

No. 16

Air Manila, Inc., Fairchild F-27, PI-C871, accident at Ibajay, Aklan, the Philippines, on 8 March 1968. Report, dated 25 October 1968, released by the Aircraft Accident Investigation Board, the Philippines

1.- Investigation1.1 History of the flight

Flight AM 507 was a scheduled domestic flight from Manila International Airport to Lapu-Lapu/Mactan International Airport. Before departure the pilot was briefed by the Air Manila dispatcher on the existence of a cold front across the route and was provided with an en-route weather forecast valid from 1200 to 2400 hours which mentioned "Isolated thunderstorm over Eastern Visayas and generally fair elsewhere". No information regarding thunderstorms on the route was given to the pilot.

The flight took off from Manila at 1814 hours and was cleared to Mactan at FL 130 by the ATC, via Track 5, Amber 4 and Amber 1. The flight plan proposed an airspeed of 210 kt and an estimated time en route of 1 hour 45 minutes. Normal radio contact was maintained at all time between the flight and the air traffic services. At 1908 hours the flight reported over Romblon at FL 130, estimating Mactan at 1954 hours. This was the last message from the aircraft.

Several residents of Ibajay, a coastal town in Aklan, stated that at approximately 1918 hours they had heard a sound similar to that of an aircraft flying at high altitude in a southeast direction along the coastline. They then heard several loud explosions and saw fireballs falling into the sea. They all agreed that the initial fireball they saw could not have been the result of a prolonged fire, but rather a small fire which rapidly developed into a large orange-yellow-red ball and then disappeared. After a few moments, smaller fireballs emerged from the large one, some dying out before reaching the sea, some reaching the sea and developing into a large fire. At the same time a large object resembling an airplane was seen to emerge from thick clouds and fall into the sea followed by a trail of smaller objects. Approximately one hour later two bodies were recovered from approximately 2 km offshore of Bo. Colong-Colong, Ibajay, Aklan.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	4*	10*	
Non-fatal			
None			

* Only two bodies, those of a steward and of a passenger were found. The other 3 crew members and 9 passengers were missing, presumably killed.

1.3 Damage to aircraft

The aircraft was destroyed.

1.4 Other damage

None mentioned in the report.

1.5 Crew information

The pilot-in-command, aged 33, held an airline pilot's licence valid until 21 April 1968 with ratings in DC-3 since 23 April 1965 and in the F-27 aircraft since 6 February 1968. His medical certificate was current with no waivers or limitations. He passed his latest proficiency check in DC-3 and F-27 aircraft on 31 October 1967 and 8 January 1968, respectively. He had flown a total of 5 709 hours, including 2 854 hours as pilot-in-command, and 158 hours in F-27 aircraft of which 54 hours had been flown as pilot-in-command and 104 hours as co-pilot.

The co-pilot, aged 39, held a commercial pilot's licence valid until 21 April 1968 with instrument rating as well as ratings in the DC-3 since 14 August 1965 and in F-27 aircraft since 9 January 1968. His medical certificate was current with no waivers or limitations. He had flown a total of 3 300 hours, including 92 hours as co-pilot in the F-27 aircraft.

1.6 Aircraft information

The aircraft had been purchased from Piedmont Airlines in September 1967 and was introduced in scheduled domestic operations on 8 January 1968 with a provisional aircraft permit which was renewed on 9 February and 4 March and was valid until 18 March 1968.

Maintenance records indicated that minor discrepancies reported in the flight log book were attended to before 5 March 1968 with the exception of the co-pilot's gyro attitude indicator which had been unserviceable since 5 March 1968.

It had flown a total of 21 194 hours, including 7 712 hours since the last overhaul:

The gross weight of the aircraft at take-off was 33 228 lb, which was less than the maximum permissible of 40 500 lb, and the position of the centre of gravity was within allowable limits. It was calculated that at the time of the accident the weight of the aircraft was approximately 31 700 lb.

1.7 Meteorological information

The pilot-in-command received a pre-flight briefing from the Air Manila Dispatcher. The en-route and terminal weather based on the Weather Bureau forecast valid from 1200 hours to 2400 hours was:

"Isolated thunderstorm over Eastern Visayas and generally fair elsewhere, visibility 20/30 km, winds 10 000 ft to 30 000 ft 120⁰/20 kt."

The existence of a cold front across the route was mentioned to the pilot-in-command; however, no information pertaining to thunderstorms, other than the above, was given to the pilot-in-command before or during the flight.

The pilot-in-command of an F-27 aircraft which was flying the same airway as AM 507 but proceeding towards Manila at FL 120, observed at about 1900 hours on the aircraft weather radar indications of thunderstorm activity with severe turbulence and lightning from the northeastern tip of Panay Island up to the airway (Amber 1) between 12 000 and 15 000 ft. Whilst approaching Panay Island he observed on the radar screen 20 miles ahead an unusual indication which disappeared on the succeeding sweeps. He further observed that the weather north of Romblon was fine and bright, so that one proceeding south from Romblon would be able to detect visually the lightning and bad weather ahead. Coming from the opposite direction the weather south of Romblon could be detected by weather radar but not visually. He avoided the thunderstorm by flying east of the airway (Amber 1) and was over Romblon at 1922 hours, i.e. 14 minutes after AM 507. He mentioned that shortly before 1915 hours which was his closest position to AM 507 he did not notice any interference on his radar such as he usually observed when in the vicinity of other aircraft operating their weather radar.

The pilot-in-command of a YS-11 aircraft which was equipped with weather radar and which was flying the same route as AM 507 some 15 minutes behind that aircraft confirmed the presence of severe turbulence and lightning in the area mentioned by the other pilot-in-command. To avoid the weather he made a circuitous detour further west of the airway (Amber 1) - and the crash site.

Several residents in the vicinity of the crash area stated that between 1900 and 2000 hours there were thick clouds over the area, and there was intermittent rain accompanied by lightning and thunder over and in the immediate vicinity of Ibajay, Aklan.

1.8 Aids to navigation

No details on the aids available to or used by the flight were given in the report. The aircraft was equipped with 2 ADFs, 2 VORs and weather surveillance radar.

1.9 Communication

Communications were normal until 1908 hours when the last message from the aircraft was received, approximately 10 minutes before the accident.

1.10 Aerodrome and ground facilities

Not pertinent to this accident.

1.11 Flight recorders

Not mentioned in the report

1.12 Wreckage

The wreckage was scattered over a large area about 4 km long and 500 m wide and generally oriented from northwest to southeast. The southeastern part of the area was the sea and the remaining portion was sandy and swampy land with coconut palms. Attempts to recover the part of the wreckage which fell at sea had to be abandoned because of the depth of the sea in the area of the crash. The parts which were recovered, were recovered in the following order starting from the southeast:

- offshore, a portion of the fuselage aft of the rear pressurized bulkhead with the lower portion of the vertical fin and rudder together with some seats and cushions;

- on land, the right-hand nacelle tail cone, stabilizer and engine cowling; the left-hand stabilizer, airscoop with fuselage skin aft of it; the right-hand outer flap and outer wing; together with some parts of the passengers' compartment floor, a portion of the wing trailing edge fairing, the right-hand wheel well doors and part of the right-hand elevator.

Apparently washed ashore along 18 km of shoreline, west of the wreckage trail, were seat and back cushions, passengers' seats, the right-hand part of the passengers' compartment front partition, some life vests, floor carpet, the radome, one of the main wheels and various personal belongings.

Examination of the parts which were recovered revealed the following:

1. The right-hand outer wing fractured chordwise at sta. 422, from the leading edge to the rear spar, thence at sta. 415 up to the trailing edge. The failure was caused by a force with upward and rearward components, relatively applied outboard of the fracture section, and near the leading edge. At the leading edge near the tip a dent apparently caused by impact with a blunt edged object existed.
2. The left-hand stabilizer fractured at sta. 26. The failure was caused by a force with downward and rearward components relatively applied outboard of the fracture section near the trailing edge.
3. The right-hand stabilizer fractured at the same station where the left-hand stabilizer failed by a significantly similar force. Further, it was severely mutilated apparently by a forward force applied outboard of the inboard elevator hinge bracket.

This damage appeared to have been caused by impact with a sharp edged object after the elevator had been torn off.

4. The right-hand outer flap was severed from the wing at its attachments. It sheared chordwise near its mid span, due to a rearward force relatively applied outboard of the fracture section. The outboard portion was bent by an upward force relatively applied outboard of the bend.
5. The right-hand part of the elevator showed failure caused by upward force relatively applied outboard of the fracture section.
6. The radome was severed at its attachment to the bulkhead. The failure was due to uniformly distributed rearward force.
7. There were traces of heat damage due to a flash fire of limited extent, low intensity and short duration in the inside of the right-hand nacelle tail cone and in the air duct inside the aft fuselage.
8. The aft fuselage was fractured at sta. 695. It failed by shearing due to an upward force relatively applied aft of the fracture plane. The vertical fin and rudder which fractured at stations 138 and 100, respectively, appeared to have failed by shearing caused by a sideward force.

9. All the seats were severed at or near the rail fittings. The failures were caused by forces with downward and sideways components.

All fractures were of the static type and no evidence of fatigue, explosion or lightning strike were found on any of the parts examined.

1.13 Fire

There was a flash fire in the air. It was believed that it occurred as a result of the in-flight airframe failure which destroyed the integrity of some of the fuel tanks and that the escaping fuel ignited after having contacted some heat sources.

1.14 Survival aspects

Two bodies were recovered at 2030 hours - these were still fastened in their seats and floating on the sea. Both had marks which indicated that they had been exposed to flash fire and light-to-moderate crash forces. Their deaths were attributed to the injuries they sustained.

At 2235 hours Cebu Area Control declared a "distress phase" and search and rescue operations were immediately initiated. Although an intensive search was conducted up to 31 May, no other bodies were found.

1.15 Tests and research

None were mentioned in the report.

2.- Analysis and Conclusions

2.1 Analysis

The evidence indicated that at the time of the accident there was a fully developed thunderstorm across Amber 1 airway. Two other flights, equipped with weather radar, detected the presence of that thunderstorm and requested and were granted permission to deviate from Amber 1. As stated by one of these flights the thunderstorm was quite visible from the north where AM 507 came from.

The Board therefore believed that the crew detected the thunderstorm either visually or through their weather radar. Also they should have been alerted to the presence of hazardous weather conditions along the route since they probably heard the request of the other two flights to deviate from their routes, all three flights being at that time on the same frequency with Cebu Area Control.

The fact that the accident occurred approximately 10 NM right of the airway (outbound), 10 minutes after reporting over a radio navigation aid, appears to indicate that the pilot-in-command attempted to avoid a known hazardous weather condition, since the winds aloft at that time would not explain this deviation. The crew probably did not consider that this deviation was of a sufficient magnitude to warrant requesting authorization to deviate from their planned route to Cebu Area Control.

It was believed that the aircraft suddenly flew into a hidden cumulonimbus that may have appeared as a minor build up, but which was actually a fully developed and active cumulonimbus.

The witness evidence, distribution of the wreckage and examination of the wreckage clearly indicated that there had been a structural failure in flight. The failure of both stabilizers at the same stations due to downward load showed that prior to failure; the elevator must have been deflected to produce a nose up attitude while both wings were substantially intact and laterally level. The failure of the right-hand outer wing due to air loads generated at high angle of attack must have followed. The airspeed was estimated to have been not less than 180 kt, 40 kt more than the recommended turbulent air operating speed.

The Board considered the above as the most probable sequence of the primary failure experienced by the aircraft, which was caused by air loads associated with a sudden pull up manoeuvre, combined with gust loading. Thereafter, the aircraft went out of control causing a series of subsequent secondary failures. One of the earliest secondary failures must have been the puncturing or rupturing of the right-hand outboard fuel tank and the escaping fuel and/or explosive fuel-air mixtures ignited. This gave rise to the pyrotechnics observed by witnesses and probably the flash burns on two of the airframe components, and on the two bodies recovered.

It was concluded that the flight crew in this particular case was beset by a most unusual set of circumstances and undoubtedly that weather was definitely a major factor in this accident. The above does not imply that the crew applied stick forces capable of failing an adequately designed and soundly constructed structure, but rather the crew's action dictated direction and time of failure.

The Board realized that the sequence of events as described was largely a matter of deduction. Recovery and examination of the missing occupants and aircraft parts would have undoubtedly shed additional information on the actual sequence.

2.2 Conclusions

(a) Findings

The air carrier, aircraft and crew were properly certificated by the CAA. However the aircraft's record in the CAA was incomplete and the provisional permit was extended three times since 8 January 1968. Also, the outer wing did not carry any registration marking as required by the provisions of the CAR.

The flight transmitted its last position report over Romblon at 1908 hours, approximately 10 minutes before the accident, and did not report any operating difficulty.

The aircraft disintegrated at a high altitude with considerable speed.

None of the aircraft parts recovered showed evidence of fatigue, or explosion due to combustible gas mixtures, or concentrated explosives such as dynamite.

Over the area at approximately the time of the accident, there were thunder-storm cells and two other flights deviated and avoided the area.

The crash location was about 10 NM right of the assigned airway.

Only two bodies were recovered; the other occupants and the rest of the wreckage could not be recovered due to the depth of the sea in the general area of the accident and their exact location is unknown.

(b) Cause or
Probable cause(s)

The Board determined that the probable cause of the accident was an in-flight structural failure due to air loads exceeding the design strength, while flying in a thunderstorm cell.

3.- Recommendations

It is recommended that all aircraft operators should comply with the provisions of Administrative Order No. 6, series of 1953 regarding Nationality and Registration Marking of all civil aircraft.