federal register

Friday
October 26, 1984

Part IV

Department of Transportation

Federal Aviation Administration

14 CFR Parts 25, 29, and 121
Flammability Requirements for Aircraft Seat Cushions; Final Rule

DEPARTMENT OF TRANSPORTATION

14 CFR Parts 25, 29, and 121

[Docket No. 23791; Amdt. Nos. 25-59, 29-23, and 121-184]

Flammability Requirements for Aircraft Seat Cushions

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: These amendments establish new flammability requirements for seat cushions used in transport category aircraft certificated under Part 25 and Part 29 and require that the cushions in transport category airplanes type certificated after January 1, 1958, and operating under Part 121 comply with these new requirements after November 26, 1987. These new requirements are in addition to the present flammability requirements contained in the Federal Aviation Regulations and represent a significant advancement in aircraft fire safety.

EFFECTIVE DATE: November 26, 1984.

FOR FURTHER INFORMATION CONTACT: Henri Branting, Technical Analysis Branch (AWS-120), Aircraft Engineering Division, Office of Airworthiness, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, D.C. 20591; telephone (202) 426-8382.

SUPPLEMENTARY INFORMATION:

Background

On August 23, 1983, the FAA issued Notice of Proposed Rulemaking No. 83-14 (48 FR 46250; October 11, 1983). This notice proposed to establish additional flammability requirements for seat cushions used in transport category aircraft certificated under Part 25 and Part 29 of the Federal Aviation Regulations (FAR) and to require that the cushions in most transport category airplanes operating under Part 121 comply with these new requirements 3 years after the effective date of the amendments.

The notice responded to certain findings and a recommendation of the Special Aviation Fire and Explosion Reduction (SAFER) Advisory Committee and was based on research and development carried out by the Federal Aviation Administration (FAA) Technical Center and the Ames Research Center of the National Aeronautics and Space Administration.

The SAFER Advisory Committee was established in June 1978 by the FAA as a result of information from public hearings on aircraft fire safety. The FAA directed the Committee to "examine the factors affecting the ability of the aircraft cabin occupant to survive in the post-crash environment and the range of solutions available." The Committee consisted of 24 representatives of a wide range of aviation and general public interests. Technical support groups included approximately 150 of the world's top experts in fire research, accident investigation, materials development, and related fields. At the conclusion of its investigation into cabin materials technology, the Committee issued findings and formal recommendations pertaining to long-range research, design, testing, and the problems of smoke and toxic gas emission. One recommendation was that the fire blocking layer concept be developed for aircraft seat cushions as a means of retarding flame spread. The FAA concurred in this recommendation and carried out the research and development necessary for implementation of the concept.

As a result of regulatory amendments adopted in 1972, aircraft seat cushions are typically constructed of fire-retardant polyurethane foam and upholstery covering, all of which must presently pass the Bunsen burner test prescribed in § 25.853 of the FAR. In a prolonged full-scale cabin fire condition, however, severe thermal radiation can break down the outer upholstery covering and penetrate into the relatively large fuel mass of the polyurethane foam core. This causes the core to become involved in the fire, spreading flame and producing potentially lethal smoke, combustable gases, and toxic gases. The results of accident investigations and experimental fire tests conducted by the FAA have demonstrated that this involvement of foam cushion material is a dominant factor in the spread of cabin fire. To counter this, fire retardant performance standards for seat cushions based on the level of protection that can be achieved by the fire blocking layer concept were proposed in Notice 83-14.

The fire blocking layer concept involves the use of a thin layer of highly fire-resistant material to completely encapsulate and protect the larger mass of foam core seat cushion material from involvement in the cabin fire. This layer of fire-resistant material delays the onset of ignition and retards the involvement of the core in the fire.

The initial phase of the FAA research program for fire blocking layers consisted of a series of instrumented controlled environment cabin fire tests which confirmed the efficacy and practicality of fire blocking layers for aircraft seat cushions.

The subsequent phase of the program developed the test for evaluation and certification of cushions, using an adaptation of the type of 2 gallon/hour kerosene burner which is currently in standard use throughout industry as a test for metallic tubing assemblies and components. This test subjects the cushion test specimen to temperature and heat typical of full-scale cabin fire and is far more realistic and severe than the Bunsen burner test currently required in Part 25 for cushion materials.

Notice 83-14 proposed the detailed procedures of the kerosene burner test developed by the FAA. The proposed test would subject seat bottom and seat back cushion specimens to a 2-minute burner flame impingement. The proposed criteria for acceptance were based, in part, on the percentage weight loss of the cushion specimen during the test. While the proposal was based on the performance attained by fire blocking construction, the proposal would not require that seat cushions be constructed in that way. Rather, it proposed objective standards of performance for seat cushions so that if other or improved means of accomplishing the fire safety objective are developed, they can be used without a need for regulatory amendment. The notice proposed to incorporate the new cushion flammability requirements as additions to the type certification standards for both transport category airplanes and transport category rotorcraft since the flammability requirements for these two categories of aircraft are identical. The notice also proposed that 3 years from the effective date of the final regulation, seat cushions in airplanes type certificated after January 1, 1958, and operated under Part 121 meet the new requirements.

Public Participation

These amendments are based on Notice 83-14. All interested parties have been given an opportunity to participate in the making of these amendments, and due consideration has been given to all matters presented. Except for the changes discussed below, these amendments and the reasons for their adoption are the same as those stated in Notice 83-14.

Discussion of Comments

Forty-two comments were received in response to Notice 83-14, representing the views of aircraft and equipment manufacturers, aircraft operators, material producers and testing laboratories, aircraft crew organizations, U.S. and foreign

government organizations, and consumer interests. The comments strongly support the objective of reducing the fire potential of seat cushion materials.

Several commenters believe the new cushion requirements should set limits on smoke and toxic gas emission. One commenter suggests using the National Bureau of Standards (NBS) smoke density chamber for this.

The FAA recognizes that reduction in smoke and toxic gas emission is an important issue in fire safety. Notice 83–14 explains that the new cushions will greatly reduce emissions by virtue of their reduced heat and flame spread potential. This has been proven by full-scale cabin fire tests. However, addressing the emissions issue in quantitative terms and setting limits on emissions based on a defined test procedure are beyond the scope of Notice 83–14. The NBS chamber mentioned by one commenter is a small-scale laboratory test which is not suitable for testing large cushion assemblies.

Several commenters contend the requirements should not apply to relatively small transport category airplanes such as executive airplanes and airplanes seating less than 44 passengers. Several of these commenters contend the basis for the justification for the requirements is the 40 seconds which can be gained in usable evacuation time through use of improved cushions to delay fire spread. They say while this gain might apply to larger aircraft, it cannot be realized in the smaller aircraft which generally have short evacuation times. Other commenters recommend extending the requirements to airplanes certificated under FAR Part 23 and those operated under FAR Part 135.

The FAA does not agree that benefits of the new requirements will be realized only in larger aircraft. The new requirements will greatly improve the fire safety of those furnishings which make up a major part of the cabin by reducing the potential for ignition and occurrence of fire and by inhibiting flame spread and smoke and toxic gas emission in the event fire does occur. Ignition, flame spread, smoke, and toxic gases are all potential hazards in inflight fires as well as in those post-crash fires involving emergency evacuation. Although the potential gain in evacuation time is more pronounced in larger aircraft, the new requirements will significantly benefit smaller aircraft as well. Notice 83–14 explains that the FAA is considering the need to propose similar requirements for small airplanes and rotorcraft used in Part 135 operations. Regulatory action for this would be the subject of a separate notice if found to be appropriate.

Several commenters contend the requirements should not apply to flight crewmember seats and flight attendant seats. These commenters point out that seat comfort has a significant influence on flight crewmember performance and efficiency and that there is the possibility fire blocking layers could compromise comfort on flights of long duration. They point out that the risk of fire involvement of flight crewmember seats is low because the seats are isolated from passengers and fuel, located near a fire extinguisher, and occupied at all times by personnel trained in fire prevention and control. One commenter points out that cushions of a flight attendant seat usually are thin and that the added thickness and weight of a fire blocking layer might interfere with the seat-retract mechanism.

The FAA agrees with the commenters on the issue of flight crewmember seats. Since inservice evaluation of fire blocking materials has not been completed, and those materials with optimum comfort properties have not been identified, it would be premature at this time to require the retrofit of seats the comfort of which might affect performance of the flight crewmembers. Since flight attendants do not usually remain in their seats for the duration of the flight, flight attendant seats are not considered as critical as flight crewmember seats from the standpoint of comfort and are not excluded from the requirements. There are several commercially available fire blocking materials which are thin and lightweight. These should have no effect on seat-retract mechanisms. The rule, as adopted, excludes flight crewmember seats from the requirements but does not exclude flight attendant seats.

Several commenters contend the 3-year compliance period proposed in § 121.312(b) should be extended to allow operators sufficient time to handle technical and logistical problems and to account for longer cushion life spans which they say exceed 3 years in many cases. The commenters contend the fire blocking requirements involve essentially a new technology and untested materials and that the proposed 3-year period does not allow sufficient time for cushion development, inservice testing, certification, production, and installation. They contend the added cost of an accelerated 3-year compliance period would be significant.

The FAA does not agree the compliance period should be extended. The FAA closely monitors industry progress and, while recognizing the concerns of the commenters, has not found any foreseeable technical problem to suggest that retrofit cannot be accomplished smoothly within 3 years. Although the 3-year period was taken as the life span of a typical cushion, as explained in Notice 83–14, the longer life spans of some cushions mentioned by commenters would have no adverse impact on the regulatory action since the addition of fire blocking layers does not necessarily result in discarding cushions.

Several commenters contend the 3-year compliance period proposed in § 121.312(b) is too long and that fleet retrofit should be completed in a much shorter time. They contend the safety benefits of a shorter compliance time would exceed costs and that this justifies the faster retrofit. Several commenters recommend that all newly manufactured airplanes comply with the requirements within 1 year.

The FAA generally recognizes that benefits from safety improvements are maximized the sooner required retrofits are completed. However, as pointed out by several commenters, the subject regulatory action involves a new technology, and there must be sufficient lead time in the compliance period to enable all parties affected to attain reasonable proficiency, develop design alternatives, produce finished articles, and phase in installations. Fire blocking technology entails new test equipment and criteria and advanced state-of-the-art materials, many of which have not been service tested. The FAA believes a substantial reduction in the compliance period recommended by commenters would be impractical. The recommendation that newly manufactured airplanes comply within 1 year will effectively be achieved since, as a matter of practice, seat and aircraft manufacturers would meet the operational rules which govern their market. It is highly unlikely that manufacturers would produce noncomplying seat cushions after 1 year has passed, knowing the cushions would require retrofit in less than 2 years. It is equally unlikely that older aircraft being refurbished would be refurbished with noncomplying seat cushions, knowing that they would need to be replaced before the end of their normal useful life. These commercial considerations will cause manufacturers and operators who are refurbishing older aircraft to introduce seat cushions with fire blocking layers (or other equivalent means of fire protection) soon after the effective date of this rule. The 3-year

compliance period is adopted as proposed.

Several commenters express concern that the addition of a fire blocking layer to a seat cushion approved under Technical Standard Order (TSO) C72b for flotation devices on TSO–C39a for seats might constitute a major modification of the cushion which could invalidate the TSO approvals.

The FAA has conducted cyclical flotation tests of several fire blocked cushions to determine the effect fire blocking layers might have on the buoyancy of cushions. The typical lightweight, highly fire-resistant materials being used as a fire blocker should have negligible effect on buoyancy. The use of heavy blocking material might reduce buoyancy to the extent which could require requalification under TSO–C72b. Provided the layer does not significantly reduce buoyancy or interfere with grasp straps, markings, or other flotation device features and the cushion foam core is not altered, the addition of fire blocking material is considered a minor modification and does not affect approval under TSO–C72b. Since the fire blocking layer requirements are additional to the requirements of § 25.853 and are in no way expected to affect seat cushions' eligibility to meet the standards of TSO–C39a and be so marked, approval under TSO–C39a is not affected.

Several commenters contend cushions which meet the new flammability requirements should not be required to meet § 25.853(b) as this would be redundant. Commenters contend also that if fire blocking layer material is required to meet § 25.853(b), it should be tested separately and not as part of a cushion assembly.

The FAA believes the new flammability requirements based on fire blocking performance and the requirements of § 25.853(b) are both necessary. Notice 83–14 explains that fire blocking delays, but does not prevent, ignition of cushion foam material and its involvement in cabin fire. The fire resistance required by § 25.853(b) is necessary in the event fire does penetrate the cushion. Under § 25.853(b), fire blocking material would be considered as upholstery in general and would be tested separately if it is not bonded or permanently affixed to the cushion foam. In view of the sound experience which backs up § 25.853(b), highly fire-resistant fire blocking materials should have no difficulty qualifying, whether tested separately or as part of a cushion assembly.

Several commenters contend the proposed requirements of § 25.853(c) and Appendix F, as written, are inflexible and would require an unnecessary amount of testing with the full-scale oil burner apparatus. Commenters point out there are numerous variations in color, weight, blend, texture, and other properties of cushion dress covering which have a negligible effect on fire safety. The commenters contend that once a cushion assembly is qualified by the oil burner test, minor changes in dress covering should be allowed without requalification by full-scale testing.

The FAA agrees with the commenters that once a cushion is qualified by full-scale oil burner tests, additional tests are not necessary for minor changes in dress covering provided the replacement covering is similar to the original covering in fire resistance. The FAA recognizes that as experience is gained in the testing of various fire blocking materials and material combinations, the purposes served by full-scale testing and the situations which warrant it will become clearly focused. Therefore, paragraph (a)(3) of Part II of Appendix F is revised to allow that for a cushion which has been qualified by the oil burner test, the dress covering of that cushion may be replaced with a similar dress covering if the burn length of the replacement covering, as determined by the test specified in § 25.853(b), does not exceed the burn length of the original covering.

Several commenters contend the oil burner test is impractical for aircraft certification and that there should be provisions for testing small-scale laboratory specimens with smaller equipment such as the Meker gas burner, the Ohio State University Heat Release Chamber, or a radiant panel type test. Several commenters are concerned that the oil burner test is not suitable for quality control testing.

The FAA does not agree the oil burner test is impractical or should be replaced by some other test. It is intended as a design qualification test to substantiate the performance of an assembly product. The test subjects specimens to temperature and heat flux typical of cabin fire, as determined by full-scale cabin fire tests. For seat cushions, as for other aircraft components and assemblies, the required quality level of constituent materials is assured by use of small-scale tests or other assay methods selected by the manufacturer for the particular materials in question. The FAA does believe that eventually other tests may be developed which could be used for the qualification of cushions. While the commenters do not substantiate the validity or equivalency of another test at this time, the FAA believes this option should be left open to encourage future developments. Accordingly, § 25.853(c) and § 29.853(b) are specifically revised to allow a finding of equivalency.

Several commenters contend the ten percent weight loss limit is not a realistic measure of a cushion's resistance to fire and is not an appropriate criterion for acceptance. The commenters suggest using an absolute weight loss of around one-half pound per specimen. One commenter suggests using a rate of weight loss, although no specific rate is suggested. Several commenters contend that under the 10 percent criterion, an adequate supply of fire blocking materials will not be available to meet airline needs.

The FAA believes the 10 percent weight loss criterion is appropriate. The FAA has tested over 300 candidate fire blocking materials, of which over 100 passed the 10 percent criterion. The use of absolute weight loss in lieu of percent weight loss as the criterion for these materials had an insignificant effect on the overall pass/fail results. Percent weight loss normalizes test results according to specimen weight and affords a safeguard against the use of materials which might have a lower resistance to fire in combination with a lower weight. There is no indication a rate of weight loss as suggested by one commenter is more appropriate than percent weight loss. Rate of weight loss alone in this case would not provide a relevant indication of fire resistance unless related to time. The 10 percent criterion relates to test duration which, as adopted, does not exceed 7 minutes. In view of the FAA materials tests and industry's progress in implementing the fire blocking concept, the FAA believes there is an adequate supply of materials to meet airline needs.

Several commenters contend the dimensionally standard specimens specified in Appendix F are not a realistic representation of cushions with complex curvatures and unique shapes. The commenters recommend testing actual cushions.

The FAA believes only dimensionally standard specimens should be used in the subject test to ensure a consistent baseline for comparison of cushion fire blocking performance. The test measures the effectiveness of material, or materials in combination, in delaying involvement of cushion foam in fire. For this, standard specimens of the materials are needed. The FAA evaluated the testing of nonstandard cushion shapes and found this can produce results unsuitable for the comparison of materials.

One commenter contends the requirements do not make clear if the seat bottom and seat back cushions must be constructed of identical fire blocking materials or may have different materials and different levels of fire blocking performance. This is a critical consideration since the test is more severe to the seat bottom specimen than the back specimen.

The requirements do not intend that materials in the back cushion necessarily be the same as those in the bottom cushion since material selection might be governed by comfort, durability, and other factors pertinent to the particular cushion. However, the requirements do intend that the materials in both the bottom and the back cushions be able to satisfactorily withstand the flame impingement of the test burner since in an actual cabin fire, flame impingement might be equally severe to both cushions. To clarify this intent, paragraph (a)(3) of Part II of Appendix F is revised to require that if different material configurations are used in the bottom and back cushions, each configuration must be tested as a complete specimen set.

Several commenters point out that the back sides of many seat back cushions are bonded to metal which effectively provides blocking layer protection. The commenters question whether in such cases the back side of the cushion must be enclosed by the same fire blocking material used to enclose the other sides.

The rule does not require the same blocking layer material be used to enclose all sides of a cushion, nor does it preclude the use of metal blocking layers. As adopted, it requires that the cushion meet the prescribed test requirements or equivalent. Seat structure in combination with some other material would be an acceptable combination of fire blocking materials, provided adequate performance of the combination is substantiated.

Numerous comments were submitted regarding the details of the proposed new test criteria of Appendix F. As a result, there are many revisions in the criteria, most of which are simple refinements to increase test repeatability. The most significant revisions are in section (a), Criteria for Acceptance, and these have only a minor effect on the performance level required of cushion specimens. Paragraph (a)(2) is revised to delete the requirement for venting internal cushion pressure. This requirement is not necessary since aircraft cushions inherently are self-venting by construction to accommodate cabin altitude changes. Paragraph (a)(4) is clarified by changing the term "flame spread" to the term "burn length," as currently used in Appendix F and by specification of a maximum permissible burn length based on specimen width. Also, paragraph (a)(4) is clarified regarding the number of specimens which must pass the test. Notice 83-14 proposed that one-half of the required three specimens, or two, pass. The rule as adopted specifies two out of three. Paragraph (a)(5) is revised to clarify the procedure for determining specimen weight after the test and to ensure that wide fluctuations in test results of marginal specimens do not unduly influence the pass/fail outcome of combined test results. The proposed requirement that there be no flaming accumulation of melted material beneath the test specimen is deleted. This was found to be impractical.

Flaming material accumulation is as much a function of the test apparatus as of specimen material properties.

Numerous clarifications are made in sections (b) through (h), all of which have a negligible effect on test requirements. The method for determining ventilation rate of the test area is clarified. Tolerances for length, weight, temperature, and heat flux are specified, and additional descriptive information on equipment is provided. A requirement for conditioning the specimen at 55 percent relative humidity is specified. The type of fuel used for the test is specified as #2 Grade kerosene or equivalent. The time and means are specified for terminating the test for those specimens which do not self-extinguish.

Regulatory Evaluation

This amendment is expected to provide a net benefit to society, as likely benefits are expected to exceed likely costs. This evaluation relies heavily on information developed in a study done by the National Bureau of Standards (NBS), Center for Fire Research entitled *Decision Analysis Model for Passenger—Aircraft Fire Safety With Application to Fire—Blocking of Seats,* published in March 1984. A copy of this study is available in the docket of this rulemaking action.

The NBS study reviewed an accident data base which included all world aircraft accidents where fire was a factor in fatalities, as well as major aircraft hull property damage incidents where a fire blocking seat interior might have lessened or eliminated property loss. The NBS study report lists all of these accidents, as well as the rationale for estimating the effectiveness of fire blocking layers in saving lives and lessening property damage.

The benefit effectiveness of fire blocking layers is basically a function of the increased time that is made available for aircraft evacuation, as a result of fire-blocking layers. This time is varied, ranging between 20 seconds and 60 seconds, in the NBS study. Table 1 below summarizes three basic values for fire-blocking benefits, based on assumptions of increased evacuation time and different levels of property damage. The only adjustment to the NBS study data is the use of a value of life of $650,000 compared to the $500,000 value in the NBS study. The higher number is used in FAA evaluations.

FIRE BLOCKING SEAT ALTERNATIVES
ANNUALIZED BENEFIT SUMMARY

[Values in millions of 1983 dollars]

Additional evacuation time (seconds)	High	Middle	Low
20	16.9 lives	10.8 lives	4.4 lives.
	$3.87 damage	$2.21 damage	$1.76 damage.
	$14.85 total	$9.23 total	$4.60 total.
43	20.1 lives	13.6 lives	4.7 lives.
	$3.87 damage	$2.21 damage	$1.76 damage.
	$16.92 total	$11.05 total	$4.81 total.
60	22.3 lives	13.6 lives	4.7 lives.
	$3.87 damage	$2.21 damage	$1.76 damage.
	$18.37 total	$11.05 total	$4.81 total.

NOTE.—Lives saved are valued at $650,000 per life.
Source: NBS study p. 28 (except as per note).

For purposes of this evaluation, we will concentrate on the middle and high benefit range and limit analysis to the 20- and 43-second added evacuation time summaries. In this approach, we eliminate the extremes of very long evacuation times and very low benefit rates.

The NBS study estimated the costs of fire blocking seat alternatives much as the NASA study cited in FAA's preliminary regulatory evaluation did. The important elements of incremental cost are the incremental costs of refurbishing seats with seat blocking materials and the operating cost of carrying added weight around in the aircraft.

The following table summarized the high, middle, and low cost estimates of the incremental cost of material and installation for three blocking alternatives. The first is Norfab, a weave of 25 percent Nomex, 70 percent Kevlar, and 5 percent Kynol, aluminized on one side. The second is a loosely woven fiberglass scrim and a lightweight fiberglass paper bonded with a fire retardant adhesive. The third is 3/16" Neoprene foam, bonded to urethane. The manufacturing costs are based on estimates provided by two seat manufacturers.

INCREMENTAL COST OF FIRE BLOCKING LAYERS FOR U.S. FLEET (MATERIALS, INSTALLATION AND OPERATING COSTS)

[Data are in millions of 1983 dollars]

Fire block alternative	High	Middle	Low
Modacrylic			
Materials and installation	$16.56	$11.83	$9.75
Operating cost	9.93	9.93	9.93
Total cost	26.49	21.76	19.68
Fiberglass			
Materials and installation	11.17	5.69	4.81
Operating cost	2.92	2.92	2.92
Total cost	14.09	8.59	7.73
Neoprene			
Materials and installation	16.95	9.29	5.40
Operating cost	19.49	19.49	19.49
Total cost	36.44	28.78	24.89

Source: Tables G-19 and 6 of NBS study.

The results of the NBS study indicate that there are fire blocking alternatives for which likely benefits clearly exceed likely costs. The fiberglass fabric alternative has a benefit/cost ratio greater than one except in those instances where comparisons use low benefits or high costs and middle benefit. Comparing middle costs with middle benefits, the benefit/cost ratio is 1.15.

There is some uncertainty about the predicted ultimate costs and benefits of the fire blocking rule which is adopted by this amendment. The major questions result from the uncertainties as to which technically feasible solutions will be practical. Several different solutions are being tried by industry, each of which appears promising. The optimum solutions will be known only after having fire blocking alternatives put into widescale utilization and testing with the airlines. On balance, however, FAA believes that this evaluation and the NBS study show that the amendment will create a net benefit to society.

It is expected that the airline supplies and materials industries will work with the airlines to develop a relatively inexpensive, lightweight fire blocking material. Even if practical problems are encountered with a fiberglass material, these problems will likely be solved, or alternatives will likely be developed with have weight and expense factors similar to fiberglass fabrics.

Regulatory Flexibility Act Determination

A final Regulatory Flexibility Analysis was conducted in compliance with section 604(a) of the Regulatory Flexibility Act. The conclusion in the initial regulatory evaluation, that the rule may cause a significant economic impact on a substantial number of small entities, is not altered by the present evaluation.

There were no public comments in response to the initial regulatory flexibility analysis, and there are no alternatives which lessen the impact on small entities while providing all members of the traveling public with an equal level of protection.

Paperwork Reduction Act

Information collection requirements in this regulation (Part 25, Appendix F) have been approved by the Office of Management and Budget under the provisions of the Paperwork Reduction Act of 1980 (Pub. L. 96-511) and have been assigned OMB Control Number 2120-0018.

Conclusion

Under the terms of the Regulatory Flexibility Act (the Act), the FAA has reviewed this amendment to determine the impact it might have on small entities.

Since the estimated impact on the small unscheduled air carriers could be approximately $9,000 per year, it has been determined that this rule may have a significant economic impact on a substantial number of small entities, such as small air carriers operating under Part 121. As required by the Act, the FAA has completed a regulatory flexibility analysis as part of the regulatory evaluation. A copy of the analysis/evaluation is contained in the regulatory docket. A copy of it may be obtained by contacting the person identified under the caption "FOR FURTHER INFORMATION CONTACT."

The Act also requires that when there is a significant impact on small entities the agency must consider alternatives in the rulemaking process. In the case of flammability requirements, the alternatives are limited in number. One alternative would be to lessen the impact on small entities by making the more stringent requirements apply only to the larger air carriers or by allowing the smaller entities a longer period to come into compliance. These alternatives were rejected because of the importance of passenger safety, whether traveling on a large, scheduled airline or on a smaller, unscheduled airline. As alternative approaches, the FAA considered both regulations that would specify the only materials and construction processes permitted to be used and regulations that set performance standards to be met. The FAA has proposed performance standards to permit those operating under Part 121 the opportunity to choose and install the most economical materials and processes capable of meeting the flammability performance standards.

This rule is not likely to result in an annual effect on the economy of $100 million or more, or a major increase in costs for consumers, industry, or Federal, State, or local government agencies. In addition, this rule would have little or no impact on trade opportunities for United States firms doing business overseas or for foreign firms doing business in the United States. Accordingly, it has been determined that this is not a major regulation under Executive Order 12291. In addition, the FAA has determined that this action is significant under Department of Transportation Regulatory Policy and Procedures (44 FR 11034; February 26, 1979).

List of Subjects

14 CFR Part 25

Air transportation, Aircraft, Aviation safety, Safety, Tires.

14 CFR Part 29

Air transportation, Aircraft, Aviation safety, Safety, Tires, Rotorcraft.

14 CFR Part 121

Aviation safety, Safety, Air carriers, Air transportation, Aircraft, Airplanes, Airworthiness directives and standards, Flammable materials, Transportation, Common carriers.

Adoption of the Amendment

Accordingly, Parts 25, 29, and 121 of the Federal Aviation Regulations (14 CFR Parts 25, 29, and 121) are amended as follows, effective November 26, 1984:

PART 25--AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

1. By amending § 25.853 by redesignating present paragraphs (c) through (e) as paragraphs (d) through (f) and adding a new paragraph (c) as follows:

§ 25.853 Compartment interiors.

* * * * *

(c) In addition to meeting the requirements of paragraph (b), seat cushions, except those on flight crewmember seats, must meet the test requirements of Part II of Appendix F of this part, or equivalent.

* * * * *

2. By amending Appendix F to Part 25 by removing the introductory sentence and by designating the text of Appendix F to Part 25 as Part I as follows:

Appendix F

Part I—An Acceptable Test Procedure for Showing Compliance With §§ 25.853, 25.855, and 25.1359

* * * * *

3. By amending Appendix F to Part 25 by adding a new Part II to read as follows:

* * * * *

Part II—Flammability of Seat Cushions

(a) *Criteria for Acceptance.* Each seat cushion must meet the following criteria:

(1) At least three sets of seat bottom and seat back cushion specimens must be tested.

(2) If the cushion is constructed with a fire blocking material, the fire blocking material must completely enclose the cushion foam core material.

(3) Each specimen tested must be fabricated using the principal components (i.e., foam core, flotation material, fire blocking material, if used, and dress covering) and assembly processes (representative seams and closures) intended for use in the production articles. If a different material combination is used for the back cushion than for the bottom cushion, both material combinations must be tested as complete specimen sets, each set consisting of a back cushion specimen and a bottom cushion specimen. If a cushion, including outer dress covering, is demonstrated to meet the requirements of this appendix using the oil burner test, the dress covering of that cushion may be replaced with a similar dress covering provided the burn length of the replacement covering, as determined by the test specified in § 25.853(b), does not exceed the corresponding burn length of the dress covering used on the cushion subjected to the oil burner test.

(4) For at least two-thirds of the total number of specimen sets tested, the burn length from the burner must not reach the side of the cushion opposite the burner. The burn length must not exceed 17 inches. Burn length is the perpendicular distance from the inside edge of the seat frame closest to the burner to the farthest evidence of damage to the test specimen due to flame impingement, including areas of partial or complete consumption, charring, or embrittlement, but not including areas sooted, stained, warped, or discolored, or areas where material has shrunk or melted away from the heat source.

(5) The average percentage weight loss must not exceed 10 percent. Also, at least two-thirds of the total number of specimen sets tested must not exceed 10 percent weight loss. All droppings falling from the cushions and mounting stand are to be discarded before the after-test weight is determined. The percentage weight loss for a specimen set is the weight of the specimen set before testing less the weight of the specimen set after testing expressed as the percentage of the weight before testing.

(b) *Test Conditions.* Vertical air velocity should average 25 fpm±10 fpm at the top of the back seat cushion. Horizontal air velocity should be below 10 fpm just above the bottom seat cushion. Air velocities should be measured with the ventilation hood operating and the burner motor off.

(c) *Test Specimens.* (1) For each test, one set of cushion specimens representing a seat bottom and seat back cushion must be used.

(2) The seat bottom cushion specimen must be 18±⅛ inches [457±3 mm] wide by 20±⅛ inches [508±3 mm] deep by 4±⅛ inches [102±3 mm] thick, exclusive of fabric closures and seam overlap.

(3) The seat back cushion specimen must be 18±⅛ inches [432±3 mm] wide by 25±⅛ inches [635±3 mm] high by 2±⅛ inches [51±3 mm] thick, exclusive of fabric closures and seam overlap.

(4) The specimens must be conditioned at 70±5 °F (21±2 °C) 55%±10% relative humidity for at least 24 hours before testing.

(d) *Test Apparatus.* The arrangement of the test apparatus is shown in Figures 1 through 5 and must include the components described in this section. Minor details of the apparatus may vary, depending on the model burner used.

(1) *Specimen Mounting Stand.* The mounting stand for the test specimens consists of steel angles, as shown in Figure 1. The length of the mounting stand legs is 12±⅛ inches (305±3 mm). The mounting stand must be used for mounting the test specimen seat bottom and seat back, as shown in Figure 2. The mounting stand should also include a suitable drip pan lined with aluminum foil, dull side up.

(2) *Test Burner.* The burner to be used in testing must—

(i) Be a modified gun type;

(ii) Have an 80-degree spray angle nozzle nominally rated for 2.25 gallons/hour at 100 psi;

(iii) Have a 12-inch (305 mm) burner cone installed at the end of the draft tube, with an opening 6 inches (152 mm) high and 11 inches (280 mm) wide, as shown in Figure 3; and

(iv) Have a burner fuel pressure regulator that is adjusted to deliver a nominal 2.0 gallon/hour of # 2 Grade kerosene or equivalent required for the test.

Burner models which have been used successfully in testing are the Lennox Model OB–32, Carlin Model 200 CRD, and Park Model DPL 3400. FAA published reports pertinent to this type of burner are: (1) Powerplant Enginering Report No. 3A, Standard Fire Test Apparatus and Procedure for Flexible Hose Assemblies, dated March 1978; and (2) Report No. DOT/FAA/RD/76/213, Reevaluation of Burner Characteristics for Fire Resistance Tests, dated January 1977.

(3) *Calorimeter.*

(i) The calorimeter to be used in testing must be a (0–15.0 BTU/ft²-sec. 0–17.0 w/cm²) calorimeter, accurate ±3%, mounted in a 6-inch by 12-inch (152 by 305 mm) by ¾-inch (19 mm) thick calcium silicate insulating board which is attached to a steel angle bracket for placement in the test stand during burner calibration, as shown in Figure 4.

(ii) Because crumbling of the insulating board with service can result in misalignment of the calorimeter, the calorimeter must be monitored and the mounting shimmed, as necessary, to ensure that the calorimeter face is flush with the exposed plane of the insulating board in a plane parallel to the exit of the test burner cone.

(4) *Thermocouples.* The seven thermocouples to be used for testing must be 1/16- to ⅛-inch metal sheathed, ceramic packed, type K, grounded thermocouples with a nominal 22 to 30 American wire gage (AWG)-size conductor. The seven thermocouples must be attached to a steel angle bracket to form a thermocouple rake for placement in the test stand during burner calibration, as shown in Figure 5.

(5) *Apparatus Arrangement.* The test burner must be mounted on a suitable stand to position the exit of the burner cone a distance of 4±⅛ inches (102±3 mm) from one side of the specimen mounting stand. The burner stand should have the capability of allowing the burner to be swung away from the specimen mounting stand during warmup periods.

(6) *Data Recording.* A recording potentiometer or other suitable calibrated instrument with an appropriate range must be used to measure and record the outputs of the calorimeter and the thermocouples.

(7) *Weight Scale.* Weighing Device—A device must be used that with proper procedures may determine the before and after test weights of each set of seat cushion specimens within 0.02 pound (9 grams). A continuous weighing system is preferred.

(8) *Timing Device.* A stopwatch or other device (calibrated to ±1 second) must be used to measure the time of application of the burner flame and self-extinguishing time or test duration.

(e) *Preparation of Apparatus.* Before calibration, all equipment must be turned on and the burner fuel must be adjusted as specified in paragraph (d)(2).

(f) *Calibration.* To ensure the proper thermal output of the burner, the following test must be made:

(1) Place the calorimeter on the test stand as shown in Figure 4 at a distance of 4±⅛ inches (102±3 mm) from the exit of the burner cone.

(2) Turn on the burner, allow it to run for 2 minutes for warmup, and adjust the burner air intake damper to produce a reading of 10.5±0.5 BTU/ft²-sec. (11.9±0.6 w/cm²) on the calorimeter to ensure steady state conditions have been achieved. Turn off the burner.

(3) Replace the calorimeter with the thermocouple rake (Figure 5).

(4) Turn on the burner and ensure that the thermocouples are reading 1900±100 °F (1038±38 °C) to ensure steady state conditions have been achieved.

(5) If the calorimeter and thermocouples do not read within range, repeat steps in paragraphs 1 through 4 and adjust the burner air intake damper until the proper readings are obtained. The thermocouple rake and the calorimeter should be used frequently to maintain and record calibrated test parameters. Until the specific apparatus has demonstrated consistency, each test should be calibrated. After consistency has been confirmed, several tests may be conducted with the pre-test calibration before and a calibration check after the series.

(g) *Test Procedure.* The flammability of each set of specimens must be tested as follows:

(1) Record the weight of each set of seat bottom and seat back cushion specimens to be tested to the nearest 0.02 pound (9 grams).

(2) Mount the seat bottom and seat back cushion test specimens on the test stand as shown in Figure 2, securing the seat back cushion specimen to the test stand at the top.

(3) Swing the burner into position and ensure that the distance from the exit of the burner cone to the side of the seat bottom cushion specimen is 4± ⅛ inches (102±3 mm).

(4) Swing the burner away from the test position. Turn on the burner and allow it to run for 2 minutes to provide adequate warmup of the burner cone and flame stabilization.

(5) To begin the test, swing the burner into the test position and simultaneously start the timing device.

(6) Expose the seat bottom cushion specimen to the burner flame for 2 minutes and then turn off the burner. Immediately swing the burner away from the test position. Terminate test 7 minutes after initiating cushion exposure to the flame by use of a gaseous extinguishing agent (i.e., Halon or CO_2).

(7) Determine the weight of the remains of the seat cushion specimen set left on the mounting stand to the nearest 0.02 pound (9 grams) excluding all droppings.

(h) *Test Report.* With respect to all specimen sets tested for a particular seat cushion for which testing of compliance is performed, the following information must be recorded:

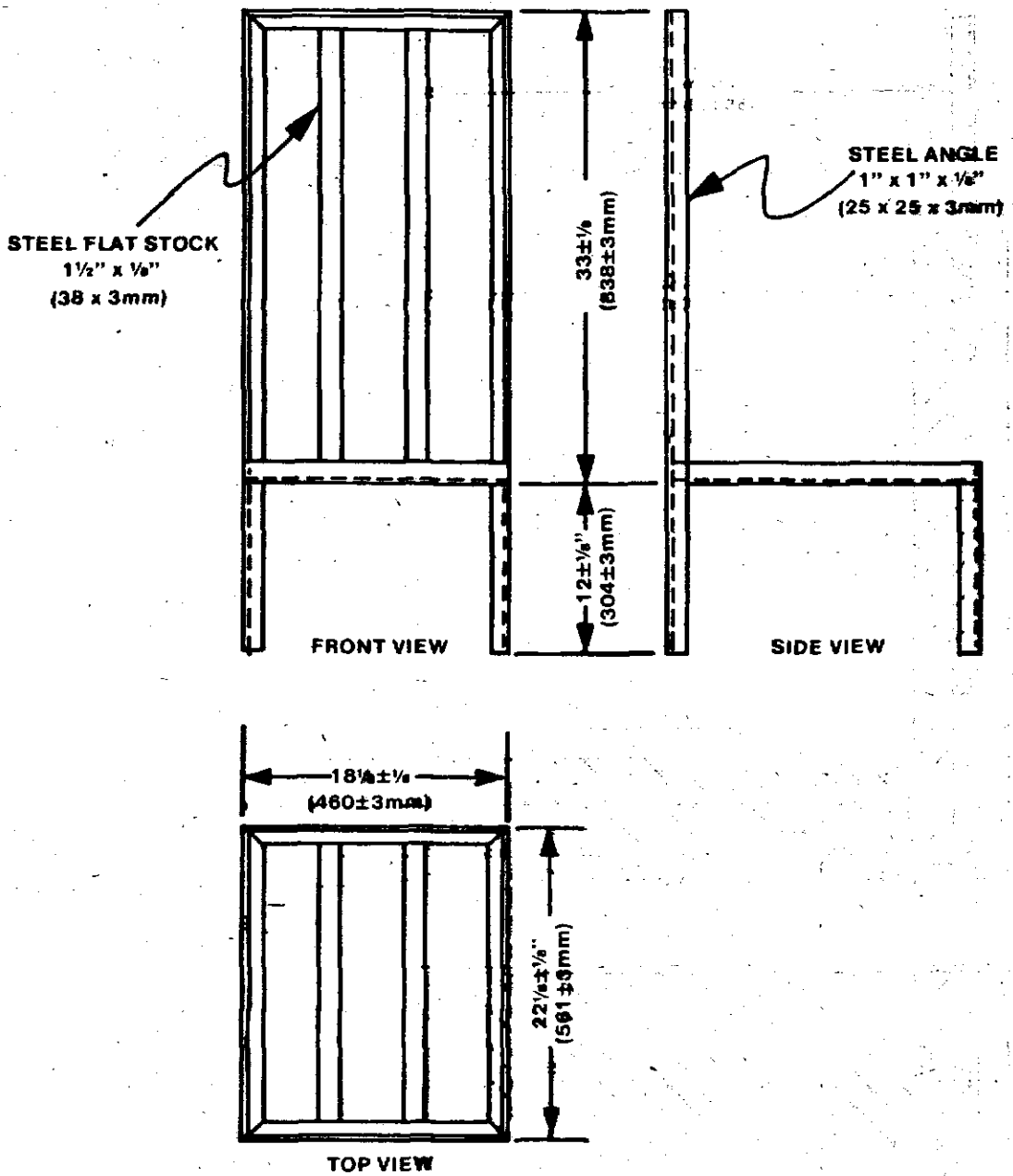
(1) An identification and description of the specimens being tested.

(2) The number of specimen sets tested.

(3) The initial weight and residual weight of each set, the calculated percentage weight loss of each set, and the calculated average percentage weight loss for the total number of sets tested.

(4) The burn length for each set tested.

BILLING CODE 4910-13-M



NOTE:

ALL JOINTS WELDED
FLAT STOCK BUTT WELDED
ALL MEASUREMENTS INSIDE

FIGURE 1

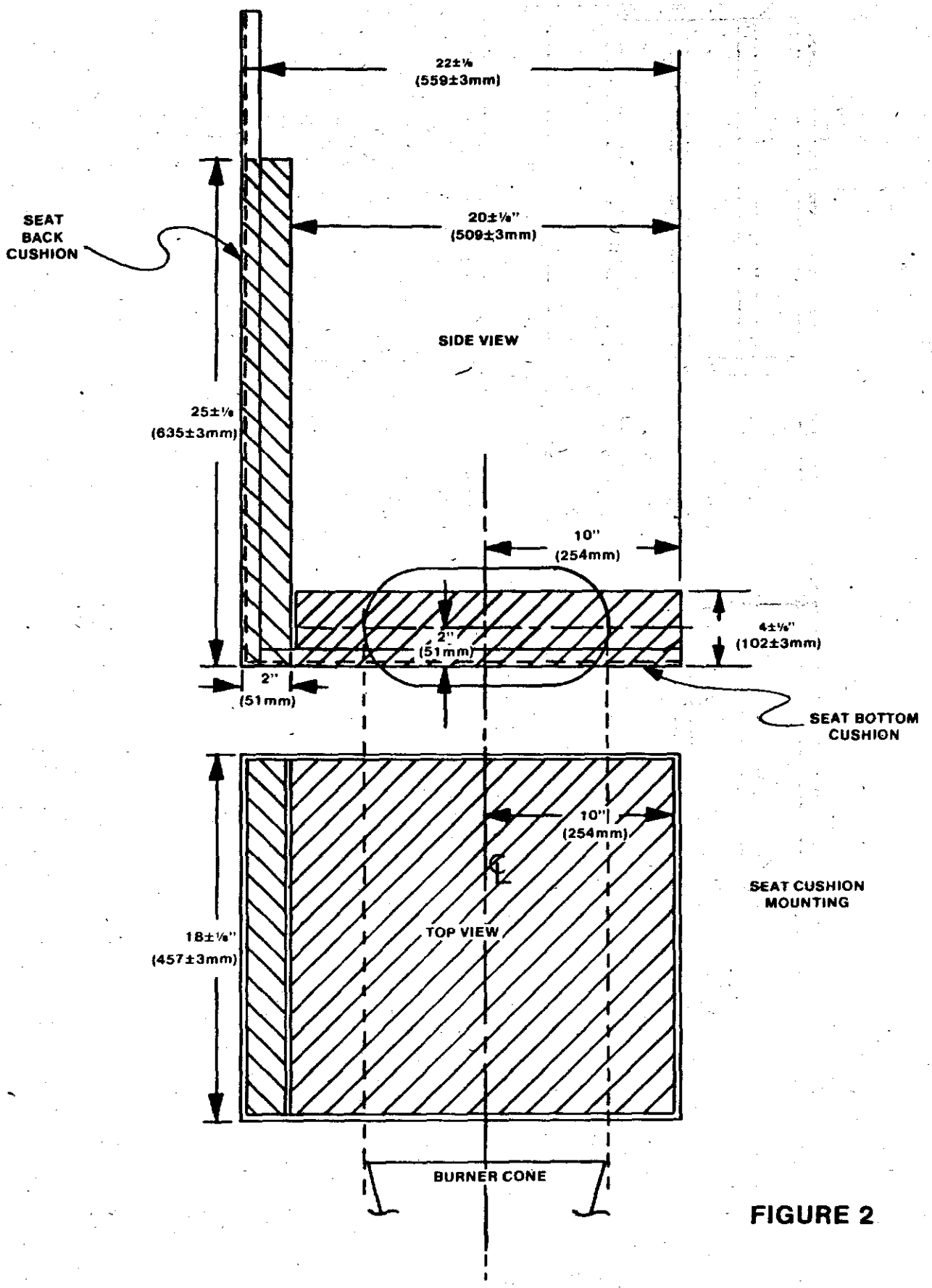

22±⅛
(559±3mm)
SEAT
BACK
CUSHION
20±⅛"
(509±3mm)
SIDE VIEW
25±⅛
(635±3mm)
10"
(254mm)
4±⅛"
(102±3mm)
2"
(51mm)
2"
(51mm)
SEAT BOTTOM
CUSHION
10"
(254mm)
SEAT CUSHION
MOUNTING
18±⅛"
(457±3mm)
TOP VIEW
BURNER CONE

FIGURE 2

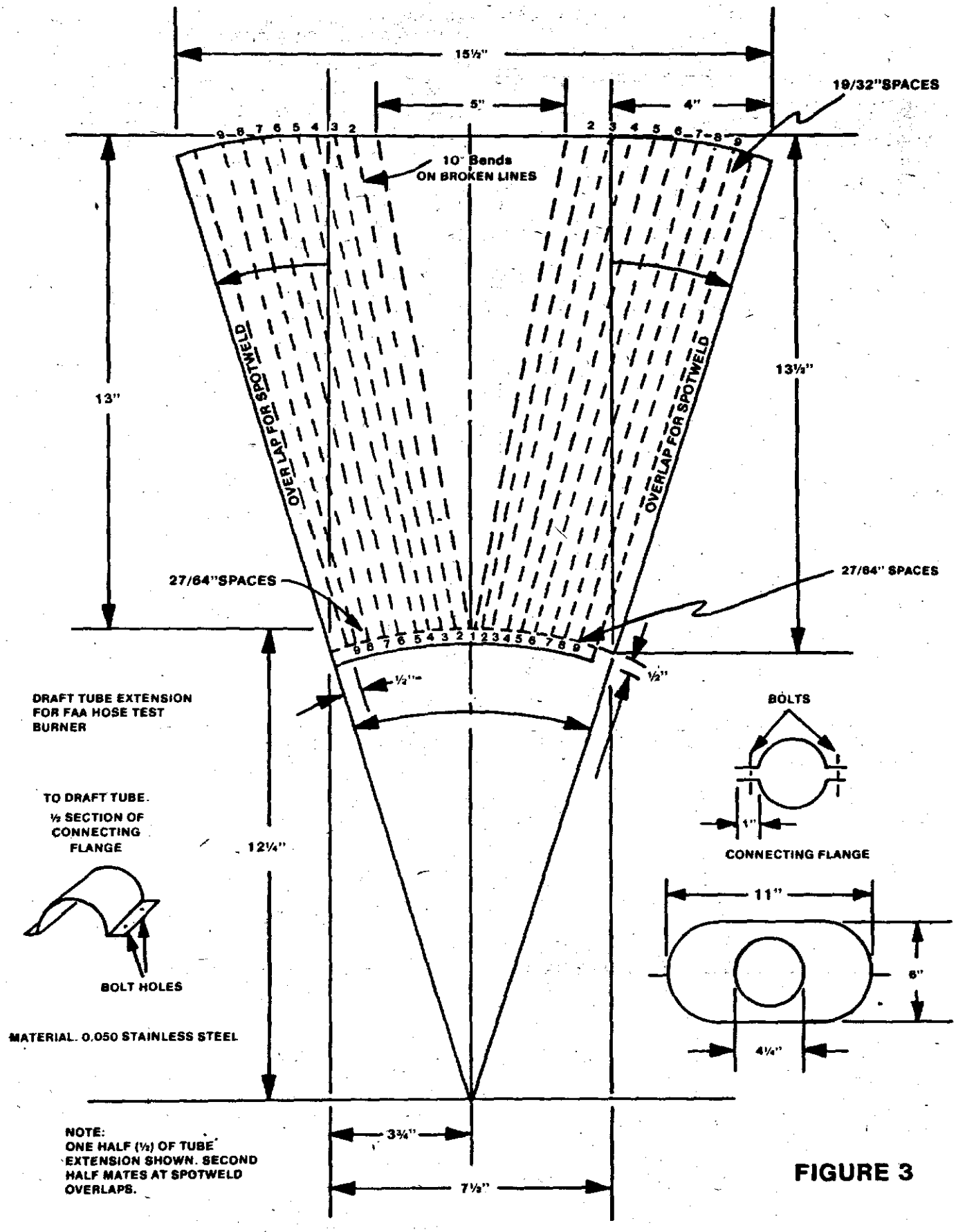

15½"
5"
4"
19/32"SPACES
10 Bends
ON BROKEN LINES
13"
13⅓"
OVERLAP FOR SPOTWELD
OVERLAP FOR SPOTWELD
27/64"SPACES
27/64" SPACES
½"
½"
DRAFT TUBE EXTENSION
FOR FAA HOSE TEST
BURNER
TO DRAFT TUBE.
½ SECTION OF
CONNECTING
FLANGE
12¼"
BOLT HOLES
MATERIAL. 0.050 STAINLESS STEEL
BOLTS
1"
CONNECTING FLANGE
11"
6"
4¼"
3¾"
7⅓"
NOTE:
ONE HALF (½) OF TUBE
EXTENSION SHOWN. SECOND
HALF MATES AT SPOTWELD
OVERLAPS.

FIGURE 3

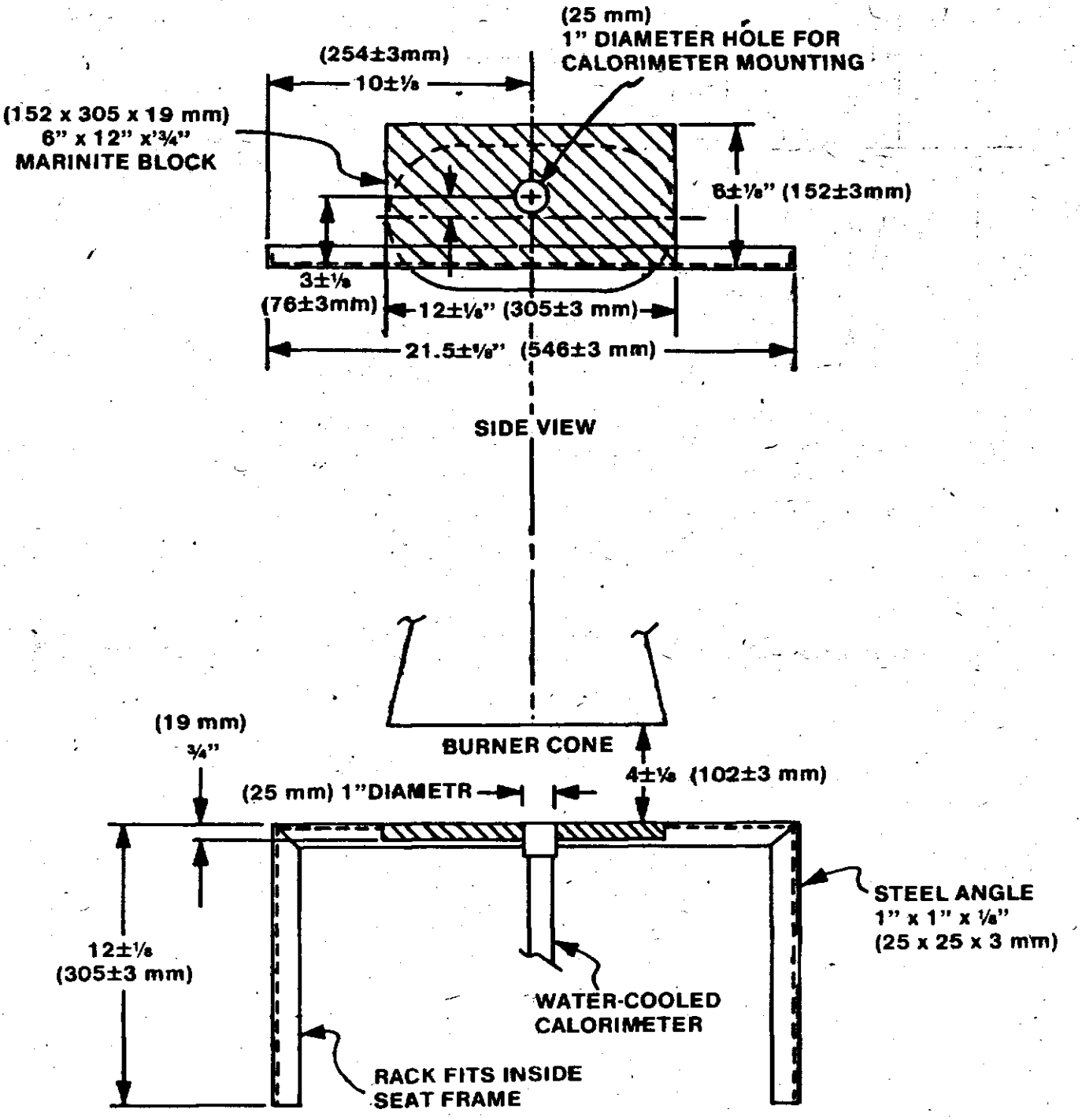
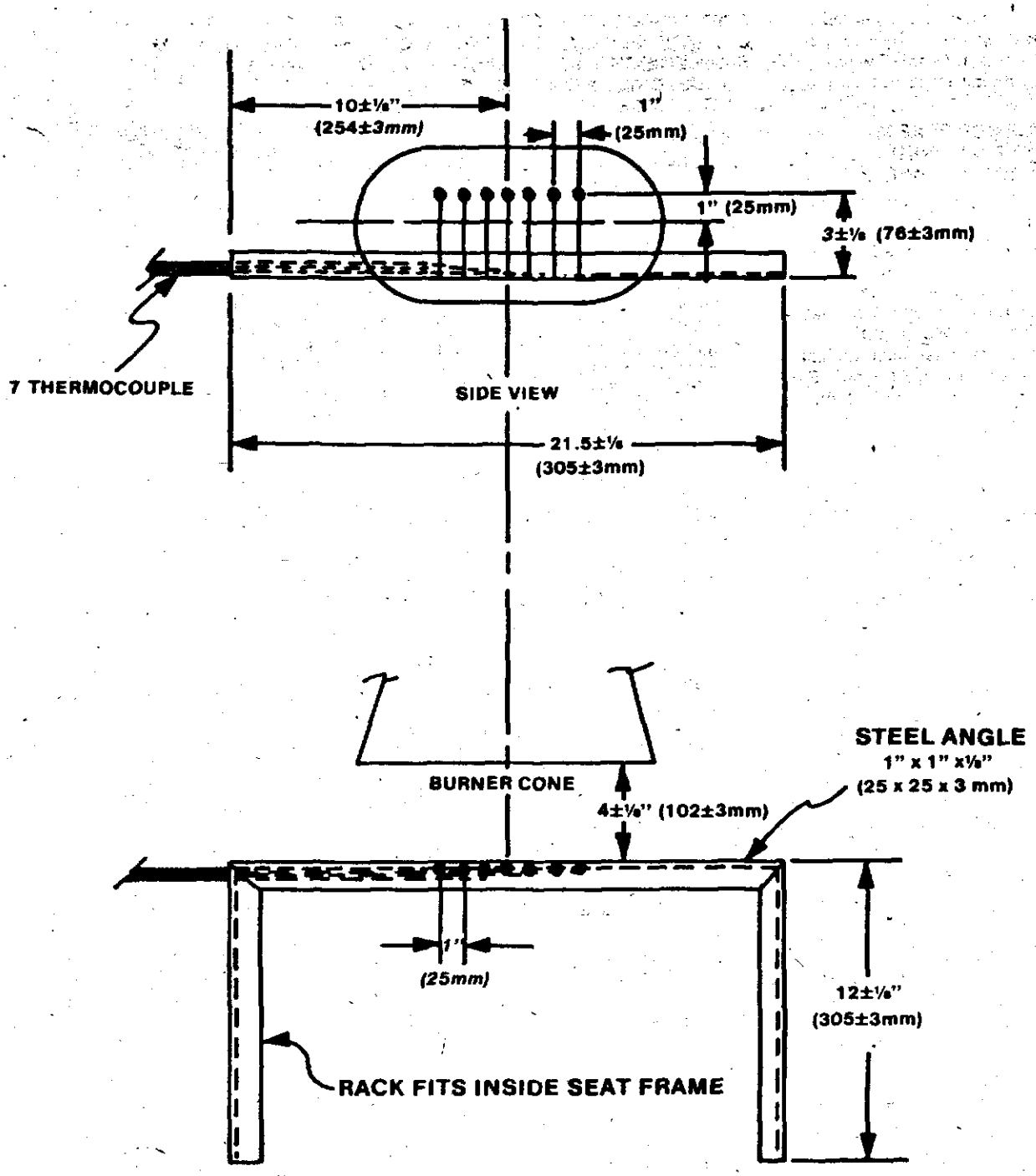

(25 mm)
1" DIAMETER HOLE FOR
CALORIMETER MOUNTING
(254±3mm)
10±⅛
(152 x 305 x 19 mm)
6" x 12" x ¾"
MARINITE BLOCK
6±⅛" (152±3mm)
3±⅛
(76±3mm)
12±⅛" (305±3 mm)
21.5±⅛" (546±3 mm)
SIDE VIEW
BURNER CONE
(19 mm)
¾"
4±⅛ (102±3 mm)
(25 mm) 1"DIAMETR
STEEL ANGLE
1" x 1" x ⅛"
(25 x 25 x 3 mm)
12±⅛
(305±3 mm)
WATER-COOLED
CALORIMETER
RACK FITS INSIDE
SEAT FRAME
TOP VIEW
CALORIMETER BRACKET

FIGURE 4



TOP VIEW
THERMOCOUPLE RAKE BRACKET

FIGURE 5

BILLING CODE 4910-13-C

4. By amending newly designated Part I of Appendix F of Part 25 by removing the words "of this appendix" wherever they appear and inserting, in their place, the words "Part I of this appendix".

PART 29—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY ROTORCRAFT

5. By amending § 29.853 by adding a new paragraph (b) as follows:

§ 29.853 Compartment interiors.

* * * * *

(b) In addition to meeting the requirements of paragraph (a)(2), seat cushions, except those on flight crewmember seats, must meet the test requirements of Part II of Appendix F of Part 25 of this chapter, or equivalent.

* * * * *

PART 121—CERTIFICATION AND OPERATIONS: DOMESTIC, FLAG, AND SUPPLEMENTAL AIR CARRIERS AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT

6. By amending § 121.312 by redesignating present paragraphs (a) and (b) as (1) and (2), by redesignating the introductory paragraph as (a), and by adding a new paragraph (b) to read as follows:

§ 121.312 Materials for compartment interiors.

* * * * *

(b) For airplanes type certificated after January 1, 1958, after November 26, 1987, seat cushions, except those on flight crewmember seats, in any compartment occupied by crew or passengers must comply with the requirements pertaining to fire protection of seat cushions in § 25.853(c), effective November 26, 1984, and Appendix F to Part 25 of this chapter, effective November 26, 1984.

(Secs. 313, 314, and 601 through 610, Federal Aviation Act of 1958, as amended (49 U.S.C. 1354, 1355, and 1421 through 1430); 49 U.S.C. 106(g) (Revised, Pub. L. 97-449, January 12, 1983))

Issued in Washington, D.C., on October 23, 1984.

Donald D. Engen,

Administrator.

[FR Doc. 84-28294 Filed 10-23-84; 2:10 pm]

BILLING CODE 4910-13-M