Dated: April 6, 2005.

Kenneth C. Clayton,

Acting Administrator, Agricultural Marketing Service.

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. NM305; Notice No. 25–05–04–SC]

Special Conditions: Airbus Model A380–800 Airplane; Dynamic Braking, Interaction of Systems and Structures, Limit Pilot Forces, Side Stick Controllers, Dive Speed Definition, Electronic Flight Control System-Lateral-Directional Stability, Longitudinal Stability, and Low Energy Awareness, Electronic Flight Control System-Control Surface Awareness, Electronic Flight Control System-Flight Characteristics Compliance Via the Handling Qualities Rating Method, Flight Envelope Protection-General Limiting Requirements, Flight Envelope Protection-Normal Load Factor (G) Limiting, Flight Envelope Protection-High Speed Limiting, Flight Envelope Protection-Pitch and Roll Limiting, Flight Envelope Protection-High Incidence Protection and Alpha-Floor Systems, High Intensity Radiated Fields (HIRF) Protection, and Operation Without Normal Electrical Power

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed special conditions.

SUMMARY: This notice proposes special conditions for the Airbus A380–800 airplane. This airplane will have novel or unusual design features when compared to the state of technology envisioned in the airworthiness standards for transport category airplanes. These design features include side stick controllers, a body landing gear in addition to conventional wing and nose landing gears, electronic flight control systems, and flight envelope protection. These proposed special conditions also pertain to the effects of such novel or unusual design features, such as their effects on the structural performance of the airplane. Finally, the proposed special conditions pertain to the effects of certain conditions on these novel or unusual design features, such as the effects of high intensity radiated fields (HIRF) or of operation without normal electrical power. Additional special conditions will be issued for other novel or unusual design features of the Airbus A380–800 airplanes. A list is provided in the section of this document entitled ''Discussion of Novel or Unusual Design Features.''

DATES: Comments must be received on or before May 27, 2005.

ADDRESSES: Comments on this proposal may be mailed in duplicate to: Federal Aviation Administration, Transport Airplane Directorate, Attention: Rules Docket (ANM–113), Docket No. NM305, 1601 Lind Avenue SW., Renton, Washington 98055–4056; or delivered in duplicate to the Transport Airplane Directorate at the above address. All comments must be marked: Docket No. NM305. 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: Holly Thorson, FAA, International Branch, ANM–116, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98055–4056; telephone (425) 227–1357; facsimile (425) 227–1149.

SUPPLEMENTARY INFORMATION:

Comments Invited

The FAA invites interested persons to participate in this rulemaking by submitting written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data. We ask that you send us two copies of written comments.

We will file in the docket all comments we receive as well as a report summarizing each substantive public contact with FAA personnel concerning these proposed special conditions. The docket is available for public inspection before and after the comment closing date. If you wish to review the docket in person, go to the address in the **ADDRESSES** section of this notice between 7:30 a.m. and 4 p.m., Monday through Friday, except Federal holidays.

We will consider all comments we receive on or before the closing date for comments. We will consider comments filed late, if it is possible to do so without incurring expense or delay. We may change the proposed special conditions in light of the comments we receive.

If you want the FAA to acknowledge receipt of your comments on this proposal, include with your comments a pre-addressed, stamped postcard on which the docket number appears. We will stamp the date on the postcard and mail it back to you.

Background

Airbus applied for FAA certification/validation of the provisionally-designated Model A3XX–100 in its letter AI/L 810.0223/98, dated August 12, 1998, to the FAA. Application for certification by the Joint Aviation Authorities (JAA) of Europe had been made on January 16, 1998, reference AI/L 810.0019/98. In its letter to the FAA, Airbus requested an extension to the 5-year period for type certification in accordance with 14 CFR 21.17(c). The request was for an extension to a 7-year period, using the date of the initial application letter to the JAA as the reference date. The reason given by Airbus for the request for extension is related to the technical challenges, complexity, and the number of new and novel features on the airplane. On November 12, 1998, the Manager, Aircraft Engineering Division, AIR–100, granted Airbus' request for the 7-year period based on the date of application to the JAA.

In its letter AI/LE–A 828.0040/99 Issue 3, dated July 20, 2001, Airbus stated that its target date for type certification of the Model A380–800 has been moved from May 2005, to January 2006, in order to match the delivery date of the first production airplane. In accordance with 14 CFR 21.17(d)(2), Airbus chose a new application date of April 20, 1999, and requested that the 7-year certification period which had already been approved be continued. The part 25 certification basis for the Model A380–800 airplane was adjusted to reflect the new application date.

The Model A380–800 airplane will be an all-new, four-engine jet transport airplane with a full double-deck, two-aisle cabin. The maximum takeoff weight will be 1.235 million pounds with a typical three-class layout of 555 passengers.

Type Certification Basis

Under the provisions of 14 CFR 21.17, Airbus must show that the Model A380–800 airplane meets the applicable provisions of 14 CFR part 25, as amended by Amendments 25–1 through 25–98. If the Administrator finds that the applicable airworthiness regulations do not contain adequate or appropriate safety standards for the Airbus A380–800 airplane because of novel or unusual design features, special conditions are prescribed under the provisions of 14 CFR 21.16.

In addition to the applicable airworthiness regulations and special conditions, the Airbus Model A380–800 airplane must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the noise certification requirements of 14 CFR part 36. In addition, the FAA must issue a finding of regulatory adequacy pursuant to section 611 of Public Law 93–574, the ''Noise Control Act of 1972.''

Special conditions, as defined in 14 CFR 11.19, are issued in accordance with 14 CFR 11.38 and become part of the type certification basis in accordance with 14 CFR 21.17(a)(2), Amendment 21–69, effective September 16, 1991.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, or should any other model already included on the same type certificate be modified to incorporate the same novel or unusual design features, the special conditions would also apply to the other model under the provisions of 14 CFR 21.101(a)(1), Amendment 21–69, effective September 16, 1991.

Discussion of Novel or Unusual Design Features

The Airbus A380–800 airplane will incorporate a number of novel or unusual design features. Because of rapid improvements in airplane technology, the applicable airworthiness regulations do not contain adequate or appropriate safety standards for these design features. The special conditions proposed for Airbus Model A380 contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

These proposed special conditions are identical or nearly identical to those previously required for type certification of the basic Model A340 airplane or earlier models. One exception is the special condition pertaining to Interaction of Systems and Structures. It was not required for the basic Model A340 but was required for type certification of the larger, heavier Model A340–500 and –600 airplanes.

In general, the proposed special conditions were derived initially from standardized requirements developed by the Aviation Rulemaking Advisory Committee (ARAC), comprised of representatives of the FAA, Europe's Joint Aviation Authorities (now replaced by the European Aviation Safety Agency), and industry. In some cases, a draft Notice of Proposed Rulemaking has been prepared but no final rule has yet been promulgated.

Additional special conditions will be issued for other novel or unusual design features of the Airbus Model A380–800 airplane. Those proposed special conditions pertain to the following topics:

- Fire protection,
- Evacuation, including availability of stairs in an emergency,
- Emergency exit arrangement—outside viewing,
- Escape system inflation systems,
- Escape systems installed in non-pressurized compartments,
- Ground turning loads,
- Crashworthiness,
- Flotation and ditching,
- Discrete gust requirements,
- Transient engine failure loads,
- Airplane jacking loads,
- Landing gear pivoting loads,
- Design roll maneuvers, and
- Extendable length escape systems.

1. Dynamic Braking

The A380 landing gear system will include body gear in addition to the conventional wing and nose gear. This landing gear configuration may result in more complex dynamic characteristics than those found in conventional landing gear configurations. Section 25.493(d) by itself does not contain an adequate standard for assessing the braking loads for the A380 landing gear configuration.

Due to the potential complexities of the A380 landing gear system, in addition to meeting the requirements of § 25.493(d), a rational analysis of the braked roll conditions is necessary. Airbus Model A340–500 and –600 also have a body-mounted main landing gear in addition to the wing and nose gears. Therefore, a special condition similar to that required for that model is appropriate for the model A380–800.

2. Interaction of Systems and Structures

The A380 is equipped with systems which affect the airplane's structural performance either directly or as a result of failure or malfunction. The effects of these systems on structural performance must be considered in the certification analysis. This analysis must include consideration of normal operation and of failure conditions with required structural strength levels related to the probability of occurrence.

Previously, special conditions have been specified to require consideration of the effects of systems on structures. The special condition proposed for the Model A380 is nearly identical to that issued for the Model A340–500 and –600 series airplanes.

3. Limit Pilot Forces

Like some other Airbus models, the Model A380 airplane is equipped with a side stick controller instead of a conventional control stick. This kind of controller is designed to be operated using only one hand. The requirement of § 25.397(c), which defines limit pilot forces and torques for conventional wheel or stick controls, is not appropriate for a side stick controller. Therefore, a special condition is necessary to specify the appropriate loading conditions for this kind of controller.

A special condition for side stick controllers has already been developed for the Airbus model A320 and A340 airplanes, both of which also have a side stick controller instead of a conventional control stick. The same special condition would be appropriate for the model A380 airplane.

4. Side Stick Controllers

The A380—like its predecessors, the A320, A330, and A340—will use side stick controllers for pitch and roll control. Regulatory requirements for conventional wheel and column controllers, such as requirements pertaining to pilot strength and controllability, are not directly applicable to side stick controllers. In addition, pilot control authority may be uncertain, because the side sticks are not mechanically interconnected as with conventional wheel and column controls.

In previous Airbus airplane certification programs, special conditions pertaining to side stick controllers were addressed in three separate issue papers, entitled ''Pilot Strength,'' ''Pilot Coupling,'' and ''Pilot Control.'' The resulting separate special conditions are combined in this special condition under the title of ''Side Stick Controllers.'' In order to harmonize with the JAA, the following has been added to Special Condition 4.c. Side Stick Controllers:

Pitch and roll control force and displacement sensitivity must be compatible, so that normal inputs on one control axis will not cause significant unintentional inputs on the other.

5. Dive Speed Definition

Airbus proposes to reduce the speed spread between V_C and V_D required by § 25.335(b), based on the incorporation of a high speed protection system in the A380 flight control laws. The A380—like the A320, A330, and A340—is equipped with a high speed protection system which limits nose down pilot authority at speeds above V_C/M_C and prevents the airplane from actually performing the maneuver required under § 25.335(b)(1).

Section 25.335(b)(1) is an analytical envelope condition which was originally adopted in Part 4b of the Civil Air Regulations to provide an acceptable speed margin between design cruise speed and design dive speed. Freedom from flutter and airframe design loads is affected by the design dive speed. While the initial condition for the upset specified in the rule is 1g level flight, protection is afforded for other inadvertent overspeed conditions as well. Section 25.335(b)(1) is intended as a conservative enveloping condition for all potential overspeed conditions, including non-symmetric ones. To establish that all potential overspeed conditions are enveloped, the applicant should demonstrate either of the following:

- Any reduced speed margin—based on the high speed protection system in the A380—will not be exceeded in inadvertent or gust induced upsets, resulting in initiation of the dive from non-symmetric attitudes; or
- The airplane is protected by the flight control laws from getting into non-symmetric upset conditions.

In addition, the high speed protection system in the A380 must have a high level of reliability.

6. Electronic Flight Control System: Lateral-Directional Stability, Longitudinal Stability, and Low Energy Awareness

In lieu of compliance with the regulations pertaining to lateral-directional and longitudinal stability, this special condition ensures that the model A380 will have suitable airplane handling qualities throughout the normal flight envelope (reference paragraphs 6.a. and 6.b.).

The unique features of the A380 flight control system and side-stick controllers, when compared with conventional airplanes with wheel and column controllers, do not provide conventional awareness to the flight crew of a change in speed or a change in the direction of flight (reference paragraph 6.c.). This special condition requires that adequate awareness be provided to the pilot of a low energy state (low speed, low thrust, and low altitude) below normal operating speeds.

a. Lateral-Directional Static Stability: The model A380 airplane has a flight control design feature within the normal operational envelope in which side stick deflection in the roll axis commands roll rate. As a result, the stick force in the roll axis will be zero (neutral stability) during the straight, steady sideslip flight maneuver of § 25.177(c) and will not be ''substantially proportional to the angle of sideslip,'' as required by the regulation.

The electronic flight control system (EFCS) on the A380 as on its predecessors—the A320, A330 and A340—contains fly-by-wire control laws that result in neutral lateral-directional static stability. Therefore, the conventional requirements of the regulations are not met.

With conventional control system requirements, positive static directional stability is defined as the tendency to recover from a skid with the rudder free. Positive static lateral stability is defined as the tendency to raise the low wing in a sideslip with the aileron controls free. The regulations are intended to accomplish the following:

- Provide additional cues of inadvertent sideslips and skids through control force changes.
- Ensure that short periods of unattended operation do not result in any significant changes in yaw or bank angle.
- Provide predictable roll and yaw response.
- Provide acceptable level of pilot attention (*i.e.*, workload) to attain and maintain a coordinated turn.

b. Longitudinal Static and Dynamic Stability: The longitudinal flight control laws for the A380 provide neutral static stability within the normal operational envelope. Therefore, the airplane design does not comply with the static longitudinal stability requirements of §§ 25.171, 25.173, and 25.175.

Static longitudinal stability on conventional airplanes with mechanical links to the pitch control surface means that a pull force on the controller will result in a reduction in speed relative to the trim speed, and a push force will result in higher than trim speed. Longitudinal stability is required by the regulations for the following reasons:

- Speed change cues are provided to the pilot through increased and decreased forces on the controller.
- Short periods of unattended control of the airplane do not result in significant changes in attitude, airspeed or load factor.
- A predictable pitch response is provided to the pilot.
- An acceptable level of pilot attention (*i.e.*, workload) to attain and maintain trim speed and altitude is provided to the pilot.
- Longitudinal stability provides gust stability.

The pitch control movement of the side stick is a normal load factor or ''g'' command which results in an initial movement of the elevator surface to attain the commanded load factor. That movement is followed by integrated movement of the stabilizer and elevator to automatically trim the airplane to a neutral (1g) stick-free stability. The flight path commanded by the initial side stick input will remain stick-free until the pilot gives another command. This control function is applied during ''normal'' control law within the speed range from V_{aprot} (the speed at the angle of attack protection limit) to V_{MO} to M_{MO}. Once outside this speed range, the control laws introduce the conventional longitudinal static stability as described above.

As a result of neutral static stability, the A380 does not meet the requirements of part 25 for static longitudinal stability.

c. Low Energy Awareness: Static longitudinal stability provides an awareness to the flight crew of a low energy state (low speed and thrust at low altitude). Past experience on airplanes fitted with a flight control system which provides neutral longitudinal stability shows there are insufficient feedback cues to the pilot of excursion below normal operational speeds. The maximum angle of attack protection system limits the airplane angle of attack and prevents stall during normal operating speeds, but this system is not sufficient to prevent stall at low speed excursions below normal operational speeds. Until intervention, there are no stability cues, because the airplane remains trimmed. Additionally, feedback from the pitching moment due to thrust variation is reduced by the flight control laws. Recovery from a low speed excursion may become hazardous when the low speed is associated with low altitude and the engines are operating at low thrust or with other performance limiting conditions.

7. Electronic Flight Control System: Control Surface Awareness

With a response-command type of flight control system and no direct coupling from cockpit controller to control surface, such as on the A380, the pilot is not aware of the actual surface deflection position during flight maneuvers. Some unusual flight conditions, arising from atmospheric conditions or airplane or engine failures or both, may result in full or nearly full surface deflection. Unless the flight crew is made aware of excessive deflection or impending control surface deflection limiting, piloted or auto-flight system control of the airplane might be inadvertently continued in a way which would cause loss of control or other unsafe handling or performance characteristics.

This special condition requires that suitable annunciation be provided to the flight crew when a flight condition exists in which nearly full control surface deflection occurs. Suitability of such a display must take into account that some pilot-demanded maneuvers (*e.g.*, rapid roll) are necessarily associated with intended full or nearly full control surface deflection. Therefore, simple alerting systems which would function in both intended or unexpected control-limiting situations must be properly balanced between needed crew awareness and not getting nuisance warnings.

8. Electronic Flight Control System: Flight Characteristics Compliance Via the Handling Qualities Rating Method (HQRM)

The Model A380 airplane will have an Electronic Flight Control System (EFCS). This system provides an electronic interface between the pilot's flight controls and the flight control surfaces (for both normal and failure states). The system also generates the actual surface commands that provide for stability augmentation and control about all three airplane axes. Because EFCS technology has outpaced existing regulations—written essentially for unaugmented airplanes with provision for limited ON/OFF augmentation—suitable special conditions and a method of compliance are required to aid in the certification of flight characteristics.

This special condition and the method of compliance presented in Appendix 7 of the Flight Test Guide, AC 25–7A, provide a means by which one may evaluate flight characteristics—as, for example, ''satisfactory,'' ''adequate,'' or ''controllable''—to determine compliance with the regulations. The HQRM in Appendix 7 was developed for airplanes with control systems having similar functions and is employed to aid in the evaluation of the following:

- All EFCS/airplane failure states not shown to be extremely improbable and where the envelope (task) and atmospheric disturbance probabilities are each 1.
- All combinations of failures, atmospheric disturbance level, and flight envelope not shown to be extremely improbable.

The HQRM provides a systematic approach to the assessment of handling qualities. It is not intended to dictate program size or need for a fixed number of pilots to achieve multiple opinions. The airplane design itself and success in defining critical failure combinations from the many reviewed in Systems Safety Assessments would dictate the scope of any HQRM application.

Handling qualities terms, principles, and relationships familiar to the aviation community have been used to formulate the HQRM. For example, we have established that the well-known COOPER–HARPER rating scale and the proposed FAA three-part rating system are similar. This approach is derived in part from the contract work on the flying qualities of highly augmented/relaxed static stability airplanes, in relation to regulatory and flight test guide requirements. The work is reported in DOT/FAA/CT–82/130, Flying Qualities of Relaxed Static Stability Aircraft, Volumes I and II.

9. Flight Envelope Protection: General Limiting Requirements

This special condition and the following ones—pertaining to flight envelope protection—present general limiting requirements for all the unique flight envelope protection features of the basic A380 Electronic Flight Control System (EFCS) design. Current regulations do not address these types of protection features. The general limiting requirements are necessary to ensure a smooth transition from normal flight to the protection mode and adequate maneuver capability. The general limiting requirements also ensure that the structural limits of the airplane are not exceeded. Furthermore, failure of the protection feature must not create hazardous flight conditions. Envelope protection parameters include angle of attack, normal load factor, bank angle, pitch angle, and speed. To accomplish these envelope protections, one or more significant changes occur in the EFCS control laws as the normal flight envelope limit is approached or exceeded.

Each specific type of envelope protection is addressed individually in the special conditions which follow.

10. Flight Envelope Protection: Normal Load Factor (G) Limiting

The A380 flight control system design incorporates normal load factor limiting on a full time basis that will prevent the pilot from inadvertently or intentionally exceeding the positive or negative airplane limit load factor. This limiting feature is active in all normal and alternate flight control modes and cannot be overridden by the pilot. There is no requirement in the regulations for this limiting feature.

Except for the Airbus airplanes with fly-by-wire flight controls, the normal load factor limit is unique in that traditional airplanes with conventional flight control systems (mechanical linkages) are limited in the pitch axis only by the elevator surface area and deflection limit. The elevator control power is normally derived for adequate controllability and maneuverability at the most critical longitudinal pitching moment. The result is that traditional airplanes have a significant portion of the flight envelope in which maneuverability in excess of limit structural design values is possible.

Part 25 does not require a demonstration of maneuver control or handling qualities beyond the design limit structural loads. Nevertheless, some pilots have become accustomed to the availability of this excess maneuver capacity in case of extreme emergency, such as upset recoveries or collision avoidance. Airbus is aware of the concern and has published the results of its research which indicate the following:

- Pilots rarely, if ever, use the excess maneuvering capacity in collision avoidance maneuvers, and
- Other features of its flight control system would have prevented most, if not all, of the upset cases on record where pilots did exceed limit loads during recovery.

Because Airbus has chosen to include this optional design feature for which part 25 does not contain adequate or appropriate safety standards, a proposed special condition pertaining to this feature is included. This special condition establishes minimum load factor requirements to ensure adequate maneuver capability during normal flight.

11. Flight Envelope Protection: High Speed Limiting

The longitudinal control law design of the A380 incorporates a high speed limiting protection system in the normal flight mode. This system prevents the pilot from inadvertently or intentionally exceeding the airplane maximum design speeds, V_D/M_D. Part 25 does not address such a system that would limit or modify flying qualities in the high speed region.

The main features of the high speed limiting function are as follows:

- It protects the airplane against high speed/high mach number flight conditions beyond V_{MO}/M_{MO}.
- It does not interfere with flight at V_{MO}/M_{MO}, even in turbulent air.
- It still provides load factor limitation through the ''pitch limiting'' function described below.
- It restores positive static stability beyond V_{MO}/M_{MO}.

This special condition establishes requirements to ensure that operation of the high speed limiter does not impede normal attainment of speeds up to the overspeed warning.

12. Flight Envelope Protection: Pitch and Roll Limiting

Currently, part 25 does not specifically address flight characteristics associated with fixed attitude limits. Airbus proposes to implement pitch and roll attitude limiting functions on the A380 via the Electronic Flight Control System (EFCS) normal modes. These normal modes will prevent airplane pitch attitudes greater than +30 degrees and less than −15 degrees and roll angles greater than plus or minus 67 degrees. In addition, positive spiral stability is introduced for roll angles greater than 33 degrees at speeds below V_{MO}/M_{MO}. At speeds greater than V_{MO}/M_{MO}, the maximum aileron control force with positive spiral stability results in a maximum bank angle of 45 degrees.

This special condition establishes requirements to ensure that pitch limiting functions do not impede normal maneuvering and that pitch and roll limiting functions do not restrict or prevent attaining certain roll angles necessary for emergency maneuvering.

Special conditions to supplement § 25.143 concerning pitch and roll limits were developed for the A320, A330 and A340 in which performance of the limiting functions was monitored throughout the flight test program. The FAA expects similar monitoring to take place during the A380 flight test program to substantiate the pitch and roll attitude limiting functions and the appropriateness of the chosen limits.

13. Flight Envelope Protection: High Incidence Protection and Alpha-Floor Systems

The A380 is equipped with a high incidence protection system that limits the angle of attack at which the airplane can be flown during normal low speed operation and that cannot be overridden by the flight crew. The application of this limitation on the angle of attack affects the longitudinal handling characteristics of the airplane, so that there is no need for the stall warning system during normal operation. In addition, the alpha-floor function automatically advances the throttles on the operating engines whenever the airplane angle of attack reaches a predetermined high value. This function is intended to provide increased climb capability. This special condition thus addresses the unique features of the low speed high incidence protection and the alpha-floor systems on the A380.

The high incidence protection system prevents the airplane from stalling, which means that the stall warning system is not needed during normal flight conditions. If there is a failure of the high incidence protection system that is not shown to be extremely improbable, the flight characteristics at the angle of attack for C_{LMAX} must be suitable in the traditional sense, and stall warning must be provided in a conventional manner.

14. High Intensity Radiated Fields (HIRF) Protection

The Airbus Model A380–800 will utilize electrical and electronic systems which perform critical functions. These systems may be vulnerable to high-intensity radiated fields (HIRF) external to the airplane. There is no specific regulation that addresses requirements for protection of electrical and electronic systems from HIRF. With the trend toward increased power levels from ground-based transmitters and the advent of space and satellite communications, coupled with electronic command and control of the airplane, the immunity of critical avionics/electronics and electrical systems to HIRF must be established.

To ensure that a level of safety is achieved that is equivalent to that intended by the regulations incorporated by reference, a special condition is needed for the Airbus Model A380 airplane. This special condition requires that avionics/electronics and electrical systems that perform critical functions be designed and installed to preclude component damage and interruption.

It is not possible to precisely define the HIRF to which the airplane will be exposed in service. There is also uncertainty concerning the effectiveness of airframe shielding for HIRF. Furthermore, coupling of electromagnetic energy to cockpit-installed equipment through the cockpit window apertures is undefined. Based on surveys and analysis of existing HIRF emitters, adequate protection from HIRF exists when there is compliance with either paragraph a. or b. below:

a. A minimum threat of 100 volts rms (root-mean-square) per meter electric field strength from 10 KHz to 18 GHz.

(1) The threat must be applied to the system elements and their associated wiring harnesses without the benefit of airframe shielding.

(2) Demonstration of this level of protection is established through system tests and analysis.

b. A threat external to the airframe of the field strengths indicated in the table below for the frequency ranges indicated. Both peak and average field strength components from the table below are to be demonstrated.

Frequency	Field strength (volts per meter)	
	Peak	Average
10 kHz–100 kHz	50	50
100 kHz–500 kHz	50	50
500 kHz–2 MHz	50	50
2 MHz–30 MHz	100	100
30 MHz–70 MHz	50	50
70 MHz–100 MHz	50	50
100 MHz–200 MHz	100	100
200 MHz–400 MHz	100	100
400 MHz–700 MHz	700	50
700 MHz–1 GHz	700	100
1 GHz–2 GHz	2000	200
2 GHz–4 GHz	3000	200
4 GHz–6 GHz	3000	200
6 GHz–8 GHz	1000	200
8 GHz–12 GHz	3000	300
12 GHz–18 GHz	2000	200
18 GHz–40 GHz	600	200

The field strengths are expressed in terms of peak root-mean-square (rms) values over the complete modulation period.

The threat levels identified above are the result of an FAA review of existing studies on the subject of HIRF.

15. Operation Without Normal Electrical Power

These special conditions were developed to address fly-by-wire airplanes starting with the Airbus Model A330. As with earlier airplanes, the Airbus A380–800 fly-by-wire control system requires a continuous source of electrical power for the flight control system to remain operable.

Section 25.1351(d), ''Operation without normal electrical power,'' requires safe operation in visual flight rules (VFR) weather conditions for at least five minutes with inoperative normal power. This rule was structured around a traditional design utilizing mechanical control cables for flight control while the crew took time to sort out the electrical failure, start the engine(s) if necessary, and re-establish some of the electrical power generation capability.

To maintain the same level of safety as that associated with traditional designs, the Model A380 design must not be time limited in its operation, including being without the normal source of engine or Auxiliary Power Unit (APU) generated electrical power. Service experience has shown that the loss of all electrical power generated by the airplane's engine generators or APU is not extremely improbable. Thus, it must be demonstrated that the airplane can continue through safe flight and landing—including steering and braking on the ground for airplanes using steer/brake-by-wire—using its emergency electrical power systems. These emergency electrical power systems must be able to power loads that are essential for continued safe flight and landing.

Applicability

As discussed above, these special conditions are applicable to the Airbus A380–800 airplane. Should Airbus apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design features, these special conditions would apply to that model as well under the provisions of § 21.101(a)(1), Amendment 21–69, effective September 16, 1991.

Conclusion

This action affects only certain novel or unusual design features of the Airbus A380–800 airplane. It is not a rule of general applicability, and it affects only the applicant which applied to the FAA for approval of these features on the airplane.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

PART 25—[AMENDED]

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Proposed Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the Federal Aviation Administration (FAA) proposes the following special conditions as part of the type certification basis for the Airbus A380–800 airplane.

1. Dynamic Braking

In addition to the requirements of § 25.493(d), the following special condition applies:

Loads arising from the sudden application of maximum braking effort must be defined, taking into account the behavior of the braking system. Failure conditions of the braking system must be analyzed in accordance with the criteria specified in proposed special condition number 2, ''Interaction of Systems and Structures.''

2. Interaction of Systems and Structures

In addition to the requirements of part 25, subparts C and D, the following special condition applies:

a. For airplanes equipped with systems that affect structural performance—either directly or as a result of a failure or malfunction—the influence of these systems and their failure conditions must be taken into account when showing compliance with the requirements of part 25, subparts C and D. Paragraph c. below must be used to evaluate the structural performance of airplanes equipped with these systems.

b. Unless shown to be extremely improbable, the airplane must be designed to withstand any forced structural vibration resulting from any failure, malfunction, or adverse condition in the flight control system. These loads must be treated in accordance with the requirements of paragraph a. above.

c. Interaction of Systems and Structures

(1) General: The following criteria must be used for showing compliance with this special condition and with § 25.629 for airplanes equipped with flight control systems, autopilots, stability augmentation systems, load alleviation systems, flutter control systems, and fuel management systems. If this paragraph is used for other systems, it may be necessary to adapt the criteria to the specific system.

(a) The criteria defined herein address only the direct structural consequences of the system responses and performances. They cannot be considered in isolation but should be included in the overall safety evaluation of the airplane. These criteria may, in some instances, duplicate standards already established for this evaluation. These criteria are applicable only to structures whose failure could prevent continued safe flight and landing. Specific criteria that define acceptable limits on handling characteristics or stability requirements when operating in the system degraded or inoperative modes are not provided in this paragraph.

(b) Depending upon the specific characteristics of the airplane, additional studies may be required that go beyond the criteria provided in this paragraph in order to demonstrate the capability of the airplane to meet other realistic conditions, such as alternative gust or maneuver descriptions for an airplane equipped with a load alleviation system.

(c) The following definitions are applicable to this paragraph.

Structural performance: Capability of the airplane to meet the structural requirements of part 25.

Flight limitations: Limitations that can be applied to the airplane flight conditions following an in-flight occurrence and that are included in the flight manual (*e.g.*, speed limitations and avoidance of severe weather conditions).

Operational limitations: Limitations, including flight limitations, that can be applied to the airplane operating conditions before dispatch (*e.g.*, fuel, payload and Master Minimum Equipment List limitations).

Probabilistic terms: The probabilistic terms (probable, improbable, and extremely improbable) used in this special condition are the same as those used in § 25.1309.

Failure condition: The term failure condition is the same as that used in § 25.1309. However, this special condition applies only to system failure conditions that affect the structural performance of the airplane (*e.g.*, system failure conditions that induce loads, change the response of the airplane to inputs such as gusts or pilot actions, or lower flutter margins).

(2) Effects of Systems on Structures.

(a) *General.* The following criteria will be used in determining the influence of a system and its failure conditions on the airplane structure.

(b) *System fully operative.* With the system fully operative, the following apply:

(1) Limit loads must be derived in all normal operating configurations of the system from all the limit conditions specified in Subpart C, taking into account any special behavior of such a system or associated functions or any effect on the structural performance of the airplane that may occur up to the limit loads. In particular, any significant non-linearity (rate of displacement of control surface, thresholds or any other system non-linearities) must be accounted for in a realistic or conservative way when deriving limit loads from limit conditions.

(2) The airplane must meet the strength requirements of part 25 (Static strength, residual strength), using the specified factors to derive ultimate loads from the limit loads defined above. The effect of non-linearities must be investigated beyond limit conditions to ensure that the behavior of the system presents no anomaly compared to the behavior below limit conditions. However, conditions beyond limit conditions need not be considered, when it can be shown that the airplane has design features that will not allow it to exceed those limit conditions.

(3) The airplane must meet the aeroelastic stability requirements of § 25.629.

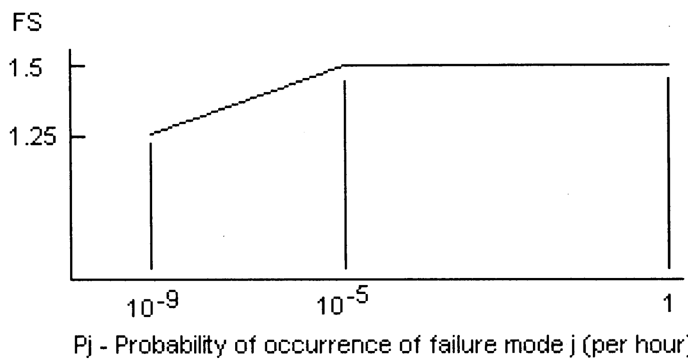
(c) *System in the failure condition.* For any system failure condition not shown to be extremely improbable, the following apply:

(1) At the time of occurrence. Starting from 1g level flight conditions, a realistic scenario, including pilot corrective actions, must be established to determine the loads occurring at the time of failure and immediately after failure.

(i) For static strength substantiation, these loads multiplied by an appropriate factor of safety that is related to the probability of occurrence of the failure are ultimate loads to be considered for design. The factor of safety (F.S.) is defined in Figure 1.

Figure 1

Factor of safety at the time of occurrence



(ii) For residual strength substantiation, the airplane must be able to withstand two thirds of the ultimate loads defined in subparagraph (c)(1)(i) of this section.

(iii) Freedom from aeroelastic instability must be shown up to the speeds defined in § 25.629(b)(2). For failure conditions that result in speed increases beyond V_C/M_C, freedom from aeroelastic instability must be shown to increased speeds, so that the margins intended by § 25.629(b)(2) are maintained.

(iv) Failures of the system that result in forced structural vibrations (oscillatory failures) must not produce loads that could result in detrimental deformation of primary structure.

(2) For the continuation of the flight. For the airplane in the system failed state and considering any appropriate reconfiguration and flight limitations, the following apply:

(i) The loads derived from the following conditions at speeds up to V_C or the speed limitation prescribed for the remainder of the flight must be determined:

(A) the limit symmetrical maneuvering conditions specified in § 25.331 and in § 25.345.

(B) the limit gust and turbulence conditions specified in § 25.341 and in § 25.345.

(C) the limit rolling conditions specified in § 25.349 and the limit unsymmetrical conditions specified in § 25.367 and § 25.427(b) and (c).

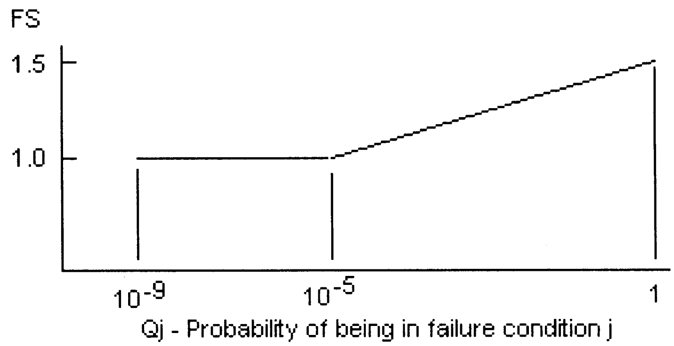
(D) the limit yaw maneuvering conditions specified in § 25.351.

(E) the limit ground loading conditions specified in § 25.473 and § 25.491.

(ii) For static strength substantiation, each part of the structure must be able to withstand the loads in subparagraph (2)(i) of this paragraph multiplied by a factor of safety, depending on the probability of being in this failure state. The factor of safety is defined in Figure 2.

Figure 2

Factor of safety for continuation of flight



$Q_j = (T_j)(P_j)$

Where:

T_j = Average time spent in failure condition j (in hours)

P_j = Probability of occurrence of failure mode j (per hour)

Note: If P_j is greater than 10^{-3} per flight hour, then a 1.5 factor of safety must be applied to all limit load conditions specified in Subpart C.

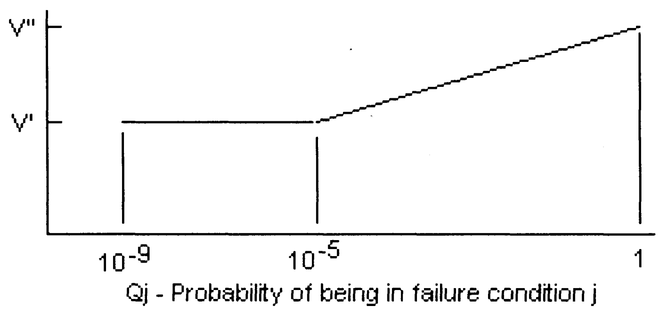
(iii) For residual strength substantiation, the airplane must be able to withstand two thirds of the ultimate loads defined in subparagraph (c)(2)(ii).

(iv) If the loads induced by the failure condition have a significant effect on fatigue or damage tolerance, then their effects must be taken into account.

(v) Freedom from aeroelastic instability must be shown up to a speed determined from Figure 3. Flutter clearance speeds V' and V'' may be based on the speed limitation specified for the remainder of the flight, using the margins defined by § 25.629(b).

Figure 3

Clearance speed



V' = Clearance speed as defined by § 25.629(b)(2).

V'' = Clearance speed as defined by § 25.629(b)(1).

$Q_j = (T_j)(P_j)$

Where:

T_j = Average time spent in failure condition j (in hours)

P_j = Probability of occurrence of failure mode j (per hour)

Note: If P_j is greater than 10^{-3} per flight hour, then the flutter clearance speed must not be less than V''.

(vi) Freedom from aeroelastic instability must also be shown up to V' in Figure 3 above for any probable system failure condition combined with any damage required or selected for investigation by § 25.571(b).

(3) Consideration of certain failure conditions may be required by other sections of this Part, regardless of calculated system reliability. Where analysis shows the probability of these failure conditions to be less than 10^{-9}, criteria other than those specified in this paragraph may be used for structural substantiation to show continued safe flight and landing.

(d) *Warning considerations.* For system failure detection and warning, the following apply:

(1) The system must be checked for failure conditions, not extremely improbable, that degrade the structural capability below the level required by part 25 or significantly reduce the reliability of the remaining system. The flight crew must be made aware of these failures before flight. Certain elements of the control system, such as

mechanical and hydraulic components, may use special periodic inspections, and electronic components may use daily checks in lieu of warning systems to achieve the objective of this requirement. These certification maintenance requirements must be limited to components that are not readily detectable by normal warning systems and where service history shows that inspections will provide an adequate level of safety.

(2) The existence of any failure condition, not extremely improbable, during flight that could significantly affect the structural capability of the airplane and for which the associated reduction in airworthiness can be minimized by suitable flight limitations must be signaled to the flightcrew. For example, failure conditions that result in a factor of safety between the airplane strength and the loads of part 25, subpart C below 1.25 or flutter margins below V'' must be signaled to the crew during flight.

(e) *Dispatch with known failure conditions.* If the airplane is to be dispatched in a known system failure condition that affects structural performance or affects the reliability of the remaining system to maintain structural performance, then the provisions of this special condition must be met for the dispatched condition and for subsequent failures. Flight limitations and expected operational limitations may be taken into account in establishing Qj as the combined probability of being in the dispatched failure condition and the subsequent failure condition for the safety margins in Figures 2 and 3. These limitations must be such that the probability of being in this combined failure state and then subsequently encountering limit load conditions is extremely improbable. No reduction in these safety margins is allowed, if the subsequent system failure rate is greater than 1E–3 per flight hour.

3. Limit Pilot Forces

In addition to the requirements of § 25.397(c) the following special condition applies:

The limit pilot forces are as follows:

a. For all components between and including the handle and its control stops.

Pitch	Roll
Nose up 200 lbf	Nose left 100 lbf.
Nose down 200 lbf	Nose right 100 lbf.

b. For all other components of the side stick control assembly, but excluding the internal components of the electrical sensor assemblies to avoid damage as a result of an in-flight jam.

Pitch	Roll
Nose up 125 lbf	Nose left 50 lbf.
Nose down 125 lbf	Nose right 50 lbf.

4. Side Stick Controllers

In the absence of specific requirements for side stick controllers, the following special condition applies:

a. *Pilot strength:* In lieu of the ''strength of pilots'' limits shown in § 25.143(c) for pitch and roll and in lieu of the specific pitch force requirements of §§ 25.145(b) and 25.175(d), it must be shown that the temporary and maximum prolonged force levels for the side stick controllers are suitable for all expected operating conditions and configurations, whether normal or non-normal.

b. *Pilot control authority:* The electronic side stick controller coupling design must provide for corrective and/ or overriding control inputs by either pilot with no unsafe characteristics. Annunciation of the controller status must be provided and must not be confusing to the flight crew.

c. *Pilot control:* It must be shown by flight tests that the use of side stick controllers does not produce unsuitable pilot-in-the-loop control characteristics when considering precision path control/ tasks and turbulence. In addition, pitch and roll control force and displacement sensitivity must be compatible, so that normal inputs on one control axis will not cause significant unintentional inputs on the other.

d. *Autopilot quick-release control location:* In lieu of compliance with 25.1329(d), autopilot quick release (emergency) controls must be on both side stick controllers. The quick release means must be located so that it can readily and easily be used by the flight crew.

5. Dive Speed Definition

In lieu of the requirements of § 25.335(b)(1)—if the flight control system includes functions which act automatically to initiate recovery before the end of the 20 second period specified in § 25.335(b)(1)—the greater of the speeds resulting from the following special condition applies.

a. From an initial condition of stabilized flight at V_C/M_C, the airplane is upset so as to take up a new flight path 7.5 degrees below the initial path. Control application, up to full authority, is made to maintain this new flight path. Twenty seconds after initiating the upset, manual recovery is made at a load factor of 1.5 g (0.5 acceleration increment) or such greater load factor that is automatically applied by the system with the pilot's pitch control neutral. The speed increase occurring in this maneuver may be calculated, if reliable or conservative aerodynamic data is used. Power, as specified in § 25.175(b)(1)(iv), is assumed until recovery is made, at which time power reduction and the use of pilot controlled drag devices may be used.

b. From a speed below V_C/M_C with power to maintain stabilized level flight at this speed, the airplane is upset so as to accelerate through V_C/M_C at a flight path 15 degrees below the initial path—or at the steepest nose down attitude that the system will permit with full control authority if less than 15 degrees.

Note: The pilot's controls may be in the neutral position after reaching V_C/M_C and before recovery is initiated.

c. Recovery may be initiated three seconds after operation of high speed warning system by application of a load of 1.5g (0.5 acceleration increment) or such greater load factor that is automatically applied by the system with the pilot's pitch control neutral. Power may be reduced simultaneously. All other means of decelerating the airplane, the use of which is authorized up to the highest speed reached in the maneuver, may be used. The interval between successive pilot actions must not be less than one second.

d. The applicant must also demonstrate either that

(1) the speed margin, established as above, will not be exceeded in inadvertent or gust induced upsets, resulting in initiation of the dive from non-symmetric attitudes, or

(2) the airplane is protected by the flight control laws from getting into non-symmetric upset conditions.

e. The probability of failure of the protective system that mitigates for the reduced speed margin must be less than 10^{-5} per flight hour, except that the probability of failure may be greater than 10^{-5}, but not greater than 10^{-3}, per flight hour, provided that:

(1) Failures of the system are annunciated to the pilots, and

(2) The flight manual instructions require the pilots to reduce the speed of the airplane to a value that maintains a speed margin between V_{MO} and V_D consistent with showing compliance with 25.335(b) without the benefit of the system, and

(3) no dispatch of the airplane is allowed with the system inoperative.

6. Electronic Flight Control System: Lateral-Directional and Longitudinal Stability and Low Energy Awareness

In lieu of the requirements of § 25.171 and sub-section 25.177(c), the following special condition applies:

a. The airplane must be shown to have suitable static lateral, directional, and longitudinal stability in any condition normally encountered in service, including the effects of atmospheric disturbance.

b. The airplane must provide adequate awareness to the pilot of a low energy (low speed/low thrust/low height) state when fitted with flight control laws presenting neutral longitudinal stability significantly below the normal operating speeds.

c. 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 symmetrical power condition, at speeds from 1.13 V_{S1g} up to V_{FE}, V_{LE}, or V_{FC}/M_{FC} (as appropriate).

d. In straight, steady sideslips (unaccelerated forward slips), the rudder control movements and forces must be substantially proportional to the angle of sideslip, and the factor of proportionality must be 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 a rudder pedal force of 180 pounds (81.72 kg) is obtained—the rudder pedal forces may not reverse, and increased rudder deflection must produce increased angles of sideslip. Unless the airplane has a suitable sideslip indication, there must be enough bank and lateral control deflection and force accompanying sideslipping to clearly indicate any departure from steady, unyawed flight.

7. Electronic Flight Control System: Control Surface Awareness

In addition to the requirements of §§ 25.143, 25.671 and 25.672, the following special condition applies:

a. A suitable flight control position annunciation must be provided to the crew in the following situation:

A flight condition exists in which—without being commanded by the crew—control surfaces are coming so close to their limits that return to normal flight and (or) continuation of safe flight requires a specific crew action.

b. In lieu of control position annunciation, existing indications to the crew may be used to prompt crew action, if they are found to be adequate.

Note: The term ''suitable'' also indicates an appropriate balance between nuisance and necessary operation.

8. Electronic Flight Control System: Flight Characteristics Compliance Via the Handling Quantities Rating Method (HQRM)

a. Flight Characteristics Compliance Determination for EFCS Failure Cases:

In lieu of compliance with § 25.672(c), the HQRM contained in Appendix 7 of AC 25–7A must be used for evaluation of EFCS configurations resulting from single and multiple failures not shown to be extremely improbable.

The handling qualities ratings are as follows:

(1) *Satisfactory:* Full performance criteria can be met with routine pilot effort and attention.

(2) *Adequate:* Adequate for continued safe flight and landing; full or specified reduced performance can be met, but with heightened pilot effort and attention.

(3) *Controllable:* Inadequate for continued safe flight and landing, but controllable for return to a safe flight condition, safe flight envelope and/or reconfiguration, so that the handling qualities are at least Adequate.

b. Handling qualities will be allowed to progressively degrade with failure state, atmospheric disturbance level, and flight envelope, as shown in Figure 12 of Appendix 7. Specifically, for probable failure conditions within the normal flight envelope, the pilot-rated handling qualities must be satisfactory in light atmospheric disturbance and adequate in moderate atmospheric disturbance. The handling qualities rating must not be less than adequate in light atmospheric disturbance for improbable failures.

Note: AC 25–7A, Appendix 7 presents a method of compliance and provides guidance for the following:

- Minimum handling qualities rating requirements in conjunction with atmospheric disturbance levels, flight envelopes, and failure conditions (Figure 12),
- Flight Envelope definition (Figures 5A, 6 and 7),
- Atmospheric Disturbance Levels (Figure 5B),
- Flight Control System Failure State (Figure 5C),
- Combination Guidelines (Figures 5D, 9 and 10), and
- General flight task list, from which appropriate specific tasks can be selected or developed (Figure 11).

9. Flight Envelope Protection

a. *General Limiting Requirements:* (1) Onset characteristics of each envelope protection feature must be smooth, appropriate to the phase of flight and type of maneuver, and not in conflict with the ability of the pilot to satisfactorily change the airplane flight path, speed, or attitude, as needed.

(2) Limit values of protected flight parameters (and if applicable, associated warning thresholds) must be compatible with the following:

(a) Airplane structural limits,

(b) Required safe and controllable maneuvering of the airplane, and

(c) Margins to critical conditions. Dynamic maneuvering, airframe and system tolerances (both manufacturing and in-service), and non-steady atmospheric conditions—in any appropriate combination and phase of flight—must not result in a limited flight parameter beyond the nominal design limit value that would cause unsafe flight characteristics.

(3) The airplane must be responsive to intentional dynamic maneuvering to within a suitable range of the parameter limit. Dynamic characteristics, such as damping and overshoot, must also be appropriate for the flight maneuver and limit parameter in question.

(4) When simultaneous envelope limiting is engaged, adverse coupling or adverse priority must not result.

b. *Failure States:* EFCS failures, including sensor failures, must not result in a condition where a parameter is limited to such a reduced value that safe and controllable maneuvering is no longer available. The crew must be alerted by suitable means, if any change in envelope limiting or maneuverability is produced by single or multiple failures of the EFCS not shown to be extremely improbable.

10. Flight Envelope Protection: Normal Load Factor (g) Limiting

In addition to the requirements of 25.143(a)—and in the absence of other limiting factors—the following special condition applies:

a. The positive limiting load factor must not be less than:

(1) 2.5g for the EFCS normal state.

(2) 2.0g for the EFCS normal state with the high lift devices extended.

b. The negative limiting load factor must be equal to or more negative than:

(1) Minus 1.0g for the EFCS normal state.

(2) 0.0g for the EFCS normal state with high lift devices extended.

Note: This Special Condition does not impose an upper bound for the normal load factor limit, nor does it require that the limit exist. If the limit is set at a value beyond the structural design limit maneuvering load factor ''n,'' indicated in § 25.333(b) and 25.337(b) and (c), there should be a very positive tactile feel built into the controller and obvious to the pilot that serves as a deterrent to inadvertently exceeding the structural limit.

11. Flight Envelope Protection High Speed Limiting

In addition to § 25.143, the following special condition applies:

Operation of the high speed limiter during all routine and descent procedure flight must not impede normal attainment of speeds up to the overspeed warning.

12. Flight Envelope Protection: Pitch and Roll Limiting

In addition to § 25.143, the following special condition applies:

a. The pitch limiting function must not impede normal maneuvering for pitch angles up to the maximum required for normal maneuvering—including a normal all-engines operating takeoff plus a suitable margin to allow for satisfactory speed control.

b. The pitch and roll limiting functions must not restrict or prevent attaining roll angles up to 65 degrees or pitch attitudes necessary for emergency maneuvering. Spiral stability, which is introduced above 33 degrees roll angle, must not require excessive pilot strength to achieve roll angles up to 65 degrees.

13. Flight Envelope Protection: High Incidence Protection and Alpha-Floor Systems

a. *Definitions.* For the purpose of this special condition, the following definitions apply:

High Incidence Protection System. A system that operates directly and automatically on the airplane's flying controls to limit the maximum angle of attack that can be attained to a value below that at which an aerodynamic stall would occur.

Alpha-Floor System. A system that automatically increases thrust on the operating engines when the angle of attack increases through a particular value.

Alpha Limit. The maximum angle of attack at which the airplane stabilizes with the high incidence protection system operating and the longitudinal control held on its aft stop.

V_{min} The minimum steady flight speed is the stabilized, calibrated airspeed obtained when the airplane is decelerated at an entry rate not exceeding 1 knot per second, until the longitudinal pilot control is on its stop with the high incidence protection system operating.

V_{min1g} V_{min} corrected to 1g conditions. It is the minimum calibrated airspeed at which the airplane can develop a lift force normal to the flight path and equal to its weight when at an angle of attack not greater than that determined for V_{min}.

b. *Capability and Reliability of the High Incidence Protection System:*

(1) It must not be possible to encounter a stall during pilot induced maneuvers, and handling characteristics must be acceptable, as required by Paragraphs e and f below, entitled High Incidence Handling Demonstrations and High Incidence Handling Characteristics respectively.

(2) The airplane must be protected against stalling due to the effects of windshears and gusts at low speeds, as required by Paragraph g below, entitled Atmospheric Disturbances.

(3) The ability of the high incidence protection system to accommodate any reduction in stalling incidence resulting from residual ice must be verified.

(4) The reliability of the system and the effects of failures must be acceptable, in accordance with § 25.1309 and Advisory Circular 25.1309–1A, System Design and Analysis.

(5) The high incidence protection system must not impede normal maneuvering for pitch angles up to the maximum required for normal maneuvering, including a normal all-engines operating takeoff plus a suitable margin to allow for satisfactory speed control.

c. *Minimum Steady Flight Speed and Reference Stall Speed:*

In lieu of the requirements of § 25.103, the following special condition applies:

(1) V_{min} The minimum steady flight speed, for the airplane configuration under consideration and with the high incidence protection system operating, is the final stabilized calibrated airspeed obtained when the airplane is decelerated at an entry rate not exceeding 1 knot per second until the longitudinal pilot control is on its stop.

(2) The minimum steady flight speed, V_{min}, must be determined with:

(a) The high incidence protection system operating normally.

(b) Idle thrust.

(c) Alpha-floor system inhibited.

(d) All combinations of flap settings and landing gear positions.

(e) The weight used when V_{SR} is being used as a factor to determine compliance with a required performance standard.

(f) The most unfavorable center of gravity allowable, and

(g) The airplane trimmed for straight flight at a speed achievable by the automatic trim system.

(3) V_{min1g} is V_{min} corrected to 1g conditions. Vm_{in1g} is the minimum calibrated airspeed at which the airplane can develop a lift force normal to the flight path and equal to its weight when at an angle of attack not greater than that determined for V_{min}. V_{min1g} is defined as follows:

$$V_{min\ 1g} = \frac{V_{min}}{\sqrt{n_{zw}}}$$

Where:

n_{zw} = load factor normal to the flight path at V_{min}

(4) The Reference Stall Speed, V_{SR}, is a calibrated airspeed selected by the applicant. V_{SR} may not be less than the 1g stall speed. V_{SR} is expressed as:

$$V_{SR} \geq \frac{V_{CL_{MAX}}}{\sqrt{n_{zw}}}$$

Where:

V_{CLMAX} = Calibrated airspeed obtained when the load factor-corrected lift coefficient

$$\left(\frac{n_{ZW} W}{qS}\right)$$

is first a maximum during the maneuver prescribed in paragraph (5)(h) of this section.

n_{zw} = Load factor normal to the flight path at V_{CLMAX}

W = Airplane gross weight

S = Aerodynamic reference wing area, and

q = Dynamic pressure.

(5) V_{CLMAX} must be determined with the following conditions:

(a) Engines idling or—if that resultant thrust causes an appreciable decrease in stall speed—not more than zero thrust at the stall speed

(b) The airplane in other respects, such as flaps and landing gear, in the condition existing in the test or performance standard in which V_{SR} is being used.

(c) The weight used when V_{SR} is being used as a factor to determine compliance with a required performance standard.

(d) The center of gravity position that results in the highest value of reference stall speed.

(e) The airplane trimmed for straight flight at a speed achievable by the automatic trim system, but not less than 1.13 V_{SR} and not greater than 1.3 V_{SR}.

(f) The alpha-floor system inhibited.

(g) The high incidence protection system adjusted to a high enough incidence to allow full development of the 1g stall.

(h) Starting from the stabilized trim condition, apply the longitudinal control to decelerate the airplane so that the speed reduction does not exceed one knot per second.

(6) The flight characteristics at the angle of attack for C_{LMAX} must be suitable in the traditional sense at FWD and AFT CG in straight and turning flight at IDLE power. Although for a normal production EFCS and steady full aft stick this angle of attack for C_{LMAX} cannot be achieved, the angle of attack can be obtained momentarily under dynamic circumstances and deliberately in a steady state sense with some EFCS failure conditions.

d. *Stall Warning.* (1) *Normal Operation:* If the conditions of Paragraph b above which is entitled Capability and Reliability of the High Incidence Protection System are satisfied, a level of safety equivalent to that intended by § 25.207, Stall Warning, must be considered to have been met without provision of an additional, unique warning device.

(2) *Failure Cases:* Following failures of the high incidence protection system not shown to be extremely improbable, if the system no longer satisfies sub paragraphs (1), (2), and (3) of Paragraph b above which is entitled Capability and Reliability of the High Incidence Protection System, stall warning must be provided in accordance with § 25.207. The stall warning should prevent inadvertent stall under the following conditions:

(a) Power off straight stall approaches to a speed 5 percent below the warning onset.

(b) Turning flight stall approaches at entry rates up to 3 knots per second when recovery is initiated not less than one second after the warning onset.

e. High Incidence Handling Demonstrations: In lieu of the requirements of § 25.201, the following special condition applies:

Maneuvers to the limit of the longitudinal control in the nose up direction must be demonstrated in straight flight and in 30 degree banked turns under the following conditions:

(1) The high incidence protection system operating normally.

(2) Initial power condition of:

(a) Power off

(b) The power necessary to maintain level flight at 1.5 V_{SR1}, where V_{SR1} is the reference stall speed with the flaps in the approach position, the landing gear retracted, and the maximum landing weight. The flap position to be used to determine this power setting is that position in which the stall speed, V_{SR1}, does not exceed 110% of the stall speed, V_{SR0}, with the flaps in the most extended landing position.

(3) Alpha-floor system operating normally, unless more severe conditions are achieved with alpha-floor inhibited.

(4) Flaps, landing gear and deceleration devices in any likely combination of positions.

(5) Representative weights within the range for which certification is requested, and

(6) The airplane trimmed for straight flight at a speed achievable by the automatic trim system.

(7) Starting at a speed sufficiently above the minimum steady flight speed to ensure that a steady rate of speed reduction can be established, apply the longitudinal control so that the speed reduction does not exceed one knot per second until the control reaches the stop.

(8) The longitudinal control must be maintained at the stop until the airplane has reached a stabilized flight condition and must then be recovered by normal recovery techniques.

(9) The requirements for turning flight maneuver demonstrations must also be met with accelerated rates of entry to the incidence limit, up to the maximum rate achievable.

f. High Incidence Handling Characteristics: In lieu of the requirements of § 25.203, the following special condition applies:

(1) Throughout maneuvers with a rate of deceleration of not more than 1 knot per second, both in straight flight and in 30 degree banked turns, the airplane's characteristics must be as follows:

(a) There must not be any abnormal airplane nose-up pitching.

(b) There must not be any uncommanded nose-down pitching that would be indicative of stall. However, reasonable attitude changes associated with stabilizing the incidence at alpha limit as the longitudinal control reaches the stop would be acceptable. Any reduction of pitch attitude associated with stabilizing the incidence at the alpha limit should be achieved smoothly and at a low pitch rate, such that it is not likely to be mistaken for natural stall identification.

(c) There must not be any uncommanded lateral or directional motion, and the pilot must retain good lateral and directional control by conventional use of the cockpit controllers throughout the maneuver.

(d) The airplane must not exhibit buffeting of a magnitude and severity that would act as a deterrent to completing the maneuver.

(2) In maneuvers with increased rates of deceleration, some degradation of characteristics is acceptable, associated with a transient excursion beyond the stabilized alpha-limit. However, the airplane must not exhibit dangerous characteristics or characteristics that would deter the pilot from holding the longitudinal controller on the stop for a period of time appropriate to the maneuvers.

(3) It must always be possible to reduce incidence by conventional use of the controller.

(4) The rate at which the airplane can be maneuvered from trim speeds associated with scheduled operating speeds such as V_2 and V_{REF} up to alpha-limit must not be unduly damped or significantly slower than can be achieved on conventionally controlled transport airplanes.

g. Atmospheric Disturbances: Operation of the high incidence protection system and the alpha-floor system must not adversely affect aircraft control during expected levels of atmospheric disturbances or impede the application of recovery procedures in case of windshear. Simulator tests and analysis may be used to evaluate such conditions but must be validated by limited flight testing to confirm handling qualities at critical loading conditions.

h. Alpha Floor: The alpha-floor setting must be such that the aircraft can be flown at normal landing operational speed and maneuvered up to bank angles consistent with the flight phase, including the maneuver capabilities specified in 25.143(g), without triggering alpha-floor. In addition, there must be no alpha-floor triggering, unless appropriate, when the airplane is flown in usual operational maneuvers and in turbulence.

i. Proof of Compliance: In addition to the requirements of § 25.21, the following special condition applies:

The flying qualities must be evaluated at the most unfavorable center of gravity position.

j. Longitudinal Control: (1) In lieu of the requirements of § 25.145(a) and 25.145(a)(1), the following special condition applies:

It must be possible—at any point between the trim speed for straight flight achievable by the automatic trim system and V_{min}—to pitch the nose downward, so that the acceleration to this selected trim speed is prompt, with the airplane trimmed for straight flight at the speed achievable by the automatic trim system.

(2) In lieu of the requirements of § 25.145(b)(6), the following special condition applies:

With power off, flaps extended and the airplane trimmed at 1.3 V_{SR1}, obtain and maintain airspeeds between V_{min} and either 1.6 V_{SR1} or V_{FE}, whichever is lower.

k. Airspeed Indicating System: (1) In lieu of the requirements of subsection 25.1323(c)(1), the following special condition applies:

V_{MO} to V_{min} with the flaps retracted.

(2) In lieu of the requirements of subsection 25.1323(c)(2), the following special condition applies:

V_{min} to V_{FE} with flaps in the landing position.

14. High Intensity Radiated Fields (HIRF) Protection

a. Protection from Unwanted Effects of High-intensity Radiated Fields:

Each electrical and electronic system which performs critical functions must be designed and installed to ensure that the operation and operational capabilities of these systems to perform critical functions are not adversely affected when the airplane is exposed to high intensity radiated fields external to the airplane.

b. For the purposes of this special condition, the following definition applies:

Critical Functions: Functions whose failure would contribute to or cause a failure condition which would prevent the continued safe flight and landing of the airplane.

15. Operation Without Normal Electrical Power

In lieu of the requirements of § 25.1351(d), the following special condition applies:

It must be demonstrated by test or combination of test and analysis that the airplane can continue safe flight and landing with inoperative normal engine and APU generator electrical power (*i.e.*, electrical power sources, excluding the battery and any other standby electrical sources). The airplane operation should be considered at the critical phase of flight and include the ability to restart the engines and maintain flight for the maximum diversion time capability being certified.

Issued in Renton, Washington, on March 29, 2005.

Kalene C. Yanamura,

Acting Manager, Transport Airplane Directorate, Aircraft Certification Service.

[FR Doc. 05–7320 Filed 4–11–05; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 71

[Docket No. FAA–2005–20574; Airspace Docket No. 05–ACE–11]

Proposed Establishment of Class E2 Airspace; and Modification of Class E5 Airspace; Chillicothe, MO

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking.

SUMMARY: This notice proposes to create a Class E surface area at Chillicotte, MO. It also proposes to modify the Class E5 airspace at Chillicothe, MO.

DATES: Comments for inclusion in the Rules Docket must be received on or before May 13, 2005.

ADDRESSES: Send comments on this proposal to the Docket Management System, U.S. Department of Transportation, Room Plaza 401, 400 Seventh Street, SW., Washington, DC 20590–0001. You must identify the docket number FAA–2005–20574/ Airspace Docket No. 05–ACE–11, at the beginning of your comments. You may also submit comments on the Internet at *http://dms.dot.gov*. You may review the public docket containing the proposal, any comments received, and any final disposition in person in the Dockets Office between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The Docket Office (telephone 1–800–647–5527) is on the plaza level of the Department of Transportation NASSIF Building at the above address.

FOR FURTHER INFORMATION CONTACT: Brenda Mumper, Air Traffic Division, Airspace Branch, ACE–520A, DOT Regional Headquarters Building, Federal Aviation Administration, 901 Locust, Kansas City, MO 64106; telephone (816) 329–2524.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested parties are invited to participate in this proposed rulemaking by submitting such written data, views, or arguments, as they may desire. Comments that provide the factual basis supporting the views and suggestions presented are particularly helpful in developing reasoned regulatory decisions on the proposal. Comments are specifically invited on the overall regulatory, aeronautical, economic, environmental, and energy-related aspects of the proposal. Communications should identify both docket numbers and be submitted in triplicate to the address listed above. Commenters wishing the FAA to acknowledge receipt of their comments on this notice must submit with those comments a self-addressed, stamped postcard on which the following statement is made: ''Comments to Docket No. FAA–2005–20574/Airspace Docket No. 05–ACE–11.'' The postcard will be date/time stamped and returned to the commenter.

Availability of NPRM's

An electronic copy of this document may be downloaded through the Internet at *http://dms.dot.gov*. Recently published rulemaking documents can also be accessed through the FAA's Web page at *http://www.faa.gov* or the Superintendent of Document's Web page at *http://www.access.gpo.gov/nara*.

Additionally, any person may obtain a copy of this notice by submitting a request to the Federal Aviation Administration, Office of Air Traffic Airspace Management, ATA–400, 800 Independence Avenue, SW., Washington, DC 20591, or by calling (202) 267–8783. Communications must identify both docket numbers for this notice. Persons interested in being placed on a mailing list for future NPRM's should contact the FAA's Office of Rulemaking (202) 267–9677, to request a copy of Advisory Circular No. 11–2A, Notice of Proposed Rulemaking Distribution System, which describes the application procedure.

The Proposal

This notice proposes to amend Part 71 of the Federal Aviation Regulations (14 CFR part 71) to establish Class E airspace designated as a surface area for an airport at Chillicothe, MO. Controlled airspace extending upward from the surface area for an airport at Chillicothe, MO. Controlled airspace extending upward from the surface of the earth is needed to contain aircraft executing instrument approach procedures to Chillicothe Municipal Airport. Weather observations would be provided by an Automatic Weather Observing/Reporting System (AWOS) and communications would be direct with Columbia Automated Flight Service Station.

This notice also proposes to revise the Class E airspace area extending upward from 700 feet above the surface at Chillicothe, MO. An examination of this Class E airspace area for Chillicothe, MO revealed noncompliance with FAA directives. This proposal would correct identified discrepancies by increasing the area from a 6.4-mile to a 6.9-mile radius of Chillicothe Municipal Airport, defining the extension to the airspace