No. 7

Royal Netherlands Aircraft Factories - Fokker, Friendship F-27/200, PK-PFB, accident at Malaybalay, Bukidnon, the Philippines, on 27 April 1967. Report, dated 9 June 1967, released by the Aircraft Accident Investigation Board, the Philippines

1.- Investigation

1.1 History of the flight

The aircraft was under a two week lease from the owner, the Permina Oil Company of Indonesia, to the Royal Netherlands Aircraft Factories - Fokker, for the purpose of a series of demonstration flights in the Philippines. It arrived at Manila on 24 April 1967 and conducted demonstration flights at various airports on 26 and 27 April 1967. On that day the aircraft took off from Mactan at 0816 hours and after having flown to ten different aerodromes it arrived at Davao at 1557 hours where the main fuel tanks and water/methanol tanks were filled to capacity. At 1635 hours the aircraft took off from Davao and landed at Malaybalay Airport on runway 06 at 1705 hours. It continued its landing roll up to the end of the runway, made a 180° turn and then took off from runway 24. According to ground witnesses the take-off was initiated with both engines at maximum power and the aircraft became airborne at about two-thirds of the runway length. At that time the right hand propeller was starting to slow down and stopped when the aircraft reached a height of about 1 metre above the ground. The aircraft appeared to have difficulty in gaining height and followed a creek between two hills in a right wing low attitude. It struck a tree and some bamboos and crashed on a hill 45 m higher than the runway elevation. The site of the accident was located 1 380 m from the end of runway 04 and 136.5 m to the right of its extended centre line. The accident occurred at 1710 hours.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	3	16	
Non-fatal			
None			

1.3 Damage to aircraft

The aircraft was destroyed by the impact and ensuing fire.

1.4 Other damage

None mentioned in the report.

1.5 Crew information

The pilot-in-command, aged 39, held a Netherlands commercial pilot's licence valid until 27 May 1967, with type ratings for all single and multi-engined landplanes having a gross weight not exceeding 2 000 kg and the Fokker F-27. He passed his last instrument proficiency check in the F-27 on 9 November 1966 and had an instrument rating. He also held a temporary airman's certificate issued by the Directorate of Civil Aviation, Indonesia on 19 April 1967. This certificate authorized him to exercise for a period of two weeks from date of issue the privileges of a senior commercial pilot with ratings for the F-27. He held a valid medical certificate. He had flown a total of 4 365 hours including 2 190 hours on the F-27 aircraft. Within the past 90 days he had flown 113 hours on the F-27.

The co-pilot was one of the four Philippine Airline pilots on board the subject flight. They all held a current airline transport pilot's licence with type rating for the Fokker F-27.

The flight engineer, aged 44, held a Netherlands flight engineer's licence valid until 7 March 1968 with type rating for the Fokker F-27. He also held a temporary airman's certificate issued by the Directorate of Civil Aviation, Indonesia on 19 April 1967 authorizing him to exercise for a period of two weeks the privileges of a flight engineer in the F-27 aircraft. He had a valid medical certificate. He had flown a total of 6 588 hours including 2 000 hours on the F-27. During the past 90 days he had flown 19 hours on the F-27.

At the time of the accident the pilot-in-command was occupying the right hand seat, the Philippine Airline pilot the left hand seat and the flight engineer the jump seat, as required by the company for demonstration flights.

1.6 Aircraft information

The certificate of airworthiness of the aircraft was valid until 1 January 1968.

The aircraft had been maintained in accordance with the approved maintenance procedures of the Directorate of Civil Aviation, Indonesia. According to the log sheets, there had never been any major discrepancies nor any carryover items.

Prior to take-off at Davao, the main fuel and water/methanol tanks were serviced to full. A total of 580 U.S. gallons of JP-4 fuel was added.

Weight and balance computation showed that the gross weight of the aircraft at take-off from Malaybalay was 37 200 lb: the centre of gravity was within limits. At this weight the second segment climb gradient was 1.9 per cent and V_2 minimum was 93 kt. According to the Flight Manual of the F-27 Series 200, the runway field length limited the take-off gross weight to 35 000 lb which would have given a second segment climb gradient of 2.6 per cent and V_2 minimum of 90 kt. At a weight of 35 000 lb the aircraft could have cleared the crash site but not the higher hills located beyond.

1.7 Meteorological information

Weather observation at Malaybalay at 1700 hours was as follows:

Wind:	320°/5 kt
Visibility:	32 km
Altimeter setting:	1 005.2 mb
Temperature:	26°C
Dew point:	21°C
Clouds:	3/8 Cb at 2 500 ft and overcast at 22 000 ft. No middle clouds.

1.8 Aids to navigation

Not pertinent to the accident.

1.9 Communications

No communications difficulties were reported.

1.10 Aerodrome and ground facilities

Malaybalay Airport has a 3 055 ft by 98 ft runway with 200 ft overruns on both ends. The runway is oriented 06/24 - beyond the west end of runway 24 rows of hills gradually increase in height creating an impression that the runway slopes down towards the west; in fact, runway 24 has an uphill slope of 0.647 per cent. The surface is macadamized and covered with turf. The elevation of the airport is 2 050 ft AMSL.

Accurate data pertaining to the runway and its approaches had not been published.

1.11 Flight recorders

Not mentioned in the report.

1.12 Wreckage

The aircraft first struck a tree about 10 cm in diameter with the left side of the fuselage, propeller marks were found 5 m farther and 2 m to the right and the aircraft crashed on a hill, the wreckage settling on the other side of the hill. The whole wing assembly was severed from the fuselage and came to rest 5 m away. Both propellers were torn off from their respective engines. The leading edges and tips of the blades of the left engine propeller were severely battered and dented indicating that it was under power at impact. Furthermore, marks left by the propeller indicated that it was rotating at no less than 11 000 rpm. The propeller of the right engine was found in the feathered position; however, a strip examination of the engine and its propeller did not reveal any discrepancies. The landing gear was retracted and the flaps extended to the 16.5° position. The cockpit instruments and central pedestal were so damaged by fire that no readings or other indications could be obtained.

No evidence of malfunction or failure of the aircraft or its systems prior to impact was found. All damage was attributed to impact and the ensuing fire.

1.13 Fire

Fire broke out following impact and appeared to have developed all over the area where parts of the wreckage were strewn. The left wing and the forward part of the fuselage were extensively burned.

Malaybalay Airport was not provided with a fire crash unit. The Bukidnon fire fighting unit and personnel of the 27th BCT responded to the emergency and arrived at the site of the accident approximately fifteen minutes after the accident. They performed fire fighting and rescue operations.

1.14 Survival aspects

All the occupants died as a result of the accident including two who survived the impact but succumbed in hospital a few days later.

1.15 Tests and research

None mentioned in the report.

1.16 Other pertinent information

One of the non-operating airline pilots who survived the impact stated that the pilot-in-command was demonstrating a single-engine take-off, closing down an engine at V_1. On a previous flight at another airport an Administration pilot had observed the pilot-in-command land with both engines operating, taxi straight ahead to the end of the runway, turn through 180° and take-off. Before the aircraft became airborne at a speed between V_1 and V_2, he noticed that the starboard engine had been feathered: the take-off was continued and at a height of 800 ft above terrain the engine was restarted. After landing the starboard engine was again feathered during the next demonstration take-off.

2.- Analysis and conclusions

2.1 Analysis

The evidence indicated that the aircraft was in an airworthy condition prior to the take-off and no malfunctioning or defect was found in the starboard engine or propeller. The port engine was rotating under power at no less than 11 000 rpm.

It was considered that the starboard engine was intentionally closed down and the propeller feathered to simulate an engine failure at take-off. In the conditions pertaining, the single engine performance was insufficient for the aircraft to outclimb the rising terrain.

During the preparations for this demonstration flight the obstruction clearance relative to climb-out performance had not been computed - the maximum permissible all-up weight of the aircraft to enable it to have cleared the terrain with one engine feathered was less than the 35 000 lb permitted by the runway length considerations. Therefore, at 37 200 lb the aircraft was overloaded by more than 2 200 lb in respect of single engine climb-out performance.

It is probable that the erroneous impression of runway downslope, together with difficulty in estimating the height of the distant terrain, misled the pilot-in-command.

2.2 Conclusions

(a) Findings

The crew were properly certificated.

The aircraft was on lease from an Indonesian firm to the Royal Netherlands Aircraft Factories - Fokker for demonstration flights in the Philippines. Its certificate of airworthiness was valid and it had been properly maintained.

Weather was not a factor in this accident.

During take-off the starboard engine was feathered to simulate an engine failure at take-off. The aircraft did not gain enough height to clear hills in its flight path and crashed. No evidence of malfunction or failure of the aircraft and its power-plants were found.

No obstruction clearance computations were made prior to the demonstration flight at Malaybalay. Weight computation after the accident revealed that the take-off weight, allowed by the field length considerations, was exceeded by 2 200 lb.

The take-off weight should have been less than that allowed by the field length considerations to have enabled the aircraft to clear the terrain with one engine feathered.

Terrain configuration and lack of accurate data on the runway and its vicinity may have caused the pilot to underestimate the problem involved.

(b) Cause or Probable cause(s)

The probable cause of the accident was poor judgement of the pilot in taking off towards the direction where the terrain was unsuitable for single engine performance.

Also contributing to the accident were the following:

(1) The gross take-off weight was more than that allowed to clear the rising terrain along the flight path; and

(2) Inadequate available data regarding Malaybalay Airport.

3.- Recommendations

The following recommendations were made:

(1) that the AGA Section of the Aeronautical Information Publication be updated to reflect all the necessary aerodrome data; and