

International Standard



6833

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Air cargo — Minimum requirements for future wide-body aircraft cargo systems and compartments (intermodal)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 6833 was developed by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, and was circulated to the member bodies in July 1981.

It has been approved by the member bodies of the following countries :

Australia	France	South Africa, Rep. of
Austria	Germany, F. R.	Spain
Belgium	Ireland	United Kingdom
Brazil	Italy	USA
Czechoslovakia	Japan	USSR
Egypt, Arab Rep. of	Romania	

The member body of the following country expressed disapproval of the document on technical grounds :

Netherlands

Air cargo — Minimum requirements for future wide-body aircraft cargo-systems and compartments (intermodal)

1 Scope

This International Standard specifies minimum performance, design and test requirements for future civil wide-body dedicated freighter aircraft equipment identified as a main deck unitized cargo handling and restraint system. It further outlines the general design requirements for the cargo compartment and envelope.

2 Field of application

The dedicated aircraft addressed herein is to be an uncompromised all-freighter aircraft developed primarily for use in the civil transport industry.

The requirements of this document are applicable but not limited to airborne equipment which is subject to the airworthiness directives of U.S. FAR Part 25 (or equivalent regional or national regulations) and which is designed to accommodate unitized cargo in the form of intermodal containers and other compatible unitized load devices. Intermodability in the context of this document encompasses the air-truck-rail-sea modes, and considers uncertificated as well as certificated Unit Load Devices (ULDs). This International Standard covers the fundamental prerequisites for the aircraft cargo compartment and the onboard cargo handling and restraining system. The cargo system and compartment considers primarily 2,44 m (96 in) wide, multiple bottom configuration ULDs. The cargo system and compartment should handle outsize cargo. The cargo system, compartment, and the cargo-related aircraft physical features should be sufficiently defined to establish specifications for ground interface mobile and/or fixed loading equipment and facilities with a goal of standardization thereof.

This International Standard is intended to assist air carriers in standardizing to the degree necessary to ensure the smooth flow of cargo between ground and aircraft and between various aircraft in the future. It is not intended to inhibit the development of new systems, but rather to establish a solid interface for the introduction of such systems.

3 Applicable documents

3.1 ULD's

The following ULD specifications, standards, or applicable portions thereof, should be considered. Additional requirements

may be obtained from equipment manufacturers' manuals, catalogues, and drawings.

a) Certified ULD's

ISO 1496/7, *Series 1 freight containers — Specifications and tests — Part 7 : Air mode containers.*

ISO 4115, *Air land cargo pallet nets — Specification and testing.*

ISO 4117, *Air land cargo pallets — Specification and testing.*

ISO 4128, *Air mode modular containers.*¹⁾

ISO 8149, *Aircraft and space vehicles — Air cargo — Insulated air cargo containers.*²⁾

ISO 8150, *Aircraft and space vehicles — Air cargo — Main deck 3 175 mm (125 in) containers for high capacity aircraft.*

NAS 3610-2F1, 2G1, 2H1 and 2J1, *Cargo Unit Load Devices (Specification for TSO/C90 and FAR Part 37.199).*

b) Uncertificated ULD's

ISO 1496/1, *Series 1 freight containers — Specifications and tests — Part 1 : General cargo containers.*

ISO 1496/2, *Series 1 freight containers — Specifications and tests — Part 2 : Thermal containers.*

ISO 1496/5, *Series 1 freight containers — Specification and testing — Part 5 : Platform containers.*

3.1.1 Optional (non-standard gauge) ULD's

The following additional ULD specifications, or applicable portions thereof, may be considered for handling by optional system equipment :

ISO 4171, *Interline air cargo pallets.*

ISO 6895, *Aircraft — Structural igloo system.*¹⁾

1) At present at the stage of draft.

2) In preparation.

3.2 General

The following cargo-related airframe or aircraft equipment specifications, standards, handbooks, etc., or applicable portions thereof, should be considered. Additional applicable documents and/or requirements may be specified or forthcoming from customer and/or contracting agencies.

Government

U.S. FAR Part 25, *Airworthiness Standards: Transport Category Aircraft* (or equivalent regional or national regulations).

Industry

ISO 4116, *Ground equipment requirements for compatibility with aircraft ULD's*.

ISO 6702, *Requirements for aircraft on-board weight and balance systems*.¹⁾

4 Requirements

4.1 Interface

Cargo system and compartment compatibility with unitized cargo, other cargo, ground equipment, facilities and pertinent cargo-related aircraft physical and environmental features, including capacities and limitations, should be clearly and completely defined herein and by reference to appropriate documentation.

4.1.1 Cargo

The ULD specifications and standards or applicable portions thereof as listed in 3.1, and the cargo types as described in 4.2.1, should be considered as the cargo for the future dedicated freighter aircraft.

4.1.2 Air vehicle cargo system

The air vehicle cargo system should provide for the handling and restraint of specified ULD's and outsize cargo in the aircraft.

4.1.2.1 Conveyance

The system should provide for the conveyance of the ULD's across the aircraft threshold and in and out of the aircraft cargo compartment.

4.1.2.2 Support and restraint

The system should provide for the structural support and restraint of the ULD's during flight and ground manoeuvre in a manner which will assure the cargo will not present a hazard to

the aircraft or its crew, and shall be in accordance with the requirements of U.S. FAR Part 25 (or equivalent regional or national regulations).

4.1.2.3 Guidance

The guidance features of the air vehicle cargo systems should assure that positive control will be maintained over moving ULD's and that ULD excursions will remain within the aircraft cargo envelope. Compatibility at the interface with ground loading equipment should be provided to assure guidance continuity.

4.1.2.4 Powered movement

The system equipment should provide for powered movement and control of ULD's.

4.1.2.5 Stick Loading

The system should provide for individual and/or multiple unit stick loading and unloading of ULD's.

4.1.2.6 Outsize cargo

The system should provide for the handling and restraint of outsize cargo within the limits of the aircraft.

4.1.2.7 Uncertificated ULD's

The system should be capable of handling and restraining uncertificated ULD's, including standard containers which do not have continuous flat bottom surfaces. This capability may be provided directly by the cargo system or through the use of adapters installed in the cargo system or on/under the ULD.

4.1.2.8 Containers

The system should not impose unusual or peculiar requirements upon the ULD's which would be detrimental to the function of the ULD's in other transport modes.

4.1.2.9 Component application

Some system components applicable to the loading/unloading function may be introduced into the aircraft for that function but remain with the ground equipment.

4.1.2.10 Optional ULD's

Provisions may be incorporated for the handling of optional ULD's. Aircraft cargo system equipment pertinent only to optional ULD's or to outsize cargo may be provided either as optional onboard equipment or as quickly removable kit-installed equipment.

1) At present at the stage of draft.

4.1.3 Aircraft physical and environmental features

The aircraft cargo system and compartment should be thoroughly compatible and integrated with those aircraft physical, functional, and environmental features which impact the system and the compartment.

4.1.3.1 Physical and functional features

Example aircraft physical and functional features are : door opening size, shape and location, cargo envelope and clearances, cargo movement paths, sill height, cargo floor attitude and excursion, aircraft stabilization characteristics, crew location with respect to cargo compartment, cargo floor and fuselage structural characteristics. These features are further covered later in this document.

4.1.3.2 Environmental features

Example aircraft environmental features are : temperature, pressure, atmosphere, venting, vibration/shock, noise and lighting. These features are further covered later in this document.

4.1.4 Ground equipment

The following specifications, standards, and recommendations should be considered. Additional requirements may be obtained from equipment manufacturers' manuals, catalogues, and drawings. (See ISO 4116).

4.1.4.1 Compatibility

The ground equipment should be fully compatible with the aircraft cargo handling system.

4.1.4.2 Cargo alignment

The combination of the aircraft cargo system, aircraft interfacing ground equipment, and aircraft physical features should minimize the criticality of cargo positioning and aligning during loading/unloading.

4.1.4.3 Facility

With respect to interface of the aircraft and/or unitized cargo to the facility, the facility and the ground equipment can be considered as synonymous when only the function of loading and unloading the aircraft is considered.

4.2 Loadability

The chosen spectrum of cargo should be readily loadable if the aircraft is to perform efficiently. The cargo compartment should be sized to receive and contain the cargo utilizing most effectively the volume determined to meet the performance requirements. The cargo aperture and envelope should be located and sized, respectively, to meet the needs of the cargo and the handling system, which, in turn, should perform to meet the requirements of aircraft turn-around and unloading. There should be no constraints on methods to load or unload the cargo compartment of the aircraft.

4.2.1 Types of cargo

The cargo compartment should accept various types of unitized and non-unitized cargo.

4.2.1.1 General cargo

General cargo unitized in containers or on suitable pallets will constitute the majority of the civil freighter domestic and international cargo in future air cargo operations. The ULD's listed in 3.1 will encompass the ULD spectrum which must be handled through the cargo aperture and in the cargo compartment.

4.2.1.2 Special cargo

Special cargo is generally defined as cargo which may not be environmentally or physically compatible with the containers used for general cargo (see 4.2.1.1) but will be handled on suitable pallets within the dimensions and weights defined for general cargo. This cargo may include liquids, autos, live animals, etc. Preservation of compatibility with ground transportation should be considered a requirement.

4.2.1.3 Outsize cargo

Outsize cargo are those items incapable of being contained or restrained by the various ULD's listed (see 3.1), but that will fit with adequate clearance, the cargo envelope of the aircraft being developed. Bulk loading, special pallets or containers, dollies, or other means of entry and tiedown may be used depending upon the capability of the airframe and/or the design features desired by the buyer/user.

4.2.2 Cargo envelope

The size and shape of the cargo compartment and access thereto should have no constraints for receiving and restraining the specified spectrum of cargo. Criteria for applicable existing and proposed ULD's for the future cargo aircraft should constitute the items used to determine the cargo envelope and, in turn, the fuselage contour. An efficient use of the volume should be achievable under maximum payload operations.

4.2.2.1 Loading method effects

Cargo compartment envelope sizing may be affected by loading methods. Proper positioning of the cargo within the compartment may also require design consideration for both the compartment and the loading equipment.

4.2.2.2 Sizing factors

The figure shows the various cargo envelope development sizing factors. A space allowance should be provided for guidance and restraint equipment. This space may or may not fall within the clearance space provided between the payload and structure. If required for outsize or other cargo, and additional space may be required for access to floor tiedowns. A space allowance should be provided for personnel ingress along the inboard or outboard sides of the cargo sticks. In addition to the basic clearance dimension of 51 mm (2 in) between payload and structure during both the loading and unloading operations.