



# Air Accident Investigation Unit Ireland

**FACTUAL REPORT**

**INCIDENT**

**BAE Systems Avro 146-RJ85, EI-RJH**

**Near Dublin Airport**

**22 May 2014**



**An Roinn Iompair  
Turasóireachta agus Spóirt**

Department of Transport,  
Tourism and Sport

## 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 13<sup>1</sup> to the Convention on International Civil Aviation, Regulation (EU) No 996/2010<sup>2</sup> and Statutory Instrument No. 460 of 2009<sup>3</sup>, 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.

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

<sup>2</sup> **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.

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



AAIU Report No: 2015 - 016  
 State File No: IRL00914036  
 Report Format: Factual Report  
 Published: 26 August 2015

In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No 996/2010 and the provisions of SI 460 of 2009, the Chief Inspector of Air Accidents on 22 May 2014, appointed Mr Thomas Moloney as the Investigator-in-Charge to carry out an Investigation into this Incident and prepare a Report. Due to the retirement of Mr Thomas Moloney, Mr Kevin O’Ceallaigh, an Inspector of Air Accidents, was appointed to complete the publication of the Report.

<b>Aircraft Type and Registration:</b>	BAE Systems Avro 146-RJ85, EI-RJH	
<b>No. and Type of Engines:</b>	4 x Honeywell LF507-1F	
<b>Aircraft Serial Number:</b>	E2345	
<b>Year of Manufacture:</b>	1999	
<b>Date and Time (UTC)<sup>4</sup>:</b>	22 May 2014 @ 06.35 hrs approximately	
<b>Location:</b>	Near Dublin Airport (EIDW), Ireland	
<b>Type of Operation:</b>	Public Transport - Scheduled	
<b>Persons on Board:</b>	Crew - 4	Passengers - 48
<b>Injuries:</b>	Crew - Nil	Passengers - Nil
<b>Nature of Damage:</b>	None	
<b>Commander’s Licence:</b>	ATPL <sup>5</sup> issued by the Irish Aviation Authority (IAA)	
<b>Commander’s Details:</b>	Male, aged 51 years	
<b>Commander’s Flying Experience:</b>	12,950 hours, of which 4,500 were on type	
<b>Notification Source:</b>	Airport Duty Manager EIDW	
<b>Information Source:</b>	AAIU Investigation, AAIU Report Form submitted by the Pilot	

<sup>4</sup> **UTC:** Universal Co-ordinated Time. All timings in this report are quoted in UTC; to obtain the local time add one hour.

<sup>5</sup> **ATPL:** Airline Transport Pilot Licence.

## SYNOPSIS

Shortly after departure from Dublin Airport (EIDW), the Flight Crew noticed fumes and smoke entering the cockpit. Fumes and smoke were also reported in the passenger cabin. The Flight Crew donned their oxygen masks and smoke goggles and carried out the appropriate emergency checklist actions. The aircraft returned to EIDW and landed safely, by which time the smoke had dissipated. The aircraft taxied to its parking stand and the passengers and crew disembarked normally. Subsequent examination of the No. 4 engine found a leak in an oil supply pipe, which is likely to have caused oil contamination of the bleed air supply used for air conditioning.

## 1. FACTUAL INFORMATION

### 1.1 History of the Flight

EI-RJH was performing a scheduled passenger flight from EIDW to London City Airport, UK (EGLC). The aircraft departed off Runway (RWY) 34 at EIDW at approximately 06.35 hrs. The Captain reported that about five minutes after departure, following selection of the engines' bleed air supply and both air conditioning packs to ON, the Flight Crew noticed fumes and smoke entering the cockpit. At this time, the ice protection system was OFF and the windscreen de-ice system was ON. All engine parameters remained normal.

The Flight Crew donned their oxygen masks and smoke goggles. The Cabin Crew also reported that there were fumes and smoke in the passenger cabin. The Flight Crew made the decision to make an immediate return to EIDW and declared a PAN<sup>6</sup> to Air Traffic Control (ATC). They completed the emergency checklist and briefed the Cabin Crew. As communications from the cockpit were difficult due to the Flight Crew wearing oxygen masks, the Captain instructed the Cabin Crew to make a public address announcement to the passengers.

The Captain informed the Investigation that the smoke was oil-based judging by its smell. He stated that the smoke seemed to dissipate as the aircraft made its approach, at which time the Flight Crew were ram air ventilating the cabin. One other aircraft was broken off its approach to Runway (RWY) 28 by ATC to facilitate EI-RJH and several other aircraft entered holding patterns. EI-RJH landed safely on RWY 28 at 06.55 hrs and taxied to a parking stand accompanied by the Airport Fire Service (AFS). The AFS informed the Investigation that, when the aircraft arrived on stand, one of the Operator's engineers communicated with the Flight Crew and then briefed the AFS that all was in order. The passengers and crew exited the aircraft normally through the main cabin door.

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<sup>6</sup> PAN: A state of urgency.

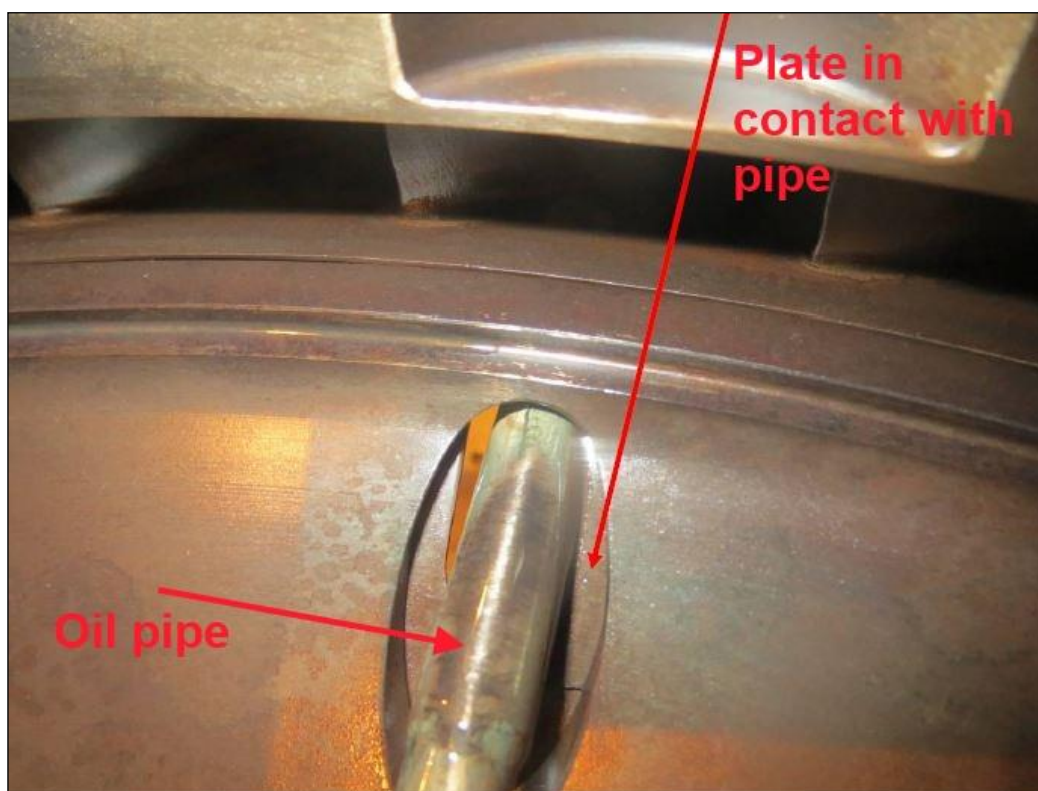


## 1.2 Engineering Investigation

Following the event, the Operator's maintenance personnel carried out inspections of both air conditioning packs but no evidence of contamination was found. The air filters for the flight deck and cabin were replaced. There was a noticeable smell in the flight deck and cabin when air conditioning pack No. 2 was run using APU<sup>7</sup> air. This smell dissipated after approximately 10 minutes.

No smell was evident when pack No. 1 was in use. The engines were inspected for signs of contamination. Oil was noted around the forward ecology drain of the No. 4 engine. The ecology drain was removed and the compressor exit area was inspected. Oil was noted at the base of the area. The No. 4 engine, LF507-1F s/n 7771, was removed from EI-RJH and was shipped to an approved maintenance facility for examination and repair. The Operator informed the Investigation that the engine, which had a total operating time of 22,823 hours, had completed an overhaul 318 engine hours prior to the occurrence.

The maintenance facility reported that initial disassembly revealed the engine to be in the expected condition relative to its achieved in service life. The combustor/turbine (CT) module was removed to access the high-pressure turbine (HPT). Upon disassembly of the HPT there was evidence of a leak on the diffuser<sup>8</sup>. The plate that is welded around the oil inlet pipe to the No. 2 bearing housing was found to have fractured and had located itself under the remaining plate and was contacting the inlet pipe (**Photo No. 1**).



**Photo No. 1:** Fractured plate and adjacent oil pipe.

<sup>7</sup> APU: Auxiliary Power Unit.

<sup>8</sup> Diffuser: A duct or chamber which converts velocity energy of air leaving the engine compressor into pressure energy before the air passes into the combustion chamber.

Upon pressure testing of the diffuser and No. 2 bearing housing it was evident that the leak was from the oil inlet pipe.

Bleed air, taken from this section of the engine, is used to supply the air conditioning packs. Thus, it is probable that the bleed air supplied to the air conditioning packs was contaminated by oil leaking from the pipe, which in turn led to the smoke and fumes entering the cockpit and cabin.

The Operator informed the Investigation that, due to the location of the oil supply pipe, it was not possible to carry out a routine examination of the area, either visually or by borescope<sup>9</sup> inspection of the area in question. Prior to 1997, there were instances of oil leaks in the diffuser area, which were addressed by Honeywell SB<sup>10</sup> 72-1035 and SB 72-1037. The operator confirmed that these SB's had been incorporated into engine LF507-1F s/n 7771 prior to the occurrence. The manufacturer informed the Investigation that it has no recent records of failure of the subject oil pipe and considers this incident to be an isolated occurrence. This was the first occasion on which the Operator had experienced a crack in this oil pipe.

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<sup>9</sup> **Borescope:** An optical device used for visual inspection of areas which are inaccessible by other means.

<sup>10</sup> **SB:** Service Bulletin

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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