



Federal Aviation Administration

Memorandum

Date: July 15, 2016

To: Manager, Chicago Aircraft Certification Office, ACE-115C

From: Manager, Small Airplane Directorate, ACE-100

Prepared by: Wess Rouse, Propulsion & Program Management Branch, ACE-118C

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Cirrus Design Corporation, Model SF50, 14 CFR part 23, Amendment 23-62, FAA Project #: TC06444CH-A

ELOS Memo#: TC06444CH-A-F-5

Regulatory Ref: 14 CFR 23.45, 23.51, 23.63, 23.67, 23.73, 23.77, 23.161, 23.181, 23.221, 23.251, 23.253, 23.571, 23.785, 23.831, 23.1195, 23.1197, 23.1199, 23.1201, 23.1527, 23.1545, and 23.1583 at amendment 23-62

This memorandum informs the certificate management aircraft certification office of an evaluation made by the Accountable Directorate on the establishment of an equivalent level of safety finding for the Cirrus Design Corporation Model SF50 jet.

Background:

Airplane Certification Basis:

The Model SF50 jet is a new model airplane that will receive a new Federal Aviation Administration (FAA) Type Certificate (TC) upon completion of the certification process. The type certification basis for the Model SF50 jet includes 14 CFR part 23, effective February 1, 1965, as amended by amendments 23-1, dated July 29, 1965 through amendment 23-62, dated January 31, 2012; 14 CFR part 34, effective September 10, 1990, as amended by amendment 34-1, dated July 31, 1995 through amendment 34-5A, dated October 23, 2013; and 14 CFR part 36, effective March 11, 1994, as amended by amendment 36-1, dated December 1, 1969 through amendment 36-28, dated February 3, 2006.

Airplane Description:

The Model SF50 jet is a low-wing, five-plus-two-place (2 children), single-engine turboprop-powered aircraft. It incorporates an Electronic Flight Information System (EFIS), pressurized cabin, retractable gear, and a V-tail. Its Full Authority Digital Engine Control (FADEC) type Williams International FJ33-5A engine is mounted on the upper fuselage/tail cone along the aircraft centerline. It is constructed largely of carbon and fiberglass composite materials. Like other Cirrus products, the Model SF50 jet includes a ballistically deployed airframe parachute.

The Model SF50 jet has a maximum operating altitude of 28,000 ft, where it cruises at speeds up to 300 knots true airspeed. Its V_{mo} is 250 knots calibrated airspeed and M_{mo} is 0.53. The maximum takeoff weight will be at or below 6000 pounds with a range at economy cruise of roughly 1000 nautical miles.

The Model SF50 jet will be certified for single-pilot operations under part 91 and part 135 operating rules. The following operating conditions will be included:

- Day and Night Visual Flight Rules
- Instrument Flight Rules
- Flight into Known Icing

Amendment 23-62 ([76 FR 75736](#)), dated December 2, 2011 amended the applicable regulations for part 23 turbofan- and turbojet-powered airplanes to reflect the current needs of industry, accommodate future trends, address emerging technologies, and provide for future airplane operations.

Recently, while working several new certification projects that incorporated amendment 23-62, some unintentional errors were discovered by the FAA. The Small Airplane Directorate reviewed amendment 23-62, identified the errors, and drafted a corrected version of regulations. The Small Airplane Directorate is drafting a technical amendment to correct amendment 23-62. In the meantime, to avoid project delays for applicants certifying new airplanes under amendment 23-62, the FAA created Issue Paper F-5 to show an ELOS to the intent of amendment 23-62.

Applicable regulations:

§§ 23.45, 23.51, 23.63, 23.67, 23.73, 23.77, 23.161, 23.181, 23.221, 23.251; 23.253, 23.571, 23.785, 23.831, 23.1195, 23.1197, 23.1199, 23.1201; 23.1527, 23.1545, and 23.1583.

Regulations requiring an ELOS finding:

§§ 23.45, 23.51, 23.63, 23.67, 23.73, 23.77, 23.161, 23.181, 23.221, 23.251; 23.253, 23.571, 23.785, 23.831, 23.1195, 23.1197, 23.1199, 23.1201; 23.1527, 23.1545, and 23.1583.

Description of compensating design features or alternative Methods of Compliance (MoC) which allow the granting of the ELOS (including changes, limitations, or equipment needed for equivalency):

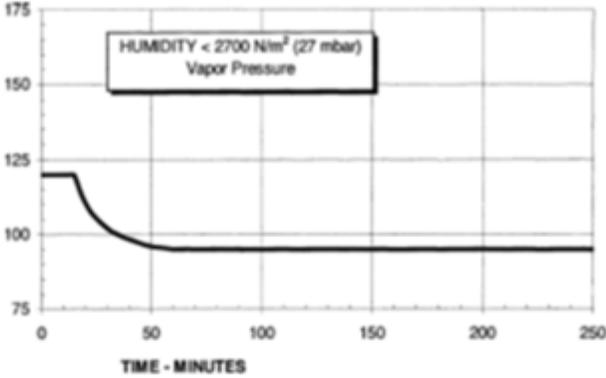
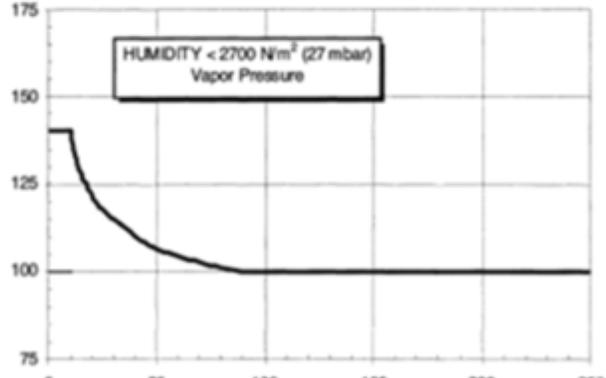
The FAA has determined that an ELOS finding is the appropriate means for showing that the Model SF50 jet meets the intent of amendment 23-62. The following table documents the ELOS to amendment 23-62 for the Model SF50 jet.

<u>CFR 14 Reference</u>	<u>Equivalent Interpretations</u>
<i>§ 23.45, General (Performance)</i>	
§ 23.45(h)(4) change:	“§ 23.67(c)(4)” to “§ 23.67(d)(4)”

<u>CFR 14 Reference</u>	<u>Equivalent Interpretations</u>
<i>§ 23.51, Takeoff speeds</i>	
§ 23.51(c)(4) change:	“§ 23.67(c)(1) and (c)(2)” to “§ 23.67(d)(1) and (d)(2)”
<i>§ 23.63, Climb: General</i>	
§ 23.63(c), including (c)(1) and (c)(2), change to read:	<p>(c) For each of the following normal, utility, and acrobatic category airplanes: (1) reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, (2) single engine turbines, and (3) multiengine turbine airplanes of 6,000 pounds or less maximum weight, compliance must be shown at weights as a function of airport altitude and ambient temperature within the operational limits established for takeoff and landing, respectively, with:</p> <p>(1) For reciprocating engine-power airplanes of more than 6,000 pounds maximum weight:</p> <p style="padding-left: 40px;">(i) Sections 23.65(b) and 23.67(b)(1) and (2), where appropriate, for takeoff and</p> <p style="padding-left: 40px;">(ii) Section 23.67(b)(2), where appropriate, and § 23.77(b), for landing,</p> <p>(2) For single-engine turbines:</p> <p style="padding-left: 40px;">(i) Section 23.65(b), for takeoff, and</p> <p style="padding-left: 40px;">(ii) Section 23.77(b) for landing.</p> <p>(3) For multiengine turbine airplanes of 6,000 pounds or less maximum weight:</p> <p style="padding-left: 40px;">(i) For takeoff, § 23.65(b) and</p> <p style="padding-left: 80px;">(A) If a turbopropeller-power airplane, § 23.67(b)(1), and (2), where appropriate.</p> <p style="padding-left: 80px;">(B) If a jet airplane, § 23.67(c)(1), and (2), where appropriate.</p> <p style="padding-left: 40px;">(ii) For landing, § 23.77(b) and</p> <p style="padding-left: 80px;">(A) If a turbopropeller-powered airplane, § 23.67(b)(2), where appropriate.</p> <p style="padding-left: 80px;">(B) If a jet airplane, § 23.67(c)(2), where appropriate.</p>
§ 23.63(d)(1) change to read:	<p>(d) * * *</p> <p>(1) If a normal, utility, or acrobatic category, turbopropeller-powered airplane:</p> <p style="padding-left: 40px;">(i) Section 23.67(b)(1), and (2), where appropriate, for takeoff, and</p> <p style="padding-left: 40px;">(ii) Section 23.67(b)(2), where appropriate, and § 23.77(c), for landing.</p>
§ 23.63(d)(2) change to read:	<p>(d) * * *</p> <p>(2) If a jet or commuter category airplane:</p> <p style="padding-left: 40px;">(i) Section 23.67(d)(1), (2), and (3), where appropriate, for takeoff, and</p> <p style="padding-left: 40px;">(ii) Section 23.67(d)(3), and (4), where appropriate, and § 23.77(c) for landing.</p>

<u>CFR 14 Reference</u>	<u>Equivalent Interpretations</u>
<i>§ 23.67, Climb: One engine inoperative</i>	
§ 23.67(a) change:	“reciprocating engine-powered” to “reciprocating multiengine-powered”
§ 23.67(b) change:	“reciprocating engine-powered” to “reciprocating multiengine-powered” and “turbopropeller-powered” to “multiengine turbopropeller-powered”
§ 23.67(c) change:	“jets” to “multiengine jets”
§ 23.67(d) change:	“jets” to “multiengine jets”
§ 23.67(d)(1)(i) change:	“propeller” to “propeller, if applicable,”
§ 23.67(d)(2)(i) change:	“propeller” to “propeller, if applicable,”
§ 23.67(d)(3)(i) change:	“propeller” to “propeller, if applicable,”
§ 23.67(d)(4)(i) change:	“propeller” to “propeller, if applicable,”
<i>§ 23.73, Reference landing approach speed</i>	
§ 23.73(b) change to read:	“Each of the following normal, utility, and acrobatic category airplanes: (1) reciprocating engine-powered airplane of more than 6,000 pounds maximum weight, (2) turbine powered airplane of 6,00 pounds or less maximum weight, and (3) single engine turbine powered airplane of more than 6,000 pounds maximum weight,”
§ 23.73(c) change:	“jets of more than” to “multiengine turbine powered airplanes over”
<i>§ 23.77, Balked landing</i>	
§ 23.77(b) change to read:	“Each of the following normal, utility, and acrobatic category airplanes: (1) reciprocating engine-powered airplane of more than 6,000 pounds maximum weight, (2) turbine powered airplane of 6,000 pounds or less maximum weight, and (3) single engine turbine powered airplane of more than 6,000 pounds maximum weight,”
<i>§ 23.161, Trim</i>	
§ 23.161(d) change:	“§ 23.67(a), (b)(2), or (c)(3),” to “§ 23.67(a), (b)(2), (c)(2), or (d)(3),”
<i>§ 23.181, Dynamic stability</i>	
§ 23.181(c)	“(b)(2)” to “the fixed position testing of (b)”

<u>CFR 14 Reference</u>	<u>Equivalent Interpretations</u>
change:	
<i>§ 23.221, Spinning</i>	
§ 23.221(a)(2)(ii) change:	“§ 23.201(e)” to “§ 23.201(f)”
§ 23.221(b) change:	“§ 23.807(b)(7)” to “§ 23.807(b)(6)”
§ 23.221(c) change:	“§ 23.807(b)(6) to “§ 23.807(b)(5)”
<i>§ 23.251, Vibration and buffeting</i>	
§ 23.251(a) change:	“turbojets” to “jets”
<i>§ 23.253, High speed characteristics</i>	
§ 23.253(b)(2) change:	“turbojets” to “jets”
<i>§23.571, Metallic pressurized cabin structures</i>	
§ 23.571 change:	“... evaluated under one of the following” to “... evaluated under paragraphs (a), (b), or (c). In addition, the requirements of paragraph (d) must be met when applicable.”
<i>§ 23.785, Seats, berths, litters, safety belts, and shoulder harnesses</i>	
§ 23.785(c) add to end of paragraph:	“Commuter category jet airplanes, must also comply with the requirements of § 23.562.”
<i>§ 23.831, Ventilation</i>	
§ 23.831(d) add to the end of the paragraph:	<p>“The cabin cooling system must be designed to meet the following conditions during flight above 15,000 feet mean sea level (MSL):</p> <p>(1) After any probable failure, the cabin temperature-time history may not exceed the values shown in Figure 1 of this paragraph.</p> <p>(2) After any improbable failure, the cabin temperature-time history may not exceed the values shown in Figure 2 of this paragraph.”</p>

CFR 14 Reference	Equivalent Interpretations
	 <p>TEMPERATURE (°F)</p> <p>HUMIDITY < 2700 N/m² (27 mbar) Vapor Pressure</p> <p>TIME - MINUTES</p> <p>TIME - TEMPERATURE RELATIONSHIP FIGURE 1</p>  <p>TEMPERATURE (°F)</p> <p>HUMIDITY < 2700 N/m² (27 mbar) Vapor Pressure</p> <p>TIME - MINUTES</p> <p>TIME - TEMPERATURE RELATIONSHIP FIGURE 2</p>
	<i>§ 23.1195, Fire extinguishing systems</i>
§ 23.1195(a) change:	“For all airplanes . . .” to “For commuter category airplanes, and all airplanes . . .”
	<i>§ 23.1197, Fire extinguishing agents</i>
§ 23.1197 introduction sentence, change:	“For all airplanes . . .” to “For commuter category airplanes, and all airplanes . . .”
	<i>§ 23.1199, Fire extinguishing containers</i>
§ 23.1199 introduction sentence, change:	“For all airplanes . . .” to “For commuter category airplanes, and all airplanes . . .”

<u>CFR 14 Reference</u>	<u>Equivalent Interpretations</u>
<i>§ 23.1201, Fire extinguishing materials</i>	
§ 23.1201 introduction sentence, change:	“For all airplanes . . .” to “For commuter category airplanes, and all airplanes . . .”
<i>§ 23.1527, Maximum operating altitude</i>	
§ 23.1527(b) change:	“§ 23.775(e)” to “§ 23.775(d)”
<i>§ 23.1545, Airspeed indicator</i>	
§ 23.1545(d) change:	“(b)(4)” to “(b)(3)”
<i>§ 23.1583, Operating limitations</i>	
§ 23.1583(c)(3) change to read:	“For each of the following normal, utility, and acrobatic category airplanes: (1) reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, (2) single-engine turbines, and (3) multiengine turbines of 6,000 pounds or less maximum weight . . .”
§ 23.1583(c)(3)(i) change:	“§ 23.63(c)(1)” to “§ 23.63(c)(1)(i), (c)(2)(i), or (c)(3)(i), as appropriate”
§ 23.1583(c)(3)(ii) change:	“§ 23.63(c)(2)” to “§ 23.63(c)(1)(ii), (c)(2)(ii), or (c)(3)(ii), as appropriate”
§ 23.1583(c)(4) change:	“jets” to “turbines”
§ 23.1583(c)(4)(i) change:	“§ 23.63(d)(1)” to “§ 23.63(d)(1)(i), or (d)(2)(i), as appropriate”
§ 23.1583(c)(5) change:	“jets” to “turbines”
§ 23.1583(c)(5)(i) change:	“§ 23.63(d)(1)” to “§ 23.63(d)(1)(ii) or (d)(2)(ii), as appropriate”

Explanation of how design features or alternative Methods of Compliance (MoC) provide an equivalent level of safety intended by the regulation:

The FAA has determined that an ELOS finding is the appropriate means for showing that the Model SF50 jet meets the intent of amendment 23-62. The following table documents the ELOS to amendment 23-62 for the Model SF50 jet.

FAA approval and documentation of the ELOS finding:

The FAA has approved the aforementioned ELOS finding in project issue paper F-5. This memorandum provides standardized documentation of the ELOS finding that is non-proprietary and can be made available to the public. The Accountable Directorate has assigned a unique ELOS memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS memorandum number must be listed in the Type Certificate Data Sheet under the Certification Basis section (TCs & ATCs) or in the Limitations and Conditions section of the STC.

Equivalent Level of Safety findings has been made for the following regulation(s):

- 23.45 General (Performance)
- 23.51 Takeoff speeds
- 23.63 Climb: General
- 23.67 Climb: One engine inoperative
- 23.73 Reference landing approach speed
- 23.77 Balked landing
- 23.161 Trim
- 23.181 Dynamic Stability
- 23.221 Spinning
- 23.251 Vibration and buffeting
- 23.253 High speed characteristics
- 23.571 Metallic pressurized cabin structures
- 23.785 Seats, berths, litters, safety belts, and shoulder harnesses
- 23.831 Ventilation
- 23.1195 Fire extinguishing systems
- 23.1197 Fire extinguishing agents
- 23.1199 Fire extinguishing characteristics
- 23.1201 Fire extinguishing materials
- 23.1527 Maximum Operating Altitude
- 23.1545 Airspeed indicator
- 23.1583 Operating limitations

(documented in ELOS Memo TC06444CH-A-F-5)

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July 15, 2016

Pat Mullen, Acting Manager, Small Airplane Directorate,
Aircraft Certification Service

Date

ELOS Originated by: Chicago ACO	Manager, Chicago ACO: Timothy P. Smyth	Routing Symbol: ACE-115C
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