

Log # 2651



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 29, 1997

In reply refer to: A-97-53 through -55

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

During a detailed review of accidents involving amateur-built aircraft, the Safety Board found that the manner in which some information is stored in the Federal Aviation Administration's (FAA) aircraft registry data base prevents it from being used to disseminate safety information to owners of amateur-built experimental aircraft. The Safety Board also found that some accidents may be related to inadequate flight training by pilots who flight test or transition into amateur-built aircraft, which have flight characteristics that are unfamiliar to them.

Title 14 Code of Federal Regulations (CFR) 21.191(g) provides a mechanism for the FAA to issue experimental airworthiness certificates for operating amateur-built aircraft if the major portion of the fabrication and assembly is undertaken and completed by an amateur builder solely for educational or recreational purposes. Because experimental airworthiness certificates are issued to amateur-built aircraft, they are exempt from certain maintenance requirements (Title 14 CFR 43), and their operation is subject to the limitations set forth in Title 14 CFR 91.319.¹

FAA Advisory Circular (AC) 20-27D, "Certification and Operation of Amateur-Built Aircraft," provides guidance to builders, but amateur aircraft building is only minimally regulated by the FAA. Although the FAA does maintain a list of aircraft kits that satisfy the "major portion" language in Title 14 CFR 21.191(g), there are no FAA regulatory standards for the design or building of amateur-built aircraft. For example, there are no structural strength requirements or systems tests, and no standards for control response, flight stability, design conformity, flight testing to any specific parameters, or crashworthiness design requirements.

Because owners often seek commercial assistance from experienced builders, in April 1996, the FAA issued AC 20-139, "Commercial Assistance During Construction of Amateur Built

¹These include a prohibition against operating an aircraft that has an experimental certificate for compensation or for hire. Further, experimental aircraft may not be operated for any purpose other than the purpose for which the airworthiness certificate was issued. Finally, experimental aircraft may not be operated outside an area assigned by the FAA Administrator (usually an initial flight test area with a 25-statute-mile radius) until it is shown that the aircraft is controllable and safe. Additional limitations appear in the regulations.

Aircraft," which provides guidance for builders who want to obtain commercial assistance with their project without violating the "major portion" rule. It should also be noted that the builder of an amateur-built aircraft may sell aircraft to someone who did not participate in its construction; however, after transfer of ownership, an amateur-built aircraft still must be operated subject to the limitations of its experimental airworthiness certificate.

Although many amateur-built aircraft are designed by their builders or are built according to plans purchased from a third party, most of these aircraft are constructed from kits supplied by manufacturers.² The Sport Aircraft Manufacturer's Association estimates that about 150 aircraft kit manufacturers are active at any given time, that about 20 manufacturers enter the marketplace each year, and that about the same number become inactive. Construction of a kit-built aircraft may involve the assembly of some premanufactured components, provided that the amateur builder completes the majority of the work. Unlike builder-designed aircraft, kit-built aircraft are not usually one-of-a-kind aircraft, and safety problems discovered in one kit-built aircraft may also be present in other kit-built aircraft of the same model.

Adequacy of Information Maintained in the FAA Aircraft Registry

On June 18, 1992, N107WB, an amateur-built experimental Bovard Glasair airplane, collided with trees during its initial climb after takeoff from the Woodland Airport, Woodland, Washington, because the pilot was unable to maintain directional control.³ Visual meteorological conditions prevailed at the time, and no flight plan was filed. The airplane was destroyed by postcrash fire, and the commercial pilot, who was the sole occupant, was killed.

The Safety Board's investigation determined that the airplane had been modified with manufacturer-provided wing tip extensions that increased the wingspan by 4 feet. This increase in wingspan and area reduced the takeoff and stall speeds so that it was possible for the airplane to become airborne and climb at an airspeed below V_{mca} , the minimum airspeed required for sufficient rudder authority to maintain directional control in the air.

The manufacturer of the Glasair kit, Stoddard-Hamilton Aircraft, Inc., reported that approximately 100 kits were sold with the original rudder and wingspan before the rudder was redesigned and enlarged. While the first 100 kits were being sold, the wing tip extension modification package became available, so it was possible to purchase and install the wing tip extensions onto one of the first 100 airplanes with the original, small rudder. It was also possible to acquire an airplane kit from Stoddard-Hamilton with a small rudder and the wing tip extensions. The kit involved in this accident was delivered on April 5, 1984; the larger rudder, which became standard with all kits upon its availability in the fall of 1985, had not been installed on the accident airplane.

²*Manufacturer* refers to the commercial supplier of an aircraft kit, and *builder* refers to the person who undertakes the major portion of the fabrication and assembly of an aircraft.

³For more information, refer to NTSB Brief of Accident, SEA92LA129.

Before this accident, Stoddard-Hamilton had published articles in its newsletter recommending that the larger rudder be installed on all Glasairs that had been retrofitted with the wing tip extensions. As a result of the Safety Board's investigation, Stoddard-Hamilton issued, and mailed to kit owners who were on the company mailing list, a "mandatory" service bulletin⁴ stating that all Glasairs with wing tip extensions should be retrofitted with the larger rudder. In the case of the accident airplane, both the owner, who was flying the aircraft at the time of the accident, and the builder were aware of the newsletter articles concerning the installation of the larger rudder but had not made the modification. The kit builder, who was on the manufacturer's mailing list, had discussed the larger rudder with the aircraft owner, but they had decided that the airplane was operating suitably with the small rudder.

In this case, both the kit builder and the aircraft owner were made aware through newsletter articles of the manufacturer's recommendation to install the larger rudder. However, the Safety Board is concerned that some Glasair owners and operators may not have received the newsletter, and therefore may be unaware of the manufacturer's recommendation.

On December 5, 1993, N4YP, an amateur-built experimental Upton Mustang M-II airplane, broke up in flight near Guthrie, Oklahoma.⁵ The airplane was destroyed, and the private pilot, the sole occupant, was killed. The Safety Board determined that the probable cause of the accident was the in-flight failure of the left aileron for undetermined reasons. The kit manufacturer, Mustang Aeronautics, Inc., had previously cautioned owners and builders to replace the aileron counterweight pop rivets with a stronger type of rivet, but it was not possible to determine if the owner had received this information. The airplane's maintenance logs showed no evidence that this modification had been accomplished; and inspection of the airplane revealed that the modification had not been completed.

On August 26, 1995, N3204S, an amateur-built experimental Short Lancair 320 airplane, sustained substantial damage when the pilot lost control during the landing flare at Rio Vista, California.⁶ The private pilot sustained minor injuries, and the sole passenger was seriously injured. The pilot reported that during the landing flare, the right wing dropped and contacted the runway, despite full left aileron input. The airplane bounced, the right wing dropped again, and the airplane veered off the runway to the left and ground-looped. Postaccident inspection revealed that the left wing flap was fully extended and that the right wing flap was fully retracted with no indication of impact damage. The right flap-actuating pushrod was bent, and the threaded portion of the rod end was fractured. Neico Aviation, Inc., the kit manufacturer, stated that 4 years before the accident, it had redesigned the failed pushrod because bent pushrods had been discovered on other airplanes. At that time, Neico used its company mailing list to send a bulletin to kit owners calling for the replacement of the pushrod, but the modification was not mandated by the FAA. The owner of the accident airplane did not remember receiving the change notice.

⁴Compliance with an aircraft manufacturer's service bulletin is not required unless it is mandated by an FAA airworthiness directive.

⁵For more information, refer to NTSB Brief of Accident, FTW94FA044.

⁶For more information, refer to NTSB Brief of Accident, LAX95LA306.

On June 12, 1994, a Bellah RotorWay Executive amateur-built experimental helicopter, N727TB, experienced a loss of tail rotor effectiveness in cruise flight near Johnson City, New York.⁷ The pilot entered an autorotation, but the helicopter rolled onto its left side after touchdown and was substantially damaged. The pilot, who was the sole occupant, received minor injuries. Examination of the wreckage revealed that one of the tail rotor drive belts had failed. The belt had been in service for only 57.9 hours since new, and the manufacturer's recommended life limit was 250 hours. Two years before the accident, RotorWay International issued Mandatory Bulletin M-07, which called for using stronger, fiber-backed drive belts. This bulletin was sent to RotorWay owners using the company's mailing list, but the owner of the accident helicopter was not aware of it. The Safety Board is concerned that important safety information, such as this bulletin, may not reach owners who do not appear on company mailing lists.

The activities of RotorWay and other manufacturers, which use company mailing lists to send safety information and newsletters to builders of their kit aircraft are laudable, but these efforts are insufficient to disseminate such important safety information. Further, there is no systematic means for the kit manufacturer to track ownership changes of amateur-built aircraft; however, owners are required to register their aircraft with the FAA, and this information is stored in the aircraft registry data base. This data base appears to be an appropriate tool for sending information to owners of amateur-built aircraft; however, a problem with the manner in which the information is currently stored precludes this.

The owner of a kit-built aircraft may now register the aircraft using his or her own name as the aircraft manufacturer, or the registrant can choose a name using any desired make, model, or serial number. Often, kit owners use the model and serial numbers designated by the kit manufacturers; however, there is no requirement to do so. This makes it impossible to find registration records for all of the registered owners of a specific kit model in the aircraft registry data base. Searching for type certificated aircraft is much easier because standard make and model codes are used to facilitate data searches.

Therefore, the Safety Board believes that the FAA should revise the procedures for registering experimental aircraft built from kits so that the aircraft registry data base reflects the aircraft kit manufacturer, model name and serial number, and the make and model of any installed powerplant and propeller. This should be accomplished in a way that ensures that all registered owners of a given kit model can be readily identified. The Safety Board also believes that the FAA should cooperate with aircraft kit manufacturers, when requested, to ensure that the most current and complete mailing lists are used for the dissemination of safety information to owners of amateur-built experimental aircraft.

Availability of Type-Specific Flight Training

On May 28, 1994, N786RW, an amateur-built experimental Wray KR-2 airplane, collided with terrain after takeoff at Puyallup, Washington.⁸ The private pilot, who was the builder and sole

⁷For more information, refer to NTSB Brief of Accident, BFO94LA098.

⁸For more information, refer to NTSB Brief of Accident, SEA94LA143.

occupant of the airplane, was not injured; the airplane sustained substantial damage. According to the pilot, it was his intention to conduct slow- and high-speed taxi-testing of the airplane. During a high-speed run, the pilot encountered oscillations about the pitch axis, followed by the airplane veering toward the left edge of the runway. The pilot chose to add power and take off. After takeoff, the pilot realized that the airplane was just above stall speed at 75 percent power. He reported commanding full throttle; but the engine sputtered to a low idle. He stated that the airplane mushed, then stalled and rolled to the left before crashing. Later testing by the builder determined that the electric boost pump was not functioning properly. Although the pump provided adequate fuel flow at reduced power settings, insufficient fuel flow occurred at high power settings. The private pilot had 115 hours total flight time, with 67 hours pilot-in-command time, and 6 hours in the preceding 30 days. He had no previous flight test experience, or any flight time in a KR-2.

The Safety Board determined that the probable cause of this accident was the improperly functioning fuel boost pump; however, the Board noted that the pilot encountered control difficulties that led to an unplanned initiation of the flight. Small airplanes, such as the KR-2, may have pitch and control sensitivities that are quite different from type certificated airplanes, such as the Cessna 150 in which this pilot had trained. Type-specific flight training might have prepared him to safely conduct his taxi tests and first flight without encountering control difficulties.

In 1995, there were 140 accidents involving single-reciprocating-engine, amateur-built experimental airplanes, in which information about the pilot's flight time in the type of aircraft involved in the accident was available. Of these, 38 accidents (almost 30 percent) involved pilots with 10 or fewer hours in that type of aircraft. The Safety Board is concerned that so many of these accidents involve pilots with very little experience in the accident-aircraft type. This may be related to the limited availability of flight training for amateur-built aircraft.

The Safety Board recognizes that the vast majority of pilots learn to fly in type-certificated aircraft, which have been tested and demonstrated to have stability, controllability, and performance characteristics that fall within a defined envelope. Further, after their training, most pilots continue to operate type-certificated airplanes, which comprise most of the general aviation fleet. Consequently, it may be difficult for them to transition to many amateur-built aircraft, which may have flight characteristics that fall outside the familiar envelope of type-certificated aircraft, without the benefit of transition training.

A major impediment to the availability of type-specific flight training for pilots transitioning to amateur-built experimental aircraft is the regulatory prohibition against the use of experimental aircraft for compensation or hire (14 CFR 91.319(a)(2)).⁹ An owner/builder may pay for instruction received in the owner/builder's aircraft but cannot pay for the use of another experimental aircraft to receive instruction. Thus, a certificated flight instructor who owns an experimental aircraft cannot provide instruction in and charge for the use of that aircraft. The Safety Board is aware that the FAA Regulatory Exemption 5209 permits the Popular Rotorcraft Association to allow its member flight instructors to provide such training in experimental gyroplanes for compensation.

⁹A further regulatory impediment is the prohibition against operating an experimental aircraft for a purpose other than the purpose for which the airworthiness certificate was issued (14 CFR 91.319(a)(1)).

The Safety Board concludes that type-specific flight training is critical for pilots transitioning into amateur-built experimental aircraft. Builders of these aircraft need the opportunity to receive such training in a flight-tested aircraft before conducting initial flight tests in their own newly built aircraft; and new owners who acquire amateur-built experimental aircraft in the secondary marketplace should have the opportunity to receive transition training, unless their prior flight experience makes it unnecessary. Therefore, the Safety Board believes that the FAA should revise the Federal aviation regulations (or issue an exemption) to enhance the availability of transition flight instruction in experimental airplanes built from kits, while maintaining a sufficient level of safety.

Recommendations

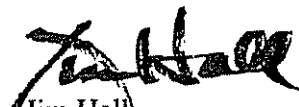
Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Revise the procedures for registering experimental aircraft built from kits so that the aircraft registry data base reflects the aircraft kit manufacturer, model name, and serial number, and the make and model of any installed powerplant and propeller, and does so in a way that ensures that all owners of a given kit model can be readily identified. (A-97-53)

Cooperate with aircraft kit manufacturers, when requested, to ensure that the most current and complete mailing lists are used for the dissemination of safety information to owners of amateur-built experimental aircraft. (A-97-54)

Revise the Federal aviation regulations (or issue an exemption) to enhance the availability of transition flight instruction in experimental airplanes built from kits, while maintaining a sufficient level of safety. (A-97-55)

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By: 
Jim Hall
Chairman