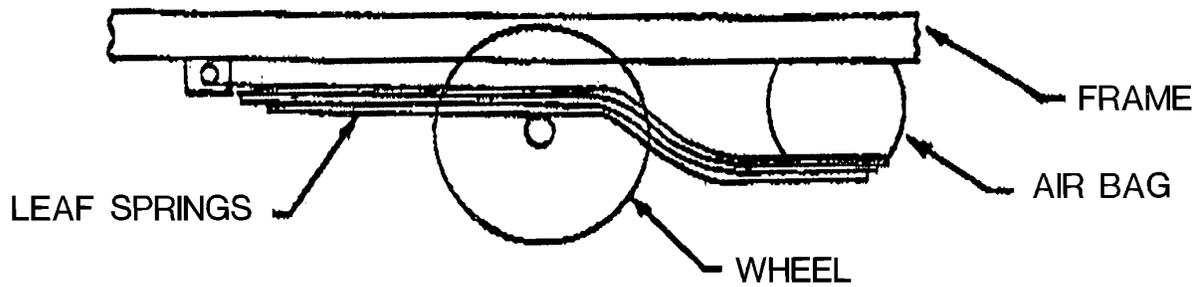
NOTE

The above torque loads may be used for all cadmium plated steel nuts of the fine or coarse thread series which have approximately equal number of threads and equal face bearing areas.



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Figure 4-3. Pneumatic Suspension (Air Ride) Truck and Trailer (Typical) (Sheet 1 of 2)



NOTE: SHOCKS OMITTED
FROM ALL FIGURES
FOR CLARITY.

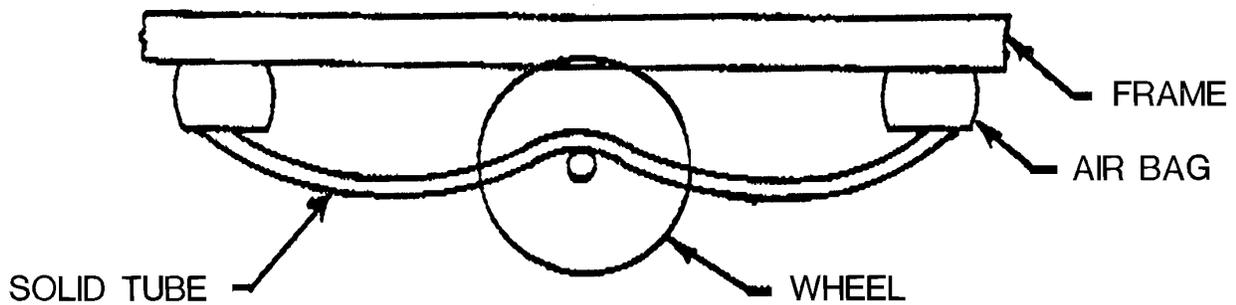


Figure 4-3. Pneumatic Suspension (Air Ride) Truck and Trailer (Typical) (Sheet 2)

4.8 SHIPPING OF ENGINES WITH INSTALLED AFTERBURNERS.

4.8.1 Surface transportation. Unless operational commitment dictates otherwise, afterburner engines shall not be shipped with afterburners installed. If afterburners is installed, all engines shipped will be via ride truck and air ride trailer. Engines shipped by this method shall be verbally cleared by Oklahoma City ALC/DSTR, Autovon 339-7751 and have DD FORM 1348-1 so annotated. If an F100-PW-220 engine is found not to have been transported on an air ride tractor trailer, the proper management office (ASD or SA-ALC) must be contacted to determine if maintenance/inspection will be required or continue engine in service.

4.8.1.1 J85, F100 and F110 series engines are exempt from this requirement.



Failure to ensure proper mounting and related road conditions will result in damage to vital engine components.

4.8.1.2 In the event off-base surface movement of engines with afterburner installed, due to geographical location of test cell or other situation, it is imperative that extreme caution be exercised regarding speed, road conditions, tie down methods, etc. Engines prepared for shipment with afterburner installed shall be properly located on the trailer to ensure the center of gravity is well forward of the rear axle (preferably at midpoint between front and rear axles if possible).

NOTE

- Air ride tractor-trailer is required for off-base surface transportation of F100 and F110 series engines.
- J79 engines may be shipped by surface transportation with A/B installed by utilizing 4100 trailers rail on a 3000F trailer using adapters in accordance with TO 35-1-8, figure 2-59.
- When applicable, engine may be shipped with QEC kit installed.
- TF30 engines with afterburners installed may be transported by air ride tractor-trailer as an alternate means of transportation within a 300 mile radius of point of embarkation.

4.8.2 Air Transportation. Engines may be shipped by air with afterburner if:

4.8.2.1 Engines are located well forward on trailer to obtain best center of balance location between axles.

4.8.2.2 Tiedowns are limited on lateral distance to prevent rail spreading.

4.8.2.3 All tiedowns have as nearly equal tensions applied as is possible.

NOTE

F100 and F110 engines may be shipped with the engine positioned on truck with aft end of engine to front of truck.

4.9 INSPECTIONS.

4.9.1



Prior to shipment. Failure to insure the installation of the aft and forward engine adapters safety pins during shipment, storage, or removal of aircraft engines will cause damage to aircraft equipment and possible injury to personnel.

Inspection shall be made before shipment of engine shipping devices and protective covering for obvious damage, cracks, corrosion, and general appearance. Transportation officers are authorized to refuse engines and/or shipping devices offered for shipment when evidence of above damage is noted.

4.9.2 General cargo will not be placed or stacked against engines during handling, storage, or shipment. The space under the engines can be utilized during shipment via surface and air for compatible type cargo. Extreme caution must be exercised when using this space under the engines to ensure that cargo is properly placed and secured to the pallet or floor of aircraft or commercial trailer. The tie-down of this cargo must be inspected by the loading supervisor or shipping foreman prior to release. A minimum of six inches of clearance must be maintained between the bottom of engine and shipping conveyance.

4.9.3 Correction of Deficiencies. When shipment has been damaged (seals broken or open; containers dented or punctured; dehydrating agent discolored) or sub-standard conditions are present, comply with [Chapter 2](#).

4.10 ENGINE RECORDS.

4.10.1 Container shipments. Engine historical records shall be placed in receptacle provided.

4.10.2 Trailer shipments. The waterproof pouch marked "Engine Records Enclosed" shall be folded flap of pouch toward front of trailer thus preventing entrance of water. Secure pouch to rail with specification PPP-T-97 or PPP-T-60 tape.

4.11 SHIPMENT OF J79 ENGINES WITH AFTERBURNER AND QUICK ENGINE CHANGE (QEC) KIT INSTALLED ON TRAILER.

4.11.1 Air Transportation. Whenever airlift is required of J79 engines with afterburners and Quick Engine Change Kits installed, the 4100 rail system on 3000 series trailers, with multipurpose adapter assemblies (NSN 4920-00-960-4676) and transportation yokes (strong backs (NSN 4920-00-960-4678)) may be used, provided:

4.11.1.1 Engines are located well forward on trailer to obtain best center of balance.

4.11.1.2 Tie downs ([Figure 4-4](#)) are used.

4.11.1.2.1 Front tie downs require chains to be looped on both sides of adapter around rail.

4.11.1.2.2 Rear tie downs require chains through eyelet on yoke and additional chains looped around yoke on both sides above adapter.

4.11.1.2.3 Chafing pads consisting of aluminum strips or other durable material or wrapping of chain with tape at point of friction on trailer rail will eliminate scarring of rail.

4.11.1.3 Tie downs are limited on lateral distance to prevent rail spreading.

4.11.1.4 All tie downs have as nearly equal tension applied as possible.

4.12 F101-GE-102 ENGINE DEVIATIONS TO SHIPPING INSTRUCTIONS.

4.12.1 Engine will be shipped with augmentor (A/B) installed. Shipments may be either one (1) or two (2) engines per vehicle.

4.12.2 The engine and adapter shall only be supported on a 3000E trailer during shipping.

4.12.3 Shipment shall only be via air ride truck and trailer.

4.12.4 The forward engine adapter mounts will be tied down using the criss-cross method (right side chained to the left side of the flat bed trailer and the left mount chained to the right side of the flat bed trailer) at 20 degrees to 30 degrees forward location of engine. The rear end of the engine adapter will be tied down in the trapezoidal configuration. See sketches for one and two engine shipments. Roller assemblies shall be rail locks tightened with a square drive bar wrench. Verify forward torqued to 65 foot lbs.

4.12.5 Tire Inflation. The tires on the 3000E trailer should be inspected prior to shipment. Tire pressure shall be 30 PSI +5 or -0 PSI. Suspect tires should be repaired or replaced. The transporter should be required to inspect the tires periodically during the trip. A flat tire during shipments can cause the engine to become unserviceable.

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4.12.6 See [Figure 4-5](#) and Figure 4-6.

4.13 F118-GE-100 ENGINE DEVIATIONS TO SHIPPING INSTRUCTIONS.

4.13.1 Shipments may be either one (1) or two (2) engines per vehicle.

4.13.2 Engines which have TCTO 2J-F118-517 complied with can be shipped using either adapter, P/N 3C3658 or P/N 3C3528G01, with the 3000E trailer. Engines which do not have TCTO 2J-F118-517 complied with shall use adapter, P/N 3C3528G01, only for supporting engine for shipment using 3000E trailer.

4.13.3 Ground shipment shall be via air ride truck and trailer only.

4.13.4 Tie down shall be trapezoidal configuration for one (1) and two (2) engine shipments ([Figure 4-7](#) and [Figure 4-8](#)).

4.13.5 Tire Inflation. Tires on the 3C3658 trailer shall be inspected prior to shipment. Tire pressure shall be 30 PSI +5 or -0 PSI. Suspect tires should be repaired or replaced. The transporter should be required to inspect tires periodically during the trip. A flat tire during shipment can cause engine to become unserviceable.

4.13.6 See [Figure 4-4](#) and Figure 4-8.

4.14 F118-GE-101 ENGINE DEVIATIONS TO SHIPPING INSTRUCTIONS.

4.14.1 Shipments may be either one (1) or two (2) engines per vehicle.

4.14.2 The engine and adapter shall only be supported on a 75GH109 transportation trailer during shipment.

4.14.3 Ground shipment shall only be via air ride truck and trailer.

4.14.4 Tire Inflation. Tires on 75GH109 transportation trailer shall be inspected prior to shipment. Tire pressure shall be 30 PSI +5 PSI or -0 PSI. Suspect tires should be repaired or replaced. The transporter should be required to inspect tires periodically during the trip. A flat tire during shipment can cause engine to become unserviceable.

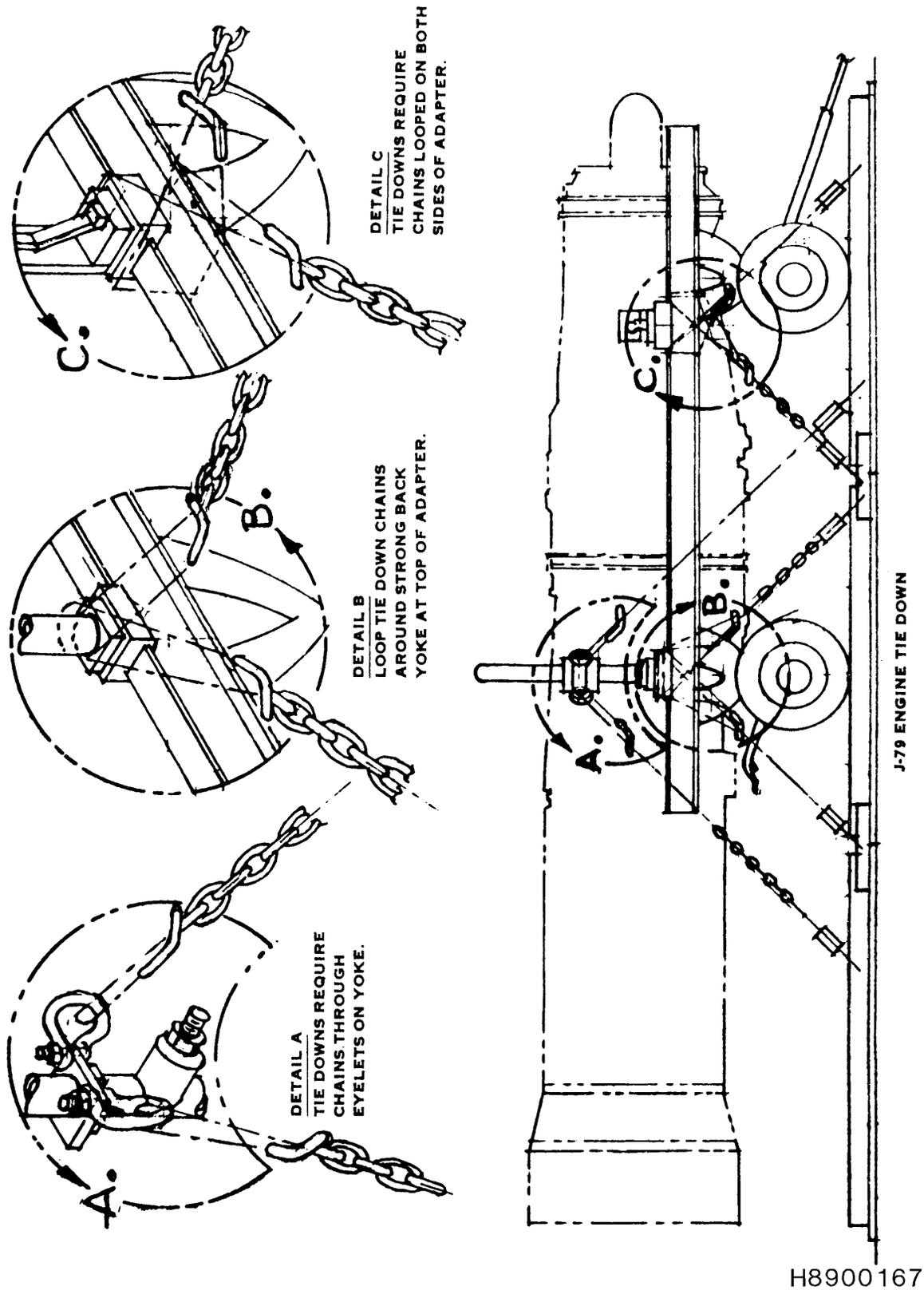


Figure 4-4. Tie Down Diagram for Air Lift of Trailer

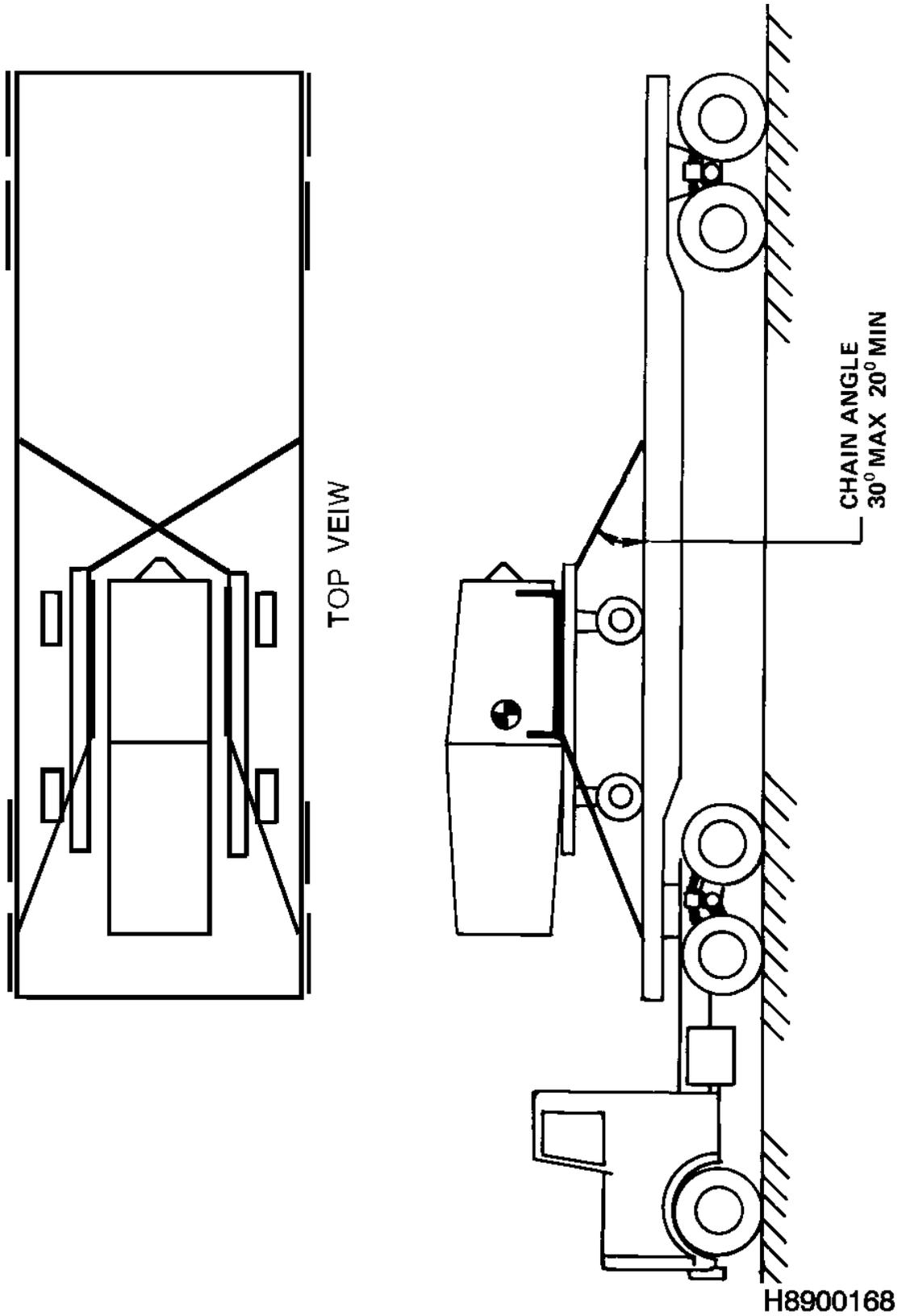


Figure 4-5. Two Engine Tie Down

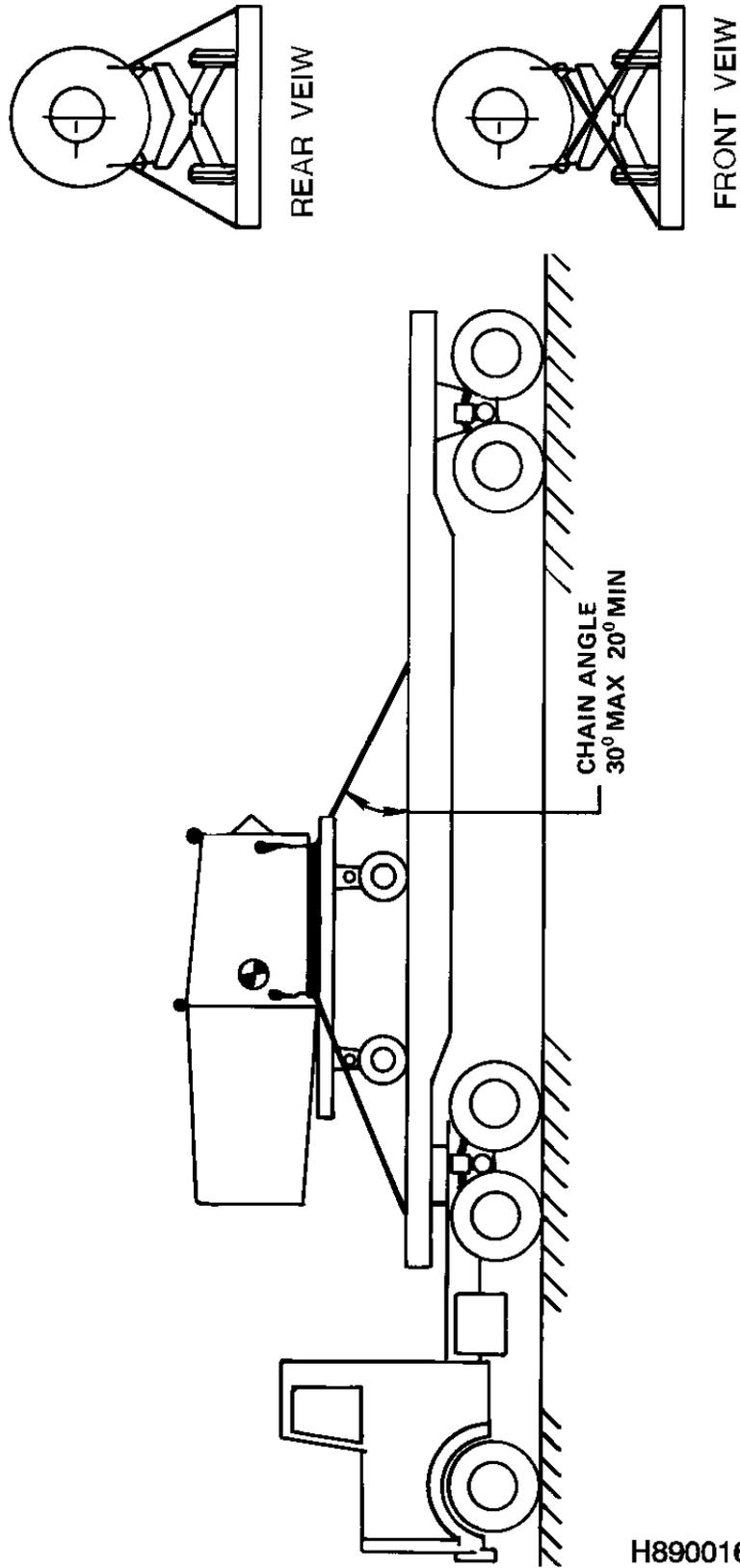


Figure 4-6. One Engine Tie Down

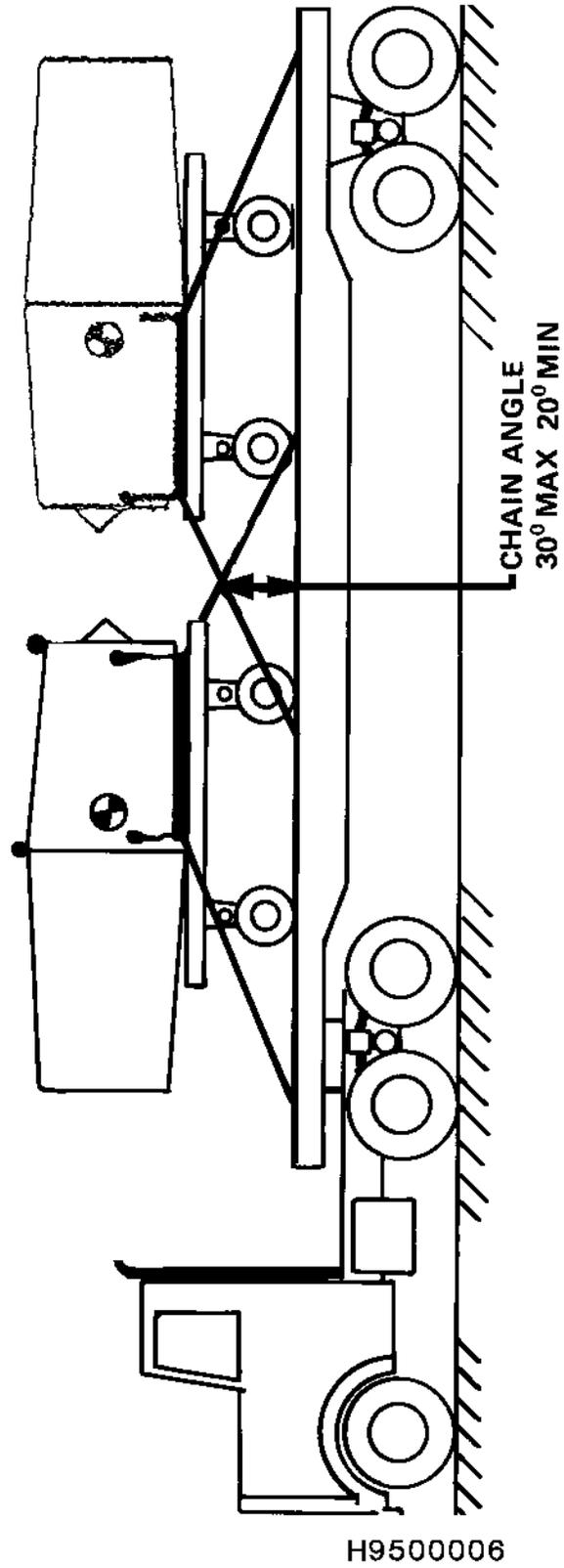


Figure 4-7. Two Engine Tie Down

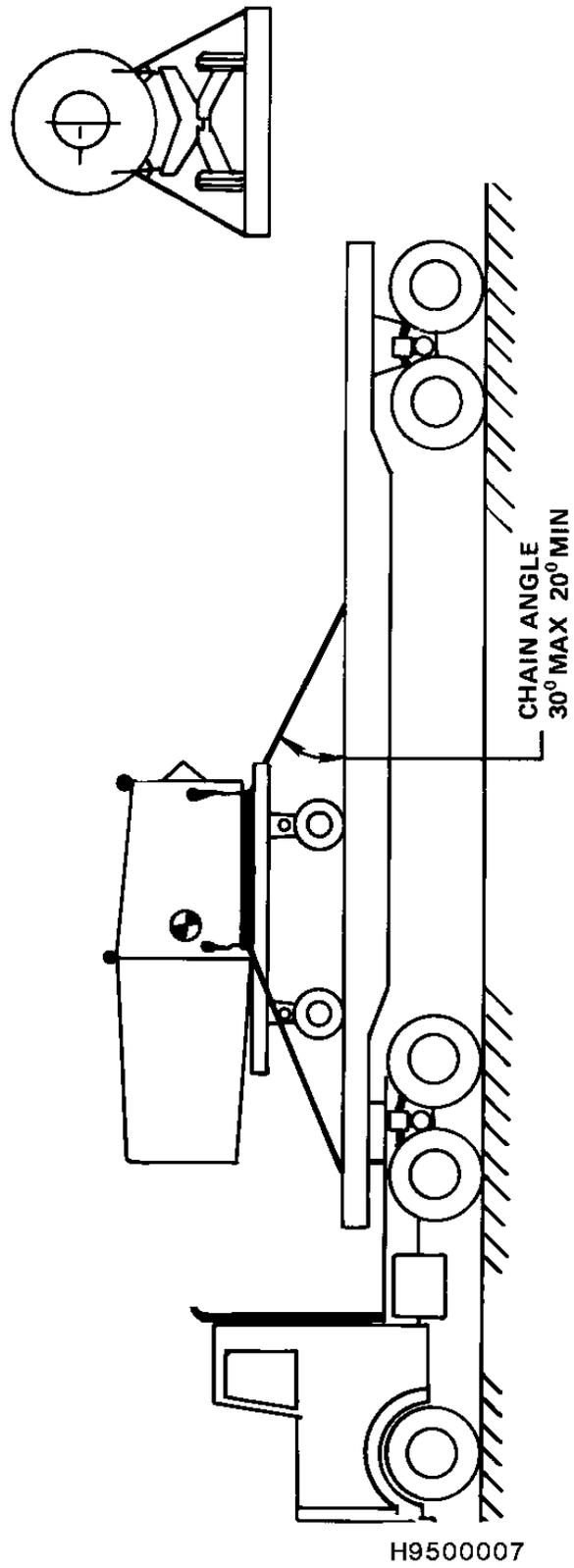


Figure 4-8. One Engine Tie Down

CHAPTER 5

ENGINE AND SHIPPING DEVICE HANDLING

5.1 EQUIPMENT.

5.2 General selection of proper Material Handling Equipment and aids for handling engine during ON and OFF loading operations is important to prevent damage to engines and their protective covers.

5.2.1 Use of platform and fork extensions in conjunction with forklifts or side loader trucks is necessary for safe and effective engine handling.

5.2.2 Under no circumstances will an engine sling be used to transport or lift an engine that is installed in an airlift trailer, half engine container, or engine dollie.

5.3 HANDLING ENGINES IN METAL AND FRP CONTAINERS BY FORKLIFT.

5.4 Forklifts used to handle engines in metal or FRP containers must have a lifting capacity equal or greater than the gross weight of engine and container. GROSS weights will be obtained from [Chapter 3](#) of this Technical Order and forklift capacity will be found on forklift nameplate.

5.5 Horizontal containers shall be handled from the side. When lifting containers by forklift, the prongs shall be long enough to fully catch the support rail on the opposite side of the container. Prongs should be spread wide to prevent tipping or tilting of engine container. The outer end or tip of prongs should be tilted upward to prevent engine from slipping off.

5.6

CAUTION

When engine container and engine must be moved after the container top has been removed, DO NOT lift engine and container half by engine hoist fittings as serious damage may result.

The center of gravity (center of balance) of a container with engine installed is indicated on the side of the container. Forklift prongs shall be positioned equidistant from this "CG" marking before lifting.

5.7 A safety chain from engine to forklift should be used when moving engines by forklift.

5.8 Forklifts will NOT be used to raise airlift trailers with engine installed. When terminal loading ramps are not available, a suitable pallet or bridge, of sufficient strength and dimensions to adequately support the engine, shall be used.

5.9

CAUTION

Extreme care must be taken in handling the TURBOFAN engines due to the circumference of the intake area. This is especially necessary when using a tug or tractor to tow or to back an engine mounted on a trailer to assure that tow bar does not damage the large fan.

When handling turbofan engines, extreme care shall be used to prevent damage to the turbofan are by the trailer tow bar. Raising of the tow bar during loading or off loading can result in damage sufficient to require overhaul before use of engine is possible.

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5.10 HANDLING ENGINES ON DOLLIES OR TRAILERS.

5.11 The safest method of loading engines which are mounted on dollies or trailers is from a loading ramp. Push the engine dolly or trailer onto the shipping vehicle by use of a forklift or tug using a bridge or platform to span the gap between vehicle and ramp.

5.12 Engine may be loaded by hand when forklift or tug is not available. However, sufficient personnel must be present for handling the engine by hand (minimum of four).

NOTE

A supervisor must be present at all times during loading of engine mounted on dollies or trailers. Trailer brakes must be applied when trailer is not in motion.

5.13 When using an inclined ramp for loading, insure that sufficient clearance exists around engine and to insure that tongue of trailer has sufficient clearance to preclude damage of nose section of engine.

5.14 LOADING F108/MULTI-PURPOSE TRAILER ONTO FLATBED WITH FORKLIFT TRUCK (FIGURE 4-3, FIGURE 5-1, FIGURE 5-2 AND TABLE 4-3).

5.14.1



Highway transportation of the F108 engine requires use of pneumatic suspension equipped (air ride) truck and trailer (Figure 4-3 and table 4-3).

Minimum 15K capacity forklift required.

5.14.2 Remove trailer steering tongue from steerable axle. Stow tongue.

5.14.3



Do not rotate engine in trailer with removable forklift tube assembly installed in rear forklift slot. Damage to engine may occur if forklift tube assembly is not properly stowed in front forklift slot.

Remove cradle pin and rotate cradle from level position to forklift position.

NOTE

Forklift and level positions are clearly marked on trailer.

5.14.4 Re-pin cradle.

5.14.5

WARNING

KEEP TOES CLEAR WHEN LOWERING TRAILER.

CAUTION

- Trailer must be in the forklift position before forklift tube is installed.
- Rear forklift tube assembly must be properly installed during all forklift operations. Failure to adhere to this requirement could damage engine/trailer.

Remove rear forklift tube assembly from stowed position and insert tube in rear forklift slot.

5.14.6 Lower Trailer. The procedure for lowering the trailer is as follows:

WARNING

TO AVOID PERSONAL INJURY OR DAMAGE TO THE ASSEMBLY, DO NOT USE FORCE TO REMOVE A WHEEL ASSEMBLY LOCKPIN.

5.14.6.1 Ensure front axle and rear wheel selector valves are set to trailer UP or NEUTRAL position ([Figure 5-2](#)).

WARNING

KEEP TOES CLEAR WHEN LOWERING TRAILER.

CAUTION

Both front cylinder rod extensions must be even at all times to prevent damage.

5.14.6.2 Remove four wheel assembly lockpins. If a lockpin cannot be removed easily, set selector valves to trailer UP and pump to apply pressure to cylinder until pin can be removed.

NOTE

The trailer will lower under trailer weight. The rate of lowering is controlled by flow restrictor/check valves. Wait approximately three minutes before raising the trailer to allow the hydraulic fluid to flow through restrictor valves.

5.14.6.3 Set front axle and rear wheel selector valves to trailer DN.

5.14.6.4 Raise wheel assembly to align holes and insert lockpins through each wheel arm to prevent lowering of wheels.

5.14.6.5 Ensure front wheel pin is installed in upper hole, raising wheel assembly as required.

5.14.6.6 Set selector levers to NEUTRAL position.

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5.14.7

CAUTION

If forklift tines are not inserted 72 inches (3/4 length of tubes) into tubes, damage will occur. When inserting forklift tine into forklift tubes, be careful that binding does not occur. Binding could damage engine/trailer.

Insert forklift tines into forklift tubes at least 72 inches.

5.14.8 Carefully lift trailer and engine onto flatbed.

5.14.8.1 Position single engine at forward end of flatbed just aft of truck axle with forward end of engine (fan) facing the front of the flatbed trailer.

5.14.8.2 When transporting two (2) engines, position engines so that load is evenly distributed over flatbed and truck axles, with forward end of engine (fan) facing the front of the flatbed trailer.

5.14.9 Back forklift truck away from trailer. Be careful not to bind tines in tubes.

5.14.10

CAUTION

- In order to prevent damage to nose cowl, leave cradle in forklift position to maintain clearance between tie down chains and inlet cowl.
- Do not rotate engine in trailer with removable forklift tube assembly installed in rear forklift slot. Damage to engine may occur if forklift tube assembly is not properly stowed in front forklift slot.

Remove rear forklift tube assembly and stow in front forklift slot.

5.14.11 Secure trailer front, rear and sides in accordance with paragraph 6.13.

5.15 LOADING F108/STAND (PART NUMBER 856A1200) ONTO FLATBED WITH FORKLIFT TRUCK (FIGURE 4-3, FIGURE 6-14, FIGURE 6-15 AND TABLE 4-3).

5.15.1

CAUTION

- If forklift tines are not inserted 72 inches (3/4) length of tubes, damage will occur. When inserting forklift tines into forklift tubes, be careful that binding does not occur. Binding could damage engine/stand.
- Highway transportation of the F108 engine requires use of pneumatic suspension equipped (air ride) truck and trailer (Figure 4-3 and table 4-3)

Minimum 15K capacity forklift required.

5.15.2 Insert forklift tines into forklift tubes at least 72 inches.

5.15.3 Insure transportation wheels are in the up and locked position.

5.15.4 Carefully lift trailer and engine onto flatbed.

5.15.4.1 Position single engine at forward end of flatbed just aft of truck axle with forward end of engine (fan) facing the front of the flatbed trailer.

5.15.4.2 When transporting two (2) engines, position engines so that load is evenly distributed over flatbed and truck axles, with forward end of engines (fan) facing the front of the flatbed trailer.

5.15.5 Back forklift truck away from trailer. Be careful not to bind tines in tubes.

5.15.6 Secure trailer in accordance with paragraph 6.14.

5.16 TRANSPORTATION OF JET ENGINES BY TOWING.

5.16.1 Background Information. Because of roadway conditions, railroad crossings, foreign objects, surface roughness in general, and the engineering design of jet engines, necessary precautions will be taken to prevent damage during towing or transportation operations. The heavy compressor and turbine rotors of the jet engine are supported only by the bearings and carbon seals, and are subjected to permanent damage by sudden stops/impacts.

5.16.2 Practices to be Observed. Organizational chiefs having vehicle operators who tow jet engines will ensure that the operators are aware of the necessity for using extreme care in transporting jet engines. The following practices will be observed:

CAUTION

Prior to movement of J85 series engine on J85 trailers, the engine must be installed on the trailer with the nose dome AFT of the trailer tongue to prevent damage to the dome assembly.

5.16.2.1 Prior to movement of the engines:

5.16.2.1.1 Check for and remove from the tug or tractor and trailers all loose bolts, nuts, washers, or other loose objects.

5.16.2.1.2 Check the tug or tractor hitch and all trailer hitches for security and ensure that tongue assemblies and locking pins are properly secured.

NOTE

Engines will not be moved unless the tug or tractor and trailer hitches, locking pins, and tongue assemblies are in good operating condition.

5.16.2.1.3 Check and maintain trailer tire pressure.

5.16.2.1.4 Check to ensure that slow moving vehicle emblems are placed on the left rear of the last engine being towed. To install, use the quick release pin at this location. These emblems will be deployed at all times (day or night) while engines are being pulled.

5.16.2.2 Confine speed to 5 miles per hour regardless of the speed limit stenciled on the dolly or posted for the particular roadway.

5.16.2.3 Stop or adjust speed down from the 5 miles per hour limit to compensate for rough roadway conditions such as railroad crossings, temporary crossovers, and locations where utilities are laid on top of the ground.

CAUTION

- When towing engine down loading ramp, do not turn until engine/trailer is completely off inclined surface.
- A maximum speed of 2 miles per hour shall be maintained for inshop transportation during turning operations for the F101 and F110 engines.

5.16.2.4 Approach each stop with precaution to avoid jackknifing of dollies or trailers.

CAUTION

When towing engine down loading ramp, do not turn until engine/trailer is completely off inclined surface.

5.16.2.5 No more than four trailers, loaded or empty, will be pulled by any tractor. To avoid jackknifing trailer trains, they will be arranged with the most heavily loaded trailer next to the towing vehicle, the next heaviest second in line, and so on. If movement is required on a building ramp, the “train hookup” will be restricted to three trailers.

5.16.2.6 Maintain a minimum of 8 inches clearance between engine pulled in train to allow for slack in coupling pins, tongue assembly and turns that must be made.

5.16.2.7 Secure attaching pins, bolts, and adapters upon removal of the engine from the trailers. All attaching hardware will be inspected to ensure serviceability and completeness of threads.

5.16.2.8 Attach a light on the back of the rear engine of all engines being towed during the hours of darkness or poor visibility.

5.17 ADDITIONAL TOWING INSTRUCTIONS FOR F108 ENGINE/MULTI-PURPOSE TRAILER (ETU-111/E).

5.17.1 Raise Trailer. The procedure for raising the trailer is as follows:

WARNING

To avoid personal injury or damage to the assembly, do not use force to remove a wheel assembly lockpin.

CAUTION

Both front cylinder rod extensions must be even at all times to prevent damage.

5.17.1.1 Remove wheel assembly lockpins.

5.17.1.2 Set front axle and rear wheel selector levers to trailer UP.

5.17.1.3 Actuate hand pumps continuously through full range of travel.

5.17.1.4 Lower wheels until wheel assembly lockpins can be inserted.

5.17.1.5 Install steering tongue from stow position and install lockpins.

5.17.2 Remove rear forklift tube assembly from rear forklift slot and stow in front forklift slot.

5.17.3 Remove cradle lockpin, rotate cradle to level position and insert lockpin.

5.17.4 Check to ensure all loose equipment is secured to, or removed from trailer.

5.17.5 Ensure cargo compartment floor dolly is fully retracted.

5.17.6 Ensure tires are serviceable and inflated to 85-95 psi.

5.18 COMPACT AIRCRAFT SUPPORT PACKAGE.

5.18.1 Fabricate or modify APU/Engine change support according to [Figure 5-1](#), [Figure 5-2](#), and [Figure 5-3](#).

5.18.2 Fabricate tool box support according to drawing in [Figure 5-4](#).

5.18.3 Fabricate tire rack according to drawing in [Figure 5-6](#).

- 5.18.4 Procure four (4) extra rail brakes.
- 5.18.5 Remove rails from two (2) 3000E transportation trailers IAW TO 35D3-3-26-1.
- 5.18.6 Remove lug nuts from tires and remove tires from wheels on one of the trailers.
- 5.18.7 Drill four (4) each 1/2 inch diameter holes in each rail as indicated in [Figure 5-7](#) of attached drawings.
- 5.18.8 Install two (2) of the drilled rails on trailer that tires were left installed on axles.
- 5.18.9 Disassemble tow bar from front axle and install axle to rear set of holes of assembled trailer with tow bar end pointing forward. (Use bolts removed during disassembly to install into holes that were drilled in rail).
- 5.18.10 Mount rear disassembled axle to front holes of assembled trailer. (Use bolts removed during disassembly to install into holes that are drilled in rail).
- 5.18.11 Mount removed rails to assembled trailer IAW [Figure 5-5](#) of attached drawing using two (2) bolts from transfer adapter pins on assembled trailer.

NOTE

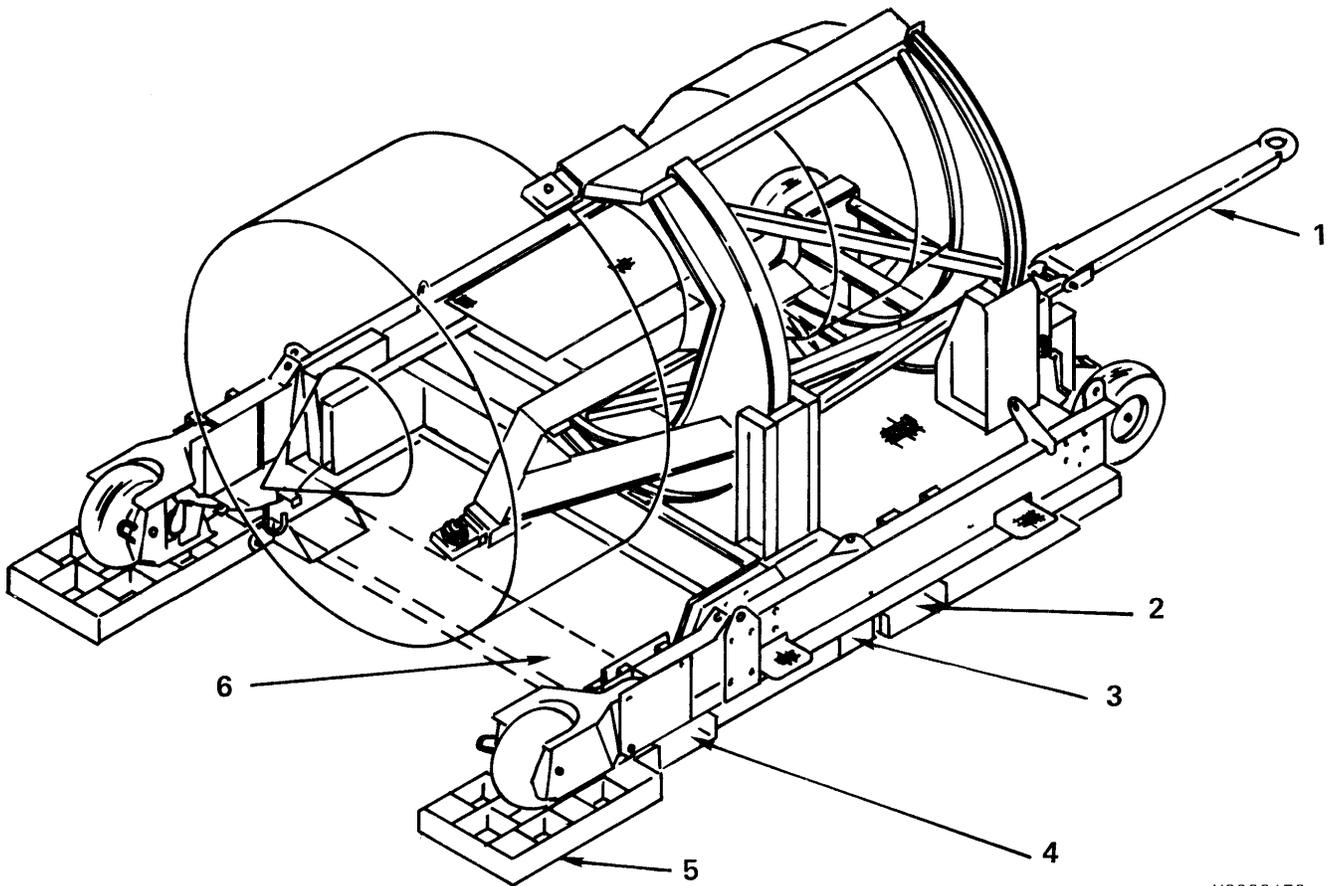
Rails are installed upside down.

- 5.18.12 Load engine onto assembled trailer.
- 5.18.13 Load spare rear TF34 engine adapter onto assembled engine trailer.
- 5.18.14 Load spare front TF34 engine adapter onto assembled engine trailer.
- 5.18.15 Load engine change monorail through the back of assembled trailer. Monorail installed underneath and must be installed where one of the holes in the monorail will line up with one of the cross bars for engine adapters. Install cross bar through hole in monorail to hold monorail in place.
- 5.18.16 Install APU in APU engine change support ([Figure 5-1](#), [Figure 5-2](#), and [Figure 5-3](#)) and load APU engine change support onto assembled trailer at the rear of trailer.
- 5.18.17 Attach engine change hoists to APU engine change support using existing pins for hoists that are removed from monorail to hold in place.
- 5.18.18 Load engine change CTK onto APU engine change support.
- 5.18.19 Load torque wrench onto APU engine change support.
- 5.18.20 Mount tool box support, [Figure 5-4](#), to front of assembled trailer; use bolts from transfer adapter pins to hold in place.
- 5.18.21 Mount two (2) each rail brakes on rails that were assembled in step 11 of procedures.
- 5.18.22 Strap lateral support bars for engine adapters to installed engine lateral support bars.
- 5.18.23 Secure tool boxes and torque wrench.

NOTE

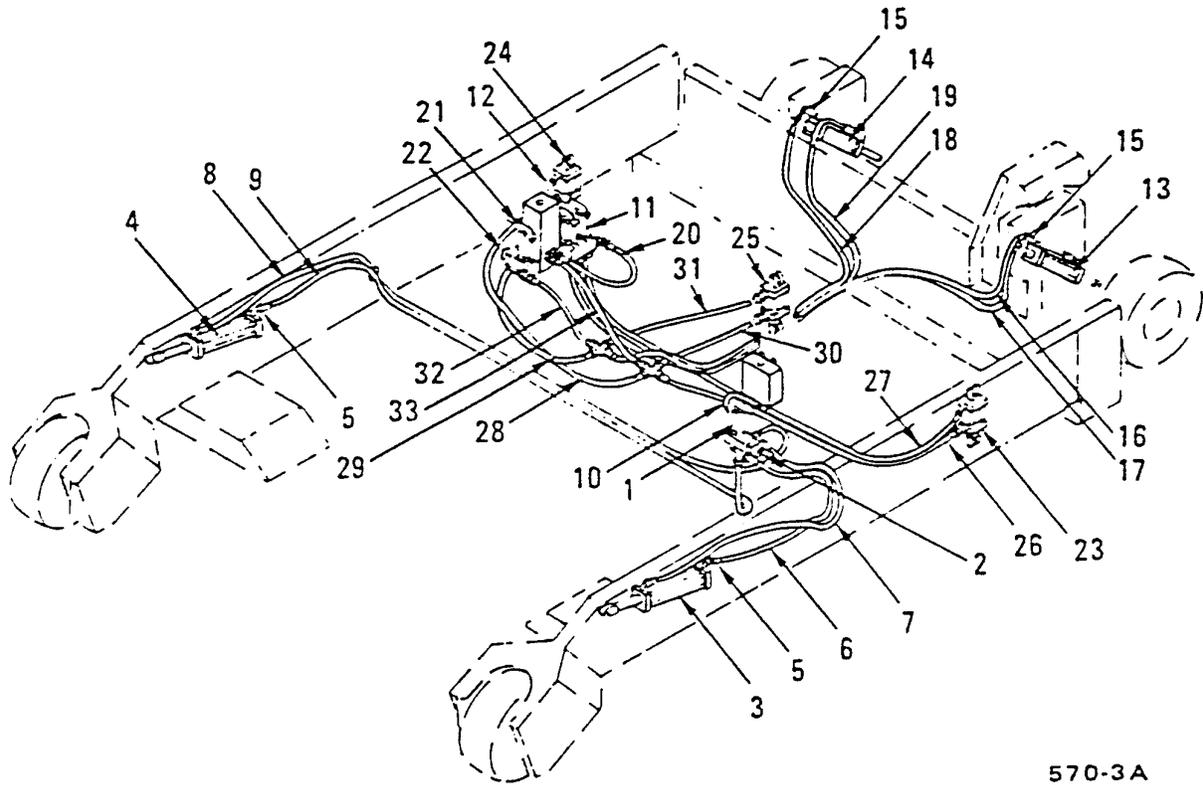
- Weight of assembled trailer with engine, APU, and all equipment is 5600 lbs. Cube is not affected.
- When engine change is required two (2) people can remove equipment from assembled trailer and rebuild disassembled trailer in approximately 40 minutes. This has been tested at this station and both times took approximately this long on both occasions. While this is in progress three (3) people can be disconnecting engine from aircraft.
- Tools required for assembly and disassembly of trailer and equipment are normally contained in composite tool kits. Tools used are: 3/4 X 3/8 dr. socket or 1/2 inch dr., 3/8 or 1/2 in ratchet, 9/16 in socket either drive and 9/16 combination wrench, adjustable jaw wrench and a mallet.

5.18.24 When engine change is required, two (2) people remove equipment and rebuild trailer. Engine removed from aircraft is then dropped onto trailer being assembled. After engine is installed from other trailer the reverse procedures are accomplished.



H8900170

Figure 5-1. Multi-Purpose Trailer - F-108 Engine



570-3A
H9101991

LEGEND

1. Rear wheel mount hydraulic pump (PR)	12. Steering axle selector valve	23. Main cargo floor dolly right-hand cylinder (RD)
2. Rear wheel mount selector valve	13. Steering axle right-hand cylinder (RF)	24. Main cargo floor dolly left-hand cylinder (LD)
3. Rear wheel mount right-hand cylinder (RR)	14. Steering axle left-hand cylinder (LF)	25. Main cargo floor dolly center cylinder (CD)
4. Rear wheel mount left-hand cylinder (LR)	15. Restrictor/check valve	26. Hose (H17)
5. Restrictor/check valve	16. Hose (H10)	27. Hose (8)
6. Hose (H15)	17. Hose (H9)	28. Hose (H19)
7. Hose (H1)	18. Hose (H11)	29. Hose (H6)
8. Hose (H2)	19. Hose (H12)	30. Hose (H18)
9. Hose (H16)	20. Hose (H14)	31. Hose (H7)
10. Hose (H4)	21. Cargo compartment floor dolly hydraulic pump (PD)	32. Hose (H14)
11. Steering axle hydraulic pump (PF)	22. Bleed needle valve	33. Hose (H14)

Figure 5-2. Hydraulic System

NOTES:
WELD ALL CONNECTIONS AS REQD

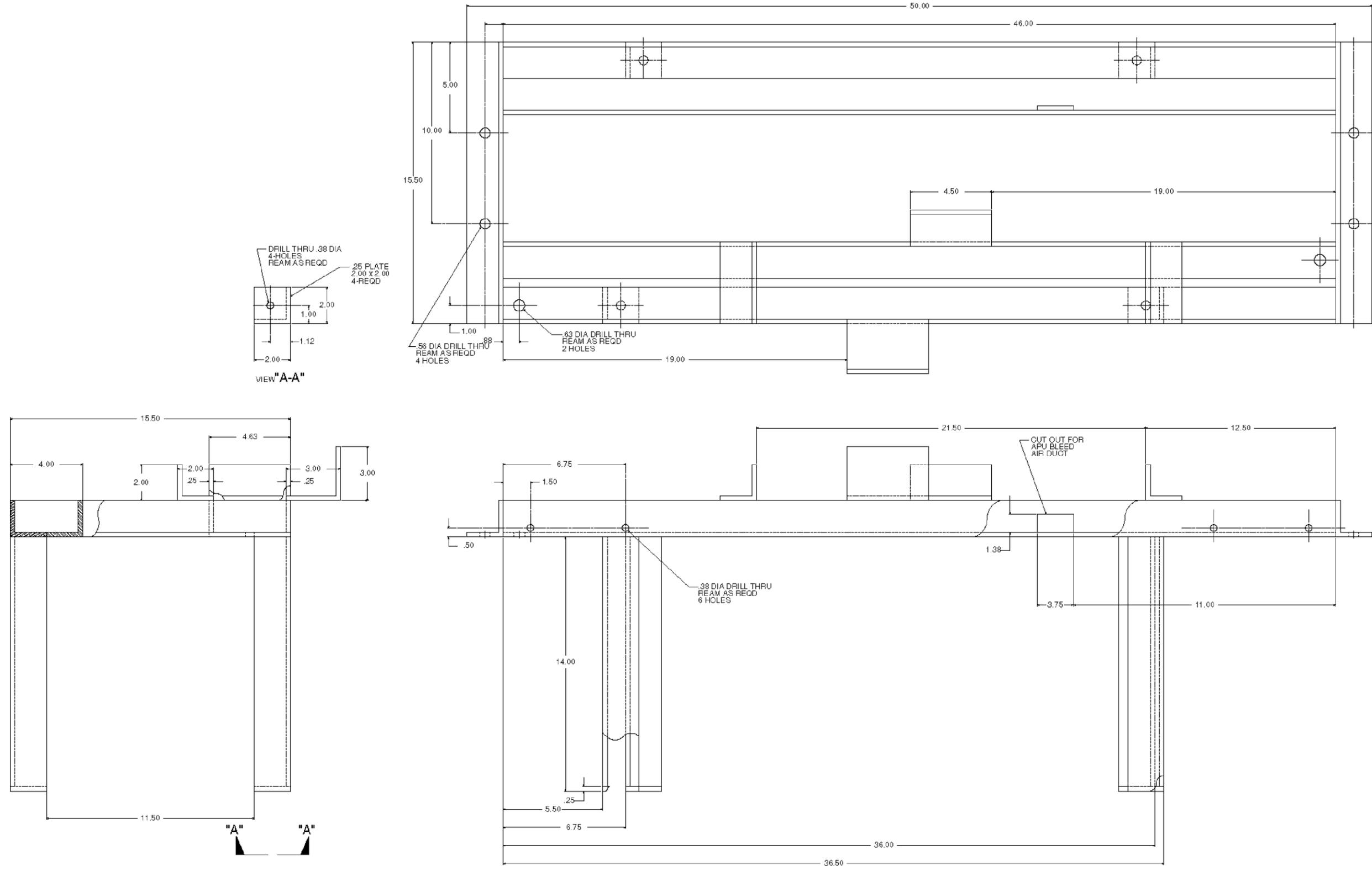
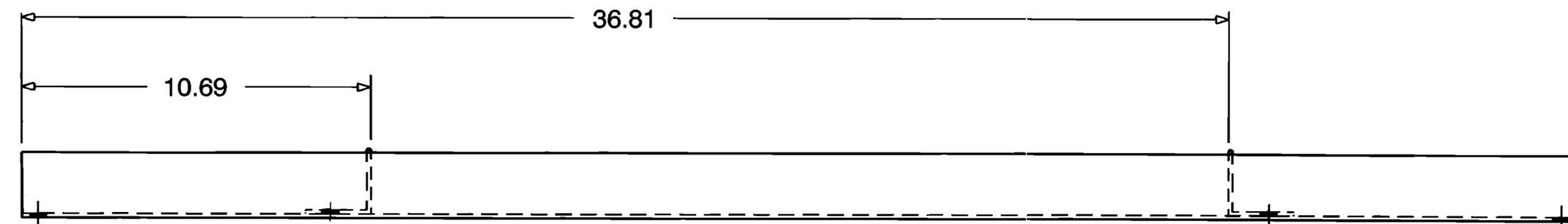
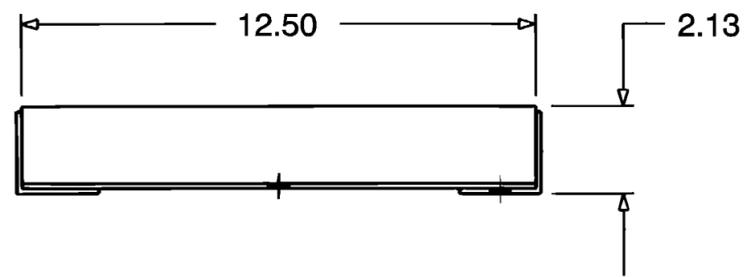
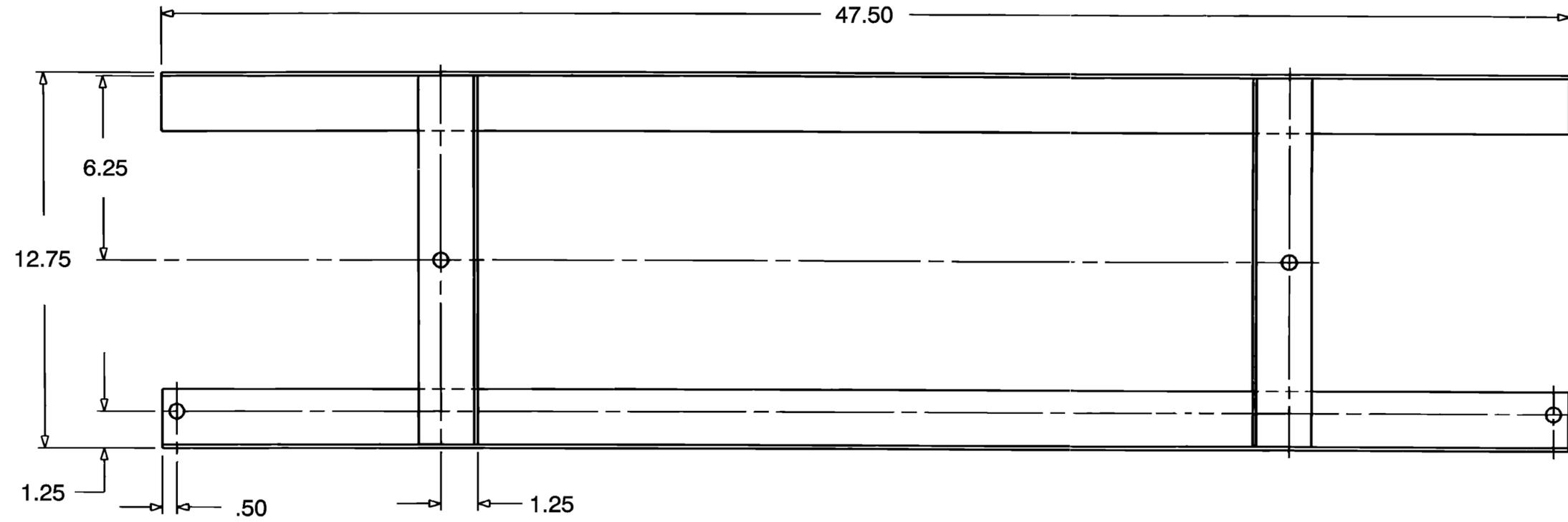


Figure 5-3. APU/Eng Change Support

NOTES: ALL WELDED CONSTRUCTION

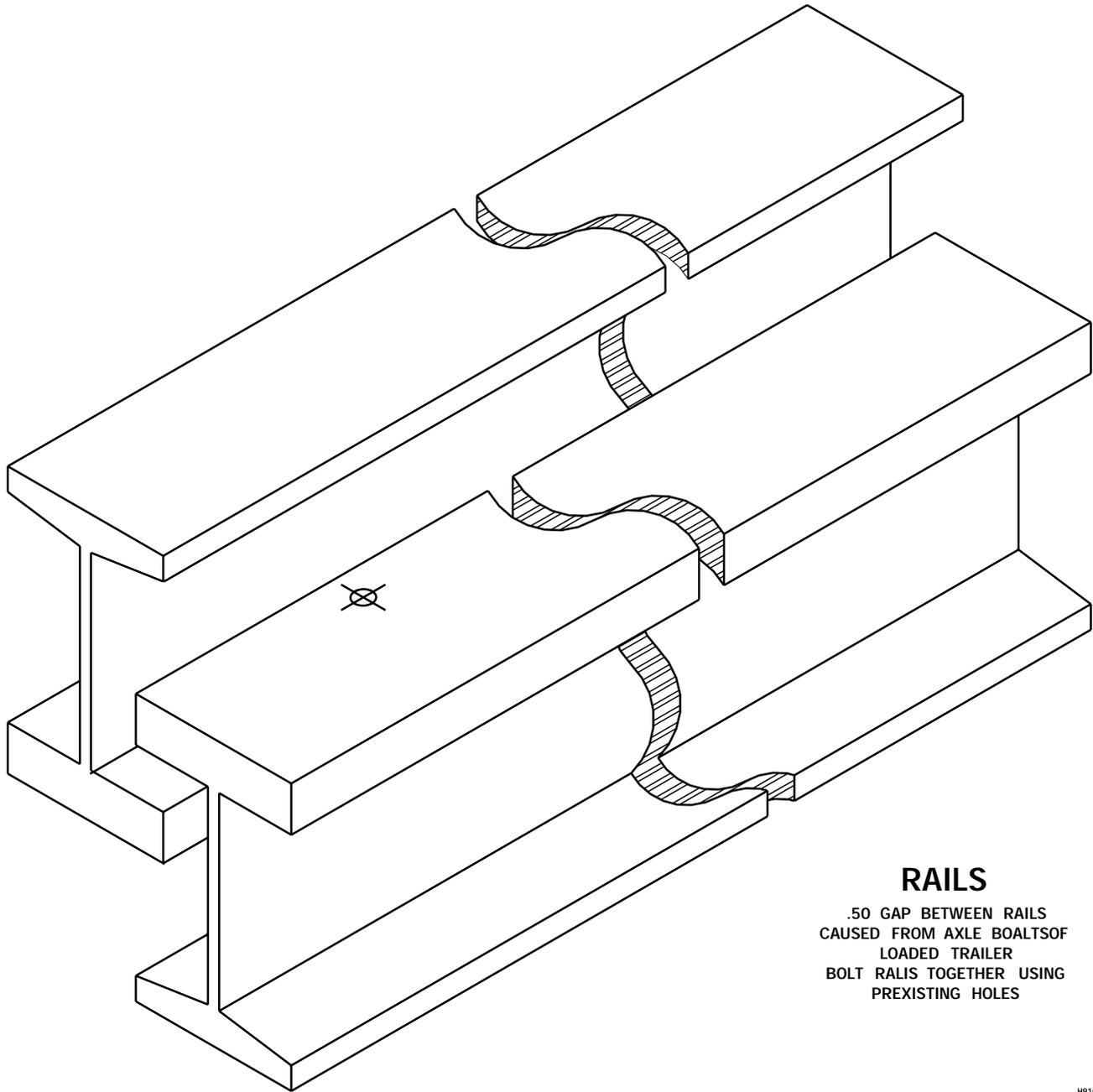


TOOL BOX SUPPORT

SCALE: .13 = 1.00
MATERIAL LIST:
2.00 x 2.00 ANGLE IRON
10' LG

H9102898

Figure 5-4. Tool Box Support



RAILS

.50 GAP BETWEEN RAILS
CAUSED FROM AXLE BOLTS OF
LOADED TRAILER
BOLT RAILS TOGETHER USING
PREEXISTING HOLES

H9102699

Figure 5-5. Rails

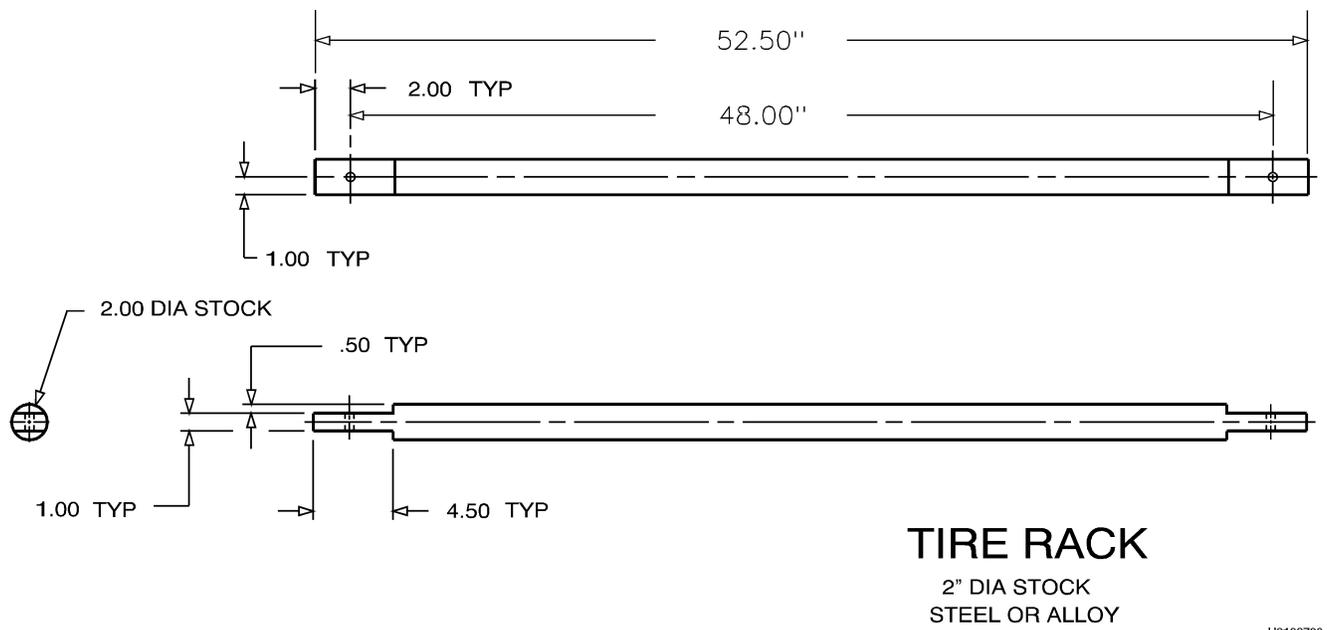


Figure 5-6. Tire Rack

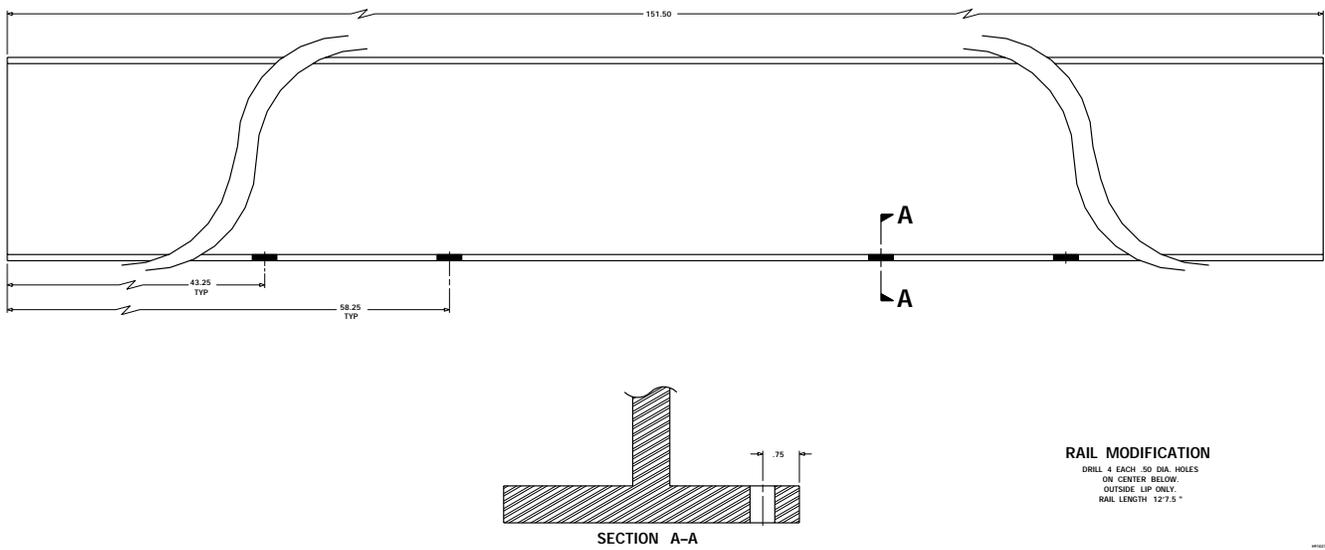


Figure 5-7. Rail Modification

CHAPTER 6

TIE DOWN INSTRUCTIONS

6.1 GENERAL.

6.2 The tie down instructions in this section are applicable to engines being shipped by aircraft, surface carrier equipment including vans, flatbed trailers, deep-well trailers and rail shipment.

6.3 This section describes various tie down instructions for several shipping devices in different methods of shipment.

6.4 Figures in this TO depict an approved method of tiedown for the type of equipment illustrated; however, an illustration of a 2000 pound engine tiedown is not necessarily the same method or equipment which should be used for a 5000 pound engine. Illustrations show an approved method of tie down for a given type of loading unless otherwise noted. The illustrations used herein are intended to depict approved methods of tie downs for different modes of shipment and may be applied to all applicable shipments.

6.5 In accordance with ICC regulations and AFR 75-1, the responsibility for securing engines on trucks or rail cars rests with the shipping activity. Therefore, before acceptance of any transportation facility for shipping aircraft engines by any method the facility shall be inspected by responsible Air Force personnel to insure that the dock will adequately support the engines.

NOTE

The Transportation Officer should notify trucking companies when ordering trailers that only wood beds are acceptable as the Air Force has no available means of tying down to metal beds, trailers, or trucks.

6.6 RAIL SHIPMENT.

6.6.1 Shipment of gas turbine engines loaded on airlift trailers is NOT authorized. Approved engines for rail shipment will be prepared as follows (Figure 6-7 and Figure 6-8):

6.6.2 Wood skids shall be inspected for good condition and shall be blocked at each end of container by nailing a block in each position mentioned above. The blocks shall be of 2 x 4 or larger material nailed to the decking by 20 dd nails, a second 2 x 4 block shall be nailed on top of the first set of blocks. Blocks shall be at least 18 inches or longer.

6.6.3 In addition to the blocks, containers shall be secured by steel bands across the top of the container. The steel bands shall be at least two inches wide and each container shall require two each steel bands. Strapping shall conform to specification QQ-S-781, type I, class A.

6.6.4 Strapping or bands shall be protected at all points where the band passes over sharp edges or around corners, to prevent damage.

6.6.5 Anchor plates, NSN 5340-00-252-3014 or 5340-00-252-3015, as applicable, shall be used for fastening strapping to deck if required to adequately secure the container. Anchor plates shall be secured with gimlet point round head screws.

6.7 AIRLIFT SHIPMENT.

6.7.1 Shipment of airlift trailers of the 2000 and 3000 series containing engines for AIR shipment shall be tied down as follows (Figure 6-6):

6.7.2 Position trailers on cargo deck.

6.7.3 Apply brakes.

6.7.4 Attach all tie down chains or cables to engine adapters.

TO 00-85-20

6.7.5 Position tie down cables or chains to avoid contact with each other or with any part of engine or trailer to prevent chafing.

6.7.6 Maintain lowest possible angle between floor and tie down cable or chain 45° or less.

6.7.7

CAUTION

DO NOT block or shore up beneath rails or axles. DO NOT route chains or cables over tops of rails or axles.

Holes in ends of rails shall not be used for tie downs.

6.7.8 Tow bar may be stored when space is limited by removing cotter pin and pulling the hinge pin.

6.7.9 Tires shall be inspected for proper inflation (Figure 4-6).

6.7.10 For shipment of containerized engines, see Chapter 4.

6.8 TRUCK SHIPMENT.

Trailer mounted engines shipped by flatbed shall be tied down and blocked (Figure 6-1, Figure 6-2 and Figure 6-3).

NOTE

Enclosed trucks WILL NOT be used for dolly or trailer mounted engines unless equipped with floor mounted bull rings and proper tie down equipment.

6.8.1 Wheel chocks of wood (4 x 4 inches or 4 x 6 inches) shall be placed fore and aft of each wheel. The chocks shall be chamfered and toenailed to the carrier deck using 30 dd nails to further secure the engine.

6.8.2 NOMINAL 2 x 4 inches or wider blocks, approximately 18 inches or longer shall be nailed with 20 dd nails to the truck floor or deck one inch from the outside of each tire, nail a second block on top of these blocks. These blocks will restrict side movement without damage to the side wall of tires.

6.8.3 Dolly mounted engines shall be tied down, and in addition shall be secured by blocking or bracing to prevent lateral or longitudinal movement. Timbers 2 inches thick and 4 or 6 inches wide shall be nailed to the floor or deck with 20 dd nails at each end and each side of box, skid or dolly and blocks shall be not less than 18 inches in length. A second block of same size and length shall be nailed on top of the first blocks using the same type of nails.

6.8.4 Engines in metal or FRP containers shall be tied down using one or more of the following methods:

6.8.4.1 Attach tie downs across container skids at each end and each side or from container pad eyes to truck anchors.

6.8.4.2 Attach cables, chains or strapping across top of container (protect container and tie down by use of cardboard placed under tie down).

6.8.4.3 Steel strapping used for securing containers shall be at least one and one-half inches wide for truck transports; two inches for rail shipment. Strapping shall conform to specification QQ-S-781 type I, class A. Strapping will be padded when routed over sharp edge or around corners.

6.8.4.4 When additional anchoring facilities are required to adequately secure engine container to transports by strapping, use anchor plates NSN 5340-00-252-3014 and 5340-00-252-3015 with gimlet point round head screws.

6.8.4.5 Canned engines loaded within the confines of closed vans will be secured by 2 x 4 inch blocks or with other freight and at the discretion of the transportation officer.

6.9 CERTIFICATION AND SEALS.

6.9.1 The agent or personnel responsible for securing the engine on the carrier shall sign the applicable copy of the government bill of lading in the area marked Blocked and Braced by ____. Authorized personnel shall sign the transportation copy in the area marked Blocking and Bracing inspected by ____.

6.9.2 All closed VAN type trucks shall be sealed when the following conditions apply:

6.9.2.1 Truck is fully loaded.

6.9.2.2 When exclusive use of vehicle is requested by shipper.

6.9.2.3 When requested by the carrier.

6.9.2.4 When shipment is tendered at truckload rates.

NOTE

Seal numbers shall be applied to appropriate shipping document so number can be transferred to government bill of lading.



Figure 6-1. Side View of Trailer Mounted Engine Loaded for Open Truck Shipment

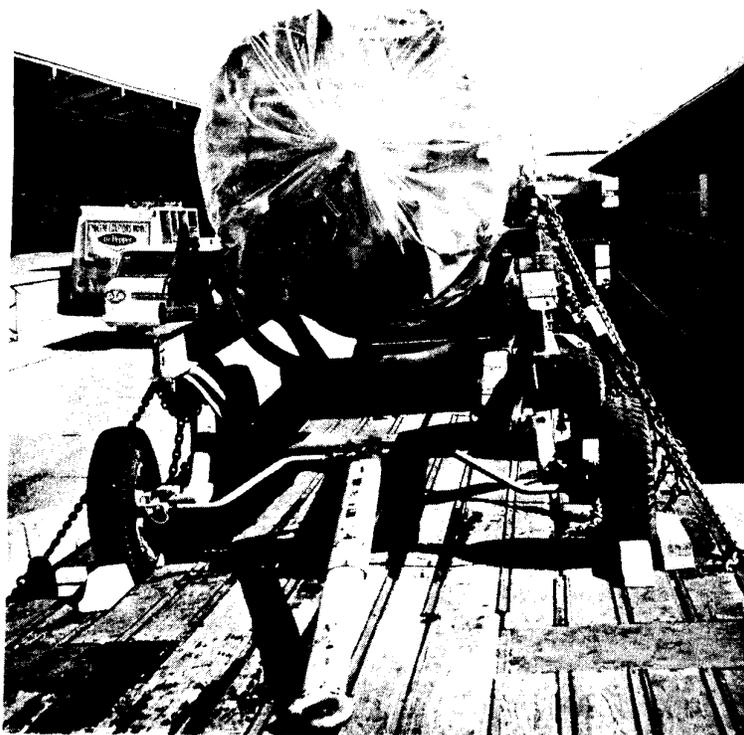


Figure 6-2. Front View of Trailer Mounted Engine Loaded for Open Truck Shipment

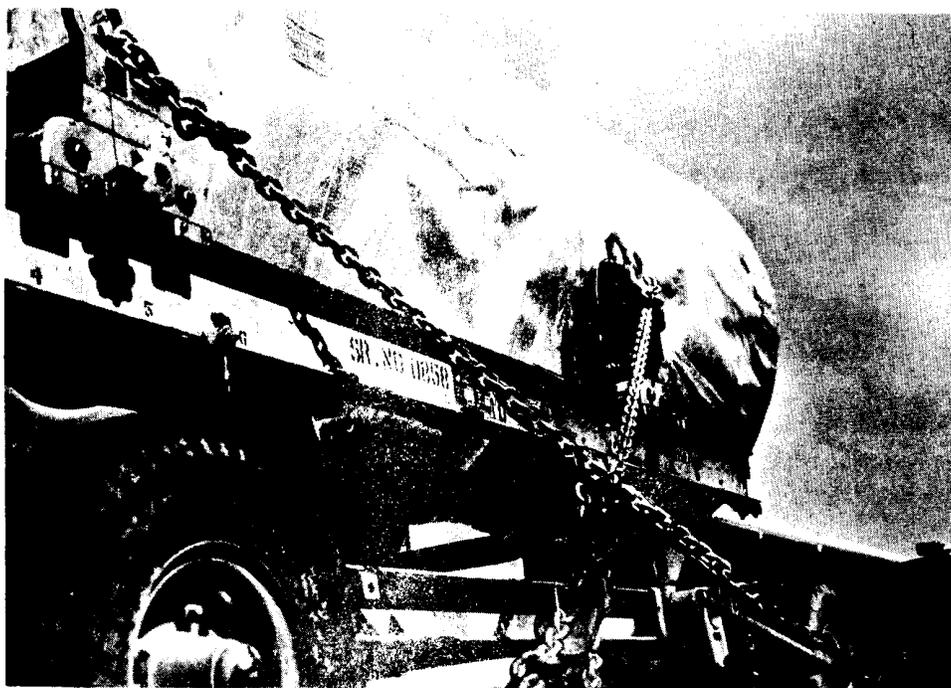


Figure 6-3. Close-Up View of Tie Down at Engine Mount

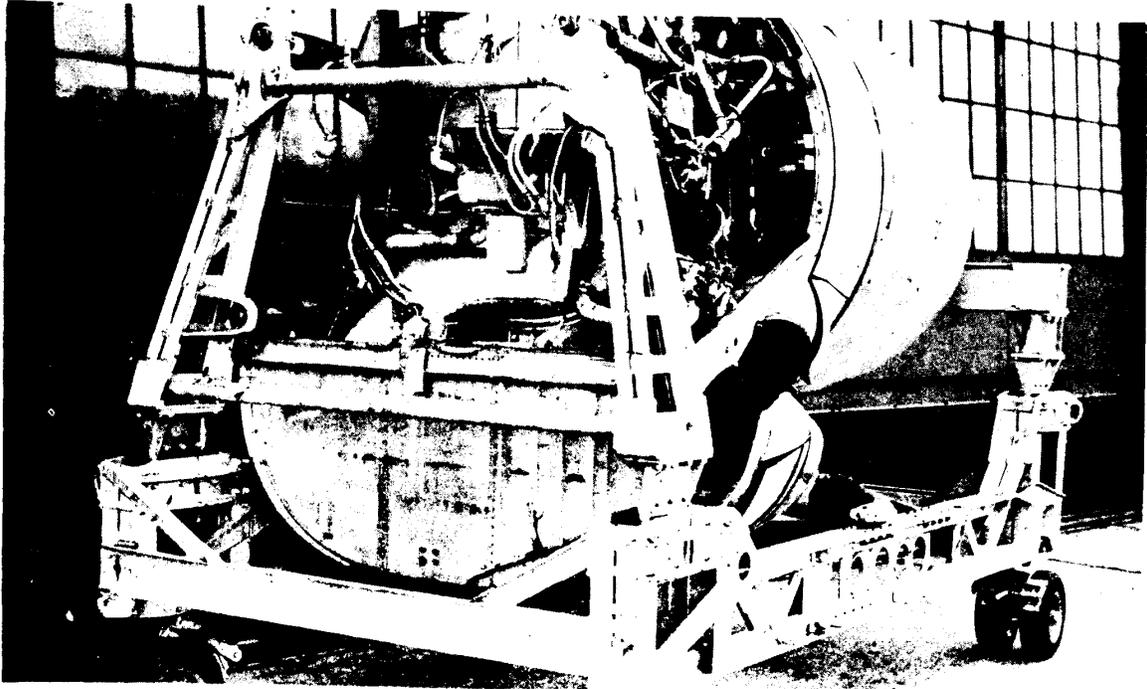


Figure 6-4. Trailer 55J9109 with KC-97 Power Package Installed, Right Rear Three-Quarter View

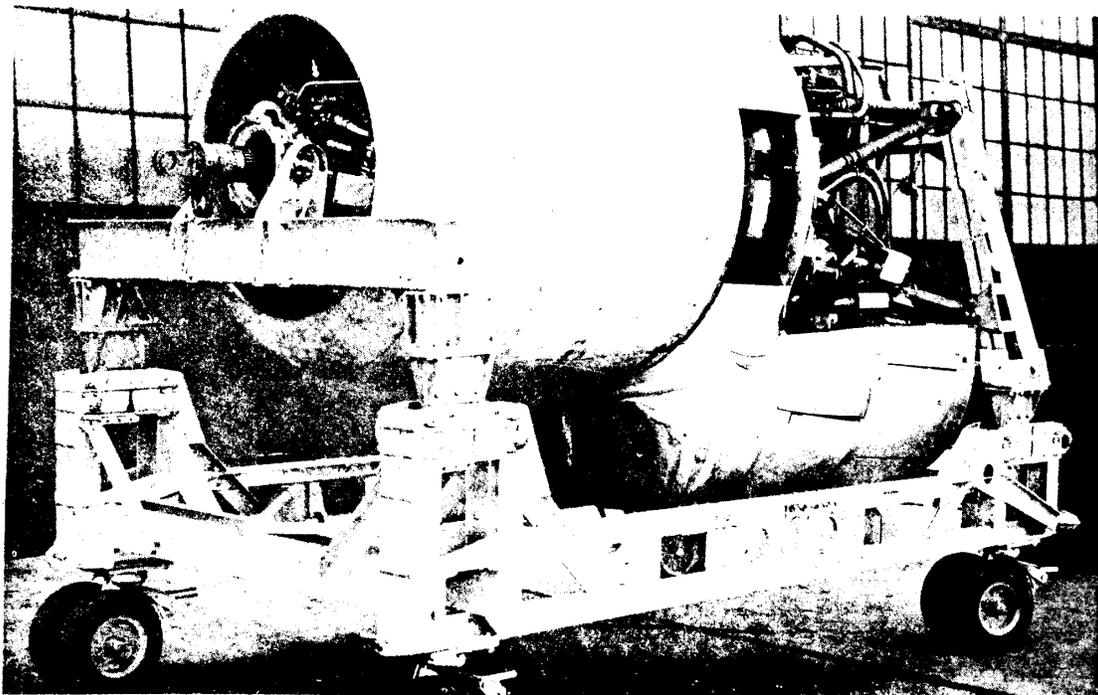


Figure 6-5. Trailer 55J9109 with KC-97 Power Package Installed, Left Front Three-Quarter View

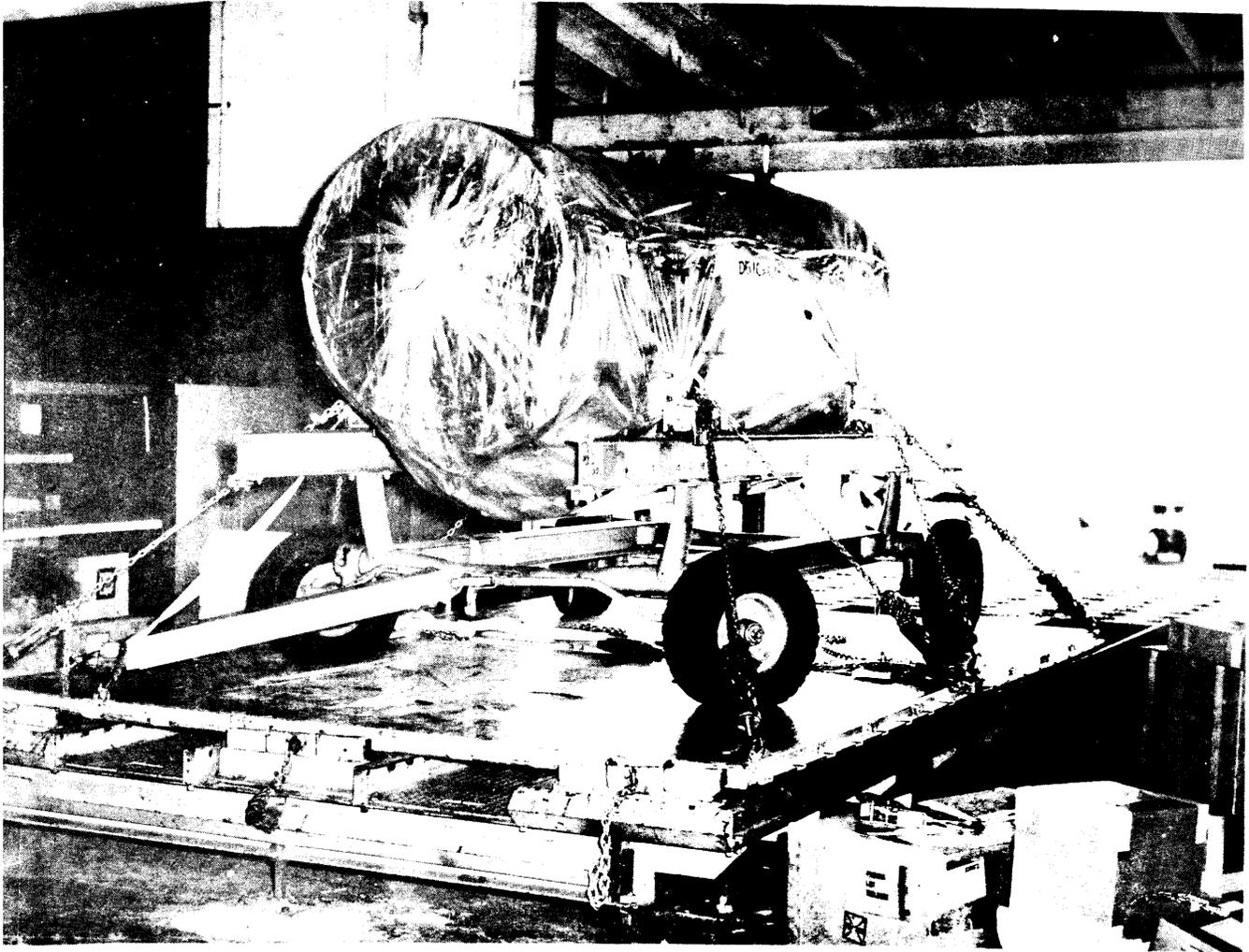


Figure 6-6. Recommended Tiedown Position for Air Shipment

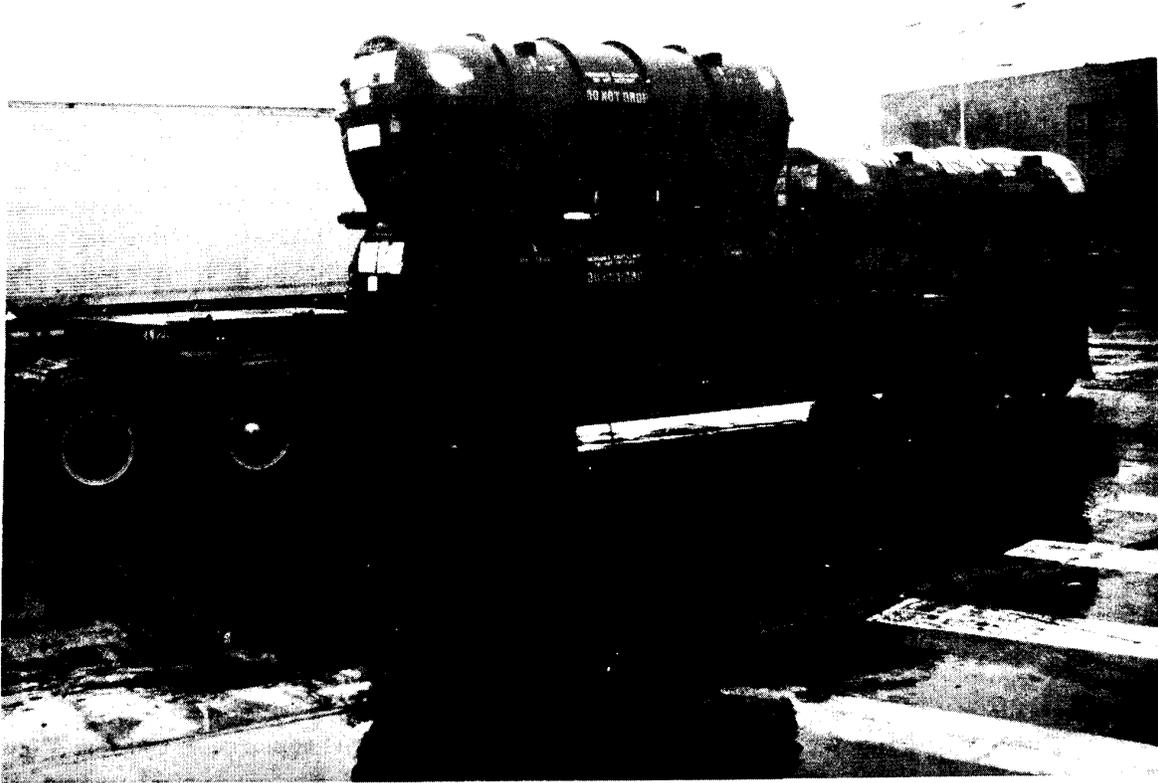


Figure 6-7. Engine Containers Double Decked



Figure 6-8. Engine Tie Down for Flat Car on Truck Shipment

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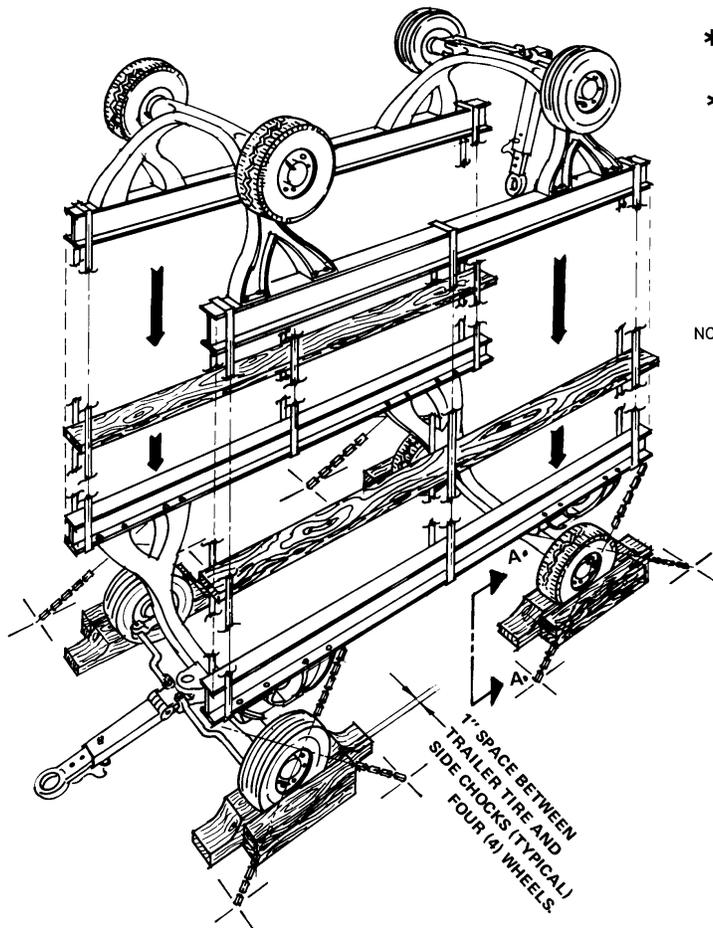
6.9.3 When shipping 3000E1 trailer piggyback on a 4000 trailer, follow procedures in [Figure 6-9](#) with the following exceptions:

6.9.3.1 Prepare the 4000 trailer by centering the lateral and rotational adjustments.

6.9.3.2 Lower rails until upper frame pads rest on lower frame pads.

6.9.3.3 Raise the 4000 trailer main frame to maximum height.

6.9.3.4 Open both relief valves to engage wheel cylinder locks. Return both relief valves to the closed position when the wheel cylinder lock has been engaged.



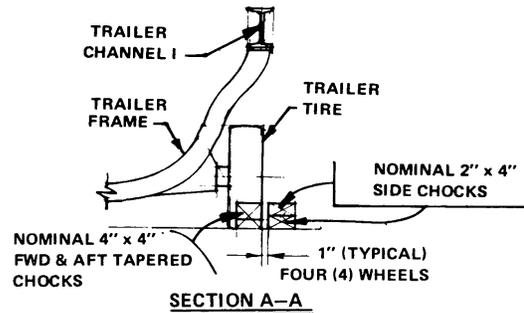
* ALTERNATE METHOD
USE FIBERBOARD, TRIPLEWALL,
PPP-F-320, SAME DIMENSIONS,
IN LIEU OF LUMBER

NOTES

1. THIS DIAGRAM PERTAINS TO THE 3000 & 4000 SERIES TRAILERS AND ADAPTERS AS REQUIRED IN PREPARATION FOR SHIPMENT.
- * 2. A NOMINAL 1" x 4" (LUMBER) SHALL BE PLACED BETWEEN THE RAILS OF TOP AND BOTTOM TRAILER PRIOR TO STRAPPING.
- * 3. TRAILERS SHALL BE STACKED AS ILLUSTRATED UTILIZING A NOMINAL 1" x 4" (LUMBER) BETWEEN RAILS TO ACT AS EXPANSION JOINT TO PREVENT STRAPPING BREAKAGE.
4. STRAPPING SHALL CONSIST OF 3/4 INCH WIDE STRAP WITH A MINIMUM OF THREE STRAPS OR THREE TIE DOWN CARGO STRAPS, STOCK NUMBER 1670-00-725-1437 OR EQUIVALENT. ONE CENTER STRAP AND THE OTHER STRAPS SPACED SIX INCHES FROM THE END OF EACH RAIL.
5. TRAILERS SHALL BE CHOCKED TO CARGO DECK AS ILLUSTRATED.

NOTE: USE AND AMBIENT TEMPERATURES HAVE A DIRECT RELATIONSHIP TO TIRE PRESSURE. THE HIGHER THE TEMPERATURE OF THE TIRE, THE HIGHER THE TIRE PRESSURE. THEREFORE, IT MUST BE RECOGNIZED THAT A TIRE GAUGED AFTER USAGE OR DURING THE HEAT OF THE DAY MAY EXCEED THE SPECIFIC PRESSURE TOLERANCE AND SHOULD NOT BE LOWERED.

6. TIRE PRESSURE SHALL BE 30-35 PSI FOR 6 PLY TIRES, 65 ± 10 PSI FOR 10 PLY TIRES ON 3000 SERIES TRAILERS, AND 90 PSI ± 10 PSI FOR 10 PLY TIRES 4000 SERIES TRAILERS.



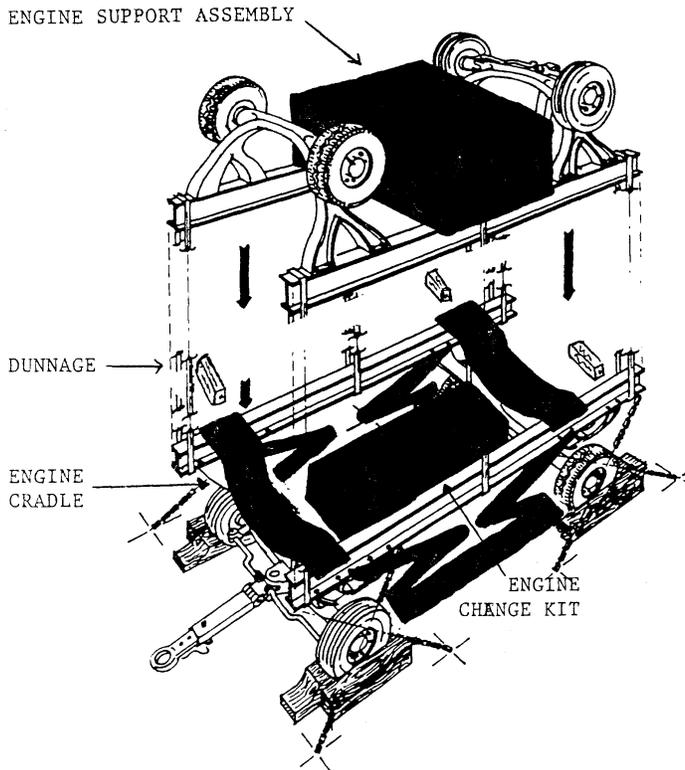
(TYPICAL) FOUR (4) WHEELS OF TRAILER MOUNTED TO DECK.

NOTES (CONTINUED)

7. ENGINE ADAPTERS MAY BE SECURED TO RAILS OF TRAILERS OR ADAPTERS CAN BE EITHER BANDED TO PALLETS OR PACKED IN WOOD BOXES AND SECURED TO CARGO DECK OF CONVEYANCE.
8. PIGGYBACK ADAPTERS SHALL BE PLACED 6 TO 10 INCHES FROM END OF RAILS. ENGINE ADAPTERS MAY BE INSTALLED ON BOTTOM TRAILER TO PERMIT LOWER CENTER OF GRAVITY, UNLESS SUCH ADAPTERS ARE PERMANENTLY SECURED TO TRAILERS WITH NUTS AND BOLTS.

H8900179

Figure 6-9. Shipment of Engine Transportation Trailers



ADDITIONAL NOTES FOR STACKING
3000/4000 TRAILERS

9. NESTING BOXES (ENGINE CHANGE KIT) MAY BE SECURED "INSIDE" 4000 TRAILER TO MAINTAIN LOWER CENTER OF GRAVITY.
10. A DIS-ASSEMBLED F100 ENGINE SUPPORT ASSEMBLY (HARDBACK) WITH NESTING BOX MAY BE PLACED ON/INSIDE THE 3000 TRAILER. SECURE TO UPPER TRAILER ONLY.
11. DUNNAGE SHOULD BE KEPT TO A MINIMUM MAINTAINING LEVEL RAILS. MAXIMUM OF 6" DUNNAGE.
12. REMOVE F100 ENGINE SUPPORT ASSEMBLY (HARDBACK) TOP AND SIDE BRACES FROM SUPPORT ASSEMBLIES. INSTALL SUPPORT ASSEMBLIES ON THE 4000 TRAILER RAIL AFT OF FORWARD LOCK PINS. LOCK ROLLER ADAPTERS OF SUPPORT ASSEMBLIES TO RAILS OF TRAILER BY TORQUEING BRAKE KNOB 375 TO 400 INCH POUNDS. SECURE THE BRACES TIGHTLY TO THE SIDE OF THE 4000 TRAILER WITH TIE DOWN CARGO STRAPS.

NOTE:

THE 3000 TRAILER CAN OVERHANG THE 4000 TRAILER BY APPROXIMATELY 24 INCHES.

H9335280

Figure 6-10. Shipment of Engine Transportation/Installation Trailers

6.10 LOADING UNITED TRAILER FOR AIR TRANSPORT.

The trailer, with power plant, may be air transported in either a C-130, C-141A, or C-5 aircraft. The procedure to load the trailer is the same for all aircraft. However, the trailer must be loaded into the C-130 and C-141A aft and first. Loading the trailer into a C-5A, either end can go first. It is recommended that the trailer be winched aboard the aircraft and the aft and/or forward manual steering utilized as required. It is necessary to have observers inside and outside the aircraft to be certain all clearances are maintained. The following procedure is for use with C-130 and C-141A aircraft with notes to delineate the options for the C-5A. Read the entire procedure before starting. Proceed as follows:

6.10.1 With the towing vehicle, position the trailer directly in line with the aircraft loading ramp. It may be necessary to maneuver the trailer by hand and manually steer it both fore and aft.

6.10.2

CAUTION

Remove the foot pads if they are installed in place and stow them on the top of the mainframe side rails as provided. Failure to comply will prevent proper clearances to be maintained.

Attach a sling to the rear (front or rear for C-5A), tie down rings and connect the aircraft cargo winch to its center.

6.10.3 Position the observers, release the parking brakes and start the winch.

6.10.4 If necessary, make any minor steering adjustments that are required to maintain side clearance.

6.10.5

CAUTION

Always reinstall the locking cylinder pins after operating the hydraulic lift mechanism. Failure to comply could result in excess power plant shock should any failure occur in the hydraulic system.

Stop the winch when the ground clearance becomes inadequate.

NOTE

When the trailer is being winched aboard an aircraft, initially the ground clearance is critical and must be maintained. At some point when one set of wheels are on the ramp and one set in the aircraft, the ceiling clearance becomes critical.

6.10.6 Operate the hydraulic lift mechanism and increase the floor/ceiling clearance as required, while observing the ceiling/floor clearance to maintain adequate overall clearance. Replace the locking cylinder pins.

6.10.7 Start the winch.

6.10.8 Repeat paragraph 6.10.6, paragraph 6.10.7 and paragraph 6.10.8 as many times as necessary until all four trailer wheels are on the same plane.

6.10.9 Install the foot pads.

6.10.10 When the trailer and power plant have been winched to the position desired, set the aft parking brakes and fully kneel the trailer.

6.10.11 Set the forward parking brakes and close the hydraulic pump bleed valve and metering valve.

6.10.12 After the trailer is positioned on the carrier, secure it with chains or cables as shown in [Figure 6-10](#).

6.11 LOADING LOCKHEED ENGINE TRAILER IN AIRCRAFT, TF39.

NOTE

In case of conflict between these instructions and applicable aircraft loading instructions, the applicable aircraft loading instructions shall be followed.

- 6.11.1 Tow the trailer to the vicinity of the aircraft loading ramp. Unkneel the trailer.
- 6.11.2 Remove and stow foot pads from the front of the trailer.
- 6.11.3 Load and position trailer on the aircraft. The rear towbar may be used for manual steering.
- 6.11.4 Straighten front and rear wheels and install lock pin in rear tongue. Secure trailer by engaging front and rear handbrakes.
- 6.11.5 Secure trailer in accordance with applicable loading instructions using tie-down rings.

6.12 LOADING ENGINE TRAILER ON FLAT BED TRUCK OR RAILWAY FLAT CAR, TF39.

WARNING

Carrier bed must be of sufficient width, or incorporate outriggers to provide full contact with trailer tire treads. No tread overhang shall be permitted.

6.12.1

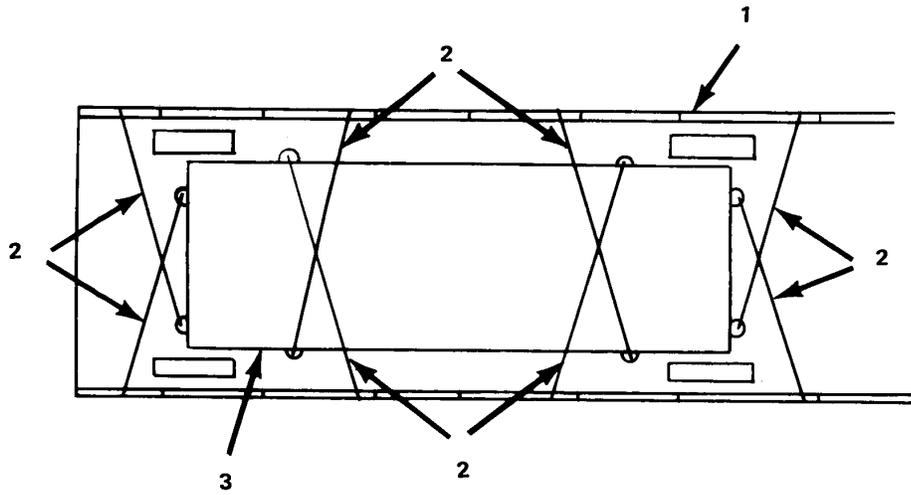
CAUTION

- Hoist the trailer only at the four rings located on outside corners of main frame marked hoist ring.
- Due to engine height, and to prevent engine bearing damage, use only lowboy air suspension or railway air suspension when transporting engine by surface transportation.
- The trailer must be in the unkneeled position. Shipping in the kneeled position could result in damage to the trailer and/or engine.

The trailer, with an engine installed, may be loaded on the carrier with a tow vehicle which has facilities for air brake systems.

6.12.2 The trailer/engine combination may be loaded on the carrier using a crane and sling. The sling must have spreader bars to assure the four cables clear the engine.

6.12.3 After trailer is positioned on carrier, remove and stow front towbar in a convenient location on truck bed/flat car. Secure trailer by attaching tie-down chains or cables to the tie-down/hoist rings as shown in [Figure 6-10](#).



- 1. TRAILER
- 2. TIEDOWN CHAIN
- 3. TRUCK BED

NOTE

REMOVE AND STOW FORWARD TOWBAR IN A CONVENIENT LOCATION ON THE TRUCK BED.

Figure 6-11. Position of Tiedown Chains or Cables

6.13 TIEDOWN INSTRUCTIONS FOR MULTI-PURPOSE TRAILER, F108.

6.13.1 Load engine/trailer on flatbed in accordance with paragraph 5.14.

6.13.2

CAUTION

- Rear tiedown, for engines with QEC Kit installed, must be checked to ensure sufficient clearance exists between ring cowl and tiedown. Insufficient may result in costly engine damage.
- When preparing F108 engines for surface shipment, ensure no tiedowns cross over any position of the cradle and shock mount assembly. Any tiedown attached to or which passes over cradle and shock mount assembly would eliminate shock damping features and result in engine bearing damage.

Attach and secure tiedowns to front, rear and sides of trailer in accordance with [Figure 6-11](#), [Figure 6-12](#), and [Figure 6-13](#).

6.14 TIEDOWN INSTRUCTIONS FOR F108 ENGINE STAND (PART NUMBER 856A1200) (FIGURE 6-15 AND FIGURE 6-16).

6.14.1 Load engine/stand on flatbed in accordance with paragraph 5.15.

6.14.2

CAUTION

- To ensure vibration dampening feature of the shipping stand is not nullified, there must be a minimum clearance of 1.5 inches (38 mm) between the lowest part of engine or shipping stand cradle and trailer bed. If necessary, wood shoring can be placed beneath the stand base, forklift tunnels and trailer bed in order to achieve the required minimum clearance. Shoring must be placed beneath stand so that it does not protrude inboard within the vertical plane movement of cradle.
- Tie-down chains and straps must be installed properly and attached solely to tie-down rings. Loose ends of tie-down must be kept clear from the top and underneath engine/stand. If improper tie-down is performed, the vibration dampening feature of the shipping stand shock mounts will be nullified resulting in possible engine bearing damage from excessive G loads.

Anchor the engine/stand base to the flatbed by tie-down straps or chains.

NOTE

There are ten tie-down rings on the stand base. Any combination can be used; however, use of the rings located at the four inside corners of the stand base is recommended.

6.14.3 Attach tie-downs to rings and pull them diagonally along the truck bed to anchoring points on the flatbed. Pull all tie-down chains or straps taut and secure ([Figure 6-15](#)).

6.14.4 Acceptable alternate method is to pass chains or straps through the engine/stand base forklift tunnels. Pull tie-downs forward and aft along side of flatbed and secure to anchoring points. Pull all tie-down chains and straps taut and secure ([Figure 6-16](#)).

6.15 F110 ENGINE SHIPPING AND STORAGE STAND GENERAL INFORMATION.

6.15.1 The ETU-114/E Engine Shipping and Storage Stand is intended for transportation and storage of the F110-GE-100 Turbofan Engine with augments installed. The shipping and storage stand consists of an outer rigid supporting structure and an inner frame attached to the support structure by an elastic suspension. The inner frame includes provisions for supporting the engine by the flight support points.

6.15.2 The physical size of the ETU-114/E Engine Shipping and Storage Stand is as follows:

(1) WITH ENGINE INSTALLED:

Length = 186 inches
 Width = 48 inches
 Height = 56 inches
 Cube = 289.3 feet

Weight (maximum) = 5620 pounds

(2) EMPTY:

Length = 90 inches
 Width = 48 inches
 Height = 56 inches
 Cube = 140.0 feet
 Weight = 1020 pounds

6.15.3 Two-way forklift entry is provided to permit handling by forklift truck.

6.15.4 Four hoisting eyes provided on the top to permit hoisting with a four part sling.

6.15.5 Unloaded stands may be stacked two-high for transportation and storage. Loaded stands may be stacked two-high for storage but not for transportation. Tapered guide pins are provided to aid stacking alignment. A positive stacking interlock is located at each corner.

6.15.6 Four rings are provided along the top of the stand that may be used for surface transportation tie down. These may be used in various combinations to tie down a single stand or groups of two or more stands. In addition, there are two lower loops that are used for air transport tiedown only.

6.16 ETU-114/E STAND SURFACE TRANSPORTATION, F110.

6.16.1 Surface transportation of engines, an air ride tractor and trailer will be used. The trailer must be at least 40 feet in length.

NOTE

Nylon straps are the preferred method of tiedown.

6.16.2 Engine stand forward and aft movement will be restricted by the use of 2 inch x 6 inch x 24 inch blocks, nailed to the bed of the trailer with 2 odd nails at all four corners (Figure 6-17.)

6.16.3 Multiple shipment engine stands will be side by side, with the stand upright members parallel. The engines will face one forward and one aft. The engines must be at least one foot from the forward or aft end of the trailer. The distance between two engines on the same side of the trailer must be at least two feet (Figure 6-14).

6.16.4 Four upper tiedown rings will be utilized for surface transportation. Do not use the lower loops (Figure 6-17).

TO 00-85-20

6.17 PLACEMENT FOR THE SHIPMENT OF 1, 2, 3 AND 4 ENGINES, F110.

6.17.1 One engine: Placed on the center of the trailer.

6.17.2 Two engines: Placed on the center of the trailer.

6.17.3 Three engines: Two engines placed forward on the trailer and one engine placed on the rear of the trailer.

6.17.4 Four engines: Two engines placed forward on the trailer and two engines placed on the rear of the trailer.

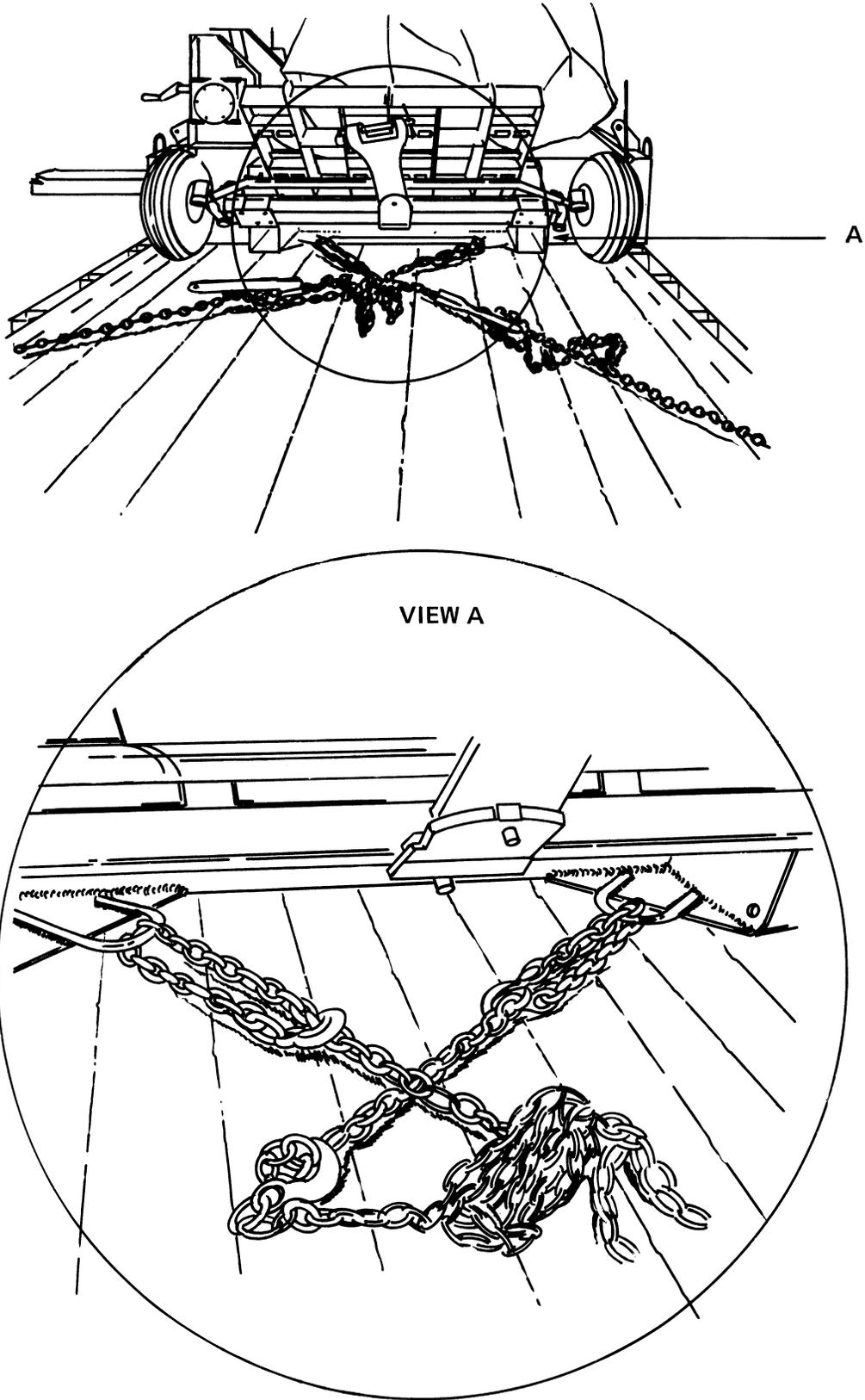


Figure 6-12. Front Tiedown

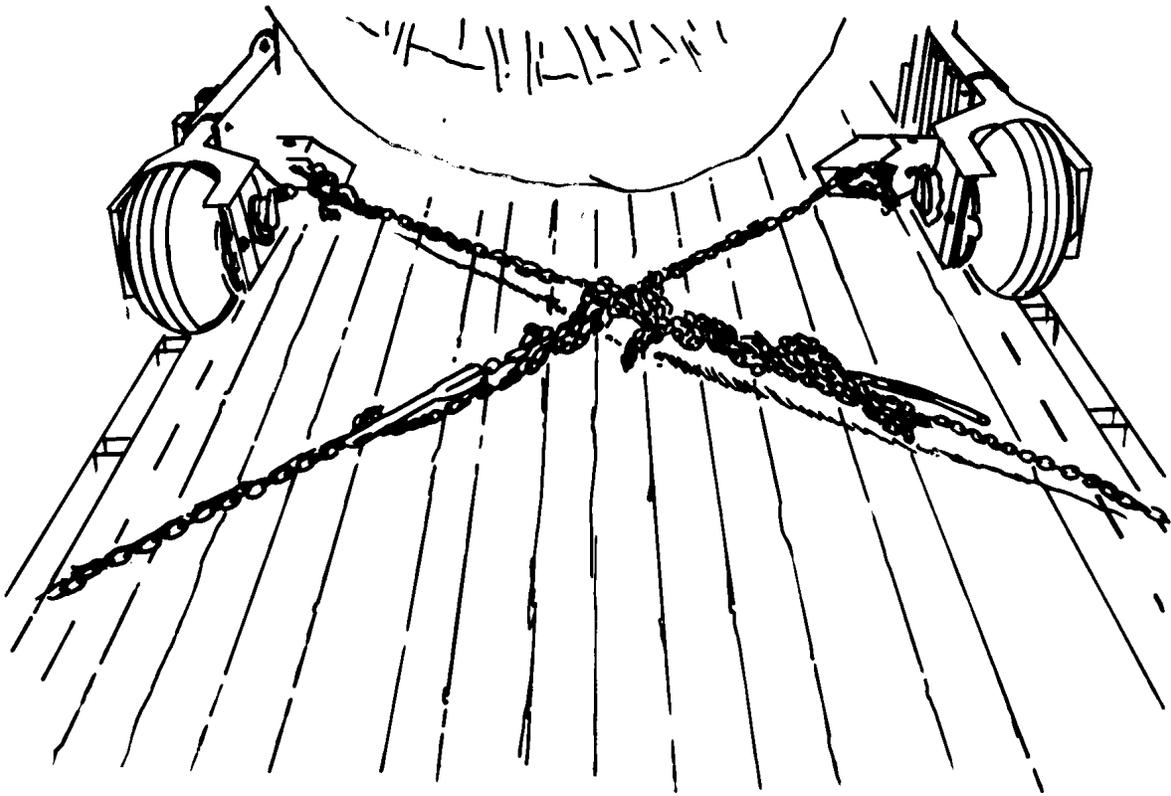
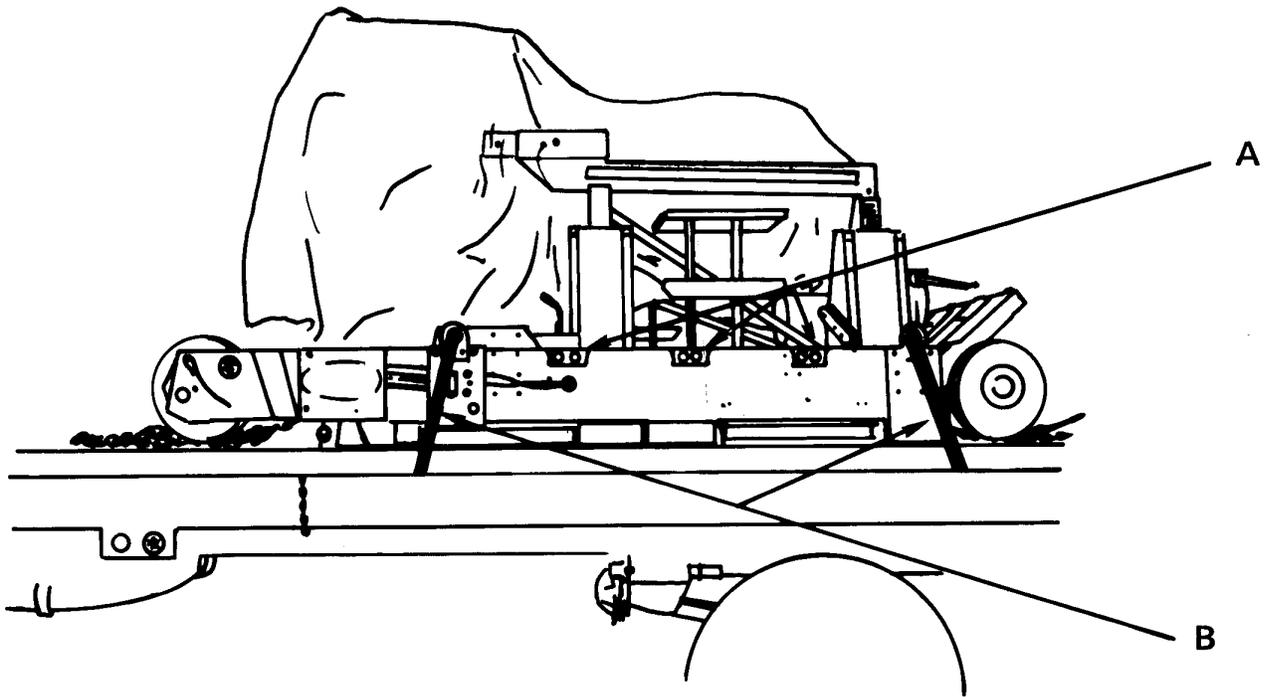


Figure 6-13. Rear Tiedown

REAR

FRONT



A. FOR AIRCRAFT TIEDOWN ONLY

B. SIDE TIEDOWNS

Figure 6-14. Side Tiedowns (2 sides)

TO 00-85-20

6.18 AIR TRANSPORTATION, F110 (FIGURE 6-20).

6.18.1 Air transportation of engines/stands will utilize the HCU-6/E pallet.

6.18.2 Four upper tiedown rings and two lower tiedown loops will be utilized for air transportation.

6.18.3

CAUTION

Use only a four-part sling with a minimum reach of 50 inches. Stands with engines installed may be stacked two high for storage purposes. Stands with engines will not be shipped stacked.

Single engine shipment, the engine will face forward. Dual engine shipment (paragraph 6.16.3).

NOTE

Use a four-part sling with a minimum reach of 50 inches.

6.18.4 Remove the four quick disconnect locking pins from the bottom stand.

6.18.5 Lift stand and lower onto the lower stand using the tapered locating pins as a guide.

6.18.6 Insert the four quick disconnect pins of the lower stand into the tapered locating pins protruding through the base of the upper stand.

6.19 UNSTACKING ETU-114/E STAND, F110.

6.19.1 Remove the four quick disconnect pins from the lower stand's tapered locating pins.

6.19.2 Raise the upper stand from the lower stand.

6.19.3 Replace the quick disconnect locking pins in storage holes on the lower stand.

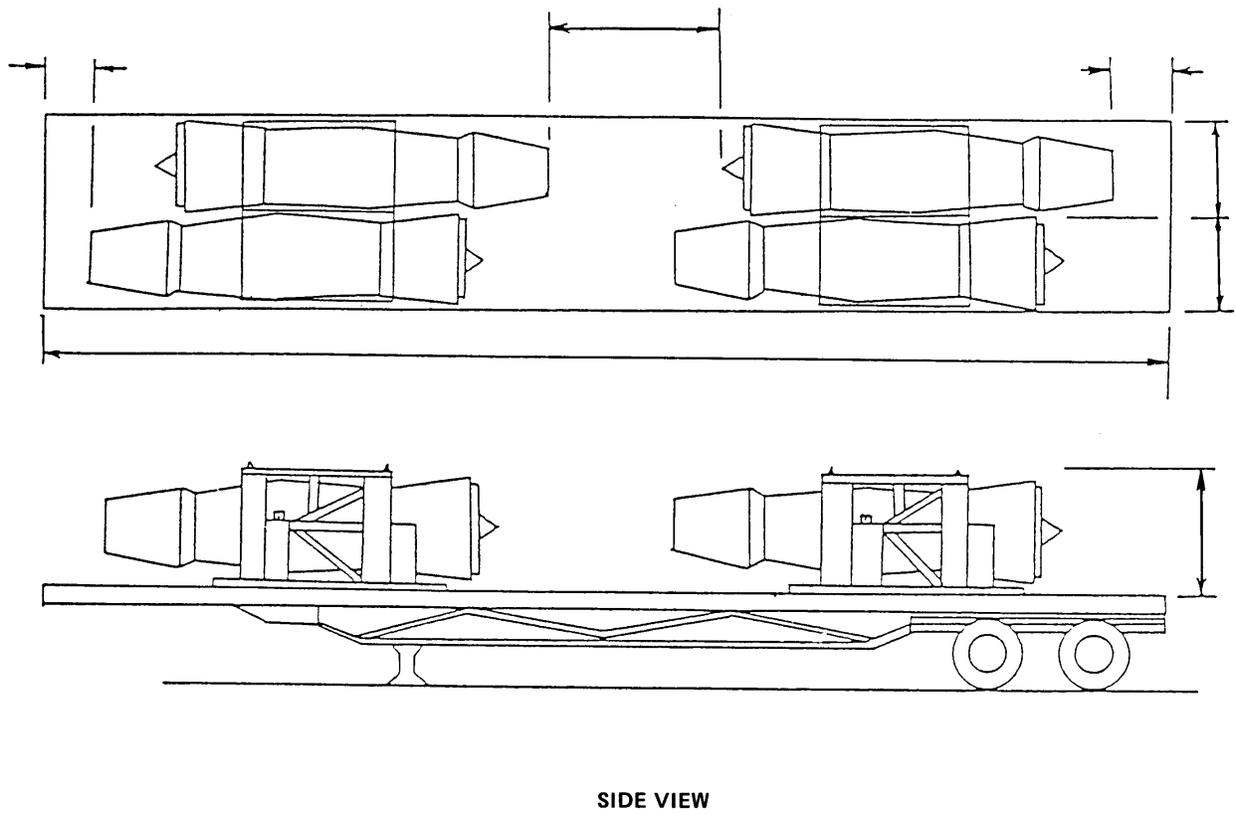
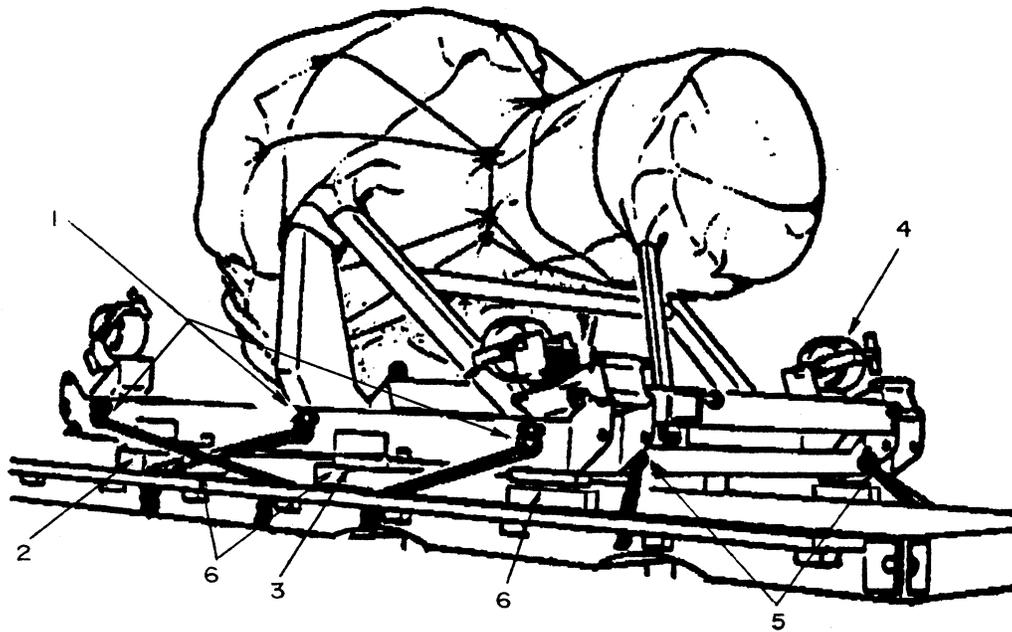
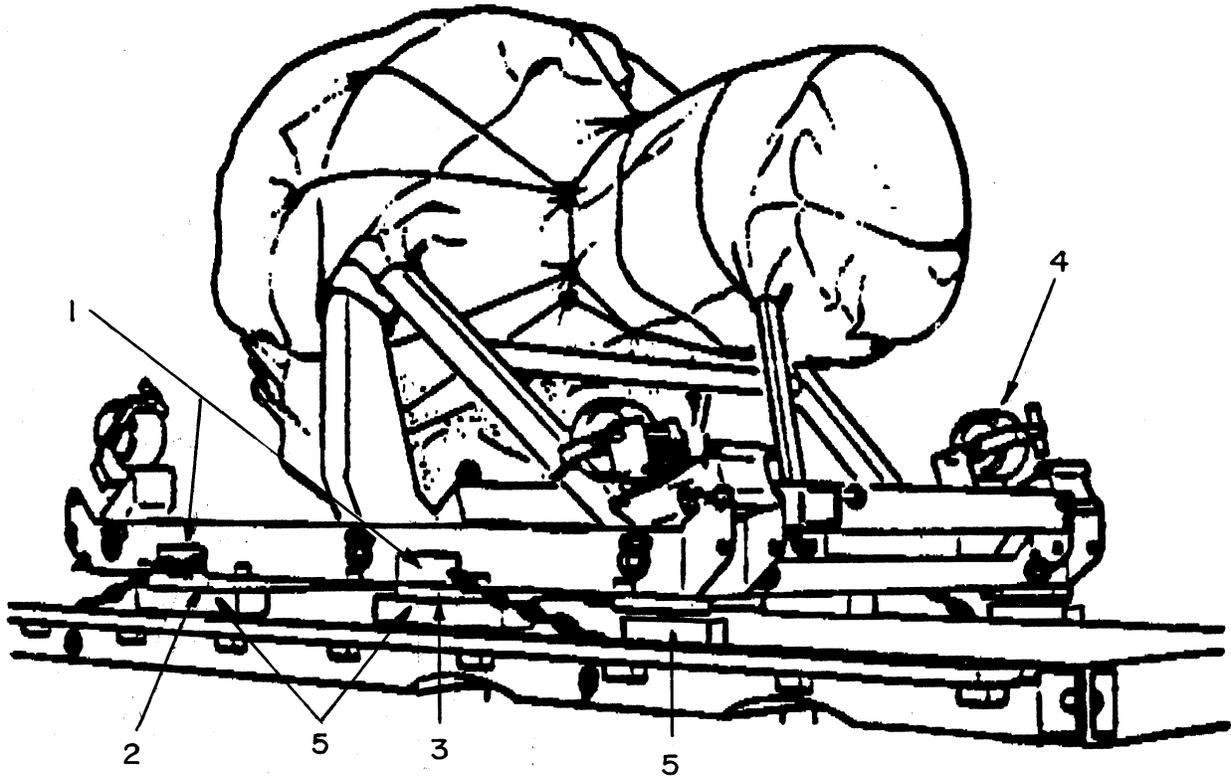


Figure 6-15. Surface Transportation, F110



1. Tie-Down Rings (Both sides)
2. Forward Base Support
3. Aft Base Support
4. Transportation Wheels Up and Locked
5. Rear Inside Corner Tie-Down Rings
(Front Inside Corner Tie-Down Rings Not Shown)
6. Shoring

Figure 6-16. F108 Transportation Stand Tie Down



1. Forklift Tunnels
2. Forward Base Support
3. Aft Base Support
4. Transportation Wheels Up and Locked
5. Shoring

Figure 6-17. F108 Transportation Stand Tie-Down (Alternate Method)

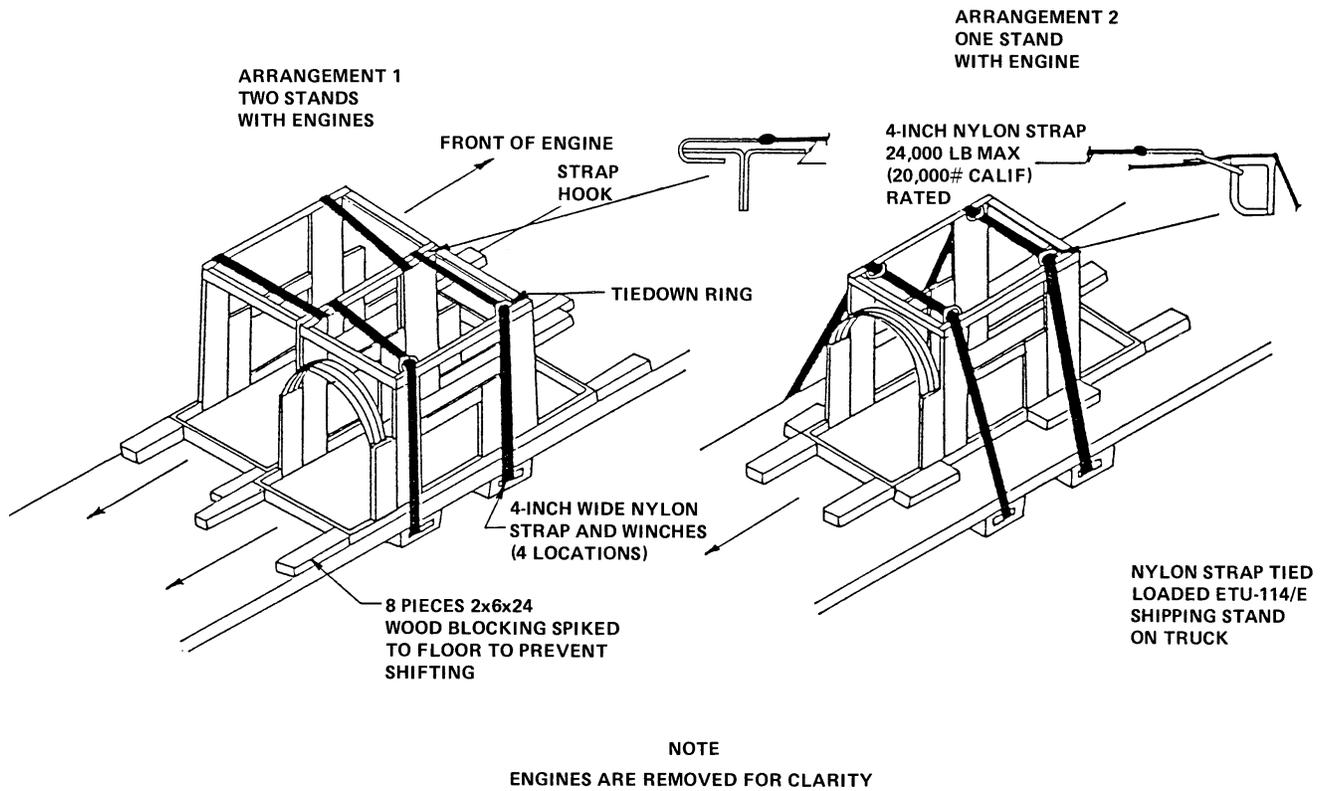


Figure 6-18. Nylon Strap Tiedown (Preferred Method)

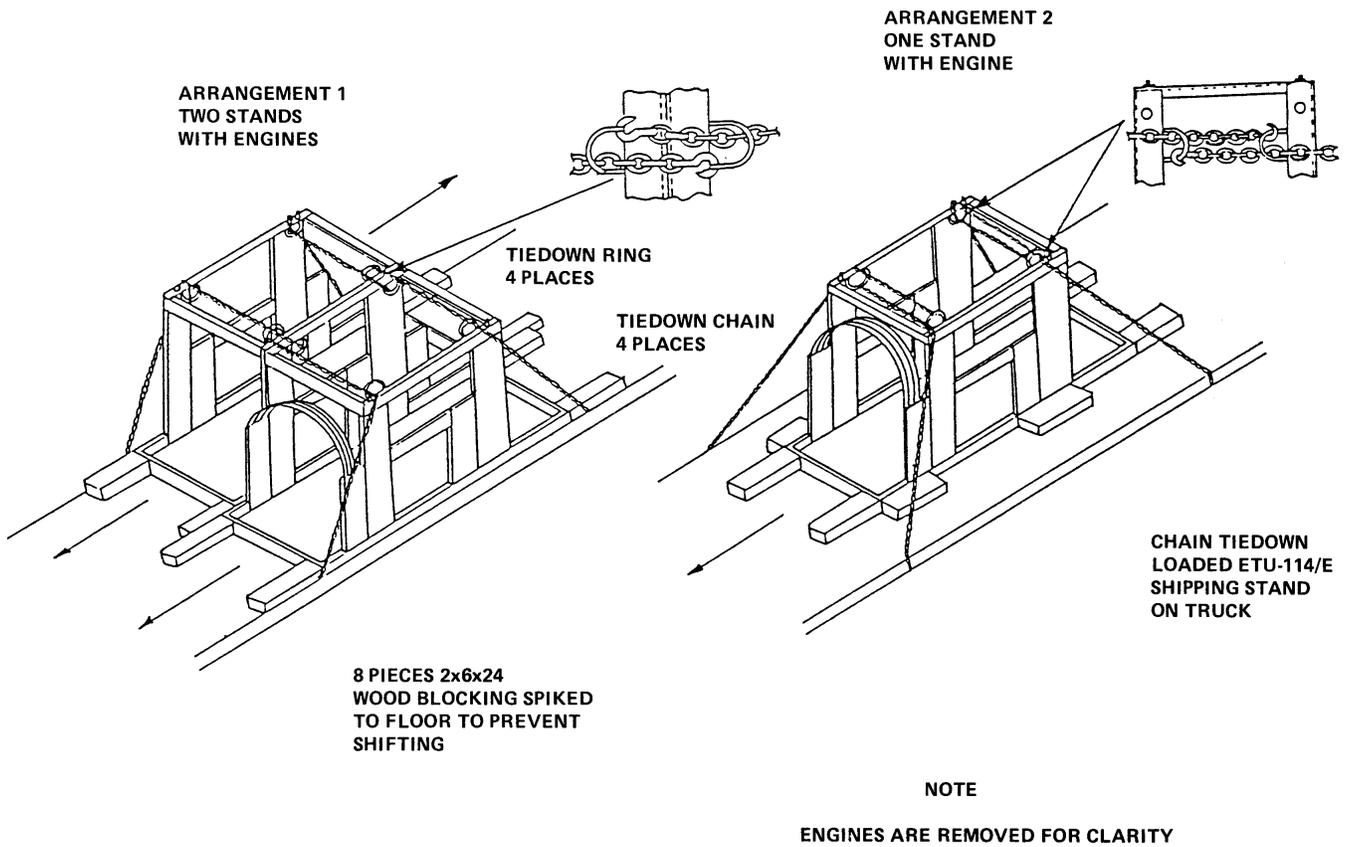


Figure 6-19. Chain Tiedown (Alternate Method)

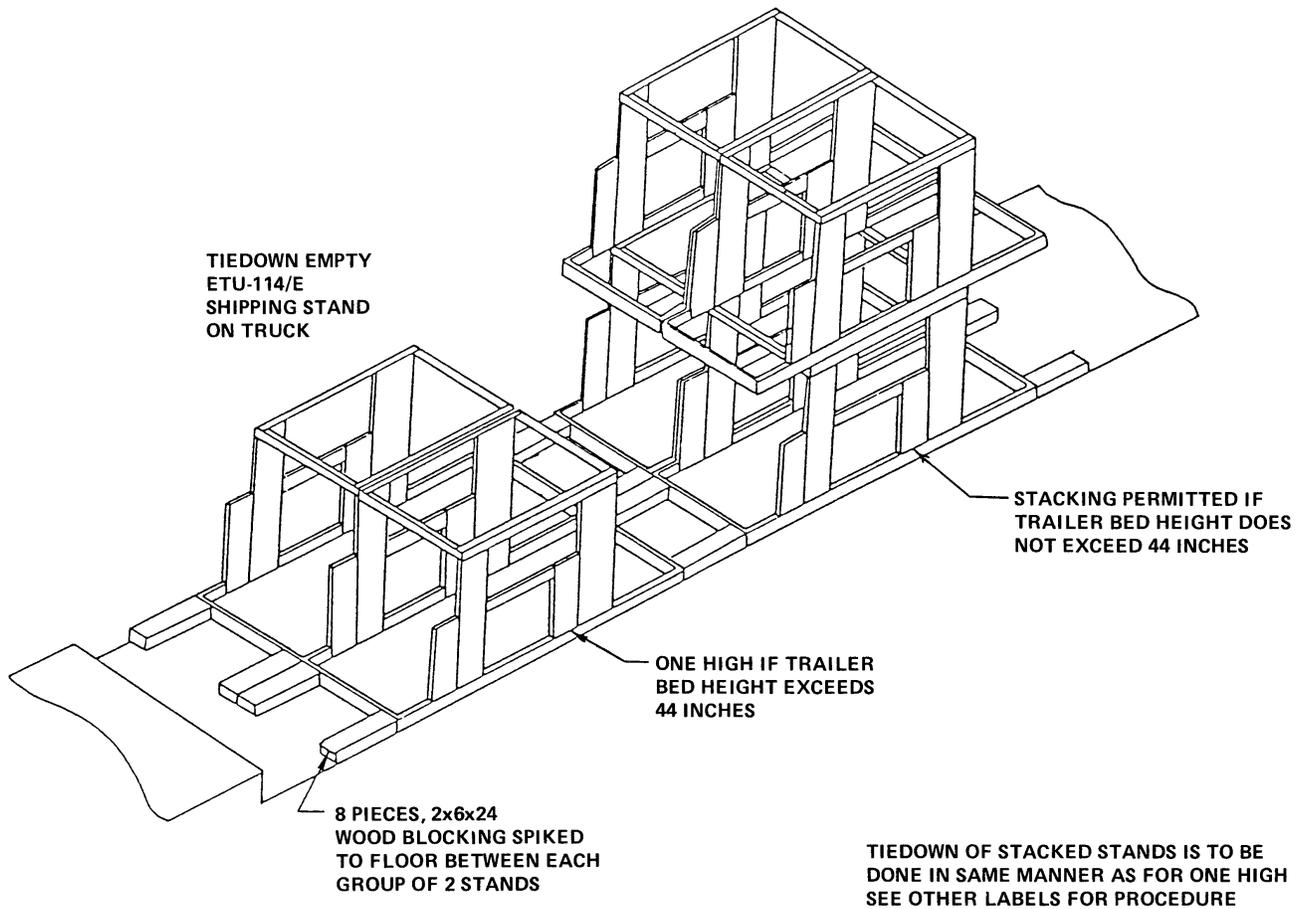


Figure 6-20. Stack Stand Tiedown

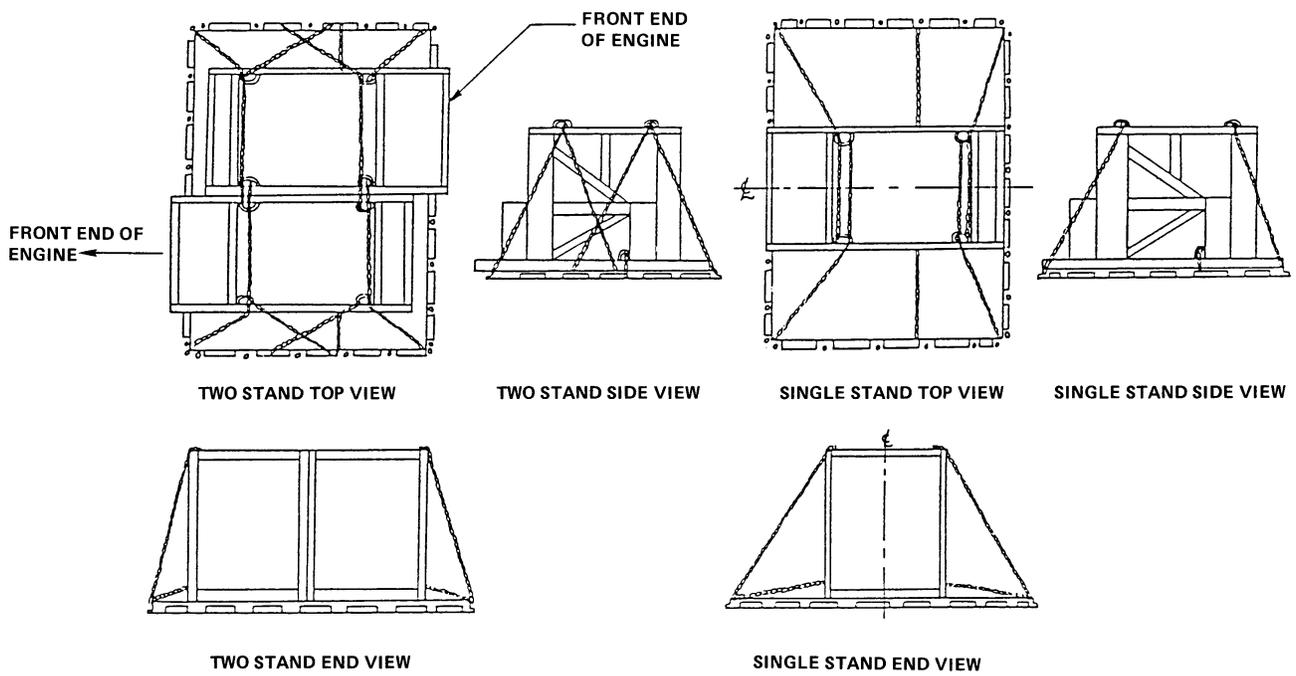


Figure 6-21. HCU-6/E Pallet Tiedown

6.20 LOADING TT90-F-503/TT90-F-505 TRAILER AND F117-PW-100 ON A FLAT BED TRAILER USING TOW VEHICLE.

CAUTION

- Surface transportation of the F117-PW-100 requires the use of pneumatic suspension (Air-Ride) tractor-trailer. Due to the height of the engine, only low boy tractor trailer shall be used. The loaded height of the engine and trailer should not exceed 13 feet 6 inches (thirteen feet – six inches) to clear bridge overhangs.
- Loading of the TT90-F transportation trailer with engine installed shall not be accomplished using a forklift because the forks will damage the engine.
- Carrier's tractor-trailer bed must have a sufficient width to accommodate the wheelbase of the engine trailer. Tire tread hang over is not permitted.
- The two vehicle must be equipped with a pintle hook and have a minimum drawbar rating of grades/ramps and when conditions reduce traction.

6.20.1 With a suitable tow vehicle, position the trailer with the centerline of tractor trailer ramp. Disconnect trailer brake system (quick disconnect) coupling to aid in backing.

6.20.2 Set engine trailer's forward and aft hand brakes.

6.20.3 Install steering bar at engine trailer's rear (engine fwd) steering assembly. Remove pin from the steering linkage arm.

6.20.4 Release engine trailer's front and rear brakes.

6.20.5 Push back the engine trailer up the flat bed ramp, making minor steering adjustments with the steering bar.

6.20.6 Set the forward hand brakes only. Reconnect brake hose coupling.

6.20.7 Disengage tow vehicle. Stow engine trailer draw bar in the vertical position and install lock pin.

6.20.8 Remove and stow the trailer steering bar. Install lock pin **in** the trailer rear steering linkage arm.

6.20.9 TT90-F-503 with articulating pins.

6.20.9.1 Remove lift mechanism articulating pins. Actuation of the hydraulic hand pump may be required to easily remove articulating pins.

6.20.10 TT90-F-505.

WARNING

Do not attempt to lower the trailer after actuator locking blocks have seated against the hydraulic actuator. Failure to comply may result in injury to personnel or damage to trailer.

6.20.10.1 Shoring dimensions shall be as follows: four stacks 20 inches L X 11 inches W X 14 to 16 inches H. Each stack of shoring shall be placed under the trailer and frame, centered under the SHORING markings. To prevent shifting during transport, the shoring stack-up should be fastened together using glue, nails, straps or screws. Additional shim pieces may be required to ensure even contact between the shoring and the frame after the trailer is lowered.

6.20.11 TT90-F-503.

6.20.11.1 Operate the hand pump and lower the engine trailer onto the tractor-trailer flatbed surface. Making sure the trailer is evenly lowered to prevent tipping.

6.20.11.2 TT90-F-505.

Railer trailer frame to clear lumber shoring using the trailer's hand pump and selector valves. Place the shoring under the trailer frame as shown in Figure 6-22A.

6.20.11.3 TT90-F-505.

Operate the hand pump and appropriate selector valves to lower trailer until the frame rests firmly on the shoring in all four locations.

6.20.12

CAUTION

Do not attach cables, chains, or strapping across the top of the engine, shipping cradle, or trailer rails. If improper tie down is performed, the shock and vibration damping feature of the engine trailer is nullified, resulting in serious damage to the engine during shipment.

Check that all four hand brakes are set. Chocking of the wheel is recommended per paragraph 6.8.

6.20.13 Secure with chains and binder that comply with D.O.T. 393-102 standards. Use a cargo strap to secure drawbar to truck trailer to prevent lateral movement. Optional: The drawbar can be removed and secured on the trailer bed.

6.20.14 TT90-F-503.

6.20.14.1 Install tarpaulins cover over engine and secure with 2x3 boards nailed together and secure to the bed of the carriers trailer to prevent vibration and flapping damage during transport.

6.20.15 TT90-F-505.

6.20.15.1 Ensure the engine is sealed in a shipping bag or plastic sheeting per paragraph 4.4. Install tarpaulins over engine and secure using elastic bungee cords, rubber straps, etc. Do not allow metal hardware to come in contact with the engine to prevent impact damage during transport.

6.20.16 Comment:

- a. Release rear brake (-503 and 505). Add steps to raise the -503 trailer from the floor of the flat bed trailer and install articulating pins.
- b. Add step to raise the -505 to remove shoring from under frame. Add step to lower the -505 trailer until actuator locking blocks have seated against the Hydraulic actuator.
- c. Lower front draw bar (-503 and 505)
- d. Install rear steering bar (-503 and 505)
- e. Connect tow vehicle to draw bar (-503 and 505)
- f. Release front brakes (-503 and 505)
- g. Tow trailer from truck trailer (-503 and 505)

(Do not disconnect brake line to pull trailer off of truck, brake system is needed to slow trailer down as it is pulled down the ramp.) (-503 and 505)

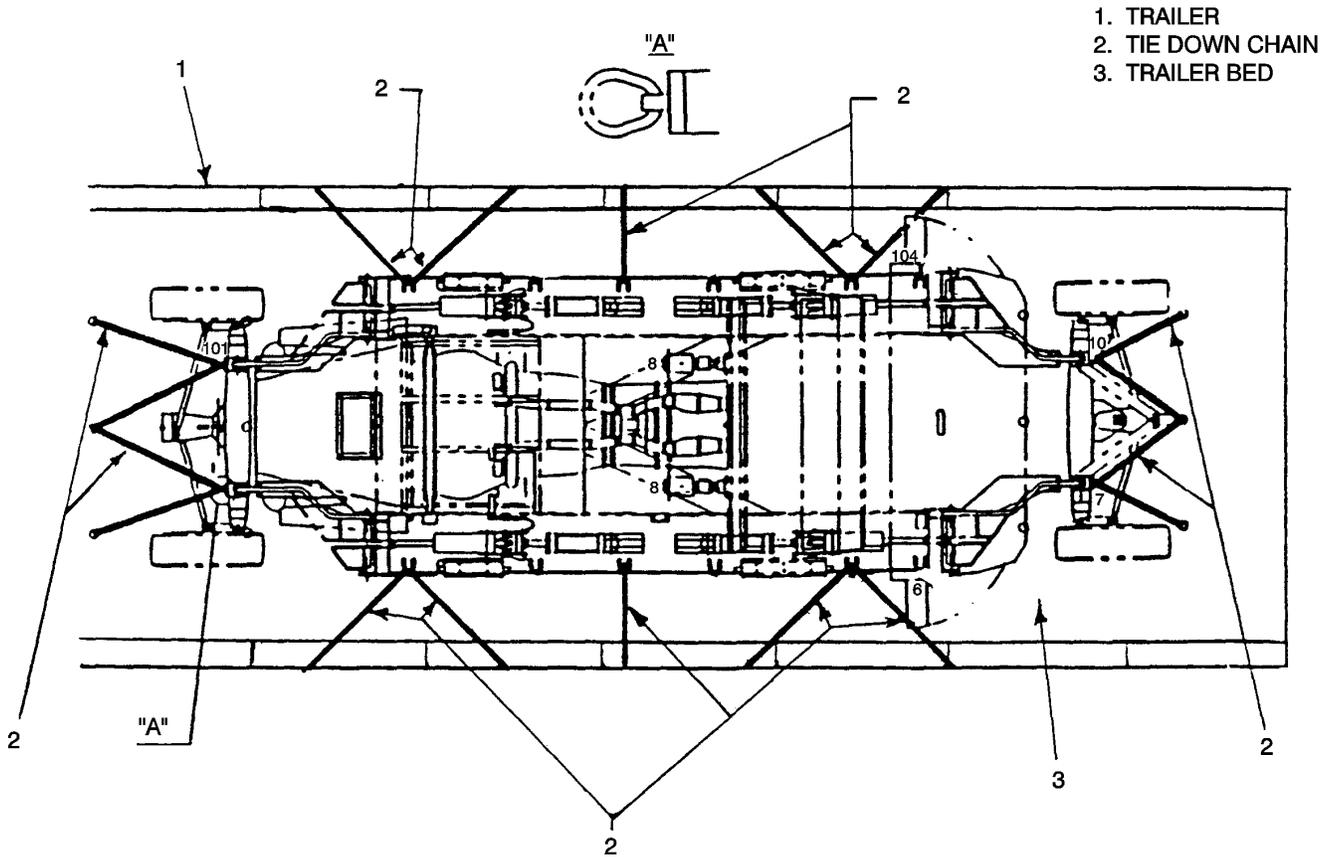
6.21 LOADING TT90-F TRAILER IN AIRCRAFT, F117-PW-100.

6.21.1 The trailer with the power plant may be transported in either the C-17 or C-5 transport Aircraft. It is recommended that the trailer be winched aboard the aircraft aft engine first using the trailer aft steering assembly to maintain clearance. The use of observers both inside and outside are required to insure clearances are maintained.

NOTE

Aircraft Loading Instructions, if available, shall override the instructions below.

- 6.21.2 With tow vehicle, position the trailer in line with the aircraft loading ramp. Manual movement may be required for proper alignment.
- 6.21.3 Set trailer's front and rear brakes. Disengage tow vehicle.
- 6.21.4 Remove trailer towbar (aft engine) and stow.
- 6.21.5 Install steering bar at trailer rear (engine front) steering assembly. Remove pin from the aft steering stabilizing rod.
- 6.21.6 Attach a sling to the trailer front tiedown rings and connect the cargo winch to the sling.



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Figure 6-22. Transportation Trailer Tiedown Configuration (Flatbed Truck)

6.21.7

CAUTION

Ground clearance is critical when loading into aircraft cargo areas. Clearance is most critical when the trailer wheels crest the loading ramp onto the cargo floor and the trailer remaining wheels are still on the loading ramp resulting in reduced ceiling clearance.

Release trailer front and rear brakes.

6.21.8 Start winch and make minor steering adjustments as required using the trailer's rear steering bar.

6.21.9 Stop winch once the desired position has been obtained.

6.21.10 Set trailer's rear brakes (engine front).

6.21.11 Remove lift mechanism articulating pins. Actuation of the hydraulic lift mechanism may be required to easily remove articulating pins.

6.21.12 Operating the hydraulic lift mechanism, lower the trailer onto the cargo floor.

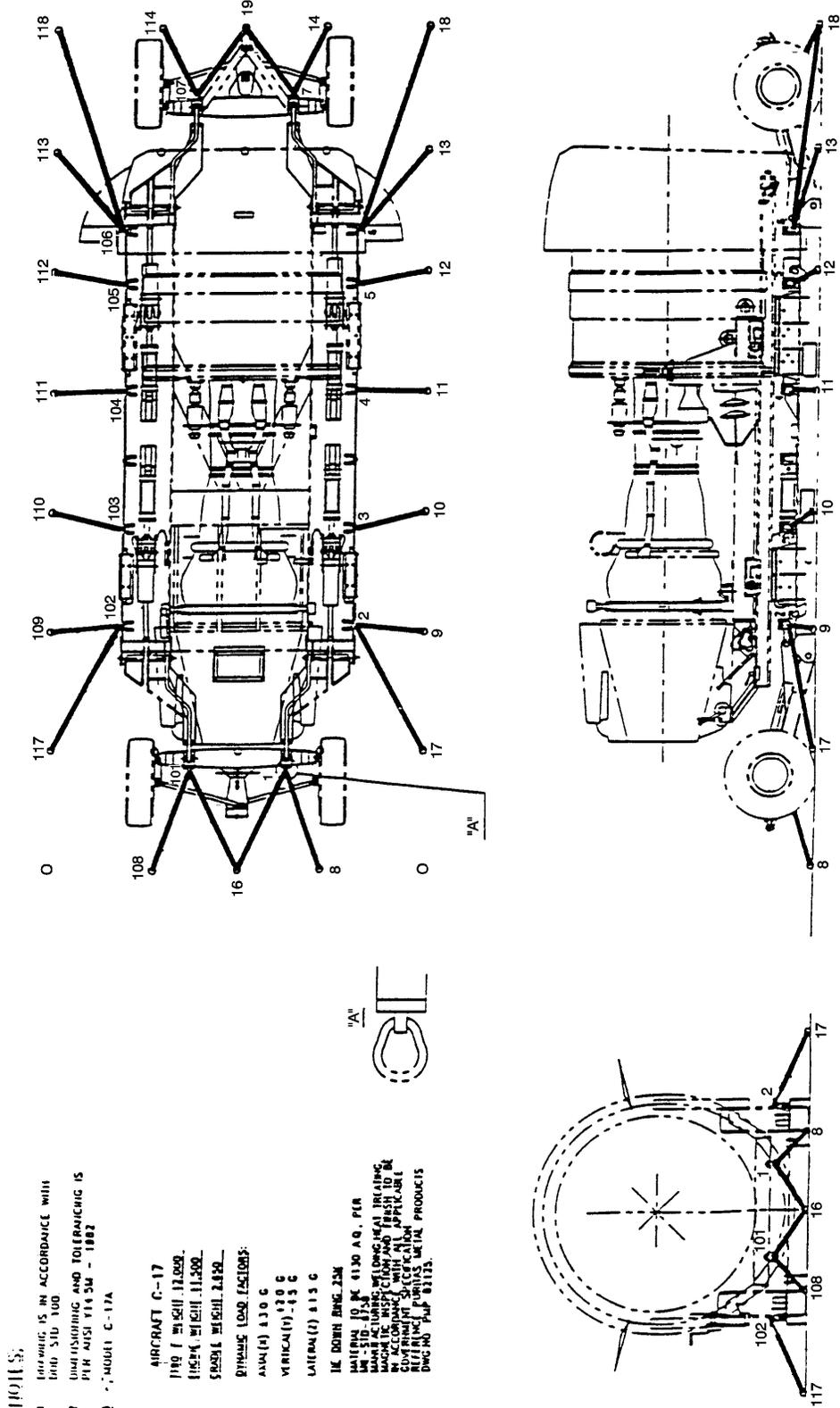
6.21.13

CAUTION

Do not attach cables, chains, or strapping across the top of the engine or isolated cradle assembly of this shipping system.

Remove and stow rear steering bar.

6.21.14 Remove winch and secure with chains or cables as [Figure 6-22](#) (Sheets 1 and 2).



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Figure 6-23. Transportation Trailer Tiedown Configuration (Sheet 1 of 2)

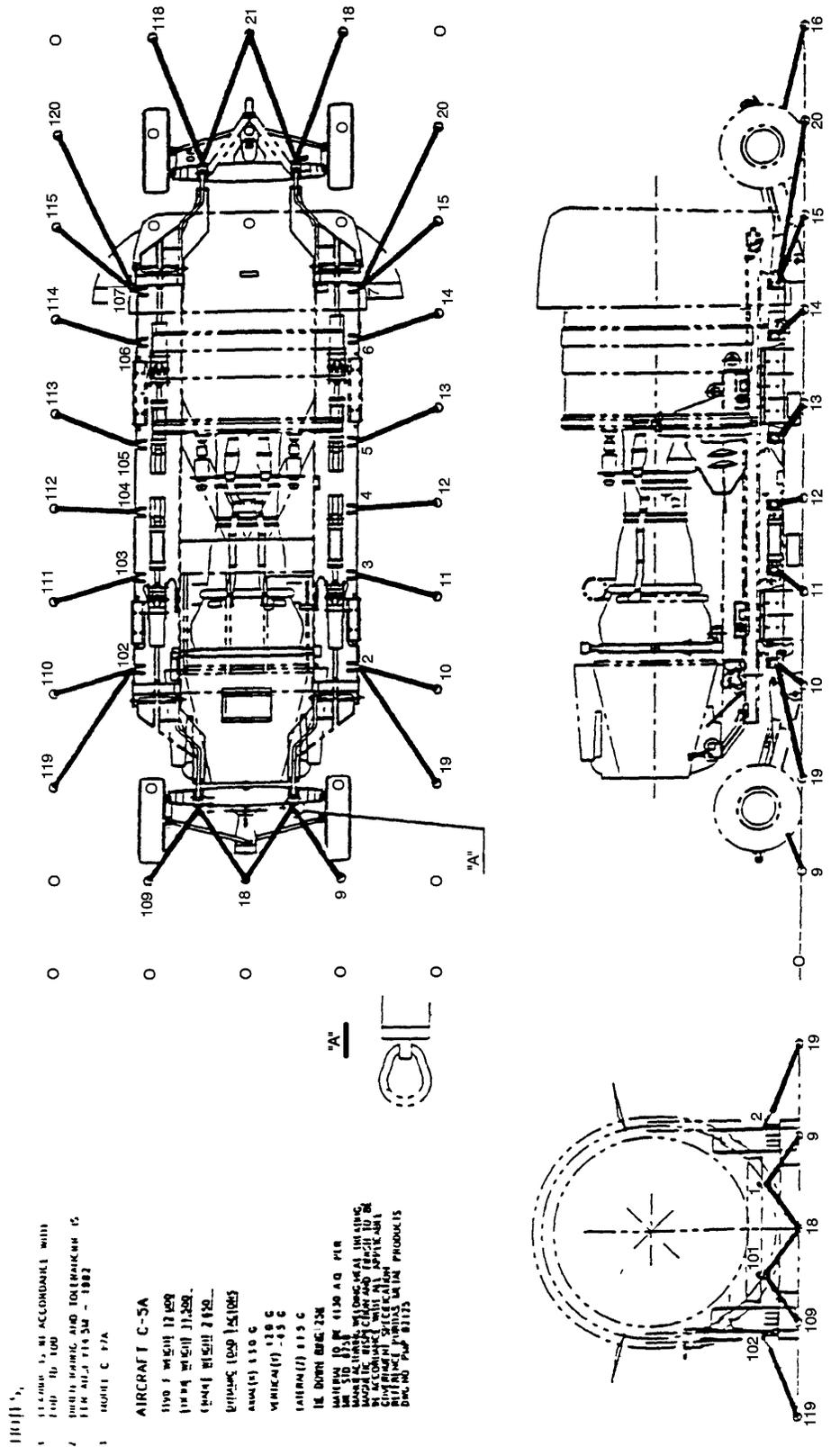


Figure 6-23. Transportation Trailer Tiedown Configuration (Sheet 2)

6.22 LOADING 150504-1 INSTRUCTIONS FOR SURFACE TRANSPORTATION, F117-PW-100.

6.22.1 Surface transportation of the F117-PW-100 requires the use of Air Ride tractor and trailers. Due to the height of the engine, only single or doubled stepped trailers may be used. Loaded height of the engine(s) and trailer is not to exceed 13 feet, 6 inches (thirteen feet, six inches).

6.22.2 If shipping only one engine on the tractor trailer, the aft end of the engine should be placed on the forward part of the trailer near the gooseneck. No additional freight shall be permitted.

6.22.3 If two engines are shipped on a single stepped truck trailer, the engines should be placed such that the forward ends of the engine face each other at the center of the truck trailer. Ensure sufficient separation to avoid contact with the other engine.

6.22.4 Forklifts used to handle engines in shipping stands or transportation trailers must have a lifting capacity equal to or greater than the gross weight of the engine and shipping stand.

6.22.5 The following steps cover the loading and tie-down of the engine using the PW Transportation Stand (P/N 150504-1). This stand is normally used for transportation between the manufacturer and the airframer.

NOTE

Forklifts used to handle engines in shipping stands must have a lifting capacity equal to or greater than the gross weight of the engine and shipping stand. The outer end of the forklift prongs should be long enough to fully catch the support rail on the opposite side of the stand.

6.22.5.1 Using appropriate forklift, enter the shipping stand support lift rails from the sides only. Secure a safety chain between the Transportation Stand base and the forklift.

CAUTION

Do not attach cables, chains, or strapping across the top of the engine or across the engine cradle section of the shipping system. Improper tie-down can lead to external hardware damage and bearing damage by nullifying the shock damping features.

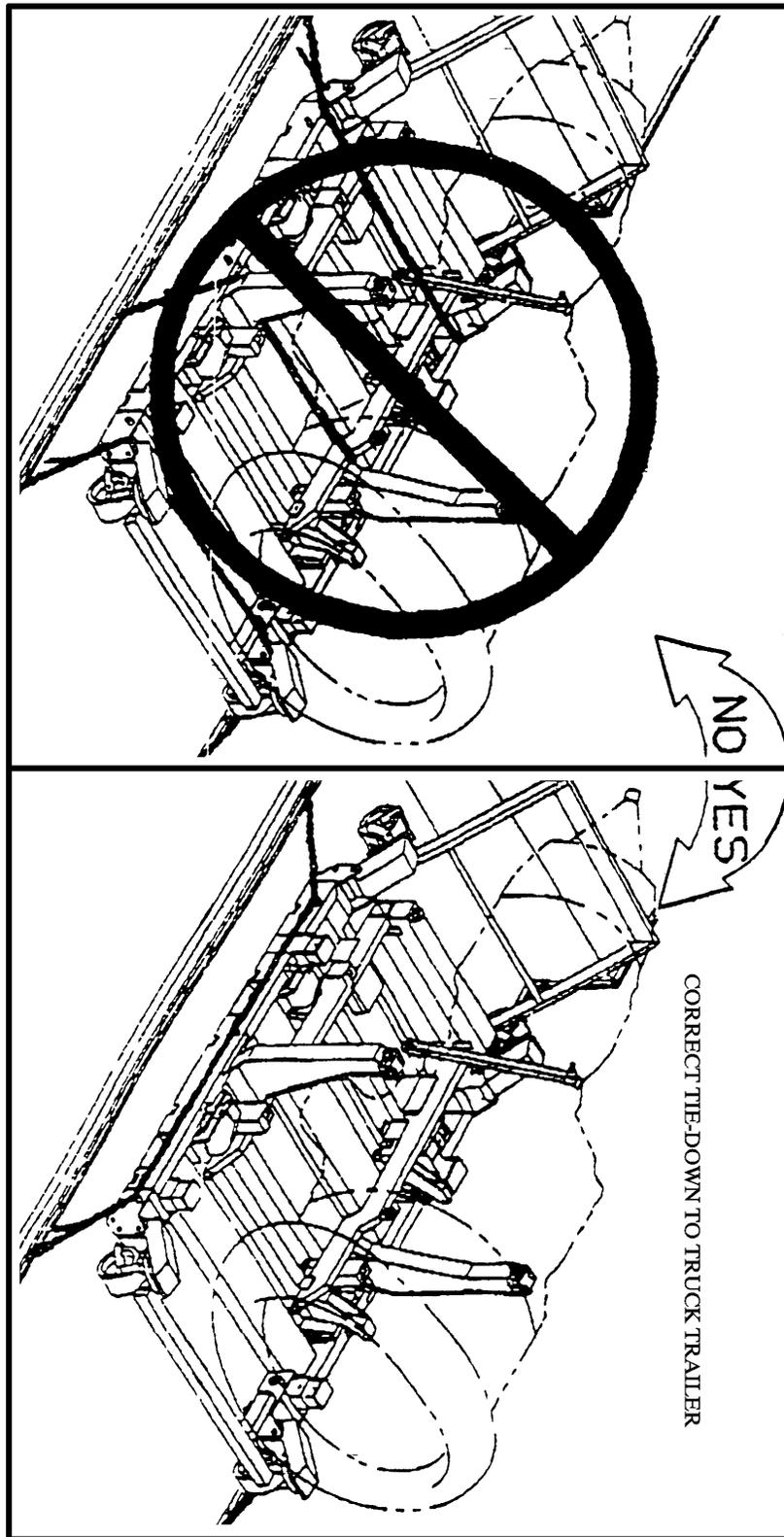
6.22.5.2 Load and position engine/Transportation Stand on the trailer.

NOTE

Position tie-down chains or cables to avoid contact with each other, parts of the engine, or trailer to prevent chafing.

6.22.5.3 Secure engine/Transportation Stand by attaching tie-downs per [Figure 6-23](#) and pull all tie-down chains and straps taut.

6.22.5.4 Install tarpaulins and secure with 2x3 boards nailed into the bed of the trailer to prevent vibration and flapping during movement.



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Figure 6-24. Truck Trailer Tie-Down

Table 6-1. Trailer

ENGINE	TYPE ADAPTER/WEIGHT	TYPE TRAILER/WEIGHT	ENGINE/GROSS/GROSS WEIGHT
F117-PW-100	1730012509737/2700#	1740012538064/11700#	11500#/25900#

Table 6-2. Trailer

ENGINE	NSN	P/N	DIMENSIONS	ENGINE WEIGHT	DEVICE WEIGHT	GROSS WEIGHT
F117 Inlet Fan	8145013883770	P60019	67 x 67 x 61	510#	772#	1282#
F117 Core	8145013886660	P60022	8x3 x 77 x 56	920#	2210#	3130#
F117 HPT	8145013883770	P60018	67 x 67 x 61	720#	577#	1297#
F117 LPT	8145013883792	P60023	67 x 67 x 61	1115#	787#	1902#
F117 Main Gearbox	8145013883019	P60021	57 x 39 x 42	170#	690#	860#
F117 Angle Gearbox	8145013883021	P60020	38 x 36 x 29	63#	305#	368#
F117 Trailer	1740012538064	TT90-F	331 x 96 x 57	11500#	11700#	25900#
F117 Cradle Adapter	1740012509737	17G230005-1	136 x 96 x 61	11500#	2700#	25900#

Table 6-3. Shipping Device Weights

ENGINE	CONTAINER	STOCK NUMBER
F117-PW-100	P60018 Fiberglass	8145013883770
F117-PW-100	P60019 Fiberglass	8145013885805
F117-PW-100	P60020 Fiberglass	8145013883021
F117-PW-100	P60021 Fiberglass	8145013883019
F117-PW-100	P60022 Fiberglass	8145013886660
F117-PW-100	P60023 Fiberglass	8145013883792

6.23 F118-GE-101 ENGINE TIE DOWN INSTRUCTIONS FOR TRAILER (PART NUMBER 75GH109).

6.23.1 Surface transportation of the F118-GE-101 engine requires the use of Air Ride Tractor and Trailer.

NOTE

No additional freight is authorized when shipping an F118-101 Engine. A dedicated tractor-trailer must be used.

6.23.2 If shipping only one engine on the tractor-trailer, the aft part of the engine should be placed on the forward part of the trailer near the gooseneck.

6.23.3 If two engines are shipped on a single tractor-trailer, the engines should be placed such that the forward ends of the engine face each other at the center of the truck trailer. Ensure sufficient separation to avoid contact with the other engine.

6.23.4

CAUTION

- Cables, chains, tarpaulins, or tie down devices shall not be thrown over the engine. Failure to comply may result in damage to engine and/or engine shipping bag.
- Failure to use the chaining configuration shown may result in the engine becoming disengaged from the shipping adapters and dropping between the trailer rails.

Secure engine/transportation trailer to Air Ride Tractor trailer as follows (Figure 6-24):

CAUTION

Failure to install spreader bars may result in the engine coming loose and falling during shipment.

6.23.4.1 Ensure spreader bars (2 each) are installed across trailer rails, one forward and one aft of the engine.

6.23.4.2 Ensure engine trailer is centered on flat bed tractor-trailer, equal distance from side to side.

6.23.4.3 Attach chain to forward most eyelet/hole on left front adapter. Route chain forward of adapter and under trailer rail to right side of flat bed trailer, approximately 4 to 7 feet forward of engine (Detail A).

6.23.4.4 Attach chain to forward most eyelet/hole on right front adapter. Route chain forward of adapter and under trailer rail to left side of flat bed trailer, approximately 4 to 7 feet forward of engine (Detail A).

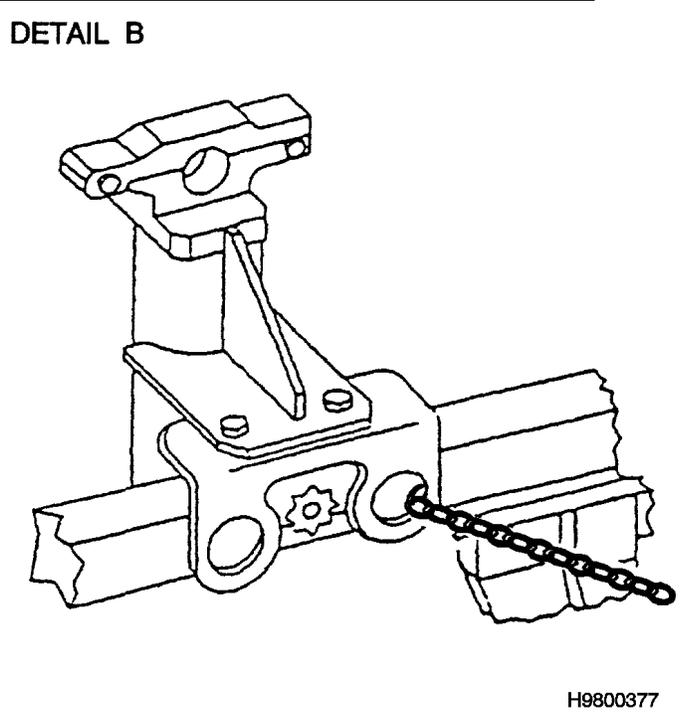
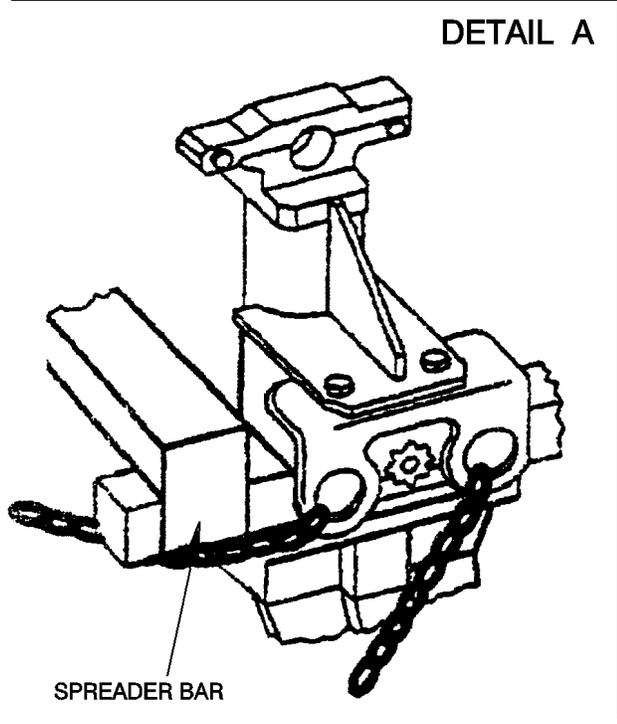
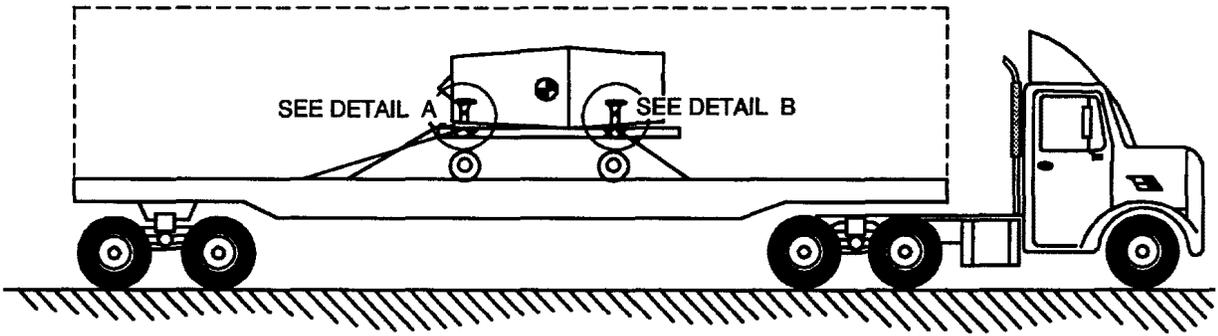
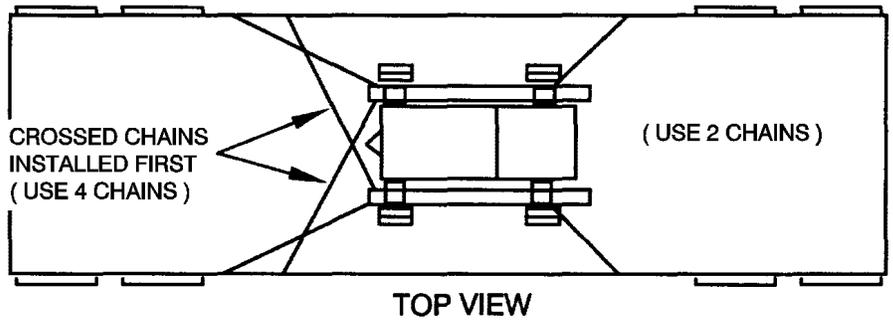
6.23.4.5 Attach chain to rear most eyelet/hole on right rear adapter. Route chain to right side of flat bed trailer approximately 6 to 9 feet aft of engine (Detail B).

6.23.4.6 Attach chain to rear most eyelet/hole on left rear adapter. Route chain to left side of flat bed trailer approximately 6 to 9 feet aft of engine (Detail B).

6.23.4.7 Attach chain to rear most eyelet/hole of left front adapter. Route chain to left side of flat bed trailer approximately 6 to 9 feet forward of engine (Detail A).

6.23.4.8 Attach chain to rear most eyelet/hole of right front adapter. Route chain to right side of flat bed trailer approximately 6 to 9 feet forward of engine (Detail A).

6.23.4.9 All chains will be tightened with equal tension in the same order as they were installed.



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Figure 6-25. F118-GE-101 Engine Tie Down Procedure

6.24 LOADING AND TRANSPORTATION FOR F119 ENGINE.

6.25 PURPOSE.

This procedure will provide the information and instructions for loading and securing the F119 engine in preparation for surface and air transportation.

6.26 GENERAL INFORMATION.

NOTE

- Engine shipments shall use the F119 Engine Shipping System (ESS) (P/N P4330450) and the 3000E transportation trailer (3000E) (NSN 4800-000-00) or equivalent 10000 lb capacity transportation trailer. The 3000E transportation trailer must use tire size 7.50 x 10, 10 ply rating, inflated to 90-100 PSI.
- The engine inlet must be mounted towards trailer towbar, but the trailer may face fore or aft with respect to the transport truck bed.

6.27 INSPECTION OF 3000E TRANSPORTATION TRAILER.

NOTE

- Prior to mounting and packaging the engine/ESS on the 3000E, a thorough inspection of the 3000E must be performed.
- Anomalies discovered in this inspection must be repaired prior to mounting or packaging the engine on that 3000E trailer per technical orders which govern the inspection, repair, and part content of the trailers.

6.28 POSITIONING OF F119/ESS ON 3000E TRANSPORTATION TRAILER.

6.28.1 Mount F119/ESS on 3000E with engine inlet towards towbar.

6.28.2 Position F119/ESS on 3000E such that center of gravity symbol is located midway between the 3000E axles.

ENGINE	DIMENSIONS (L x W x H)	ENGINE WEIGHT	DEVICE WEIGHT	GROSS WEIGHT
F119	196 x 71 x 99	5000 lbs.	1450 lbs.	7550 lbs.

See [Figure 6-25](#) through [Figure 6-34](#)

Weight is indicated in pounds. Dimensions are in inches and do not include towbar.

6.28.3 Tighten rail clamps on ESS roller adapters to 375-400 in-lbs. (See [Figure 6-30](#)).

6.29 F119 ENGINE SHIPPING INSTRUCTIONS.



Proper material handling equipment must be used during ON and OFF loading operations to prevent injury to personnel and damage to the engine.

NOTE

A loading ramp or bridge or lift platform is the preferred method to roll transfer an engine into a transporting vehicle.

6.29.1 F119 Engine Ground Transport Shipping Instructions. .

NOTE

- Highway transportation of a properly secured F119 engine can be accomplished using either an air ride suspension tractor/trailer or a conventional spring ride suspension tractor/trailer.
- Enclosed trailers are the preferred trailer type for transporting engines but may only be used if properly equipped with sufficient floor mounted tiedown rings and proper tiedown equipment.

6.29.2 Loading F119/ESS/3000E Engine On Ground Transport Vehicle.

6.29.3 Roll On Loading (Preferred Method).



Proper material handling equipment must be used during ON and OFF loading operations to prevent injury to personnel and damage to the engine.



There must be sufficient personnel on hand to safely handle the combined weight of the F119, ESS, and 3000E, particularly if the transporting vehicle has an inclined cargo bed.

NOTE

If a forklift or tug is unavailable, manually push the F119/ESS/3000E over the loading ramp onto the lift platform or onto the transporting vehicle.

6.29.3.1 Use a forklift or other suitable tug to push the F119/ESS/3000E onto the lift platform or onto the transporting vehicle.

6.29.3.2 Position 3000E parallel with truck bed, centered laterally.

6.29.3.3 Engage both 3000E wheel brakes.

6.29.4 Lift On Loading (Permitted Only If Loading Ramp Is Unavailable).



The forklift must have sufficient lift capacity, lift range, reach and time length to safely support, raise and position the F119/ESS/3000E on the transporter vehicle. See weight summary in Section 2.0 General Information.

NOTE

This procedure is applicable only to flatbed or softside enclosed vans.

6.29.4.1 Align the F119/ESS/3000E close to and parallel with the truck bed.

6.29.4.2 Set both wheel brakes on 3000E.

6.29.4.3 Remove towbar from steering mechanism on 3000E.

6.29.4.4 Position the tines of the forklift truck under the rails of the 3000E as shown in [Figure 6-28](#).

CAUTION

Movement of the forklift must be minimized any time the F119/ESS/3000E is supported on the forklift tines.

- 6.29.4.5 Lift the F119/ESS/3000E straight up with clearance sufficient to clear the truck bed.
- 6.29.4.6 Carefully center the F119/ESS/3000E on the truck bed.
- 6.29.4.7 Lower the F119/ESS/3000E onto the flatbed transporter.
- 6.29.4.8 Reinstall towbar to steering mechanism of trailer.
- 6.29.5 Hoist On Loading Is Not Permitted.
- 6.29.5.1 Ensure that F119/ESS/3000E is positioned parallel with truck bed, laterally centered.
- 6.29.5.2 Ensure that both 3000E wheel brakes are fully engaged.
- 6.29.5.3 Place chamfered wooden wheel chocks (4x4 inches) fore and aft of each 3000E wheel. Toenail the chocks to the truck bed using 30 dd nails as shown in [Figure 6-31](#). These blocks will restrict side movement without damage to the tire side wall.
- 6.29.5.4 Nail blocks 2x4x18 inches minimum to the truck bed using 20 dd nails one inch from the outer sidewall of each tire. Nail a second block on top of the first as shown in [Figure 6-31](#). These blocks will restrict side movement without damage to the tire side wall.
- 6.29.5.5 Secure trailer towbar using 20 dd nails as shown on [Figure 6-30](#).

WARNING

Tiedown chains must be 10000 lb capacity minimum and be attached per tiedown geometry on [Figure 6-25](#), [Figure 6-26](#) and [Figure 6-27](#).

- 6.29.5.6 Attach tiedown chains or cables to ESS tiedown rings and to truck bed as shown in [Figure 6-25](#) through [Figure 6-27](#).

NOTE

Holes in end of trailer rails are not to be used for attaching tiedown chains or cables.

- 6.29.5.7 Tighten tiedown chains or cables incrementally with roughly equal tensions so that transportation trailer cannot move.
- 6.29.5.8 Cover F119/ESS/3000E with 20 foot x 40 foot tarp and secure to truckbed using tiedown straps.
- 6.29.6 F119 Engine Air Transport Shipping Instructions (For ESS/3000E Trailer Mounted Engines Only).

NOTE

The F119 engine may be air transported on C130, C141, C5, and C17 transport aircraft provided the aircraft are fitted with appropriate floor tiedown receptacles.

6.29.7 Loading F119 Engine on Transport Aircraft.

6.29.8 Roll On Loading (Only Approved Method).

CAUTION

The packaged F119/ESS/3000E must be pulled into the transporting aircraft engine inlet first. Failure to observe this caution may result in damage to the engine exhaust nozzle tip.

NOTE

The aircraft loadmaster shall supervise all aspects of loading, positioning, and securing the packaged F119/ESS/3000E into the transport aircraft.

6.29.8.1 Pull the packaged F119/ESS/3000E into the transport aircraft by attaching the internal aircraft winch to the towbar of the 3000E trailer.

6.29.8.2 Position 3000E parallel with aircraft cargo bed, laterally centered, symmetrical with 10000 lb capacity floor tiedown receptacles.

6.29.8.3 Engage both 3000E wheel brakes.

6.29.9 Lift On Loading Is Not Permitted.

6.29.10 Hoist On Loading Is Not Permitted.

6.29.11 Securing F119 Engine in Transport Aircraft.

6.29.11.1 Ensure that F119/ESS/3000E is positioned parallel with aircraft cargo bed, laterally centered, symmetrical with 10000 lb capacity floor tiedown receptacles.

6.29.11.2 Ensure that both 3000E wheel brakes are fully engaged.

WARNING

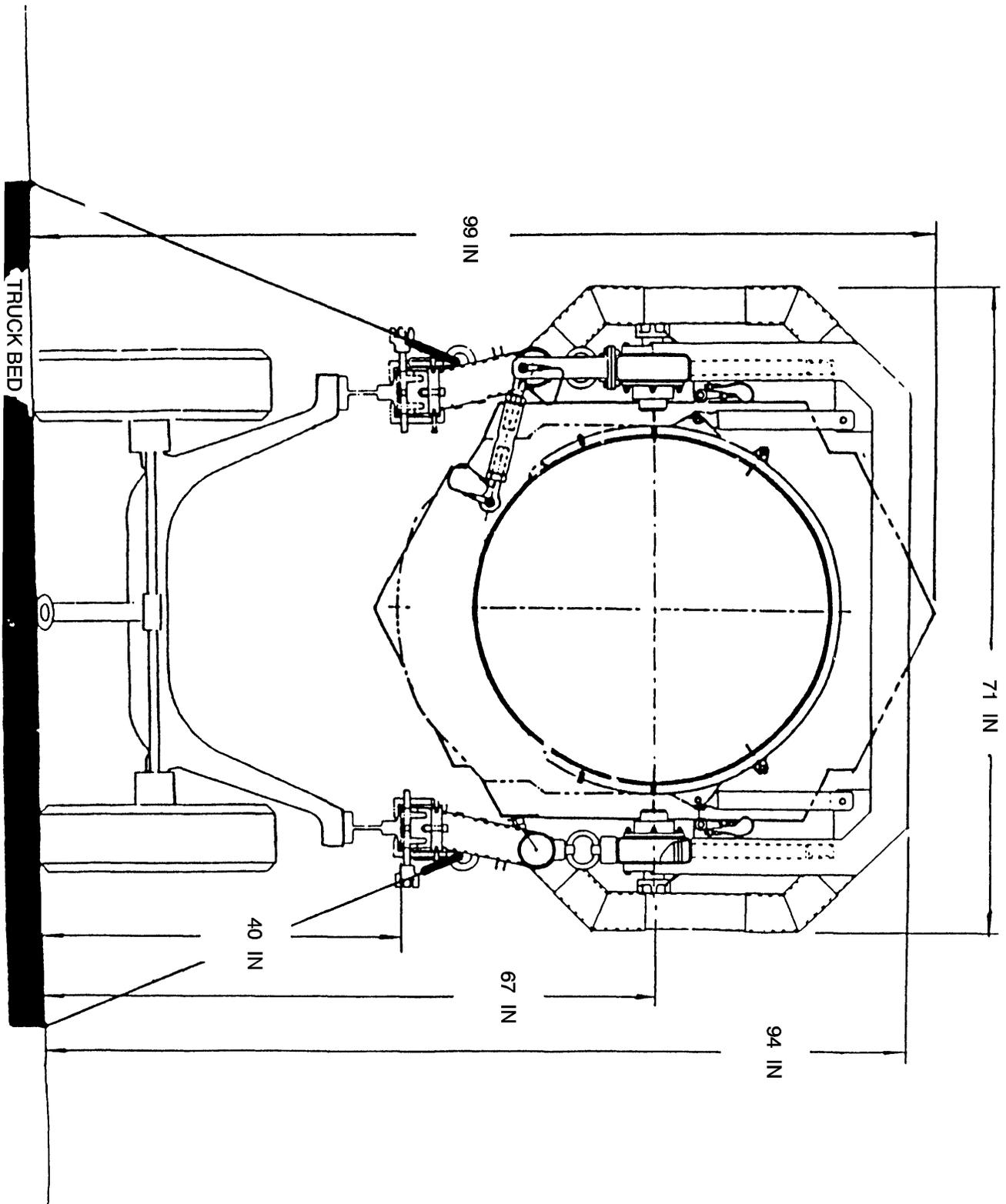
Tiedown chains must be 10000 lb capacity minimum and be attached per tiedown geometry on [Figure 6-34](#).

6.29.11.3 Attach tiedown chains or cables to ESS tiedown rings and to aircraft cargo bed as shown in [Figure 6-32](#).

NOTE

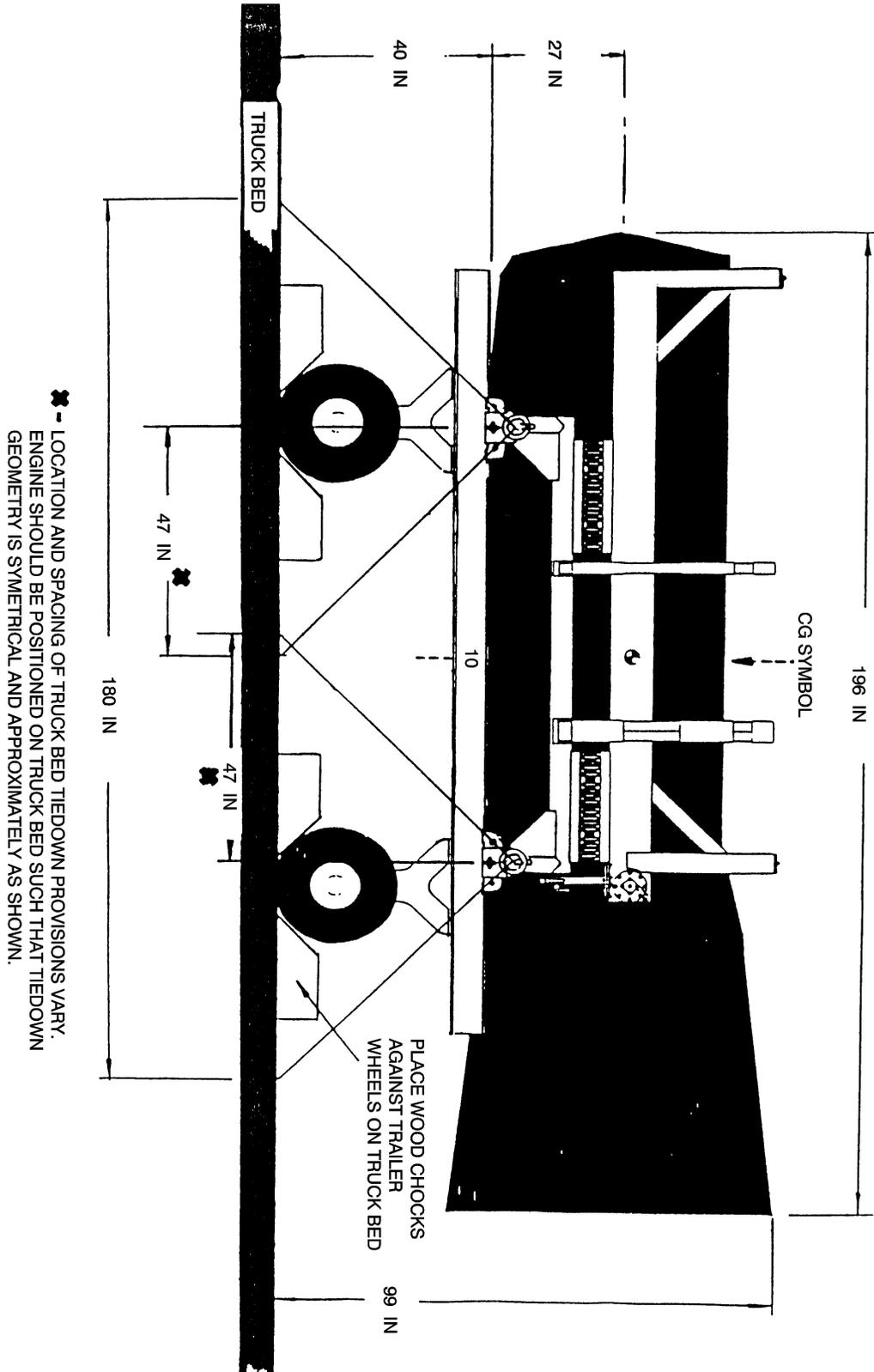
Holes in end of trailer rails are not to be used for attaching tiedown chains or cables.

6.29.11.4 Tighten tiedown chains or cables incrementally with roughly equal tensions so that transportation trailer cannot move.



H0000839

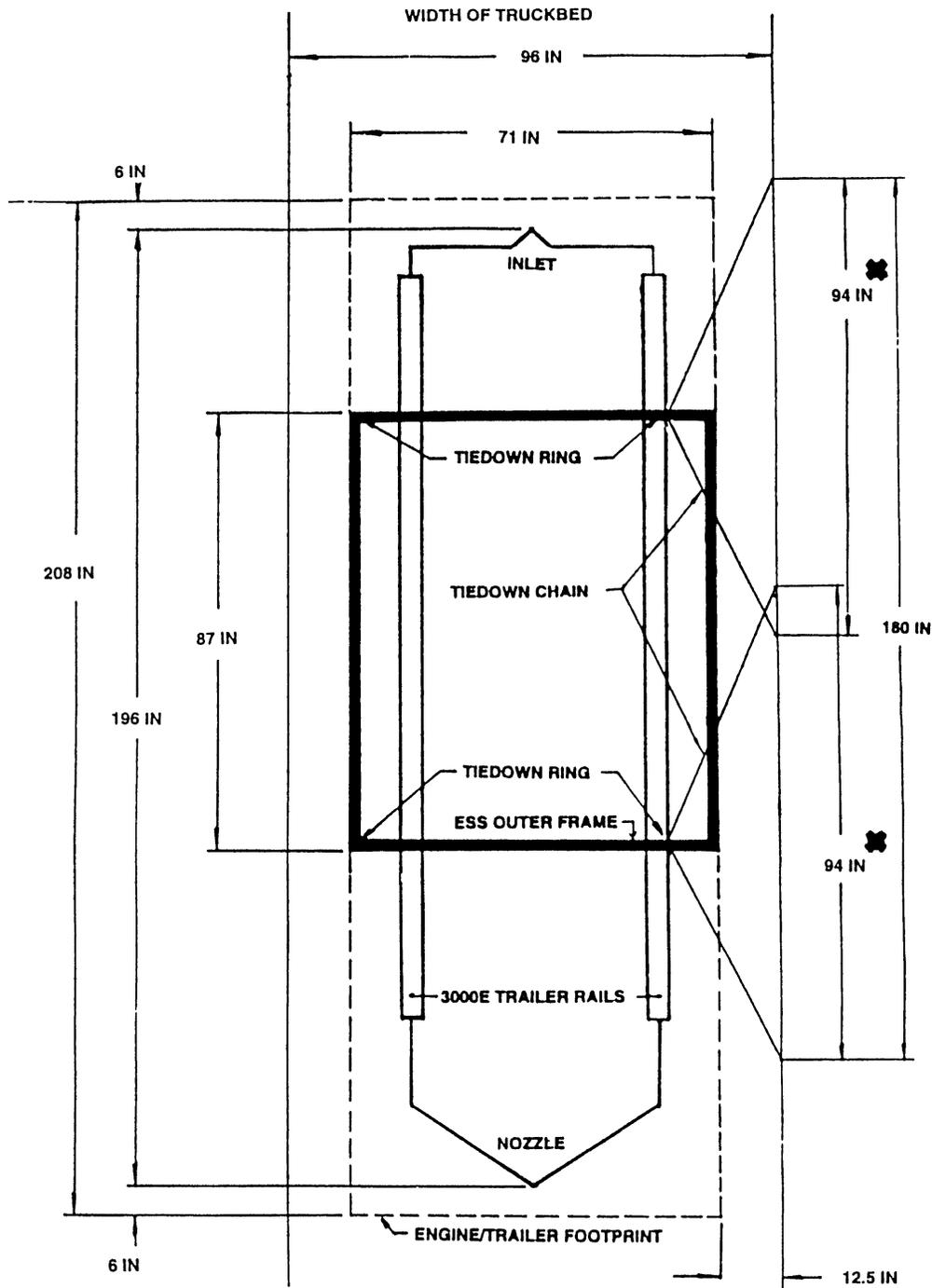
Figure 6-26. F119/ESS/3000E Overall Dimensions and Truck Tiedown Configuration - Front View



H0000840

Figure 6-27. F119/ESS/3000E Overall Dimensions and Truck Tiedown Configuration - Side View

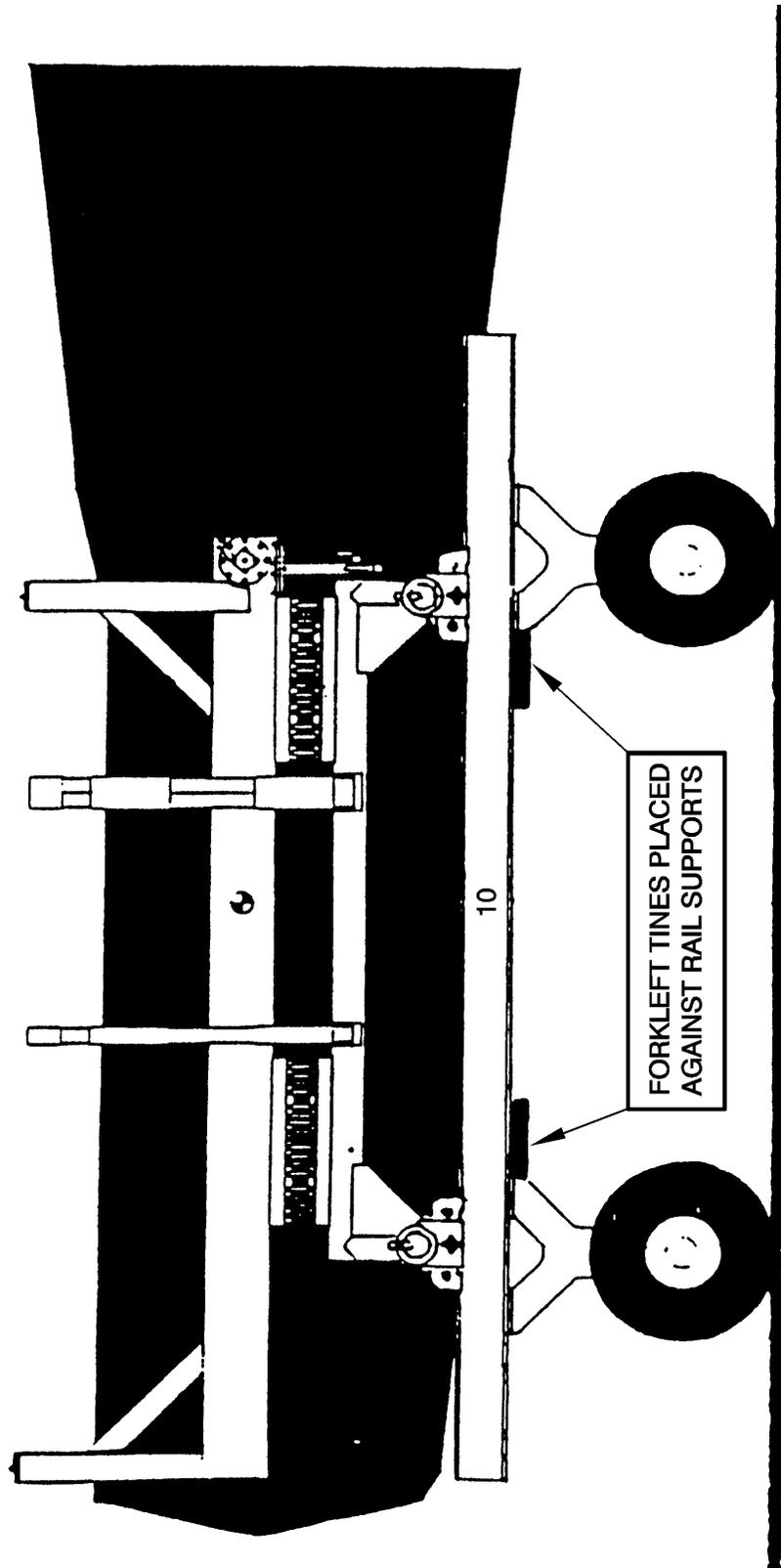
NOTE: LEFT AND RIGHT TIEDOWNS REQUIRED. LEFT SIDE TIEDOWNS ARE IDENTICAL TO RIGHT SIDE TIEDOWNS BUT ARE NOT SHOWN DUE TO DIMENSIONAL INFO SHOWN



✱ - LOCATION AND SPACING OF TRUCKBED TIEDOWN PROVISIONS VARY. ENGINE SHOULD BE POSITIONED ON TRUCK BED SUCH THAT TIEDOWN GEOMETRY IS SYMETRICAL AND APPROXIMATELY AS SHOWN.

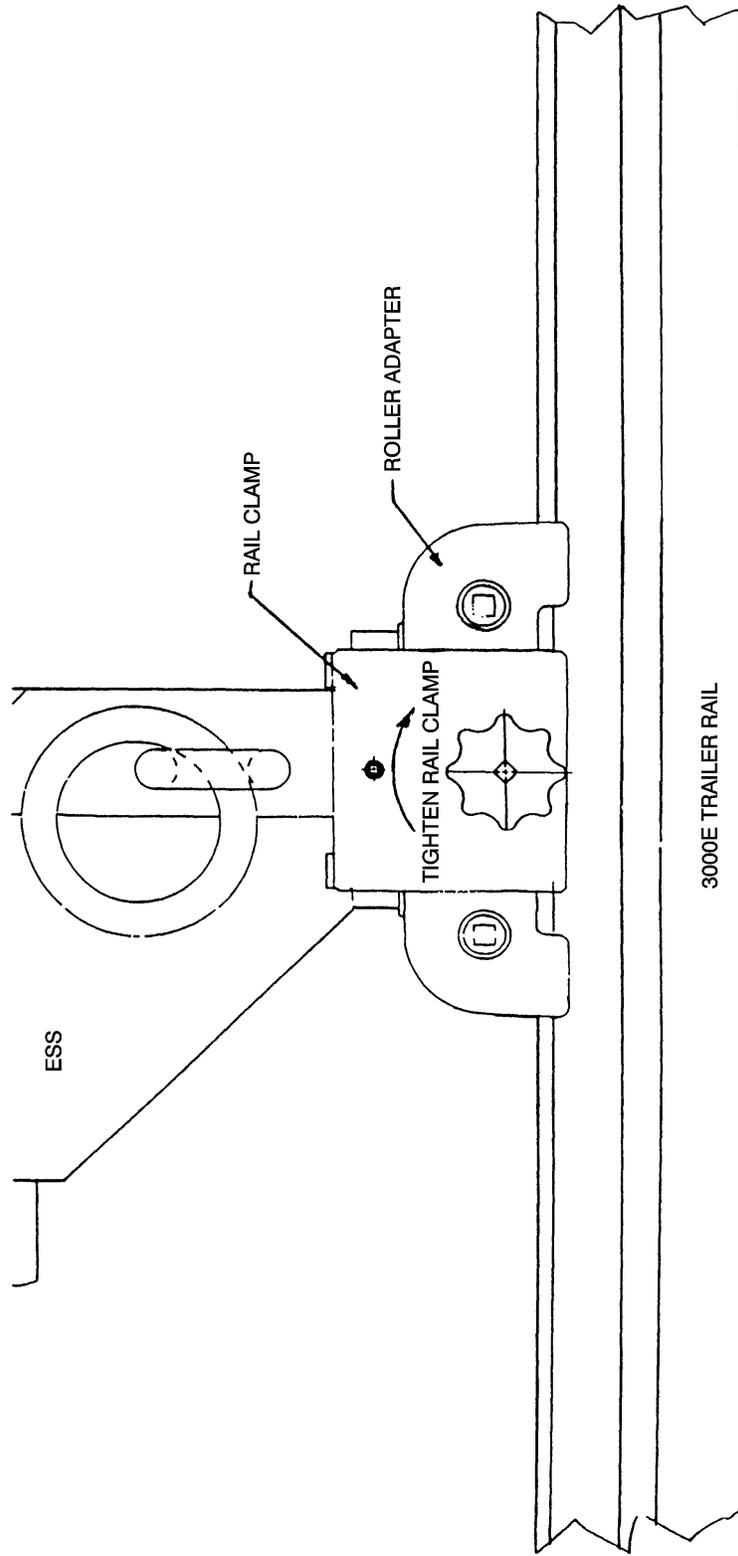
H0000841

Figure 6-28. F119/ESS/3000E Overall Dimensions and Truck Tiedown Configuration - Plan View



H0000842

Figure 6-29. Positioning of Heavy Duty Forklift Tines for Lifting F119/ESS/3000E onto a Flatbed Truck



H0000843

Figure 6-30. Tighten Rail Clamps to 375-400 IN LBF

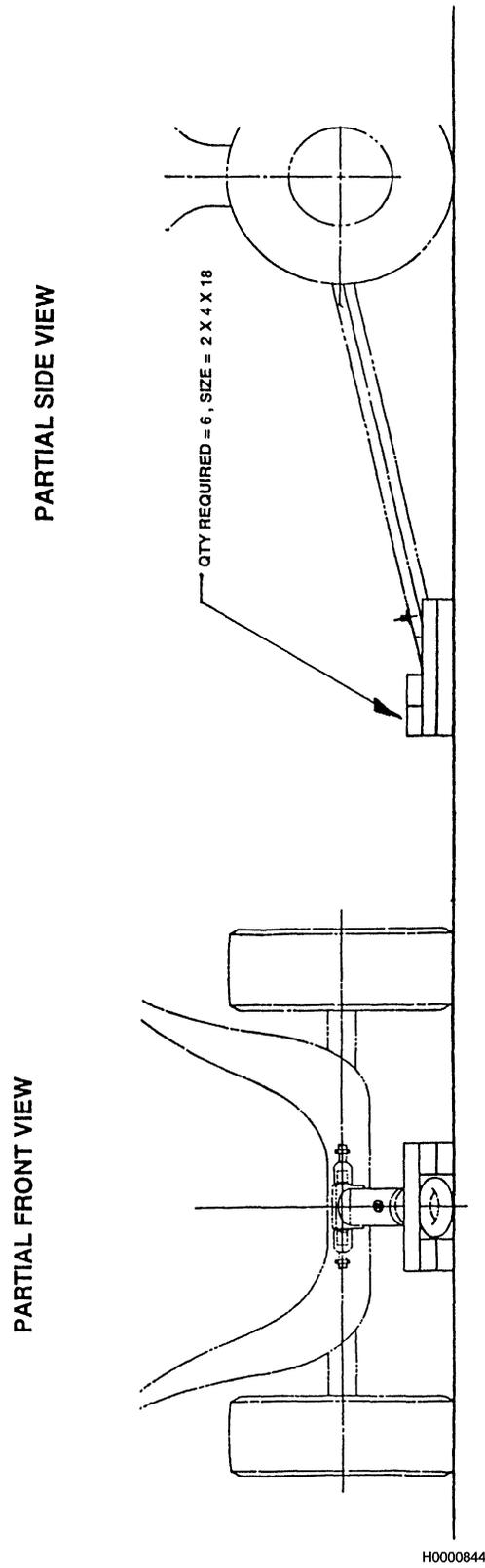
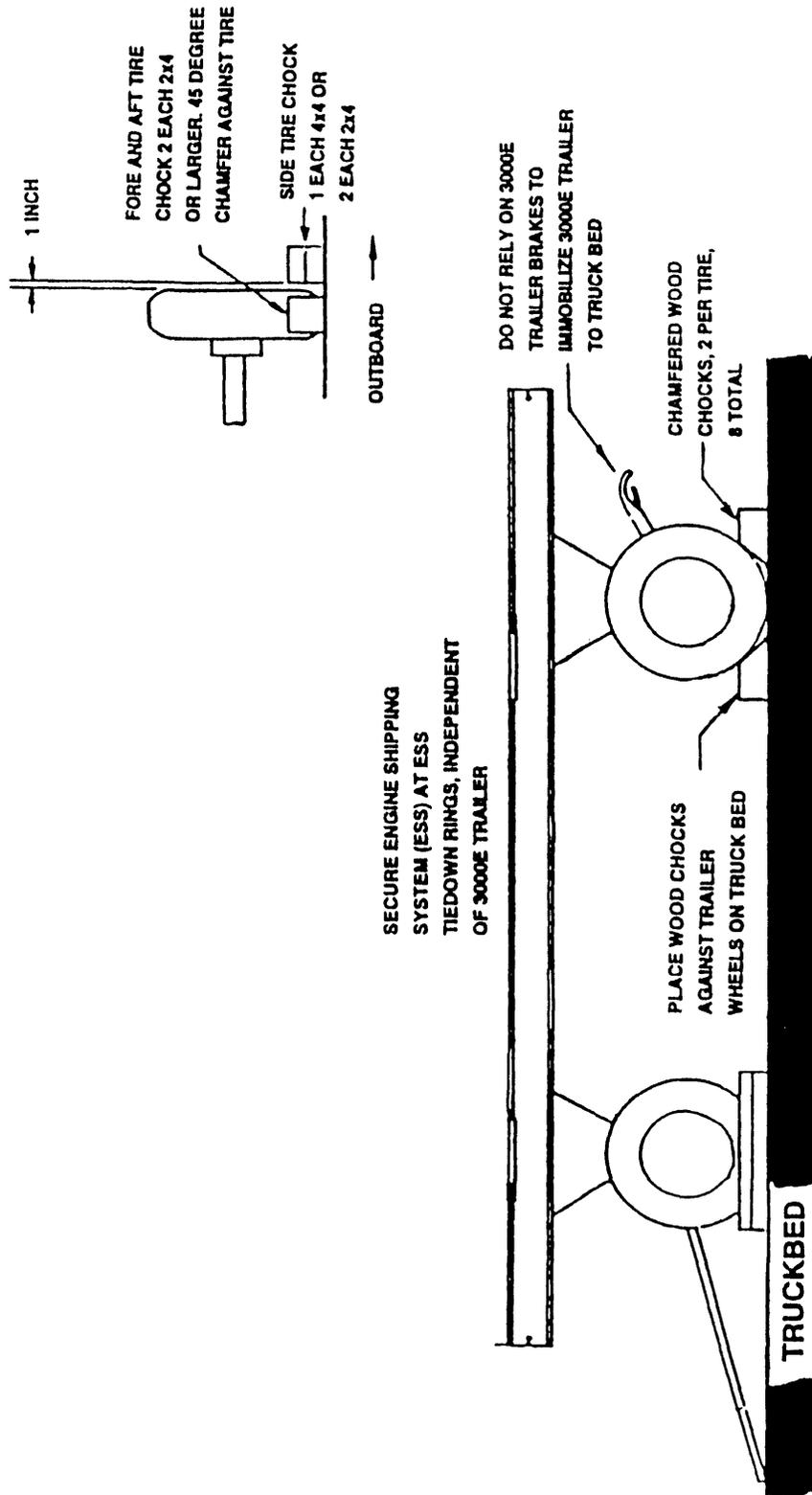
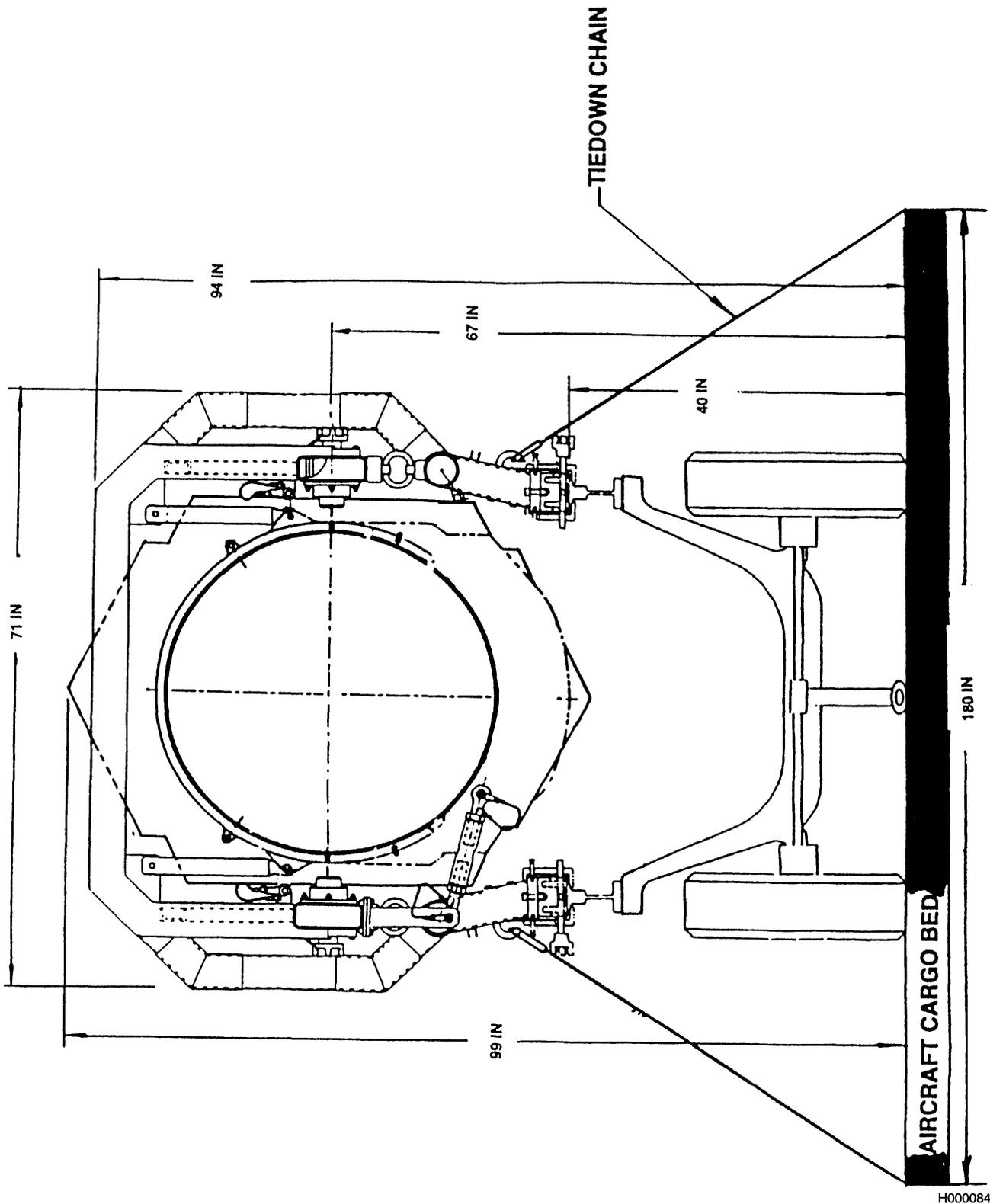


Figure 6-31. Block and Secure Towbar to Truckbed



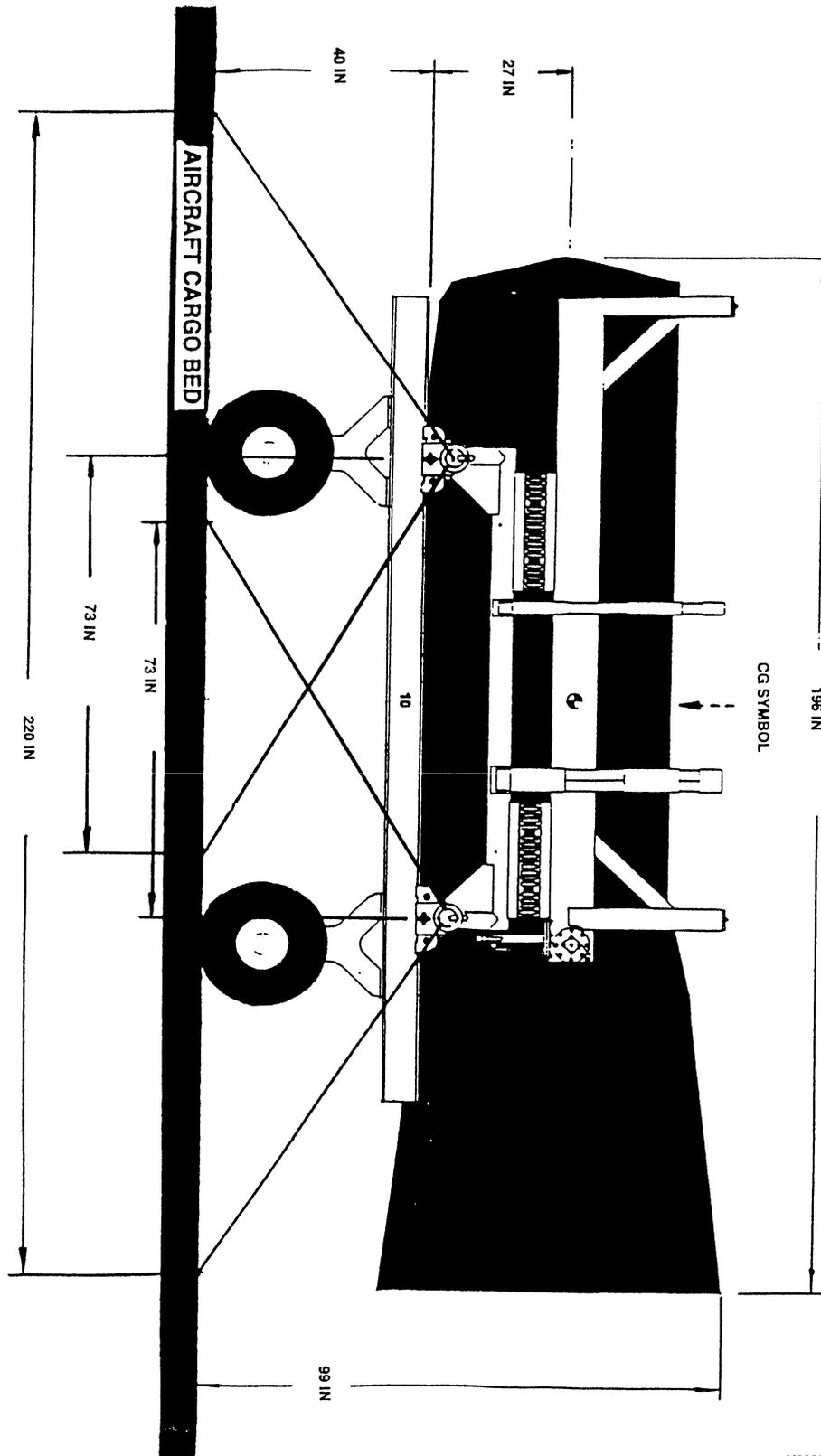
H0000845

Figure 6-32. Block and Chock 3000E Trailer Tires On Truck Bed



H0000846

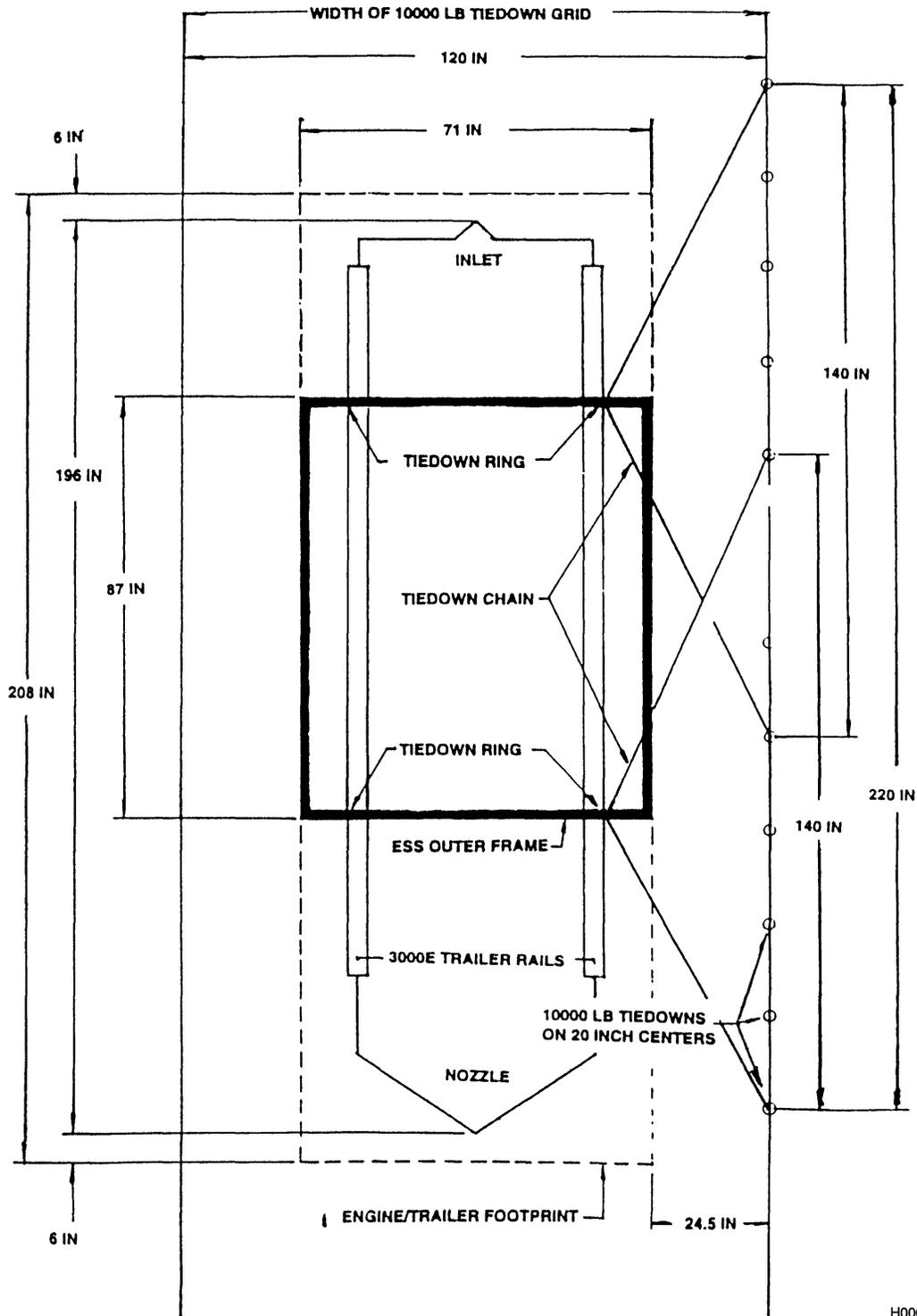
Figure 6-33. F119/ESS/3000E Overall Dimensions and Cargo Aircraft Tiedown Configuration - Front View



H0000847

Figure 6-34. F119/ESS/3000E Overall Dimensions and Cargo Aircraft Tiedown Configuration - Side View

NOTE: LEFT AND RIGHT TIEDOWNS REQUIRED. LEFT SIDE TIEDOWNS ARE IDENTICAL TO RIGHT SIDE TIEDOWNS BUT ARE NOT SHOWN DUE TO DIMENSIONAL INFO SHOWN



H0000848

Figure 6-35. F119/ESS/3000E Overall Dimensions and Cargo Aircraft Tiedown Configuration - Plan View

CHAPTER 7

ENGINE SHIPPING DEVICE MANAGEMENT

7.1 The Comprehensive Engine Management System (CEMS) will provide the Base Engine Manager with a means of maintaining the on-hand quantity and serviceability of non-EMO engine shipping devices by type. This capability will be provided by the automatic decrementing and incrementing of a counter each time an AF FORM 1534, which contains engine shipping device information in block 13, is entered into a 4 character alpha numeric code. These four codes, when combined, will provide exact information as to what type of trailer was used, if it was serviceable, and what type of adapter was installed. Guidelines on the use of this expanded feature is outlined below.

- a. Type Engine Shipping Device. The first position of this four character alpha numeric code will be used to identify the type of engine shipping device used, i.e., container, trailer, stand, dolly, box, or pallet and its serviceability, if applicable. For example, this first column identifier (table 7-1) would use a "T" to indicate the item is a serviceable trailer or an "F" to indicate it is a serviceable full container, etc.
- b. Engine Trailers. The second and third column identifier, when used in conjunction with the first column identifier for trailers, serves to provide more specific information about the trailer. The second and third column identifiers (table 7-2) correspond to a specific engine trailer stock number. For example, "AL" is the code assigned to engine trailer NSN 1740-00-516-7930.
- c. Engine Shipping Containers. When the first column identifier indicates the item is an engine container, the second, third and fourth column identifiers are combined to specify exactly which container (table 7-4), by NSN, is being used. For example, code "ABT" represents NSN 8145-00-285-6110. This code, when combined with a first column identifier (table 7-1) for containers such as "J", would indicate the stock number of the container plus indicate that it was a non-serviceable half container.
- d. Adapters. The fourth column identifier is used to identify the type of adapter on the engine trailer identified by the second and third column identifiers. For example, if adapter NSN 1730-00-589-9465 were used, its code would be "N" (table 7-3).
- e. Other Codes. In addition to providing codes for trailers, containers and adapters, a single character code is provided for stands, dollies, boxes and pallets (table 7-1). This single code serves as the first column identifier while the second, third and fourth column identifiers remain blank. Also, to preclude duplicate counting of containers, pallets, etc., when more than one engine/module is shipped in the same container a "9" code is used. This code is inserted in block 13 of the AF FORM 1534 for the second, third, etc., engine/module shipped in the same container and fills all four column identifiers (i.e., 9999).

NOTE

Until CEMS is implemented, only the first position code (table 7-1) will be repeated on the AF FORM 1534.

- f. Identification and Marking. All engine shipping devices, containers, adapters, and trailers will be marked with the proper NSN using the following methods.
 - (1) If the manufacturers data plate contains a valid and legible NSN, no further marking is required for that item.
 - (2) For trailers, metal containers, and fiberglass containers, use a paper stencil of the NSN (1/2" letters) and spray paint the NSN on the device in a conspicuous plate.
 - (3) For adapters, select a smooth surface that will always be visible and vibropeen the NSN on the adapter.
 - (4) All base engine managers are responsible for ensuring that the devices at their stations be properly identified.

Table 7-1. Engine Shipping Devices - First Column Identifier Codes

NOUN	CODE	DESCRIPTION
TRAILER	T	Serviceable Trailer
TRAILER	U	Nonserviceable
CONTAINER	F	Full Container Serviceable
CONTAINER	G	Full Container Nonserviceable
CONTAINER	H	Half Container Serviceable
CONTAINER	J	Half Container Nonserviceable
STAND/DOLLY	S	-
BOX	B	-
PALLET	P	-

NOTE

These codes are not used to account for the shipment of empty engine devices (trailer, containers, adapters, boxes, etc.). These must be deleted or added to Shipping Device Status (SDS) system by the housekeeping TRIC Engine Status Update (ESU) since no AF FORM 1534 will be involved.

Table 7-2. Engine Shipping Devices - Trailers - Second and Third Column Identifier Codes

CODE	NSN	P/N	TMS
AA	1740-00-294-3638	340552	T56
AB	1740-00-106-8512	200-000-101	T56
AC	1740-00-718-1579	404190-1	T56
AD	1740-00-488-9469	U533747	TF39
AE	1740-00-602-6365	4S30031-101A	TF39
AF	1740-00-711-3135	60-H7553	J69
AG	1740-00-690-5284	107238	J60, T58
AH	1740-00-580-0494	MILT 26232	Multi-engine
AJ	1740-00-554-1667	104624	Multi-engine
AK	1740-00-534-0595	101671	Multi-engine
AL	1730-00-516-7930	100315	Multi-engine
AM	1730-00-655-7736	100315-500	Multi-engine
AN	1740-00-516-7929	100334	Multi-engine
AP	1740-00-713-5908	107640	Multi-engine
AQ	1740-00-713-5908	107640	TF33
AR	1740-00-051-3535	PDG0324	J60, J85
AS	1740-00-058-4955XD	11020MEC	J60
AT	1740-00-713-5908	107640	T64
AU	1740-01-127-4954	STC90856-1	F108
AV	1740-00-554-1667	104624	F100-GE102
AW	1740-00-713-5908	107640	F100-PW-100/200/220/220/229

Table 7-3. Engine Shipping Devices - Adapters - Fourth Column Identifier Codes

CODE	NSN	P/N
A	1730-00-036-7271	PDG4352
B	1730-00-051-3536	PDG0325
C	1730-00-051-3539	PDG0328E
D	1730-00-052-4450	PDA2675
E	1720-00-238-8019	68E25591-1
F	1730-00-485-8615	F71401
G	1730-00-573-5113	105064
H	1730-00-573-5114	105065
J	1730-00-573-5115	105067
K	1730-00-573-5116	105069
L	1730-00-574-2109	105003
M	1730-00-589-9464	105001
N	1730-00-589-9465	105004
P	1730-00-626-5691	105901
Q	1730-00-654-8388	106355
R	1730-00-657-1178	105865
T	1730-00-676-6848	8-96398-1
U	1730-00-676-6850	8-96398-5
V	1730-00-875-5399	F71401-2
W	1740-00-103-0870	P41640
X	1740-00-522-2754	101164
Y	1740-00-523-3572	PDG4543
Z	1740-00-734-6470	60D7559-3-5
1	1740-00-911-1026	P33003
2	4920-00-591-6975	21C5270G01
3	1730-00-238-8019	68E2559-1
4	1730-00-708-7948CN	6865331
5	1730-00-503-7625	P4006409
6	Other/Wrong Adapter	
7	No Adapter Installed	
8	1730-00-764-2441	21C2206G003
9	1740-00-059-7339	65700-70016-045
10	1740-01-189-4164	3C3461-G02

Table 7-4. Engine Shipping Devices - Containers - Second, Third and Fourth Position Codes

CODE	NSN	ENGINE TMS
AAA	8115-00-526-2868	T56
AAB	8145-00-005-8744	J85-17/17A
AAC	8145-00-032-6705	J85-21
AAD	8145-00-044-8858	J85-T/13
AAE	8145-00-049-5204	T58-A7-A9
AAF	8145-00-200-2411	R2800
AAH	8145-00-292-9642	J69-T25
AAJ	8145-00-390-5561	R2800
AAK	8145-00-390-5563	R1830/R2000
AAL	8145-00-390-5565	R1300/R1820
AAM	8145-00-390-5574	J65
AAN	8145-00-399-6066	R3350-93/93A
AAP	8145-00-451-5228	T56-A15
AAQ	8145-00-465-6373	T400-GB400
AAR	8145-00-465-6374	T400-CP400
AAS	8145-00-550-7451	T56-A7-A9-A15
AAT	8145-00-614-4805	T53-L11A
AAU	8145-00-661-2972	G56-A7-A9-A15
AAV	8145-00-663-9802	T56-A7-A9
AAW	8145-00-687-8110	T56-A7-A9
AAX	8145-00-839-8418	T56-A7, A9-A15
AAZ	8145-00-845-7668	J60
AAZ	8145-00-845-7670	J85-5/7/13
ABA	8145-00-111-5843PL	T64
ABB	8145-00-871-8557	O-300,IO-360D,O-470-11B,G50-480-540
ABC	8145-00-887-1949	G56-A7-A9-A15
ABD	8145-00-888-3698	T56-A7-A9-A15
ABF	8145-00-927-1744	R1820/R2000
ABG	8145-00-929-9454	J85-5/13
ABH	8145-00-988-3676	J85-21/13
ABJ	8145-00-994-3822	J85-7
ABK	8145-00-994-3823	J85-5/13
ABM	8145-00-031-1497	J47-25/25A/27
ABN	8145-00-111-5843	T64-7/7A
ABP	8145-00-113-8946	T64-7/7A
ABQ	8145-00-113-8947	T64-7/7A
ABR	8145-00-193-8877	TF41-2/400
ABT	8145-00-285-6110	J47-25/25A/27
ABU	8145-00-290-1386	J79-2/3/7/11/15/15A
ABV	8145-00-390-5568	J33-35/35A
ABW	8145-00-390-5573	J33-35/35A
ABY	8145-00-390-5581	J33-35/35A

Table 7-4. Engine Shipping Devices - Containers - Second, Third and Fourth Position Codes - Continued

CODE	NSN	ENGINE TMS
ACB	8145-00-391-0487	J47-25/25A/27
ACC	8145-00-439-2463	TF41-2/400
ACD	8145-00-550-6205	J79-2/3/7/11/15/15A/17/17A/17C
ACE	8145-00-587-2431	J57-13/19/21/23
ACF	8145-00-590-4854	J79-2/3/7/11/15/15A/17
ACG	8145-00-597-5771	J47-25/25A/27
ACJ	8145-00-664-9558	J75-17/19/19W
ACK	8145-00-785-4807	J79-2/3/7/11/15/15A/17/17A
ACL	8145-00-785-4808	J79-2
ACM	8145-00-785-4809	J79-2/7/11/15/15A/17/17A/17C
ACP	8145-00-785-4811	J79-2/7/11/15/15Z/17/17A/17C
ACQ	8145-00-844-0050	TF33-3/11A
ACR	8145-00-855-0549	T58-3
ACS	8145-00-887-9328	J79-2/3/7/11/15/15A/17/17A/17C
ACT	8145-00-901-6327	T64-7/7A
ACW	8145-00-928-4859	T58-5
ACY	8145-00-988-3674	T58-3
ACZ	8145-00-988-3679	T58-3
ADA	8145-00-901-6327	T64
ADB	8115-00-901-6327	T64
ADC	8115-NL	GTCP8570//85180/85397/T62
ADD	8145-00-390-5572PJ	J33
ADG	8145-00-394-6561PT (Metal)	F100-23C/24C Fan Drive
	8145-01-116-9590PT	
ADH	8145-00-394-6566PT (Metal)	F100-23A/24A Inlet Drive
	8145-01-116-9588PT	
ADJ	8145-00-394-6673PT (Metal)	F100-23G/24G Gearbox
	8145-01-116-9586PT	
ADK	8145-00-390-5575	R4360-59B63A
ADM	8145-00-251-9495	J85-17/17A
ADN	8145-00-901-6427	T64
ADQ	8145-00-394-6562PT (Metal)	F100-23F-24F Augmentor
ADS	8145-00-772-7866	T53
ADT	8145-01-116-9586PT (Fiberglass)	F100-23G/24G Gearbox
ADU	8145-01-116-9587PT (Fiberglass)	F100-23B/24B Core
ADV	8145-01-116-9588PT (Fiberglass)	F100-23A/24A Inlet Drive
ADW	8145-01-116-9589PT (Fiberglass)	F100-23F/24F Augmentor
ADX	8145-01-116-9590PT (Fiberglass)	F100-23C/24C Fan Drive
ADY	8145-01-035-1387PT (Metal)	F100-23H/24H HPT
ADZ	8145-00-396-2056PT (Metal)	F100-23B/24B Core
AEA	8145-00-394-6566PT	F100-24A
AEB	5305-00-558-5047	J79
AEC	8145-00-785-4810AN	J79
AED	8145-00-292-9642AS	J69

Table 7-4. Engine Shipping Devices - Containers - Second, Third and Fourth Position Codes - Continued

CODE	NSN	ENGINE TMS
AEE	8145-00-813-4558	J60
AEF	8145-00-048-7394RU	J57
AEG	8145-00-626-3681AN	J57/J75
AEH	8145-00-674-7656AN	J57/J75
AEJ	8145-00-405-3279PQ	TF30
AEK	8145-00-070-3684AN	J79
AEL	8145-00-319-4329AN	J79
AEM	8145-00-785-4812AN	J79
AEN	8145-00-785-4813AN	J79
AEP	8145-00-785-4814AN	J79
AER	8145-00-661-2972AS	T56
AES	8145-00-887-1949AS	T56
AEU	8145-01-070-5771RV	TF33
AEV	8145-01-070-5772RV	TF33
AEW	8145-01-057-2235RT	J75
AEX	8145-01-057-2236RT	J75
AEY	8145-00-097-1441	J57
AFA	8145-00-168-6895	TF41
AFB	8145-00-182-6302	TF41
AFC	8145-00-104-5568PQ	TF30
AFD	8145-00-139-6187	TF30
AFE	8145-00-413-0987PQ	TF30
AFF	8145-00-927-5373PQ	TF30
AFG	8145-00-927-5380	TF30
AFH	8145-00-998-4932	TF30
AFJ	8145-00-998-4935	TF30
AFK	8145-00-832-9706	T76
AFL	8145-01-125-1478AN	F107-101
AFM	1680-00-677-5227	M9A
AFN	8145-00-839-8418AS	T56A7/A9/A15
AFQ	8145-01-125-1473AN	F107-400 Engine
AFR	8145-01-116-9590PT	F100-24C (Metal)
AFS	8145-00-394-6562PT	F100-24F (Metal)
AFT	8145-00-394-6673PT	F100-24B (Metal)
AFU	8145-00-928-4859AN	T58-100
AFV	8145-01-059-5689AN	T700
AFW	8145-01-206-9889AN	F112-WR-100
AFX	8145-01-221-3623PT	F100-P100
AFY	8145-01-226-7980PT	F100-P100
AFZ	8145-01-230-5085PT	F100-P100