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Aircraft — Pressure equalization requirements for cargo containers

*Aéronefs — Exigences d'égalisation de pression pour les conteneurs de
fret*



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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 preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11242 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 9, *Air cargo and ground equipment*.

Annexes A, B and C of this International Standard are for information only.

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Introduction

The decrease in ambient pressure with altitude creates a pressure differential between the inside of a cargo container and the outside environment. When the internal volume and/or area of a container are significant, this may, if not properly controlled, result in tremendous forces exerted on the container panels, thus becoming a major flight safety hazard. Incidents were recorded during flight in which overly airtight containers broke down or nearly exploded during climb.

In order to avoid such potentially hazardous situations, it is essential that this problem be clearly identified and taken into account when designing any type of container to be moved regularly or occasionally by air cargo.

Aircraft — Pressure equalization requirements for cargo containers

1 Scope

Since most modern civil transport aircraft capable of carrying air cargo unit load devices or large-size shipping containers have pressurized cabins and cargo compartments, two different cases must be considered:

- a) normal (low airflow) pressure equalization during climb and descent — from the departure airport pressure down to the cruise flight cabin pressure, up to the landing airport pressure;
- b) emergency (rapid decompression) pressure equalization in the event of a sudden (possibly “explosive”) depressurization of the aircraft fuselage occurring at cruise altitude: this case requires very fast (high airflow) pressure equalization between cruise flight cabin pressure and outer ambient pressure.

This International Standard defines the minimum safety requirements to be met by containers used to transport cargo by civil transport aircraft in either case a) or b) above.

The flight safety requirements specified in this International Standard are applicable to the design of

- aircraft containers for general cargo, as covered by
 - ISO 4118 for non-certified lower deck containers,
 - ISO 6517 for base-restrained certified containers exclusively for the lower deck of high-capacity aircraft,

- ISO 8323 for air/surface intermodal containers,
- ISO 10327 for certified containers for air cargo;
- air mode insulated containers, as covered by ISO 8058;
- any airtight shipping containers with an internal volume of 1 m³ (35 ft³) or more.

NOTE 1 Most shipping containers/packageings used for air cargo are made of sufficiently low-strength material (e.g. fibreboard) or provide sufficient air leakage (e.g. wooden crates) that they cannot be considered airtight and do not present any significant hazard as a result of pressure equalization

There are however a number of special containers, notably for the carriage of satellites/space hardware, aircraft spares, sensitive scientific or technical equipment, etc., which are airtight per design (in order to protect the contents against atmospheric pollution) or per construction (because of the quality of sealing and materials used)

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards

ISO 4118:1996, *Non-certified lower-deck containers for air transport — Specification and testing*.

ISO 6517:1992, *Air cargo equipment — Base-restrained certified containers exclusively for the lower deck of high-capacity aircraft.*

ISO 8058:1985, *Air cargo equipment — Air mode insulated containers — Thermal efficiency requirements.*

ISO 8097:1995, *Aircraft — Minimum airworthiness requirements and test conditions for certified air cargo unit load devices (Endorsement of NAS 3610, 10th edition).*

ISO 8323:1985, *Freight containers — Air/surface (intermodal) general purpose containers — Specification and tests.*

ISO 10327:1995, *Aircraft — Certified aircraft container for air cargo — Specification and testing.*

ICAO, *Technical instruction for the safe transport of dangerous goods by air.*¹⁾

IATA, *Dangerous Goods Regulations.*²⁾

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 airtight shipping container: Any container, unless constructed of low-strength materials (fibreboard or equivalent), where the cumulated cross-sectional area of all apertures allowing a flow of air between the inside and the outside of the container is less than 5 cm² per cubic metre (0,02 in² per cubic foot) of internal container volume.

3.2 pressurized shipping container: Airtight container which is entirely sealed and does not include either means of pressure equalization as described in clause 7 or an expandable volume as described in clause 8.

3.3 normal flight conditions: Flight conditions with cabin/cargo compartment pressure decreasing from standard sea level 101,3 kPa (14,4 lbf/in²) to minimum cruise flight cabin altitude pressure 75 kPa (10,7 lbf/in²) during climb, and increasing back to standard sea level during descent, at the maximum rates given in table 1.

3.4 emergency (rapid decompression) conditions: Cabin/cargo compartment atmosphere dropping linearly from a minimum normal equivalent altitude of 1 830 m (6 000 ft), i.e. a maximum normal pressure of 81 kPa (11,8 lbf/in²) in cruise flight, to the standard ambient pressure at 13 715 m (45 000 ft) altitude of 15 kPa (2,14 lbf/in²) in a duration of 1 s.

4 Environment

4.1 General

The decrease of ambient atmospheric pressure with altitude is described by the international standard atmosphere as shown in annex A.

The maximum operating altitude for modern civil transport aircraft (with the exception of supersonic aircraft which do not carry air cargo containers) is 13 715 m (45 000 ft), corresponding to an ambient pressure of approximately 15 kPa (2,14 lbf/in²) as compared to the standard sea level atmospheric pressure of approximately 101,3 kPa (14,4 lbf/in²).

Table 1

	Cabin altitude rate		Cabin pressure rate	
	m/s	ft/min	Pa/s	(lbf/in ²)/min
Maximum climb rate	+ 12,7	+ 2 500	– 150	– 1,3
Maximum descent rate	– 7,6	– 1 500	+ 90	+ 0,78

1) Available from the International Civil Aviation Organization, 1000 Sherbrooke Street West, Suite 400, Montreal, Quebec H3A 2R2, Canada

2) Available from IATA Publications Dept., 2000 Peel Street, Montréal, Québec H3A 2R4, Canada or IATA Publications Dept., Route de l'Aéroport 33, PO Box 672, CH-1215 Genève 15 Aéroport, Switzerland