



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

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**Date:** May 24, 2002

**In reply refer to:** A-02-09 through -11

Honorable Jane F. Garvey  
Administrator  
Federal Aviation Administration  
Washington, D.C. 20591

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On July 14, 2001, a Stemme S10-VT powered glider,<sup>1</sup> N502SC, experienced a loss of power in its Rotax 914F2/S1 engine and an in-flight fire after takeoff from Langlade County Airport (AIG), Antigo, Wisconsin.<sup>2</sup> The pilot returned to AIG for an emergency landing. When the airplane touched down on runway 8, the right main landing gear collapsed. The airplane came to rest off the right side of the runway. The airplane was operating on a personal flight under the provisions of 14 *Code of Federal Regulations* (CFR) Part 91. The airplane was destroyed by fire, but the pilot and passenger were not injured.

The pilot reported that approximately 1 mile from AIG, at 1,000 feet above ground level, he heard a loud bang in the engine compartment, which was located directly behind the cockpit. The pilot also reported that the engine immediately began to run rough and that smoke entered the cockpit. The pilot shut down the engine, closed the fuel valve, and lowered the landing gear before the airplane lost all electrical power. The pilot returned to AIG. A witness on the ground stated that while the airplane was on final approach to AIG, a fire was burning through the left side of the fuselage, just aft of the cockpit. The pilot reported that after performing the emergency landing (less than 2 minutes after the initial engine failure) and exiting the airplane, he observed flames burning through the left side of the engine compartment. The pilot further indicated that the ensuing fire engulfed the area forward of the engine compartment within 5 minutes of the initial engine failure.

The Safety Board's examination of the wreckage revealed that the fire originated in the engine compartment and appeared to have started near the left carburetor. The fire destroyed all of the airplane's nonmetallic components (except the outboard portion of the wings) forward of

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<sup>1</sup> Federal Aviation Administration (FAA) Advisory Circular (AC) 21.17-2A, "Type Certification—Fixed Wing Gliders (Sailplanes), Including Powered Gliders," indicates that powered gliders are airplanes for which the number of occupants does not exceed two, the maximum weight does not exceed 1,874 pounds (lb), and the maximum weight-to-wing span squared does not exceed 0.62 lb/ft<sup>2</sup>. This recommendation letter uses the terms "powered glider" and "airplane" to refer to the Stemme S10-VT.

<sup>2</sup> A description of this accident, CHI01LA216, can be found on the National Transportation Safety Board's Web site at <<http://www.nts.gov>>.

the empennage, including the wing attachment area, which is located directly over the engine compartment. This accident is still under investigation.

Because the accident airplane's engine compartment was destroyed by fire, Safety Board investigators had to examine a new production Stemme S10-VT airplane to determine the configuration of the firewall and the location of the fuel lines. During this examination, Board investigators noted several safety deficiencies in the engine compartment, including unsealed gaps in the firewall, unprotected fuel lines and fittings, and unshielded exhaust components.

Specifically, investigators noted the following: (1) The forward and aft firewalls contain openings as large as 1 inch to accommodate aircraft structural members (tubular steel) and the propeller drive shaft. These openings do not incorporate fireproof grommets, bushings, or firewall fittings, which would prevent a hazardous quantity of liquid, gas, or flame from passing between the engine compartment and other parts of the airplane. (2) Rubber fuel lines and fittings within the engine compartment are not adequately protected with fire-resistant sleeving or with sealed or clamped ends to prevent exposure to engine fires. Further, these unprotected rubber fuel lines and plastic fuel filters are mounted against the forward side of the engine firewall, subjecting them to the radiant heat that would be generated by a fire inside the engine compartment. (3) The carburetors and other associated fuel system components are located directly over unprotected exhaust system components, which under normal operating conditions would be hot enough to ignite flammable fluids or vapors. Further, although the forward, top, and aft sides of the Stemme S10-VT engine compartment are made of 0.040-inch-thick stainless steel sheet metal, the sides and bottom of the engine compartment are made of composite material, which contains hydrocarbons and therefore can easily become fuel for a fire when heated.

The Safety Board notes that, based on the statements of the accident pilot and the witness, the fire spread quickly from the engine compartment to other unprotected areas of the accident airplane after the initial loud bang. The Board considers it likely that safety deficiencies similar to those found in the engine compartment of the new production Stemme S10-VT, noted previously, contributed to the initiation of the fire in the accident airplane and to the speed at which the fire spread. Had the accident airplane been at a higher altitude, the pilot might not have had sufficient time to perform a successful emergency landing. The Board is concerned that the multiple design deficiencies identified in the new production model could pose a serious risk of in-flight fires in the engine compartment of other Stemme S10-VT airplanes. Currently, 38 Stemme S10-VT airplanes are operating in the United States.

The Safety Board notes that the certification criteria applicable to the German-designed and -manufactured Stemme S10-VT include regulatory standards that are intended to prevent these safety deficiencies. Although Stemme submitted statements to the Federal Republic of Germany's aviation certification authority, the Luftfahrt-Bundesamt (LBA), detailing how the Stemme S10-VT airplane complied with those certification criteria, it appears that the Stemme S10-VT design does not in fact comply with those criteria.

Title 14 CFR 21.17(b) indicates that, for the type certification and airworthiness certification of special classes of aircraft (including powered gliders), the applicable

airworthiness criteria provide a level of safety equivalent to Parts 23, 25, 27, 29, 31, 33, and 35. On April 1, 1980, several European civil aviation authorities<sup>3</sup> agreed to the Joint Aviation Requirements (JAR) for Sailplanes and Powered Sailplanes,<sup>4</sup> JAR-22, which is based on the LBA's national airworthiness code. The Stemme S10-VT airplane was certificated by the LBA under JAR-22 on August 15, 1997. In AC 21.17-2A, the FAA indicated that the criteria contained in JAR-22 provided an acceptable level of safety and were therefore appropriate for the type certification of gliders and powered gliders. On September 22, 1997, the FAA Small Airplane Directorate granted FAA Type Certificate No. G06CE for the Stemme S10-VT, with a certification basis of JAR-22. In a March 27, 2002, letter to the FAA's Associate Administrator for Regulation and Certification, the Director of the Safety Board's Office of Aviation Safety questioned the process by which the FAA had certified the Stemme S10-VT and whether, given the design deficiencies in the Stemme S10-VT, the FAA considered the existing certification process to provide an adequate level of safety for foreign-designed and -manufactured products. The letter also requested information about any procedural changes that the FAA has adopted, or plans to adopt, to prevent the type certification of other foreign-manufactured products with design deficiencies.

With regard to sealing the engine compartment, JAR 22.1191 states the following:

- (a) The engine must be isolated from the rest of the sailplane by a firewall, shroud or equivalent means.
- (b) The firewall or shroud must be constructed so that no hazardous quantity of liquid, gas or flame can pass from the engine compartment to other parts of the sailplane.
- (c) The firewall and shroud must be fireproof and protected against corrosion.

Regarding protection of fuel lines and fittings, JAR 22.993(d) states that "[e]ach fuel line and fitting in any area subject to engine fire conditions must be at least fire resistant."<sup>5</sup> With regard to the shielding of exhaust components, JAR 22.1121(b) states the following:

[e]ach exhaust system part with a surface hot enough to ignite flammable fluids or vapors must be located or shielded so that leakage from any system carrying flammable fluids or vapors will not result in a fire caused by impingement of the fluid or vapors on any part of the exhaust system, including shields for the exhaust system.

The Safety Board notes that the Stemme S10-VT airplane is a derivative of the Stemme S10 and S10-V airplanes. Therefore, in light of the safety deficiencies discussed

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<sup>3</sup> The countries included Belgium, the Federal Republic of Germany, France, Italy, the Netherlands, Sweden, and the United Kingdom.

<sup>4</sup> Although JAR-22 uses the terms "sailplanes" and "powered sailplanes," the terms "gliders" and "powered gliders" are also used to describe these aircraft.

<sup>5</sup> AC 20-135, "Powerplant Installation and Propulsion System Component Fire Protection Test Methods, Standards and Criteria," indicates the following:

When applied to powerplant installations such as fluid-carrying lines, flammable fluid system components, wiring, air ducts, fittings and powerplant controls, "fire resistant" means the capability of a material or component to perform its intended functions under the heat and other conditions likely to occur at the particular location and to withstand a 2000°F [Fahrenheit] flame (±150°F) for 5 minutes minimum.

previously, the Safety Board believes that the FAA should require that existing Stemme S10, S10-V, and S10-VT powered gliders be modified to reduce the risk of fires in the engine compartment, including sealing the engine compartment, protecting fuel lines and fittings, and shielding exhaust components. Further, the Safety Board believes that the FAA should require that future Stemme S10, S10-V, and S10-VT powered gliders be designed and manufactured to reduce the risk of fires in the engine compartment, including sealing the engine compartment, protecting fuel lines and fittings, and shielding exhaust components.

Finally, the Safety Board notes that while these design changes are being developed and implemented, operators of the affected Stemme airplanes could benefit from being made aware of the circumstances of this accident. Therefore, the Safety Board believes that the FAA should notify all registered operators of Stemme S10, S10-V, and S10-VT powered gliders about the circumstances of the July 14, 2001, Antigo, Wisconsin, accident, including their related design deficiencies.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require that existing Stemme S10, S10-V, and S10-VT powered gliders be modified to reduce the risk of fires in the engine compartment, including sealing the engine compartment, protecting fuel lines and fittings, and shielding exhaust components. (A-02-09)

Require that future Stemme S10, S10-V, and S10-VT powered gliders be designed and manufactured to reduce the risk of fires in the engine compartment, including sealing the engine compartment, protecting fuel lines and fittings, and shielding exhaust components. (A-02-10)

Notify all registered operators of Stemme S10, S10-V, and S10-VT, powered gliders about the circumstances of the July 14, 2001, Antigo, Wisconsin, accident, including their related design deficiencies. (A-02-11)

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

*Original Signed*

By: Marion C. Blakey  
Chairman