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622-A050024-1
825-A05W0148

14 December 2005

Mr. Merlin Preuss
Director General, Civil Aviation
Transport Canada
330 Sparks Street
Place de Ville
Tower C, 5th Floor, Area A
Ottawa, Ontario
K1A 0N8

Re: AVIATION SAFETY INFORMATION LETTER A050024-1 (A05W0148)
Use of Non-aircraft Parts in Critical Systems in Amateur Built Aircraft

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Dear Mr Preuss,

On 20 July 2005, an amateur built VariEze, registration N914VE, departed runway 12 at the Lethbridge airport on a visual flight rules (VFR) flight to Airdrie, Alberta. The aircraft was observed to be trailing smoke as it departed on the downwind leg for runway 12, and approximately one minute and twenty seconds after take-off the pilot advised the Lethbridge Flight Service Station (FSS) that the aircraft was on fire. The pilot subsequently attempted to force-land in a grain field approximately five-eights of a mile to the northwest of the airport. After touchdown the aircraft nosed over, struck the shoulder of a secondary road, and came to rest inverted on the road. An intense post-impact fire ensued and the pilot, the sole occupant, sustained fatal injuries. (TSB Class 5 occurrence A05W0148 refers).

The aircraft had been recently modified with the installation of a turbocharged, liquid-cooled Rotax 914 UL-2 pusher engine (sn V9144874) which replaced the original Lycoming O-235 engine. This was reportedly the only VariEze currently flying with this engine configuration. Post-impact examination of the airframe and engine indicated the aircraft had sustained an intense, in-flight engine fire. This was consistent with witness observations. The short duration of the flight and degree of in-flight fire damage to the engine and cowlings indicated the fire was fuel-fed from within the engine compartment.

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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. A major repair or alteration to an amateur built aircraft requires re-licensing and issuance of a new airworthiness certificate and operating limitations. Although the original Special Airworthiness Certificate that was issued to the aircraft specified that no changes could be made without FAA notification, the recent modifications had not been reported to the Federal Aviation Administration (FAA).

A piece of detached, heat-damaged tubing, complete with clamp and remnants of a burned rubber hose, was recovered from an unburned area of the wreckage trail. The tubing was submitted to the TSB Engineering Branch to determine if it was a fuel system component (see Figure 1) and the mode of failure. Examination of the fracture surface of the fitting did not identify any signs of a progressive failure; however, the fracture surface displayed fire damage. As the tubing, clamp, and hose were recovered from an area of the wreckage trail that was not exposed to the post-impact fire, the fire damage likely occurred prior to impact (see Figure 2).

Visual and dimensional comparison of the tube fragment indicated it was the inlet post of a NAVMAN fuel flow transducer (see Figures 3 and 4). Information provided by NAVMAN revealed the fuel flow transducer was designed for marine applications, and not for use in aircraft. At present there is no FAA or Transport Canada (TC) regulation that precludes the installation of non-aviation parts in critical systems in amateur built aircraft.

The major portion of the fuel flow transducer was not recovered. Due to the extent of fire and impact damage, the precise location of the transducer was not determined. The engine fuel

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system utilized a fuel pressure regulator that bypassed surplus fuel back to the fuel tanks; therefore the transducer would most likely have been mounted between the fuel pressure regulator and the carburetors within the engine compartment, so as to accurately record the amount of fuel actually being consumed. The transducer was designed to be mounted on the suction side of a fuel pump, rather than the pressure side. It was manufactured from a composite glass FORTRON material. It had a published maximum operating temperature of 50°C and a component failure temperature of 509°C. Fuel flow transducers used in aircraft applications are normally mounted within the engine compartment, and transducer housings are usually made of stainless steel. The engine compartment would see temperatures of several hundred degrees Celsius during normal operation, particularly near the turbo-charger, and if the transducer was mounted in the engine compartment it could have been exposed to temperatures that exceeded its maximum designed environmental temperature range.

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 exact reason for the fire could not be determined.

There is a potential risk related to the use of non-aviation components in critical systems in amateur built aircraft. Failure of a critical fuel system component like a non-aviation fuel flow transducer within an aircraft engine compartment could result in a pressure-fed fuel leak which, if ignited, would generate an intense in-flight engine fire. Builders must consider the application, environmental exposure, and consequence of component failure when installing components that are not produced under a production certificate, a technical standard order (TSO) or a parts manufacturer approval, on an amateur built aircraft. While investigators were unable to directly link the origin of the in-flight fire to the marine fuel flow transducer in this case, there may be other situations where the use of non-aviation parts in critical systems present an on-going risk in the amateur built aviation community.

The foregoing is provided for whatever follow-up action is deemed appropriate.

Yours sincerely,

Original signed by Nick Stoss
December 14, 2005

Nick Stoss
Director, Air Investigations

cc: Tom Poberezny, President, EAA Aviation Center
Steven B. Wallace, Director, Office of Accident Investigation, Federal Aviation Administration
Judy Rutherford, Director, System Safety, TC

BACKGROUND INFORMATION

Occurrence No.: A05W0148

Safety Communication No.: A050024

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The following TSB Engineering Branch report was completed:

LP 087/2005 - Fuel Pressure Regulator Fitting