

No. 13

Aigle Azur Extrême-Orient, Boeing SA-307-BI, F-BHHR, accident 900 m from the intersection of the two runways, Tan-Son-Nhut Airport, Saigon, Viet-Nam, on 22 May 1961. Report released by the Director of Civil Aviation, Viet-Nam.

Circumstances

F-BHHR departed Tan-Son-Nhut Airport at 0340 hours GMT for Vientiane (Laos) on an IFR flight plan. Four crew and 24 passengers were aboard. At 0410 hours the pilot advised that he was returning to Saigon with No. 4 engine out. The airfield was sighted at 0436 hours, and descent was commenced in visual meteorological conditions. Six minutes later the last turn was made, and the aircraft was aligned on radio beacon SG, runway 25 - long final. Sight of the field was lost and on contacting the tower the flight was advised that the aerodrome was QBI (IFR flight compulsory) ceiling 200 m, visibility 500 to 1 000 m, wind 270°, 16 kt.

On short final the weather conditions deteriorated, and visibility dropped to 50 to 80 m. The pilot decided to go around and reapplied power on three engines, at an airspeed of 118 kt, and the landing gear and flaps were retracted. The aircraft then entered a violent squall, running into heavy rain and turbulence. It was blown to the right, dipped, touched the ground and crashed on the airfield at 0448 GMT. No one was injured, but the aircraft was 90% damaged.

Investigation and EvidenceThe Aircraft

The aircraft had valid certificates of registry and airworthiness. Its last maintenance check was made on 5 April 1961 by the Bureau Véritas.

The maximum gross weights permitted by the certificate of airworthiness

for this flight were 24 495 kg for take-off and 23 154 kg for landing. The trim sheet presented by the Aigle Azur Company mentions a total weight of 22 640 kg.

Following the accident, the Board recalculated the gross weight of the aircraft at take-off and at the time of the accident. The results were 23 386 kg and 22 466 kg respectively. The latter was close to the maximum authorized landing weight.

The Crew

The pilot-in-command, out of a total of 20 251 hours flying, had flown 19 594 as pilot-in-command and 2 274 at night: his experience on this type of aircraft amounted to 3 000 hours.

The flight engineer had approximately 8 000 hours on Boeing 307's out of a total of about 15 000 hours.

Weather Situation

At the pilot's request, the Saigon tower passed on the following weather information to F-BHHR at 0443:

visibility 500 to 1 000 m; 3/8 stratus at 200 m; wind 270°/16 kt.

Two minutes later the flight advised that it was going around having missed the runway. The accident occurred at 0448.

The details of the deteriorating conditions released by the MET service were as follows:

0455 - cloud 4/8 Fs/60m, 6/8
Cb/300 m, 6/8 As/3
(after the 300 m visibility - 100 m;
accident) wind 280°, 15 kt; maxi-
mum gust speed - 20 kt;
thundershowers

On the day of the accident the squall came onto the aerodrome very quickly, at the time when the aircraft was on long final.

An eyewitness affirmed that the rain, which started coming down shortly before the accident, penetrated inside the trailer where he was; in view of the orientation of the trailer, this seemed to indicate that the wind was whirling at that point.

Furthermore, the engineer aboard the aircraft stated that the airspeed indicator suddenly fell from 118 to 85 when the aircraft entered the squall. It was, therefore, submitted to strong turbulence that forced it into the ground before the pilot had time to react.

During the monsoon season from May to October violent thunder squalls with strong gusts of west wind are very frequent over Saigon/Tan-Son-Nhut, and winds may reach a force of 35 kt.

Reconstruction of the flight

Twenty minutes after taking-off from Saigon the aircraft's No. 4 engine started vibrating as the flight was passing through cumulonimbus cloud at 7 900 ft. The propeller was feathered, and the aircraft climbed to flight level 85 on three engines. No. 4 engine was restarted but vibrated again, so it was stopped, and its propeller was again feathered. Tan-Son-Nhut was then advised that the flight was returning with No. 4 engine out. The stewardess reported that smoke was coming from the hold. The engineer took the necessary action.

At 0436 the aircraft was over the station at 4 500 ft in 50% visual meteorological conditions, and was cleared to

descend to 2 500 ft and instructed to call over SG. The radio operator advised that the radio compass was not operating correctly and requested landing instructions. The tower gave him the following information: "surface wind 260°/16 kt, runway 25, QNH 29.77". It also told the flight (at 0440) that it was then "QBI at the aerodrome."

Two minutes later, at 1 500 ft with rear wind, the aircraft made its procedure turn in sight of the ground, (the radio operator seeing the field during the turn), and lined up on radio beacon SG on a heading of 248°, flaps out to 24°, indicated airspeed 125 kt. The aircraft was on long final, and the crew had lost sight of the runway.

Shortly thereafter the visibility decreased, and the pilot decided to re-apply power. It was re-applied on three engines at an indicated airspeed of 118 kt, at an altitude of about 300 ft and a distance of 1 370 m from the threshold of runway 25, when the aircraft was over beacon SG, the radio compass needle moving to heading 180°. The engineer retracted the landing gear and flaps at the same time. All three engines responded normally and developed full power.

One to two seconds later, the aircraft entered a violent squall, within which it encountered whirling downdrafts, first full crosswind then full rearwind, accompanied by violent rain that reduced visibility to nil.

It was blown to the right and dropped, the indicated airspeed falling to 85 kt. The stewardess advised the crew that smoke was again entering the cabin.

The aircraft touched the ground at 0445 and the pilot closed the throttles, the engineer cut the ignition, and the aircraft crashlanded. Its position on the ground was normal, approximately in the line of flight. The feathered propeller of No. 4 engine broke off a wooden marking post 2 m from the ground. The lower part

of the fuselage touched the ground, and the propellers of No. 3 and 4 engines dragged along the ground. No. 4 propeller and engine hit a gravel heap 1m20 in height, and the whole unit fell off. After that impact the aircraft inclined onto the left wing, and the aileron was torn off and thrown rearwards. The aircraft came to a halt as it reached a heap of stones 1m60 in height, which was rammed by the lower part of the fuselage, from the right wing to the level of No. 4 engine, and by No. 3 engine.

Technical examinations

It was ascertained by dismantling No. 4 engine, which had been stopped at 0405 hours, that the rods of Nos. 5, 6 and 7 lower cylinders were broken. The damage was apparently caused by breakage of the rod on cylinder No. 6 following failure of the piston gudgeon-pin.

There was no sign of jamming or lack of oil.

It was possible to determine the origin of smoke that issued into the cabin shortly after the pilot had advised he was returning to Saigon. The electric motor controlling the hydraulic pump (both being mounted in the hydraulic hold) heated abnormally causing the interior varnishing, the solder of the wires to the collector, the wires and varnishes of the rotor, etc. to melt. The overheating was due to breakage of one of the screws fixing the brush-holder plate. This screw moved into a slightly sideways position, thus causing bonding by electric arc.

As the electric motor and auxiliary pump are not vital elements for the aircraft's flight, the failure of that electric motor may be eliminated as a direct cause of the accident.

Special technical tests conducted one week after the accident by the Bureau Véritas (Saigon Branch), in the presence of the Board of Inquiry, also included the checking on the ground and in flight of

landing gear retraction time for another aircraft of the same type and checking of the conditions for regaining altitude following re-application of power on three engines. The objective of this last-mentioned test was to discover whether the performance of the aeroplane was notably affected by retracting the flaps and landing gear at the moment when power is re-applied (possibility of loss of altitude).

Conditions for the in-flight tests were kept as similar as possible to those prevailing at the time of the accident: same load, same trim; only the altitude at which the tests were conducted was different (3 500 ft).

The tests showed that full retraction of the landing gear, had it been possible, would have occurred in a time between 31 and 38 seconds.

On the basis of the position of the landing gear at the time of the accident, and taking into account a maximum duration of 5 seconds between the time when the pilot ordered re-application of power and retraction of landing gear, and the start of that manoeuvre, it may be assumed that the pilot's order was given about 24 seconds \pm 2 seconds before contact with the ground.

Thence it may be deduced that the order to re-apply power was given at an altitude of 250 to 300 ft, above radio beacon SG. This was confirmed by the testimony of the engineer, who saw the road that passes near that beacon and the testimony of the pilot, who observed the turn-around of his radio compass needle at that time. It was contradicted by the report of the pilot asserting he read the altimeter at about 450 ft.

In his report the pilot mentioned "the hasty action on the part of the engineer in automatically retracting the flaps at the same time as the landing gear when power was re-applied", an action that apparently increased the rate of descent.

On the other hand, the airline's operations manual stipulates that in case of climb-out on three engines, the flaps and landing gear must be retracted as soon as possible.

The in-flight tests showed that the influence of flap retraction on possible loss of altitude was not great, a difference of 30 ft. It may, therefore, be assumed that the flap retraction was not a determining cause of the accident.

Probable Causes

The direct cause seems to derive mainly from the sudden worsening of the atmospheric conditions. The violence of the storm was definitely localized in the approach of the squall and in the squall. Whirling winds, three quarters front and then full cross, were the cause of the displacement of the aircraft to the right in spite of the efforts of the pilot, who felt that No. 3 engine was not yielding its full power. The subsequent downdrafts and rain forced the aircraft down, caused it to lose altitude and brought it to the ground.

The re-application of power, effected at an altitude of approximately 250 to 300 ft, and 25 to 30 seconds from the beginning of the runway, occurred late.

In identical weather conditions, if the pilot had re-applied power as soon as he received the QBI and QAM (latest MET observation) he had requested from the tower, the aircraft would have been at an altitude of approximately 560 to 600 ft and one minute and twenty seconds from the runway, at a distance of 4 km. It would have met the squall in higher altitude and speed conditions that would have avoided the aircraft's being brought to the ground.

The following factors had an aggravating effect although they were not direct causes of the accident:

-QBI was first announced by the tower while the aircraft was at

1 500 ft in a rear wind. The pilot and the radio operator stated that they did not hear it at that time. However, a playback of the recorded tape definitely included the voice of the radio operator answering: "Aerodrome is QBI; all right". Had the pilot known of the QBI condition at that time, he would probably have requested a QAM and would have been in a better position to make a prompt decision to re-apply power.

-The second report of appearance of smoke, the origin of which could not be detected on board, distracted the attention of the crew from the controls for a fraction of a second, causing them to apprehend danger from the holds.

-The load was 660 kg heavier than that submitted by the company. The airline should have re-weighed the baggage instead of relying on the weights shown on the packages and on the manifest drawn up and filed.

Recommendations

It was recommended:

- a) that carriers, and in particular non-scheduled carriers, check weights and trim on departure, and not rely on the statements of users; that a warning be issued to the company to that effect;
- b) that the Tan-Son-Nhut control tower be enabled to advise pilots of possible worsening of the weather before it occurs, by direct observation from the tower. A meteorological rating for controllers is very useful in such cases, particularly in the rainy season.