

Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

**AVIATION INVESTIGATION REPORT
A06W0139**



LOSS OF CONTROL AND COLLISION WITH TERRAIN

**NORTH-WRIGHT AIRWAYS LTD.
CESSNA 337C SKYMASTER C-FWHP
FORT GOOD HOPE, NORTHWEST TERRITORIES, 23 nm E
16 AUGUST 2006**

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Aviation Investigation Report

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North-Wright Airways Ltd.

Cessna 337C Skymaster C-FWHP

Fort Good Hope, Northwest Territories, 23 nm E

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Report Number A06W0139

Summary

The North-Wright Airways Ltd. Cessna 337C aircraft (registration C-FWHP, serial number 337-0895) was operating in accordance with Section 703 of the *Canadian Aviation Regulations* as NWL316 and had departed Fort Good Hope, Northwest Territories, at 1250 mountain daylight time on a visual flight rules flight to Norman Wells, Northwest Territories. At 1435, the company reported the aircraft overdue to the Norman Wells flight service station, and radio and aerial searches were initiated. The aircraft wreckage was located at 1616, approximately 23 nautical miles (nm) east of Fort Good Hope. The pilot and five passengers sustained fatal injuries and the aircraft was destroyed. There was no post-impact fire.

Ce rapport est également disponible en français.

Other Factual Information

The aircraft was manufactured in 1968 and had been registered to the company since 1998. It could carry five passengers. Records indicate that the aircraft had been maintained in accordance with existing regulations. It was used for daytime and nighttime visual flight rules (VFR) operations. The flight was dispatched under Section 703 of the *Canadian Aviation Regulations* (CARs) and an operational flight plan.

The aircraft was equipped with a panel-mounted Garmin GNC 250XL global positioning system (GPS) receiver. This GPS unit has an altitude field that

... can display either the present altitude, minimum safe altitude (MSA) or en route safe altitude (ESA). MSA is the recommended minimum altitude within a 10-mile radius of (the aircraft's) present position. ESA is the recommended minimum altitude within a 10-mile radius of an active route. ... MSA and ESA altitudes are calculated from information contained in the database and generally include mountains, buildings and other permanent features.¹

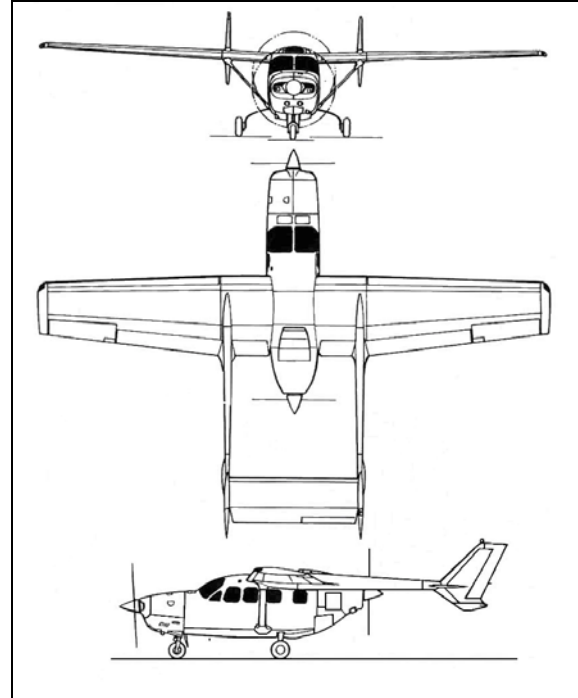


Figure 1. Cessna 337 Skymaster

The database card in this unit was for VFR operations in America. The effective date was from 25 November 2004 to 22 December 2004. It could not be determined if the GPS or any of its function were used during the occurrence flight. This model of GPS did not store track point data that could be used in the investigation.

The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder, and neither was required by regulation. Aircraft typically used in CARs Section 703 operations are not fitted at the time of manufacture with the electrical infrastructure required to support an FDR. The installation of FDRs in this category of aircraft would require extensive system upgrades.

An alternative to an FDR can be seen in GPS units that possess non-volatile memory capable of recording track point data and can be used to reconstruct some aspects of the flight. Cockpit video digital recorder (CVDR) technology also exists that can record the instrument panel and the view forward from an aircraft in flight. A GPS unit capable of recording data or with a functioning CVDR would have allowed investigators to have a better understanding of the circumstances that led to the accident.

¹ Garmin Corporation, *GNC 250XL – Pilot's Guide and Reference*, Kansas, 1997, p. 18.

The aircraft was not equipped with a terrain awareness warning system (TAWS), nor was it required to be so equipped.

The pilot held a commercial pilot licence (aeroplane) and was endorsed with a multi-engine rating and Group 1 instrument rating in accordance with existing regulations. The pilot had been employed by the company for 2 ½ years. During this time, he had been based in Fort Good Hope for a six-month period. The pilot had accumulated a total of 1723 hours of flight time. An initial VFR pilot competency check on the Cessna 337C was completed on 12 May 2006, and he had accumulated 25 hours on the aircraft at the time of the occurrence. The pilot had also completed his annual instrument proficiency training on the Beech 99 on 29 March 2006. Additionally, the pilot had completed controlled flight into terrain (CFIT) training on 01 May 2006.

Information provided by Environment Canada indicated that, at the time of the occurrence, the region of Fort Good Hope to Norman Wells was under the influence of a low pressure system and associated cold front north of Fort Good Hope. At the time of the occurrence, pilot reports indicated cloud ceilings in the Fort Good Hope area to be around 1500 feet above sea level (asl), while the Norman Wells weather station reported light rain with scattered clouds at 1000 feet asl throughout the afternoon. Convective activity was reported to have been minimal. There were some isolated convective cells developing near 1600 mountain daylight time² to the southwest and southeast of Norman Wells.

Weather conditions reported at Norman Wells at 1300 were as follows: winds 290° true (T) at 4 knots, visibility 30 statute miles, intermittent light rain. Clouds were few at 1000 feet above ground level (agl), scattered at 3000 feet agl and overcast at 9000 feet agl. The temperature was 14.6°C and the dew point was 11.4°C. The cloud composition was 1/8 stratus, 4/8 stratocumulus and 3/8 altocumulus.

The forecast winds aloft at Norman Wells at 3000 feet asl were 310°T at 26 knots.

The pilot had refuelled the aircraft while in Norman Wells earlier in the day. At 1140, he departed Norman Wells on a VFR repositioning flight to Fort Good Hope. The flight was conducted at 4500 feet asl. However, before reaching Fort Good Hope, the pilot had to descend to 1700 feet asl in order to remain VFR.

CARs Section 602.115
VFR – Uncontrolled Airspace

No person shall operate an aircraft in VFR flight within uncontrolled airspace unless the aircraft is operated with visual reference to the surface.

Where the aircraft is operated at or above 1000 agl, during the day, flight visibility is to be not less than 1 mile. The distance of the aircraft from cloud is not less than 500 feet vertically and 2000 feet horizontally.

Where the aircraft is not a helicopter and is operated at less than 1000 agl, during the day, flight visibility is to be not less than 2 miles and the aircraft is operated clear of cloud.

² All times are mountain daylight time (Coordinated Universal Time minus six hours).

In Fort Good Hope, five passengers boarded the aircraft and their baggage was loaded. The flight departed at approximately 1250 and the pilot reported 5 nm out and levelling off at 3500 feet asl. Shortly thereafter, the pilot encountered rain, but did not indicate any deviations or concerns about the weather or the aircraft. CARs require that pilots maintain visual references with the surface when operating VFR.

At 1345, the company initiated its overdue aircraft response, which included a radio communication search, followed by the dispatching of company aircraft at 1430. The wreckage site was located at 1616 on the southern slope of Mount Effie, 23 nm southeast of Fort Good Hope (see Figure 2).

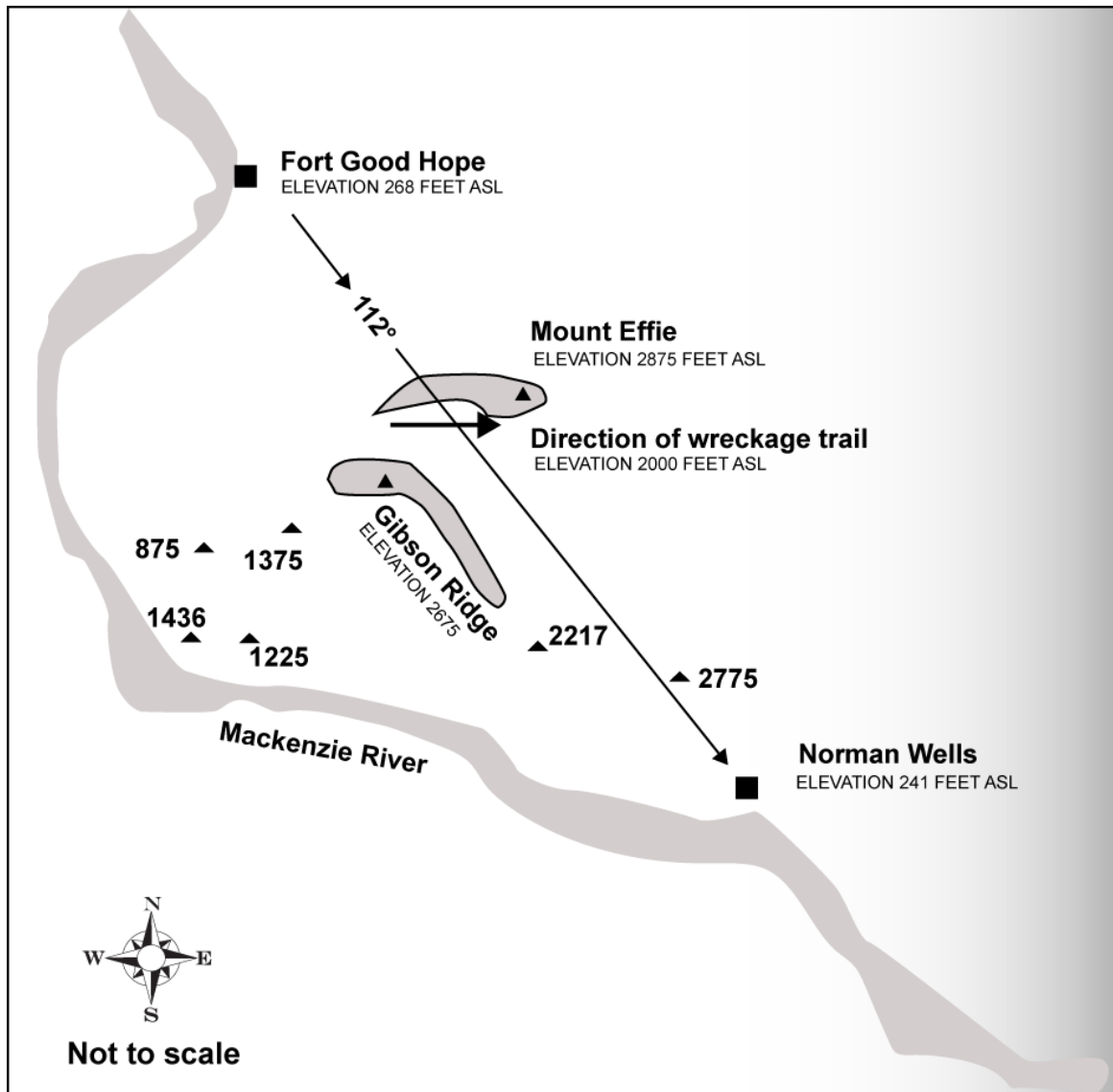


Figure 2. Fort Good Hope-Norman Wells geographic area

There are numerous mountains in the area. Mount Effie is orientated in an east-west axis, perpendicular to the direct-line route from Fort Good Hope to Norman Wells. This formation is approximately 11 nm long and 3 nm wide. The feature has two peaks, one measuring 2875 feet

asl on the east side and the other measuring 2275 feet asl on the west side. The local VFR navigational chart (VNC) indicates that the maximum elevation figure (MEF) where Mount Effie is located is 3300 feet asl. The MEF is based on information available concerning the highest known feature in that area plus suitable factors to allow for inaccuracy and incompleteness of the topographical height information.

The wreckage site was located about 3 nm east of the direct route from Fort Good Hope to Norman Wells. The 60-foot wreckage trail runs parallel to the southern slope of Mount Effie, on a 50° magnetic (M) heading, at an elevation of 2000 feet asl. The aircraft descended in a nose-up attitude of approximately 20° resulting in the rear propeller striking the ground first. The bottom of the fuselage then absorbed the bulk of the impact force, resulting in the passenger cabin being compressed to two feet in height. The front propeller was broken off at the engine flange. The propeller tips had sustained damage that was consistent with power at the time of contact. Both engines were producing power at the time the occurrence.

In 1997, the United States Federal Aviation Administration (FAA), as part of its Flight 2000 program, initiated the Capstone Program in Alaska. This three-phase program was designed to address the high rate of small aircraft accidents in Alaska. Phase 1 was implemented in the Yukon-Kuskokwim Delta region. The following description explains how the technology used during this program assisted in reducing the accident rate.

Accidents associated with navigation are addressed by showing pilots their location on a moving map on a multi-function display (MFD). The location of the aircraft is derived from GPS, and the map is stored as part of an onboard navigation database. En route CFIT is addressed using terrain elevations from the database. Nearby terrain is compared to the aircraft's altitude and GPS location and then colour-coded on the MFD (yellow if close in altitude, red if immediately hazardous). The GPS unit also has programmable functions to aid en route flight planning and may reduce pilot navigation workload.³

The Capstone final report indicated that, from 2000 to 2004, it was estimated that 44 per cent of preventable navigation and CFIT accidents were avoided as a result of the implementation of the Capstone Program.⁴

Following a 1993 accident in Sandy Lake, Ontario, in which all seven occupants of a Hawker Siddeley HS-748 were fatally injured, the TSB issued aviation investigation report A93H0023, which included a recommendation (A95-10). The Board recommended that the Department of Transport require the installation of a ground proximity warning system (GPWS) on all turbine-powered instrument flight rules-approved commuter and airline aircraft capable of carrying 10 or more passengers. Transport Canada, under the mandate of its Flight 2005 program, has developed regulations and standards that will require the installation and operation of TAWS equipment for commercial air taxi, commuter and airline operations to prevent CFIT accidents. Although still under review, the new TAWS regulations will be

³ Aviation Technology Division, *The Impact of Capstone Phase 1 Program – Final Report*, Anchorage, University of Alaska Anchorage, 2005, p. 10.

⁴ *ibid*, p. 56.

effective for newly manufactured aeroplanes on the date the regulations are promulgated. All aeroplanes will have to be in compliance two years after the date the regulations are promulgated.

The requirement for TAWS equipment in Canada will be based on the type of commercial operation and the number of passenger seats. Class B TAWS will be required for aircraft involved in air taxi operations configured for six or more passenger seats and for commuter operations with six to nine passenger seats. Aircraft operating under day VFR operations will not be required to be TAWS-equipped because of incompatibilities between the TAWS alerting envelopes and the minimum altitudes permitted by regulations for en route obstacle clearance.⁵

Analysis

The weather conditions in the area of Fort Good Hope to Norman Wells and the pilot's previous experience on the recent flight to Fort Good Hope indicate that he probably encountered instrument meteorological conditions (IMC) shortly after departing Fort Good Hope. It could not be determined whether the aircraft's departure from 3500 feet asl was a result of the pilot's actions or that of external environmental elements. Before reaching 2000 feet asl, the aircraft entered a nose-up attitude resulting in a loss of airspeed. The short wreckage trail, combined with the high vertical damage and flight path angle through the trees, is consistent with the aircraft being in an aerodynamic stall.

When the new regulations come in force, the Cessna 337 will not be required to be equipped with TAWS equipment because it carries less than six passengers and, in this case, the aircraft was being operated in day VFR conditions. In this occurrence, TAWS equipment could have provided additional information as to the aircraft's vertical and lateral position relative to surrounding terrain.

The following TSB Engineering Laboratory report was completed:

LP 083/2006 - Exhaust Temperature Analysis

This report is available from the Transportation Safety Board of Canada upon request.

Finding as to Causes and Contributing Factors

1. For undetermined reasons, the aircraft descended out of its en route altitude, entered an aerodynamic stall and struck the ground.

Other Findings

1. Investigators were not able to determine why the aircraft departed from controlled flight. The aircraft was not fitted with a flight recording device, which may have allowed investigators to reconstruct the circumstances that led to the accident.

⁵ Transport Canada, *Commercial and Business Aviation Advisory Circular 0236*, 2005, p. 8.

2. The aircraft was not equipped with terrain awareness warning system equipment, nor was it required to be so equipped. That equipment could have provided additional information as to the aircraft's vertical and lateral position relative to surrounding terrain.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 10 July 2007.

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