

Department of Transport
Bureau of Air Safety Investigation

INVESTIGATION REPORT
B/931/1004

Cessna U206G VH-FMP
Near Weipa, Queensland
9 January 1993

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SYNOPSIS

Cessna U206G aircraft VH-FMP was on a flight from Weipa to Aurukun (a distance of 80 km) with the pilot and three passengers on board when the pilot transmitted a Mayday call. He stated that the aircraft was 10 NM (18 km) north-west of Aurukun, that it had experienced an engine failure, and that he would be conducting a forced landing into trees. No further transmission was heard from the aircraft. Some five hours later a search aircraft sighted the burnt-out wreckage in a densely treed, inhospitable area 44 km north of Aurukun.

The investigation determined that the engine fuel mixture control cable end had become detached from the mixture control arm on the fuel control unit. This allowed the control arm to move to the 'idle cut-off' position, causing the engine to fail because of fuel starvation.

1. FACTUAL INFORMATION

1.1 History of the flight

Earlier in the day, the pilot had flown one passenger from Aurukun to Weipa. Some supplies and an additional passenger were to be collected for the return flight.

There were no witnesses to the departure of the aircraft from Weipa. However, it was later established that there were three passengers on board the aircraft for the return flight.

At 1236 hours EST, the pilot transmitted a Mayday call stating that he had an engine failure, that his location was 10 NM (18 km) north-west of Aurukun and that he was carrying out a forced landing into trees. Brisbane Flight Service acknowledged the call, requesting the pilot to advise the number of persons on board. There was no response to this transmission or to another call to the aircraft 30 seconds later.

The burnt-out wreckage was subsequently located in a densely treed area 44 km north of Aurukun.

1.2 Injuries to persons

The pilot and the three passengers on board the aircraft suffered fatal injuries in the accident.

1.3 Damage to aircraft

Impact with the trees tore the empennage and right wing from the aircraft. The cabin section was destroyed by post-impact fire.

1.4 Personnel information

The pilot in command held a Commercial Pilot's Licence and was endorsed on Cessna 206 aircraft. His approximate flying experience at the time of the accident was 9,600 hours. Although his experience on Cessna 206 aircraft could not be accurately determined, it was probably in excess of 500 hours.

1.5 Aircraft information

The aircraft was manufactured by Cessna Aircraft Company in 1979 as Serial No. U20605067. At the time of the accident, it had accumulated approximately 3,650 flying hours and was at an

estimated weight of 1,480 kg. (The maximum take-off weight for the aircraft was 1,633 kg.) The centre of gravity position could not be determined.

1.6 Meteorological information

The weather in the Aurukun area around the time of the accident was reported to have been five oktas of cloud with base approximately 2,200 ft, and wind from the north-west at 10–15 kts, with showers in the area.

1.7 Wreckage and impact information

The initial impact occurred 21 m above ground level when the right wingtip struck and was torn off by a branch of a large tree. The aircraft heading at this time was approximately 040°M. The wings and tailplane then hit at least five other trees as the aircraft descended, before it struck the ground in a steep nose-low attitude 64 m after the initial tree impact. These later impacts tore the right wing and the empennage from the fuselage, which escaped significant impact damage. The left wing, while still attached to the fuselage, had been pushed back at an angle.

The fuselage was lying on its right side, with almost the whole cabin area destroyed by fire which was fed by fuel from the left wing tank. The severity of the fire was sufficient to destroy most of the instrument panel, seats, and cabin fittings.

Detailed examination of the wreckage revealed the following:

1. The flaps were in the up position at impact.
2. The rear cabin door on the right side of the fuselage was open (i.e. folded back against the fuselage) at ground impact. The internal handle for this door, when the door is locked, is stowed flush at the mating join with the forward door section. (This means that the forward door must be opened before the rear door can be unlocked.) The internal handle for the rear door was found in the unlocked position and the top and bottom latches, and their respective striker plates, were undamaged.
3. In the engine compartment, the mixture control link (cable to link arm) was detached from its associated swivel rod end and the mixture control arm on the fuel control unit was in the 'idle cut-off' position. Specialist examination of the mixture control linkage was undertaken.

The results were:

- The maximum thread length engagement of the mixture control link arm into the socket of the swivel end on the mixture control arm was four threads. The swivel end incorporates a safety hole as a guide to confirm the depth of engagement of the link arm. The minimum number of threads to engage deeper than the safety hole was 11 threads.
 - No evidence of stripping of the thread or any mechanical damage consistent with impact damage was found which might have caused the link arm to disengage from the socket of the swivel end.
 - Because of the short length of thread engagement of the link arm into the swivel end, the link arm was able to move inside the socket. This caused yielding and deformation of the threads on the arm and inside the socket until the threads could no longer retain the arm in position.
4. An inspection of the remainder of the wreckage, including a strip examination of the engine, did not reveal any other defect which may have contributed to the accident.

1.8 Medical and pathological information

There was no evidence that the pilot suffered from any medical, physical or psychological condition which may have contributed to the accident.

1.9 Survival aspects

Fire damage to the aircraft prevented a calculation of the impact forces involved when the aircraft struck the ground. The post-impact fire, however, was not survivable.

1.10 Additional information

The last periodic maintenance check on the aircraft was conducted on 6 November 1992. Worksheets from that check showed that a new engine fuel control mixture cable was fitted during the check. No documented evidence was available as to the number of hours the aircraft had flown in the period between the maintenance check and the accident. The aircraft operator estimated that the aircraft had flown about 15 hours in this period. However, the maintenance organisation which conducted the periodic check reported that it received information from the pilot one day before the accident indicating that the aircraft had flown about 70 hours since the check.

It was established that the new cable had been fitted by an aircraft maintenance engineer (AME) under the supervision of a licensed aircraft maintenance engineer (LAME). The AME had been employed part-time (as an AME) since May 1992 and prior to that had been an apprentice for 12 months with another aircraft maintenance organisation. The AME indicated that he had not previously fitted a mixture control cable to an aircraft. The supervising LAME reported that he checked that the cable had been fitted correctly on completion of the task by the AME.

Information was obtained which indicated that in the past the aircraft operator had listed defects on a separate sheet of paper rather than on the maintenance release document. One such list examined appeared to indicate that, prior to the most recent periodic maintenance check, rectification work had been carried out by persons outside the maintenance organisation. Examples of this work included retensioning of the alternator belt and tightening the throttle linkage 'at the butterfly'. No record was found, however, of any work having been performed on the aircraft since the periodic maintenance check, either by the maintenance organisation or any other person.

There was no spring or other device on the mixture control arm to control its position in the event of the cable separating. Due to the weight of the control arm, its natural movement was downwards towards the idle cut-off position.

The rear cabin doors on the right side of the aircraft open under the trailing edge of the wing in the region of the wing flap. To prevent the electrically powered flaps from operating when the doors are open, a microswitch, positioned at the top of the forward door frame, interrupts electrical power to the flap motor whenever this door is open.

2. ANALYSIS

The specialist tests on the mixture control cable link and the mixture control arm clearly showed that they had not been assembled correctly. That the thread length engagement between the two components was only four turns instead of at least 11 appears to indicate a lack of knowledge of the correct procedures for the adjustment of the mixture control linkage on the part of some person(s), the identity of whom was not established. The tests also showed that the two components had become detached before ground impact. Control of the mixture from the cockpit was then lost and, once the control arm moved to the 'idle cut-off position' under its own weight, the pilot was faced with conducting an engine-out landing in difficult terrain.

There was a considerable discrepancy between the position of the aircraft as reported by the pilot in his Mayday call (18 km north-west of Aurukun) and where the wreckage was found—some 44 km north of Aurukun. Also, the aircraft heading when it struck the trees was towards Weipa and not Aurukun, as if the pilot headed towards the nearest airfield when the problem arose. It seems, therefore, that the position given by the pilot was an error, perhaps induced by the pressure of the situation he found himself in.

It would normally be expected for the aircraft flaps to have been operated during the forced landing sequence and for them to have been found in the down position during the wreckage examination. That they were in the up position is readily explained by the inter-relationship between the flap system and the right side cabin doors and the fact that these doors were open at impact. Given the position and operating action of the handle for the rear door, it is most unlikely that this door could have been opened as a result of the aircraft impacting trees. It appears, therefore, that the doors were opened deliberately during flight, although no reason can be advanced as to why this should have been done.

3. CONCLUSIONS

3.1 Findings

1. The pilot was medically fit, suitably licensed, and qualified to undertake the flight.
2. The aircraft had accumulated a total of approximately 3,650 flying hours at the time of the accident.
3. The estimated weight of the aircraft at the time of the accident was 1,480 kg.
4. The centre of gravity position for the aircraft could not be determined.
5. At 1236.18 hours EST, the pilot transmitted a Mayday call, stating that the aircraft engine had failed and that the aircraft was being landed into trees.
6. The aircraft was destroyed by tree impact forces and post-impact fire.
7. The wing flaps were in the up position at ground impact.
8. The rear cabin door on the right side of the fuselage was open at ground impact.
9. The mixture control link (cable to link arm) became detached from its associated swivel rod end during flight, allowing the mixture control arm to move to the 'idle cut-off' position.
10. The aircraft engine failed from fuel starvation.
11. There was no device to prevent the mixture control arm, by virtue of its own weight, moving to the 'idle cut-off' position in the event of the cable separating.
12. The maximum thread length engagement of the mixture control arm into the socket of the swivel end was four threads compared to 11 threads to engage deeper than the safety hole.
13. A list of defects compiled by the operator indicated that, prior to the last periodic maintenance check, rectification work on the aircraft had been carried out by person(s) outside the maintenance organisation.
14. At the last periodic maintenance check, a new mixture control cable was fitted by an AME under the supervision of a LAME.
15. The AME had not previously fitted a mixture control cable to an aircraft.
16. The supervising LAME reported that he checked the correct installation of the new cable.
17. The circumstances surrounding the incorrect adjustment of the mixture control cable were not established.

3.2 Significant Factors

1. The mixture control link (cable to link arm) was not attached correctly to its associated swivel rod end.
2. The mixture control link separated from the swivel rod end during flight.
3. There was no device to prevent the mixture control arm, after the control link had separated, from moving to the 'idle cut-off' position.
4. The mixture control arm moved to the 'idle cut-off' position, causing the engine to fail from fuel starvation.
5. The pilot was forced to land the aircraft in unsuitable terrain.

4. SAFETY ACTION

4.1 Recommendation

For reasons which have been discussed in this report, the mixture control cable became disconnected from the the mixture control lever arm of the fuel control unit.

Occurrence B914/1001 (VH-MNN Jabiru 7 January 1991) details the disconnection of a throttle control cable from the lever arm which resulted in loss of power when the throttle automatically closed. As the result of that occurrence, and a recommendation included in the report, the Civil Aviation Authority issued Airworthiness Advisory Circular (AWI)1-67.

To address the issue of throttle and mixture control lever arms moving to an unsafe position as the result of control cable disconnections, the Bureau of Air Safety Investigation recommends:

That the Civil Aviation Authority, in conjunction with the United States Federal Aviation Administration, implement a requirement that the mixture and throttle lever arms of the fuel control units fitted to the Teledyne Continental Motors IO-520 (and other similar) series engines be modified to ensure that, should a control cable disconnect, the mixture and throttle control levers move automatically to the safe 'full rich' and 'throttle open' positions.

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