
Encounter with digger on landing, B737-448, EI-BXC, 6 June 1998 at Cork Airport

Micro-summary: During a low-visibility landing, this Boeing 737 had an encounter with a digger.

Event Date: 1998-06-06 at 0525 UTC

Investigative Body: Air Accident Investigation Unit (AAIU), Ireland

Investigative Body's Web Site: <http://www.aaiu.ie/>

Cautions:

1. Accident reports can be and sometimes are revised. Be sure to consult the investigative agency for the latest version before basing anything significant on content (e.g., thesis, research, etc).
 2. Readers are advised that each report is a glimpse of events at specific points in time. While broad themes permeate the causal events leading up to crashes, and we can learn from those, the specific regulatory and technological environments can and do change. ***Your company's flight operations manual is the final authority as to the safe operation of your aircraft!***
 3. Reports may or may not represent reality. Many many non-scientific factors go into an investigation, including the magnitude of the event, the experience of the investigator, the political climate, relationship with the regulatory authority, technological and recovery capabilities, etc. It is recommended that the reader review all reports analytically. Even a "bad" report can be a very useful launching point for learning.
 4. Contact us before reproducing or redistributing a report from this anthology. Individual countries have very differing views on copyright! We can advise you on the steps to follow.
-

AAIU Report No:- 1999/004
AAIU File No:- 19980021
Published: 30/06/1999

Aircraft Type and Registration: B737-448, EI-BXC

No. and Type of Engines: 2 x CFM56-3B2

Aircraft Serial Number: 24773

Year of Manufacture: 1990

Date and Time (UTC): 6 June 1998, 0525 hrs

Location: Runway 17, Cork Airport

Type of Flight: Public Transport

Persons on Board: Crew 6 Passengers 146

Injuries: Crew None Passengers
None

Nature of Damage: None

Commanders Licence: Airline Transport Pilots Licence

Commanders Age: 38 Years

Commanders Flying Experience: Total 10,002 hrs
Total Last 90 days 166 hrs
Total Last 28 days 60 hrs
Total Last 24 hours 8 hrs 42 min

Information Source: Aircraft Incident Report Form submitted
by operator.
AAIU Field Investigation.

Synopsis

The AAIU was informed of this incident by Cork ATC at 0645 hrs on 6th. June 1998.

The aircraft which was on a holiday charter flight from Faro, Portugal, to Cork, landed on Runway 17 at Cork Airport. The weather conditions at the time were poor with mist, poor visibility and very low cloud.

The weather passed to the aircraft at 0505 hrs was:-

Wind	170/03,
Visibility	600 M, light rain and fog,
Cloud	Scattered 100, Broken 200, Broken 600,
Temperature	12°C
QNH	1004,
RVR	750 M, 1100 M.

During the landing roll a mechanical digger was observed by the crew to exit the runway on the right hand side approximately 250 feet in front of the aircraft. A van which was parked on the right hand side of the runway did not exit.

The aircraft was stopped short of the van using maximum reverse thrust and overriding the auto brake system to achieve greater braking than was available at the level 2 auto brake setting. It was also necessary for the aircraft to depart from the runway centreline.

Background

Cork Airport is State owned and operated by Aer Rianta. Aer Rianta is a Semi-State body acting as an agent of the Minister for the Department of Public Enterprise.

In February 1998 engineers from Aer Rianta met with the Irish Aviation Authority to discuss proposed construction works at Cork Airport. The work involved the construction of an overlay and shoulders to Runway 17/35 at Cork Airport. The expected duration of the work was 32 weeks. The intention was to carry out the major works at night between the hours of 2300 and 0600 hrs, six nights per week, commencing in early April 1998. The details of the construction work were published by the IAA in an AIP Ireland supplement NR2/98 10 March 1998, Appendix A.

Aer Rianta engaged a construction company familiar with working on airport projects and experienced in the type of activities envisaged for the Cork works. In a detailed specification for the work prepared by Aer Rianta it states inter alia:-

Hours of Work

".....In order to interfere as little as possible with aircraft operations the Contractor's possession of the runway and taxiways will be rigidly restricted to the hours of darkness. It is expected that work will be carried out generally between 23.00 hrs and 06.00 hrs for 6 nights per week. It is expected that the six nights will be Sunday, Monday, Tuesday, Wednesday, Thursday and Friday nights.

The nominated electrical subcontractor may undertake some preparatory works in the workshop during other hours from time to time. The exact working hours will be decided in consultation with the Engineer and the Airport Authority. (During the agreed working hours it may be necessary to clear the site to facilitate aircraft movements as hereinafter specified in Clause 2.9. The Contractor should allow for this eventuality in his rates. Items A293.23 to A297.27 in the Bill of Quantities specifically refers). The working hours may change from day to day.

To ensure that the pavement is promptly restored for operational service at the end of the work period the Contractor shall cease all construction work one hour in advance of the stipulated time for ending the work period, to allow the work area to be thoroughly cleaned before the end of that work period....."

General Information

Clearing Up

"On completion of the works, the Contractor shall clear the site of all plant, equipment, tools, unused materials, pieces of wire, iron or broken blocks, stones, debris or loose objects of any description. All earth debris and other waste material arising from the work shall be disposed of as hereinbefore specified and the site shall be left clean and tidy to the satisfaction of the Engineer."

Safety

General Instruction

"The principal considerations when works are taking place in and adjacent to operational areas will be safety and security. Any instructions given by the Engineer relating to conduct of the contractor's works must be rigidly adhered to."

Safety of Aircraft and Air Service Vehicles

".....The Contractor shall take all precautions to avoid risk of damage to aircraft or air service vehicles on or in the vicinity of the site and shall observe all safety regulations that may be imposed upon him or his Agents or workmen by the Engineer or by the Airport Authority for the purpose of safeguarding aircraft or air service vehicles....."

Permission

Obtaining Permission to Enter on the Airfield

"Specific permission must be obtained on every occasion by the Contractor's representatives from the Engineer or from the Airport Authority before any of the Contractor's staff, plant, vehicles or equipment enter on the airfield at the commencement of a work period. The procedure to be followed in seeking permission will be settled at the commencement of the works. Permission to enter in advance of the authorised time for commencing work will not be given."

Reporting Clearance of the Airfield

"When work has ceased at the end of a work period the Contractor's representative shall report the fact to the Engineer or the Airport Authority. The procedure to be followed in reporting will be settled at the commencement of the works".

Suspension of Work for Airport Purposes

....."If it should be necessary to clear the site for airport purposes during the authorised working hours, work shall be suspended at any time on the instructions of the Engineer or the Airport Authority.

The Contractor shall not return to the site until authorised to do so by the Engineer....."

1. Factual Information

During the night of 5-6 June 1998, construction work involving the opening of a trench for cable ducting was in progress. The work was being carried out by the main contractor. The work party consisted of a foreman and a party of eight. They were engaged in laying ducts for new wiring along the Runway 17/35 edge.

The work was being carried out at two different points along the runway, hereinafter referred to as Location 1 and Location 2. There was a mechanical digger at each location, (Appendix B)

At approximately 03.30 hrs, both diggers accidentally cut the existing cable for the runway lights. From this time to the time of the aircraft landing, electricians, a contractor and the other Aer Rianta employees were engaged in trying to reconnect the cables.

Communication between ATC and the construction workers was via a radio-van. This vehicle acted as a shepherd to construction vehicles and workers. One of the duties of the operator of this vehicle, was as per the Aer Rianta specifications for the construction, to gather up workers, tools and portable equipment one hour before the work was due to finish each morning, and to conduct all construction vehicles and equipment to a hard standing referred to as the fireground., Location 3.

At 0456 hrs the electrician informed the control tower that the runway edge lights were unserviceable due to several cuts in the cable. The tower informed the electricians that an aircraft was due at Cork Airport at 0520 hrs from Faro, Portugal. The following exchange took place between the Tower and the electricians:-

TIME	STATION	MESSAGE
0455.46	Ground	Hello Cork Tower Hello.
0456.57	Ground	Hello Cork Tower.
0456.57	Electrician	Hello Tower Electricians here.
	Ground	Good Morning.
		I'm afraid we have a problem here we won't have any 17/35 edge lights for a while we don't know how long for. We have a problem outside theres a lot of cables after being cut.
	Ground	Ah ahm there is a Shamrock coming in from Faro he's supposed to be here at 0620.
	Electrician	I doubt if we'll have it for then.
	Ground	Ahm OK how long do you reckon it'll be.
	Electrician	I honestly don't know I'll have to look for the faults you know we're not even sure where the must where they were cut.
	Ground	Alright ahm did you tell the Duty Manager.
	Electrician	I can't get him.
	Ground	OK ahm yeah ahm I'll have to get ontoShannon about this Shamrock because Im sure there's no way he's going to land without those edge lights particularly in this fog but listen I'll get back to you in a few minutes OK are you down in

The scheduled arrival time for this aircraft was 0545. The following is an extract from the exchanges between the surface movements controller and the various vehicles engaged on the airfield as the daily clean up and airfield checks were carried out:-

TIME	STATION	MESSAGE
0510.48	Ground	Maint one ground.
0510.53	Maint 1	Go ahead tower from Maint 1.
0510.56	Ground	Maint 1 are you nearly finished - this morning.
0511.02	Maint 1	Yes tower I'm just giving the runways a check for you.
0514.21	Rescue 3	Ground from 3 testing how do you read or ground from 4.
0514.29	Ground	Rescue 4 Ground.
	Rescue 4	Testing.
0514.32	Ground	Rescue 4 read you loud and clear.
0514.33	Rescue 4	Read you also loud and clear.
0515.55	Foxtrot Seirra 1	Cork Ground Foxtrot Sierra 1 testing how do you read?
	Ground	Sierra 1 read you strength 5.
0515.55	Foxtrot Sierra 1	Read you 5 x 5 Thank you.
0517.57	Ground	Read you loud and clear.
0518.04	Ground	Maint 2 Ground.
0518.14	Maint 1	Maint 1 tower.
0518.15	Ground	Maint 1 sorry are you ah clear of runway 17.
0518.19		Yes tower I'm clear of runway 17 I'm at the fireground.
0518.26	Ground	Maint 1 Ground Roger thanks.
0518.28	Ground	Rescue 5 Ground.
0518.40	Ground	Rescue 5 Ground.

0518.43	Rescue 5	Ground Rescue 5. Clear of 17/35, runways and taxiways are clear all airside checks carried out and doing landside now.
0518.56	Ground	Rescue ah 5 thats copies remain clear of Rw 17/35.
0519.01	Rescue 5	Will do.
0519.57	Maint 1	Cork Ground Maint 1.
	Ground	Maint 1 Ground.
	Maint 1	Whats the position getting on to Runway 35 runway tower please.
TIME	STATION	MESSAGE
	Ground	Maint 1 say again.
0520.04	Maint 1	Whats the position getting on to 35 runway for a minute or 2.
0520.11	Ground	Maint 1 negative traffic 5 mile finals runway 17.
0520.16	Maint 1	Thank you tower.
0520.22	Rescue 5	Ground Rescue 5 back on the ramp.
	Ground	Rescue 1 ground Roger Thanks.
0522.30		Ground Rescue 5 back on the ramp CAT II checks complete.

The radio-van gathered some workers from Locations 1 and 2 (Appendix B) who carried out runway cleaning duties before returning to the fireground. The electricians returned to the airport buildings from where the power to the runway lights was controlled. The foreman and the digger drivers remained in their respective positions.

As per the daily routine prior to the commencement of airport operations, the rescue vehicle, Rescue 5, from the Aer Rianta fire services carried out a runway and taxiway clearance run at 0503 hrs and reported all clear at 0518.50 hrs. At 0518 hrs the tower contacted maintenance 1 (the radio-van) who reported *"yes tower clear of runway 17, I'm at the fireground"*.

At 0520 hrs Maintenance 1 requested permission to enter Runway 35. The tower responded "*negative - traffic 5 miles Runway 17*".

At 0520 hrs Rescue 5 reports back on the ramp.

At 0523 the aircraft landed and the crew saw a mechanical digger exiting the side of the runway and brought the aircraft to a halt short of the blue van which was on the runway. The crew did not see the mechanical digger exiting at Location 1(Appendix B).

1.2 Injuries

Nil injuries.

1.3 Damage

Nil damage.

1.4 Personnel Information

Not applicable.

1.5 Meteorological Information

The following are the METARS issued for Cork Airport between 0600 UTC and 0700 UTC on 6th. June 1998:-

EICK 060600 17004KT 4500 BR SCT002
BKN007 BKN040 13/12 Q1004 TEMPO 8000 BKN010

EICK 060630 17004KT 3000S 6000N BR SCT002
BKN004 BKN008 13/12Q1004 TEMPO 8000 BKN010

EICK 060700 17004KT 1500 2000N - RADZ BKN002
BKN007 13/12 Q1004 BECMG 5000 SCT00 5 BKN008

1.6 Aids to Navigation

ILS to Runway 17 at Cork Airport.

1.7 Communication

Frequencies Used:-

Shannon 124.7

Cork Approach 119.9

Cork Tower 119.3

Cork Ground 121.8

Fire and Security Frequencies:-

1.8 Aerodrome Information

Cork Airport is an International Airport operated by Aer Rianta, at 51°50'N 08°29'W, located 3.5 nautical miles South of Cork City at 502 feet AMSL.

1.9 Flight Recorders

Not applicable.

1.10 Wreckage

Not applicable.

1.11 Medical

Not applicable.

1.12 Fire

There was no fire.

1.13 Survival Aspects

Not applicable

1.14 Tests and Research

Not applicable.

1.15 Additional Information

1.15.1 Organisation and Management

Several aspects of this incident merit consideration under this heading.

Aer Rianta engineers met with members of the Aerodrome Safety Section of the Irish Aviation Authority in February 1998, to outline the proposed works at Cork Airport. In these discussions, Aer Rianta according to minutes of the meeting produced by the IAA agreed to, inter alia, provide training for all the staff of the successful contractor, (it should be noted that this minute was not agreed by Aer Rianta).

The IAA pointed out the need for the contractors to have radios for two way communication with ATC however this was not a requirement for the construction works to proceed, and only the Aer Rianta radio-van was so fitted. None of the construction workers had either vehicle mounted or hand held radios tuned to the ATC or fire service frequencies as this would have been contrary to Aer Rianta policy on radio communications.

It is important to understand the structure of Air Rianta in order to establish the relationship between the various parties involved.

1.15.2 Aer Rianta Technical Consultants

Aer Rianta Technical Consultants produced the specification and contract for the work to be carried out at the three State airports, Dublin, Shannon and Cork. Technically then, in this instance, Aer Rianta Cork was the client of ARTC. Engineering supervision for the projects would have been provided in previous years by one of Cork Airports two resident engineers. These appointments have however been withdrawn by Aer Rianta and engineering support is provided on an ad hoc basis either from ARTC or from a locally recruited engineer, when such engineering support is required.

The nominated engineer for the overlay project at Cork Airport was on a short term contract and was not present or apparently required to be so during the works on June 5-6 1998. This in effect meant that the engineering supervision provided by either ARTC or Aer Rianta Cork was delegated to the operative in the radio-van.

During the morning of June 6, once the cable had been cut, all substantial construction work ceased. The electricians were working as fast as they could to restore power to the cables, for the expected arrival of the flight from Faro. It is important at this point to examine the communication between the control tower and the electricians.

As the effort to reconnect the cables continued towards the standard clear off time of 0500 hrs., several different but related activities took place. The radio-van operative began to gather construction workers and tools to return to the fireground. The standard daily checks of the runways and taxiways was begun by Rescue 5, the Fire and Emergency Services vehicle. These checks are standard procedure before flight movements irrespective of construction or other works.

Both drivers were interviewed. In his evidence, the radio-van operator said that he called to Location 1 and Location 2. He gathered up personnel not required for the cable reconnection, thereby leaving at Location 1 a mechanical digger and its driver, an electrician and his van, the contract foreman and his blue van, and at Location 2, a mechanical digger and its driver, an Aer Rianta electrician was also working at Location 1, and he also had a vehicle.

The driver of Rescue 5, passed these locations and noted that the radio-van was present. This driver assumed therefore that the radio-van would escort all personnel from the runway as usual. The electricians however continued working past the clear-off time, and instructed the construction workers to remain behind to backfill the trenches which had been opened.

In his evidence the contract electrician said that he meant the construction workers to remain in the fireground to be available for back filling. The foreman in his evidence understood he was required to remain at Location 1 and 2 with the mechanical digger. When the electrician returned to the airport buildings to try to power up the lights, the two mechanical diggers together with their drivers and its foreman in the blue van, and some tools remained on or close to the runway.

On reaching the fireground the driver of the radio van realised that all the vehicles had not returned to the fireground. He contacted the Tower, at 0520.04 to try to enter Runway 17/35 but was advised that he that an aircraft was on final approach. He could see however that there were still vehicles on or near the runway. The foreman had driven his blue van along the runway from Location 1 to Location 2, and had exited the van which was on the runway between the centre line and the right hand edge of the runway to engage the mechanical digger driver, who was in the cabin of his vehicle, in conversation.

The radio-van operator having been refused permission to enter the runway, without explaining why he wished to do so, now drove from the fireground towards Locations 1 and 2 to warn the digger drivers of the approaching aircraft. His vehicle however became bogged down and he exited the vehicle to run to the digger drivers shouting a warning as he did so.

The drivers of the mechanical diggers fortunately had seen the aircraft on the runway. The first digger moved rapidly from the runway edge (the aircraft crew were unaware of this vehicle). The digger driver at Location 2, shouted a warning at the foreman and drove his digger from the runway edge. The foreman ran to the blue van which was on the runway, but decided that he would not have time to move the van before the aircraft reached it. He therefore abandoned the van and ran from the runway after the digger.

1.15.3 Discussion

There is little doubt that all the parties, electricians, construction workers, operatives, were fully committed to restoring the runway edge lights for the arrival of the aircraft, and all efforts were in good faith in the mistaken belief that the airport would not be opened unless the runway edge lights were restored.

As can be seen from the exchange between the control tower and the electricians and given the weather conditions when the cutting of the cables was first reported, the implication that no aircraft could land was probably given to all the construction workers and the radio-van driver.

Thus when the normal runway clearance check by Rescue 5 and the call from the radio-van, that the runway was clear and whether the electricians left the runway to check if the runway edge lights could be powered, or to comply with the requirement to be clear by 0500 hrs., the two digger drivers and their foreman together with their three vehicles remained on or near the runway in the mistaken belief that the airport could not accept landing traffic in the weather conditions then pertaining without the runway edge lights.

This was a presumption on the part of the contract personnel. Notwithstanding the above there was also presumption on the part of the Rescue 5 driver in calling the runway clear whilst having passed vehicles (radio-van, blue van, 2 x mechanical digger, electricians van), which he assumed would be clear.

On reaching the fireground and realising that some vehicles were still on the runway instead of requesting permission to enter the runway the radio van driver should have informed the Tower that there were still vehicles on or near the runway, especially when he knew that there was an aircraft on 5 mile final. This was the final breakdown in a confused and confusing communication trail.

Notwithstanding the above, it must be stated that the level of supervision (given that on other than routine light construction work was ongoing due to the cutting of cables) devolved to the radio-van driver was far in excess of that which he was qualified or trained for.

Once the cables were cut the scenario changed from planned, straight-forward construction work, to emergency maintenance. No non-routine or emergency procedures were in place for such an event. The absence of an engineer either from ARTC or from Aer Rianta Cork created an oversight or management lacuna, which led to assumption, confusion and omission on the part of all the involved supervisory personnel.

2. Findings

- 2.1 The aircraft crew were properly qualified and rated.
- 2.2 The alertness of the aircraft crew averted an accident.
- 2.3 The driver of Rescue 5 reported runways and taxiways clear and that airside checks of the CAT II procedures were complete, despite seeing vehicles on the runway.

- 2.4 The driver of the radio-van called runway clear when it was not.
- 2.5 The driver of the radio-van did not advise the Tower of the presence of the vehicles when he was advised that there was an aircraft on final.
- 2.6 The electricians request for the construction workers to remain to backfill the trenches was ambiguous.
- 2.7 The construction foreman presumed that no aircraft would land because the runway edge lights were unserviceable.
- 2.8 Aer Rianta did not have a qualified engineer overseeing the work, at all times.
- 2.9 Aer Rianta did not, as had been requested by the IAA, provide radios for the construction foreman or his crew, as this would have been contrary to previous policy.
- 2.10 No provision was made in the procedures of handing back the runway from the construction personnel to ATC for any unforeseen event.
- 2.11 As the clean-up was ongoing at 0510 hours, the daily hand back of the airfield was already late.
- 2.12 There was inadequate communication between ATC, the Watch Tower, the rescue services and the construction foreman.
- 2.13 No training was given to the construction workers in the use of radio communications as this would have been contrary to previous policy.
- 2.14 The range of responsibilities delegated to the radio-van operative, including the supervision of the contracting crews and their equipment, the handing back of the runway on completion of work, were excessive for his skill, knowledge and training.

3. **Safety Recommendations (SR)**

- 3.1 When major construction works are planned for any airport the Airport Manager or his engineering representative should provide a detailed plan to the Aerodrome Safety Section of the Irish Aviation Authority. **(SR 8 of 1999)**
- 3.2 The plan should include detailed operational procedures to ensure the safety of the manoeuvring area. **(SR 9 of 1999)**

- 3.3 The Airport Manager should produce a Method Statement which the Irish Aviation Authority should examine as a Safety Case Risk Analysis and direct the Airport Management accordingly. **(SR 10 of 1999)**
- 3.4 The Airport Management should provide contractors with appropriate orientation on the nature of aircraft procedures at the subject airport. **(SR 11 of 1999)**
- 3.5 The Airport Management should liaise with Air Traffic Management to ensure confidence between Airfield Fire Services and Air Traffic Services is maintained. **(SR 12 of 1999)**
- 3.6 The Airport Management should ensure that all personnel engaged in airside activities including contract personnel are encouraged to bring any safety deficiencies, whether real or imagined directly to Air Traffic Services or Aircraft Operators attention. **(SR 13 of 1999)**

The following Interim Safety Recommendation was made by the AAIU on the 11th. June 1998, to the IAA and Aer Rianta:-

Prior to the commencement of operations at Cork Airport each day, the Air Traffic Control Tower Controller, shall ensure that the manoeuvring area is checked and reported clear of all vehicles and obstructions by the Aer Rianta Police and Emergency Service.

APPENDIX A

AIP SUPPLEMENT

IRELAND

Nr 2/98
10
MAR

AERONAUTICAL INFORMATION SERVICE

**IRISH AVIATION AUTHORITY
AVIATION HOUSE
HAWKINS STREET
DUBLIN 2**

Tel +353 1 6031192 Fax +353 1 6774068 AFTN EIDWYOYX

CORK AIRPORT (EICK)

**WORK ASSOCIATED WITH THE CONSTRUCTION OF AN OVERLAY
AND SHOULDERS TO RUNWAY 17/35**

1. For a period of approximately 32 weeks commencing in early April 1998 work will be in progress on the construction of an overlay and shoulders to Runway 17/35 at Cork Airport.
2. Construction work, which will be carried out in the areas shown on the appendix to this supplement, will consist of:-
 - (a) Installation of cable ducting along pavement edges,
 - (b) installation of temporary runway edges,
 - (c) construction of 7.5m wide shoulders on both sides of the runway,
 - (d) construction of an asphaltic overlay to the existing runway pavement and
 - (e) removal and reinstallation of light fittings in the runway and taxiway pavements
3. Work will generally be carried out between 23.00 and 06.00 hours, seven nights a week. In addition some electrical works including cabling may be undertaken between the hours of 08.00 and 18.00, Monday to Saturday inclusive.

During the night time working periods Runways 17/35 and 07/25 will be withdrawn from service. At the end of each of these work periods the runways will be restored to service by the provision of temporary ramps and runway markings.

4. The construction of the overlay will necessitate the withdrawal of the runway centreline and touchdown zone lights from service for approximately 24 weeks.
5. To facilitate the construction of the runway shoulders, the runway edge lights will be re-positioned at a distance of 10m from the existing runway edges. It is expected that the runway edge lights will be located in this temporary position for approximately 19 weeks.
6. Exact dates and times of (a) the commencement of the works, (b) the withdrawal of runway centreline and touchdown zone lights from service, (c) the introduction of the temporary runway edge lights into service and (d) the cabling works will be promulgated by NOTAM.
7. The working area will, where necessary, be marked by day and lighted at night.

B. D. Mc. Donnell
Chief Executive