Air Accident Investigation Unit Ireland

SERIOUS INCIDENT REPORT
Boeing 737-8F2, TC-JGG
Airbus 319, D-AGWJ
Dublin Airport, Co. Dublin
16 October 2010

An Roinn Iompair
Turasóireachta agus Spóirt

Department of Transport,
Tourism and Sport

AAIU Report No: 2011-019
State File No: IRL00910111
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In accordance with the provisions of SI 460 of 2009, the Chief Inspector of Air Accidents, on 18 October 2010, appointed Mr. Thomas Moloney as the Investigator-in-Charge to carry out a Field Investigation into this Serious Incident and prepare a Report. The sole purpose of this Investigation is the prevention of aviation Accidents and Incidents. It is not the purpose of the Investigation to apportion blame or liability.

Aircraft Type and Registration:	(1)	Boeing 737-8F2, TC-JGG
	(2)	Airbus 319, D-AGWJ
No. and Type of Engines:	(1)	2 x CFM56-7B26
	(2)	2 x IAE V2524-A5
Aircraft Serial Number:	(1)	34405
	(2)	3375
Year of Manufacture:	(1)	2005
	(2)	2008
Date and Time (UTC):	16 October 2010 @ 10.30 hrs	
Location:	Dublin Airport (EIDW), Co Dublin, Ireland	
Type of Flight:	Scheduled Public Transport	
Persons on Board:	(1)	Crew - 6 Passengers - 99
	(2)	Crew - 5 Passengers - 125
Injuries:	Nil	
Nature of Damage:	None	
Commander's Licence:	(1)	ATPL issued by DGCA[1] of Turkey
	(2)	ATPL issued by LBA[2] of Germany
Commander's Details:	(1)	Male, aged 45 years
	(2)	Male, aged 38 years
Commander's Flying Experience:	(1)	6,250 hours, of which 2,812 were on type
	(2)	7,957 hours, of which 7,032 were on type
Notification Source:	Dublin Air Traffic Control (ATC)	
Information Source:	Reports submitted by the Commanders of both aircraft. AAIU Field Investigation	

1 **DGCA:** Directorate General of Civil Aviation

2 **LBA:** Luftfahrt-Bundesamt, the German Civil Aviation Authority

SYNOPSIS

A serious incident occurred at Dublin Airport on 16 October 2010 when a Boeing 737-800 aircraft (TC-JGG) taxied onto the active Runway (RWY) 28 while an Airbus A319 aircraft (D-AGWJ) was on short final approach to land on the same runway. Dublin ATC had cleared TC-JGG to taxi in preparation for subsequent departure from RWY 28 and the aircraft was instructed to hold short of the runway. D-AGWJ had been cleared to land. The crew of the landing aircraft observed TC-JGG approaching the runway and initiated a go-around manoeuvre. Simultaneously ATC issued a go-around instruction. D-AGWJ descended to a height of less than 200 ft above the ground, less than 0.4 nautical miles (nm) from its touchdown point, before it climbed away. The Report of the Investigation makes six Safety Recommendations.

1. FACTUAL INFORMATION

1.1 History of the Incident

This serious incident occurred during late morning in good weather conditions. RWY 28 was the active runway for arrivals and departures. TC-JGG was preparing to depart from EIDW en route to Istanbul (LTBA) while D-AGWJ was arriving into EIDW from Köln (EDDK).

(Note: The taxiway and runway layouts for EIDW in use by the crew of TC-JGG were provided in Jeppesen Airport Charts 10-9 and 10-9B, which are reproduced at **Appendix A** and **Appendix B** respectively).

At 10.26:26 hrs, the ATC Surface Movements Controller (SMC), transmitting on Dublin Ground frequency 121.800 MHz, gave a clearance for TC-JGG to taxi from the parking area as follows, "Taxi link four, foxtrots, echo one[3], *hold short runway two eight*". TC-JGG replied, "*Taxi foxtrot, echo one, holding point runway two eight*". At this time D-AGWJ was approximately 10 nm from touchdown on RWY 28. TC-JGG commenced taxiing at 10.26:56 hrs.

At 10.27:35 hrs, the SMC transmitted to TC-JGG, "*Hold short runway two eight, monitor Tower one one eight six, bye bye*". TC-JGG responded, "*Hold short two eight, one one eight decimal six, good day*". At this time TC-JGG was taxiing on Taxiway (TWY) F3 while D-AGWJ was 6.2 nm from touchdown.

At 10.29:20 hrs, the Air Movements Controller (AMC), operating on the Tower frequency 118.600 MHz, cleared D-AGWJ to land on RWY 28. At this time, D-AGWJ was 1.7 nm from the touchdown point. D-AGWJ acknowledged the landing clearance at 10.29:24 hrs.

At 10.29:32 hrs, TC-JGG crossed the TWY E1 holding position of RWY 28, at which time D-AGWJ was 1.25 nm from the touchdown point.

At 10.29:42 hrs, the AMC transmitted to D-AGWJ, "*Go around runway two eight, wind zero one zero six knots*".

Simultaneously and crossing with this transmission from the AMC, D-AGWJ transmitted, "*…We're going around there's (an aircraft) entering the runway*". At this time, TC-JGG was entering RWY 28 and D-AGWJ was 1 nm from touchdown. A Mode C altitude[4] readout of 500 ft and groundspeed of 129 kts for D-AGWJ were recorded on ATC radar. As the threshold of RWY 28 is at an elevation of 202 ft, this 500 ft radar readout is equivalent to a height of approximately 300 ft above the runway surface.

3 **Foxtrots, echo one:** Radiotelephony phraseology for Taxiways F (F3, F2, F1) and E1

4 **Mode C Altitude:** This altitude, displayed in 100 ft increments on an ATC radar screen, is referenced to sea-level.

At 10.29:47 hrs, D-AGWJ's Mode C altitude was 400 ft (equivalent to approximately 200 ft above the runway surface) with a groundspeed of 131 kts, at a distance of approximately 0.65 nm from touchdown. 400 ft was the lowest altitude recorded on ATC approach radar. Recorded surface radar data indicates that TC-JGG taxied onto the centreline of RWY 28 as D-AGWJ passed a point approximately 0.5 nm from touchdown. Data from the multi-lateration surface movements control system indicates that the minimum recorded vertical separation between the two aircraft was approximately 144 ft at a point where their horizontal separation was approximately 0.4 nm.

At 10.29:56 hrs, D-AGWJ transmitted, *"Ah did you copy"*. At 10.29:59 hrs D-AGWJ's Mode C altitude readout changed from 400 ft to 500 ft with a groundspeed of 135 kts, at a distance of approximately 0.2 nm from touchdown.

At 10.30:00 hrs, TC-JGG transmitted, *"(Callsign) two eight vacate the runway"*.

At 10.30:04 hrs, D-AGWJ passed overhead the touchdown point of RWY 28, at which time its Mode C altitude readout was 700 ft, equivalent to 500 ft above the runway surface.

At 10.30:10 hrs, the AMC transmitted to TC-JGG, "*Do you wish to hold position I'll have departure for you shortly"*.

At 10.30:14 hrs, TC-JGG transmitted, *"Alright leaving runway right"*.

At 10.30:14 hrs, D-AGWJ transmitted, *"(Callsign) we are on missed approach"*. The AMC responded, *"(Callsign) straight ahead to 3,000 ft and standby for the onward frequency"*. D-AGWJ acknowledged, *"Straight ahead to 3,000 and traffic three miles 600 feet above"*.

Recorded approach radar data shows that the minimum separation between D-AGWJ and the aircraft ahead, another Boeing 737-800 which was climbing away following take-off from RWY 28, was 3 nm horizontally and 600 ft vertically. The 600 ft vertical separation occurred when this Boeing 737-800 was passing 2,700 ft while D-AGWJ was passing 2,100 ft, and again when the respective altitudes were displayed as 3,000 ft and 2,400 ft respectively. The Standard Instrument Departure (SID) procedure which the Boeing 737-800 was following incorporated an initial climb clearance of FL90[5]. The published Missed Approach procedure for an ILS approach to RWY 28 is to climb straight ahead to 3,000 ft and to contact ATC.

At 10.30:48 hrs, TC-JGG transmitted, *"(Callsign) sorry for the inconvenience turning right vacating runway"*.

The surface radar recording shows that TC-JGG taxied onto the centre-line of RWY 28 and continued forward, initially on the centreline and then along the right hand side of the runway and exited to the right onto TWY E2 at 10.30:58 hrs.

At 10.30:55 hrs, the AMC instructed D-AGWJ to turn right onto a heading of 010°, to stop climb at 3,000 ft and to contact the approach radar frequency. At 10.31:14 hrs, the AMC instructed TC-JGG to proceed onto RWY 34 and to hold short of RWY 28.

Subsequently TC-JGG departed on its flight to LTBA and D-AGWJ landed uneventfully on RWY 28.

5 **FL90:** Equivalent to an altitude of 9,000 ft

1.2 ATC and CVR[6] Records

Following the occurrence, records of the ATC communications along with approach and surface radar data were preserved and made available to the Investigation. It was possible for radio messages which were passed in simultaneous, crossed transmissions to be listened to by the Investigation. The recorded approach radar data was updated every 4 secs.

Since TC-JGG departed from EIDW directly after the incident, the CVR recording for that aircraft was over-written and was not available to the Investigation.

1.3 Commanders' Reports

The Commanders of the two aircraft were asked to submit reports to the AAIU through their national accident investigation agencies.

1.3.1 Commander of TC-JGG

The Commander of TC-JGG submitted a completed AAIU Incident Report Form to the Investigation. In his description of the incident, he stated that during their pre-departure briefing the crew discussed the following information contained on Jeppesen Airport Briefing page 10-1P2, *"For normal visibility conditions, CAT 1 RWY holding positions are established on all TWYs which intersect with RWYs. A further holding position is established on RWY16/34."* He stated that the crew interpreted the word "*further*" as meaning *"ahead"* and thus they understood that there was an additional holding position for RWY 28 on TWY E1 on RWY 16/34. He stated that when ATC Ground Control (the SMC) cleared the aircraft to the holding position of RWY 28, the crew both thought that a RWY 28 holding position followed after the RWY 34 holding position. The Commander's statement continued, *"On (TWY) E1 when doing mandatory head-down tasks I had a quick sight of "CAT I holding signage of RWY 34" and continued for the holding point RWY 28 which was supposed to be on RWY 16/34!"* The crew had switched radio frequency to Tower (AMC) as instructed by the SMC and were monitoring Tower communications. The statement continued, *"All of a sudden we recognised that when we penetrated into RWY 16/34 we also penetrated RWY 28.*

At the same time a "go-around" call was heard from the approaching aircraft." The Commander stated that in order to increase the separation between the two aircraft, they taxied quickly to TWY E2 where they vacated the runway, and they transmitted to Tower that they were vacating. He stated that the crew did not hear any call from the Tower until the aircraft had almost vacated the runway at TWY E2 *"by the shortest and fastest means."*

In the section of the AAIU Form entitled *"Your assessment of the Cause of the Incident"*, the Commander wrote that the statement on Jeppesen page 10-1P2 that *"A further holding position is established on RWY 16/34"* was not understood correctly by the crew. He stated that the SMC cleared the aircraft to the holding position for RWY 28, but that the correct name for that holding position should be *"Holding Point RWY 28 and 34"*. He considered that when the SMC specified only RWY 28, this supported the crew's misunderstanding that there were two separate holding positions for RWYs 28 and 34. He also said that nowhere in the documentation was there a statement to the effect that RWY 28 and 34 have the same holding position. He stated that when the crew were doing mandatory head down tasks and calling cabin crew to be prepared for take-off, they only saw the signage of RWY 34 and they did not notice any other numbers. He considered that they had already decided that there were two holding positions and thus they *"did not notice enough"*. He considered that if the taxi instruction was given as *"Holding point RWY 28/34 for RWY 28"*, that would be helpful. He also considered that Ground Control should not change an aircraft to Tower frequency by means of an instruction to *"monitor"* the frequency. He felt that positive radio contact with the Tower might assist with an advance warning, when there was a runway incursion hot spot ahead.

6 **CVR:** Cockpit Voice Recorder

1.3.2 Commander of D-AGWJ

In his report, the Commander stated that his aircraft had been cleared for and established on its final approach for an ILS[7] to RWY 28 in EIDW. The wind was around 260° at 5 to 8 kts, with visibility greater than 10 kms and cloud base around 3,000 ft with *"scattered skies"*. The First Officer was the Pilot Flying (PF). They received their landing clearance and had completed their final checks.

They noticed an aircraft approaching the holding position on TWY E1 at the corner crossing of RWY 28/34. The Commander stated that the Boeing 737 was moving without hesitation towards RWY 28.

He stated that at 300 ft they decided to go around as the taxiing aircraft was entering RWY 28. He estimated that the closest vertical distance must have been less than 200 ft, because they heard the 200 ft auto call out. ATC was informed and they followed the published missed approach (straight ahead 280°, climb 3,000 ft).

He stated that ATC was very busy, so he had to call them twice to say that they were on the missed approach. As they approached 3,000 ft they were alerted by their TCAS[8] to an intruder aircraft on the same track, which they believed was the previously departing traffic.

He stated that the indicated vertical separation with that aircraft was 400 ft. They informed ATC about the traffic and were instructed to fly heading 010°. Thereafter they performed a second and uneventful ILS approach to RWY 28.

1.4 Aerodrome Information

1.4.1 Runway, Taxiway and Holding Position Signage

ICAO[9] defines a runway-holding position as a designated position intended to protect a runway, an obstacle limitation surface, or an ILS critical/sensitive area at which taxiing aircraft and vehicles shall stop and hold, unless otherwise authorised by the aerodrome control tower. In radiotelephony (R/T) phraseology, the expression *"holding point"* is used to designate the runway-holding position.

ICAO Standards set out minimum distances required between holding positions and a runway centreline for different types of runway, e.g. runways with a non-instrument approach or runways with different categories of precision approach such as ILS.

At EIDW, there are two holding positions for RWY 28 on TWY E1. An ILS Category (Cat) II/III holding position, which is active during low visibility conditions, is located approximately 190 m taxiing distance from the extended centreline of RWY 28. An ILS Cat I holding position, which was the active holding position at the time of the occurrence, is located approximately 130 m from the extended centreline of RWY 28. The latter position is combined with the TWY E1 holding position for RWY 34.

Figure No. 1 is an extract from the Aeronautical Information Publication (AIP) Ireland published by the Irish Aviation Authority (IAA), showing the taxiway/runway interface and holding positions at EIDW at the time when the occurrence took place.

7 **ILS:** Instrument Landing System

8 **TCAS:** Traffic Alert and Collision Avoidance System

9 **ICAO**: International Civil Aviation Organisation

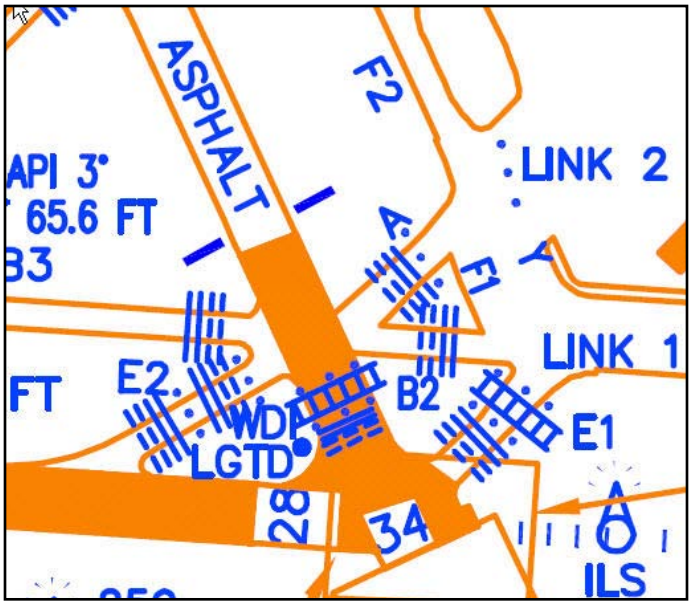


Figure No. 1: Portion of AIP Chart of Incident Area

As an aircraft taxied along TWY E1 from TWY F1 towards the thresholds of RWY 28 and RWY 34, it first encountered the ILS Cat II/ III holding position for RWY 28. This was marked by runway designation/Cat II/III holding position signage in accordance with the requirements of ICAO Annex 14 - Aerodromes. These signs were located in the grass verges on both sides of TWY E1, and displayed "28 CAT II/III" in white against a red background, **Photo No. 1**. At the same point, there were two large rectangular signs painted on the taxiway surface, one on either side of the centreline, with "34 28" in white against a red background. These were immediately followed, in the direction of taxi, by double yellow lines painted across the taxiway, as per runway-holding position marking "Pattern B", as defined in ICAO Annex 14, see **Appendix C**.

Photo No. 1: TWY E1 Cat II/III Holding Position for RWY 28

Approximately 60 m further along TWY E1, a taxiing aircraft encountered the combined holding position signage for RWY 28 ILS Cat I and for RWY 34. These were red and white signs marked "34 28CAT I" accompanied by yellow flashing runway guard lights, mounted in the grass verges on both sides of the taxiway, **Photo No. 2**. At the same point, there were two large rectangular signs painted on the taxiway surface, one on either side of the centreline, with "34 28" in white against a red background. There were also double yellow solid lines and double yellow broken lines painted across the taxiway, as per runway holding position marking "Pattern A", as defined in ICAO Annex 14, see **Appendix C**.

Photo No. 2: TWY E1 Cat I Holding Position RWY 28, Holding Position RWY 34

1.4.2 Jeppesen Airway Manual Information

The crew of TC–JGG were using Jeppesen Airway Manual information for EIDW. The information in this Manual is based on the aeronautical data published by the IAA in AIP Ireland. The Jeppesen Manual contained the following information for EIDW in Section 1.7.2 titled "Facilities in Vicinity of THR[10] *28 and 34"*.

"All TWYs are provided with location signs (yellow inscription on black background) and direction signs (black on yellow).
Mandatory signs (white inscription on red background) are provided to identify locations which ACFT shall not pass unless authorised by ATC. These signs include RWY designation signs, RWY-holding position signs etc.
For normal visibility conditions, CAT I RWY-holding positions are established on all TWYs which intersect with RWYs. A further holding position is established on RWY 16/34. These holding positions are denoted by:
- Yellow painted markings.
- Red mandatory signs, including the inscription CAT I and the designation of the RWY AHEAD.
- Yellow flashing RWY guard lights (on TXYs E1 and E2 and RWY 16/34).
- Location sign indicating the TWY designation."

10 **THR**: Runway Threshold

The Manual also described the Cat II/III runway holding position on TWY E1, which was active during low visibility conditions when higher precision Cat II and Cat III ILS approaches to RWY 28 were being carried out.

It continued, *"RWY-holding positions cannot be passed without permission from ATC."*

It also stated, *"Aircrew are advised that should they become unsure of their position while taxiing, they should contact ATC immediately and request assistance."*

On EIDW Airport Chart 10-9 (**Appendix A**), the holding position for RWY 28 on TWY E1 was designated as an "Incursion Hotspot". ICAO defines a hot spot as *"a location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary."*

1.4.3 AIP Ireland

The AIP contains data relating to aeronautical activity carried out in Ireland. It is published by the Aeronautical Information Service (AIS) of the IAA. Aeronautical data for inclusion in the AIP may originate within the IAA or may come from an external agency such as an airport authority.

1.4.4 Advanced Surface Movements Guidance and Control System (ASMGCS)

The ASMGCS is a modern technology system which has been installed for the control of surface movements of aircraft and vehicles at EIDW. It takes data feeds from the surface movements radar and the approach radar and also incorporates a multi-lateration system consisting of 23 sensors located around the airfield.

The Investigation notes that ASMGCS Level 2 was activated at EIDW on 8 August 2011. Level 2 incorporates a Runway Incursion Monitoring and Conflict Alert System (RIMCAS) which uses vector calculations to predict possible conflicts between aircraft or other objects. It assists air traffic controllers by providing them with visual and aural alerts, warning of evolving runway incursions which may result in potential traffic conflicts or collisions. The Investigation is supportive of this development.

1.4.5 Stopbar Lights

Stopbar lights consist of a row of unidirectional in-pavement lights spaced at intervals of 3 m across a taxiway which, when activated, show red to aircraft or vehicles moving in the intended direction of approach to an intersection or runway-holding position. They are normally activated during low visibility conditions and are controlled, either manually or automatically, by ATC.

ICAO Annex 14 – Aerodromes states at Section 5.3.19 Note 2, *"Runway incursions may take place in all visibility or weather conditions. The provision of stop bars at runway-holding positions and their use at night and in visibility conditions greater than 550 m runway visual range can form part of effective runway incursion prevention measures."*

At the time of the occurrence, AIP Ireland stated that controllable stopbar lights were installed at the CAT II/III holding position for RWY 28 on TWY E1. Fixed stopbar lights were installed on TWY E2 and on RWY 16/34 for use in low visibility conditions. The stopbar lights on TWY E2 were illuminated whenever RWY 10 was active.

1.5 Operations Manual

The Investigation requested and was provided with copies of the relevant extracts from the Operations Manual of the Operator of TC-JGG.

Taxi procedures were included in the Operations Manual Part-B Boeing 737, Chapter 2 Normal Procedures in *"**Section 2.2.13 Taxi**"*.

Relevant procedures were included in the following extracts:-

*"**Prior to Taxi**"*

"An airport diagram should be kept in a location readily available to both crewmembers during taxi. Ensure crewmembers understand the cleared taxi route and write down the taxi clearance when received."

"During taxi, both pilots must be very careful about the environment. Both pilots keeping their eyes inside the cockpit, placing the Jeppesen plans, especially for Commander, setting the communication frequency or transponder code, making changes on the CDU or MCP is not advised."

"The maximum taxi speeds during long and straight routes is 20 kts and for turns and at the apron, 10 kts."

"The routes to follow during taxi must be followed closely by the PM[11] from the airport diagram."

The situation and the airport diagram may not fit each other sometimes, in such situations the commander must slow the taxi to give the co-pilot enough time to solve it."

*"**During Taxi**"*

"Progressively follow taxi position on the airport diagram."

"If unfamiliar with the airport consider requesting a FOLLOW ME vehicle or progressive taxi instructions."

"Use standard radio phraseology."

"PF and PM shall continuously monitor ATC communications during taxi and read back all clearances. If any crewmember is in doubt regarding the clearance, verify taxi routing with the written clearance or with ATC. Stop the airplane if the clearance is in doubt."

"Avoid distractions during critical taxi phases; plan ahead for checklist accomplishment and company communications."

Do not allow ATC or anyone else to rush you."

"Verify the runway is clear (both directions) and clearance is received prior to entering a runway."

Taxi procedures stated that taxiing shall be carried out by the Commander only.

11 **PM**: Pilot Monitoring

2. ANALYSIS

2.1 General

The recorded radar data indicates that TC-JGG taxied onto the centreline of RWY 28 as the approaching D-AGWJ passed a point 0.5 nm from touchdown. The crew of D-AGWJ saw the encroaching aircraft as it approached the runway, and initiated a go-around manoeuvre. Data from the surface movements control system indicates that the minimum vertical separation between the two aircraft was approximately 144 ft at a point when their horizontal separation was approximately 0.4 nm. Thereafter D-AGWJ commenced climbing as its engines reached high power following a short spooling-up period. As D-AGWJ passed overhead its touchdown point, it had climbed to an altitude of 700 ft, equivalent to approximately 500 ft above the runway surface.

The report submitted by the Commander of D-AGWJ confirmed that their aircraft probably descended to a height less than 200 ft above the ground before it commenced climbing in the go-around, as the crew heard their automatically generated height alert at 200 ft.

The AMC in the Tower observed TC-JGG approaching the runway and issued a go-around instruction to D-AGWJ. However this transmission crossed with the message from D-AGWJ that they were going around. This meant that the crew of D-AGWJ probably did not hear the go-around instruction from ATC, and the AMC did not hear the first transmission from D-AGWJ that they were going around.

D-AGWJ followed the published missed approach procedure, climbing straight ahead to 3,000 ft. The crew of D-AGWJ received a TCAS advisory concerning the aircraft which had taken off ahead of their anticipated landing. The minimum horizontal separation between the two aircraft was three miles while the minimum vertical separation recorded was 600 ft, which occurred as the preceding aircraft was approaching and climbing through D-AGWJ's missed approach clearance limit of 3,000 ft. Thus there was no possibility of a conflict between them due to the respective procedures which the two aircraft were following.

2.2 Taxi Procedures

TC-JGG was cleared by the SMC to taxi from the parking area via Link 4, the Foxtrot TWYs (F3, F2 and F1) and TWY E1, to *"hold short runway 28"*. The taxi clearance appears to have been correctly understood by TC-JGG, as the clearance was confirmed back to the SMC by the crew as being to the holding point of RWY 28. As the aircraft taxied along TWY F3, the SMC again instructed the crew to hold short of RWY 28 and to change over to and monitor the Tower frequency of 118.600 MHz. Again this instruction was acknowledged correctly by the crew of TC-JGG. Subsequently the aircraft taxied as cleared along TWY F2, TWY F1 and onto TWY E1. On TWY E1, the aircraft passed the Cat II/III holding position for RWY 28.

This point was marked by ICAO standard signage on both sides of the taxiway and by painted signage on the taxiway surface. As this holding position was normally only active during low-visibility conditions, it was not in use at the time of the incident. Nevertheless the signage should have alerted the crew to the fact that they were approaching the active RWY 28.

The Operations Manual in use by the crew of TC-JGG stated that a situation whereby both pilots keep their eyes inside the cockpit during taxi was not advisable. The Commander stated that, while he was carrying out "*mandatory head-down tasks*", he caught a quick sight of the Cat I holding position signage of RWY 34. In fact, what he caught sight of was the signage for the combined holding position of RWY 34 and Cat I RWY 28, i.e. his taxi clearance limit, (**Photo No. 2)**. However, the aircraft failed to halt, continued past its clearance limit and entered RWY 28 without permission.

The Jeppesen Chart 10-9 (see **Appendix A**) which was available to the crew of TC-JGG designated the holding position for RWY 28 at TWY E1 as an "Incursion Hotspot", a location which required heightened attention by crews. However, it would appear that this additional warning was not taken into account by the crew.

The Investigation considers that the taxiing procedures laid down in the Operations Manual in use by the crew of TC-JGG could be strengthened with regard to the careful monitoring of a crew's environment, i.e. consideration could be given to a procedure whereby the handling pilot should maintain a constant external look-out throughout the taxi. A Safety Recommendation to the Operator is made in this regard.

Further confusion appears to have been experienced by the crew of TC-JGG with their interpretation of the wording in their Jeppesen manual which stated, *"A further holding position is established on RWY 16/34"*. Believing that he had passed the Cat I holding position for RWY 34, the Commander thought that he would then see signage for the RWY 28 Cat I holding position somewhere on RWY 16/34. In fact, the further holding position on RWY 16/34 referenced in the Jeppesen is established for aircraft which are approaching RWY 28 from the north along RWY 16/34.

In order that any possible confusion regarding the further holding position on RWY 16/34 may be reduced, the Investigation recommends that a proposed amendment to the AIP aeronautical data for EIDW should be originated by the Dublin Airport Authority (DAA) to the effect that a further holding position established on RWY 16/34 is applicable to aircraft approaching RWY 28 from the north along RWY 16/34. The relevant section in AIP Ireland is at EIDW AD 2.20, paragraph 8.4.

Also, the Investigation considers that a statement in the AIP at EIDW AD 2.20 to the effect that the holding position for RWY 34 on TWY E1 is combined or co-located with the Cat I holding position for RWY 28 on TWY E1 would be helpful to crews who are unfamiliar with EIDW. A Safety Recommendation for the origination of such a statement is issued to the DAA.

As the AIP is published by the IAA, these two Safety Recommendations are issued to the DAA in conjunction with the IAA.

Both of these Safety Recommendations concerning AIP Ireland have been accepted by the DAA and IAA. Further information is contained in Section 4, Safety Recommendations.

In his report submitted to the Investigation, the Commander of TC-JGG considered that a standard ATC instruction to taxi to the holding position of RWY 28/34 for RWY 28 would be helpful. This matter was discussed with the IAA. Currently, aircraft using TWY E1 for departure off RWY 28 are instructed to *"Hold short RWY 28"* or alternatively to *"Taxi Echo 1 holding point RWY 28"*. In neither case is a reference to RWY 34 included in the taxi instruction. ICAO documentation does not offer any guidance on phraseology regarding taxi instructions to a co-located holding position which serves two runways. As this is a recognised hotspot area, a Safety Recommendation is issued to the IAA for consideration of the inclusion of a reference to both RWYs 28 and 34 in R/T transmissions to aircraft taxiing in this area.

While the procedures in the Operations Manual in use by the crew of TC-JGG required a crew to verify that a runway was clear in both directions and that clearance had been received prior to entering a runway, there was no specific procedure for a crew to verbally cross-check with each other that they had received the appropriate clearance to cross or enter a runway, whether active or non-active. Accordingly, a Safety Recommendation is issued in this regard to the Operator of TC-JGG.

2.3 Stopbar Lights

It can be seen from **Figure No. 1** that the general layout in proximity to the thresholds of RWY 28 and RWY 34 is complex. It is unusual that a single taxiway (TWY E1) leads to the adjacent thresholds of two divergent runways, and that there is a combined runway-holding position on TWY E1. This combined holding position is noted as an incursion hotspot in AIP Ireland.

In these circumstances, the Investigation considers that the provision of a stopbar facility at the combined holding position of RWY 34 and RWY 28 Cat I on TWY E1 would provide an additional degree of protection against runway incursions at this location. This is in accordance with the guidance provided in ICAO Annex 14. A Safety Recommendation is issued to the DAA, in conjunction with the IAA (as the ATC service provider), in this regard.

The Investigation notes that stopbar lights were introduced into service at the combined holding position of RWY 34 and RWY 28 Cat I on TWY E1, and also at TWY B7 protecting RWY 10, on 25 October 2011. Further information is provided in Section 4 Safety Recommendations.

3. CONCLUSIONS

(a) Findings

1. Dublin ATC cleared TC-JGG to taxi for departure and to hold short of RWY 28. This instruction was issued twice and was acknowledged on each occasion by TC-JGG.

2. Dublin ATC issued a landing clearance on RWY 28 to D-AGWJ.

3. TC-JGG passed the combined holding position for RWY 34 and Cat I RWY 28 and entered RWY 28 without clearance, taxiing onto the centreline of RWY 28.

4. As TC-JGG took up position on the centreline of the active RWY 28, D-AGWJ was approximately 0.5 nm from its touchdown point.

5. The crew of D-AGWJ saw TC-JGG encroaching onto the runway and initiated a go-around manoeuvre.

6. The AMC also saw TC-JGG approaching the active runway and issued a go-around instruction to D-AGWJ. However the AMC's transmission crossed with a transmission from D-AGWJ and it is probable that the crew of D-AGWJ did not hear the instruction.

7. The minimum vertical separation between the two aircraft was recorded by the surface movements control system as approximately 144 ft, at a point where their horizontal separation was approximately 0.4 nm.

8. During its missed approach procedure, D-AGWJ received a TCAS alert from the aircraft which had departed RWY 28 immediately prior to D-AGWJ's scheduled landing. There was no conflict between the two aircraft due to the published procedures each aircraft was following.

9. The Commander of TC-JGG was distracted by "heads-in" tasks inside the cockpit during the taxi and did not correctly see and interpret the signage for the combined holding position of RWY 34 and CAT I RWY 28. He believed that the holding position signage that he caught sight of referred only to RWY 34.

10. The holding position for RWY 28 on TWY E1 is designated as an "Incursion Hotspot" in the Jeppesen Manual, which was being used by the crew of TC-JGG.

11. The crew of TC-JGG misinterpreted the statement in their Jeppesen Manual that *"A further holding position is established on RWY 16/34"*, in that they believed that they would see a further holding position for RWY 28 on RWY 16/34.

12. The Operations Manual in use by the crew of TC-JGG contained no specific procedure for a crew to verbally cross-check that they had received clearance to enter or cross a runway.

(b) Probable Cause

The crew of TC-JGG did not comply with their taxi clearance limit as issued by ATC, and the aircraft entered an active runway without permission.

(c) Contributory Factors

1. Distraction of the crew of TC-JGG during the taxi by head-down cockpit tasks. The Operator's Operations Manual states that, while taxiing, *"both pilots must be very careful about the environment"*.

2. Misinterpretation by the crew of TC-JGG of a statement concerning a further holding position in their Jeppesen Manual.

3. The absence of a verbal cross-check procedure for runway entry in the Operations Manual of TC-JGG.

4. SAFETY RECOMMENDATIONS

It is recommended that:

1. Turkish Airlines should consider an amendment to their Operations Manual Part-B Chapter 2 Normal Procedures to ensure that the handling pilot maintains an external look-out at all times during taxi. **(IRLD2011018)**

2. Turkish Airlines should consider an amendment to their Operations Manual Part-B Chapter 2 Normal Procedures to include a verbal cross-check between crew members when an aircraft is about to enter or cross a runway, whether active or non-active. **(IRLD2011019)**

3. The Dublin Airport Authority, in conjunction with the Irish Aviation Authority, should consider originating an amendment of AIP Ireland, Section EIDW AD 2.20, paragraph 8.4, to clarify the statement *"A further holding position is established on RWY 16/34"*. **(IRLD2011020)**

4. The Dublin Airport Authority, in conjunction with the Irish Aviation Authority, should consider originating an amendment of AIP Ireland, Section EIDW AD 2.20, to include a statement that the holding position for RWY 34 on TWY E1 is combined or co-located with the Cat I holding position for RWY 28 on TWY E1. **(IRLD2011021)**

In response to Safety Recommendations IRLD2011020 and IRLD2011021, the DAA responded as follows on 29 August 2011:

"The attached revision of AIP EIDW AD2.20, Section 8 has been submitted to AIS for publication, with an effective date of 17 November, **(Appendix D)***. The amendments proposed by AAIU are contained in para 8.4. Additional supporting text has also been included in para 8.1, while Para 8.10 has been reinforced in response to other recent incidents.*

The associated (AIP) Runway Incursion Hotspot Chart has been updated and is also attached, **(Appendix E)***."*

In response to Safety Recommendations IRLD2011020 and IRLD2011021, the IAA responded as follows on 30 September 2011:

"I agree with your recommendation. These changes are scheduled to be included in the November release cycle of the AIP."

5. The Dublin Airport Authority, in conjunction with the Irish Aviation Authority, should consider the provision of stopbar lights on TWY E1 at the combined holding position for RWY 34 and RWY 28 Cat I. **(IRLD2011022)**

   In response to Safety Recommendation IRLD2011022, the DAA responded as follows on 29 August 2011.

   "There is already a stop bar in place at the combined RWY28/RWY34 CAT I runway-holding position. The installation of this stop bar was completed on the 23 March 2010 and it is available for operational use by Dublin ATC. I understand that Dublin ATC will introduce this stop bar into operation in the immediate future, along with a similar stop bar at B7 protecting Runway 10."

   In response to Safety Recommendation IRLD2011022, the IAA responded as follows on 30 September 2011.

   "With regard to recommendation 5, the DAA have already installed stopbar lights on TWY E1 at the combined holding position for RWY 34 and RWY 28 Cat I. Pending completion of a risk assessment by Dublin ATC for the use of this stopbar H24[12] and the installation of the associated switching HMI[13] equipment by the DAA, this stopbar will not be used operationally. It is expected to have the stopbar available for H24 operation by mid to late October 2011."

   DAA Airside Operations Notice 42 /2011 noted that the stopbars on Taxiways B7 and E1 were introduced into service on Tuesday 25 October 2011.

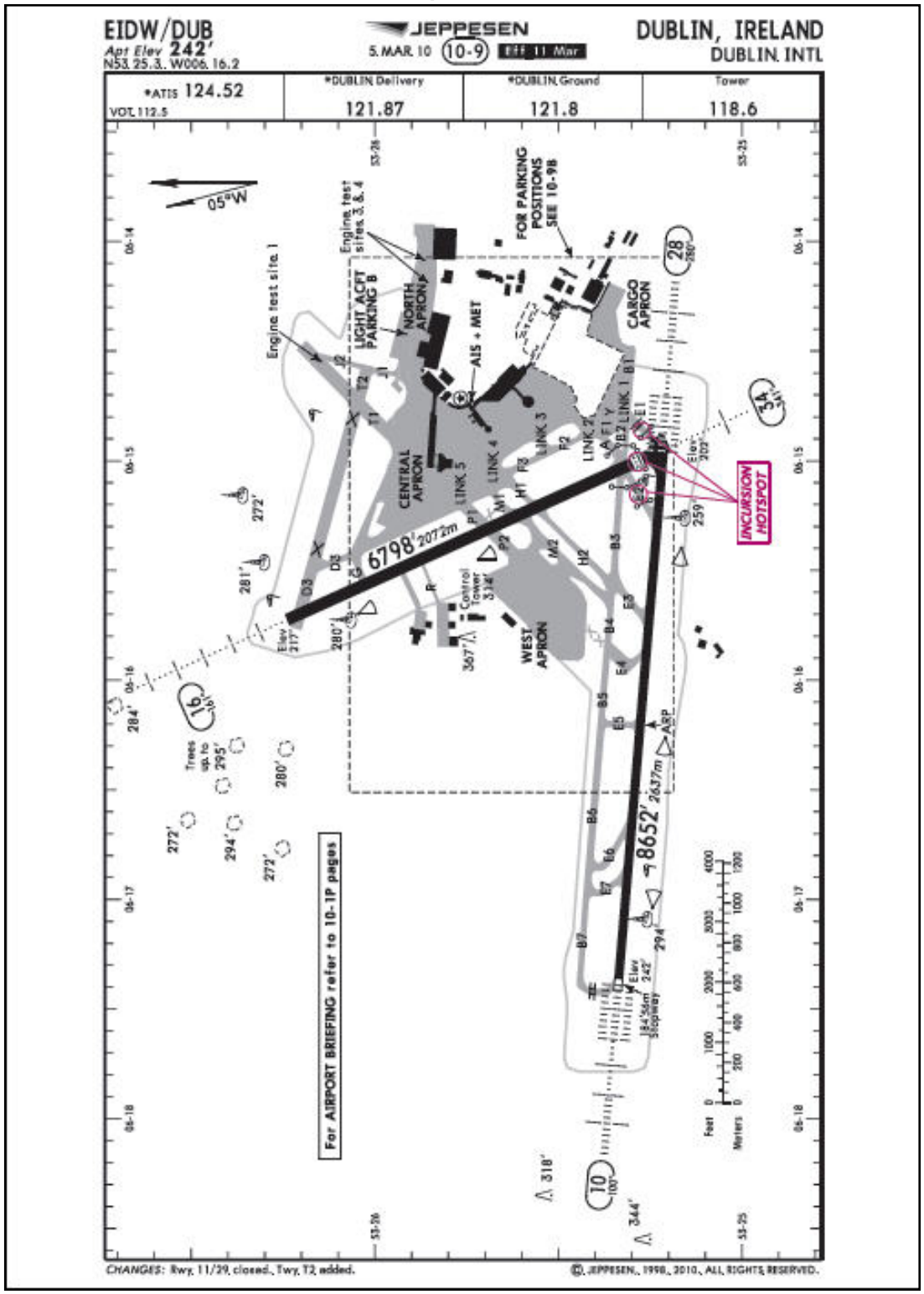
6. The Irish Aviation Authority should consider the inclusion of a reference to both RWYs 28 and 34 in ATC instructions to aircraft taxiing in the area of the combined runway holding position. **(IRLD2011023)**

12 **H24**: On a 24 hour basis

13 **HMI**: Human Machine Interface

APPENDIX A

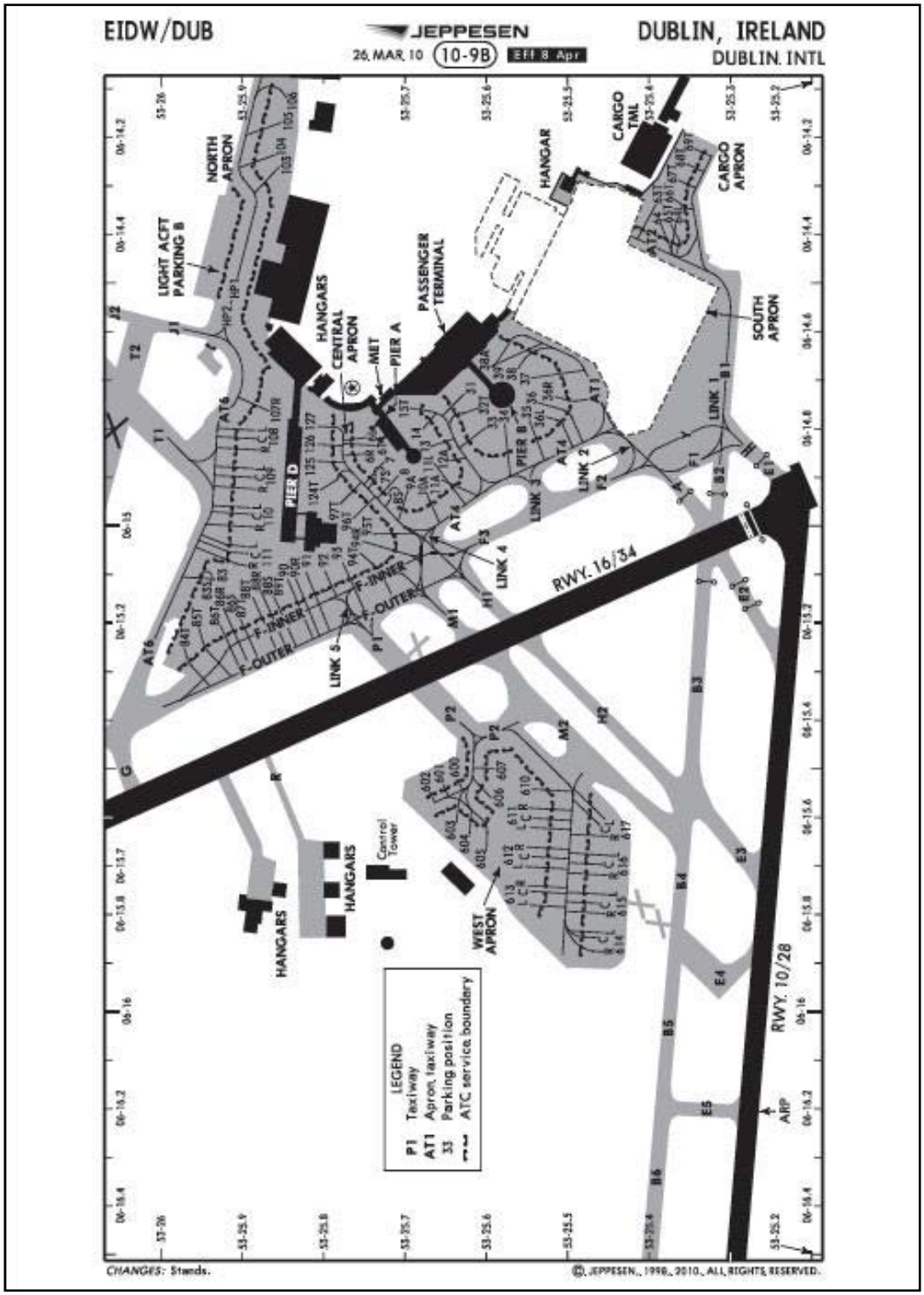
EIDW Airport Chart 10-9



Source: Jeppesen GmbH

APPENDIX B

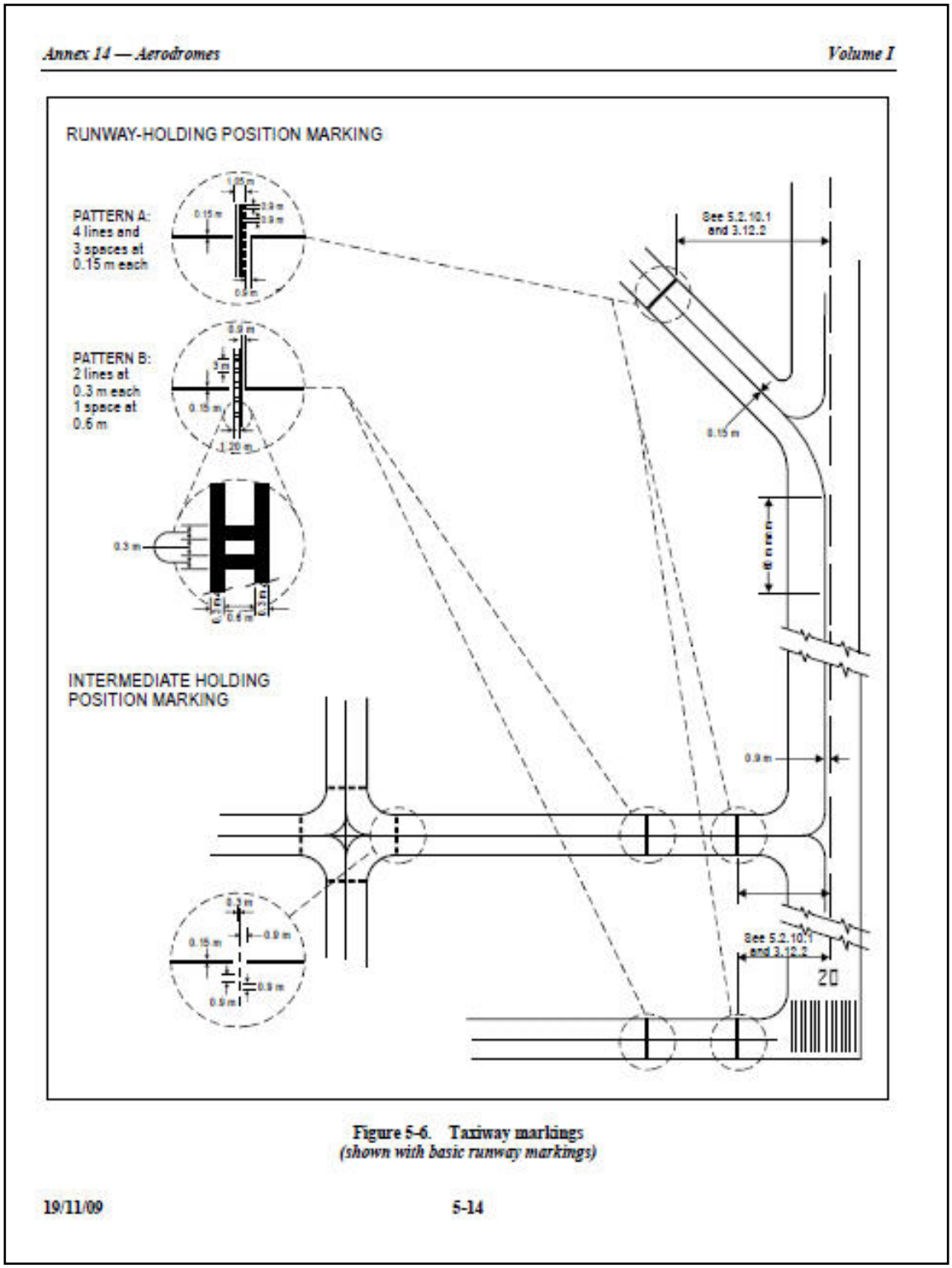
EIDW Airport Chart 10-9B



Source: Jeppesen GmbH

APPENDIX C

ICAO Runway Holding positions Markings



Source: ICAO

APPENDIX D

Revised AIP Effective 17 November 2011

AIP Changes for 17 November 2011

EIDW AD 2.20 LOCAL TRAFFIC REGULATIONS

8 RUNWAY INCURSION HOTSPOTS - Aerodrome Facilities in vicinity of thresholds Runways 28 and 34

8.1 The following resume and associated diagram are provided for ease of familiarity with aerodrome facilities on this complex area of the aerodrome. The attention of all aircrews is drawn to the layout of taxiways, the location of holding positions, and the proximity of the thresholds of Runway 28 and Runway 34. Close attention must be paid to visual aids (markings, lighting, signage).

8.2 All taxiways are provided with location signs (yellow inscription on black background) and direction signs (black on yellow). Centreline markings, edge markings, and blue edge lights are also provided.

8.3 Mandatory signs (white inscription on red background) are provided to identify locations which aircraft shall not pass unless authorised by ATC. These signs include runway designation signs, runway-holding position signs etc.

8.4 For normal visibility conditions, CAT I runway-holding positions are established on all taxiways which intersect with runways. The CAT I runway-holding position on Taxiway E1 is a combined position for Runway 28 and Runway 34. A CAT I runway-holding position is also established on Runway 16/34, for aircraft taxiing along Runway 16/34 towards Runway 28. These holding positions are denoted by:

(i) Yellow painted holding-position markings;

(ii) Red mandatory markings, indicating the designation of the runway ahead;

(iii) Red mandatory signs, including the inscription CAT I and the designation of the runway ahead;

(iv) Yellow flashing runway guard lights;

(v) Location sign indicating the taxiway designation in yellow on a black background.

8.5 For low visibility conditions, a CAT II/III runway-holding position is established on Taxiway E1. This holding position is denoted by:

(i) Yellow painted markings;

(ii) Red mandatory signs with the inscription 28 CAT II/III;

(iii) Red controllable stopbar lights;

(iv) Yellow flashing runway guard lights;

(v) Location sign indicating E1 in yellow on a black background.

8.6 Runway-holding positions cannot be passed without permission from ATC.

8.7 Red fixed stopbar lights are installed on Taxiway E2 and on Runway 16/34 for use in low visibility conditions.

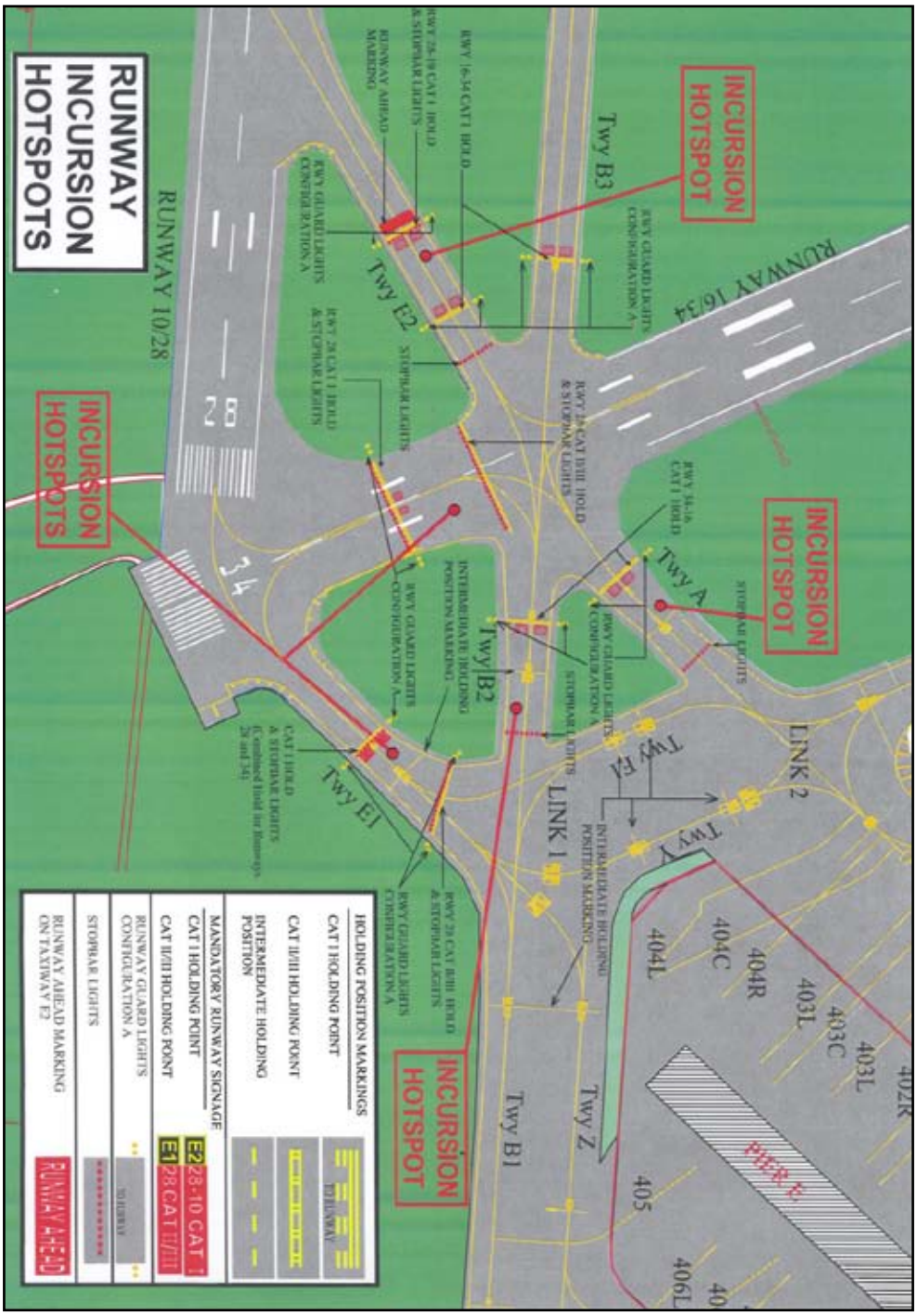
8.8 Stopbar lights on Taxiway E2 are illuminated at all times when Runway 10 is active.

8.9 Aircrews are advised that should they become unsure of their position while taxiing, they should contact ATC immediately and request assistance.

8.10 Due to the close proximity of the two runways, aircrews taking off from Runway 28 or Runway 34 are advised to ensure that they are lined up on the correct runway before commencing take-off run.

APPENDIX E

Revised AIP Runway Incursion Hotspot Chart for EIDW
Effective 17 November 2011



-END-

In accordance with Annex 13 to the International Civil Aviation Organisation Convention, Regulation (EU) No 996/2010, and Statutory Instrument No. 460 of 2009, AIR NAVIGATION (NOTIFICATION AND INVESTIGATION OF ACCIDENTS, SERIOUS INCIDENTS AND INCIDENTS) REGULATION, 2009, the sole purpose of these investigations is to prevent aviation accidents and serious incidents. It is not the purpose of any such accident investigation and the associated investigation report to apportion blame or liability.

A safety recommendation shall in no case create a presumption of blame or liability for an occurrence.

Produced by the Air Accident Investigation Unit

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