



Federal Aviation Administration

Memorandum

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To: See Distribution

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

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Subject: Policy Statement on Minimizing Potential Injury Hazards of Deployment Mechanisms.

Memo No.: ANM-115-05-016

Regulatory Reference: § 25.601

Summary

This policy memorandum clarifies Federal Aviation Administration (FAA) certification policy to minimize potential injury hazards of deployment mechanisms of interior features. Its purpose is threefold:

- To enhance awareness of current industry standards and practices.
- To clarify that the standards may be applied to areas beyond seats and folding carts.
- To provide an alternative method for evaluating potentially injurious mechanisms.

Definition of Key Terms

In the policy statement below, the formatting (*italics*, plain text, or [square brackets]) and terms used (“must,” “should,” or “recommend”) have a specific meaning that is explained in Attachment 1. For the purposes of this memo only, the term “cabin” excludes the main deck cargo compartment, if installed, provided there is no in flight access to that compartment by passengers. This policy is intended for the passenger compartment (including crew areas such as a crew rest or galley work area) and the flight deck.

Current Regulatory and Advisory Material

Section 25.601 states, “*The airplane may not have design features or details that experience has shown to be hazardous or unreliable. The suitability of each questionable design detail and part*”

must be established by tests.” Technical Standard Order (TSO)-C39c and TSO-C127a both reference Aerospace Standard (AS) 8049a (September 1997), which has design guidance that states “all moving parts (e.g., legrests, deployable video) should have restricted motion or be designed such that they are free from pinching or shearing effects to eliminate potential injury hazards.” For clarification, deployable video is a system that typically incorporates seat or sidewall mounted video monitors mounted to deployment mechanisms. The aircraft seating industry has published widely supported design standards found in Aerospace Recommended Practice (ARP) 5526 (January 2003), which states “Moving parts accessible to the occupant (e.g., legrests, deployable video, integral tables, and folding flight attendant seats) should have restricted motion, or be shielded so that pinching and/or shearing hazards are minimized.” TSO-C175 references AS8056 (November 2004) for folding cart design which states “Scissor Type Devices: Folding carts shall collapse in a manner that minimizes risk of injury. Exposed scissor type devices are not acceptable.”

Although evaluating deployment mechanisms for potential injury may not be specifically referred to by regulation, § 25.601 requires that they are non-hazardous. It is our intent that each method of compliance relate clearly to this requirement.

Relevant Past Practice

Deployment mechanisms have caused in-service injuries to occupants’ fingers in the form of entrapment and dismemberment. Specifically, occupants’ fingers were injured during operation of footrests, tray tables, armrests, and folding carts. In 1996 we issued Airworthiness Directive (AD) 96-12-09, Amendment 39-9651 (61 FR 32317, June 24, 1996), requiring corrective action of seat-mounted footrest assemblies that caused finger injuries when occupants attempted to extend or retract the footrest. Other regulatory authorities issued similar ADs for such mechanisms in folding flight attendant seats.

Although the above industry best practices have been available for some time, occasionally deployment mechanism designs are proposed/produced that present a potential hazard. Therefore, we have determined that guidance based on industry best practice will be helpful in ensuring that these hazardous details are addressed.

Policy

We have determined that the current design practices noted above may be generally applied to areas in the cabin beyond seats and folding carts. Minimizing or eliminating these hazardous details by following these practices is strongly recommended. Deployment mechanisms that have potential to cause injury may be hazardous and noncompliant with § 25.601. Note: mechanisms that have the potential to cause serious injury could rise to the level of an unsafe condition requiring possible AD action.

Occasionally, the FAA or its designees may become aware that a deployment mechanism is suspect. As an alternative to minimizing or eliminating these hazardous designs per industry practice, we are providing an alternative means for the applicant to demonstrate deployment mechanisms installed in the aircraft cabin are not hazardous. This alternate method is detailed in Attachment 2 of this policy memo, “Alternative Method for Evaluating Potentially Injurious Mechanisms.”

Effect of Policy

The general policy stated in this document does not constitute a new regulation. The FAA personnel or designees 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, the applicant may choose to either follow the previous acceptable methods of compliance established by the FAA or its designee, or follow the guidance contained in this policy.

Comments on Previously Approved Deployment Mechanisms

Occasionally, the FAA or design approval holder, although not actively evaluating a deployment mechanism, may become aware that a previously approved deployment mechanism is suspect. This could occur, for instance, if a mechanic working on the airplane discloses that someone was injured while operating the mechanism. The local FAA office should work with the approving office to determine if the mechanism was evaluated for hazards. If it is determined that a potentially hazardous condition exists, the local FAA office should initiate corrective action per the agreements between the applicant and the FAA office that certified the mechanism.

Corrective action for previously approved, yet hazardous, mechanisms should be encouraged as soon as practicable. For more information on implementing corrective action on previously approved mechanisms for seats that have TSO approval, or are intended to have TSO approval, follow the guidance in FAA policy PS-AIR120-2003-TSO, "Type Certificate (TC)/Technical Standard Order (TSO) Seat Issues and Their Resolution" (4/9/2004).

Notes for mechanisms in seats approved under a TSO:

1. For mechanisms in seats approved to TSO-C39c and TSO-C127(any revision level): These mechanisms should already incorporate compliant designs. Therefore, FAA engineers and designees should not need to evaluate these mechanisms. However, if it becomes apparent that a suspect mechanism has not been evaluated, the mechanism may be evaluated per this policy.

For mechanisms in seats approved to TSO-C39b: This standard references National Aircraft Standard Specification 809, "Aircraft Seats and Berths," dated 1/1/1956, and does not include criteria to evaluate a deployment mechanism as hazardous. Therefore, during installation assessment, FAA engineers and designees should evaluate the seat for compliance with § 25.601 as described above.

For resolving the noncompliance or hazardous condition of a mechanism in seats approved to a TSO, follow the guidance in policy PS-AIR120-2003-TSO. This should result in resolving the problem at the source.

For performing a design change (i.e., modification) of a seat approved under a TSO, follow the guidance in Advisory Circular 21-25A, "Approval of Modified Seating Systems Initially Approved under a Technical Standard Order," dated 6/3/1997.

Signed by Ali Bahrami

Ali Bahrami

Attachment 1: Definition of Key Terms

Attachment 2: Alternate Method for Evaluating Potentially Injurious Mechanisms

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Attachment 1

Definition of Key Terms

Table A-1 defines the use of key terms in this policy statement. The table describes the intended functional impact, and the formatting used to highlight these items.

- The term “must” refers to a regulatory requirement that is mandatory for design approval. Text communicating a requirement is in *italics*.
- The term “should” refers to instructions for a particular method of compliance. If an applicant wants to deviate from these instructions, he has to coordinate the alternate method of compliance with the Transport Standards Staff using an issue paper. There is no special text formatting used for methods of compliance.
- The term “recommend” refers to a recommended practice that is optional. Enclose recommendations in [] brackets.

Table A-1 Definition of Key Terms

	Regulatory Requirements	Acceptable Methods of Compliance	Recommendations
Language	Must	Should	Recommend
Format	<i>Italics</i>	Regular text (No special formatting)	[Square brackets]
Functional Impact	No Design Approval if not met	Alternative has to be approved by issue paper.	None, because it is optional

Examples from policy on Power Supply Systems for Portable Electronic Devices (PSS for PED):

- *Even though PSS for PED systems may use wiring that is produced for the consumer market, the wiring must meet the flammability requirements of § 25.869.*
- Although multiple power control switches may be used (e.g., zonal control of system power), there should be a single master switch that allows for the immediate removal of power to the entire PSS for PED
- [We recommend that you provide a means of indication to enable the cabin crew to determine which outlets are in use or which outlets are available for use.]

Attachment 2

Alternative Method for Evaluating Potentially Injurious Mechanisms

Limitation: This test method is only intended to be applied to those areas that have the potential to cause injuries in normal use. For example, there are several areas where the use of this method may fail to accurately represent a potential hazard, because the test method would represent an obviously improper operation or use. In those cases, employ good judgment and common sense. In some evaluations it may not be appropriate to simulate a finger with a rigid test probe (pencil) as described below. Although not required, more complex test probes, methods, and associated pass/fail criteria may be employed if desired, but are beyond the scope of this policy. The FAA has not evaluated or endorsed the other methods. There are various product safety test methods and probes available such as the Underwriters Laboratory (UL) Articulated Finger Probe - ULP01.

The evaluation should consist of investigating the accessibility/exposure of the mechanism, and, if deemed appropriate, testing the severity of the potential injury the mechanism could cause. If the mechanism does not meet the pass/fail criteria, it is the responsibility of the applicant to work with the FAA engineer or designee and propose or implement appropriate corrective action.

Accessibility/exposure: Perform a visual inspection of the mechanism while operating the mechanism in all possible deployment to stowed positions and assess it for areas that could cause dismemberment, entrapment, severe cuts, etc. Review the effects of software controlled and/or power assisted mechanisms (and their manual override features) that could contribute to or minimize an injury. If the portion of the mechanism that could cause injury is accessible, the mechanism is considered exposed and suspect. If that portion of the mechanism is not exposed, the mechanism is considered compliant. The mechanism is assumed to be in a normal operation state and not in other states such as a maintenance condition. If gaining access to the portion of the mechanism requires removing cover plates, cushions, etc., the mechanism is considered not exposed and therefore compliant. If the mechanism is considered exposed, perform the following severity test.

Severity test: Perform a minimum of three tests in each suspect area of the mechanism. To test the severity of a mechanism that could cause injury, use a standard HB wood pencil (a 7 ± 1 millimeter (mm) diameter dowel made from California incense cedar or equivalent softwood is also acceptable) to simulate a finger or toe. For each test, place a new pencil into the suspect portion of the mechanism (e.g., typically any acute angle that closes in a scissor mechanism, or a cavity that closes up during a rotation). For a suspect cavity, insert the pencil as far as it will go into the cavity. For a scissor like mechanism, place the midpoint of the pencil near the scissor. Hold, or fasten a holder to, the pencil and firmly and deliberately operate the deployment

Attachment 2

mechanism as quickly as is expected in normal operation such that the suspect area closes in on the pencil.

Severity Test Pass/Fail Criteria: Make certain that the pencil remained in position during each test. If there are no significant markings on the pencil, the design may be considered compliant with § 25.601. If the pencil snaps in two, or is significantly marked/crushed (e.g., less than half of the original thickness remaining post-test), from all three of the tests, the mechanism is considered to be noncompliant with § 25.601 and could rise to the level of an unsafe condition. These mechanisms cannot be approved as part of the type design until corrective action is taken to eliminate the noncompliant condition. For those situations that could rise to the level of an unsafe condition, follow the airworthiness concern process of the local FAA office to determine if mandatory action is warranted for airplanes in service. It is beyond the scope of this policy memo to make that determination.

Corrective action: Eliminate the hazards by any number of means including:

1. Installing protective guards that would render the subject portion of the existing mechanism unreachable by the occupant (not exposed); or
2. Redesigning the mechanism to eliminate the design features that could cause injury (e.g., using a telescoping rather than scissor mechanism, installing spacers to create gaps that would leave room for fingers to access the area without injury).