



**National Transportation Safety Board
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**“B-767-300ER Variant Lower Lobe
Cargo ULD Restraint System”**

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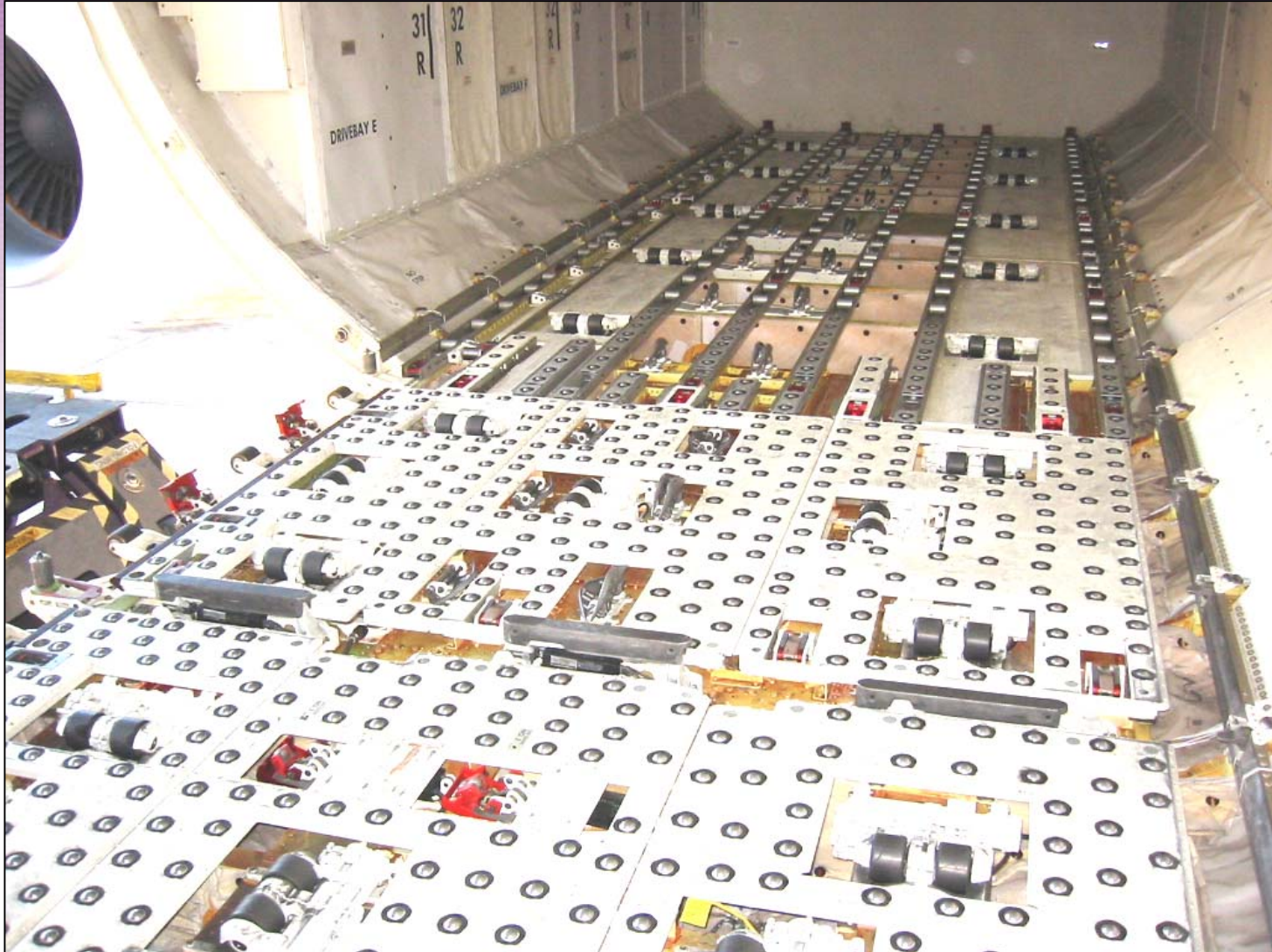
Problem Statement

- **Hawaiian acquired its first B-767-300ER aircraft N580HA in October 2001**
- **We immediately began to receive reports of “suspected in-flight load shifts”**
- **After delivery of 3 newly-manufactured aircraft equipped with the large forward cargo door, we acquired 3 former LTU aircraft with a small forward cargo door.**
- **We soon began to see an association of “suspected in flight load shifts” on aircraft equipped with the large forward cargo door.**

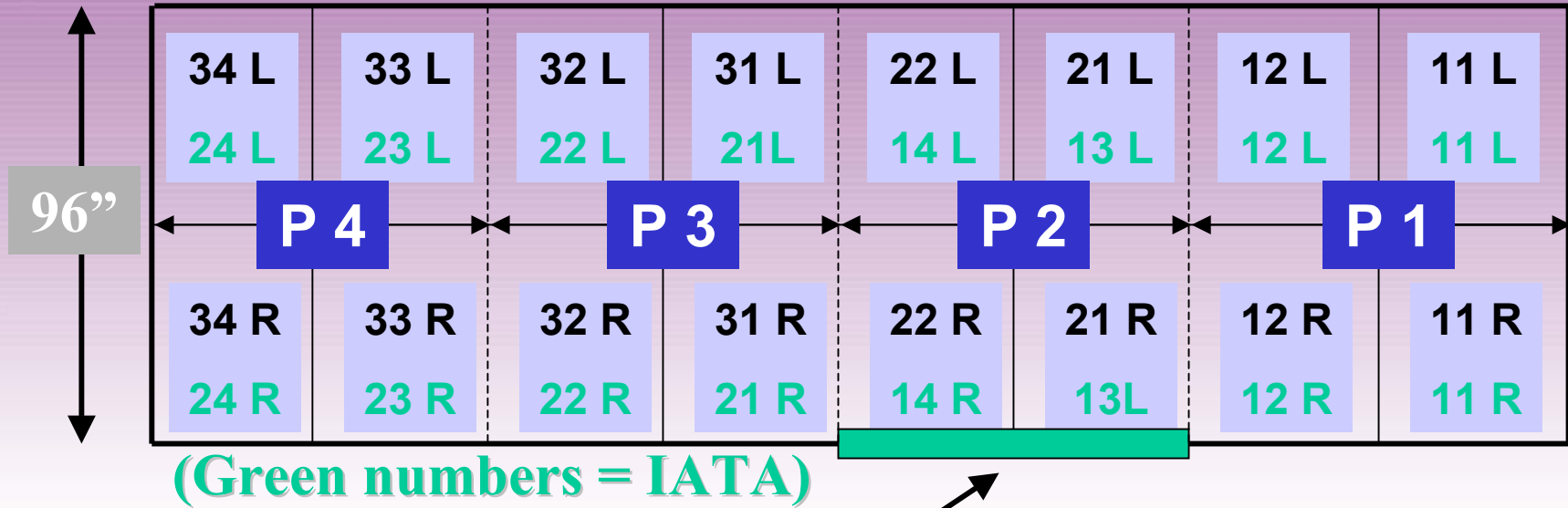


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B-767-300ER with Large Door



Depiction of Fwd Cargo Compt



Large Door is 134" wide

Boeing designed the compartment to accommodate a variety of Unit Load Devices and 125" X 96" or 125 X 88" Pallets

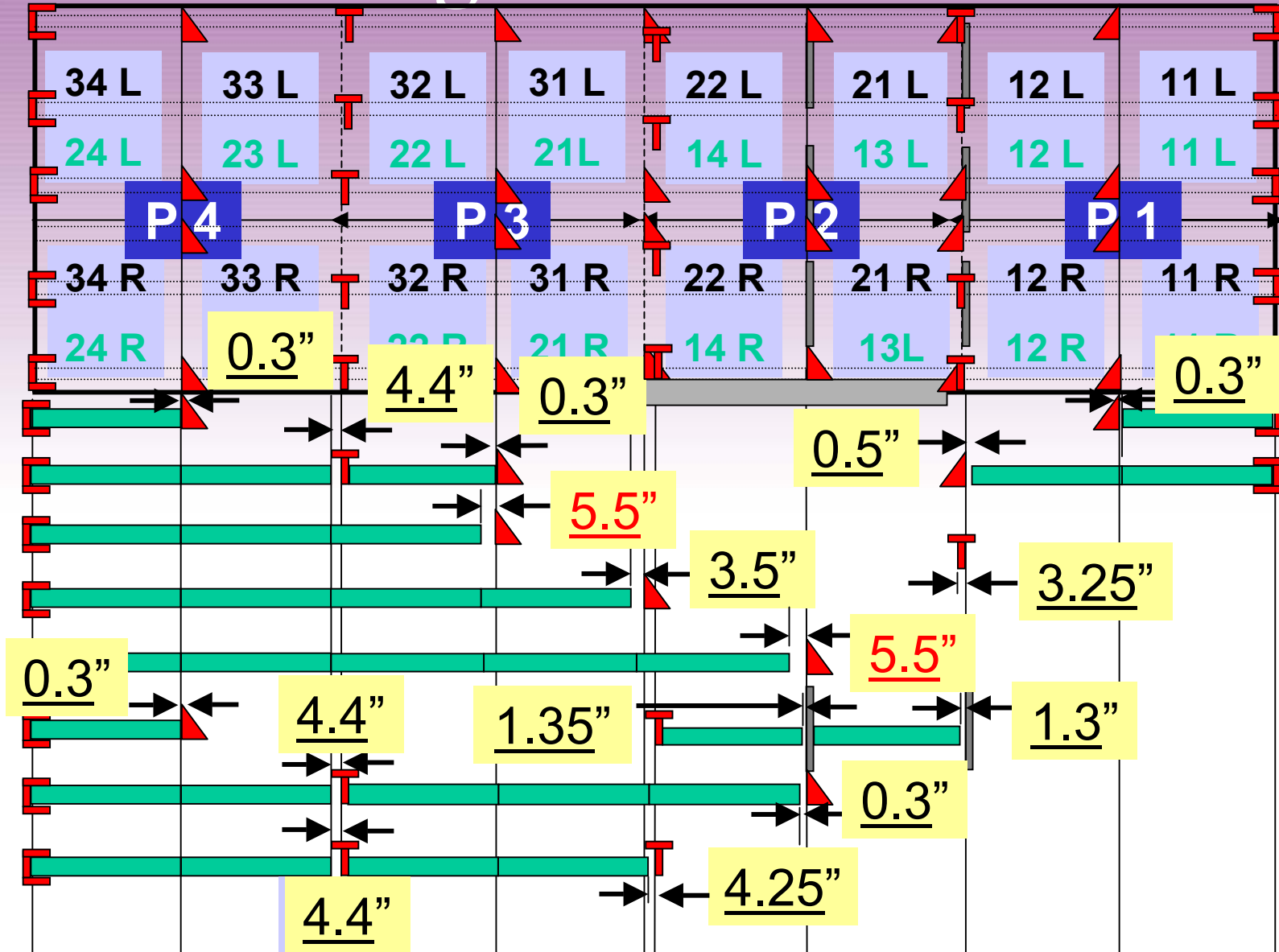


Why Load Shifts?

- **Recognition, Training, and Initiatives**
 - Vendors thought they “knew” the B-767; they likely “knew” the small-door model with no pallet capability, no pallet locks, no “pallet end stops,” no auxiliary side-guide rails for 125” X 88” pallets, etc.
 - Hawaiian and vendor load personnel were given additional “differences training” to identify peculiarities between small-door and large-door aircraft.
- **Some gaps, although undesirable, are acceptable**
 - The merits of “cheese blocks” and other work-arounds were considered
 - Reporting of “suspected shifts” is still a necessity



“Thinking Man’s Restraints”





Why Gaps?

- **The inherent gaps range from 0.3” – 5.5”**
- **Air Carriers were apparently polled in the design stage and favored less restraint hardware for multi-mix containers to reduce weight, fuel consumption and cost.**
- **5.5” of gap were deemed acceptable, and will not exceed structural design limitations.**

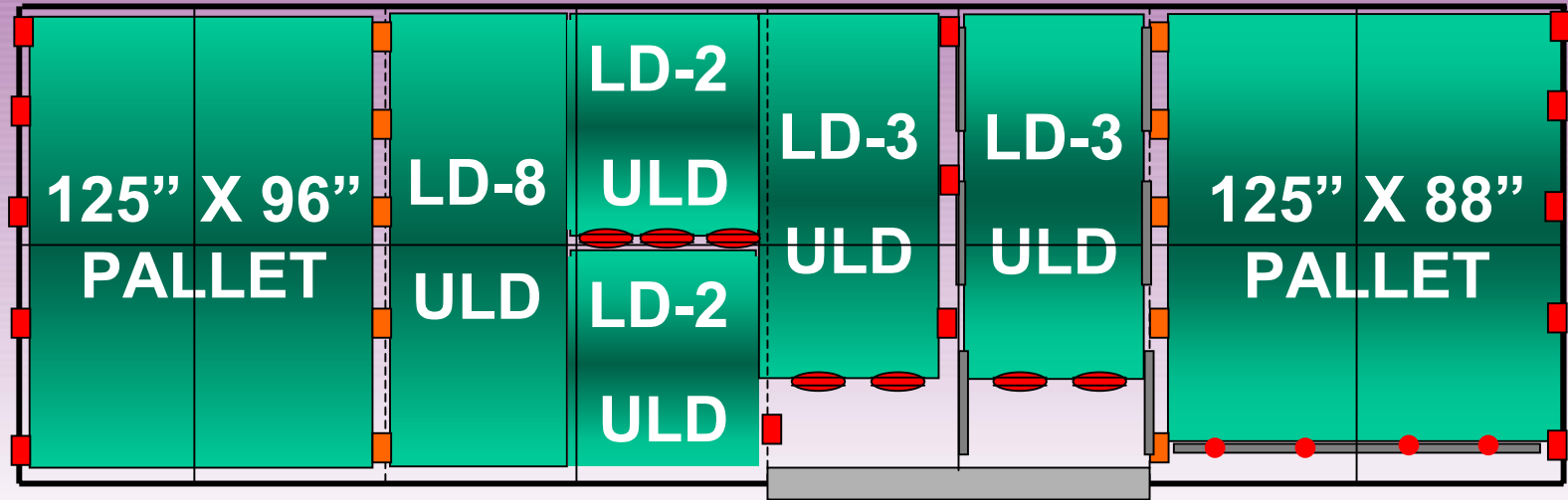


Manufacturer Comments

- **Service Letter 767-SL-25-051-A updated 6 June 1996 addresses the issue.**
- **Several lower lobe cargo compartment loading options are offered.**
 - ✓ **1) cargo containers only** **(HA LTU A/C)**
 - 2) containers and half pallets**
 - ✓ **3) containers and full pallets** **(other HA A/C)**
 - 4) containers, full and half pallets**

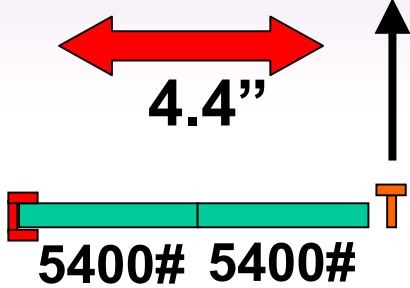
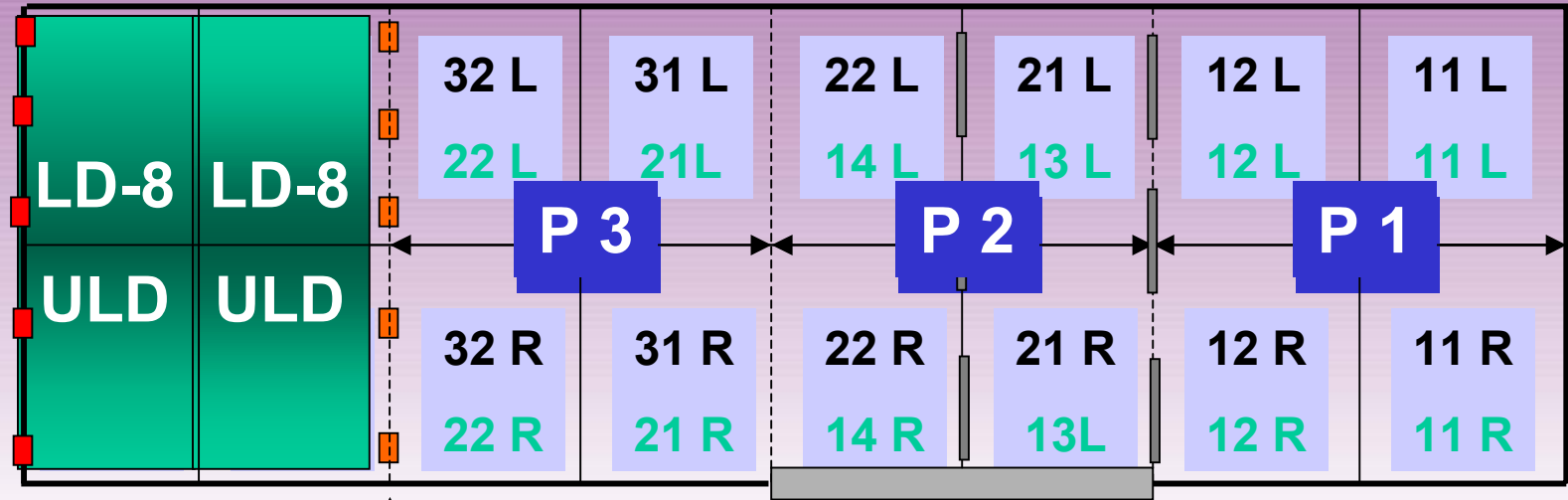
These options are available in either the forward or aft cargo compartments.

“Multi-Mix” Container Loading



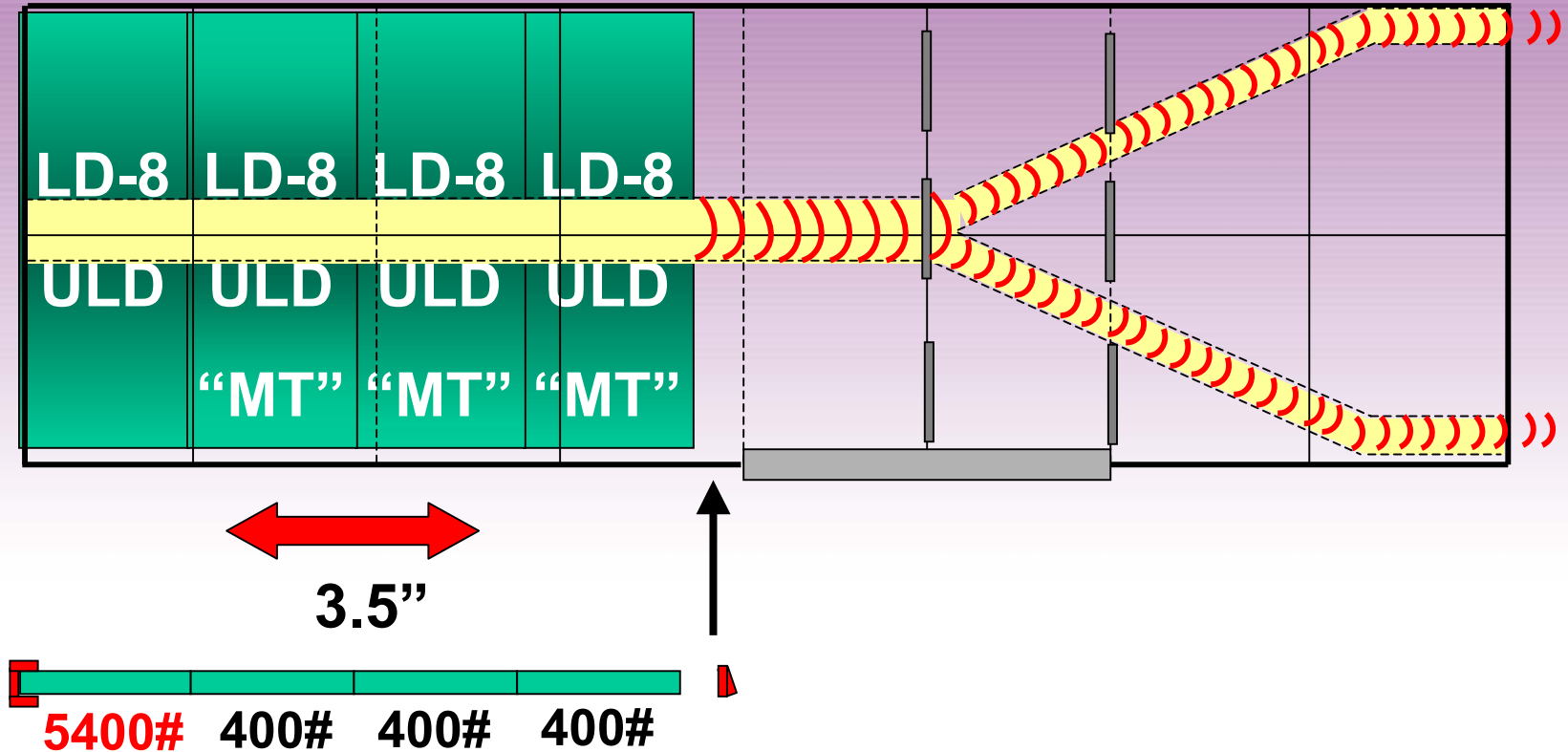
The ability to load various types of pallets and containers comes with a price...accommodation requires a compromise between location and type of restraint hardware...resulting in restraint of groups or “stacks” of containers vs. individual ULDs (our previous experience with the DC-10).

Perceived vs. True Load Shifts



There are only pallet locks between IATA position 22L&R and 23L&R! You must accept a 4.4" gap with a "stack" of only 2 LD-8s, 2 LD-3s, or 4 LD-2s here.

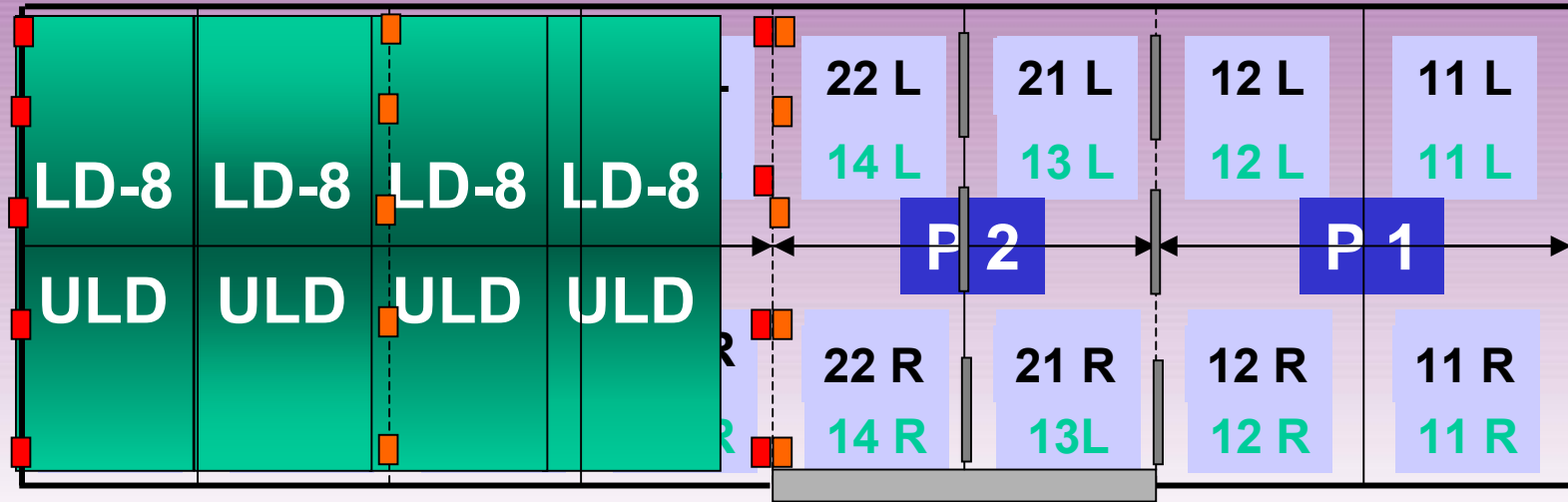
Perceived vs. True Load Shifts



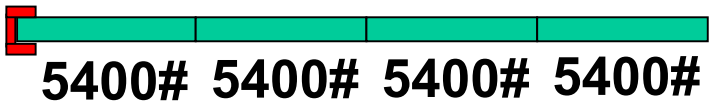
Why does the noise sound like it's coming from directly behind the cockpit? One theory – empty cans act like a bellows...a large ventilation duct below the cargo deck transmits sound waves.



Choices



3.5"



4.4"

4.4"

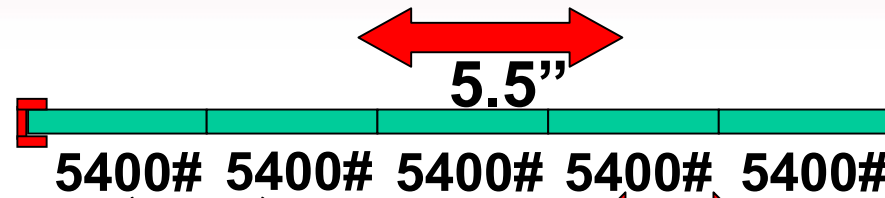
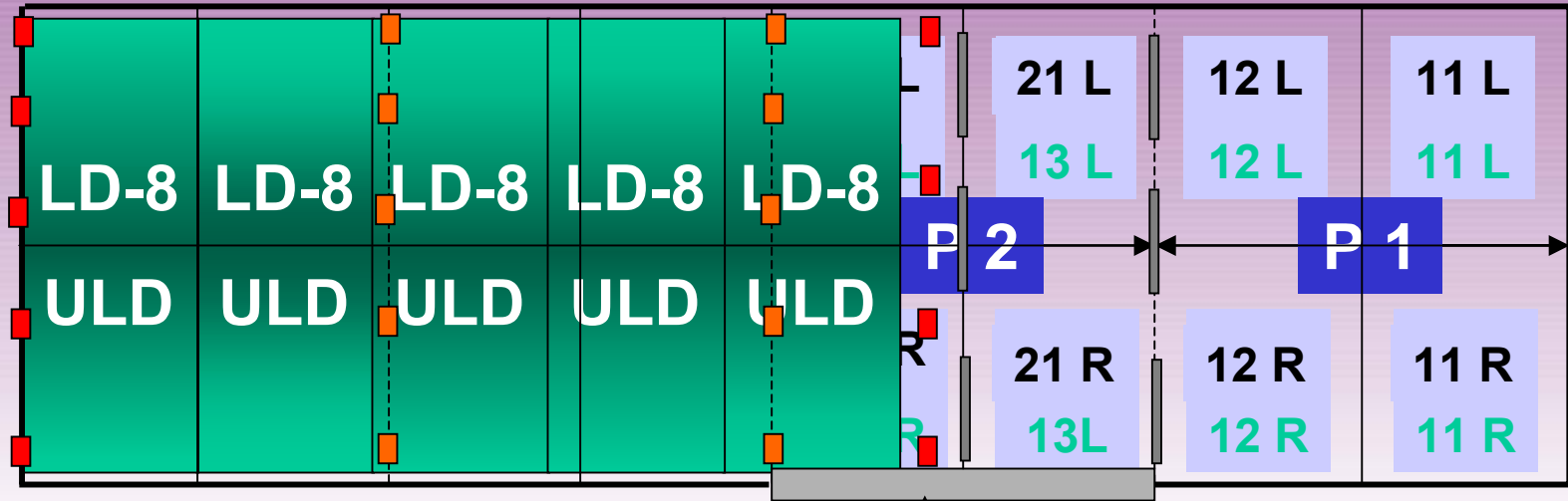


In the case of 4 ULDs, it's better to work with a stack of 3.5"

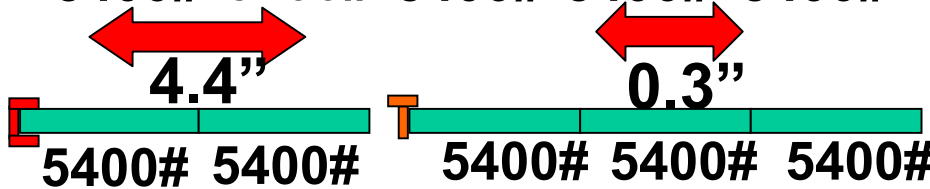
By raising the pallet locks* aft of IATA positions 14L&R & 22L&R you get two large gaps



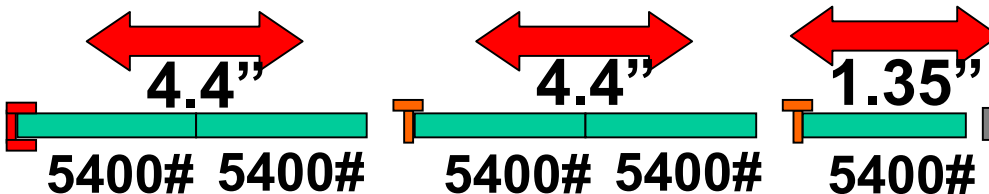
Choices



1 gap



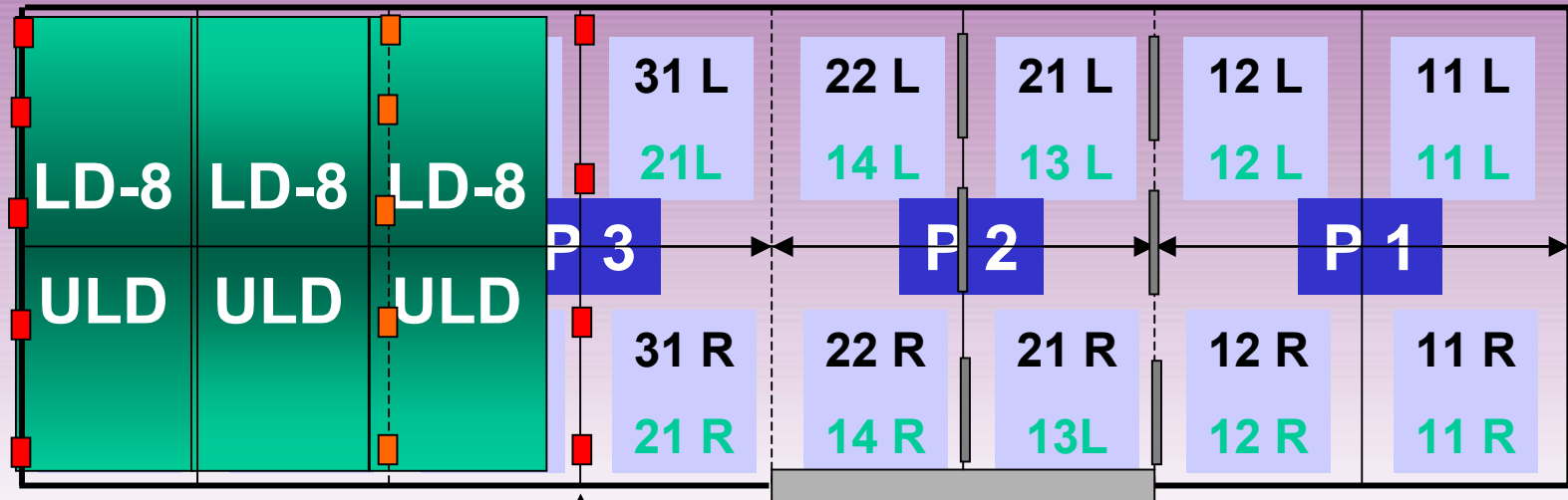
2 gaps (optimal)



3 gaps



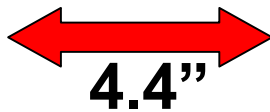
Choices



5.5"



5400# 5400# 5400#



4.4"



0.3"



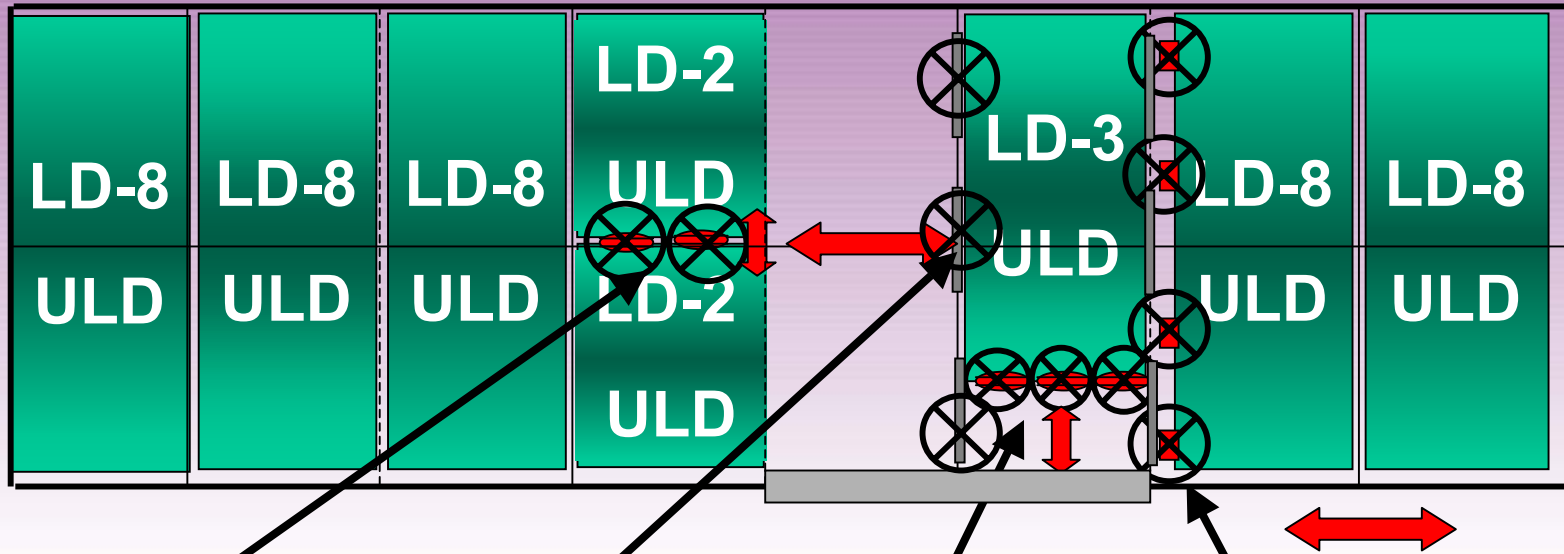
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This is one option but a better one might be...

Raise the pallet locks* aft of IATA position 22L&R to reduce gap



Urban Legends



**“No need”
to raise
Center
Guides on
LD-2...cans
“shingle”
together**

**“No need”
to raise Lateral
Guides in
Forward Door
Position...can in
Position 13L&R
will “float”**

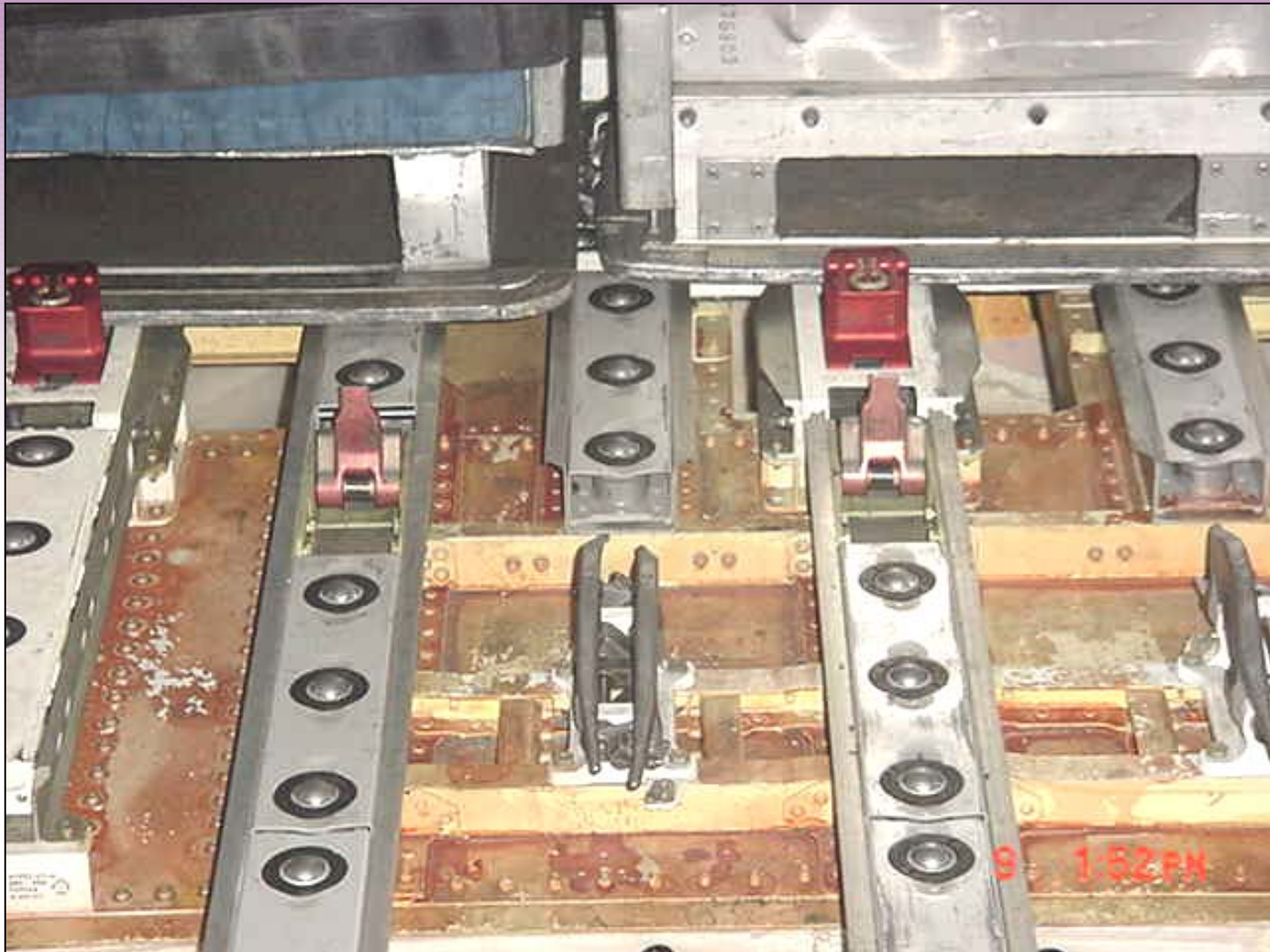
**“No need”
to raise
Auxiliary
Guides on
LD-3...can
will move
laterally**

**“No need”
to raise Partial
Load Stops behind
Position 12L&R
...6” gap between
container and
Lateral Guides**



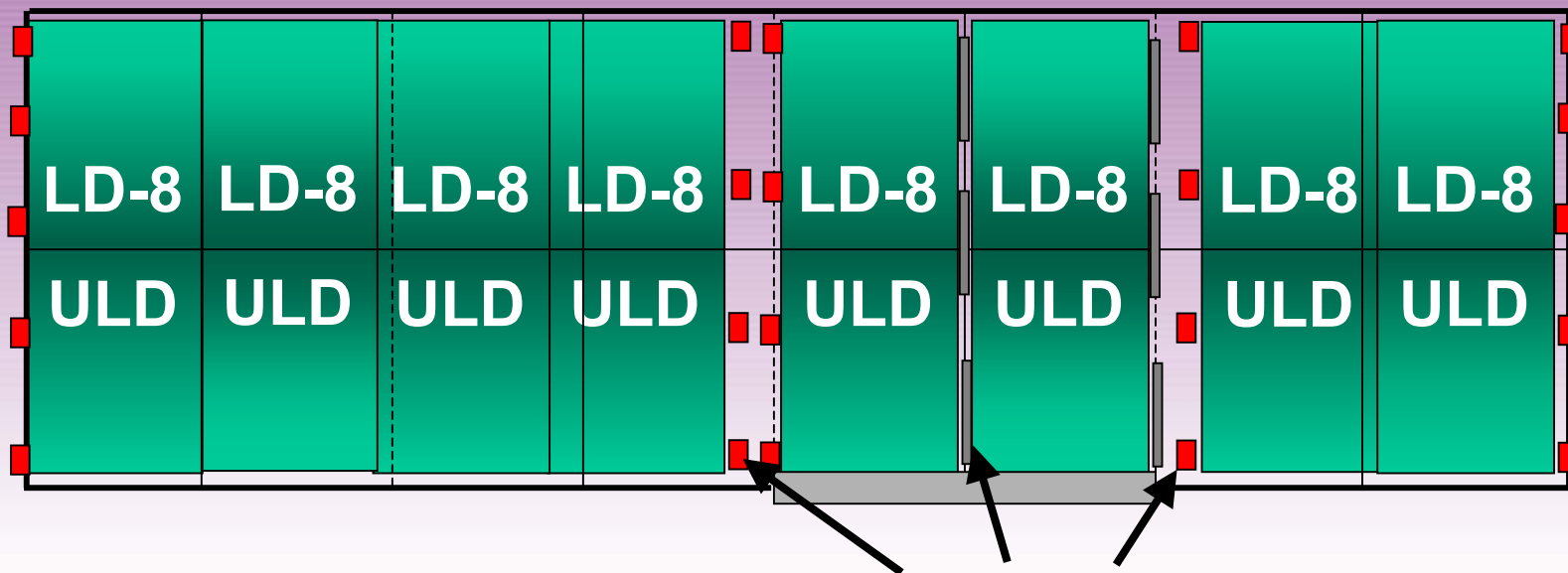
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LD-2s – No Center Guides





Urban Legend #1

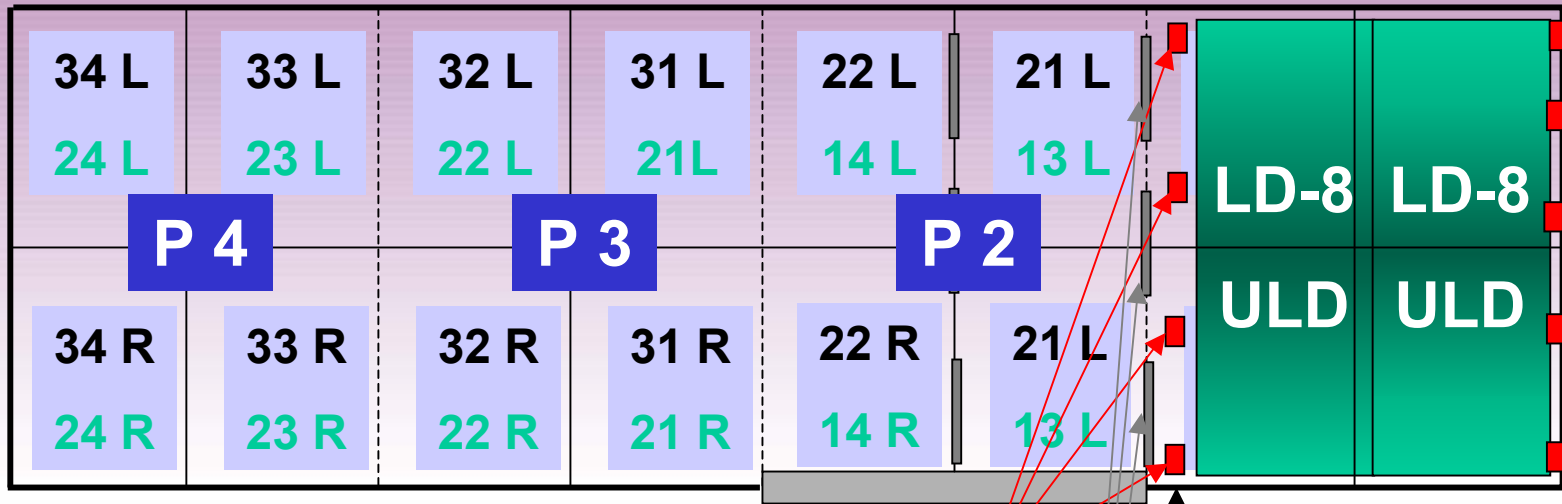


“Please advise the loaders that certain latches need to be set even if the hold is a full fit to reduce gaps, which can cause noise, triggering false alarm load shifts.”

– from a report generated after a suspected load shift

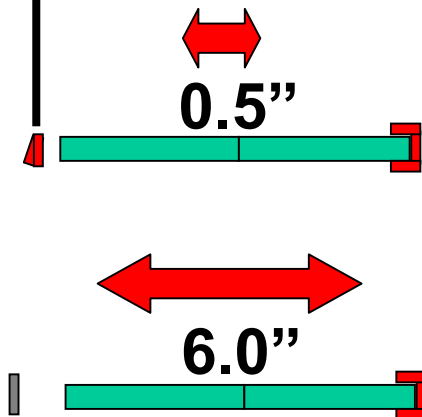


Urban Legend #2



Stack of 2 LD-8s restrained by 4
Partial Load Stops

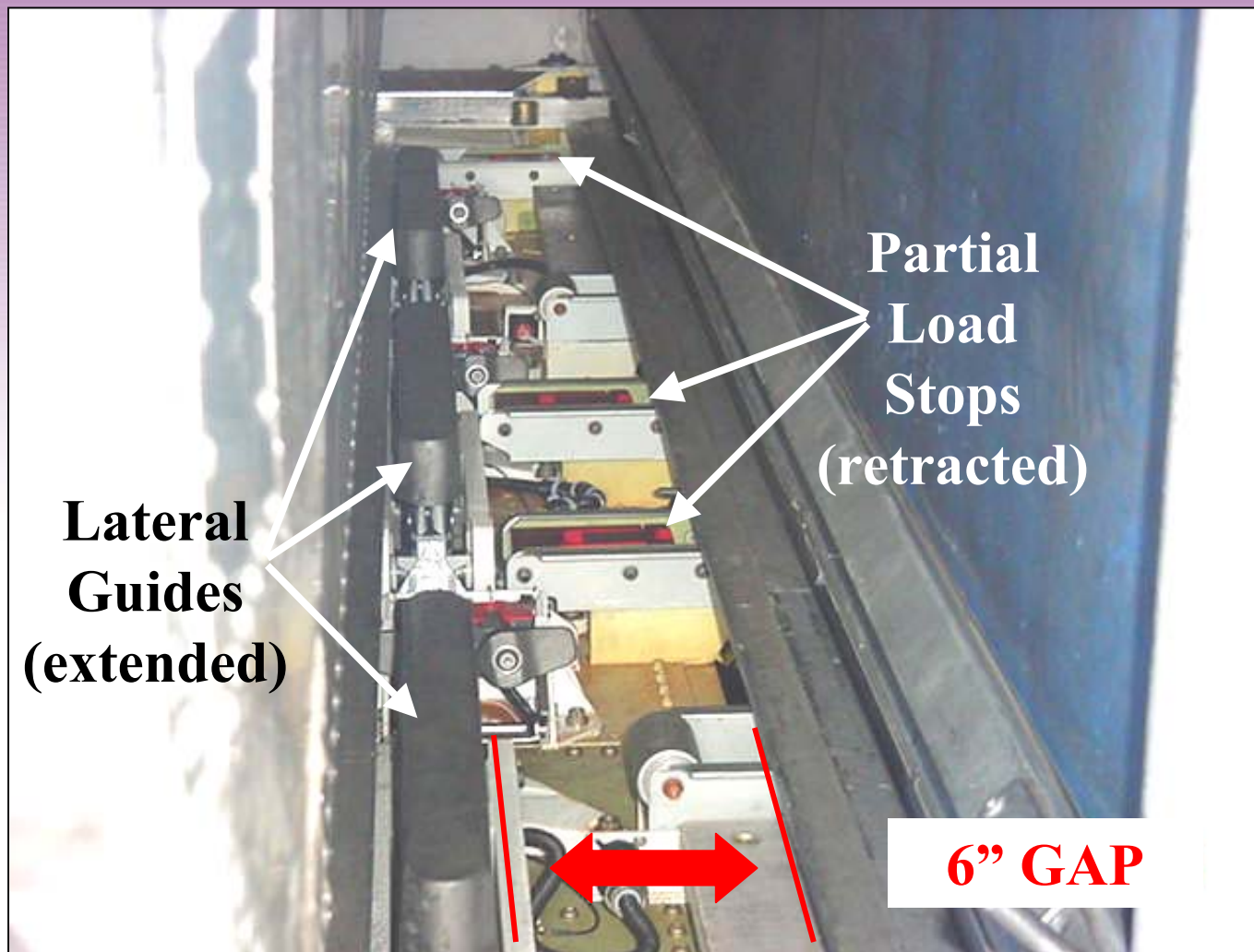
But if you forget to raise the Partial
Load Stops, you will be depending
on the Lateral Guides!





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Urban Legend #2 cont.





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One Air Carrier's Statement

“The Cargo Loading Manual contains policies, procedures, warnings, cautions and notes that must be complied with when applicable to the operation. All Loadmaster training will focus on safety first in all aspects of the ground operation. In order to promote consistency in the operation, the loading manual will be used as the primary source for training as well as a reference on a daily basis. Adherence to the manual is mandatory.”



Manufacturer Recommendations

“These gaps and load limits are structurally acceptable within the limitations imposed by the reference Weight and Balance Document.”

SUGGESTED OPERATOR ACTION

“The operators may wish to review this service letter with appropriate personnel to inform them that the possibility of cargo containers shifting during flight, within the limits shown in the attachment, is normal.”

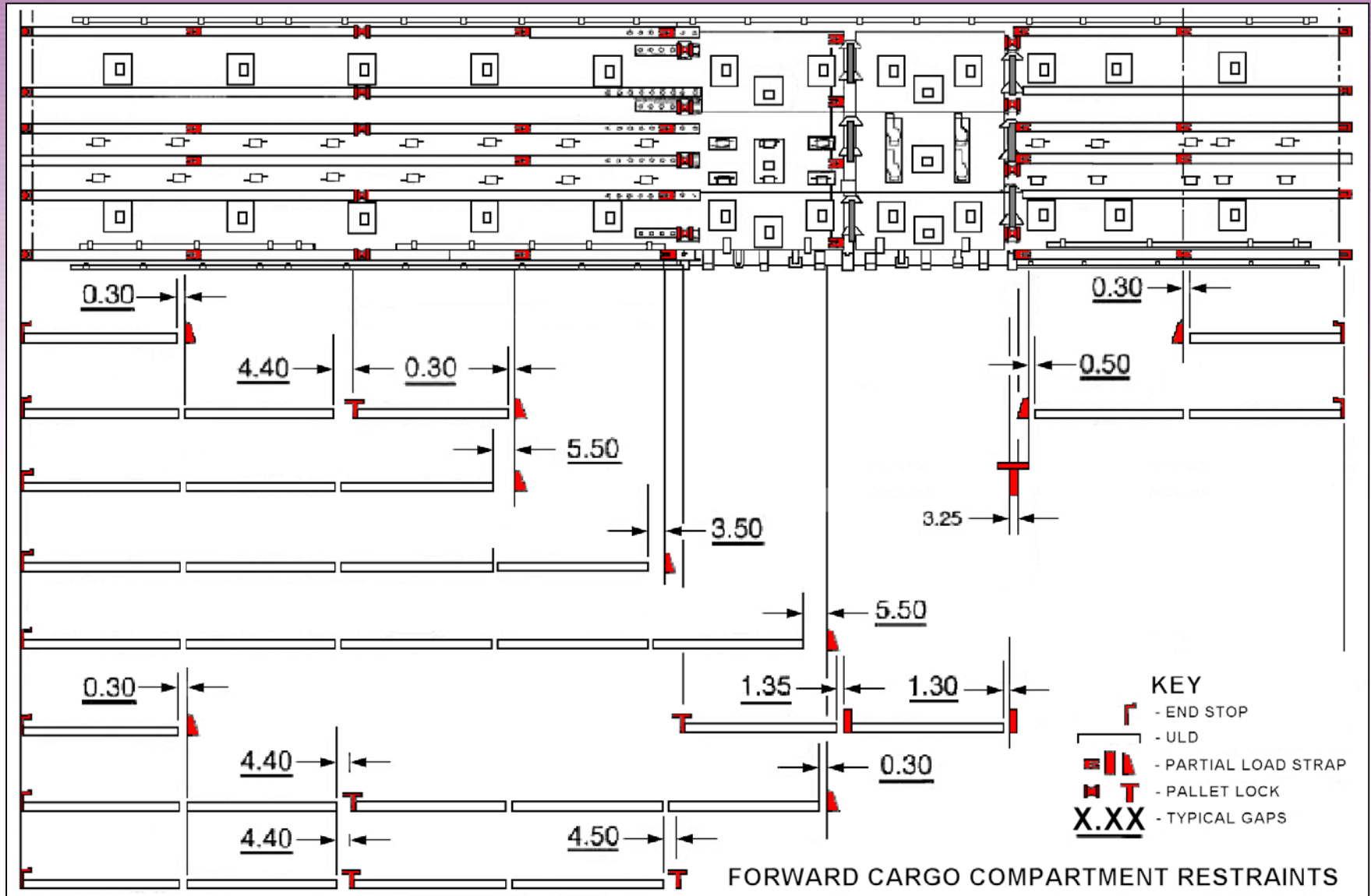


Hawaiian's Initiatives

- **Load Shift Investigations**
- **Pilot Procedure for suspected Load Shifts**
- **Revised Handling Procedures**
- **Enhanced Training**
 - **Station Manager Familiarization**
 - **Loadmaster Recertification**
 - **Revised initial training syllabus**
 - **Load Planners**
- **Pocket Job Aid for Ramp Personnel**



HA Job Aid





Close-Up Procedure

Before closing door, accomplish the following:

- ✓ All Lateral Guides - **up** (unless pallet loaded in P2)
- ✓ Rollout Stops – **raised and locked**
- ✓ Rail or Set of Latches – **at every exposed edge**
(no more than 5.5” of gap)

When using LD-2s or LD-3s:

- ✓ (2) sets Center Guides between adjacent LD-2s - **up**
- ✓ (2) Auxiliary Guides outboard of each LD-3 – **up**

For added safety, raise any remaining locking devices