

## Diversion, go-around on short final with low fuel level

<b>Aircraft</b>	British Aerospace Avro RJ85 (BAe 146), registered EI-RJW
<b>Date and time</b>	Thursday 17 June 2010 at around 17 h 30 UTC <sup>(1)</sup>
<b>Operator</b>	City Jet
<b>Place</b>	Basel-Mulhouse-Freiburg Airport (68)
<b>Type of flight</b>	Public transport of passengers
<b>Persons on board</b>	4 crew members, 40 passengers
<b>Consequences and damage</b>	None

<sup>(1)</sup>All times in this report are UTC, except where otherwise specified. Two hours should be added to obtain the legal time applicable in mainland France on the day of the accident.

*This is a courtesy translation by the BEA of the Final Report on the Safety Investigation. As accurate as the translation may be, the original text in French is the work or reference.*

### HISTORY OF FLIGHT

Note: The following information is drawn from data from the QAR and ATC recordings and from statements by the crew and the controller.

The crew was performing a flight from Paris Charles de Gaulle to Zürich.

On arrival at Zürich at about 16 h 50, the crew made a go-around during final approach because of bad meteorological conditions. Given the immediate forecast and the absence of an estimated time for a new approach, the crew decided to divert to the diversion aerodrome, Basel-Mulhouse-Freiburg, without holding at Zürich. The remaining fuel quantity was about 2,170 kg, which corresponded to about 75 minutes of flight at cruising speed.

The Zürich controller informed the controller in charge of coordination at Basel-Mulhouse-Freiburg of the diversion of the BAe 146 due to meteorological conditions.

At 17 h 11, during the first contact with the Basel-Mulhouse-Freiburg approach controller, the crew declared that they had diverted. The controller informed them that they would be radar-vectorred for runway 33.

About 8 minutes later, during radar vectoring, the crew asked for a shortened flight path, without giving any reason.

At 17 h 20, the approach controller cleared the crew to intercept the ILS and to perform the approach then asked them to change frequency. The crew then contacted the tower controller and said they were 14 NM from runway 33.

At 17 h 24 min 29, the tower controller asked, in French, the crew of an A319, situated at the holding point, if they were "ready for a departure within a minute". The latter answered immediately: "ah within a minute yes in thirty seconds". The controller then cleared them to line up on the runway and to take off.

On final approach, the crew of the BAe 146 noticed the A319 on the runway. When the airplane was about 4.7 NM from the runway threshold, they contacted the tower controller to ask him to confirm that they were in fact cleared to land. The controller answered: "negative, continue approach runway three three, an Airbus three one nine at departure".

At 17 h 26 min 16, while the BAe146 was 1.8 NM from the runway threshold, the crew of the A319 not having taken off, the tower controller told them : "*stop immediately, hold position, repeat, stop immediately, a BAe 46 on go-around*". Then he asked the crew of the BAe to make a go-around. The latter refused because they did not have enough fuel and requested that the A319 vacate the runway.

Note: At this time and according to the airline's analysis, the quantity of fuel remaining was estimated at 1,400 kg. The final reserve is defined as 850 kg.

At 17 h 26 min 36, the controller ordered a go-around, which the crew performed.

At 17 h 26 min 58, the crew stated: "we are declaring a fuel emergency now we request priority vectors for landing".

The tower controller contacted the approach controller by telephone. They decided to have the airplane climb to 6,000 ft on the extended runway centreline and to "*make it as short as possible*". The tower controller asked the crew to climb to 6,000 ft and to change frequency.

At 17 h 28 min 23, the crew of the BAe 146 contacted approach control: "Mayday Mayday Mayday, City 108X, declaring fuel emergency, request priority landing".

After ensuring that they had the runway in sight, the approach controller offered the crew of the BAe 146 a visual approach, which was accepted.

At 17 h 34, the crew landed.

On the ground, the quantity of fuel remaining was 1,220 kg.

## ADDITIONAL INFORMATION

### Meteorological Conditions

The conditions observed<sup>(2)</sup> at Zurich at the time the diversion decision was made indicate the presence of cumulonimbus and storms, with heavy rainfall.

### FEED LO LEVEL annunciators

The engines of the BAe 146 are fuelled by two feed tanks, themselves supplied from the main tanks. The FEED LO LEVEL annunciator indicates that one or both of the feed tanks is not full (fuel quantity below 544 kg).

According to the FCOM, a full feed tank is sufficient to supply one engine for either:

- a minimum of 23 minutes of continued operation at cruise power, or
- a descent from high level, an approach, a go-around and a further approach to landing.

<sup>(2)</sup>METAR LSZH  
171650Z 08007kt  
8000 3500N TSRA  
FEW024CB SCT032  
BKN037 17/14  
Q1012 TEMPO  
4000 +SHRA

### “Low Fuel Quantity” Procedure

In case of a low fuel quantity, the “Fuel Low Quantity” procedure is applicable (FCOM Vol 3, part 3, page 9.09). It states:

#### Fuel Low Quantity

##### Flight at Low Fuel Quantity - No System Failures

Use 24° of flap for landing - see **24° Flap Landing** on Page 9.05.

Balance the fuel as necessary up to the point that the FEED LOW LEVEL annunciators illuminate.

**When the FEED LO LEVEL annunciators illuminate:**

INNER, OUTER and STBY PUMPS ..... ON

COMMON FEEDS and X FEED ..... OPEN

Apply thrust changes smoothly and slowly.

If a climb or go-around is required, maintain the minimum pitch attitude and thrust required for safe flight.

### Fuel Management

The following information concerning fuel quantities is taken from airline’s internal analysis:

- The quantity of fuel required for the flight was 4,263 kg. The crew had planned carrying 417 kg of additional fuel due to the unfavourable meteorological conditions forecast on arrival.
- The final reserve was 850 kg.
- At the time of the diversion, the fuel quantity was 2,170 kg.
- At the time of the go-around, the quantity of fuel remaining was estimated at 1,400 kg.
- After the landing, remaining fuel was measured at 1,220 kg.

### Telecommunications

At Basel-Mulhouse-Freiburg, the crew successively communicated with the approach controller, with the tower controller, then after the go-around with the approach controller until the landing. Only the significant exchanges are included in the “History of Flight” section.

The exchanges with the crew of the BAe 146 were in English while the exchanges with the A319 crew were in French.

### Regulatory requirements relating to fuel to be carried

Commission Regulation (EC) No 859/2008 of 20 August 2008, amending Council Regulation (EEC) No 3922/91 as regards common technical requirements and administrative procedures applicable to commercial transportation by aeroplane (EU OPS) states in appendix 1 to OPS 1.005 (a) paragraph 12 “OPS 1.255 Fuel policy”:

- (ii) For A to B Flights — An operator shall ensure that the pre-flight calculation of usable fuel required for a flight includes;
  - (A) Taxi fuel — Fuel consumed before take-off, if significant; and
  - (B) Trip fuel (Fuel to reach the destination); and

(C) Reserve fuel –

(1) Contingency fuel — Fuel that is not less than 5% of the planned trip fuel or, in the event of in-flight replanning, 5% of the trip fuel for the remainder of the flight; and

(2) Final reserve fuel — Fuel to fly for an additional period of 45 minutes (piston engines) or 30 minutes (turbine engines); and

(D) Alternate fuel — Fuel to reach the destination alternate via the destination, if a destination alternate is required; and

(E) Extra fuel — Fuel that the commander may require in addition to that required under subparagraphs (A)-(D) above.

### **Minimum fuel procedures and low fuel level**

#### **Regulatory requirements for air traffic control**

The definition of minimum fuel is not integrated in the French regulations (Decree of 3 March 2006 modified in relation to the rules of the air and to air traffic control services (RDA)).

This definition is however mentioned in ICAO Doc 4444 (15th edition, 2007) – Procedures for air navigation services– Air Traffic Management – chapter 1 definitions:

***Minimum fuel.*** The term used to describe a situation in which an aircraft’s fuel supply has reached a state where little or no delay can be accepted.

Note: This is not an emergency situation but merely indicates that an emergency situation is possible, should any undue delay occur.

A national DSNA instruction dated 6 July 2004 reminds air traffic control organisations of the requirements relating to a minimum fuel situation or to an emergency situation.

This DSNA instruction was distributed locally to controllers at Basel-Mulhouse-Freiburg in the form of a service memo dated 8 September 2004, and concludes with: “this information does not thus lead to the granting of any type of priority”.

#### **Regulatory requirements for public transport operators**

☐ The EU OPS regulations state in paragraph OPS 1.375 part b) 3) that:

“The commander shall declare an emergency when calculated usable fuel on landing, at the nearest adequate aerodrome where a safe landing can be performed, is less than final reserve fuel.”

An emergency situation can be transmitted either by an urgency “PAN PAN” message or by a distress “MAYDAY” message.

#### **Airline’s Operations Manual**

The airline’s operations manual (Part A) states:

“A fuel emergency exists when it is estimated to have reduced to an amount where an approach and landing should be commenced without delay. The amount of fuel remaining at this stage is 850 kg.

In the case of the RJ this equates to the OPS minimum reserve fuel, which is sufficient fuel for holding for 30 min at 1,500 ft.

A Mayday shall be declared if it is estimated that the aircraft will land with less than the OPS minimum reserve fuel.

This fuel is not to be considered as a separate requirement in the fuel planning process. The 850 kg is useable fuel and may be consumed as part of the arrival procedure at any aerodrome.

When it is estimated that the fuel remaining upon landing will be reduced to an amount of 1,200 kg or less then the Commander shall declare a PAN.

This fuel is not to be considered as a separate requirement in the fuel planning process. The 1,200 kg is useable fuel and may be consumed as part of the arrival procedure at any aerodrome. The requirement that crews declare a PAN or Mayday ensures crews benefit from the priority ATC will place on an aircraft declaring such emergency."

### **Testimony**

The Captain stated that he declared an emergency because:

- He did not know the number of aeroplanes on landing there were in front of him and considered that if there were 5 or 6 aeroplanes, his landing fuel would be below the minimum regulatory quantity;
- He had a low-level fuel caution.

He stated that he did not apply the "low fuel quantity" procedure as he had priority to land and he was concentrating on the visual circuit and the landing procedures.

### **LESSONS LEARNED AND CONCLUSIONS**

The crew of EI-RJW diverted due to meteorological conditions. The controller knew about the diversion situation, thanks to coordination with the controller at Zürich aerodrome. The ATC procedures do not grant priority to an airplane in a diversion situation.

It should be noted that fuel reserves do not directly take into account a go-around at a diversion aerodrome.

The crew announced a diversion on first contact then later asked for a shortened flight path, without giving any reason. They did not transmit the "PAN PAN" urgency message because, in accordance with the procedure in the airline's operations manual, the estimated quantity of fuel remaining for landing was above 1,200 kg. They told the controller just before the go-around that they were in a low fuel situation.

The controller handled this diverted airplane as any other. Given the time pressure associated with the temporary increase in traffic, he slotted in an airplane taking off during the approach of EI-RJW.

The crew of the airplane on takeoff was not aware of the low fuel situation of the airplane on final.

The controller called for the takeoff to be aborted then a go-around for the airplane on approach.

During this phase, the crew of EI-RJW estimated that they no longer had any fuel management margin. They declared an emergency situation.

<sup>(3)</sup> See <http://www.bea.aero/docspa/2000/f-ed000525a/pdf/f-ed000525a.pdf>

## Use of English for Air Traffic Control

The crew of the aeroplane on approach did not understand the exchange of communications in French between the controller and the crew of the aeroplane on the runway because they were English-speakers. They only became aware late in the day that the runway was occupied. If they had been aware of the situation, it is likely that they would have carried out a missed approach earlier.

The accident on 25 May 2000 at Paris Charles de Gaulle (95) to the aircraft registered F-GHED operated by Air Liberté and G-SSWN operated by Streamline Aviation was the subject of a report<sup>(3)</sup> that contains the following recommendation:

In addition, and stressing that the investigation did not aim to evaluate the advantages and disadvantages of the systematic use of a single language, that:

- **4.1.8. in the light of the analysis of this accident and previously acquired experience, the DGAC study the expediency and methods of implementation for the systematic use of the English language for air traffic control at Paris Charles de Gaulle aerodrome, as well as the extension of this measure to other aerodromes with significant international traffic.**

A review of how this recommendation was dealt with was undertaken during the meeting of the steering committee of the State Safety Programme (PSE) in December 2009. The main difficulties encountered during the assessment study are noted below:

- The existence of an experiment in Spring 2000 that was not a success and which was the subject of a report that highlighted the negative effects induced;
- The political and even diplomatic difficulty of a mandatory use of English in France; with similar problems in other countries (Canada for example);
- The lack of any adequate training in English for users of the airport, apart from pilots and controllers;
- Greater ease of use by French pilots of their own native language, and thus less fluent interactions for francophone pilots if the English language is used;
- The difficulty of finding a skilled organisation with the necessary objectivity to carry out this type of study in a profound manner;
- The very differing views of the members of the steering PSE committee on the possible corresponding improvements to safety and on the aptitude of a study organisation to evaluate this in a non-controversial manner.

These conclusions closed the assessment study undertaken in response to this recommendation. The DGAC does not plan to take any additional action to those undertaken elsewhere, specifically those relating to the level of English language skills of the agents involved and the implementation of the European Action Plan for the Prevention of Runway Incursions (EAPPRI)<sup>(4)</sup>.

<sup>(4)</sup> See [http://www.eurocontrol.int/runwaysafety/public/standard\\_page/EuropeanAction.html](http://www.eurocontrol.int/runwaysafety/public/standard_page/EuropeanAction.html)

## CONCLUSIONS

The incident was due to the late communication by the crew to the Air Traffic controller of their low fuel situation and their emergency situation. This led to the controller being unaware of the emergency situation.

The following elements contributed to the event:

The lack of an appropriate “minimum fuel” procedure associated with the remaining flying time.

The communications in French that made it impossible for the English-speaking crew to immediately understand that another airplane was going to take off before them.

## SAFETY RECOMMENDATION

Note: In accordance with Article 17.3 of European Regulation (EU) 996/2010 of the European Parliament and Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation, a safety recommendation shall in no case create a presumption of blame or liability for an accident, a serious incident or an incident. The addressee of a safety recommendation shall inform the safety investigation authority which issued the recommendation of the actions taken or under consideration, under the conditions described in Article 18 of the aforementioned Regulation.

### Notion of minimum fuel

The notion of minimum fuel defined by ICAO allows a crew to describe to the air traffic services a potentially critical situation during a diversion while avoiding the declaration of a distress or emergency situation.

This notion of minimum fuel is not defined in the European regulation.

In its report on the serious incident on 28 August 1999 at Paris Charles de Gaulle (95) to the Boeing 737-528 registered F-GJNF operated by Air France, the BEA had already recommended that the DGAC define the “Minimum fuel” callout. In answer to this recommendation the DGAC considered that: “The minimum fuel callout is a source of confusion. This callout does not lead to any action by ATC, so the crew must then declare a distress situation as soon as the quantity of fuel planned for the landing is lower than the final reserve”.

In the light of this event, the BEA recommends that:

- **the DGAC and EASA implement the “minimum fuel” message already defined by ICAO, with the associated procedures. [Recommendation FRAN-2012-026].**