



AEROSPACE RECOMMENDED PRACTICE

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

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ARP 945

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Revised

MINIMUM REQUIREMENTS FOR AIRPLANE CARGO SYSTEMS

1. PURPOSE

This Aerospace Recommended Practice specifies minimum performance, design, and test requirements for civil aircraft equipment identified as a pallet handling and restraint system.

2. SCOPE

The requirements of this document are applicable to airborne equipment which is subject to the airworthiness directives of FAR Part 25 or CAR Part 4b and which is designed to accommodate unitized cargo in the form of pallet-net combinations or containers.

3. REQUIREMENTS

3.1. Interface - System compatibility with unitized cargo, ground equipment and facilities, including capacities and limitations, should be clearly and completely defined by appropriate documentation and placards.

3.1.1 Cargo - The following pallet, net and container specifications should be considered. Additional requirements should be obtained from equipment manufacturers' manuals and catalogs.

ARP 830 - Minimum Requirements for Air Cargo Pallets

ARP 831 - Pallet Sizes

ARP 832 - Minimum Requirements for Air Cargo Containers

ARP 990 (proposed) - Minimum Requirements for Air Cargo Pallet Nets

MIL-P-27443 (USAF) - Pallet, Cargo, Aircraft HCU-6/E

MIL-N-27444 (USAF) - Net, Cargo Tiedown, Pallet HCU-7/E

MIL-P-27648 (USAF) - Pallet, Cargo, Aircraft HCU-10/C

MIL-N-27647 (USAF) - Net, Cargo Tiedown, Pallet HCU-11/C

MIL-P-27700 (USAF) - Pallet, Cargo, Aircraft HCU-12/E

3.1.2 Ground Equipment - The following specifications should be considered. Additional requirements should be obtained from equipment manufacturers' manuals and catalogs.

Military equipment data may be obtained from applicable portions of MIL-HDBK-300.

ARP 834 - Minimum Requirements for Self-Propelled Pallet Transport and Lift Vehicles

ARP 835 - Minimum Requirements for Pallet Dolly

3.1.3 Facilities - Information and requirements should be obtained from civil and military authorities.

3.2 System Performance - The system should provide a capability for maximum payload of unitized cargo with minimum loss of loadable volume.

3.2.1 Functional Characteristics - The system should consist of a low-friction load-bearing surface for conveyance of pallets/containers to and from their loaded position within the aircraft, directional control equipment, and restraint devices.

3.2.1.1 All load/unloading and restraint operations should be capable of being accomplished by personnel encumbered with special clothing such as arctic gloves.

3.2.1.2 System equipment should be adjustable to accommodate pallets/containers of various standard widths, lengths, and configuration. When this capability is provided, the adjustment should be accomplished without special tools and should be operable by personnel wearing arctic clothing.

3.2.1.3 The system should be capable of accommodating the maximum load for which each pallet-net combination or container is designed.

3.2.2 Reliability/Maintainability - System reliability should provide for high equipment availability, and when a failure occurs, the repair or replacement time should not be more than 10 minutes.

3.2.2.1 The components of the system should have a normal service life of five years based on expected operational usage.

3.2.2.2 Assembly, disassembly, and maintenance (including servicing) should be accomplished with general-purpose tools and equipment normally and commercially available.

3.2.2.3 All small loose parts which might be easily lost should be attached to the equipment with cable or chain.

3.2.3 Environment - The system should be capable of operating under the following conditions:

a. Temperature range from -65 to +160 F

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- b. Relative humidity up to 95%
- c. Exposure to salt-sea atmosphere
- d. Vibration incident to service use
- e. Sand and dust particles as encountered in desert areas

3.2.3.1 System components should be capable of withstanding impact loads resulting from rough handling. Pallets/containers moving at speeds up to 240 fpm should be considered unless speed-limiting devices are used.

3.2.4 Safety - Provisions for the safety of personnel should be incorporated to the maximum extent possible with regard to anticipated operating conditions and the capability of operating personnel.

3.2.5 Convertibility - Systems designed for use in convertible or combination aircraft shall be capable of installation or removal times that are consistent with the conversion time of the aircraft.

3.3 Detail Design - The system components should be minimum weight, simple, rugged, and low cost.

3.3.1 Conveyors - The load bearing surface should be capable of supporting pallets/containers under the critical limit load factors (excluding emergency landing conditions) without damage to the pallets/containers or to the bearing surface.

3.3.1.1 The horizontal force required for manual movement of the unitized cargo on roller or ball conveyors on a level plane should not exceed 3% of the pallet load.

3.3.1.2 The weight and size of roller and ball conveyor sections should permit installation or removal by not more than two men.

3.3.1.3 Lateral and longitudinal spacing of roller conveyors and ball casters should be such that the deflection of a 5/8 in., plywood-core pallet, with a load concentration of 300 psf, does not impair functional performance of the system or damage the pallet.

3.3.1.4 All exposed edges of rollers should be rounded or chamfered to protect the pallet surface.

3.3.2 Guide Rails - Guide rails or fittings should maintain positive lateral directional control and should permit free longitudinal movement of pallets/containers during loading operations.

3.3.2.1 The weight and size of rail sections should permit installation or removal by not more than two men.

3.3.2.2 Rails or fittings designed for lateral guidance and restraint should be spaced so that the total lateral clearance between pallet/container edge and rail surface will be not less than 1/4 in. and not greater than 1/2 inch.

3.3.2.3 Rails or fittings designed for vertical restraint should provide a minimum vertical clearance of 1/4 in. between pallet/container surface and the restraint lip.

3.3.3 Restraint Devices - Pallet/container restraint devices should be capable of being operated by

one man without accessory tools or equipment.

3.3.3.1 The latching system should incorporate means, whether automatic or manual, to determine positive pallet/container restraint.

3.3.3.2 Fittings designed to provide forward and aft restraint should limit the longitudinal freedom of pallet/container movement to a maximum of 1/4 inch.

3.3.3.3 Fittings designed to react vertical loads should meet the requirements of paragraph 3.3.2.3.

3.3.4 Barriers - Cargo compartment bulkheads or barrier nets designed for crew and personnel protection during emergency landing operations should incorporate means for access between compartments. Such access provisions during normal operations should be operable by one man and the time for opening or closing should not exceed three minutes.

3.3.5 Threshold Equipment - Cargo door sill equipment, designed to ease the transfer of pallets/containers into the aircraft, may be either a part of the system or it may be a part of the ground equipment or terminal facilities.

3.3.5.1 Conveyors in this area should be capable of supporting a fully loaded pallet/container in either a "teetering" or "bridging" condition.

3.3.5.2 Guidance devices should accommodate pallets/containers in either a teetering or bridging condition.

3.3.5.3 Safety devices should be incorporated to preclude a pallet/container from inadvertent movement out of an open door after the pallet/container has been positioned within the system.

3.3.6 Materials, Parts and Processes - Materials selected should be corrosion resistant or protected by plating or other surface treatment.

3.3.6.1 Materials and parts should be non-nutrients for fungus or should be treated prior to use.

3.3.6.2 Standard, proven, and economical parts should be used to the maximum extent consistent with reliability and performance.

3.3.6.3 All materials and finishes should meet FAA requirements for flame resistance.

3.3.7 Workmanship - All details of workmanship should be of the highest grade consistent with the intent of this ARP. There should be no cracks, dents, scratches, burrs, sharp edges, foreign matter, or any other evidence of poor workmanship that will render the system unsuitable for the intended purpose.

3.3.8 Interchangeability - All like assemblies and replaceable parts should be designed and manufactured to permit substitution without physical modification to any part of the equipment.

4. QUALITY ASSURANCE

The following qualification tests should be performed