FAR 170

170-1

See 170-1A

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 170

[Docket No. 26425]

RIN 2120-AC98

Establishment and Discontinuance Criteria for Airport Traffic Control Tower Facilities

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This amendment prescribes benefit-cost based criteria for establishment and discontinuance of visual flight rules (VFR) airport traffic control tower facilities. The FAA uses these criteria to assess the benefits and costs associated with establishing or decommissioning an airport traffic control tower as a part of its mission to maximize safety and efficiency throughout the airport and airway system consistent with available resources. This regulation implements the requirements of recent legislation requiring the publication of criteria for navigational aids and airport traffic control towers. The tower criteria prescribed by this rule will be followed by criteria for other navigational aids as they are developed and revised.

EFFECTIVE DATE: February 4, 1991.

FOR FURTHER INFORMATION CONTACT: Mr. Evan Soffer, Office of Aviation Policy and Plans, Federal Aviation Administration, 800 Independence Ave., SW., Washington, DC 20591; telephone (202) 267-3286.

SUPPLEMENTARY INFORMATION:

Background

The FAA has the responsibility to establish or discontinue airport traffic control towers through the national airspace system when activity levels and safety considerations merit such action. Criteria for the installation of towers have historically been developed by the FAA and its predecessor organization, approved internally within the organization, and published since 1951. Current criteria, including the general qualifications necessary to become a candidate site for establishment or discontinuance of VFR airport traffic control towers, are published in "Airway Planning Standard Number One—Terminal Air Navigation Facilities and Air Traffic Control Services" (FAA Order No. 7031.2C) and detailed in " Establishment and Discontinuance Criteria for Airport Traffic Control Towers." (Report No. FAA-APO-83-2). Decisions to establish and operate airport traffic control towers have been and will continue to be based on benefits exceeding costs of such actions. The Airport and Airway Safety and Capacity Expansion Act of 1987, Public Law 100-223, section 308 (49 U.S.C. 1348), mandated that these criteria be revised and, for the first time, promulgated through Federal administrative regulation.

History

Criteria to establish airport traffic control towers have evolved over time. Initially applied in 1951, a minimum number of operations was required to qualify as a tower candidate. From 1951 through 1974, FAA established minimum qualifying levels of 24,000 annual itinerant operations at air carrier airports, and 50,000 annual itinerant operations at general aviation airports. Differential levels of operations were established under the theory that, at air carrier airports, a greater mix of traffic with a wider range of performance characteristics created a greater potential for accidents.

In 1975, the criteria were revised to incorporate benefit-cost analysis. To qualify for establishment of a tower, the ratio of benefits to costs had to equal or exceed one.

$$\frac{\text{Benefits}}{\text{Costs}} > 1$$

Forming the basis of current criteria, the 1975 criteria considered collision and other accident risk, reduction in flying time, mix of aircraft types, percent of passengers injured, and percent of aircraft damaged.

Criteria for discontinuing tower services have been employed since 1956. In 1977, the first economic-based discontinuance criteria were detailed in a draft report, "An Analysis of Continued Operation of Selected Airport Traffic Control Towers." The report provided a comprehensive benefit-cost approach to assess the merits of the continued funding of towers. Locations were identified as candidates for discontinuance whenever benefits from continued tower operation were less than operating and maintenance costs over a 15-year forecast period.

In 1983, the FAA revised the economic analysis for VFR airport traffic control towers and the corresponding establishment and discontinuance criteria. These criteria will remain in effect until the effective date of the rule contained herein.

Current Criteria

The criteria in effect today are divided into two phases. Phase I criteria were constructed as a simplified screening device to manually identify potential candidates for future benefit-cost analysis. They are in the form of a ratio test based on one year's activity for three consecutive one-year reporting periods. A site becomes a candidate for Phase II establishment analysis if the ratio sum of the following formula equals or exceeds 1:

AC		AT		GAI		GAL		MI		ML	
38,000	+	90,000	+	160,000	+	280,000	+	48,000	+	90,000	1>

A site becomes a candidate for Phase II discontinuance analysis if the ratio sum of the following formula is less than 1:

AC		AT		GAI		GAL		MI		ML	
15,000	+	40,000	+	75,000	+	125,000	+	20,000	+	35,000	1<

where:

AC = Air carrier operations
AT = Air taxi operations
GAI = General aviation itinerant operations
GAL = General aviation local operations
MI = Military itinerant operations
ML = Military local operations

The formula considers activity by user class and differentiates by aircraft size by evaluating air carrier and commuter activity, which are defined in part by aircraft size, in separate classes. Phase II criteria compare the present value of tower benefits with the present value of tower costs over a 15-year period. If the tower meets the initial benefit-cost screening for either establishment or discontinuance, then a site-specific analysis is performed.

The 1983 methodology to calculate benefits and costs for establishment and discontinuance criteria is still in effect today (see Report No. FAA-APO-83-2). Site-specific activity forecasts are used to estimate the benefits resulting from prevented aircraft collisions, from other prevented accidents, and from reduced flying time. Considered in the benefit analysis is the mix of aircraft types—air carrier, air taxi, general aviation, and military—and levels of local and itinerant traffic operating within the terminal area. Also considered are the number of enplaned passengers and crew members who might be fatally or nonfatally injured in a collision or other type of tower-preventable accident. Dollar values are assigned to prevented fatalities, injuries, reduced aircraft operating costs, and time savings for passengers to provide a common basis for comparing benefits and costs.

Recurring tower costs include annual costs of staffing, maintenance, equipment, supplies, and leased services. Establishment costs include nonrecurring investment costs, such as facilities, equipment, and operational startup. Tower discontinuance criteria use the same annual costs as establishment criteria. Discontinuance criteria also consider the costs of closing the tower.

Revised Criteria

As in past criteria, the revised criteria for VFR airport traffic control tower establishment require that candidate airports have life cycle benefits that exceed life-cycle costs.

$$\frac{\text{Present Discounted Value of Benefits}}{\text{Present Discounted Value of Costs}} > 1$$

Criteria for airport control tower discontinuance specify that the present value of benefits derived from continued tower operation compared to the present value cost of continued operation are less than one.

$$\frac{\text{Present Discounted Value of Benefits}}{\text{Present Discounted Value of Costs}} < 1$$

In compliance with Public Law 100-223, the FAA revised the establishment and discontinuance criteria for airport traffic control towers, the procedures to calculate benefits and costs, and the results when the criteria are applied to airports using current forecasts of activity (see Report No. FAA-APO-90-7, "Establishment and Discontinuance Criteria for Airport Traffic Control Towers"). The revised criteria methodology eliminate Phase I criteria, update accident rates, and update economic values used to calculate benefits. In addition, the statute requires that the criteria eliminate qualification distinctions based on aircraft size.

Distinctions according to classes of aircraft are eliminated in two ways. First, by eliminating Phase I criteria, the distinction based on aircraft size is removed ("air carrier" and "commuter" service is defined in part by aircraft size). Second, the methodology to calculate benefits contains no reference to aircraft size. Only three functional user groups are used in the benefit-cost calculation: scheduled commercial, nonscheduled commercial, and noncommercial. These user groups have been constructed to reflect differences in the nature of public transport in today's deregulated environment, operating requirements, and sources of data considered helpful in obtaining accurate estimates of potential tower benefits.

The elimination of Phase I criteria reduces confusion regarding the meaning of the formula result. Because of improved automation and the widespread availability of computer equipment, the need no longer exists for the preliminary screening provided by Phase I criteria. Detailed Phase II benefit-cost analysis can now be accomplished quickly and accurately.

Benefit-cost analyses of potential airport traffic control towers are based on two types of benefits (safety and efficiency) and two types of costs (annual and investment). Safety benefits derive from avoiding accidents and their associated fatalities, injuries and property damage. Efficiency benefits derive from the reduction in flying time—saving time of aircraft occupants and reducing variable operating costs of aircraft. Investment costs include the initial costs associated with installing and staffing a new tower. Annual costs are comprised of staffing costs for operation, maintenance, leased communications, and administrative overhead. Discontinuance criteria substitute decommissioning costs for investment costs.

Explicit values assigned to passenger time, life, injuries, aircraft replacement and restoration, and aircraft operating costs provide a basis for comparing benefits to costs across airports. Economic benefits are based on airport-specific aviation activity projected in the FAA's annual Terminal Area Forecasts. Benefits and costs are estimated for a 15-year life cycle and are discounted to their present value using a 10 percent discount rate as directed by the Office of Management and Budget.

How the Criteria Apply

The FAA uses the benefit-cost criteria to determine the eligibility of sites for establishment or discontinuance of VFR airport traffic control tower facilities. A site is eligible for the establishment of a facility or service when the ratio of the benefits to the costs of establishment equals or exceeds 1.0. A facility or service may be discontinued if the benefits expected to be realized over the remainder of its life cycle fall below its recurring operation, maintenance, and decommissioning costs. Additional factors, such as terrain, weather, operational requirements, or national security, may also be considered in the evaluation of sites as candidates for establishment or decommissioning.

Meeting the economic criteria is usually a necessary condition for facility establishment. However, meeting the criteria is not a guarantee that a tower will be established.

Criteria Results

All nonmilitary airports in the Terminal Area Forecasts were evaluated with the current and revised benefit-cost computer programs for establishment or discontinuance of an airport traffic control tower. Since the FAA issued the notice of proposed rulemaking (NPRM) for establishment and discontinuance criteria for VFR airport traffic control towers (54 FR 22698; May 25, 1989), it has finalized a separate and independent update of various standardized economic values used in FAA investment and regulatory analyses. In addition, aviation activity projections provided by the FAA's Terminal Area Forecasts data base have been updated since the issuance of the NPRM. The criteria and underlying benefit-cost analysis on which this rule is based have been changed to account for differences between the revised draft and final economic values. The FAA

believes that the resulting criteria will promote the efficient use of resources while satisfying air traffic control requirements.

Because of the changes, the results outlined below are different than those in the NPRM, resulting in four fewer establishment sites and five additional discontinuance sites. Approximately 3,500 nontowered airports, along with 20 FAA contract towered airports, 43 nonfederal contract towered airports, and 23 airports with decommissioned or temporarily closed towers were considered for tower establishment. Of these sites, 29 had benefit-cost ratios of 1.0 or greater and could be processed as candidates for tower establishment on a site-specific basis. An additional 400 airports have FAA control towers and were considered for discontinuance. Of the VFR towered airports, 31 had benefit-cost ratios less than 1 and could be evaluated for discontinuance on a site-specific basis.

Need for the Regulation

This rule is promulgated under the authority of Pub. L. 100–223 which requires the promulgation of regulations to establish criteria for the installation of airport control tower facilities and other navigational aids. The promulgation of this rule satisfies the requirement for airport traffic control tower criteria. Criteria for other navigational aids will be promulgated through future rulemakings as they are developed and revised.

Discussion of Comments

Introduction

Twenty-four parties responded to the NPRM. The comments were categorized as follows: concurrence without comment, site-specific concern over the proposed discontinuance criteria, applicability to contract towers, identification of and credit for all benefits, definitional problems, and other comments. The FAA has considered all the comments and has amended the rule and the underlying benefit-cost analysis, where appropriate.

Concurrence Without Comment

Three commenters concurred with the provisions of the proposed rule without further comment. These commenters included the Aircraft Owners and Pilots Association (AOPA), the Air Transport Association of America (ATA), and the Air Line Pilots Association (ALPA).

Site-Specific Concern over the Proposed Discontinuance Criteria

The most frequent comment pertained to site-specific concerns over the proposed discontinuance criteria. Of the 12 parties that so commented, 10 parties commented specifically on the Joplin Municipal Airport (Joplin, MO), including local officials of Joplin and surrounding communities, the Chamber of Commerce, the airport manager, a fixed-base operator, and a reservation travel service company. The two remaining parties were the airport director of Owensboro-Daviess County Regional Airport (Owensboro, KY) and the Director of Transportation of Jefferson City, MO.

Most of the parties expressing concern over Joplin Municipal vis-a-vis the discontinuance criteria stated that "the FAA plans to close air traffic control towers at smaller airports using arbitrary numbers" and that "such action will jeopardize the growth of business and economic development in the communities served by smaller airports."

In response, the FAA has no general policy or plans to close any specific tower or group of towers. The primary purpose of towers is to enhance the safety of aircraft operations. The FAA believes that the revised criteria will maximize safety for the aviation system as a whole, consistent with the finite resources available to provide air traffic control services. Tower operations will be continued where benefits are demonstrated as outweighing the costs.

The discontinuance criteria require an economic comparison of the safety and efficiency benefits with the net costs of continued tower operation (where net costs include operations and maintenance costs reduced by the termination costs associated with decommissioning or discontinuance). At sites where the benefits fall short of the costs, it is economically sensible to consider termination of tower services and divert these resources to other sites with greater accident prevention and efficiency benefit potential. Conversely, if the benefits outweigh the costs, continued operation of the tower is the preferred action.

While meeting the discontinuance criteria qualifies a site as a discontinuance candidate, decisions to actually discontinue a tower are made on a case-by-case basis. Before a final decision to discontinue a tower is made, the candidate site is subjected to close and highly detailed scrutiny, not only on the basic benefit algorithms within the benefit-cost analysis, but also on the basis of site-peculiar nonquantifiable factors and considerations.

Applicability to Contract Towers

Six parties, including the American Association of Airport Executives (AAAE), the Director of Transportation of Jefferson City (MO), and the airport managers of Enid Woodring Municipal, Paducah, Cuyahoga County, and Flagstaff Pulliam airports, commented on the uniqueness of contract towers vis-a-vis FAA-funded and -operated towers. The recurring theme in this comment category pertained to the lower cost structures of contract towers relative to the cost structure presented in the underlying benefit-cost report. In addition, the Director of Transportation of Jefferson City requested consideration of the FAA in funding his non-Federal tower and the manager of Twin Cities Airport/Ross Field (Benton Harbor, MI) requested that his tower be reopened.

In response, the illustrative costs presented in the benefit-cost analysis report (Report No. FAA-APO-90-7) are based on average costs for FAA-funded and -operated towers. The rule itself permits the use of site-specific costs. Hence, notwithstanding the cost illustration, tower costs will differ from case-to-case and are accommodated in the evaluation process. When sites are reviewed and evaluated as candidates for establishment or discontinuance in actual practice and application, site-specific cost data are used in the benefit-cost analysis performed. The cost data would be either actual/estimated FAA costs or the actual/estimated contract costs, as appropriate, and tailored to the extent possible to the site being evaluated.

The objective of the FAA's Contract Tower Program is to continue providing air traffic control (ATC) services at airports with low activity VFR control towers in the most economical manner. This will permit the FAA to make better use of its limited resources, to maintain an efficient network of control towers, and to provide effective and safe service in a cost effective manner. Construction of an airport traffic control tower (ATCT) structure is beyond the scope of the FAA's Contract Tower Program since the contracts are only for the provision of ATC services. The FAA plans to contract for the operation of its Level I VFR control towers as long as continued operation is cost beneficial under a contract operation. Site-specific data, including actual or projected contract costs, are and will be used in each benefit-cost analysis to determine if the ATCT meets criteria for continued

operation (i.e., above the discontinuance criteria) or if an ATCT that had been previously closed should be reopened.

The Contract Tower program also includes a process for the review and consideration of an airport with an operating non-Federal control tower if it meets the criteria for continued operation (i.e., above discontinuance criteria using actual or projected contract costs). Airports that do not have an operating non-Federal ATCT or a control tower structure available for occupancy that meets building standards would not be considered for inclusion in this program. As noted above, construction of an ATCT structure is beyond the scope of the FAA's Contract Tower Program since the contracts are only for the provision of ATC services.

Identification of and Credit for all Benefits

Three parties suggested that not all benefits are addressed by the underlying benefit-cost analysis. In response, and in addition to responses to specific comment outlined below, it should be noted that the rule itself doesn't specify the exact form of the benefits analysis. The benefit-cost analysis is illustrative and may include other benefit categories on a site-by-site basis.

The general manager of Mizzou Aviation Company, a fixed-based operator serving Joplin Municipal Airport, stated that the criteria do not seem to consider growth factors which can be immediate and phenomenal. This commenter also felt that air traffic occurring when the tower is closed had not been considered. In response, this commenter apparently overlooked the fact that the benefit-cost analysis program supporting the tower criteria can and should consider the forecast traffic activity for each and every year of the tower's life cycle. Also, the analysis does account for air traffic activity occurring when the tower is closed.

Among other comments discussed separately below, the airport manager of Paducah Airport Corporation (Paducah, KY) and the airport director of Owensboro-Daviess County Regional Airport (Owensboro, KY) stated that they were unable to determine whether any benefit recognition is given for firefighting, rescue and medical treatment supplies used as the result of an aircraft accident, and Aircraft Rescue and Fire Fighting (ARFF) response to an aircraft accident where there is a control tower to guide ARFF crews to the accident site. In response, although not directly apparent from the recommended benefit-cost approach, averted ARFF expenses are embodied and amortized within the value per life saved used by the analysis in quantifying the value of averted fatalities. ARFF response time, however, is not included in the quantified benefit methodology due to expected variability from site-to-site (e.g., presence of UNICOM, fixed-base operators, population density, etc.). In practice, these benefits may be expressly estimated on a site-specific basis or treated as a nonquantified benefit and acknowledged as such.

Both the Paducah airport manager and the Owensboro-Daviess airport director also commented that the FAA has not made benefit allowances for the value of lives and property when an off-airport accident occurs. In response, lives lost on the ground in tower-preventable accidents (i.e., other than aircraft occupants) are accounted for by virtue of drawing on the National Transportation Safety Board Data Base which distinguishes between aircraft occupants and other persons. Damage to property other than aircraft is not expressly quantified (due to extreme variability), but rather included with other "nonquantified" benefits and recognized as such.

In addition, the Owensboro-Daviess airport director states that: (1) It is not clear if military aircraft costs and values are included in the noncommercial functional category; and (2) there is no value placed on the effects of aviation liability insurance premiums. In response to (1), military aircraft operations are included in the noncommercial functional user category. In response to (2), aviation liability insurance premiums are, in effect, already captured in the benefits methodology by virtue of accounting for expected economic losses of destroyed and damaged aircraft (i.e., aggregate pooled insurance premiums simply represent the expected losses to be incurred by the parties insured, ignoring insurance company administrative expenses and profit margins). To further expressly add liability premiums would, therefore, constitute double counting.

In addition to the ARFF and off-airport loss comments, the Paducah airport director had other comments and questions in the category of benefit accountability. He commented that it is unclear what weight nonquantitative factors will bear as compared to quantitative analysis vis-a-vis evaluation of one site against another (e.g., will one airport's runway threshold's line-of-sight problems be evaluated in the same manner as another's; or what weight will heavily populated property located immediately off the end of a runway have on the level of benefits). He also felt that savings generated by towers in the sequencing of aircraft (which preclude the necessity of flying a traffic pattern) were not accounted for.

In response, nonquantitative factors by nature do not lend themselves to being quantified for across-the-board application. However, because the in-depth benefit-cost analyses are performed at a central location (FAA, Washington Headquarters), treatment of qualitative considerations is relatively consistent from case-to-case. The benefits generated by towers in minimizing or reducing overflights and traffic pattern flying are addressed in detail in the benefit-cost analysis guide.

Definitional Problems

Definitional problems were cited by the AAAE, the Regional Airline Association (RAA), and the airport manager of Paducah Airport Corporation.

The AAAE recommended a clarification in the Definitions Section of the rule (subpart A § 170.3). To avoid later confusion, the AAAE recommended that the definition of "scheduled commercial service" be changed to read "the carriage by aircraft in air commerce under parts 121 and 135 of persons or property for compensation or hire based on published flight schedules." In response, the FAA has accepted this definitional comment and has made the corresponding change in the final rule, also including the addition of part 127.

The RAA asked that if the point of the NPRM was to establish criteria for tower establishment or disestablishment using the three categories of scheduled commercial, nonscheduled commercial, and noncommercial, why are "air carrier," "commuter air carrier," "commuter/air taxi operations," and "air taxi" included in the Definitions Section? In response, the FAA has accepted this comment and deleted the questioned references.

The Paducah airport manager noted that the underlying benefit-cost analysis report states that, at towered airports, data are available on operations classified as scheduled commercial, nonscheduled commercial, and noncommercial traffic. The airport manager pointed out that FAA traffic recording procedures require identification by air carrier, air taxi, itinerant general aviation, itinerant military, local civil, and local military operations. In response, the functional categories of scheduled commercial, nonscheduled commercial, and

noncommercial traffic have been constructed and adopted by the revised tower criteria to reflect differences in the nature of public transport in today's deregulated environment, operating requirements, and sources of data considered helpful in obtaining accurate estimates of potential tower benefits. They are not inconsistent, however, with current traffic activity counting and recording procedures. Scheduled commercial operations encompass air carrier and air commuter operations; nonscheduled commercial operations encompass nonscheduled air taxi operations; and noncommercial operations encompass general aviation and military operations.

The Paducah airport manager cited formula references to "the number of user class 'i' aircraft." He concluded that the inference is that the FAA will use broad classes of aircraft data or values which may have no relationship to site-specific flight operations. Use of "averaged" user aircraft classes defeats the purpose of the benefit-cost calculation. In response, while section 308 of the Airport and Airway Safety and Capacity Expansion Act prohibits the FAA from differentiating between user classes based on aircraft size, it does permit consideration of passengers served. As such, site-specific estimates of passengers per aircraft operation are considered in development and application of the criteria.

The Paducah airport manager also indicated that there is a definition gap in applicability for part 121 aircraft with fewer than 60 seats, unless such operators are placed in the "air carrier" category. He contended that, regardless of the type and size of aircraft and regardless of whether the service is certified and operated under part 121 or 135, any scheduled passenger service operation should be considered and classified as an air carrier operation. In response, Part 121 aircraft with less than 60 seats are classified and counted within the scheduled commercial category. Section 308 of the Airport and Airway Safety and Capacity Expansion Act prohibits the FAA from differentiating between user classes based on aircraft size. The illustrative benefit-cost analysis includes all parts 121, 127 and 135 operations within the scheduled commercial service functional category. Therefore, this comment is embodied in the recommended benefit-cost analysis procedure.

The Paducah airport manager further stated that lumping military operations with general aviation activity (in the noncommercial traffic category) creates a problem because of differences in their respective sophistication and values. In response, the FAA acknowledges that, as a whole, a military aircraft is significantly different from an average general aviation aircraft. However, military traffic at actual and potential towered civil airports, toward which the criteria are aimed, is not representative of the overall military fleet, but rather is skewed toward smaller aircraft such as trainers, small transports, and rotorcraft.

Other Comments

The RAA believed that the procedures in the underlying benefit-cost report should be spelled out in the published regulations. In response, the benefit-cost analysis is purely illustrative and not hard and fast. Benefit parameters such as forecast activity, value per life saved, costs of injuries, etc., will change over time and the analysis needs to be flexible enough to accommodate unique site benefits. Further, the tower criteria being promulgated under this rule are the first of a number of facilities and equipment establishment and discontinuance criteria which will eventually make up the new part 170. It is not feasible or reasonable to include the underlying benefit-cost analyses in the Federal Aviation Regulations. Therefore, the FAA will cite the underlying benefit-cost procedures by reference only and make them available on request.

The airport manager of the Enid Woodring Municipal Airport, while acknowledging that the new criteria are a significant improvement over the previous criteria, stated that the "numbers are still unrealistically high * * * for tower candidate airports struggling to reach the magic criteria which will enable them to qualify for a Federal tower." In response, the establishment criteria, among other requirements, are based on an objective economic comparison of benefits and costs to assure that there are net positive benefits from tower establishment or discontinuance.

The Owensboro-Daviess County airport director had several miscellaneous comments. He stated that "there is a strong indication that the entire program is being developed as a means of meeting an end result relating to the Department budgetary concerns." In response, the FAA disagrees with this statement. The criteria are based on an objective assessment of tower benefits and costs and the generally accepted principles of benefit-cost analysis. The criteria are developed completely independent of the budgeting process. The criteria are intended to be a decisionmaking tool and include other considerations in addition to the benefit-cost assessment.

The Owensboro-Daviess airport director also felt that there must be some way of making the evaluation process simpler and that benefit-cost analysis programs involving aviation safety should be outweighed by practicality. In response, the FAA has found benefit-cost analysis to be a useful aid in the investment decisionmaking process, far outweighing the complexities inherent in their development. Once developed, cost benefit analysis programs are easy to apply since they are microcomputer based and capable of accommodating endless sensitivity (or "what-if") analyses.

Regulatory Evaluation Summary

The promulgation of this regulation is expected to have only minimal impact, if any, on the public. Since the new criteria are not expected to result in a significant change in the number of towers being established or discontinued, there is no new cost to the FAA resulting from the application of the revised criteria. As with current criteria, costs to establish an air traffic control tower are not incurred until a site-specific benefit-cost analysis is completed and the resulting benefit-cost ratio equals or exceeds 1. Under this initial screening where benefit-cost ratios are computed using national average costs, 29 sites are identified to be analyzed on a site-specific basis. This compares to a total 32 sites using existing criteria with accident rates and economic values which have not been updated.

The application of the revised criteria is part of the normal procedures in analyzing potential ATCT sites and the current rule further formalizes these procedures. The benefit of this rule is to inform the public of the benefit-cost criteria used by the FAA for the allocation of resources for establishment of air traffic control towers and further assure adequate consideration of the safety and efficiency effects of potential traffic control towers. Since this action has not identifiable cost impact to the public and has a positive, although unquantifiable benefit, a detailed regulatory evaluation is unnecessary.

Regulatory Flexibility Determination

This rule provides a guide for internal FAA management in the establishment and discontinuance of air traffic control towers; for this reason and for the reasons discussed under "Regulatory Evaluation Summary" above, it is certified that this rule will not have a

significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

Federalism Implications

The regulation outlined herein will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this regulation does not have Federalism implications warranting the preparation of a Federalism Assessment.

Conclusion

For the reasons discussed above, the FAA certifies that this rule will not have significant economic impact, positive or negative, on a substantial number of small entities, and a regulatory flexibility analysis is not required. In addition, and for the same reasons, the proposal is not major under Executive Order 12291 and is not significant under DOT Regulatory Policies and Procedures (44 FR 11034; February 26, 1979). Since the rule will impose no additional administrative cost on the FAA, the estimated benefits are expected to exceed the estimated costs of implementation.

List of Subjects in 14 CFR Part 170

Air traffic control.

The Amendment

In consideration of the foregoing, the FAA is adding part 170 to chapter I of the Code of Federal Regulations to read as follows:

PART 170—ESTABLISHMENT AND DISCONTINUANCE CRITERIA FOR AIR TRAFFIC CONTROL SERVICES AND NAVIGATIONAL FACILITIES

Subpart A—General

Sec.

170.1 Scope.
170.3 Definitions.

Subpart B—Airport Traffic Control Tower

170.11 Scope.
170.13 Airport Traffic Control Tower (ATCT) Establishment Criteria.
170.15 ATCT Discontinuance Criteria.

Authority: 49 U.S.C. 1343, 1346, 1348, 1354(a), 1355, 1401, 12421, 1422 through 1430, 1472(c), 1502, and 1522; 49 U.S.C. 106(g).

Subpart A—General

§ 170.1 Scope.

This subpart sets forth establishment and discontinuance criteria for navigation aids operated and maintained by the United States.

§ 170.3 Definitions.

For purposes of this subpart—

Air navigation facility (NAVAID) means any facility used, available for use, or designated for use in the aid of air navigation. Included are landing areas; lights; signaling, radio direction-finding, or radio or other electronic communication; and any other structure or mechanism having a similar purpose of guiding or controlling flight or the landing or takeoff of aircraft.

Air traffic clearance means an authorization by air traffic control for an aircraft to proceed under specified traffic conditions within controlled airspace for the purpose of preventing collision between known aircraft.

Air traffic control (ATC) means a service that promotes the safe, orderly, and expeditious flow of air traffic, including airport, approach, departure, and en route air traffic control.

Air traffic controller means a person authorized to provide air traffic service, specifically en route and terminal control personnel.

Aircraft operations means the airborne movement of aircraft in controlled or noncontrolled airport terminal areas, and counts at en route fixes or other points where counts can be made. There are two types of operations: local and itinerant.

(1) *Local operations* mean operations performed by aircraft which:

(i) Operate in the local traffic pattern or within sight of the airport;

(ii) Are known to be departing for, or arriving from flight in local practice areas located within a 20-mile radius of the airport; or

(iii) Execute simulated instrument approaches or low passes at the airport.

(2) *Itinerant operations* mean all aircraft operations other than local operations.

Airport traffic control tower means a terminal facility, which through the use of air/ground communications, visual signaling, and other devices, provides ATC services to airborne aircraft operating in the vicinity of an airport and to aircraft operating on the airport area.

Alternate airport means an airport, specified on a flight plan, to which a flight may proceed when a landing at the point of first intended landing becomes inadvisable.

Approach means the flightpath established by the FAA to be used by aircraft landing on a runway.

Approach control facility means a terminal air traffic control facility providing approach control service.

Arrival means any aircraft arriving at an airport.

Benefit-cost ratio means the quotient of the discounted life cycle benefits of an air traffic control service or navigation aid facility (i.e., ATCT) divided by the discounted life cycle costs.

Ceiling means the vertical distance between the ground or water and the lowest layer of clouds or obscuring phenomena that is reported as "broken," "overcast," or "obstruction."

Control Tower—See Airport Traffic Control Tower.

Criteria means the standards used by the FAA for the determination of establishment or discontinuance of a service or facility at an airport.

Departure means any aircraft taking off from an airport.

Discontinuance means the withdrawal of a service and/or facility from an airport.

Establishment means the provision of a service or facility at a candidate airport.

Instrument approach means a series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually. It is prescribed and approved for a specific airport by competent authority.

Instrument flight rules (IFR) means rules governing the procedures for conducting flight under instrument meteorological conditions (IMC) instrument flight.

Instrument landing system (ILS) means an instrument landing system whereby the pilot guides his approach to a runway solely by reference to instruments in the cockpit. In some instances, the signals received from the ground can be fed into the automatic pilot for automatically controlled approaches.

Instrument meteorological conditions (IMC) means weather conditions below the minimums prescribed for flight under Visual Flight Rules (VFR).

Instrument operation means an aircraft operation in accordance with an IFT flight plan or an operation where IFR separation between aircraft is provided by a terminal control facility or air route traffic control center (ARTCC).

Life cycle benefits means the value of services provided to aviation users over the life span of a facility or service.

Life cycle costs means the value of research and development costs, investment costs, operation costs, maintenance costs, and termination costs over the life span of a facility or service.

LORAN-C means an electronic navigational system by which hyperbolic lines of position are determined by measuring differences in

time of reception of synchronized pulse signals from two fixed transmitters.

Maintenance costs means the costs incurred in servicing and maintaining a facility after establishment.

Mean sea level (MSL) means the base commonly used in measuring altitudes.

Microwave landing system (MLS) means a landing system which enables equipped aircraft to make curved and closely spaced approaches to properly instrumented airports.

Noncommercial traffic means all aircraft operations that are conducted free of compensation.

Nonprecision approach procedure means an FAA standard for approaching an IFR runway where no electronic glide slope is available.

Nonscheduled commercial service means the carriage by aircraft in air commerce of persons or property for compensation or hire that are not operated in regularly scheduled service such as charter flights.

Present value (PV) means the value of a stream of future benefits or costs that are discounted to the present.

PVB or *BPV* means the discounted value of life cycle benefits.

PVC or *CPV* means the discounted value of life cycle benefits.

PVCM or *CMPV* means the discounted value of operations and maintenance costs less termination costs over a facility's remaining life cycle.

Runway means a defined rectangular area on a land airport prepared for the landing and takeoff of aircraft along its length.

Runway visual range means an instrumentally derived value based on standard calibrations that represent the horizontal distance a pilot will see down the runway from the approach end.

Scheduled commercial service means the carriage by aircraft in air commerce under Parts 121, 127, and 135 of persons or property for compensation or hire based on published flight schedules.

Separation means the spacing of aircraft in flight and while landing and taking off to achieve their safe and orderly movement.

Takeoff clearance means authorization by an airport traffic control tower for an aircraft to take off.

Tower cab means an ATC facility located at an airport. Controllers at these facilities direct ground traffic, takeoffs, and landings.

Traffic advisories means advisories issued to alert pilots to other known or observed air traffic which may be in such proximity to the position or intended route of flight of their aircraft to warrant attention.

Traffic pattern means the flow of aircraft operating on and in the vicinity of an airport during specified wind conditions as established by appropriate authority.

VFR traffic means aircraft operated solely in accordance with Visual Flight Rules.

Visual flight rules (VFR) means rules that govern the procedures for conducting flight under visual conditions. The term "VFR" is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, "VFR" is used by pilots and controllers to indicate the type of flight plan.

Visual meteorological conditions (VMC) means meteorological conditions expressed in terms of visibility, distance from clouds, and ceiling equal to or better than specified minima.

Subpart B—Airport Traffic Control Towers

§ 170.11 Scope.

This subpart sets forth establishment and discontinuance criteria for Airport Traffic Control Towers.

§ 170.13 Airport Traffic Control Tower (ATCT) Establishment Criteria.

(a) The following criteria along with general facility establishment standards must be met before an airport can qualify for an ATCT:

(1) The airport, whether publicly or privately owned, must be open to and available for use by the public as defined in the Airport and Airway Improvement Act of 1982;

(2) The airport must be recognized by and contained within the National Plan of Integrated Airport Systems;

(3) The airport owners/authorities must have entered into appropriate assurances and covenants to guarantee that the airport will continue in operation for a long enough period to permit the amortization of the ATCT investment;

(4) The FAA must be furnished appropriate land without cost for construction of the ATCT; and

(5) The airport must meet the benefit-cost ratio criteria specified herein utilizing three consecutive FAA annual counts and projections of future traffic during the expected life of the tower facility. (An FAA annual count is a fiscal year or a calendar year activity summary. Where actual traffic counts are unavailable or not recorded, adequately documented FAA estimates of the scheduled and nonscheduled activity may be used.)

(b) An airport meets the establishment criteria when it satisfies paragraphs (a)(1) through (a)(5) of this section and its benefit-cost ratio equals or exceeds one. As defined in § 170.3 of this part, the benefit-cost ratio is the ratio of the present value of the ATCT life cycle benefits (BPV) to the present value of ATCT life cycle costs (CPV).

$$BPV/CPV \geq 1.0$$

(c) The satisfaction of all the criteria listed in this section does not guarantee that the airport will receive an ATCT.

§ 170.15 ATCT Discontinuance Criteria.

An ATCT will be subject to discontinuance when the continued operation and maintenance costs less termination costs (CMPV) of the ATCT exceed the present value of its remaining life-cycle benefits (BPV):

$$BPV/CMPV < 1.0$$

Issued in Washington, DC on December 26, 1990.

James B. Busey,

Administrator.

[FR Doc. 91-29 Filed 1-2-91; 8:45 am]

BILLING CODE 4910-13-M

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration

14 CFR Parts 1 and 23

[Docket No. 25811; Amdt. Nos. 1-37 and 23-42]

RIN 2120-AC15

Small Airplane Airworthiness Review Program Amendment No. 2

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This final rule upgrades the airworthiness standards for normal, utility, acrobatic, and commuter category airplanes. This amendment provides airworthiness standards for advancements in technology being incorporated in current designs, permits type certification of spin resistant airplanes, and reduces the regulatory burden in showing compliance with some of the requirements for the design and type certification of small airplanes. These new and amended airworthiness standards also result in the need for new definitions. As a result, new definitions are added.

DATES: February 4, 1991.

FOR FURTHER INFORMATION CONTACT: Ervin E. Dvorak, Standards Office (ACE-110), Aircraft Certification Division, Central Region, Federal Aviation Administration, room 1544, 601 East 12th Street, Kansas City, Missouri 64106; Telephone (816) 426-5688.

SUPPLEMENTARY INFORMATION:

Regulatory History

This amendment is based on Notice of Proposed Rulemaking (NPRM), Notice No. 89-5, (54 FR 9276, March 6, 1989). All comments received in response to Notice No. 89-5 have been addressed in the adoption of this amendment.

Related Activity

The FAA announced the Small Airplane Airworthiness Review Program on January 31, 1983 (48 FR 4290), and invited all interested persons to submit proposals for consideration. The goal of the review program was to provide an opportunity for the public to participate in improving, updating and developing the airworthiness standards applicable to small airplanes, as set forth in part 23 of the Federal Aviation Regulations (FAR). Where applicable, the review program was extended to the new commuter category requirements because the commuter category incorporated existing small airplane requirements as set forth in amendment 23-34 (52 FR 1806, January 15, 1987). Approximately 560 proposals were received in response to the request for proposals.

Following receipt of the proposals, the FAA published Notice No. CE-84-1 (49 FR 30053, July 25, 1984), containing the availability of agenda, compilation of proposals, and announcement of the Small Airworthiness Review Program conference. That conference was held on October 22-26, 1984, in St. Louis, Missouri. A copy of the transcript of all discussions held during the conference is filed in FAA Regulatory Docket 23494.

After reviewing the proposals and the public comments received at the conference, the FAA's first related rulemaking action concentrated on updating safety standards related to cabin safety and improved crashworthiness. On August 15, 1988 (53 FR 30802), in amendment 23-36, the FAA upgraded the standards for cabin safety and occupant protection during emergency landing conditions, which included dynamic testing requirements for the seat/restraint systems of small airplanes.

After further review of the conference proposals and the comments received at the conference, the FAA concluded that Small Airplane Airworthiness Review Program Notices No. 2 and 5 were next in priority. These two notices were published on the same date, March 6, 1989, as Notice No. 89-5 (54 FR 9276) and Notice No. 89-6 (54 FR 9338). Action on Notice No. 89-6 will be accomplished in a separate final rulemaking document. This final rulemaking action, resulting from Notice No. 89-5, considers all comments received on that notice.

Discussion of Comments

General

Interested persons were invited to participate in the development of these final rules by submitting written data, views, or arguments to the regulatory docket. Seven commenters responded to Notice No. 89-5. Substantive changes and editorial changes have been made to the proposed rules based on relevant comments received and on further review by the FAA. Two of these commenters strongly support the adoption of these proposals and commend the FAA for this needed upgrading of the regulations.

One commenter believes that the ongoing rulemaking actions have resulted in a continuing increase in the cost and complexity of certification requirements for general aviation airplanes. This commenter cites, as an example of this increased cost, the "dynamic testing of an airplane to prove it will meet the new certification requirements," and states that "For a small airplane, this test would mean the destruction of a minimum of 3 to 9 fuselages costing a total of from one to two million dollars." consequently, this commenter expresses support for the primary category rulemaking (54 FR 9738, March 7, 1989) and urges expeditious adoption of that rulemaking action.

Proposals in this rulemaking action respond to changes in design technology that were not envisioned in the current airworthiness standards and provide an acceptable level of safety for that new technology. Any additional airplane costs that may occur from these proposed new requirements are the result of an airplane manufacturer's selection of the technology for a new airplane design. In regard to the commenter's example of dynamic testing requirements that would require the destruction of several fuselages, the FAA has not been able to identify dynamic requirements that would require the destruction of a single fuselage. The FAA believes that this comment refers to the recently adopted dynamic seat testing requirements of amendment 23-36. The new seat design and dynamic testing needed to establish compliance may exceed the cost of the seat design and static test needed to show compliance with older requirements; however, the net benefits to be realized from the reduction in occupant fatalities and injuries are expected to exceed the increase in cost. Finally, this commenter's recommendation on the expeditious adoption of the proposed primary category aircraft rule is being addressed in a separate rulemaking action.

Discussion of Comments to Specific Sections of Part 23

The following comments and discussions are keyed to like-numbered proposals in Notice No. 89-5 with the exception of proposal 27-1 that was inadvertently omitted from the notice. Comments of an editorial nature are not included in the discussion.

Proposals 1, 3. These proposals contain the authority citations for parts 1 and 23. No comments were received on these proposals.

Proposal 2. This proposal would adopt generally accepted terminology into part 1, "Definitions and Abbreviations," to define airplane components and configurations that have come into use with new airplane designs and advanced technology. No substantive comments were received on this proposal and it is adopted as proposed.

Proposal 4. This proposal, which is applicable to normal, utility, and

acrobatic category airplanes, would establish a climb gradient in § 23.67 as the performance requirement for the one-engine-inoperative flight condition in place of the current rate of climb requirement. It is based upon the airplane's landing configuration stalling speed and would consolidate the airplane configuration requirements for determining climb gradients into one paragraph rather than three paragraphs, as currently stated.

One commenter states that presenting climb requirements as a climb gradient, instead of the rate of climb, is a step forward and that the climb gradient could be used directly to determine takeoff obstacle clearance performance. However, the commenter is concerned that all airplanes with a V_{S1} of 61 knots or less, and 6,000 pounds or less maximum weight, were excluded because of the retention of the words "rate of climb." The FAA agrees that the change would be consistent with the other climb requirements. Therefore, the word "rate" in § 23.67(b)(2) has been replaced with the word "gradient".

The same commenter states that, in § 23.67 (b)(1), (c)(2)(i), and (c)(2)(ii), the gradient should be expressed as a ratio of 1:67 instead of 1.5 percent (or 1:133 instead of .75 percent) for consistency with the other part 23 climb requirements. The FAA agrees with maintaining consistency, where possible, but the current expression of climb gradient for commuter category airplanes is expressed as a percentage, i.e., 1.2 percent rather than a ratio of 1:83. Therefore, the FAA is adopting this requirement as proposed to be consistent with commuter category airplane requirements. At some future date, a revision may be considered to change the ratios in §§ 23.65(a) and 23.77(a) to percentages.

One commenter states that, although there is explanatory language to the contrary, the one-engine-inoperative minimum climb requirements are being raised and no justification is given for this increase. Another commenter states that the change in minimum climb requirements for one-engine-inoperative reciprocating engine powered airplanes of more than 6,000 pounds is without foundation. This commenter refers to the NPRM discussion of one-engine-inoperative accidents and states that the FAA makes no correlation between the accidents and one-engine-inoperative performance. The commenter concludes that the regulatory increase is arbitrary.

While a perfect correlation between accidents and one-engine-inoperative performance does not exist, the FAA has determined that sufficient correlation exists to justify an increase in the minimum performance requirements of § 23.67. However, the increase is not significant when compared to the actual performance achieved by current type certificated designs. The proposal also would establish a uniform minimum performance standard for one-engine-inoperative climb for all multiengine airplanes with maximum weights of 6,000 pounds or more, or stall speeds in excess of 61 knots. This performance standard is unrelated to the landing configuration stall speed and requires a minimum climb gradient. Accordingly, the proposed gradients are adopted as proposed.

Contrary to one commenter's statement that the proposal would unnecessarily limit the payload capability of aircraft with stall speeds of 61 knots or less, the climb performance requirements for airplanes with a stall speed of less than 61 knots are not being changed by this proposal. This proposed regulation would change only the climb performance measurement from rate of climb to climb gradient.

One commenter does not believe that the phrase proposed in § 23.67(a) "* * * at each weight established as an operational limit * * *" should apply to the one-engine-inoperative climb performance of reciprocating multiengine airplanes. The FAA agrees with the commenter and § 23.67(a) is changed accordingly by removing this phrase. However, the weight, altitude, and temperature requirements for turbine-powered airplanes are retained in § 23.67(c)(1).

In the NPRM, the minimum speed requirement to maintain the steady climb gradient performance requirement was inadvertently omitted from the proposal. The last sentence of the explanation for this proposal in the NPRM demonstrates that the FAA's intent was to require compliance with the climb gradients of § 23.67 at a speed not less than 1.2 V_{S1}. No comments were received concerning this omission. Consequently, § 23.67 (b)(1), (b)(2), (c)(2)(i), (c)(2)(ii) has been changed to add the phrase "at a speed not less than 1.2 V_{S1}.

After further examination of this rulemaking action, it was noted that the references to § 23.67 in § 23.1047 were not addressed in the NPRM. With the changes to § 23.67, conforming revisions must also be made to § 23.1047 (d), (d)(1), (d)(5), and (e). This proposal is adopted with the aforementioned changes.

Proposal 5. This proposal would revise § 23.75 and require that landing distances be determined for all airplanes by using a steady approach at a gradient of descent of 5.2 percent. It also would require that landing distances for airplanes with short field landing features be determined at the maximum steady approach gradient selected by the applicant as an operating limitation. It would require that if any device used in determining the landing distance is dependent on the operation of any individual engine, the distance with that engine inoperative must be determined. If the use of other compensating means would result in a landing distance not more than that with all engines operating, then the all engine operating distance may be used. The landing should not require more than average piloting skills under the operating conditions expected in service.

One commenter states that it is impractical to eliminate idle power approaches for light, single-engine aircraft. The commenter maintains that, although acceptable for heavier single-engine airplanes and for most twin-engine airplanes, use of a steady, closed-throttle glide should continue to be permitted as a landing procedure for light, single-engine airplanes. The FAA agrees that idle power approaches should not be eliminated as an additional alternate approach condition if landing distance data is provided using a 5.2 percent gradient approach. This method will provide landing distance data for the normal approach and landing environment from a standard instrument landing system in which all airplanes may be required to operate. Section 23.75(a)(2) has been changed to clarify that the landing distance data, at other than a 5.2 percent gradient, is optional data in addition to the 5.2 percent gradient data. Section 23.75(a)(2) permits idle power approaches for all airplanes, including those with short field landing features, such as light, single-engine airplanes.

Two commenters state that, as proposed in the notice, § 23.75(a)(2) is not clear in which would be considered short field landing features. One of these commenters further states that additional clarification is needed on how a maximum steady approach gradient can be a defined operating limitation in a basic airplane. In consideration of these comments, and after further consideration of the explanation material in the NPRM, the words "short field landing features" have been removed from § 23.75(a)(2). In addition to approaches using the 5.2 percent gradient landing data, this section permits approaches at a gradient steeper than 5.2 percent, regardless of the airplane's landing features. The

applicant must demonstrate that these steeper approaches are safe and can be executed by pilots of average skill. A change to § 23.75(a)(2) has been made in response to the comment about defining an operating limitation. Any operating limitations that are required for the approach should be displayed to the pilot through the use of the cockpit instruments. When the approach gradient in steeper than 5.2 percent, a maximum rate of descent gradient must be used to provide an acceptable limitation, provided that an appropriate indication is available to the pilot.

One commenter is concerned about the increasing conservatism for determining landing distances, especially in regard to atmospheric conditions. The commenter states that an FAA advisory circular recommends procedures to be used for generation of landing performance data based on the most conservative atmospheric conditions; the commenter believes that these procedures are incorrect. Proposed § 23.75(b) states that "the landing may not require more than average piloting skill or conditions." The FAA agrees that the proposed change to § 23.75(b), as stated in the NPRM, needs clarification. Accordingly, § 23.75(b) has been changed to "the landing may not require more than average piloting skill when landing during the atmospheric conditions expected to be encountered in service, including crosswinds and turbulence."

Proposed § 23.75(h) has been adopted as § 23.75(g) and the present § 23.75(g), which contains additional requirements for commuter category airplanes, has been redesignated as § 23.75(h). This proposal is adopted with the aforementioned changes.

Proposal 6. The proposal would amend § 23.161 by establishing airworthiness standards for those airplanes for which a maximum operating limit speed, V_{MO}, has been established in accordance with § 23.1505(c). In addition, the proposal addresses additional flight conditions for which, as a minimum requirement, the airplanes need to be trimmed.

Concerning proposed § 23.161(c)(2)(ii), one commenter states that the current rule, which partially ties approach trim to the landing performance requirements of § 23.75, is preferred for safety reasons. The FAA agrees with the commenter that the current rule provides an approach trim requirement, which accounts for the landing flap setting(s) and speeds. After further consideration of the proposed change, the FAA recognizes that the proposed rule would not provide an approach trim requirement that is appropriate for those applicants who may wish to demonstrate landing distance at speeds greater than 1.3 V_{SO}. Therefore, the proposed change to § 23.161(c)(2)(ii) is withdrawn and the current rule is retained.

Concerning proposed § 23.161(c)(3)(i), one commenter states that V_H is not a typical "sustained cruise speed" for non-turbine-powered airplanes. The commenter recommends that $.9V_H$ be used (rather than V_H), as in proposed § 23.161(b)(1). The FAA agrees that the maximum speed in level flight at maximum continuous power (V_H) is not a typical sustained cruise speed for reciprocating engine powered airplanes. However, after review of discussions conducted at the Small Airplane Airworthiness Review Conference, the FAA has determined that V_H can be a sustained cruise condition. Retention of the change to § 23.161(c)(3)(i) is essential, and this portion of the proposal is adopted without change.

One commenter states that one problem with the proposed change to § 23.161(d) is the requirement that the trim speed be "the speed used in complying with § 23.67." The commenter states that, before amendment 23–34, § 23.67 covered only the gear-up, flaps-up claim condition, and the speeds used in complying were close to the speed range called out in § 23.161. Amendment 23–34 added the commuter category one-engine-operative climb requirements to § 23.67, including the second segment climb requirements involving a flight condition at a speed of 1.2 V_{SI}, gear up, with takeoff flaps extended. This proposal, in conjunction with revised § 23.67, would cause the 3-axis trim requirement to be applied in a manner identical to the commuter category second segment climb condition. The proposed requirement for 3-axis trimmability at the second segment climb condition would be very difficult to achieve and is not a reasonable requirement. The FAA agrees that the proposed revision to § 23.161(d) was not intended to address trim requirements during the transitory commuter category second segment climb requirements. The FAA also agrees that it is not reasonable or necessary to achieve 3-axis trimmability during second segment climb. Therefore, proposed § 23.161(d) is revised to incorporate the commuter category longitudinal and directional trim requirements adopted in amendment 23–34.

The same commenter states that there are several possible climb speeds associated with current and proposed § 23.67 for all categories of airplanes. The commenter points out that current § 23.67(d) requires that, for all multiengine airplanes, the speed for best rate of climb with one-engine-inoperative must be determined; this requirement is common to all airplane categories and is the logical one-engine-inoperative trim speed to use. It is the same speed as V_Y in current § 23.161(d) and it provides some speed margin, which makes compliance somewhat easier. The commenter, therefore, recommends that the longitudinal and directional trim speed range be from V_Y to 1.4 V_{SI} with the critical engine inoperative and, if applicable, its propeller in the minimum drag position. The FAA does not agree with the commenter concerning normal, utility, and acrobatic category airplanes. As stated in the NPRM, testing at a trim speed more closely related to operational climb speeds is desirable. Accordingly, § 23.161(d) is adopted as proposed, except to specify its applicability only to normal, utility, and acrobatic category airplanes. Additionally, a review of the transcript of the Small Airplane Airworthiness Review Conference verifies that the FAA's intent with respect to the position of the inoperative propeller is that the propeller be in the minimum drag position. Therefore, § 23.161(d) has been changed to clarify the intent that the inoperative propeller be in the minimum drag position.

This commenter also states that clarification by an advisory circular is needed when the final rules are published with respect to the lateral trim force requirements not exceeding five pounds. The commenter states that this force is very small when compared to normal system friction and asks if this condition is for maximum lateral fuel imbalance. The FAA will revise Advisory Circular 23–8A, "Flight Test Guide for the Certification of Part 23 Airplanes," to describe an acceptable means of compliance with the lateral trim force requirements. Concerning the commenter's question on lateral fuel imbalance, § 23.21(a) would require that compliance with § 23.161(d) be shown with maximum lateral fuel imbalance. This proposal is adopted with the aforementioned changes.

Proposal 7. This proposal would amend § 23.221 to allow certification of single-engine, normal category airplanes as spin resistant, an alternative to the current requirement of being recoverable from a one turn spin.

One commenter states that spin treatment proposed in the notice would deprive the flying public of safety that has been available for over 50 years. Also, the technology that led to the proposal for a "spin-resistant" class of

airplanes would contribute to a genuine advance in safety if applied to eliminating spins. The commenter recommends that § 23.221(a) be changed to read, "Normal Category airplanes shall be incapable of spinning." The commenter's suggested change would require a significant change in the existing technology and is, therefore, not being considered by the FAA at this time. Accordingly, the proposal is adopted without change.

One commenter supports proposed § 23.221(a)(1)(iii), which states that any use of primary flight or engine power controls should not result in an irrecoverable spin situation. However, this commenter also advocates special consideration of the reversed spin recovery case, which is defined as applying elevator before rudder. In the commenter's experience, this is a situation that is likely to be abused and one that merits special attention by the pilot. The subject of reversed recovery was discussed in detail during the Small Airplane Airworthiness Review Conference. As concluded in the NPRM, the proposed rule concerning misuse of controls during spin recovery includes reversed spin recovery, and a specific requirement for reversed recovery is not necessary. The proposed rule on misuse of controls is changed only slightly from the existing rule, which has a long history of satisfactory airplane service experience. Accordingly, § 23.221(a)(1)(iii) is adopted as proposed.

Concerning § 23.221(c)(3), one commenter states that this proposal appears to require exploration of power effects throughout acrobatic spins and that previous guidance was to explore power only through the first turn. The commenter believes that the rule was expanded without justification. This commenter is correct that the proposal requires the exploration of power effects throughout the acrobatic spin. As discussed at the Small Airplane Airworthiness Review Conference, the intent of the proposal is to make it impossible to obtain irrecoverable spins with any use of flight controls or engine power controls. As noted in the NPRM, the inclusion of the reference to engine power controls was accepted without comment at the conference. Following the review of the conference proposals and comments offered at the conference, the FAA has determined that engine power controls should be considered and this proposal is adopted as proposed.

Proposal 8. This proposal would establish § 23.301 criteria for determining loan intensities and distributions for airplanes with canard and tandem wing configurations. No comments were received on this proposal and it is adopted as proposed.

Proposal 9. This proposal would establish a new § 23.302 to require that airplanes with canard or tandem wing configurations meet all requirements of subpart C and subpart D applicable to a wing. This proposal is necessary because the forward structure of a canard or a tandem wing configuration performs both a control function and a lifting surface function similar to a main wing, and, therefore, it should meet both the wing and control surface requirements.

In the NPRM, the requirements in § 23.302(a) refer only to subpart C. One commenter states there could be confusion and recommends that subpart D be added to § 23.302(a); that is, subpart D is implied indirectly through reference to subpart C. For example, a forward wing of a canard configuration should also meet the requirements in § 23.641, subpart D. The FAA agrees with the commenter and, for clarity, § 23.302(a) is revised to add subpart D as a requirement. This proposal is adopted with the aforementioned changes.

Proposal 10. this proposal would correct an error in § 23.331(a) by changing the reference to § 23.331 to § 23.333 in existing paragraph (a). Also, a new paragraph (c) would be added to § 23.331 to ensure that flight loads applicable to horizontal surfaces in canard and tandem wing configurations are evaluated during the type certification process. No comments were received on this proposal and it is adopted as proposed.

Proposal 11. This proposal would establish gust load requirements in § 23.341 that must be met by an airplane with canard or tandem wing configurations.

One commenter provides the following analysis in regard to gust loads requirements. It has been shown many times, on a wide range of conventional airplanes, that wing gust loads can be accurately or conservatively estimated from the results of the current load factor formula of § 23.341. The accuracy of this approximation is dependent upon well-proven assumptions concerning the nature of the response of a conventional airplane to a vertical gust. For a canard configured airplane, some of these basic assumptions are not valid. In particular, the forward wing can impart a considerable nose-up pitch to the airplane before the main wing becomes immersed in the gust. This condition is likely to nullify the assumption that the response can be considered to be adequately represented only by the plunge motion of the airplane. Also, the downwash influence of the forward wing on the main wing can lead to significant redistribution of the aerodynamic loading across the wing span.

The commenter also points out that the inertia load factor on the canard configured airplane can be underestimated by the formula in existing § 23.341. In addition to the difference in inertia factors, the aerodynamic loads occur at different times than the peak inertia factor. This condition could result in substantially underestimating the net load on the main and forward wing if the formula assumption in existing § 23.341 was that the peak aerodynamic load and peak inertia load occurred simultaneously. This assumption is valid only for conventional airplanes. For canard configured airplanes, for both the main wing and the forward wing, the inertia relief is significantly below the value that would be computed using the peak acceleration at the center of gravity of the airplane.

The FAA agrees with the commenter and § 23.341(a) is revised to address, for a canard or tandem wing configured airplane, the concern that the relieving inertia load is not in phase with the forward wing load or the main wing load. The words, "to develop the gust loading on each lifting surface," were added to clarify that the gust load analysis must be performed considering each surface separately. This proposal is adopted with the aforementioned changes.

Proposal 12. This proposal would extend the yawing requirements in § 23.351, currently limited to vertical tail surfaces, to all vertical surfaces, such as winglets, in new airplane designs. This change is considered necessary to provide structural integrity for all vertical surfaces equivalent to that required for conventional vertical tail surfaces. No comments were received on this proposal and it is adopted as proposed.

Proposal 13. The proposal would change the heading preceding § 23.421 of subpart C because the present heading implies the sections following it are limited to tail surfaces of conventional airplane designs. The sections under this heading, as amended, are also applicable to airplanes with canard and tandem wing configurations. No comments were received on this proposal and it is adopted as proposed.

Proposal 14. This proposal would extend the current horizontal tail balancing load requirements in § 23.421 for conventional configurations to airplanes with canard and tandem wing configurations and prohibit the use of figure B6 of appendix B for tail surface load distribution.

Two comments were received on the proposal to prohibit the use of figure B6 of appendix B. One of the commenters believes that the appendix B method provides inexpensive standardization and a proven method of compliance and recommends that it be retained. The other commenter agrees with prohibiting the use of the appendix B method since the criteria in appendix B are applicable only to a limited range of light airplane configurations and the technical capability of industry is now such that more realistic loads can be developed.

The FAA does not agree that the continued use of appendix B is appropriate for average load magnitudes and load distributions for control surfaces. Appendix B was provided originally to define loads information in the absence of a more rational analysis. The curves and distributions shown in appendix B represent average conditions that were considered conservative and, as such, are compromises based on typical airplanes and aeronautical knowledge available at that time. The information presented in appendix B has been part of the small airplane certification requirements since the early 1930's. Particular curves, for example the tail surface load distribution of figure B6, have remained unchanged. The FAA recognizes that the intent of appendix B is to provide conservative load information when more extensive analysis is beyond the technical capability of the applicant. The technical capability of the industry has increased such that more accurate and realistic loads can be readily developed for the specific airplane design under consideration without the compromises used in appendix B. In some cases, the use of appendix B does not provide the conservative results intended. Accordingly, the FAA is removing appendix B in its entirety from part 23.

Proposal 15. This proposal would extend the current maneuvering loads requirements of § 23.423 for conventional type airplanes to canard and tandem wing configurations and prohibit the use of appendix B methods for demonstrating compliance. Where the current requirements refer to control deflections and up and down loads, it is proposed to refer to the control movements as nose-up and nose-down pitching of the airplane. The reasons for prohibiting the use of appendix B are discussed in detail in the explanation for proposal 14.

One commenter provides the following analysis on the fundamental difference of a canard configured airplane and a conventional airplane in the response characteristics for pitching maneuvering loads. With a conventional airplane, nose-down pitching is achieved by producing an upload on the tail surface. This load tends to increase the airplane's normal overall acceleration. Wing aerodynamic loads can be reduced to avoid exceeding the limit maneuvering load factor, but the full maneuvering capability is ensured up to the prescribed level of normal acceleration. With a canard configured airplane, nose-down pitching will have a negative forward wing load, which will tend to decrease the airplane's normal acceleration. To allow the checked maneuver to reach the limit load factor, the main wing lift must be increased. This maneuver may lead to a critical loading condition of the rear wing. An equivalent level of safety between a canard configured airplane and a conventional airplane can be ensured if the main wing with pitch control is also designed to the checked pitching maneuver.

The FAA agrees with the comment that the proposal, as written in the NPRM, could be interpreted as not being applicable to the main wing of an airplane with a canard or tandem wing configuration. In the NPRM, the words "the main wing of a canard or tandem wing configuration" were added to the first sentence of § 23.423.

The commenter also states that the applicability of § 23.423 could be interpreted to exclude the supporting structure of the horizontal surface. The FAA agrees with this comment and the words "and its supporting structure" have been added to the first sentence of the proposal. The balance of this proposal addresses the maneuvering loads on the forward surface of a three-surface configuration airplane, such as a wing, canard configuration, with a conventional tail. This three-surface configuration could have a canard surface without pitch control. This proposal is adopted with the aforementioned changes.

Proposal 16. This proposal would amend § 23.425 by extending the current gust load requirements for the horizontal tail surface to airplanes with a canard and tandem wing configuration and prohibit the use of appendix B, as discussed in detail in proposal 14. No comments were received on this proposal and it is adopted as proposed.

Proposal 17. This proposal would extend the current § 23.427 unsymmetrical loads requirements for horizontal tail surfaces of conventional configurations to airplanes with canard and tandem wing configurations. No comments were received on this proposal and it is adopted as proposed.

Proposal 18. The proposal would remove the word "tail" from the heading preceding § 23.441 because the present heading implies that the sections following it are limited to tail surfaces of conventional airplane designs. The affected sections, as amended, would be applicable to design features of airplanes utilizing vertical surfaces at locations other than the tail of the airplane. No comments were received on this proposal and it is adopted as proposed.

Proposal 19. This proposal would extend the maneuvering loads requirements of § 23.441, which are currently limited to vertical tail surfaces, to all vertical surfaces, such as winglets, in new airplane designs. It also would prohibit the use of appendix B, as discussed in detail in proposal 14. No comments were received on this proposal and it is adopted as proposed.

Proposal 20. This proposal would extend the gust load requirements of § 23.443 for conventional airplanes to include the canard and tandem wing configuration and prohibit the use of appendix B, as discussed in detail in proposal 14. No comments were received on this proposal and it is adopted as proposed.

Proposal 21. This proposal would amend the outboard fin requirements in § 23.445 to include all loads that are likely to occur simultaneously. It would require that the rational analysis include all loads likely to be applied to horizontal surfaces, and the 1g unaccelerated normal horizontal surface loads during the maneuvering conditions specified in § 23.441. It also would extend the requirements to all vertical surfaces that are mounted on horizontal surfaces, including wings. No comments were received on this proposal and it is adopted as proposed.

Proposal 22. This proposal would prohibit the use of appendix B in § 23.455, as discussed in detail in proposal 14. No comments were received on this proposal and it is adopted as proposed.

Proposal 23. This proposal would extend the current requirements of § 23.677 for powered trim system runaways to all categories of part 23 airplanes. No comments were received

on this proposal and it is adopted as proposed.

Proposal 24. This proposal would update § 23.701 to include provisions for airplanes with a flap configuration other than one flap on each wing. Some airplanes currently being manufactured have two flaps on each side of the airplane and some are designed with flaps on canard and tandem wings. It also addresses the failure of any single element in the flap control system and would permit an equivalent alternate means to the mechanical interconnection of the flaps as required by the present rule. No comments were received on this proposal and it is adopted as proposed.

Proposal 25. This proposal would establish minimum airworthiness standards in § 23.735 for airplanes equipped with antiskid braking systems. No comments were received on this proposal and it is adopted as proposed.

Proposal 26. This proposal would extend the current § 23.831 requirements to provide for hazardous gas-free ventilating air and for smoke evacuation to all categories of part 23 pressurized airplanes. No comments were received on this proposal and it is adopted as proposed.

Proposal 27. This proposal would add a § 23.939 requirement for an in-flight investigation of turbocharged reciprocating engine operating characteristics. It also would make it clear that, for turbine engines, the airflow distortion must not cause vibration harmful to these engines.

One commenter questions why the proposal for § 23.939(b) is limited to turbocharged engines. The commenter does not provide a different proposal for extending the applicability to other engine types or provide any justification or recommendations to include other types of engines.

At the review conference, there was no recommendation to extend this requirement to other engine types. The existing paragraph § 23.939(a) provides in-flight investigation requirements for turbine engines. Proposed paragraph (b) would add similar requirements for turbocharged reciprocating engines. The FAA recognizes that there may be some merit to the comment, but the commenter does not suggest other engine types or offer supporting justification. The need to extend this requirement to other engine types was not discussed at the Small Airplane Airworthiness Review Conference. Adequate justification for changing the requirement from the proposal in the NPRM is not available at this time. The FAA will consider this comment in future rulemaking activities and § 23.969(b) is adopted as proposed.

In addition, based on further study by the FAA, it was determined that the references in § 23.1047(d), (d)(1), (d)(5), and (e) need to be changed to agree with the proposed changes to § 23.67.

Proposal 28. This proposal would add a new § 23.1109 that ensures clean air for the pressurized cabins of airplanes equipped with pressurization systems taking bleed air from turbocharger systems. This proposal would establish requirements similar to those required for bleed air from turbine engines, currently stated in § 23.1111.

A commenter requests guidance by asking two questions about the proposed rule: Whether the operating procedures for emergencies may be used to meet the rule, and whether the alternate induction air may still come from the engine compartment. Additional details on describing the entire system design are required to answer these questions. Since these questions are in the nature of seeking guidance, these issues will be addressed by a future policy letter or advisory circular after the rule is adopted. The proposal is adopted as proposed.

Proposal 29. This proposal would revise § 23.1163 to require that any accessory remotely driven by an engine of normal, utility, and acrobatic category airplanes must cease hazardous rotation following a malfunction. This requirement was adopted for commuter category airplanes in amendment 23–24. The proposal also would add torque limiting criteria for accessory drives of accessories mounted on engines and would add requirements for accessories driven by gearboxes. No comments were received on this proposal and it is adopted as proposed.

Proposal 30. This proposal would require a heated pitot tube, or an equivalent means of preventing malfunction due to icing, and would clarify the requirement that a heated pitot tube be part of the system approval for flight in icing conditions, pursuant to § 23.1419. No comments were received on this proposal and it is adopted as proposed.

Proposal 31. This proposal would revise § 23.1325 to allow airplanes that are prohibited from flight in instrument meteorological conditions (IMC) to be certificated without an alternate static air source. No comments were received on this proposal. However, since the reference to IMC includes icing conditions, the proposal has been modified to eliminate the unnecessary wording and is adopted as modified.

Proposal 32. This proposal would remove appendix B, as discussed in detail in proposal 14, and is adopted as proposed.

Regulatory Evaluation Summary

Introduction

This section summarizes the full regulatory evaluation prepared by the FAA that provides more detailed estimates of the economic consequences of this regulatory action. This summary and the full evaluation quantify, to the extent practicable, estimated costs to the private sector, consumers, Federal, State and local governments, as well as anticipated benefits.

Executive Order 12291, dated February 17, 1981, directs Federal agencies to promulgate new regulations or modify existing regulations only if potential benefits to society for each regulatory change outweigh potential costs. The order also requires the preparation of a Regulatory Impact Analysis of all "major" rules except those responding to emergency situations or other narrowly defined exigencies. A "major" rule is one that is likely to result in an annual effect on the economy of $100 million or more, a major increase in consumer costs, a significant adverse effect on competition, or is highly controversial.

The FAA has determined that this rule is not "major" as defined in the executive order; therefore, a full regulatory analysis, which includes the identification and evaluation of cost reducing alternatives to this rule, has not been prepared. Instead, the agency has prepared a more concise document, termed a "regulatory evaluation," that analyzes only this rule without identifying alternatives. In addition to a summary of the regulatory evaluation, this section also contains a regulatory flexibility determination required by the 1980 Regulatory Flexibility Act (Pub. L. 96–354) and an international trade impact assessment. If more detailed economic information is desired than is contained in this summary, the reader is referred to the full regulatory evaluation in the docket.

Benefit/Cost Comparison

This rule amends several airworthiness standards for small airplanes. The amendments are based on discussions at the Small Airplane Airworthiness Review Conference held in October 1984 in St. Louis.

Most of the amendments within this rule are directed at developing uniform airworthiness standards in addressing the design and incorporation of advanced technology in small airplanes. Many of the airworthiness standards

have been applied previously as special conditions in specific type certification programs. The amendment also facilitates the type certification of new designs, canard or tandem wing configurations. These amendments are of a cost-relieving nature because they eliminate the need for special conditions processing, which often involves costly and unnecessary delays. In addition, most of these amendments are optional in the sense that the manufacturers are not being directed to incorporate the newest technology in their future models but are instead being afforded a set of regulations to follow should they choose the applicable new equipment.

Furthermore, it was determined that four of the amendments to part 23 involve quantifiable benefits in the form of the prevention of fatalities, injuries, and aircraft damage over the 20-year study period. The combined net present value of the benefits expected to accrue from these amendments is estimated to be $3.1 million.

Note: Fatalities prevented represent the majority of the estimated benefits. In order to provide the public and government officials with a benchmark comparison of the expected safety benefits of rulemaking actions over an extended period of time with estimated costs in dollars, the FAA currently uses a minimum value of $1.5 million to statistically represent a human fatality avoided (in accordance with guidelines issued by the Secretary of Transportation on June 22, 1990).

The following table summarizes the benefits and costs associated with the amendments having quantifiable economic impacts.

SUMMARY OF ESTIMATED BENEFITS AND COSTS

[000's 1989 dollars]

Amendments to the rule	Estimated benefits		Costs
	Nondiscounted	Discounted	
23.221–23.445 Spin Resistant and Canard Configured Airplanes	$8,618	$2,795	Relieving.
23.785 Antiskid Braking Systems	310	101	Negligible.
23.831 Ventilation	349	113	Relieving.
23.1163 Powerplant Accessories	179	58	Relieving.
Total	$9,456	$3,067	

International Trade Impact Statement

The provisions of this rule will have little or no impact on trade for both U.S. firms doing business in foreign countries and foreign firms doing business in the United States. In the United States, foreign manufacturers will have to meet U.S. requirements, and, thus, they will gain no competitive advantage. In foreign countries, U.S. manufacturers will not be bound by part 23 requirements and, therefore, could choose to implement or not to implement the rule solely on the basis of competitive considerations.

Regulatory Flexibility Determination

The FAA has also determined that the rule changes will not have a significant economic impact on a substantial number of small entities. The FAA's criteria for a small aircraft manufacturer is one employing fewer than 75 employees, a substantial number is a number that is not fewer than 11 and that is more than one-third of the small entities subject to the rule.

A review of domestic general aviation manufacturing companies indicates that only 2 companies meet the size threshold of 75 employees or fewer. The amendments to part 23 will, therefore, not affect a substantial number of small entities.

Federalism Implications

The regulations adopted herein will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this final rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

This document amends the airworthiness standards to provide for advancements in technology, including: Type certification of spin resistant airplanes; structures requirements for canard or tandem wing configurations; and requirements for antiskid braking systems. These airworthiness standards provide design options to the manufacturer that are not available under existing regulations. This document concerns rules that do not impose a burden, but merely afford an alternative, and they will not result in a major increase in consumer costs or have an annual effect on the economy of $100 million or more. The FAA has determined that this amendment is not major as defined in Executive Order 12291. For the same reason, this amendment is not considered to be significant as defined in Department of Transportation Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). Since there are only two small entities affected by this rulemaking, it is certified that, under the criteria of the Regulatory Flexibility Act, this amendment will not have a significant economic impact, positive or negative, on a substantial number of small entities. In addition, this final rule will have little or no impact on trade opportunities for U.S. firms doing business overseas or for foreign firms doing business in the United States. A copy of the regulatory evaluation prepared for this project may be examined in the Rules Docket or obtained from the person identified under the caption "**FOR FURTHER INFORMATION CONTACT.**"

List of Subjects

14 CFR Part 1

Aircraft, Air transportation, Aviation safety, Safety.

14 CFR Part 23

Aircraft, Air transportation, Aviation safety, Safety.

The Amendment

In consideration of the foregoing, the Federal Aviation Administration amends parts 1 and 23 of the Federal Aviation Regulations (14 CFR parts 1 and 23), as follows:

PART 1—DEFINITIONS AND ABBREVIATIONS

1. The authority citation for part 1 continues to read as follows:

Authority: 49 U.S.C. 1347, 1348, 1354(a), 1357(d)(2), 1372, 1421 through 1430, 1432, 1442,

1443, 1472, 1510, 1522, 1652(e), 1655(c), 1657(f); 49 U.S.C. 106(g).

2. Section 1.1 is amended by adding the definitions "Canard" and "Canard configuration" after "Calibrated airspeed"; "Forward wing" after "Foreign air transportation"; "Tandem wing configuration" after "Takeoff thrust"; and "Winglet or tip fin" after "VFR over-the-top" to read as follows:

§ 1.1 General definitions.

* * * * *

Canard means the forward wing of a canard configuration and may be a fixed, movable, or variable geometry surface, with or without control surfaces.

Canard configuration means a configuration in which the span of the forward wing is substantially less than that of the main wing.

* * * * *

Forward wing means a forward lifting surface of a canard configuration or tandem-wing configuration airplane. The surface may be a fixed, movable, or variable geometry surface, with or without control surfaces.

* * * * *

Tandem wing configuration means a configuration having two wings of similar span, mounted in tandem.

* * * * *

Winglet or tip fin means an out-of-plane surface extending from a lifting surface. The surface may or may not have control surfaces.

* * * * *

PART 23—AIRWORTHINESS STANDARDS: NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES.

3. The authority citation for part 23 continues to read as follows:

Authority: 49 U.S.C. 1344, 1354(a), 1355, 1421, 1423, 1425, 1428, 1429, 1430; 49 U.S.C. 106(g).

4. Section 23.67 is amended by revising paragraphs (a) introductory text, (a)(2), (a)(5), (b), and (c) to read as follows:

§ 23.67 Climb: One engine inoperative.

(a) For normal, utility, and acrobatic category, reciprocating engine-powered multiengine airplanes, one-engine-inoperative climb gradients must be determined with the—

* * * * *

(2) Remaining engines at not more than maximum continuous power or thrust;

* * * * *

(5) Means for controlling the engine cooling air supply in the position used in the engine cooling tests required by §§ 23.1041 through 23.1047.

(b) For normal, utility, and acrobatic category reciprocating engine-powered multiengine airplanes, the following apply:

(1) Each airplane with a V_{so} of more than 61 knots, or of more than 6,000 pounds maximum weight, must be able to maintain a steady climb gradient of at least 1.5 percent at a pressure altitude of 5,000 feet at a speed not less than 1.2 V_{S1} and at standard temperature (41 °F) with the airplane in the configuration prescribed in paragraph (a) of this section.

(2) Each airplane with a V_{so} of 61 knots or less and of 6,000 pounds or less maximum weight must have its steady climb gradient at a pressure altitude of 5,000 feet at a speed not less than 1.2 V_{S1} and at standard temperature (41 °F) determined with the airplane in the configuration prescribed in paragraph (a) of this section.

(c) For normal, utility, and acrobatic category turbine engine-powered multiengine airplanes the following apply:

(1) The steady climb gradient must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant, with the airplane in the configuration prescribed in paragraph (a) of this section.

(2) Each airplane must be able to maintain at least the following climb gradients with the airplane in the configuration prescribed in paragraph (a) of this section:

(i) 1.5 percent at a pressure altitude of 5,000 feet at a speed not less than 1.2 V_{S1}, and at standard temperature (41 °F); and

(ii) 0.75 percent at a pressure altitude of 5,000 feet at a speed not less than 1.2 V_{S1} and 81 °F (standard temperature plus 40 °F).

(3) The minimum climb gradient specified in paragraphs (c)(2) (i) and (ii) of this section must vary linearly between 41 °F and 81 °F and must change at the same rate up to the maximum operating temperature approved for the airplane.

* * * * *

5. Section 23.75 is amended by redesignating paragraph (g) as (h); by revising paragraphs (a), (b), and (f)(3); and by adding a new paragraph (g) to read as follows:

§ 23.75 Landing.

* * * * *

(a) A steady approach with a calibrated airspeed of not less than 1.3 V_{S1} must be maintained down to the 50-foot height and—

(1) The steady approach must be at a gradient of descent not greater than 5.2 percent (3 degrees) down to the 50-foot height.

(2) In addition, an applicant may demonstrate by tests that a maximum steady approach gradient steeper than 5.2 percent, down to the 50-foot height, is safe. The gradient must be established as an operating limitation and the information necessary to display the gradient must be available to the pilot by an appropriate instrument.

(b) The landing may not require more than average piloting skill when landing during the atmospheric conditions expected to be encountered in service, including crosswinds and turbulence.

* * * * *

(f) * * *

(3) Is such that no more than average skill is required to control the airplane.

* * * * *

(g) If any device is used that depends on the operation of any engine, and the landing distance would be increased when a landing is made with that engine inoperative, the landing distance must be determined with that engine inoperative unless the use of other compensating means will result in a landing distance not more than that with each engine operating.

* * * * *

6. Section 23.161 is amended by revising paragraphs (b)(1), (c)(1), (c)(2) introductory text, (c)(2)(i), (c)(3)(i), (d) introductory text, (d)(1), and (d)(4); and by adding a new paragraph (c)(4) to read as follows:

§ 23.161 Trim.

* * * * *

(b) * * *

(1) For normal, utility, and acrobatic category airplanes at a speed of 0.9 V_H, V_C, V_{MO}, whichever is the lower; and

* * * * *

(c) * * *

(1) A climb with maximum continuous power at—

(i) The speed used in determining the climb performance required by § 23.65 of this part with the landing gear retracted, and the flaps in the takeoff position; and

(ii) The recommended all-engines-operating climb speed specified in § 23.1585(a)(2)(i) of this part.

(2) An approach at a gradient of descent of 5.2 percent (3 degrees) with the landing gear extended, and with—

(i) Flaps retracted and at a speed of 1.4 V_{S1}; and

* * * * *

(3) * * *

(i) For normal, utility, and acrobatic category airplanes, at any speeds from

the lesser of V_H and V_{N0} or V_{M0}, as applicable, to 1.4 V_{S1}; and

* * * * *

(4) A descent at 0.9 V_{NO} or 0.9 V_{MO}, whichever is applicable, with power off and with the landing gear and flaps retracted.

(d) In addition, each multiengine airplane must maintain longitudinal and directional trim, and the lateral control force must not exceed 5 pounds, at the speed used in complying with § 23.67 for normal, utility, and acrobatic categories and at a speed between V_Y and 1.4 V_{S1} for commuter category with—

(1) The critical engine inoperative, and if applicable, its propeller in the minimum drag position;

* * * * *

(4) Wing flaps in the position selected for showing compliance with § 23.67 for normal, utility, and acrobatic category airplanes and wing flaps retracted for commuter category airplanes.

* * * * *

7. Section 23.221 is amended by revising paragraphs (a), (b), and (c)(3) to read as follows:

§ 23.221 Spinning.

(a) *Normal category.* Except as provided in paragraph (d) of this section, a single-engine, normal category airplane must demonstrate compliance with either the one-turn spin or the spin-resistant requirements of this paragraph.

(1) One-turn spin. The airplane must recover from a one-turn spin or a three-second spin, whichever takes longer, in not more than one additional turn after the controls have been applied for recovery. In addition—

(i) For both the flaps-retracted the flaps-extended conditions, the applicable airspeed limit and positive limit maneuvering load factor must not be exceeded;

(ii) There must be no excessive back pressure during the spin or recovery;

(iii) It must be impossible to obtain unrecoverable spins with any use of the flight or engine power controls either at the entry into or during the spin; and

(iv) For the flaps-extended condition, the flaps may be retracted during the recovery, but not before rotation has ceased.

(2) Spin resistant. The airplane must be demonstrated to be spin resistant by the following:

(i) During the stall maneuvers contained in § 23.201, the pitch control must be pulled back and held against the stop. Then, using ailerons and rudders in the proper direction, it must be possible to maintain wings-level flight within 15 degrees of bank and to roll the airplane from a 30-degree bank in one direction to a 30-degree bank in the other direction;

(ii) Reduce the airplane speed using pitch control at a rate of approximately 1 knot per second until the pitch control reaches the stop; then with the pitch control pulled back and held against the stop, apply full rudder control in a manner to promote spin entry, for a period of 7 seconds or through a 360-degree heading change, whichever occurs first. If the 360-degree heading change is reached first, it must have taken no fewer than 4 seconds. This maneuver must be performed first with the ailerons in the neutral position, and then with the ailerons deflected opposite the direction of turn in the most adverse manner. Power or thrust and airplane configuration must be set in accordance with § 23.201(f) without change during the maneuver. At the end of 7 seconds or a 360 degree heading change, the airplane must respond immediately and normally to primary flight controls applied to regain coordinated, unstalled flight without reversal of control effect and without exceeding the temporary control forces specified by § 23.143(c); and

(iii) Compliance with §§ 23.201 and 23.203 must be demonstrated with the airplane in uncoordinated flight, corresponding to one ball width displacement on a slip-skid indicator, unless one ball width displacement cannot be obtained with full rudder, in which case the demonstration must be with full rudder applied.

(b) *Utility category.* A utility category airplane must meet the requirements of paragraph (a) of this section or the requirements of paragraph (c) of this section if approval for spinning is requested.

(c) * * *

(3) It must be impossible to obtain unrecoverable spins with any use of the flight or engine power controls either at the entry into or during the spin.

* * * * *

8. Section 23.301 is amended by revising paragraph (b) to read as follows:

§ 23.301 Loads.

* * * * *

(b) Unless otherwise provided, the air, ground, and water loads must be placed in equilibrium with inertia forces, considering each item of mass in the airplane. These loads must be distributed to conservatively approximate or closely represent actual conditions. Methods used to determine load intensities and distribution on canard and tandem wing configurations must be validated by flight test measurement unless the methods used for determining those loading conditions are shown to be reliable or conservative on the configuration under consideration.

* * * * *

9. Part 23 is amended by adding a new § 23.302 after § 23.301 to read as follows:

§ 23.302 Canard or tandem wing configurations.

The forward structure of a canard or tandem wing configuration must:

(a) Meet all requirements of subpart C and subpart D of this part applicable to a wing; and

(b) Meet all requirements applicable to the function performed by these surfaces.

10. Section 23.331 is amended in paragraph (a) by replacing "§ 23.331" with "§ 23.333" and by adding a new paragraph (c) to read as follows:

§ 23.331 Symmetrical flight conditions.

* * * * *

(c) Mutual influence of the aerodynamic surfaces must be taken into account when determining flight loads.

11. Section 23.341 is amended by designating the existing text as paragraph (b); by adding the words "for conventional configurations" after the word "analysis" in newly designated paragraph (b); and by adding a new paragraph (a) to read as follows:

§ 23.341 Gust load factors.

(a) The gust load for a canard or tandem wing configuration must be computed using a rational analysis, considering the criteria of § 23.333(c), to develop the gust loading on each lifting surface or may be computed in accordance with paragraph (b) of this section provided that the resulting net loads are shown to be conservative with respect to the gust criteria of § 23.333(c).

* * * * *

§ 23.351 [Amended]

12. Section 23.351 is amended by removing the word "tail".

Subpart C—[Amended]

13. Subpart C is amended by revising the heading preceding § 23.421 to read as follows:

Horizontal Stabilizing and Balancing Surfaces

§ 23.421 [Amended]

14. Section 23.421 is amended by removing the word "tail" in paragraph (a) and inserting in its place the word "surface"; by removing the word "tail" in paragraph (b) and adding in its place

the word "balancing"; and by removing the last sentence of paragraph (b).

15. Section 23.423 is revised to read as follows:

§ 23.423 Maneuvering loads.

Each horizontal surface and its supporting structure, and the main wing of a canard or tandem wing configuration, if that surface has pitch control, must be designed for the maneuvering loads imposed by the following conditions:

(a) A sudden movement of the pitching control, at the speed V_A, to the maximum aft movement, and the maximum forward movement, as limited by the control stops, or pilot effort, whichever is critical.

(b) A sudden aft movement of the pitching control at speeds above V_A, followed by a forward movement of the pitching control resulting in the following combinations of normal and angular acceleration:

Condition	Normal acceleration (n)	Angular acceleration (radian/sec$_2$)
Nose-up pitching.....	1.0	$+39n_m \div V \times (n_m - 1.5)$
Nose-down ptiching.	n_m	$-39n_m \div V \times (n_m - 1.5)$

where—

(1) n_m = positive limit maneuvering load factor used in the design of the airplane; and

(2) V = initial speed in knots.

The condition in this paragraph involve loads corresponding to the loads that may occur in a "checked maneuver" (a maneuver in which the pitching control is suddenly displaced in one direction and then suddenly moved in the opposite direction). The deflections and timing of the "checked maneuver" must avoid exceeding the limit maneuvering load factor. The total horizontal surface load for both nose-up and nose-down pitching conditions is the sum of the balancing loads at *V* and the specified value of the normal load factor *n*, plus the maneuvering load increment due to the specified value of the angular acceleration.

16. Section 23.425 is amended by removing the text of current paragraph (b) and marking it "[Reserved]"; by revising paragraphs (a), (c), and (d) introductory text to read as set forth below; and by revising definitions of a_{ht} and S_{ht} in the formula following paragraph (d) from "a_{ht} = Slope of horizontal tail lift curve (per-radian)" to "a_{ht} = Slope of aft horizontal lift curve (per radian)" and "S_{ht} = Area of horizontal tail (ft^2); and" to "S_{ht} = Area of aft horizontal lift surface (ft^2); and".

§ 23.425 Gust loads.

(a) Each horizontal surface, other than a main wing, must be designed for loads resulting from—

* * * * *

(c) When determining the total load on the horizontal surfaces for the conditions specified in paragraph (a) of this section, the initial balancing loads for steady unaccelerated flight at the pertinent design speeds V_F, V_C, and V_D must first be determined. The incremental load resulting from the gusts must be added to the initial balancing load to obtain the total load.

(d) In the absence of a more rational analysis, the incremental load due to the gust must be computed as follows only on airplane configurations with aft-mounted, horizontal surfaces, unless its use elsewhere is shown to be conservative:

* * * * *

§ 23.427 [Amended]

17. Section 23.427 is amended by removing the word "tail" in paragraph (a) and inserting the phrase "other than main wing" after the words "horizontal surfaces"; by removing the phrase "tail surfaces," in paragraph (b) and inserting the phrase "horizontal surfaces other than main wing," in its place; and by removing the word "tail" in paragraph (c) and inserting the phrase "other than main wing" after the phrase "horizontal surfaces".

Subpart C—[Amended]

18. Subpart C is amended by revising the heading preceding § 23.441 to read as follows:

Vertical Surfaces

§ 23.441 [Amended]

19. Section 23.441 is amended by removing the word "tail" in two places in paragraph (a); and by removing the text of paragraph (b) and designating paragraph (b) as "Reserved."

§ 23.443 [Amended]

20. Section 23.443 is amended by removing the word "tail" from paragraph (a); by removing in three places the word "tail" in the definitions in paragraph (c) and adding in its place the word "surface"; and by removing paragraph (d).

21. Section 23.445 is amended by revising the section heading; by revising paragraph (a); by adding the words "or winglets" after the words "outboard fins" in paragraphs (b) and (c); and by adding a new paragraph (d) to read as follows:

§ 23.445 Outboard fins or winglets.

(a) If outboard fins or winglets are included on the horizontal surfaces or wings, the horizontal surfaces or wings must be designed for their maximum load in combination with loads induced by the fins or winglets and moments or forces exerted on the horizontal surfaces or wings by the fins or winglets.

* * * * *

(d) When rational methods are used for computing loads, the maneuvering loads of § 23.441 on the vertical surfaces and the one-g horizontal surface load, including induced loads on the horizontal surface and moments or forces exerted on the horizontal surfaces by the vertical surfaces, must be applied simultaneously for the structural loading condition.

§ 23.455 [Amended]

22. Section 23.455 is amended by removing the text of paragraph (b) and marking it "[Reserved]".

23. Section 23.677 is amended by revising paragraph (d) to read as follows:

§ 23.677 Trim Systems.

* * * * *

(d) It must be demonstrated that the airplane is safely controllable and that the pilot can perform all maneuvers and operations necessary to effect a safe landing following any probable powered trim system runaway that reasonably might be expected in service, allowing for appropriate time delay after pilot recognition of the trim system runaway. The demonstration must be conducted at critical airplane weights and center of gravity positions.

24. Section 23.701 is amended by revising paragraph (a); by redesignating paragraph (b) as (c); and by adding a new paragraph (b) to read as follows:

§ 23.701 Flap interconnection.

(a) The main wing flaps and related movable surfaces as a system must—

(1) Be synchronized by mechanical connection; or

(2) Maintain synchronization so that the occurrence of an unsafe condition has been shown to be extremely improbable; or

(b) The airplane must be shown to have safe flight characteristics with any combination of extreme positions of individual movable surfaces (mechanically interconnected surfaces are to be considered as a single surface).

* * * * *

25. Section 23.735 is amended by adding a new paragraph (c) to read as follows:

§ 23.735 Brakes.

* * * * *

(c) If antiskid devices are installed, the devices and associated systems must be designed so that no single probable malfunction or failure will result in a hazardous loss of braking ability or directional control of the airplane.

§ 23.831 [Amended]

26. Section 23.831 is amended by removing the words, "In addition, for pressurized commuter category airplanes," in paragraph (b) and adding in their place the words, "For pressurized airplanes,".

27. Section 23.939 is amended by adding paragraph (b) and revising paragraph (c) to read as follows:

§ 23.939 Powerplant operating characteristics.

* * * * *

(b) Turbocharged reciprocating engine operating characteristics must be investigated in flight to assure that no adverse characteristics, as a result of an inadvertent overboost, surge, flooding, or vapor lock, are present during normal or emergency operation of the engine(s) throughout the range of operating limitations of both airplane and engine.

(c) For turbine engines, the air inlet system must not, as a result of airflow distortion during normal operation, cause vibration harmful to the engine.

§ 23.1047 [Amended]

27–1. Section 23.1047 is amended in paragraph (d) introductory text by removing the phrase "§ 23.67(a) or"; in paragraph (d)(1) by removing the phrase "or § 23.67(b)(1)"; in paragraph (d)(5) by removing the phrase "§ 23.67(a) or"; and in paragraph (e) by removing the phrase "§ 23.67(a) or".

28. Part 23 is amended by adding a new § 23.1109 after § 23.1105 to read as follows:

§ 23.1109 Turbocharger bleed air system.

The following applies to turbocharged bleed air systems used for cabin pressurization:

(a) The cabin air system may not be subject to hazardous contamination following any probable failure of the turbocharger or its lubrication system.

(b) The turbocharger supply air must be taken from a source where it cannot be contaminated by harmful or hazardous gases or vapors following any probable failure or malfunction of the engine exhaust, hydraulic, fuel, or oil system.

29. Section 23.1163 is amended by revising paragraphs (a)(1), (a)(2), and (a)(3); by removing the phrase "In addition, for commuter category airplanes, if" in paragraph (d) and inserting in its place the word "If"; and by adding a new paragraph (e) to read as follows:

§ 23.1163 Powerplant accessories.

(a) * * *

(1) Be approved for mounting on the engine involved and use the provisions on the engines for mounting; or

(2) Have torque limiting means on all accessory drives in order to prevent the torque limits established for those drives from being exceeded; and

(3) In addition to paragraphs (a)(1) or (a)(2) of this section, be sealed to prevent contamination of the engine oil system and the accessory system.

* * * * *

(e) Each accessory driven by a gearbox that is not approved as part of the powerplant driving the gearbox must—

(1) Have torque limiting means to prevent the torque limits established for the affected drive from being exceeded;

(2) Use the provisions on the gearbox for mounting; and

(3) Be sealed to prevent contamination of the gearbox oil system and the accessory system.

30. Section 23.1323 is amended by adding a new paragraph (e) to read as follows:

§ 23.1323 Airspeed indicating system.

* * * * *

(e) If certification for instrument flight rules or flight in icing conditions is requested, each airspeed system must have a heated pitot tube or an equivalent means of preventing malfunction due to icing.

31. Section 23.1325 is amended by adding a new paragraph (g) to read as follows:

§ 23.1325 Static pressure system.

* * * * *

(g) For airplanes prohibited from flight in instrument meteorological conditions, in accordance with § 23.1559(b) of this part, paragraph (b)(3) of this section does not apply.

Appendix B [Removed and Reserved]

32. Part 23 is amended by removing Appendix B and inserting the words "Appendix B [Reserved]" in its place.

Issued in Washington, DC, on December 21 1990.

James B. Busey,

Administrator.

[FR Doc. 91–23 Filed 1–2–91; 8:45 am]

BILLING CODE 4910–13–M