



SAIB: CE-10-08

SUBJ: Wings: Zodiac CH601XL and CH650 Wing Structural Modifications **Date:** November 7, 2009

This is information only. Recommendations aren't mandatory.

Introduction

This Special Airworthiness Information Bulletin informs you of an airworthiness concern on all variants of Zodiac CH601XL and CH650 airplanes, all serial numbers, including special light-sport category aircraft (S-LSA), experimental light-sport aircraft (E-LSA), and experimental amateur-built aircraft.

Background

Since April 2009, the FAA has been conducting a special review of the Zodiac CH601XL and the nearly identical CH650 to evaluate design and operational details of these aircraft. This review was a continuation of efforts to investigate several in-flight structural failures of the CH601XL dating back to 2005. Five in-flight structural failure accidents have occurred in the United States and several abroad. The U.S. accidents involved two S-LSA, one E-LSA, and two experimental amateur-built kit aircraft. The design of all CH601XL & CH650 airplanes is essentially the same, but only the S-LSA aircraft are designed and produced to ASTM International LSA standards. We quickly launched the FAA special review because of the accidents exhibited signs of structural failures. After the review we made a determination that these accidents did not clearly indicate a single root cause. Instead, it implicated the potential coupling of design and operational aspects of the aircraft.

Our analysis did reveal several areas of concern regarding the CH601XL design that may impact the overall safety of the design. Those causing the greatest concern are as follows:

- **Wing structure:** FAA analysis shows bending loads used to design the wing structure were non-conservative and the basic static strength of the CH601XL/CH650 does not appear to meet the intent of the ASTM standards for a 600kg (1320 lb) airplane, given the current flight envelope in the Pilot Operating Handbook.
- **Structural Stability:** Other aviation authorities have noted the presence of buckling in the wing structure, including in the center section. Such structural instabilities can have a significant effect on static strength and flutter characteristics.
- **Flutter:** Our detailed review of available flutter analysis reports was inconclusive. However, accident photos clearly indicated flutter was present during the in-flight structural failures. The FAA believes flutter may either be a first order root cause of in-flight structural failure or a secondary cause after some initial wing structural deformation or twisting.
- **Airspeed calibration:** Calibration procedures do not appear to adequately account for basic static pressure source error due to the location of the static port. This could lead to potential airspeed indication anomalies, particularly since the CH601XL/650 derivatives can be delivered/built with several different airspeed indicators installed or without an indicator at all. The situation could lead to the potential of operating the airplane above the maneuver speed and/or the design cruise speed, potentially leading to structural failure.

- **Stick force characteristics:** Flight test data from foreign authorities indicates at aft center of gravity the stick forces become very light. The FAA believes this may be a contributing factor in structural failure accidents if coupled with operations over gross weight, at speeds higher than V_A , and/or for aircraft loaded improperly. In such conditions, it would be very easy to dynamically load the CH601XL/CH650 wing beyond its design structural load limit.

Recommendations

In order to prevent potential catastrophic structural failure, we strongly recommend that all owners and operators of Zodiac CH601XL/CH650 comply with actions outlined in a forthcoming Aircraft Manufacturing & Design, LLC (AMD) Safety Directive / Safety Alert to address the above-referenced concerns before further flight.

For SLSA owners and operators: We remind all owners and operators of their regulatory obligation to comply with Safety Directive / Safety Alert issued by AMD in accordance with the ASTM International consensus standards safety directive process and recommend the following:

- Reference 14 CFR §21.190(c)(5) – The manufacturer’s requirement to issue safety directives.
- Reference 14 CFR §91.327(b)(4) – Owner/operator compliance with each safety directive.
- Obtain and install AMD’s modification kit (i.e., major alteration) per drawings and instructions.
 - ✓ Contact AMD for any requests to correct the unsafe condition in a manner different from that specified in the safety directive.
 - ✓ Since the AMD safety directive adheres to the applicable consensus standard, the FAA will not likely issue any waivers from the provisions of the safety directive.
- Adhere to the manufacturer’s drawings and instructions. These drawings and instructions address the structural design changes that are required to meet the ASTM design and performance standard T they also address other operating limitations.
- If necessary, obtain a special flight permit to fly the aircraft to a location where the safety directive modifications can be made. The FAA may add special requirements for operating your aircraft to a place where the modifications can be done. The FAA may also decline to issue a special flight permit in particular cases if we determine you cannot move the aircraft safely. To apply for a special flight permit, follow the procedures in 14 CFR 21.199.

For amateur-built and E-LSA owners and operators: Due to shared design characteristics that amateur-built and E-LSA aircraft have with S-LSA, we strongly recommend compliance with the drawings and instructions contained in the AMD Safety Directive/Safety Alert and recommend the following:

- Reference 14 CFR §91.7: “(a) No person may operate a civil aircraft unless it is in an airworthy condition. (b) The pilot in command of a civil aircraft is responsible for determining whether that aircraft is in condition for safe flight. The pilot in command shall discontinue the flight when un-airworthy mechanical, electrical, or structural conditions occur.”

- Obtain and install the kit manufacturer’s structural modification kit. The modification kit addresses the structural design changes and operating limitations required to meet a safe condition for operation.
- Contact the kit manufacturer with any modifications already incorporated to correct the identified unsafe condition to validate safety-of-flight issues.
- If necessary, obtain a special flight permit to fly the aircraft to a location where the safety directive modifications can be made. The FAA may add special requirements for operating your aircraft to a place where the modifications can be done. The FAA may also decline to issue a special flight permit in particular cases if we determine you cannot move the aircraft safely. To apply for a special flight permit, follow the procedures in 14 CFR 21.199.

For Further Information Contact

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