

Memorandum

U.S. Department
of Transportation

**Federal Aviation
Administration**

Subject: **INFORMATION:** Policy Statement on Use of Surrogate
Parts When Evaluating Seatbacks and Seatback Mounted
Accessories for Compliance with §§ 25.562(c)(5) and
25.785(b) and (d)

Date: DRAFT

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

Reply to
Attn. of: ANM-03-115-28

To: See Distribution

Regulatory Reference: 25.562(c)(5)
25.785(b) and (d)

Summary

The purpose of this memorandum is to streamline the seat certification process by providing Federal Aviation Administration (FAA) certification policy on using surrogate test articles in lieu of actual production seatback mounted accessories (e.g., video monitor, telephone) during blunt trauma tests in accordance with §§ 25.562(c)(5) and 25.785(b) and (d). This policy will reduce certification delays caused by the unavailability of production accessories for certification tests. Additionally, production accessories are typically damaged during certification tests and are not usable in subsequent tests or for installation and delivery to a customer. This policy will reduce certification costs by allowing tests to be conducted without these actual accessories.

This memorandum also provides acceptable methods of demonstrating that sharp, injurious edges would not be formed by a head impact against the actual production accessory since this evaluation cannot be accomplished from a test that uses a surrogate part.

Current Regulatory and Advisory Material

Section 25.562(c)(5) requires that each occupant must be protected from serious head injury under the conditions prescribed in paragraph h (b) of that section. Where head contact with seats or other structure can occur, protection must be provided so that the head impact does not exceed a Head Injury Criterion (HIC) of 1,000 units.

Section 25.785(b) requires that each seat, berth, safety belt, harness, and adjacent part of the airplane at each station designated as occupiable during takeoff and landing must be designed so that a person making proper use of those facilities will not suffer serious injury in an emergency landing as a result of inertia forces specified in §§ 25.561 and 25.562.

Section 25.785(d) requires, in pertinent part, that each occupant of a forward or aft facing seat be protected from head injury by the elimination of injurious objects within the striking radius of the head.

Policy

In many row-to-row seat configurations, seatback mounted accessories are installed within the head paths of forward facing seated occupants. In order to demonstrate compliance with the aforementioned requirements, dynamic tests are conducted to assess the injury potential of these seatbacks and accessories.

The types of dynamic tests that are conducted are dependant on the certification basis of the airplane. Airplane certification bases which include § 25.562(c)(5) require that protection be provided so that a head impact does not result in a HIC greater than 1,000 units under the dynamic test conditions specified in § 25.562(b). Typically, airplanes which do not have § 25.562(c)(5) in their certification basis, must still comply with the more general occupant protection requirements of §§ 25.785(b) and (d). Sections 25.785(b) and (d) require that a seat be designed so that an occupant would not suffer “serious injury” in an emergency landing and that injurious objects within the striking radius of the head be eliminated. As a result, seatbacks/accessories on these airplanes must be evaluated to ensure that an occupant would not suffer serious head injury from blunt trauma. Additionally, it must be demonstrated per §§ 25.785(b) and (d) that a seated occupant would not be severely injured by sharp edges formed by a head impact against a seatback mounted accessory. The requirement for this evaluation is applicable to all part 25 airplanes.

Currently, seatback mounted accessories are represented by actual production parts during blunt trauma tests. Industry has informed the FAA that certification delays occur due to the unavailability of these parts for testing. In addition, these production parts are typically damaged during certification tests and are not usable in subsequent tests or for installation and delivery to a customer. Several specimens of the same part number are typically used, and damaged, during certification tests due to test failures or substantiating alternate seatback designs. This results in significant costs to manufacturers and customers.

The FAA has determined that it is acceptable to use a surrogate test article made of 6061-T4 aluminum which meets the below criteria in lieu of a production accessory for demonstrating compliance with §§ 25.562(c)(5) and 25.785(b) and (d) for blunt trauma assessments. An exception to the use of the surrogate test article occurs when the accessory is more rigid (deflects less and absorbs less energy during impact) than the plate defined in this memorandum. In that case, the actual accessory should be used in the test(s) and not a surrogate test article.

The following criteria are applicable when using a surrogate test article during blunt trauma testing in accordance with §§ 25.562(c)(5) and 25.785(b) and (d):

- The surrogate part should be fabricated from 6061-T4 aluminum and have a minimum thickness of 0.25 inch. The length and width of the surrogate part should equal, within tolerances, the length and width of the actual part, respectively.
- The exposed surface of the surrogate part that will be impacted should be flat. That is, it is not required to have the contour of the accessory's exposed surface represented by the surrogate part. Note that this is based on typical accessory installations which are essentially mounted flush with the seatback and have a generally homogeneous contact area. Small variations in the surface due to the contour of plastic parts may be ignored. Designs that differ from this (e.g., a design with an exposed structural protrusion) might require the exposed surface of the actual part to be represented in order to adequately assess head injury potential.
- The weight of the surrogate part, and additional ballast if needed, should be the same or a maximum of 10 percent more than the weight of the actual part.
- The surrogate part should be located on the seatback in the same place where the actual part would be located in terms of the x and y coordinates in the attached figure. The surrogate part should be located such that the surface, which will be contacted during the test, is at the same location where the actual part would be in terms of the z coordinate (see the attached figure).
- The surrogate part should be attached to the seat by the final production hardware or a conservative representation of the final production hardware. For substantiating blunt trauma requirements, a conservative representation of the attachment hardware would be at least as rigid as the actual hardware. The surrogate part should be mounted so that it would not move farther or faster, with respect to the seatback, than the actual part during the test. Note that a conservative representation of the attachment hardware for determining HIC may not adequately represent the attachment hardware for substantiating it to § 25.562 loads.
- If the surrogate part cracks during a test, the test results are invalid.

A surrogate part made of a material and thickness other than 6061-T4 aluminum in a thickness of 0.25 inch may be used if an FAA Aircraft Certification Office finds that it is at least as rigid (i.e., it deflects less and absorbs less energy during the test). Surrogate test articles which are less rigid than the aluminum surrogate part defined above are not addressed in this memorandum. If an applicant desires to use a surrogate part which is less rigid, its use should be approved through the issue paper process (or equivalent) or by an FAA policy memorandum. Testing may be required to determine the acceptability of these less rigid surrogate parts.

Although this policy memorandum allows utilization of surrogate test articles, it does not alleviate the responsibility of the seat manufacturer/seat installer to demonstrate that the production part would not cause serious injury to passengers as a result of sharp edges caused by head impact. To assess whether or not sharp edges are created as a result of head impact, the following methods are considered acceptable:

Method 1

- Mount the actual accessory in a rigid fixture.
- Impact the accessory at a minimum impact velocity of 34 feet per second with one of the following devices:
 1. A bowling ball weighing a minimum of 13.0 lbs.
 2. A Free Motion Headform, as defined in 49 CFR part 572, subpart L
 3. A Head Component Test Device or equivalent. A Head Component Test Device consists of a Hybrid II ATD head and neck mounted on a pendulum. The head/neck assembly is accelerated with a pneumatic piston to achieve the desired impact velocity.
- The angle of impact should be approximately perpendicular to the exposed surface of the test article.

Note: A 13 pound bowling ball dropped from a height of 18 feet will yield an impact velocity of approximately 34 feet per second.

Method 2

Conduct a single § 25.562(b)(2) seat dynamic test like that used for showing compliance with the § 25.562(c)(5) requirements, but in this case conduct the test to establish whether or not sharp and injurious edges are created as a result of a head impact. For this specific test, the primary goal is to assess the part's susceptibility to generating sharp edges and corners, and therefore, it is not required (although it is permissible) to gather HIC data.

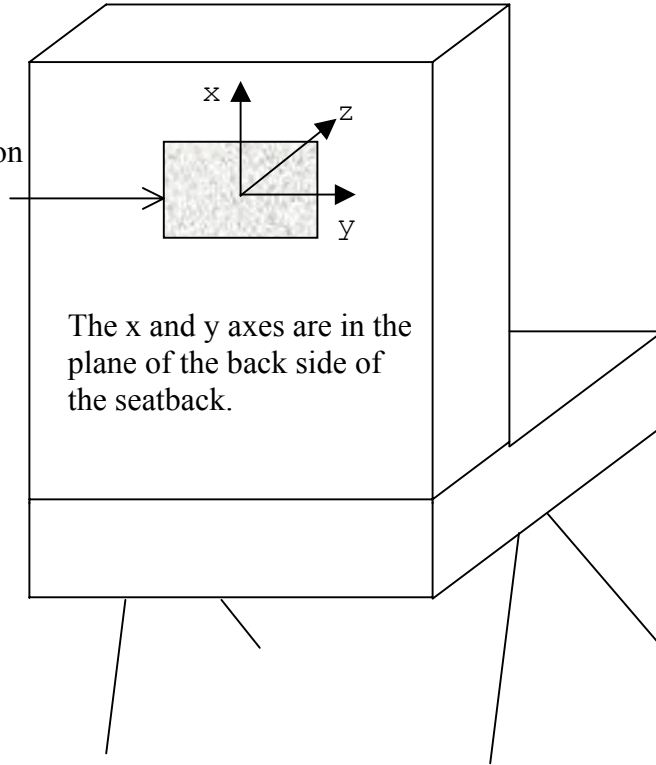
Effect of Policy

The general policy stated in this document does not constitute a new regulation or create what the courts refer to as a "binding norm". The office that implements policy should follow this policy when applicable to the specific project. Whenever an applicant's proposed method of compliance is outside this established policy, it must be coordinated with the policy issuing office, e.g., through the issue paper process or equivalent. Similarly, if the implementing office becomes aware of reasons that an applicant's proposal that meets this policy should not be approved, the office must coordinate its response with the policy issuing office.

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

Attachment: Surrogate Part Installed on Seatback

Surrogate part installed on the back side of the seatback in lieu of the actual accessory.



The x and y axes are in the plane of the back side of the seatback.