NOTICE OF PROPOSED AMENDMENT (NPA) No 12/2006

DRAFT DECISION OF THE EXECUTIVE DIRECTOR
AMENDING
DECISION NO. 2003/16/RM OF THE EXECUTIVE DIRECTOR
of 14 November 2003 on
Certification Specifications, including airworthiness code and acceptable means of compliance, for Large Rotorcraft (CS-29)

Performance and Handling Qualities Requirements for Large Rotorcraft

TABLE OF CONTENTS.

A. EXPLANATORY NOTE

I. General

1. The purpose of this Notice of Proposed Amendment (NPA) is to envisage amending Decision 2003/16/RM of the Executive Director of 14 November 2003[1]. The scope of this rulemaking activity is described in more detail below.

2. The Agency is directly involved in the rule-shaping process. It assists the Commission in its executive tasks by preparing draft regulations, and amendments thereof, for the implementation of the Basic Regulation[2], which are adopted as "Opinions" (Article 14.1). It also adopts Certification Specifications, including Airworthiness Codes and Acceptable Means of Compliance and Guidance Material to be used in the certification process (Article 14.2).

3. This rulemaking activity is included in the Agency's rulemaking programme for completion in 2006. It implements the rulemaking task 27&29.001 "Performance & Handling Qualities".

4. The text of this NPA was originally developed by the Performance and Handling Qualities Harmonisation Working Group (PHQHWG), a group formed under ARAC on the recommendation of both FAA and the JAA Rotorcraft Steering Group (RSG). It was subsequently further developed by a Drafting Group and the Agency to conform to the rulemaking procedures.

5. The EASA Working Group met in October 2004 following closure of the comment period on JAA NPA 29-26, with the objective of reviewing comments received on the JAA NPA, refining the text of the proposals and to ensure co-ordination between EASA and the FAA.

6. This NPA is submitted for consultation of all interested parties in accordance with Article 43 of the Basic Regulation and Articles 5(3) and 6 of the EASA rulemaking procedure[3].

II. Consultation

7. To achieve optimal consultation, the Agency is publishing this draft decision of the Executive Director on its internet site. As the content of this NPA was the subject of a full worldwide consultation through JAA NPA 29-26, the transitional arrangements of Article 15 of the EASA rulemaking procedure apply. This allows for a shorter consultation period of six weeks instead of the standard 3 months and exempts this proposal from the requirement to produce full Regulatory Impact Assessment.

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[1] Decision No 2003/16/RM of the Executive Director of the Agency of 14.11.2003 on certification specifications for large rotorcraft (« CS-29 »)

[2] Regulation (EC) No 1592/2002 (OJ L 240, 7.9.2002, p.1). Regulation as last amended by Regulation (EC) No 1701/2003 (OJ L 27.9.2003, p. 5).

[3] Decision of the Management Board concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material ("rulemaking procedure"), EASA MB/7/03, 29.6.2003.

8. Comments on this proposal may be forwarded *(preferably by e-mail)*, using the attached comment form, to:

By e-mail: NPA@easa.europa.eu

By correspondence: Process Support
Rulemaking Directorate
EASA
Ref: NPA 12-2006
Postfach 10 12 53
D-50452 Cologne
Germany

9. Comments should be received by the Agency before 27 September 2006. If received after this deadline they might not be treated. Comments may not be considered if the form provided for this purpose is not used.

III. Comment response document

10. All comments received in time will be responded to and incorporated in a comment response document (CRD). This may contain a list of all persons and/or organisations that have provided comments. The CRD will be widely available on the Agency's website.

11. The review of comments will be made by the Agency unless the comments are of such a nature that they necessitate the establishment of a group.

IV. Content of the draft decision

12. This NPA contains JAA NPAs 29-26 "Performance and Handling Qualities Requirements for Large Rotorcraft" which had followed and completed the JAA consultation process:

Section B of this EASA NPA is structured with the follows sub-sections:

I. Explanatory Note - Describing the development process and explaining the contents of the proposal.

II. Proposals - The actual proposed amendments.

III. Original JAA NPA justification - The proposals were already circulated for comments as a JAA NPA. This part contains the justification for the JAA NPA.

IV. JAA NPA Comment Response Document - This part summarizes the comments made on the JAA NPA and the responses to those comments.

B. JAA NPA 29-26: Performance And Handling Qualities Requirements For Large Rotorcraft

I) Explanatory Note

1. For practical reasons, the initial issue of CS-29 was based upon JAR-29 at Amendment 3. During the transposition of airworthiness JARs into Certification Specifications, however, the rulemaking activities under the JAA system where not stopped and significant rulemaking proposals have since been developed. In order to assure a smooth transition from JAA to EASA, the Agency has committed itself to continue as much as possible the JAA rulemaking activities. It has therefore included most of the JAA rulemaking programme into its own plans. This EASA NPA is a result of this commitment and is based on JAA NPA 29-26 which was circulated for comments from 1 May 2003 till 1 August 2003.

2. This NPA proposes changes to the airworthiness requirements for large rotorcraft, CS-29, due to technological advances in design and operational trends in large rotorcraft performance and handling qualities. It is issued in conjunction with NPA 11/2006, which makes related changes in CS-27. The changes would enhance the safety standards for performance and handling qualities to reflect the evolution of rotorcraft capabilities.

II) Paragraphs Affected

CS 29.25; CS 29.143; CS 29.173; CS 29.175; CS 29.177; CS 29.1587; Appendix B Paragraphs V and VII.

AMC 29.25; AMC 29.143; AMC 29.173; AMC 29.175; AMC 29.177; AMC 29.1587 and AMC 29 Appendix B.

III) Proposals

The text of the amendment is arranged to show deleted text, new text or a new paragraph as shown below:

1. ~~Text to be deleted is shown with a line through it.~~
2. New text to be inserted is highlighted with grey shading.
3. New paragraph or parts are not highlighted with grey shading, but are accompanied by the following box text:

Insert new paragraph / part *(Include N° and title)*, or replace existing paragraph/ part

4. ….
   Indicates that remaining text is unchanged in front of or following the reflected amendment.

….

Book 1 AIRWORTHINESS CODE
SUBPART B - FLIGHT

1) Amend CS 29.25 by adding sub-paragraph (a)(4) to read as follows:

CS 29.25 Weight Limits

(a) ….

(4) For Category B rotorcraft with 9 or less passenger seats, the maximum weight, altitude, and temperature at which the rotorcraft can safely operate near the ground with the maximum wind velocity determined under CS 29.143(c) and may include other demonstrated wind velocities and azimuths. The operating envelopes must be stated in the Limitations section of the Rotorcraft Flight Manual.

….

2) Amend CS 29.143, by removing the word "Glide" and adding the word "Autorotation" in its place in sub-paragraph (a)(2)(v); redesignating sub-paragraphs (d) and (e) as sub-paragraphs (e) and (f) respectively; revising sub-paragraph (c); and adding a new sub-paragraph (d) to read as follows:

CS 29.143 Controllability and Manoeuvrability

(a) ….

(2) ….

(v) ~~Glide~~ Autorotation; and

….

(c) ~~A wind velocity of not less than~~ Wind velocities from zero to at least 31 km/h (17 knots), from all azimuths, must be established in which the rotorcraft can be operated without loss of control on or near the ground in any manoeuvre appropriate to the type (such as crosswind take-offs, sideward flight, and rearward flight), with:

(1) Critical Weight;

(2) Critical center of gravity; ~~and~~

(3) Critical rotor rpm; and

(4) Altitude from standards sea-level conditions to the maximum take-off and landing altitude capability of the rotorcraft.

(d) Wind velocities from zero to at least 31 km/h (17 knots), from all azimuths, must be established in which the rotorcraft can be operated without loss of control out-of-ground effect, with:

(1) Weight selected by the applicant;

(2) Critical center of gravity;

(3) Rotor rpm selected by the applicant; and

(4) Altitude, from standard sea-level conditions to the maximum take-off and landing altitude capability of the rotorcraft.

(~~d~~e) ….

(~~e~~f) ….

3) Amend CS 29.173 by removing the words "a speed" in the two places in sub-paragraph (a) and adding the words "an airspeed" in both their places; deleting sub-paragraph (c); and revising sub-paragraph (b) to read as follows:

CS 29.173 Static Longitudinal Stability

(a) The longitudinal control must be designed so that a rearward movement of the control is necessary to obtain ~~a speed~~ an airspeed less than the trim speed, and a forward movement of the control is necessary to obtain ~~a speed~~ an airspeed more than the trim speed.

(b) Throughout the full range of altitude for which certification is requested, with the throttle and collective pitch held constant during the manoeuvres specified in CS 29.175(a) ~~to (c)~~ through (d), the slope of the control position versus airspeed curve must be positive ~~throughout the full range of altitude for which certification is requested~~. However, in limited flight conditions or modes of operation determined by the Agency to be acceptable, the slope of the control position versus airspeed curve may be neutral or negative if the rotorcraft possesses flight characteristics that allow the pilot to maintain airspeed within ±9 km/h (±5 knots) of the desired trim airspeed without exceptional piloting skill or alertness.

~~(c) During the manoeuvre specified in CS 29.175(d), the longitudinal control position versus speed curve may have a negative slope within the specified speed range if the negative motion is not greater than 10% of total control travel.~~

4) Amend CS 29.175 by deleting sub-paragraph (d); revising the introductory text in sub-paragraphs (a) and (b); revising sub-paragraphs (b)(3) and (b)(5); redesignating sub-paragraphs (c) as (d) and revising redesignated sub-paragraph (d); and adding a new sub-paragraph (c) to read as follows:

CS 29.175 Demonstration of Static Longitudinal Stability

(a) *Climb*. Static longitudinal stability must be shown in the climb condition at speeds from ~~0.85 Vy, or 28 km/h (15 knots) below Vy whichever is less, or 1.2 Vy, or 28 km/h (15 knots) above Vy, whichever is greater~~ Vy - 19 km/h (10 knots) to Vy + 19 km/h (10 knots), with:

….

(b) *Cruise*. Static longitudinal stability must be shown in the cruise condition at speeds from 0.8 V_{NE} - 19 km/h (10 knots) to 0.8 V_{NE} + 19 km/h (10 knots) or, if V_H is less than 0.8 V_{NE}, from V_H - 19 km/h (10 knots) to V_H + 19 km/h (10 knots) ~~0.7 V_H or 0.7 V_{NE}, whichever is less, to 1.1 V_H or 1.1 V_{NE}, whichever is less~~, with:

(1) ….

(2) ….

(3) Power for level flight at 0.8 V_{NE} or V_H ~~0.9 V_H or 0.9 V_{NE}~~, whichever is less;

(4) ….

(5) The rotorcraft trimmed at 0.8 V_{NE} or V_H~~0.9 V_H or 0.9 V_{NE}~~, whichever is less.

(c) *V_{NE}*. Static longitudinal stability must be shown at speeds from V_{NE} – 37 km/h (20 knots) to V_{NE} with:

(1) Critical weight;

(2) Critical center of gravity;

(3) Power required for level flight at V_{NE} – 19 km/h (10 knots) or maximum continuous power, whichever is less;

(4) The landing gear retracted; and

(5) The rotorcraft trimmed at V_{NE} – 19 km/h (10 knots).

(~~c~~d) *Autorotation*. Static longitudinal stability must be shown in autorotation at ~~airspeeds from 0.5 times the speed for minimum rate of descent, or 0.5 times the maximum range glide speed for Category A rotorcraft, to V_{NE} or to 1.1 V_{NE} (power-off) if V_{NE} (power-off) is established under CS 29.1505 (c), and with:~~

~~(1) Critical weight;~~

~~(2) Critical centre of gravity;~~

~~(3) Power off;~~

~~(4) The landing gear:~~

~~(i) Retracted; and~~

~~(ii) Extended; and~~

~~(5) The rotorcraft trimmed at appropriate speeds found necessary by the Agency to demonstrate stability throughout the prescribed speed range.~~

(1) Airspeeds from the minimum rate of descent airspeed – 19 km/h (10 knots) to the minimum rate of descent airspeed + 19 km/h (10 knots), with:

(i) Critical weight;

(ii) Critical center of gravity;

(iii) The landing gear extended; and

(iv) The rotorcraft trimmed at the minimum rate of descent airspeed.

(2) Airspeeds from the best angle-of-glide airspeed – 19 km/h (10 knots) to the best angle-of-glide airspeed + 19 km/h (10 knots), with:

(i) Critical weight;

(ii) Critical center of gravity;

(i) The landing gear retracted; and

(ii) The rotorcraft trimmed at the best angle-of-glide airspeed.

~~(d) *Hovering*. For helicopters, the longitudinal cyclic control must operate with the sense, direction of motion, and position as prescribed in CS 29.173 between the maximum approved rearward speed and a forward speed of 31 km/h (17 knots) with:~~

~~(1) Critical weight;~~

~~(2) Critical centre of gravity;~~

~~(3) Power required to maintain an approximate constant height in ground effect;~~

~~(4) The landing gear extended; and~~

~~(5) The helicopter trimmed for hovering.~~

5) Revise CS 29.177 to read as follows:

CS 29.177 Static Directional Stability

~~Static directional stability must be positive with throttle and collective controls held constant at the trim conditions specified in CS 29.175(a), (b), and (c). Sideslip angle must increase steadily with directional control deflection for sideslip angles up to ± 10° from trim. Sufficient cues must accompany sideslip to alert the pilot when approaching sideslip limits.~~

(a) The directional controls must operate in such a manner that the sense and direction of motion of the rotorcraft following control displacement are in the direction of the pedal motion with throttle and collective controls held constant at the trim conditions specified in CS 29.175 (a), (b), (c) and (d). Sideslip angles must increase with steadily increasing directional control deflection for sideslip angles up to the lesser of:
   (1) ±25 degrees from trim at a speed of 28 km/h (15 knots) less than the speed for minimum rate of descent varying linearly to ±10 degrees from trim at V_{NE};
   (2) The steady state sideslip angles established by CS 29.351;
   (3) A sideslip angle selected by the applicant which corresponds to a sideforce of at least 0.1g; or,
   (4) The sideslip angle attained by maximum directional control input.

(b) Sufficient cues must accompany the sideslip to alert the pilot when the aircraft is approaching the sideslip limits.

(c) During the manoeuvre specified in sub-paragraph (a) of this paragraph, the sideslip angle versus directional control position curve may have a negative slope within a small range of angles around trim, provided the desired heading can be maintained without exceptional piloting skill or alertness.

Book 1 AIRWORTHINESS CODE
SUBPART G - OPERATING LIMITATIONS AND INFORMATION

6) Amend CS 29.1587 by revising sub-paragraph (a)(7) and (b)(8) to read as follows:

CS 29.1587 Performance information

….

(a) ….
   (7) Out-of-ground effect hover performance determined under CS 29.49 and the maximum ~~safe wind demonstrated under the ambient conditions for data presented.~~ weight for each altitude and temperature condition at which the rotorcraft can safely hover in-ground effect and out-of-ground effect in winds of not less than 17 knots from all azimuths. These data must be clearly referenced to the appropriate hover charts.

(b) ….
   (8) Out-of-ground effect hover performance determined under CS 29.49 and the maximum safe wind demonstrated under the ambient conditions for data presented. In addition, the maximum weight for each altitude and

temperature condition at which the rotorcraft can safely hover in-ground effect and out-of-ground effect in winds of not less than 31 km/h (17 knots) from all azimuths. This data must be clearly referenced to the appropriate hover charts; and

….

Book 1 AIRWORTHINESS CODE
APPENDIX B – AIRWORTHINESS CRITERIA FOR HELICOPTER INSTRUMENT FLIGHT

7) Amend Appendix B to CS-29 - Airworthiness Criteria for Helicopter Instrument Flight by revising sub-paragraph (V)(b) by removing the word "cycle" and adding the correct word "cyclic" in its place; and revising sub-paragraphs V(a) and VII(a) to read as follows:

Appendix B to CS-29--Airworthiness Criteria for Helicopter Instrument Flight

….

V. *Static lateral-directional stability*

(a) Static directional stability must be positive throughout the approved ranges of airspeed, power, and vertical speed. In straight~~,~~ and steady sideslips up to ±10° from trim, directional control position must increase ~~in approximately constant proportion to angle of sideslip.~~ without discontinuity with the angle of sideslip, except for a small range of sideslip angles around trim. At greater angles up to the maximum sideslip angle appropriate to the type, increased directional control position must produce an increased angle of sideslip. It must be possible to maintain balanced flight without exceptional pilot skill or alertness.

(b) During sideslips up to ± 10° from trim throughout the approved ranges of airspeed, power, and vertical speed there must be no negative dihedral stability perceptible to the pilot through lateral control motion or force. Longitudinal ~~cycle~~ cyclic movement with sideslip must not be excessive.

….

VII. *Stability Augmentation System (SAS)*

(a) If a SAS is used, the reliability of the SAS must be related to the effects of its failure. ~~The occurrence of any failure condition which~~ Any SAS failure that would prevent continued safe flight and landing must be extremely improbable. It must be shown that for any failure ~~condition~~ of the SAS that is not shown to be extremely improbable:

(1) The helicopter ~~must be~~ is safely controllable ~~and capable of prolonged instrument flight without undue pilot effort. Additional unrelated probable failures affecting the control system must be considered~~ when the failure or malfunction occurs at any speed or altitude within the approved IFR operating limitations; and

(2) ~~The flight characteristics requirements in Subpart B of CS-29 must be met throughout a practical flight envelope.~~
The overall flight characteristics of the helicopter allow for prolonged instrument flight without undue pilot effort. Additional unrelated

probable failures affecting the control system must be considered. In addition:

(i) The controllability and manoeuvrability requirements in Subpart B of CS-29 must be met throughout a practical flight envelope;

(ii) The flight control, trim, and dynamic stability characteristics must not be impaired below a level needed to allow continued safe flight and landing;

(iii) For Category A helicopters, the dynamic stability requirements of Subpart B of CS-29 must also be met throughout a practical flight envelope; and

(iv) The static longitudinal and static directional stability requirements of Subpart B of CS-29 must be met throughout a practical flight envelope.

….

Book 2 ACCEPTABLE MEANS OF COMPLIANCE
SUBPART B - FLIGHT

8) Proposed AMC material

Proposed AMC material related to the above rule changes is contained in Appendix A of this NPA. This material is considered to be a part of this NPA, and is published for comment in accordance with EASA procedures. In due course, it will be circulated for comment to interested parties in the USA by the FAA. The material (amended as necessary as a result of comments received in response to this NPA and the FAA circulation) will be published in the future in an update to FAA AC 29-2C and will then undergo a further formal consultation process in accordance with EASA procdures before adoption as AMC to CS-29. It is not intended to published the amended AMC in Book 2 of CS-29 directly.

IV Original JAA NPA Proposals Justification

a) Background

Due to technological advances in design and operational trends in normal and transport rotorcraft performance and handling qualities, the FAA and EASA are proposing new and revised airworthiness standards. Some of the current Part 29/Part 29 and CS-29/CS-29 regulations are outdated and do not reflect, in some cases, safety levels attainable by modern rotorcraft, and FAA and EASA approved equivalent level of safety findings.

b) History

It has been approximately 20 years since the last major promulgation of rules that address the performance and handling qualities of rotorcraft (FAA Amendments 29-24 and 29-21, 49 FR 44433 and 49 FR 44436, November 6, 1984). Since then, the FAA has developed policy and procedures that address certain aspects of these requirements to make the Part 27 and 29 rules workable within the framework of later rotorcraft designs and operational needs. In addition, most manufacturers have routinely exceeded some of the minimum performance requirements in Part 27 and 29 of the Code of Federal Regulation (CFR) in order to meet customer needs.

After the publication of the first issue of the Joint Aviation Regulations (JAR) for Parts 27 and 29, which closely mirrored Federal Aviation Regulation (FAR) Part 29 at amendment 31 and FAR Part 27 at amendment 27, the European Joint Aviation Authorities (JAA) Helicopter Airworthiness Study Group (HASG) and the FAA agreed to form a specialist sub-group to review proposals on flight matters that were not incorporated during promulgation of the JAR. This sub-group consisted of representatives of the JAA, Association of European des Constructeurs de Material Aerospatiale (AECMA), Aerospace Industries Association of America (AIA), and the FAA. The sub-group first met in January 1994 and presented their findings to the HASG and the FAA in May 1994.

<u>Aviation Rulemaking Advisory Committee (ARAC) Involvement</u>

The FAA announced the formation of the Performance and Handling Qualities Requirements Harmonization Working Group (PHQHWG) in the Federal Register (60 FR 4220, January 20, 1995) to act on the recommendation presented to the HASG and the FAA by the specialist sub-group. The PHQHWG was charged with recommending to ARAC new or revised standards for flight-test procedures and requirements. The PHQHWG was tasked to “Review Title 14 Code of Federal Regulations Part 27 and Appendix B, and Part 29 and Appendix B, and supporting policy and guidance material for the purpose of determining the course of action to be taken for rulemaking and/or policy relative to the issue of harmonizing performance and handling qualities requirements.”

The PHQHWG included representatives that expressed an interest by responding to the notice the FAA published in the Federal Register. The PHQHWG included representatives from the AIA, the AECMA, the European JAA, Transport Canada, and the FAA Rotorcraft Directorate. Additionally, the PHQHWG consulted representatives from the manufacturers of small rotorcraft. This broad participation is consistent with the FAA policy to involve all known interested parties as early as practicable in the rulemaking process. The PHQHWG first met in March 1995 and has subsequently met nine times.

c) Discussion of Proposals

General

Using the report submitted to the HASG as a starting point, the PHQHWG agreed there was a need to update the rotorcraft performance and handling qualities standards. As the meetings progressed, the group evaluated additional internally generated proposals to change the performance and handling qualities requirements that were believed to be pertinent to the group's task. These proposals were either accepted or rejected on their merits and by consensus of the group. The group also came to a common understanding of some acceptable methods of compliance for the proposals as well as the current requirements, and appropriate Advisory Circular material was developed concurrently with this proposed rule.

There was much discussion in the working group about the evolution of the Appendix B Instrument Flight Rules (IFR) flight characteristic requirements. Early IFR helicopters were developed using relatively simple analog systems consisting primarily of two or three-axis rate damping with, in some cases, attitude or heading hold features. Today, there are complex digital automatic flight control systems or flight management systems available with highly redundant system architectures. These highly complex systems may have enough redundancy or compensating features to allow system operating characteristics as well as acceptable aircraft handling qualities to be maintained in degraded modes of operation. Due to the difficulty of adequately addressing all the various elements of these complex systems and the associated flight characteristics, it was decided not to initiate Parts 27 and 29 rulemaking addressing these complex systems at this time, and that the certification requirements for these types of complex systems would be handled on a case-by-case basis within the current regulatory structure.

Proposal 1 - CS 29.25 Weight Limits

FAA Amendments 29-21 (48 FR 4374, January 31, 1983) and 29-24 (49 FR 44422, November 6, 1984) granted relief to certain operating limitations for Category B certificated rotorcraft with a passenger seating capacity of nine or less. These amendments stated that, for these rotorcraft, the hover controllability requirements of 29.143(c) should not be operating limitations. However, these amendments did not specifically include language that would assure appropriate limitations are provided in the RFM. The FAA has determined that it is necessary to establish appropriate limitations to ensure safe aircraft operations within the demonstrated performance envelope of the helicopter. This proposed rule would amend CS 29.25 by requiring that the maximum weights, altitudes, and temperatures demonstrated for compliance with CS 29.143(c), which may also include limited wind azimuths, become operating limitations.

Proposal 2 - CS 29.143 Controllability and Manoeuvrability

The proposed rule would revise CS 29.143(a)(2)(v) to replace the word "glide" with "autorotation". This minor change does not affect the method of compliance but states the required flight condition in more traditional rotorcraft terminology.

Sub-paragraph (c) in 29.143 was rewritten to clarify that controllability on or near the ground must be demonstrated throughout a range of speeds from zero to at least 17 knots. The current Part 29 rule could lead some applicants to the conclusion that only a 17-knots controllability data point must be considered when, in fact, the most critical speed may be less than 17 knots. This proposed rule would add sub-paragraph (c)(4) to CS 29.143 to explicitly require that controllability be determined for wind velocities up to at least 17 knots, at an altitude from standard sea level conditions to the maximum take-off and landing altitude capability of the rotorcraft. This proposed rule reflects current practice.

This proposed rule would add sub-paragraph (d) to CS 29.143(d) to require that controllability be determined for wind velocities up to at least 17 knots OGE at weights selected by the applicant. Today, operations in support of law enforcement, search and rescue, and media coverage will often be performed in such a manner that the rotorcraft performance in rearward or quartering flight are of a safety concern.

Proposal 3 - CS 29.173 Static Longitudinal Stability

A minor clarification change is made to sub-paragraph (a) in CS 29.173 to change "a speed" to "an airspeed". Sub-paragraph (b) would be combined with sub-paragraph (c) in CS 29.173 to allow neutral or negative static stability in limited areas of the flight envelope, if adequate compensating characteristics are present and the pilot can maintain airspeed within 5 knots of the desired trim speed during the conditions specified in CS 29.175.

The ability to maintain appropriate airspeed control during other flight conditions would be tested under CS 29.143. Neutral or negative static longitudinal stability in limited flight domains has been allowed for numerous rotorcraft under equivalent level of safety findings when adequate compensating features have been present. The satisfactory experience gained with these equivalent safety findings has provided the basis for the proposed change. Historically, these limited flight domains have been encountered at the aft limit of the weight/CG envelopes during descent, or autorotation, or climb stability demonstrations. Historically, negative longitudinal control position gradient versus airspeed has generally been no more than 2 to 3 percent of the total control travel.

Additionally, these proposals would delete the CS 29.173(c) requirement relating to the hover demonstration specified in the current CS 29.175(d). See additional discussion at CS 29.175.

Proposal 4 - CS 29.175 Demonstration of Static Longitudinal Stability

The proposals in sub-paragraphs (a) and (b) would decrease the speed range about the specified trim speeds to more representative values than are currently contained in the rule. A new sub-paragraph (c) would require an additional level flight demonstration point. The current sub-paragraph (c) would be redesignated as sub-paragraph (d), and the current sub-paragraph (d) containing the hover demonstration point would be deleted.

Some current requirements in 29.175 are not appropriate for the newer generation of rotorcraft. When the current regulation was written, the cruise demonstration of 0.7 V_H to 1.1 V_H typically represented approximately a 30-knots speed variation for helicopters. Now, the cruise demonstration, between the maximum and the minimum speeds (1.1 V_H and 0.7 V_H), can encompass such a large speed range that the trim point and end points actually represent completely different flight regimes rather than perturbations about a trim point in a given flight regime. For some modern helicopters with a never-exceed speed (V_{NE}) in excess of 150 knots, the speed variation for the cruise demonstration could approach 60 knots, which makes the manoeuvre difficult to perform and does not represent a normal variation about a trim point. These proposals would reduce the speed range for the cruise demonstration to ±10 knots about the specified trim point.

An additional demonstration point at a trim airspeed of V_{NE} -10 knots is proposed to maintain the data coverage over a speed range similar to that contained in the current 29.175(b).

For the demonstration in autorotation, the current requirement specifies that the rotorcraft be trimmed at speeds found necessary by the Aministrator/Agency to demonstrate stability. The proposed rule would specify typically used trim speeds--minimum rate of descent and best angle of glide airspeeds--for the stability demonstration. The conditions required to develop these airspeeds are currently stated in CS 29.67 and CS 29.71. The proposed rule would also limit the speed range for demonstration to ±10 knots from the trim points. The proposed new trim points and speed ranges may not encompass V_{NE} in autorotation as explicitly required in the current CS 29.175. The proposed trim points, however, provide data at the most likely operating conditions. Autorotation at V_{NE} is typically a transient and dynamic flight condition that often places high workload demands on the pilot due primarily to maintaining rotor speed control and the desired flight path. During these dynamic conditions of autorotation at V_{NE} that are evaluated under CS 29.143, longitudinal static stability is less important than in the more stabilized conditions as proposed.

This proposed rule would delete the hover demonstration requirements of the current CS 29.175(d). The requirement to demonstrate static longitudinal stability in a hover has been shown to be unnecessary since the proper sense and motion of controls during hover are evaluated as part of other required tests. The controllability and maneuverability requirements of CS 29.143(a) and (c) adequately address the safety considerations during hover flight.

Proposal 5 - CS 29.177 Static Directional Stability

This proposed rule would revise CS 29.177 to change the demonstration criteria for static directional stability. The current Part 29 rule contains general language and relies primarily on a pilot's subjective judgement that he is approaching the sideslip limit, which renders it difficult to make compliance determinations due to a lack of objective test criteria. The proposals would provide further objective criteria over which the directional stability characteristics of rotorcraft are evaluated. The proposed rule also allows for a minimal amount of negative stability around each trim point. This recognizes the characteristics exhibited by many rotorcraft that have some airflow blockage of the vertical fin or tail rotor at small sideslip angles. This minimal amount of negative stability does not materially affect the overall safety considerations of static directional stability.

Proposal 6 - CS 29.1587 Performance Information

The proposal to revise CS 29.1587 would require new performance information be included in the RFM. 29.1587(a)(7) and 29.1587(b)(8) would be amended to include the requirements for presenting maximum safe winds for OGE operations established in the proposed CS 29.143.

Proposal 7 - Appendix B - Airworthiness Criteria for Helicopter Instrument Flight

The proposed rule would amend sub-paragraph (V)(a) to allow for a minimal amount of neutral or negative stability around trim and would replace the words "in approximately constant proportion", with “without discontinuity”. This is intended to be a more objective standard that does not allow irregularity in the aircraft response to control input. Also, this is consistent with the change that is proposed in CS 29.177 of the VFR requirements that proposes more specific criteria over which to evaluate stability characteristics, but also recognizes a minimal amount of negative stability. Additionally, the proposed sub-paragraph would require that the pilot must be able to maintain the desired heading without exceptional skill or alertness. Lastly, in sub-paragraph (V)(b) - the word "cycle" is replaced by the correct word, "cyclic".

This proposed rule would also revise sub-paragraphs VII(a)(1) and VII(a)(2). This revision reorganizes the sub-paragraphs to further specify the standards that must be met when considering a stability augmentation system failure.

Proposal 8 - Advisory Material

A substantial package of advisory material was developed by the ARAC Working Group at the same time as the above proposals and is contained in Appendix A of this NPA. This will be made available by the FAA by notice in the Federal Register. In due course, when the material is published in an update to FAA AC 29-2C, an NPA will be raised to adopt the changes in Book 2 of CS-29.

d) Effects on Harmonisation

Harmonisation of CS-29 with FAR Part 29 will be maintained by identical amendments to FAR Part 29 which are being proposed by the FAA concurrently with this NPA.

e) Economic Impact Evaluation Assessment

A complete economic evaluation assessment has been undertaken as part of the FAA NPRM process. In summary the FAA has determined in conducting this assessment that the NPRM has benefits which justify its costs and that the NPRM is not a “significant regulatory action” as defined in Executive Order 12866 and is not “significant” as defined in the Department of Transportation's regulatory policies and procedures. The FAA has concluded that the industry will incur almost all of the cost expected to accrue from implementation of the proposed NPRM but that the total estimated cost is not large.

The FAA has determined that the proposed changes to 29.143, 29.175 and 29.177 would incur additional costs for manufacturers but that 29.25, 29.1587 and Appendix B would impose no substantive costs on the manufacturers and 29.173, on static longitudinal stability, would be cost relieving to the manufacturers.

This proposed rule overall is designed to improve aviation safety. Some of the proposed changes clarify existing language and adopt existing practices while others harmonize the United States Federal Aviation Regulations with the European airworthiness standards. Other proposals would require manufacturers to update the rotorcraft performance and handling quality standards for new rotorcraft certification. One specific group of provisions, 29.143 on controllability and manoeuvrability, should have a more positive effect on aviation safety by explicitly requiring that controllability be determined for wind velocities up to at least 17 knots, at an altitude from standard sea level conditions to the maximum take-off and landing altitude capability of the rotorcraft. Controllability testing is also conducted to ensure that the helicopter can hover and manoeuvre with cross winds and tail winds. The proposed 29.143 would also require manufacturers to obtain out-of-ground effect (OGE) controllability data. Obtaining these data would be beneficial and enhance safety because many helicopter operators utilize their helicopters in the low-speed, out-of ground-effect flight regime.

Based upon the low compliance cost coupled with the potential safety benefits, the FAA concludes, and EASA concurs, that the benefits of the proposed rule changes justify the costs of the proposed changes to FAR Part 29 and CS-29.

V JAA NPA Comment-Response Document

In May 2003 the JAA published NPA 29-26 for public comment. The comments received (see following Table) were not dispositioned at the time, as it was felt that it would be more efficient to await the outcome of the FAA NPRM on the same subject, and to disposition comments jointly at the Working Group level.

While EASA retains this basic view, comments reviewed by the JAA as a result of NPA 29-26 have ungone a limited review and (as far as they were accepted and are still applicable) have been incorporated into this NPA. Where no response is given, comments are being held in abeyance for future disposition along with comments received on this NPA and the associated FAA NPRM.

Paragraph	Comment	Response
29.25 (a)(4)	The new NPA text for JAR 29.25(a)(4) includes reference to "maximum … **temperature**". It is understood that the text is performance/handling driven, but why is "temperature" not mentioned under all the other existing sub-paragraphs of JAR 29.25 (a) and (b). Is this automatically assumed as included under WAT discussions and/or perhaps a minimum change was being sought elsewhere ?	
29.175(d)	(1) (iv) The rotorcraft trimmed at the minimum rate of descent **airspeed** (2) (iv) The rotorcraft trimmed at the best angle-of-glide **airspeed**	Accepted and incorporated in this NPA
29.177	Delete current NPA text on JAR 29.177(a)(4).	
29.177(a)(2)	Change the current NPA text for JAR 29.177(a)(2) from "**The limit sideslip angle defined under JAR 29.351**"; and replace it with new text : "**The steady state sideslip angles resulting from compliance with JAR 29.351**";	Partially Accepted. Proposed wording is further amended and incorporated in this NPA.
AC 29.1587B	(iv) (K) Part in brakets "(25-foot for VTOL operations from an elevated heliport)" should be deleted	Accepted.

Appendix A

Advisory Material

*(**Note** – While this AMC material is considered to be a part of this NPA, and is published for comment in accordance with EASA procedures, it is not intended to publish this material in Book 2 of CS-29 directly. In due course, the material (amended as necessary as a result of comments received in response to this NPA and separate FAA consultation), will be published in an update to FAA AC 29-2C and will then undergo a further formal consultation process in accordance with EASA procedures before adoption by reference in Book 2 of CS-29).*

Proposal 8.1

Amend AC 29.25 by the addition of:

AC 29.25A. § 29.25 (Amendment 29-XX) WEIGHT LIMITS.
a. Explanation. Amendment 29-XX added a new paragraph (a)(4) which requires that the controllability demonstrated under FAR 29.143(c) be included in a limitation in the Rotorcraft Flight Manual. The change allows, in addition to the 17 knot controllability requirements, the applicant to provide additional controllability information within an applicant selected limited azimuth range if the rotorcraft is certified with nine or less passenger seats. This effectively allows increased weights within this limited range. Amendments 29-21 and 29-24 allowed for this relief and subsequent regulatory policy implemented the requirement for these limitations as is now codified. The explanation regarding the relief for presentation of hover controllability limits in paragraph AC29.143(a)(2)(ii) (Amendment 29-24) is superceded by this change.
b. Procedures. The policy material pertaining to the procedures outlined in this section remain in effect.

Proposal 8.2

Amend AC 29.143 by the addition of:

AC 29.143A. § 29.143 (Amendment 29-XX) Controllability and Maneuverability.
a. Explanation.
Amendment 29-XX made a minor clarification to assure that IGE controllability is demonstrated at all speeds up to 17 knots. In many rotorcraft, the entry into the regime of translational lift requires the most power, thus potentially causing control difficulties, and frequently occurs at speeds less than 17 knots. The amendment also requires that OGE controllability be determined up to a speed of at least 17 knots at a weight selected by the applicant. The amendment clarifies the intent of Amendment 29-21 and Amendment 29-24 with respect to removing hover controllability as a limit. 29.25 is amended to assure that appropriate weight limitations be incorporated into the RFM when the relieving provisions of the previous amendments are adopted by an applicant. The previous amendment and associated AC material indicated that certain Category B rotorcraft were relieved from providing, as a limitation, the conditions of 29.143(c). In practice, the 17 knot controllability requirement was still treated as a limitation, but, as indicated in the amended 29.25, additional limits could be included, when demonstrated, that allowed for something other than 17 knot all azimuth controllability. The established weight, altitude, and temperature charts, including any associated wind constraints, could be contained in the performance

section of the flight manual when the appropriate reference to those charts were included in the limitations section of the RFM. In addition, in practice the relief of amendments 29-21 and 29-24 were only intended for those category B rotorcraft with nine or less passenger seats.

All the policy material pertaining to this section remains in effect with the following changes:

(1) This regulation contains the basic controllability requirements for transport rotorcraft. It also specifies a minimum maneuvering capability for required conditions of flight. The general requirements for control and for maneuverability are summarized in § 29.143(a) which is largely self-explanatory. The hover condition is not specifically addressed in § 29.143(a)(2) so that the general requirement may remain applicable to all rotorcraft types, including those without hover capability. For rotorcraft, the hover condition clearly applies under "any maneuver appropriate to the type."

(2) Paragraphs (b) through (e), § 29.143, include more specific flight conditions and highlight the typical areas of concern during a flight test program.

(i) Section 29.143(b) specifies flight at V_{NE} with critical weight, center of gravity (CG), rotor RPM, and power. Adequate cyclic authority must remain at V_{NE} for nose down pitching of the rotorcraft and for adequate roll control. Nose down pitching capability is needed for control of gust response and to allow necessary flight path changes in a nose down direction. Roll control is needed for gust response and for normal maneuvering of the aircraft. In the past, 10 percent control margin has been applied as an appropriate minimum control standard. The required amount of control power, however, has very little to do with any fixed percentage of remaining control travel. There are foreseeable designs for which 5 percent remaining is adequate and others for which 20 percent may not be enough. The key is, can the remaining longitudinal control travel at V_{NE} generate a clearly positive nose down pitching moment, and will the remaining lateral travel allow at least 30° banked turns at reasonable roll rates? Moderate lateral control reversals should be included in this evaluation and since available roll control can diminish with sideslip, reasonable out of trim conditions (directionally) should be investigated. This "control remaining" philosophy must also be applied for other flight conditions specified in this section.

(ii) Section 29.143(c) and (d) requires a minimum ~~17-knot~~ control capability for hover and take-off in winds from zero to at least 17 knots from any azimuth. Control capability in wind from zero to at least 17 knots must also be shown for any other appropriate maneuver near the ground such as rolling take-offs for wheeled rotorcraft. These requirements must be met at all altitudes approved for take-off and landing. On ~~rotorcraft~~ helicopters incorporating a tail rotor, efficiency of the tail rotor decreases with altitude so that a given sideward flight condition requires more pedal deflection, a higher tail rotor blade angle, and more horsepower. Hence, directional capability in sideward flight (or at critical wind azimuth) is most critical during testing at a high altitude site. Prior to Amendment 29-24, hover controllability, height-velocity, and hover performance were the three regulatory requirements that ordinarily determined the shape of the limiting weight-altitude-temperature (WAT) curve for take-off and landing. For Category A performance rotorcraft operations, of course, the one-engine-inoperative climb performance requirements may also influence the WAT limit curve. Amendment 29-24 allows, under certain conditions, the deletion of any hover controllability condition determined under Section 29.143(c) from becoming an operating limitation. Section 29.1587 of Amendment 29-24 provides a means wherein Category B certificated rotorcraft (in accordance with the requirements of 29.1, effective with

Amendment 29-21) may not be limited by the hover controllability requirements of 29.143(c). Section 29.1583(g) requirements for Category A certificated rotorcraft are unchanged from past regulatory requirements in that if the hover controllability requirements of 29.143(c) result in the most restrictive envelope it will be published as an operating limitation. Section 29.1587(b) provides a means wherein Category B certificated rotorcraft, as defined in FAR 29.1, may not be restricted in its utilization. It allows such rotorcraft to publish the maximum take-off and landing capabilities of the rotorcraft, provided something other than the 17 knot hover controllability requirement is not limiting. This may be zero wind IGE hover performance or any other performance the applicant elects to use if the maximum safe wind for operations near the ground is provided. Rotorcraft certificated prior to Amendment 29-24 can update their certification basis to take advantage of this provision. If an applicant with a previously type certificated rotorcraft elects to update to this later amendment, caution should be taken to verify that the height-velocity information is done in accordance with Amendment 29-21; that all engine out landing capabilities are satisfactorily accounted for at the new proposed gross weight, altitude, temperature combinations; that take-off/landing information is provided; and that sufficient information is provided to properly advise the crew of the rotorcraft's capabilities when utilizing this increased performance capabilities.

(iii) Section 29.143(d) requires adequate controllability when an engine fails. This requirement specifies conditions under which engine failure testing must be conducted and includes minimum required delay times.

(A) For rotorcraft which meet the engine isolation requirements of Category A, demonstration of sudden complete single-engine failure is required at critical conditions throughout the flight envelope including hover, take-off, climb at V_Y, and high speed flight up to V_{NE} . Entry conditions for the first engine failure are engine or transmission limiting maximum continuous power (or take-off power where appropriate) including reasonable engine torque splits. For multi-engine Category A installations (three or more engines) subsequent engine failures should be conducted utilizing the same criteria as that used for first-engine failure. The applicant may limit his flight envelope for subsequent failures. Initial or sequential engine failure tests are ordinarily much less severe than the "last" engine failure test required by § 29.75(b)(5). The conditions for last-engine failure are maximum continuous power, or 30-minute power if that rating is approved, level flight, and sudden engine failure with the same pilot delay of 1 second or normal pilot reaction time, whichever is greater.

(B) For Category B powerplant installation rotorcraft, demonstration of sudden complete power failure is required at critical conditions throughout the flight envelope. This includes speeds from zero to V_{NE} (power-on) and conditions of hover, take-off and climb at V_Y . Maximum continuous power is specified prior to the failure for the cruise condition. Power levels appropriate to the maneuver should be used for other conditions. The corrective action time delay for the cruise failure should be 1 second or normal pilot reaction time (whichever is greater). Cyclic and directional control motions which are part of the pilot task of flight path control are normally not subject to the 1-second restriction; however, the delay is always applied to the collective control for the cruise failure. If the aircraft flying qualities and cyclic trim configuration would encourage routine release of the cyclic control to complete other cockpit tasks during cruise flight, consideration should be given to also holding cyclic fixed for the 1-second delay. Although the same philosophy could be extended to the directional controls, the likelihood of the pilot having his feet away from the pedals is much lower, unless the aircraft has a heading hold feature. Rotor speed at execution of the cruise condition power failure should be the minimum power-on value. The term "cruise" also includes cruise climb and cruise descent conditions. Normal pilot reaction times are used elsewhere. Although this requirement specifies maximum continuous (MC) power, it does not limit engine failure testing to MC power. If a take-off power rating is authorized for hover or take-off, engine failure testing must also be accomplished for those conditions in order to comply with § 29.63(c). Following power failure, rotor speed, flapping, and aircraft dynamic characteristics must stay within structurally approved limits.

(iv) Section 29.143(e) addresses the special case in which a V_{NE} (power-off) is established at an airspeed value less than V_{NE} (power-on). For this case, engine failure tests are still required at speeds up to and including V_{NE} (power-on), and the rotorcraft must be capable of being slowed to V_{NE} (power-off) in a controlled manner with normal pilot reactions and skill. There is, however, no controllability requirement for stabilized power-off flight at speeds above 1.1 V_{NE} (power-off) when V_{NE} (power-off) is established per § 29.1505(c).

(v) Application of the controllability requirement for pitch, roll, and yaw at speeds of 1.1 V_{NE} (power-off) and below is similar to that described above for power-on testing at V_{NE} . Sufficient directional control must exist to allow straight flight in autorotation during all approved maneuvers including 30° banked turns up to V_{NE} (power-off) with some small additional allowance for gust control. Adequate controllability margins must exist in all axes throughout the approved autorotative flight envelope. Testing to V_{NE} at MC power per § 29.143(b)~~, 1.1 V_{NE} at power for 0.9 V_H per § 29.175(b) or § 29.1505,~~ and § 29.175(c), and to 1.1 V_{NE} (power-off) in autorotation per § 29.143(e) should be sufficient to assure adequate control margin during a descent condition at high speed and low power. The high speed, power-on descent condition should be checked for adequate control margin as a "maneuver appropriate to the type." There has been one instance where insufficient directional pedal was available to maintain a reasonable trimmed sideslip angle with low power at very high speeds, and a case where there was insufficient forward and lateral cyclic available to reach the power-on V_{NE} . The insufficient directional pedal margin was due to the offset vertical stabilizers. The lack of cyclic stick margin was because the cyclic stick migrated to the right as power was reduced and the control limits were circular. This provided less total available forward cyclic stick travel when the cyclic was moved right and forward about 45° from the center position. Each of the above rotorcraft was certificated with a rate of descent limitation to preclude operation in the control-limited area.

(vi) An evaluation of the emergency descent capability of the rotorcraft should be made, either analytically or through flight test. Areas of consideration are the rate of descent available, the maximum approved altitude, and the time before a catastrophic failure following the loss of transmission oil pressure or other similar failure. Each rotorcraft should have the capability to descend to sea level and land from the maximum certificated altitude within the time period established as safe following a critical failure. If the time period does not permit a sea level landing, the maximum height above the terrain must be specified in the limitation section of the Rotorcraft Flight Manual.

(3) The required controllability and maneuvering capabilities must also be considered following the failure of automatic equipment used in the control system (§ 29.672). Examples include stability augmentation systems (SAS), stability and control augmentation systems (SCAS), automatic flight control systems (AFCS), devices to provide or improve longitudinal static stability such as a pitch bias actuator (PBA), yaw dampers, and fly-by-wire elevator or stabilator surfaces. These systems all use actuators of some type, and they are subject to

actuator softover and hardover malfunctions. The flight control system should be evaluated to determine whether an actuator jammed in an extreme position would result in reduced control margins. Generally, if the flight control system stops are between the actuator and the cockpit control, the control margin will be affected. If the control stops are between the actuator and the rotor head, the control margins may not be affected, but the location of the cockpit control may be shifted. This could produce interference with other items in the cockpit. An example of this would be a lateral actuator jammed hardover causing a leftward shift in the cyclic stick position. Interference between the cyclic stick, the pilot's leg, and the collective pitch control could reduce the left lateral control available and reduce left sideward flight capability. In the case of fly-by-wire surfaces, both the high speed forward flight controllability and the rearward flight capabilities could be affected. Flight control systems that incorporate automatic devices should be thoroughly evaluated for critical areas. Every failure condition that is questionable should be flight tested with the appropriate actuator fixed in the critical failure position. These failures may require limitations of the flight envelope. Any procedure or limitation that must be observed to compensate for an actuator hardover and/or softover malfunction should be included in the Rotorcraft Flight Manual.

b. Procedures. The policy material pertaining to this section remains in effect with the following changes and additions:

(1) Flight test instrumentation should include ambient parameters, all flight control positions, rotor RPM, main and tail rotor flapping (if appropriate), engine power instruments, and throttle position. Flight controls that are projected to be near their limits of authority should be rigged to the most adverse production tolerance. A very accurate weight and balance computation is needed along with a precise knowledge of the aircraft's weight/CG variation as fuel is burned.

(2) The critical condition for V_{NE} controllability testing is ordinarily aft CG, MC power, and minimum power-on rotor RPM, although power and RPM variations should be specifically evaluated to verify their effects. The turbine engine is sensitive to ambient temperatures which affect the engine's ability to produce rated maximum continuous torque. Flight tests conducted at ambient temperatures that cause the turbine temperature to limit maximum continuous power would not produce the same results obtained at the same density altitude at colder ambient temperatures where maximum continuous torque would be limiting. Forward CG should be spot checked for any "tuck under" tendency at high speed. The V_{NE} controllability test is normally accomplished shortly after the 1.1 V_{NE} (or 1.1 V_H) point obtained during stability tests required by § 29.175(b). Controllability must be satisfactory for both conditions. If V_{NE} varies with altitude or temperature, V_{NE} for existing ambient conditions is utilized for the test. Extremes of the altitude/temperature envelope should be analyzed and investigated by flight test.

(3) Controllability

(i) The critical condition for controllability testing in a hover is ordinarily forward CG at maximum weight with minimum power-on rotor RPM. For rearward flight testing of configurations where the forward CG limit varies with weight, low or high gross weight may be critical. Lateral CG limits should also be investigated. A calibrated pace vehicle is needed to assure stabilized flight conditions. Surface winds should be less than 3 knots throughout the test sequence. Testing can be done in higher stabilized wind conditions (gusting less than 3 knots); however, these conditions are very difficult to find and the method is very time consuming due to the necessity of waiting for stabilized winds. Testing in calm winds is preferred. IGE ~~H~~hover controllability testing should be accomplished with the lowest portion of the rotorcraft at the published hover height above ground level; however, the test altitude above the ground may be increased to provide reasonable ground clearance. OGE testing should be done with the rotor at a predetermined height above the ground at which it has been determined that there is no ground effect. Although the necessary yaw response will vary somewhat from model to model, sufficient control power should be available to permit a clearly recognizable yaw response after full directional control displacement when the rotorcraft is held in the most critical position relative to wind.

Testing will normally be carried out at the power required to achieve stabilised flight conditions. However it is also important to show that yaw control remains adequate to allow normal power changes that might be required in normal operational manoeuvres typical for the type and use of the rotorcraft. With rotorcraft that are operating in conditions such that the gross mass is limited by the power available, there should always be adequate tail rotor pedal available to maintain yaw control when using up to Take-off Power, but this will not be the case if the rotorcraft weight in the low speed flight envelope is limited by yaw control system capability. There may be other conditions where adequate yaw control is not available at high power, for example a rotorcraft which is limited by the Cat A weight [for rotorcraft certificated to 29.1 (c)].

To cover the case where excess power is available, it is appropriate to examine the rotorcraft characteristics with some small amounts of additional power applied above the trim power required to hover to allow for typical power variations that will be experienced during normal use of the rotorcraft. For example, manoeuvring or turbulence will cause the pilot to use some of the excess power available. The rotorcraft should be flown, both IGE and OGE, with the most adverse wind speed and direction for directional control within the flight envelope proposed, using power variations above trim that might be expected during normal use of the rotorcraft giving consideration to the amount of excess power available, the ease with which power can be controlled via collective and the characteristics of the rotorcraft if the limits of directional control are approached. There should be no tendency to deviate rapidly or suddenly in yaw. This assessment is normally conducted in conjunction with the critical azimuth testing.

It may be appropriate to provide Flight Manual information on the directional control characteristics, including any relevant maximum power above which it could be expected that directional control might not be maintained.

(ii) Comprehensive controllability tests are typically conducted at low, intermediate (~7000 feet Hd) and high tests sites, with prepared landing surfaces, in conjunction with take-off, landing, and performance testing.

(iii) Alternatively, a predicted controllability model developed for high altitude may be used if verified by limited flight testing with steady ambient winds. The extrapolation guidelines in paragraph AC 29.45 b (2) are still applicable. These high altitude controllability tests could typically be conducted in conjunction with take-off, landing and performance tests.

(iv) Controllability can usually be extrapolated up to a maximum of 2,000 feet above the highest test site altitude.

NOTE: Engine operating characteristics must be considered during the limited high altitude tests.

(4) Prior to engine failure testing, it is mandatory that the pilot be fully aware of his engine, drive system, and rotor limits. These limits were established during previous ground and flight tests and they should be specified in the TIA. Particular attention should be given to minimum stabilized and minimum transient rotor RPM limits. These values must be included in the TIA and should be approached gradually with a build-up in time delay unless the company testing has completely validated all pertinent aspects of engine failure testing. On Category A installations the maximum power output of each engine must be limited so that when an engine fails and the remaining engine(s) assume the additional load, the remaining engine(s) are not damaged by excessive power extraction and over-temping. This is needed for compliance with § 29.903(b). The propulsion engineer should have assured that this feature was properly addressed in the engine and drive system substantiation; however, it must be assumed that for some period of time the pilot may extract maximum available power from the remaining engine(s) when an engine fails during critical flight maneuvers. Substantiation of this feature should be accomplished primarily by engine and drive system ground tests.

(5) Longitudinal cyclic authority at V_{NE} with any power setting must permit suitable nose down pitching of the rotorcraft. If the remaining control travel is considered marginal, tests should include applications up to full control deflection to assess the remaining authority. Some knowledge of the aircraft's response to turbulence is useful in assessing the remaining margin. As a minimum, the rotorcraft must have adequate margin available to overcome a moderate turbulent gust and must not have any divergent characteristic which requires full deflection of the primary recovery control to arrest aircraft motion. If other controls must be utilized to overcome adverse aircraft motion, the results are unacceptable; e.g., if a pitch up tendency resulting from an actual or simulated moderate turbulent gust cannot be satisfactorily overcome by remaining forward cyclic, the use of throttle or collective controls to assist the recovery is not an acceptable procedure; however, the use of lateral cyclic to correct roll in conjunction with forward cyclic to correct pitchup is satisfactory. Obviously during the conduct of these tests, all available techniques should be utilized when the pilot finds himself "out of control." However, compliance with this section requires that recovery must be shown by use of only the primary control for each axis of aircraft motion.

(6) Cyclic control authority in autorotation must be sufficient to allow adequate flare capability and landing under the all engine inoperative requirements of § 29.75(b)(5) and (c). See paragraph AC 29.75.

<u>Proposal 8.3</u>

Amend AC 29.173 by the addition of:

AC 29.173A. § 29.173 (Amendment 29-XX) STATIC LONGITUDINAL STABILITY.
a. Explanation.

(1) Amendment 29-XX makes a major change to the requirement by allowing for neutral or negative static longitudinal stability in limited flight domains. Additionally the requirement for the hover demonstration found in 29.173(c) has been deleted as this requirement is adequately covered by the controllability requirements. The basic tenants of

the rule are unchanged in that the rule contains control system design requirements for both stability and control. Paragraph (a) contains the basic control philosophy necessary for all civil aircraft. Forward motion of the cyclic control must produce increasing speeds and aft motion must result in decreasing speeds. For rotorcraft, this is accomplished with throttle and collective held constant. This requirement in no way assures aircraft stability. It is simply a control requirement which speaks to direction of control motion. Rotorcraft with either highly stable or highly unstable static longitudinal stability characteristics can typically comply with the basic requirement for control sense of motion.

All the policy material pertaining to this section remains in effect with the following changes and additions:

(2) The remainder of § 29.173, through reference to § 29.175, contains the basic control position requirements necessary to establish a minimum level of static longitudinal stability. Positive stability is found for conditions of climb, cruise, V_{NE}, and autorotation in § 29.175 by ~~requiring~~ demonstrating a stable stick position gradient through a specified speed range. ~~A defined level of instability is permitted for the hovering condition.~~ This is the primary method of demonstrating compliance with the longitudinal static stability requirements.

(3) For aircraft that do not possess positive control position stability for some limited flight conditions or modes of operation, an alternative method of compliance is provided which requires a qualitative evaluation of the pilot's ability to maintain a given airspeed within 5 knots of the desired speed without exceptional piloting skill or alertness. These flight conditions and modes of operation could include various combinations of gross weight, CG, flight regime (climb, cruise, descent), ambient conditions (altitude/temperature) as well as possible variations in the stability augmentation configuration. In the past regulatory authorities have, under equivalent level of safety findings, certified numerous rotorcraft which have neutral or negative static longitudinal stick position stability in some flight domains. This amendment to § 29.173 is intended to allow for this case without having to resort to an equivalent safety finding. For these previous equivalent safety findings, acceptable qualitative flight characteristics were found on aircraft which possessed negative longitudinal stick position gradients of up to 2-3% of total control travel in certain flight regimes, however, this value is not intended to be a limit. When this alternative means of compliance is elected by the applicant, in addition to the qualitative pilot evaluation it is still necessary to collect the data associated with the classical static longitudinal stability testing as defined in § 29.175.

b. Procedures.
All the policy material pertaining to this section remains in effect with the following changes and additions:

(1) The control requirement of paragraph (a) of this section is so essential to basic flight mechanics that compliance may be found during conventional flight testing for compliance with other portions of the regulations. No special or designated testing should be required.

(2) The procedures necessary to assure compliance with the primary stability requirements of this section are contained under § 29.175, Demonstration of static longitudinal stability. Refer to paragraph AC 29.175 of this advisory circular for an explanation of detailed flight test procedures.

(3) The procedures necessary to assure compliance with the alternative (i.e., pilot evaluation) method of compliance are provided below.

(i) For those limited conditions where compliance with the basic control position requirements cannot be shown, the evaluation must focus on the ability of the pilot to maintain airspeed in the flight regime without exceptional piloting skill or alertness under typical flight conditions. “Limited flight conditions” infers that the aircraft should be in reasonable compliance with the stick position stability requirements of § 29.173(b) for most of the flight conditions and configurations tested. Extraordinary means of complying with § 29.173(b) should not be forced on the aircraft design if the airspeed retention task meets the pilot skill and alertness guidelines. The demonstration flight regimes are defined in § 29.175(a) - (d). For those flight regimes, conditions and configurations where compliance with stick position requirements of § 29.173(b) cannot be shown, the evaluation pilot should assess the ease of maintaining airspeed within the specified +/- 5 knots.

(ii) When assessing the ease of maintaining airspeed the total workload must be considered. Secondary tasks pertinent to the minimum flight crew in each flight regime should be conducted. This may include visual navigation and communication in cruise, traffic avoidance in climb, and landing site selection in autorotation.

(iii) The cues that the aircraft provides are an important contributor to the evaluation, and the nature of these cues should be noted in the compliance report where this alternate qualitative evaluation determines that the aircraft has satisfactory airspeed stability characteristics. The cues that supplant the control position cues may be found to be sufficient if these cues are natural to the speed maintenance task, and provide adequate guidance to the pilot during the task. One important cue might be the pitch attitude gradient with speed, where a perceptible change in trimmed pitch attitude is required for a perceptible airspeed change. Where pitch attitude is the predominant cue the relationship should be positive (nose down with airspeed increase) and perceptible without exceptional alertness. With this relationship, the evaluation pilot may find that the natural pitch control tasks associated with attitude control result in adequate airspeed retention, and the aircraft would be found to be in compliance. It may be that the power/airspeed relationship of the aircraft can create adequate cues, where a significant rate of descent is created by a nose-down pitch attitude change and a subsequent airspeed increase. In this case, the normal cues associated with altitude retention during fixed power cruise flight may prove to be acceptable for airspeed retention if the evaluation pilot finds that, within the context of the overall flight task, airspeed retention is sufficiently accurate. These altitude change cues may not be usable in autorotation or climb, but may be sufficient in cruise, or V_{NE} tasks.

(iv) Other cues may be found for a specific aircraft, such as small but perceptible changes in noise or vibration. It is not intended that the evaluation pilot search for these cues in order to learn how to maintain airspeed in the aircraft under evaluation. These cues should be perceptible to the typical pilot and sufficient to reinforce the airspeed maintenance task.

Proposal 8.4

Amend AC 29.175 by the addition of:

AC 29.175A. § 29.175 (Amendment 29-XX) DEMONSTRATION OF STATIC LONGITUDINAL STABILITY.

a. Explanation.

Amendment 29-XX reduces the speed range for the climb and cruise demonstration points of 29.175(a) and 29.175(b), respectively. A new paragraph (c) was added to require an additional cruise demonstration point in order to compensate for the change in reduced speed range in paragraph (b). Additionally, for autorotation, two typically used trim points are required in place of the current requirement. The requirement for the hover demonstration was eliminated for the reasons given in paragraph AC 29.173 (Amendment 29-XX).

All the policy material pertaining to this section remains in effect with the following changes:

(1) This rule incorporates the specific flight requirements for demonstration of static longitudinal stability. Specific loadings, configurations, power levels, and speed ranges are stated for conditions of climb, cruise, V_{NE}, and autorotation~~, and hover~~.

(2) Some rotorcraft in forward flight experience significant changes in engine power with changes in airspeed even though collective and throttle controls are held fixed and altitude remains relatively constant. For these cases, the guidance in § 29.173, which states that throttle and collective pitch must be held constant, is appropriate for administration of this rule, and the specified powers in § 29.175~~(a), (b) and (c)~~ should be considered as power established at initial trim conditions. This will result in slightly higher or lower ~~torque~~ power readings at “off trim” conditions. Collective and throttle controls are held constant when obtaining test data~~ during climb, cruise, and autorotation tests~~.

(3) The effects of rotor RPM on autorotative static stability should be determined, and positive stability demonstrated for the most critical RPM. For Category A rotorcraft this requirement may be satisfied at a nominal RPM value. RPM values can be expected to change as airspeed is varied from the “trimmed” condition. Manufacturer’s recommended autorotation airspeed is ordinarily used for trim.

~~(4) Hovering is considered a flight maneuver for which the pilot repeatedly adjusts collective to maintain an approximately constant altitude above the ground. For hover stability tests, collective and throttle adjustments are made as necessary to maintain an approximately constant height above the ground. Also, a limited amount of negative longitudinal control travel is allowed with changes in speed.~~

b. Procedures.

All the policy material pertaining to this section remains in effect with the following changes:

(1) Instrumentation.

(i) Sensitive control position instrumentation is mandatory. Engine power parameters should be recorded at trim. For testing of minor modifications or when using a “before and after” method, a tape measure or a stick plotting board may be utilized. A stick plotting board consists of a level surface with a clean sheet of paper on it and attached to the cockpit or seat structure. The installation must not interfere when the flight controls are fully displaced. A recording pencil is attached to the cyclic control by an offsetting arm in such a manner that it can be pushed down on the board to record relative cyclic position at key times during test maneuvers. The Figure AC 29.175-1 plot is a typical presentation of longitudinal static stability.

(ii) Other necessary parameters include pitch attitude, pressure altitude, ambient temperature, and indicated airspeed~~ (pace vehicle or theodolite speed for hover tests). For hover tests, hover height (radar altitude if available) and surface winds should be documented. Two-way communication with a pace vehicle is highly desirable. Ground safety equipment is desirable~~.

(2) <u>Ambient Conditions</u>. Smooth air is necessary for stability testing. ~~Allowable wind conditions for hover stability testing are the same as those for hover controllability tests and are described in that section (paragraph AC 29.151). Extrapolation is covered in paragraph AC 29.53.~~

(3) <u>Loading</u>. Aft center of gravity (CG) is ordinarily critical for longitudinal stability testing, although high speed flight ~~and hover~~ should be checked at full forward CG and maximum weight. At aft CG, light or heavy weight conditions can be critical. The manufacturer's flight data should be reviewed to determine critical loading conditions.

(4) <u>Conducting The Test</u>.

(i) The rotorcraft should be established in the desired configuration and flight condition (climb, cruise, V_{NE}, autorotation) with the required power and rotor speed at the trim airspeed. The collective stick should be fixed in that position, usually by applying sufficient friction to insure that it is not inadvertently moved. For autorotative tests, a rotor speed should be selected so that the variations in rotor speed as airspeed and altitude change do not exceed the allowable limits. This point is recorded as the trim point. Airspeed is then increased or decreased in about ~~10~~5-knot increments, stabilizing on each speed and recording the data. At least two points on each side of the trim speed should be taken.

(ii) The cruise test should be conducted by varying airspeed around the desired altitude with throttle and collective fixed. This should be accomplished by first determining V_H (level flight speed at maximum continuous power) at the test altitude. Then ~~reduce~~ adjust power to establish a level trimmed condition at ~~0.9 V_H (or 0.9 V_{NE} if lower)~~ V_H (or 0.8 V_{NE} if lower). This point is then recorded as the trim point.

(iii) For climb and autorotation tests, conduct fixed collective tests through an altitude band (usually ±2,000 feet)~~, first increasing airspeed as data points are collected, then decreasing speed through the same altitude band~~. It will probably not be possible to obtain the required data on one pass through the altitude band. If repeated passes are required, a trim point should be taken at the beginning of each pass unless very sensitive collective pitch position information is available in the cockpit. ~~Generally, it will be possible to acquire all the high speed points on one pass and the low speed points on the second.~~

(iv) If extremely precise results are required, an alternate method of testing can be used to acquire the data at a constant altitude. For cruise and V_{NE}, data can be obtained by alternating airspeeds above and below the trim speed to arrive in the vicinity of the test altitude as the point is recorded. This method results in very precise data because collective and throttle are not moved as airspeed is changed at a constant altitude. A typical sequence of speeds that could produce these results would be: ~~150 (V_H), 135 ($0.9V_H$) trim speed, 125, 145, 115, 155, 105, and 165.~~ 140 (0.8 V_{NE}) trim speed, 135, 145, 130, and 150.

(v) For rotorcraft with high rates of climb, a series of climbs, each at a different speed, may be required through a given altitude, utilizing sensitive instrumentation to assure collective position is the same for each data point. In autorotation, a similar case arises and a series of descents, each at a different speed, may be required through a given altitude band, using sensitive instrumentation to assure a repeatable collective position.

~~(vi) Hover tests should be conducted by maintaining an approximately constant altitude above the ground at the hover height established for performance purposes. The test altitude above the ground may be increased to provide reasonable ground clearance during rearward flight. Groundspeed is varied using a pace vehicle, theodolite, or other velocity measuring equipment. A pace vehicle is an aid in maintaining an accurate hover height. The pilot can accurately maintain height by controlling his sight picture of the pace vehicle (level with the roof, antenna, etc.). Hover stability tests are ordinarily conducted in conjunction with hover controllability tests because instrumentation and facilities are essentially the same.~~

(vi~~vii~~) Normally ~~climb, cruise, and autorotation~~ tests should be conducted at low, medium, and high altitudes. See paragraph AC 29.45 for guidance on interpolation and extrapolation. High speed stability has been critical during cold weather testing. ~~In two recent models, V_{NE} at cold temperatures has been limited by the stability requirements of § 29.175(b).~~ Cold weather testing should be accomplished or a conservative approach for advancing blade tip Mach number should be used to limit cold weather V_{NE} to tip Mach number values demonstrated ~~during warm weather testing~~.

~~(viii) Hover stability should be verified at low altitude and, if required, at high altitude. Refer to paragraph AC 29.45b(2) for guidance on expansion and extrapolation of altitude.~~

NOTE: Figure AC 29.175-1 to be redrawn to delete the hover test and show representative trim speeds and the new +/- 10 kts speed range and 5 kt increments.

Proposal 8.5

Amend AC 29.177 by the addition of:

AC 29.177A. § 29.177 (Amendment 29-XX) Static Directional Stability.
a. Explanation.
Amendment 29-XX makes an extensive change to the current requirement and provides for a clear definition of the sideslip envelope to be evaluated. Most rotorcraft exhibit satisfactory quantitative and qualitative directional characteristics except for the first 2-3 degrees either side of trim due to inherent airflow blockage of the vertical fin or tail rotor. This amendment takes this consideration into account while requiring that positive directional stability is maintained at larger sideslip angles. The actual demonstration has been increased from a maximum range of ±10° at all speeds, as the previous amendment requires, to ±25° at slow speeds and linearly decreasing to ±10° at V_{NE}. Alternatively to the previous range specified, the requirement limits the maximum sideslip to be demonstrated to at least 0.1g of sideforce or the steady state sideslip angles established by 29.351. As in the previous amendment, sufficient cues should alert the pilot when approaching sideslip limits.

b. Procedures
The policy material pertaining to the procedures outlined in this section remain in effect.

Proposal 8.6

Amend AC 29.1587 by the addition of:

AC 29.1587B. § 29.1587 (Amendment 29-XX) Performance Information.
a. Explanation.
Amendment 29-XX added the requirement to include in the RFM the maximum weight, altitude, and temperature for which the rotorcraft can safely hover out-of-ground effect in winds of at least 17 knots in all azimuths. This change is in conjunction with the new demonstration requirements of 29.143(d). Additionally, this change makes clear that the in-ground effect performance with winds of at least 17 knots be included in the RFM.

All the policy material pertaining to this section remains in effect with the following changes:

(1) This section should contain the performance information necessary for operation in compliance with applicable performance requirements of Part 29 and applicable special conditions, together with additional information and data essential for implementing pertinent operational requirements.

(2) Performance information and data may be presented for the range of weight, altitude, temperature, and other operational variables stated as operational performance limitations. Performance information which exceeds any operating limitation should be shown only as required for clarity of presentation. If data beyond operating limits are shown, the limits should be clearly marked and the data outside of the limits clearly distinguishable from the data within the limits.

(3) Performance information presented in the unapproved or "manufacturers' ; data" section of the RFM should not include performance data that are beyond operating limitations unless the particular operating limit that may be exceeded is clearly distinguishable from similar performance data that are within limits. For example, if the weight-altitude-temperature (WAT) limits for take-off and landing are based on in-ground effect (IGE) hover performance capability at a 5-foot skid height, 3-foot skid height hover performance data allowing increased hovering weights should not be presented in the manufacturers' data unless clearly identified as being beyond operating limitations for normal operations. It is recommended that performance information and data be presented substantially in accordance with the following paragraphs. Where applicable, reference to the appropriate requirement of the certification or operating regulation should be included.

(i) General . Include all descriptive information necessary to identify the configuration and conditions for which the performance data are applicable. Such information may include the complete model designations of rotorcraft and engines, definition of installed rotorcraft features, and equipment that affects performance together with the operative status thereof. This section should also include definitions or terms used in the performance section (i.e., IAS, CAS, ISA, configuration, CDP, V_{TOSS} , Category A, Category B, LDP, etc.) plus calibration data for airspeed, altimeter, ambient air temperature, and other information of a general nature.

(ii) Performance Procedures . The procedures, techniques, and other conditions associated with obtainment of the flight manual performance should be included. The procedures may be presented as a performance subsection or in connection with a particular performance graph. In the latter case, a comprehensive listing of the conditions associated with the particular performance may serve the objective of "procedures" if sufficiently complete. Performance figures are based on the installed minimum specification engine, unless normally depreciated engine performance is approved.

(iii) Wind Accountability . Wind accountability may be utilized for determining take-off and landing field lengths. This accountability may be up to 100 percent of the minimum wind component along the take-off or landing path opposite to the direction of take-off. Wind accountability data presented in the RFM should be labeled " ;UNFACTORED" (if 100 percent accountability is taken) and should be accompanied by the following note: "Unless otherwise authorized by operating regulations, the pilot is not authorized to credit more than 50 percent of the performance increase resulting from the actual headwind component and must reduce performance by 150 percent of the performance decrement resulting from the actual tail wind component." In some rotorcraft, it may be necessary to discount the beneficial aid to take-off performance for winds from zero to 10 knots. This should be done if it is evident that the winds from zero to 10 knots have resulted in a significant degradation to the take-off performance due to flight through the main rotor vortex. Degradation may be determined by determining the power required to fly, by reference to a pace vehicle, at speeds of 10 knots or less.

(iv) The following list is illustrative of the information that should be provided for a transport Category "A" and "B" rotorcraft.

(A) Density altitude chart for converting from pressure to density altitude.

(B) Temperature conversion chart (°C to °F to °C).

(C) Airspeed calibration (calibrated vs. indicated airspeed) for both pilot and copilot systems for level flight, climb, autorotation, and recommended approach rate of descent.

(D) Altimeter correction for pilot and copilot instruments showing the correction factor vs. indicated airspeed at sea level and altitude.

(E) Hover performance charts both in and out-of-ground (OGE) effect with instructions for their use. ~~The OGE hover performance chart is not required but may be useful.~~

(F) A series of climb performance charts for various weights showing rate of climb vs. pressure altitude for a range of temperatures and showing the variation of best rate of climb speed with pressure altitude. The conditions should appear on each chart (i.e., power, weight, single, or multi-engine, etc.). The OEI climb performance charts at 30-minute power and maximum continuous power or at continuous OEI power should provide rate of climb performance down to a minimum of -500 feet/min. The effect of engine air bleed, particle separators or other devices, on the rate of climb/descent performance must be provided.

(G) A chart showing the take-off flight path for Category A presented in height vs. distance from the hover wheel height to the point at which V_{TOSS} and not less than 35 feet is reached, and the rejected take-off distance. The chart should identify the critical decision point and V_{TOSS}.

(H) Charts to allow calculation of distance to climb at V_{TOSS} from the point at which V_{TOSS} and not less than 35 feet is reached (or from the lowest point of the take-off profile for elevated heliport) to 200 feet with one engine inoperative and other engines within approved operating limitations. If conservative, providing charts to allow calculation of the total distance from V_{TOSS} and 35 feet to V_Y and 200 feet is allowed.

(I) A series of charts to allow calculation of any additional distance which may be required to accelerate to best rate of climb speed from V_{TOSS} with one engine inoperative and other engines within approved operating limitations. If conservative, providing charts to allow calculation of the total distance from V_{TOSS} and 35 feet to V_Y and 200 feet is allowed.

(J) Charts to allow calculation of distance to climb at V_Y from 200 feet to 1000 feet above the take-off surface (or from the lowest point of the take-off profile for elevated heliport) with one engine inoperative and other engines at 30-minutes OEI power or maximum continuous OEI power. If conservative, providing charts to allow calculation of the total distance from V_{TOSS} and 35 feet to V_Y and 1000 feet is allowed.

(K) Landing distance chart for Category A showing the landing distance from a 50-foot height to a stop with one engine inoperative vs. pressure altitude over the range of temperatures being certified. This chart should identify the balked landing decision point (LDP) so the pilot will know how to achieve this performance.

(L) For Category B, a series of charts at various weights showing take-off distance from hover to 50 feet vs. pressure altitude over the range of temperatures being certified.

(M) For Category B, a landing distance chart similar to the one for Category A from a 50-foot height to stop with one engine inoperative.

(N) For turbine-powered rotorcraft in all categories, a power assurance check chart.

(O) For Category B, a statement of the maximum crosswind and downwind components that have been demonstrated as safe for operation near the ground unless this information is incorporated as an operating limitation. (See paragraph AC 29.1583.)

(P) For Category B, the height-velocity (HV) envelope except for rotorcraft which must incorporate the HV diagram as an operating limitation.

(Q) For Category B, the autorotative glide distance as a function of altitude if required by § 29.71. (See paragraph AC 29.71.)

(v) Miscellaneous Performance Data. Any performance information or data not covered in items (A) through (Q) above, but considered necessary to enhance safety or to enable application of the operating regulations, should be included.

Proposal 8.7

Amend AC 29 Appendix B by the addition of:

AC 29 Appendix B (Amendment 29-XX) Airworthiness Guidance for Rotorcraft Instrument Flight.

a. Explanation.

Amendment 29-XX made a change to Section V Static Lateral-Directional Stability that is concurrent with the change to 29.177 to allow for a small range of sideslip angles (2-3 degrees) for which sideslip angles need not increase steadily with control deflection. The previous rule language stating that directional control position must increase in approximate constant proportion with sideslip angle has been replaced. The intent of this change is that an increase in directional control position must produce an increase in sideslip angle linearly. At greater sideslip angles appropriate to the type, increase in directional control position need not produce a linear increase in sideslip angle but should not become neutral or negative. The change in section VII was a rewrite of the current requirement to clearly state the requirements to be evaluated in the failure case.

b. Procedures. The policy material pertaining to the procedures outlined in this section remain in effect.