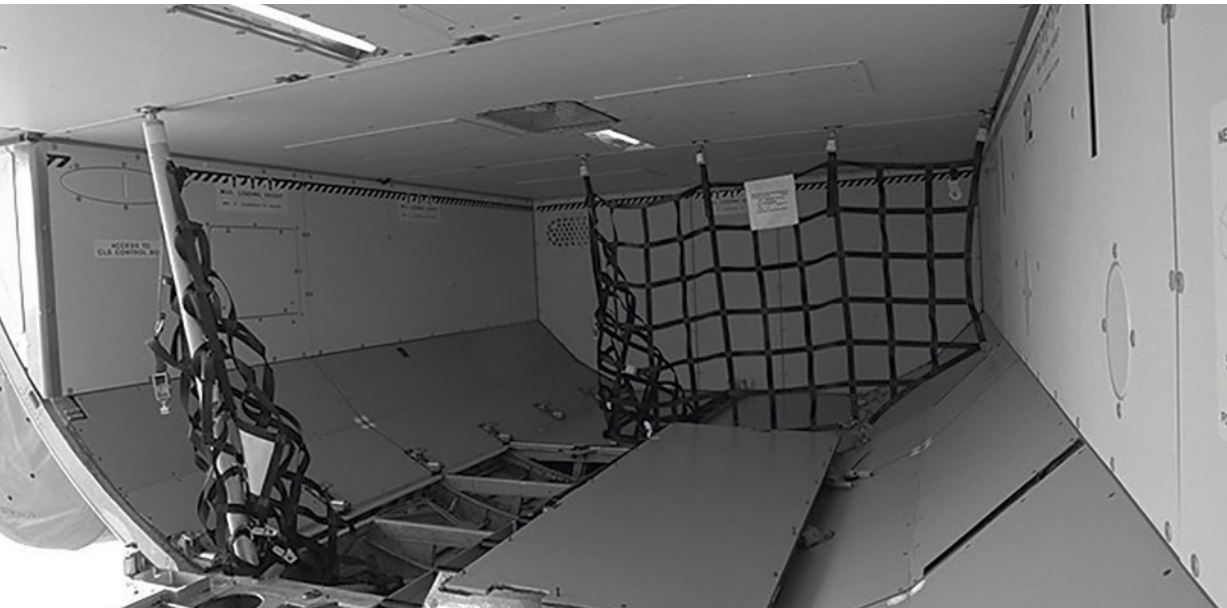




A320 Family cargo Containers/pallets movement

No crew likes the idea of Unit Load Devices (ULD – containers and pallets) moving around in the cargo holds of their aircraft during flight. This type of occurrences may have multiple causes.

**FRÉDÉRIC DANO**

Cockpit & Crew
Rest Compartment,
Customer Services

**NICOLAS MERLIN**

Engineer, Cockpit Door
& Cargo Systems,
Customer Services

**CORALINE BABUT**

Engineer, Cockpit Door
& Cargo Systems,
Customer Services

IN-SERVICE EVENT

Mid of last year, an A321 cockpit crew reported hearing loud noises during the approach and landing phases.

Theses sounds were coming from the aft part of the forward cargo hold.

Once on the ground, inspection of the forward cargo hold revealed that all container restraining XZ latches were lowered. The hold was loaded with a single container, the noises

were therefore attributed to the free movement of that container in the cargo hold.

The inspection, which revealed no damage to the cargo linings, concluded that the XZ latches were not correctly locked before take-off. ■

CARGO LOADING SYSTEM DESCRIPTION

General

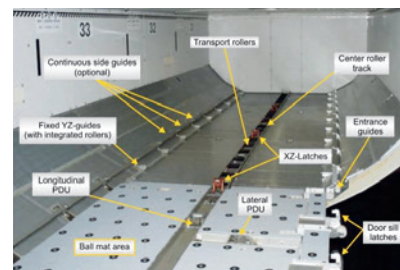
The standard A320 Family cargo hold is configured for bulk loading.

Around one third of the fleet is equipped with the optional semi-automatic Cargo Loading System (CLS), which is proposed for all members of the Family except the A318.

The CLS is an electrically powered system that allows ULDs to be carried in the aircraft. The main goal is to reduce manpower and loading/unloading time.

The CLS is composed of several components, which can be grouped according to their intended functions **(fig. 1)**:

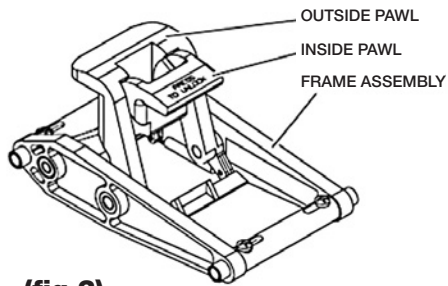
- Guidance, thanks to entrance guides and YZ guides along each side of the holds.
- Transport and Conveyance, performed by power drive units on ball mats and roller tracks.
- Restraint of ULDs, ensured by XZ latches, installed on the centre roller track.



(fig.1)
A320 Family CLS components

OPERATIONS

A320 Family cargo Containers/pallets movement



(fig.2)

XZ latch 2842T100 series

Restraint of ULDs

The ULDs are maintained in position by XZ latches, which consist of an aluminium frame and a pair of spring-loaded interlocking pawls.

If the outside pawl is lifted up, the inside pawl extends and locks automatically. Conversely, if the inside pawl is depressed into the retracted position, the outside pawl automatically folds down (fig.2).

Once each ULD is in position, the loading procedures call for these XZ latches to be raised and locked manually (fig.3).

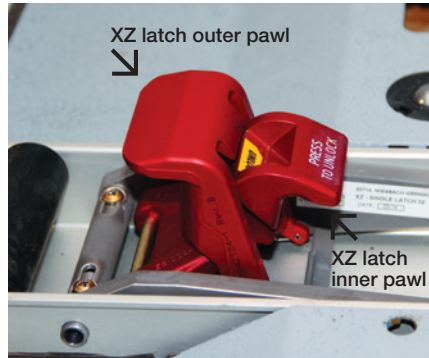
Each ULD is then restrained by one XZ latch on each side of their baseplate or by one latch and one end-stop for those located at the borders of each holds (fig.4).

(fig.3)

XZ latch manual operation



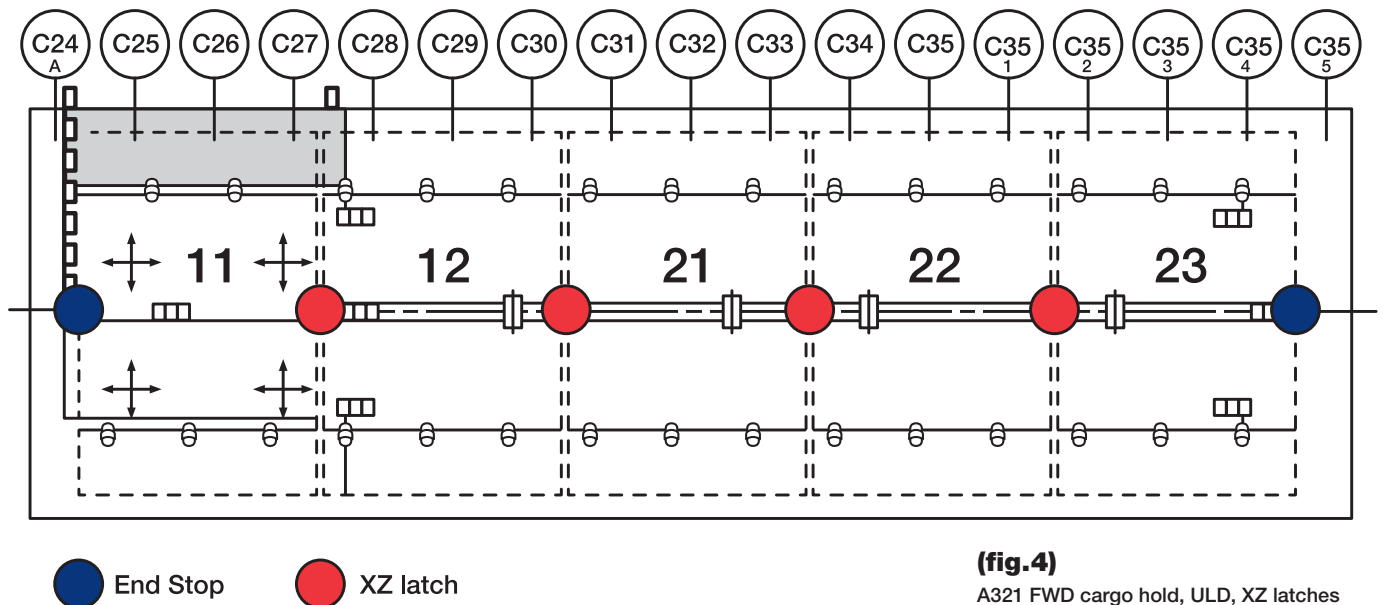
XZ latch in down position



XZ latch in intermediate position (not yet locked)



XZ latch raised and locked Interface with ULD/ pallet baseplate



(fig.4)

A321 FWD cargo hold, ULD, XZ latches and End stops positions



NOTE

On the other Airbus types ULD movements are rare occurrences, because most loading configurations call for 2 latches on each side of the ULD baseplates. Moreover, the wide body aircraft often fly with fully loaded cargo holds.

CAUSES OF ULD MOVEMENTS AND HOW TO AVOID THEM

Several possible root causes have been identified, based on the ULD movement events reported by operators.

Latch not raised or not correctly locked

If the loader does not raise up the latch or does not properly lock it into position, the container/ pallet will not be restrained in the X (flight) direction and will therefore move freely.

» Alleviation means

Awareness

Loaders should be made aware that instructions call for **all latches to be raised and properly locked**, independently of whether the positions are empty or not, as specified in the Weight and Balance Manuel (WBM, chapters 1.10.05 and 1.10.06), and Aircraft Maintenance Manual (AMM, chapter 25-52).

Design improvement

If the outside pawl is lifted up, the inside pawl extends and locks automatically.

A weak spring may not extend the inner pawl enough when the outside pawl is lifted up, leaving the latch in an intermediate (unlocked) position. The new design calls for an increased spring force.

This design equally calls for the addition of an easily visible yellow indicator when the latch is in intermediate position, i.e. not raised enough to be in the locked position **(fig.5 and 6)**.

This latch (Part Number 2842T100-3) has been introduced in production from MSN 0573 onwards (Feb 1996) and is proposed through the Illustrated Parts Catalogue (IPC) as alternate.

Damaged latch

An inoperative or damaged latch may as well lead to ULD movements.

» Alleviation means

The following A320 Family Maintenance Planning Document (MPD) tasks call for visual and operational checks of the XZ Latches:

- Task 255000-11: "Visual check of the xz latches and door sill latches" Interval: 750 FH
- Task 255000-02: "Operational check and detailed inspection of XZ latches" Interval: 8000 FH

A third task has recently been added (in the July 2013 revision) for a detailed inspection of the latch after removal. The removal of the part allows for an easier inspection, especially regarding the spring condition.

- Task 255000-25: "Remove XZ latches for detailed inspection" Interval 24000 FH

(fig.5)

Latch correctly locked: the yellow indicator is not visible



(fig.6)

Latch in intermediate position, not correctly locked: the yellow indicator is visible



Interference between the ULD baseplate and the XZ latch

A non-standard or damaged ULD baseplate may also impair the proper functioning of the latch.

» Alleviation means

- ULDs should comply with National Aerospace Standards (NAS) 3610 and IATA specifications during their entire lifetime.

- ULDs should be loaded in accordance with the WBM.

- Airbus encourages airlines to clean their cargo hold to avoid debris that could interfere between the ULD baseplate and the XZ latch, as recommended in Task 12-21-12-100-007-A.

Object falling from ULD

An object falling from an improperly closed container/pallet on the inner pawl could lead to a latch disengagement.



NOTE

This scenario is excluded when the cargo is fully loaded. In such case, both pawls of every XZ latch are blocked by the adjacent ULD baseplate.

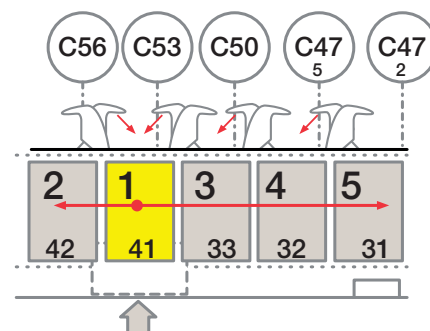
procedure, proposed in SIL 25-162, remains identical for all holds and aircraft types. Its application will ensure that the inner pawl of the latch, i.e. the movable pawl, will always be blocked by the adjacent ULD/ pallet baseplate **(fig.7)**.

» Alleviation means

To mitigate this risk, a specific loading procedure is recommended when cargo holds are not fully loaded. This

fig.8 below illustrates, when two containers are loaded in positions 41 and 42, how the inner pawls of the latches are blocked by adjacent containers, making any disengagement impossible. ■

(fig.7)
Recommended A321 AFT cargo hold loading sequence

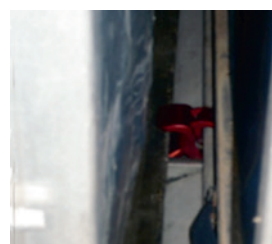


Possible movement of the inner pawl of the Latch

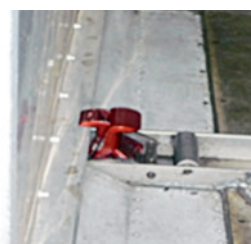
- 1,2,3...: loading sequence priority with regard to the total number of ULDs to be loaded

(fig.8)

Latches in locked position after loading



Latch at frame C56 between ULDs at position 42 and 41



Latch at frame C53 behind ULD at position 41

FEEDBACK TO AIRBUS

As illustrated above, feedback from airlines led Airbus to propose a design modification of the latches to reduce the number of ULD movements.

Airbus encourages operators to communicate any suspected or confirmed

case of ULD movement by means of a specifically designed reporting sheet.

This sheet is available in SIL 25-162 and has been specifically produced to facilitate the search for the root cause of the movement **(fig.9)**.

AIRBUS cargo
A321 Cargo Hold fwd

Report prepared by:
Name: _____ (signature)
Company: _____
Date: _____ Time: _____ airport

Flight Phase:
What was the movement suspected:
☐ taxi, ☐ take off, ☐ climb, ☐ cruise, ☐ descent, ☐ landing.
☐ sound, ☐ vibrations, ☐ CG-shift of A/C, ☐ reported by:
☐ cockpit-crew, ☐ flight attendant, ☐ passengers, ☐

Status of the Cargo Hold:
Observation at arrival:
Status of XZ-latch:
Frame lowered raised damaged/function remarks
C30C31 ☐ ☐ ☐ ☐
C30C34 ☐ ☐ ☐ ☐
C35-1C38-2 ☐ ☐ ☐ ☐

Damages/mafunctions/discrepancies at:
☐ latches, ☐ other CLS items, ☐ floor/ ceiling, ☐

Loose items/ cargo in the area of CLS:
Size: _____ (length) _____ (width) _____ (height) _____ (area or vol)
Weight: _____ (kg or lbs)
Description (incl. number of items): _____

Remarks:

ULD Movement Report Sheet No. 21. Provided by: AIRBUS Operations Division, Bremen. Airbus Tech 180303

(fig.9)

Airbus ULD Movement Report-Sheet

A320 Family operators regularly report cargo hold ULD movements during flights. Most of these highly undesirable occurrences...

can be attributed to one of these four causes:

- A latch not raised or not correctly locked
- A damaged latch
- Interference between a ULD baseplate and a latch
- An object falling from an ULD, which unlocks a latch

and could be avoided by:

- Following the recommended loading procedures
- Using only standardized containers and pallets
- Filling them according to specifications
- Applying the documented inspection tasks
- Regularly cleaning the cargo holds.

To minimize the number of improperly locked XZ latches, a new design has been developed with a stronger spring and a clear visual indication to confirm whether the latch is properly locked.

To help Airbus develop new prevention means, operators are encouraged to communicate all cases of ULD movements during flight by means of a specifically designed reporting sheet available in SIL 25-162.

Safety first

Safety first, #18 July, 2014. Safety first is published by Airbus S.A.S. - 1, rond point Maurice Bellonte - 31707 Blagnac Cedex/France. Publisher: Yannick Malinge, Chief Product Safety Officer, Editor: Corinne Bieder, Director Product Safety Strategy & Communication. Concept Design by Airbus Multi Media Support 20141680. Reference: GS 420.0045 Issue 18. Photos by Airbus, H. Goussé, Lindner Fotografie, A. Doumenjou, C. Brinkmann, JB. Accariez, HGE, W. Schroll, S. Ramadier, F. Lancelot, F. Lepissier, A. Barth, P. Masolet, M. Fyrol, Aneese, P. Pigeyre. Computer rendering by Fixion. Printed in France by Art & Caractère.

This brochure is printed on Triple Star Satin. This paper is produced in factories that are accredited EMAS and certified ISO 9001-14001, PEFC and FSC CoC. It is produced using pulp that has been whitened without either chlorine or acid. The paper is entirely recyclable and is produced from trees grown in sustainable forest resources.

The printing inks use organic pigments or minerals. There is no use of basic dyes or dangerous metals from the cadmium, lead, mercury or hexavalent chromium group.

The printer, Art & Caractère (France 81500), is engaged in a waste management and recycling programme for all resulting by-products.

© Airbus S.A.S. 2014 – All rights reserved.
Proprietary documents.

By taking delivery of this Brochure (hereafter "Brochure"), you accept on behalf of your company to comply with the following guidelines:

» No other intellectual property rights are granted by the delivery of this Brochure than the right to read it, for the sole purpose of information.

» This Brochure and its content shall not be modified and its illustrations and photos shall not be reproduced without prior written consent of Airbus.

» This Brochure and the materials it contains shall not, in whole or in part, be sold, rented, or licensed to any third party subject to payment.

This Brochure contains sensitive information that is correct at the time of going to press.

This information involves a number of factors that could change over time, effecting the true public representation. Airbus assumes no obligation to update any information contained in this document or with respect to the information described herein.

Airbus S.A.S. shall assume no liability for any damage in connection with the use of this Brochure and of the materials it contains, even if Airbus S.A.S. has been advised of the likelihood of such damages.

The Airbus magazine contributing to the enhancement of the safety of aircraft operations by increasing knowledge and communication on safety related topics.

Safety first is published by the Product Safety department. It is a source of specialist safety information for the restricted use of flight and ground crew members who fly and maintain Airbus aircraft. It is also distributed to other selected organisations.

Material for publication is obtained from multiple sources and includes selected information from the Airbus Flight Safety Confidential Reporting System, incident and accident investigation reports, system tests and flight tests. Material is also obtained from sources within the airline industry, studies and reports from government agencies and other aviation sources.

All articles in Safety first are presented for information only and are not intended to replace ICAO guidelines, standards or recommended practices, operator-mandated requirements or technical orders. The contents do not supersede any requirements mandated by the State of Registry of the Operator's aircraft or supersede or amend any Airbus type-specific AFM, AMM, FCOM, MMEL documentation or any other approved documentation.

Articles may be reprinted without permission, except where copyright source is indicated, but with acknowledgement to Airbus. Where Airbus is not the author, the contents of the article do not necessarily reflect the views of Airbus, neither do they indicate Company policy.

Contributions, comment and feedback are welcome. For technical reasons the editors may be required to make editorial changes to manuscripts, however every effort will be made to preserve the intended meaning of the original. Enquiries related to this publication should be addressed to:

Airbus
Product Safety department (GS)
1, rond point Maurice Bellonte
31707 Blagnac Cedex - France
safetycommunication@airbus.com
Fax: +33(0)5 61 93 44 29



iOS (iPad & android)