

criteria that enhance the overall level of safety and that can be achieved with reasonable cost. Therefore, this rule addresses two aspects of fire safety related to insulation material.

We intend this final rule to enhance the overall level of safety of the airplane when insulation that meets the upgraded flammability tests is installed. Because of the need to provide a suitable thermal and acoustical environment inside the airplane, we consider it extremely unlikely that insulation would be removed as a means to avoid having to comply with this rule. In fact, we considered requiring the removal of insulation material as an option to address flame propagation issues, but rejected it since it would effectively diminish the burnthrough capability that currently exists. Should removal of insulation become a common practice, we will revisit the need for a specific fuselage burnthrough standard.

A commenter asserted that the NPRM was ambiguous with regard to whether materials installed in the lower half of the fuselage would have to pass the fire penetration test. The commenter assumed that only those materials installed near the exterior skin of the fuselage would have to comply. Other commenters were concerned that the proposed requirement would apply to any thermal/acoustic insulation installed in the lower half, whether or not it would play a role in burnthrough.

The FAA's intent is that final § 25.856(b) applies to all thermal/acoustic insulation installed in the lower half of the fuselage that contributes to delaying burnthrough. For example, insulation on ducts in the lower half of the fuselage does not have to comply. To clarify this point, we added to final § 25.586(b) a statement that it does not apply to thermal/acoustic insulation installations that the FAA finds would not contribute to fire penetration resistance.

One commenter recommended that the flame penetration test not be limited to airplanes with 20 or more passenger seats. The commenter cited an accident involving an airplane with fewer than 20 seats, where improved insulation might have provided a benefit.

The FAA does not agree with the commenter's assessment of the potential role of insulation materials in the cited accident. The accident involved a non-transport category airplane that does not meet the other safety requirements of part 25. Thus, considering the addition of insulation materials apart from the other requirements of part 25 is not an accurate way to assess potential benefits. As noted in the NPRM, we

have assessed the potential benefits of requiring insulation materials to pass the flame penetration test and have concluded that smaller airplanes, with their greater evacuation capability, would not realize a benefit commensurate with the costs of compliance. Readers should note, however, that this final rule does not preclude manufacturers from installing upgraded insulation materials on smaller airplanes, if they so choose.

Several commenters recommended that the requirement for flame penetration resistance be applied to insulation materials installed in the entire fuselage, not just the lower half. One commenter stated that upgraded insulation materials installed in the entire fuselage would help protect airplanes from events such as lightning strikes, which usually come from above or to the side of the airplane. These commenters noted that the NPRM stated that providing such protection would not result in great cost. Conversely, several other commenters asked that the term "lower half" be better defined, or that the requirement be changed to something related to the airplane design, such as the window line, or the main deck cabin floor.

The FAA has carefully considered whether insulation materials installed in the entire fuselage should have to pass the flame penetration test. As discussed in the preamble to the NPRM, the main issue is that the benefits of such a requirement would be negligible. While a scenario can be envisaged where materials in the upper fuselage would provide a benefit, the conditions would be extremely rare, and were not evident in the benefit study used to develop the proposal. For materials in the upper fuselage to be beneficial, the airplane would have to be rolled an extreme amount (by specifying the lower half, the requirement already accounts for significant roll), and still be intact. While this scenario may not be far-fetched, there must also be post-crash fire for there to be any benefit from the materials. An accident that causes a combination of severe roll attitude, no fuselage rupture, but with a post-crash fire, is extremely rare if even feasible and is not considered a reasonable basis on which to base a requirement. In addition, while the NPRM characterized the increased costs as "not great," it should be noted that they are also not trivial. Any added weight would effectively be doubled, and the costs of materials would also rise. Since these costs would not be balanced by benefit, it would not be appropriate to mandate that the entire fuselage be fitted with thermal/acoustic

insulation that meets the flame penetration requirement. Regarding threats from other in-flight occurrences, such as lightning, the flame propagation test required by final § 25.856(a), which is applicable to all thermal/acoustic insulation installed in the airplane, will provide added protection.

Final § 235.586(b) applies to thermal/acoustic insulation installed in the "lower half of the airplane fuselage." This phrase means the area below a horizontal line that bisects the cross section of the fuselage, as measured with the airplane in a normal attitude on the ground. We have looked at the accident history, as well as research testing, and concluded that benefits will be realized with the lower half of the fuselage protected. Using another measure, such as the window line, or the main cabin floor, would not provide the intended benefit, unless those locations were in the upper half of the fuselage. We realize that thermal/acoustic insulation installations are not typically tied to the upper or lower half of the airplane, so this requirement will probably result in either changes to insulation installation approaches, or use of the complying material over somewhat more than half of the fuselage. Since new installations of insulation materials will likely be required for compliance anyway, this is not considered to be a significant point.

The FAA has determined that future design possibilities, such as blended wing-body configurations, would have to be addressed specifically, if the concept of the lower half is not appropriate.

As discussed above, final § 25.856(b) applies to thermal/acoustic insulation installed near the outer skin of the lower half of the airplane fuselage. The intent of the rule, however, is to provide a barrier that will delay entry of a post-crash fire into the occupied areas of the airplane. Therefore, if an airplane were to incorporate insulation not on the fuselage shell, but along the underside of the floor, this insulation would be subject to the flame penetration test of final § 25.856(b). In the case where insulation is installed in both places, an applicant may choose which insulation would be subject to the flame penetration test. This will be discussed and illustrated in more depth in a forthcoming Advisory Circular.

Both final 25.856(a) and 25.856(b) include a provision that allows a manufacturer to substitute approved equivalent methods for the tests specified in final parts VI and VII of Appendix F to Part 25. These provisions allow for the incorporation of improvements to the test methods as