State of Israel
Ministry of Transport and Road Safety
Aviation Incidents and Accidents Investigation

# Safety Investigation Report

## (Final Report)

## Serious Incident Case No. 100-14

## Engine Failure During Initial Climb-Out

| | |
|---|---|
| **Date** | **10.8.2014** |
| **Type of Aircraft** | **MD83** |
| **Registration Mark** | **YR-OTY** |
| **Flight Number** | **OTJ874** |
| **Location** | **Ben Gurion** |

**For Safety Purposes Only**

The Investigations conducted by the Israeli Investigation Office (IAIAI) are in accordance with Annex 13 to the ICAO Convention on International Civil Aviation, and the Israeli Aviation Law 2011, chapter 7, and its respective Aviation regulations.

The sole objective of the investigation of an accident or incident under these Regulations is the prevention of future accidents and incidents. It is not the purpose of such an investigation to apportion blame or liability.

Accordingly, it is not appropriate that AIAI reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

This report has been translated to the English language for other parties' convenience, and should adhere to the Original report in the Hebrew language - In any case of abstruseness or miss-understanding, the original report in the Hebrew language is taking over.

# Safety Investigation Report
## (Final Report)

## Serious Incident Case No. 100-14

### Synopsis

Note: All times given are in UTC format, unless otherwise indicated.

On Sunday, August 10, 2014, at 13:18, Ten Airways Flight No. 874 (OTJ874) departed from runway 08 at Ben Gurion Airport (LLBG). The aircraft was manned by 2 pilots, a cabin crew of 4, and was carrying 169 passengers.

Shortly after takeoff, while climbing south east of NIREL waypoint, at the altitude of 6,000 feet QNH, the crew of OTJ874 identified that the Engine Indicating and Crew Alerting System (EICAS) parameters displayed rapid increase in the Exhaust Gas Temperature (EGT) of Engine 1 (left engine). The EGT increased and peaked at 800 degrees Celsius. In addition, a loud noise was heard in the tail section of the aircraft, accompanied with strong tremors of the cabin.

The Captain, which was the Pilot Flying (PF), immediately responded to the signs of malfunction, and turned off the left engine seconds after receiving the high temperature warning. The EGT value dropped and no fire warnings were received. The crew reported to Ben Gurion Approach ATC about the engine failure: "Ben Gurion Departure OTJ874 We have one engine failure".

Ben Gurion Approach ATC immediately started vectoring traffic in the vicinity of flight OTJ874, with the intention to clear the way for the aircraft to crash-land in Ben Gurion Airport. The initial report of the crew was perceived by the ATC as a two-engine failure, thus "Emergency State 3" (the Israeli equivalent to "Full Emergency") was declared in the airport and preparation for an emergency landing were initiated by the local fire brigade and rescue crews. In addition, large numbers off-airport fire brigades and ambulances were called, as required according to the airport emergency procedures.

Approximately 20 minutes after the initial emergency declaration in Ben Gurion Airport, the state was changed to "Emergency State 2".

The crew of flight OTJ874, maintained altitude and increased speed and states their intention to land on runway 08. The crew was then vectored to an ILS approach to runway 21, and eventually accepted the ATC proposal of an ILS approach to runway 26 (The longest runway at Ben Gurion Airport). The aircraft landed safely at 13:35.


**The aircraft involved in the incident**

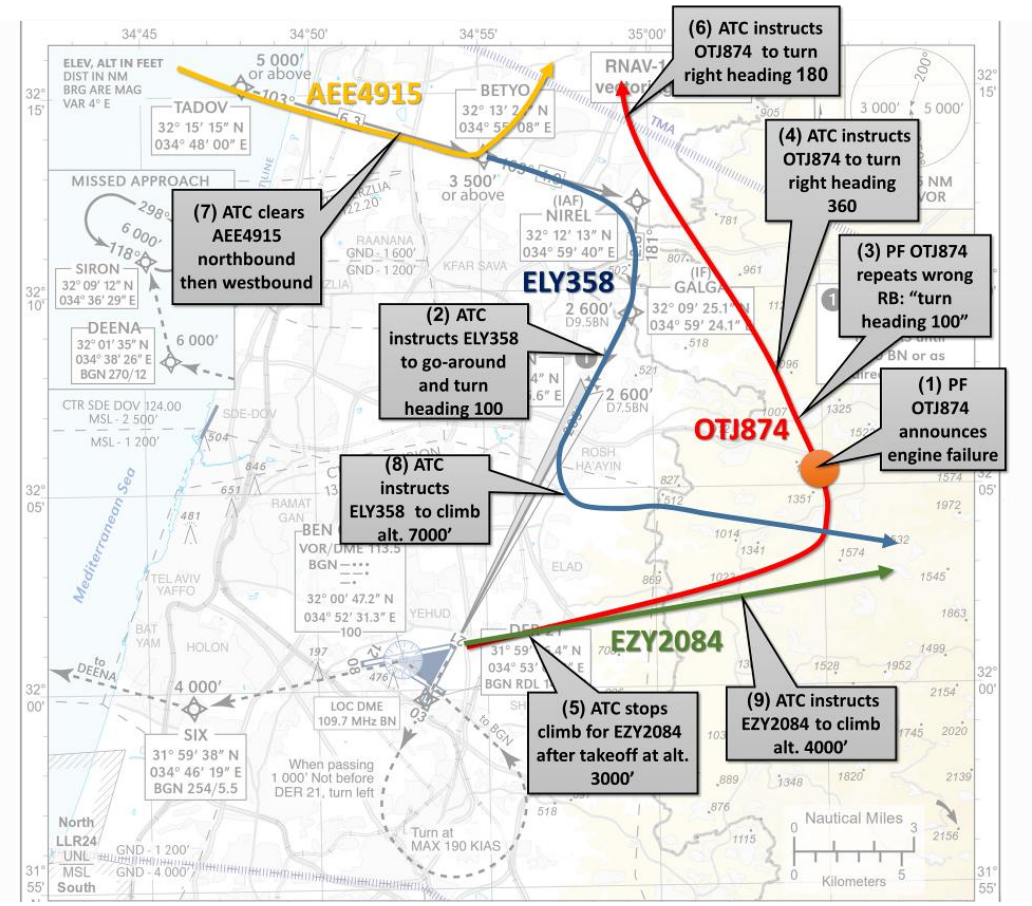
# 1. Factual Information

## 1.1 History of the flight

In the description of the incident, five different flights are mentioned, and for ease of reading, they are detailed below by reference to call signs and a description of the starting location of the aircraft involved:

- ☒ OTJ874 - The aircraft in which the engine failure occurred, after taking off from Runway 08 at LLBG.
- ☒ ELY358 - An aircraft during approach to Runway 21 at Ben Gurion Airport, in the midst of the final approach segment.
- ☒ EZY2084 - An aircraft that took off from Runway 08 at Ben Gurion Airport at its initial climb, after OTJ874.
- ☒ AEE4915 - Inbound for LLBG, abeam Netanya, east of the shoreline.
- ☒ ELY2522 - Inbound LLBG, approaching Netanya, west of the shoreline.

The chart set out below shows the schematic location of all the aircraft and outlines the routes that were taken. The chart is based on the radar records and Pilot-ATC communications. The text on the chart describes only part of the reports and actions, and is linked to the location of the relevant aircraft at the time of the described occurrence. The routes are shown against the ILS21 approach chart (AIP-AD2.5-44)



On Sunday, August 10, 2014, at 13:18, Ten Airways Flight No. 874 (OTJ874) to Corfu, Greece (LGKR), departed from runway 08 at Ben Gurion Airport (LLBG). The aircraft was manned by 2 pilots and a cabin crew of 4, and was carrying 169 passengers.

Shortly after takeoff, Ben Gurion ATC instructed the crew of OTJ874 to turn north heading 030.

At 13:22, while climbing south east of NIREL waypoint, at the altitude of 6,000 feet QNH, the crew of OTJ874 identified that the EICAS parameters displayed rapid increase in the EGT of Engine 1 (left engine). The EGT increased and peaked at 800 degrees Celsius. In addition, a loud noise was heard in the tail section of the aircraft, accompanied with strong tremors of the cabin. The Captain, which was the PF, immediately responded to the signs of malfunction, by setting the left engine to IDLE status for several seconds, and then turning off the fuel flow to the engine – practically shutting the engine down. The EGT value dropped and no fire warnings were received. At this stage, the aircraft maintained altitude 6,000 feet QNH with IAS of 260 knots.

At 13:22:50 the first officer, which served as Pilot Monitoring (PM), reported to Ben Gurion Approach ATC the engine failure: ″Ben Gurion Departure OTJ874 **We have one engine failure**″.

Ben Gurion Approach ATC interpreted the report as a two-engine failure ("Engines Failure") and requested the crew to state their intentions. Several seconds later, the crew responded:

″OTJ874 requesting vectors from back to Ben Gurion for ILS approach to runway 08″.

The ATC, which already declared the emergency in the Radar Section of the Tower, heard the word "landing" and interpreted it as a request for immediate landing on runway 21.

An "Emergency Status 3" (the equivalent to "Full Emergency") was declared by the Radar Section, controlling flight OTJ874, to the Tower Section. This was later changed to "Emergency Status 2". The Tower alerted the local fire brigade, and according to airport procedures, large numbers of off-airport ambulances and additional fire brigades were called to the airport.

Based on the notion that flight OTJ874 is executing a crash landing, The ATC immediately started vectoring traffic in the vicinity of the flight, starting by canceling the approach of an El Al flight ELY358 that was on the final segment of the approach to runway 21, approximately 7-8 miles from the threshold.

At 13:23:10, the ATC instructed flight ELY358 to turn left, heading 100, and climb to altitude 5,000 feet QNH. The instruction was mistakenly read-back by the crew of OTJ874 without the ATC noticing it.

At 13:23:26, after realizing that the El Al flight did not turn eastbound, the ATC repeated the turn instruction and the cancel-approach instruction. These were read-back by the El Al crew.

Note: At this point, while the El Al flight ELY358 was executing a go-around, a serious incident of extreme pitch-up and speed loss had occurred. The incident was investigated separately. Further details can be found at Safety Investigation Report 101-14.

At 13:23:35, the ATC instructed OTJ874 to turn right, heading 360. 15 seconds passed since the crew of OTJ874 confirmed a clearance not intended for them, until a new clearance was issued. During that time, the crew did not turn or change altitude.

At 13:23:43, El Al flight ELY2522 that was west of the shoreline headed to Ben Gurion was instructed to turn westbound. At this point, EasyJet flight EZY2084 contacted the ATC, after taking off from runway 08, heading east and climbing.

At 13:24:20, the ATC instructed EZY2084 to stop climb at altitude 3,000 feet QNH, in order to separate it from ELY358 that was instructed to turn to the east and climb to altitude 5,000 feet QNH (ELY358 had just initiated the turn). The crew of EZY2084 confirmed the clearance to stop climb, and indicated that there are mountains east of the airport.

At 13:24:26, the ATC instructed the crew of OTJ874 to turn right heading south, to runway 21 of the airport. At the same time, Aegean flight AEE4915 was crossing BETYO waypoint, heading east for landing in Ben Gurion.

At 13:24:32, the ATC instructed AEE4915 to turn north, while maintaining altitude of 4,000 feet QNH. Immediately after, the ATC instructed flight ELY2522 to change frequency and contact Tel Aviv Control. The ATC instructed flight AEE4915 to climb to altitude 4,000 feet QNH.

At 13:25:09, the ATC requested information from the crew of OTJ874 regarding souls on board, fuel and dangerous goods. The crew responded no dangerous goods are onboard the aircraft and that it is carrying 169 passengers and a crew of 6. In addition, the Captain of OTJ874 stated he is ready to approach Ben Gurion Airport. At this point, OTJ874 was east of Netanya, turning right at altitude 6,000 feet QNH, with Ground Speed (GS) of 300 knots. The ATC noticed the relatively high speed and realized that the aircraft is able to maintain altitude.

At 13:25:18, the ATC instructed the crew of OTJ874 to turn right heading 180 and land on runway 21. The supervisor at the Radar Section of the Tower recommended the ATC change the runway to 26 (4 km runway, the longest in the airport). The ATC contacted the OTJ874 crew, which then confirmed the runway for landing will be 26.

OTJ874 intercepted the ILS following radar vectoring, and landed safely on runway 26, at 13:35. The stop point of OTJ874 on the runway was west of Kilo junction, the aircraft was escorted by a Follow Me vehicle to the east and soon cleared the runway.

### 1.2 The Pilots

- ☒ The flight crew was interviewed by the investigation team at Ben Gurion Airport, soon after the incident had occurred. The crew demonstrated knowledge in the operational procedures for single engine operation and engine failure.
- ☒ The flight crew had some experience flying to Ben Gurion – The Captain had performed dozens of flights to the airport and from it, and was familiar with the Airport characteristics and flight procedures.
- ☒ Soon after starting the investigation, from examining the recordings of the incident and interviewing the flight crew, it became clear to the investigation team that the flight crew performed according to the operational requirements. For that reason, the investigation team decided to focus the investigation on local issues, such as the Air Traffic Control actions during the incident and the Airport emergency procedures.

### 1.3 The Aircraft

- ☒ Type – MD83.
- ☒ Call sign - YR-OTY.
- ☒ Manufacturing Date - 18.11.1991.
- ☒ Operator - Ten Airways (Romania).

### 1.4 Weather Conditions

- ☒ Cloudy conditions - few clouds, cloud-base at 3,500 Feet.
- ☒ Visibility - good, more than 10 kilometers.
- ☒ Wind - 290/11 knots.
- ☒ Temperature - 31 degrees centigrade.
- ☒ The Dew Point - 21 degrees centigrade.
- ☒ Barometric area pressure – 1008.

## 1.5 Radio Transcripts

The transcript is divided into three segments, according to the different stages of flight OTJ874 and the different radio frequencies used for communication.

Radio transmissions are highlighted in correlation to the station transmitting in the following manner:

- ☒ Blue – Flight OTJ874.
- ☒ White – Ben Gurion Tower/Approach ATC.
- ☒ Red – Initial report of engine failure.
- ☒ Green –Flights other than OTJ874.

Note: The transcript includes only communication relevant to the incident.

**Transcripts of Tower ATC frequency recordings:**

**The recording begins at 13:14:00 (UTC), the time in the following table is giving relative to the beginning of the recording.**

| Voice reporting transcript | Station | Relative Time (MM:SS) |
|---|---|---|
| Ben Gurion Tower good afternoon, OTJ874 taxi to holding point runway 08 on Kilo | OTJ874 | **00:00** |
| OTJ874 Shalom, able to depart via Kilo intersection with 2736 meters? | BGN TWR | |
| Able to depart from Kilo intersection OTJ874 | OTJ874 | |
| Please expedite taxi on Sierra, lineup and wait runway 08 | BGN TWR | |
| Expediting on Sierra lineup on runway 08 OTJ874 | OTJ874 | **00:28** |
| OTJ874 wind 300 10 knots, runway 08 cleared for takeoff maintain runway heading | BGN TWR | **03:20** |
| After takeoff 08 maintain runway heading OTJ874 | OTJ874 | |

**Transcripts of Approach & Departure ATC frequency recordings:**

**The recording begins at 13:17:08 (UTC), the time in the following table is giving relative to the beginning of the recording.**

| Voice reporting transcript | Station | Relative Time (MM:SS) |
|---|---|---|
| Ben Gurion departure OTJ874 after departure on runway 08 | OTJ874 | **01:54** |
| OTJ874 Shalom departure, radar contact climb altitude 7,000 feet on runway heading | BGN DEP | **01:58** |
| 7,000 feet on runway heading OTJ874 | OTJ874 | **02:02** |
| OTJ874 report altitude passing | BGN DEP | **02:10** |
| Passing 1,700 OTJ874 | OTJ874 | **02:13** |
| OTJ874 continue climb 8,000 feet runway heading | BGN DEP | **02:51** |
| Continue climbing 8000 feet runway heading OTJ874 | OTJ874 | **02:58** |
| OTJ874 turn left heading 030 | BGN DEP | **03:38** |
| turn left heading 030 OTJ874 | OTJ874 | **03:42** |
| OTJ874 turn left NIRAL MERVA and resume own navigation | BGN DEP | **04:27** |
| Turn left to NIREL resuming navigation OTJ874 | OTJ874 | **04:33** |
| NERAL position MERVA and climb altitude 9,000 feet | BGN DEP | **04:37** |
| After NERAL to MERVA and climb to 9000 feet OTJ874 | OTJ874 | **04:40** |
| | | |
| Ben Gurion departure OTJ874 we have one engine failure | OTJ874 | **05:42** |
| Copy OTJ874 Say intentions Sir | BGN DEP | **05:51** |
| OTJ874 Requesting vectors from back to Ben Gurion for ILS approach runway 08 | OTJ874 | **05:54** |
| 348 cancel the approach sir, climb altitude 5,000 feet turn left heading 100<br>Note: the clearance is in fact intended for El Al flight 358 | BGN DEP | **06:02** |
| We are at 6,000 feet, turning left to 100 OTJ874 | OTJ874 | **06:11** |
| 358 cancel the approach left heading 100, climb 5,000 feet | BGN DEP | **06:18** |
| Climb 5,000 feet on heading 100 and cancel the approach El Al 358 | ELY358 | **06:22** |
| OTJ874 turn to the right heading 360 | BGN DEP | **06:27** |
| Turing right 360 OTJ874 | OTJ874 | **06:32** |
| El Al 2522 turn left direction ADLOD 5,000 feet | BGN DEP | **06:35** |
| Left… Say again the point | ELY2522 | **06:40** |
| 2522 left direction position ADLOD | BGN DEP | **06:46** |
| Left direct ADLOD El Al 2522 | ELY2522 | **06:49** |
| 2084 on the frequency sir? … 2084 Ben Gurion | BGN DEP | **06:52** |
| Tel Aviv departure EZY2084 passing 2,500 climbing straight ahead runway heading | EZY2084 | **07:02** |
| Maintain 3,000 feet runway heading Ma'am | BGN DEP | **07:12** |
| OK we have mountains ahead of us | EZY2084 | **07:15** |
| OTJ874 right heading 180 | BGN DEP | **07:18** |
| Right heading 180 OTJ804 … OTJ874 | OTJ874 | **07:20** |

| Voice reporting transcript | Station | Relative Time (MM:SS) |
|---|---|---|
| 4915 turn left head left heading 330, 4,000 feet | BGN DEP | **07:24** |
| Left heading 330 and maintain 4,000, Aegean 4915 | AEE4915 | **07:29** |
| 358 climb 7,000 feet | BGN DEP | **07:36** |
| Climbing 7,000 feet El Al 358 | ELY358 | **07:39** |
| 2522 Tel Aviv for further information 122.15 | BGN DEP | **07:42** |
| 122.15 El Al 2522 | ELY2522 | **07:46** |
| Easy 2084 on the heading climb 4,000 feet | BGN DEP | **07:52** |
| 4,000 heading thank you 2084 | EZY2084 | **07:56** |
| OTJ874 when … further information about souls on board, and fuel and dangerous goods | BGN DEP | **08:01** |
| Negative sir. We have 169 plus 6 crew, able to commence approach now | OTJ874 | **08:10** |
| OTJ874 to the right heading 180 runway 21 for landing | BGN DEP | **08:17** |
| 120 heading, confirm? | OTJ874 | **08:23** |
| 180 to the right | BGN DEP | **08:25** |
| Noises on the frequency, possible from OTJ874, unreadable | OTJ874 | **08:27** |
| 2084 climb 5,000 feet | BGN DEP | **08:30** |
| 5,000 feet, EZY2084 | EZY2084 | **08:32** |
| 358 turn left heading 080 | BGN DEP | **08:34** |
| Left heading 080 El Al 358 | ELY358 | **08:37** |
| | | |
| … Would you confirm heading 120 … the localize 21, OTJ874 | OTJ874 | **08:47** |
| Say again sir? | BGN DEP | **08:52** |
| OK | OTJ874 | **08:54** |
| 2084 climb altitude 6,000 feet | BGN DEP | **08:56** |
| Climb to 6,000 2084 | EZY2084 | **08:59** |
| OTJ874 I say again runway 21 for landing advise if you need runway 26 and to the right heading 180 | BGN DEP | **09:01** |
| OK we can take runway 1… runway 26 OTJ874 | OTJ874 | **09:09** |
| OTJ874 continue on the heading 180 and descend altitude 5,000 feet | BGN DEP | **09:16** |
| Heading 180 descending to 5,000 OTJ874 | OTJ874 | **09:22** |
| El Al 358 turn left heading 360 maintain 7,000 feet | BGN DEP | **09:31** |
| Left heading 360 maintain 7,000 El Al 358 | ELY358 | **09:36** |
| 2084 do not exceed more than 230 knots | BGN DEP | **09:39** |
| Maintain under 230 knots | EZY2084 | **09:42** |
| OTJ874 continue descend 4,000 feet | BGN DEP | **10:16** |
| Continue 4,000 feet OTJ874 | OTJ874 | **10:21** |
| Radar vector for ILS … runway 26 OTJ874 | BGN DEP | **10:26** |
| Radar vector for ILS 26 OTJ874 | OTJ874 | **10:29** |
| For your information you have about 22 miles until touch down OTJ874 | BGN DEP | **10:36** |

| Voice reporting transcript | Station | Relative Time (MM:SS) |
|---|---|---|
| Maintain 4,000 OTJ874 | OTJ874 | **11:44** |
| Thank you Sir you can descend 3,700 feet sir | BGN DEP | **11:48** |
| 3,700 feet OTJ874 | OTJ874 | **11:50** |
| OTJ874 next turn will be for the localizer ILS runway 26 | BGN DEP | **12:01** |
| Noises on the frequency, possible from OTJ874, unreadable | OTJ874 | **12:04** |
| OTJ874 14 miles from touch down turn right heading 230 intercept the localizer for ILS runway 26 | BGN DEP | **12:30** |
| 230 intercept localizer cleared ILS 26 OTJ874 | OTJ874 | **12:38** |
| OTJ874 all the emergency vehicles are near the runway and on stand by | BGN DEP | **13:45** |
| Thank you | OTJ874 | **13:50** |
| OTJ874 you have runway 26? | BGN DEP | **14:35** |
| … Affirm Sir, have it insight, 8 miles final | OTJ874 | **14:39** |
| Tower 134.6 good luck | BGN DEP | **14:45** |
| 134.6 thank you | OTJ874 | **14:47** |

**Transcripts of Tower ATC frequency recordings:**

**The recording begins at 13:32:00 (UTC), the time in the following table is giving relative to the beginning of the recording.**

| Voice reporting transcript | Station | Relative Time (MM:SS) |
|---|---|---|
| Ben Gurion Tower OTJ874 fully established on ILS runway 26 | OTJ874 | **00:00** |
| OTJ874 shalom, wind 300 10 knots runway 26 cleared to land | BGN TWR | **00:11** |
| Runway 26 OTJ874 | OTJ874 | **00:19** |
| OTJ if… | BGN TWR | **03:20** |
| Can we make 180 and vacate by Kilo 874? | OTJ874 | **03:30** |
| Hold position over there all the fire tracks behind you approaching, it will take one more minute | BGN TWR | **03:42** |
| OTJ874 just to verify, are you able to taxi on your own? | BGN TWR | **04:07** |
| OTJ874 in 30 seconds you will see Follow Me on your left side and he will guide you via Kilo taxiway to your gate | BGN TWR | **05:25** |
| Thank you 874 | OTJ874 | **05:35** |

### 1.6 Engine Failure/Inflight Engine Shutdown

The manufacturer instruction in case of engine failure or inflight engine shutdown is to set the relevant engine to IDLE, and stop the flow of fuel to it. In addition, the checklist details several tasks intended to maintain the weight and balance of the aircraft and allow the active engine to provide the power necessary for a safe landing.

Emergency Procedure: Engine Failure/Inflight Engine Shutdown (MD-80 Flight Crew Operations Manual, August 30, 2013)

- ☒ Throttle (Affected Engine) – IDLE
- ☒ FUEL Lever (Affected Engine) – OFF

  NOTE: After FUEL lever is off, throttles should be used together.
- ☒ PNEU X-FEED VALVE Lever (Affected Engine) – CLOSE
- ☒ AUX and TRANS HYD PUMP Switches – AS REQUIRED
- ☒ ENG IGN Selector/Switch – AS REQUIRED
- ☒ FUEL TANKS Pumps Switches / FUEL X FEED Lever – AS REQUIRED

  NOTE: Use fuel cross feed as necessary to maintain fuel balance.
- ☒ Electrical Loads – CHECK

  NOTE: Start APU (if available) to reduce electrical load on operating generator.
- ☒ AIR COND SHUTOFF Switch – OVRD
- ☒ END SYNC Selector – OFF
- ☒ AIR CONDITIONING SUPPLY Switch (Affected Engine) – OFF

  NOTE: Restricted rudder may result after applying maximum rudder due to asymmetric thrust. If RUDDER TRAVEL UNRESTRICTED light does not illuminate during deceleration, momentarily centering rudder pedals and rudder trim may allow rudder throw limiter to return to speed-scheduled position.

The company operational manual describes under paragraph 2.11.4 the required actions in case of One Engine Approach (Standard Operating Procedures MD-82, December 15, 2005)

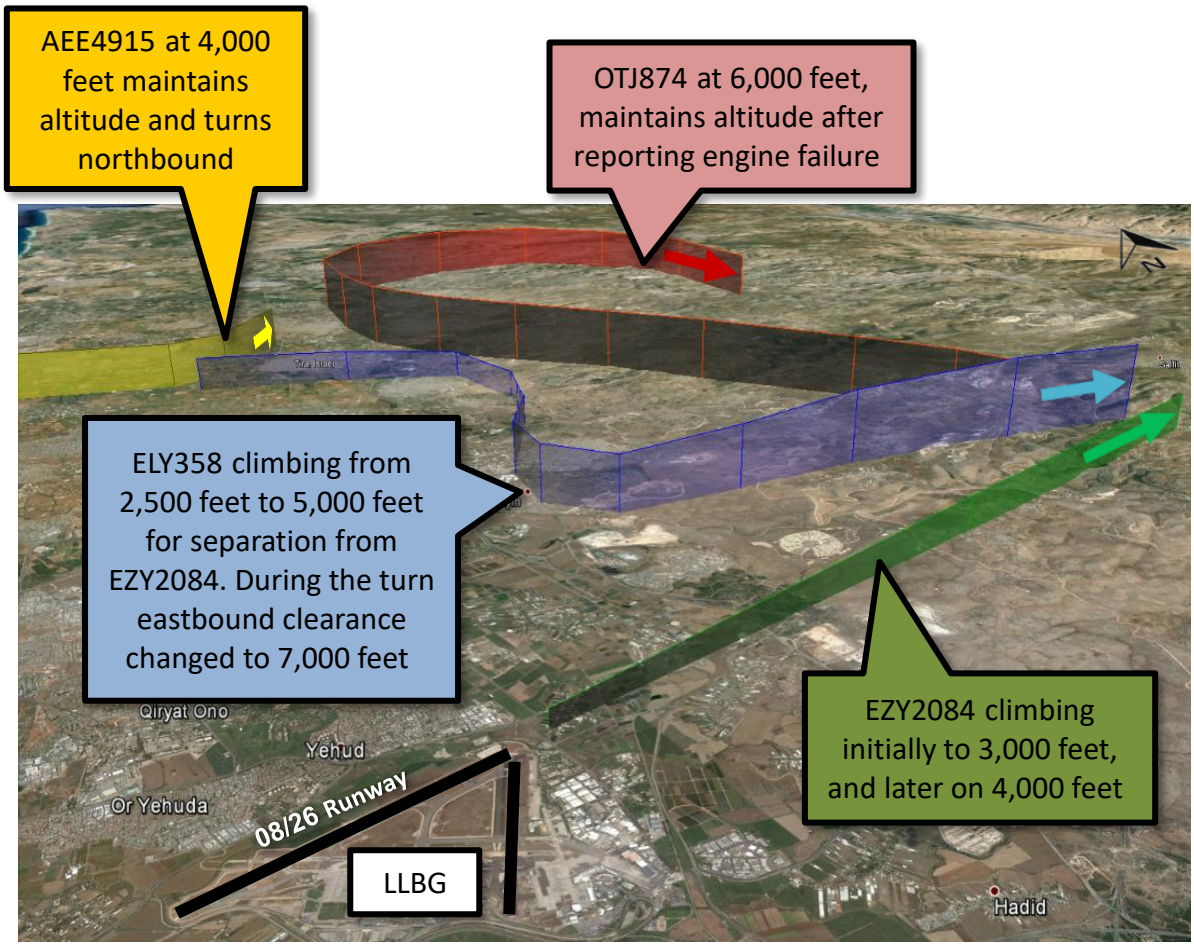
- ☒ Straight in approach is identical to two engine approach
- ☒ Landing Flaps 28°
- ☒ Autopilot ILS approach may be used until final approach fix. However, autopilot may be used in basic modes down to MDA / 500 ft.
- ☒ Autocoupled Final Approach and Autoland not authorized, however, autoland may be completed if an engine fails below 50 ft RA.

## 2. Analysis

### 2.1 Lateral and vertical maneuvers of relevant traffic from the moment of the emergency and 4 minutes later

The following diagram details the sequence of events in relation to the routes and vertical separation of four flights:

- OTJ874 - The aircraft in which the engine failure occurred, after taking off from Runway 08.
- ELY358 - An aircraft during approach to Runway 21 at Ben Gurion Airport, in the midst of the final approach segment.
- EZY2084 - An aircraft taking off from Runway 08 at Ben Gurion Airport at its initial climb.
- AEE4915 - An aircraft inbound for Ben Gurion Airport, abeam Netanya, east of the shoreline.



## 2.2 Classification of the emergency by the flight crew

The crew of flight OTJ874 monitored the engine parameters, including temperature, during the take-off from Ben Gurion Airport. The parameters were within the normal range, before and after V1. The EGT value was 550 degrees Celsius after take-off. When the PF initiated a left turn heading northbound, a loud noise was heard along with a temporary trembling of the aircraft. The EGT value of the left engine increased rapidly and peaked at 800 degrees Celsius, and the Captain immediately set the left engine throttle to IDLE. After several seconds at IDLE state, the captain stopped the fuel flow to the left engine. After the shutdown of the left engine, the EGT values decreased rapidly, and no fire warning was received. At this relatively early stage, the captain classified the situation as one that allows an organized, controlled and calm approach, without any immediate risks to the aircraft or to the passengers.

The operational procedures of the airliner, Ten Airways, includes clear definitions for emergency and abnormal flight. The emergency procedures detail a list of actions and requirements from flight crew, including communication with ATC and the use of terms MAYDAY and PAN PAN.

When the crew of flight OTJ874 reported the engine failure to Ben Gurion ATC, it was after the situation was classified and understood in the cockpit. From the point of view of the crew, the situation required landing back in Ben Gurion, as a safety measure and not due to any immediate risk to the aircraft. This led the flight crew to report the engine failure while not declaring emergency (MAYDAY or PAN PAN). The decision of the crew was based on the characteristics of the malfunction and the fact it was contained, leading to very specific and relatively simple operational restrictions. These restrictions allowed the crew to return to Ben Gurion in full control while only limiting the turn rate slightly.

The crew decided to follow the Engine Failure procedure, and Single Engine Approach procedure (both detailed in the company operational literature), as opposed to the emergency procedures, due to the classification of the situation.

According to the procedures the crew followed, the aircraft was to be landed at the nearest suitable airport according to the crew's discretion. These procedures do not include a requirement to report the ATC with MAYDAY or PAN PAN reports, unless it is necessary. The crew fully performed the company procedure.In standard operation, landing speed is between 140 to 141 knots, with flaps at 40 and weight of 63.5 tons. At the incident, the aircraft was landing with only one engine, 67 tons, flaps at 28 and speed of 163 knots.

Because of the landing parameters, the landing required ¾ of runway 26 and the aircraft stopped after 3 kilometers. The wheels temperature was 200 degrees, well within the maximal range of 305-460 degrees. A technician of the company that examine the engine after the landing found a piece of carbon fibers and metal, that originated probably from the engine itself.

The aircraft was grounded at Ben Gurion Airport for approximately one month, and only after the engine was replaced, on September 14, 2014, the aircraft was released and returned, empty, to Bucharest.

### 2.3 The information gap between the flight crew and the ATC

During the incident, the crew of flight OTJ874 reacted to the engine failure according to the company and manufacturer procedures. The initial concern, at the cockpit, that a serious malfunction had occurred, one that may put the aircraft and its passengers at risk, was disproved in the first few seconds of the incident – following the successful shutdown of the left engine and the drop of EGT to normal values.

When the crew contacted the ATC, the cockpit was operating according to the Single Engine Operation procedure, based on the understanding that the aircraft is in no immediate risk.

While the incident occurred, Ben Gurion airport and the TMA were relatively congested. The large number of approaching and departing traffic, in addition to several restriction on the airspace due to security reasons, contributed to the operational complexity from the point of view of the ATC.

From the second OTJ874 reported the engine failure, the ATC had little time to form his situational awareness of the event while assisting OTJ874 to land, separating it from other traffic and providing services to the other flights on the approach frequency. The actions of the ATC were purposeful and suited to the situation, as he understood it. In practice, an information gap had developed between the ATC and the crew of OTJ874, starting in the first few seconds of the event. In the cockpit, the incident was classified as a controlled malfunction that does not require declaration of emergency, whereas the ATC's situational awareness was of a serious two-engine failure that will most likely lead to a crash landing and requires a full-emergency at the airport. After a short time, when it was understood in the Tower that flight OTJ874 is able to maintain altitude and speed, and in fact the crew is turning to the north – away from the airport, the initial declaration of emergency in the airport was downgraded from "Emergency State 3" to "Emergency State 2". The last was the actual instruction to the local emergency crews. In both states, a large numbers of off-airport emergency crews are alerted and called to the airport.

The fact that the ATC misunderstood the initial report of the crew contributed to the inaccurate perception of the situation, as a serious two-engine failure, where in fact the crew of OTJ874 was capable to operate almost with no operational restrictions.

The ATC at the Approach station was the only one monitoring the Approach frequency at the Tower when the crew of OTJ874 reported the engine failure.

It is possible that if the crew of OTJ874 would have used PAN PAN in their initial report to the ATC, the situational awareness at the Tower would be more similar to the one in the cockpit. The use of PAN PAN would still lead to priority in the landing sequence while transmitting to the Tower the fact that the aircraft and souls on board are under no immediate risk.

The ATC actions, including the go-around instruction to El Al flight ELY358, were greatly influenced by the situational awareness created due to the information gap between the Tower and the crew of OTJ874.

The fact that the approach airspace and frequency were congested in the first few minutes of the incident, contributed to the partial situational awareness, and the wrong interpretation, of several reports by OTJ874:

- ✓ The initial report of one-engine failure was interpreted as a two-engine failure
- ✓ The flight crew intention to land on runway 08 was interpreted as a report of an immediate return for landing on runway 21
- ✓ The wrong read-back by OTJ874 in reply to a clearance originally given to flight ELY358, was not corrected by the ATC, even though 15 seconds later a new clearance was issued for OTJ874, dismissing the wrong read-back

The ATC insured separation is maintained between all the flights under his control. With the assistance of other personnel in the Tower, the runways and airspace were effectively vacated.The information gap between the ATC and flight crew did not lead to a safety hazard, but instead caused the incident to be operated at the airport on a more serious level than actually necessary.The issues of Emergency States at Ben Gurion Airport and the amount of off-airport agencies involved in the different states were recently investigated. These issues are addressed, in detail, as part of Safety Investigation Report 92-14.It is important to emphasize that the analysis is not intended to contradict the general notion in aviation that when there is doubt, or lack of time, the worst case scenario should be the one acted upon. This is true especially when operating an emergency of a large aircraft, which require preparation in the airport and is time sensitive.

## 3. Conclusions

**3.1** **An engine failure to flight OTJ874, after take-off, led to an engine shutdown and** a declaration of Full Emergency in Ben Gurion Airport. The aircraft landed safely.

**3.2** **The engine failure was not reported by the flight crew as an emergency, but only as an explanation to the fact that a landing in LLBG was required.** From the point of view of the flight crew, the engine failure was an abnormal event, but did not pose an immediate risk to the aircraft, and did not require any specific emergency assistant at the airport.

**3.3** **In the initial stages of the incident, three reports of the flight crew were wrongly or partially interpreted by the ATC.** The ATC was the only one monitoring the frequency at the Tower, which led to partial situational awareness at the Tower.

Note: Understanding the abnormal situation and the nature of the malfunction are the keys to an effective and accurate decision making. Prioritization of the communication with the aircraft in state of emergency is necessary to understand the emergency.

**3.4** **The Approach ATC acted rapidly and effectively in order to clear the path for flight OTJ874.** At the time of the incident, the airspace was relatively congested and several restriction on the airspace contributed to the complexity of the situation.

**3.5** **The crew of flight OTJ874 was operating according to company procedures,** when they did not classify the incident as one that requires a declaration of MAYDAY or PAN PAN. The crew relayed on the Engine Failure and One Engine Approach procedures, which emphasize the need of informing the ATC but do not require emergency declaration.

**3.6** **The use of the term PAN PAN, on behalf of the crew of OTJ874, even though not required according to company procedures,** may help focusing the ATC in the true nature of the incident and create a common situational awareness in relation to the severity of the situation in the air and the assistance required on the ground. This may lead to actions that are more suitable in terms of emergency agencies at the airport.

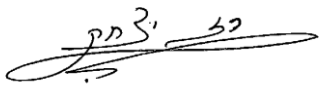
## 4. Recommendations

The subject of emergency states at Ben Gurion Airport was discussed in detail as part of Safety Investigation Report 92-14. The report includes several recommendations to the authorities in Israel.

**The report is available in Hebrew in the AIAI website;**

**http://aiai.mot.gov.il/betihut-tisa-cbl/dohot-hakira-cll/1025-92-14**

Respectfully,



Advocate Raz Yitzhak (Resnick)
Chief Investigator

Reference: 01657415 Date: September 14, 2014

**Return of items seized during a safety-related investigation**

Pursuant to Section 114 (b) (5) - (7) of the Aviation Law, 2011, the Chief Investigator shall return seized items, with the exception of fragments of an aircraft, within 45 days of the date of publication of the final investigation report. The items shall be returned to from whomever they were seized or to their owners. Aircraft fragments shall not be returned other than at the request of owners of the aircraft and at the owner's expense. A request for their return must be submitted to the Chief Investigator no later than 45 days from the date of publication of the report.

**A person who wishes that items seized shall not be returned to their owners, may submit an appropriate request to a Magistrates Court, within whose jurisdiction the item was seized.**