

Log 2574



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

---

Date: JUL 1 1996  
In reply refer to: A-96-43 and - 44

Mr. David Goulet  
President  
Quad City Ultralight Aircraft Corporation  
3610 Coaltown Road  
Moline, Illinois 61265

---

Several accidents have occurred involving amateur-built Challenger I and II series airplanes in which an apparent loss of directional control of these aircraft occurred immediately following or soon after the installation of Lexan doors<sup>1</sup> supplied by the Quad City Ultralight Corporation as accessories.<sup>2</sup> The airplanes involved in two of the accidents were flown by commercial flight instructors who lost directional control during initial climb shortly after takeoff. Both pilots reported that despite use of full right rudder, the aircraft continued to bank and turn left during an uncontrolled descent until an in-flight collision with trees or ground impact occurred. The National Transportation Safety Board believes that the installation of the above mentioned Lexan doors for amateur-built Challenger I and II series airplanes results in a significant reduction in directional stability.

The Safety Board has received reports voicing similar concern from the Popular Flying Association (PFA), the representative body in the United Kingdom for amateur aircraft construction, recreational, and sport flying. The PFA indicated that until Quad City suspended sales of all Challenger aircraft kits to the United Kingdom, Australia, and New Zealand in September 1994, the kits imported into these countries were required to include, as a standard assembly, a larger vertical tail and dorsal fin. According to the PFA, the larger tail assembly was required to improve the Challenger's directional stability, particularly when Lexan doors were installed, and to comply with all applicable certification requirements. It is the Board's understanding that Quad City reinforced the fuselage steel weldment attachment structure to accommodate the larger tails and that the United Kingdom distributor for Challenger airplanes, Westcountry Aviation, recommended that all previously purchased airplanes be retrofitted with the larger tail assemblies.

In a 1993 letter describing the characteristics of his airplane to the Challenger News, a quarterly publication of the International Challenger Owners Association, a United Kingdom owner/operator reported:

---

<sup>1</sup>Cockpit enclosure and larger windshield.

<sup>2</sup>For more detailed information, read Briefs of Accident CHI95LA144, CHI94LA350, and CHI94LA040 (attached).

The main difference as you will probably be able to see from the photo is the UK spec has a larger fin and rudder, since the opinion of everyone who flew it in the early stages over here, was that there simply was not enough rudder available. A factory mod was produced, resulting in another 25% on the dorsal main fin and rudder, which has drastically improved the handling of the aircraft, particularly in turns and close to the ground at lower speeds. Why all Challengers don't have this, I just can't figure out.

Comments appearing in other (1992 and 1993) editions of the Challenger News from United States Challenger owner/operators direct specific attention to the change in flight characteristics with the Lexan doors installed. For example:

The airplane flies great with the doors off and has been a lot of fun. However doors on is another story. The two place Challenger with the doors-on requires a lot of rudder and is somewhat unstable. A slip-skid string taped to the windshield, like sailplanes use, is a must to learn coordinated flight.

Our Challengers fly well with the exception of the Yaw Axis which seems to be very unstable, especially with the doors installed. We have added fins outboard on the horizontal stabilizers that seems to help some but not enough. Seems like it needs a larger vertical stabilizer, or a longer fuselage, or a skeg, or a fly by wire computer.

I'm sure many of you have experienced the strange handling difference when you fly the two seater with doors on. Rudder response is very "different" when compared to doors off flying. Some of it is attributed to the changed airflow into the prop. One of my customers had someone explain another theory to him like this: Adding all that vertical side area in front of the CG causes the front of the plane to fight against the tail in a turn. It's like putting feathers on the front end of an arrow. It wants to de-stabilize its flight; so installing the doors is almost like putting a vertical tail on the front of the plane.

A recent letter that Quad City submitted to the Safety Board contained a draft of an owner/operator advisory describing the effect of the Lexan doors on the Challenger's flight characteristics. The advisory stated, "With the installation of doors, the Challenger has a tendency to oversteer in the yaw (rudder) axis. To help correct this problem we advise installing stabilizer fins to the ends of the horizontal stabilizers. This drawing shows their installation. The drawing is self explanatory." Quad City indicated in its letter that it intended to send the advisory to all Challenger dealers and to the Challenger Owners Association pending an official request from the Safety Board to do so. Also, Quad City indicated that it needed the Safety Board's approval of the stabilizer fin modification. While the Safety Board can and does recommend that design modifications enhancing the Challengers' directional stability accompany installation of the Lexan doors, the Board is an investigative rather than a certification agency and, unlike the Federal Aviation Administration (FAA), is not empowered to approve individual airplane designs or design modifications.

Because Challenger airplanes operate in both the ultralight and experimental categories and are constructed in a variety of configurations from kits or components supplied by Quad City,

including Rotax and Hirth engines, Lexan doors, floats, skis, and Fiberglass nose cones, the directional stability characteristics of these aircraft may differ markedly. As a result, the Safety Board believes that Quad City should determine the design modifications necessary to ensure that all of these configurations exhibit positive directional stability characteristics throughout the operating envelope, i.e., tend to recover from a skid (sideslip) with the rudder free. The appropriate modifications, where applicable, might include vertical fins/endplates on the horizontal stabilizer, an enlarged and/or more effective vertical tail assembly, changes to fuselage shape and/or sideform dimensions, and might be supplied by Quad City as options or accessories, or in the form of engineering drawings for construction by the individual builders of these ultralight/experimental airplanes.

Therefore, the National Transportation Safety Board recommends that the Quad City Ultralight Aircraft Corporation:


Issue a safety/service advisory letter to all owner/operators of Challenger airplanes recommending that Lexan door enclosures be removed before further flight until appropriate design modifications are incorporated to provide positive directional stability throughout the operating envelope. (Class II, Priority Action)( A-96-43)

Determine any additional design modifications necessary, if any, to ensure that Challenger airplanes configured with floats, skis, etc., also exhibit positive directional stability characteristics throughout the operating envelope; make such modifications available as options or accessories or provide engineering drawings of the modifications to Challenger owner/builders; and issue a safety/service advisory letter to all owner/operators of Challenger kit airplanes, recommending that they incorporate these modifications. (Class II, Priority Action)(A-96-44)

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "...to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any actions taken as a result of its safety recommendations and would appreciate a response from you regarding action taken or contemplated with respect to the recommendation letter. Please refer to Safety Recommendations A-96-43 and -44 in your reply.

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

By:

  
 Jim Hall  
 Chairman

National Transportation Safety Board  
Washington, D.C. 20594

Brief of Accident  
Adopted 06/20/1996

CHI95LA144  
FILE NO. 572 05/02/95 BRIDGEPORT, MI AIRCRAFT REG. NO. N100GB TIME (LOCAL) - 15:50 EST

MAKE/MODEL - QUAD CITY CHALLENGER  
ENGINE MAKE/MODEL - ROTAX 503  
AIRCRAFT DAMAGE - Destroyed  
NUMBER OF ENGINES - 1  
OPERATING CERTIFICATES - None  
TYPE OF FLIGHT OPERATION - Personal  
REGULATION FLIGHT CONDUCTED UNDER - 14 CFR 91  
HOMEBUILT

LAST DEPARTURE POINT - Same as Accident  
DESTINATION - Local  
AIRPORT PROXIMITY - On airstrip

CONDITION OF LIGHT - Daylight

WEATHER INFO SOURCE- Pilot  
BASIC WEATHER - Visual (VMC)  
LOWEST CEILING - 9000 Ft Broken  
VISIBILITY - 0015 000 SM  
WIND DIR/SPEED - 050 /005 KTS  
TEMPERATURE (F) - 60  
OBSTR TO VISION - None  
PRECIPITATION - None

PILOT-IN-COMMAND AGE - 60  
CERTIFICATES/RATINGS  
Commercial, Flight instructor  
Single-engine land, Multiengine land  
INSTRUMENT RATINGS  
Airplane  
FLIGHT TIME (Hours)  
TOTAL ALL AIRCRAFT - 3091  
LAST 90 DAYS - 12  
TOTAL MAKE/MODEL - 4  
TOTAL INSTRUMENT TIME - 2

THE PILOT REPORTED THAT WHILE CLIMBING TURN AFTER TAKEOFF, APPROXIMATELY 500 FEET AGL, THE AIRPLANE STARTED TO BANK TO THE LEFT. DESPITE HIS USE OF FULL RIGHT RUDDER, HE WAS UNABLE TO REGAIN CONTROL. ACCORDING TO THE PILOT, "THE PLANE KEPT TIGHTENING UP INTO A LEFT FLAT SPIRAL TO THE GROUND." THE AIRPLANE HAD LEXAN DOORS INSTALLED TO ENCLOSE THE COCKPIT/CABIN AREA. THE DOORS WERE NOT INCLUDED IN THE ORIGINAL DESIGN OF THIS KIT AIRPLANE, BUT WERE SUBSEQUENTLY MADE AVAILABLE AS A STANDARD OR OPTIONAL FEATURE, DEPENDING ON THE MODEL. THE MANUFACTURER STATED THAT WHEN THE DOORS ARE INSTALLED. THE AIRPLANE BECOMES RUDDER DOMINANT AND SENSITIVE AND THAT PILOTS MUST NOT TAKE THEIR FEET OFF THE RUDDER PEDALS.

Brief of Accident (continued)

CHI95IA144  
FILE NO. 572                      05/02/95                      BRIDGEPORT, MI                      AIRCRAFT REG. NO. N100GB                      TIME (LOCAL) - 15:50 EST

Occurrence# 1                      LOSS OF CONTROL - IN FLIGHT  
Phase of Operation                      TAKEOFF - INITIAL CLIMB

Findings

1. - AIRCRAFT CONTROL - NOT MAINTAINED
2. - ACFT/EQUIP, INADEQUATE DESIGN - KIT MANUFACTURER

Occurrence# 2                      IN FLIGHT COLLISION WITH OBJECT  
Phase of Operation                      DESCENT - UNCONTROLLED

Findings                      3. - OBJECT - TREE(S)

Occurrence# 3                      IN FLIGHT COLLISION WITH TERRAIN/WATER  
Phase of Operation                      DESCENT - UNCONTROLLED

The National Transportation Safety Board determines that the Probable Cause(s) of this Accident was:  
INADEQUATE DIRECTIONAL STABILITY OF THE AIRCRAFT (DUE TO INSTALLATION OF LEXAN COCKPIT ENCLOSURE DOORS), WHICH  
PRECIPITATED A LOSS OF DIRECTIONAL CONTROL.

National Transportation Safety Board  
Washington, D.C. 20594

Brief of Accident  
Adopted 06/20/1996

CHI94LA350  
FILE NO. 1979  
09/20/94  
PRINCETON, IL  
AIRCRAFT REG. NO. NONE  
TIME (LOCAL) - 10:00 CDT

MAKE/MODEL - ULTRALIGHT CHALLENGER II  
ENGINE MAKE/MODEL - ROTAX Model Unk/Nr  
AIRCRAFT DAMAGE - Substantial  
NUMBER OF ENGINES - 1  
FATAL 0  
SERIOUS 0  
MINOR/NONE 1  
CREW 0  
PASS 0

OPERATING CERTIFICATES - None  
TYPE OF FLIGHT OPERATION - Personal  
REGULATION FLIGHT CONDUCTED UNDER - 14 CFR 103  
HOMEBUILT

LAST DEPARTURE POINT - ERIE, IL  
DESTINATION - ARGOS, IN

AIRPORT PROXIMITY - Off airport/airstrip

CONDITION OF LIGHT - Daylight  
WEATHER INFO SOURCE - Weather observation facility

BASIC WEATHER - Visual (VMC)  
LOWEST CEILING - None  
VISIBILITY - 0010.000 SM  
WIND DIR/SPEED - 240 / 007 KTS  
TEMPERATURE (F) - 72  
OBSTR TO VISION - None  
PRECIPITATION - None

PILOT-IN-COMMAND AGE - 25

CERTIFICATES/RATINGS  
Student  
INSTRUMENT RATINGS  
None

FLIGHT TIME (Hours)

TOTAL ALL AIRCRAFT - Unk/Nr  
LAST 90 DAYS - Unk/Nr  
TOTAL MAKE/MODEL - Unk/Nr  
TOTAL INSTRUMENT TIME - Unk/Nr

THE STUDENT PILOT REPORTED THAT AT ABOUT 1100 FEET ABOVE THE GROUND, THE AIRPLANE JOLTED, SHUDDERED, AND BEGAN TO TURN LEFT. THE BANK ANGLE BECAME PROGRESSIVELY STEEPER AND THE TURN PROGRESSIVELY TIGHTER. THE STUDENT PILOT SAID THAT IN AN ATTEMPT TO MAINTAIN CONTROL, HE APPLIED RIGHT RUDDER AND RIGHT AILERON, BUT THE AIRPLANE DID NOT RESPOND. THE AIRPLANE ENTERED INTO A DIVE TO THE LEFT AND IMPACTED A BEAN FIELD. THE STUDENT PILOT'S FIRST FLIGHT IN THE CHALLENGER, WITHOUT THE OPTIONAL KIT DOORS, WAS TAKEN THE DAY BEFORE THE ACCIDENT. HOWEVER, THE DOORS WERE INSTALLED AT THE TIME OF THE ACCIDENT.

Brief of Accident (continued)

CHI941A350  
FILE NO. 1979                      09/20/94                      PRINCETON, IL                      AIRCRAFT REG. NO. NONE                      TIME (LOCAL) - 10:00 CDT

Occurrence# 1                      LOSS OF CONTROL - IN FLIGHT  
Phase of Operation                      CRUISE

Findings

1. - AIRCRAFT CONTROL - NOT MAINTAINED
2. - ACFT/EQUIP, INADEQUATE DESIGN - KIT MANUFACTURER

Occurrence# 2                      IN FLIGHT COLLISION WITH TERRAIN/WATER  
Phase of Operation                      DESCENT - UNCONTROLLED

The National Transportation Safety Board determines that the Probable Cause(s) of this Accident was:  
INADEQUATE DIRECTIONAL STABILITY OF THE AIRCRAFT (DUE TO INSTALLATION OF LEXAN COCKPIT ENCLOSURE DOORS), WHICH  
PRECIPITATED A LOSS OF DIRECTIONAL CONTROL.

National Transportation Safety Board  
Washington, D.C. 20594

Brief of Accident

Adopted 06/20/1996

CHI94LA040  
FILE NO. 2112  
11/28/93  
ESCANABA, MI  
AIRCRAFT REG. NO. N4285V  
TIME (LOCAL) - 12:30 EST

MAKE/MODEL - STEVEN ULRICH CHALLENGER II  
ENGINE MAKE/MODEL - HIRTH 203  
AIRCRAFT DAMAGE - Substantial  
NUMBER OF ENGINES - 1

OPERATING CERTIFICATES - None  
TYPE OF FLIGHT OPERATION - TEST FLIGHT  
REGULATION FLIGHT CONDUCTED UNDER - 14 CFR 91  
HOMEBUILT

CREW  
PASS

FATAL 0  
SERIOUS 0  
MINOR/NONE 1  
0

CONDITION OF LIGHT - Daylight

WEATHER INFO SOURCE- Weather observation facility

BASIC WEATHER - Visual (VMC)  
LOWEST CEILING - Unk/Nr  
VISIBILITY - 0010/000 SM  
WIND DIR/SPEED - 290 /008 KTS  
TEMPERATURE (F) - 28  
OBSTR TO VISION - None  
PRECIPITATION - None

LAST DEPARTURE POINT  
DESTINATION - Same as Accident  
- Local

AIRPORT PROXIMITY - On airport  
AIRPORT NAME - DELTA COUNTY AIRPORT  
RUNWAY IDENTIFICATION - 27  
RUNWAY LENGTH/WIDTH (Feet) - 6500/ 150  
RUNWAY SURFACE - Asphalt  
RUNWAY SURFACE CONDITION - Dry

PILOT-IN-COMMAND AGE - 66

CERTIFICATES/RATINGS  
Commercial, Flight instructor  
Single-engine land  
INSTRUMENT RATINGS  
Airplane

FLIGHT TIME (Hours)  
TOTAL ALL AIRCRAFT - 1700  
LAST 90 DAYS - 39  
TOTAL MAKE/MODEL - 17  
TOTAL INSTRUMENT TIME - 315

The flight was the first flight for this pilot with a door modification installed. The pilot reports being unable to fly the aircraft in other than a left bank resulting in a circling climb then circling descent to a forced landing on the airport. No control malfunction was found. The President of the aircraft distribution company stated that the plane could be flown with the doors on but the pilot had to stay ahead of the aircraft and additional flight training would be suggested.



Brief of Accident (continued)

CHI941A040  
FILE NO. 2112  
11/28/93  
ESCANABA, MI  
AIRCRAFT REG. NO. N4285V  
TIME (LOCAL) - 12:30 EST

Occurrence# 1 LOSS OF CONTROL - IN FLIGHT  
Phase of Operation TAKEOFF - INITIAL CLIMB

Findings

1. - AIRCRAFT CONTROL - NOT MAINTAINED
2. - ACFT/EQUIP, INADEQUATE DESIGN - KIT MANUFACTURER

Occurrence# 2 DRAGGED WING, ROTOR, POD, FLOAT OR TAIL/SKID  
Phase of Operation DESCENT - UNCONTROLLED

The National Transportation Safety Board determines that the Probable Cause(s) of this Accident was:  
INADEQUATE DIRECTIONAL STABILITY OF THE AIRCRAFT (DUE TO INSTALLATION OF LEXAN COCKPIT ENCLOSURE DOORS), WHICH  
PRECIPITATED A LOSS OF DIRECTIONAL CONTROL.