Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

17803 - 106A Avenue
Edmonton, Alberta
T5S 1V8

05 February 2007

Alberta Justice
Office of the Chief Medical Examiner for Alberta
7007 - 116 Street NW
Edmonton, Alberta
T6H 5R8

A05W0148

Attention: Medical Records Dept. - Sylvia Sheppard

Dear Ms Sheppard:

Reference: Aviation Accident
VariEze N914VE
Lethbridge Airport, Alberta
20 July 2005

As you are aware, Transportation Safety Board (TSB) investigators attended the site of this accident. A review of the details gathered at the site, as well as information resulting from subsequent follow-up work, indicates that a TSB investigation of the accident is not likely to provide new information that will lead to a reduction of risk to persons, property, or the environment.

The following factual information gathered by the TSB is provided to assist you.

The aircraft, registration N914VE, had departed runway 12 at the Lethbridge airport on a visual flight rules (VFR) flight to Airdrie, Alberta. When the aircraft was outbound on the downwind leg for runway 12, it was observed to be trailing smoke. Immediately thereafter the pilot advised the Lethbridge Flight Service Station (FSS) that the aircraft was on fire, and he attempted to force-land the aircraft in a grain field to the northwest of the airport. After touchdown the aircraft struck the shoulder of a gravel road, bounced, and came to rest inverted on the road. An intense post-impact fire ensued, and the pilot, the sole occupant, was fatally injured.

The pilot intended to meet his wife, who was visiting her brother in Airdrie, and then fly to Vernon, British Columbia. The pilot was an employee of Rotax Aircraft Engines and the purpose of the trip to Vernon was to consult with representatives of Rotech Research Canada

regarding the new engine installation in the aircraft. He held a medically valid private pilot license (aeroplane), issued in the United States, and endorsed for single and multi engine land. His last available record of flight time, recorded on an Federal Aviation Administration (FAA) document dated August 1999, was 275 hours. No personal log books were recovered for examination, and the pilot's total flying time on the date of the accident was not determined. The pilot also held a U. S. FAA Airframe and Power plant (A & P) aircraft maintenance license.

Figure 1: Photo of VariEze

The aircraft, known as a VariEze, was originally constructed in 1982 and was registered in the United States under the Experimental category, approved for amateur built operations. An amateur-built aircraft is defined as an aircraft in which the major portion of the aircraft has been fabricated and assembled by persons who undertook the construction project solely for their own education or recreation. The VariEze is a Burt Rutan design and the airframe is primarily composite (fibreglass) construction. The design is somewhat unconventional in that it utilizes a canard wing at the front of the fuselage to control pitch attitude, and a "pusher" engine mounted at the rear of the fuselage (see Figure 1). The aircraft is fitted with fixed main gear and a retractable nose wheel. The nose gear may be retracted in the air for optimum performance, as well as on the ground to provide nose-down parking.

FAA records indicated the pilot had purchased the aircraft in June of 2003. The aircraft had been recently modified with the installation of a turbocharged, liquid-cooled Rotax 914 UL-2 engine (sn V9144874) which replaced the original Lycoming O-235 engine. This was reportedly the only VariEze currently flying with this engine configuration. In addition to the engine installation being unique to this model of aircraft, the engine itself was also highly modified, with the addition of an intercooler on the induction system and higher compression cylinders and pistons.

The *VariEze Owner's Manual* states that a major repair or alteration of the VariEze requires re licensing and issuance of a new airworthiness certificate and operating limitations. The original Special Airworthiness Certificate that was issued to the aircraft specified that no changes could be made without FAA notification. The engine change had not been reported to the FAA. Had the engine change been reported as required by regulation, the FAA would of had an opportunity to review the change and to conduct an audit of the installation. The aircraft had also been modified with the installation of a NAVMAN Fuel 2100 computerized fuel flow monitoring system that indicated the amount of fuel being consumed by the engine. Information provided by NAVMAN revealed the Fuel 2100 system is designed for marine applications, and not for use in aircraft. Current regulations do not address the use of non-aviation components in critical systems in amateur-built aircraft.

The pilot had arrived in Lethbridge at 1358 mountain daylight time (MDT)[1], following a flight from Rapid City, North Dakota. A total of 39 litres of 100LL was added to the aircraft before departure. The pilot had difficulty starting the aircraft prior to departure, and he deplaned and hand-propped the engine several times before a successful start was achieved. No pre-take off runup was observed. The aircraft took off on runway 12 at 1534 (see Figure 2). Bystanders described the take-off, the initial climb, and the left turn to the downwind leg of the airport circuit as normal. When the aircraft was approximately 1000 feet above ground and outbound on the downwind leg for runway 12 it was observed to be trailing smoke. The intensity of the smoke increased rapidly as the aircraft continued on the downwind leg and approximately one minute and twenty seconds after take-off the pilot advised the Lethbridge FSS that the aircraft was on fire. The aircraft was then observed to turn left, as if to position on a left base for runway 12, and dive rapidly toward the ground. The aircraft continued on an extended base leg, past the centre line of runway 12, and force-landed in a grain field, immediately adjacent to a secondary gravel road.

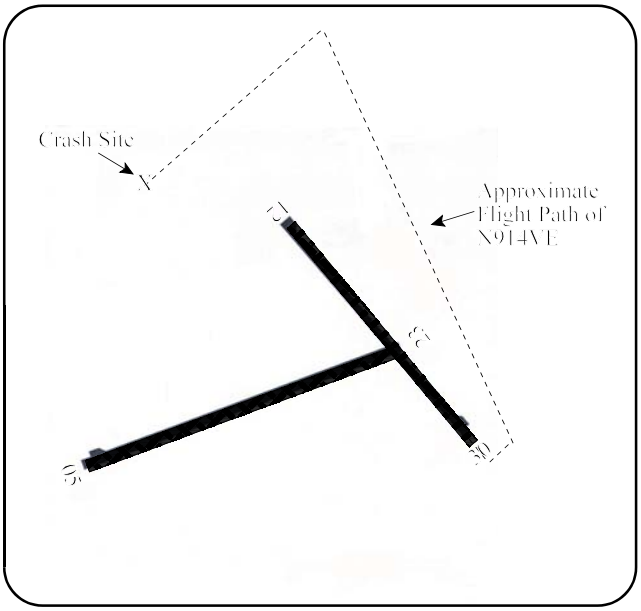

Figure 2: Flight path

The aircraft nosed over after touchdown, struck the shoulder of the road, bounced, and came to rest inverted (see Figure 3). There was an explosion at impact and the aircraft was destroyed by an intense post-impact fire. The accident occurred at 1536, and the accident site was located approximately five-eighths of a mile to the northwest of the threshold of runway 12. The fatally injured pilot was found in the front cockpit of the aircraft. A latched lap-belt was found in the wreckage. Initial information from Alberta Medical Examiner's office indicated the cause of death was the thermal effects of fire.


Figure 3: Wreckage trail

Airport personnel arrived at the site within four minutes of the accident. The fuselage was engulfed in flame and they were unable to extinguish the fire with hand-held fire extinguishers. The Lethbridge Fire Department responded to the accident at 1539 and arrived on scene with a pumper truck, an ambulance, and a tanker truck at 1543. The multiple small fires were

[1] All times are MDT (Coordinated Universal Time minus six hours) unless otherwise noted.

extinguished within 10 to 15 minutes. The aircraft was fitted with an emergency locator transmitter (ELT). The ELT did not activate at impact and was destroyed by the post-impact fire.

Examination of the aircraft, the occurrence site, and the wreckage trail showed that the aircraft struck the field on a heading of 214° Magnetic (M). The aircraft had struck a fence post prior to impact. A swath through the 24 to 30-inch-high grain crop indicated the aircraft touched down in a wings and nose level attitude. The nose gear was in the retracted position at impact. The left wing detached when the aircraft struck the shoulder of the road, which may have resulted in fuel being released from the left wing fuel tank. The inboard section of the left wing and the left side of the fuselage sustained extreme post-impact fire damage.

Field examination of the engine indicated an in-flight fire had developed in the engine compartment. This was consistent with witness observations. Although the engine had torn away from the airframe during the impact sequence and had come to rest in an area that was not subjected to the post-impact fire, it displayed evidence of severe fire damage. The ignition module, dual carburettors, and fuel pressure regulator were partially melted and heat deformed. The carburettors and fuel pressure regulator were manufactured of an aluminum alloy which has a melting point of 538 to 593°C. The dual carburettors and the fuel pressure regulator were recovered from the wreckage and submitted to the TSB Engineering Branch for examination. No failures were observed that might have caused them to be a contributing factor in the fire that occurred prior to the aircraft impacting the ground.

A piece of detached, heat-damaged tubing, complete with clamp and remnants of a burned rubber hose, was recovered from the wreckage trail and submitted to the TSB Engineering Branch to determine if it was from the fuel pressure regulator, one of the carburettors or another component in the fuel system. Examination of the fracture surface of the fitting did not identify any signs of a progressive failure. Visual and dimensional comparison of the fitting indicated it was the inlet post of a NAVMAN fuel flow transducer (see figures 4 and 5).

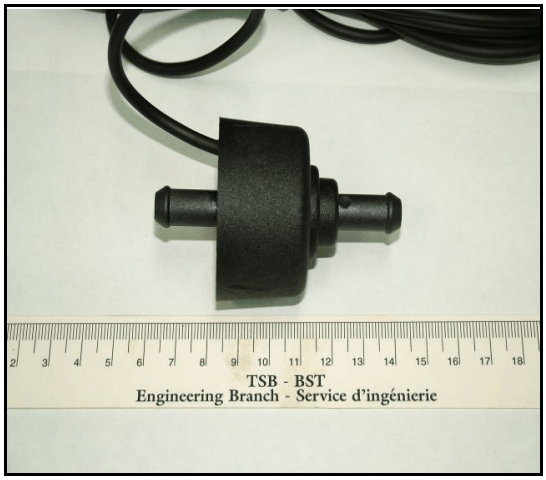

Figure 4: Exemplar NAVMAN Fuel Flow Transducer

Figure 5: Recovered Inlet Post of Fuel Flow Transducer compared to Exemplar

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Since only this small part of the fuel flow transducer was recovered, it could not be determined where it had been mounted in the aircraft, or if it was clearly a factor in the in-flight fire. The NAVMAN installation instructions state that the fuel flow transducer must be installed after the main fuel filter. In this aircraft, the main fuel filter was mounted on the forward side of the firewall, immediately adjacent to where the main fuel line entered the engine compartment, and installing the transducer after the main fuel filter would have placed it in the engine compartment. As well, flow transducers used in aviation applications are usually mounted in the engine compartment. The transducer has a published maximum operating temperature of 50°C and a component failure temperature of 509°C. The transducer, including the outer casing, is manufactured from a composite glass FORTRON material. Fuel flow transducers used in aircraft applications normally have housings made of stainless steel. The engine compartment would see temperatures of several hundred degrees Celsius during normal operation, and if the fuel flow transducer was mounted in the engine compartment it could have been exposed to temperatures that exceeded its maximum designed environmental temperature range.

The aircraft was fitted with two wing fuel tanks, each with a capacity of approximately 12 US gallons, and one auxiliary tank with a capacity of 18 US gallons. The auxiliary tank had been installed in the rear cockpit, and was held in place with crisscrossed straps that were looped through seat-belt rings. It was manufactured from marine-grade plastic, and was intended for a marine application. The tank was plumbed directly to the fuel selector valve, in that way bypassing a smaller fuselage tank that was part of the original fuel system. The auxiliary tank was found inverted and severely fire damaged, under the main fuselage.

The airframe and engine were fire damaged to the extent that no component testing or leak checks could be accomplished. While the occurrence is consistent with the aircraft having sustained a fuel fed in-flight engine fire, the reason for the fire was not determined.

A standard emergency procedure to deal with an in-flight engine fire in a single engine aircraft is to close the throttle and select the mixture control to the idle cut-off position, place the fuel selector and boost pump switches in the OFF positions, place the ignition switches in the OFF positions, and perform an engine out landing in the most suitable available area. If the fire does not extinguish quickly, a pilot may elect to dive the aircraft in an effort to find an airspeed that will provide an incombustible fuel / air mixture. The *VariEze Owner's Manual* states that in the event of an in-flight fire, "determine the cause: if electrical, all electrical power off; if fuel, fuel off and electrical power off. Execute a precautionary landing as soon as possible." Post-accident examination of the cockpit determined that the fuel selector handle was in the vertical position, which would indicate it was selected to the auxiliary fuselage tank, and the fuel boost pump switches and magneto switches were in the ON positions at impact. The aircraft was not fitted with an engine fire extinguisher, and was not required to be fitted with an engine fire extinguisher system under current regulation.

The weather was suitable for VFR flight and weather was not considered a factor in the occurrence. The sky conditions were near clear and the surface winds were from 120°M at 10 knots.

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The following Engineering Branch report was completed:

LP 087/2005 - Fuel Pressure Regulator Fitting

I hope the foregoing information is of assistance. If the TSB can be of any further help in this matter, then please do not hesitate to contact the Investigator-in-Charge; Mr. Bill Kemp @ (780) 495-2003.

Yours truly,

ORIGINAL SIGNED BY JON LEE

Mr. J. R. (Jon) Lee
Regional Manager
TSB Air - Western Region
Telephone: (780) 495-3866
Facsimile: (780) 495-2079

Enclosure(s)