

AVIATION INVESTIGATION REPORT

A01W0239

LOSS OF CONTROL AFTER TAKE-OFF

BEECH UC45-J N45N

SWAN LAKE AIRSTRIP, YUKON TERRITORY

13 SEPTEMBER 2001

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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### *Summary*

The privately owned and operated Beech UC45-J, a US Navy derivative of the Beech 18 series, serial number 43-51312, was flying out of an outfitter's camp located near Swan Lake, Yukon Territory. The aircraft departed the clay-and-gravel strip for Mayo with one pilot, two passengers, luggage, and a reported load of 800 pounds of moose and caribou meat. The aircraft accelerated down the runway in a normal fashion, with the tail becoming airborne first. The aircraft left the surface of the runway and began a steep climb, followed by a yaw and bank to the left. The aircraft entered the Pleasant Creek valley off the end of the runway in a near-vertical, nose-down attitude. An explosion occurred, followed by a plume of smoke. Two persons immediately attempted to rescue the pilot and the passengers but discovered the aircraft partly submerged in the creek and engulfed in flames from the post-crash fire. There were no survivors.

*Ce rapport est également disponible en français.*

## *Other Factual Information*

Records indicate that the aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. Because the aircraft was almost completely destroyed by the impact forces and the fire, it could not be determined whether any failure or system malfunction contributed to this accident. No failures or system malfunctions were identified.

The Swan Lake airstrip is in a valley with few obstacles at either end. The strip is approximately 2400 feet above sea level (asl), 2300 feet long, and 80 feet wide.<sup>1</sup> The orientation of the strip is 210/030° magnetic. The surface was a relatively firm mixture of compacted clay and gravel. The centre 30 feet of the runway width was clear of growth. Sparse weeds, 20 to 30 inches high, were growing on the remainder of the width. There were some undulations in the strip 1500 feet from the threshold of Runway 21.

Weather at the airstrip at the time of the occurrence was good. There were few clouds, the wind was down Runway 21 at 5 knots, and the temperature was 17°C. This information was consistent with meteorological data gathered from Mayo and Faro, each 80 nautical miles (nm) from the accident site.

The pilot had purchased the aircraft approximately 18 months before the accident. He had flown about 200 hours on the aircraft and had a total of 700 hours' flight time. The pilot was licensed according to US Federal Aviation Administration (FAA) regulations and obtained a Canadian foreign licence validation certificate for a private pilot—airplane from the Transport Canada office in Whitehorse on 11 September 2001. The pilot completed five arrivals and four departures out of the Swan Lake airstrip in the previous nine days. When taking off from this airstrip, the pilot used 15° of flaps and lifted off at 70 to 80 mph; this was consistent with what was seen of the accident flight.

The pilot and one passenger occupied the front two seats; the second passenger faced aft directly behind the co-pilot seat. Personal luggage was secured to the other aft-facing seat beside the rear passenger. The meat was loaded onto a plastic tarpaulin that covered a sheet of plywood resting on the nylon carpet runner. The meat was bundled together in a pile about three feet long. The meat was not weighed before take-off, but was estimated to be approximately 800 pounds. Two straps were placed longitudinally on top of the meat and secured to the support structure of the aft-facing passenger seats and to some rings in the aft cargo compartment. The aircraft was not equipped with any cargo tie-down rings or pins near where the meat was loaded.

The weight and balance of the aircraft was considered by the pilot, but no calculations were found. The investigation determined that the aircraft weighed approximately 9000 pounds at take-off, with a centre of gravity (C of G) of 120.7 inches. The aircraft was equipped with a supplemental type certificate modification allowing a gross take-off weight of 10 100 pounds. At 9000 pounds, the C of G envelope for the aircraft is from 108.6 inches to 120.5 inches.

Flight test data from the manufacturer for a Beech E18S (basically the same as the occurrence aircraft) indicated that a C of G of 2.3 inches aft of the aft datum produced excessive roll at the stall and a 3-mph increase in the stall speed. Placing the meat in the rear of the cabin would produce a C of G of 126.9 inches, which is 6.4 inches beyond the designed aft limit.

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<sup>1</sup> Units are consistent with official manuals, documents, and instructions used by or issued to the crew.

The aircraft struck the ground 60 feet from the edge of Pleasant Creek, approximately 500 feet from the departure end of the runway, in a valley that is 100 feet lower than the elevation of the air strip. Significant impact marks were found on only one large tree. The marks, coupled with the ground scars on the bank of the creek, were consistent with a near-vertical flight path at impact, with the top of the aircraft facing back toward the airstrip. Both engines detached from the aircraft, came to rest in the creek, and were not fire damaged. Several propeller blades detached from the hubs, and all examined blades exhibited chord-wise scratching, leading-edge damage, and twisting consistent with considerable power being produced at the time of impact.

## *Analysis*

The meat was placed on a plastic tarp, probably slippery, and not adequately restrained. Acceleration forces and jostling of the load on the uneven airstrip most likely caused the meat to shift rearward during the later stages of the take-off roll and the initial climb. This would place the C of G well beyond the aft limit, and the aircraft would pitch up uncontrollably after becoming airborne.

The high pitch attitude would have led to an aerodynamic stall. With the engines at take-off power, the slipstream from the propellers would cause the aircraft to roll and yaw to the left as described. The pilot's inability to recover the aircraft from the ensuing dive can be attributed to the low altitude at which the event took place and the apparent lack of pitch control.

## *Findings as to Causes and Contributing Factors*

1. The meat was loaded into the aircraft on a slippery surface and not adequately secured.
2. The manner in which the meat was loaded and secured most likely allowed the load to shift to the rear of the cabin during take-off. This rearward shift resulted in the loss of pitch control and an aerodynamic stall from which the pilot could not recover.

## *Other Findings*

1. The aircraft's C of G was most likely at or aft of the aft limit before engine start.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 01 May 2002.*