No. 6

Philippine Air Lines, Inc., Fokker F-27, PI-C501, accident at Basak, Lapu-Lapu City, the Philippines, on 28 February 1967. Report, dated April 1967, released by the Aircraft Accident Investigation Board, the Philippines

1.- Investigation

1.1 History of the flight

Flight 345 was a scheduled domestic flight from Manila to Mactan. It departed Manila at 1720 hours on an IFR clearance direct to Mactan, via Amber 1 at flight level 130. At 1908 hours the flight reported to Mactan Control Approach that it was descending through FL 70. It was cleared to FL 50, given an altimeter setting of 29.81 in Hg and requested to report at FL 60. At 1909 hours the flight requested a visual descent from FL 50 to 30 and at 1913 hours it reported commencing a VOR approach to runway 04. At 1917 hours the flight reported on final and Mactan Approach cleared the flight to land, giving the wind as 330^{o}/5 kt. The flight acknowledged the clearance and this was the last communication from the aircraft.

Whilst on a long final approach commenced from a height of 1 500 feet approximately 4 miles from the runway threshold, the aircraft suddenly assumed a nose-high attitude and additional power was applied. A crew member then came out of the cockpit and spoke in the direction of a number of supernumerary crew travelling in the passenger compartment instructing them to move forward. Moments later a flight attendant came from the cockpit and instructed everybody to move forward. Before all the passengers could comply, the aircraft started banking alternately to the right and left, descending in a tail low attitude and crashed at approximately 1918 hours 0.9 miles before the threshold of runway 04. At 1919 hours the aerodrome controller observed a fire near the approach end of runway 04 and alerted the emergency services.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	4	8	
Non-fatal		7	
None			

1.3 Damage to aircraft

The aircraft was destroyed by impact and the ensuing fire.

1.4 Other damage

None mentioned in the report.

1.5 Crew information

The pilot-in-command, aged 35, held an airline transport pilot's licence valid until 15 April 1967 with ratings for the V 784, F-27 and DC-3. His medical certificate was current with no waiver or limitation. He passed his last proficiency check in F-27 aircraft on 26 September 1966 and had never been involved in an accident or incident. He had flown a total of approximately 8 000 hours including 1 180 hours in the F-27, 649 hours as pilot-in-command and 531 hours as co-pilot. He had flown 938 hours during the last year, 252 hours during the last three months, 68 hours in February, including 1:45 hours on the previous day.

The co-pilot, aged 24, held a commercial pilot's licence valid until 19 April 1967 with ratings for the C-150, DC-3 and F-27 as well as an instrument rating. He was issued a medical certificate with no waiver or limitation on 15 October 1966. He had flown a total of approximately 1 758 hours, including 1 116 hours in F-27 as co-pilot.

1.6 Aircraft information

The certificate of airworthiness of the aircraft was valid until 26 April 1967. The aircraft had flown a total of 15 927 hours, including 5 947 hours since the last major overhaul on 17 April 1964 and 165 hours since the last periodic check, a Block 2 check, on 3 February 1967.

Maintenance records indicated that during the six months prior to the accident the aircraft was replaced by other aircraft on 72 scheduled flights due to deficiencies reported by pilots, some of which were recurring. The rate of climb indicator was changed 17 times and the airspeed indicator 16 times. Vibrations, ranging from slight to severe, were reported 12 times.

The aircraft had a total payload of 6 198 lb, well below the allowable payload for the flight of 8 852 lb. The weight and balance computation based on the load manifest indicated that the centre of gravity was located at Sta. 377.7 for take-off and at Sta. 378.19 for landing. The authorized limits for landing were: Forward - 360.28 inches, Aft - 378.52 inches. The traffic and sales personnel who participated in the preparation of the load manifest and loading of the aircraft stated that they were not sure that the load was distributed as reflected in the load manifest; in particular, they were unable to state exactly what weight of cargo had been loaded in the front cargo compartment, on 28 blocked seats, and in the rear cargo compartment. The foremost twenty-eight seats were loaded with an estimated 1 200 lb of cargo at an average of 43 lb per seat, and the rearmost sixteen seats were occupied by fifteen persons weighing an average of 155 lb each. Subsequent to the accident, weight and balance computations under four different load configurations all resulted in a centre of gravity position beyond the prescribed aft limit.

1.7 Meteorological information

The weather conditions were as follows:

Ceiling: 10 000 ft broken, high thin broken
Temperature: 77°F
Dew Point: 70°F

QNH: 29.81 in Hg
Wind: 340/5 kt
Visibility: 13 miles

1.8 Aids to navigation

The Mactan Alternate International Airport was equipped with GCA, NDB and VOR. The aircraft was equipped with 2 ADFs, VOR and a weather surveillance radar. The aircraft VOR was set on to the Mactan VOR.

1.9 Communications

Communications were normal until 1917 hours when the last communication from the aircraft was received.

1.10 Aerodrome and ground facilities

Mactan Alternate International Airport had an 8 500 ft by 150 ft concrete runway, with 1 000 ft overrun on both ends. The airport was rated for night operation.

1.11 Flight recorders

See recommendations.

1.12 Wreckage

The wreckage was scattered over an area 80 ft in diameter. Examination of the accident site revealed that the aircraft was descending in a left wing low attitude and that its left wing struck a coconut tree and some banana trees before plowing the ground with its tip for about 10 ft. The left propeller then struck the ground and separated from its engine. The aircraft nosed over and slid on its back, the fuselage broke up and burned and both engines were torn off (Fig. 6-1).

Evidence revealed that at the time of impact the landing gear was extended, the flaps were retracted, and that both engines were operating with their propellers in the flight fine pitch range. The elevator trim tab was found in the full nose down position. All structural failures were apparently due to impact and no evidence of any fire prior to impact was found.

1.13 Fire

Fire broke out following impact and was concentrated on the centre section of the fuselage.

The fire fighting and emergency units arrived at the scene of the accident about 25 minutes after the accident.

1.14 Survival aspects

No information was contained in the report.

1.15 Tests and research

None mentioned in the report.

2.- Analysis and Conclusions

2.1 Analysis

The flight had apparently proceeded without difficulty until after it commenced the final approach which was a visual approach with the runway lights in sight. It was considered that as the airspeed was reduced during the final approach, the aircraft progressively assumed a nose-up attitude which was checked by application of nose-down trim until the limit of the trim was reached and the elevator was at its maximum travel. Whether or not the flaps were extended at this time was not determined but they were retracted at impact. The evidence indicated that power was applied and the pilot-in-command issued instructions with the intention of moving the passengers forward to relieve tail heavy loading. Before this action became effective the aircraft stalled and crashed.

No mechanical failure or malfunctioning of the aircraft was found and it was considered unlikely that there was a malfunctioning of the airspeed indicator system which could have led to a deterioration of airspeed which would not have been detected by the crew.

The load chart for this aircraft was based on the assumption that each occupied seat represented a weight of 145 lb. The evidence indicated that on this flight the first twenty-eight seats were loaded to an average of 43 lb per seat and the fifteen rearmost seats were loaded to an average of 155 lb per seat. The evidence also indicated that proper regard was not given to the weight of the loading in the forward and rear cargo compartments. It was considered, therefore, that the action of the pilot-in-command in instructing the passengers to move forward during the emergency was entirely consistent with difficulty being experienced in longitudinal control arising from an aft centre of gravity becoming evident with reduction in airspeed.

2.2 Conclusions

(a) Findings

The crew were properly certificated.

The aircraft had a valid certificate of airworthiness and had been properly maintained.

The weather conditions did not contribute to the accident.

No evidence of malfunction or failure of the aircraft or its engines prior to impact was found. Evidence revealed that the aircraft struck the ground in a left wing low attitude with the landing gear extended and the flaps retracted. The elevator trim tab was found in a full nose-down position.

The aircraft was loaded in such a way that the centre of gravity was located beyond the aft limit.

(b) Cause or
Probable cause(s)

The Board determined that the probable cause of the accident was a loss of control at a low altitude. The contributory factor was the distribution of load which placed the centre of gravity aft of the rear centre of gravity limit.

3.- Recommendations

The Board recommended:

(1) That all personnel participating in the preparation of load manifests be certificated by the CAA as to their knowledge of and competence in the preparation of weight and balance computations of the different types of aircraft.

(2) That a committee be created to look into the maintenance procedures of PAL, particularly the corrections made on pilots' remarks for every flight.

(3) That to effect ready reference, all certificates of airworthiness and certificates of registration be numbered.

(4) That flight recorders shall be included (as a "No Go" item) in all types of turbine aircraft used for airline operations.

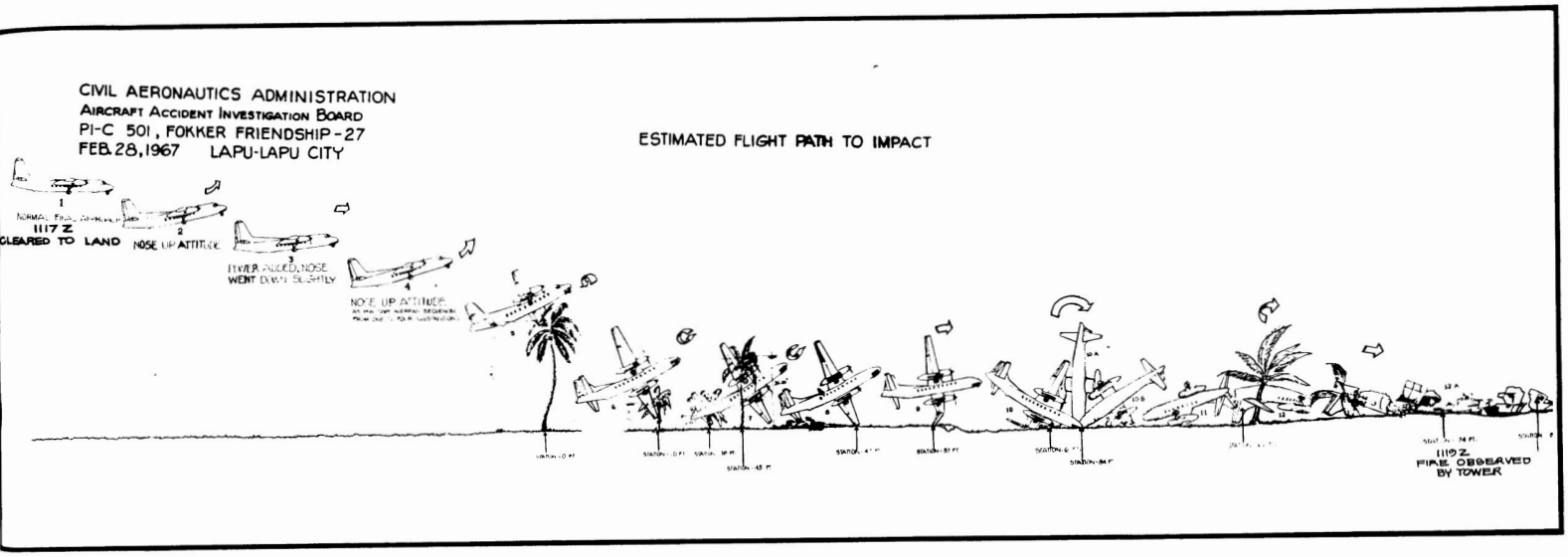
CIVIL AERONAUTICS ADMINISTRATION
AIRCRAFT ACCIDENT INVESTIGATION BOARD
PI-C 501, FOKKER FRIENDSHIP-27
FEB. 28, 1967 LAPU-LAPU CITY
ESTIMATED FLIGHT PATH TO IMPACT
1117 Z
CLEARED TO LAND
NOSE UP ATTITUDE
1119 Z.
FIRE OBSERVED
BY TOWER

Figure 6-1