LOSS OF CONTROL IN HUDSON

At the conclusion of a survey flight in the Northern Territory, a Lockheed Hudson called the Tennant Creek Flight Service Unit and reported that it was in the circuit area. The aircraft did not land as expected and no further communications were received from it. A search was subsequently carried out, and the wreckage of the aircraft was found two miles west of the aerodrome. All six occupants had been killed and the aircraft destroyed.

The Flight

The aircraft was owned and operated by an aerial survey company and at the time of the accident, was returning from a magnetometer survey flight in an area about 120 miles south-east of Tennant Creek. The aircraft had been carrying out survey flights from Tennant Creek for several weeks.

Before departing on the morning of the accident, the captain of the aircraft submitted a flight plan which showed that the aircraft would be operating in the survey area for 200 minutes. The flight was to be carried out below 5,000 feet and the aircraft's endurance was 400 minutes. The flight plan nominated a SARTIME of 0300 hours G.M.T., 1230 hours local time.

For survey flights of this nature, the usual complement of the aircraft was pilot-in-command, survey navigator and magnetometer operator, but on this particular flight, three additional persons were being carried. A second pilot, who had recently been endorsed on the aircraft, was observing the operation to gain experience in survey work, a Doppler equipment technician was travelling on the aircraft to check the operation of the equipment in the air, and an eleven year old boy was being carried as a passenger at the invitation of the pilot-in-command.

After a daily inspection had been completed, the aircraft departed from Tennant Creek at 0630 hours local time and reached the survey area an hour later. The aircraft commenced survey operations, but at 0750 hours the Doppler equipment became unserviceable, and at 0800 hours, after light rain had been encountered the survey work had to be abandoned. Ten minutes later, the aircraft advised Tennant Creek that it was returning and that its estimated time of arrival was 0910 hours.

At 0907 hours, the aircraft reported 10 miles south of Tennant Creek and the aerodrome weather was passed to the aircraft. At 0914 hours, the aircraft reported that it was in the circuit area and requested the present wind velocity. The Flight Service Officer advised the aircraft that the

wind was 070 degrees at 14 knots, and the aircraft acknowledged the transmission.

The aircraft did not call again and although the Flight Service Officer knew it had not landed, he also knew that on several previous occasions when the aircraft had returned with unserviceable equipment, the crew had carried out lengthy equipment checks before landing. At 0952 hours however, the aerodrome refuelling agent walked into the Flight Service Office and asked what had become of the Hudson, mentioning that he had seen it in the circuit more than half an hour before with the undercarriage down. The refuelling agent said the aircraft had been to the north of the airport, heading west with the undercarriage lowered, as though on a downwind leg for a landing on runway 07.

The aircraft's SARTIME was not due to expire for more than two and a half hours, but the Flight Service Officer, disturbed at the refuelling agent's information, immediately began calling the aircraft and when it failed to reply, declared the Uncertainty Phase. Further attempts were then made to contact the aircraft from both Tennant Creek and adjacent Flight Service Units, but without success. At 1014 hours, the Alert Phase was declared, and attempts were made to obtain aircraft sighting reports from the surrounding area. The airport area was checked from the ground and the pilot of a Cessna aircraft based at Tennant Creek, was requested to carry out an aerial search of the surrounding area. At 1043 hours, the Distress Phase was introduced. Some ten minutes later, the pilot of the Cessna sighted the wreckage of the Hudson two miles west of the threshold of runway 07.

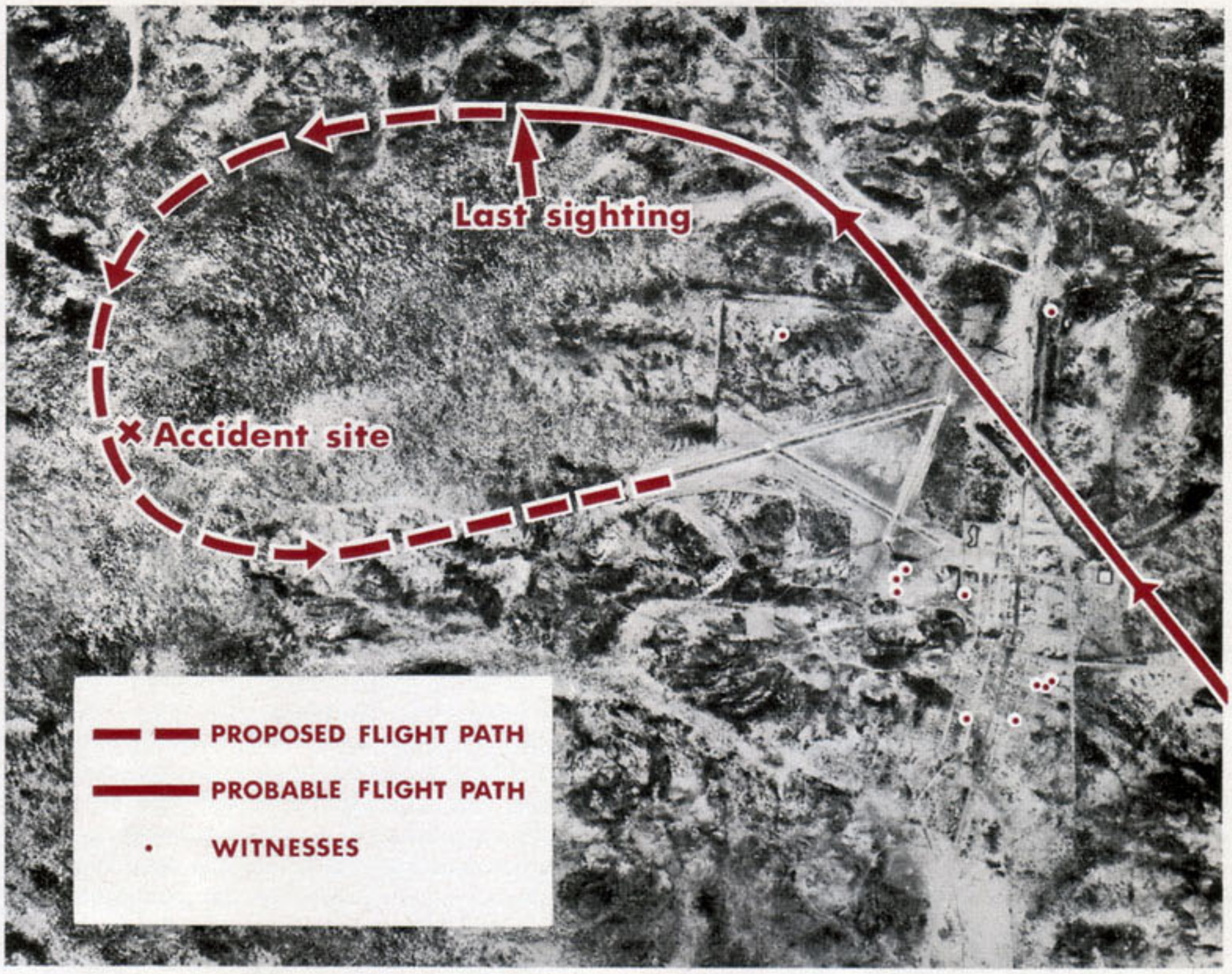
Investigation

The area in which the crash occurred is relatively flat, lightly timbered country, but the crash site itself is screened from the town by low hills. The weather conditions at the time of the accident were fine and warm with a visibility of 20 miles, the wind was 080 degrees at 10 knots, and there was 1/8th of cloud at 10,000 feet.

The aircraft appeared to have struck the ground at low forward speed and all major components of the aircraft were found in the area of impact. There was no evidence of any structural failure, fire or explosion which could have affected the structural integrity of the aircraft in flight. It was established that the undercarriage was lowered and the flaps were retracted at the time of impact. The possibility of an asymmetric flap condition was investigated very thoroughly, but rejected. Both propellers had been rotating at impact, but neither engine appeared to have been delivering significant power. Examination of the engines themselves showed that they had been capable of normal operation up to the time of impact. All four fuel tanks had burst open at impact and their contents spilt, but examination of the fuel system revealed nothing to suggest that fuel would not have been available to the engines. The engine magneto switches were on, selected to the "Both" position. Although the master ignition push-pull switch was on, it was not possible to determine if the switch was in fact in this position at impact. Because of the extensive damage and possible movement at impact, the positions of the throttle mixture and pitch controls could not be established, but the firewall shut-off lever for the starboard engine was in the closed position, and it was evident that it had been moved to this position before impact. This indicated that although the engines were capable of normal operation, some action might have been taken to shut them down immediately before impact.

Because on survey flights, it was necessary for the crew to have access to the nose compartment of the aircraft, neither the co-pilot's seat nor the co-pilot's rudder pedals were installed, and the second pilot was on board the aircraft primarily to observe the operation. The co-pilot's control column was installed however, and some limited control of the aircraft with aileron and elevator, would have been possible by standing or squatting in the co-pilot position.

The most significant finding to emerge from the examination of the wreckage was that one of the duplicated aileron control chains in the pilot's control column was broken in the region of the control wheel sprocket. The breakage had occurred when a link pin of the chain had failed, and there was evidence that the broken link pin could have subsequently jammed the assembly as the control wheel was being rotated. Following further extensive examination and laboratory testing, it was concluded that the failure of the chain and the associated damage to the control column assembly, were not consistent with impact damage, but the investigation could not positively establish



Aerial photograph of Tennant Creek area, showing to wnship, aerodrome, final flight path and accident site.

when the failure had occurred, or what was the sequence of events which led to the separation of the chain. Measurements of the possible control restriction which could have resulted from the failure of the chain showed that fouling could have occurred in two positions, at 17 and 12 degrees from neutral, as the control wheel was being returned from a port-wing-down movement. A flight test in another Hudson was arranged to check the effect that jamming of the controls in these positions would have produced, but it was found that control of the aircraft could be maintained comparatively easily with rudder and elevator.

A load sheet had been completed and signed by the pilot-in-command before the commencement of the flight. Although this sheet contained a number of errors and the aircraft was overloaded to some extent at the time of take-off, the position of the centre of gravity was well within its limits of allowable travel, and it was clear that the load condition of the aircraft had had no bearing on the accident.

There were no witnesses to the accident itself, nor could any be located who had seen or heard the aircraft flying other than normally. A number of witnesses saw the aircraft shortly before the accident and it was evident that, after approaching Tennant Creek from the south-east, the aircraft had passed over the eastern side of the aerodrome at 1,500 feet, lowered the undercarriage, and made a descending turn to the north of the aerodrome to enter a downwind leg for a normal left hand circuit and landing on runway 07. The crash site was consistent with a position on base leg, shortly before the aircraft would have

turned on to final approach. From evidence obtained from various sources, it was concluded that the aircraft had crashed at 0918 hours local time.

Inquiries into the medical history of the pilot-in-command, showed that he had been intermittently in poor health throughout the nine months preceding the accident, and that on several flights some four or five months before the accident, he had suffered symptoms which included restriction of vision and vertigo. Following these occurrences, he had undergone a medical investigation but no diagnosis was reached and he was regarded by the medical specialist who examined him as fit to fly.

Further inquiries revealed that on one occassion six years previously, while the pilot was carrying out a survey flight from Mackay, Queensland, he had told his crew that he was feeling ill and was going to return to Mackay. The navigator had hurried to the cockpit to find the pilot looking very pale and slumped in his seat, and although not a pilot himself, he had taken over control of the aircraft for several minutes until the pilot recovered sufficiently to descend and land. It is believed that the pilot subsequently consulted a doctor in Mackay, and that his complaint was diagnosed as malaria, but this information could not be positively confirmed. Details of this occurrence were not reported to the Department as an air safety incident, nor did the pilot disclose the episode at his next medical examination for the renewal of his licence.

It was found also that, during the month preceding the accident at Tennant Creek, the pilot had experienced headaches, shivering and vomiting and had said that he thought it was a recurrence of the malaria. The pilot had twice consulted a doctor locally but no definite diagnosis had been made, and he had continued to fly in command of the aircraft. The pilot appeared to be in normal health before departing on the flight which ended in the accident.

Analysis

The investigation established that the aircraft had entered the traffic pattern at Tennant Creek for a normal landing in good weather conditions, that the undercarriage had been extended, and that a loss of control then occurred because of something that happened between the time the aircraft entered the downwind leg and when it would have turned on to final approach. The aircraft had subsequently struck the ground in a stalled condition. The normal pre-landing checks were being carried out at the time control was lost and there was evidence that the procedures were interrupted at a point immediately before the first flap extension was made.

Aerial view of the wreckage. The initial point of impact is at the extreme left of the picture.

The pilot was experienced both in general flying and on Hudson aircraft and with him in the aircraft was another pilot who had recently been endorsed on the type and who, it would be reasonable to assume, would be taking a critical interest in the handling of the aircraft.

Although the investigation failed to bring to light any one item which, in itself, suggests a reason for the loss of control, it nevertheless revealed two independent, anomalous situations, which must be considered as possible factors in the sequence of events that led to the loss of control.

Firstly, it was found that one of the duplicated aileron control chains in the pilot's control column assembly had broken and there was evidence that it had temporarily jammed. The damage was believed to be inconsistent with impact damage and consideration was therefore given to the effect of such a situation occurring in flight. Flight and ground tests conducted to simulate such sudden jamming, showed that although the pilot would be temporarily deprived of aileron control, the aircraft could still be controlled to maintain level flight with the elevator and rudder controls alone. The tests could not however, simulate the element of surprise. Similarly, it was not possible to test the reaction of a pilot to circumstances in which he would not only be required to control the aircraft, while it was turning to the left, probably at low airspeed, but would also be required to try and overcome the restriction by exerting considerable force on the control wheel. It was found that the physical force required to free the aileron controls in such a situation, would be well within the capacity of one person. While it could not be conclusively established what overall effect the total situation would have on the control of the aircraft, the test results showed that the very least effect would be a gross distraction of the pilot from his task.

Secondly, the investigation established that the pilot had been intermittently in poor health during the nine months preceding the accident, and that although he had undergone a medical investigation some three months before the accident, no diagnosis was reached. The investigation also established that periods during which the pilot had been ill, could be linked with occurrences in which he had suffered restriction of vision and vertigo in flight. In view of this association, and the fact that the pilot had again been ill in the month before the accident, it was possible that he had suffered a similar experience during the flight that had ended in the accident. On this flight however, such an event in itself should not necessarily have led to an accident, for the other pilot on board the aircraft should have been able to change places with the captain, unless the onset of his symptoms was very rapid and accompanied by a severe deterioration in ability. But even if the pilot-in-command had become incapacitated very suddenly in the control seat, the other pilot should have been able to maintain control of the aircraft despite the limited co-pilot controls, and to discontinue the landing approach, unless this had reached a very critical stage. The position of the wreckage in relation to the duty runway, and the fact that the flaps had not been extended, suggests that the approach had not reached a very critical stage, and that there should have been more than adequate height available to allow the second pilot to safely take over control.

If it had so happened however, that the aileron controls had jammed in the manner discussed after the aircraft entered the traffic pattern of the aerodrome and the captain had become partly or fully incapacitated at about the same time, it is most unlikely that safe control of the aircraft could have been maintained from the co-pilot position. Indeed, in such an unfortunate and unusual combination of circumstances, a complete loss of control could easily have resulted. In the circumstances of this accident, remote though the chances may seem, the possibility that such a coincidence of the two factors did occur, is one which cannot be disregarded.

Cause

The cause of this accident was a loss of control of the aircraft, and although the evidence available does not permit the reason for the loss of control to be determined, the possibility cannot be eliminated that the pilot suffered an impairment of ability and, coincidentally, was deprived temporarily of aileron control.