Carolina; Cincinnati, Ohio; Cleveland, Ohio; Southwestern Oregon; Pittsburg, Pennsylvania; Eastern Tennessee; Houston-Galveston-Texas City, Texas; Roanoke, Virginia; and Milwaukee, Wisconsin, wage areas by revising the lead agency listings for those areas from ''VA'' to ''DOD''.

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**BILLING CODE 6325–01–P**

## DEPARTMENT OF TRANSPORTATION

## Federal Aviation Administration

## 14 CFR Part 23

**[Docket No. CE145, Notice No. 23–98–01–SC]**

## Special Conditions; Raytheon Model 390 Airplane

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Notice of proposed special conditions.

**SUMMARY:** This notice proposes special conditions for the Raytheon Aircraft Company Model 390 airplane. This new airplane will have novel and unusual design features not typically associated with normal, utility, acrobatic, and commuter category airplanes. These design features include turbofan engines, engine location, swept wings and stabilizer, and certain performance characteristics necessary for this type of airplane, for which the applicable regulations do not contain adequate or appropriate airworthiness standards. This notice contains the additional airworthiness standards that the Administrator considers necessary to establish a level of safety equivalent to that existing in the current business jet fleet and expected by the user of this class of aircraft.

**DATES:** Comments must be received on or before December 2, 1998.

**ADDRESSES:** Comments on this proposal may be mailed in duplicate to: Federal Aviation Administration, Regional Counsel, ACE–7, Attention: Rules Docket Clerk, Docket No. CE145, Room No. 1558, 601 East 12th Street, Kansas City, Missouri 64106. All comments must be marked: Docket No. CE145. Comments may be inspected in the Rules Docket weekdays, except Federal holidays, between 7:30 a.m. and 4 p.m.

**FOR FURTHER INFORMATION CONTACT:** Lowell Foster, Aerospace Engineer, Standards Office (ACE–110), Small Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, Room 1544, 601 East 12th Street, Kansas City, Missouri 64106; telephone (816) 426–5688.

**SUPPLEMENTARY INFORMATION:**

### Comments Invited

Interested persons are invited to participate in the making of these special conditions by submitting such written data, views, or arguments as they may desire. Communications should identify the regulatory docket or notice number and be submitted in duplicate to the address specified above. All communications received on or before the closing date for comments specified above will be considered by the Administrator before taking further rulemaking action on this proposal. Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this notice must include a self-addressed, stamped postcard on which the following statement is made: ''Comments to Docket No. CE145.'' The postcard will be date stamped and returned to the commenter. The proposals contained in this notice may be changed in light of the comments received. All comments received will be available, both before and after the closing date for comments, in the rules docket for examination by interested parties. A report summarizing each substantive public contact with FAA personnel concerned with this rulemaking will be filed in the docket.

### Background

On August 1, 1995, Raytheon Aircraft Company (then Beech Aircraft Corporation), 9707 East Central, Wichita, Kansas 67201, made application for 14 CFR part 23 normal category type certification of its Model 390 airplane. The Model 390 has a composite fuselage, a metal wing with 22.8 degrees of leading-edge sweepback, and a combination composite/metal empennage in a T-tail configuration with trimmable horizontal tail with 27.3 degrees of leading-edge sweepback. The airplane will accommodate six passengers and a crew of two. The Model 390 will have a $V_{MO}/M_{MO}$ of 320 knots/M.83, and has two turbofan engines mounted on the aft fuselage above and behind the wing.

### Type Certification Basis

Type certification basis of the Model 390 airplane is as follows: 14 CFR part 23, effective February 1, 1965, through Amendment 23–52, effective July 25, 1996; 14 CFR part 36, effective December 1, 1969, through the amendment effective on the date of type certification; 14 CFR part 34; exemptions, if any; and the special conditions adopted by this rulemaking action.

### Discussion

Special conditions may be issued and amended, as necessary, as part of the type certification basis if the Administrator finds that the airworthiness standards designated in accordance with 14 CFR part 21, § 21.17(a)(1), do not contain adequate or appropriate safety standards because of novel or unusual design features of an airplane. Special conditions, as appropriate, are issued in accordance with 14 CFR part 11, § 11.49, after public notice, as required by §§ 11.28 and 11.29(b), effective October 14, 1980, and become part of the type certification basis as provided by part 21, § 21.17(a)(2).

Raytheon plans to incorporate certain novel and unusual design features into the Model 390 airplane for which the airworthiness regulations do not contain adequate or appropriate safety standards. These features include turbofan engines, engine location, swept wings and stabilizer, and certain performance characteristics necessary for this type of airplane.

### Performance

The Raytheon Model 390 has a wing with 22.8 degrees of leading-edge sweepback and a T-tail configuration with trimmable horizontal stabilizer with 27.3 degrees of leading-edge sweepback. The Model 390 will have a $V_{MO}/M_{MO}$ of 320 knots/M.83, and it will have two turbofan engines mounted on the aft fuselage.

Previous certification and operational experience with airplanes of like design in the transport category reveal certain unique characteristics compared to conventional aircraft certificated under part 23. These characteristics have caused safety problems in the past when pilots attempted takeoffs and landings, particularly with a large variation in temperature and altitude, using procedures and instincts developed with conventional airplanes.

One of the major distinguishing features of a swept-wing design not considered in current part 23 is a characteristically flatter lift curve without a ''stall'' break near the maximum coefficient of lift, as in a conventional wing. The ''stall'' separation point may occur at a much higher angle of attack than the point of maximum lift, and the angle of attack for maximum lift can be only recognized by precise test measurements or specific detection systems. This phenomenon is not apparent to a pilot accustomed to operating a conventional airplane where

increasing angle of attack produces increased lift to the point where the wing stalls. In a swept-wing design, if the pilot does not operate in accordance with established standards developed through a dedicated test program, increasing angle of attack may produce very little lift yet increase drag markedly to the point where flight is impossible. These adverse conditions may be further compounded by the characteristics of turbofan engines, including specified $N_1/N_2$ rotational speeds, temperature, and pressure limits that make its variation in thrust output with changes in temperature and altitude more complex and difficult to predict. In recognition of these characteristics, Special Civil Air Regulations No. SR–422 and follow-on regulations established weight-altitude-temperature (WAT) limitations and procedures for scheduling takeoff and landing for turbine powered transport category airplanes, so the pilot could achieve reliable and repeatable results under all expected conditions of operation. This entails specific tests such as minimum unstick speed, $V_{MU}$, to ensure that rotation and fly-out speeds are correct and that the airplane speed schedule will not allow the airplane to lift off in ground effect and then be unable to accelerate and continue to climb out. In conjunction with the development of takeoff and landing procedures, it was also necessary to establish required climb gradients and data for flight path determination under all approved weights, altitudes, and temperatures. This enables the pilot to determine, before takeoff, that a safe takeoff, departure, and landing at destination can be achieved.

**Takeoff**

Based upon the knowledge and experience gained with similar high speed, high efficiency turbojet airplanes, special conditions require performance standards for takeoff, takeoff speeds, accelerate-stop distance, takeoff path, takeoff distance, takeoff run, and takeoff flight path.

Additionally, procedures for takeoff, accelerate-stop distance, and landing are proposed as those established for operation in service and must be executable by pilots of average skill and include reasonably expected time delays.

**Climb**

To maintain a level of safety that is equivalent to the current business jet fleet for takeoff, takeoff speeds, takeoff path, takeoff distance, and takeoff run, it is appropriate to require specific climb gradients, airplane configurations, and consideration of atmospheric conditions that will be encountered. These special conditions include climb with one engine inoperative, balked landing climb, and general climb conditions.

**Landing**

Landing distance determined for the same parameters is consistent with takeoff information for the range of weights, altitudes, and temperatures approved for operation. Further, it is necessary to consider time delays to provide for in-service variation in the activation of deceleration devices such as spoilers and brakes.

**Trim**

Special conditions are issued to maintain a level of safety that is consistent with the use of $V_{MO}/M_{MO}$ and the requirements established for previous part 23 jet airplanes. Current standards in part 23 did not envision this type of airplane and the associated trim considerations.

**Demonstration of Static Longitudinal Stability**

To maintain a level of safety consistent with existing business jet airplanes, it is appropriate to define applicable requirements for static longitudinal stability. Current standards in part 23 did not envision this type of airplane and the associated stability considerations. Special conditions will establish static longitudinal stability requirements that include a stick force versus speed specification and stability requirements applicable to high speed jet airplanes.

Consistent with the concept of $V_{MO}/M_{MO}$ being a maximum operational speed limit, rather than a limiting speed for the demonstration of satisfactory flight characteristics, it is appropriate to extend the speed for demonstration of longitudinal stability characteristics from the $V_{MO}/M_{MO}$ of 14 CFR part 23 to the maximum speed for stability characteristics, $V_{FC}/M_{FC}$, for this airplane.

**Static Directional and Lateral Stability**

Consistent with the concept of $V_{MO}/M_{MO}$ being a maximum operational speed limit, rather than a limiting speed for the demonstration of satisfactory flight characteristics, it is appropriate to extend the speed for demonstration of lateral/directional stability characteristics from the $V_{MO}/M_{MO}$ of part 23 to the maximum speed for stability characteristics, $V_{FC}/M_{FC}$ for this airplane.

**Stall Characteristics**

The stall characteristics requirements are relaxed from part 23 to be equivalent to that acceptable in current business jets. These special conditions reflect a higher expected pilot proficiency level, the remote chance that a stall will be encountered in normal operation, and the requirements are relaxed as compensation for meeting the higher performance requirements in these special conditions.

**Vibration and Buffeting**

The Raytheon Model 390 will be operated at high altitudes where stall-Mach buffet encounters (small speed margin between stall and transonic flow buffet) are likely to occur, which is not presently addressed in part 23. The special condition will require buffet onset tests and the inclusion of information in the Airplane Flight Manual (AFM) to provide guidance to the flightcrew. This information will enable the flightcrew to plan flight operations that will maximize the maneuvering capability during high altitude cruise flight and preclude intentional operations exceeding the boundary of perceptible buffet. Buffeting is considered to be a warning to the pilot that the airplane is approaching an undesirable and eventually dangerous flight regime, that is, stall buffeting, high speed buffeting or maneuvering (load factor) buffeting. In straight flight, therefore, such buffet warning should not occur at any normal operating speed up to the maximum operating limit speed, $V_{MO}/M_{MO}$.

**High Speed Characteristics and Maximum Operating Limit Speed**

The Raytheon Model 390 will be operated at high altitude and high speeds. The proposed operating envelope includes areas in which Mach effects, which have not been considered in part 23, may be significant. The anticipated low drag of the airplane and the proposed operating envelope are representative of the conditions not envisioned by the existing part 23 regulations. These conditions may degrade the ability of the flightcrew to promptly recover from inadvertent excursions beyond maximum operating speeds. The ability to pull a positive load factor is needed to ensure, during recovery from upset, that the airplane speed does not continue to increase to a value where recovery may not be achievable by the average pilot or flightcrew.

Additionally, to allow the aircraft designer to conservatively design to higher speeds than may be operationally

required for the airplane, the concept of $V_{DF}/M_{DF}$, the highest demonstrated flight speed for the type design, is appropriate for this airplane. This permits $V_D/M_D$, the design dive speed, to be higher than the speed actually required to be demonstrated in flight. Accordingly, the special conditions allow one to determine a maximum demonstrated flight speed and to relate the speeds $V_{MO}/M_{MO}$ and $V_{DF}/M_{DF}$.

**Flight Flutter Tests**

Flight flutter test special conditions are proposed to $V_{DF}/M_{DF}$ rather than to $V_D$, in keeping with the $V_{DF}/M_{DF}$ concept.

**Out-of-Trim Characteristics**

High speed airplanes have experienced a number of upset incidents involving out-of-trim conditions. This is particularly true for swept-wing airplanes and airplanes with a trimmable stabilizer. Service experience has shown that out-of-trim conditions can occur in flight for various reasons and that the control and maneuvering characteristics of the airplane may be critical in recovering from upsets. The existing part 23 regulations do not address high speed out-of-trim conditions. These special conditions test the out-of-trim flight characteristics by requiring the longitudinal trim control be displaced from the trimmed position by the amount resulting from the three-second movement of the trim system at this normal rate with no aerodynamic load, or the maximum mis-trim that the autopilot can sustain in level flight in the high speed cruise condition, whichever is greater. Special conditions require the maneuvering characteristics, including stick force per g, be explored throughout a specified maneuver load factor speed envelope. The dive recovery characteristics of the aircraft in the out-of-trim condition specified would be investigated to determine that safe recovery can be made from the demonstrated flight dive speed $V_{DF}/M_{DF}$.

**Takeoff Warning System**

Jet airplanes incorporating leading-edge sweep in the wing and horizontal tail and incorporating a trimmable horizontal tail have had accidents because of the criticality of the airplane's configuration at takeoff. Unlike simple, straight wing airplanes, an incorrect flap or horizontal tail trim setting can significantly alter the takeoff distance. Special conditions to require a takeoff warning system are proposed to maintain a level of safety appropriate for this class of aircraft.

**Engine Fire Extinguishing System**

The Model 390 design includes engines mounted aft on the fuselage; therefore, early visual detection of engine fires is precluded. The applicable existing regulations do not require fire extinguishing systems for engines. Aft mounted engine installations were not envisaged in the development of part 23; therefore, special conditions for a fire extinguishing system with the applicable agents, containers, and materials for the engines of the Model 390 are appropriate.

**Airspeed Indicating System**

To maintain a level of safety consistent with that existing in the current business jet fleet, and to be consistent with the establishment of speed schedule performance requirements, it is appropriate to establish applicable requirements for determining and providing airspeed indicating system calibration information. Additionally, it is appropriate to establish special conditions requiring protection of the pilot tube from malfunctions associated with icing conditions. Special conditions will establish airspeed indicating system calibration and pilot tube ice protection requirements applicable to transport category jet airplanes.

**Static Pressure System**

Special conditions are appropriate to establish applicable requirements for providing static pressure system calibration information in the AFM. Since aircraft of this type are frequently equipped with devices to correct the altimeter indication, it is also appropriate to establish requirements to ensure the continued availability of altitude information where such a device malfunctions. Current standards in part 23 did not envision this type of airplane and the associated static pressure requirements.

**Minimum Flightcrew**

The Raytheon Model 390 operates at high altitudes and speeds not envisioned in part 23 and must be flown in a precise speed schedule to achieve flight manual takeoff and landing distances. Therefore, it is appropriate to specify workload considerations. Special conditions will specify the items to be considered in workload determination.

**Airplane Flight Manual (AFM) Information**

To be consistent with the performance special conditions, it is also necessary to require that the maximum takeoff and landing weights, takeoff distances, and associated atmospheric conditions be made available to the pilot in the AFM and that the airplane be operated within its performance capabilities. Special conditions will add maximum takeoff weights, maximum landing weights, and minimum takeoff distances as limitations in the AFM. Additionally, special conditions are included to add takeoff flight path and procedures necessary to achieve the performance in the limitations section as information in the AFM.

**Effects of Contamination on Natural Laminar Flow Airfoils**

Airfoil configurations similar to the Raytheon Model 390 had measurable degradations of handling qualities and performance when laminar flow was lost due to airfoil contamination. Tripping of the boundary layer could be caused from flight in precipitation conditions or by the presence of contamination such as insects. If measurable effects are detected, it should be determined that the minimum flight characteristics standards continue to be met and that any degradations to performance information are identified. This may be accomplished by a combination of analysis and testing. Current standards in part 23 did not envision this type of airplane and the associated airfoil contamination considerations. Special considerations are issued since existing regulations do not require these adverse effects to be evaluated.

**Conclusion**

In view of the design features discussed for the Raytheon Model 390 airplane, the following special conditions are proposed. This action is not a rule of general applicability and affects only the model/series of airplane identified.

**List of Subjects in 14 CFR Part 23**

Aircraft, Aviation Safety, Signs and Symbols.

**Citation**

The authority citation for these Special Conditions is as follows:

**Authority:** 49 U.S.C. 106(g); 40113, 44701, 44702, and 44704; 14 CFR 21.16 and 21.17; and 14 CFR 11.28 and 11.29(b).

**The Proposed Special Conditions**

Accordingly, pursuant to the authority delegated to me by the Administrator, the Federal Aviation Administration proposes the following special conditions as part of the type

certification basis for the Raytheon Model 390 airplane:

SC23.45 Performance: General.

Instead of the requirements of § 23.45(g) and (h), the following apply:

(g) The following, as applicable, must be determined on a smooth, dry, hard-surfaced runway—

(1) Takeoff distance of special condition SC23.53;

(2) Accelerate-stop distance of special condition SC23.55;

(3) Takeoff distance and takeoff run of special condition SC23.59; and

(4) Landing distance of special condition SC23.75.

**Note:** The effect on these distances of operation on other types of surfaces (for example, grass, gravel), when dry, may be determined or derived and these surfaces listed in the Airplane Flight Manual.

(h) Unless otherwise prescribed, the applicant must select the takeoff, enroute, approach, and landing configurations for the airplane.

In addition to the requirements of § 23.45 and the paragraphs above, the following apply:

(i) The airplane configurations may vary with weight, altitude, and temperature to the extent that they are compatible with the operating procedures required by paragraph (d) of this special condition.

(j) Unless otherwise prescribed, in determining the accelerate-stop distances, takeoff flight paths, takeoff distances, and landing distances, changes in the airplane's configuration, speed, power, and thrust, must be made in accordance with procedures established by the applicant for operation in service.

(k) Procedures for the execution of balked landings and discontinued approaches associated with the conditions prescribed in special conditions SC23.77 and SC23.67(d) must be established.

(l) The procedures established under paragraphs (d) and (e) of this special condition must:

(1) Be able to be consistently executed in service by crews of average skill;

(2) Use methods or devices that are safe and reliable; and

(3) Include allowance for any time delays in the execution of the procedures that may reasonably be expected in service.

SC23.49 Stalling speed.

In § 23.49(b), change the reference from ''§ 23.201'' to ''§ 23.201 and special condition SC23.201.''

SC23.51 Takeoff speeds.

Instead of compliance with § 23.51, the following apply:

(a) $V_1$ must be established in relation to $V_{EF}$, as follows:

(1) $V_{EF}$ is the calibrated airspeed at which the critical engine is assumed to fail. $V_{EF}$ must be selected by the applicant, but may not be less than $V_{MCG}$ determined under § 23.149(f) and special condition SC23.149(f).

(2) $V_1$, in terms of calibrated airspeed, is the takeoff decision speed selected by the applicant; however, $V_1$ may not be less than $V_{EF}$ plus the speed gained with the critical engine inoperative during the time interval between the instant at which the critical engine failed and the instant at which the pilot recognizes and reacts to the engine failure, as indicated by the pilot's application of the first retarding means during the accelerate-stop test.

(b) $V_{2\ min}$, in terms of calibrated airspeed, may not be less than the following:

(1) 1.2 $V_{S1}$, or

(2) 1.10 times $V_{MC}$ established under § 23.149.

(c) $V_2$, in terms of calibrated airspeed, must be selected by the applicant to provide at least the gradient of climb required by special condition SC23.67(b), but may not be less than the following:

(1) $V_{2\ min}$, and

(2) $V_R$ plus the speed increment attained (in accordance with special condition SC23.57(c)(2)) before reaching a height of 35 feet above the takeoff surface.

(d) $V_{MU}$ is the calibrated airspeed at and above which the airplane can safely lift off the ground and continue the takeoff. $V_{MU}$ speeds must be selected by the applicant throughout the range of thrust-to-weight ratios to be certified. These speeds may be established from free-air data if these data are verified by ground takeoff tests.

(e) $V_R$, in terms of calibrated airspeed, must be selected in accordance with the following conditions of paragraphs (e)(1) through (e)(4) of this special condition:

(1) $V_R$ may not be less than the following:

(i) $V_1$;

(ii) 105 percent of $V_{MC}$;

(iii) The speed (determined in accordance with special condition SC23.57(c)(2)) that allows reaching $V_2$ before reaching a height of 35 feet above the takeoff surface; or

(iv) A speed that, if the airplane is rotated at its maximum practicable rate, will result in a $V_{LOF}$ of not less than 110 percent of $V_{MU}$ in the all-engines-operating condition and not less than 105 percent of $V_{MU}$ determined at the thrust-to-weight ratio corresponding to the one-engine-inoperative condition.

(2) For any given set of conditions (such as weight, configuration, and temperature), a single value of $V_R$, obtained in accordance with this special condition, must be used to show compliance with both the one-engine-inoperative and the all-engines-operating takeoff provisions.

(3) It must be shown that the one-engine-inoperative takeoff distance, using a rotation speed of 5 knots less than $V_R$, established in accordance with paragraphs (e)(1) and (e)(2) of this special condition, does not exceed the corresponding one-engine-inoperative takeoff distance using the established $V_R$. The takeoff distances must be determined in accordance with special condition SC23.59(a)(1).

(4) Reasonably expecting variations in service from the established takeoff procedures for the operation of the airplane (such as over-rotation of the airplane and out-of-trim conditions) may not result in unsafe flight characteristics or in marked increases in the scheduled takeoff distances established in accordance with special condition SC23.59.

(f) $V_{LOF}$ is the calibrated airspeed at which the airplane first becomes airborne.

SC23.53 Takeoff performance.

Instead of complying with § 23.53, the following apply:

(a) In special conditions SC23.51, SC23.55, SC23.57 and SC23.59, the takeoff speeds, the accelerate-stop distance, the takeoff path, the takeoff distance, and takeoff run described must be determined:

(1) At each weight, altitude, and ambient temperature within the operation limits selected by the applicant; and

(2) In the selected configuration for takeoff.

(b) No takeoff made to determine the data required by this section may require exceptional piloting skill or alertness.

(c) The takeoff data must be based on a smooth, dry, hard-surfaced runway.

(d) The takeoff data must include, within the established operational limits of the airplane, the following operational correction factors:

(1) Not more than 50 percent of nominal wind components along the takeoff path opposite to the direction of takeoff, and not less than 150 percent of nominal wind components along the takeoff path in the direction of takeoff; and

(2) Effective runway gradients.

SC23.55 Accelerate-stop distance.

In the absence of specific accelerate-stop distance requirements, the following apply:

(a) The accelerate-stop distance is the sum of the distances necessary to—

(1) Accelerate the airplane from a standing start to $V_{EF}$ with all engines operating;

(2) Accelerate the airplane from $V_{EF}$ to $V_1$, assuming that the critical engine fails at $V_{EF}$; and

(3) Come to a full stop from the point at which $V_1$ is reached assuming that, in the case of engine failure, the pilot has decided to stop as indicated by application of the first retarding means at the speed $V_1$.

(b) Means other than wheel brakes may be used to determine the accelerate-stop distance if that means—

(1) Is safe and reliable;

(2) Is used so that consistent results can be expected under normal operating conditions; and

(3) Is such that exceptional skill is not required to control the airplane.

(c) The landing gear must remain extended throughout the accelerate-stop distance.

SC23.57 Takeoff path.

In the absence of specific takeoff path requirements, the following apply:

(a) The takeoff path extends from a standing start to a point in the takeoff at which the airplane is 1,500 feet above the takeoff surface or at which the transition from the takeoff to the enroute configuration is completed and a speed is reached at which compliance with special condition SC23.67(c) is shown, whichever point is higher. In addition, the following apply:

(1) The takeoff path must be based on procedures prescribed in special condition SC23.45;

(2) The airplane must be accelerated on the ground to $V_{EF}$, at which point the critical engine must be made inoperative and remain inoperative for the rest of the takeoff; and

(3) After reaching $V_{EF}$, the airplane must be accelerated to $V_2$.

(b) During the acceleration to speed $V_2$, the nose gear may be raised off the ground at a speed not less than $V_R$. However, landing gear retraction may not begin until the airplane is airborne.

(c) During the takeoff path determination, in accordance with paragraphs (a) and (b) of this special condition, the following apply:

(1) The slope of the airborne part of the takeoff path must be positive at each point;

(2) The airplane must reach $V_2$ before it is 35 feet above the takeoff surface and must continue at a speed as close as practical to, but not less than, $V_2$ until it is 400 feet above the takeoff surface;

(3) At each point along the takeoff path, starting at the point at which the airplane reaches 400 feet above the takeoff surface, the available gradient of climb may not be less than 1.2 percent; and

(4) Except for gear retraction, the airplane configuration may not be changed, and no change in power or thrust that requires action by the pilot may be made, until the airplane is 400 feet above the takeoff surface.

(d) The takeoff path must be determined by a continuous demonstrated takeoff or by synthesis from segments. If the takeoff path is determined by the segmental method, the following apply:

(1) The segments must be clearly defined and must be related to the distinct changes in the configuration, speed, and power or thrust;

(2) The weight of the airplane, the configuration, and the power or thrust must be constant throughout each segment and must correspond to the most critical condition prevailing in the segment;

(3) The flight path must be based on the airplane's performance without ground effect; and

(4) The takeoff path data must be checked by continuous demonstrated takeoffs, up to the point at which the airplane is out of ground effect and its speed is stabilized, to ensure that the path is conservative relative to the continuous path.

**Note:** The airplane is considered to be out of the ground effect when it reaches a height equal to its wing span.

SC23.59 Takeoff distance and takeoff run.

In the absence of specific takeoff distance and takeoff run requirements, the following apply:

(a) Takeoff distance is the greater of the following:

(1) The horizontal distance along the takeoff path from the start of the takeoff to the point at which the airplane is 35 feet above the takeoff surface, determined under special condition SC23.57; or

(2) 115 percent of the horizontal distance along the takeoff path, with all engines operating, from the start of the takeoff to the point at which the airplane is 35 feet above the takeoff surface, as determined by a procedure consistent with special condition SC23.57.

(b) If the takeoff distance includes a clear way, the takeoff run is the greater of the following:

(1) The horizontal distance along the takeoff path from the start of the takeoff to a point equidistant between the point at which $V_{LOF}$ is reached and the point at which the airplane is 35 feet above the takeoff surface, as determined under special condition SC23.57; or

(2) 115 percent of the horizontal distance along the takeoff path, with all engines operating, from the start of the takeoff to a point equidistant between the point at which $V_{LOF}$ is reached and the point at which the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with special condition SC23.57.

SC23.61 Takeoff flight path.

In the absence of specific takeoff flight path requirements, the following apply:

(a) The takeoff flight path begins 35 feet above the takeoff surface at the end of the takeoff distance determined in accordance with special condition SC23.59.

(b) The net takeoff flight path data must be determined so that they represent the actual takeoff flight paths (determined in accordance with special condition SC23.57 and with paragraph (a) of this special condition) reduced at each point by a gradient of climb equal to 0.8 percent.

(c) The prescribed reduction in climb gradient may be applied as an equivalent reduction in acceleration along that part of the takeoff flight path at which the airplane is accelerated in level flight.

SC23.63 Climb: general.

Instead of compliance with § 23.63, the following applies:

Compliance with the requirements of special conditions SC23.67 and SC23.77 must be shown at each weight, altitude, and ambient temperature within the operational limits established for the airplane and with the most unfavorable center of gravity for each configuration.

SC23.65 Climb: all engines operating.

Delete requirement of § 23.65.

SC23.66 Takeoff climb: One engine inoperative.

Delete requirement of § 23.66.

SC23.67 Climb: One engine inoperative.

Instead of compliance with § 23.67, the following apply:

(a) Takeoff; landing gear extended. In the critical takeoff configuration existing along the flight path (between the points at which the airplane reaches $V_{LOF}$ and at which the landing gear is fully retracted) and in the configuration used in special condition SC23.57 without

ground effect, unless there is a more critical power operating condition existing later along the flight path before the point at which the landing gear is fully retracted, the steady gradient of climb must be positive at $V_{LOF}$ and with the following:

(1) The critical engine inoperative and the remaining engines at the power or thrust available when retraction of the landing gear begins in accordance with special condition SC23.57, and

(2) The weight equal to the weight existing when retraction of the landing gear begins, determined under special condition SC23.57.

(b) Takeoff; landing gear retracted. In the takeoff configuration existing at the point of the flight path at which the landing gear is fully retracted and in the configuration used in special condition SC23.57, without ground effect, the steady gradient of climb may not be less than 2.4 percent at $V_2$ and with the following:

(1) The critical engine inoperative, the remaining engines at the takeoff power or thrust available at the time the landing gear is fully retracted, determined under special condition SC23.57 unless there is a more critical power operating condition existing later along the flight path but before the point where the airplane reaches a height of 400 feet above the takeoff surface; and

(2) The weight equal to the weight existing when the airplane's landing gear is fully retracted, determined under special condition SC23.57.

(c) Final takeoff. In the enroute configuration at the end of the takeoff path, determined in accordance with special condition SC23.57, the steady gradient of climb may not be less than 1.2 percent at not less than 1.25 $V_S$ and with the following:

(1) The critical engine inoperative and the remaining engines at the available maximum continuous power or thrust; and

(2) The weight equal to the weight existing at the end of the takeoff path, determined under special condition SC23.57.

(d) Approach. In the approach configuration corresponding to the normal all-engines-operating procedure in which $V_S$ for this configuration does not exceed 110 percent of the $V_S$ for the related landing configuration, the steady gradient of climb may not be less than 2.1 percent with the following:

(1) The critical engine inoperative, the remaining engine at the available in-flight takeoff power or thrust;

(2) The maximum landing weight; and

(3) A climb speed established in connection with normal landing procedures, but not exceeding 1.5 $V_S$.

SC23.73 Reference landing approach speed.

In § 23.73(b), change the reference from ''§ 23.149(c)'' to ''special condition SC23.149.''

SC23.75 Landing distance.

Instead of compliance with § 23.75, the following apply:

(a) The horizontal distance necessary to land and to come to a complete stop from a point 50 feet above the landing surface must be determined (for each weight, altitude, temperature, and wind within the operational limits established by the applicant for the airplane), as follows:

(1) The airplane must be in the landing configuration;

(2) A steady approach at a gradient of descent not greater than 5.2 percent (3 degrees), with an airspeed of not less than $V_{REF}$, determined in accordance with special condition SC23.73, must be maintained down to the 50-foot height;

(3) Changes in configuration, power or thrust, and speed must be made in accordance with the established procedures for service operation;

(4) The landing must be made without excessive vertical acceleration, tendency to bounce, nose over, ground loop, or porpoise;

(5) The landings may not require exceptional piloting skill or alertness; and

(6) It must be shown that a safe transition to the balked landing conditions of special condition SC23.77 can be made from the conditions that exist at the 50-foot height.

(b) The landing distance must be determined on a level, smooth, dry, hard-surfaced runway. In addition, the following apply:

(1) The brakes may not be used so as to cause excessive wear of brakes or tires; and

(2) Means other than wheel brakes may be used if that means is as follows:

(i) Is safe and reliable;

(ii) Is used so that consistent results can be expected in service; and

(iii) Is such that exceptional skill is not required to control the airplane.

(c) The landing distance data must include correction factors for not more than 50 percent of the nominal wind components along the landing path opposite to the direction of landing and not less than 150 percent of the nominal wind components along the landing path in the direction of landing.

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

SC23.77 Balked landing.

Instead of compliance with § 23.77, the following apply:

In the landing configuration, the steady gradient of climb may not be less than 3.2 percent with the following:

(a) The engines at the power or thrust that is available eight seconds after initiation of movement of the power or thrust controls from the minimum flight idle to the inflight takeoff position; and

(b) A climb speed of not more than $V_{REF}$, as defined in § 23.73(b).

SC23.145 Longitudinal control.

In § 23.145(c), change the reference from ''§ 23.251'' to ''special condition SC23.251.''

SC23.149 Minimum control speed.

In § 23.149(c), change the reference from ''§ 23.75'' to ''special condition SC23.75.''

Delete § 23.149(d).

In § 23.149(f), delete ''At the option of the applicant, to comply with the requirements of § 23.51(c)(1), $V_{MCG}$ may be determined.''

SC23.153 Control during landings.

In § 23.153(c), change the reference from ''§ 23.75'' to ''special condition SC23.75.''

SC23.161 Trim.

Instead of compliance with § 23.161, the following apply:

(a) General. Each airplane must meet the trim requirements of this special condition after being trimmed, and without further pressure upon or movement of the primary controls or their corresponding trim controls by the pilot or the automatic pilot.

(b) Lateral and directional trim. The airplane must maintain lateral and directional trim with the most adverse lateral displacement of the center of gravity within the relevant operating limitations during normally expected conditions of operation (including operation at any speed from 1.4 $V_{S1}$ to $V_{MO}/M_{MO}$).

(c) Longitudinal trim. The airplane must maintain longitudinal trim during the following:

(1) A climb with maximum continuous power at a speed not more than 1.4 $V_{S1}$, with the landing gear retracted, and the flaps in the following positions:

(i) Retracted, and

(ii) In the takeoff position.

(2) A power approach with a 3 degree angle of descent, the landing gear extended, and with the following:

(i) The wing flaps retracted and at a speed of 1.4 $V_{S1}$; and

(ii) The applicable airspeed and flap position used in showing compliance with special condition SC23.75.

(3) Level flight at any speed from 1.4 $V_{S1}$ to $V_{MO}/M_{MO}$ with the landing gear and flaps retracted, and from 1.4 $V_{S1}$ to $V_{LE}$ with the landing gear extended.

(d) Longitudinal, directional, and lateral trim. The airplane must maintain longitudinal, directional, and lateral trim (for the lateral trim, the angle of bank may not exceed five degrees) at 1.4 $V_{S1}$ during climbing flight with the following:

(1) The critical engine inoperative;

(2) The remaining engine at maximum continuous power or thrust; and

(3) The landing gear and flaps retracted.

SC23.171 [Stability] General.

In § 23.171, change reference from ''§§ 23.173 through 23.181'' to ''special conditions SC23.173, SC23.175, SC23.177, SC23.181, and § 23.181.''

SC23.173 Static longitudinal stability.

Instead of compliance with § 23.173, the following apply:

Under the conditions specified in special condition SC23.175, the characteristics of the elevator control forces (including friction) must be as follows:

(a) A pull must be required to obtain and maintain speeds below the specified trim speed, and a push must be required to obtain and maintain speeds above the specified trim speed. This must be shown at any speed that can be obtained except speeds higher than the landing gear or wing flap operating limit speeds or $V_{FC}/M_{FC}$, whichever is appropriate, or lower than the minimum speed for steady unstalled flight.

(b) The airspeed must return to within 10 percent of the original trim speed for the climb, approach, and landing conditions specified in special condition SC23.175, paragraph (a), (c), and (d), and must return to within 7.5 percent of the original trim speed for the cruising condition specified in special condition SC23.175, paragraph (b), when the control force is slowly released from any speed within the range specified in paragraph (a) of this special condition.

(c) The average gradient of the stable slope of the stick force versus speed curve may not be less than 1 pound for each 6 knots.

(d) Within the free return speed range specified in paragraph (b) of this special condition, it is permissible for the airplane, without control forces, to stabilize on speeds above or below the desired trim speeds if exceptional attention on the part of the pilot is not required to return to and maintain the desired trim speed and altitude.

SC23.175 Demonstration of static longitudinal stability.

Instead of compliance with § 23.175, static longitudinal stability must be shown as follows:

(a) Climb. The stick force curve must have a stable slope at speeds between 85 and 115 percent of the speed at which the airplane—

(1) Is trimmed, with—

(i) Wing flaps retracted;

(ii) Landing gear retracted;

(iii) Maximum takeoff weight; and

(iv) The maximum power or thrust selected by the applicant as an operating limitation for use during climb; and

(2) Is trimmed at the speed for best rate of climb except that the speed need not be less than 1.4 $V_{S1}$

(b) Cruise. Static longitudinal stability must be shown in the cruise condition as follows:

(1) With the landing gear retracted at high speed, the stick force curve must have a stable slope at all speeds within a range which is the greater of 15 percent of the trim speed plus the resulting free return speed range, or 50 knots plus the resulting free return speed range, above and below the trim speed (except that the speed range need not include speeds less than 1.4 $V_{S1}$, nor speeds greater than $V_{FC}/M_{FC}$, nor speeds that require a stick force of more than 50 pounds), with—

(i) The wing flaps retracted;

(ii) The center of gravity in the most adverse position;

(iii) The most critical weight between the maximum takeoff and maximum landing weights;

(iv) The maximum cruising power selected by the applicant as an operating limitation, except that the power need not exceed that required at $V_{MO}/M_{MO}$; and

(v) The airplane trimmed for level flight with the power required in paragraph (b)(1)(iv) of this special condition.

(2) With the landing gear retracted at low speed, the stick force curve must have a stable slope at all speeds within a range which is the greater of 15 percent of the trim speed plus the resulting free return speed range, or 50 knots plus the resulting free return speed range, above and below the trim speed (except that the speed range need not include speeds less than 1.4 $V_{S1}$, nor speeds greater than the minimum speed of the applicable speed range prescribed in paragraph (b)(1), nor speeds that require a stick force of more than 50 pounds), with—

(i) Wing flaps, center of gravity position, and weight as specified in paragraph (b)(1) of this special condition;

(ii) Power required for level flight at a speed equal to $(V_{MO} + 1.4\ V_{S1})/2$; and

(iii) The airplane trimmed for level flight with the power required in paragraph (b)(2)(ii) of this special condition.

(3) With the landing gear extended, the stick force curve must have a stable slope at all speeds within a range which is the greater of 15 percent of the trim speed plus the resulting free return speed range, or 50 knots plus the resulting free return speed range, above and below the trim speed (except that the speed range need not include speeds less than 1.4 $V_{S1}$, nor speeds greater than $V_{LE}$, nor speeds that require a stick force of more than 50 pounds), with—

(i) Wing flap, center of gravity position, and weight as specified in paragraph (b)(1) of this section;

(ii) The maximum cruising power selected by the applicant as an operating limitation, except that the power need not exceed that required for level flight at $V_{LE}$; and

(iii) The aircraft trimmed for level flight with the power required in paragraph (b)(3)(ii) of this section.

(c) Approach. The stick force curve must have a stable slope at speeds between 1.1 $V_{S1}$ and 1.8 $V_{S1}$, with—

(1) Wing flaps in the approach position;

(2) Landing gear retracted;

(3) Maximum landing weight; and

(4) The airplane trimmed at 1.4 $V_{S1}$ with enough power to maintain level flight at this speed.

(d) Landing. The stick force curve must have a stable slope, and the stick force may not exceed 80 pounds, at speeds between 1.1 $V_{S0}$ and 1.8 $V_{S0}$ with—

(1) Wing flaps in the landing position;

(2) Landing gear extended;

(3) Maximum landing weight;

(4) Power or thrust off on the engines; and

(5) The airplane trimmed at 1.4 $V_{S0}$ with power or thrust off.

SC23.177 Static directional and lateral stability.

Instead of compliance with § 23.177, the following apply:

(a) The static directional stability (as shown by the tendency to recover from a skid with the rudder free) must be positive for any landing gear and flap position, and it must be positive for any

symmetrical power condition to speeds from 1.2 $V_{S1}$ up to $V_{FE}$, $V_{LE}$, or $V_{FC}/M_{FC}$ (as appropriate).

(b) The static lateral stability (as shown by the tendency to raise the low wing in a sideslip with the aileron controls free and for any landing gear position and flap position, and for any symmetrical power conditions) may not be negative at any airspeed (except speeds higher than $V_{FE}$ or $V_{LE}$, when appropriate) in the following airspeed ranges:

(1) From 1.2 $V_{S1}$ to $V_{MO}/M_{MO}$.

(2) From $V_{MO}/M_{MO}$ to $V_{FC}/M_{FC}$, unless the Administrator finds that the divergence is—

(i) Gradual;

(ii) Easily recognizable by the pilot; and

(iii) Easily controllable by the pilot.

(c) In straight, steady, sideslips (unaccelerated forward slips) the aileron and rudder control movement and forces must be substantially proportional to the angle of the sideslip. The factor of proportionality must lie between limits found necessary for safe operation throughout the range of sideslip angles appropriate to the operation of the airplane. At greater angles, up to the angle at which full rudder control is used or when a rudder pedal force of 180 pounds is obtained, the rudder pedal forces may not reverse and increased rudder deflection must produce increased angles of sideslip. Unless the airplane has a yaw indicator, there must be enough bank accompanying sideslipping to clearly indicate any departure from steady unyawed flight.

SC23.181 Dynamic stability.

In § 23.181(d), change the reference from § 23.175 to SC23.175.

SC23.201 Wings level stall.

In § 23.201 (c), change the reference from ''§ 23.49'' to ''§ 23.49 and special condition SC23.49.''

Instead of compliance with § 23.201 (d) and (e), the following apply:

(d) The roll occurring between the stall and the completion of the recovery may not exceed approximately 20 degrees.

(e) Compliance with the requirements of this section must be shown with:

(1) Power—

(i) Off; and

(ii) The thrust necessary to maintain level flight at 1.6 $V_{S1}$ (where $V_{S1}$ corresponds to the stalling speed with flaps in the approach position, the landing gear retracted, and maximum landing weight).

(2) Flaps and landing gear in any likely combination of positions.

(3) Trim at 1.4 $V_{S1}$ or at the minimum trim speed, whichever is higher.

(4) Representative weights within the range for which certification is requested.

(5) The most adverse center of gravity for recovery.

SC23.203 Turning flight and accelerated turning stalls.

Instead of compliance with § 23.203(c), the following apply:

(c) Compliance with the requirements of this section must be shown with:

(1) The thrust necessary to maintain level flight at 1.6 $V_{S1}$ (where $V_{S1}$ corresponds to the stalling speed with flaps in the approach position, the landing gear retracted, and maximum landing weight).

(2) Flaps and landing gear in any likely combination of positions.

(3) Trim at 1.4 $V_{S1}$ or at the minimum trim speed, whichever is higher.

(4) Representative weights within the range for which certification is requested.

(5) The most adverse center of gravity for recovery.

SC23.207 Stall warning.

Instead of compliance with § 23.207(c), the following applies:

(c) During the stall tests required by § 23.201(b) and § 23.203(a)(1), the stall warning must begin at a speed exceeding the stalling speed by seven percent or at any lesser margin if the stall warning has enough clarity, duration, distinctiveness, or similar properties.

SC23.251 Vibration and buffeting.

Instead of compliance with § 23.251, the following apply:

(a) The airplane must be designed to withstand any vibration and buffeting that might occur in any likely operating condition. This must be shown by calculations, resonance tests, or other tests found necessary by the Administrator.

(b) Each part of the airplane must be shown in flight to be free from excessive vibration, under any appropriate speed and power conditions up to $V_{DF}/M_{DF}$. The maximum speeds shown must be used in establishing the operating limitations of the airplane in accordance with special condition SC23.1581.

(c) Except as provided in paragraph (d) of this special condition, there may be no buffeting condition in normal flight, including configuration changes during cruise, severe enough to interfere with the control of the airplane, to cause excessive fatigue to the flightcrew, or to cause structural damage. Stall warning buffeting within these limits is allowable.

(d) There may be no perceptible buffeting condition in the cruise configuration in straight flight at any speed up to $V_{MO}/M_{MO}$, except that stall warning buffeting is allowable.

(e) With the airplane in the cruise configuration, the positive maneuvering load factors at which the onset of perceptible buffeting occurs must be determined for the ranges of airspeed or Mach Number, weight, and altitude for which the airplane is to be certified. The envelopes of load factor, speed, altitude, and weight must provide a sufficient range of speeds and load factors for normal operations. Probable inadvertent excursions beyond the boundaries of the buffet onset envelopes may not result in unsafe conditions.

SC23.253 High speed characteristics.

Instead of compliance with § 23.253, the following apply:

(a) Speed increase and recovery characteristics. The following speed increase and recovery characteristics must be met:

(1) Operating conditions and characteristics likely to cause inadvertent speed increases (including upsets in pitch and roll) must be simulated with the airplane trimmed at any likely cruise speed up to $V_{MO}/M_{MO}$. These conditions and characteristics include gust upsets, inadvertent control movements, low stick force gradient in relation to control friction, passenger movement, leveling off from climb, and descent from Mach to airspeed limit altitudes.

(2) Allowing for pilot reaction time after effective inherent or artificial speed warning occurs, it must be shown that the airplane can be recovered to a normal attitude and its speed reduced to $V_{MO}/M_{MO}$ without the following:

(i) Exceptional piloting strength or skill;

(ii) Exceeding $V_D/M_D$, or $V_{DF}/M_{DF}$, or the structural limitations; and

(iii) Buffeting that would impair the pilot's ability to read the instruments or control the airplane for recovery.

(3) There may be no control reversal about any axis at any speed up to $V_{DF}/M_{DF}$ with the airplane trimmed at $V_{MO}/M_{MO}$. Any tendency of the airplane to pitch, roll, or yaw must be mild and readily controllable, using normal piloting techniques. When the airplane is trimmed at $V_{MO}/M_{MO}$, the slope of the elevator control force versus speed curve need not be stable at speeds greater than $V_{FC}/M_{FC}$, but there must be a push force at all speeds up to $V_{DF}/M_{DF}$ and there must be no sudden or excessive reduction of elevator control force as $V_{DF}/M_{DF}$ is reached.

(b) Maximum speed for stability characteristics. $V_{FC}/M_{FC}$. $V_{FC}/M_{FC}$ is the maximum speed at which the requirements of special conditions SC23.173, SC23.175, SC23.177, SC23.181 and § 23.181 must be met with the flaps and landing gear retracted. It may not be less than a speed midway between $V_{MO}/M_{MO}$ and $V_{DF}/M_{DF}$ except that, for altitudes where Mach number is the limiting factor, $M_{FC}$ need not exceed the Mach number at which effective speed warning occurs.

SC23.255 Out-of-trim characteristics.

In the absence of specific requirements for out-of-trim characteristics, the Raytheon Model 390 must comply with the following:

(a) From an initial condition with the airplane trimmed at cruise speeds up to $V_{MO}/M_{MO}$, the airplane must have satisfactory maneuvering stability and controllability with the degree of out-of-trim in both the airplane nose-up and nose-down directions, which results from the greater of the following:

(1) A three-second movement of the longitudinal trim system at its normal rate for the particular flight condition with no aerodynamic load (or an equivalent degree of trim for airplanes that do not have a power-operated trim system), except as limited by stops in the trim system, including those required by § 23.655(b) for adjustable stabilizers; or

(2) The maximum mis-trim that can be sustained by the autopilot while maintaining level flight in the high speed cruising condition.

(b) In the out-of-trim condition specified in paragraph (a) of this special condition, when the normal acceleration is varied from +l g to the positive and negative values specified in paragraph (c) of this special condition, the following apply:

(1) The stick force versus g curve must have a positive slope at any speed up to and including $V_{FC}/M_{FC}$; and

(2) At speeds between $V_{FC}/M_{FC}$ and $V_{DF}/M_{DF}$, the direction of the primary longitudinal control force may not reverse.

(c) Except as provided in paragraph (d) and (e) of this special condition, compliance with the provisions of paragraph (a) of this special condition must be demonstrated in flight over the acceleration range as follows:

(1) $-1$ g to +2.5 g; or

(2) 0 g to 2.0 g, and extrapolating by an acceptable method to $-1$ g and +2.5 g.

(d) If the procedure set forth in paragraph (c)(2) of this special condition is used to demonstrate compliance and marginal conditions exist during flight test with regard to reversal of primary longitudinal control force, flight tests must be accomplished from the normal acceleration at which a marginal condition is found to exist to the applicable limit specified in paragraph (b)(1) of this special condition.

(e) During flight tests required by paragraph (a) of this special condition, the limit maneuvering load factors, prescribed in §§ 23.333(b) and 23.337, need not be exceeded. Also, the maneuvering load factors associated with probable inadvertent excursions beyond the boundaries of the buffet onset envelopes determined under special condition SC23.251(e), need not be exceeded. In addition, the entry speeds for flight test demonstrations at normal acceleration values less than 1g must be limited to the extent necessary to accomplish a recovery without exceeding $V_{DF}/M_{DF}$.

(f) In the out-of-trim condition specified in paragraph (a) of this special condition, it must be possible from an overspeed condition at $V_{DF}/M_{DF}$ to produce at least 1.5 g for recovery by applying not more than 125 pounds of longitudinal control force using either the primary longitudinal control alone or the primary longitudinal control and the longitudinal trim system. If the longitudinal trim is used to assist in producing the required load factor, it must be shown at $V_{DF}/M_{DF}$ that the longitudinal trim can be actuated in the airplane nose-up direction with the primary surface loaded to correspond to the least of the following airplane nose-up control forces:

(1) The maximum control forces expected in service, as specified in §§ 23.301 and 23.397.

(2) The control force required to produce 1.5 g.

(3) The control force corresponding to buffeting or other phenomena of such intensity that is a strong deterrent to further application of primary longitudinal control force.

SC23.629 Flutter.

Instead of the term/speed ''$V_D$'' in § 23.629(b), use ''$V_{DF}/M_{DF}$.''

SC23.703 Takeoff warning system.

In the absence of specific requirements for a takeoff warning system, the following apply:

Unless it can be shown that a lift or longitudinal trim device that affects the takeoff performance of the aircraft would not give an unsafe takeoff configuration when selected out of an approved takeoff position, a takeoff warning system must be installed and meet the following requirements:

(a) The system must provide to the pilots an aural warning that is automatically activated during the initial portion of the takeoff roll if the airplane is in a configuration that would not allow a safe takeoff. The warning must continue until—

(1) The configuration is changed to allow safe takeoff, or

(2) Action is taken by the pilot to abandon the takeoff roll.

(b) The means used to activate the system must function properly for all authorized takeoff power settings and procedures and throughout the ranges of takeoff weights, altitudes, and temperatures for which certification is requested.

SC23.1195 Engine Fire Extinguishing System.

(a) Fire extinguishing systems must be installed and compliance must be shown with the following:

(1) Except for combustor, turbine, and tailpipe sections of turbine-engine installations that contain lines or components carrying flammable fluids for which a fire originating in these sections can be controllable, a fire extinguisher system must serve each engine compartment.

(2) The fire extinguishing system, the quantity of the extinguishing agent, the rate of discharge, and the discharge distribution must be adequate to extinguish fires.

(3) The fire extinguishing system for a nacelle must be able to simultaneously protect each compartment of the nacelle for which protection is provided.

(b) Fire extinguishing agents must meet the following requirements:

(1) Be capable of extinguishing flames emanating from any burning of fluids or other combustible materials in the area protected by the fire extinguishing system;

(2) Have thermal stability over the temperature range likely to be experienced in the compartment in which they are stored; and

(3) If any toxic extinguishing agent is used, provisions must be made to prevent harmful concentrations of fluid or fluid vapors from entering any personnel compartment even though a defect may exist in the extinguishing system. This must be shown by test except for built-in carbon dioxide fuselage compartment fire extinguishing systems for which:

(i) Five pounds or less of carbon dioxide will be discharged, under established fire control procedures, into any fuselage compartment; or

(ii) Protective breathing equipment is available for each flight crew member on flight deck duty.

(c) Fire extinguishing agent containers must meet the following requirements:

(1) Each extinguishing agent container must have a pressure relief to prevent bursting of the container by excessive internal pressures.

(2) The discharge end of each discharge line from a pressure relief connection must be located so the discharge of the fire extinguishing agent would not damage the airplane. The line must also be located or protected to prevent clogging caused by ice or other foreign matter.

(3) A means must be provided for each fire extinguishing agent container to indicate that the container has discharged or that the charging pressure is below the established minimum necessary for proper functioning.

(4) The temperature of each container must be maintained, under intended operating conditions, to prevent the pressure in the container from falling below that necessary to provide an adequate rate of discharge, or rising high enough to cause premature discharge.

(5) If a pyrotechnic capsule is used to discharge the fire extinguishing agent, each container must be installed so that temperature conditions will not cause hazardous deterioration of the pyrotechnic capsule.

(d) Fire extinguisher system materials must meet the following requirements:

(1) No material in any fire extinguishing system may react chemically with any extinguishing agent so as to create a hazard; and

(2) Each system component in an engine compartment must be fireproof.

SC23.1323 Airspeed indicating system.

In addition to the requirements of § 23.1323, the following apply:

(a) The airspeed indicating system must be calibrated to determine the system error in flight and during the accelerate-takeoff ground run. The ground run calibration must be determined as follows:

(1) From 0.8 of the minimum value of $V_1$ to the maximum value of $V_2$, considering the approved ranges of altitude and weight; and

(2) With the flaps and power settings corresponding to the values determined in the establishment of the takeoff path under special condition SC23.57, assuming that the critical engine fails at the minimum value of $V_1$.

(b) The information showing the relationship between IAS and CAS, determined in accordance with paragraph (a) of this special condition, must be shown in the Airplane Flight Manual.

SC23.1325 Static pressure system.

In addition to the requirements of § 23.1325, the following apply:

(a) The altimeter system calibration required by § 23.1325(e) must be shown in the Airplane Flight Manual.

(b) If an altimeter system is fitted with a device that provides corrections to the altimeter indication, the device must be designed and installed in such manner that it can be by-passed when it malfunctions, unless an alternate altimeter system is provided. Each correction device must be fitted with a means for indicating the occurrence of reasonably probable malfunctions, including power failure, to the flightcrew. The indicating means must be effective for any cockpit lighting condition likely to occur.

SC23.1501 [Operating Limitations and Information] General.

Instead of the requirements of § 23.1501(a), the following apply:

(a) Each operating limitation specified in §§ 23.1505 through 23.1522, 23.1524 through 23.1527 and special conditions SC23.1505, SC23.1513, and SC23.1523.

SC23.1505 Airspeed limitations.

In § 23.1505(a)(2)(ii), change the reference from ''§ 23.251'' to ''special condition SC23.251.''

Instead of compliance with § 23.1505(c), the following applies: The maximum operating limit speed ($V_{MO}$/$M_{MO}$ airspeed or Mach number, whichever is critical at a particular altitude) is a speed that may not be deliberately exceeded in any regime of flight (climb, cruise, or descent), unless a higher speed is authorized for flight test or pilot training operations. $V_{MO}$/$M_{MO}$ must be established so that it is not greater than the design cruising speed, $V_C$, and so that it is sufficiently below $V_D$/$M_D$, or $V_{DF}$/$M_{DF}$, to make it highly improbable that the latter speeds will be inadvertently exceeded in operations. The speed margin between $V_{MO}$/$M_{MO}$ and $V_D$/$M_D$, or $V_{DF}$/$M_{DF}$, may not be less than that determined under § 23.335(b) or found necessary during the flight tests conducted under special condition SC23.253.

SC23.1513 Minimum control speed.

In § 23.1513, change the reference from ''§ 23.149'' to ''§ 23.149 and special condition SC23.149.''

SC23.1523 Minimum flightcrew.

Instead of compliance with § 23.1523, the following apply:

The minimum flightcrew must be established so that it is sufficient for safe operation considering:

(a) The workload on individual flightcrew members and each flightcrew member workload determination must consider the following:

(1) Flight path control,

(2) Collision avoidance,

(3) Navigation,

(4) Communications,

(5) Operation and monitoring of all essential airplane systems,

(6) Command decisions, and

(7) The accessibility and ease of operation of necessary controls by the appropriate flightcrew member during all normal and emergency operations when at the flightcrew member station.

(b) The accessibility and ease of operation of necessary controls by the appropriate flightcrew member; and

(c) The kinds of operation authorized under § 23.1525.

SC23.1541 [Markings and Placards] General.

Instead of § 23.1541(a)(1), the following applies:

(a)(1) The markings and placards specified in §§ 23.1545 to 23.1567 and special condition SC23.1545; and

SC23.1545 Airspeed indicator.

In § 23.1545(d), change the reference from ''§ 23.1505(c)'' to ''special condition SC23.1505.''

SC23.1581 [Airplane Flight Manual and Approved Manual Material.] General.

In § 23.1581 replace references to § 23.1583, § 23.1585, and § 23.1587 with special conditions SC23.1583, SC23.1585, and SC23.1587, respectively.

SC23.1583 Operating limitations.

Instead of the requirements of § 23.1583, the following apply:

(a) Airspeed limitations. The following airspeed limitations and any other airspeed limitations necessary for safe operation must be furnished:

(1) The maximum operating limit speed, $V_{MO}$/$M_{MO,}$ and a statement that this speed limit may not be deliberately exceeded in any regime of flight (climb, cruise, or descent) unless a higher speed is authorized for flight test or pilot training.

(2) If an airspeed limitation is based upon compressibility effects, a statement to this effect and information as to any symptoms, the probable behavior of the airplane, and the recommended recovery procedures.

(3) The maneuvering speed, $V_{O,}$ and a statement that full application of rudder and aileron controls, as well as maneuvers that involve angles of attack near the stall, should be confined to speeds below this value.

(4) The maximum speed for flap extension, $V_{FE,}$ for the takeoff, approach, and landing positions.

(5) The landing gear operating speed or speeds, $V_{LO}$.

(6) The landing gear extended speed, $V_{LE}$ if greater than $V_{LO,}$ and a statement that this is the maximum speed at which the airplane can be safely flown with the landing gear extended.

(b) Powerplant limitations. The following information must be furnished:

(1) Limitations required by § 23.1521.

(2) Explanation of the limitations, when appropriate.

(3) Information necessary for marking the instruments, required by § 23.1549 through § 23.1553.

(c) Weight and loading distribution. The weight and extreme forward and aft center of gravity limits required by §§ 23.23 and 23.25 must be furnished in the Airplane Flight Manual. In addition, all of the following information and the information required by § 23.1589 must be presented either in the Airplane Flight Manual or in a separate weight and balance control and loading document, which is incorporated by reference in the Airplane Flight Manual:

(1) The condition of the airplane and the items included in the empty weight, as defined in accordance with § 23.29.

(2) Loading instructions necessary to ensure loading of the airplane within the weight and center of gravity limits, and to maintain the loading within these limits in flight.

(d) Maneuvers. A statement that acrobatic maneuvers, including spins, are not authorized.

(e) Maneuvering flight load factors. The positive maneuvering limit load factors for which the structure is proven, described in terms of accelerations, and a statement that these accelerations limit the angle of bank in turns and limit the severity of pull-up maneuvers must be furnished.

(f) Flightcrew. The number and functions of the minimum flightcrew must be furnished.

(g) Kinds of operation. The kinds of operation (such as VFR, IFR, day, or night) and the meteorological conditions in which the airplane may or may not be used must be furnished. Any installed equipment that affects any operating limitation must be listed and identified as to operational function.

(h) Additional operating limitations must be established as follows:

(1) The maximum takeoff weights must be established as the weights at which compliance is shown with the applicable provisions of part 23 (including the takeoff climb provisions of special condition SC23.67(a) through (c) for altitudes and ambient temperatures).

(2) The maximum landing weights must be established as the weights at which compliance is shown with the applicable provisions of part 23 (including the approach climb and balked landing climb provisions of special conditions SC23.67(d) and SC23.77 for altitudes and ambient temperatures).

(3) The minimum takeoff distances must be established as the distances at which compliance is shown with the applicable provisions of part 23 (including the provisions of special conditions SC23.55 and SC23.59 for weights, altitudes, temperatures, wind components, and runway gradients).

(4) The extremes for variable factors (such as altitude, temperature, wind, and runway gradients) are those at which compliance with the applicable provision of part 23 and these special conditions is shown.

(i) Maximum operating altitude. The maximum altitude established under § 23.1527 must be furnished.

(j) Maximum passenger seating configuration. The maximum passenger seating configuration must be furnished.

(k) Maximum operating temperature. The maximum operating temperature established under § 23.1521 must be furnished.

SC23.1585 Operating procedures.

Instead of the requirements of § 23.1585, the following applies:

(a) Information and instruction regarding the peculiarities of normal operations (including starting and warming the engines, taxiing, operation of wing flaps, slats, landing gear, speed brake, and the automatic pilot) must be furnished, together with recommended procedures for the following:

(1) Engine failure (including minimum speeds, trim, operation of the remaining engine, and operation of flaps);

(2) Restarting turbine engines in flight (including the effects of altitude);

(3) Fire, decompression, and similar emergencies;

(4) Use of ice protection equipment;

(5) Operation in turbulence (including recommended turbulence penetration airspeeds, flight peculiarities, and special control instructions);

(6) Procedures for transition from landing approach to balk landing climb; and

(7) The demonstrated crosswind velocity and procedures and information pertinent to operation of the airplane in crosswinds.

(b) Information identifying each operating condition in which the fuel system independence prescribed in § 23.953 is necessary for safety must be furnished, together with instructions for placing the fuel system in a configuration used to show compliance with that section.

(c) For each airplane showing compliance with § 23.1353(g)(2) or (g)(3), the operating procedures for disconnecting the battery from its charging source must be furnished.

(d) If the unusable fuel supply in any tank exceeds 5 percent of the tank capacity, or 1 gallon, whichever is greater, information must be furnished indicating that, when the fuel quantity indicator reads ''zero'' in level flight, any fuel remaining in the fuel tank cannot be used safely in flight.

(e) Information on the total quantity of usable fuel for each fuel tank must be furnished.

(f) The buffet onset envelopes determined under special condition SC23.251 must be furnished. The buffet onset envelopes presented may reflect the center of gravity at which the airplane is normally loaded during cruise if corrections for the effect of different center of gravity locations are furnished.

SC23.1587 Performance information.

Instead of the requirements of § 23.1587, the following applies:

(a) Each Airplane Flight Manual must contain information to permit conversion of the indicated temperature to free air temperature if other than a free air temperature indicator is used to comply with the requirements of § 23.1303(d).

(b) Each Airplane Flight Manual must contain the performance information computed under the applicable provisions of this part for the weights, altitudes, temperatures, wind components, and runway gradients, as applicable, within the operational limits of the airplane, and must contain the following:

(1) The conditions under which the performance information was obtained, including the speeds associated with the performance information.

(2) $V_S$ determined in accordance with special condition SC23.49.

(3) The following performance information (determined by extrapolation and computed for the range of weights between the maximum landing and maximum takeoff weights):

(i) Climb in the landing configuration.

(ii) Climb in the approach configuration.

(iii) Landing distance.

(4) Procedures established under special condition SC23.45(d), (e), and (f) that are related to the limitations and

information required by special condition SC23.1583(h) and by this paragraph. These procedures must be in the form of guidance material, including any relevant limitations or information.

(5) An explanation of significant or unusual flight or ground handling characteristics of the airplane.

SC23.A Effects of contamination on natural laminar flow airfoils.

In the absence of specific requirements for airfoil contamination, airplane airfoil designs that have airfoil pressure gradient characteristics and smooth aerodynamic surfaces that may be capable of supporting natural laminar flow must comply with the following:

(a) It must be shown by tests, or analysis supported by tests, that the airplane complies with the requirements of §§ 23.141 through 23.207, 23.233, 23.251, 23.253 (and any changes made to these paragraphs by these special conditions) with any airfoil contamination that would normally be encountered in service and that would cause significant adverse effects on the handling qualities of the airplanes resulting from the loss of laminar flow.

(b) Significant performance degradations identified as resulting from the loss of laminar flow must be provided as part of the information required by special conditions SC23.1585 and SC23.1587.

Issued in Kansas City, Missouri on October 11, 1998.

**Michael Gallagher,**

*Manager, Small Airplane Directorate, Aircraft Certification Service.*

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## FEDERAL TRADE COMMISSION

## 16 CFR Part 305

## Rule Concerning Disclosures Regarding Energy Consumption and Water Use of Certain Home Applicances and Other Products Required Under the Energy Policy and Conservation Act (''Appliance Labeling Rule'')

**AGENCY:** Federal Trade Commission.

**ACTION:** Notice of proposed rulemaking.

**SUMMARY:** The Federal Trade Commission (''the Commission'') proposes amending Appendix F to its Appliance Labeling Rule (''the Rule'') to eliminate the ''Front-Loading'' and ''Top-Loading'' sub-categories for clothes washers.

**DATES:** Written comments will be accepted until December 17, 1998.

**ADDRESSES:** Written comments should be directed to: Secretary, Federal Trade Commission, Room H–159, Sixth St. and Pennsylvania Ave., NW, Washington, DC 20580. Comments about this proposed amendment to the Appliance Labeling Rule should be identified as: ''Appliance Labeling Rule Clothes Washer Categories, 16 CFR Part 305—Comment.''

**FOR FURTHER INFORMATION CONTACT:** James Mills, Attorney, Division of Enforcement, Rm 4616, Federal Trade Commission, Washington, DC 20580 (202–326–3035).

**SUPPLEMENTARY INFORMATION:**

### I. Background

*A. The Commission's Appliance Labeling Rule*

The Commission issued the Appliance Labeling Rule on November 19, 1979, pursuant to a directive in section 324 of Title III of the Energy Policy and Conservation Act of 1975, 42 U.S.C. 6294 (''EPCA''). The Rule requires manufacturers to disclose energy information about major household appliances to enable consumers purchasing appliances to compare the energy use or efficiency of competing models. When published, the Rule applied to eight appliance categories: Refrigerators, refrigerator-freezers, freezers, dishwashers, water heaters, clothes washers, room air conditioners, and furnaces. Since then, the Commission has expanded the Rule's coverage five times: in 1987 (central air conditioners, heat pumps, and certain new types of furnaces, 52 FR 46888 (Dec. 10, 1987)); 1989 (fluorescent lamp ballasts, 54 FR 28031 (July 5, 1989)); 1993 (certain plumbing products, 58 FR 54955 (Oct. 25, 1993)); and twice in 1994 (certain lighting products, 59 FR 25176 (May 13, 1994)), and pool heaters and certain other types of water heaters (59 FR 49556 (Sept. 28, 1994)).

Manufacturers of all covered appliances must disclose specific energy consumption or efficiency information at the point of sale in the form of an ''EnergyGuide'' label affixed to the covered product. The information on the EnergyGuide also must appear in catalogs from which covered products can be ordered. Manufacturers must derive the information from standardized tests that EPCA directs the Department of Energy (''DOE'') to promulgate. 42 U.S.C. 6293. Manufacturers of furnaces, central air conditioners, and heat pumps also either must provide fact sheets showing additional cost information or be listed in an industry directory that shows the cost information for their products. Required labels for appliances and required fact sheets for heating and cooling equipment must include a highlighted energy consumption or efficiency disclosure and a ''range of comparability,'' which appears as a bar on the label below the main energy use or efficiency figure, that shows the highest and lowest energy consumption or efficiencies for all similar appliance models. Labels for clothes washers and some other appliance products also must disclose estimated annual operating cost based on a specified national average cost for the fuel the appliances use.

*B. Ranges of Comparability and the Categories in Appendix F*

The ''range of comparability'' on the EnergyGuide is intended to enable consumers to compare the energy consumption or efficiency of the other models (perhaps competing brands) in the marketplace that are similar to the labeled model they are considering. Section 305.8(b) of the Rule, 16 CFR 305.8(b), requires manufacturers to report annually (by specified dates for each product type) the estimated annual energy consumption or energy efficiency ratings for the appliances derived from the DOE test procedures. To keep the required information on labels consistent with these changes, the Commission publishes new range figures (but not more often than annually) for manufacturers to use on labels if an analysis of the reported information indicates that the upper or lower limits of the ranges have changed by more than 15%. 16 CFR 305.10. Otherwise, the Commission publishes a statement that the prior ranges remain in effect for the next year.

Each category of the products covered by the Rule is divided to some extent into sub-categories for purposes of the ranges of comparability. These subcategories, which are the same as those developed by DOE in connection with its efficiency standards program,[1] are based on fuel type, size, and/or functional features, depending on the type of product.

When the Commission published the Rule in 1979, the clothes washer category in Appendix F was divided into the sub-categories ''Standard'' and

[1] Section 325 of EPCA, 42 U.S.C. 6295, directs DOE to develop efficiency standards for major household appliances to achieve the maximum improvement in energy efficiency for residential appliances that is technologically feasible and economically justified. As amended, the statute itself sets the initial national standards for appliances and establishes a schedule for regular DOE review of the standards for each product category.