



Federal Aviation Administration

Memorandum

Date: April 4, 2006

To: See Distribution

From: Manager, Transport Airplane Directorate, Aircraft Certification Service,
ANM-100

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Subject: Policy Statement on acceptance of SAE International Aerospace
Recommended Practice 5577 as an acceptable method of compliance to
the Lightning Direct Effects requirements of § 25.581

Reply to Attn of: ANM-111-05-004

Regulatory Reference: § 25.581

Summary

This memorandum recognizes SAE International Aerospace Recommended Practice (ARP) 5577, Aircraft Lightning Direct Effects Certification, as an acceptable method of compliance to the lightning direct effects requirements of § 25.581. That document is a reference for the certification of part 25 lightning direct effects requirements, and has been harmonized with the European Organization for Civil Aviation Equipment (EUROCAE). It is technically equivalent to EUROCAE document ED-113.

Lightning direct effects are defined as any physical effects to the aircraft and or equipment due to the direct attachment of the lightning channel and/or conduction of lightning current. This includes dielectric puncture, blasting, bending, melting, burning and vaporization of aircraft or equipment surfaces and structures. It also includes direct injected voltages and current in associated wiring, plumbing, and other conductive components. Finally, direct effects also include shock and flash blindness to personnel.

Although lightning direct effects may not be specifically referred to by regulation, the regulations or requirements that apply are identified below in *italics*.

Current Regulatory and Advisory Material

Section 25.581 requires that transport airplanes be protected against the catastrophic effects of lightning. However, other than the general regulatory language in the rule, there is no standardized approach or FAA advisory material on compliance with § 25.581.

Relevant Past Practice

Since there was no FAA advisory material on compliance with § 25.581, applicants have used a number of different approaches to show lightning direct effects compliance. Many have used the approach identified in Advisory Circular (AC) 20-53A, “Protection of Airplane Fuel Systems Against Fuel Vapor Ignition Due to Lightning”, and modified the approach to satisfy § 25.581 for entire airplane structure. Similarly, others have used the compliance approach in AC 20-136, “Protection of Aircraft Electrical/Electronic Systems Against the Indirect Effects of Lightning”, and modified the approach to satisfy § 25.581 for direct lightning effects. Many applicants retain lightning specialists, using their own unique approach to compliance. As a result of these various approaches, there has not been a consistent structured and rigorous approach to finding compliance to § 25.581.

Policy

Aerospace Recommended Practice 5577 outlines an approach to lightning certification which involves 6 steps, namely:

1. establishing lightning zones
2. defining the lightning environment for each zone
3. performing a Lightning Hazard Assessment
4. incorporating protection with acceptance criteria
5. verifying compliance
6. implementing corrective measures as needed

The ARP provides guidance for each of these steps. Specific lightning zones for airplanes are defined, as well as the lightning environment. A Lightning Hazard Assessment is accomplished in order to determine the potential hazards to airplane structure from lightning direct effects. Acceptance criteria are defined. For example, the maximum hole size of a melted wing skin or acceptable composite delamination from a lightning strike is defined. Compliance is verified by determining that the structures, systems or components can tolerate the applicable lightning environments. Should the acceptance criteria not be met, modifications to the design are made.

Effect of Policy

The general policy stated in this document does not constitute a new regulation. The FAA individual who implements policy should follow this policy when it is applicable to a specific project. Whenever a proposed method of compliance is outside this established policy, that individual has to coordinate it with the policy issuing office using an issue paper. Similarly, if the implementing office becomes aware of reasons that an applicant's proposal should not be approved, the office must coordinate its response with the policy issuing office.

Applicants should expect that certificating officials would consider this information when making findings of compliance relevant to new certificate actions. In addition, as with all advisory material, this statement of policy identifies one means, but not the only means, of compliance.

Implementation

This policy discusses compliance methods that should be applied to type certificate, amended type certificate, supplemental type certificate, and amended supplemental type certification programs. The compliance methods apply to those programs with an application date that is on or after the effective date of the final policy. If the date of application precedes the effective date of the final policy, and the methods of compliance have already been coordinated with and approved by the FAA or its designee, the applicant may choose to either follow the previously acceptable methods of compliance or follow the guidance contained in this policy.

Signed by
Ali Bahrami

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