SAE Aerospace
An SAE International Group

AEROSPACE RECOMMENDED PRACTICE

SAE ARP5492
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Aircraft Cargo Systems - Missing Restraint Limitations Layouts

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1. SCOPE:

1.1 Purpose:

This SAE Aerospace Recommended Practice (ARP) provides recommendations for aircraft manufacturers and operating carriers about how to establish common information for the use of cargo systems with missing/inoperative restraints. Because of the fact that the certified restriction requirements due to missing/inoperative restraints are dependent of the specific aircraft structure and the system layout of the cargo loading system, this document shall only recommend common layout of information for the users based on the certified data provided to allow for common training, understanding and handling. This shall be used right from the beginning for future aircraft types for certified data.

1.2 Field of Application:

This document provides common rules for the presentation and format of limitations due to missing/damaged restraints in cargo systems, for lower deck cargo compartments of passenger aircraft and upper deck/main deck/lower deck compartments of Combi and Freighter aircraft based on the certified data provided for the individual aircraft type.

2. REFERENCES:

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, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

ARP1757 Symbology for Standardization of ULD Handling Devices

2.2 ISO Publications:

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.

ISO 9031 Aircraft cargo equipment – Handling systems for unit load devices (ULD'S) – Symbols for pictorial representation

2.3 List of Abbreviations:

ARP	Aerospace Recommended Practice
CLS	Cargo Loading System
ISO	International Standardization Organization
SAE	Society of Automotive Engineers
ULD	Unit Load Device
W & B	Weight and Balance

3. GENERAL:

3.1 Guidelines for missing/inoperative restraints in aircraft cargo systems are primarily given in the limitations chapters of the Weight & Balance manuals.

3.2 Operating carriers provide this information in their "Ground Operation Manuals" and in the form of placards inside the aircraft. Depending on the intended purpose (Part of the W & B manual only or other documentation and/or also as placard inside the aircraft) the presentation of the data may differ, but the format, the general contents and the used symbols (ARP1757) shall be common, simple and user friendly.

3.3 Due to the fact, that the same symbol according to ARP1757 can relate to different restraint hardware (for example: there are may different XZ latches represented by the same symbol), it is recommended to have pictorial illustrations in field documents and on placards to facilitate the understanding for the field staff.

3.4 Restraint components are understood as:

a. Restraint hardware in cargo loading systems, for X, Y, Z restraint.

b. Attachment of nets and the nets themselves, subdividing bulk loaded cargo compartments used to keep cargo in the relevant section.

3.5 Missing/inoperative restraint hardware may require transport restriction such as: empty positions, positions with restricted maximum gross weight allowances or empty compartments, dependent on the system and safety requirements.

3.6 Furthermore, components with load supporting function such as transport rollers, should be considered for limitations if necessary (dependent on system layout and load path/transfer).

4. REQUIREMENTS TO HANDLE CARGO SYSTEMS WITH MISSING/DAMAGED RESTRAINTS:

4.1 General:

The following tables and sketches shall be used for the definition of the missing/ inoperative restraints requirements in the relevant aircraft documentation as W & B manual or cargo handling manual, and where necessary, as placards inside the cargo compartments.

4.2 Required Contents of the Tables/Sketches:

4.2.1 For Use in W & B Manual:

a. Sketch(es) of the relevant CLS (FWD lower compartment, AFT lower compartment, Main deck compartment, Upper deck compartment), using the symbols of the standards referred to in Section 2.

b. Tables referring to the sketches giving restriction requirements for missing/damaged restraints.

4.2.2 For Use in Field Documents and on Placards:

a. Sketch(es) of the relevant CLS (FWD lower compartment, AFT lower compartment, Main deck compartment, Upper deck compartment), using the symbols of the standards referred to in Section 2, and a pictorial illustration of the relevant restraint hardware.

b. Tables referring to the sketches giving restriction requirements for missing/damaged restraints.

4.2.3 Table for restriction requirements (W & B Manual Application).

TABLE 1

Restriction requirements								
Symbol	Loading Pos.	One Restraint missing	One Restraint and one on opp. side	2 Restraints on one side NON adjacent	More than 2 Restraints on one side NON adjacent	One Restraint and two NON adjacent on opp. Side	2 Restraints on one side adjacent	Remarks

Legend (Statements to be included into the table – see example in 4.2.5)

MAX. = No reduction – No weight penalty is required

N(IL) = The ULD location must remain EMPTY

X = An EMPTY ULD can be carried or the position must remain unoccupied.

2000 kg = Maximum allowable gross weight of the ULD under the defective 4409 lbrestraint conditions

N/A = Not applicable

1) = If the failure relates to one restraint of a multiple latching unit, only the concerned restraint causes restrictions to the relevant ULD position.

If the failure relates to the frame of a multiple latching unit, all restraints of this unit cause restrictions to the concerned ULD position.

NOTE: All functional restraints are to be raised to avoid ULD movements.

4.2.4 Table for restriction requirements (used as placard).

TABLE 2

Restriction requirements								
Symbol Reference to pictorial illustration	Loading Pos.	One Restraint missing	One Restraint and one on opp. side	2 Restraints on one side NON adjacent	More than 2 Restraints on one side NON adjacent	One Restraint and two NON adjacent on opp. Side	2 Restraints on one side adjacent	Remarks

A pictorial illustration of the relevant hardware shall be provided showing the real components to ease the identification of the components for the loading staff. (Taken from CMM for example). The pictorial illustrations should be provided adjacent to the symbols of the restriction table (see example in 4.2.6).

Legend (Statements to be included into the table – see example in 4.2.6)

MAX. = No reduction – No weight penalty is required

N(IL) = The ULD location must remain EMPTY

X = An EMPTY ULD can be carried or the position must remain unoccupied.

2000 kg = Maximum allowable gross weight of the ULD under the defective 4409 lbrestraint conditions

N/A = Not applicable

1) = If the failure relates to one restraint of a multiple latching unit, only the concerned restraint causes restrictions to the relevant ULD position.

If the failure relates to the frame of a multiple latching unit, all restraints of this unit cause restrictions to the concerned ULD position.

NOTE: All functional restraints are to be raised to avoid other ULD movements.

4.2.5 Example for a Wide Body Aircraft Lower Deck Cargo Compartment - Loading of 88”/96” x 125” Pallets:

For use in W & B Manual (symbols according to Section 2).

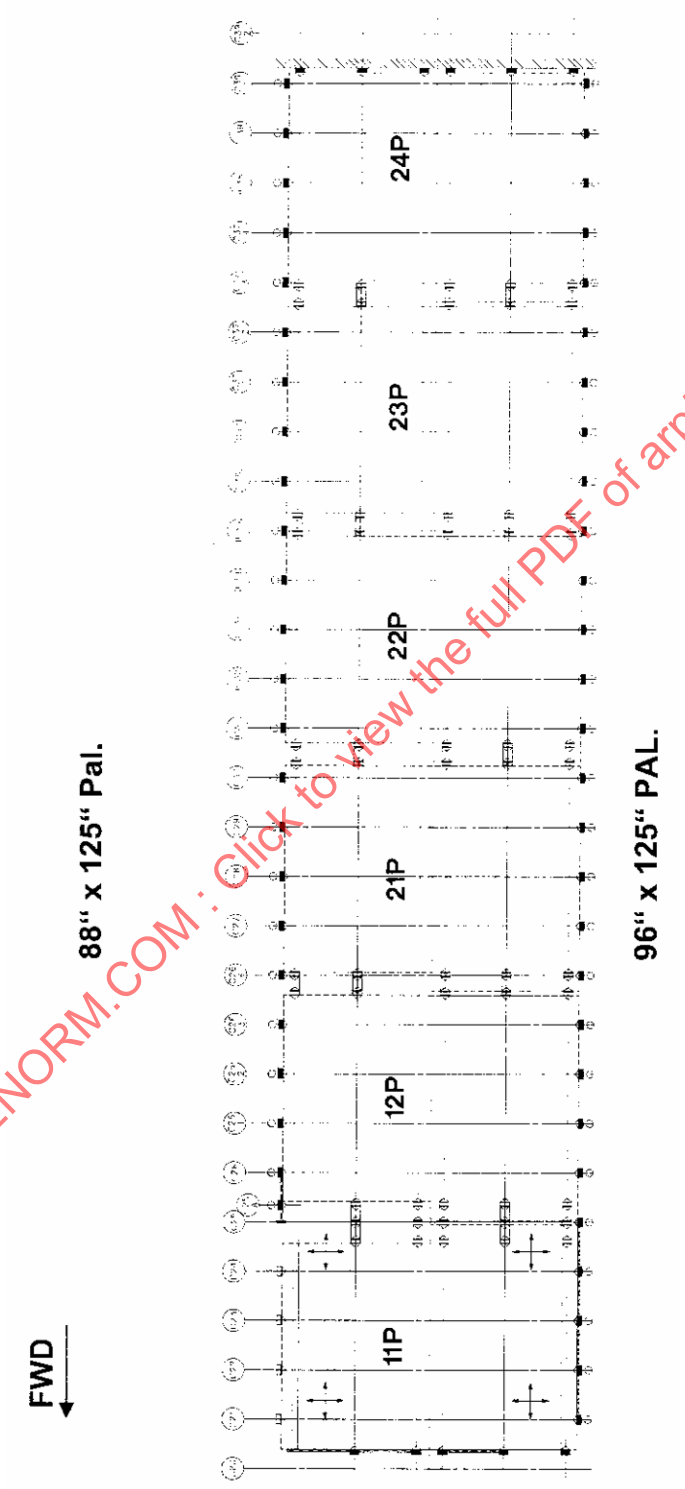

FIGURE 1