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AVIACIÓN **C**IVIL

Report IN-012/2016

Incident involving a Boeing 737-700 aircraft, registration PH-XRZ, operated by Transavia Airlines at the Barcelona-El Prat Airport (Spain) on 17 April 2016

GOBIERNO DE ESPAÑA
MINISTERIO DE FOMENTO

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COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

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Foreword

This report is a technical document that reflects the point of view of the Civil Aviation Accident and Incident Investigation Commission (CIAIAC) regarding the circumstances of the accident object of the investigation, and its probable causes and consequences.

In accordance with the provisions in Article 5.4.1 of Annex 13 of the International Civil Aviation Convention; and with articles 5.5 of Regulation (UE) nº 996/2010, of the European Parliament and the Council, of 20 October 2010; Article 15 of Law 21/2003 on Air Safety and articles 1., 4. and 21.2 of Regulation 389/1998, this investigation is exclusively of a technical nature, and its objective is the prevention of future civil aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent from their reoccurrence. The investigation is not pointed to establish blame or liability whatsoever, and it's not prejudging the possible decision taken by the judicial authorities. Therefore, and according to above norms and regulations, the investigation was carried out using procedures not necessarily subject to the guarantees and rights usually used for the evidences in a judicial process.

Consequently, any use of this report for purposes other than that of preventing future accidents may lead to erroneous conclusions or interpretations.

This report was originally issued in Spanish. This English translation is provided for information purposes only.

Índice

Abbreviations

° ' "	Grado(s), minuto(s) y segundo(s) sexagesimal(es)
ºC	Grado(s) centígrado(s)
ACARS	Aircraft Communications Addressing and Reporting System
ACAS	Airborne Collision Avoidance System
ACC	Area Control Center
ACS	Area Control Surveillance rating
ADI	Aerodrome Control Instrument rating
AEMET	Spanish Meteorological Agency
AESA	Spain's National Aviation Safety Agency
AFM	Aircraft Flight Manual
AGL	Above ground level
AIP	Airport Information Publication
AIR	Air Control rating endorsement
AIRAC	Aeronautical Information Regulation and Control
AMC	Acceptable Means of Compliance (EASA)
AMOSFG	Aerodrome Meteorological Observation and Forecast Study Group
APP	Approach
APS	Approach Control Surveillance rating
APU	Auxiliary power unit
ARO	Airport Reporting Office
ARP	Airport Reference Point
ARR	Arrivals
ATC	Air traffic control
ATIS	Automated terminal information service
ATL	Aircraft technical logbook
ATM	Air traffic management
ATPL	Airline Transport Pilot License
ATS	Air traffic services
BCN	IATA code for the Barcelona Airport (Spain)
CAT	Commercial air transport
CECOPS	Operations Coordination Center
CGA	Airport Management Centre
CI	Cost index

CIAIAC	Spain's Civil Aviation Accident and Incident Investigation Commission
CNS	Communications, Navigation and Surveillance
CTA	Control Area
CVR	Cockpit voice recorded
DGAC	Civil Aviation General Directorate
DSB	Dutch Safety Board
EASA	European Aviation Safety Agency
EC	Executive Controllers
EFB	Electronic flight bag
EHAM	ICAO code for the Amsterdam Airport (The Netherlands)
ELR	Preferred daytime runway configuration (East)
ENR	Preferred nighttime runway configuration (East)
EUROCAE	European Organization Civil Aviation Equipment
ETA	Estimated time of arrival
EZFW	Estimated zero-fuel weight
EZY	Radio callsign for EasyJet
FAA	Federal Aviation Administration (USA)
FAF	Final Approach Fix
FCOM	Flight Crew Operation Manual
FDM	Flight data monitoring
FDR	Flight data recorder
FL	Flight level
FMC	Flight management computer
FNA	Final approach
FPFM	Flight Planning and Fuel Management
FPL	Flight plan
ft	Feet (altitude)
Ft/min	Feet per minute
GM	Guidance material
GMC	Ground Movement Control rating endorsement
GMS	Ground Movement Surveillance rating endorsement
GS	Ground speed
h	hours
HIRO	High-Intensity Runway Occupation procedure
IAF	Initial approach fix
IATA	International Air Transport Association

ICAO	International Civil Aviation Organization
ILS	Instrument landing system
IR	Instrument rating
JAA	Joint Aviation Authorities
kg	Kilograms
Kg/k	Kilograms per liter
Km	Kilometer(s)
Km/h	Kilometers per hour
Kt	Knots
L	Left
lb	Pounds
LCL	Local controller
LEBL	ICAO code for the Barcelona Airport (Spain)
LECB	ICAO code for the Barcelona Control Center (Spain)
LERS	ICAO code for the Reus Airport (Spain)
LoA	Letter of agreement
M	Mach number
M	Meter(s)
MDA/DH	Minium decision altitude / Decision height
METAR	Routine aviation weather report
MHz	Megahertz
MPA	Multi-pilot aircraft
m/s	Meters per second
N/A	Not affected
NM	Nautical miles
NPA	Notice of Proposed Amendment
OFP	Operational flight plan
OJTI	On-the-job training instructor
OM	Operations Manual
ORY	IATA code for Paris Orly airport (France)
QTY	Quantity
PC	Planning controllers
PF	Pilot flying
PSI	Integrated Supervisory Post
QAR	Quick access recorder
QM	Queue Manager

QNH	Atmospheric pressure adjusted to sea level
R	Right
RAD	Aerodrome Radar Control rating endorsement
RCA	Spain's Air Traffic Regulations
RFFS	Rescue and Firefighting system
RMT	RuleMaking Tast
RWY	Runway
SACTA	Automated Air Traffic Control System
SERA	Standardized European Rules of the Air
SID	Standard instrument departure
SOP	Standard Operating Procedures
T	Tons
TAF	Terminal aerodrome forecast
TCL	Terminal Control rating endorsement
TDZ	Touchdown zone
TMA	Terminal manoeuvering area
TRA	Radio callsign for Transavia
TRM	Team resource management
TWR	Control tower
TWR	Tower Control rating endorsement
UTC	Coordinated universal time
VNAV	Vertical navigation
VOR	VHF omni-directional range
WLL	Preferred nighttime runway configuration (West)
WRL	Preferred daytime runway configuration (West)
ZFW	Zero Fuel Weight

Sinopsis

Operator:	Transavia Airlines
Aircraft:	Boeing 737-700, registration PH-ZRX
Date and time of incident:	Sunday, 17 April 2016 at 19:00 UTC
Site of incident:	Barcelona – El Prat Airport (Spain)
Persons onboard:	132 passengers, 5 crew. No injuries reported.
Type of flight:	Air transport – Scheduled – International – Passenger
Phase of flight:	Approach
Date of approval:	25 October 2016

Summary of the event:

On Sunday, 17 April 2016, a Boeing 737-700 aircraft, registration PH-ZRX, after making an initial approach to runway 25R at the Barcelona Airport, conducted a go-around due to a sudden change in wind direction and intensity which excess the aircraft tailwind limitation. This meteorological phenomenon forced several other aircraft making the same approach to runway 25R to also execute go-around maneuvers, as a result of which ATC decided to place runway 07L/R in use, thus shifting from the WRL to the ELR configuration.

After the go-around, the crew of PH-XRZ declared a fuel emergency (MAYDAY), as a result of which they received landing priority. They landed without further incident on runway 07L. When they reached the parking stand, they had a total of 1080 kg onboard, versus a stated final reserve of 1001 kg.

The situation created a traffic conflict when the flight paths of aircraft on final approach crossed.

The Transavia crew reported the fuel shortage as soon as they went around and requested priority. They were thus prompted by the controller to declare an emergency (MAYDAY) if required. Once the fuel emergency was declared, the crew received vectors to establish on final for runway 07L.

In the meantime, ATC arranged to remove two aircraft that were at the runway 25R localizer from the approach by ordering them to go around to the south of the airfield. The second aircraft in the approach sequence, a Ryanair airplane, was taken out at the localizer while an EasyJet airplane was kept on approach, the goal being to increase the separation between them.

On very short final, the EasyJet aircraft was instructed to go around and proceed south, but with no altitude restrictions. The crew began the go-around maneuver, but their proximity to the landing zone made the local arrivals controller for runway 25R think they were attempting to land, as a result of which he called the crew to clear the maneuver. Eventually, due to the two conflicting clearances and to the adverse weather conditions, the EasyJet crew went around and was instructed to execute the standard go-around maneuver. At the same time, they were instructed to contact the approach sector, which at that time was handling the approach of the aircraft operated by Transavia.

This instruction directed the EasyJet aircraft in the opposite direction, toward the Transavia approaching on 07L.

Once in contact with the approach sector, the EasyJet aircraft was instructed to turn immediately to heading 130, which cleared the conflict.

Both aircraft reported having the other in sight. The minimum distance between the two was 2,2 NM and 500 ft, though this separation occurred after the EasyJet aircraft turned south and diverged from the flight path of the Transavia aircraft.

The incident is deemed to have been caused by incorrect fuel consumption planning by the Transavia crew.

The following factors contributed to the incident:

- The change in the preferred runway configuration at the Barcelona Airport as the result of an unpredicted sudden shift in wind direction.
- Improper coordination by the different ATS stations, which resulted in a head-on approach between two aircraft under their control.

This report contains seven operational safety recommendations, three directed at the ATS operator, ENAIRE, one at the air operator, Transavia, one at the European Aviation Safety Agency (EASA), one at the Spanish Aviation Safety Agency (AESA) and one at Spain's Civil Aviation General Directorate (DGAC).

1. FACTUAL INFORMATION

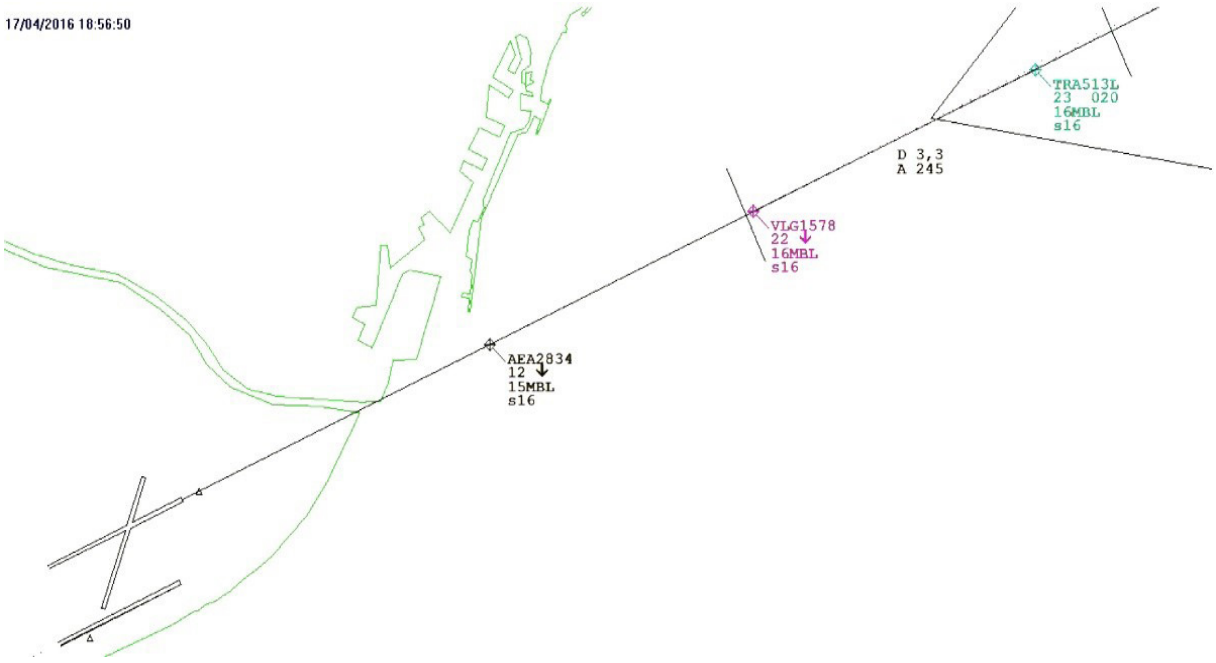
1.1. History of the flight

On Sunday, 17 April 2016, a Boeing B-737 aircraft, registration PH-XRZ, operated by Transavia Airlines and with callsign TRA513L, flew to the Barcelona-El Prat Airport (LEBL) from the Amsterdam Airport (EHAM), which it departed at 17:12 UTC.

It was cleared to fly the instrument departure maneuver LEKKO3V for 36L. It then flew the route specified in its Operational Flight Plan. There were no weather problems en route and the authorized flight level was FL390. It started its descent at 18:30 in the vicinity of point DEGOL, to fly the standard arrival route ALBER 1T, on schedule.

At the Barcelona-El Prat Airport, due to an unforeseen change in the wind situation, and after being informed of the presence of windshear on final, the TWR and ACC supervisors coordinate to deactivate HIRO [1] procedures at 18:46:26. The controllers were informed of the presence of a tailwind with an intensity of 10 to 15 knots at 1000 feet AGL. In the Tower they had tailwind readings for both thresholds 07/25.

At 18:56:36, the final controller for runway 25R informed the Transavia crew that the preceding aircraft had reported a 20-knot tailwind. The crew asked for confirmation that they were cleared for the approach, which the controller confirmed, transferring them to the Tower frequency, which repeated the clearance and reported the presence of windshear at 1000 feet.



1 High-Intensity Runway Operations. Procedures to optimize runway use.

At 18:58:37, the tailwind component caused an aircraft to land long. The crew of the following aircraft then decided to go around since the runway was occupied.

At 19:00:34, TRA513L reported that it was going around, after which it was cleared to make the standard go-around maneuver.

At 19:01:06, the Tower and TMA supervisors agreed to change the runway configuration.

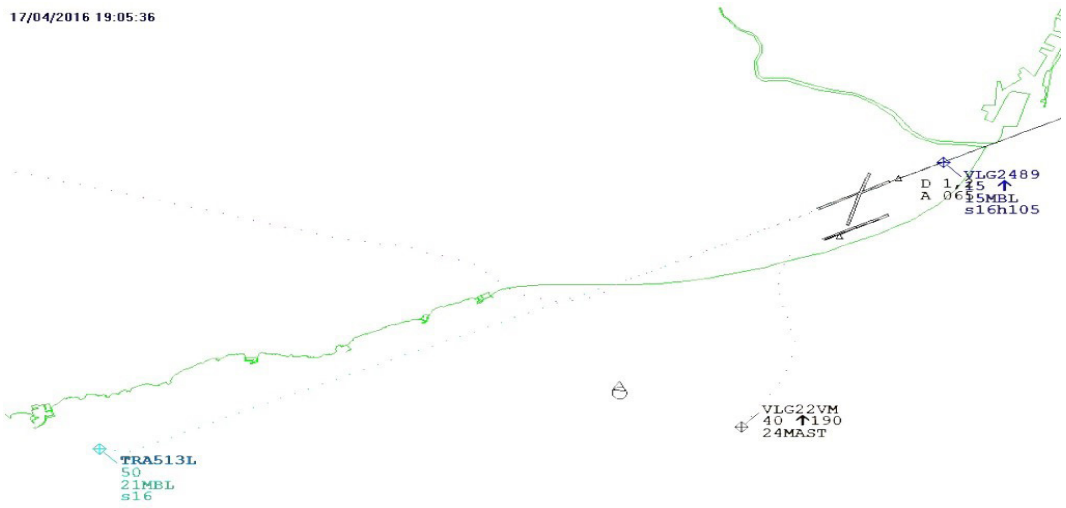
In their initial contact with the Barcelona APP controller, at 19:01:07, the crew of TRA513L were cleared to 3000 ft and they reported to ATC they were short on fuel. The controller informed them he would give them priority as much as possible.

Three minutes later, the controller again told them he would give them priority but that he had traffic proceeding to runway 25R and that, if needed, they should declare an emergency and he would make them number one in the sequence. After this, he instructed the preceding aircraft, which had also gone around, to hold over the VLA VOR.

After the crew of TRA513L reiterated their traffic situation and the need to return to Barcelona, the controller asked for confirmation that they were declaring an emergency, after which the crew issued the corresponding MAYDAY at 19:04:52.

After TRA513L went around, two other aircraft landed on runway 25R, and a third was forced to go around, afterwards being cleared to fly the standard maneuver.

The next aircraft in the sequence, an Airbus 319 operated by EasyJet with callsign EZY96BC, was conducting flight EZY-2267 inbound from the London Luton Airport. It contacted the Barcelona Tower at 19:05:20 and received instructions to continue its approach.



At 19:05:43, the TMA supervisor informed the TWR supervisor of TRA513L's emergency, and requested that they stop takeoffs and activate the ILS equipment for runway 07L. They also coordinated removing from the approach sequence the two aircraft that were established on the localizer, which included EasyJet EZY96BC and the Ryanair aircraft behind it, RYR20JU. They agreed between them to have the Ryanair, which was second in the approach, climb to 3000 feet and take it out of the sequence toward the south, and to have the EasyJet aircraft climb and, once past the airport, to also send it south, the idea being to separate them.

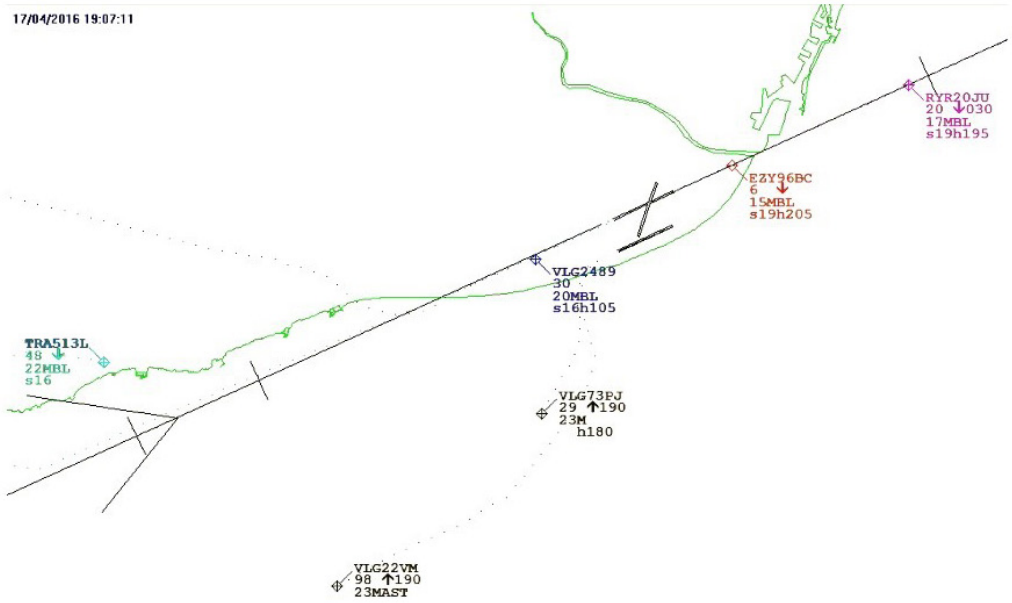
At 19:05:59, the Barcelona APP (sector T4) controller coordinated with the local arrivals controller (LCL-ARR) in the Tower to ask him to stop takeoffs until the declared emergency was resolved. The arrivals controller confirmed relaying the instruction to his colleague on departures. At that point the Transavia aircraft was starting a turn to the right to join the approach to runway 07L after having flown 14 NM away from the airfield.

Simultaneously the final approach controller for runway 25R tried unsuccessfully to contact the crew of the EasyJet, which was already on the Tower frequency, and instructed the Ryanair crew to turn heading 190º and climb to 3000 ft.

At 19:06:36, the Transavia crew asked the controller (sector T4) to descend in order to start the approach procedure for runway 07L. They were cleared to descend to 4000 ft.

At 19:07:05, the local approach controller for runway 25R spoke with the EasyJet on short final, instructing them to continue the approach. Immediately afterward he received a call from the Barcelona APP controller for sector T3, requesting that he transfer him the aircraft on a south heading.

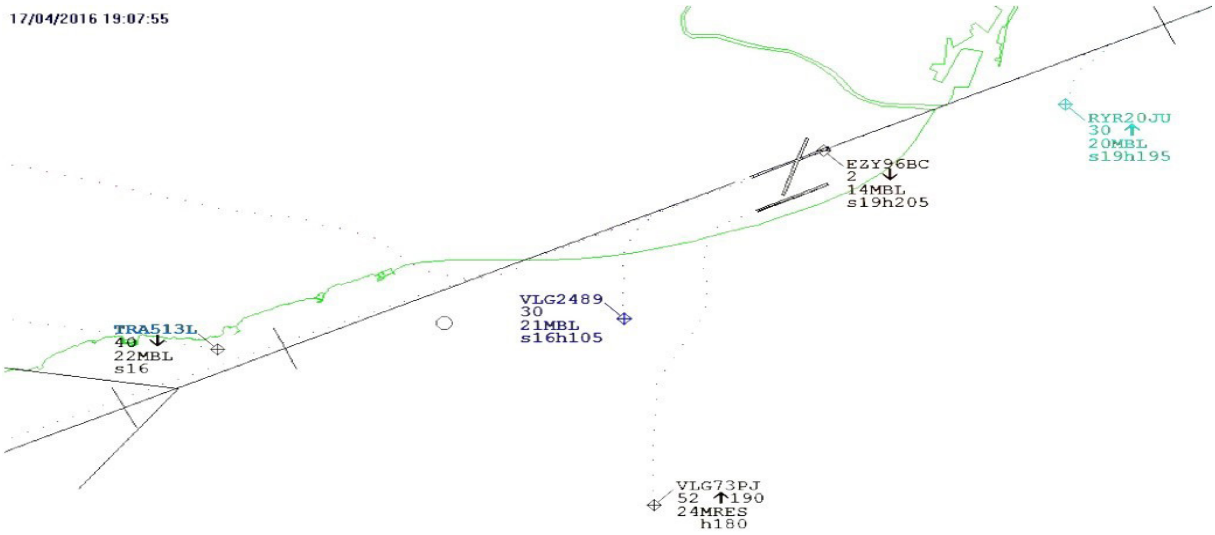
Complying with this request, the local arrivals controller instructed the EasyJet crew on short final to maintain altitude and proceed heading south. The aircraft was below 500 feet and very close to the runway (1.3 NM).



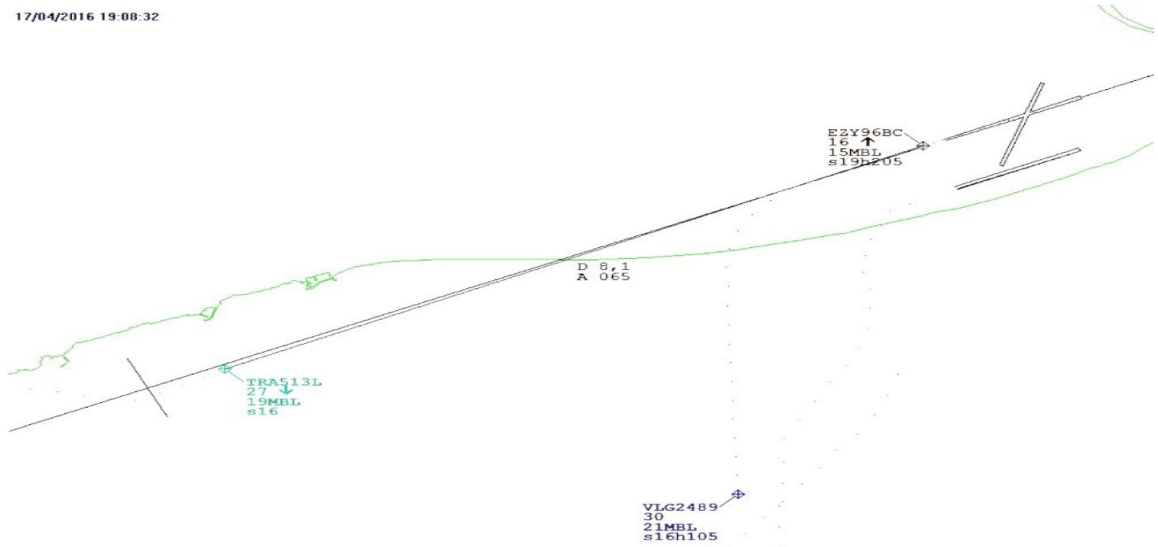
At 19:07:20, after receiving confirmation that the runway 07L localizer was activated, the Barcelona approach controller (sector T4) cleared the Transavia crew to intercept and follow the localizer.

At 19:07:27, the local arrivals controller asked the TMA controller (sector T3) the frequency and altitude to transfer the EasyJet aircraft. During this conversation to coordinate their actions, the local arrivals controller noticed that the EasyJet was continuing the approach and was close to landing, and so he hurried to give it the landing clearance with a wind on the runway from 060° at 15 knots. The crew replied, at 19:08:04, that it was commencing a go-around. As a result, they were cleared to execute the standard go-around maneuver (continue runway heading and climb to 3000 ft) and transferred to the approach controller for sector T4.

At 19:08:23, the approach controller for sector T4 asked the Transavia crew to confirm intercepting the runway 07L localizer and instructed them to maintain 3000 feet, since there was an aircraft executing a go around at the opposite threshold. By then the aircraft had already descended below the specified altitude, and so the crew stopped the descent and climbed back to 3000 feet.

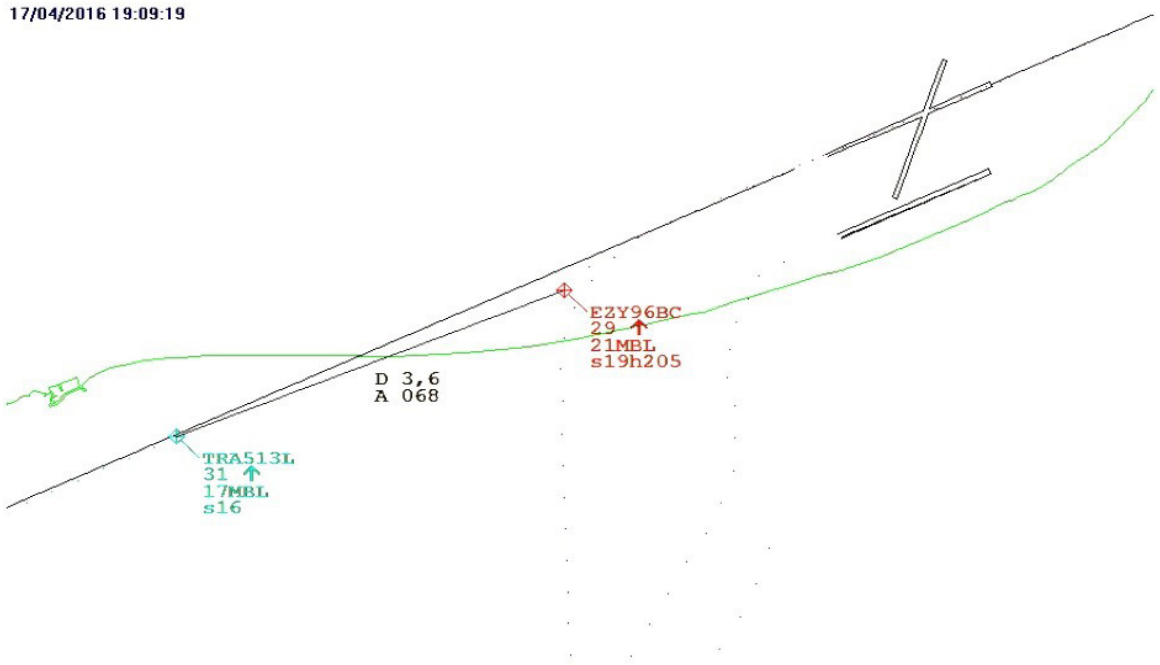


At 19:08:29, the approach controller for sector T4, noticing that the EasyJet aircraft was going around, asked the local arrivals controller to immediately transfer the traffic, which the latter confirmed had already been transferred. At the same time, the Transavia crew reported returning to 3000 ft. At that point there was a moment of uncertainty as the two aircraft were facing each other and it was unclear which controller had the EasyJet on the frequency. The controller for sector T3 also asked the local arrivals controller to turn the traffic going around to the south, but the latter replied that it was no longer on his frequency.



At 19:08:49, the approach controller for sector T4 called the EasyJet crew to instruct them to turn immediately heading south. The crew reacted to this instruction and stated that they were level at 3000 ft, at which point the controller instructed them to descend to 2000 ft.

At 19:09:19, the Transavia crew informed the approach controller for sector T4 that they were starting their approach descent. The controller provided information on the EasyJet aircraft affecting them, and received confirmation from the crew that they had visual contact with the EasyJet. At that point the two aircraft were on opposite headings, 3.6 NM apart at the same altitude.



At 19:09:43, the two aircraft reached their minimum separation, 2,2 NM and 500 ft. At that time they were on diverging headings.

At 19:09:48, the TMA supervisor informed the Tower supervisor that the Transavia was continuing its approach to runway 07L with the EasyJet in sight. With the conflict cleared, the sector controller transferred the Transavia to the Tower. The aircraft landed without further incident on runway 07L at 19:11:59 with 1170 kg of fuel onboard. Its final reserve fuel was specified as 1001 kg in its operational flight plan.

After taxiing, the aircraft proceeded to park at stand 144. The final fuel remaining was 1080 kg.

1.2. Injuries to persons

Injuries	Crew	Passengers	Total in the aircraft	Others
Fatal				
Serious				
Minor				N/A
None	5		132	N/A
TOTAL	5		132	

1.3. Damage to aircraft

The aircraft was not damaged.

1.4. Other damage

Not applicable.

1.5. Personnel information

1.5.1 Flight crew

1.5.1.1 Captain

- Age: 44
- Nationality: Dutch
- License: EASA ATPL (airplane) issued on 07/12/2005 by the Dutch Civil Aviation authority.
- Ratings:
- B737 300-900 valid until 30/06/2016
- IR (A) valid until 30/06/2016
- Medical certificate: Class 1, valid until 14/03/2017
- Total flight hours: 9500
- Flight hours on the type: 9500, 1350 of them as captain.

- Flight activity:

  Previous 90 days: 160:10 h

  Previous 7 days: 09:10 h

  Previous 24 h: 02:25 h

  Time off before flight: 23:28 h

1.5.1.2 Copilot

- Age: 33
- Nationality: Dutch
- License: JAA ATPL (airplane) issued on 18/09/2012 by the Dutch Civil Aviation authority, valid until 18/09/2017
- Ratings:
  - B737 300-900 valid until 31/05/2017
- IR (A) valid until 31/05/2017
- Medical certificate: Class 1, valid until 05/05/2017
- Total flight hours: 5000
- Flight hours on the type: 4350
- Flight activity:

  Previous 90 days: 75:00 h

  Previous 7 days: 15:05 h

  Previous 24 h: 02:25 h

  Time off before flight: 23:28 h

1.5.2 Controllers on duty

1.5.2.1 TMA Supervisor Controller

The controller, a Spanish national, had an air traffic controller license issued by Spain's National Aviation Safety Agency (AESA) on 29/01/2016, and a class-3 medical certificate valid until 16/06/2016. He also had ADI/AIR-GMC-TWR-GMS-RAD, APS/TCL and ACS/TCL rating endorsements, obtained on 15/02/1993. His license also had an APS/TCL unit endorsement for the LECB TMA, valid until 07/03/2017. He also had OJTI and Evaluator endorsements, valid until 07/03/2017 and 23/08/2017, respectively.

He had been a supervisor instructor since 01/07/2002.

1.5.2.2 Supervisor Controller at the Barcelona Tower.

The controller, a Spanish national, had an air traffic controller license issued by Spain's National Aviation Safety Agency (AESA) on 09/10/2014, and a class-3 medical certificate valid until 05/01/2017. His license had ADI/AIR-GMC-TWR-GMS-RAD, APS/RAD-TCL and ACS/RAD-TCL rating endorsements, obtained on 12/11/2008. He also had the following unit endorsements: ADI/AIR-RAD, ADI/GMC-GMS and ADI /TWR)/GMS/RAD, valid until 13/10/2016.

He had been a supervisor from 01/02/2013 until 28/02/2015, and a supervisor instructor since 01/03/2015 and chief supervisor since 13/07/2015.

1.5.2.3 Controller for Approach Sector T4.

The controller, a Spanish national, had an air traffic controller license issued by Spain's National Aviation Safety Agency (AESA) on 12/01/2012, and a class-3 medical certificate that was valid until 05/06/2016. His license had ADI/AIR-GMC-TWR-GMS-RAD, APS/RAD-TCL and ACS/RAD-TCL rating endorsements, obtained on 24/02/2000. He also had unit endorsements LECB-APS/RAD/TCL/TMA, valid until 24/11/2016.

1.5.2.4 Local arrivals controller for 25R

The controller, a Spanish national, had an air traffic controller license issued by Spain's National Aviation Safety Agency (AESA) on 13/03/2013, and a class-3 medical certificate that was valid until 14/05/2016. His license had ADI/AIR-GMC-TWR-GMS-RAD, APS/RAD-TCL and ACS/RAD-TCL rating endorsements, obtained on 21/01/2003. He also had LEBL ADI/TWR/GMS/RAD, ADI/AIR/RAD and ADI/GMC/GMS unit endorsements, valid until 22/08/2016.

1.6. Aircraft information

- Manufacturer: Boeing
- Registration PH-XRZ
- Model: B737- 7K2
- Serial number: 33462
- Year of manufacture: 2003
- Engines, number/manufacturer and model: two (2) CFMI CFM 56 7B-22
- Weights
  - Maximum takeoff weight: 69975 kg
  - Empty weight: 37750 kg
- Dimensions
  - Wingspan: 34.29 m
  - Length: 33.59 m
- Hours: 46353
- Cycles: 23319
- Airworthiness review certificate: valid until 18/02/2017, approval reference NL. MG.0001.

The Boeing 737-700 has three fuel tanks. The main tanks, no. 1 and 2, are integrated into the wing structure. The center tank is between the two wing roots in the center fuselage. The tank capacities are as follows:

Tank	Liters	Kilograms[2]
No. 1	4876	3915
No. 2	4876	3915
CENTER	16273	13066
TOTAL	26025	20896

2 Usable fuel at level attitude and a fuel density of 0.8029 kg/l.

The amount of fuel used and remaining is indicated via gauges in the cockpit, as well as in the FMC[3].

The amount of fuel shown on the FMC is provided in wholes and tenths of a tonne on the PROGRESS page. Figure 1[4] shows the how the amount of fuel remaining onboard is displayed (no. 7) and the fuel estimated until the next waypoints and until landing.

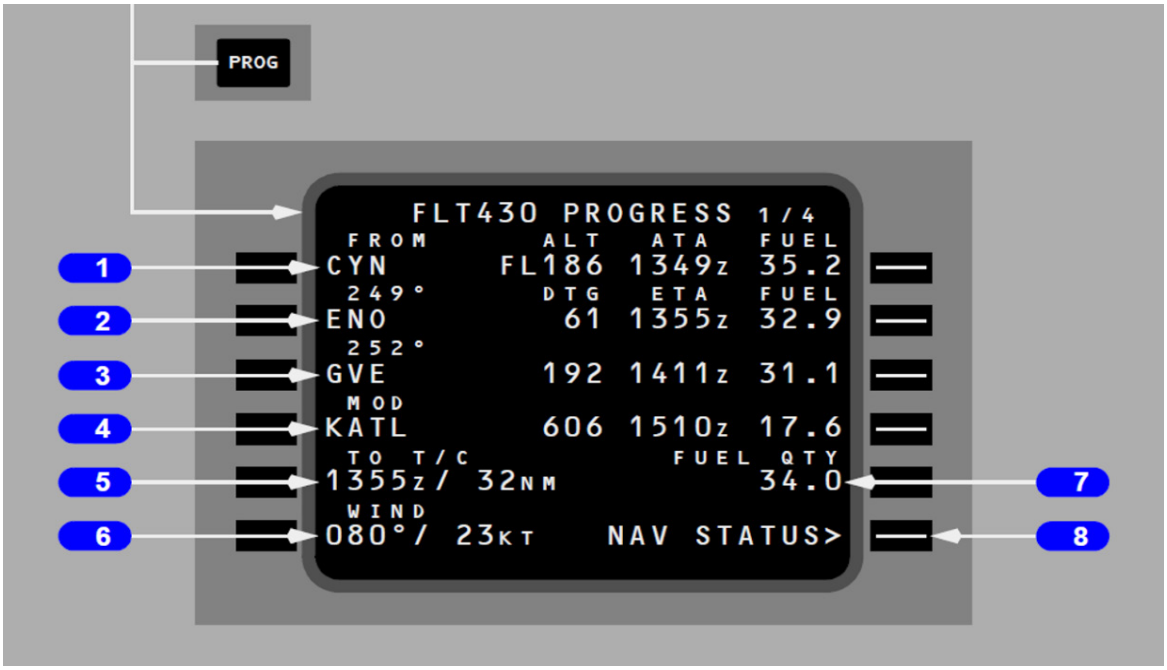


Figure 1. FMC PROGRESS page

The FMC uses the last valid fuel amount to predict fuel consumption and to enable vertical navigation (VNAV) control. The crew must manually insert the estimated fuel amount present at takeoff.

The system issues a CHEK FMC FUEL QUANTITY message if it detects an unexpected drop in the fuel amount.

The FMC constantly estimates the amount of fuel remaining before landing when flying the active lateral route. It will issue a USING RSV FUEL message if the amount of fuel remaining before landing is estimated to be below the amount entered for this item. It will also indicate INSUFFICIENT FUEL if the landing fuel forecast is equal to or less than 2000 lb (900 kg).

3 Flight Management Computer

4 Image property of Boeing. 737 FCOM (Flight Crew Operation Manual)

The aircraft will issue a LOW FUEL alert (amber) whenever:

- The amount of fuel remaining in either main tank is below 453 kg.
- It will remain on until the fuel amount is increased to 567 kg.

The operating limits of the aircraft contained in Part B of the operator's Operations Manual state that:

- The maximum tailwind components for takeoffs and landings is 15 kt.

  Note: The aircraft has been satisfactorily shown to be able to land and take off manually up to 15 knots.

1.7. Meteorological information

1.7.1 Information provided by AEMET

The METARs for the Barcelona-El Prat Airport issued between 18:00 and 19:30 UTC on the day of the event are as follows:

METAR LEBL 171800Z 23015KT 9999 FEW010 20/09 Q1013 NOSIG=

METAR LEBL 171830Z 24011KT CAVOK 19/10 Q1013 NOSIG=

METAR LEBL 171900Z 05011KT 9999 FEW020 18/10 Q1014 NOSIG=

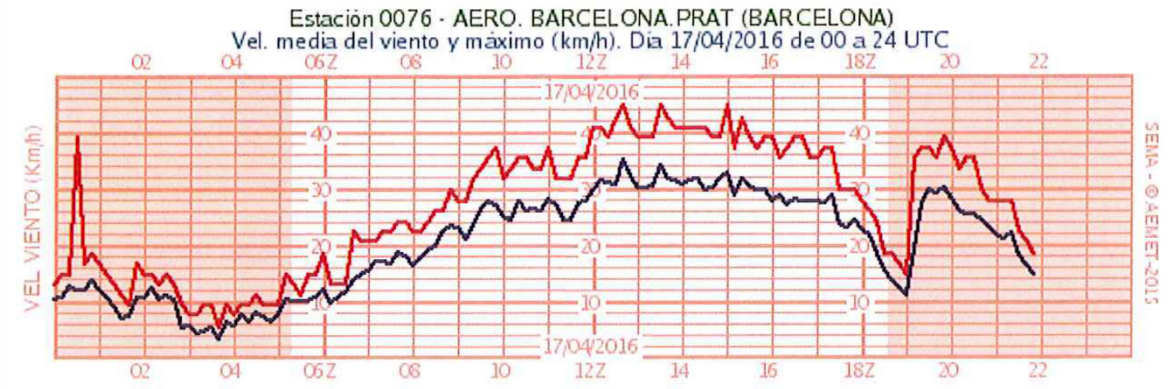
METAR LEBL 171930Z 05013KT 9999 FEW020 17/11 Q1015 NOSIG=

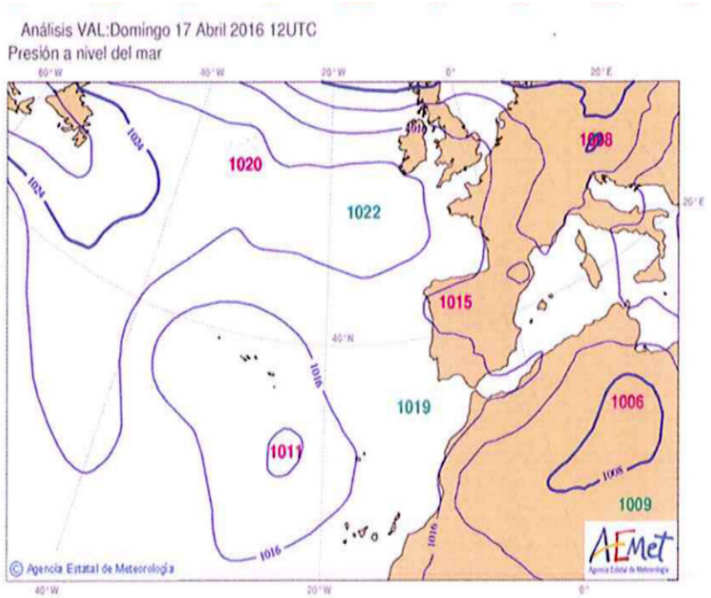
The METARs listed shows how the wind changed direction between 18:30 and 19:00, going from 240° to 050°. This sudden change in direction forced a change in the runway configuration at the airport.

The graphs below show that the change in direction was preceded by a rapid drop in wind speed, followed be a subsequent increase. According to Spain's National Weather Agency (AEMET), this is typical behavior for wind during the passage of a small low-pressure area.

An analysis of pressure at sea level shows the typical situation for the absence of a pressure gradient (isobars spaced far apart), which usually gives rise to the formation of mesoscale low-pressure areas. This can lead to wind changes of the type observed on the day of the event.


Estación 0076 - AERO. BARCELONA.PRAT (BARCELONA)
Dirección del viento. Día 17/04/2016 de 00 a 24 UTC
DIR. VIENTO
17/04/2016
270
180
90
02
04
06Z
08
10
12Z
14
16
18Z
20
22
SEMA - © AEMET-2015


Estación 0076 - AERO. BARCELONA.PRAT (BARCELONA)
Vel. media del viento y máximo (km/h). Día 17/04/2016 de 00 a 24 UTC
VEL. VIENTO (Km/h)
17/04/2016
40
30
20
10
02
04
06Z
08
10
12Z
14
16
18Z
20
22
SEMA - © AEMET-2015


Análisis VAL:Domingo 17 Abril 2016 12UTC
Presión a nivel del mar
1020
1022
1015
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1006
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1008
© Agencia Estatal de Meteorología
AEMet

1.7.2 Information available to the crew

The 10:00Z Barcelona METAR was included in the flight dispatch information.

SA 171000 23016KT 9999 FEW045 20/11 Q1012 NOSIG=

It indicates stable weather conditions with winds from the southwest.

As for the weather forecast available to the crew when the flight was dispatched, it was as follows:

FT 170500 1706/1806 24005KT 9999 FEW020 TX22/1713Z TN14/1706Z

BCMG 1708/1710 21022kt

BCMG 1722/1724 VRB03KT

TEMPO 1722/1724 06010KT

The above TAF calls for a change in wind direction, but over a later time period (between 22:00 and 24:00 UTC) than when it actually occurred.

As for the weather information for the alternate airport selected, the Reus Airport (LERS), the crew had the following information:

SA 171000 25014KT 220V290 9999 FEW035 22/08 Q 1013 =

FT 170500 1706/1806 28008KT 9999 SCT040 TX23/1714Z TN11/1706Z

TEMPO 1709/1716 28010G20KT

BCMG 1716/1718 20008KT

TEMPO 1720/1803 VRB03KT=

Both the METAR and the TAF forecast indicated visual flight conditions with low-intensity winds from the west-southwest.

The first ATIS information that warned of wind shear on final was issued at 18:46:34, and stated the following:

LEBL INFO ARR E TIME 1846 ILS Z APCH EXPECTED RWY IN USE FOR ARR 25R AND FOR DEP 25L TRL70 TWR FREQ 118.1 HIGH INTENSITY RWY OPS IN FORCE WIND TDZ 250 DEG 11 KT CAVOK T 18 DP 10 QNH 1014 NOSIG **MOD POSITIVE WINDSHEAR REPORTED IN FNA FM 1000 FT**

1.8. Aids to navigation

The aids to navigation at the Barcelona Airport worked correctly. During the runway configuration change, the ILS for runway 07L was activated to facilitate the approach of the Transavia aircraft, which had reported a fuel emergency.

1.9. Communications

The aircraft communicated with the following stations over the course of the incident:

Barcelona APP-L Final 25R	119.1 MHz
Barcelona TWR Local ARR 25R	118.1 MHz
Barcelona APP-H Sector T3	126.5 MHz
Barcelona APP-H Sector T4	127.7 MHz
Barcelona TWR Local ARR 07L	118.1 MHz

The frequencies worked correctly and the communications were not interrupted. The controllers communicated in both English and, with Spanish-speaking crews, in Spanish.

Controllers communicated with one another using a hotline. During the period analyzed, there were no technical problems that might have affected the communications.

The most relevant exchanges that took place during the incident are given in Section 1.1 of this report.

1.10. Aerodrome information

The Barcelona-El Prat Airport, ICAO code LEBL and IATA code BCN, has three 45-m wide runways, designated 02/20, 07L/25R and 07R/25L, the first two of which cross (see photograph in Figure 2[5]) .

Runway 02/20 is 2,645 m long, 07L/25R is 3,472 m long and 7R/25L is 2,780 m long. The airport's ARP is at an elevation of 4 m (14 ft).

For environmental reasons directly related to noise pollution, the airport normally operates in two different configurations over the course of the day, one for daytime operations from 07:00 to 23:00, and another for nighttime operations.

The preferred daytime configuration (West) is better known as WRL. In this configuration, aircraft land on 25R and take off from 25L. In this configuration runway 25R/07L, the longest runway, is used for landing operations instead of being used for takeoffs. This requires having specific procedures in place to accommodate heavy aircraft that need to use this runway to take off and for which runway 07R/25L is not long enough.

This was the configuration in use when the event described in this report took place.

The other non-preferred daytime configuration (East) is called ELR, and in it aircraft land on runway 07L and take off from 07R.

Figure 2. Airport aerial picture

5 Image taken from Google Earth.

The preferred nighttime configuration (North) most typically used is called ENR. In it, aircraft land on runway 02 and take off from 07R.

The other non-preferred nighttime configuration (West) is WLL, and aircraft both land and take off using runway 25L.

The published standard go-around procedure for runway 25R requires crews to maintain the runway heading up to 5 miles out of BCN VOR, then turn left to intercept and follow BCN radial 242, climb to 3000 ft and contact ATC.

1.11. Flight recorders

The aircraft was equipped with a Honeywell flight data recorder (FDR), part number 980-4700-042 and serial number 5455, and with a Honeywell cockpit voice recorder (CVR), part number 980-6022-001 and serial number CVR-120-15207. Both complied with the standards specified in document ED-112 (Minimum operational Performance Specification for Crash Protected Airborne Recorder Systems) published by the European Organization for Civil Aviation Equipment (EUROCAE [6]).

The FDR data were not available, however, and so the flight data information were obtained from the QAR (Quick Access Recorder), the raw data file from which the operator provided on 16 May 2016.

The data were converted at the CIAIAC laboratory using a file with the parameter data frame that was supplied by the aircraft manufacturer on 20 May 2016.

The CVR was preserved by the crew, as required by the stipulations of the operator's Operations Manual in the event of an accident/incident (OM A 11.2.2). It was downloaded on 24 May 2016 at an outside laboratory, yielding five audio files associated with the five different tracks. The first three had a duration of half an hour and contained the last half hour of the flight. They were recorded in high quality.

Figure 3.- Photograph of the CVR

6 EUROCAE is charged with standardizing air location and navigation electrical and electronic devices for aircraft and ground systems, and it develops standards and documents in this area, which use the abbreviation ED. The members of EUROCAE are international aviation authorities, airplane manufacturers, air safety services providers, airport operators and other entities involved in aviation.

Track no. 1 recorded the conversations picked up by the Captain's microphone, track no. 2 the conversations recorded by the copilot's microphone, and track no. 3 the messages broadcast to the passenger cabin.

Track no. 4 lasted two and a half hours and was recorded in standard quality. It contained a combination of the previous tracks (including the final half hour).

Track no. 5 also lasted two and a half hours and was recorded in standard quality, and recorded the conversations picked up on the cockpit microphone (including the final half hour).

The time stamps for the QAR and CVR data were synchronized based on the ATC communications provided by ENAIRE.

1.11.1 Quick Access Recorder (QAR)

The quick access recorder reveals that the crew started the engines at 16:55:18, when the values are first recorded. At that point, the amount of fuel recorded was 6023 kg. They took off from runway 36L at Amsterdam at 17:11:29 with 5818 kg of fuel.

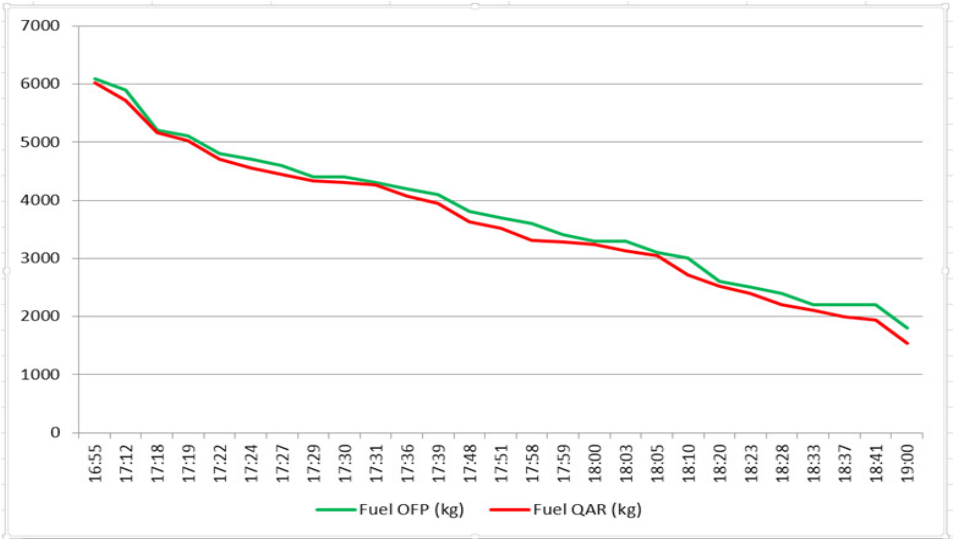
They climbed continuously to FL390, which they reached at 17:29:39 after executing standard instrument departure LEKKO3V. They had 4386 kg of fuel onboard after reaching their cruising altitude. This amount was slightly below that anticipated in the OFP.

At 17:48:47, while over point RESMI, the amount of fuel remaining was 3624 kg, which matches that indicated by the crew in their fuel management entries in the OFP. This amount was 200 kg short of the fuel amount calculated for this point.

They started the descent at 18:30:16 with 2180 kg of fuel remaining onboard. According to the OFP, they should have had 2300 kg at that point.

The cruising speed recorded for the aircraft was 0.785M. The flight was calculated to be flown at the optimal speed, corresponding to a cost index (CI) equal to 14, which required an average speed of 0.77M.

As evidenced by the operational flight plan (OFP), the crew did a new fuel management calculation during the descent, at 18:37:36, as they passed over the PPG VOR. At that point they had 1996 kg of fuel, which matched the annotated value. The amount of fuel they should have had at that point was 2200 kg, which maintained the negative 200 kg difference.

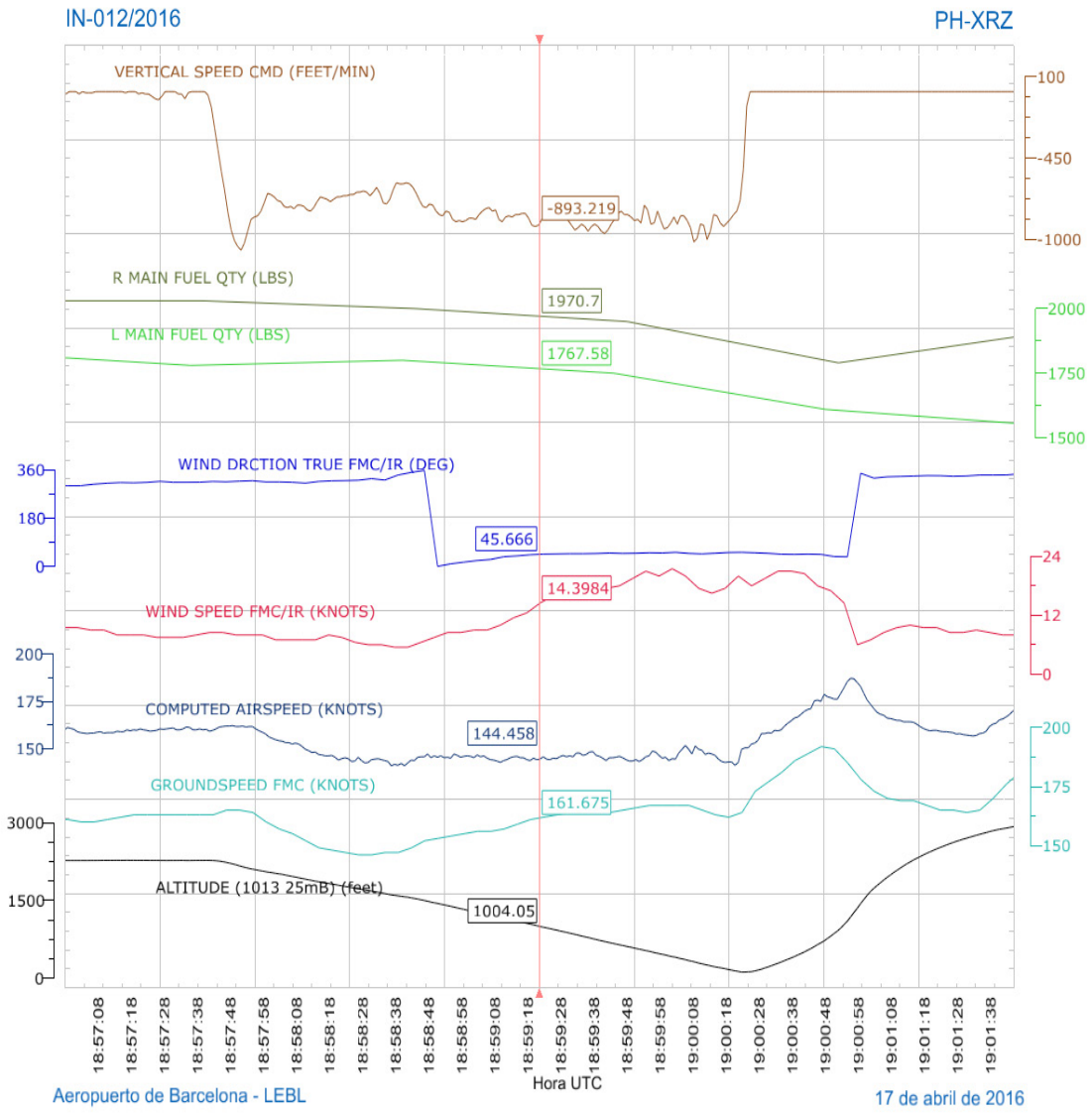


The figure shows the difference in the fuel values present at different points during the flight between those specified in the OFP and those logged by the QAR. Notice that the fuel remaining onboard was consistently below the planned amounts.

Final approach and landing

When the aircraft began its final approach, the amount of fuel recorded was 1731 kg.

GO AROUND MANEUVER



As the graph shows, the wind speed and direction, as detected by the FMC, varied drastically.

At 18:58:41, there was an increase in the wind speed, which reached a maximum value of 22 knots from 053° at 19:00:01. The wind also shifted from its previous direction, which had been 315°.

This shift, which occurred at 1567 feet and descending, resulted in an increase in ground speed (GS), which went from 147 to 167 on short final, as well as in an increased descent rate, which ranged from 700 to 900 ft/minute.

The crew executed the go-around at 19:00:22, climbing to 4000 ft with 1545 kg of fuel remaining.

At 19:04:52, when the crew declared a fuel emergency (MAYDAY), the aircraft was reaching 5000 ft outbound, with a recorded fuel amount of 1432 kg.

After following ATC's instructions, the aircraft landed on runway 07L at 19:11:46 with 1170 kg of fuel remaining.

Since the fuel level in either main tank did not drop below 453 kg, the FUEL LOW alert was not activated.

The FMC indication "USING REV FUEL" is not recorded by the QAR.

1.11.2 Cockpit Voice Recorder (CVR)

The airline Transavia, in point 11.2 of its Operations Manual, Part A, includes a guide for its crews for the steps to take if they are involved in an accident/incident. These steps include a specific instruction to preserve the CVR data so as to facilitate its analysis.

The two crewmembers spoke between them in Dutch. As a result, the CIAIAC requested the aid of the Dutch investigation authority, the Dutch Safety Board (DSB), to transcribe their conversations.

Said conversations indicate that the flight transpired with no significant problems.

At 17:35:49, shortly after reaching their cruising altitude (FL390), the crew calculated the minimum fuel with which they could reach their destination and updated the FMC with the cruising speed. Upon doing the calculation they realized that if they increased their speed to 0.79M, they would arrive at the scheduled time with 1.7 tons of fuel remaining.

The crew used the FMC to manage the fuel, and at 18:41:04, they noticed the system was indicating that they would have 1.6 tons of fuel upon arriving, close to the minimum 1613 kg required to proceed to the alternate. At that point they were descending through FL200, and they attributed the discrepancy to having flown at 0.79M instead of 0.77M.

During the descent maneuver, anticipating that the landing fuel remaining would be below the amount needed to proceed to the Reus Airport, which was their planned alternate, they noted that they were "committed to land" at the Barcelona-El Prat Airport. The crew was confused by the excess fuel consumption and did not identify anything they had done differently, other than taking off using a different runway and slightly increasing their cruising speed.

In light of this situation, at 18:48:05, while descending through FL090, they mentioned the go-around maneuver in case they had to execute it, stating that they would immediately declare MAYDAY FUEL.

At no time did they consider making a standard MINIMUM FUEL report.

They were advised by ATC of the variable wind condition on short final (windshear). The increased wind speed and the change in direction were detected by the crew at 18:59:38, indicating that they had a 16-kt tailwind reading, a value beyond the limit. The crew, believing that they were violating the landing limits, decided to go around.

When they first contacted the approach controller, they reported that they were "low on fuel", as they had planned in the event of a go-around. This message was repeated a second time to approach, and a third time before being asked by the controller if they were declaring MAYDAY FUEL.

They looked at the fuel remaining after landing in the FMC, which indicated 1.1 tons, and as a result they decided to declare MAYDAY FUEL at 19:04:52.

Following ATC's initial instructions, the copilot expressed his concern of running into traffic in the opposite direction.

During the approach, they expressed their surprise upon seeing an aircraft heading toward them, noting that they thought a lot of time had elapsed before the controller gave them instructions to avoid the conflict.

Just before landing, the captain noted that they had 1.2 tons of fuel remaining.

During the taxi and parking maneuver, the crew were discussing the flight and their fuel consumption situation, and noted that given the initial 6.1 tons of fuel, the copilot had calculated 1.7 tons upon landing. They also discussed the regulation for declaring MAYDAY FUEL as it concerns the amount of fuel remaining.

1.12. Wreckage and impact information

Not applicable.

1.13. Medical and pathological information

Not applicable.

1.14. Fire

Not applicable.

1.15. Survival aspects

Not applicable.

1.16. Tests and research

1.16.1 Crew statements

1.16.1.1 Crew of aircraft PH-XRZ (TRA 513L)

They began their activity in Barcelona at 12:20 UTC. That day's schedule called for them to fly three legs between Barcelona and Amsterdam. The incident flight was the second one.

The flight crew conducted all of the scheduled activity, while the cabin crew were replaced in Amsterdam after the first flight of the day.

The two pilots had flown the previous day's schedule together. They then had 23:38 hours off, and stated that they were not fatigued at the time of the event.

Both pilots had flown together on previous occasions, and had even done a simulator check flight together. They were familiar with operations at the Barcelona Airport. They noted that the previous day they had flown three flights to/from Barcelona.

They held the briefing in the hotel, since the airline sent all of the documentation to the pilots via e-mail. The captain did not recall the aircraft being dispatched with any deferred items or any prior maintenance activity.

They did the takeoff performance calculations using the EFB device in the cockpit, with both pilots doing a cross check of the results.

During the first flight of the day, between Barcelona and Amsterdam, during the final descent phase, they had to deal with a medical problem involving a passenger who was exhibiting nausea symptoms and who had problems speaking and moving one arm.

They stated that in Amsterdam, the fuel is ordered by the Transavia Operations Office, and the fuel amount is supplied without checking with the crew.

Since they had had a medical problem on the incoming flight, during the fuel loading operation they were busy seeing to the deplaning of the passenger and providing medical personnel with the information they required.

The airplane was refueled and they received the fuel receipt before starting their preparations for the next flight.

The captain acknowledged that if they had not had that problem, they would have asked for some more fuel, since he thought that the amount specified in the LIDO flight plan was a little tight, landing with 1.8 tons with Reus (LERS) as the alternate.

The weather conditions in Amsterdam, however, and those forecast en route and at the destination, were good and no delays were expected, so they accepted the 6100 kg fuel load specified in the LIDO flight plan.

From then on they were mindful and vigilant of the amounts of fuel consumed and remaining, and they did several checks during the leg to Barcelona.

The captain was the pilot flying (PF) during that flight.

The weather en route was good. In addition to the weather information supplied with their documentation, they updated it through ACARS messages and the ATIS.

The flight proceeded normally with no deviations from the planned route, except for the instrument departure maneuver, since they were instructed to take off from runway 36L instead of 24 as planned. There were no technical problems during the flight.

During the descent, the amount of fuel remaining upon landing shown on the FMC was between 1.7 and 1.6 tons. Before the approach, they decided they were committed to landing in Barcelona, since the fuel required to divert to the alternate was 1613 kg. During the descent briefing, they did not discuss any special considerations since the weather was good and the wind was variable but calm. They did consider the possibility of a go-around, but reiterated the need to land in Barcelona. They were cleared to fly standard arrival route ALBER1T. They did not have to fly a holding pattern; instead, they flew the route from ALBER, receiving vectors to intercept the runway 25R localizer.

They did not think there had been a calculation error in the OFP, since they stated

that if they had landed on runway 25R, the fuel remaining upon landing would have been 1.7 tons instead of the 1.8 tons calculated. The 100-kg difference could be explained by the departure maneuver from runway 36L in Amsterdam, instead of that planned in the LIDO OFP, which was runway 24.

The approach was stabilized, but they had to do a go-around when they encountered a tailwind in excess of 20 knots. The B-737 is limited to a tailwind on landing of 15 knots.

They executed the published go-around maneuver for runway 25R, leveling off at 3000 ft. They were transferred by the Tower to the Departures frequency. When in contact with the Departures controller, they were cleared first to 4000 ft and then to 5000. When they carried out the go-around maneuver, they had 1.6 tons of fuel remaining.

While climbing after going around, they informed ATC they were short of fuel and were instructed to proceed to the VLA VOR to join the holding pattern.

While flying south, away from the airport, they checked what the fuel amount would be if they returned to Barcelona at that point, finding out that it would have been 1.1 ton. That was when they declared an emergency (MAYDAY) and insisted on returning immediately to Barcelona. They were then cleared to turn and descend. They did not recall exactly how much fuel they had at that moment, but they estimate it would have been 1.3 or 1.4 tons.

Once they declared an emergency, they were given priority over two preceding aircraft that had also executed a go-around at the Barcelona Airport.

When they were at 5000 ft, they realized they were above the ILS slope for runway 07L, so they decided to configure the airplane by lowering the landing gear, flaps and speed brakes to increase their descent rate and capture the glide slope, which they did at 3000 ft. ATC then instructed them to hold that altitude, so they stopped their descent at 2700 ft and climbed back up to 3000.

When they looked out the window they were surprised to see the landing lights of an oncoming airplane at their 12 o'clock position. It was an EasyJet aircraft that had just executed a go-around on runway 25R and was established at 3000 ft in a heading opposite to theirs.

It took ATC an instant to take action and order the EasyJet to immediately turn left. In the meantime, to avoid a possible collision and not exhaust more fuel, they left 3000 ft and tried to recapture the glide slope, which was not easy to do after

leveling off. They managed to stabilize the approach at 1200 ft and land on runway 07L.

At the parking stand, the fuel amount indicated by the FMC was 1.1 tons. The fuel gauges read 1080 kg (490 kg in the left tank and 590 kg in the right).

They estimated that the fuel on landing was 1100 kg, a little over their final reserve fuel, which was 1001 kg.

The passengers were informed of the go-around maneuver but not of the emergency situation, which the flight crew only reported to the cabin crew. Once at the parking stand, the flight crew also informed the cabin crew of their proximity to the EasyJet aircraft during their final approach.

According to the cabin crew's statements, the passengers behaved normally.

1.16.1.2 Crew of aircraft G-EZBY (EZY-2267)

They began their activity at 11:25 UTC at the London-Luton Airport. In the crew room they briefed their activity for that day, which would involve four flights. The incident flight was the third in this series. Both crewmembers had had their required rest period after their activity the previous day.

For this segment, the captain, anticipating possible delays, requested an additional amount of fuel in excess of that specified in the Operational Flight Plan. He stated that EasyJet's policy is that the captain has final authority over the amount of fuel taken on, and that the airline only requires an explanation as to the additional fuel, but does not question the reason.

The crew stated that the fuel factor, on which the fuel calculation in the OFP is based, is correct and offers reliable consumption data.

They stated that they did the takeoff performance calculations on their electronic device (EFB) and cross-checked their results.

Both pilots had prior experience operating at Barcelona. For this leg, the copilot was the pilot flying (PF).

Their flight from Lyon took off 26 minutes later than scheduled. This delay was due to a problem with the aircraft and to control restrictions for taking off within their time slot.

Flying conditions en route were normal, as expected. They flew the leg at flight level 370 and at a speed of 0.77M, as required in the OFP. They did not expect to have a tailwind upon landing, nor was it reported in the ATIS information.

They were cleared by ATC to execute the PUMAL3T arrival to runway 25R at Barcelona. During the descent briefing, they mentioned the possibility of having to do a go-around, and specified the actions that each crewmember would have to take.

They did not have to fly a holding pattern and they made a stabilized approach maneuver.

When they received the instruction from the Tower controller, they were at 500 ft. They stopped the descent at 300 ft but did not turn south immediately due to their proximity to the ground. Shortly afterward, before completing the transition to the go-around maneuver, they were cleared to land, but they encountered a tailwind of 15 knots, gusting to 21, and so they had to abort the approach.

At no time were they informed of the emergency declaration (MAYDAY) by the Transavia aircraft or of its position. They executed the standard published go-around procedure, as instructed by ATC. They did so in accordance with the company's standard operating procedures (SOP), with the change in altitude and turn to heading 130, as instructed by the departure controller. They had 2340 kg of fuel remaining when they went around.

They received no ACAS advisories during the go-around maneuver. They only had visual contact with the landing lights on the Transavia aircraft after they started to turn to 130, as they had been instructed to do.

The crew is not claiming coordination problems with ATC. They were cleared to land on runway 07L at Barcelona, which they did with 1814 kg of fuel remaining, versus a final reserve fuel of 1010 kg. Their alternate airport was Reus (LERS).

They expressed some concern that most of the communications with other aircraft had been in Spanish, which hampered their situational awareness.

On their next flight they returned to their base. They stated their belief that they were not fatigued during said activity.

1.16.2 Statements from air traffic control (ATC) personnel.

1.16.2.1 Statement from TMA Supervisor.

There were two supervisors in the ACC. The wind situation was complex and it was obvious they were going to change runways. It was a very fast runway change, but they were ready for it since it was evident it had to happen.

The Transavia crew went around and reported they had Minimum Fuel. He told them to climb to 5000 ft, after which they immediately declared an emergency.

He then contacted the Tower (TWR) to coordinate the approaching aircraft from Ryanair and EasyJet, assuming the Tower was in contact with them due to their position of the radar display. He told them first to remove the Ryanair from the approach sequence and send it south at 3000 ft. Then, once the EasyJet was in contact with the Tower, to send it south as well at the same altitude.

He stated that there is a certain complexity to coordinating traffic, since there are many links where the chain can be broken, depending on the circumstances affecting each of the parties involved and which are not always known. In this case, the process required him to coordinate with the Tower Supervisor, him with the local executive controller, and him with the pilot. As a result, a mistake can happen sometimes and the end result is not as expected.

He stated that before this, they had stopped all takeoffs and he notified the coordinators of the South sectors that they would be receiving these aircraft and that takeoffs had been halted.

The sector T4 controller instructed the Transavia crew to capture the runway 07L localizer and maintain 4000 ft.

He additionally noted that the EasyJet aircraft was at 100 ft, so he thought it was landing and that the Tower had not complied with their arrangement.

The traffic in emergency (the Transavia) had been cleared for the ILS approach. It was then that he saw the two aircraft were on opposite headings and closing. The Transavia could have been instructed to make a 360° turn south, but he doubted if the EasyJet would also turn south at some point, as had been arranged previously. Neither crew reported a TCAS advisory, but they did report having the other in sight. In the end, the EasyJet aircraft turned south, creating a safe separation distance between the aircraft.

He thought that ideally, they should have waited to clear out the aircraft on approach and insert the airplane in emergency. The controller's excessive zeal to help the pilot and his ignorance of the situation make the controller assume the worst situation and attempt to help the aircraft in emergency by giving it priority so it can execute its maneuvers.

No consideration was given to directing the aircraft to runway 07R because that is never done, since operations on that runway are restricted for environmental reasons. Moreover, if the EasyJet aircraft had turned south, it could have created a conflict with the aircraft making this approach.

In addition, controllers are conditioned to direct aircraft in emergency to the longest runway if possible[7].

As for the operational environment, he stated that it was a complicated day with a high workload, good visibility but strange winds. In light of the swirling wind, they were ready to change the runway in use.

He was confused by the fact that the Transavia crew immediately declared a fuel emergency when they should have had fuel remaining.

His conclusion from this incident is that one conflict should not be avoided only to create a worse one, meaning that an aircraft should not be instructed to make an approach when there is another aircraft approaching on the opposite runway.

1.16.2.2 Statement from the Control Tower Supervisor.

The situation was complicated by the windshear that had been reported on runway 25R and by the tailwind present all over the airport.

When the reports were made by the crews, in the Tower they had tail wind indications at both runway thresholds (07/25).

By the time the aircraft started going around, they had already decided to change the runway in use.

They were contacted by the control center (TMA) to inform them that the Transavia aircraft was coming in on the opposite runway, that is, on 07L.

The TMA supervisor contacted him to request that they take the Ryanair and EasyJet

7 At LEBL the longest runway is 07L/25R.

aircraft out of the approach sequence, and immediately send the Ryanair to the south. In an effort to separate them, the EasyJet aircraft would then have to continue the approach before being turned to the south.

While speaking with the TMA Supervisor during a coordination conversation that was longer than usual, the local arrivals controller was being called by up to three controllers, some of them giving him information that did not agree with what he was being told by the other Supervisor.

He acknowledged that it is a mistake for each one to coordinate separately and individually, since several options arise that you might be unprepared for. In this case, he was not aware that others had already spoken with the local arrivals controller.

He seemed to recall that he told his controller that the Transavia aircraft was going to runway 07L.

In the event timeline, he remembers that the Transavia aircraft turned around while the Ryanair aircraft exited the sequence and proceeded south.

The EasyJet aircraft was very close to the 25R threshold at that point, and the local controller decided that he would try to land it. The crew, however, did a go-around, executing the standard maneuver, and the local controller transferred them as quickly as possible to the approach frequency for separation purposes.

He thought that the EasyJet crew took a long time to call the new frequency (around one minute), but once they did, they were routed to the south, thus resolving the conflict.

He did not think it right to send an aircraft on final, despite the MAYDAY declaration, when there is an aircraft on approach. The controller always tries, by all means available, to help the pilot, but it is not easy to correctly evaluate the situation.

The local controller instructed the Transavia to clear the runway, and its crew did not report any additional problems while on the frequency with the Tower.

Analyzing the event, he thinks that coordination is an essential problem to address. During an abnormal event, everyone wants to coordinate. There has to be a clear coordination process involving the Supervisor or the executive controllers.

1.16.2.3 Statement from the approach controller (Sector T4)

A potential runway configuration change was required. They were ready for it since a runway change caused by changing weather conditions is a relatively common part of the job of approach controllers.

He was on duty as the executive controller for TMA sector T4, meaning that in that configuration (WRL), he handled go-arounds from 25R and departures to the north.

The situation was calm, since he had no aircraft at the time and he was aided by the auxiliary controller beside him who handled the coordination.

After the first go-around, by a Vueling aircraft, the Supervisor told him they were going to change runways. At that point he only had one aircraft but he was expecting many more due to the go-arounds. At that time the assistant also worked on changing the flight plans of the airplanes to aid the executive controller. He stated that there are no written instructions that specifies the assistant's tasks.

The Vueling crew, after going around, already expressed their concern over any possible delays, requesting information on their estimated time of arrival (ETA), information that he could not provide at that time. He sent them to the VLA VOR, from where they would be inserted into the new approach sequence and assigned them an order in which they would be taken out subsequently.

As soon as they contacted the sector, the Transavia crew declared minimum fuel and asked for priority. He asked if they were declaring an emergency, to which the crew replied no. After coordinating with the other feeder sector and with final, he decided to give them priority as it did not penalize any other aircraft, since the Transavia was the closest for a landing on the opposite runway, 07L.

From then on his mission was changed, from controlling takeoffs and go-arounds to feeding the final sector for runway 07L in the ELR runway configuration.

At the same time he continued receiving go-arounds and he separated the traffic using altitudes, in anticipation of additional go-arounds on runway 25R.

The Transavia aircraft, after declaring MAYDAY, was already coordinated with the other sectors and the supervisor to give it priority.

He stated that if in doubt, he had internalized the fact that the aircraft with a problem always came first. It was easier to make the Transavia aircraft hold at the VLA VOR than the Vueling. He cleared the Transavia to climb to leave clear altitudes for other traffic that may be coming behind.

He kept the crew apprised at all times of aircraft going around and of the last aircraft on approach.

He instructed the Transavia aircraft to maintain heading for subsequent routing to runway 07. At that point he again asked the crew to confirm that they were declaring a MAYDAY, if they required an immediate approach, which the crew did. It is routine procedure to ask a crew reporting any unusual occurrence to confirm its nature. This is because the controller's actions are not the same if priority is requested, which allows for more time, as if an emergency is declared, at which point the priority is absolute and the traffic is routed to facilitate the maneuvers of the crew that declared the emergency.

He instructed the crew to turn right to final on 07 instead of left, being mindful of any potential takeoffs that might take place. The crew insisted on descending, so he cleared them to proceed to 4000 ft.

The supervisor stopped takeoffs and routed approaching traffic away from the localizer.

He felt that he was not communicating well with the controllers in the Tower, since they were not answering him and he had to call them several times. He was worried about the takeoffs and he called the local departures controller for 25L to have him stop the maneuvers.

The controller who answered the arrivals hotline told him that they had already called to stop the takeoffs. The T4 controller then asked to be notified when the ILS for runway 07L was turned on.

He saw that the EasyJet aircraft was very low, but he was informed by his supervisor that the aircraft was landing. Despite being initially told that this aircraft was going to land, the supervisor immediately informed him that it was going around. In any event, he was tracking the aircraft on radar, so he was not concerned and it did not catch him off guard. He was ready and looking out for the eventuality of one last go-around on 25R.

He thought that the aircraft should never have been routed to the Tower, but rather that it should have been taken out of the approach sequence earlier. The thing is by the time he saw it, the crew was already in contact with the local arrivals controller for runway 25R.

When the EasyJet began its go-around, the aircraft was almost on the runway, and someone told him it would stay at 2000 ft. With this information in mind, he

descended the Transavia aircraft to 3000 ft, since the aircraft needed to descend to stay on the glide slope. He then informed its crew of the position of the EasyJet aircraft. Upon seeing that the EasyJet did not hold 2000 ft, as expected, the situation became very tense.

None of what he had anticipated for the EasyJet aircraft happened. It did not land, it did not hold 2000 ft during the go-around, and it did not turn south of the airport, unlike other aircraft that had gone around.

When he saw the EasyJet aircraft go around, he asked the Tower several times to have it stop at 2000 ft and turn left, but no one answered him. The only information he was receiving was from the supervisor, while his assistant worked to coordinate with the rest of the team in the room. He asked his supervisor to move the traffic, and he told him that it would be done and to remain calm.

During that time, to prepare for the runway change, the final controller had been changed from one post to an adjacent post that was physically to the right. The controller should have transferred the traffic on final as per procedure, but he arranged in direct coordination with him, and with the supervisor's assistance, to turn the aircraft to final and make the transfer directly with the Tower.

His impression is that the EasyJet crew were not informed about the status of the Transavia aircraft in emergency until it was under his control. He should have been informed earlier so as to have the crew contact him much earlier, an action that he thinks was delayed.

As soon as it was possible he turned it south. This resolved the conflict situation as soon as the crew carried out this maneuver. This evasive maneuver clearance was reported to the crew when they were on the frequency, though he had called the crew earlier several times to expedite the maneuver. He also provided essential traffic information to the two crews, which confirmed they had each other in sight.

He noted that it was clear to him that if an emergency is declared, preceding aircraft cannot be cleared to land, lest the runway remain occupied if anything happens to the cleared aircraft, which would worsen the situation for the aircraft in emergency.

The situation involving facing traffic, one on approach and the other inbound, is a routine procedure during the recurring runway change that takes place on a daily basis. This procedure considers a minimum separation distance in miles as a safety margin, and the aircraft are separated by altitude. It is coordinated with the Tower and with his supervisor. The supervisors coordinate what the last aircraft to land on

the runway will be and what takeoffs are pending, as per the standard procedure.

If the emergency had not been declared, the Transavia aircraft would have been directed away from the airport to subsequently return to the 07 localizer or to the holding fix associated with runway 07L, based on the traffic situation.

He stated that in his daily briefing before going on duty, he is not given information on the prevailing weather, on the sector configuration or on the runway in use, and that he only has access to medium/long-term bureaucratic information. He also receives information on any special maneuvers for that day, on the status of the navaids and on any aerial work being performed.

He stated that the weather information to which the supervisor has access is very limited and insufficient, as it does not help anticipate situations like the one that took place.

1.16.2.4 Statement from the local arrivals controller for runway 25R

The event happened on a Sunday evening at about 21:00 local time. She had started her shift at 19:30.

She had not worked at a control post since 24 March, since she had taken two vacation cycles and in that time had only had one proficiency evaluation session and a few days of office work.

That month she was assigned to office duty, but in order to fill all the duty stations, she was assigned to cover a shift on that day. This had been published with the usual advance notice.

The Barcelona Airport was in the preferred parallel-runway (25L/R) configuration (WRL). The wind direction shifted suddenly to 007, with the wind speed going from an 8-9 knot tailwind to 18-20 knots and gusting between 23 and 26. By then the wind change had been detected in the Tower and the supervisor was coordinating the runway change, since it was clear to them that with that wind, aircraft would be unable to land and would have to go around.

This prediction came true and the third traffic in the sequence, a Transavia aircraft, declared a fuel emergency. She found out via the hotline with the sector T3 controller that the airplane would be landing on runway 07. She assumed it would land on 07R, and was convinced of this. Perhaps she had been influenced by an exercise conducted during training that the aircraft would land on 07R.

She immediately spoke with the local departures controller to have him stop takeoffs, which he replied had already been done.

She focused her attention on the two aircraft that were in the approach sequence, and informed the supervisor of her reasonable doubts that they would be able to land.

The Supervisor instructed her to send the second aircraft in the sequence, operated by Ryanair, to the south. This aircraft was some 11 miles out and was not on her frequency. She was not given any instructions for the closer aircraft, operated by EasyJet, even though she urgently requested instructions. The Supervisor told her, for the time being, to keep it in the approach sequence.

She awaited instructions, holding up the strip to get the supervisor's attention. She was eventually instructed to divert the EasyJet to the south, but without specifying the altitude to which she should clear it. At that point the aircraft was at 200 ft. Since it was so low, she asked for confirmation from the Supervisor to divert the aircraft to the south, since given the EasyJet's proximity to the ground, she thought it unsafe. At about the same time, someone from approach also told her to divert it to the south without specifying an altitude.

She relayed this instruction to the EasyJet, but the crew were unable to comply since they were so low. Upon seeing they were almost touching down on the runway, she decided to authorize the landing so the crew could land while being cleared to do so.

Just then she saw the aircraft go around and its crew reported their intention to abort the approach maneuver. At the same time, she attempted to communicate with approach sectors T3 and T4, but did not receive intelligible information from their controllers.

She did not know the position of the Transavia aircraft since, due to the zoom level on the raster screen, she could not see the 07L approach. She also was not told that the aircraft was starting its approach to runway 07L. Believing she was confronting a new situation, she decided to issue it a standard go-around and immediately transfer it to the sector T4 frequency (127.7 MHz), thinking that the controller for that sector would expect this maneuver. With the EasyJet at that position on final, it did not occur to her to think that the Transavia would really be where it was, opposite the other aircraft.

Nobody considered coordinating the EasyJet's maneuver in case it went around, and so she received no instructions in this regard.

1.16.3 Operational flight plan

Investigators analyzed the operational flight plan (OFP) filed, including the crew's entries. For this leg, a flight plan was filed that indicated Reus and Palma de Mallorca as the first and second alternate airports, with an estimated takeoff time of 17:06.

Figure 4 shows an excerpt from the OFP involving the fuel planning. These calculations indicate that:

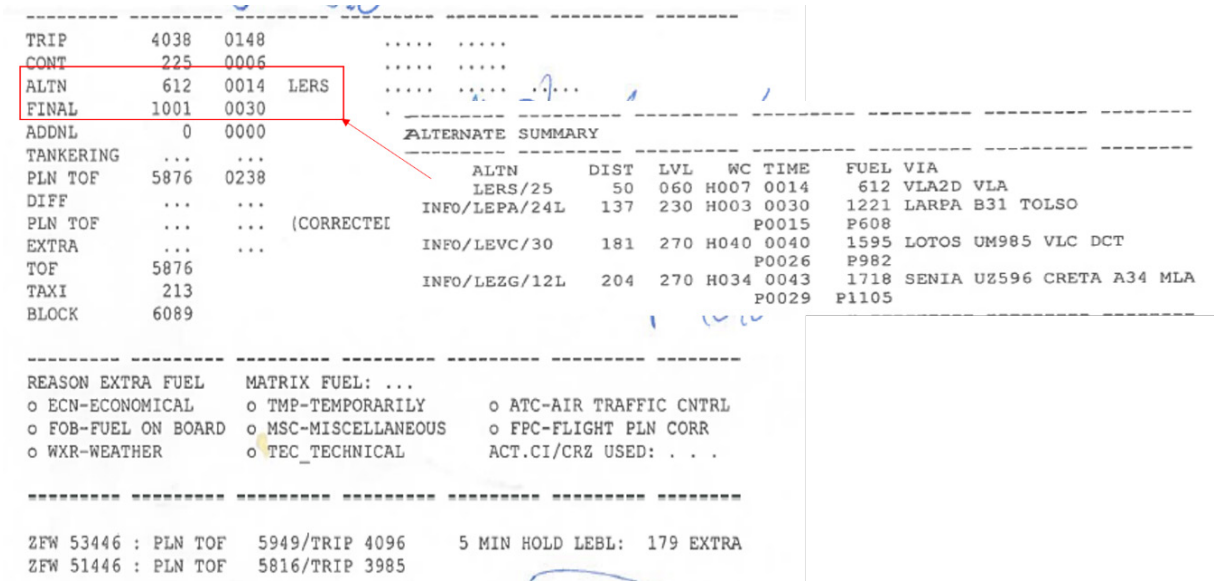
- No fuel in addition to that planned for the operation was added before takeoff.
- The calculation of the fuel estimated for the flight did not have to be corrected[8] for increased aircraft weight.
- No additional contingency fuel was added to the amount calculated. This amount is defined by the OM A as that required to compensate for unforeseen factors, such as deviations from the planned route or flight level for meteorological reasons, as well as differences in fuel consumption from the planned amount by a specific aircraft.
- Fuel was loaded for Reus as the alternate airport, which would have required 612 kg of fuel flying at FL060. They did not consider adding fuel for a second alternate airport.
- The final reserve fuel was 1001 kg.
- No additional fuel was added, defined by the OM A as that required by the type of operation and determined by the operator's Technical Flight Department.
- No extra fuel was added either, the loading of which is left to the captain's discretion, whose primary reason for loading extra fuel must be noted in the OFP, as per the OM A.
- The estimated consumption for the taxi phase was 213 kg.

Therefore, the amount of fuel required (BLOCK), with Reus as the alternate airport, was 6089 kg (the crew refueled 6100 kg according to the load sheet). The aircraft's estimated zero fuel weight (EZFW) was 52466 kg. This means that once the pre-takeoff fuel was consumed (160 kg for APU/TAXI), the aircraft's estimated takeoff

8 If the real weight had been more than calculated, the flight plan considered a consumption correction of 58 kg of additional fuel for every 1000 kg of excess weight over the EZFW, which in this case did not have to be applied.

weight was 58322 kg. This weight was used for all of the performance and flight consumption calculations.

The QAR data showed that the amount of fuel burned during the taxi phase was 282 kg, higher than estimated. At takeoff, the aircraft weighed 57036 kg, 1286 kg less than estimated, which should have been favorable for the conduct of the flight. Considering the amount refueled (6100 kg) yields the aircraft's zero fuel weight (ZFW) of 51172 kg. This favourable weight difference from the planned amount would have translated, according to OFP data, into a reduction in fuel consumption en route of around 60 kg.



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TRIP        4038   0148
CONT         225   0006
ALTN         612   0014  LERS
FINAL       1001   0030
ADDNL          0   0000
TANKERING    ...    ...
PLN TOF     5876   0238
DIFF         ...    ...
PLN TOF      ...    ...  (CORRECTEI
EXTRA        ...    ...
TOF         5876
TAXI         213
BLOCK       6089

ALTERNATE SUMMARY
         ALTN      DIST  LVL   WC TIME   FUEL VIA
         LERS/25     50  060 H007 0014    612 VLA2D VLA
INFO/LEPA/24L       137  230 H003 0030   1221 LARPA B31 TOLSO
                                P0015   P608
INFO/LEVC/30        181  270 H040 0040   1595 LOTOS UM985 VLC DCT
                                P0026   P982
INFO/LEZG/12L       204  270 H034 0043   1718 SENIA UZ596 CRETA A34 MLA
                                P0029  P1105

REASON EXTRA FUEL    MATRIX FUEL: ...
o ECN-ECONOMICAL     o TMP-TEMPORARILY      o ATC-AIR TRAFFIC CNTRL
o FOB-FUEL ON BOARD  o MSC-MISCELLANEOUS    o FPC-FLIGHT PLN CORR
o WXR-WEATHER        o TEC_TECHNICAL        ACT.CI/CRZ USED: . . .

ZFW 53446 : PLN TOF   5949/TRIP 4096     5 MIN HOLD LEBL:  179 EXTRA
ZFW 51446 : PLN TOF   5816/TRIP 3985
```

Figure 4. Fuel calculations for the incident flight (OFP)

The flight plan assumed instrument departure LEKKO1S from runway 24 at the Amsterdam Airport and a cruising altitude of FL390. The fuel calculation was based on a cost index [9] of 14 (CI14), which gave an optimal speed of around 0.77M. The long-range cruise speed for that weight at the optimal flight level of FL390 was 0.773M. The fuel flow factor[10] applied was +1.9.

It also contained (Figure 3) information on four alternate airports in order of preference, with Reus being the first. For each airport, it provided the distance, the wind component, the time, the flight level and the fuel required. To make an approach to runway 25 at Reus, the OFP gave a distance of 50 NM, which would require 14 minutes and 612 kg of fuel flying at FL060.

9 The Cost Index is a value that relates the direct operating costs with the price of fuel. This figure is used by the FMC to calculate the optimal cruise speed and minimize costs.

10 The fuel flow factor is a variable that corrects the consumption based on the deteriorated aerodynamic performance that aircraft experience over time

The crew had written notes by hand pertaining to fuel management and time at two points along the route. Both reveal a 200 kg difference with the estimated fuel remaining.

1.16.4 Validation of the Operational Flight Plan data.

So as to evaluate if the flight was planned correctly, investigators asked the operator to prepare an operational flight plan under the same conditions as those present on the day of the event, but updating the consumption for taxiing to runway 36L at the Amsterdam airport and modifying the planned instrument departure to the one actually flown, LEKKO3V. The operator provided OFPs calculated with the differences requested and with the actual weights used.

According to the operator, Transavia uses the option of making flight plans with the most likely standard departure route (SID).

The differences noted were an increased consumption of 54 kg for taxi fuel and 168 kg for trip fuel. These two amounts total 222 kg, which, in the original flight plan, is close to the 225 kg amount allocated as contingency fuel.

1.16.5 Fuel flow factor

The fuel flow factor is a correction applied to the standard fuel consumption. It is generated by the manufacturer to compensate for deteriorated performance of the aircraft and its engines.

This factor is included in the FMC database and is updated with each AIRAC[11] cycle, which lasts 28 days. It is also used when generating Operational Flight Plans (OFP) to adjust the planning for the flights to be carried out. In this case this information is mentioned in the OFP.

The operator was asked for information on the fuel flow factors used during this event.

The fuel flow factor used during the cycle in which the event occurred was +1.9, while in the previous cycle it had been +1.8 and in the subsequent one +2.1. This indicates that the characteristics of aircraft PH-XRZ were deteriorating in terms of fuel consumption.

In order to properly evaluate this event, the operator was asked to generate a flight

11 AIRAC Aeronautical Information Regulation and Control

plan using the actual route flown with similar planning factors, including the +2.1 fuel flow factor with cost index CI14, and another with this factor and a cruising speed of 0.78M.

It was concluded that this change in the value of the fuel flow factor increases consumption, but not enough to be a determining factor. The same applies to the increased speed. It was concluded that the factor that did in fact have a significant effect on the difference in fuel use was the increased distance due to the change in the instrument departure maneuver (SID) and to the longer taxi distance.

1.16.6 Load and balance.

The load and balance information for the aircraft was analyzed. This revealed that even though the position of the center of gravity on takeoff was shifted forward, a factor that is deemed to favor fuel use, it was within the authorized operating limits.

The operator stated that the LIDO program, which produces the operational flight plans and the associated fuel consumption, is adjusted to use a default value for the center of gravity during cruise of 8%. This value, as per the AFM, is the forward position limit for the center of gravity on the B 737-200 aircraft, and is used to ensure conservative fuel planning.

1.17 Organizational and management information

1.17.1 Documentation of the air operator.

The air operator's Operations Manual lays out the following criteria:

- On the authority, duties and responsibilities of the captain (OM Part A, 1.4), it states that during the flight preparation and execution period (period of flight activity), the crew are subordinate to the captain. If the captain's orders are contrary to company policy or to written instructions, the crewmembers are to inform the captain of this but must, however, follow his orders if the reiterates them.

  As concerns his responsibility, he must ensure that the correct type and amount of fuel and oil are loaded in sufficient amounts to meet the company requirements for the flight planned.

- On the number of alternate airports (OM Part A, 8.1.3.6)[12]: for flights such as the incident flight, one or two alternate airports are to be selected, ensuring that the forecast tailwind and crosswind components (including gusts) are within the applicable limits.

- If the forecast indicates that the wind limitation at the planned arrival time (±1 hour) will exceed 55 knots (including gusts), the destination airport shall be considered to be below minimums and two alternate airports shall be required to dispatch the flight.

- The operator's fuel policy is contained in its Operations Manual A (OM A 8.1.7) and is consistent with the contents of the European Air Ops regulations (CAT.OP.MPA 150 Fuel Policy). It states that flight planning shall be based on procedures and data derived from those supplied by the manufacturer and on data specific to each aircraft obtained from the consumption monitoring system. The operational conditions under which the flight will be carried out shall be considered, including:

    - Actual fuel consumption data for the aircraft

    - Planned operating weights

    - Expected weather conditions

    - Procedures and restrictions of air traffic services (ATS).

- The pre-flight calculation for the usable fuel required shall include:

    - *Taxi fuel:* Fuel required to taxi before takeoff, including that consumed by the APU and the engine start-up and ground movement operations.

    - *Trip fuel:* Fuel required to fly from the departure to the destination airport, calculated based on the operating conditions.

    - *Reserve fuel:* Includes

        - Contingency fuel: amount that compensates for unforeseen factors that could affect consumption. This amount shall be the higher of:

            - 5% of the planned trip fuel

            - The amount needed to fly for 5 minutes while holding at 1500 ft above the destination aerodrome in standard conditions.

        - *Alternate fuel:* fuel needed to proceed to the alternate aerodrome

12 These are the criteria specified in CAT.OP.MPA.180 Selection of aerodromes.

after executing a go-around from the MDA/DH at the destination and flying on a planned route to land at the alternate airport.

- *Final reserve:* fuel needed to fly for 30 minutes at holding speed at 1500 ft above the aerodrome in standard conditions, calculated using the estimated weight upon arriving at the alternate aerodrome.

- *Additional fuel: amount required based on the operation type, and specified by the technical flight department.*

The minimum block fuel for dispatching the aircraft must be the sum of these amounts.

- Extra fuel: an additional amount over the minimum fuel required that may be loaded at the discretion of the aircraft's captain. The primary reason for taking on this amount must be indicated on the Operational Flight Plan.

The Operations Manual (OM 8.1.7.4) includes a fuel matrix table that shows various cases in which crews must consider taking on fuel for the second alternate and/or add a specific amount of fuel. In the event of adverse weather at the destination that could compromise the aircraft's landing performance, fuel for a second alternate shall be included, along with 600 kg of extra fuel.

- In addition, the Manual (OM A 8.1.7) includes a requirement for crews to enter into the Aircraft Technical Logbook (ATL) the fuel readings before the flight, as well as the readings for the fuel remaining after the flight. On the day of the event, the crew recorded that there were 6100 kg of fuel prior to the flight, after having taken on 4000 kg. The fuel remaining recorded was 1080 kg.

Similarly, the crew logged in the ATL that the departure and takeoff times were 16:53 and 17:12 respectively, and that the landing and on-block times were 19:12 and 19:17. The time logged for the previous flight's on-block time in Amsterdam had been 15:33, three minutes after landing. This indicates that the stop-over lasted 1:20 hours.

- On in-flight fuel policy and fuel management (OM Part A 8.3.7):

The Manual, in keeping with CAT.OP.MPA.280, states the need for crews to make regular checks of the amount of fuel remaining in flight. This amount must be noted in the Operational Flight Plan in order to compare real versus planned consumption, to ensure that the fuel remaining will be sufficient to complete the flight, and to determine the amount estimated upon arriving at the destination.

If as a result of the in-flight fuel checks, the expected amount remaining upon landing is below that required to proceed to the alternate plus final reserve fuel, the captain shall consider the traffic situation, taking into account information on delays and the prevailing operational conditions at the destination aerodrome, as well as the diversion route and conditions at the alternate, so as to decide whether to continue to the planned destination or divert in such a way as not to land with less than the minimum reserve fuel.

As concerns reporting "MINIMUM FUEL", the Operations Manual states:

"If decided to land at a specific airport and any change to the existing ATC clearances may jeopardize final reserve fuel, the commander shall advise ATC of a minimum fuel state by the call "MINIMUM FUEL".

Note: The "MINIMUM FUEL" call informs ATC that any change to the communicated (diversion) plan may result in a landing with less than final reserve fuel.

Note: This call is not a fuel emergency but an indication that should any alteration to the intended route be made, a fuel emergency is possible.

Note: Priority handling as result of a "MINIMUM FUEL" call should not be expected. ATC will, however advise flight crew of any additional delays as well as coordinate transferring of control to ensure other ATC units are aware of the flight's fuel state."

The captain must declare a fuel emergency immediately upon realizing that the fuel onboard upon landing at the nearest aerodrome where a safe landing can be executed will be below final reserve fuel. The distress notification "MAYDAY MAYDAY MAYDAY, FUEL" shall be used. An emergency notification due to low fuel indicates the need for priority to ensure a safe landing. The usable fuel amount in minutes shall be reported, along with the crew's intentions.

The inclusion of this terminology is in keeping with the recommendation laid out in EASA Safety Information Bulletin 2013-12, which recommends applying the relevant stipulations from ICAO Annex 6. This document states the following concerning the MINIMUM FUEL notification:

"The declaration of MINIMUM FUEL informs ATC that all planned aerodrome options have been reduced to a specific aerodrome of intended landing and any change to the existing clearance may result in landing with less than planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur."

In this regard, the EASA is conducting a rulemaking task to change the ARO and CAT parts of the Air Ops regulation (NPA 2016-06), which include the conditions under which a crew must report "MINIMUM FUEL", as per stated in ICAO Document 9976 "Flight Planning and Fuel Management (FPFM) Manual.

- On the refueling procedure (OM A 8.2.1)

The operator requires the refueling supervisor to inform the crew of the start and completion of refueling operations if the crew are onboard.

If the refueling procedure is done with the passengers onboard or disembarking, two-way communications must be maintained, using the aircraft's intercom system or other available means, between the personnel supervising the refueling and the flight crew in the cockpit.

1.17.2 Documentation of the ATS operator

Annex A of the Operations Manual of the ATS station (LECB), on general procedures, specifies the actions that a controller should take in the event of a "Minimum fuel-related emergency or priority". These procedures are consistent with the associated procedures in the RCA.

If a pilot declares a **fuel emergency,** the controller shall respond as specified in the RCA:

"4.3.16.2.2. Emergency due to fuel and minimum fuel

4.3.16.2.2.1. The fuel emergency shall be declared by the captain or pilot in command when, regardless of the type of operation in question, the circumstances occur that are specified in CAT.OP.MPA.280 letter b), Section 3, CAT.OP.MPA.281, letter c), of Commission Regulation (EU) no. 965/2012 of 5 October, which lays down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council, and other relevant regulations.

Note 1: Pursuant to CAT.OP.MPA.280, letter b), Section 3 of Regulation no. 965/2012, the commander shall declare an emergency when the calculated usable fuel on landing, at the nearest adequate aerodrome where a safe landing can be performed, is less than final reserve fuel.

Note 2: The term MAYDAY FUEL describes the nature of this unsafe situation as required in 10.5.3.2.1.1"

4.4.12.1.1. The approach sequence shall be determined so as to facilitate the arrival of the largest number of aircraft with the minimum average delay. Priority shall be given to:

a) An aircraft that anticipates being forced to land due to reasons that affect its safety (engine failure, fuel emergency, etc.)...

Controllers shall proceed pursuant to Chapter 3, Section 4.3.16, for every aircraft in emergency.

"4.5.7.6. Landing priority shall be given to:

a) All aircraft that anticipate being required to land due to reasons that affect its safe operation, including engine failure or fuel emergency..."

If a pilot declares **minimum fuel,** the LECB Operations Manual states that the contents of the RCA shall apply:

"4.3.16.2.3. When the pilot reports minimum fuel, the controller shall inform the pilot as soon as possible of any expected delays, or that no delays are expected.

Note 1: A flight in a minimum fuel situation does not have priority over other traffic.

Note 2: The declaration of MINIMUM FUEL informs the air traffic controller that all planned aerodrome options have been reduced to a specific aerodrome of intended landing and any change to the existing clearance may result in landing with less than planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur.

Note 3: A minimum fuel declaration shall consider the stipulations of CAT.OP. MPA.280 and CAT.OP.MPA.281 in Regulation (EU) no. 965/2012 and related regulations on in-flight fuel management.

Note 4: See the phraseology in Section 4.10.3.1.13."

As for **coordination messages,** whether an emergency is declared or minimum fuel is declared, the stipulations in paragraph 4.8.1.1 of the RCA shall apply.

«4.8.1.1 If an aircraft is in an emergency situation or in any other situation in which the safety of the aircraft cannot be guaranteed, the coordination message shall include the type of emergency and the circumstances affecting the aircraft. The

coordination message shall also include a minimum fuel declaration."

Whether an emergency of minimum fuel is declared, the controller shall report it to the person responsible for filling out the Daily Log at the station, so that it can be included in said Log along with any relevant information (diversion to alternate, adverse weather, etc.). It also specifies the obligation to fill out the incident reporting form as per the steps specified in this Operations Manual.

1.18. Additional information

1.18.1 Maintaining the preferred configurations at LEBL

The information contained in the AIP regarding maintaining the preferred runway configurations at the Barcelona-El Prat Airport states:

"Except when some of the following conditions are present or expected:

- *Dry runway, or wet with less than good braking action*
- *Cloud ceiling below 500 ft above aerodrome elevation.*
- *Visibility below 1.9 km (1 NM).*
- *Wind gradient reported or forecast or storms in the vicinity or on departure route.*
- *Traffic conditions, operational needs, safety situations and other weather conditions that prevent it,*

ATC shall maintain the preferred configurations ... up to 10-kt tail wind and/or 20-kt wind components, including gusts.

1.18.2 Procedures for changing runway at LEBL

The procedures for changing the runway pertinent to the TMA (LECB) and Tower (LEBL) are shown in Appendices 1 and 2 of this report.

Appendix 3 presents the coordination procedures for the two stations.

1.18.3 ACC Barcelona and Airport Tower control positions.

For arriving aircraft, in its most typical configuration, the Barcelona ACC shall be arranged into two feeder sectors and one Final Approach sector. Once aircraft reach

the vicinity of the final approach point, they are transferred to the Local Arrivals post at the Barcelona Tower, which is charged with clearing aircraft to land or to go around.

For departing aircraft, there is a post at the Barcelona Tower, Local Takeoffs, that issues takeoff clearances. There are two takeoff sectors in the Barcelona ACC.

Therefore, for one runway configuration, the most typical sector arrangement at the Barcelona ACC will feature two feeder sectors, one final approach post and two takeoff posts. There is also one controller acting as the TMA Supervisor who performs organizational tasks, operations support tasks, and who manages special situations and functions involving controlling traffic flow.

As for the Barcelona Tower, it will have two Local positions, one for takeoffs and another for arrivals. Analogously, it also has a Tower Supervisor who performs duties similar to those of his TMA Supervisor counterpart.

Daytime configurations at the Barcelona Airport

The preferred daytime configuration at the Barcelona-El Prat Airport is WRL, in which aircraft take off from runway 25L and land on 25R. The ELR configuration is the alternate daytime configuration, and in it aircraft land on runway 07L and take off from 07R.

WRL CONFIGURATION

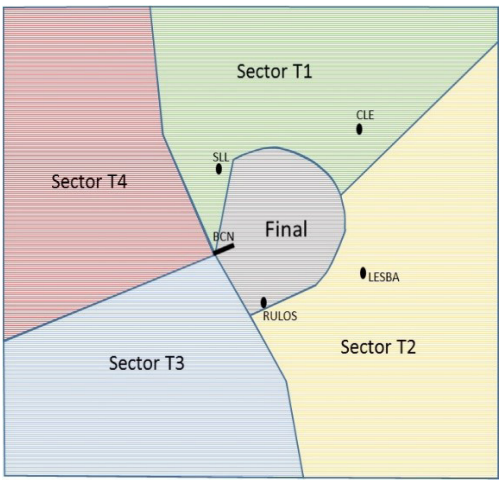

Figure 5.- Barcelona ACC approach sectors in the WRL configuration

In this configuration, the feeder sectors are T1 and T2. The main purpose of these sectors is to route aircraft to the initial approach fixes (IAF) and then to transfer them to the final approach sector, which is responsible for routing the properly separated aircraft to the vicinity of the final approach fix (FAF) for runway 25R and transfer them to the Local Arrivals post for 25R at the Barcelona Tower. If an aircraft executes a go-around maneuver, it will be transferred to sector T4 unless other arrangements are made.

As for sectors T3 and T4, these shall act as takeoff sectors. Departing aircraft are transferred from the Local Takeoffs for 25L at the Barcelona Tower to these sectors. Whether an aircraft is transferred to T3 or T4 will depend on the departure maneuver assigned to the aircraft.

ELR CONFIGURATION

In this configuration the feeder sectors are T4 and T3, which will transfer the aircraft to Final Approach. The takeoff sectors will be T1 and T2. At the Barcelona Tower there will also be two local posts, one for arrivals on 07L and another for takeoffs from 07R.

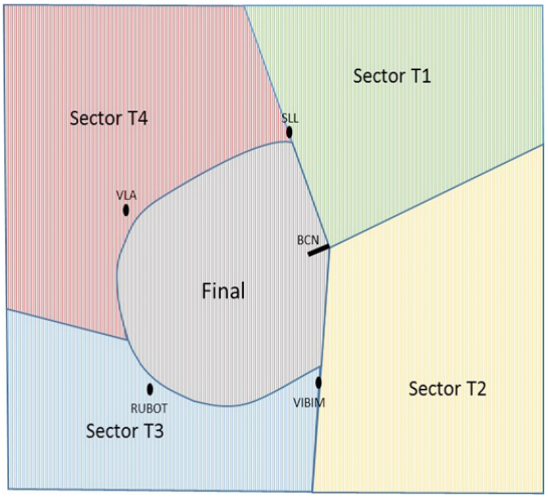

Figure 6.- Barcelona ACC approach sectors in the ELR configuration

When switching from the WRL to ELR configuration, the T1 and T2 controllers, who were feeding aircraft, now transfer to handling takeoff functions. Those in T3 and T4, on the other hand, go from takeoff duties to feeder duties. As for the Final Approach for 25R post, it will now occupy the Final Approach post for 07L, meaning its duties do not change.

The controller working the Local Arrivals post for 25R will, after a configuration change, continue to work the Local Arrivals post, but for runway 07L. Analogously, the Local Takeoff controller for runway 25L will become the Local Takeoff controller for runway 07R.

1.18.4 Guide to emergencies and special situations

The ATS provider, ENAIRE, has a document called "Guide to emergencies and special situations" (S41-02-GUI-001-4.2), in which it offers controllers guidelines for evaluating emergency situations and the suitable procedures for dealing with them.

The instructions associated with "Fuel-related problems / Critical fuel level" are reproduced in Appendix 4 to this report.

1.18.5 Measures taken by ENAIRE

The ATM/CNS Safety Department for the Eastern Region of ENAIRE prepared an internal investigation report to analyze the ATS incident. This document evaluated the severity of the incident, which it classified as "C", corresponding to a Significant Incident.

The main criteria on which classification was based are the distance between the aircraft, the rate of closure between the two and an assessment of how controllable the situation or the flight were.

After analyzing the incident, the following internal safety recommendations were issued:

- Evaluate the possibility of analyzing and reviewing (if applicable) the procedure for changing the runway configurations at LEBL, in coordination with LECB, to implement possible improvements to the coordination or phraseology.
- Send the investigation report to the Training Department for both the TWR and the ACC so be used insofar as possible in the joint (TMA-TWR) TRM sessions as an example of the actions taken by controllers in emergency situations so as to identify areas of improvement to be applied in the future.

1.18.6 Measures taken by Transavia

The operator's Safety Department stated that it had conducted a review of the circumstances and of the actions taken during the incident flight, and compared them to the operating instructions contained in its manual. In addition, it contacted the Technical Flight Department in relation to conducting a review of the procedures

for selecting the departure routes and the runway in use.

1.19. Useful or effective investigation techniques

Not applicable.

2. ANALYSIS

2.1 Analysis of the operation.

2.1.1 Aircraft PH-XRZ.

The B-737 aircraft, PH-XRZ, operated by Transavia Airlines, landed at the Amsterdam Airport (EHAM) at 15:30 from Barcelona (LEBL) on flight HV5136. According to the crew's statement, during the final phase of this flight they had to deal with a medical emergency involving a passenger.

During the stopover in Amsterdam, they were busy helping medical personnel during the deplaning process.

Concurrent with the deplaning process, the airplane was refueled. This was handled by the operator's Operations Office. By the time the refueling was complete, the crew had not yet started their preparations for the next flight.

The captain acknowledged that if they had not had that problem while offloading the passengers, he would have asked for a little more fuel, since he thought the amount required in the LIDO flight plan was a little tight, given that their landing fuel was calculated to be 1.8 tons and their alternate was Reus (LERS). The weather conditions forecast on the route and at the destination were good, however, and no delays were expected, so they accepted the 6100 kg fuel load specified in the flight plan.

The next flight, to Barcelona (LEBL), was scheduled to depart at 16:50. They started the engines at 16:55. According to data contained in the Aircraft Technical Logbook (ATL), the stopover lasted 1:20 hours.

According to the operator's Operations Manual, the captain is responsible for ensuring that the correct type and amount of fuel and oil are loaded in sufficient amounts to meet the company's requirements for the proposed flight. However, the crew stated that the fuel at Amsterdam is ordered by the Transavia Operations Office and that the amount of fuel is supplied without checking with the crew.

It is worth noting that with the time available for the stopover, the refueling process was not properly supervised by the flight crew, which stated that the end of process caught them off guard, as they had been tending to the medical personnel that had reported to care for the sick passenger.

In addition, the captain has the authority and the responsibility to verify that the amount of fuel loaded is sufficient to complete the flight without compromising safety and is in accordance with regulations.

The operational flight plan anticipated that the aircraft would take off from runway 24 and fly standard instrument departure (SID) LEKKO1S. However, the runway in use they were cleared to was runway 36, with instrument departure LEKKO3V. The crew stated that both the taxi route from their parking stand to the runway threshold, and the instrument departure maneuver involved travelling longer distances, and therefore increased fuel consumption.

The crew did not sufficiently evaluate the changes entailed by the different configuration for the runways in use versus the amounts calculated in the operational flight plan (OFP). The crew could have decided to request a new flight plan or to add extra fuel to offset the estimated increased consumption. The stopover time is not considered to have been a limiting factor in this regard.

The amount of fuel logged at engine start-up was 6023 kg. The aircraft took off with 5818 kg of fuel, which means that the start-up and taxi phases consumed 282 kg of fuel, which was 69 kg more than planned.

The initial climb was to FL390 and without restrictions, through the SID as authorized. They reached their cruising level with 4386 kg of fuel onboard, which was slightly below that anticipated in the OFP. It should be noted that during the flight phases in which the aircraft is subject to acceleration, the fuel readings recorded can vary slightly from reality.

The conversations recorded on the CVR reveal that the crew were more concerned about arriving at their destination at the scheduled time than about economizing fuel, even though they had departed only six minutes behind schedule. They calculated that they would make up the time by increasing their speed to 0.79M, which would allow them to reach LEBL with 1.7 tons of fuel remaining. This was the minimum required to proceed to the planned alternate (Reus).

Once established at their cruising altitude at a practically constant speed, twenty minutes after reaching said altitude, while flying over point RESMI, the amount of fuel remaining recorded was 3630 kg, which matches the amount indicated by the crew in their fuel management entries, which they are required to make by regulation and by their Operations Manual. This amount was 200 kg below that calculated for this point, which means they had consumed their contingency fuel plus an amount in excess of the trip fuel corresponding to the flight. Despite this, the FMC indicated that they would reach their destination with the required 1.7 tons of fuel remaining.

On such a short flight, the contingency fuel (5% of the trip fuel) allows very little margin for deviation. Specifically, if a deviation takes place during the climb phase, when the aircraft is consuming more fuel, the aircraft is susceptible to consuming

the amount assigned to the contingency fuel, which in this case was 225 kg, equivalent to six minutes of flight time.

The flight plans provided by the Operator indicate that the difference in consumption due to the longer time taxiing and to the SID for runway 36L was 222 kg, which is equivalent to the contingency fuel calculated.

The CVR reveals that the crew discussed fuel consumption at 17:35:49 and starting at 18:41:04.

Once they were descending, during the approach maneuver, the crew realized that the amount of fuel on landing would be 1.6 tons. This difference of 100 kg detected could also be explained by a slight variation in the cockpit reading for the fuel remaining caused by an acceleration and/or by a change in the pitch angle.

From then on, the crew stated that their only option was to land in Barcelona, since the estimated fuel remaining on arrival was less than that required to proceed to the alternate.

In this regard, the captain, with the information available at the time, which indicated that weather conditions at the airport did not indicate the need for any contingency, acted in accordance with the regulation contained in the *EASA's Air Ops CAT.OP.MPA.280 (b) (2) (i),* and in his Operations Manual:

"If an in-flight fuel check shows that the expected usable fuel remaining on arrival at the destination aerodrome is less than

> *i) the required alternate fuel plus final reserve fuel, the commander shall take into account the traffic and the operational conditions prevailing at the destination aerodrome, at the destination alternate aerodrome and at any other adequate aerodrome in deciding whether to proceed to the destination aerodrome or to divert so as to perform a safe landing with not less than final reserve fuel..."*

The crew also did not consider the possibility of reporting MINIMUM FUEL during the flight, even though according to the operator's Operations Manual, this report shall be made:

> *"If decided to land at a specific airport and any change to the existing ATC clearances may jeopardize final reserve fuel, the commander shall advise ATC of a minimum fuel state by the call "MINIMUM FUEL".*

Note: The "MINIMUM FUEL" call informs ATC that any change to the communicated (diversion) plan may result in a landing with less than final reserve fuel.

Note: This call is not a fuel emergency but an indication that should any alteration to the intended route be made, a fuel emergency is possible.

Note: Priority handling as result of a "MINIMUM FUEL" call should not be expected. ATC will, however advise flight crew of any additional delays as well as coordinate transferring of control to ensure other ATC units are aware of the flight's fuel state."

This information is based on the recommendations of ICAO Annex 6, contained in EASA SIB 2013-12, which states: *"The declaration of MINIMUM FUEL informs ATC that all planned aerodrome options have been reduced to a specific aerodrome of intended landing and any change to the existing clearance may result in landing with less than planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur."*

According to this definition, the "MINIMUM FUEL" declaration was applicable starting at 18:56:36, when the final controller for runway 25R informed the Transavia crew that the preceding crew had reported a 20 knot tailwind, which exceeded their landing limits. This report served to inform the crew of the possibility that if they had to execute a go-around, the conditions existed that a *"change to the existing clearance may result in landing with less than planned final reserve fuel".*

This report would have allowed ATC to learn, four minutes before the aircraft executed a go-around, of the marginal fuel situation affecting the Transavia aircraft.

Based on this report, which by definition does not imply priority, the controller would have been alerted to the fact that from the very start of the go-around maneuver, he could have expected the imminent declaration of a fuel emergency. ATC would thus have had about four additional minutes to deal with the traffic separation, which is how long it took the crew to declare MAYDAY FUEL following the start of their go-around maneuver, and which diverted them from the "existing clearance". In addition, since the previous aircraft had been forced to go around due to the windshear reported on final, knowing the low fuel status of the aircraft would have allowed ATC to anticipate this contingency without being caught off guard.

The first ATIS broadcast to inform of the presence of windshear on final was issued at 18:46:34. This information could also have alerted crews to the difficulty of

landing in Barcelona, but there is no record that the crew heard it.

In this regard, a safety recommendation is issued to the operator, Transavia:

- Provide specific training to its crews on the use of the MINIMUM FUEL and MAYDAY FUEL reports and their implications, based on the current recommendations of the EASA and ICAO.

It is noted that the change to the "existing clearance" not only limits ATC, but also the decision making of the crew, since operational factors such as the weather or a malfunction in an onboard system can result in a deviation to occur.

Since the European regulation in this regard is in the drafting process, as per NPA 2016-06 (A), it is recommended that the EASA:

> Within the framework of the ongoing EASA rulemaking task RMT. 0573 on fuel management, EASA should consider providing guidance on "appropriate use of the" minimum fuel declaration by operating flight crew, as described in ICAO Doc. 9976 "Flight Planning and Fuel Management (FPFM) Manual" through use of examples of various scenarios to illustrate how and when to use the term.

The FDR clearly indicates the increase recorded in wind speed and the change in direction starting at an altitude of 1567 ft, with its maximum value being at 18:58:41, when it reached 22 knots from a direction of 053°. This value exceeds the 15-knot value that the B737 aircraft has as an operational limit; thus, the crew executed a go around and the standard missed approach procedure as instructed.

In their first communication with approach sector T4, the crew reported they were "low on fuel", information they later provided a second time. At 19:04:52, when the FMC indicated that the fuel remaining on landing would be 1.1 tons, close to the reserve fuel, they decided to declare MAYDAY FUEL at 19:04:52, at the controller's request, after declaring low fuel for the third time.

They immediately received vectors to return to runway 07L at the airport. They started their descent upon intercepting the localizer in order to make a stabilized approach. This descent was interrupted at 3000 ft when ATC informed them there was an aircraft going around in the opposite direction.

The CVR indicates the copilot's concern over maneuvering to proceed in the direction opposite that being used by aircraft that were departing and going around. The crew also exhibited apprehension on seeing the lights of the aircraft heading toward them, believing that it took ATC a long time to give them separation instructions.

The aircraft landed without further incident with 1170 kg of fuel onboard over the required reserve fuel of 1001 kg.

2.1.2 Aircraft G-EZBY

The aircraft operated by EasyJet, inbound from London Luton, intercepted the 25R localizer and was number four in the approach sequence, behind the Transavia aircraft. Its crew contacted the Barcelona Tower at 19:05:20, which instructed them to continue the approach.

When they were instructed by the Tower to go around, they were at an altitude of 500 ft. The crew discussed not starting the turn to the south immediately due to the proximity of the ground, but they did stop the descent at 300 ft. A short time later, before completing the go-around maneuver, they were cleared to land. They had a tailwind component of 15 knots, gusting to 21, which exceeded their operational limitations. This, along with the destabilization caused by stopping the approach, forced them to go around.

After reporting they were going around, the crew were instructed to execute the standard missed approach maneuver and contact approach. At no time were the crew informed of the emergency situation affecting the Transavia aircraft or of its position, and thus they did not expedite the change in frequency, focusing instead on executing the maneuver, as specified by their company's operating procedures. The time that elapsed between the start of the go-around and contacting the T4 approach sector controller was 54 seconds. This is considered somewhat slower than average, since other crews that missed their approach took 20 seconds on average to contact approach following the start of the go-around maneuver.

Once in contact with the controller of the T4 approach sector, the crew were instructed to turn to heading 130° and descend to 2000 ft, which they did without delay after establishing visual contact with the traffic.

They then received vectors for the approach sequence to runway 07L, where they landed with an amount of fuel remaining that was well in excess of final reserve fuel.

In their statement, the crew expressed some concern with the fact that most of the communications with other traffic had been conducted in Spanish. Investigators have confirmed that this statement was inaccurate, since all relevant communications with the crews involved in this incident or that could have affected them were carried out in English.

2.2 Analysis of ATC management.

Both supervisors stated that the need to change the runway configuration was obvious, given the problems aircraft were having attempting to land with the rapidly changing wind conditions. The wind sensors at the Tower indicated a tailwind at both thresholds. The weather forecasts available did not warn of the possibility of a change in wind direction at that time.

The low fuel and emergency declarations by the Transavia crew as soon as they missed their approach surprised them, since they thought the aircraft should have had enough fuel to at least proceed to the alternate.

The sector T4 controller, faced with the crew's insistent low-fuel declaration, stated that he would give them priority but that if they needed to return immediately, they would have to declare an emergency (MAYDAY). Once the crew made this declaration, he started to coordinate the aircraft's immediate return to runway 07L. He did so by coordinating with his supervisor, with the sector T3 controller and with the local arrivals and departures controllers. The controller stated his feeling that he was not communicating correctly with the controllers in the Tower since they were not answering him and he had to make several calls.

In such circumstances, a controller is unaware of the actual urgency of the situation and may think that any delay in his actions that prolongs the aircraft's return could have tragic consequences. Thus, the controller clearance to initiate the approach was done without foreseen the coordination problems that led to the risk occurrence confronting two aircraft with less than the regulated distance.

The supervisors coordinated the return of the Transavia to the airport, which required removing from the sequence the aircraft that were on approach to runway 25R. The first priority was to send south of the airport a Vueling aircraft that had missed its approach, and that preceded the EasyJet, which was on 25R runway heading at 3000 ft. To this end, they correctly coordinated stopping takeoffs from runway 25L. At that moment, the Transavia was 11 NM away from the airfield and it had not captured the runway 07L localizer.

There was a moment of confusion at first regarding who had the following aircraft under control, it being determined that the EasyJet was under the control of local arrivals (TWR) and the Ryanair under the control of final approach (ACC). The Tower and TMA supervisors coordinated among themselves to first to have the Ryanair, which was second on approach, climb and proceed south. They then had the EasyJet climb and, once past the airfield, it too would be sent south, thus providing separation between them.

The instruction that reached the local arrivals controller, with whom the EasyJet crew were in contact, was to keep the EasyJet on approach, which he did until the supervisor told him to instruct its crew to go around and proceed to the south. Also taking part in this coordination was the sector T3 controller, who was expecting to be transferred these aircraft.

Once it was decided that the aircraft on approach were not going to land on runway 25R, however, the most convenient thing to do would have been to coordinate the transfer of the two aircraft to the sector T3 controller's frequency, and for this transfer to take place immediately. Sector T3 is responsible for the area south of the airfield, and thus its controller would have been aware of the traffic in his area and would have ensured their separation without delay. In contrast, it was not correct to maintain the EasyJet aircraft on the frequency of the local arrivals controller and to clear it to continue its approach. This resulted in significant time being lost, as became obvious later. This fact also resulted in more coordination being required among controllers, with the ensuing increase in workload that entails and with the added risk of misunderstandings.

The local arrivals controller stated that after telling the EasyJet crew to halt their descent and proceed south, it seemed that the aircraft was not following his instructions. He thus hurried to clear it to land in an effort to keep the aircraft from landing without being cleared to do so. Immediately after issuing said clearance, the crew reported they were going around. Issuing contradictory clearances could have led the crew to execute a destabilized landing maneuver. Furthermore, clearing the aircraft to land was contrary to the arrangements that had been made and created an additional risk, since there was an aircraft in emergency due to low fuel that was proceeding to that runway to land on it.

Since there was no alternate plan, the local arrivals controller instructed the EasyJet crew to execute a standard missed approach and transferred them to the sector T4 frequency. The local arrivals controller is assumed to have done this because that is what is normally done in typical operations, but this was contrary to the arrangements made previously, which were to instruct the crew to turn south and transfer them to the sector T3 frequency.

The local arrivals controller did not tell the EasyJet crew to contact the T4 sector immediately, nor did he tell them that there was an aircraft in emergency approaching that runway on an inverse heading, since according to his statement, he was unaware of the position of the Transavia aircraft. This was because of the small scale he was using on the raster screen, which prevented him from seeing the position of said traffic in emergency. Furthermore, he thought that the aircraft in emergency would proceed to runway 07R. At this point it should be noted that

anytime both runways are operational, landings take place on runway 25R/07L. No runway change had been arranged for the landing of the Transavia aircraft.

The contents of the two paragraphs above reinforce the idea that the EasyJet aircraft should not have been authorized to continue its approach maneuver, and that it should have been transferred immediately to sector T3 and taken out of the approach sequence.

The T4 sector controller, upon noticing the aircraft's go-around maneuver, stopped the descent of the Transavia aircraft and requested that the EasyJet be sent to the south, not realizing that it had been transferred to his frequency. Until the EasyJet crew contacted him, there was a moment of uncertainty and a lack of knowledge at the Barcelona ACC as to what frequency the aircraft was on.

When the EasyJet crew first contacted the sector T4 controller, he instructed them to proceed south and descend to 2000 ft, which created separation between the two conflicting aircraft. In the end, the minimum horizontal distance between the aircraft was 2,2 NM and 500 ft, by which time they were on divergent courses.

This incident saw the simultaneous occurrence of two delicate situations from a control standpoint: a configuration change that was not anticipated early enough, and an emergency situation involving an aircraft. In particular, in this type of situation the coordination must be efficient and involve as few actions as possible. These actions must be clear and be verified to have been properly understood. This investigation, however, identified inefficient arrangements, such as the multiple cross-communications between various controllers on the one hand, and the incorrect nature of some of these communications, as the controllers in question themselves stated.

As a result, there is a need to improve the coordination procedures, particularly in emergency situations and in those involving two control stations. The investigation has revealed that there is no joint coordination training by the Barcelona Tower and the ACC. Thus, in order to address this shortfall, the two following safety recommendations are issued:

- It is recommended that ENAIRE review its coordination procedures when two control stations are involved in an emergency situation.
- It is recommended that ENAIRE, as part of its refresher training plans, include combined TMA-TWR TRM[13] sessions that place special emphasis on coordination procedures that allow controllers to handle emergency situations.

13 Team Resource Management.

It is also obvious that the figure of the supervisor is essential to making decisions, and especially to coordinate actions between the stations. It is thus important for the supervisor figure to be involved in the TRM sessions.

The investigation checked the procedures contained in the unit manuals, and shown in Annexes 1, 2 and 3 of this report, for changing the runway configuration. These procedures have proven their effectiveness during the numerous configuration changes that are carried out on a daily basis at the Barcelona Airport for environmental reasons.

2.3 Analysis of the runway configuration change due to wind

The Barcelona Airport is subject to significant environmental restrictions that condition its operation.

The AIP Spain requires that the preferred configurations must be in use at the Barcelona Airport whenever surface wind conditions, including gusts, do not exceed a **10-kt tailwind** and a 20-kt crosswind, inclusive.

This restriction satisfies Point 4.5.4.3.3 of the RCA, which states:

"Noise abatement shall not be a determining factor in runway nomination under the following circumstances: ...

(e) When the crosswind component, including gusts, exceeds 37 km/h (20 kt), or the tailwind component, including gusts, exceeds 19 km/h (10 kt)"

The text of this article literally reflects that contained in PANS-ATM Doc. 4444, Sixteenth Edition, "Air Traffic Management", Article 7.2.6, except in the following aspect:

"...(e) When the crosswind component, including gusts, ***exceeds 28 km/h (15 kt),*** *or the tailwind component, including gusts,* ***exceeds 9 km/h (5 kt)."***

These limits were reviewed by the ICAO's Aerodrome Meteorological Observation and Forecast Study Group (AMOFSG)[14], which proposed the inclusion of an additional article in Document 4444 that would allow expanding the crosswind limits to 10 m/s (20 kt) and the tailwind limits to 3.5 m/s (7 kt) as long as certain restrictive conditions were observed involving the accuracy of measurement sensors, the performance of precision approaches, specific wind reports, good braking action

14 Document AMOFSG/10-SN No. 14

and a wind information report on ATIS that was separated by runways in the event of multiple-runway operations.

These limitations are based on statistics from the Flight Safety Foundation[15] that indicate that adverse wind conditions are involved in 33% of accidents that occur during the approach and landing phase.

Other international regulations were reviewed, like those from the FAA[16] and the Australian air services provider :

- The American regulation limits the tailwind component to 5 kt (expandable to 7 kt if there are wind gauges installed in the vicinity of the thresholds), and to 3 kt if the runway is wet.
- The Australian regulation recommends a 5-kt tailwind component, and 0 knots if the runway is wet.

The operational limitations for the tailwind component on landing specified for the Airbus 320 and the Boeing 737, which are widely used for short- and medium-range flights, are 10 and 15 knots, respectively.

The AIP regulates the runway change based on wind surface values. Winds aloft tend to have a higher value, meaning that a 10-kt tailwind usually implies an even higher tailwind aloft, especially during the critical final approach phase (500-1000 ft), when the pilot has to be able to meet the conditions to complete a stabilized approach.

In Spain, in compliance with the RCA's stipulations, runways are required to be kept in use with higher tailwind components than in other countries, and what is recommended in ICAO Doc 4444, due to noise abatement concerns. This means with the current regulation, the service provider keeps the runway in use despite the tailwind component until the value specified in the regulation is exceeded. This restriction means that the runway is often not changed until an aircraft is forced to go around due to exceeding its operational landing limits or to deviating from the stabilized approach parameters. This situation forces the ATS provider to change runways hastily, leading to a situation in which aircraft are missing their approaches and there is a build-up of traffic in holding patterns and so on.

15 Flight Safety Foundation Flight Safety Digest Volume 17 & 18 – November 1998, 7 February 1999

16 Order 8400/93

If the margins for changing runways due to tailwind conditions were reduced to reflect the values recommended in international regulations, this would allow the service provider[17] to:

- undertake the runway change process in a more planned and orderly fashion,
- allow the risk of having aircraft on approach with tailwind components in excess of those operationally desired,
- avoid the risk of having an unexpected runway change coinciding with traffic executing missed approaches due to tailwind against the direction of traffic flow to the new runway.

The investigators were helped in their task by the main airline operating at the Barcelona Airport, which turned over its FDM landing statistics for comparison with those for the Paris-Orly Airport for the second and third four-month periods in 2016.

These statistics (Figure 7) show that the number of landings made in Barcelona with a tailwind component in excess of 10 kt was around 5%, versus less than 1% at Paris-Orly.

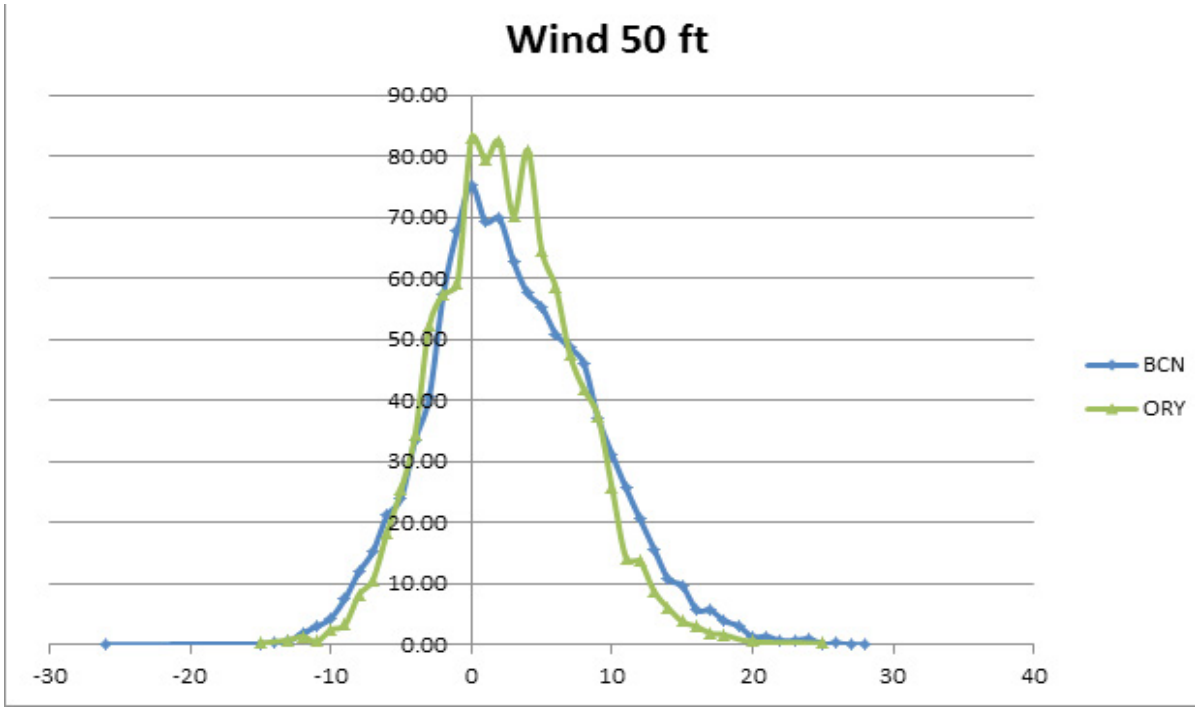

Figure 7.- – Comparison of landing statistics based on tailwind component at the Barcelona and Paris-Orly airports.

17 12-139 FAC NCIS-Runway-selection

The Tower manual at the Orly Airport states that the Tower supervisor shall decide the runway configuration considering a maximum tailwind component of 5 kt.

The European Aviation Safety Agency (EASA) is in the process of generating a rulemaking task (RMT.0464) on Regulation of Common ATM / ANS Requirements, for which it has issued the Notice of Proposed Amendment NPA 2016-09 (B). In this document the discussed subject is included, as Acceptable Means of Compliance (AMC[18]), under AMC1 ATS.TR.260 (g), which considers the adoption of section 7.2.6 of ICAO Doc. 4444. This NPA is currently subject to assessment in relation to the comments issued at European level, so that, at the time of issuance of this report, the content of the final wording of the regulation is uncertain.

In order to solve the problem detected, two safety recommendations are issued in this regard that request the DGAC and AESA to commence a regulatory process to revise the RCA, thus enhancing the operability of airports:

- It is recommended that Spain's National Aviation Safety Agency (AESA) take the regulatory initiative to adapt Article 4.5.4.3.3 of Spain's Air Traffic Regulations (RCA), on selecting the runway in use, to reflect the content of the ICAO's recommendations, as specified in Article 7.2.6 of Document 4444, "Air Traffic Management", thus enhancing the operability of airports.

- It is recommended that Spain's Civil Aviation General Directorate (DGAC) draft the necessary regulatory stipulations to adapt Article 4.5.4.3.3 of Spain's Air Traffic Regulations (RCA), on selecting the runway in use, to reflect the content of the ICAO's recommendations, as specified in Article 7.2.6 of Document 4444, "Air Traffic Management", thus enhancing the operability of airports.

2.4 Analysis of the communications. "MAYDAY FUEL" declaration.

The operator's Operations Manual on its in-flight fuel policy and fuel management (OM Part A 8.3.7) states that "The captain shall declare a fuel emergency immediately upon concluding that the fuel onboard upon landing at the nearest aerodrome where a safe landing can be executed will be below final reserve fuel. The distress notification "MAYDAY MAYDAY MAYDAY, FUEL" shall be used. An emergency notification due to low fuel indicates the need for priority to ensure a safe landing. The usable fuel amount in minutes shall be reported, along with the crew's intentions."

18 AMCs are non-binding standards adopted by EASA to illustrate means to establish compliance with the Basic Regulation and its Implementing Rules. The AMCs issued by EASA are not of a legislative nature. They cannot create additional obligations on the regulated persons, who may decide to show compliance with the applicable requirements using other means

The emergency report is in keeping with the requirements of Amendment 36 to ICAO Annex 6 Part I. Based on this definition, the emergency declaration can take place at an indeterminate time as long as there is sufficient time to make a safe landing at the nearest aerodrome. It should be noted that this aerodrome need not be the destination aerodrome or the alternates, for which the crew has operational and meteorological information.

Knowing the aircraft's endurance would allow controllers to coordinate their actions in a more orderly fashion and even to offer the crews options that would help them remedy their emergency situation.

The Transavia Operations Manual states the need to complete the fuel emergency report by stating the amount of usable fuel in minutes as well as the crew's intentions.

The Transavia crew did not make its report as per these requirements. However, they landed at Barcelona with 176 kg of fuel over their final reserve, which would have allowed for a further five minutes of flight time. This would have allowed the controller to delay the approach and avoid the traffic conflict.

Both ICAO Document 4444 on Air Traffic Management, as concerns emergency procedures, and the Standardised European Rules of the Air, in the guidance material (GM) that explains Article SERA.14095 on distress and urgency radiotelephony communication procedures, indicate the usefulness of obtaining fuel range information from the crew.

ENAIRE, the ATS provider, in its "Guide to emergencies and special situations", twice mentions the need to inquire about the aircraft's fuel range, expressing that it would help undo any mistakes in the phraseology and the crew's doubts when declaring the emergency (MAYDAY).

The T4 sector controller, however, did not request this information, and instead reacted with extreme urgency, accelerating the return of the aircraft in emergency before the traffic separation process was complete, as required by the aforementioned guide. As a result, the following safety recommendation is issued:

- It is recommended that ENAIRE provide training to its controllers so that, when an aircraft declares fuel problems, controllers assess the convenience of requesting the endurance information, in values of remaining flight time, to facilitate the most convenient option to manage the priority landing.

3. CONCLUSIONS

3.1. Findings

- The members of the aircraft's flight crew had valid licenses and medical certificates.
- The ACC and Tower supervisors and controllers involved had valid licenses and medical certificates.
- The aircraft was airworthy and its documentation was in effect.
- The crew authorized the refueling as per the requirements of the Operational Flight Plan (OFP).
- They were cleared to taxi and take off from a runway other than the one specified in the fuel calculation in the OFP, and which required higher fuel consumption.
- The crew noticed that the fuel remaining onboard would not allow them to proceed to their alternate airport in the event of a go-around.
- A windshear phenomenon occurred in final approach to runway 25R at Barcelona, resulting in tailwind components at landing, which ATC did not expect.
- Due to this weather phenomenon, several aircraft, including the Transavia, were forced to go around.
- After reporting three times that they were low on fuel, the Transavia crew declared a fuel emergency to obtain landing priority.
- The TMA controller provided vectors for the aircraft in emergency to return immediately to runway 07L at the airport.
- To facilitate this maneuver, ACC and the Tower coordinated a change in the runway configuration and the re-routing of traffic heading to runway 25R.
- Improper coordination resulted in an EasyJet aircraft missing its approach to runway 25R and receiving go-around instructions that took it toward the aircraft in emergency, which was approaching on the opposite runway.
- Once both aircraft were on the same ATC frequency, they received instructions to separate their flight paths. The closest distance between them was 2.2 NM and 500 ft on divergent headings.
- The Transavia aircraft landed without further incident on runway 07L with fuel remaining in excess of the final reserve fuel.

3.2. Causes/contributing factors

The incident was caused by the Transavia crew's improper planning of the fuel consumption for the flight.

The following factors contributed to the incident:

- The change in the preferred runway configuration at the Barcelona Airport as the result of an unpredicted sudden shift in wind direction.
- Improper coordination by the different ATS stations, which resulted in a head-on approach between two aircraft under their control.

4. SAFETY RECOMMENDATIONS

In its State Letter 10/2012, the ICAO announced the adoption of Amendment 36 to Annex 6, Part I, effective 15 November 2012. This amendment added, among other things, new phraseology related to fuel management, specifically the use of the MINIMUM FUEL and MAYDAY FUEL reports. This terminology is considered in the operator's Operations Manual. This investigation has determined, however, that it was incorrectly used by the incident crew. As a result, the following safety recommendation is issued:

- **REC 56/17** It is recommended that Transavia provide specific training to its crews on the use of the MINIMUM FUEL and MAYDAY FUEL notifications and their implications, based on the current recommendations of the EASA and ICAO.

The European Aviation Safety Agency (EASA) is drafting an amendment to its Air Operations regulations (Air Ops) that includes, among others, the adoption of the aforementioned phraseology. In an effort to cooperate in its interpretation, the following safety recommendation is issued:

- **REC 57/17:** Within the framework of the ongoing EASA rulemaking task RMT. 0573 on fuel management, EASA should consider providing guidance on appropriate use of the "mínimum" fuel declaration by operating flight crew, as described in ICAO Doc. 9976 "Flight Planning and Fuel Management (FPFM) Manual" through use of examples of various scenarios to illustrate how and when to use the term.

The investigation has identified a fault in the coordination between the various ATS stations involved in the incident. As a result, the following safety recommendations are issued:

- **REC 58/17** It is recommended that ENAIRE review its coordination procedures when two control stations are involved in an emergency situation.

- **REC 59/17** It is recommended that ENAIRE, as part of its refresher training plans, include combined TMA-TWR TRM sessions that place special emphasis on coordination procedures that allow controllers to handle emergency situations.

The investigation confirmed that different documents and procedures recommend gathering additional information during an emergency in order to handle it better. As a result, the following safety recommendation is issued.

- **REC 60/17:** It is recommended that ENAIRE provide training to its controllers so that, when an aircraft declares fuel problems, controllers assess the convenience of requesting the endurance information, in values of remaining flight time, to facilitate the most convenient option to manage the priority landing.

The wind limits considered in the RCA, which take precedence over environmental concerns when choosing the preferred configuration for the runways in service, are the same as the operational limits for much of the fleet of active commercial air transport aircraft. For this reason, keeping the runway configuration until this limit is exceeded leads to go-around maneuvers and landing operations that surpass the operating limits of the aircraft. So as to facilitate the management of airports and avoid these situations, the following safety recommendations are issued:

- **REC 61/17** It is recommended that Spain's National Aviation Safety Agency (AESA) take the regulatory initiative to adapt Article 4.5.4.3.3 of Spain's Air Traffic Regulations (RCA), on selecting the runway in use, to reflect the content of the ICAO's recommendations, as specified in Article 7.2.6 of Document 4444, "Air Traffic Management", thus enhancing the operability of airports.

- **REC 62/17** It is recommended that Spain's Civil Aviation General Directorate (DGAC) draft the necessary regulatory stipulations to adapt Article 4.5.4.3.3 of Spain's Air Traffic Regulations (RCA), on selecting the runway in use, to reflect the content of the ICAO's recommendations, as specified in Article 7.2.6 of Document 4444, "Air Traffic Management", thus enhancing the operability of airports.

APPENDIX 1

Barcelona (LECB) TMA procedure for changing the configuration of the runway in use.

TMA (LECB) procedure for changing the runway.

The procedures for changing the runway at LEBL are contained in the Unit Operating Manual, Annex B, "Unit-Specific Procedures".

This document indicates that changing the operational configuration is a very delicate situation that requires maximum concentration from the supervisors and controllers involved. They must be subject to as little interference as possible and require the cooperation of the remaining personnel, even if they are not directly involved in the process. It is very important that affected aircraft be given the relevant information as soon as possible, and that the sectors that have them on their frequency change the standard arrival route (STAR) assigned once the landing runway is confirmed.

The actions that the controller must carry out during the runway change are as follows:

- The Supervisor will declare the Transition in progress and inform each sector which traffic will be the last to land on the runway still in use.
- The Supervisor will update the Acceptance Rate for the new runway.
- The planning controllers (PC) in every sector will check the routes of the aircraft on their frequency that are going to the new runway, and will completely update their flight plans (FPL) when needed, starting with aircraft closest to the airfield.
- In parallel, the queue manager (QM) will validate the sequence number of aircraft going to the new runway. If when this is done, the aircraft in question does not have its FPL up to date, the QM will first partially update the updated flight plan (CPL) in order to move the aircraft to the new VAMAN [19]. The QM will report this situation to the PC of the corresponding FEEDER sector.
- The executive controllers (EC) of the FEEDER sectors will adhere to the new sequence validated by the QM.
- When the last aircraft going to the old runway leaves its initial approach fix (IAF), the TMA Supervisor will ask the LEBL Supervisor to change the arrival parameters.
- If the EC of any sector is unable to fully update the CPL, at least a partial update will be conducted so as not to delay the validation of the new sequence.

19 VAMAN: AMAN Window (system for managing the approach sequence)

In the Operations Manual, the procedure for the supervisor is given as a checklist.

APPENDIX 2

Barcelona (LEBL) Control Tower procedure for changing the configuration of the runway in use.

Control Tower (LEBL) procedure

Point 7.7.1.16, Annex B of the LEBL Operations Manual, on changing the runway configuration, refers to the ENAIRE document "Procedure for changing the configuration at the Barcelona-El Prat Airport".

This document states that the responsibility for selecting the active runway configuration at the Barcelona-El Prat Airport belongs to the Chief Supervisor in the Tower (SJ TWR) or, in his absence, to the Tower Supervisor (SUP TWR). The factors to take into account when making the decision are as follows:

- System of preferred configurations published in the AIP LEBL.
- Existing weather reports (METAR, TAFOR, etc.).
- Weather conditions observed from the Tower or reported by pilots.
- Forecast for how long certain weather conditions will persist (so as to reduce configuration changes as much as possible).
- Availability and condition of the facility (runways, taxiways, lights, navaids, etc.).
- Personnel staffing.
- Aircraft in emergency.

As for the actions to take, the reference document states that the SJ TWR/SUP TWR will manage the configuration change process dynamically, deciding on the most suitable order in which to carry out the following tasks, ignoring those that are not considered necessary for the change in progress, and assigning or delegating eligible tasks to personnel under his control as deemed necessary or convenient.

Once the configuration change is deemed necessary, the SJ TWR/SUP TWR will:

- Call the TMA Supervisor (SUP TMA) to coordinate the change.
- If necessary, give instructions to the CLR/GMC CTA to stop start-ups, pushbacks and taxi maneuvers. These operations will be resumed as soon as possible.
- Notify the controllers in the South Tower and coordinate constantly to ensure they are aware at all times of the configuration change process.
- Allocate aircraft to the new fixed points.

- When requested by the SUP TMA and until the transition is complete, request the LCL/GMC CTA to update the cleared altitude for departures to 6,000 ft QNH.

- Turn on the lights for the new configuration, watching the stop bars that are turned on and seeing how they will affect taxiing traffic. Decide on the right time to update the taxi directions to change with the new configuration.

- Change the ATIS.

- Change the aerodrome parameters in SACTA[20].

- Ensure that the last takeoff before the configuration change will be in the air before the last arrival lands. If not possible, coordinate an alternative.

- Ask officials at the Centralized Incident Management Center (GCI) to turn on the ILS as soon as it no longer affects aircraft approaching the arrivals runway involved in the change. Notify APP when the ILS is online, or instruct the LCL CTA to do so.

- Inform the GMC CTAs to start taxiing to the new takeoff runway, and ensure that that the ATC clearances of aircraft not affected by the change in takeoff runway are reviewed, informing them of the new SID, and changing the information in the SACTA.

- Load the new operating configuration into the Integrated Supervisory Post (PSI). This may require moving some controllers to a new post.

- In the PSI, update the COM values for the capacity of the takeoff runways (preferred and non-preferred) under the new configuration.

- Ensure that the correct cameras are selected.

- Report the configuration change to the Operations Coordination Center (CECOPS) (which will relay the information to the RFFS[21], Medical, CGA[22] Room Supervisor and Service Executive).

- If necessary, change the highlighted active runways in the PSI.

- If an active runway is to become an inactive runway, ensure the proper lights are on/off or instruct the LCL CTA to do so. The condition of the stop bar lights can only be changed by the LCL CTA or the SJ TWR/SUP TWR.

20 SACTA: Automated Air Traffic Control System

21 RFFS: Rescue and Firefighting Service.

22 CGA: Airport Management Center.

- Note the time when the configuration goes into effect in the Log, as per point 6.2 of this document.
- Turn off the lights for the old configuration after ensuring that there are no taxiing aircraft that require them, or instruct the LCL CTA to do so.
- Clear aircraft from fixed points for configuration not in use.
- Ask the GCI to turn off the ILS that is no longer needed.
- Coordinate with every post in the Tower before authorizing the first takeoff in the new configuration. Coordinate "completed transition".

APPENDIX 3

Procedure for coordinating transition between stations during configuration changes

(Letter of Agreement LECB APP - LEBL TWR dated 26/06/2014)

Procedures for coordinating stations.

The procedures for coordinating the stations are contained in point **D.1.4 Procedure for coordinating transition between stations during configuration changes (RUNWAY CHANGE)** in the Letter of Agreement (LoA) between LECB APP and LEBL TWR dated 26/07/2014, currently in effect. Said section says the following:

«D.1.4.1 When the Chief Supervisor in the LEBL TWR proposes a configuration change, based on his takeoff sequence, he will inform the LECB APP Supervisor of the number of aircraft awaiting takeoff, the estimated takeoff time for the last aircraft and its callsign.

D.1.4.2 The LECB APP Supervisor, based on his arrivals sequence and the time estimated by LEBL TWR for takeoffs from the current runway, will evaluate and inform LEBL TWR of the number of aircraft that will land before the configuration change and the callsign of the last aircraft, such that the last takeoff is airborne before the last arrival.

D.1.4.3 So as to optimize the handling of aircraft during the configuration change, the LECB APP Supervisor will attempt to adhere as much as possible to the time reported by the LEBL TWR Chief Supervisor when evaluating the number of aircraft to land on the current runway.

D.1.1.4 Except in very rare cases (emergencies, sudden weather changes, etc.), this decision cannot be changed.

D.1.4.5 It shall be the LECB APP Supervisor's responsibility to specify the time when the TRANSITION BEGINS and ENDS.

D.1.4.6 The LECB APP Supervisor shall report to the LEBL TWR Chief Supervisor "TRANSITION STARTED", after which the following events will take place:

- *LEBL TWR will clear departing traffic for the relevant instrument departure (SID) and 6,000 ft.*
- *The LECB APP Supervisor shall request the LEBL TWR Chief Supervisor to change the parameters for the Arrivals Runway in SACTA.*
- *The LEBL TWR Chief Supervisor shall change the parameters for the Arrivals Runway in SACTA.*
- *The LEBL TWR Chief Supervisor shall inform the LECB APP Supervisor of the callsign of the first aircraft to take off in the new configuration.*

- *The LECB APP Supervisor shall inform the LEBL TWR Chief Supervisor of the callsign of the first inbound aircraft in the new configuration.*

- *When takeoff/landing operations are being carried out using the runways associated with the new configuration, the LECB APP Supervisor shall report "TRANSITION COMPLETE" to the LEBL TWR Chief Supervisor.*

APPENDIX 4

Guide to emergencies and special situations (S41-02-GUI-001-4.2) “Fuel-related problems / Critical fuel level”

Fuel-Related Problems / Fuel Emergency

May lead to: Engine failure

Off-field landing

Expect:

- Emergency call: "**MAYDAY, MAYDAY, MAYDAY** FUEL"
- Absolute priority. Acknowledge with "ROGER MAYDAY FUEL".
- The crew must declare an emergency when planning to land with a fuel amount below final reserve fuel. This is the minimum fuel required to fly 30 minutes at 1500 ft over the alternate (or destination) airport.
- ATC shall give to priority to aircraft in emergency. It can degrade to an engine failure. In this case, expect a turn to the side on which the engine failed, due to the asymmetric thrust, until this thrust is compensated for. Expect possible maneuverability problems with the aircraft and specific requests, including a preference to turn toward the side with the running engine. Traffic squawk Mode A 7700.
- Expect the aircraft to arrive "high" at the aerodrome. It may land off-field due to undershooting the runway. If it is going too high, it could make a very hard landing or even experience a runway excursion. In these cases, note its last position and the time.
- Expect short approaches, even visual or in contact to shorten the landing distance. Expect requests to fly direct.
- After the landing, always conduct a runway inspection to look for possible fuel spilled on the runway. Request sufficient separation after the emergency for the subsequent arrivals.
- Expect operations to be suspended on the landing runway.

NOTA (1 /2)

- The PAN PAN terminology is incorrect if used for fuel. **The only recognized terms are MAYDAY and "minimum fuel".** If the pilot reports PAN PAN, inform him to report an emergency if he requires priority.

The **TWR Supervisor** must inform:

- CECOA, to coordinate the necessary services
- ACC /Control Room Supervisor
- Tower Chief or Regional Coordinator, if applicable.
- SYSRED H24

The **ACC/Control Room Supervisor** must inform:

- Adjacent stations affected
- Landing/destination aerodrome
- Head of Operations
- SYSRED H24
- SAR

Note: The term TWR Supervisor refers to the Chief Supervisor or to the Supervisor, in stations where these posts are different, or to a CTA where the different supervisor positions do not exist.

Fuel Related Problems/Fuel Emergency

Maydav maydav do to fuel emergencv

Possible report from the aircraft:

- **MAYDAY, MAYDAY, MAYDAY** due to fuel emergency, request radar vectors for immediate landing
- Causes of the fuel problem: Fuel situation due to: heavy nose wind, leaking/ syphoning tank, bad weather diversion, closed or below minima airport, etc.

Possible requirements from aircraft:

- Cannot accept any delays or go around.
- Diversion to the nearest most suitable airport
- Radar vectors to a specific position on final
- Weather information updates at destination,
- All ATC units and services aware of the problem and alerted?
- Continuous descent approach
- Airfield in sight, request visual approach
- Request only right/left turns

Pilot information / Requirements:

- All ground services have been alerted
- Expect straight-in approach
- Expect visual approach
- Update of remaining fuel/Endurance? (in flight time)
- Persons/ People/Souls on board
- Any hazardous/dangerous goods/material/cargo on board?
- Relevant route, approach and landing information, including ILS and NAV frequencies, if applicable
- If necessary, length of runway and any obstacle close to the landing area
- Leaking/Syphoning fuel observation

Fuel-Related Problems / Fuel Emergency

NOTE (2/2)

- A call reporting "MINIMUM FUEL" does NOT have priority. Reply "ROGER MINIMUM FUEL, NO DELAY EXPECTED/EXPECT ..... MINUTES DELAY".
- Minimum fuel informs ATC that any change to the current clearance could result in an emergency declaration due to fuel, but it shall not have priority if an Emergency is not declared.

Remember:

- **ASSIST {Acknowledge, Separate, Silence, Inform, Support, Time)**
- **Acknowledge** the type of situation being declared by the aircraft, **MAYDAY** or MINIMUM FUEL (the latter does **NOT** have priority over other aircraft.). Request "Endurance" (flight time) to remove the possibility of the wrong phraseology being used or crew doubts when declaring MAYDAY.

- **Separate** the aircraft from other traffic. Aircraft in emergency have complete priority. Anticipate sufficient separation with the following aircraft. Arrivals may have to be temporarily suspended.

- **Silence.** There could be a high workload in the cockpit. Do not increase it unnecessarily and keep radio silence unless a transmission is essential. If necessary, impose radio silence on the frequency on short final and during the landing.

- **Inform:**

    - **PRESS THE ALARM BUTTON (TWR)**

    - Inform the Supervisor

    - Provide the aircraft details on the landing aerodrome (RWY in use, length, surface, elevation, weather, frequencies, obstacles, etc.), especially if it is not the planned aerodrome.

- **Support:**

    - Keep the aircraft at high flight levels to save fuel and increase its glide range.

    - Have the pilot report, when possible, the number of persons onboard or if it is carrying dangerous cargo.

    - If in the TWR, prepare the runway and have ground personnel standing by.

    - Inform the pilot of the presence of an EMAS (Engineered Materials Arresting System) at the destination/landing aerodrome if an emergency landing is possible.

- **Time:**

    - Minimize non-essential arrangements, use standard procedures to gain time.