

Copy #2

**CONFIDENTIAL**B-908 Crash  
Maintenance Report**I. Investigation of Maintenance****A. Elimination of Possible Causes**

All investigators agreed almost from the beginning that such causes as weather, navigational error, collision with flying objects and sudden illness of both pilots at the same time could be eliminated. It was quickly determined that the aircraft was not overloaded and that the load was within established balance limits.

**B. Establishment of Possible Causes**

1. This accident was most unusual in that it occurred in daylight during clear weather and over flat terrain. The aircraft had taken off to the south from Sui Nan Airfield and turned to the left 180° to proceed north to Taipei. Several competent witnesses observed the takeoff and initial climb. The aircraft behaved normally. The Control Tower operator watched the aircraft until it passed to the northeast of the airfield at which time one of the pilots called the tower and advised they were climbing on course and would see them tomorrow.
2. A number of other ground witnesses saw the aircraft as it approached Feng Yuan which is north of Taichung. The consensus of the witness reports is that the aircraft was travelling to the north when it made a sharp turn to the west and thereafter started to descend at a rapid rate. As it neared the ground the wings were said to "wave" and it hit the ground at about a 30° angle and with the left wing low.
3. No witnesses saw any part fall from the aircraft prior to impact. Several witnesses said they saw puffs of smoke but this could be imagination or vapor trails from propellers. Most witnesses in the same area saw no smoke and no fire.
4. No witnesses saw or heard anything which would indicate engine trouble.
5. The sudden transition from normal climbing flight in the direction of Taipei to a sharp turn to the left and diving into the ground almost certainly establishes only two possible causes:
  - a. A sudden and major mechanical trouble which made it impossible for the pilots to control the aircraft.
  - b. Sudden incapacitation or restraint of both pilots which rendered them unable to control the aircraft through some act of other aircraft occupants.
6. Thus investigation can be narrowed down to a search for any possible major mechanical trouble and an investigation of the other aircraft occupants for possible opportunity and means and motive to attack or restrain the flight crew.

- 2 -

## C. Investigation of Possible Mechanical Causes for the Accident

1. Specially trained American government investigators spent three weeks, partly at Taichung but largely in Tainan, in examination of the wreckage to determine possible causes. Air Asia personnel who know the C-46 aircraft intimately examined the wreckage at Taichung but were told by CAA upon its removal to Tainan that they could not participate in the examination. In these examinations all aspects that would relate to a sudden and major mechanical trouble making it impossible for the pilots to control the aircraft were considered.
2. Examination of maintenance records disclosed that all routine maintenance was performed as scheduled. Furthermore, the aircraft had flown on 37 consecutive flights prior to the accident with not one single reported trouble. This is unusual for any aircraft and indicated excellent mechanical condition.
3. Of first concern was an explosion or fire in the air. A fire would not normally have caused the aircraft to descend from an altitude of approximately 1200/1500 feet and hit the ground in within 20 to 30 seconds thereafter unless it burned long enough for a major part such as an engine or a wing to fall off. No witness saw any fire in the air. A decisive percentage of the witnesses saw no smoke. No part of the aircraft was found anywhere but at the crash site. Furthermore, examination of the wreckage disclosed no evidence of a fire prior to impact or an explosion of any kind.
4. An American expert made a detailed study of the two engines. He found no evidence of failure of either engine. All damage was only that which was caused by impact.
5. The expert next examined the two propellers. These propellers are Curtiss-Wright electrically operated propellers which are governed to maintain a constant speed (revolutions per minute) by a mechanism which automatically change blade pitch as necessary in a range between 17° (fine pitch) and 47° (coarse pitch). All parts of the right propeller were found and the blade pitch was determined positively to be 30°, the blade pitch which would exist at normal engine power and normal propeller speed. If the engine power had been less than normal or the propeller had been over-speeding the propeller blades would have to be at a fine pitch blade angle setting, but they were not.
6. The motor and reduction gear assembly of the left propeller was not found, despite very extensive and costly efforts to locate it. We must assume that someone unknown removed it from the scene of the accident, possibly during the first night after the accident, because many people specifically searched for this assembly on the following day, 21 June. However, the gear which turns the propeller blades was still in the propeller together with the propeller fixed stop plate. The American expert's report is quoted as follows:

- 3 -

"Detailed Report

"Blade gear damage is described elsewhere, however, it is essentially the same as that of the right propeller and represents blade angles at impact of approximately 30°.

"Of the power unit, only the power gear and adaptor plate remained. As of this writing, the remainder has not been recovered. Initial attempts to identify reference marks on the power gear from which to establish its position relative to blade angle were unsuccessful because of corrosion. Subsequently, by etching it was possible to identify a reference mark from which the 17° reference spline was established. Comparison with a serviceable unit established its angular position when removed from the hub to be approximately 30°. To establish precise correlation of its position with a serviceable unit required rotating the power gear two splines from the normal 17° reference spline. Each spline represents a blade angle change of 0.3°, consequently the variable introduced by the two spline position uncertainty is 0.6°.

"Summary

The left propeller power unit was not recovered except for the power gear and adaptor plate. The power gear and adaptor plate were jammed in a fixed position in the hub. This position was noted and subsequently determined to represent an approximate 30° blade angle."

Thus the report finds the blade angle of the left propeller to be the same as that of the right propeller, the blade angle which would exist at normal engine power and speed and not at engine power less than normal or with an overspeeding propeller.

7. In addition to the above we have the following evidence that the left propeller was operating normally:
  - a. All witnesses state that they heard no unusual engine sound except loudness. If a propeller were overspeeding a high pitched whine would be very noticeable.
  - b. The manifold pressures of both engines were the same. An overspeeding propeller would noticeably change manifold pressure, or the pilot's first reaction would be to reduce manifold pressure.
  - c. There is no evidence of overspeed damage to the nose section of the left engine.
  - d. Magnaflux and careful magnifying glass examination of power gear teeth shows cracks at roots of individual gear teeth and impact marks on sides of gear teeth which are related to gear tooth engagement at the time of impact. By analysis of the manner in which blades were pulled from the hub these damage marks on the power gear would indicate a power gear position at time of impact corresponding to roughly 30° blade angle position.

- 4 -

- e. The damage of the left propeller blade gears of the left propeller in relation to the damage of the blades themselves has been compared with similar damage of the right propeller. There is definite and positive correlation which also is evidence that the left propeller had the same blade angle as the right propeller (and thus had about the same speed of rotation).
  - f. Subsequent to the departure of the American experts Air Asia personnel found deep gouges inside the propeller hub of the left, as well as right, propellers. These gouges were caused by the blade gears as they were pulled out from the hub. Careful measurements and drawings were made to match the gouges to the blade gears of the propellers. In all cases where gouges were clearly defined it was found that they showed blade angles of very close to 30° at time of impact. This evidence alone is positive proof that both propellers were at the same blade angle setting and there was no engine or propeller trouble. It can be stated with certainty that the left propeller was not over-speeding.
  - g. Location of the left power unit would not materially add to the above evidence and in fact could not be expected to give any more evidence than already exists.
- 8. The next part of the investigation was an examination for some structural or control system defect. All major structural parts were examined by an American expert. His examination disclosed no structural defects or damage which did not occur as the result of impact.
  - 9. Examination of the control system was very thorough. It started with examination of the cockpit trim controls. All of these were found to be in an almost neutral position on the night of the accident. Later another American expert found a piece of trim tab control cable which he thought should be sent to a laboratory in Washington for analysis.
  - 10. One expert later examined all parts of the control system in Tainan. He found no defects that did not appear to be the result of the crash. However, he sent one piece of aileron control cable to Washington for laboratory examination.
- II. Review of CAA's "Salient Points of Investigation Report on CAT B-908 (C-46) Crash", dated 15 July 1964.

A. Elevator Trim Tab Control Cable

- 1. In paragraph 3 of the CAA report it is stated:

"USCAB experts who tested on the control cables affirmed in a report that ... the cable used for control of left elevator trim tab showed substantial wear and tear, although the breakage was more probably due to impact with the ground. The majority Board opinion is that even if these cables became broken during flight prior to crash, the crew should have encountered no particular difficulty in controlling the aircraft in continued flight."

- 5 -

2. Yet in paragraph 5 of the same report the following statement is made:

"Based on substantial wear and tear of left control cable ... the Board deemed that normal time maintenance for the aircraft was not attentively carried out ...."

This conclusion obviously cannot be made from the statement in paragraph 3 of the report. In fact, the report made by the laboratory in Washington upon which this conclusion would presumably be based, describes the damage to the cable in great detail but does not say what caused the damage.

3. This cable is connected to a drum or "motor" in the stabilizer (horizontal tail) which turns a shaft to operate the trim tab. The cable is 3/32 inch diameter cable which is composed of 49 separate small wires. The cable is designed to be strong enough to withstand at least 920 pounds of tension. In tests several cables of this size broke at 1200 pounds tension. The normal force on the cable needed to operate the trim tab is only 20 pounds of tension. Thus the cable is at least 50 times stronger than necessary for the normal load.
4. All control cables in the entire aircraft were completely removed and inspected as part of CAT's routine aircraft overhaul procedures at the end of January 1964. Furthermore, during another inspection on 20 April 1964 it was found that the left elevator trim tab had a little too much "play" (movement when pushed with the hand) which was caused by wear inside the trim tab motor. On that date the trim tab motor together with the cable was replaced with overhauled parts. These facts are both proof of excellent maintenance and show that the cable was used for only two months prior to the accident. Normally this cable will remain in use for many years.
5. Examination of the left horizontal stabilizer where this section of the cable is located shows why the cable was found worn and torn. The crash damage to the cable guide, pulley, pulley mounting bracket, and two fuselage bulkheads of the tail section (all of which is documented by photographs) positively show that prior to the impact the cable was intact and was strong enough (actually, far stronger than required) to perform its function in control of the aircraft.

At the time of impact when the aircraft was broken into pieces almost all cables were broken. At that time the left elevator trim tab cable which was sent for examination pulled away from the pulley which changes its direction of travel 90° to allow it to go from the fuselage to the left stabilizer. With the pulley no longer guiding it this cable and its companion cable were forced against the sides of two holes in a bulkhead of the fuselage tail and cut into the bulkhead for a distance of several inches. The photograph (attached) of this bulkhead shows that both of these trim tab cables had great and approximately equal strength prior to impact.

- 6 -

This action understandably wore through the outer part of this cable. Although very minor wear of the cable prior to impact is possible the failure of the cable was caused by being pulled through aircraft structure and finally by overload in tension at the time of the crash. The pull on this cable almost certainly exceeded 1,000 pounds to have caused it to tear through the bulkhead as shown, whereas normal pull is only 20 pounds.

6. This evidence, which is of great significance to technically trained persons, is proof that this conclusion of paragraph 5 of the CAA report is completely erroneous.

B. Left Propeller

1. In paragraph 4 of the CAA report appears the statement:

"... although there was a difference in RPM of more than 1000. The Board deemed that such would obviously give rise to overspeeding of left propeller."

2. In paragraph 5 of the CAA report it is said:

"Based on the ... overspeeding of left propeller, the Board deemed that normal time maintenance for the aircraft was not attentively carried out..."

3. It is noted that none of the American experts, which we have quoted, concurred in either of the above statements.
4. The American expert's report positively established that the left propeller was set at a blade angle of 30° at the time of impact. At this angle (which is the same as the right propeller) the left propeller would operate at about the same speed as the right propeller and could not possibly overspeed.
5. The CAA report apparently was based on an examination made of the tachometer indicator for the left engine. American expert's report on the indicator states as follows:

"The tachometer was examined for evidence of engine RPM at impact. The pointer shaft gears do show some impact damage in more than one place on the periphery of the gear. These marks are to be examined under greater magnification than was available to determine if significant RPM indications can be obtained. It must be noted that the pointers are comparatively lightly restrained under normal operation and that multiple damage marks may result in inability to obtain a single reliable RPM reading."

- 7 -

A careful reading of this statement clearly shows that examination of the tachometer for engine (and consequently propeller) speed could give only a doubtful indication at best. Yet it appears the doubtful indication of this tachometer, situated in the aircraft cockpit and separated from the propeller and engine mechanisms by electric wire and an electric generator which transformed the speed of the engine to an analagous electric voltage, was accepted in place of the positive indications directly from the propeller mechanism itself.

6. Thus, there is no evidence that the left propeller was overspeeding. It is apparent that the CAA investigator neither understood how the propeller operates or its effects nor read the expert's report, which said something quite different.

### III. Conclusion

CAA's finding that "normal time maintenance of the aircraft was not attentively carried out" is not only contrary to available significant technical evidence of positive reliability and to the statements of eyewitnesses but contrary also to the reports of American experts and laboratory analyses. There is in fact no evidence of any kind uncovered to date that there was any mechanical trouble of any nature at the time of the crash. Such findings by CAA, following an investigation in which CAA's participation was cursory at best and which was rushed to conclusion without due consideration, are an offense to reason and due process and a grievous injustice.