

**ACCIDENT**

<b>Aircraft Type and Registration:</b>	1) Boeing 737-73S, EI-SEV 2) Boeing 737-33A, G-GDFB
<b>No &amp; Type of Engines:</b>	1) EI-SEV: 2 CFM56-7B turbofan engines 2) G-GDFB: 1 CFM56-3B2 turbofan engine, 1 CFM56-3C1 turbofan engine
<b>Year of Manufacture:</b>	1) EI-SEV: 1999 (Serial no: 29078) 2) G-GDFB: 1992 (Serial no: 25743)
<b>Date &amp; Time (UTC):</b>	30 April 2019 at 0647 hrs
<b>Location</b>	Stand 24, East Midlands Airport
<b>Type of Flight:</b>	Positioning flight (non-revenue)
<b>Persons on Board:</b>	1) Crew - 2                      Passengers - None 2) Crew - None                Passengers - N/A
<b>Injuries:</b>	1) Crew - None                Passengers - None 2) Crew - N/A                 Passengers - N/A
<b>Nature of Damage:</b>	1) Right winglet partially detached 2) Damage to underside of right horizontal stabiliser
<b>Commander's Licence:</b>	1) Airline Transport Pilot's Licence 2) N/A
<b>Commander's Age</b>	1) 35 Years 2) N/A
<b>Commander's Flying Experience:</b>	1) 6,500 hours (of which 2,650 were on type) Last 90 days - 140 hours Last 28 days - 62 hours  2) N/A
<b>Information source:</b>	Aircraft Accident Report Form submitted by the pilot, internal investigation reports by the Operator and Air Traffic Service Unit and further enquiries by the AAIB

**Synopsis**

EI-SEV was taxiing to park on Stand 22 (S22) at East Midlands Airport (EMA) and the routing passed behind G-GDFB on Stand 24 (S24). As EI-SEV passed behind G-GDFB its winglet struck the other aircraft's right horizontal stabiliser.

Low Visibility Procedures (LVPs) were in force, and controllers could not see the apron area and were unaware that S24 was occupied. Neither the UK Aeronautical Information Publication (AIP) nor the pilots' airfield charts indicated that wingtip clearance could be compromised when taxiing behind parked aircraft in that location.

Following the accident, the airport operator closed S22 pending a safety review and conducted a survey of parking stands across the airport to identify any similar aircraft taxi-separation hazards. The operators of both aircraft alerted their EMA-based flight crew to the hazard of reduced aircraft separation when using Stands 20-25 (S20-25). EI-SEV's Operator also issued a Company NOTAM to alert all their pilots using EMA to the hazard identified through this accident.

### History of the flight

At the time of the accident EMA was operating under LVPs. The reported Runway Visual Range (RVR) was 300 to 325 m. EI-SEV arrived from Stansted Airport (STN) and landed on Runway 27 before following Taxiway Alpha eastwards to the Central Apron.

Due to the poor weather and their elevated position in the control tower, air traffic controllers could not see the aircraft, taxiway or apron. G-GDFB was not painting on the Controllers' Surface Movement Radar (SMR) display. With no other information about stand occupancy available to them, ATC were unaware that S24 was occupied. Accordingly, the ground movements controller cleared EI-SEV to taxi the shortest route to S22 which was via Quebec (Q), the western entry point to the apron (Figure 1). The EMA ATC Final Investigation Report into the accident concluded that:

*'The poor visibility rendered the parked aircraft on stand 24 invisible to ATC. Had visibility been better, ATC would have had an opportunity to visually acquire the obstruction and offer a different route.'*

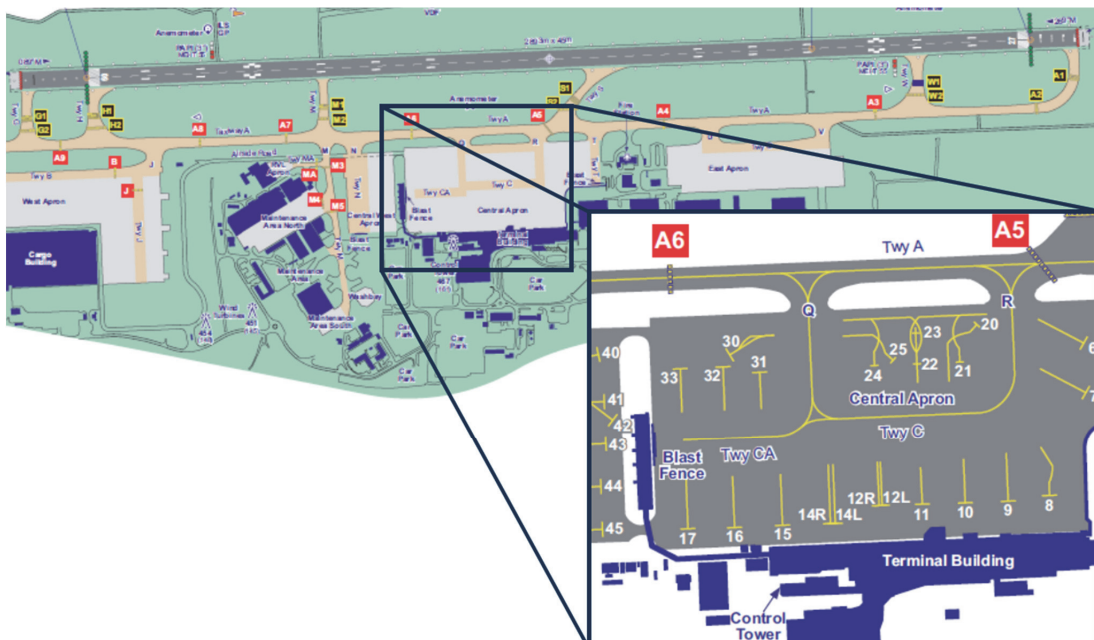


Figure 1

East Midlands Airport Chart with zoomed image of the Central Apron

The aircraft commander taxied EI-SEV as cleared, turning left from Taxiway Quebec towards Stand S22. The flight crew became aware of an aircraft parked on S24 and noted that the space available to pass behind it looked “tight”. Seeing that the parked aircraft was on its stop bar (Figure 2), they were reassured that there would be enough room to pass behind, provided they accurately tracked the stand taxi-lane centreline.

As EI-SEV crossed behind G-GDFB the commander brought the aircraft to a slow walking pace and the co-pilot monitored the right wing tip. From his perspective it appeared to be clear, but as they overlapped EI-SEV’s winglet struck G-GDFB’s right horizontal stabiliser (Figure 3). The commander brought the aircraft to a halt and reported the collision to ATC.



**Figure 2**

G-GDFB nosewheel position after the collision



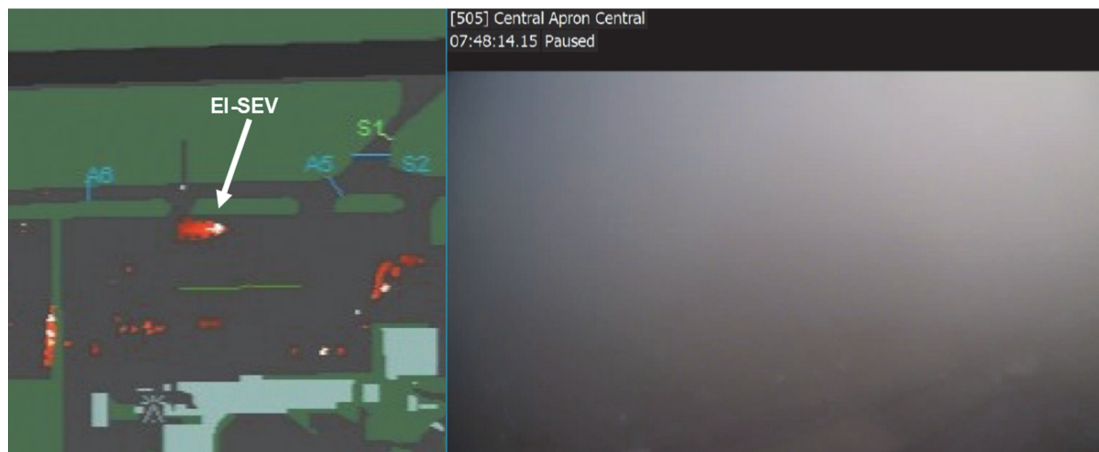
**Figure 3**

EI-SEV’s winglet in contact with right horizontal stabiliser of G-GDFB

## Recorded information

Airport CCTV and SMR footage revealed that, in the conditions prevailing at the time, neither system was capable of alerting the ATC controllers to the collision risk. The CCTV view of the apron was obscured by fog and the SMR was not designed to show stationary targets (Figure 4). The EMA ATC report noted that:

*'The East Midlands Surface Movement Radar (SMR) does not show stationary objects or parked aircraft...When aircraft are taxiing they display but as they stop, either to park or to hold, they disappear from SMR...in times of poor visibility [SMR] becomes the 'eyes' of the controller. More modern SMRs show stationary targets and would have shown the aircraft parked on stand 24... Whilst it cannot be guaranteed that a better SMR/ASMGCS<sup>1</sup> system would have prevented the collision, it would have provided the controller with much needed information as to the presence of an obstruction on [EI-SEV's] taxi route.'*



**Figure 4**

Screenshots of the SMR display (left) and the Central Apron CCTV camera (right)

Prior to this accident the airport operator had started scoping for the procurement of an improved SMR or an ASMGCS installation.

## Airfield information

G-GDFB was a Boeing 737-300 (B733) series aircraft but S24 only had stop lines for Airbus A321 and Boeing 737-800 (B738) aircraft. The B733 is approximately 6 m shorter than a B738. With a B738 parked on S24 the available clearance to taxi behind it would have been approximately 12 m. The commander considered it likely that had it been a B738 on S24 it would have been more apparent that insufficient clearance existed.

---

## Footnote

<sup>1</sup> Advanced Surface Movement Guidance Control System.

---

Neither the AIP nor the airfield charts available to the pilots contained any restrictions, warnings or guidance relating to wingtip/tail clearance on the implicated stands.

EMA ATC's final report highlighted discrepancies in three documents<sup>2</sup> regarding the requirement for follow-me vehicles during LVPs. The discrepancies related to whether follow-me vehicles were mandatory in RVRs of less than 300 m. Due to the RVR being not less than 300 m the report did not consider these findings directly relevant to the accident.

## Personnel

It was the first flight of the day for the flight crew who had stayed overnight at STN in a hotel provided by their operator. Their previous rest period was 11 hours 43 minutes which complied with Airline's flight time limitations for temporarily detached crew. They reported being well rested and did not believe that fatigue played a part in the accident. Both pilots were based at EMA but had not previously operated from the remote stands in question (S20-25).

## Human factors

Commercial flight crew routinely operate on airfields where following established taxiway markings generates safe separation. Repeated achievement of safe outcomes through compliance builds confidence and trust that airfield markings are safe to follow.

The Air Accident Investigation Unit Ireland published a synoptic report<sup>3</sup> into a similar ground collision between two B738 aircraft which occurred in October 2014. The report highlighted the limitations of the human eye in judging relative distance at ranges above 10 m. It noted that the visual perception challenge was increased on aircraft where winglets have a blended, rather than angular, appearance when viewed from the flight deck. The investigation concluded that:

*'...for pilots operating winglet equipped aircraft and/or aircraft with large wingspan, it is not possible to accurately judge absolute distance between the wingtip and another object. Therefore, regardless of experience, there is a risk that in attempting to judge separation distance at close quarters to another object, a collision may occur. As such pilots should err on the side of caution and if doubt exists as to whether an aircraft can be passed safely, the flight crew should stop, advise ATC, and request alternative instructions if available.'*

---

## Footnote

<sup>2</sup> MATS Pt2 SI no 05 of 2018: Low Visibility Procedures; EMA Airside Operational Instruction (AOI) 21: Low Visibility Instructions; and EMA AOI 05: Apron Management.

<sup>3</sup> Air Accident Investigation Unit Ireland Synoptic Report, Accident, Boeing 737-8AS, EI-EMH/EI-EKK, Link 2, Dublin Airport, Ireland 7 October 2014, <http://www.aaiu.ie/node/860> accessed 02 September 2019.

## Other information

### Aerodrome licensing standards

EMA is an EASA<sup>4</sup> Certificated Aerodrome. It operates in accordance with Commission Regulation (European Union) No 139/2014 (CR 139/2014) which details the requirements and acceptable means of compliance for Certificated Aerodromes. Topic areas relevant to this accident include operational procedures, aerodrome physical characteristics, assessment and treatment of obstacles and visual aids. The document details minimum separation distances between taxiways, including stand taxi-lane centrelines, and fixed objects (Figure 5). If separation distances are not achieved, operational restrictions, such as limiting the size of aircraft using an affected taxiway, may be imposed to mitigate safety risks. EI-SEV and G-GDFB were both Aerodrome Reference Code C (Code C) aircraft<sup>5</sup> with wingspans just less than 36 m. EI-SEV had turned off the taxiway and was following the stand taxi-lane centreline to S22.

Code letter	Distance between taxiway centre line and runway centre line (metres)								Taxiway centre line to taxiway centre line (metres)	Taxiway, other than aircraft stand taxi-lane, centre line to object (metres)	Aircraft stand taxi-lane centre line to aircraft stand taxi-lane centre line (metres)	Aircraft stand taxi-lane centre line to object (metres)
	Instrument runways Code number				Non-instrument runways Code number							
	1	2	3	4	1	2	3	4				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A	77.5	77.5	—	—	37.5	47.5	—	—	23	15.5	19.5	12
B	82	82	152	—	42	52	87	—	32	20	28.5	16.5
C	88	88	158	158	48	58	93	93	44	26	40.5	22.5
D	—	—	166	166	—	—	101	101	63	37	59.5	33.5
E	—	—	172.5	172.5	—	—	107.5	107.5	76	43.5	72.5	40
F	—	—	180	180	—	—	115	115	91	51	87.5	47.5

Note 1: The separation distances shown in columns (2) to (9) represent ordinary combinations of runways and taxiways.  
 Note 2: The distances in columns (2) to (9) do not guarantee sufficient clearance behind a holding aeroplane to permit the passing of another aeroplane on a parallel taxiway.

Table D-1. Taxiway minimum separation distances

### Figure 5

CR 139/2014 Table D-1 Taxiway minimum separation distances

CR 139/2014 states<sup>6</sup> that:

*'The safety objective of minimum taxi separation distances is to allow safe use of taxiways and aircraft stand taxi-lanes [sic] to prevent possible collision with other aeroplanes... The separation distance between the centre line of a taxiway and...an object should not be less than the appropriate dimension specified [at Figure 5]'*

### Footnote

<sup>4</sup> European Union Aviation Safety Agency.

<sup>5</sup> Wingspan  $\geq 24$  m but  $< 36$  m or outer main gear wheel span  $\geq 6$  m but  $< 9$  m.

<sup>6</sup> CR 139/2014 dated May 2019, CS ADR-DSN.D.260 <https://www.easa.europa.eu/document-library/regulations/commission-regulation-eu-no-1392014> accessed 2 September 2019.

In relation to clearance distances on aircraft stands<sup>7</sup> the regulation states that:

*'Any aircraft passing behind an aircraft parked on an aircraft stand should keep the required clearance distances defined in [Figure 5].'*

It further states that there should be a minimum clearance of 4.5 m between Code C aircraft entering or exiting a stand.

#### *Guidance for pilots*

CAP 637: Visual Aids Handbook<sup>8</sup>, is a UK CAA publication intended to explain in general terms the meaning and purpose of visual aids at UK licensed airports. The handbook covers lighting, surface markings, signs and signals and contains guidance for pilots and personnel engaged in the handling of aircraft. At paragraph 2.3.1.a, CAP 637 states:

*'Taxiway centrelines are located to provide safe clearance between the largest aircraft that the taxiway is designed to accommodate and fixed objects such as buildings, aircraft stands etc, provided that the pilot of the taxiing aircraft keeps the 'Cockpit' of the aircraft on the centreline and that aircraft on a stand are properly parked.'*

#### **Analysis**

Due a combination of poor weather and the limitations of the EMA SMR, ATC were unaware that G-GDFB was parked on S24. EI-SEV was given a taxi clearance that required it to pass directly behind G-GDFB. EI-SEV was accurately maintaining the stand taxi-lane centreline and G-GDFB was parked at an appropriate stop line on S24.

Based on known dimensions, G-GDFB's tail was less than 18 m from the S22 taxi-lane centreline. Had the minimum separation from the S22 taxi-lane centreline to G-GDFB been in accordance with CR 139/2014 there would have been at least 4.5 m clearance between the aircraft. Neither the AIP nor the pilots' airfield charts contained any limitation, warning or guidance relating to taxi separation distances on S20-25 at EMA.

To the flight crew of EI-SEV the clearance behind G-GDFB looked "tight" but passable. Routinely operating on airfields where following the taxiway lines assures safe separation, commercial flight crew can come to trust the markings. This is further reinforced by the wording of CAP 637, albeit not targeted at EASA certificated aerodromes, which infers that safety is assured by accurate taxiing and parking. It is possible that this combination of factors had desensitised the crew to the risk of ground collision.

The commander considered it unlikely he would have attempted to taxi behind a B738 on the same stand.

---

#### **Footnote**

<sup>7</sup> CR 139/2014 dated May 2019, CS ADR-DSN.E.365

<sup>8</sup> CAP 637 Visual Aids Handbook Issue 2 dated May 2007, <https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=136> accessed 15 July 2019.

The aircraft was traveling slowly and the co-pilot was visual with both EI-SEV's winglet and G-GDFB's stabiliser. From his perspective, it appeared that the winglet would remain clear of the other aircraft's tail. That the aircraft collided demonstrated that visually judging relative distance between two objects at range is prone to error.

### Conclusion

Due to the poor weather conditions and limitations of the SMR, EI-SEV was given an unachievable taxi clearance. The fallibility of the human eye in accurately judging relative distance at range seduced the crew into thinking that safe separation had been achieved. Less than minimum standard taxi separations existed on S20-25 but there were no published warnings, limitations or guidance to alert ATC or flight crews to the risks. Flight crew need to remain alert to the potential for consistently safe outcomes desensitising them to latent airfield hazards.

### Safety action

Following this event:

The airport operator closed Stand 22 pending a safety review and conducted a survey of parking stands across the airport to identify any similar aircraft taxi-separation hazards.

The operators of both aircraft alerted their EMA-based flight crew to the hazard of reduced separation when using Stands 20 to 25.

The operator of EI-SEV issued a Company NOTAM to alert its pilots to the reduced separation hazard on Stands 20 to 25 at EMA.