FINAL REPORT

AAIU Synoptic Report No: 2009-010
State File No: IRL00900939
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In accordance with the provisions of SI 205 of 1997, the Chief Inspector of Air Accidents, on 17 August 2007 appointed Mr. Leo Murray as the Investigator-in-Charge to carry out an Investigation into this Serious Incident and prepare a Synoptic Report.

Aircraft Type and Registration:	McDonnell Douglas MD-83, G-FLTM
No. and Type of Engines:	2 x Pratt & Whitney JT8D-219
Aircraft Serial Number:	53052
Year of Manufacture:	1990
Date and Time (UTC):	16 August 2007 @ 23.34 hrs
Location:	Santry Cross, near Dublin Airport
Type of Flight:	Public Transport
Persons on Board:	Crew – 6 Passengers – 112
Injuries:	Crew – Nil Passengers – Nil
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence (Aeroplanes), issued in Croatia
Commander's Details:	Male, aged 42 years
Commander's Flying Experience:	5,077 hours, of which 2,626 were on type
Notification Source:	Station Manager, Dublin ATC
Information Source:	AAIU Field investigation

SYNOPSIS

The aircraft departed Lisbon with the Co-pilot as Pilot Flying (PF). The flight progressed without incident until commencing its approach to Dublin Airport. The approach was made at night; the weather and visibility were good. Due to scheduled maintenance on the main runway (RWY 10-28), RWY 34 was in use for landing. The flight was cleared by Air Traffic Control (ATC) to carry out a non-precision approach to RWY 34. During the approach, at approximately 5 nautical miles (nm) from touchdown, the aircraft began to deviate left of the approach course. This deviation was due to the Flight Crew mis-identifying the lights of a hotel at Santry Cross as those of the runway approach lighting system on RWY 34. The aircraft continued to descend below the Minimum Descent Altitude (MDA) without proper visual identification of the runway in use, and continued to descend to an altitude of 580 ft above mean sea level (AMSL) before executing a go-around.

At the point the go-around commenced, the aircraft was approximately 1,700 ft from the building and 200 ft above it. On the instructions of ATC the aircraft turned right and climbed to a safe altitude. The aircraft subsequently landed without further incident. There were no injuries.

1. FACTUAL INFORMATION

1.1 History of the flight

The crew of six, comprising two pilots and four cabin crew, reported at Dublin Airport to operate a three-sector duty on the day of the occurrence. The first sector required the aircraft to position (carrying no passengers) to Belfast International Airport (Aldergrove). From Belfast the aircraft operated a scheduled passenger charter to Lisbon, Portugal. These sectors were operated without incident. FLT344E, departed Lisbon at 21.05 hrs with 112 passengers. The aircraft was fully serviceable with no defects noted in the aircraft technical log by the Commander. The flight proceeded routinely until descent into Dublin.

With a westerly wind forecast for Dublin, according to the London Volmet,[1] the Flight Crew prepared for a descent and approach to RWY 28, the main runway. However, a NOTAM[2] in the flight documentation (No. A1362/07) indicated that RWY 10-28 would be closed from 21.30 hrs to 04.30 hrs due to scheduled maintenance being carried out. During descent, the ATIS[3] broadcast confirmed that RWY 34 was in use for landing. The Co-pilot, as PF, then briefed the PNF for a VOR-DME[4] approach on RWY 34 using the approach plate. At 23.17 hrs the Flight Crew contacted the approach controller on 129.175 Mhz and were cleared to establish inbound for the VOR-DME approach RWY 34. At this point the aircraft was at Flight Level[5] (FL) 240 with a groundspeed of 290 knots (kts). At 23.18 hrs the controller indicated that this would be a straight-in approach, checked to see if this was acceptable to the Flight Crew (as they were high on the descent profile), and further cleared FLT344E to descend to FL100. With the aircraft 73 nm from touchdown the controller again enquired if that was sufficient distance for the Flight Crew to lose the remaining height. After a repeated call the Flight Crew replied in the affirmative, and FLT344E was further cleared to descend to FL70. At 23.25 hrs the flight was cleared to descend 5,000 ft on QNH 1014 hPa (hectoPascals). At 23.27 hrs a continued clearance to 3,000 ft was given by ATC.

At 23.30 hrs, as the aircraft passed to the west of Killiney, the Flight Crew changed frequency to the Tower Controller on 118.600 Mhz stating the flight was *'established Radial 162 inbound'*. The call was acknowledged by ATC and the aircraft was cleared to land on RWY 34. The aircraft established on the approach course to RWY 34 at a distance of 8 nm from the threshold at 2,900 ft. At 5.5 nm from touchdown and descending through 1,900 ft the aircraft began to deviate to the left of the runway approach course. At 23.34 hrs the Tower Controller passed a final wind check of 260 degrees at 12 kts. The aircraft descended below the MDA of 720 ft and continued to deviate away from the runway approach centreline. At 23.34:52 hrs the Flight Crew transmitted: '*Tower confirm that you have all… all lights on the runway three four that's on'*.

[1] **Volmet**: Meteorological information for aircraft in flight, broadcast from various stations.
[2] **NOTAM**: Notice containing essential information with regard to aeronautical services.
[3] **ATIS**: Automated Terminal Information Service.
[4] **VOR-DME**: VHF Omni Range with Distance Measuring Equipment.
[5] **Flight Level**: Three-digit representation of aircraft altitude referenced to standard pressure.

At 23.34:58 hrs the Tower Controller (AMC) transmitted: *'Flightline Three Four Four Echo you're…turn right now, turn right…you have the…you're not landing on the runway…Flightline Three Four Four Echo climb to two thousand feet.'* The PF executed a go-around and climbed as instructed, changing frequency back to the Approach Controller on 129.175 Mhz. The Approach Controller gave the Flight Crew of FLT344E the option of an ILS approach to land on RWY 16, and after considering the wind, the Flight Crew accepted vectors and completed an ILS on RWY 16, landing without further incident at 23.54 hrs. The track of FLT344E is reproduced in **Appendix A**. The Tower Controller informed the next arriving aircraft of the go-around that had occurred and indicated that the Flight Crew had a problem seeing the runway lights. The Flight Crew of the following aircraft reported that they were fully visual with the runway lights and that the brightness level was 'fine'. This aircraft then completed its approach in a routine manner and landed on RWY 34. A transcript of exchanges with ATC in set out in **Appendix B**.

1.2 Subsequent events

On completion of the flight no de-brief concerning the incident took place between the Commander and Co-pilot. The Tower Controller filed an Occurrence Report following the end of duty. The Report indicated that the aircraft was given a go-around on short finals to RWY 34 as the '*aircraft had veered to the left at 1.5 nm from touchdown due to pilot confusion with runway lights and apparent lighting in the vicinity of Westpoint Hangar*[6].' The event was logged as a reportable occurrence, but it was not classed as serious.

The following day, radio media highlighted the low flying of a commercial aircraft in the vicinity of Santry Cross, to the south of Dublin Airport. Enquires by the AAIU revealed that the aircraft had significantly deviated away from the runway approach course, and descended to such a low altitude, that the event was deemed a Serious Incident and a Formal Investigation was commenced.

1.3 Aircraft Information

The aircraft, a DC9-83 (MD-83) was built in 1990 and was registered as G-FLTM to the current operator on 1 June 2007. The EASA[7] Certificate of Airworthiness was valid to 31 May 2009.

1.4 Air Traffic Control

Air Traffic Control (ATC) at Dublin comprises Sector Radar, Approach Control, Air Movement, and Ground Movement Control. ATC is co-ordinated by a Station Manager (SM) from a position in the Control Centre.

Sector Radar is divided into two Units, North Sector and South Sector. Each Sector Radar Unit consists of an executive position and a planning position occupied by an Executive Controller (EC) and a Planning Controller (PC). Dublin North Sector operates continuously, whereas Dublin South Sector only operates from 06.30 hrs to 22.30 hrs (Local). Dublin Approach Control operates one Radar Unit. This Unit consists of two positions, Approach Finals (Approach Controller) and Approach Holding (Holding Controller). Approach Finals operates continuously, Approach Holding operates from 07.00 hrs to 22.00 hrs (Local).

[6] **Westpoint Hangar**: Situated south of, and close to the midpoint of RWY 10-28.
[7] **EASA**: European Aviation Safety Agency.

Dublin Air and Ground Movements are Controlled as follows: From 06.30 hrs to 22.00 hrs Air and Ground Movements are controlled by two ATCO's[8] positioned in the Tower. The Air Movements Controller assumes sole responsibility for both Air and Surface Movement Control after 22.00 hrs (local).

The event was initially reported to the Station Manager by the Executive Radar Controller (EC) and a written report was submitted by the Air Movements Controller (AMC) in accordance with the Irish Aviation Authority (IAA) MOR[9] scheme. An Air Traffic Management (ATM) Specialist (Safety, Standards and Procedures) was tasked with conducting an internal investigation, which commenced on 17 September 2007. The AAIU conducted interviews with the SM, the EC and the AMC. Both the EC and AMC were both appropriately licensed and rated ATCO Experts.

1.5 Interviews

1.5.1 Aircraft Commander (PNF)

The Commander submitted a written report of the occurrence to the Investigation. In this, he stated that he had received the ATIS and all relevant information for the approach, meteorological report, runway in use, and type of approach. He stated that the First Officer, who was PF, gave a standard briefing for a VOR-DME approach to RWY 34. When cleared for the approach the PF had engaged VOR tracking mode on the DFGS (Digital Flight Guidance System), the Autopilot captured the inbound course of 342ºM and tracked inbound. He said that descent was started in accordance with the procedure; the PNF called out crossing altitudes and monitored the vertical speed (descent rate).

At about 1,500 ft the PF selected Heading (HDG) on the DFGS instead of VOR tracking. The aircraft then deviated left of the inbound course. The Commander stated that he initially drew this deviation to the attention of the PF, as indicated by the Course Deviation Indicator (CDI). The PF confirmed '*I see it*' and adjusted the heading to the right to correct the deviation. With the aircraft tracking left of the approach course, he again called the CDI deviation to the PF, who then disengaged the Autopilot. The lateral DFGS mode remained in HDG. At around 1,000 ft the PNF started looking out for the runway. The PNF asked the PF '*do you see the runway?,'* the PF replied '*I see the PAPI*'. In his statement the Commander states that it was obvious that both he and the PF had a different interpretation of their position in relation to the runway. He stated that he ordered a go-around and subsequently contacted the approach controller for vectors for landing on RWY 16. His written account was expanded upon during interview. The Commander (PNF) said that he monitored the approach on the instruments down to 1,000 ft, and on looking up at this point, saw the runway lights, and had them in sight as the aircraft continued to descend. In his opinion '*a go-around was certain as the aircraft was left of track'*. He stated that he did not ask the Controller if the approach lights were switched on. A recording of the ATC Radar tape was then played at the request of the Commander, the audio channel recording clearly indicated his query to ATC: '*confirm you have the lights on 34 that's on?*' He said that just before the go-around was executed he could see the runway lights including the runway edge lights to his far right. When shown photographs of the 16-storey building at Santry Cross, under night conditions, he did not recognise it.

[8] **ATCO**: Air Traffic Control Officer.
[9] **MOR**: Mandatory Occurrence Report.

1.5.2 Co-pilot, Pilot Flying (PF)

The PF gave a frank account of the occurrence to the Investigation. The majority of his flying experience was obtained in military operations and later in fire-control (water-dropping) operations. He commenced commercial flying with an Italian-based operator in 1999, flying the MD-83. He joined the current Operator four months prior to the Occurrence.

He recalled that on the day the Flight Crew had expected an ILS approach to RWY 28 and had planned the descent profile accordingly. Only after copying the ATIS did he realise that RWY 34 was in use. This necessitated re-setting the radio aids on the flight deck and briefing for the VOR-DME RWY 34 as per the approach plate. With less track distance to this runway the aircraft became high on its descent profile. Nevertheless, the aircraft was stable and in the required landing configuration at an early point on the approach. The PF thought he saw the approach lights ahead and slightly to the left. He stated to the PNF '*I have the PAPIS*' and selected heading (HDG) mode on the Auto Flight system. He then adjusted the heading left in increments to maintain what he thought were the runway approach lights in view. When asked why he did not execute a go-around, he said he considered it to be a decision for the Commander. He only executed a go-around on the direct instruction of ATC.

1.5.3 Station Manager (SM)

The SM reported for duty at 21.00 hrs on the evening of the occurrence. Operations were normal, except that RWY 10-28 was closed due to scheduled maintenance. When the night shift commenced that evening, all five personnel were deployed at operational positions, with two in the Control Tower and three in the Control Centre. As traffic levels reduced it was normal procedure for the Approach Control function to be transferred to the EC (North) position. The SM considered it best practice for the EC Area Radar controller to be in close proximity to the Approach Radar Controller. At the time of the occurrence the deployment of staff was as follows: The SM and two multi-rated ATCOs were in the Control Centre, one ATCO was in the Tower and two ATCO's were on relief break. The SM confirmed the EC moved from the Approach Suite to the EC (North) position at approximately 23.10 hrs. Following the occurrence, the SM went immediately to the EC Radar position where he was briefed by the EC. After the go-around with FLT344E, he told the EC to offer the Flight Crew Radar vectors to an ILS approach to RWY 16. The SM considered that additional airfield lighting (due to work in progress on the closed runway) may have possibly confused the Flight Crew of FLT344E and he regarded the go-around as standard procedure and appropriate in the circumstances.

1.5.4 Executive Controller (EC)

The EC commenced duty at 22.30 hrs on the Approach Sector. Traffic was busy for the first hour or so but eased off to one or two items after this period. As the traffic volume eased, he moved to the North Radar suite position, as is normal practice during the night shift where he performed the tasks of EC North and Approach control. Also on duty was a Planning Controller (PLC) who was assisting the EC in his duties. The EC uses an Operational Display System (ODS) and varies the range and mapping settings to the task at hand. ARTAS[10] was selected as the main tracking system. The EC stated that he selected a range of 35 nm on his ODS to conduct approaches.

[10] **ARTAS**: ATM Surveillance Tracker and Server system.

FLT344E was vectored on to the final approach course and at approximately 10-12 nm from touchdown he cleared the aircraft for a VOR-DME approach to RWY 34. When the aircraft was established on the final approach track the EC transferred control of the aircraft to the AMC for landing clearance. His attention was then transferred to the second and third items of inbound line traffic. When asked if he had detected the track deviation of the FLT344E, he stated that he noticed the aircraft was marginally left of centreline, however, this did not concern him as the aircraft was conducting a non-precision approach and some track deviation was not unusual. As the deviation was slight he did not see the need for correction, given the excellent weather conditions. He believed the aircraft was paralleling the final approach track very slightly to the left. He also stated that 24 aircraft had earlier conducted VOR-DME approaches to RWY 34 with no reported problems. He noticed a significant deviation from track when FLT344E was approximately 2 to 3 nm from touchdown, immediately before the MSAW[11] activated. He contacted the AMC by intercom to initiate a go-around but the AMC was already in the process of initiating the go-around.

1.5.5 Air Movements Controller (AMC)

The AMC reported for duty at 22.30 hrs and stated to being well rested. All Tower equipment was serviceable. Of particular importance was the Remote Status Indicator (RSI), which indicated that the VOR-DME installation was radiating signals within normal limits. The AMC was assisted initially by a Surface Movements Controller (SMC). On commencing duty the Air Traffic Monitor (ATM) was set to a range of 20 nm. Runway edge and approach lighting were set at 'Strength 2' (5% of maximum brilliance). During the first hour several aircraft were vectored routinely to an ILS approach to RWY 16. Later, when traffic levels had reduced at approximately 23.15 hrs, the SMC left the tower. The AMC now assumed responsibility for both AMC and SMC operational positions.

FLT344E contacted the AMC on 118.600 MHz when it was about 8-10 nm from touchdown. The aircraft was issued with a landing clearance and given a wind check. Soon after this an R/T[12] exchange took place between the AMC and a ground vehicle working on RWY 10-28. As this exchange took place, FLT344E enquired if the runway lights were switched on. At this point the AMC noticed that the FLT344E was significantly off track and gave instructions for the aircraft to immediately turn right and to climb to 2,000 ft. Simultaneous to this transmission the EC called the AMC via the intercom to initiate a go-around. The AMC informed the following aircraft, which was landing on RWY 34 of the go-around. This aircraft advised ATC that they were visual with the runway and that the approach lighting level was '*fine*'. This following aircraft completed its approach and landed on RWY 34 without incident.

1.6 Injuries to Persons

There were no injuries to the 112 passengers or 6 crew members on board, or to any other person.

1.7 Damage to aircraft

There was no damage to the aircraft.

[11] **MSAW**: Minimum Safe Altitude Warning.
[12] **R/T**: Radio Telephony transmission.

1.8 Personnel Information

1.8.1 Aircraft Commander

Male, aged 42 years. The Commander held an Airline Transport Pilots Licence (Aeroplanes) issued in Croatia. He performed his last Periodic Check on 18 May 2007, and held a Class I medical certificate dated 23 May 2007.

Commander's Flying experience:

Total all types:	5,077 hours
Total all types (P.1):	3,386 hours
Total on MD-83:	2,626 hours
Total on MD-83 (P.1):	2,626 hours
Last 90 days:	120 hours
Last 28 days:	45 hours
Last 24 hours:	6 hours
Duty time up to incident:	9 hours 10 minutes
Rest period prior to duty:	18 hours 26 minutes

1.8.2 Co-pilot

Male, aged 62 years. The Co-pilot held an Airline Transport Pilots Licence (Aeroplanes) issued in Italy. He performed his last Periodic Check on 11 February 2007, and held a Class I medical certificate dated 6 August 2007. The Co-pilot had considerable and varied flying experience, as prior to 1999 he had gained approximately 6,500 hours on military aircraft. He then obtained an MD-83 type rating and remained on the type for 8 years. At the time of the occurrence he had 4 months with the current operator.

Co-pilot's Flying experience:

Total all types:	11,000 hours
Total on MD-83:	4,500 hours
Last 90 days:	70 hours
Last 28 days:	36 hours
Last 24 hours:	4 hours
Duty time up to incident:	9 hours 10 minutes
Rest period prior to duty:	18 hours 26 minutes

1.9 Meteorological Information

The relevant METARS[13] were obtained and showed very little change in the Meteorological situation over the period 23.00 hrs to midnight. The report at 23.30 hrs shows a south-westerly wind from 260 degrees at 12 kts, visibility in excess of 10 km, cloud cover 'Few' at 2,000 ft, 'Broken' at 7,000 ft, temperature 12 ºC, dew point 9 ºC, QNH 1014 hPa with 'no significant' change expected.

[13] **METAR**: Report of actual meteorological conditions.

16 Aug	23.00	260/11	10 km	FEW/2000	BKN/7000	12/9	1014	NS
	23.30	260/12	10 km	FEW/2000	BKN/7000	12/9	1014	NS
17 Aug	00.00	260/12	10 km	FEW/2000	BKN/7000	12/9	1014	NS

1.10 NOTAM Information

The Flight Crew were in possession of NOTAM information for all destination and alternate airports. NOTAM A1362/07 for Dublin (EIDW) indicated that the main runway 10-28 would be closed between 21.30 and 04.30 hrs for maintenance:

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DEPARTURE:EIDW(DUBLIN IRL / DUBLIN INTL)

AGA :    B)07/04/16 07:00 UTC                    C)07/10/26 15:00 UTC                    (A0609/07)
         E)RWY 11/29 CLOSED
         REF AIP EIDW AD 2.12

AGA :    B)07/08/13 21:30 UTC                    C)07/08/17 04:30 UTC                    (A1362/07)
         E) EIDW RUNWAY 10/28 CLOSED
         2130 TO 0430 HOURS DAILY

AGA :    B)07/08/13 06:00 UTC                    C)07/08/18 17:00 UTC                    (A1374/07)
         E) 0600 TO 1700 DAILY.
         RWY 16/34 CLOSED FOR LANDING AND TAKE OFF
         REF AIP EIDW AD 2.1
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1.11 Approach Procedure RWY 34

1.11.1 General

The instrument approach procedure for this runway, is the 'VOR DME 34'. The VOR associated with the VOR-DME 34 procedure is situated 5.2 nm northwest of Dublin Airport, position N53º 29.9' W006º 16.43' and operates on frequency 114.9 Mhz/Ch 96. This procedure is published in AIP Ireland[14]. The procedure is termed a 'non-precision approach' (NPA) and has two components: a lateral component, which requires an aircraft to track inbound on a course of 342 ºM towards the DUB VOR, and a vertical component, which requires the pilot to set a rate of descent so as to comply with mandatory crossing altitudes[15] on the approach. The Flight Crew must not descend below the MDA unless the landing runway is in sight and the aircraft suitably positioned and configured to land.

1.11.2 Auto Flight

The MD-83, in common with other commercial transport aircraft, can track the inbound course automatically using the VOR-LOC selection on its Auto Flight system. With VOR-LOC selected the Auto Flight system will then track the inbound course adjusting for variations in wind that may occur. The vertical profile, however, must be calculated by the PF and controlled using the vertical speed (V/S) selection on the Auto Flight system.

[14] **AIP Ireland**: Aeronautical Information Publication, Ireland published by the IAA.
[15] **Crossing altitudes**: 1,800 ft, 2,400 ft and 4,100 ft at 10.0 12.0 and 17.5 nm for DUB VOR respectively.

Any variation in wind will affect the groundspeed and will require an adjustment of the V/S rate. Both pilots must monitor the descent profile achieved during the final approach. In practice operators use commercially supplied approach charts such as *Jeppesen* instead of the AIP, as these packages cover the entire operational network (**Appendix C**) as used by the Flight Crew.

1.11.3 Approach and Runway Lighting

As the approach procedure to RWY 34 is a non-precision procedure, the approach lighting consists of a 'Simple Approach Lighting System'. This comprises a centreline of white lights with one crossbar. The runway lighting itself consists of a row of green threshold lights across the edge of the paved surface and white runway edge and centreline lights, with red/white PAPIS[16] on either side of the touchdown point (**Appendix D**).

1.12 Radar Information

Radar recordings, showing the approach of FLT344E to RWY 34 were obtained from the IAA Air Traffic Services at Dublin Airport. They show the aircraft descending under radar vectors and passing to the west of Killiney positioning to intercept the final approach course at 12 nm from the DUB VOR.

The aircraft began to deviate from the final approach course at 4.8 miles from the runway threshold. At this point the aircraft was at 2,000 ft and a speed of 130 kts. At 1.3 miles the MSAW on the Radar screen activated. Passing 1,100 ft the aircraft turned further left tracking directly towards an obstacle identified as a 16-storey Hotel situated at Santry Cross. Radar information confirmed the aircraft had descended to below 600 ft AMSL before the go-around was executed. The aircraft continued to descend until instructed to turn and climb by the AMC in the Tower. At the point where the go-around commenced, the aircraft was approximately 520 metres (1,706 ft) from the building and 61 metres (200 ft) above it.

1.13 Flight Recorders

1.13.1 Flight Data Recorder (FDR)

Information from the FDR was downloaded for examination. The data revealed the flight cruise level of FL320 with descent commencing initially to FL240. Descent from this level was continuous until the go-around manoeuvre. Passing 2,224 ft the autopilot was disconnected and a track deviation to the left began. Heading was progressively decreased to 323 degrees (M) just before the lowest altitude reached of 552[17] ft, with reference to standard pressure of 1013 hPa. At this point the go-around manoeuvre was commenced with engine power and pitch angle increasing.

1.13.2 Cockpit Voice Recorder (CVR)

Information contained on the CVR was not preserved by the Flight Crew and consequently was not available to the Investigation.

[16] **PAPIS**: Precision Approach Path Indicating System.
[17] **552 ft**: When corrected for QNH, this equates to 580 ft AMSL.

1.14 Tests and Research

The Tower Controllers report identified that the Flight Crew might have mistaken '*apparent lighting in the vicinity of Westpoint Hangar*' with the runway approach lights on RWY 34. The AAIU conducted a series of test approaches using an Irish Air Corps helicopter in both day and night conditions to determine the cause of FLT344E's deviation from the approach track.

Weather conditions on the day of the test were similar to those on the 16 August 2007 except the wind was from a more Northerly direction. Visibility was in excess of 10 km with scattered cloud. For safety reasons the approaches were made using a twin-engine helicopter, which was capable of flying the standard VOR-DME approach at the required speed and then slow up to a hover when required for photographic purposes.

A series of approaches were initially made in daylight conditions for familiarisation and to ensure no hazards were present prior to conducting night approaches. The first approach was flown along the correct inbound course as per the published procedure breaking off the approach at 500 ft. The next approach was conducted as close as possible to that flown by FLT344E with the test helicopter slowing up as it neared the go-around point. Photographs were taken of the Hotel under day and night conditions. (**Photo No. 1** and **Photo No. 2**).

Photo No. 1:
16-storey building at Santry Cross
(under daylight conditions)

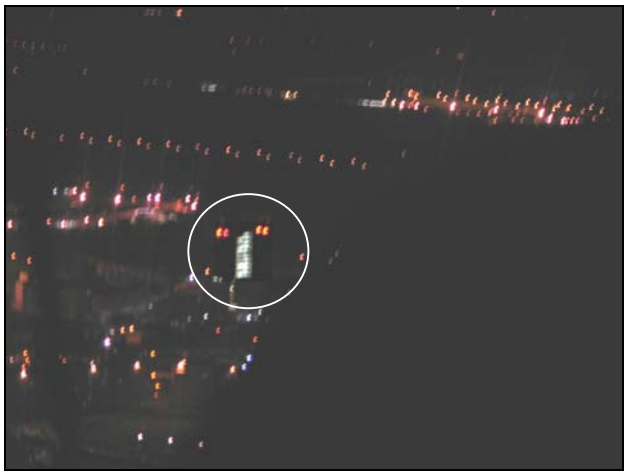

Photo No. 2:
16-storey building at Santry Cross
(under night conditions)

Photo No. 3 shows the RWY 34 Approach lighting as it would appear to an aircraft on finals. The aircraft is now on a 3-degree visual descent path, with guidance to the Pilot being provided by PAPI, indicating white/red either side of the RWY.

It was readily apparent to the Investigation that under night conditions, the lighting on the 16–storey building at Santry Cross, resembled the approach lighting on RWY 34. It was also evident that, under night conditions, the approach lighting can be difficult to identify due to extraneous lighting from the city environs on this approach. **Photo No. 4** illustrates the visual picture of the approach, at a distance of 5.5 nm to RWY 34, with the Hotel and Approach lights both visible. As this distance from the runway, the PAPI's indicate all red as the aircraft is below the visual profile.

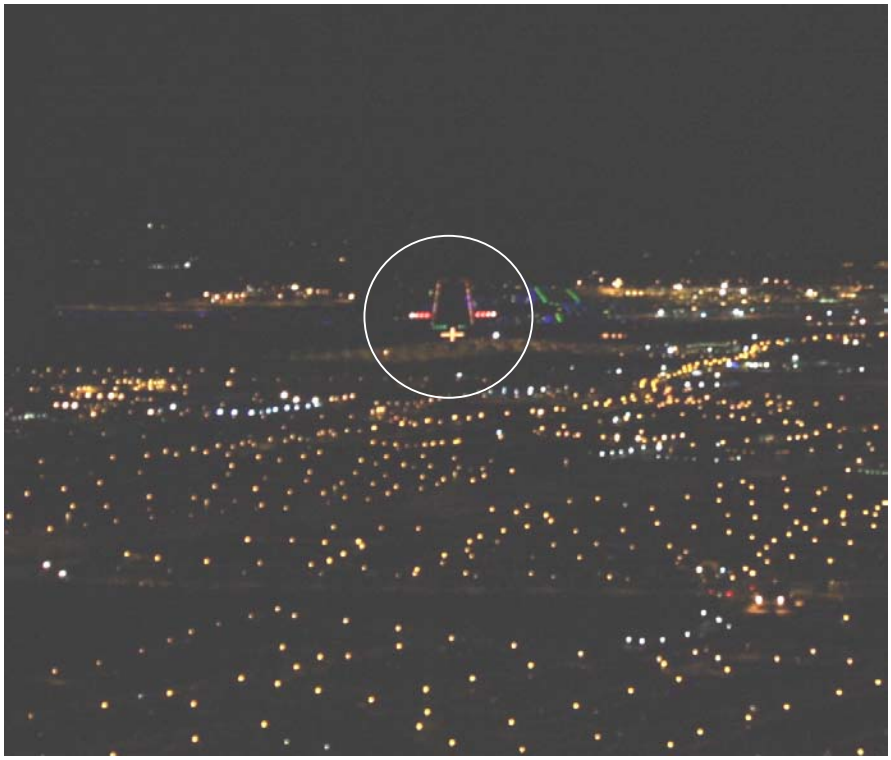

Photo No. 3: RWY 34 approach lights at 3 nm to the RWY

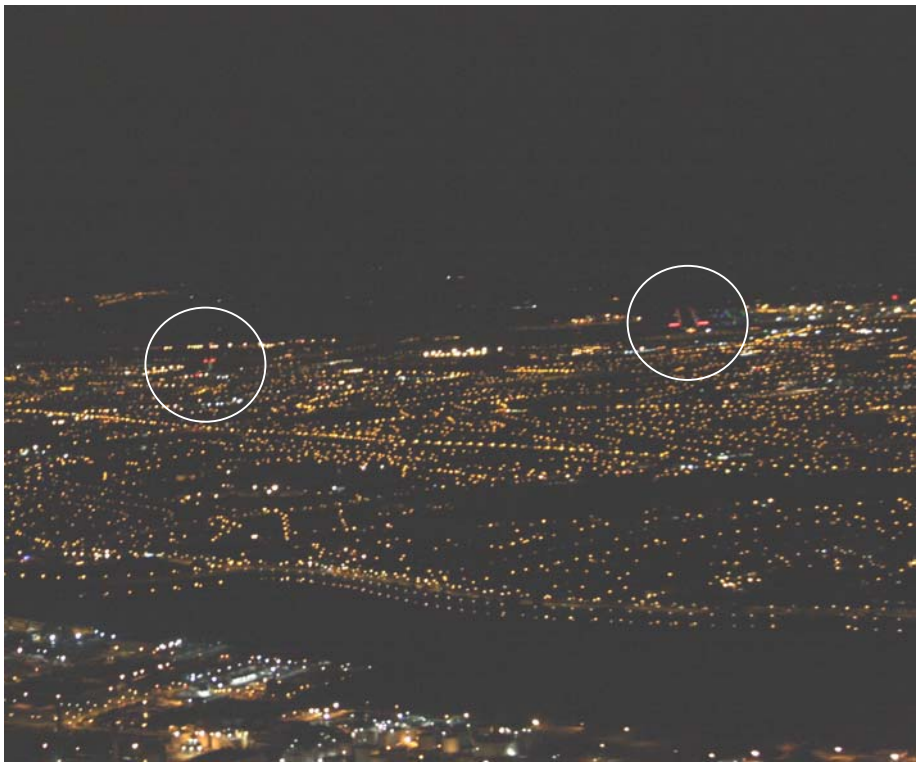

Photo No. 4: View of the RWY 34 approach at 5.5 nm to touchdown, with the Hotel building at Santry Cross indicated on the left of the photograph.

1.15 Standard Operating Procedures (SOP)

SOP are procedures formulated by the Operator to be followed by the Flight Crew in both Normal and Emergency situations. Several SOP in the Operations Manual are relevant to this occurrence:

- Use of the Flight Guidance System (Ops Manual, Section 2.1.5.2)
- Approach Policy (Ops Manual, Section 2.1.5.4)
- Crew Briefing before Approach and Landing (Ops Manual, Section 2.1.5.7)
- Crew Co-ordination Procedure for a Manual Approach, followed by a Manual Landing (Ops Manual, Sector 2.1.5.9)
- Non-Precision Approach (Ops Manual, Sector 2.1.5.10)

In line with current aviation policy, the operator encourages full use of the Auto Flight Systems, in that the primary method of executing an approach is by use of the autopilot and autothrottle regardless of weather conditions. If the approach cannot be completed using the Flight Guidance System (FGS) and is not coupled to an ILS localiser and Glideslope, a *'Manual crew co-ordination procedure'* must be carried out.

As the approach intended was a non-precision approach (no Glideslope and Localiser component) a '*Crew co-ordination Procedure for a Manual Approach, followed by a Manual Landing'* was appropriate. This states: '*Crew co-ordination and monitoring: Two types of crew co-ordination procedures for approaches are distinguished: An 'Automatic crew co-ordination procedure' where the Flight Guidance System (FGS) is in automatic flight mode of operation (Autopilot and Autothrottle ON) and is coupled to an ILS Localiser and Glideslope; and a 'Manual crew co-ordination procedure' where one or more of the above criteria cannot be complied with'.*

According to SOP, the PF shall give the approach briefing preferably before starting the descent. It shall be completed or confirmed in response to the applicable item on the descent checklist. A number of items must be covered in this briefing including Minimum Sector Altitude, Minimum Crossing Altitudes and Runway and Approach Lighting. During an approach, the PF should fly the aircraft using the Auto Flight system primarily with reference to the instruments. When external visual reference is announced by the PNF, the PF must verify these visual cues and call *'Landing'* if it is appropriate to do so. This call also indicates that from that moment on the PF will be flying primarily by visual cues. The PNF should monitor the flight path and check for visual references. He should state clearly when the approach light system, threshold lights or markings, or touchdown zone lights or markings become visible. After the PF calls *'Landing'* the PNF must monitor the flight path by reference to the flight instruments and outside visual cues. In common with other operators, the preferred method to fly a non-precision approach is using a 3º continuous descent slope starting at the Initial Approach Altitude down to MDA without destabilising platform steps. Upon reaching MDA a landing must be made or a go-around must be initiated.

1.16 Crew Resource Management (CRM)

CRM is an essential element in the operation of commercial aircraft. The use of CRM is designed to make optimum use of available resources thereby improving safety. CRM involves enhanced crew co-ordination, effective communications, good situational awareness, and conflict resolution. Flight and Cabin Crews are trained and assessed on their knowledge and use of CRM principles. Effective CRM training involves developing a wide range of skills as a crewmember. These skills include leadership, decision-making, communications, teamwork, crew co-ordination, and situational awareness.

The following extract from the Operators 'Part B Operating Procedures', Section 2.1.1.3, is relevant to this occurrence: *'Accident studies show that, in approximately 69 percent of all aviation accidents, the flight crew was identified as a primary causal factor. These accident studies also show that a breakdown in CRM was a significant factor in these flight decks. Failure to follow standard operation procedures; failure of the pilot not flying (PNF) to monitor the pilot flying (PF); and unchallenged tactical decision errors by the Captain were the leading causes identified.'*

1.17 Flight Crew Training

The Flight and Cabin Crew underwent initial and refresher training in CRM as required by regulation. In addition to this, both Flight Crew members underwent proficiency checks as required by licensing regulations in an approved simulator. These checks take the form of a Licence Proficiency Check (LPC) or Operators Proficiency Check (OPC) and include a CRM assessment, which is graded by the Type Rating Examiner (TRE). CRM training and checks were as follows:

Commander		**Co-Pilot**	
CRM Training	3 May 2007	**CRM Training**	16 June 2007
LPC	18 May 2007	**OPC**	8 June 2007
CRM Line Assessment	4 June 2007	**CRM Line Assessment**	19 July 2007

The Commander's CRM assessment during the course of his LPC was graded '*Satisfactory*' with the TRE comment '*Standard CRM & MCC issues*'. The Co-pilot's CRM assessment during the course of his OPC was graded 'Satisfactory' with the TRE comment '*Standard issues of CRM & MCC*'. Following the successful completion of the LPC/OPC both Flight Crew members underwent Line Assessments, which again include a CRM assessment.

1.18 Commander's Responsibilities

Commander's responsibilities are specified in the company Operations Manual, Part A General (Organisation). The Commander's function is described as follows: '*The Commander is responsible to his Fleet Manager to ensure the safe, legal and efficient operation of his aircraft, the safety, welfare and discipline of all persons and the security of all baggage, cargo and mail, in his charge.'*

The document further details the overall and specific responsibilities of the Commander both prior to, and during flight. Of note are the following paragraphs from *Section 1.3.13*:

During the flight: '*…to ensure the aircraft in his charge is operated at all times in accordance with Company Standard Operating Procedures (SOP), including the relevant procedures, performances and limitations specific to the aircraft type.'*

'…to ensure the accurate navigation, and control of the aircraft so that its position and the safety altitude associated with the position, is known at all times and accords with the Air Traffic Control (ATC) Clearance, as issued or amended and accepted as safe. To ensure that if the aircraft deviates from the ATC clearance, or a safe flight-path, an alternative clearance or safe flight-path is established as soon as possible.'

1.19 Obstacle at Santry Cross

1.19.1 General

The Investigation, in AAIU Preliminary Report No. 2007-019, identified the lighting on a 16-storey hotel, situated at Santry Cross, to be a contributory factor in this Serious Incident. This building, has an overall height of 52.75 metres (m) and an elevation of 116 metres O.D.[18] The building is considered to be an obstacle to aircraft in flight according to the definitions contained in S.I. 215 of 2005 (Obstacles to Aircraft in Flight) Order. This regulation defines an obstacle generally as: *'any fixed (whether temporary or permanent) or mobile object or a part thereof that extends above a defined surface intended to protect aircraft in flight or exceeds a specific height above ground or water surface level'* (**Appendix E**).

1.19.2 Lighting of Obstacles

The International Standards and Recommended Practices for the lighting and marking of obstacles are set out in ICAO Annex 14 (Aerodromes). Regulations and guidance regarding obstacles are found in Obstacles to Aircraft in Flight Order 2005, the IAA (Aerodrome Standards Order) S.I. 26 of 2000, and the AIP. Particular requirements for the Aerodrome Licensee are set out in the Aerodrome Licensing Manual. The IAA Aerodrome Licensing Manual provides direction on the assessment and treatment of obstacles. The Document is intended for use with reference to S.I. 423 of 1999, IAA (En Route Obstacles to Air Navigation) Order, 1999 and S.I. 215 of 2005, IAA (Obstacles to Aircraft in Flight) Order, 2005. Extensive objects or those with a height greater than 45 m shall be lighted with Medium-intensity lights of Type A, B or C. Type A consist of flashing white lights, Type B flashing red, and Type C fixed red. Medium-intensity obstacle lights, Type A and C should be used alone, whereas medium-intensity obstacle lights Type B should be used either alone or in a combination with low-intensity obstacle lights, Type B.

1.19.3 Santry Cross Block C Development

The building at Block C, Santry Cross was the subject of Planning Application 2830/00 and 1052/03 for a 16-storey building on a 3-storey podium. This was revised under Planning Application 3434/04 by adding two additional floors to the podium. Condition 10 of this of this permission required the applicant to consult with the IAA and meet their requirements in relation to lighting. At the commencement of construction, an 83 m high crane was erected by the main building contractor, which penetrated the Inner Horizontal Surface[19] (**Appendix F**). Neither the IAA nor Aer Rianta[20] were notified at the time by the Local Authority as required under the Planning Act.

Consequently, the IAA had to take urgent action to amend a number of flight procedures by means of NOTAMS as these flight procedures no longer provided the requisite safety levels for aircraft using Dublin Airport. The final structure at Santry Cross had an overall height of 52.75 m and penetrated the Inner Horizontal Surface of Dublin Airport by 4 m. As a result, the Aerodromes and Airspace Standards Department of the IAA issued instructions to the Architects regarding the requirements for lighting the structure under ICAO Annex 14.

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[18] **O.D.**: Ordnance Datum reference, Malin Head.

[19] **Inner Horizontal Surface**: Protected airspace within 4,000 m laterally and 45 m vertically used for visual circling prior to landing.

[20] **Aer Rianta**: became Dublin Airport Authority Plc (DAA) under the State Airports Act in October 2004.

The requirement was for the installation of fixed, red, medium-intensity Type C obstacle lights as per ICAO Annex 14 – Aerodromes, Volume I, Fourth Edition, July 2004, Table 6.3. Additionally, the obstacle lights were required to operate continuously 24 hours a day, with any lamp failures rectified immediately and failures notified to the ATC Station Manager, Dublin Airport. The obstacle light installed was a ZA766 Medium intensity Type C, fixed red fitting. Low-intensity flashing red lights were initially installed, but were upgraded in 2005 to the required Medium-intensity Type C, red fixed lights.

1.19.4 Interim Safety Recommendations

Subsequent to the occurrence, on the 4 September 2007, the Chief Inspector of Air Accidents and the Investigator-in-Charge formally briefed the Director, Safety Regulation of the IAA on the AAIU's preliminary findings of this Investigation. Following this briefing, the IAA issued Air Traffic Services (ATS) Operations Notice 043/07 in response to concerns identified by the AAIU, in particular that the fixed red obstacle lighting could be mistaken by a Flight Crew for runway approach lights. The IAA also undertook to review the obstacle lighting scheme installed on the building. On Monday 8 October 2007, the obstacle lighting was changed from fixed red lights, to flashing red.

The two Safety Recommendations made by the AAIU Preliminary Report, No. 2007-019, issued on 17 September 2007, were as follows:

1. That the IAA should promulgate to pilots and operators, the possibility of confusing the obstacle at Santry Cross with the approach lighting of RWY 34 (**SR 16 of 2007**). The IAA responded as follows: '*On the 4 September 2007, the IAA issued **ATS Operations Notice 043/07** for Dublin Airport. This notice requires that when RWY 34 is in use all ATIS broadcasts will include the following phraseology... 'Caution – Lights on a building 1.5 nm south west of the threshold of RWY 34 have the potential to disorientate flight crews'*.

2. That the IAA reviews the suitability of obstacle lighting as installed on the 52 metre-high building situated at Santry Cross, Dublin (**SR 17 of 2007**). The IAA responded as follows: *'The Authority accepts Safety Recommendation SR 17 of 2007. We have reviewed the lighting scheme installed on the 52m high hotel at Santry Cross and have been in contact with the Building Management Company to have the lights changed from fixed red obstacle lights to flashing red obstacle lights. The lighting has been operational in flashing mode since Monday, 8 October 2007'*.

1.19.5 Planning Considerations

Planning Legislation is a complex area and this Report is only concerned with planning matters from the point of view of the building being an obstacle to aircraft in flight. Planning legislation is primarily set out in the Planning and Development Acts 2001, Planning and Development Regulations 2001.

There is a certain oversight necessary regarding Planning of buildings near airports. State Planning is the responsibility of the Department of the Environment, Heritage and Local Government. Planning applications are made to the appropriate Local Authority, in this case Dublin City Council. The Local Authority then provides planning lists on a weekly basis.

Under the Planning and Development Regulations a local authority '*shall send a notice of proposed development to any relevant body or bodies specified*, *where it appears to the authority that the proposed development might endanger or interfere with the safety of, or the safe and efficient navigation of aircraft - to the IAA'*, and, '*where it appears to the authority that the proposed development might interfere with the operation and development of a licensed airport, whose passenger annual traffic is not less than 1 million passenger movements – to the airport operator.'*

The Airport Operator (in this case the DAA) has certain duties under Airport Direction 33 of the DAA Aerodrome Manual regarding new developments: *'The monitoring of weekly planning lists of planned developments external to the airport is carried out by Group Operations. Following examination of the planning file, comments are forwarded for consideration to the Planning Authorities.'* Outside the airport boundary: *'Monitoring of the planning lists is co-ordinated through Group Operations and comments are made to the relevant planning authorities. Aer Rianta* (DAA) *is primarily concerned with developments in the red (safety) areas of runway approaches as well as new residential developments within defined noise contours. However other proposed developments such as landfill sites, waste transfer stations or developments of excessive height are also of concern. By Condition 21 of the Aerodrome Licence, the Licensee is responsible for advising the IAA of planning developments which may infringe obstacle limitation surfaces within 15 km of Aer Rianta airports.'* Note: The airport reference point (ARP) is situated on the main RWY 10-28 adjacent to Taxiway B5. The building at Santry Cross is 2.4 km from the ARP.

2. ANALYSIS

2.1 General

The flight itself had been essentially routine until descent and the weather was good at the destination. The aircraft was serviceable and the Flight Crew were both experienced on type and properly licensed. This analysis will look at the series of events that took place, which resulted in this Serious Incident.

2.2 Lighting

It quickly became clear from the test flights undertaken by the AAIU that a somewhat unique problem existed with the lighting on this hotel building. Although it was lighted in accordance with ICAO Provisions, at night it closely resembled, in general appearance, the approach lighting on RWY 34. The Investigation is of the opinion that any assessment of new obstacles, or other lighted projects such as roads that are within the prescribed distance from an aerodrome, should include a general risk analysis. This analysis should include an assessment of the visual impression that such objects may present to pilots, when lighted at night.

The two *interim* Safety Recommendations (**Section 1.19.4**) made to the IAA were put in place without delay - the modification of the obstacle lighting to flashing red from 8 October 2007 reduced the risk of misidentification re-occurring as the PAPI indicators either side of the runway always appear as a combination of white/red, but steady lights.

The Investigation found that due to the extraneous lighting from the city environment, the approach lighting was not easy to identify at a distance. It is possible for ATC to increase the lighting brilliance, but this would be much too bright for Flight Crews completing the final approach and landing flare. Because the approach lighting, and by association the runway, are not easy to identify, it is therefore all the more important to complete the Instrument approach as per the procedure which brings the aircraft as close as possible to the landing position with due regard for centreline tracking and obstacle clearance. Had this procedure been followed, the aircraft would have in a position to land and the runway in full and clear view at 700 ft, the MDA. Even in poor weather, where the runway may not be visible at this height, a go-around is the mandatory action.

2.3 Safety Management System

The Operator had a Safety Management System (SMS) in place, which is designed to identify potential threats to safety in operations and put in place preventative measures. To this end the Flight Crew were trained and their competency checked in the operation of the MD-83 aircraft. This training involved achieving sufficient competency for an MD-83 type rating and Licence/Operator proficiency checks as required. These checks were carried out by the Operator's Training Section with a qualified Type Rating Examiner (TRE), on behalf of the UK Civil Aviation Authority (CAA). This training took place in an approved simulator and was concluded during normal line operations by a Line Check (LC). As part of their ground training syllabus the Flight Crew members were also trained in the principles of CRM.

2.4 The 'Error Chain'

In almost all accidents and serious incidents that occur, a chain of events must take place, commonly referred to as an error chain. Breaking the error chain at any point can prevent the accident or serious incident occurring. Although the Commander and Co-pilot had not flown together previously, standard training and adherence to SOP are designed to make Flight Crew co-ordination effective, which is usually the case. However, it is noted that the flight deck communications were conducted in English, which in neither case was their native tongue. It is evident that although there was no animosity on the flight deck, communication between the two Flight Crew members was reduced to operational matters and little else.

An error chain developed during the sector to Dublin. The Flight Crew were in possession of NOTAM information for all destination and alternate airports. The NOTAM for Dublin clearly indicated that the main RWY 10-28 would be closed later that evening for maintenance. Despite having the NOTAM in the flight paperwork, the Flight Crew were not aware of the closure and expected, and briefed for, a standard descent and ILS approach on RWY 28.

During descent the ATIS broadcast confirmed that RWY 34 was in use. Several factors then arose; the track distance for descent was now considerably shorter and the Flight Crew had to brief and prepare for a non-precision approach on RWY 34.

ATC was mindful of the shorter track distance and checked with the Flight Crew that they could lose the height in the distance available. Under the circumstances, the approach brief for RWY 34 was likely to have been rushed and incomplete.

2.5 Situational Awareness

The Flight Crew managed to lose the height in a continuous descent from FL240 and established inbound on the approach procedure for RWY 34. The aircraft was properly configured with flaps extended, landing gear down and locked and speed reduced to final approach speed at a point 6 nm prior to touchdown. At this point the error chain recommenced.

The PF, contrary to the Company SOP, looked out early for visual reference, and saw almost straight ahead what appeared to be the approach lightning of RWY 34. With the wind from 260º at 12 kts, the aircraft would have been on a heading of 336° to make good a track along the inbound course of 342°. Thus the aircraft was pointing to the left of the runway and towards the lighted building. The Auto Pilot remained engaged and the heading was adjusted to the left by the PF. The aircraft was then turned further left, steering the aircraft away from the required inbound course. Descent was continued with crossing altitudes checked by the PNF. The PNF remarked that the CDI was deviating, which the PF acknowledged and attempted to correct initially. This showed as a paralleling of the track in the ATC Radar recording, but the deviation then continued without further correction.

The PNF, checking the crossing altitudes, stated that the aircraft was 'too high' but the PF was looking at what he considers to be the PAPI, which indicated an *apparent* 'all red' or 'too low' indication. At that moment there was considerable confusion on the flight deck; the PF believed he was on course as in his opinion he could see the 'approach lights' clearly but he also realised that the CDI was indicating the aircraft left of track. The PNF called that the aircraft was 'too high' but the PF saw four red indicators apparently indicating he was too low.

The PNF who was the aircraft Commander was not in control of the situation. Firstly, the initial turn after visual acquisition of the 'approach lights' was not questioned. The CDI deviation, which confirms the deviation from course was identified by the Commander and brought to the attention of the PF. The deviation was briefly corrected, but allowed to increase as the aircraft descended. The reason for the initial deviation was not discussed. Had it been, it might have resolved the confusion. The confusion and ambiguity arose as both pilots had a different and inconsistent 'picture' of the situation. This state of affairs was enough on its own to immediately execute a go-around, as the situational awareness of the Flight Crew was now seriously compromised-contrary to company procedures.

At about 1,000 ft the PNF looked up from his instruments and saw the same 'picture' of what appeared to be the white 'approach lights' and 'PAPI' indicating red. The CDI was showing significant left deviation from the required track but the Flight Crew were now operating solely on visual cues, contrary to SOP. No reference was made to the CDI or to the DME distance, which indicated the distance to the VOR, 5.2 nm past the runway threshold. The PNF was now also of the opinion that the runway was straight ahead and as the aircraft descended below MDA was puzzled by the absence of runway edge lights beyond what appeared to be the touchdown point. He queried ATC as to the status of the runway lights and immediately the Tower controller issued instructions to turn right and climb.

2.6 Air Traffic Control

At 23.30 hrs, the Approach Controller (EC North) had handed over the flight to the Tower and was now concentrating on vectoring following traffic. He noted the FLT344E deviating slightly to the left, but was unconcerned at that point as the deviation was not significant. Once alerted by the MSAW he contacted the Tower Controller (AMC) by intercom.

The AMC, although visual with the inbound aircraft would have had difficulty in perceiving the deviation from track, primarily because any significant deviation would only be noticeable when the aircraft was much closer in, due to the line of sight from the Tower and the non-linear altitude changes of aircraft flying the non-precision approach procedure. The AMC, who was working alone in the Tower, was called on separate R/T by the Maintenance Crew working on RWY 10-28. This distraction came as FLT344E descended below the MDA. The AMC was alerted to the deviation when the PNF made his call about the runway lighting. This call occurred simultaneously with a call from the EC North controller on the intercom. At this point the error chain was finally broken by the instruction issued by ATC for the aircraft to turn right and climb.

The Investigation noted that the AMC was performing the functions of both AMC and SMC at the time of the occurrence, in accordance with published procedures. An R/T call from a Maintenance Crew engaged the sole ATCO on duty in the Tower at the time when FLT344E began deviating significantly. This deviation may have been identified earlier had an additional ATCO been present in the Tower to share the workload at the time. The Investigation is therefore of the opinion that manning levels in the Tower should be examined, in particular during night operations and during times of scheduled maintenance activity. A Safety Recommendation has been made to that effect.

2.7 Duties of the Commander

The disposition of the aircraft is the responsibility of the aircraft Commander. The safety of the aircraft and its passengers and crew are the prime responsibility of the Commander, even if the role of actually flying the aircraft has been delegated to the co-pilot. Maintaining situational awareness is paramount to the safe operation of any aircraft. Good airmanship and adherence to the Company approved SOP would have prevented initial deviation from the approach course. At any point a go-around was the clear course of action in accordance with the Operator's SOP, but the situation continued to deteriorate. The Investigation clearly identifies poor communication and teamwork, and a major degradation of situational awareness, which was not resolved by the Flight Crew. The final intervention by ATC, was the primary factor in a safe outcome to this Serious Incident.

3. CONCLUSIONS

(a) Findings

1. The Flight Crew were properly licensed.

2. The aircraft was properly registered in the United Kingdom.

3. The aircraft was properly maintained with a valid Certificate of Airworthiness at the time of the occurrence.

4. The weather was good at the time of the occurrence.

5. RWY 10-28 was closed by NOTAM for scheduled maintenance, requiring ATC to use RWY 34-16 for arrivals.

6. The Flight Crew of FLT344E were cleared for a non-precision instrument approach procedure by ATC.

7. The Flight Crew did not comply with the non-precision instrument approach procedure, and elected to continue with a visual approach from approximately 2,200 feet contrary to Company SOP.

8. The Investigation found that due to extraneous lighting from the city environs, the approach lighting on RWY 34 was not easy to identify at a distance.

9. Instrument cross-checking as per Company SOP was not carried out once the Flight Crew elected to complete the approach visually.

10. An obstacle, comprising a 16-storey hotel building was situated to the left of the approach course, and was lighted in accordance with ICAO, Annex 14 (Aerodromes), with red fixed lights.

11. On becoming visual, under clear night conditions, the Flight Crew misidentified the lighting of the 16-storey building as being the approach lighting for RWY 34.

12. At night, the combination of the white stairwell lighting and red fixed obstacle lights on the roof on the building, resembled the red and white lights of a ‘Simple Approach Lightning System’ when viewed from the approach path to RWY 34 (**Photo No. 4**).

13. The Commander identified the initial CDI deviation to the Co-Pilot (PF) but after an initial course correction the deviation increased as the aircraft tracked towards the building.

14. Descent was continued below the Minimum Descent Altitude (MDA) without proper visual identification of the runway in use, with the aircraft becoming significantly off track.

15. At a late stage the PNF queried ATC regarding the status of the runway lighting.

16. The EC (Radar Controller) observed an MSAW warning on his Radar screen and called the AMC on the intercom to advise of the deviation and initiate a go-around.

17. The AMC was engaged in a call from the Maintenance Crew on RWY 10-28 at the time the EC attempted communication by intercom.

18. The AMC, on observing the aircraft significantly off track, issued instructions for the aircraft to turn and climb as it was not in a position to land safely on RWY 34.

19. Following this instruction, FLT344E initiated a go-around.

20. The Investigation determined that the aircraft had descended to 580 ft AMSL (373 ft AGL) during the approach at an indicated ground speed of 137 kts. At the point where the go-around commenced, the aircraft was approximately 520 metres (1,706 ft) from the building and 61 metres (200 ft) above it.

21. The AMC was the sole occupant of the Tower, and was performing the functions of AMC and SMC at the time of the occurrence.

22. The AMC duties included communications with the Maintenance Crew on RWY 10-28.

23. The Commander did not ensure that his aircraft was operated in accordance with Company SOP, to ensure accurate navigation so that its position and the safety altitude associated with its position was known at all times and in accordance with the ATC clearance.

24. The Investigation identified poor communication and teamwork, and a major degradation of situational awareness, which was not resolved by the Flight Crew.

25. The final intervention by ATC, although somewhat late, was the primary factor in providing a safe outcome to this Serious Incident.

(b) Probable Cause

The decision of the Flight Crew, to continue an approach using visual cues alone, having mis-identified the lights of a building with the approach lights of the landing runway.

(c) Contributory Factors

1. The fixed red obstacle lighting on the roof of the building, together with the white internal lighting, resembled the approach lights of the landing runway when viewed from the approach path.

2. The failure of the Flight Crew to follow Company Standard Operating Procedures.

3. Poor CRM of the Flight Crew.

4. Communication with Maintenance Crews on RWY 10-28 distracted the AMC at a crucial time during the approach, while the AMC was the sole occupant of the Tower.

4. SAFETY RECOMMENDATIONS

It is recommended that:

1. The Operator undertake a comprehensive review of the CRM training provided to its Flight Crews. **(SR 08 of 2009)**

   AAIU Comment: The Operator went into administration on 3 December 2008. The Joint Administrators stated in a communication, dated 29 January 2009, that they would not be taking any action in response to this Safety Recommendation.

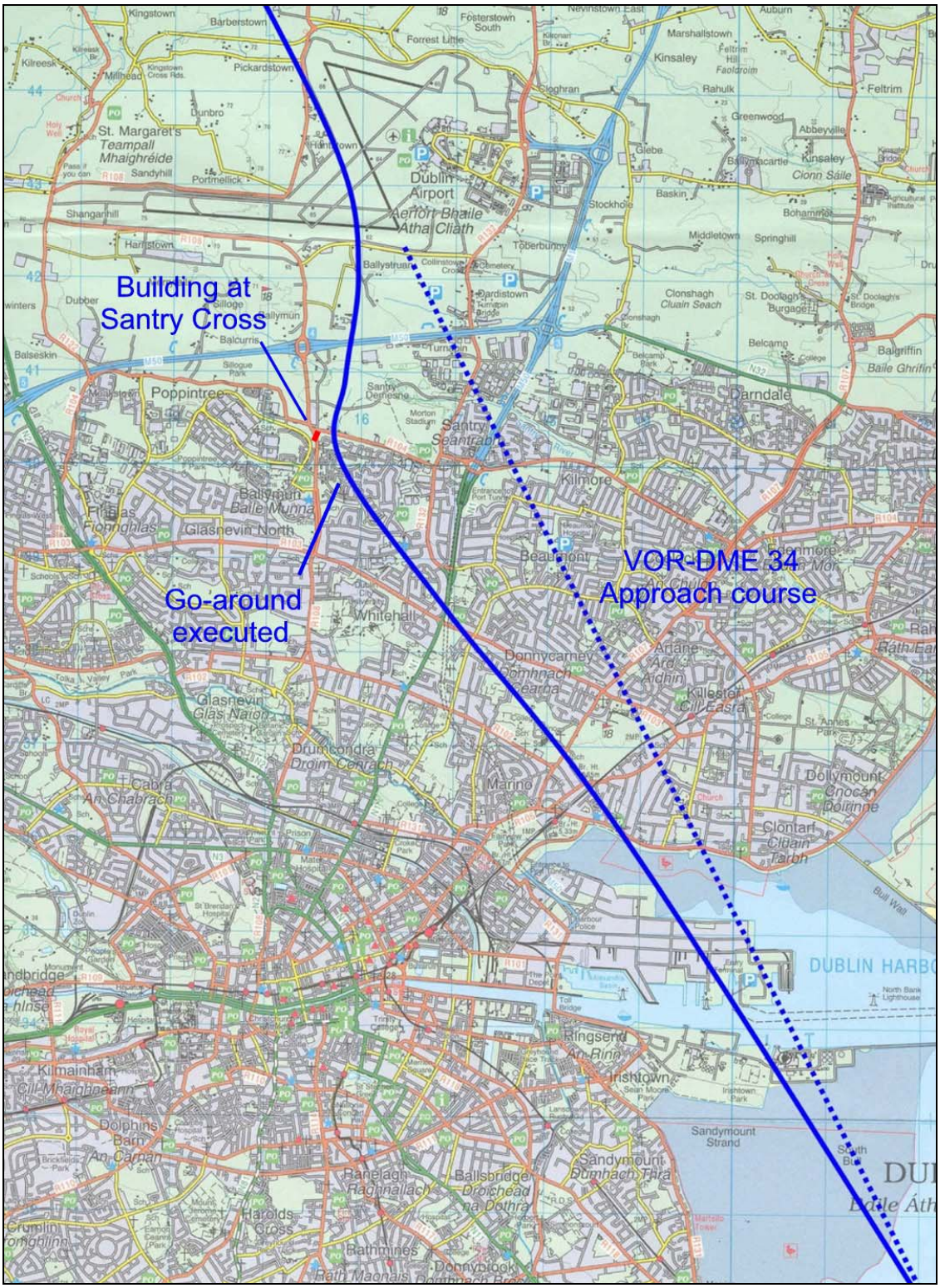
2. The IAA examine the manning levels of the Tower at night, and during periods of routine maintenance. **(SR 09 of 2009)**

3. The IAA, when considering the type and positioning of warning lights specified for an obstacle in the vicinity of an aerodrome, should take account of the potential for confusion by pilots of such lights with visual navigation aids at the aerodrome. **(SR 10 of 2009)**

   Response: In a communication to the AAIU dated 7 April 2009, the IAA confirmed that this Safety Recommendation was accepted.

Appendix A

Flight track of FLT344E



(Based on *Ordnance Survey of Ireland 1:50 000*)

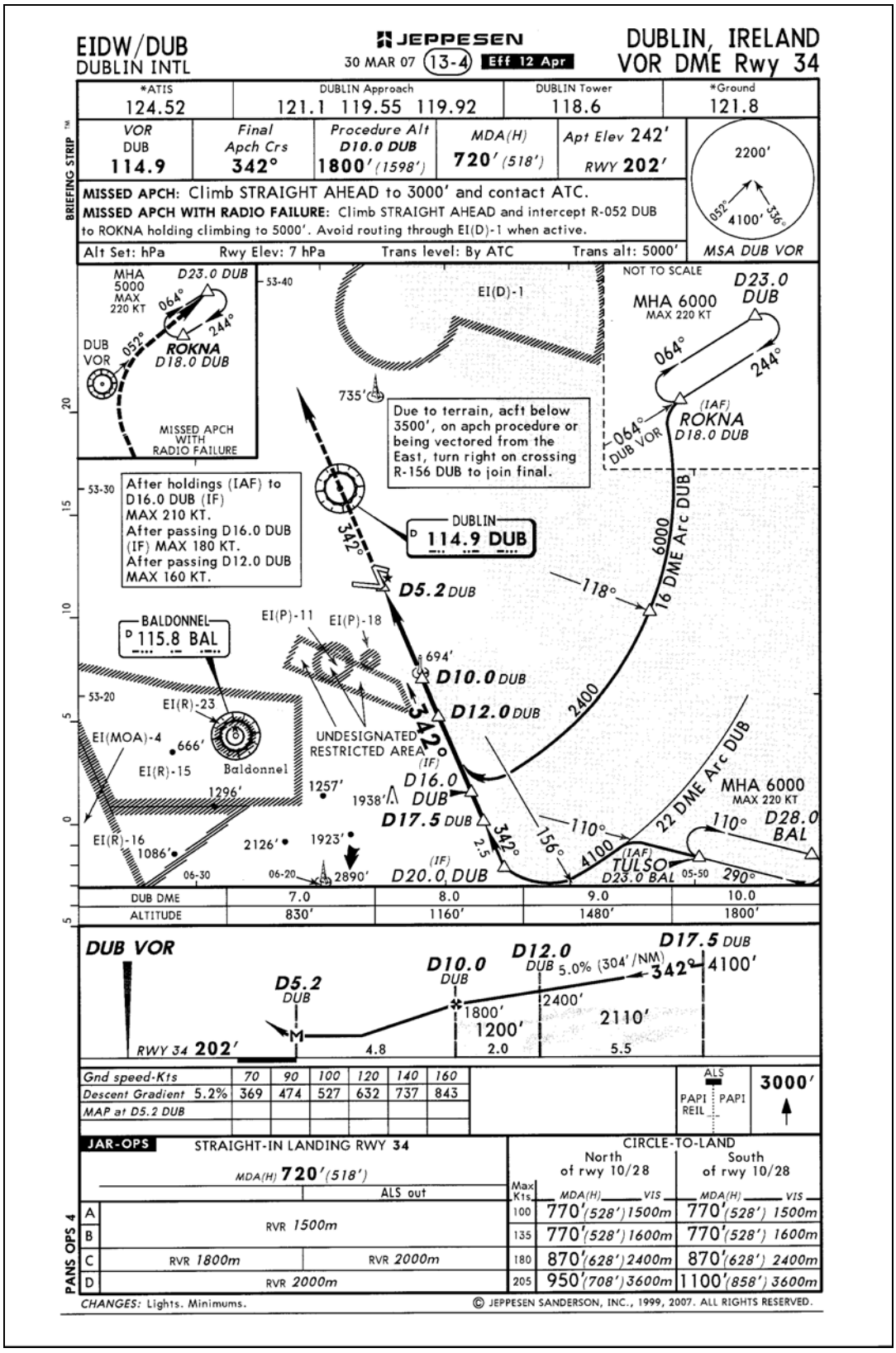
Appendix B

Transcript of Frequency 118.600 Mhz between 23.30 and 23.36 on 16 August 2007

Time:	From:	To:	Transmission:
23.30:48	FLT344E	AMC	*Dublin good morning Flightline three four four echo, established radial one six two inbo*und.
23.30:54	AMC	FLT344E	*Flightline three four four echo good night to you, cleared to land runway three four wind two six zero, one three*.
23.31:02	FLT344E	AMC	*Cleared to land runway three four Flightline three four four echo.*
23.33:11	EIN739	AMC	*Tower hello Shamrock seven three nine VOR runway three four we're two zero miles from the DUB and that's one five from the field.*
23.33:19	AMC	EIN739	*Shamrock seven three nine that checks continue on approach number two, wind two six zero, one three.*
23.33:25	EIN739	AMC	*Continue approach Shamrock seven three nine.*
23.34:20	AMC	FLT344E	*Wind check two six zero, one two.*
23.34:23	FLT344E	AMC	*Thank you*.
23.34:52	FLT344E	AMC	*Tower confirm that you have all…all lights on the runway three four that's on?*
23.34:58	AMC	FLT344E	*Flightline three three four you're… eh… turn right now, turn right…eh…you have the …you're not landing on the runway. Flightline three three four climb to two thousand feet.*
23.35:12	FLT344E	AMC	*Performing go-around Flightline three four four echo (garbled)*
23.35:16	AMC	FLT344E	*Roger three three four (sic) straight ahead to three thousand feet.*
23.35:22	FLT344E	AMC	*Continue climb three thousand feet Flightline three four four echo*.
23.35:45	AMC	FLT344E	*Flightline three four four echo climb to three thousand feet and contact Dublin one two nine one seven five.*
23.35:51	FLT344E	AMC	*Continue climbing three thousand …(garbled)… one two nine one seven five.*
23.36:21	AMC	EIN739	*Shamrock seven three nine?*
23.36:23	EIN739	AMC	*Shamrock seven three nine, go ahead…*
23.36:25	AMC	EIN739	*Seven three nine just for information the previous traffic just performed a go-around, had a problem seeing the runway lights, can you advise.*
23.36:31	EIN739	AMC	*We are fully visual this point, Shamrock seven three nine.*
23.36:34	AMC	EIN739	*Okay, and how are the brightness of the lights?*
23.36:36	EIN739	AMC	Standby one, say again for the Shamrock seven three nine please.
23.36:42	AMC	EIN739	*Seven three nine, the brightness of the lights?*
23.36:45	EIN739	AMC	*The lights are fine at the moment Shamrock seven three nine.*
23.36:47	AMC	EIN739	*Roger.*

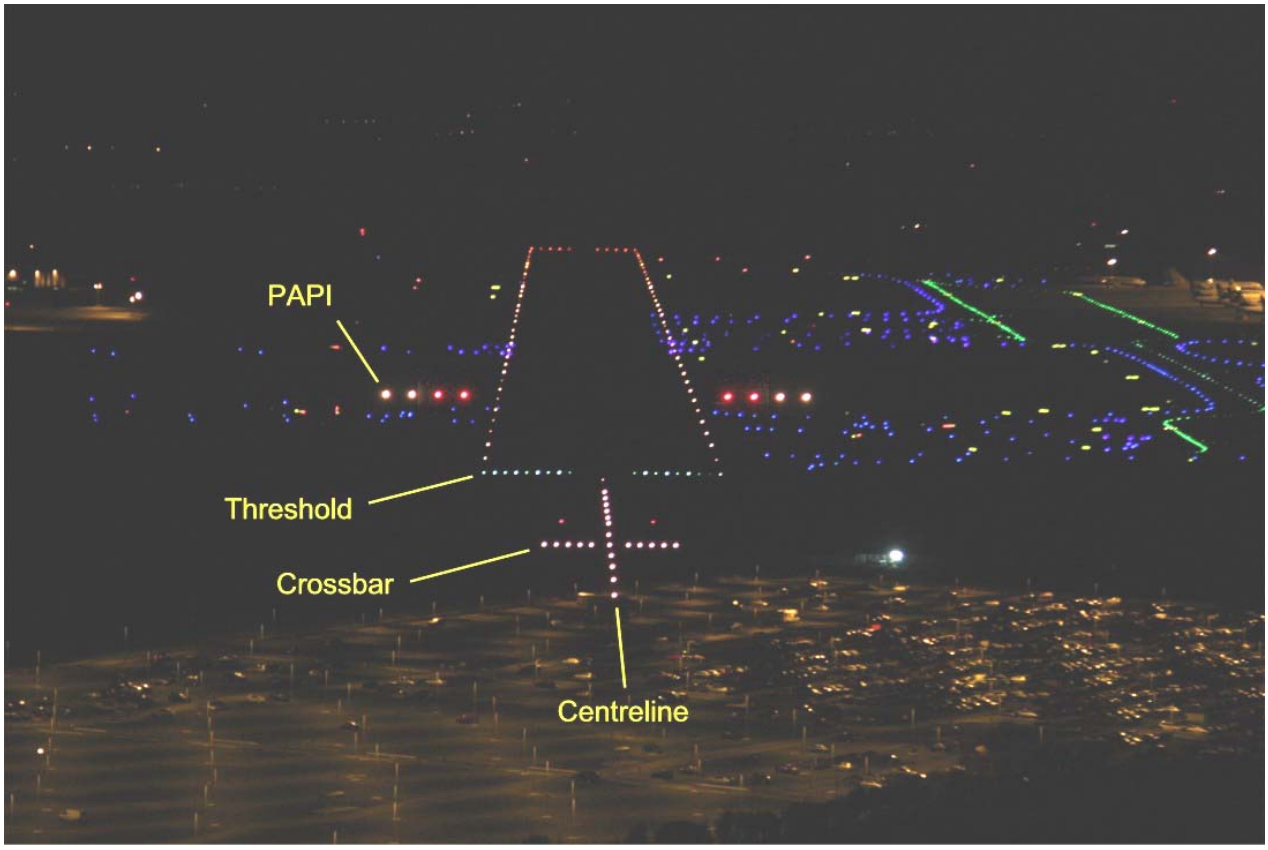
Appendix C

Jeppesen VOR DME RWY 34 Dublin Airport



Appendix D

Detailed view of RWY 34 and Simple Approach Lighting System



Detail view of the RWY 34 Simple Approach Lighting System.

The approach lights consist of a centreline of white lights with one crossbar. Threshold lighting is green in the direction of landing aircraft with white runway edge lights. Taxiway lights are blue. In the visual profile, the PAPI's should appear as pairs of white and red lights either side of the runway. From a distance, however, the PAPI's indicate all red as the aircraft is normally below the final approach profile of 3 degrees.

Appendix E

**The following text is extracted from S.I. 215 of 2005,
IAA (Obstacles to Aircraft in Flight) Order, 2005.**

4. Definition of an Obstacle

(1) An existing object, including a mobile object, is and a future object would be, an obstacle to air navigation if it is of greater height than any of the following heights or surfaces:

(a) A height of 45 metres above ground or water surface level at the site of the object or an object which otherwise constitutes an en-route obstacle or a potential en-route obstacle in accordance with this Order;

(b) A height within a runway approach area, a runway departure area or a circling approach area, which would result in the vertical distance between any point on the object and the established minimum instrument flight altitude or height as specified for the aerodrome concerned in the "AIP Ireland" within that area to be less than the required obstacle clearance. The analysis of the significance of such obstacles may have to be determined by an aeronautical study in accordance with subparagraph (4) of Article 5 of this Order;

(c) The surface of an obstacle limitation surface as defined in Chapter 4 of Annex 14 to the Convention;

(d) The surface of an obstacle protection surface as defined in Chapter 5 of Annex 14 to the Convention;

(e) An inclined plane surface, with a slope of either 1.2 per cent or 1.0 per cent, superimposed on a take-off flight path area and extending either to 10 kilometres or 12 kilometres respectively from the end of the runway concerned as specified in Chapter 3 of Annex 4.

(2) The surfaces specified in paragraph (1) above may also be defined in relation to a specific aerodrome on a safeguarding map prepared by or on behalf of the aerodrome licensee and lodged with the local Authority responsible for planning in the vicinity of that aerodrome under the Planning and Development Act 2000.

(3) The dimensions, orientation and characteristics of these surfaces are defined in Annexes 4 and 14 to the Convention as appropriate in relation to runway size and use at the aerodrome concerned.

5. Reporting and Information in respect of Obstacles

(1) A person shall not cause to be erected or constructed an object as defined in sub-paragraph (a) of paragraph (1) of Article 4 of this Order without first notifying the Authority in writing of that intended erection or construction at least thirty days prior to such erection or construction and shall provide such information in relation thereto to the Authority as may be requested under paragraph (3) of this Article.

(Note: This requirement is separate from any permission required to be obtained under the Planning and Development Act, 2000 in respect of the said erection or construction).

(2) A person shall not cause to be erected or constructed any object as defined in Article 4 of this Order within a radius of 10 kilometres of a licensed aerodrome without first notifying the aerodrome licensee of that aerodrome in writing of that intended erection or construction at least thirty days prior to such erection or construction and shall, additionally and where requested, provide such information in relation thereto to the Authority as may be required under paragraph (3) of this Article.

(Note: This requirement is separate from any permission required to be obtained under the Planning and Development Act, 2000 in respect of the said erection or construction).

(3) The Authority may require a person as specified in paragraphs (1) or (2) of this Article to make available to it information relating to an obstacle, including its geographic latitude and longitude, elevation and height.

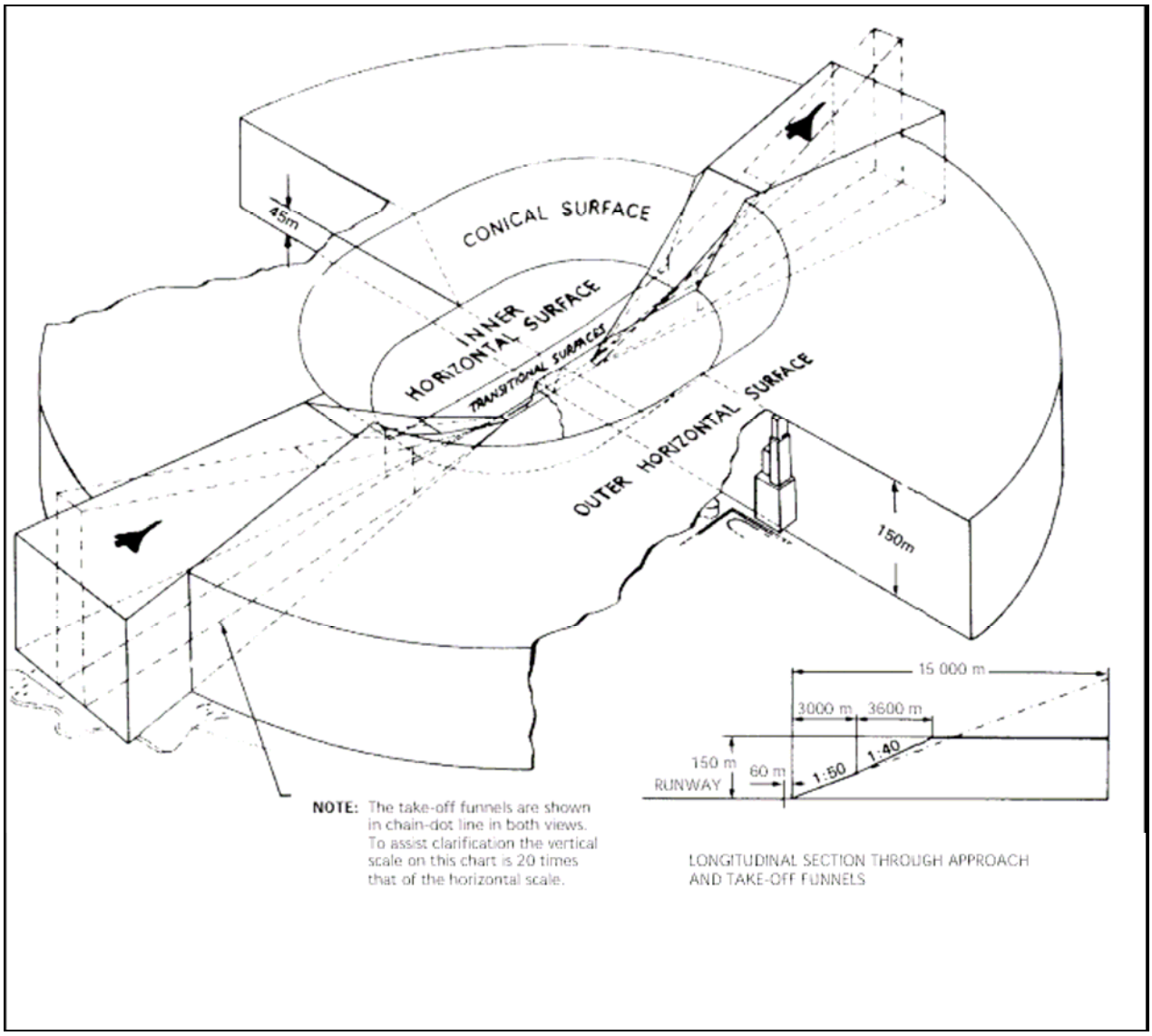
(4) The Authority may require the conduct of an aeronautical study for the purposes of subparagraph (b) of paragraph (1) of Article 4 of this Order or otherwise if it considers it necessary in a particular case.

6. Marking and Lighting of Obstacles

The Authority may require the marking and lighting of an obstacle defined in accordance with Article 4 of this Order in accordance with such instructions as the Authority may give in a particular case or by a direction under this Order to a person as specified in paragraphs (1) or (2) of Article 5 of this Order or to any other person or organization as appropriate.

Appendix F

Obstacle limitation surfaces for runways over 1,800 metres (Generic diagram)



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