SERIOUS INCIDENT

Aircraft Type and Registration:	Saab-Scania SF340B, G-LGNE
No & Type of Engines:	2 General Electric CO CT7-9B turboprop engines
Year of Manufacture:	1989
Date & Time (UTC):	17 January 2009 at 0830 hrs
Location:	Runway 24 at Benbecula Airport, W Isles, Scotland
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 3 Passengers - 10
Injuries:	Crew - None Passengers - None
Nature of Damage:	Abrasion of aluminium skin and mounting bracket
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	37 years
Commander's Flying Experience:	5,924 hours (of which 1,155 were on type) Last 90 days - 114 hours Last 28 days - 20 hours
Information Source:	AAIB Field Investigation

Synopsis

The aircraft touched down on Runway 24 at Benbecula Airport and, despite the control column being moved forward, the aircraft nose could not be lowered. The underside of the rear fuselage contacted the runway surface and as the groundspeed reduced to approximately 40 kt, the aircraft nose pitched down, the nosewheel lowered onto the runway and nosewheel steering became available.

The loading of the aircraft had not been in accordance with the planned load sheet and the aircraft's CG position was outside the aft limit for landing.

History of the flight

The crew reported for duty at 0620 hrs for a 0720 hrs departure from Glasgow to Benbecula. Having completed the flight planning and requested fuel from the handling agent, they arrived at the aircraft some 45 minutes before departure. Seat rows 8 to 11 inclusive, on the right side of the aircraft, were not available for passengers as seat converters for the carriage of newspapers had been fitted. Having boarded the passengers, their bags and the freight, the cabin attendant informed the commander of the actual seating of the passengers by zone. He then checked this against the seating plan shown at the bottom of the load sheet and found it to be correct.

Push-back was at 0718 hrs and the aircraft departed at 0727 hrs with the co-pilot as the pilot flying (PF). He

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stated the rotation from the runway appeared normal and shortly after takeoff engaged the Auto Pilot (AP). The aircraft climbed to a cruising level of FL145. Having briefed for a VOR/DME approach to Runway 24, the aircraft descended to 1,500 ft. The weather at Benbecula was given as surface wind 260°/15 kt, visibility 20 km with scattered cloud at 1,500 ft. The crew saw the airport at approximately 12 nm on the base leg, and continued with a visual approach. At about 5 nm, the AP was disconnected and with flaps set to 20º the aircraft touched down normally on the runway.

The co-pilot attempted to lower the aircraft nose but even with the control column moved forward, it remained high and the rear fuselage came into contact with the runway. The commander attempted to lower the aircraft nose using a combination of propeller reverse thrust and wheel brakes, using main wheel differential braking to maintain aircraft directional control as nosewheel steering was not available. At about 40 kt the nosewheel lowered onto the runway and the aircraft was brought to a stop. The aircraft was then taxied onto the parking area and shut down.

The attachment bracket on the underside of the rear fuselage onto which a length of tubing known as a 'pogo stick' is secured when the aircraft is parked, was worn away. The 'pogo stick', when attached, hangs down in order to prevent the aircraft tipping back onto its tail when loading passengers and freight. As this was not available, the freight was offloaded first, followed by the passengers, in order to keep the nosewheel in positive contact with the ground. At no time during the flight was there any indication that the aircraft CG was outside the permitted limits for landing and takeoff.

Damage to the rear fuselage is shown in Figure 1.

Weight and Balance

The aircraft had a maximum permitted takeoff mass of 13,155 kg; the mass and CG envelope for takeoff and landing is shown at Figure 2. The aircraft landing mass was 11,947 kg and the CG index with the passengers, baggage and freight as loaded on the incident flight was calculated as 67.5. Had the aircraft been loaded as per the final load plan, the landing mass would have remained the same, but the index would have been 47. With the aircraft as loaded, the CG position was significantly outside the aft limit for takeoff, landing and flight.

Figure 1

Damage to the underside of the aircraft tail

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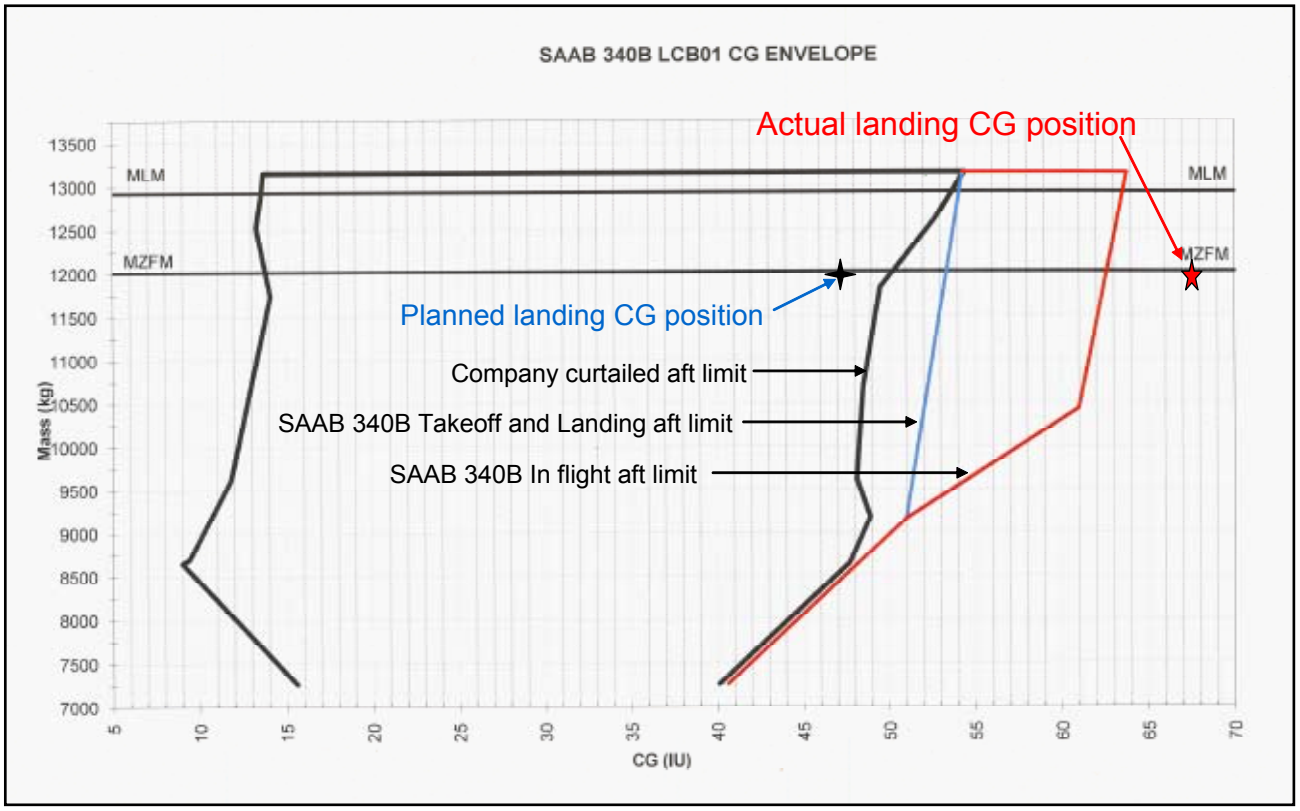

Figure 2

SAAB 340B CG position limits for takeoff, landing and flight

Aircraft loading procedures

On Friday, Saturday and Sunday each week, a large volume of newspapers are transported from Glasgow to Benbecula. Seat converters are fitted to contain bundles of newspapers which are then restrained in the normal passenger seat belts.

Two separate computer based systems are used to check-in the passengers and calculate the weight and CG index of the aircraft. Passenger check-in uses a software programme called SHARES which simply allocates seats which are available. Mass and CG planning is carried out using a software package called D-PLAN. The SHARES system is located at Glasgow airport and the D-PLAN computations are carried out at Central Load Control (CLC) based at Manchester. The D-PLAN system divides the aircraft seating into six zones from the front of the aircraft to the rear designated OA, OB, OC, OD, OE and OF. Each zone comprises two seat rows, each of which has a single seat on the left and a double seat on the right, with the exception of zone OF, which is one row of four seats. A curtailed CG envelope is used based on passenger loading within the six bay layout[1]. In order to simplify checking passenger distribution after boarding, the operator reduced the number of zones to two. Zone A included five rows of seats. Zone B included seats in row seven rearwards. With only two zones, there is an increased possibility that weight distribution, using

Footnote

[1] In order to use the full AFM CG envelop, the actual masses of the passengers and cargo must be used and their individual moments calculated. The bay method is simpler, but requires the envelope to be reduced to ensure the AFM CG envelope is not exceeded. The use of six bays allows a much wider envelope to be used than the manual load sheet, which uses two bays.

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standard passenger weights, may be less accurate and therefore the CG envelope is reduced as a safeguard when using this method.

In order to prevent seats fitted with the seat converters being allocated to passengers, the seats are 'blocked' from use on the SHARES system. The 'blocked' seats were notified to the check-in SHARES system on the day before the incident in order to facilitate passengers checking in using the internet. A total of 17 seats had been blocked on the SHARES system. This comprised all the seats in the first three rows and the double seats on the right side of the aircraft in rows 8 to 11 inclusive, where the seat converters had been fitted. The first three rows should not have been blocked and no reason for this was identified.

The dispatch department at Glasgow pass CLC the details of the aircraft registration and number of crew. The anticipated number of passengers with their bags and the freight from the cargo handling agent is also passed. Based on these details, CLC send the first edition of the load plan to the dispatcher; all load plans are controlled using an edition number for any changes. The first edition is referred to as EDNO1.

When all the passengers are checked in and the freight has been loaded in the seat converters and baggage bays, the dispatcher sends a Flight Closure Breakdown (FCB) message to CLC which contains the final number of passengers, together with their seat allocation and baggage weights. This, along with the fuel load determined by the commander, is used by the CLC Load Controller to produce the loadsheet. CLC check that the closure details match those planned and send the loadsheet to dispatch.

A release message is sent from CLC confirming the load details, including any significant details that may not have been shown on the load plans, for example, any seat changes. This release message relating to the incident flight was passed from CLC to the gate using landline telephone, although the procedure is for hard copy to be sent by fax or telex.

Where seat changes are made, the dispatcher will call the passengers forward at the gate and re-allocate them a seat in accordance with the load sheet. The SHARES seating plan attached to the bottom of the load sheet is then amended by the dispatcher to show the revised passenger seating.

The dispatcher passes the load sheet to the aircraft commander, who establishes how many passengers are seated in Zones A and B and confirms with the cabin crew that the numbers match where passengers are actually seated. If this is correct, then he signs the load sheet and the aircraft is permitted to depart.

Incident loading activity

The load controller reported for duty at 0500 hrs and occupied a work station dedicated to the aircraft operator. This is necessary as the aircraft operator's load control system is different and separate from the other systems used by CLC.

The cargo weights for the flight were sent by fax from the freight handling agent to CLC where they were received at 0623 hrs. The EDNO1 was prepared and sent to dispatch at Glasgow at 0630 hrs, showing 10 passengers, baggage compartment one (CPT 1) containing 450 kg of newspapers, and 200 kg newspapers and 124 kg of baggage in compartment two (CPT 2)[2].

Footnote

[2] The baggage compartments are located at the rear of the cabin with CPT 1 being forward of CPT 2.

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At 0632 hrs, the aircraft fuel load was received at CLC, which showed 1,500 kg of fuel onboard the aircraft and an estimated trip fuel of 331 kg. The correct flight number and aircraft registration were confirmed.

The EDNO2 was prepared and sent to Glasgow despatch at 0634 hrs, showing 10 passengers, CPT 1 with 450 kg newspapers, CPT 2 with 124 kg baggage and 210 kg of newspapers. There were three SI entries showing 150 kg of newspapers in seats 9 C/D, 10 C/D and 11 C/D. The load controller calculated that a change of passenger seating was required in order to obtain the maximum payload whilst retaining the aircraft within trim. This was passed by the load controller to the departure gate at Glasgow by telephone as a verbal instruction.

A flight closure message was sent from Glasgow to CLC and was received at 0647 hrs showing two passengers seated in bay B, four in C, one in D, two in E and one in F, with 124 kg of baggage. No change had been made to the seating plan.

The final load sheet was produced by CLC and sent to Glasgow at 0649 hrs. This showed that the passengers should be moved forward, with six in bay A and four in bay B. In order to remain in trim, 24 kg of newspapers had to be offloaded from CPT 2. However, no flight release message was sent from CLC to Glasgow, as required. The dispatcher was therefore, not aware of the need to move the passengers. They therefore boarded the aircraft and occupied the seats allocated at check in. He did not amend the seating plan at the bottom of the load sheet as there were no changes, as far as he was aware. The commander divided the seating plan into two zones at row seven and the cabin attendant confirmed that there were five passengers in zone A and five in zone B, in accordance with the seating plan. The commander then signed the load sheet.

Analysis

A procedure for calculating the safe loading of the aircraft had been established, and the load sheet for the incident flight contained the information for the correct passenger seating using the six zone method. However, in order to simplify the seating check for the crew, the operator had reduced the number of cabin zones from six to two. The addition of a seating plan at the bottom of the load sheet allows the crew to identify how many passengers should be seated in each zone and, providing the flight closure message containing any seating changes reaches the dispatcher, means the aircraft is safe to operate.

However, the flight closure message regarding the passenger seating changes on the incident flight was not received by the dispatcher and, therefore, the seating plan at the bottom of the load sheet was incorrect. The crew, using the two zone method, confirmed the passengers were apparently seated in accordance with the seating plan but this load distribution placed the aircraft CG index significantly beyond the aft limit for takeoff and landing, and slightly beyond the aft limit for flight. The situation was not recognised during takeoff or during flight, but only landing, when the nose could not be lowered and the underside of the rear fuselage contacted the runway surface. The application of reverse propeller thrust, or aerodynamic drag from discing propellers on landing, given the relatively high thrust line above the aircraft wheels, may have acted to increase the tail down moment.

Safety action

Both the operator and the handling agent carried out internal investigations. As a result, they agreed to instigate changes to their procedures. The two most significant changes are:

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The seating plan is currently still required to construct a manual load sheet, which is split into Zones A and B. However, for automated D-Plan loads sheets, the check to ensure that passengers are seated in the correct zones will be based on the six zones listed on the load sheet. A 'Passenger Headcount Confirmation Form' has been produced which is completed to show where the passengers are seated on the aircraft. The zones reflect those used in the D-PLAN programme and can be sub-totalled and checked against the zones shown on the load sheet. This procedure will ensure that the aircraft is correctly loaded. A copy is shown at Figure 3.

A flight release message will be sent by Fax or Telex clearly stating the reference number of the final load sheet. The Dispatcher can then ensure that the correct load sheet is passed to the aircraft commander and the loading of the aircraft accords with the load sheet.

Conclusions

The misloading of the aircraft occurred due to a failure in communication during the aircraft loading procedure. The flight closure message was not received by the dispatcher and the change of passenger seating was not passed to the crew. This led to an aft CG index significantly outside the permitted takeoff, landing and in-flight limits, and the underside of the tail contacting the runway surface on landing.

SAAB 340 PASSENGER HEADCOUNT CONFIRMATION FORM

DATE:			FLIGHT #:		
FROM:		TO:		ACFT REG:	

Circle each occupied seat and enter Cabin/Bay split sub-totals and Total Pax

Cabin	Seat				Bay
Fwd OA	2A		2C	2D	OA Sub tot:
	3A		3C	3D	
	4A		4C	4D	OB Sub tot:
	5A		5C	5D	
Sub tot:	6A		6C	6D	OC Sub tot:
Aft OB	7A		7C	7D	
	8A		8C	8D	OD Sub tot:
	9A		9C	9D	
	10A		10C	10D	OE Sub tot:
	11A		11C	11D	
Sub tot:	12A	12B	12C	12D	OF Sub tot:

Total Pax:

LOGANAIR SCOTLAND'S AIRLINE

LCB01 Config (Blue loadsheet) NA/B/C/D/E/F/G Form No: 9010 Iss 1

Figure 3

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