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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. CE214; Special Conditions No. 23–157–SC]

Special Conditions: Thielert Aircraft Engines GmbH, Cessna Model 172 Series, Diesel Cycle Engine Using Turbine (Jet) Fuel

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Cessna Model 172 airplane. This airplane as modified by Thielert Aircraft Engines GmbH will have a novel or unusual design feature(s) associated with the installation of an aircraft diesel engine. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. 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.

DATES: Effective January 6, 2005.

FOR FURTHER INFORMATION CONTACT: Peter Rouse, Federal Aviation Administration, Aircraft Certification Service, Small Airplane Directorate, ACE–111, 901 Locust, Room 301, Kansas City, Missouri 64106; 816–329–4135, fax 816–329–4090, e-mail *peter.rouse@faa.gov*.

SUPPLEMENTARY INFORMATION:

Background

On February 11, 2002, Thielert Aircraft Engines GmbH applied for a supplemental type certificate for installation of an aircraft diesel engine in the Cessna Model 172 airplane. The Cessna 172 series airplanes are currently approved under Type Certificate No. 3A13, and they are four-place, high wing, fixed tricycle landing gear, conventional planform airplanes. The Cessna 172 airplanes affected have gross weights in the range of 2300 to 2558 pounds in the normal category. The affected series of airplanes have been equipped with gasoline reciprocating engines of 160 to 180 horsepower.

Type Certification Basis

Under the provisions of § 21.101, Thielert Aircraft Engines, GmbH must show that the Cessna Model 172, as changed, continues to meet the applicable provisions of the regulations incorporated by reference in Type Certificate No. 3A13 or the applicable regulations in effect on the date of application for the change. The regulations incorporated by reference in the type certificate are commonly referred to as the ''original type certification basis.'' The regulations incorporated by reference in Type Certificate No. 3A13 are as follows:

The certification basis of models 172K, 172L, 172M, 172N, and 172P is:

Part 3 of the Civil Air Regulations, effective November 1, 1949, as amended by 3–1 through 3–12. In addition, effective S/N 17271035 and on, 14 CFR part 23, § 23.1559, effective March 1, 1978. 14 CFR part 36, dated December 1, 1969, plus Amendments 36–1 through 36–5 for Model 172N; 14 CFR part 36, dated December 1, 1969, plus Amendments 36–1 through 36–12 for Model 172P through 172Q. In addition, effective S/N 17276260 and on, 14 CFR part 23, § 23.1545(a), Amendment 23–23, dated December 1, 1978, including:

Equivalent Safety Items for:

Airspeed Indicator—CAR 3.757
Operating Limitations—CAR 3.778(a)

The certification basis for the model 172R is:

Part 23 of the Federal Aviation Regulations effective February 1, 1965, as amended by 23–1 through 23–6, except as follows:

14 CFR part 23, §§ 23.423; 23.611; 23.619; 23.623; 23.689; 23.775; 23.871; 23.1323; and 23.1563, as amended by Amendment 23–7. 14 CFR part 23, §§ 23.807 and 23.1524, as amended by Amendment 23–10. 14 CFR part 23, §§ 23.507; 23.771; 23.853(a), (b) and (c); and 23.1365, as amended by Amendment 23–14. 14 CFR part 23, § 23.951, as amended by Amendment 23–15. 14 CFR part 23, §§ 23.607; 23.675; 23.685; 23.733; 23.787; 23.1309 and 23.1322, as amended by Amendment 23–17. 14 CFR part 23, § 23.1301, as amended by Amendment 23–20. 14 CFR part 23, §§ 23.1353; and 23.1559, as amended by Amendment 23–21. 14 CFR part 23, §§ 23.603; 23.605; 23.613; 23.1329 and 23.1545, as amended by Amendment 23–23. 14 CFR part 23, §§ 23.441 and 23.1549, as amended by Amendment 23–28. 14 CFR part 23, §§ 23.779 and 23.781, as amended by Amendment 23–33. 14 CFR part 23, §§ 23.1; 23.51 and 23.561, as amended by Amendment 23–34. 14 CFR part 23, §§ 23.301; 23.331; 23.351; 23.427; 23.677; 23.701; 23.735; and 23.831, as amended by Amendment 23–42. 14 CFR part 23, §§ 23.961; 23.1093; 23.1143(g); 23.1147(b); 23.1303; 23.1357; 23.1361 and 23.1385, as amended by Amendment 23–43. 14 CFR part 23.562(a), 23.562(b)2, 23.562(c)1, 23.562(c)2, 23.562(c)3, and 23.562(c)4, as amended by Amendment 23–44. 14 CFR part 23, §§ 23.33; 23.53; 23.305; 23.321; 23.485; 23.621; 23.655 and 23.731, as amended by Amendment 23–45; and 14 CFR part 36, dated December 1, 1969, as amended by Amendments 36–1 through 36–21.

Equivalent Safety Items for:

Induction System Icing Protection—14 CFR 23.1093
Throttle Control—14 CFR 23.1143(g)
Mixture Control—14 CFR 23.1147(b)

The type certification basis for the modified airplanes is as stated previously with the following modifications:

The certification basis for the model 172S is:

Part 23 of the Federal Aviation Regulations effective February 1, 1965, as amended by 23–1 through 23–6, except as follows:

14 CFR part 23, §§ 23.423; 23.611; 23.619; 23.623; 23.689; 23.775; 23.871; 23.1323; and 23.1563, as amended by Amendment 23–7. 14 CFR part 23, §§ 23.807 and 23.1524, as amended by Amendment 23–10. 14 CFR part 23, §§ 23.507; 23.771; 23.853(a), (b) and (c); and 23.1365, as amended by Amendment 23–14. 14 CFR part 23, § 23.951, as amended by Amendment 23–15. 14 CFR part 23, §§ 23.607; 23.675; 23.685; 23.733; 23.787; 23.1309 and 23.1322, as amended by Amendment 23–17. 14 CFR part 23,

§ 23.1301, as amended by Amendment 23–20. 14 CFR part 23, §§ 23.1353 and 23.1559, as amended by Amendment 23–21. 14 CFR part 23, §§ 23.603; 23.605; 23.613; 23.1329 and 23.1545, as amended by Amendment 23–23. 14 CFR part 23, §§ 23.441 and 23.1549, as amended by Amendment 23–28. 14 CFR part 23, §§ 23.779 and 23.781, as amended by Amendment 23–33. 14 CFR part 23, §§ 23.1; 23.51 and 23.561, as amended by Amendment 23–34. 14 CFR part 23, §§ 23.301; 23.331; 23.351; 23.427; 23.677; 23.701; 23.735; and 23.831, as amended by Amendment 23–42. 14 CFR part 23, §§ 23.961; 23.1093; 23.1143(g); 23.1147(b); 23.1303; 23.1357; 23.1361 and 23.1385, as amended by Amendment 23–43. 14 CFR part 23, §§ 23.562(a); 23.562(b)2; 23.562(c)1; 23.562(c)2; 23.562(c)3; and 23.562(c)4, as amended by Amendment 23–44. 14 CFR part 23, §§ 23.33; 23.53; 23.305; 23.321; 23.485; 23.621; 23.655 and 23.731, as amended by Amendment 23–45.

14 CFR part 36, dated December 1, 1969, as amended by Amendments 36–1 through 36–21.

Equivalent Safety Items for:

Induction System Icing Protection—14 CFR 23.1093
Throttle Control—14 CFR 23.1143(g)
Mixture Control—14 CFR 23.1147(b)

14 CFR part 23, at Amendment level 23–51, applicable to the areas of change:

14 CFR part 23, §§ 23.1; 23.3; 23.21; 23.23; 23.25; 23.29; 23.33; 23.45; 23.49; 23.51; 23.53; 23.63; 23.65; 23.69; 23.71; 23.73; 23.77; 23.141; 23.143; 23.145; 23.151; 23.153; 23.155; 23.171; 23.173; 23.175; 23.177; 23.201; 23.221; 23.231; 23.251; 23.301; 23.303; 23.305; 23.307; 23.321; 23.335; 23.337; 23.341; 23.343; 23.361; 23.363; 23.371; 23.572; 23.573; 23.574; 23.601; 23.603; 23.605; 23.607; 23.609; 23.611; 23.613; 23.619; 23.621; 23.623; 23.625; 23.627; 23.629 (at Amendment 23–6 for Cessna 172 models R and S; Civil Aviation Regulation 3.159 applies to all other models); 23.773; 23.777; 23.777(d); 23.779; 23.779(d); 23.781; 23.831; 23.863; 23.865; 23.867; 23.901; 23.901(d)(1); 23.903; 23.905; 23.907; 23.909; 23.925; 23.929; 23.939; 23.943; 23.951; 23.951(c); 23.954; 23.955; 23.959; 23.961; 23.963; 23.965; 23.967; 23.969; 23.971; 23.973; 23.973(f); 23.975; 23.977; 23.991; 23.993; 23.994; 23.995; 23.997; 23.997(a)(2), in place of §§ 23.997(a)(1); 23.999; 23.1011; 23.1013; 23.1015; 23.1017; 23.1019; 23.1021; 23.1023; 23.1041; 23.1043; 23.1047; 23.1061; 23.1063; 23.1091; 23.1093; 23.1103; 23.1107; 23.1121; 23.1123; 23.1141; 23.1143; 23.1145; 23.1163; 23.1165; 23.1181; 23.1182; 23.1183; 23.1191; 23.1193; 23.1301; 23.1305; 23.1309; 23.1311; 23.1321; 23.1322; 23.1327; 23.1331; 23.1337; 23.1351; 23.1353; 23.1357; 23.1359; 23.1361; 23.1365; 23.1367; 23.1381; 23.1431; 23.1461; 23.1501; 23.1519; 23.1521; 23.1527; 23.1529; 23.1541; 23.1543; 23.1549; 23.1551; 23.1555; 23.1557; 23.1567; 23.1581; 23.1583; 23.1585; 23.1587 and 23.1589.

Equivalent levels of safety for:

Cockpit controls—23.777(d)
Motion and effect of cockpit controls—23.779(b)
Liquid Cooling—Installation—23.1061
Ignition switches—23.1145

The type certification basis includes exemptions, if any; equivalent level of safety findings, if any; and the special conditions adopted by this rulemaking action.

In addition, if the regulations incorporated by reference do not provide adequate standards with respect to the change, the applicant must comply with certain regulations in effect on the date of application for the change. The type certification basis for the modified airplanes is as stated previously with the following modifications:

If the Administrator finds that the applicable airworthiness regulations (i.e., part 23) do not contain adequate or appropriate safety standards for the Cessna Model 172 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 Cessna Model 172 must comply with the part 23 noise certification requirements of 14 CFR part 36.

Special conditions, as appropriate, as defined in § 11.19, are issued in accordance with § 11.38, and become part of the type certification basis in accordance with § 21.101.

Special conditions are initially applicable to the model for which they are issued. Should the applicant apply for a supplemental type certificate to modify any other model included on the same type certificate to incorporate 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 Cessna Model 172 will incorporate the following novel or unusual design features: The Cessna Model 172, as modified by Thielert Aircraft Engines GmbH, will incorporate an aircraft diesel engine utilizing turbine (jet) fuel.

Discussion of Comments

Notice of proposed special conditions No. 23–04–02–SC for the Thielert Aircraft Engines, GmbH, Cessna Model 172 Series airplanes was published on November 22, 2004, (69 FR 67860). No comments were received, and the special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to the Thielert Aircraft Engines GmbH, Cessna Model 172 Series. Should Thielert Aircraft Engines GmbH apply at a later date for a supplemental type certificate to modify any other model included on Type Certificate No. 3A12 to incorporate the same novel or unusual design feature, the special conditions would apply to that model as well under the provisions of § 21.101(a)(1).

Under standard practice, the effective date of final special conditions would be 30 days after the date of publication in the **Federal Register**; however, as the certification date for the Thielert Aircraft Engines GmbH, Cessna Model 172 Series is imminent, the FAA finds that good cause exists to make these special conditions effective upon issuance.

Conclusion

This action affects only certain novel or unusual design features on one model series 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 21.101; 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 Thielert Aircraft Engines GmbH, Cessna Model 172 Series airplanes modified by Thielert Aircraft Engines GmbH.

1. Engine Torque (Provisions Similar to § 23.361, paragraphs (b)(1) and (c)(3))

(a) For diesel engine installations, the engine mounts and supporting structure

must be designed to withstand the following:

(1) A limit engine torque load imposed by sudden engine stoppage due to malfunction or structural failure.

The effects of sudden engine stoppage may alternately be mitigated to an acceptable level by utilization of isolators, dampers clutches and similar provisions, so that unacceptable load levels are not imposed on the previously certificated structure.

(b) The limit engine torque to be considered under paragraph 14 CFR part 23, § 23.361(a) must be obtained by multiplying the mean torque by a factor of four for diesel cycle engines.

(1) If a factor of less than four is utilized, it must be shown that the limit torque imposed on the engine mount is consistent with the provisions of § 23.361(c), that is, it must be shown that the utilization of the factors listed in § 23.361(c)(3) will result in limit torques being imposed on the mount that are equivalent or less than those imposed by a conventional gasoline reciprocating engine.

2. Powerplant—Installation (Provisions Similar to § 23.901(d)(1) for Turbine Engines)

Considering the vibration characteristics of diesel engines, the applicant must comply with the following:

(a) Each diesel engine installation must be constructed and arranged to result in vibration characteristics that—

(1) Do not exceed those established during the type certification of the engine; and

(2) Do not exceed vibration characteristics that a previously certificated airframe structure has been approved for—

(i) Unless such vibration characteristics are shown to have no effect on safety or continued airworthiness, or

(ii) Unless mitigated to an acceptable level by utilization of isolators, dampers clutches and similar provisions, so that unacceptable vibration levels are not imposed on the previously certificated structure.

3. Powerplant—Fuel System—Fuel System With Water Saturated Fuel (Compliance With § 23.951 requirements):

Considering the fuel types used by diesel engines, the applicant must comply with the following:

Each fuel system for a diesel engine must be capable of sustained operation throughout its flow and pressure range with fuel initially saturated with water at 80° F and having 0.75cc of free water per gallon added and cooled to the most critical condition for icing likely to be encountered in operation.

Methods of compliance that are acceptable for turbine engine fuel systems requirements of § 23.951(c) are also considered acceptable for this requirement.

4. Powerplant—Fuel System—Fuel System Hot Weather Operation (Compliance With § 23.961 Requirements)

In place of compliance with § 23.961, the applicant must comply with the following:

Each fuel system must be free from vapor lock when using fuel at its critical temperature, with respect to vapor formation, when operating the airplane in all critical operating and environmental conditions for which approval is requested. For turbine fuel, or for aircraft equipped with diesel cycle engines that use turbine or diesel type fuels, the initial temperature must be 110°F, -0°, +5° or the maximum outside air temperature for which approval is requested, whichever is more critical.

The fuel system must be in an operational configuration that will yield the most adverse, that is, conservative results.

To comply with this requirement, the applicant must use the turbine fuel requirements and must substantiate these by flight-testing, as described in Advisory Circular AC 23–8B, Flight Test Guide for Certification of Part 23 Airplanes.

5. Powerplant—Fuel System—Fuel Tank Filler Connection (Compliance With § 23.973(f) Requirements)

In place of compliance with § 23.973(e) and (f), the applicant must comply with the following:

For airplanes that operate on turbine or diesel type fuels, the inside diameter of the fuel filler opening must be no smaller than 2.95 inches.

6. Powerplant—Fuel System—Fuel Tank Outlet (Compliance With § 23.977 Requirements)

In place of compliance with § 23.977(a)(1) and (a)(2), the applicant will comply with the following:

There must be a fuel strainer for the fuel tank outlet or for the booster pump. This strainer must, for diesel engine powered airplanes, prevent the passage of any object that could restrict fuel flow or damage any fuel system component.

7. Powerplant—Powerplant Controls and Accessories—Engine Ignition Systems (Compliance With § 23.1165 Requirements)

Considering that the FADEC provides the same function as an ignition system for this diesel engine, in place of compliance to§ 23.1165, the applicant will comply with the following:

The electrical system must comply with the following requirements:

(a) In case of failure of one power supply of the electrical system, there will be no significant engine power change. The electrical power supply to the FADEC must remain stable in such a failure.

(b) The transition from the actual engine electrical network (FADEC network) to the remaining electrical system should be made at a single point only. If several transitions (for example, redundancy reasons) are needed, then the number of the transitions must be kept as small as possible.

(c) There must be the ability to separate the FADEC power supply (alternator) from the battery and from the remaining electrical system.

(d) In case of loss of alternator power the installation must guarantee that the battery will provide the power for an appropriate time after appropriate warning to the pilot. This period must be at least 120 minutes.

(e) FADEC, alternator and battery must be interconnected in an appropriate way, so that in case of loss of battery power, the supply of the FADEC is guaranteed by the alternator.

8. Equipment—General—Powerplant Instruments (Compliance With § 23.1305 Requirements)

In place of compliance with § 23.1305, the applicant will comply with the following:

The following are required powerplant instruments:

(a) A fuel quantity indicator for each fuel tank, installed in accordance with § 23.1337(b).

(b) An oil pressure indicator.

(c) An oil temperature indicator.

(d) A tachometer indicating propeller speed.

(e) A coolant temperature indicator.

(f) An indicating means for the fuel strainer or filter required by § 23.997 to indicate the occurrence of contamination of the strainer or filter before it reaches the capacity established in accordance with § 23.997(d).

Alternately, no indicator is required if the engine can operate normally for a specified period with the fuel strainer exposed to the maximum fuel

contamination as specified in MIL–5007D and provisions for replacing the fuel filter at this specified period (or a shorter period) are included in the maintenance schedule for the engine installation.

(g) Power setting, in percentage.

(h) Fuel temperature.

(i) Fuel flow (engine fuel consumption).

9. Operating Limitations and Information—Powerplant Limitations—Fuel Grade or Designation (Compliance With § 23.1521(d) Requirements)

Instead of compliance with § 23.1521(d), the applicant must comply with the following:

The minimum fuel designation (for diesel engines) must be established so that it is not less than that required for the operation of the engines within the limitations in paragraphs (b) and (c) of § 23.1521.

10. Markings and Placards—Miscellaneous Markings and Placards—Fuel, Oil, and Coolant Filler Openings (Compliance With § 23.1557(c)(1) Requirements)

Instead of compliance with § 23.1557(c)(1), the applicant must comply with the following:

Fuel filler openings must be marked at or near the filler cover with—

For diesel engine-powered airplanes—

(a) The words ''Jet Fuel''; and

(b) The permissible fuel designations, or references to the Airplane Flight Manual (AFM) for permissible fuel designations.

(c) A warning placard or note that states the following or similar:

''Warning—this airplane equipped with an aircraft diesel engine, service with approved fuels only.''

The colors of this warning placard should be black and white.

11. Powerplant—Fuel System—Fuel-Freezing

If the fuel in the tanks cannot be shown to flow suitably under all possible temperature conditions, then fuel temperature limitations are required. These will be considered as part of the essential operating parameters for the aircraft and must be limitations.

(1) The takeoff temperature limitation must be determined by testing or analysis to define the minimum cold-soaked temperature of the fuel that the airplane can operate on.

(2) The minimum operating temperature limitation must be determined by testing to define the minimum operating temperature acceptable after takeoff (with minimum takeoff temperature established in (1) above).

12. Powerplant Installation—Vibration Levels

Vibration levels throughout the engine operating range must be evaluated and:

(1) Vibration levels imposed on the airframe must be less than or equivalent to those of the gasoline engine; or

(2) Any vibration level that is higher than that imposed on the airframe by the replaced gasoline engine must be considered in the modification and the effects on the technical areas covered by the following paragraphs must be investigated: 14 CFR part 23, §§ 23.251; 23.613; 23.627; 23.629 (or CAR 3.159, as applicable to various models); 23.572; 23.573; 23.574 and 23.901.

Vibration levels imposed on the airframe can be mitigated to an acceptable level by utilization of isolators, dampers clutches and similar provisions, so that unacceptable vibration levels are not imposed on the previously certificated structure.

13. Powerplant Installation—One Cylinder Inoperative

It must be shown by test or analysis, or by a combination of methods, that the airframe can withstand the shaking or vibratory forces imposed by the engine if a cylinder becomes inoperative. Diesel engines of conventional design typically have extremely high levels of vibration when a cylinder becomes inoperative. Data must be provided to the airframe installer/modifier so either appropriate design considerations or operating procedures, or both, can be developed to prevent airframe and propeller damage.

14. Powerplant Installation—High Energy Engine Fragments

It may be possible for diesel engine cylinders (or portions thereof) to fail and physically separate from the engine at high velocity (due to the high internal pressures). This failure mode will be considered possible in engine designs with removable cylinders or other non-integral block designs. The following is required:

(1) It must be shown that the engine construction type (massive or integral block with non-removable cylinders) is inherently resistant to liberating high energy fragments in the event of a catastrophic engine failure; or,

(2) It must be shown by the design of the engine, that engine cylinders, other engine components or portions thereof (fragments) cannot be shed or blown off of the engine in the event of a catastrophic engine failure; or

(3) It must be shown that all possible liberated engine parts or components do not have adequate energy to penetrate engine cowlings; or

(4) Assuming infinite fragment energy, and analyzing the trajectory of the probable fragments and components, any hazard due to liberated engine parts or components will be minimized and the possibility of crew injury is eliminated. Minimization must be considered during initial design and not presented as an analysis after design completion.

Issued in Kansas City, Missouri, on January 6, 2005.

James E. Jackson,

Acting Manager, Small Airplane Directorate, Aircraft Certification Service.

[FR Doc. 05–852 Filed 1–13–05; 8:45 am]

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 73

[Docket No. FAA–2004–17773; Airspace Docket No. 04–ASW–11]

RIN 2120–AA66

Modification of Restricted Areas 5103A, 5103B, and 5103C, and Revocation of Restricted Area 5103D; McGregor, NM

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule, correction.

SUMMARY: This action corrects a final rule (Airspace Docket No. 04-ASW–11) published in the **Federal Register** on December 13, 2004 (69 FR 72113). In that rule, the effective date was inadvertently published as January 20, 2005. The correct effective date is March 17, 2005. This action corrects that error.

DATES: 0901 UTC, March 17, 2005.

FOR FURTHER INFORMATION CONTACT: Steve Rohring, Airspace and Rules, Office of System Operations and Safety, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591; telephone: (202) 267–8783.

SUPPLEMENTARY INFORMATION: On December 13, 2004, Airspace Docket No. 04–ASW–11 (69 FR 72113), was published modifying R–5103A, R–5103B, and R–5103C, and revoking R–5103D in McGregor, NM. In that rule, the effective date was inadvertently published as January 20, 2005. The correct effective date is March 17, 2005. This action corrects that error.