Technical report

IN-007/2018

Incident involving a Boeing 737-740 aircraft operated by Jet Time A/S, registration OY-JTY, 35 NM north of Gran Canaria Airport (Las Palmas, Spain), on 25 February 2018

Please note that this report is not presented in its final layout and therefore it could include minor errors or need type corrections, but not related to its content. The final layout with its NIPO included (Identification Number for Official Publications) will substitute the present report when available.

MINISTRY OF TRANSPORT, MOBILITY AND URBAN AGENDA

UNDERSECRETARIAT

CIVIL AVIATION ACCIDENT AND INCIDENT INVESTIGATION COMMISSION

NOTICE

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

In accordance with the provisions in Article 5.4.1 of Annexe 13 of the International Civil Aviation Convention; and with Articles 5.5 of Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010; Article 15 of Law 21/2003 on Air Safety; and Articles 1, 4 and 21.2 of RD 389/1998, this investigation is exclusively of a technical nature, and its objective is the prevention of future aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent their recurrence. The investigation is not intended to attribute any blame or liability, nor to prejudge any decisions that may be taken by the judicial authorities. Therefore, and according to the laws detailed above, the investigation was carried out using procedures not necessarily subject to the guarantees and rights by which evidence should be governed in a judicial process.

Consequently, the use of this report for any purpose other than the prevention of future accidents may lead to erroneous conclusions or interpretations.

CONTENTS

ABBREVIATIONS

º.....Degree

ACC .....Area control centre

AEMET.....Spain's State Meteorological Agency

ATC .....Air traffic control

ATPL(A) .....Airline transport pilot license (aircraft)

CPL(A) .....Commercial pilot license (aircraft)

EKYT .....ICAO code for Aalborg Airport (Denmark)

FL.....Flight level

GCFV.....ICAO code for Fuerteventura Airport (Spain)

GCLP .....ICAO code for Gran Canaria Airport (Spain)

GCRR .....ICAO code for Lanzarote Airport (Spain)

GCTS.....ICAO code for Tenerife South Airport (Spain)

GCXO .....ICAO code for Tenerife North Airport (Spain)

ft.....Feet

GS.....Ground speed

h.....Hour

IFR .....Instrument flight rules

kg .....Kilogramme

kt .....Knot

METAR .....Meteorological aerodrome report

min .....Minute

NM .....Nautical mile

s .....Second

s/n .....Serial number

SPECI .....Special aerodrome weather report

TAF .....Terminal aerodrome forecast

UTC.....Coordinated universal time

Technical Report IN-007/2018

Owner and operator:	Jet Time A/S
Aircraft:	Boeing 737-740, OY-JTY (Denmark), JTG427
Date and time of incident:	Sunday, 25 February 2018; 15:35 UTC[1]
Site of incident:	35 NM north of Gran Canaria Airport at FL230
Persons on board:	5 (crew members), 148 (passengers)
Type of flight:	Commercial air transport - scheduled - international - passengers
Phase of flight:	En route
Flight rules:	IFR
Date of approval:	27 October 2021

Synopsis

On Sunday, 25 February 2018, flight JTG427, which was operated by Jet Time and carrying 153 people on board, landed at its alternative airport with 33 kg less than the mandatory final reserved fuel established by the regulations.

The investigation has highlighted the operational particularities of the Canary Islands airports as a whole, specifically, that the closure of one of the airports directly affects the others because their geographical location limits holding times and the use of alternative airports. This unique circumstance was evidenced in the event of flight JTG427, which took place on a day when the Canary Islands were being affected by a highly active front moving from west to east, with two specific consequences:

- Firstly, it directly impacted the weather conditions at the airports, reducing their operational capacity (with the opening of low-visibility procedures and the cessation of activity in the manoeuvring area).
- Secondly, and as a result of the above, the accumulation of diverted traffic bound for other destinations led to a saturation of the airports' stands, which eventually also diminished their operational capacity.

In this scenario, the aircraft was forced to remain in a holding pattern, extending its flight time until eventually, the crew had to declare a MAYDAY due to insufficient fuel in order to be prioritised for landing. The aircraft landed at its alternative airport on Gran Canaria (GCLP) without sustaining any damage or injuries.

[1] All times used in this report are UTC, as extracted from the aircraft's flight data recorder. At the destination airport, local time and UTC were the same.

The investigation has concluded the incident was caused by the extension of the expected flight time as a result of the adverse weather conditions that decreased the operational capacity of the Canary Islands airports.

No operational safety recommendations are issued.

1. THE FACTS OF THE INCIDENT

1.1. Summary of the incident

On Sunday, 25 February 2018, the Boeing 737-740 aircraft, registration OY-JTY, operated by Jet Time with flight number JTG427, commenced a scheduled flight at 09:35 from Aalborg Airport EKYT (Denmark) with 153 people on board. The scheduled flight duration to Tenerife South GCTS (Spain) was 5 h 25 min, and the expected arrival time was 15:00. The alternative airports were Gran Canaria GCLP and Fuerteventura GCFV.

It was the first flight of the day for the aircraft and crew, and the flight plan included two trips: EKYT-GCTS and GCTS-EFYT[2]. The Canary Islands were being affected by a very active Atlantic front, and the weather forecasts at the destination prompted the crew to load extra fuel.

At 09:57, the aircraft rotated for take-off. At 14:16, the aircraft was transferred to the Canary Islands ACC. Two minutes later, at 14:18, it was instructed to fly a holding pattern above the TFN VOR/DME (hereinafter TFN), where four other aircraft were already holding.

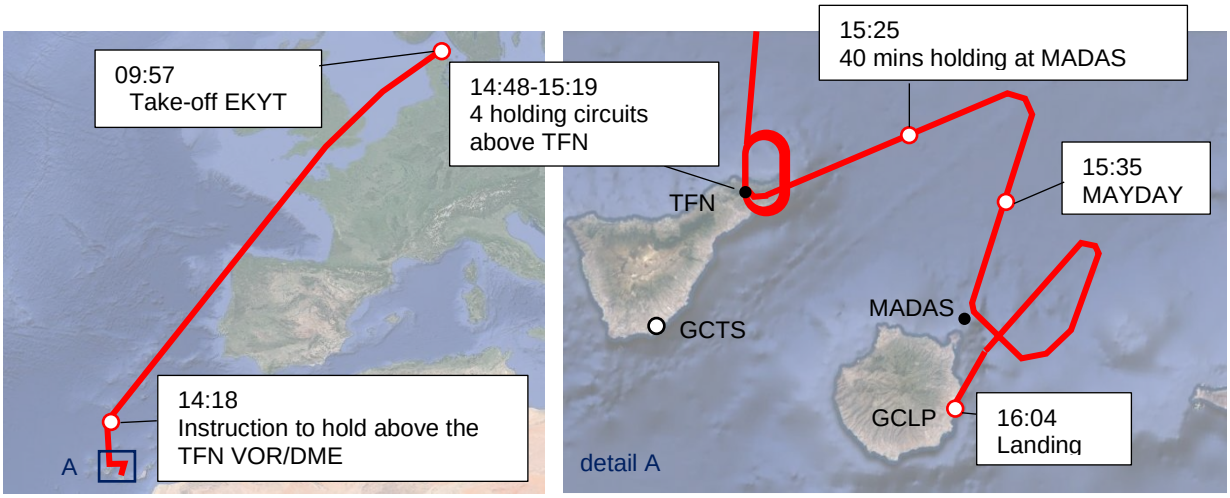

Figure 1. Trajectory

At 14:48, the aircraft arrived at TFN and began to fly a holding pattern. From that moment on, the sequence of events was as follows:

- 14:54: ATC reported that Tenerife North and Tenerife South had been forced to close due to the weather conditions and that Gran Canaria had also closed due to a lack of space on the apron. As a consequence of this situation, the OY-JTY aircraft requested a diversion to other airports, as did the other aircraft that were holding.
- 15:06: request for a diversion to Fuerteventura airport.
- 15:09: request for a diversion to Lanzarote airport.
- 15:14: request for a diversion to Gran Canaria airport after hearing two other aircraft offered the option on the radio.

At 15:19, the aircraft left TFN after a 31-minute wait to head to Gran Canaria, being transferred to a new sector.

[2] EKYT 09:35 GCTS 15:00, with flight number JTG427.
GCTS 16:00 EKYT 21:15, with flight number JTG428.

At 15:25, the controller informed them that to land at Gran Canaria there was a holding time of 40 min above the MADAS waypoint, where there were already four more aircraft in the holding pattern. The crew replied that they did not have enough fuel to hold and needed to land at Gran Canaria. After 10 minutes, the controller confirmed again that the minimum wait time at MADAS was at least 25 min. On receiving this information, the crew decided to declare an emergency to obtain priority.

At 15:35, the aircraft declared an emergency using the term MAYDAY. It then landed without incident at 16:05 on runway 21R at Gran Canaria airport, with 977 kg of fuel (33 kg less than the specified “final reserve fuel”).

There were no injuries to the persons on board and no damage to the aircraft.

One hour later (17:35), the whole crew was able to fly from Gran Canaria to Tenerife South. The aircraft returned to Aalborg the following day.

1.2. Injuries to persons

Injuries	Crew	Passengers	Total in the aircraft	Others
Fatalities				
Serious				
Minor				
Unharmed	5	148	153	
TOTAL	5	148	153	

1.3. Damage to the aircraft

None.

1.4. Other damage

None.

1.5. Personnel information

The 56-year-old captain had a valid ATPL(A) license and the B737 300-900 rating (valid until 31/05/2018). He had 16,114 hours of flight experience, of which 10,250 hours were in type. He had previously worked for other operators and joined Jet Time in May 2014.

The co-pilot was 30 years old, had a valid CPL(A) license and the co-pilot B737 300-900 rating (valid until 31/03/2019). He had 1,400 hours of experience, of which 1,203 hours were in type. He hadn’t worked previously for any other operator and had been hired by Jet Time in February 2016.

Previous activity:

The crew's activity on 25/02/2018 began at 08:35 at Aalborg Airport (Denmark). They were scheduled to make two trips that day: Aalborg-Tenerife South and Tenerife South-Aalborg. Prior

to these flights, the crew had flown the day before and finished work in the afternoon, giving them a rest period of 13 hours. Therefore, in their opinion, they were not fatigued when the event occurred.

Previous experience at Tenerife South:

The captain was very familiar with Tenerife South Airport and the airports of the Canary Islands[3] in general because he had been operating in the area since 1997. The co-pilot had made 3 flights that winter to Tenerife South and others in previous periods.

1.6. Aircraft information

The Boeing 737-740 aircraft with s/n 30727 and registration OY-JTY had a valid airworthiness certificate (until 19/05/2018). The aircraft has two CFM56-7B22 engines. At 05:00 on 25/02/2018 (5 h before take-off), the routine "service check" inspection was signed-off with satisfactory results.

Weight and balance calculations:

The weight and balance calculations showed that the operation was carried out within the certified limits (21% of the MAC and 66,957 kg). The calculated and actual weights (obtained from the flight data recorder) for the operation were as follows:

Aircraft's empty weight without fuel:	52,263 kg (max. 55,202 kg)
Weight of the fuel on take-off:	14,816 kg
Total take-off weight:	67,079 kg (max. 70,080 kg)

Estimated weight of fuel consumed during the flight:	11,790 kg
Actual weight of fuel consumed during the flight:	13,839 kg

Estimated weight on landing:	55,289 kg (max. 58,604 kg)
Actual weight on landing:	53,227 kg (max. 58,604 kg)

Fuel plan:

The initial fuel plan specified loading 14,190 kg of fuel. However, the captain increased the fuel load by an additional 610 kg.

1.7. Meteorological information

This section provides information about the meteorological forecasts issued before the flight, which were available to perform the flight plan. The meteorological phenomena expected between 14:00 and 15:00, the aircraft's expected time of arrival in the Canary Islands, have been marked in grey. The medium-high elevation hazardous weather maps issued before the start of the flight did not show any phenomena around the Canarian archipelago.

[3] The Canary Islands were a regular destination for the operator, Jet Time.

1.7.1 Forecasts for 25/02: Special adverse phenomena warnings

On 23/02 and 24/02, AEMET issued two special adverse phenomena warnings[4] for rain and wind due to the passing of a very active Atlantic front which affected the Canary Islands all day on 25/02 (the day of the incident) and up until the early hours of the morning on 26/02. Compared to the warning issued on 23/02, the warning for 24/02 predicted deteriorating conditions, above all in terms of winds:

- Warning issued on day 23: Strong winds and very strong gusts of up to 90 km/h.
- Warning issued on day 24: Strong winds and very strong gusts of up to 95 km/h generally, increasing in speed to 110 km/h.
- Warnings issued on day 23 and 24: Generalised showers and storms that could be very heavy in places (up to 30 mm in 1 hour).

1.7.2 TAF for Tenerife South GCTS for day 25

The TAFs at 02:00 and 08:00 (the one consulted by the crew in preparation for the flight) indicated identical conditions between 14:00 and 15:00, the aircraft's expected time of arrival in the Canary Islands:

- 20 kt wind practically aligned with the runway.
- Decreased visibility at 4,900 m.
- Heavy showers.
- Tower-shaped cumulus clouds.
- Moderate chance of storms and cumulonimbus.
- One hour later, the forecast was for winds of 25 kt with gusts of 43 kt.

TAF GCTS 250800Z 2509/2609 26009KT 9999 BKN025 TX21/2514Z TN13/2606Z BECMG 2512/2514 23020KT TEMPO 2516/2606 26025G43KT TEMPO 2509/2519 4900 SHRA SCT030TCU PROB30 TEMPO 2509/2519 TS SCT030CB

1.7.3 METAR for Tenerife South GCTS for day 25

This section details the actual conditions recorded at GCTS airport throughout the day on 25/02, up until the aircraft's arrival time.

- 26 METAR and 1 SPECI between 00:00 and 13:00: increase in cloud cover and wind up to 16 kt. The crew consulted the 08:30 METAR before the flight:

METAR GCTS 250830Z 27008KT 9999 FEW010 SCT015 BKN030 18/16 Q1005 NOSIG

- 2 METAR and 2 SPECI between 13:30 and 14:00: worsening conditions:
  - decreased visibility up to 2,000 m.
  - 18 kt variable wind.
  - rain.
- 4 METAR and 2 SPECI between 14:30 and 16:00: worsening conditions:
  - decreased visibility up to 600 m.

[4] Special Warning number 12/2018 y 13/2018, respectively.

- 19 kt variable wind, with gusts of 25 kt.
- heavy rain.

1.7.4 TAF for the alternative airports on day 25

Three TAFs were issued for Gran Canaria GCLP: an amendment at 00:11 and the ordinary TAFs at 02:00 and 08:00, the latter being the one consulted by the crew in preparation for the flight. The three forecasts indicated identical conditions between 14:00 and 15:00, the aircraft's expected time of arrival in the Canary Islands:

- 25 kt wind with gusts of 35 kt.
- Decreased visibility at 4,900 m.
- Heavy showers.
- Tower-shaped cumulus clouds.
- After the aircraft's arrival, moderate chance of 35 kt wind with gusts of 50 kt.
- Moderate chance of storms and cumulonimbus.

TAF GCLP 250800Z 2509/2609 20018KT 9999 BKN030 TX21/2514Z TN13/2606Z TEMPO 2509/2520 20025G35KT PROB40 TEMPO 2515/2519 20035G50KT TEMPO 2511/2521 4900 SHRA SCT030TCU PROB30 TEMPO 2511/2521 TS SCT030CB

For Fuerteventura GCFV, two TAFs were issued at 02:00 and 08:00 (the latter being the one consulted by the crew in preparation for the flight). They indicated identical conditions between 14:00 and 15:00, the aircraft's expected time of arrival in the Canary Islands:

- 25 kt wind with gusts of 40 kt.
- Rain.
- After the aircraft's arrival, a reduction in visibility at 4,900 m, heavy showers, towering cumulus, and a moderate chance of storms and cumulonimbus.

TAF GCFV 250800Z 2509/2609 19018KT 9999 SCT030 TX22/2514Z TN13/2606Z TEMPO 2512/2523 19025G40KT PROB40 TEMPO 2509/2515 RA TEMPO 2515/2524 4900 SHRA SCTTCU PROB30 TEMPO 2515/2524 TS SCT030CB

1.7.5 Assessment of the meteorological conditions by the Crew

When preparing for the flight, the crew referred to the TAFs (highlighted in the previous sections) for both the destination and the alternative airports. According to their statements, their flight planning considered the strong wind expected at Tenerife South and Gran Canaria and its direction with respect to the runway.

They also commented on the moderate chance (PROB30 TEMPO) of thunderstorms (TS) and the fact there was a 2-hour difference between the expected appearance of the phenomenon in Gran Canaria and Tenerife South. While mitigating for PROB TEMPO forecasts is not a requirement for the planning phase, the crew did take the information into account and decided to carry additional fuel as a result.

After evaluating all the forecasts for the islands' airports they concluded that they could rule out a problematic situation because it seemed highly unlikely that all the airports would be affected simultaneously. Based on this assumption, they decided against loading even more fuel.

Once airborne, the crew obtained VOLMET information on the actual weather conditions en route (Faro, Seville, Gran Canaria and Tenerife Sur airports).

1.7.6 Meteorological information used by ENAIRE for ATFM measures

The ATM service provider referred to meteorological information to carry out the pre-tactical[5] flow management phase for the weekend of 24-25 February. The meteorological information in the report was as follows:

“The weekend will be affected by the passing of several fronts that will produce rain in all areas and reduce visibility in the vicinity of the aerodromes, although the prevailing wind en route will be as expected. Diversions may be necessary, adding to the workload in some sectors. The adverse weather conditions may necessitate a prompt activation of the capacity reduction procedure.

Sunday: Southwesterly winds continue to be forecast throughout the archipelago (..) As the front passes over, rainfall will lead to a significant reduction in visibility.

GCTS: Moderate wind from the SW
GCLP: Strong wind from the SW with powerful gusts."

1.8. Aids to navigation

Information included in sections 1.1 and 1.9.

1.9. Communications

The information provided in this section starts from the moment the aircraft first made contact with the Canary Islands ACC at 14:16 after flying for 4 h and 19 minutes. At this point, the aircraft’s fuel consumption was in line with the expected consumption detailed in the flight plan. It should be noted that while this report only specifies the communications with the JTG427 traffic, throughout the period covered, all the ATC frequencies involved were busy and dealing with a high workload.

<u>14:16-14:48 Aircraft enters the Canary Islands ACC airspace on a southerly heading:</u>

14:16 Aircraft makes initial call to the Canary Islands ACC. Established at FL390 and 240 CAS. 3,828 kg of fuel.

14:18 ATC instruction to go to TFN and join the holding pattern. The aircraft requests a reduction to 230 kt and initiates a southbound turn towards TFN. At this point, 4 other traffics are already holding at TFN. During the next 30 minutes, the aircraft under

[5] The pre-tactical phase lasts from D-6 to D-1, with D being the day of the operation. The pre-tactical report analyses the expected meteorological conditions, the expected traffic demand and other conditions to calculate the personnel requirements and operational configurations needed to provide the ATC service.

investigation heads towards TFN. Meanwhile, two of the aircraft already holding there leave for other airports.

14:48 Arrival at TFN established at FL240 and 210 CAS. At this point, there were 3 traffics already in the holding pattern. These were joined by a further two, one of which was the JTG427.

14:48-15:19 In the holding pattern at VOR/DME TFN

14:48 Aircraft joins the holding pattern above TFN at FL240 with 3,020 kg of fuel. In total, it flew 4 circuits, each one taking approximately 8 minutes. Its altitude remained unchanged at FL240. The last circuit ended at 15:19.

With regard to the ATC units, conversations between the units about the situation at GCXO, GCTS and GCLP were recorded, in which it was stated that *"there was no room for more traffic"*. They made calls to check the capacity at GCFV and GCRR after several traffics were diverted there. They began to coordinate with Lisbon ACC to stop more traffic from reaching the affected area, diverting it instead to Funchal Airport (Madeira-Portugal).

They began to automatically divert all traffic entering the Canary Island ACC airspace to GCFV. The traffic holding at TFN began to request information on expected waiting times and the possibility of landing at GCXO and GCTS, and one of them requested a diversion to another airport.

14:54 Closure of GCTS and diversions to GCFV and GCRR

14:54 ATC confirms to one of the aircraft holding at TFN that GCTS Airport is closed. The JTG427 has just started its second circuit. Internal conversations between controllers about the situation: GCTS and GCXO are closed, and GCLP has no room on its apron. Four minutes later, the controller again confirms to the traffic that visibility at GCTS is 600 m and that, until it increases to 800 m, the airport will remain closed. From that moment on, there were numerous requests from traffic asking to divert to alternative airports.

15:02 ATC confirms to one of the traffics in the holding pattern that the forecast is for the visibility at GCTS to remain at 600 m until 15:40 and, therefore, the airport would remain closed.

15:05 ATC confirms to a traffic that there are no operations at GCTS, that there are no parking spaces available at GCLP and that the expectation is that GCTS may be able to reopen in 40 min.

15:05 After this communication, the JTG427 asks ATC if there's room at GCLP. ATC replies that there is no room. One minute later, the JTG427 informs ATC that it wants to go to GCRR, and the controller confirms that they will check if there is room for them. Two waiting traffics are diverted.

15:09 JTG427 confirms that it wants to change to GCFV instead of GCRR. Two more traffics arrive at TFN. In total, there are five traffics in the holding pattern.

15:11 JTG427, which has just started its fourth circuit, repeats its request to go to GCFV. One of the traffics holding is diverted.

15:13-15.16 Two traffics are cleared to enter GCLP

15:13 ATC informs a traffic diverted to GCFV to expect a diversion to GCLP.
15:14 After this call, another traffic and the JTG427 request a diversion to GCLP.
15:15 New call from the JTG, now in its fourth holding circuit "we need to divert to Las Palmas or Fuerteventura". ATC responds that they are aware and will call them back. At this point, there were 3 traffics in the holding pattern. One minute later, ATC offers an already diverted traffic the possibility of entering GCLP.

15:17 Clearance to divert to GCLP

15:17 New call from JTG427 with 2,248 kg of fuel: *"*We are expecting minimum fuel, we prefer to divert to Gran Canaria*".* "We prefer to go to Gran Canaria. If we have to go to Fuerteventura, we have to declare a MAYDAY". ATC gives them vectors to GCLP (heading 070º).
15:19 The aircraft leaves the holding pattern, where only one aircraft remains. At this point, it has 2,186 kg of fuel.
15:22 Request to descend from the JTG427. ATC postpones this request due to the high volume of traffic in the holding pattern for GCLP.

15:25 Notification of 40 min waiting time to enter GCLP

15:25 The aircraft is transferred to 130.95 MHz, the frequency of the approach sector to enter GCLP. After a series of communications, the controller asks them if they have enough fuel to hold for 40 minutes, to which the aircraft replies negatively:

- "Do you have enough fuel to hold 40 min?"
- "Negative, in that case we will have to declare MAYDAY. Our fuel is up to 2 tons now. We need to land at Gran Canaria". The FDR data shows that the aircraft was indeed carrying 1,952 kg of total fuel and flying at FL240, 206 CAS, on a 070º heading.
- "Do you have enough fuel to hold 20 min?"
- "No, we need to come in more or less straight."

15:28 ATC instructs the aircraft to turn towards MADAS, the holding point where the traffic waiting to enter GCLP was in a holding pattern.
15:33 The aircraft speaks to ATC again:

- "If we have to wait for another 10 minutes, we will have to declare an emergency." Do you want us to give a MAYDAY call? The FDR data shows that the aircraft was carrying 1,684 kg of total fuel and flying at FL240, 206 CAS, on a direct 204º heading to MADAS.

15:35 Emergency declaration

15:35 ATC informs the aircraft that it will have to hold for at least 25 min, after which the aircraft declares an emergency.

- "You have to hold at least 25 min. If you need to enter now, you have to declare emergency".
- "MAYDAY MAYDAY MAYDAY, Jet Time 427". The aircraft had 1,586 kg of total fuel.

15:39 The aircraft was transferred to the approach frequency, and once in contact with the controller, it repeated the emergency call due to fuel "MAYDAY MAYDAY MAYDAY fuel, descending FL180 direct MADAS".
15:50 The controller asks for the number of people on board. ILS manoeuvre to runway 21R.
15:58 Aircraft transferred to TWR with 1,153 kg of fuel.
16:02 Aircraft stabilised at 1,000 ft above the ground.
16:03 Aircraft acknowledges the clearance to land with 1,004 kg of fuel.

16:04 Landing

16:04 Touchdown with 977 kg of final fuel.

1.10. Aerodrome information

Gran Canaria Airport is located at an elevation of 77 feet and has two parallel runways designated 03L/21R and 03R/21L. The JTG427 aircraft used runway 21R.

1.11. Flight recorders

Any relevant information from the flight recorders is included in section 1.9.

1.12. Aircraft wreckage and impact information

The aircraft did not sustain any damage during the event.

1.13. Medical and pathological information

There were no injuries to the persons on board.

1.14. Fire

There was no fire.

1.15. Survival aspects

Given that the aircraft did not sustain any damage, survival aspects were not a factor in the event.

1.16. Tests and research

1.16.1 ATFM measures applied to the Canary Islands ACC during the pre-tactical phase

On 23 and 24 February, the Canary Islands ACC took steps to mitigate the expected conditions on 25/02/2018. It alerted to the possibility of diversions and additional hours being added to flight

plans. The storm was expected to affect the aerodromes and the approaches, but not the en-route flight phases.

- En route: no measures were applied because the traffic demand could be managed using the maximum configuration of 5 route sectors.
- Approach: It was confirmed that the runways to be used on Sunday, 25/02/2018, would not be the usual ones at any of the aerodromes, implying a reduced capacity at GCTS and GCLP. For this reason, an 18/60 regulation was applied to arrivals in the GCLP approach sector between 10:00 and 14:00. At the end of the day, and in view of the forecasts for the following day, this regulation was updated to 16/60 between 10:00 and 12:00. No regulations were applied to the other approach sectors because demand was below capacity, and the peak, where demand would exceed capacity, was expected at 13:00 h, so they decided to wait until the following day.
- Tower: no additional measures were applied to GCLP because it was already covered by the approach regulations. No additional regulations were applied to GCTS because demand was around 70% of declared capacity. Low demand was expected at GCRR and GCFV, so the decision to implement traffic flow measures was postponed until the following day.

1.16.2 ATFM measures applied to the Canary Islands ACC in the tactical phase

Demand was expected to be higher in the morning than the afternoon, with a proportion of 65-35%. On the morning of Sunday, 25/02/2018, the regulation decided on in the pre-tactical phase to limit approaches to GCLP was in force, and an additional regulation of 10% was applied to another approach sector. With the exception of GCRR, which was affected by a low cloud anchored to the orography and expected to clear at noon, the morning operations at the archipelago´s airports proceeded normally, albeit in a south configuration.

08:45: aborted landings began to occur at GCRR, and, in the space of 45 min, 5 traffics were diverted to GCFV and 2 to GCLP. The diversions continued during the following hours (a total of 14). Most of the traffic was sent to GCFV (10), a few to GCLP (3) and 1 went to GCTS.

12:15: GCXO declared Low Visibility Procedures (LVP) and traffic heading there requested clearance to proceed to the alternative GCTS, which wasn't initially affected by parking issues. At this point, two of the airports (GCXO and GCRR) were not accepting traffic, so a warning that the mass diversion plan could potentially be activated was issued.

13:44: GCTS notified that it only had one stand available for unanticipated traffic.

14:00: rate 0[6] is declared at GCXO, preventing traffic from being diverted there.

14:27: the procedure for stopping operations in the manoeuvring area (PPOAM) is declared at GCTS due to the heavy rain and reduced visibility below 600 m. At the same time, a SPECI is issued, and the information on the flooded runway is uploaded to the ATIS. Consequently, rate 0

[6] The rate is the number of IFR movements per hour.

is declared for GCTS, and a 12/60 limitation is issued for GCLP, which would later be reduced to 6/60. The mass diversion procedure is activated (PDM) for GCTS, GCXO and GCRR.

14:35: GCTS reports that its runway is flooded and contaminated by FOD. This situation lasts for a while, with almost zero visibility from the tower's cab and surface visibility below 500 m. It rained for an hour, dragging material onto the runway, which the firefighters later had to clear.

15:00: the only functioning airports in the archipelago are GCLP and GCFV, although the former is experiencing bad weather and the latter has limited parking available due to having accepted the flights diverted from GCRR in the morning. The Brussels FMP is informed about the situation to prevent aircraft destined for the Canary Islands from taking off and manage diversions before they enter the airspace. A 6/60 limitation is issued for GCLP, and a 5/60 is issued for GCRR.

15:15: the Air Force gives clearance to use 8 stands at the Gando base. Given the forecast for bad weather at GCLP, the non-acceptance of traffic at GCTS, GCXO and GCLP is managed in conjunction with the collateral control centres (Casablanca and Lisbon), which re-route the traffic to airports outside the Canary Islands. At this point, various traffics make minimum fuel calls, and the JTG427 issues its mayday. The GCLP approach sectors are managing 15 arrivals, with the traffic in two holding patterns at two waypoints (MADAS and ENETA), as well as take-offs.

15:30: all the traffic destined for GCTS is under management at GCLP or GCFV.

15:45: the weather begins to improve at GCTS, clearing from the west. Work to clear and inspect the runway begins. The weather at GCLP begins to improve.

16:36: the runway at GCTS is declared operational, and at 16:46, the PPOAM is deactivated.

16:42: first take-off from GCTS.

16:50: after the runway at GCTS opens, a 15/60 limitation is established for its arrivals. At 16:51, the first aircraft lands and from that moment on, parking stands at the airport are freed up.

19:00: the arrivals limitation is deactivated and more traffic begins to land than take-off, resulting in a saturation of the apron at 20:40 and the need to instruct 3 of the 5 traffics on approach to GCTS to abort.

21:00: normalisation of the situation.

1.16.3 The operator’s fuel policy

The EASA regulation for commercial air transport operations (CAT.OP.MPA.150 Fuel Policy) establishes criteria for fuel planning. These criteria are relayed verbatim in Jet Time’s Operating Manual part A (8.1.7. Fuel planning). According to the regulations, planning must be based on the procedures and information supplied by the aircraft manufacturer (b.1) and the operating

conditions under which the flight will be carried out (b.2). As part of the latter, it stipulates that the following factors must be considered when fuel planning:

- (iii) the forecasted meteorological conditions
- (iv) air navigation service providers' procedures and restrictions.

The final calculation (c) must include the fuel for the taxi (1), the flight (2), the reserve fuel (3) and the extra fuel (4), which will be decided by the captain. The reserve fuel consists of the contingency fuel, alternate destination fuel and final reserve fuel.

Jet Time's Operating Manual specifies that the contingency fuel should be equivalent to 3% of the flight fuel, so long as there is an alternative aerodrome en route. This calculation criterion complies with the EASA AIROPS CAT.OP.MPA standard. The alternative en route airport for the incident flight was Faro (LPFR), a choice that also complied with EASA regulations.

With regard to the fuel allowed for diversion to the alternative airport, the calculations were based on a single alternative airport (in this case, GCLP) because it met the regulatory conditions for the selection of aerodromes, airport operating minima and planning minima for IFR flights in regards to destinations and alternatives.

Therefore, the calculations made for the incident flight were in line with EASA's regulatory requirements and were reviewed by the crew who, in addition, decided to increase the fuel allowed for the taxi and extra concepts:

- (1) 100 kg of fuel for the taxi, which was increased by another 100 kg.
- (2) 11,790 kg of fuel for the Aalborg-Tenerife South flight.
- (3) 2,300 kg of reserve fuel, calculated as the sum of:
  - 360 kg of contingency fuel
  - 930 kg for diversion to the alternative - GCLP
  - 1,010 kg of final reserve fuel
- (4) 510 kg of fuel as extra fuel.

For this aircraft, the extra fuel loaded was sufficient for a 15-minute increase to the flight time.

1.17. Organisational and management information

N/A.

1.18. Additional information

1.18.1 Improvement measures adopted by ENAIRE

Following an internal analysis of the events of 25/02/2018, the service provider, ENAIRE, set out the following improvement measures:

- Improve the Canary Islands' Mass Diversion Plan by creating a traffic volume that allows for the monitoring and regulating of all arrivals to the archipelago as a whole.

- Improve the process of obtaining information on available parking stands at all Canarian airports.
- Improve the coordination between units in the event of a decrease in operational capacity at an airport.
- Study the potential for runways to be contaminated by rain at all the airports.
- Establish regulations for other airfields in the event of adverse meteorological conditions that affect all the airfields.
- Improve the process for obtaining information on diverted traffic.
- Improve flow control measures to recover the normal rate after a rate 0.

1.19. Useful or effective investigation techniques

N/A.

2. ANALYSIS

On Sunday, 25 February 2018, Jet Time flight JTG427 landed with 33 kg less than the mandatory final reserved fuel established by the regulations. The aircraft found itself in this situation as a result of the meteorological conditions and their impact on operations at the Canarian airports.

The investigation has highlighted the operational particularities of the Canary Islands airports as a whole, specifically, that the closure of one of the airports directly affects the others because their geographical location drastically limits the use of alternatives. This unique circumstance was highlighted in the event of flight JTG427, which took place on a day when the Canary Islands were being affected by a highly active front that was moving from west to east with two specific consequences:

- Firstly, it directly impacted the weather conditions at the airports, reducing their operational capacity (with the opening of low-visibility procedures and the cessation of activity in the manoeuvring area).
- Secondly, and as a result of the above, the accumulation of diverted traffic bound for other destinations led to a saturation of the airports' stands, which eventually also diminished their operational capacity.

2.1. Meteorological forecast

The situation at the Canary Islands airports was generated by the passing of an extremely active Atlantic front that was moving from west to east and affected the entire archipelago. The front's impact on operations increased throughout the day on 25/02/2018, reaching its most critical point at 15:00, with 3 of the 5 airports having to close.

AEMET had issued two special warnings in the two days prior (23 and 24), signalling the likelihood of generalised storms with the potential for high winds and heavy rain. These warnings were not used by the aeronautical community, which instead relies on specific meteorological information adapted to the requirements of the sector. The investigation has found that the aeronautical meteorological information was consistent with AEMET's general warnings.

The adverse meteorology affected the lower surface levels (airports and approaches) but not the upper levels. Indeed, the information contained in the hazardous weather maps issued before the take-off of flight JTG427 ruled out hazardous meteorological phenomena en route. On the contrary, the TAFOR, which was the forecast most frequently used by the ATM services and the operator, predicted the following situation:

- At the aircraft's scheduled time of arrival in the Canary Islands, the same conditions were expected at both the destination and the alternative airports.
- The expected conditions were:
  - strong-very strong and gusty winds, reduced visibility, rain and cloud cover.
  - moderate chance of storm activity.

2.2. Assessment of the meteorological conditions by the crew

Taking into account the previous conclusions (the three airports affected by the same conditions and the chance of storm activity), it would have been justifiable to load more extra fuel than the 500 kg loaded by the crew, which was enough to sustain an additional 15 minutes of flight.

There were no weight issues because the aircraft still had a margin of 3,000 kg both for take-off and landing before reaching the maximum weights. The review of the criteria applied for the flight found that the fuel planning was in line with both EASA's regulations and Jet Time's operating manual; therefore, normatively speaking, the planning procedure was adequate. However, the crew's assessment of the forecasts at the destination and alternative airports was highly optimistic, being based on the hope that the adverse conditions would not affect all three islands simultaneously.

2.3. Assessment of meteorological conditions during the en-route phase

The crew's handwritten notes on the operational flight plan confirm that as the aircraft was approaching the Canary Islands, they checked the actual meteorological conditions at different airports, both in Portugal and in the Canary Islands. At that time, the prevailing conditions at the Canary Islands airports were not causing any problems for their operations, which meant the aircraft could continue to its destination, passing the point where it would have been able to divert to the alternative route (LPFR).

The METARs show that the conditions began to worsen in the Canary archipelago after 13:30, with the situation becoming critical after 14:00. At this time, the aircraft was about to be transferred to the Canary Islands ACC (14:16). Furthermore, given that the situation had been managed satisfactorily until that point, the ATM services had not yet initiated flow control measures to prevent traffic from entering the ACC.

Therefore, the in-flight decisions taken by the crew were appropriate and consistent with the information available at the time.

2.4. Weather conditions in the Canary Islands upon the arrival of the aircraft

At 14:16, when the aircraft was transferred to the Canary Islands ACC, the meteorological conditions at its GCTS destination airport had begun to worsen, even if, meteorologically speaking, they were still sufficient for operations to continue (2,000 m visibility and 18 kt of variable wind). The problem was that the airport had accumulated a number of traffics on hold and had limited parking due to having received the diverted traffic from GCXO and some of the traffic from GCRR for two hours.

In the next 15 minutes (14:27), with the aircraft heading towards TFN and the storm front over the island of Tenerife, the conditions at GCTS began to deteriorate to the point of completely collapsing the airport. The torrential rain caused drainage problems, flooding and dragged various materials onto the runway and the manoeuvring area, which were then classed as contaminated. This situation, together with the decrease in visibility to less than 600 m, forced GCTS to close for

two hours and declare rate 0. In light of this event, ENAIRE has taken measures to pre-assess the impact of heavy rainfall or extreme weather conditions, as was the situation in this case, on runways, manoeuvring areas and parking stands, in order to better anticipate impacts on operations at the Canarian airports in the future.

As a consequence, the situation in the Canary Islands at 15:00 was that 3 of the archipelago's airports had been rendered inoperative by the meteorological conditions (GCRR, GCXO and GCTS). Only GCLP and GCFV remained open to traffic, although they were also operating at a reduced capacity due to having absorbed the traffic diverted from the islands' other airports and the inclement weather (the front's passage from west to east).

To summarise, flight JTG427 arrived in the Canary Islands at the most critical point of the day.

2.5. Management of the fuel emergency

As a result of the previously analysed meteorological and operational context, when flight JTG427 arrived, it was instructed to hold, initially, before proceeding to its original GCTS destination. When GCTS was subsequently closed and only two airports remained in operation in the entire archipelago, the aircraft had to continue in the holding pattern.

The aircraft's flight time was extended by 42 minutes, with the entire flight lasting 6 hours and 7 minutes. From the moment they joined the holding pattern at TFN, the crew monitored the available fuel. This was demonstrated by their ATC communications at 15:17 (*we are expecting minimum fuel*) and 15:25 (*In that case we will have to declare MAYDAY*. *Our fuel is up to 2 tons now*). The records have shown that the actual amount on board was consistent with the amount reported to ATC.

The crew's management during this holding period was adequate, monitoring the remaining fuel, keeping ATC informed of the fuel situation and, eventually, when it became apparent that they did not have enough fuel on board to comply with the minimum holding time, declaring an emergency with the term MAYDAY to obtain priority.

Following the aircraft's emergency notification, ATC, which was highly congested and saturated due to the ongoing situation, prioritised the JTG427 traffic over the other aircraft waiting to enter GCLP. They were given vectors to GCLP and the aircraft landed safely after making a stable approach to runway 21R. Despite being given priority, the aircraft landed carrying 33 kg less than the mandatory minimum amount of fuel.

In conclusion, both the crew and ATC managed the fuel emergency correctly.

2.6. The joint operation of the Canary Islands airports

The JTG427 incident has highlighted the fact that the geographical location of the Canary Islands airports means that in certain circumstances, such as the adverse meteorological conditions that affected this case, they function as a single unit. The sequence of events on 25/02/2018

demonstrated that the introduction of operational restrictions at two airports can eventually overload the others.

The number of available stands became an important factor in this event, limiting the operational capacity of airports that, meteorologically speaking, had no restrictions. The events have shown that activating the mass diversion plan, whatever the reason for doing so, directly affects the other airports in the archipelago. The measures adopted by ENAIRE (1.18.1) after the incident contain improvements in this regard.

2.7. Flow management measures during the event

The predicted meteorological conditions were known and considered in ENAIRE's “pre-tactical” phase and, as a result, mitigatory measures were put in place in the days prior to the event.

However, on the day of the incident, the situation did not develop as expected (the conditions were worse in the morning than in the afternoon). During the morning, operations proceeded normally, with only GCRR experiencing operational issues due to the meteorology. At 12:15, GCXO also began to have operational problems, declaring LVP procedures. Despite the implications that this began to entail for the other operating airports (impact on parking stands and holding times), the request to limit the traffic entering the Canary Islands ACC was not made until 15:00, when the situation had reached its most critical point.

Given the “isolated” geographical location of the archipelago and the consequent implications for the other airports, consideration should be given to an earlier implementation of flow control measures.

3. CONCLUSIONS

3.1. Findings

- The aircraft took off at 09:57 from Denmark.
- The weather forecasts did not affect the en-route phase but did indicate complications for the approach phases and at the destination.
- The aircraft loaded additional fuel for a further 15 minutes of flight.
- The flight proceeded without incident until 14:16, when it was transferred to the Canary Islands ACC.
- The Canary Islands were affected by the passing of an Atlantic front that affected the entire archipelago.
- The meteorological conditions deteriorated throughout the day, reaching their worst point at 15:00, at which time the archipelago only had two operating airports.
- The diversion of traffic to the open airports saturated their parking platforms and affected their operations.
- The aircraft's destination airport, GCTS, closed at 14:27 and remained closed for two hours.
- The aircraft requested a diversion to various airports before finally asking to be diverted to GCLP.
- During the leg to GCLP, and after being informed of the holding time, the aircraft declared a MAYDAY due to insufficient fuel.
- The ATC services prioritised the aircraft’s entry into GCLP and it landed safely at 16:05.
- On landing, the aircraft was carrying 33 kg less fuel than the minimum reserve fuel established by the regulations.

3.2. Causes/contributing factors

The incident involving the OY-JTY aircraft was caused by the extension of its expected flight time as a result of the adverse weather conditions that decreased the operational capacity of the Canary Islands airports. As a consequence, the aircraft landed at its alternate airport with 33 kg less than the minimum reserve fuel specified by the applicable regulations.

4. OPERATIONAL SAFETY RECOMMENDATIONS

No operational safety recommendations are issued.