



Air Accident Investigation Unit Ireland

SYNOPTIC REPORT

SERIOUS INCIDENT

ATR 72-212A, EI-FAW

Dublin Airport, Ireland

2 September 2016



An Roinn Iompair
Department of Transport

Foreword

This safety investigation is exclusively of a technical nature and the Final Report reflects the determination of the AAIU regarding the circumstances of this occurrence and its probable causes.

In accordance with the provisions of Annex 13¹ to the Convention on International Civil Aviation, Regulation (EU) No 996/2010² and Statutory Instrument No. 460 of 2009³, safety investigations are in no case concerned with apportioning blame or liability. They are independent of, separate from and without prejudice to any judicial or administrative proceedings to apportion blame or liability. The sole objective of this safety investigation and Final Report is the prevention of accidents and incidents.

Accordingly, it is inappropriate that AAIU Reports should be used to assign fault or blame or determine liability, since neither the safety investigation nor the reporting process has been undertaken for that purpose.

Extracts from this Report may be published providing that the source is acknowledged, the material is accurately reproduced and that it is not used in a derogatory or misleading context.

¹ **Annex 13:** International Civil Aviation Organization (ICAO), Annex 13, Aircraft Accident and Incident Investigation.

² **Regulation (EU) No 996/2010** of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation.

³ **Statutory Instrument (SI) No. 460 of 2009:** Air Navigation (Notification and Investigation of Accidents, Serious Incidents and Incidents) Regulations 2009.



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In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No 996/2010 and the provisions of SI No. 460 of 2009, the Chief Inspector of Air Accidents on 5 September 2016, appointed Mr Kevin O’Ceallaigh as the Investigator-in-Charge to carry out an Investigation into this Serious Incident and prepare a Report.

Aircraft Type and Registration:	ATR ⁴ 72-212A, EI-FAW	
No. and Type of Engines:	2 X Pratt & Whitney PWC 127M	
Aircraft Serial Number:	1122	
Year of Manufacture:	2013	
Date and Time (UTC)⁵:	2 September 2016 @ 16.38 hrs	
Location:	On approach to Dublin Airport (EIDW)	
Type of Operation:	Commercial Air Transport / Scheduled	
Persons on Board:	Crew – 4	Passengers – 50
Injuries:	Crew – Nil	Passengers – Nil
Nature of Damage:	Nil	
Commander’s Licence:	Airline Transport Pilot Licence (ATPL) Aeroplane (A) issued by ENAC ⁶	
Commander’s Age:	51 years	
Commander’s Flying Experience:	11,000 hours, of which 61 hours were on type ⁷	
Notification Source:	Dublin Air Traffic Services (ATS)	
Information Source:	AAIU Report Forms submitted by the Flight Crew	

⁴ **ATR:** Avions de Transport Régional

⁵ **UTC:** Co-ordinated Universal Time. All timings in this report are quoted in UTC; Local time is UTC + 1 hour.

⁶ **ENAC:** Ente Nazionale per l’Aviazione Civile; The Civil Aviation Authority of Italy.

⁷ **On type:** Specific to the ATR72-212A ‘-600’ version.

SYNOPSIS

The aircraft, an ATR 72-212A, was approaching Dublin Airport (EIDW) following a scheduled passenger flight from Edinburgh Airport (EGPH) in the United Kingdom. During the intermediate descent prior to commencing the published instrument approach procedure, the aircraft descended below the altitude assigned by the Air Traffic Control Officer (ATCO). The '*Minimum Safe Altitude Warning*' (MSAW) activated on the ATCO's radar screen to warn the ATCO about the aircraft's continued descent. When contacted by the ATCO, the Commander initiated a missed approach, climbed to a safe altitude and obtained radar vectors for a second approach. The aircraft subsequently landed at EIDW without further incident. There were no injuries reported to the Investigation and the aircraft was undamaged.

NOTIFICATION

An occurrence report was submitted by the ATCO through the Safety Occurrence Tracking System (SOTS) of the Irish Aviation Authority (IAA). A report, which was submitted by the Flight Crew to the Operator and forwarded to the SOTS, did not reflect the circumstances described in the ATCO's report. As a result, the Operator did not directly notify the AAIU about this serious incident.

1. FACTUAL INFORMATION

³ 1.1 History of the Flight / Occurrence

The aircraft, an ATR 72-212A⁸ was en-route to EIDW during a scheduled passenger flight from EGPB. The Co-pilot was the Pilot Flying (PF) and the Aircraft Commander was the Pilot Monitoring (PM) on what was the second flight of their duty period. The aircraft had departed EGPB at 15.47 hrs. It entered the Dublin Control Area (CTA) 23 nautical miles (NM) east of Dundalk at 16.29 hrs and was cleared by Dublin ATC to descend to 3,000 ft and to route direct to the position LAPMO⁹. The aircraft was told to contact '*Dublin Director*' for further ATC instructions. At 10 NM from LAPMO, ATC cleared the aircraft to route direct to the position MAXEV¹⁰ (**Figure No. 1**) for an ILS (Instrument Landing System) approach to Runway (RWY) 28, and directed the Flight Crew to report when established on the ILS. The aircraft was also requested to descend to 2,000 ft. At 16.32 hrs, the aircraft was given a speed restriction of 190 kts in order to maintain separation from another item of traffic that was 7.5 NM ahead in the approach sequence. One minute later, the ATCO advised the aircraft to further reduce speed to 160 kts upon reaching MAXEV.

⁸ The ATR72-212A version in question is also referred to in this Report as the '-600' version.

⁹ **LAPMO**: A navigational waypoint 11 NM east of Dublin Airport on the extended centreline of RWY 28.

¹⁰ **MAXEV**: A navigational waypoint 7.1 NM east of Dublin Airport on the extended centreline of RWY 28.



The aircraft reached the ATC altitude restriction of 2,000 ft at 16.38 hrs, approximately 2.5 NM before MAXEV, at a rate of descent of 2,000 ft per minute and an indicated airspeed (IAS) of 185 kts. At 16.39:07 hrs, the aircraft, still descending, passed MAXEV at an altitude of 1,670 ft and an IAS of 181 kts, while commencing a right turn onto a magnetic heading of 284 degrees. Thereafter, the aircraft maintained a rate of descent of 1,200 feet per minute.

At 16.39:26 hrs, as the aircraft passed an altitude of 1,200 ft, an MSAW alert was triggered on the controller's ATC radar screen, causing the ATCO to request the aircraft to *"confirm established on the localiser¹¹ runway 28?"* The Aircraft Commander responded *"Em ye yes confirm we are now eh going eh going around eh [callsign]"*. The ATCO requested clarification of the intentions of the Aircraft Commander by asking *"eh [callsign] just confirm you are going around?"* to which the Commander replied *"Affirm"*. The ATCO acknowledged this transmission with *"Ok [callsign] roger"*. During this interaction, the aircraft continued descending until reaching an altitude of 1,082 ft and an IAS of 168 kts at a point 1.75 NM west of MAXEV. The altitude of an aircraft at this point on the ILS glideslope for RWY 28 should have been 1,975 ft.



Figure No. 1: EI-FAW Flight Path overlay with the aircraft's position at 16.39 hrs

During the first approach the aircraft flaps remained at zero degrees and the undercarriage remained in the 'UP' position. Following the MSAW alert and the controller's intervention, the aircraft executed a go-around and climbed to an assigned altitude of 3,000 ft.

During the go-around, at 1,390 ft and 177 kts while climbing, the flaps were selected from zero to 15 degrees. The IAS gradually reduced and reached 147 kts at 2,800 ft as the aircraft began to level at 3,000 ft. The flaps remained at 15 degrees for a further three minutes until selected to zero. The aircraft was provided with radar guidance by the ATCO for a subsequent ILS approach and landing, which was completed without incident. The aircraft taxied to the parking stand and the passengers disembarked.

¹¹ **Localiser:** An ILS antenna which transmits a radio signal to provide lateral guidance for approaching aircraft.

The aircraft continued to operate for four more flights after the occurrence flight. The Cockpit Voice Recorder (CVR) and the Flight Data Recorder (FDR) were not de-energised or retained following the occurrence. The Flight Crew submitted a Report at 17.30 hrs on Friday 2 September 2016 that was forwarded to the IAA's Safety Occurrence Tracking System. The Report stated;

'During approach, performed go around for unstable approach due to TLU [Travel Limitation Unit] fault- to stop over speed in flight otherwise AC would be grounded. All the approached was always conducted under the control of crew in safe conditions'.

On 5 September 2016, a Mandatory Occurrence Report was submitted by the Dublin ATCO through the IAA SOTS, which stated;

'[EI-FAW] was an arrival from the North. ... the aircraft passed overhead MAXEV at 1900 feet. As the aircraft turn onto the localiser it continued descending. At 1639.39 the MSAW (Minimum Safe Altitude Warning) activated as the aircraft reached 1200 feet, 5.5 nm from touchdown. The Finals controller asked [EI-FAW] if they were established on the ILS. The pilot reported that they were going around. [EI-FAW] was given vectors back to the ILS and landed at 1653.'

Upon reviewing this Mandatory Occurrence Report, the AAIU commenced an Investigation.

1.2 Injuries to Persons

5

No injuries were reported to the Investigation.

1.3 The Aircraft

1.3.1 General

The aircraft, an ATR 72-212A, which was manufactured in 2013, is a short range, narrow fuselage, twin turbo-prop aircraft, powered by two Pratt & Whitney PWC-127M turbo-prop engines (**Photo No. 1**). The version involved was an ATR 72 '600', which incorporates a number of performance improvements and equipment enhancements over its predecessor, the ATR 72 '500', including upgraded cockpit avionics and instruments.



Photo No. 1: An ATR 72-212A similar to EI-FAW



Although the designation ATR 72-212A refers to both the ‘-500’ and ‘-600’ versions of the ATR 72, the EASA¹² *Type Certificate Data Sheet*¹³ (TCDS) states that;

- (1) *“ATR 72-500” is the commercial designation¹⁴ of the ATR 72-212A aircraft model. In particular, this designation is not recognised at EASA level as any certified aircraft model and this must not be used on ATR certified/approved documentation, where only ATR 72-212A must be indicated.*
- (2) *ATR 72-212A “600 version” is the designation to identify ATR 72-212A aircraft models having received the New Avionic Suite (NAS) modification, also named as “Glass Cockpit”, which represents the incorporation of ATR Significant Major Change no 5948 and a batch of associated ATR (major & minor) modifications.*

ATR 72-212A “600 version” aircraft are not considered as new aircraft model or variant.

“ATR 72-600” is the commercial designation of the ATR 72-212A aircraft model fitted with NAS modification. This designation must not be used on ATR certified / approved documentation, and only mention of ‘Mod 5948’, ‘ATR 72-212A with Mod 5948’, “ATR 72-212A fitted with NAS” or ATR 72-212A “600 version” must be indicated.

1.3.2 Aircraft Systems – Travel Limitation Unit

The rudder control system of the ATR 72-212A is fitted with a TLU in order to prevent excessive movement of the rudder pedals that may cause excessive rudder movement when flying at high speed. The TLU is controlled automatically by the Multi-Function Computer (MFC) using data from the Air Data Computer (ADC). The MFC will place the TLU in ‘High Speed’ mode when the aircraft accelerates through 185 kts, and places the TLU in ‘Low Speed’ mode as the aircraft decelerates through 180 kts. The active TLU mode determines the maximum amount of rudder deflection that can be achieved by the pilot.

The TLU is controlled from an overhead panel in the cockpit (**Figure No. 2**). The TLU switch is normally selected to AUTO. In the event of a failure of the system, an amber FAULT light in the TLU panel will illuminate and the TLU can be operated manually by the Commander by placing the switch in the ‘HI SPD’ (High Speed) or ‘LO SPD’ (Low speed) mode as the appropriate airspeed is reached. The operation of the TLU is the same for both the ‘-500’ and ‘-600’ versions of the ATR 72-212A.

¹² EASA: European Union Aviation Safety Agency

¹³ TCDS No. EASA.A.084; ATR 42 - ATR 72, Issue 03, dated 17 October 2012, page 19-20

¹⁴ Emphasis in original EASA document

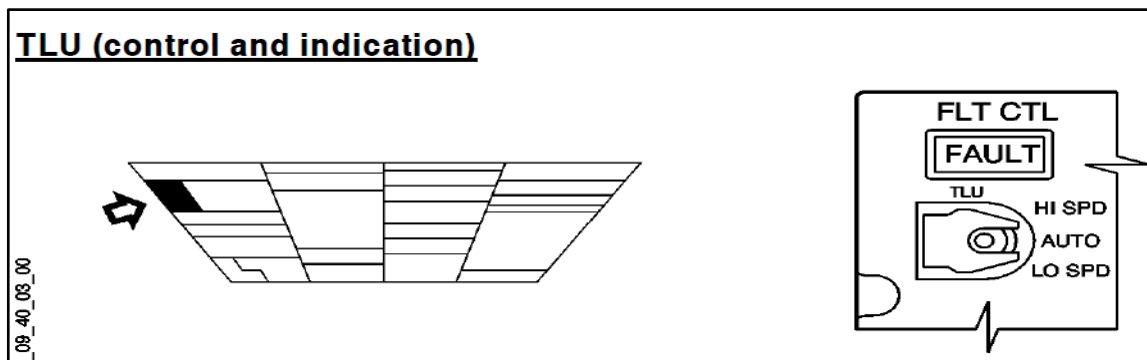


Figure No. 2: ATR 72-212A TLU Controls and Indication

On the day prior to the flight, the TLU System in EI-FAW was inoperative in AUTO mode and this was recorded in the Aircraft Technical Logbook (ATL). The '-600' version (the subject aircraft) includes an additional caution indication that illuminates on the central Engine and Warning Display (EWD) which states 'FLT CTL TLU'. There is no equivalent indication in the '-500' version.

The Minimum Equipment List (MEL) for both versions of the ATR 72-212A permitted the aircraft to dispatch with AUTO mode inoperative on condition that MANUAL mode was operative. An extract from the MEL for the '-500' and '-600' version of the ATR 72-212A is reproduced in **Figure No. 3**. The MEL deferral criteria for failure of the TLU in AUTO mode is the same for both versions.

7

23-1	Travel Limiter Unit (TLU)	C	1	0	May be inoperative in the low speed position provided speed is limited to: 185 kt
	(1) Automatic Mode	C	1	0	* (o) Automatic mode may be inoperative provided manual mode is operative
23-1	Travel Limiter Unit (TLU)	C	1	0	May be inoperative in the low speed position provided speed is limited to: 185 kt
	(1) Automatic Mode	C	1	0	* (o) Automatic mode may be inoperative provided manual mode is operative

Figure No. 3: TLU deferral criteria in the MEL; for the '-500' (upper) and '-600' version (lower)

The MEL for the ATR 72-212A included an operational procedure for manual operation of the TLU while in flight (**Figure No. 4**). It required the pilot to manually select 'HI SPD' in flight when reaching 185 kts during an acceleration, or 'LO SPD' when reaching 180 kts during a deceleration. This in-flight procedure was the same for both the '-500' and '-600' versions of the ATR 72.



23-1 - Travel Limiter Unit (TLU)

OPERATIONAL PROCEDURES

During Cockpit preparation:

- Select manually HI SPD and check alert is generated after 25 seconds: master caution, single chime, FLT CTL TLU on FWS and TLU FAULT light. Check rudder travel limited.
- Select LO SPD and check alert stops after 15 sec and check rudder travel no longer limited.

In flight select manually:

- HI SPD when reaching 185 kt during an acceleration.
- LO SPD when reaching 180 kt during a deceleration.

MAINTENANCE PROCEDURES

None.

Figure No. 4: Operational procedure for the ATR 72 when operating the TLU manually

In response to a request from the Investigation, the Aircraft Manufacturer provided the following additional information in relation to the TLU on the ATR 72 ‘-600’ version.

- On the ATR 72, a maximum speed indication of 185 kts is displayed on the speed tape when the TLU is manually selected on LO SPD (**Figure No. 5**). This is indicated through the striped red and white “Barber’s Pole” band on the speed scale [of the ‘-600’ version].

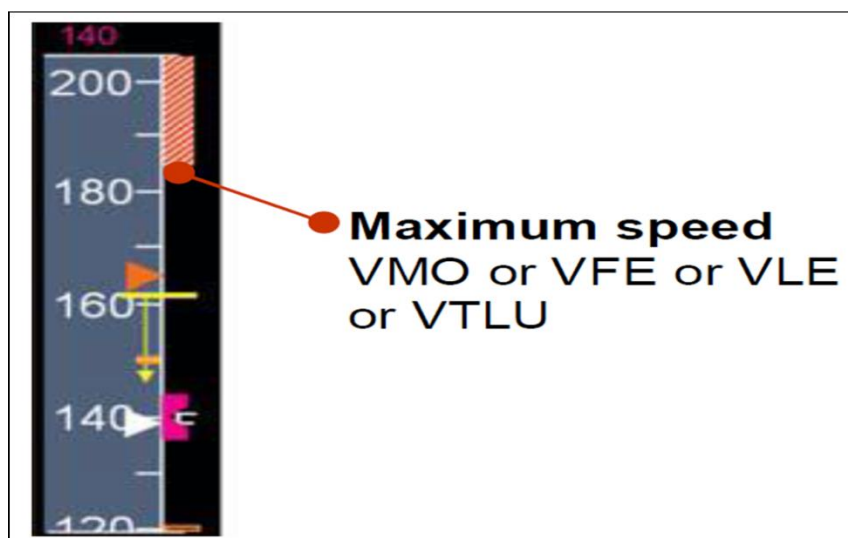


Figure No. 5: Context-dependent overspeed value on the ATR72 ‘-600’ cockpit speed tape

Note: The display of overspeed value in the ATR 72 ‘-500’ is not context-dependent.

- When the TLU is manually selected to LO SPD while the IAS is above the max speed of 185kts (VTLU), there is no aural warning as there is for max speed due to VFE (max flap extension speed), VLE (max landing gear extension speed) or VMO (max operating speed).
- Whenever the AP function is disengaged manually without disengaging the Yaw Damper (YD) function, the AP green arrows turn off, AP DISENG is displayed on the Flight Mode Annunciator (FMA) as a white on red message reverse video, and the “cavalry charge” aural warning is generated. The disengagement is achieved by action on one of the following devices:

- AP pushbutton on FGCP [Flight Guidance Control Panel]
- Quick disconnect pushbutton on control wheel
- Go-around (GA) mode activation
- STBY or NORMAL pitch trim switch activation
- Effort on control column (pitch axis) over 100 N (22 lb)

1.3.3 Flight Crew Qualification

The EASA TCDS established that both the ‘-500’ and ‘-600’ versions of the ATR 72-212A aircraft could be flown under a single common type rating for pilots. Notwithstanding this common rating, ‘Regulation (EU) 1178/2011¹⁵, Annex I: PART FCL, SUBPART H; CLASS AND TYPE RATINGS; SECTION 1’ states that;

Common requirements

FCL.710 Class and type ratings — variants

(a) *In order to extend his/her privileges to another variant of aircraft within one class or type rating, the pilot shall undertake differences or familiarisation training. In the case of variants within a type rating, the differences or familiarisation training shall include the relevant elements defined in the operational suitability data established in accordance with Part-21.*

(b) *If the variant has not been flown within a period of 2 years following the differences training¹⁶, further differences training or a proficiency check in that variant shall be required to maintain the privileges, except for types or variants within the single-engine piston and TMG¹⁷ class ratings.*

Regulation (EU) 965/2012 ‘Organisation Requirements for Air Operations’, Part ORO.FC.125 states that:

Differences training and familiarisation training

a) *Flight crew members shall complete differences or familiarisation training when required by Annex I (Part-FCL) to Regulation (EU) No 1178/2011 and when changing equipment or procedures requiring additional knowledge on types or variants currently operated.*

b) *The operations manual shall specify when such differences or familiarisation training is required.*

¹⁵ **1178/2011:** COMMISSION REGULATION (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council.

¹⁶ Emphasis added for clarity.

¹⁷ **TMG:** Touring Motor Glider



The Operator's *Operations Manual Part D* stated;

2.1.35 Differences Training

ORO.FC.125

Flight crew members shall complete differences training when:

- a) operating another variant of an aircraft of the same type or another type of the same class currently operated; or*
- b) a change of equipment and/or procedures on types or variants currently operated, requires additional knowledge and training on an appropriate training device.*

[The Operator] shall provide differences training through their ATO¹⁸ as required for the following courses:

- *ATR 42/72 Non-PEC to PEC¹⁹*
- *ATR 42/72 PEC to Non-PEC*
- *ATR 72 (PEC) to ATR 72 (Glass Cockpit)*

The Operator's *Operations Manual Part D* did not include the time limitations on the validity of differences training that was included in FCL.710 (b) of Regulation (EU) 1178/2011. The EASA TCDS stated that the '-500' and '-600' were not variants of the ATR 72 and shared a single common type rating. The differences in cockpit instrument layout between the '-500' cockpit and '-600' 'Glass Cockpit' can be seen in **Photo No. 2**.

10



Photo No. 2: An ATR 72-212A; '-500' cockpit (left) and '-600' 'Glass Cockpit' (right)

Notwithstanding the content of the *Operations Manual Part D* relating to limitations on the validity of differences training, the Operator did conduct additional training and a Proficiency Check as per *FCL.710(b) of Regulation (EU) 1178/2011* prior to commencing Line Training with the Commander.

¹⁸ **ATO:** Approved Training Organisation

¹⁹ **PEC:** Propeller Electronic Control; A dual channel electronic control unit which provides closed-loop control over the propeller pitch change system. It also detects and isolates systems faults.

1.3.4 Flight Crew Composition

The Operator's *Operations Manual Part A* prescribed how newly qualified pilots would be placed on the flying roster. This was achieved through the designation, by the Operator, of newly qualified pilots as 'Restricted Flying Flight Crew' for rostering purposes.

'5.2.16 Restricted Flying (RF) Flight Crew

In the interests of safety, flying restrictions are placed on new pilots. Pilots who are restricted will be identified by the symbol "RF" on the roster.

RF pilots may not fly together [...]

A newly appointed Captain will be restricted (RF) until following successful completion of their command training and their final command line check they have completed a minimum of 100 hours flight time or 100 sectors, whichever occurs last and completed a minimum of 2 months of consecutive flying.

A First Officer will be restricted (RF) until, following the completion of a Type Rating and the associated line flying under supervision, he has achieved on the type either:

- (a) 100 flying hours or 100 sectors which occurs last within 120 consecutive days; or*
- (b) 150 flying hours and flown 50 sectors...*

...Direct-entry Captains with previous command experience on the applicable type will have a period of restricted flying stipulated by the FOM [Flight Operations Manager].'

11

1.3.5 Reporting Procedures and Rules of the Air

The Operator's *Operations Manual Part A, Section 11 Handling of Accidents and Occurrences* contained comprehensive guidance for flight crews on the procedures to be followed. *Section 11.2* stated:

Accident and Incident Reporting

[The Operator] shall report to the IAA and any other organisation required by the State any accident, serious incident or incident as defined in S.I. 285 of 2007, Regulation (EU) No. 996/2010 of the European Parliament and of the Council and Directive 2003/42/EC.

In relation to ATC Incidents or deviations from Rules of the Air, *Section 11.2.4* stated that:

*An ATC incident or Deviations from Rules of the Air must be reported immediately to the appropriate ATSU²⁰. The Commander is responsible for notifying the company of any ATC incident or Deviations from Rules of the Air involving the aircraft. The Commander is also responsible for ensuring that a written report is filed with the IAA within 72 hours of the incident or deviation and if required by the state where the incident occurred, with the local authority. **A written report must be forwarded to [The Operator's] Operations within 24 hours.***

²⁰ **ATSU:** Air Traffic Services Unit



Section 11.2.5 provided a list of occurrences that required a report to be submitted in accordance with S.I. 285 of 2007. This list included, inter alia,

- (j) When a **NAVIGATION ERROR**²¹ occurs involving a significant deviation from the intended track [...]
- (m) When a **HEIGHT CONTROL** error of more than 300 feet occurs [...]
- (p) When a **GO-AROUND** is flown.

Furthermore, the Operator's Operations Manual Part A, Section 12 Rules of the Air stated that:

The Flight Data Recorder must not be switched off, erased or disabled during flight or recorded data erased after a flight during which an accident or a reportable incident occurred.

In addition to the Flight Data Recorder, all [Operator] aircraft are equipped with a Cockpit Voice Recorder capable of recording the aural environment of the flight deck during flight and retaining the recorded information for a minimum of the last 30 minutes of operation.

The Cockpit Voice Recorder must not be disabled or switched off during flight unless the Commander believes that the recorded data, which would otherwise be erased automatically, should be preserved for incident or accident investigation.

12

Section 12 also stated the requirements for the operation of the aircraft flight controls as follows:

The commander must ensure that the aircraft is under direct control of one pilot at all times. The use of the autopilot does not alter this requirement.

There should never be any doubt as to who has physical control of the aircraft. If a transfer of aircraft control is required or occurs:

- *The pilot assuming control of the aircraft will state:*

"I have control"

- *The pilot relinquishing control will state:*

"You have control"

²¹ **Bold text** for emphasis was included in the original document.

The Operator's Safety Management Systems Manual stated that:

In accordance with S.I. 285 of 2007, the Commander of any flight is responsible for reporting any safety occurrences to the competent authority (IAA) as soon as is practicable after they occur, and to give to the competent authority, as soon as is practicable after being requested to do so, such further information necessary or appropriate. Raising the report in [the Operator's internal safety reporting system] fulfils this requirement as Safety Office personnel process all reports and notify the IAA as required using the IAA's Safety Occurrence Tracking System (SOTS) form.

1.4 Personnel Information

1.4.1 Aircraft Commander

The Aircraft Commander held a European Union (EU) Airline Transport Pilot Licence (Aeroplane) issued in August 2013 by ENAC. The Commander's type and instrument ratings for the ATR 42/72 series aircraft were revalidated on 20 December 2015. The Commander's Class One Medical Certificate was valid until 1 June 2017. At the time of the event, the Commander had amassed approximately 11,000 hours total flying time. This included a total of 7,200 hours on ATR 42/72 aircraft. This comprised 60.47 flying hours on the ATR 72-212A '-600' version, all of which were as Pilot-in-Command. These hours were achieved as part of the Commander's initial training with the Operator, which commenced on 19 July 2016.

13

The Commander completed a five day Differences Course at the ATR Training Centre at Toulouse Blagnac, France in December 2013. This course was to instruct the student on the differences between the ATR 72-212A '-500' version and the ATR 72-212A '-600' version in compliance with *Regulation (EU) 1178/2011, Annex I: Part FCL.710*. The course consisted of ground school lectures. It did not include any simulator-based training, flight training or a written examination. Following completion of the Differences Course, the Commander joined a European Boeing 717 operator in March 2014.

He then joined a different European operator flying the ATR 72-212A '-500' version in September 2015. He had flown 300 hours during the six months prior to joining the Operator in July 2016. He did not fly the ATR 72-212A '-600' version during that time.

Upon joining the Operator, the Commander initially conducted two training sessions on 7 August 2016 at a Full Flight Simulator in Toulouse Blagnac, France. This was 32 months after completing the Differences Course. The instructor's debrief notes for the first flight stated that '*3 years since 600 Delta²² → much forgotten. Revise all calls + SOPs. General flying + handling to a good standard but FMS and Glass Cockpit procedures need work*'. The debrief notes from the second simulator flight conducted on the same day noted '*Additional sim to improve use of 600 due to lack of time on variant, flying fine*'.

²² **Delta:** In this case is a reference to the word 'Differences'.



The Commander completed an Operator Proficiency Check (OPC) on 9 August 2016. The examiner's comments noted that '[Commanders name] *is improving with 600 but still needs to review all [Operator] procedures in relation to who sets what and PF/PM callouts...All flying to standard. It has been some time since [Commander's name] completed the delta course and as a consequence he has become rusty with the variant.*' The records from the simulator sessions and the OPC did not indicate any use or operation of the TLU in manual mode.

The Commander commenced Line Training on 11 August 2016. Line Training consisted of 48.19 flying hours accrued over 38 scheduled passenger-carrying flights, which were conducted with a training captain. The Commander's Line Check was successfully completed on 29 August 2016 and consisted of four scheduled flights of 6.30 hours duration. He was noted on the de-briefing sheet to be '*A confident and capable commander*'. The Line Training and Line Check did not indicate any use or operation of the TLU in manual mode by the Commander. The Pilot Line Check Report Form noted "*Needs to call out any deviations on approach as PF, eg speed correcting, 3 reds correcting etc...*" and that the Commander "*Needs to remember to announce all changes on the flight deck.*" The *Operations Manual Part A 5.2.16* stated that '*Direct-entry Captains with previous command experience on the applicable type will have a period of restricted flying stipulated by the FOM*'. There was no indication in the Training Records that such a period was stipulated nor was such a stipulation required, as the Commander met the Operators experience criteria based on the EASA TCDS for the ATR 72-212A and the Operators *Operations Manual Part A 5.2.16*. The Operator informed the Investigation that any RF limits on flight crew would be notified by the FOM to the Operator's crew rostering section to ensure the appropriate pairing of flight crews was maintained.

1.4.2 Co-pilot

The Co-pilot was the holder of an EU Commercial Pilot Licence (Aeroplane) issued by the IAA on 16 February 2015. The Co-pilot's type and instrument rating for the ATR 42/72 series aircraft was revalidated on 22 April 2016. The Co-pilot's Class One Medical Certificate was valid until 19 May 2017. At the time of the event, the Co-pilot had 441 hours total flying time, of which 203 hours were on type.

1.5 Flight Crew Interviews

1.5.1 Interview with the Commander

The Commander told the Investigation that he had completed the Differences Course in 2013, but that the company he had joined at that time had ceased trading soon afterwards. He continued flying the ATR 72-212A '-500' version and the Boeing 717 for another airline.

He said that he had joined the Operator following an evaluation in June 2016, and completed three simulator sessions as part of an Operator Conversion Course (OCC) and an OPC. After this check flight, he commenced Line Training on the ATR 72-212A '-600' version. His Line Check had been conducted four days prior to the occurrence.

The occurrence flight was the second scheduled flight for the Flight Crew that day. A further return flight to Edinburgh was completed following the occurrence flight. The Commander said that he acted as the PF for the first scheduled flight, with the Co-pilot acting as PF for the occurrence flight. The Commander stated in his AAIU Pilot Report Form that he had to manually set the TLU to 'Lo speed', which he did at 3,500 ft and 185 kts. This caused the V_{MO} indication on the display to move to the current IAS so the Commander stated that he returned the TLU to 'Hi speed' and told the PF to disconnect the autopilot in order to decelerate the aircraft. The Commander then set the TLU to 'Lo speed' again and stated that he then noticed that the IAS was increasing and that the aircraft was still descending. He stated that he asked the PF three times to 'Climb'.

The Report submitted by the Commander stated that, when ATC called to confirm if they were established, he called "Go-around" to the PF, and when no response was received he took control of flying the aircraft. The Commander did not indicate the method by which he informed the Co-pilot that he was taking control of the aircraft. The Report stated that he conducted a normal go-around (GA) and then received vectors from ATC for another ILS approach and landing. Under the heading of 'Your Assessment of the Cause of the Accident/Incident' on the Report Form, the Commander stated that *'MEL of the TLU is different from ATR 600 and ATR 500. The indication of VMO induced in error to disconnect autopilot to adjust quickly the speed; PF loss altitude cleared and I checked with delay this fact; due to few experiences of PF was not reactive to the order to climb...'* The Commander emphasised in his Report that he was satisfied that the aircraft was at all times operating in VMC conditions with the ground in sight.

15

During the interview, the Commander told the Investigation that he had overestimated the Co-pilot's experience level and ability to fly the aircraft. He said that he personally did not have a lot of experience with the '-600' version, and that *"the operation of the TLU was completely different and new"* because the V_{MO} indication system was different between the two aircraft, and that as a result he did not monitor the PF as closely as he should. He was unsure if a V_{MO} aural warning alarm existed on the aircraft, but was sure that no such alarm sounded during the flight.

The Commander stated that he was not aware that the flaps had been selected to 15 degrees at 1,390 ft during the go-around. He informed the Investigation that, consequently, he was also unaware that the flaps had been retracted to zero three minutes after levelling at 3,000 ft.

The Commander was asked why the details of the occurrence were not reported in accordance with the Operator's procedures. He accepted that the Operator's documentation required the Commander to report any accidents or serious incidents to the Operator and the Irish Aviation Authority, and he accepted that he did not do this. He also accepted that it was the Commander's responsibility to isolate the CVR and FDR data following an accident or serious incident. The CVR and FDR were both over-written and the data for the flight was unavailable to the Investigation.



1.5.2 Interview with the Co-pilot

The Co-pilot informed the Investigation that he had a background in general aviation and had taken up flying as a profession early in 2016. He observed that, in his opinion, the Commander's comprehension of the English Language was at around 90% of what was being said to him, both prior to and during the flight. He stated that the Commander flew the first leg to Edinburgh and he acted as PM. He flew the return leg to Dublin and the Commander fulfilled the PM duties. He said that the initial part of the flight from Edinburgh to Dublin was uneventful. The aircraft was cleared by ATC to route to position LAPMO and to descend to 3,000 ft. The approach briefing and checklist items had been completed. The aircraft was then cleared to position MAXEV and to descend to 2,000 ft. The Co-pilot initiated a turn to the right in heading mode to assist the interception process. The aircraft undercarriage was UP and the flap position was set to zero degrees. As the aircraft intercepted the approach at an estimated 185 kts, he stated that the Commander changed the TLU switch to LO SPD. At the same time, the autopilot disconnected, the aircraft pitched up and the speed reduced towards 170 kts. The Co-pilot stated that he did not disconnect the autopilot and that the Commander had his hand gripped on the control column while using the radio transmit button. He said that this led him to presume that the Commander had disconnected the autopilot.

He asked the Commander if he had taken control of the aircraft. The Co-pilot said that the Commander was calling ATC on the radio at the time to report that the aircraft was established on the localiser. The Co-pilot said that he asked the Commander a second time if he had control, and there was no response. The Co-pilot said that he resumed manual control of the aircraft to return it to the approach centreline as the speed increased again. The Co-pilot stated that as the Commander noted the deviation from the centreline and the crew elected to commence a go-around, ATC called to request confirmation that the aircraft was established on the approach. The Flight Crew then confirmed that a go-around had been commenced and ATC provided a heading to the north-west to facilitate traffic flow.

The Co-pilot stated that he conducted the initial part of the go-around and climbed at a speed of around 170-180 kts on a north-westerly heading. He stated that at approximately 1,300 ft the Commander took control of the aircraft and configured it for a go-around. This included deploying the flaps to 15 degrees at 1,400 ft and advancing the power levers. The Co-pilot said that the selection of flaps to 15 degrees was made by the Commander. The Co-pilot did not indicate how he was informed by the Commander that he was taking control of the aircraft. He said that after the aircraft reached 3,000 ft, control was then returned to him and the flight continued to a landing without further incident. He said that after the aircraft reached its parking stand, the Flight Crew commenced debriefing the approach and go-around, but before it could be discussed in detail, other personnel began to come on board as part of the turn-around of the aircraft for the next sector. Consequently, the occurrence was not discussed until later that day following two additional flight sectors: a return flight to Edinburgh.

Under the heading of *'Your Assessment of the Cause of the Accident/Incident'* on the AAIU Pilot Report Form, the Co-pilot stated *'Early engagement of the TLU manually above 180 kts'* and that the Commander *'appeared unfamiliar with the [aircraft] particularly with its automation'*.

The Co-pilot was asked about the entry in the Operator's internal reporting system, which was made under the Co-pilot's log-in. It described the event as *'During approach, performed go around for unstable approach due to TLU fault- to stop overspeed in flight otherwise AC would be grounded. All the approached was always conducted under the control of crew in safe conditions.'* The Co-pilot told the Investigation that the Commander did not have a log-in to the Operators Reporting System, so he used the Co-pilot's log-in to submit the report to the Operator.

1.6 Aids to Navigation

1.6.1 Airspace

The airspace around Dublin is complex and busy. There are three airports within the vicinity of the city: Dublin Airport (EIDW), Weston Airport (EIWT) and Casement Aerodrome (EIME). The airspace system is designed to integrate the arrival, departure and transit of civil traffic, military traffic, fixed-wing aircraft, rotary-wing aircraft, commercial flights and general aviation traffic through the airspace. In addition, the airspace is designed to simultaneously integrate and separate traffic operating under visual or instrument flight rules. The Aeronautical Information Publication (AIP Ireland) Visual Approach Chart for EIDW is included in **Appendix A**. The portion of the chart relating to the airspace to the east of EIDW is shown in **Figure No. 6**.

It can be seen that there are designated routes, holding points and Visual Reporting Points (VRPs) for visual traffic. This enables traffic transiting through Dublin's airspace to remain laterally and/or vertically separated from instrument traffic approaching RWY 28 at EIDW. Such traffic would usually be assigned an altitude of between 1,000 ft and 1,500 ft in order to maintain vertical separation with traffic conducting an ILS approach to the runway.

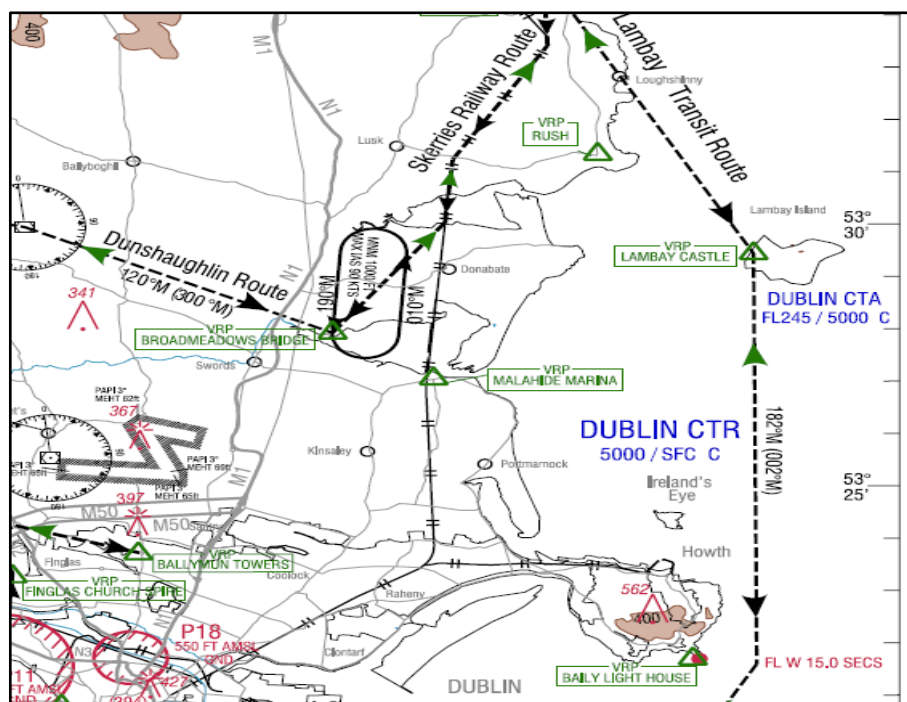


Figure No. 6: Extract from Dublin Airport Visual Approach Chart



1.6.2 The ILS Approach

The aircraft was being provided with radar guidance by Dublin Air Traffic Control for the ILS approach to RWY 28 (**Appendix B**). An ILS is a precision approach aid, which consists of two radio beams that provide signals to on-board instruments that give the pilot both vertical and lateral guidance during an approach to land in all weather conditions. The lateral guidance is transmitted from a *localiser* antenna and provides a display in the cockpit of either left or right of runway centreline. The vertical guidance is provided by a *glideslope* antenna and is displayed in the cockpit as being either above or below the optimum approach path which equates to an approximate rate of descent of 300 ft per NM. The approach procedure is usually commenced from an altitude²³ that provides clearance for the aircraft from the surrounding terrain, once the aircraft remains within the lateral and vertical constraints of the procedure. For aircraft conducting the ILS approach to RWY 28 at EIDW, this altitude facilitates vertical separation from visual traffic that may be transiting the airspace to the east of the airport.

The waypoints of LAPMO and MAXEV are on the extended centreline of RWY 28 at EIDW and are positioned to facilitate ATC assigning an interception point for the localiser to arriving aircraft. Eurocontrol²⁴ guidance²⁵ on the use of ILS states that;

‘An ILS is only valid if used within strict boundaries either side of the transmitted LOC and GS beams as documented on the corresponding AIPs Instrument Approach Procedure (IAP). From a pilot perspective, these limits are defined as Full Scale Deflection (FSD) of the deviation indication on the ILS displays in the flight deck, since once the deviation in respect of either the LOC [localiser] or GS [glideslope] reaches FSD, it becomes impossible to know the extent of the deviation.

Because of this, pilots navigating their aircraft onto an ILS, whether from below the GS or above, have always been expected, when acquiring an ILS GS, to cross-check their range from touchdown against their indicated altitude/height and confirm that their aircraft is on the promulgated IAP GS.’

1.6.3 Conduct of the Approach

As part of successfully completing the ILS approach as described above, there are a number of actions that a flight crew must complete during an approach to a runway. In order to ensure accurate completion of the required actions, the Aircraft Manufacturer and Operator provide checklists for flight crew to follow. The Operator’s Operations Manual Part B contained a checklist of internal cockpit communications and cross-checks for an ILS approach (**Appendix C**). This includes crosschecking whether the aircraft has captured the localiser signal, the glideslope signal, aircraft divergence from either lateral or vertical profiles, crossing altitude and speed restrictions listed on the published chart.

²³ This altitude is often referred to as the platform altitude.

²⁴ **EUROCONTROL:** The organisation for the safety of air navigation and air traffic management across Europe. It currently has 41 member states and is headquartered in Brussels, Belgium.

²⁵ Document accessed 3 September 2020 at [https://www.skybrary.aero/index.php/Instrument_Landing_System_\(ILS\)](https://www.skybrary.aero/index.php/Instrument_Landing_System_(ILS))

The checklist is used to ensure that the aircraft does not diverge from the approach without the flight crew being aware of it. In addition, the aircraft normal checklist (**Figure No. 7**) must be completed prior to landing. This is designed to ensure that the aircraft is correctly configured to successfully complete a landing from the ILS approach.

ATR 42/72 (PEC)		ATR 72	
APPROACH		BEFORE LANDING	
SEAT BELTS	ON	LDG GEAR	3 GREEN
LANDING LIGHTS	ON	FLAPS	CHECK
ALTIMETER	SET & CHECK	PWR MANAGEMENT	TAKE OFF
CABIN ALTITUDE	CHECK	TLU	LO SPEED
		ICING AOA LIGHT	CHECK
		EXTERNAL LIGHTS	ON

Figure No. 7: ATR72 Normal Checklist extracted from the Operator's OMB

In particular, the 'Before Landing' checklist includes the requirement to extend the landing gear, check for the required flap selection, and to confirm that the TLU is set to the low speed mode.

The Operators' Operations Manual Part B, Section 2.1.22 stated that for the conduct of the approach to be continued below 1,000 ft above the aerodrome level, the following criteria must be met:

- *The aircraft is on the correct flight path.*
- *Only small changes in heading or pitch are required to maintain the correct flight path.*
- *The aircraft is in the correct landing configuration*
- *All checklists and briefings are complete*
- *The aircraft speed is Vapp (with wind correction) +10kts/-0kts*
- *Descent rate is less than 1000 ft/min (If the approach requires a higher descent rate, this must be covered in the briefing)*
- *Power is set correctly, according to aircraft weight and conditions [...]*

Additional Criteria:

- *Precision approaches must be flown within ½ scale deflection of the glideslope and localizer*

Furthermore, Part B, Section 2.5.3.1 requires both crew members to monitor the conduct of the approach as follows:

'Both crew-members are required to continually monitor the approach with particular reference to the altitude vs distance. On an ILS approach, a minimum of one height check shall be performed, normally at the FAF [Final Approach Fix] or OM [Outer Marker]. If any crossing or check altitude is incorrect, or if the approach is not progressing as expected or becomes unstable then a missed approach should be initiated.'



1.7 Recorders

1.7.1 General

The aircraft was equipped with Cockpit Voice Recorder (CVR) and a Flight Data Recorder (FDR). In addition, the Operator maintained a Flight Data Monitoring capability through a third-party provider. The Air Navigation Services Provider retains radar video and recorded audio transmissions for the airspace around Dublin Airport.

1.7.2 On-Board Voice and Data Recorders

The aircraft was equipped with a FA2100 CVR and a FA2100 FDR, both manufactured by L3 Communications, U.S.A. The CVR, which records two hours of voice recordings before being over-written, was not preserved immediately following the flight and so was unavailable to the Investigation. By the time that the AAIU became aware of the occurrence, the aircraft had completed over 25 hours of flight time, which is the recording limit for the FDR. This resulted in the FDR data for the flight probably being over-written and unavailable to the Investigation. For this reason, and due to the Investigation being in possession of the Flight Data Monitoring (FDM) data, the FDR was not removed from the aircraft for download.

1.7.3 Flight Data Monitoring

1.7.3.1 General

The Operator provided data from their FDM program to the Investigation. This provided a limited set of aircraft parameters related to the occurrence flight, some of which are reproduced in **Figure No. 8**.

It was noted from the data that the undercarriage remained retracted for the duration of the first approach and go-around, and that the flaps were not extended during the approach, but were extended to 15 degrees while climbing through 1,400 ft during the go-around and were retracted again after the aircraft levelled at 3,000 ft.

According to the FDM data, the aircraft passed 3,500 ft at 16.37:22 hrs while the aircraft was at an IAS of 202 kts. The aircraft reached an IAS of 185 kts while passing an altitude of 2,320 ft at 16.38:40 hrs.

The data indicated that at 16.38:18 hrs while at 2,600 ft altitude and 190 kts indicated airspeed, the engaged²⁶ lateral navigation mode (LNAV) mode on the Flight Mode Annunciator (FMA) Panel changed to a selected heading (HDG SEL) of 224 degrees, and the armed lateral mode changed to Localiser (LOC). The armed vertical mode of selected altitude (ALT SEL) changed to ALT SEL GS (glideslope). This in effect meant that approach mode was active at this time.

²⁶ A navigation mode is 'armed' when it has been selected by the crew on the FGCP, but the necessary criteria for engagement have yet to be met. A navigation mode is 'engaged' when it has been selected by the crew on the FGCP, or captured by the AFCS.

At 16:38:36 hrs, passing 2,300 ft at 186 kts, the FDM recorded an abnormal disconnect of the Automatic Flight Control System (AFCS) and autopilot (**AFCSABDIS** in **Figure No. 8**), and a Flight Mode Annunciator of 'AP DISENG' was activated in the cockpit.

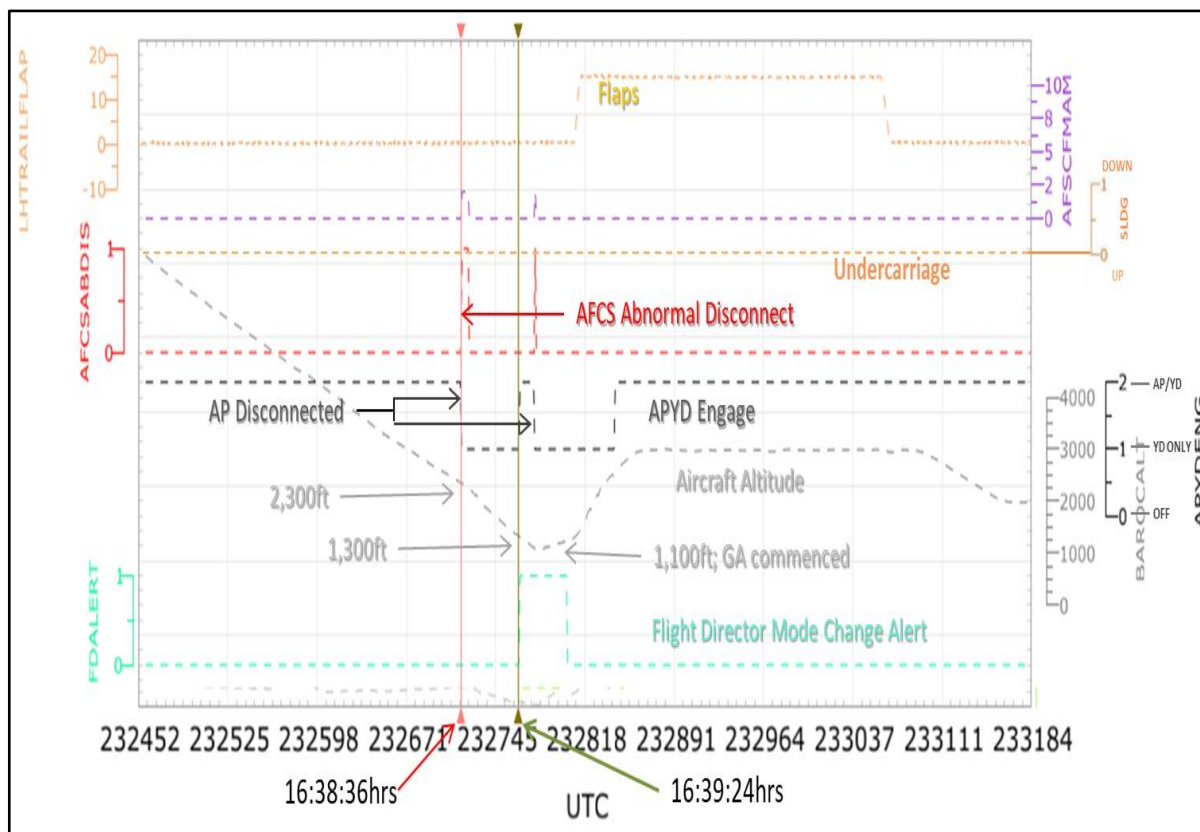


Figure No. 8: FDM Data showing moment of Autopilot disconnect during first approach

At 16:38:43 hrs (seven seconds later), the armed vertical mode changed from ALT SEL GS to GS indicating that the selected altitude was being captured. The engaged vertical mode changed to ALT*, which is the capture mode for the pre-selected altitude of 2,000 ft. The autopilot remained disengaged. At 16:38:58 hrs, while at 1,800 ft and 184 kts on a heading of 224 degrees, the engaged lateral mode changed from HDG SEL to LOC*, which is the capture mode for the localiser. However, during LOC* the HDG SEL will still cause the aircraft heading to change until the localiser is captured. The aircraft commenced a right turn onto a heading of 283 degrees. This turn was conducted while the autopilot was disengaged (the Co-pilot recalled initiating the turning of the aircraft).

The autopilot was re-engaged at 16:39:24 hrs. Twelve seconds later, at 16:39:36 hrs, the AFCS vertical mode of ALT* was still engaged as the autopilot disconnected again. The aircraft was at 173 kts on a heading of 283 degrees and descending through 1,300 ft. The AFCS vertical mode then changed to PITCH HOLD as there was no valid engaged vertical mode selected (such as ALT* or ALT HOLD), and a Flight Director Mode Change alert (FDALERT) was triggered.



Nine seconds later (16.39:45 hrs), at 1,100 ft and 171 kts, an abnormal mode change of the AFCS was recorded. This coincided with the commencement of the go-around, during which the aircraft descended to 1,075 ft. At 16.40:03 hrs, at 1,230 ft and 170 kts, the engaged vertical mode changed from PITCH HOLD to GA (go-around) mode. The engaged lateral mode changed from LOC* to HDG HOLD in accordance with the GA mode. At 16.40:13 hrs, while climbing through 1,390 ft at 177 kts, the flaps were extended to 15 degrees. The speed continued to reduce as the aircraft climbed, reaching 145 kts at 2,598 ft at 16.40:43 hrs. The aircraft levelled at 3,000 ft at 16.41:07 hrs, and accelerated to 160 kts. The aircraft maintained this altitude and speed and the flaps were retracted to zero degrees at 16.44:29 hrs. The remainder of the flight was completed without incident.

1.7.3.2 Autopilot Disengagement

The Investigation requested the Aircraft Manufacturer to assist in providing possible reasons for the disconnection of the Autopilot at 16.38:36 hrs and at 16.39:45 hrs. The Aircraft Manufacturer stated that;

'If the TLU is manually selected to HI SPD while IAS is below 185 kts, the Autopilot (AP) is prone to command rudder input higher than the limitation provided by the TLU which could saturate the AP actuator control, which could lead to a YD and AP disconnection. Nevertheless, it does not appear to be the case here since the YD was kept engaged when the AP disconnected.'

Some root causes cannot be excluded from QAR²⁷ data (internal AFCS failure, AHRS vertical speed monitoring, AP push button or AP quick release) but as a pitch effort on the control column greater than 10daN²⁸ is noticed on QAR data just before AP disconnection, this root cause is the most probable explanation for AP disengagement.

This condition is triggered when the effort applied on the rod becomes greater than $\pm 35\text{daN}$ (parameter "Pitch Effort Rod": CCOLFBx [Figure No. 9]). At GMT 16:38:35, the effort applied by the captain on the Rod becomes lower [a greater negative force] than -35daN and reaches -39daN , the AP is disconnected 1s later due to AFCA and MFC confirmation time and refresh rate.

²⁷ **QAR:** Quick Access Recorder: A recording device that stores the FDM data on-board the aircraft.

²⁸ **daN:** Decanewton. An SI unit of force equal to 10^1 Newtons.

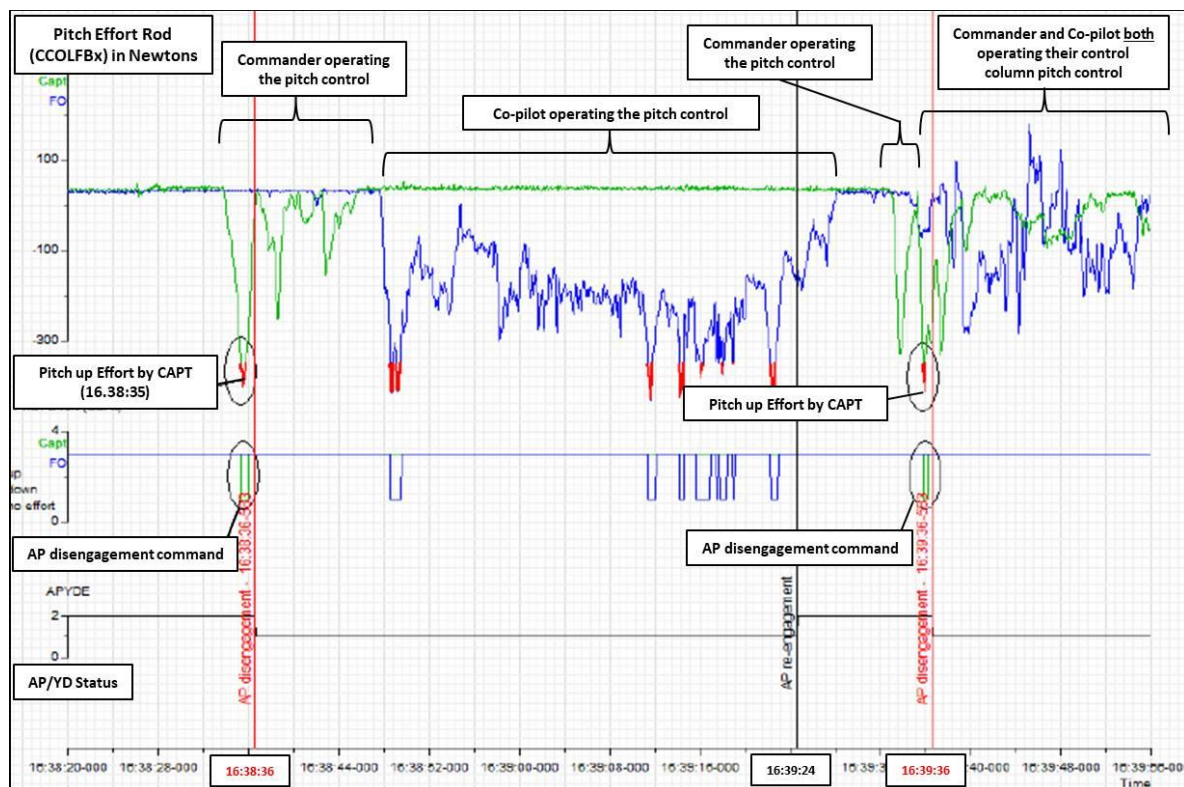


Figure No. 9: Extract of FDM Data provided by Aircraft Manufacturer.

23

Following this AP disconnection, several efforts (up) are applied on the pitch control by first officer. AP is reengaged at 16:39:24 but another effort (up) is applied by the captain at 16:39:36 which lead to a second AP disconnection.'

After the second autopilot disconnection, there was a period of 20 seconds, from 16:39:36 hrs until 16:39:56 hrs, when pitch forces were being applied to both Pilots' control columns simultaneously. This period coincided with the go-around.

1.7.4 Air Traffic Control

The Dublin Air Traffic Control (ATC) recording of the occurrence was retained and provided to the Investigation. The recording consisted of a video of the radar data displayed during the aircraft's approach and landing at EIDW, and an audio recording of the communications between the aircraft and ATC.

As the aircraft descended through 4,700 ft, it was cleared by ATC to route direct to position MAXEV and to descend to 2,000 ft altitude. At this time clearance was given by ATC for the aircraft to conduct the ILS approach to RWY 28. As the aircraft passed 2,600 ft, ATC issued a speed control instruction of 160 kts. The aircraft crossed overhead MAXEV at 1,670 ft, which was 330 ft below the ATC-assigned altitude, and commenced a right turn towards the airport. There was no radio call made to ATC that the aircraft was established on the localiser or glideslope.



The ATC radar screen at 16.39:35 hrs is shown in **Figure No. 10**, and indicates the moment that the MSAW activated. The ATCO enquired whether the aircraft was established on the localiser. In response, the Commander stated that a go-around was being commenced.



Figure No. 10: ATC Radar Screen showing the position of EI-FAW at the time of the MSAW

The recording indicates that the Commander was operating the radios until the go-around was commenced, and that the Co-pilot responded during the initial stage of the go-around. The Commander resumed operation of the radios for the subsequent communications.

2. ANALYSIS

2.1 General

The aircraft was conducting a scheduled passenger flight from EGPB to EIDW. The Co-pilot was PF and the Commander was PM. The failure of the TLU automatic mode was recorded in the Technical Log as a deferred item for the flight in accordance with the aircraft MEL. This deferral required that the TLU be operated manually during the flight. The Commander, who was operating the TLU, stated that the operation of this system in the '600' version of the ATR 72 was not familiar to him. In particular, he was concerned that the aircraft would exceed its maximum permitted operating speed (V_{TLU}) when the switch was cycled to LO SPD.

The Investigation established that the TLU deferral criteria and in-flight operational procedures in the MEL for both the '500' and '600' versions of the ATR 72 are the same, although the Commander's assessment of the cause of the occurrence was '*MEL of the TLU is different from ATR 600 and ATR 500.*' The Commander told the Investigation that he set the TLU to LO SPD at 3,500 ft and 185 kts. According to the FDM data, the aircraft passed 3,500 ft at 16.37:22 hrs while the aircraft was at an IAS of 202 kts. This speed is above the V_{TLU} indication on the Commander's cockpit speed tape, and would cause the '*Barber's Pole*' (of the '600' version) to move to 185 kts, indicating an overspeed situation to the Commander.

He said that he then told the PF to disconnect the autopilot, that he continued to cycle the TLU between LO SPD and HI SPD, and next told the PF to go-around. The Commander did not indicate to the Investigation that any other actions were completed within the intervening period, including monitoring the progress of the ILS approach, or conducting the approach and before landing checklist. This indicates that the Commander was focused on the effects of TLU selection from 16.37:22 hrs until 16.39:45 hrs (2 minutes 23 seconds) to the exclusion of other activities. This would suggest that the Commander, who was PM, had become distracted from monitoring the position and configuration of the aircraft.

The Co-pilot stated that at an estimated 185 kts, the Commander changed the TLU switch to LO SPD, the autopilot disconnected and the speed reduced towards 170 kts. The Co-pilot stated that he did not disconnect the autopilot and said that as a result of the disconnection, he presumed that the Commander had disconnected it. The Aircraft Manufacturer identified that there was a force of -39daN applied to the Commanders control column at this time, which was enough to cause the disconnection of the autopilot. It is probable that the Commander applied this force inappropriately to his control column due to his concern the aircraft was about to exceed the V_{TLU} . When the autopilot disconnected, the Co-pilot, who was the PF, asked the Commander if he had taken control of the aircraft. This was the phase of flight during which the approach checklist, including extending flap and landing gear, and the checklist confirming that the aircraft had captured the ILS should have been completed. During this period of confusion in the cockpit, the aircraft continued to descend below the ILS glideslope without the Flight Crew being aware of it, to an altitude that triggered the MSAW in the Control Tower. Furthermore, between 16.39:36 hrs and 16.39:55 hrs, both Pilots were operating their respective control column pitch control simultaneously.

25

The Commander emphasised in his AAIU Pilot Report Form that he was satisfied that the aircraft was at all times operating in VMC conditions with the ground in sight. However, the Investigation considers that the Commander's distraction due to the TLU, combined with the Co-pilot's uncertainty as to whether or not the Commander had taken control of the aircraft, were factors in the aircraft deviating from the ILS/MSA/permitted approach profile. This militated against the likelihood that the Flight Crew would have detected the presence of other traffic operating under VFR to the East of Dublin Airport.

During the go-around, the FDM indicates that the flaps were extended to 15 degrees during the initial climb through 1,400 ft at an IAS of 177 kts, resulting in a linear reduction of IAS to 145 kts at 2,600 ft. Although the Commander took control of the aircraft during the go-around, he returned control to the Co-pilot prior to completion of the procedure. The Co-pilot stated that the Commander configured the aircraft during the go-around but could not recall who extended the flaps. The Commander was unaware that the flaps had been extended.

While the CVR was not retained following the flight, it is evident from the other available sources that there was a breakdown in cockpit communication and Flight Crew co-ordination during this phase of the flight. The CVR was not isolated. This resulted in the loss of critical information which would have been invaluable to the Investigation, such as verbal interactions between the Flight Crew including transfer of control of the aircraft in accordance with the Operator's Operations Manual Part A, Section 12.



The CVR would also retain the various aural warnings associated with the disconnecting of the autopilot, and how, and by whom, the multiple mode changes of the AFCS during the approach and go-around were initiated. The FDR data was similarly not isolated. This resulted in the loss of a number of additional parameters that were not included in the FDM data that was retained by the Operator.

The incident report submitted by the Commander through the Operator's internal safety reporting system did not reflect the serious nature of the occurrence. This limited the opportunity for staff from the Operator's Safety Office to retain the FDR data prior to it being over-written. Consequently, the following Safety Recommendation is made to the Operator in this regard.

Safety Recommendation

Stobart Air should ensure that its flight crews understand the requirements of the *Operations Manual Part A* in relation to the preservation of recorded data and responsibilities of the flight crew for accurate reporting of occurrences (IRLD2021001).

Furthermore, based on the information provided to the Investigation, it appears that during the ILS approach between 16.38:36 hrs (autopilot disconnect) and 16.39:56 hrs (go-around), there were periods when the aircraft was flying without the certainty that it was being directly controlled by either of the Pilots, or by the autopilot. Thereafter, and for the duration of the go-around, both Pilots were manipulating the aircraft pitch control simultaneously.

2.2 Training

The Commander was experienced in operating ATR aircraft, with 7,200 hours on the ATR 42 and ATR 72. The Commander had not operated the ATR 72-212A '-600' version prior to joining the Operator in July 2016. He had completed a Differences Course at the ATR Training Centre at Blagnac, France in December 2013. The Operator conducted two simulator training sessions and an OPC with the Commander prior to the commencement of Line Training.

There were a number of references in the debriefing sheets for both the simulator and line training of the Commander's lack of familiarity with the '-600' version of the ATR 72, and also the considerable time period that had elapsed from completion of the Differences Course. There was no indication from the debriefing sheets that the TLU was operated in manual mode at any time during these flights.

Regulation (EU) 1178/2011, FCL.710 Class and type ratings — variants stated that 'If the variant has not been flown within a period of 2 years following the differences training, further differences training or a proficiency check in that variant shall be required to maintain the privileges...' However, the EASA TCDS stated that 'ATR 72-212A "600 version" aircraft are not considered as new aircraft model or variant'.

Irrespective of the training provided by the Operator, and based on this Regulation, the Commander, who was a direct-entry Captain, would be categorised as experienced under the Operator's Ops Manual Part A 5.2.16, due to his previous flying hours on the '-500' version and 61 hours on the '-600' version prior to the incident flight.

The Co-pilot joined the Operator in February 2015 and had 203 hours on type. Consequently, the Co-pilot would not be considered as '*Restricted Flying Flight Crew*' as per the Operations Manual Part A 5.2.16.

Notwithstanding the content of the Operator's Operations Manual Part A 5.2.16, the training records, crew interviews and FDM data all indicated that there was a sub-optimal level of combined experience in the cockpit for this particular version of the ATR 72 aircraft (the '-600'). While the Commander had considerable experience in the ATR 72 '-500' version, he acknowledged during his interview that he was not familiar with a number of differences between the two versions of the aircraft. The Commander also mistakenly believed that there were differences in how the TLU operated in manual mode on each version. The Investigation noted that the Operator's Operations Manual Part A 5.2.16 did not give consideration to the differences between the '-500' and '-600' version of the ATR 72 aircraft when assessing whether a pilot is designated as '*restricted flying flight crew*'. Consequently, the Investigation makes the following Safety Recommendation to the Operator in this regard.

Safety Recommendation

Stobart Air should review and amend the *Operations Manual Part A* relating to '*Restricted Flying Flight Crew*' to account for differences between the '-500' and '-600' versions of the ATR 72 series aircraft (IRLD2021002).

27

3. CONCLUSIONS

3.1 Findings

1. The aircraft was conducting a scheduled flight between EGPH and EIDW. It was the Flight Crew's second flight of their duty period.
2. The aircraft was carrying a defect of a failed 'AUTO' mode on the TLU which was deferred in accordance with the MEL for the ATR 72-212A.
3. The Flight Crew were each in possession of a valid flight crew licence, and a current type and instrument rating for the aircraft that they were flying.
4. The medical certificate for each Flight Crew Member was valid at the time of the occurrence.



5. The Commander completed a Differences Course for transitioning from the ATR 72 '500' version to the '600' version 32 months prior to the event.
6. The Commander did not fly the '600' version of the ATR 72 during the period between the Differences Course and joining the Operator.
7. The Operator's training records noted that the Commander lacked familiarity with the '600' version of the ATR 72.
8. The Commander informed the Investigation that he was not familiar with the manual operation of the TLU in the '600' version of the ATR 72, although it operated in the same manner as the '500' version.
9. The Commander became distracted by the manual operation of the TLU to the extent that the flight path was not adequately monitored.
10. Neither pilot recalled disconnecting the autopilot.
11. The autopilot disconnected at 2,300 ft during the descent at 16.38:36 hrs, which was prior to the aircraft reaching the extended centreline of the runway, and before the AFCS had captured the ILS localiser signal.
12. A pitch up force of -39daN was applied to the Commanders control column at 16.38:35 hrs and at 16.39:36 hrs. In both cases this was substantially higher than the -10daN required for the autopilot to disconnect. This disconnected the autopilot.
13. The autopilot disconnected at 16.38:36 hrs and at 16.39:36 hrs. Both disconnect events were caused by the inappropriate pitch up force of -39daN applied to the Commander's control column.
14. Neither the CVR nor FDR data was preserved by the Flight Crew following this serious incident.

3.2 Probable Cause

While conducting an ILS approach, the aircraft was descended unintentionally to an altitude that triggered the ATC Minimum Safe Altitude Warning.

3.3 Contributory Cause(s)

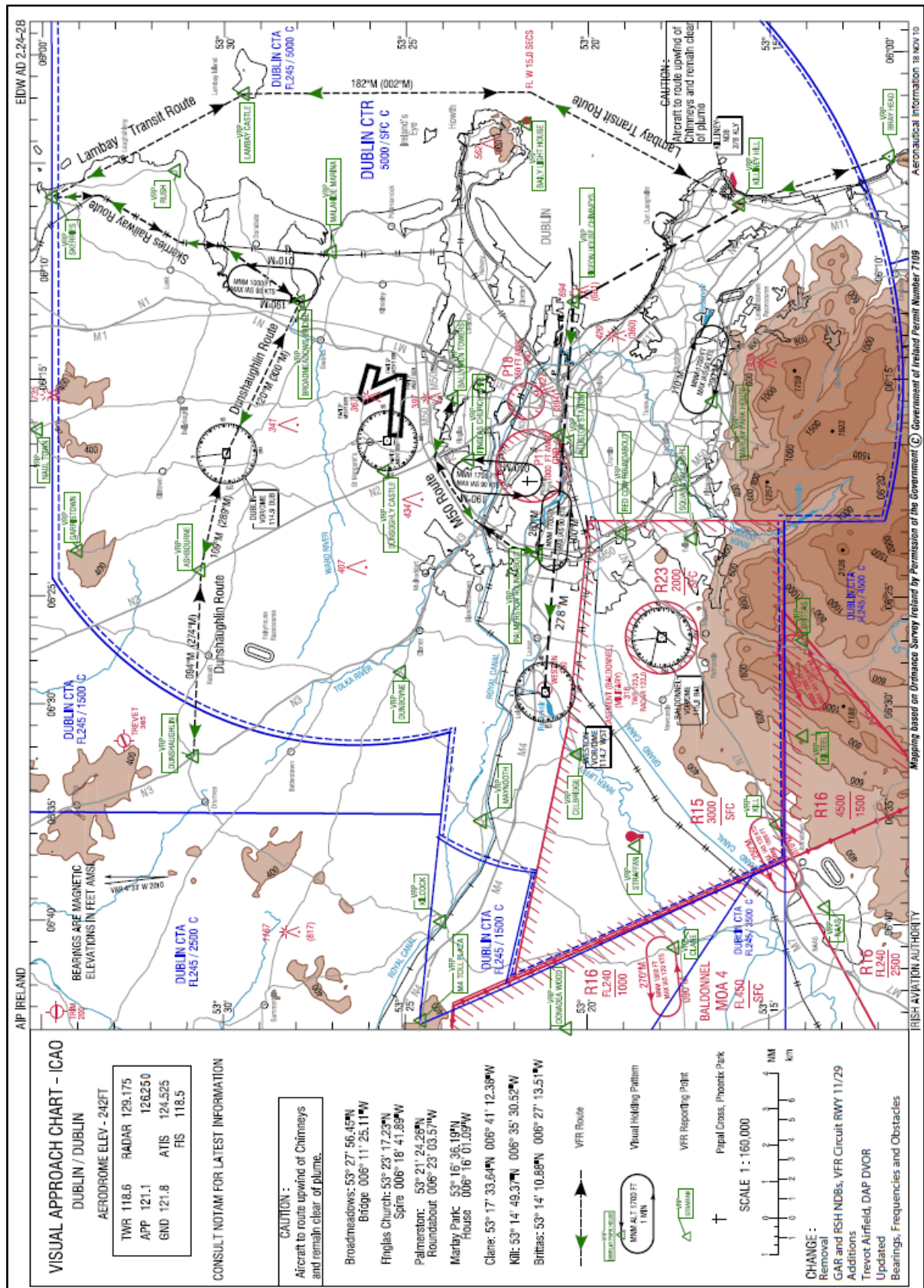
1. The Flight Crew's lack of experience on the ATR 72 '600' aircraft.
2. The Commander became distracted by the manual operation of the TLU to the extent that the flight path was not adequately monitored.
3. There were inappropriate pitch inputs made to the Commander's control column that caused the autopilot to disengage.
4. The level of cockpit communication and co-ordination between the Flight Crew was sub-optimal.

4. SAFETY RECOMMENDATIONS

No.	It is Recommended that:	Recommendation Ref.
1.	Stobart Air should ensure that its flight crews understand the requirements of the <i>Operations Manual Part A</i> in relation to the preservation of recorded data and responsibilities of the flight crew for accurate reporting of occurrences.	IRLD2021001
2.	Stobart Air should review and amend the <i>Operations Manual Part A</i> relating to 'Restricted Flying Flight Crew' to account for differences between the '-500' and '-600' versions of the ATR 72 series aircraft.	IRLD2021002

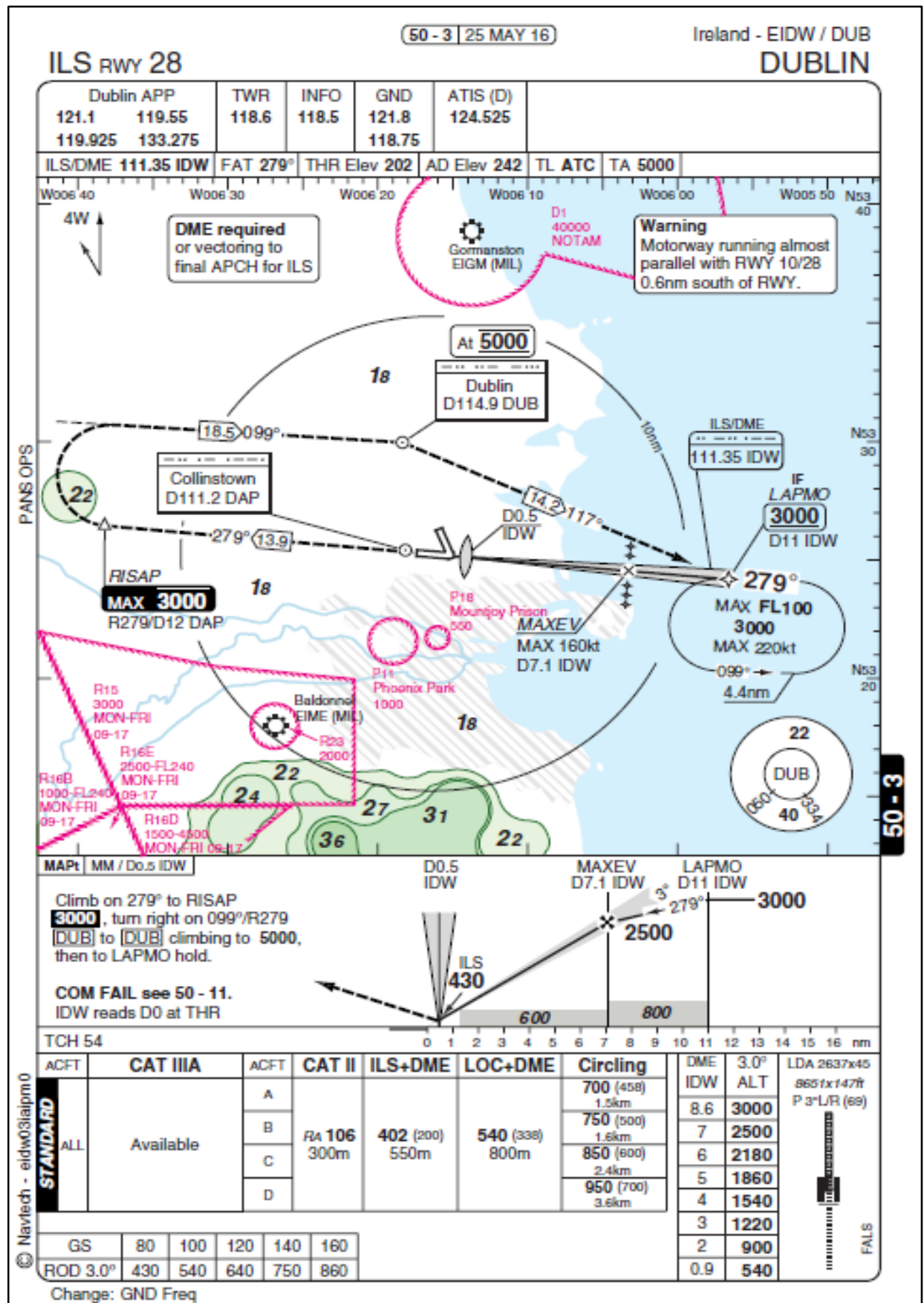
[View Safety Recommendations](#) for Report 2021-001

Appendix A Dublin Airport Visual Approach Chart



Appendix B

ILS Approach Chart – Runway 28, Dublin Airport



Appendix C

Operator's Operations Manual Part C: Flight Crew Callouts - ILS Approach

2.5.3.4. Cat I ILS approach

Refer to Cat I ILS Approach Profile – Page 162

FLIGHT EVENT	PM	PF
Cleared for the approach	Checks approach mode is armed and calls: "Checked"	Arms approach mode and calls: "Approach mode armed, LOC white, GS white"
Localiser Movement	"Localiser alive"	Checks LOC is armed, dual ILS and calls: "Check, localiser armed, dual ILS"
Localiser Star	"LOC **"	Checks GS is armed and calls: "Check, Set HDG to runway, GS armed"
Glideslope Alive	"Glideslope alive" Checks limiting speed and calls: "Speed checked, Flap 15" & selects flaps 15.	"Check" Reduce speed towards 160kts (ATR42) 170kts (ATR72) When below Flap 15 limiting speed, calls: "Flaps 15"
One dot to GS capture	"One dot" Checks limiting speed, calls "Speed checked, gear down" & selects gear down, selects PWR MGT to Take Off and Taxi & T/O light ON.	"Check" Reduce speed towards 150kts When below Gear Limiting speed, calls: "Gear down"
When 3 greens	Calls: "Gear down, 3 Greens"	
½ Dot to GS capture	"½ Dot" Checks limiting speed, calls "Speed checked, flaps 30", selects flaps 30 & CL's as required and reads the Before Landing Checklist. Sets speed bug and calls "Vapp, Set"	"Flaps 30, CL's max RPM/Auto, before landing checks" Calls and sets "Speed bug, Vapp"
Glideslope Star	"Glide **" Sets missed approach altitude	"Check, set missed approach altitude"
OM/4 DME or equivalent point	"Checked"	"Outer marker, xxxft"
Stabilisation Ht	"Stabilised" or Not Stabilised, Go-around"	
500' above minimums	"500 above"	"Check"
100ft Above DA	"100 above"	"Check"
DA	"Decide"	If Visual "Landing" If Not Visual "Go-Around"
Refer To Missed Approach or Landing Calls as applicable		

Note 1: Once the aircraft is established on the LOC with a correction made for any crosswind factor, the HDG bug should be centred on the lubber line.

Note 2: Actual speed and configuration selection may differ according to ATC requirements. The aircraft must be fully stabilised with the before landing checks complete by 1000 ft above airfield elevation in IMC and by 500 ft above airfield elevation in VMC.

Note 3: A minimum of one height check must be conducted, normally at the OM/4NM or equivalent point.

In accordance with Annex 13 to the Convention on International Civil Aviation, 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 this investigation is to prevent aviation accidents and serious incidents. It is not the purpose of any such 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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