SERIOUS INCIDENT

Aircraft Type and Registration:	Boeing 737-8K5, G-FDZJ
No & Type of Engines:	2 CFM56-7B27/3 turbofan engines
Year of Manufacture:	2007 (Serial no: 34690)
Date & Time (UTC):	28 September 2017 at 1804 hrs
Location:	Malta International Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 6 Passengers - 136
Injuries:	Crew - None Passengers - None
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	39 years
Commander's Flying Experience:	9,699 hours (of which 782 were on type) Last 90 days - 277 hours Last 28 days - 85 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB

Synopsis

G-FDZJ was operating a charter flight from Malta to Manchester on behalf of a cruise ship company. On takeoff the pilot flying found the aircraft required significantly more aft control column movement than normal to rotate. The available evidence indicates that the aircraft was out of trim due to an incorrect MACTOW[1] on the load sheet. This occurred because passenger's actual seating positions were not passed to the handling agent. When producing the load sheet the handling agent assumed an even distribution of passengers within the cabin, when the actual distribution created a forward bias.

History of the flight

G-FDZJ was operating a charter flight from Malta to Manchester. The aircraft, with a capacity for 189 passengers, had 136 passengers, 2 pilots and 4 cabin crew on board.

The load sheet recorded a takeoff weight of 65.6 tonnes and MACTOW of 23.4%. The pilots elected to take off from intersection F for Runway 13 and calculated the following speeds for takeoff with Flap 10: V_1 141 kt, V_R 142 kt and V_2 145 kt. Stabiliser trim was set to 4.5 units based on the load sheet information entered into the Flight Management Computer (FMC). Although not certain, the crew believe that all the passengers sat in their allocated seats.

Footnote

[1] MACTOW – Mean Aerodynamic Chord Takeoff Weight – this is the centre of gravity position at takeoff expressed as a percentage of the wing chord.

The takeoff acceleration was normal. At V_R, the commander, who was pilot flying (PF), pulled back on the control column, but no rotation occurred with the normal pull effort. The PF continued to pull back and then with approximately ¾ elevator deflection the aircraft started a slow rotation. The aircraft was airborne with approximately 300 m of runway remaining. Once the aircraft was safely climbing away the PF applied rearward trim to remove the control force.

The flight proceeded without further incident.

Recorded data

The FDR data showed that the elevator deflection required for the rotation for this takeoff was 10.9º. Typical elevator deflections were 8.3º (based on the previous 6 flights).

The data showed the aircraft was trimmed, once airborne, from the pre-takeoff setting of 4.5 units to approximately 7 units.

Organisational information

The flight was operated on behalf of a cruise ship company. The passengers checked in for the flight and were allocated their seats by the cruise operator whilst aboard the cruise ship. Passenger loading details were passed from the cruise ship operator to the handling agent at Malta. These details gave the number of males, females and infants but did not specify the seating locations. Normally these flights are full so the seating locations are not required. For non-cruise flights, the handling agent checks in the passengers and consequently knows the passenger seating positions. Because the passengers were checked in by the cruise operator the handling agent did not have this information. Without it the handling agent assumed the passengers were evenly distributed throughout the cabin. The handling agent produced the electronic load sheet based on this incorrect assumption. The actual passenger distribution was biased towards the front of the aircraft.

Weight and balance

A manual load sheet, produced for the investigation and using the actual passenger distribution, indicated a MACTOW of 17%. A manual load sheet using an even distribution indicated a MACTOW of 23.5%, in line with the load sheet given to the flight crew.

The flight crew loaded the FMC using the load sheet provided, resulting in a takeoff trim setting of 4.5. The performance calculations performed by the flight crew were correct for the load sheet they received.

Operator safety action

Following its review into this incident, the operator indicated it would take the following safety action:

1. Update the existing process to ensure the position of any empty seats on a cruise flight (or any flight where check in and seating is not completed by the handling agent) is communicated by the cruise line representative to the load controller.

2. Ensure all handling agents that deal with cruise flights (or any flight where they do not handle the check in themselves) have a method of determining the actual seating position of passengers on any partly loaded flight in order to produce an accurate load sheet.

Conclusion

The aircraft took off with incorrect stabiliser trim set because an incorrect MACTOW was shown on the load sheet. This occurred because the seating position of the passengers was not passed to the handling agent. The handling agent assumed an even distribution of passengers within the cabin, when the actual loading created a forward bias.