ACCIDENT

Aircraft Type and Registration:	Airbus A340-642, G-VFIT
No & Type of Engines:	4 Rolls-Royce RB211 Trent 556-61 turbofan engines
Year of Manufacture:	2006 (Serial no: 753)
Date & Time (UTC):	21 August 2019 at 1230 hrs
Location:	En route from New Delhi Airport, India to London Heathrow Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 15 Passengers - 305
Injuries:	Crew - 1 (Minor) Passengers - 1 (Serious)
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	54 years
Commander's Flying Experience:	18,062 hours (of which 5,722 were on type) Last 90 days - 162 hours Last 28 days - 62 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquires by the AAIB

Synopsis

Whilst passing through northern Turkey at FL360 the aircraft encountered moderate to severe turbulence during which a passenger was severely injured. The turbulence was not forecast and there were no indications, visually or on the aircraft's weather radar, to suggest the aircraft was approaching an area of turbulence.

History of the flight

G-VFIT, an Airbus A340, was flying from New Delhi Airport, India to London Heathrow Airport (Heathrow). At approximately 1230 hrs, five and a half hours into the flight, the aircraft was over northern Turkey, at FL360, routing toward the border with Bulgaria (Figure 1). The commander had just returned from his rest period. The relief co-pilot was in the right seat and was the pilot flying. The weather forecast for the area was for isolated embedded cumulonimbus clouds with tops at FL320.

The commander reported that as they approached waypoint OLUPO (Figure 1) he saw a single "non-threatening" cloud on their track which was not showing on the aircraft's weather radar. There were cumulonimbus clouds on the horizon but no other clouds in their immediate vicinity. The aircraft was then cleared from OLUPO direct to waypoint ODERO on the Turkey/Bulgaria border, which took the aircraft clear of the single cloud. However, as the aircraft passed abeam the cloud, they encountered moderate to severe turbulence. The

co-pilot saw the speed trend arrow indicating +40 kt and the speed increasing rapidly. To prevent an overspeed he selected a lower Mach number and extended the speed brakes. The commander turned the seatbelt signs ON. The commander recalled seeing the wind shifting from a 40 kt tailwind to a 20 kt headwind in 2-3 seconds. The worst of the turbulence lasted for approximately 5 seconds. The aircraft was then subject to light turbulence until able to climb to FL380 at 1237 hrs.

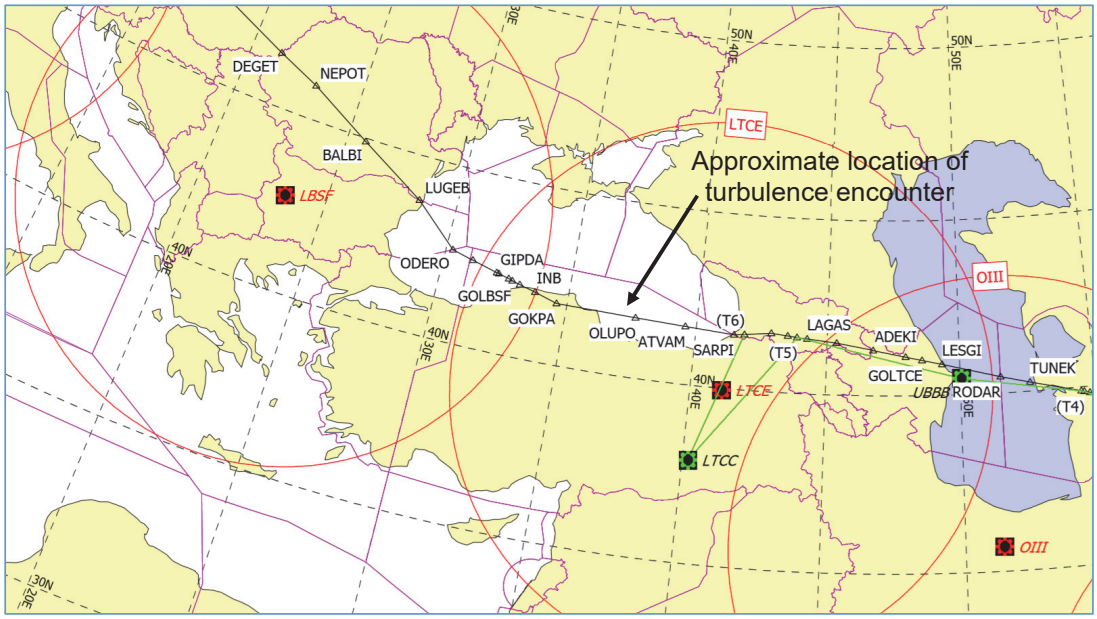

Figure 1

G-VFIT route through Turkey showing location of turbulence event

When the turbulence occurred the senior cabin crew member on duty made an announcement to reassure the passengers and to instruct the passengers and cabin crew to take their seats and fasten their seat belts.

After the aircraft was clear of the turbulence the commander was informed that a passenger in the rear galley had fallen over in the turbulence and had injured his ankle. The passenger was moved to a more comfortable seat and medical advice was obtained from a ground-based service provider[1].

The aircraft continued to Heathrow without further incident. A medical emergency was declared on arrival in the London FIR and a priority approach was requested and granted. On arrival, the aircraft was met by paramedics who treated the passenger. He was taken to hospital with a suspected broken ankle. He had surgery on his ankle the next day and was released from hospital seven days later.

One cabin crew member reported that he injured his shoulder when he fell against a bulkhead during the turbulence, but no medical treatment was required.

Footnote

[1] Flight crew can contact the service in-flight, via satellite phone, to receive emergency medical advice from a doctor.

Passenger report

The injured passenger reported that he was waiting to use the toilet in the rear galley when the turbulence occurred. The seatbelt signs were OFF, and he recalled that he suddenly found himself lying on the floor not knowing what had happened. His right ankle was extremely painful and swelled up within a few seconds. A cabin crew member tried to get him to move back to his seat, but he was unable to get up. His wife and son helped him back to his seat and the cabin crew brought him an ice pack. Later the crew moved him to a seat with more space and gave him painkillers. However, his ankle continued to be extremely painful. After landing he was taken to hospital, where it was found that his ankle was dislocated and broken in two places.

Recorded data

The operator reviewed the available flight data which showed that at 1230 hrs the aircraft was at FL360 and Mach 0.82. The turbulence occurred at 1231:08 hrs with vertical acceleration varying between +0.64 g and +1.56 g, the speed increasing to Mach 0.86 and the aircraft rolled +/- 5°. The seatbelt signs were turned ON at 1232:57 hrs.

Meteorology

Forecast information available to the flight crew

Parts of the significant weather and wind charts issued to the flight crew prior to the flight are shown in Figures 2 and 3. The significant weather chart shows an area of isolated embedded cumulonimbus clouds with tops at FL320 in the area where the turbulence occurred. There was no clear air turbulence forecast in this area. The wind chart shows the wind circulating round a low pressure centred in north-west Turkey.

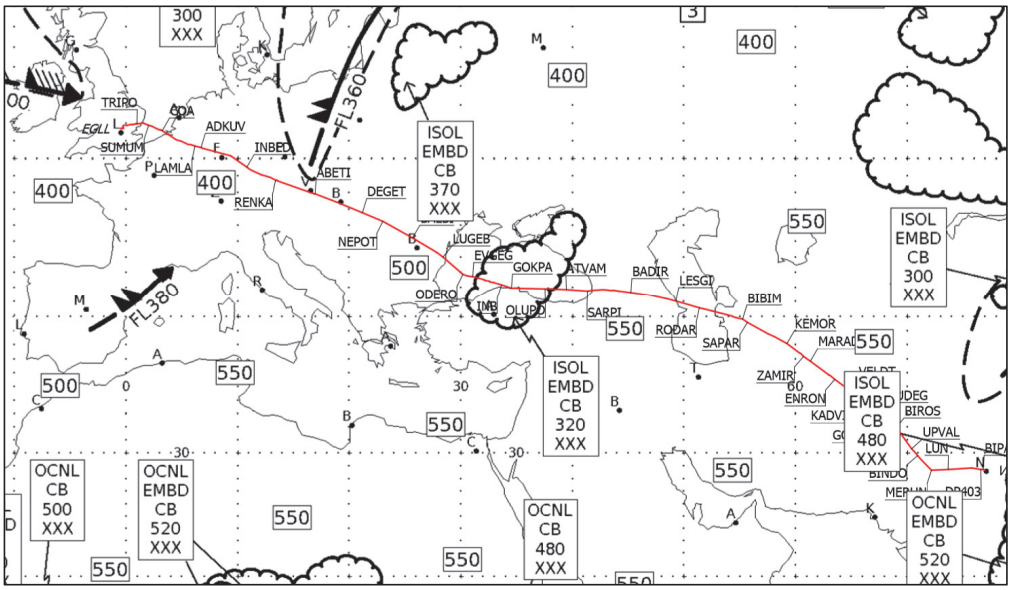

Figure 2

Segment of the significant weather chart valid at 1200 hrs on 21 August 2019

The significant weather chart included a note that cumulonimbus cloud implies moderate or severe turbulence. However, these clouds were below the cruise level of G-VFIT and the commander reported that the aircraft was clear of cloud when the turbulence occurred.

Ankara FIR had issued six SIGMETs[2], valid at the time of the turbulence event, which reported that thunderstorms had been observed in the area. There was no forecast or report of turbulence.

Flight plans issued to the flight crew provide forecast wind and temperature on the route which can give an indication of likely turbulence. The forecast wind at OLUPO was 202° at 63 kt; over the next 300 nm the wind was forecast to gradually change to an easterly wind. The temperature in this region at FL360 was forecast to be steadily decreasing from -43°C to -46°C. The plan also provided a forecast vertical shear rate in knots per 200 ft, which can indicate an area of turbulence. The value at OLUPO was one, increasing to four over the next 300 nm. The commander reported that shear values in single digits do not normally indicate significant turbulence.

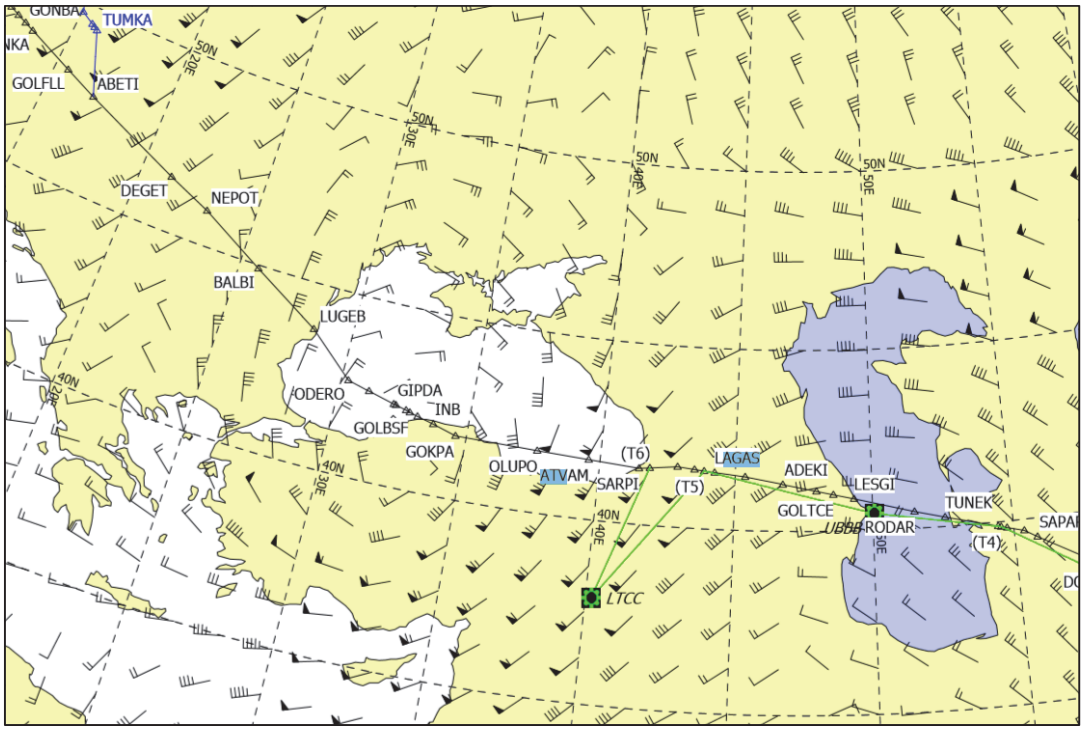

Figure 3

Segment of the wind chart valid at 1151 hrs on 21 August 2019

The flight crew used a charting application on their tablet devices which showed en route weather layers, forecast winds and areas of turbulence. The commander reported that

Footnote

[2] A SIGMET (SIGnificant METrological information) is a notification of an en route weather phenomena which may affect the safety of aircraft operations.

the application did not show any turbulence in this area. At the time of the accident the operator only approved flight crew to upload data to the tablet on the ground, so it only contained the information available before the aircraft departed. Since the accident the operator has approved the use of the onboard WiFi system to update the application in-flight and to provide the most up-to-date information to the flight crew.

Aftercast weather

Figure 4 shows a derived satellite image showing cloud top heights at the time of the incident, produced by the Met Office after the accident. The image indicates there was a large area of cloud with tops between 30,000 ft and 35,000 ft across the area in question.

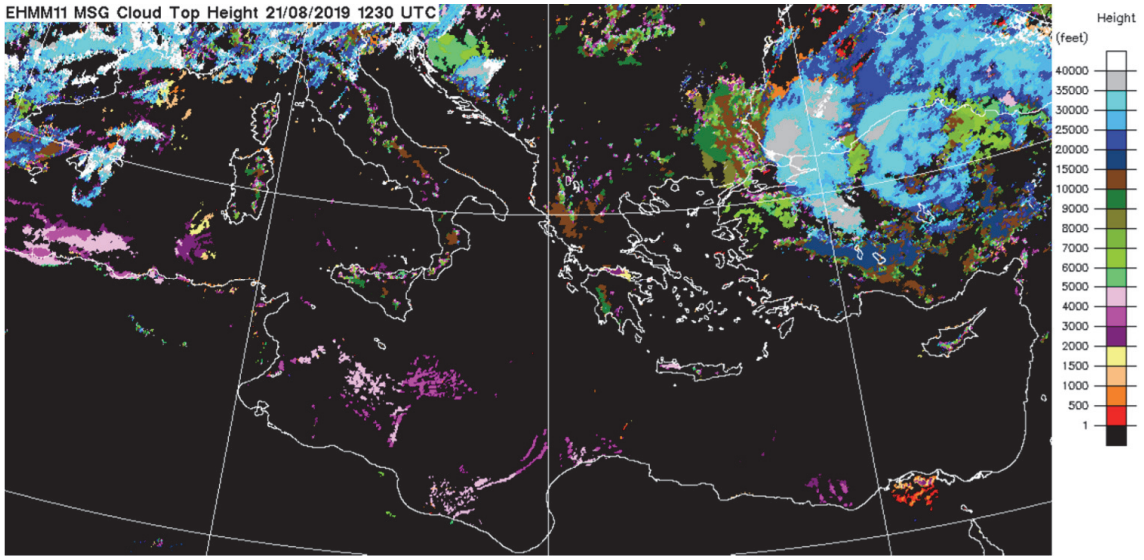

Figure 4

Derived Satellite Image showing Cloud Top Heights
valid at 1230 hrs on 21 August 2019

Seatbelt signs

The seatbelt signs were selected OFF when the turbulence occurred. Flight crew will normally turn the seatbelt signs ON if they anticipate turbulence, but on this occasion there was no indication that turbulence was likely to occur.

In general, flight crew face a difficult balance in deciding when to turn the seatbelt signs ON. If there are clear indications or reports of turbulence ahead, the signs can be turned ON in advance. However, if the flight crew put the signs on every time there is any chance of turbulence, it is likely the signs would be on for extended periods in smooth conditions, which can be frustrating for passengers. So, flight crew must balance the need to ensure the signs are on prior to any significant turbulence with the need to ensure the are not on unnecessarily.

Analysis

The aircraft encountered turbulence over northern Turkey during which a passenger was seriously injured. The turbulence was caused by a rapid wind shift.

There was no information available to the flight crew, either in the pre-flight paperwork, from the weather radar or visually to forewarn the flight crew that they were approaching an area of turbulence. Therefore, the seatbelt signs were OFF when they encountered the turbulence.