INCIDENT

Aircraft Type and Registration:	Avro RJ85, D-AVRJ
No & Type of Engines:	4 Avco Lycoming LF 507-1H turbofan engines
Year of Manufacture:	1996
Date & Time (UTC):	21 April 2008 at 0650 hrs
Location:	London City Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 4 Passengers - 37
Injuries:	Crew - None Passengers - None
Nature of Damage:	Minor damage
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	45 years
Commander's Flying Experience:	10,000 hours (of which 7,000 were on type) Last 90 days - 150 hours Last 28 days - 50 hours
Information Source:	AAIB Field Investigation

Synopsis

An Avro RJ85 aircraft was parked on Stand 10 at London City Airport, with an Avro RJ100 parked to its left, on the adjacent Stand 11. Prior to taxiing, the RJ85 had been repositioned by a tug to gain sufficient wingtip clearance from the RJ100. This had the effect of reducing the tail clearance between the two aircraft, which was not identified. As the RJ85 taxied forward and to the right, its tail contacted the tail of the RJ100, causing minor damage to the RJ100's right elevator. The airport operator has taken safety actions to prevent such collisions in the future.

History of the flight

The two aircraft involved, an Avro RJ85, D-AVRJ, and an Avro RJ100, G-BZAT, were similar types and derivatives of the BAe 146 series of aircraft. Both had a wingspan of 26 m. D-AVRJ had arrived from Munich and parked on Stand 10 at London City Airport under the guidance of a marshaller. Following a normal turnaround, the passengers were boarded and the engines started. The commander commented to his co-pilot that the RJ100 aircraft parked to the left, on Stand 11, appeared to be closer than normal. He therefore asked the marshaller to monitor his taxi off stand, paying particular attention to the left wingtip clearance. The aircraft's heading whilst parked was 338°(M).

The commander intended to turn initially to the right and then, once clear of the RJ100, to make a left turn

towards Holding Point Alpha. He taxied forward slowly and commenced a right turn, shortly after which the marshaller gave the 'stop' signal. The aircraft came to a stop on a heading of 013°(M). The marshaller connected his headset to the aircraft's intercom system and advised the commander that there was insufficient clearance between his aircraft's left wingtip and the right wingtip of the RJ100 on the left.

It was decided that D-AVRJ would be pushed back, to gain sufficient wingtip clearance, before taxiing again. A tug was attached and the aircraft was pushed back onto stand. The aircraft's heading was now 018°(M).

The tug was disconnected and the commander then began taxiing forward again. As before, he made a right turn under the guidance of the marshaller. Another airport staff member stood by the left wingtip to monitor the wingtip clearance with the RJ100. Shortly after commencing the taxi, the marshaller once again gave the 'stop' signal. During the right turn, the left horizontal stabiliser of D-AVRJ had moved to the left, passed under and then made contact with the right horizontal stabiliser of the RJ100, causing scoring of the RJ100's right elevator. The aircraft's final heading when stopped was 039°(M).

The sequence of events leading up to the collision is depicted in Figure 1.

Once aware of the situation, the commander of D-AVRJ shut down the aircraft. He kept the passengers on board to maintain weight on the aircraft and to prevent it from rising up on the landing gear oleos, which would have caused further damage. Additional ballast was then placed on the aircraft and the nosewheel tyres on the RJ100 were deflated to provide sufficient vertical clearance to allow the two aircraft to be separated without causing further damage. The passengers were then disembarked.

Figure 2 shows a photograph of the contact between the two aircraft.

Aircraft initial positions

The RJ100 on Stand 11 had been parked 1 m to the right of the stand centreline but parallel to it, thus reducing the clearance from the RJ85, D-AVRJ, on Stand 10 by the same amount. D-AVRJ was initially parked on the stand centreline.

Airfield information

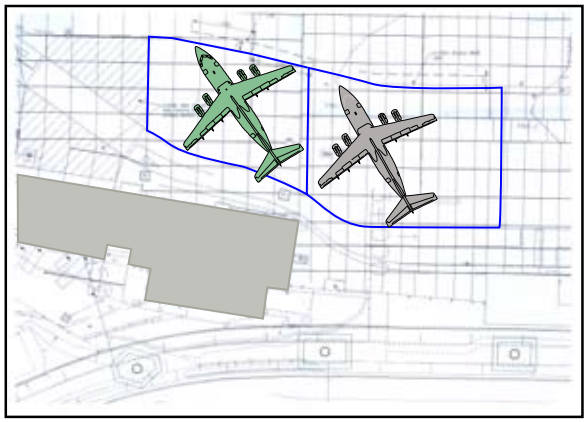
At the time of the incident there were 13 stands at London City (Figure 3). Stands 10 and 11 are smaller and non-uniform in shape when compared with Stands 1 to 9.

Stands 10 and 11 are approximately 38 m and 31 m wide respectively.

Airport operating procedures

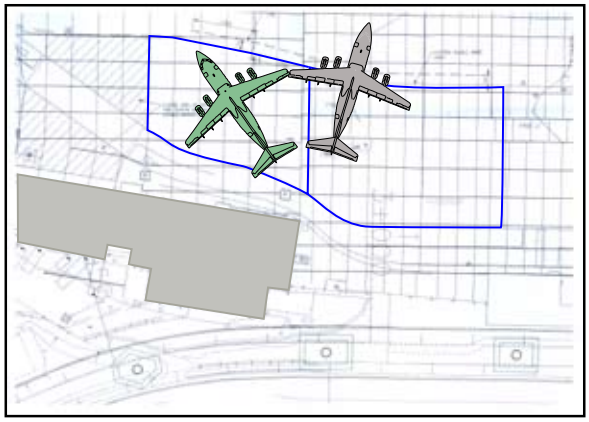
In 2005, London City Airport completed a programme of further development of the western apron. On 13 May 2005, an Operational and Safety Information Notice (OSIN) was issued, providing operating staff with comprehensive procedures for the movement of aircraft on Stands 11, 12, 13 and an additional Stand 14 that had not been developed.

Whilst 146/RJ-sized aircraft could self-manoeuvre onto and off Stand 10, only Dornier 328-sized aircraft were permitted to self-manoeuvre onto Stand 11, under the direction of a marshaller. Larger aircraft had to park on the taxiway, adjacent to Stand 11, and then be pushed back onto the stand using a tug and ground staff (GS) to monitor wingtip clearance.

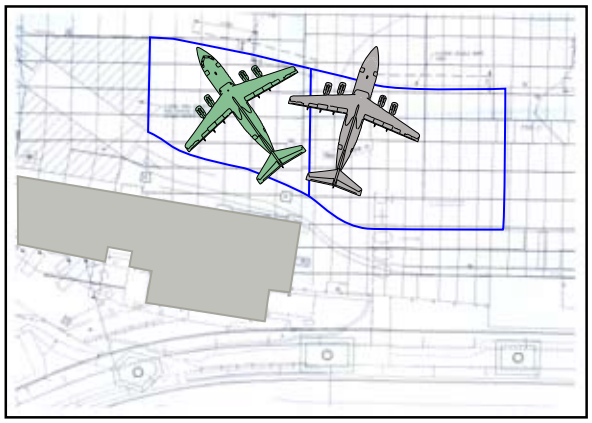


Location of the two parked aircraft.

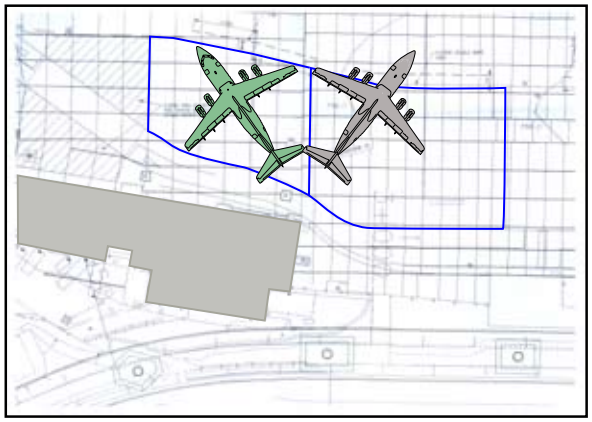
D-AVRJ is the aircraft on the right and is about to taxi off the stand



Position of the aircraft after the inital movement of D-AVRJ, which has stopped due to inadequate clearance between the left wing tip of D-AVRJ and the right wing tip of G-BZAT



Position of the aircraft after D-AVRJ has been pushed backwards by a tug to provide additional wing tip clearance



Position of the aircraft after D-AVRJ has taxied forward and contact has been made between the two horizontal tail planes

Figure 1

Sequence of events leading up to the collision

Figure 2

Photograph showing contact between D-AVRJ and G-BZAT

On 23 March 2007, the OSIN was updated to require GS to be provided to monitor wingtip clearance for an aircraft self-manoeuvring off Stand 10 when another aircraft was parked on Stand 11. There was no requirement to monitor the tail clearance between similar types.

CAA Aerodrome Operating Standards requirements

Guidance for establishing aircraft parking stands at an airport is contained in Civil Aviation Publication (CAP) 168, Licensing of Aerodromes. The information pertinent to this incident is as follows:

'An apron is a defined area on a land aerodrome which is intended to accommodate aircraft for the purpose of loading or unloading passengers, mail or cargo, refuelling, parking or maintenance'

'An apron may be divided into stands in order to facilitate safe parking and movement of aircraft and people'

Size

'There should be room enough on the apron to provide for the number and types of aircraft expected to use it with adequate safety margins from obstructions including parked aircraft. The design of the apron should aim at facilitating the movement of aircraft and avoiding difficult manoeuvres which might require undesirable use of excessive amounts of engine thrust, or impose abnormal stress on tyres'.

'The dimensions of the apron should be such that the minimum clearance between a manoeuvring

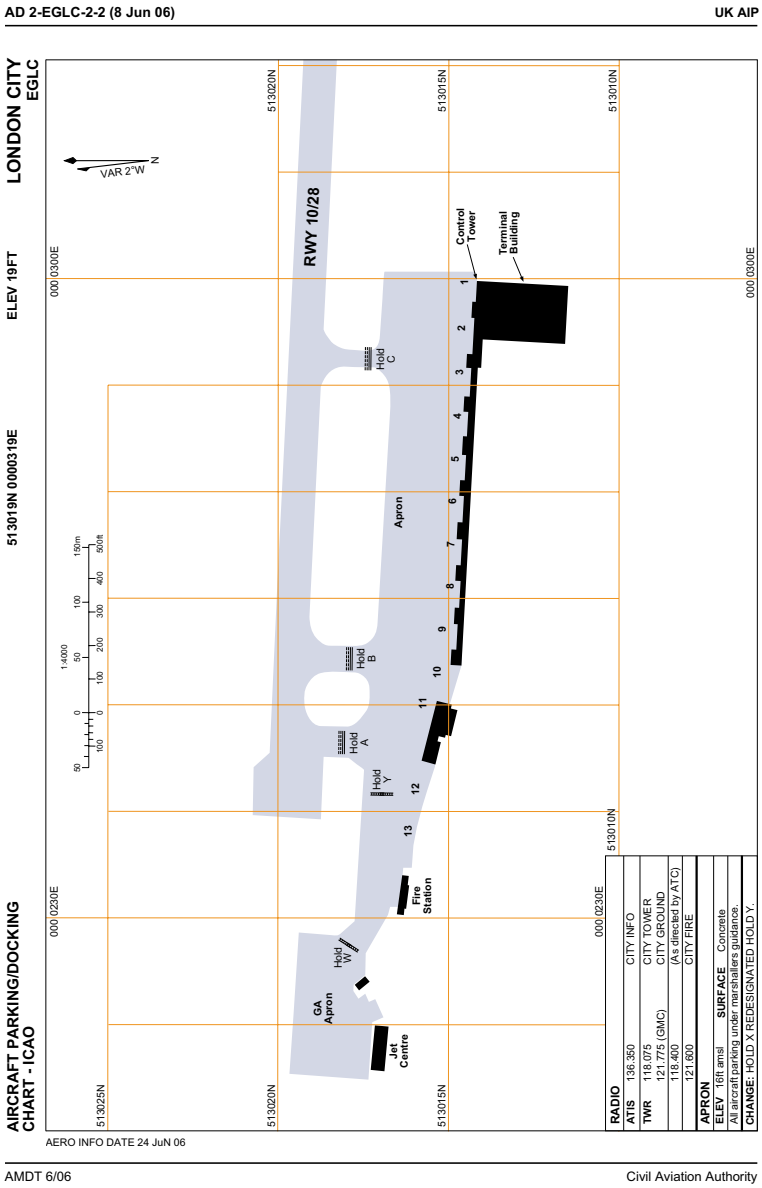


Figure 3

ICAO Parking/Docking Chart for London City Airport
(current at time of accident)
as published in UK AIP

aircraft and any obstruction is 20% of wingspan'.

'For nose in push-back stands this safety clearance may be reduced to 4.5m where a suitably managed guidance system, acceptable to the CAA, is available'.

Analysis

Both aircraft had been parked on their respective, adjacent stands. The RJ100 on Stand 11 was 1 m to the right of the stand centreline and parallel to it, thus reducing the clearance from D-AVRJ on Stand 10 by the same amount. D-AVRJ was correctly parked on its stand centreline.

When taxiing off Stand 10, the commander of D-AVRJ commenced a right turn, to ensure sufficient clearance with the RJ100. The aircraft was stopped on a heading of 013°(M). The heading then increased further during the pushback to 018°(M). The net effect of this was to increase the wingtip clearance, whilst reducing the tail clearance between the two aircraft, which went unnoticed.

As D-AVRJ taxied forward again and turned to the right, its tail would have moved to the left, further reducing the tail clearance to the point where contact occurred.

The CAA guidance material in CAP 168 for establishing parking stands recommends that a manoeuvring aircraft should have a minimum clearance of 20% of the wingspan. For BAe 146/RJ aircraft with a wingspan of 26 m, the minimum recommended clearance is therefore approximately 5 m. When taxiing off Stand 10 with an aircraft on Stand 11, the clearance between two BAe 146/RJ or similar sized aircraft is reduced below this amount. The airport operator had addressed this potential hazard by introducing a requirement for a person to monitor wingtip clearance, but the possibility of tailplane contact had not been identified and thus no specific measures had been taken to prevent tail collisions.

Airport operator's safety actions

Following the incident, the airport operator introduced three safety actions to address the possibility of tail-to-tail contact between aircraft parked on Stands 10 and 11. These were:

1. *When a 146/135 aircraft is positioned on Stand 11 GS must provide wing-tip and tail fin observation for any aircraft self-manoeuvring off of Stand 10. If for any reason the aircraft on Stand 10 is slightly out of parking alignment consideration must be given as to whether the aircraft should be towed off stand if an aircraft remains parked on Stand 11 during the departure.*

2. *If the aircraft is to be towed off stand the GS marshaller must re-establish head set communication with the cockpit and all GS personnel undertaking wing tip/tail fin observation should also wear a headset to allow direct communications.*

3. *Operations will also endeavour to give consideration to which aircraft types are parked on Stand 10.*

Conclusion

The collision occurred due to a combination of the RJ100 on Stand 11 being parked 1 m to the right of its stand centreline, D-AVRJ on Stand 10 being pushed back onto a heading which further reduced the tail clearance, and the limited clearance between aircraft of this size when using these stands. The absence of a person monitoring the tail area meant that the inadequate tail clearance was not identified prior to the collision.

The safety actions already taken by the airport operator following this incident should reduce the risk of tail collisions between aircraft operating from Stands 10 and 11 at London City Airport. Therefore no Safety Recommendations are considered necessary.