



AEROSPACE RECOMMENDED PRACTICE

ARP1840™

REV. B

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Reaffirmed 2020-11

Superseding ARP1840A

Aircraft Engine Transport Devices

RATIONALE

A five year review of ARP1840 resulted in major revisions to the original document. A definitions section was added and some renumbering of the paragraphs. Figures 2 and 3 were deleted from the document as these pallets are now included in NAS 3610/AS36100A.

Document was restructured to be more general in nature so as to read as an ARP versus an AS.

Metric measurements were added where they did not exist in previous version.

Figure 1 was maintained as an example of an STC Type pallet.

All remaining changes were either spelling or grammar.

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FOREWORD

Aircraft engines can be transported as outsize bulkloads restrained to the requirements of the applicable Weight and Balance Manual.

This ARP1840, however, covers their transport as aircraft engine transport devices, as a unit being secured in the aircraft certified restraint system compatible with ULDs designed to meet loading requirements as set forth by the Airframers Weight and Balance manuals or STC.

The following are definitions of abbreviations and terms used in this document:

- a. **ENGINE TRANSPORT DEVICE:** A rigid structure that is specifically designed to transport specific aircraft engines.
- b. **PALLET (AIR CARGO):** A unit load device consisting of a flat platform with flat undersurface of standard dimensions, on which goods are assembled and secured by a net before being loaded as a unit onto the aircraft handling and restraint system.
- c. **RESTRAINT SYSTEM:** Equipment for supporting and restraining unit load devices in an aircraft against the ground/flight loads. It usually consists of such items as rollers, side guides and locks for securing unit load devices to the aircraft structure. It does not include unit load devices, barrier nets and tie-down straps
- d. **SPLIT ENGINE PACKS:** Aircraft engines which are partially disassembled, i.e., cowlings, fan section and/or tail cones removed.
- e. **FULL ENGINE TRANSPORT:** Engines that are transported fully assembled.
- f. **UNIT LOAD DEVICE (ULD):** Device for grouping, transferring and restraining cargo for transit. It may consist of a pallet with a net or it may be a container.

1. SCOPE

1.1 Types of Engine Transport Devices

This document establishes two types of engine transport devices:

Type A: For split engine pack transport (mainly lower deck)

Type B: For full engine transport (mainly main deck)

1.1.1 Type A

Will be used for shipping of split engine packs,

e.g. Core-engine packs
Fan-engine packs

or additional equipment required on air cargo pallets of the below size, as applicable.

60.4 in x 125 in (1534 mm x 3175 mm) (Size Code L)

88 in x 125 in (2235 mm x 3175 mm) (Size Code A)

96 in x 125 in (2438 mm x 3175 mm) (Size Code M)

The transport device shall be compatible with aircraft restraint systems designed for NAS 3610/AS 36100A type 2 ULDs or equivalent STC approved ones.

1.1.2 Type B

Will be used for shipping full engine packs, generally referred to as "quick engine change" (QEC) kits, compatible with the allowable aircraft volume on integrated air cargo pallets/stands or air cargo pallets of the size

88 in x 125 in (2235 mm x 3175 mm) (Size Code A)

96 in x 125 in (2438 mm x 3175 mm) (Size Code M)

96 in x 196 in (2438 mm x 4978.4 mm) (Size Code R)

96 in x 238.5 in (2438 mm x 6057.9 mm) (Size Code G)

and compatible with aircraft restraint systems designed for NAS3610/AS36100A type 2 ULDs or equivalent STC approved ones.

The restraint of the engine transport device onto the pallet shall use appropriate tie down devices complying with any requirements of aircraft Weight and Balance manuals, pallet manufacturer's, or engine transport device manufacturer's instructions.

1.1.3 For both types of engine transport devices the use of pallet nets is not recommended.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AS1130	Air and Air/Surface (Platform) Cargo Pallet
ARP1334	Ground Equipment Requirements for Compatibility with Aircraft ULDs
AS1491	Interline Air Cargo Pallets
ARP1757	Symbology for Standardization of ULD Handling Devices
AS36100A	Air Cargo Unit Load Devices - Performance Requirements and Test Parameters

2.2 AIA Publications

Available from Aerospace Industries Association of America, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

NAS 3610	Cargo Unit Load Devices - Specification for (Revision 10)
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2.3 IATA Publications

Available from International Air Transport Association, Publications Assistant, 800 Place Victoria, P.O. Box 113, Montreal, Quebec H4Z 1M1, Canada, Tel: 1-514-874-0202, www.iata.org.

IATA ULD Technical Manual 50/0, Requirements for Interlining of ULD

IATA ULD Technical Manual 50/1, Pallets for Class II Restraint Systems (NAS3610/AS36100A)

IATA ULD Technical Manual 50/9, 16' & 20' Pallets for Class II Restraint Systems (NAS3610/AS36100)

2.4 ISO Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ISO 3394	Dimensions of rigid rectangular packages - Transport packages
ISO 3676	Packaging - Unit load sizes - Dimensions
ISO 7166	Aircraft - Rail and stud configuration for passenger equipment and cargo restraint
ISO 8097	Minimum airworthiness requirements and test conditions for certified air cargo unit load devices
ISO 21100	Air cargo unit load devices - Performance requirements and test parameters

2.5 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

Technical Standard Order TSO C90 - Cargo Pallets, Nets and Containers

Federal Aviation Regulations Title 14 CFR Part 25 - Airworthiness Standards: Transport Category Airplanes

Motor Carriers Safety Regulations Part 393.100 Subpart I, Protection Against Falling or Shifting Cargo, United States Department of Transportation Stock No. 5004-00010

3. DESIGN OBJECTIVES

3.1 General

This document is intended to establish design objectives for an aircraft engine transport device for quick engine change (QEC) packs and split engine packs with consideration of the following interfaces:

3.1.1 The Airframe Manufacturers

Aircraft Loadability Interface (ALI) Spec. or Weight and Balance Manual outsize cargo restraint requirements.

- Cargo envelope, Pallet configuration
 - Maximum gross weights, CG limits, maximum local and area loads
 - Equipment strength (A/C g-load envelope)
 - Loading procedure/requirements, pallet sequence.

NOTE: Total aircraft engine transport devices should be submitted to the appropriate airframe manufacturers who will evaluate the total engine transport device, and pallet interface as pertains to technical and operational requirements, if the WBM indicated limitations can not be met or specific transport assistance is requested. Further requirements to be met for engine change are included in relevant documentation.

- Bootstrap hoist point geometry in TEM (Tool and Equipment Manual)
- Pylon hoist limitations in MM (Maintenance Manual)