



# Federal Aviation Administration

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## Memorandum

Date: AUG 21, 2012

To: See Distribution List

From: David W. Hempe, Manager, Aircraft Engineering Division, AIR-100 *symCable*

Prepared by: Randall Petersen, Engineering Procedures Office, AIR-110

Subject: Application of Electrical and Electronic System Lightning Protection Final Rules under Title 14, Code of Federal Regulations (14 CFR) § 21.101

Policy Memo  
Number: AIR-100-12-110-001

Regulatory  
Reference: 14 CFR 21.16, 21.101, 23.1306, 25.1316, 27.1316 and 29.1316

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### Purpose

This memorandum provides guidance to find compliance with the electrical and electronic system lightning protection standards (Title 14, Code of Federal Regulations (14 CFR) §§ 23.1306 [Amendment 23-61], 25.1316 [Amendment 25-134], 27.1316 [Amendment 27-46], and 29.1316 [Amendment 29-53]) under the provisions of 14 CFR 21.101, *Designation of Applicable Regulations*.

### Background

Prior to the adoption of 14 CFR 25.1316 in 1994 [Amendment 25-80], the FAA used special conditions (14 CFR 21.16) to impose requirements to protect aircraft electrical and electronic systems from lightning.

Electrical and electronic systems lightning protection requirements for aircraft certificated under parts 23, 27, and 29 were imposed by 14 CFR 23.1309(e), 27.1309(d), and 29.1309(h) which stated that lightning “must be considered.” However, the part 23 lightning regulation 14 CFR 23.1309(e) did not apply to powerplant systems provided as part of a type certificated engine. Consequently, the FAA used special conditions to impose lightning protection requirements for full-authority electronic engine control systems. In 1993, the FAA initiated rulemaking to establish harmonized standards for the protection of all aircraft electrical and electronic systems from adverse affects caused by lightning. Regulations based on these

standards became effective August 8, 2011. Guidance on how to comply with these standards can be found in Advisory Circular 20-136B.

### **Establishing the Certification Basis**

Section 21.101 requires a change to the type design of a product to meet the latest requirements, except where the design change is not significant (14 CFR 21.101(b)(1)); for areas not affected by the design change (14 CFR 21.101(b)(2)); or where it would be impractical or would not contribute materially to the level of safety (14 CFR 21.101(b)(3)). Therefore, if a design change is determined to be significant, and it does not meet one of the above exceptions, compliance must be shown to the latest regulatory standards for electrical and electronic system lightning protection (14 CFR 23.1306 [Amendment 23-61], 25.1316 [Amendment 25-134], 27.1316 [Amendment 27-46] and 29.1316 [Amendment 29-53]). Advisory Circular (AC) 21.101-1A provides guidance on determining whether a change to a type design is considered significant or not significant.

For design changes determined to be not significant, 14 CFR 21.101 allows continued compliance with the existing certification basis. However, if the existing certification basis does not provide adequate standards (reference AC 21.101-1A and Order 8110.48), the change must comply with later appropriate regulations or special conditions. For proposed installations of electrical and electronic systems requiring “catastrophic failure conditions” compliance under 14 CFR parts 23, 27, and 29; the certification basis is considered inadequate when it does not include 14 CFR 23.1306, 27.1316, or 29.1316.

For proposed installations of electrical and electronic systems with “catastrophic failure conditions” on transport category airplanes certificated under 14 CFR part 25, the certification basis is considered inadequate when the certification basis does not include 14 CFR 25.1316 [Amendment 25-134], 14 CFR 25.1316 [Amendment 25-80], or special conditions for electrical and electronic system lightning protection equivalent to the level of safety at Amendment 80.

For questions regarding compliance and application of regulatory standards contained in this memorandum, contact Lee Nguyen, Avionics Systems Branch, AIR-130, at (202) 385-4676. For questions regarding application of 14 CFR 21.101 (changed product rule), contact Randy Petersen, Certification Procedures Branch, AIR-111 202-385-6325.

The attached table summarizes how electrical and electronic system lightning protection standards are to be applied during type design changes.

| If the aircraft certification basis...                                                                                             | ....and the design change is determined to be:                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                    | Significant under 14 CFR 21.101                                                                                                                                                                                              | Not Significant under 14 CFR 21.101(b)(1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| ...does not include the lightning rule under Amendments 23-61, 27-46, or 29-53                                                     | Compliance with paragraphs (a) and (b) of the lightning rule under Amendments 23-61, 27-46, or 29-53, as appropriate, must be shown, unless an exception to paragraph (b) of the lightning rule is granted in 14 CFR 21.101. | <p>Certification basis is considered inadequate to address lightning protection for installations of electrical and electronic systems with <u>catastrophic failure conditions</u>. Compliance to paragraph (a) of the lightning rule under Amendments 23-61, 27-46, or 29-53 must be shown.</p> <p>For installations of electrical and electronic systems with <u>hazardous and/or major failure conditions</u>, compliance to paragraph (b) of the new lightning rules under Amendments 23-61, 27-46, or 29-53, as appropriate, is recommended, but not required.</p> |
| ...does not include a lightning rule under Amendment 25-134, Amendment 25-80, or an existing part 25 lightning special conditions. | Compliance with paragraphs (a) and (b) of the lightning rule under Amendment 25-134, as appropriate, must be shown.                                                                                                          | <p>Certification basis is considered inadequate to address lightning protection for installations of electrical and electronic systems with <u>catastrophic failure conditions</u>. Compliance to paragraph (a) of the lightning rule under Amendment 25-80 must be shown.</p> <p>For installations of electrical and electronic systems with <u>hazardous and/or major failure conditions</u>, compliance to paragraph (b) of the lightning rule under Amendment 25-80, is recommended, but not required.</p>                                                          |
| ...includes the lightning rule, or an existing lightning special condition equivalent at Amendment 25-80,                          | Compliance with the lightning rule under Amendment 25-134 must be shown.                                                                                                                                                     | Compliance with the lightning rule under Amendment 25-80 or existing part 25 lightning special condition must be shown.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| ...includes the lightning rules under Amendment 25-134, 23-61, 27-46, or 29-53                                                     | Compliance with the lightning rules under Amendments 25-134, 23-61, 27-46, or 29-53, must be shown.                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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