



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. FAA-2011-1387; Special Conditions No. 23-256-SC]

Special Conditions: XtremeAir GmbH, XA42; Acrobatic Category Aerodynamic Stability.

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the XtremeAir GmbH XA42 airplane.

The XA42 airplane has a novel or unusual design feature associated with its static stability.

This airplane can perform at the highest level of aerobatic competition. To be competitive, the

aircraft was designed with positive and, at some points, neutral stability within its flight

envelope. Its lateral and directional axes are also decoupled from each other providing more

precise maneuvering. The applicable airworthiness regulations do not contain adequate or

appropriate safety standards for these design features. These special conditions contain the

additional safety standards that the Administrator considers necessary to establish a level of

safety equivalent to that established by the existing airworthiness standards. These special

conditions are only applicable to aircraft certified solely in the acrobatic category.

EFFECTIVE DATE: [Insert date 30 days after publication in the FEDERAL REGISTER]

FOR FURTHER INFORMATION CONTACT: Mr. Ross Schaller, Federal Aviation

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SUPPLEMENTARY INFORMATION:

Background

On May 3, 2011, XtremeAir GmbH applied for a type certificate for their new model XA42. The XA42 is certified under EASA authority as a dual category (acrobatic/utility) airplane. It has a two-place tandem canopy cockpit and a single-engine. It also features a conventional landing gear, conventional low-wing planform and is of composite construction. The engine is a Lycoming AEIO-580-B1A with a rated power of 315 Hp at 2,700 rpm. The airplane is proposed to be approved for Day-VFR operations with no icing approval.

The maximum takeoff weight is 2,200 pounds in utility category, 1,874 pounds in acrobatic category. V_{NE} is 225 knots, V_{NO} is 185 knots and V_A is 174 knots, indicated airspeed. Maximum altitude is 15,000 feet.

Acrobatic airplanes previously type certificated by the FAA did comply with the stability provisions of Subpart B of 14 CFR part 23. However, airplanes like the XA42 are considered as “unlimited” acrobatic aircraft because they can perform at the highest level of acrobatic competition and can perform any of the maneuvers listed in the Aresti Catalog. Generally, the evolution of the “unlimited” types of acrobatic airplanes, with very low mass, exceptional roll rates and very high G capabilities, in addition to power to mass ratios that are unique to this type of airplane, have led to airplanes that cannot comply with the stability provisions of the regulations. These airplanes can still be type-certificated, but in the acrobatic category only and with an appropriate set of special conditions and associated limitations.

The FAA will only consider certifying the XA42 in the acrobatic category. XtremeAir GmbH will not be able to offer a utility category operating envelope to accommodate the

increased fuel load designed for cross-country operations. The FAA does recognize that fuel exhaustion is one of the top accident causes associated with this class of aircraft. For this reason, the FAA allows XtremeAir to seek certification of a limited acrobatic envelope at a higher weight that will still meet the minimum load requirements of +6/-3 g associated with 14 CFR, part 23, § 23.337. The XA42 airplane would be approved for unlimited maneuvers at or below its designed unlimited acrobatic weight. The airplane would also be approved at some higher weight (for fuel) that would still meet the requirements of § 23.337 for acrobatic category and may have restrictions on the maneuvers allowed.

Type Certification Basis

Under the provisions of 14 CFR, part 21, § 21.17, XtremeAir GmbH must show that the XA42 meets the applicable provisions of part 23, as amended by Amendments 23-1 through 23-59 thereto.

Part 36 of Title 14 of the Code of Federal Regulations, effective December 1, 1969, as amended by Amendments 36-1 through 36-28.

Not approved for ditching; compliance with provisions for ditching equipment in accordance with 14 CFR § 23.1415(a)(b) has not been demonstrated.

Approved for VFR-day only. Flight in known icing prohibited.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 23) do not contain adequate or appropriate safety standards for the XA42 because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

In addition to the applicable airworthiness regulations and special conditions, the XA42 must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the

noise certification requirements of 14 CFR part 36 and the FAA must issue a finding of regulatory adequacy pursuant to section 611 of Public Law 92-574, the "Noise Control Act of 1972."

Special conditions, as defined in § 11.19, are issued in accordance with § 11.38 and become part of the type certification basis in accordance with § 21.17(a)(2).

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, the special conditions would also apply to the other model under the provisions of § 21.101.

Novel or Unusual Design Features

The XtremeAir GmbH XA42 will incorporate the following novel or unusual design features:

For acrobatic category airplanes with unlimited acrobatic capability:

Neutral longitudinal and lateral static stability characteristics

Discussion

The Code of Federal Regulations states static stability criteria for longitudinal, lateral, and directional axes of an airplane. However, none of these criteria are adequate to address the specific issues raised in the flight characteristics of an unlimited aerobatic airplane. Therefore, the FAA has determined after a flight test evaluation that, in addition to the requirements of part 21 and part 23, special conditions are needed to address these static stability characteristics.

Accordingly, these special conditions are for the XtremeAir GmbH XA42 static stability characteristics to be certified solely as an acrobatic category airplane. Other conditions may be

developed, as needed, based on further FAA review and discussions with the manufacturer and civil aviation authorities.

Discussion of Comments

A notice of proposed special conditions No. 23-11-02-SC for the XtremeAir GmbH XA42 airplanes was published in the Federal Register on December 27, 2011 (76 FR 80829). One comment was received; however, it appeared to be made in error. It discussed new hire training through approved 142 training centers, which is not relevant to the acrobatic category aerodynamic stability special conditions being imposed on XtremeAir GmbH's XA42 airplane. For this reason, no further action will be taken and the special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to the XA42. Should XtremeAir GmbH apply at a later date for a change to the type certificate to include another model on the same type certificate incorporating the same novel or unusual design feature, the special conditions would apply to that model as well.

Conclusion

This action affects only certain novel or unusual design features on one model of airplane. It is not a rule of general applicability and it affects only the applicant who applied to the FAA for approval of these features on the airplane.

List of Subjects in 14 CFR Part 23

Aircraft, Aviation safety, Signs and symbols.

Citation

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113 and 44701; 14 CFR 21.16 and 21.17; and 14 CFR 11.38 and 11.19.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for XtremeAir GmbH XA42 airplanes.

1. Unlimited Acrobatic-Only Category Static Stability Requirements

For unlimited, acrobatic-only category aircraft, XtremeAir GmbH XA42 will comply with the following stability special conditions in lieu of the existing §§ 23.171, 23.173, 23.175, and 23.177:

(A) In place of 14 CFR part 23, § 23.171 Flight - General (stability) requirement, comply with the following:

SC23.171 Flight – General: The airplane must be neutrally or positively stable in the longitudinal, directional, and lateral axes under sections SC23.173 through SC23.181. In addition, the airplane must show suitable stability and control "feel" (static stability) in any condition normally encountered in service, if flight tests show it is necessary for safe operation.

(B) In place of 14 CFR part 23, § 23.173, Static longitudinal stability requirement, comply with the following:

SC23.173 Static longitudinal stability: Under the conditions specified in SC23.175 and with the airplane trimmed as indicated, the characteristics of the elevator control forces and the friction within the control system must be as follows:

(a) A pull must be required to obtain and maintain speeds below the specified trim speed and a push required to obtain and maintain speeds above the specified trim speed. This must be shown at any speed that can be obtained, except that speeds requiring a control force in excess of 40 pounds or speeds above the maximum allowable speed or below the minimum speed for steady unstalled flight need not be considered.

(b) The stick force or position must vary with speed so that any substantial speed change results in a stick force or position clearly perceptible to the pilot.

(C) In place of 14 CFR part 23, § 23.175, Demonstration of static longitudinal stability requirement, comply with the following:

SC23.175 Demonstration of static longitudinal stability:

(a) Climb. The stick force curve must have, at a minimum, a neutrally stable to stable slope at speeds between 85 and 115 percent of the trim speed, with—

(1) Maximum continuous power; and

(2) The airplane trimmed at the speed used in determining the climb performance required by section 23.69(a).

(b) Cruise. With the airplane in trim with power for level flight at representative cruising speeds at high and low altitudes, including speeds up to V_{NO} , except that the speed need not exceed V_H --

(1) The stick force curve must, at a minimum, have a neutrally stable to stable slope at all speeds within a range that is the greater of 15 percent of the trim speed plus the resulting free return speed range, or 40 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable—

(i) At speeds less than $1.3 V_{S1}$; or

(ii) For airplanes with V_{NE} established under section 23.1505(a), at speeds greater than V_{NE} .

(c) Landing. The stick force curve must, at a minimum, have a neutrally stable to stable slope at speeds between $1.1 V_{S1}$ and $1.8 V_{S1}$ with—

(1) Landing gear extended; and

(2) The airplane trimmed at—

(i) V_{REF} , or the minimum trim speed if higher, with power off; and

(ii) V_{REF} with enough power to maintain a 3 degree angle of descent.

(D) In place of 14 CFR part 23, § 23.177, Static directional and lateral stability requirement, comply with the following:

SC23.177 Static directional and lateral stability:

(a) The static directional stability, as shown by the tendency to recover from a wings level sideslip with the rudder free, must be positive for any landing gear and flap position appropriate to the takeoff, climb, cruise, approach, and landing configurations. This must be shown with symmetrical power up to maximum continuous power, and at speeds from $1.2 V_{S1}$ up to the maximum allowable speed for the condition being investigated. The angle of sideslip for these tests must be appropriate to the type of airplane. At larger angles of sideslip, up to that at which full rudder is used or a control force limit in section 23.143 is reached, whichever occurs first, and at speeds from $1.2 V_{S1}$ to V_O , the rudder pedal force must not reverse.

(b) In straight, steady slips at $1.2 V_{S1}$ for any landing gear and flap positions, and for any symmetrical power conditions up to 50 percent of maximum continuous power, the rudder control movements and forces must increase steadily, but not necessarily in constant proportion, as the angle of sideslip is increased up to the maximum appropriate to the type of airplane. The aileron control movements and forces may increase steadily, but not necessarily in constant proportion, as the angle of sideslip is increased up to the maximum appropriate to the type of airplane. At larger slip angles, up to the angle at which the full rudder or aileron control is used or a control force limit contained in section 23.143 is reached, the aileron and rudder control movements and forces must not reverse as the angle of sideslip is increased. Rapid entry into,

and recovery from, a maximum sideslip considered appropriate for the airplane must not result in uncontrollable flight characteristics.

Issued in Kansas City, Missouri, on March 1, 2012.

John R. Colomy
Acting Manager, Small Airplane Directorate
Aircraft Certification Service

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