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Loading related event involving Boeing 737, VH-VUF

Adelaide Airport, South Australia, 13 December 2016

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Addendum

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Loading related event involving Boeing 737, VH-VUF

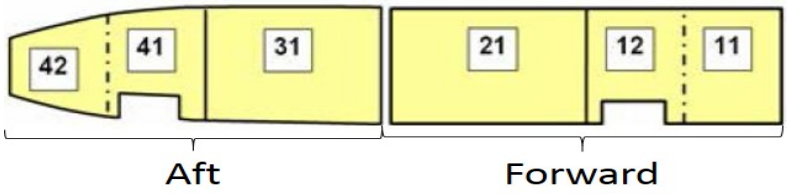
What happened

On 13 December 2016, a Virgin Australia Boeing 737-800 aircraft, registered VH-VUF, was being prepared to operate flight VA 1393 from Adelaide, South Australia to Brisbane, Queensland.

At 0927 Central Standard Time (CST), the graphical load instruction report (GLIR) was sent to the ramp staff allocated to load the aircraft. Virgin Australia used an electronic load control system (LCS), which was accessed by the leading hand on a mobile tablet device to organise the loading of the aircraft.

The GLIR indicated the Brisbane bound bags and all cargo (seafood and four dogs) were to be loaded in the forward compartment (section 21), and the bags which would be transferred to connecting flights and the priority Brisbane bags were to be loaded in the aft compartment (section 31) (Figure 1).

Figure 1: Compartments of a Boeing 737-800



Source: Operator (modified by the ATSB)

While loading the aircraft, a member of the loading staff advised the leading hand that the Brisbane bags would not fit into the compartment with the cargo unless they were placed on top of the dog crates. If the bags were placed on the crates, the loading staff thought the dogs may not have enough oxygen to breathe. To resolve this issue, the leading hand used the LCS to move 55 bags into section 31, and saved the changes in the system. When the changes were made, the 'Move Mode' and the 'Ramp Clear Mode' buttons on the tablet's screen greyed out and the load control status changed to 'LL'.[1] The loading staff proceeded to load these bags in section 31. When the leading hand refreshed the device after the bags had been moved, the status returned to normal and the leading hand presumed the changes had been accepted.

At about 0938, the load controller in Brisbane noticed an approval request in the LCS (for the load to be redistributed). This request was for 55 bags (equal to 870 kg) to be moved from section 21 to section 31. The LCS will allow the leading hand/load supervisor to move up to 500 kg of freight provided the centre of gravity moment does not change by more than 5 index units[2] without the approval of the load controller only if the resultant centre of gravity remains within operational limits. However, as this amount exceeded the limits, the change needed to be approved by the load controller. Two indications were generated by the LCS for the leading hand indicating the system was locked and the take-off index was exceeded (greying out of the 'Ramp Clear Mode' and 'Move Mode', and the load control status change to LL).

A high priority message was also shown on the load controller's screen stating the take-off index had exceeded the aft limit by 4.8 index units. This meant the aircraft was no longer within the

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1 LL means 'Load Control Closed-Approve Distribution required'.

2 A unit of measure used to represent the moment of an aircraft or the moment effect of adding or removing weight from an aircraft. A moment is the weight of an object multiplied by the distance of the object from a datum.

required centre of gravity limits. In response, the LCS was locked for 7 minutes while the load controller calculated the required changes to the load and approved the changes in the LCS.

The load controller calculated that moving 40 bags from section 31 of the aircraft back to section 21, or moving a number of passengers forward, would be enough to return the aircraft to balance.

Because the leading hand was using the mobile application, the load controller thought they had a direct line of communication with the leading hand so they used the in-built messaging system to send a message. The message the load controller wrote was the request to move the bags was denied and the solution was to move passengers or to put 40 bags in section 21. The load controller received no response from the leading hand and amended the LCS. The flight information was then unlocked so the ground crew could continue to update the LCS. The leading hand did not receive these messages and they subsequently finalised the flight, without making any changes or checking the LCS, and the final documents were released by the LCS automatically. This indicated the changes had been accepted and the aircraft had been loaded correctly.

After the aircraft had departed, the leading hand was re-checking the paperwork and saw the bags had been moved in the LCS back to section 21 by load control. The leading hand then spoke to the airport movement co-ordinator (AMCO). The AMCO attempted to contact the aircraft by radio, but received no response.

The AMCO then contacted the load controller to explain what had happened. The load controller determined the aircraft was out of balance by 4.8 index units past the aft limit for take-off and the flight crew should be advised 40 bags (equal to 626 kg) were in section 31, not section 21.

To return the aircraft to balance, the load controller advised the AMCO that three passengers would have to move forward from zone D to zone B. When the flight crew rang for the departure call, the AMCO passed on this information, however, when asked to confirm they had received this information, there was no response. Flight dispatch then contacted the flight crew via satellite phone and confirmed the flight crew had received this information. The flight crew contacted the cabin supervisor with the request to move three passengers forward. There were no control issues during flight.

Loading procedures

Virgin's airport airside operations manual included the following steps in regards to loading aircraft:

Loading aircraft

- The load supervisor/leading hand/delegate confirms the final load is loaded in accordance with the final loadsheet and this is reflected in the loading report (LDR).

Live animals loading/unloading

- All ramp staff are responsible for monitoring and protecting the welfare of live animals.
- Baggage and/or cargo must not be loaded on top of cages and ventilation holes on the cages must not be covered.

Load control system

Subscribe to flight

- Before a flight is selected to work on, the user must first subscribe and add themselves to it. This is needed to ensure any messages regarding the flight are received and it also adds the users contact details.

Identifying compartment overloads

- Compartments will only display in red on the LCS, if the leading hand/AMCO/delegate makes a change to the deadload[3] that exceeds the compartment weight or volume.

Deadload change ramp tolerance

- Changes can be made to a flight's deadload on the LCS without having to verbally communicate with load control. The change to the deadload weight for a Boeing 737, in the operator's system, is limited to 500kg when the change to the centre of gravity moment is no more than 5 index units and the resultant centre of gravity remains within operational limits.
- Changes that are made outside these tolerances will need to be approved by load control. The notification is sent automatically to load control for their approval.
- If load control denies the change request, e.g. out of balance, then a phone call will be made to the port to advise. If the change is approved, the leading hand/AMCO/delegate will see this approval by viewing the load control flight status.
- As a result, if changes are required above the pre-determined tolerances, the leading hand/AMCO/delegate should contact the load controller for the flight by either phone or by using the message screen.

Out of balance

Virgin's load control standard operating procedures included the following steps in regards to solving out of balance situations:

- Contact the leading hand/delegate with the requirements advising what deadload and in which compartment it needs to be moved to.
- The leading hand/delegate is responsible for ensuring the deadload is redistributed as advised and updated in the mobile application to reflect the changes.

Operator report

The operator conducted an internal investigation with the following findings:

- If the aircraft is out of trim, overweight or the move exceeds the pre-set tolerance (500kg and/or five index units) allowable for a ramp agent the change, as long as it is acceptable, may be approved by the load controller. Any change requiring load control acceptance, is indicated by the 'Move Mode' and 'Ramp Clear Mode' buttons becoming 'greyed out' and not being accessible. In addition to this, the load control status at the top of the screen changes to 'LL' (Load Control Closed-Approve Distribution required). The leading hand recalled being unsure of what the load control status meant.
- The load controller used the flight management loading system to move the 40 bags to compartment 21. The screen on the mobile application was refreshed a short time later with the 'Move Mode' and 'Ramp Clear Mode' button becoming active, indicated by the buttons having a green border and text. The leading hand believed the 'Move Mode' and 'Ramp Clear Mode' buttons had become active after the refresh of the screen as a result of their original change.
- The visual aids incorporated into the flight management mobile application alone are not effective in preventing a configuration misalignment.

Load controller comments

The load controller provided the following comments:

- They thought using the messaging system was the best way to communicate with the leading hand given they had just made the change in the system and thought they had a direct line of communication via the messaging system.

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[3] Cargo, such as baggage or freight.

- The GLIR is automatically generated by the system.

Leading hand comments

The leading hand provided the following comments:

- Making changes to the load plan is considered a last resort and only if necessary. This is emphasised given this incident.
- Once the changes were made in the LCS, they assumed the changes were accepted and did not double check the figures accurately. Cross checking the LDR and the actual load is part of the procedure.
- There have been instances in the past where the load plan has not been practical, but it can be difficult to predict because they do not always know about the size of the bags, for example.

AMCO comments

The AMCO provided the following comments:

- To receive messages within the system, you must add and subscribe to the flight you are currently loading. Because the leading hand was not subscribed to the flight, they did not receive the messages.
- It is possible to enter into flights within the system without subscribing as it is not a compulsory screen. It is also possible to enter flights without realising you have not subscribed.
- The load controller advised based on the fuel usage, the aircraft would be in trim for landing.

Previous occurrences:

A search of the ATSB database of previous loading related occurrences involving incorrect load or weight on the aircraft were detected, particularly when procedures were not followed during the process and discrepancies were not identified in the load sheet:

- Loading related event, Bali, Indonesia, 26 May 2014 (ATSB investigation AO-2014-110).[4] A Boeing 737 aircraft was being loaded at Bali Airport for a flight to Melbourne, Victoria. Due to the time restrictions, the ground staff were unable to load all of the bags for the flight before aircraft had to be prepared for departure. The load controller assessed a total of 93 bags had been loaded and the flight documents produced were using that figure. About 30 minutes after the aircraft departed Bali, the ground handler advised network operations and load control the final baggage numbers were incorrect. The total number of bags loaded onto the aircraft was 189 instead of 93, which an estimated additional weight of about 1,600 kg. Prior to loading, the ground crew were under time pressure due to the flight already being delayed, breakdown of a baggage belt, scheduled closure of the runway, and impending airport curfew.
- Loading event, Sydney Airport, New South Wales, 8 September 2016 (ATSB investigation AO-2016-119).[5] An Airbus A320 was being loaded at Sydney for a flight to Brisbane, Queensland. The leading hand received the deadload weight statement (DWS) and checked the containers. The third container number (1483) did not match the number listed on the DWS (4183), nor the container card (4183). The leading hand assumed the freight handler had inadvertently transposed the numbers incorrectly and amended the card and DWS with 1483 and continued loading. When the aircraft was unloaded in Brisbane, it was found that the incorrect container (1483) was delivered and was nearly 650kg heavier than container 4183. The loading procedure if the DWS is incorrect is the container must not be loaded onto the aircraft. The leading hand noted the short turnaround time and the flight was the last one of the day led to procedures being bypassed.

[4] https://www.atsb.gov.au/publications/investigation_reports/2014/aair/ao-2014-110/
[5] https://www.atsb.gov.au/publications/investigation_reports/2016/aair/ao-2016-119/

Safety analysis

The first step for users in the LCS is to subscribe and add themselves to the flight. This is undertaken to ensure the messages are received by people within the network, such as AMCOs, load controllers, freighters, and leading hands. This is not a compulsory page in the LCS and can be skipped when opening a particular flight. The leading hand had not subscribed to the system, meaning they did not receive the messages from the load controller about the aircraft being out of trim due to the movement of baggage from section 21 back to section 31.

When the baggage from section 21 was moved to section 31 by the leading hand in the LCS, the system locked. This was indicated on the LCS display by the buttons being greyed out and the load control status at the top of the screen changing to 'LL'. This did not provide clear indications that the load distribution change needed acceptance by the load controller before proceeding with loading the aircraft. The leading hand was not sure what the load control status meant. Furthermore, as the system returned to open when they reset the system they did not realise that changes had been made in the LCS.

The load controller received an error message in the system because the number of bags moved by the leading hand meant that the aircraft was out of balance. The load controller attempted to contact the leading hand via the messaging system but was unaware the leading hand was not subscribed to the system so the messages were not received.

The operator had two procedures for load control to notify the leading hand that changes have been made in the LCS. The 'deadload change ramp tolerance' in the standard operating procedures for the flight management mobile application required that load control make a phone call to advise the leading hand or the AMCO that they had denied a change request through the LCS. The second procedure, which is in the controlling document used by load control, for 'out of balance operations' required that load control communicated the requirements to the leading hand (which was normally done through the messaging system within the LCS). In this incident, the load controller used the messaging system which was not effective as the leading hand was not subscribed to the system.

Once the loading is completed, it is the leading hand's responsibility to confirm that the LDR reflects how the aircraft has been loaded. Although the leading hand did check, they did not detect the error until after the aircraft had departed.

Findings

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- The leading hand was not subscribed to the load control system, meaning they did not receive the messages from load control about the aircraft being out of trim and subsequent change to the load distribution.
- Although the load control system locked after the leading hand made changes to the load distribution, it did not provide sufficient feedback to the leading hand to indicate that the changes needed to be accepted by the load controller before proceeding.
- Although the controlling document for load controller noted that contacting the leading hand was required due to an out of balance situation, another document regarding the loading system specified a phone call was to be made.
- The leading hand did not accurately cross check that the aircraft was loaded in accordance with the LDR.

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Operator

As a result of this occurrence, the aircraft operator has advised the ATSB they are taking the following safety actions:

Safety bulletin: subscribing to flights

The operator has issued a safety bulletin for leading hands to subscribe to the flight management system.

> Due to recent occurrences throughout the network, it has highlighted the requirement to ensure leading hands subscribe to flights which they are assigned to, in the Flight Manager Program.
>
> Subscribing to a flight attaches your contact details to the flight.
>
> This will allow messages to be sent between you and load control. Once subscribed to a flight you will receive a conformation pop up message. You can subscribe to more than one flight at a time.

Safety bulletin: changes to deadload

The operator has also issued a safety bulletin about making changes to deadload:

> It is very important that changes made to the planned deadload remain at a minimum, and they must only be made if deemed absolutely necessary – i.e. if there are concerns with the safety of the flight or there is restricted volume in the aircraft hold.
>
> If changes are required above the pre-determined Deadload Change Ramp Tolerances, the Leading Hand/AMCO/Delegate should contact the Load Controller for the flight by using the message screen in the Ramp Application, or if this is not possible, by phone. It is important to read and acknowledge all messages received from the Load Controller.

System functionality

> New system functionality is being introduced where a leading hand allocates him/herself to a flight and therefore no one else has access.

Safety message

This incident highlights the importance following procedures and communication have during the loading process. Communication when there is an error is particularly important to ensure all team members share the same understanding of the error and the correction. The ATSB report: *Aircraft loading occurrences - July 2003 to June 2010* identified loadsheet errors as contributing to these occurrences.

General details

Occurrence details

Date and time:	13 December 2016 – 0950 CST	
Occurrence category:	Incident	
Primary occurrence type:	Loading related	
Location:	Adelaide Airport	
	Latitude: S 34° 56.70' S	Longitude: 138° 31.83' E

Aircraft details

Manufacturer and model:	Boeing 737	
Registration:	VH-VUF	
Operator:	Virgin Australia Airlines	
Serial number:	34168	
Type of operation:	Air Transport High Capacity	
Persons on board:	Crew – 6	Passengers – 154
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; and fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.