Federal Aviation Administration
Aviation Rulemaking Advisory Committee

Air Carrier Operations Issue Area
Airplane Performance Harmonization Working Group

Task 1 – Airplane Performance Operating Limitations

Task Assignment

[Federal Register: November 12, 1997 (Volume 62, Number 218)]

[Notices]

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee; Air Carrier Operations Issues--New Task

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

ACTION: Notice of new task assignment for the Aviation Rulemaking Advisory Committee (ARAC).

SUMMARY: Notice is given of a new task assigned to and accepted by the Aviation Rulemaking Advisory Committee (ARAC). This notice informs the public of the activities of ARAC.

FOR FURTHER INFORMATION CONTACT:

Quentin J. Smith, Federal Aviation Administration (AFS-200), 800

Independence Avenue, SW., Washington, DC 20591; phone (202) 267-5819; fax (202) 267-5229.

SUPPLEMENTARY INFORMATION:

Background

The **FAA** has established an Aviation Rulemaking Advisory Committee to provide advice and recommendations to the **FAA** Administrator, through the Associate Administrator for Regulation and Certification, on the full range of the **FAA**'s rulemaking activities with respect to aviation-related issues. This includes obtaining advice and recommendations on the **FAA**'s commitment to harmonize its regulations and practices with its trading partners in Europe and Canada.

One area ARAC deals with is air carrier operations issues. These issues involve the operational requirements for air carriers, including crewmember requirements, airplane operating performance and limitations, and equipment requirements.

The Task

This notice is to inform the public that the **FAA** has asked ARAC to provide advice and recommendation on the following harmonization tasks:

Airplane Performance Operating Limitations

1. Review **FAA** and JAA airplane operational performance requirements (14 CFR parts 121 and 135/JAR-OPS) and develop a list of differences

between the two sets of requirements. (use should be made of preliminary work on the task carried out by industry). During this review, if differences are identified in the associated certification requirements, such difference should be reported to the Aviation Rulemaking Advisory Committee (ARAC) and the Harmonization Management Team by the **FAA** and JAA contacts.

2. When the first step is completed, explore the feasibility of harmonization of each identified difference in the following order of priority: Performance Class A, Class B, and Class C.

3. Within one year of publication of the ARAC task in the Federal Register, develop recommendations for common (harmonized) operational performance requirements for those items identified under item above as being feasible for harmonization. If the working group determines **FAA** rulemaking is required, that determination must be forwarded to the **FAA** for consideration of rulemaking priority, resource allocation, and additional tasking to ARAC, as appropriate.

Working Group Activity

The Airplane Performance Harmonization Working Group is expected to comply with the procedures adopted by ARAC. As part of the procedures, the working group is expected to:

1. Recommend a work plan for completion of that tasks, including the rationale supporting such a plan, for consideration at the meeting of ARAC to consider air carrier operations issues held following publication of this notice.

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2. Give a detailed conceptual presentation of the proposed recommendations, prior to proceeding with the work stated in item 3 below.

3. Draft an appropriate report.

4. Provide a status report at each meeting of ARAC held to consider air carrier operations issues.

Participation in the Working Group

The Airplane Performance Harmonization Working Group is composed of experts having an interest in the assigned task. A working group member need not be a representative of a member of the full committee..

An individual who has expertise in the subject matter and wishes to become a member of the working group should write to the person listed under the caption FOR FURTHER INFORMATION CONTACT expressing that desire, describing his or her interest in the tasks, and stating the expertise he or she would bring to the working group. The request will be reviewed by the assistant chair, and the individual will be advised whether or not the request can be accommodated. Requests to participate on the Airplane Performance Harmonization Working Group should be submitted no later than January 2, 1998. To the extent possible, the composition of the working group will be balanced among the aviation interests selected to participate.

The Secretary of Transportation has determined that the formation and use of ARAC are necessary and in the public interest in connection with the performance of duties imposed on the **FAA** by law.

Meeting of ARAC will be open to the public. Meetings of the Airplane Performance Harmonization Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on November 5, 1997.

Quentin J. Smith,

Assistant Executive Director, for Air Carrier Operations Issues,

Aviation Rulemaking Advisory Committee.

[FR Doc. 97-29729 Filed 11-10-97; 8:45 am]

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[Federal Register: January 4, 1999 (Volume 64, Number 1)]
[Notices]
[Page 201-202]
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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee; Air Carrier Operations Issues--New Task

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

ACTION: Notice of new task assignment for the Aviation Rulemaking Advisory Committee (ARAC).

SUMMARY: Notice is given of a new task assigned to and accepted by the Aviation Rulemaking Advisory Committee. This notice informs the public of the activities of ARAC.

FOR FURTHER INFORMATION CONTACT: Quentin J. Smith, Federal Aviation Administration (AFS-200), 800 Independence Avenue, SW., Washington, DC 20591; phone (202) 267-5819; fax (202) 267-5229.

SUPPLEMENTARY INFOMATION:

Background

The **FAA** has established an Aviation Rulemaking Advisory Committee to provide advice and recommendations to the **FAA** Administrator, through the Associate Administrator for Regulation and Certification, on the full range of the **FAA**'s rulemaking activities with respect to aviation-related issues. This includes obtaining advice and recommendations on the **FAA**'s commitment to harmonize its regulations and practices with its trading partners in Europe and Canada.

One area ARAC deals with is air carrier operations issues. These issues involve the operational requirements for air carriers, including crewmember requirements, airplane operating performance and limitations, and equipment requirements.

The Tasks

This notice is to inform the public that the **FAA** has asked ARAC to provide advice and recommendations on the following harmonization tasks:

Tasks 1 through 3 have been previously published and are restated here for continuity; Task 4 is new and is hereby added by this notice. Task 4 also cites the required completion date for all tasks.

Airplane Performance Operating Limitations

1. Review **FAA** and JAA airplane

operational performance requirements (14 CFR parts 121 and 135/JAR-OPS) and develop a list of differences between the two sets of requirements. (Use should be made of preliminary work on the task carried out by industry). During this review, if differences are identified in the associated certification requirements, such differences should be reported to the Aviation Rulemaking Advisory Committee (ARAC) and the Harmonization Management Team by the **FAA** and JAA contracts.

2. When the first step is completed, explore the feasibility of harmonization of each identified difference in the following order of priority: Performance Class A, Class B, and Class C.

3. Develop recommendations for common (harmonized) operational performance requirements for those items identified under item 2 above as being feasible for harmonization. If the working group determines **FAA** rulemaking is required, that determination must be forwarded to the **FAA** for consideration of rulemaking priority, resource allocation, and additional tasking to ARAC, as appropriate.

4. (The new task) Within one year of publication of this revised ARAC task in the Federal Register, recommend: a) whether the standards adopted by the **FAA** on February 18, 1997, in the final rule, ``Improved Standards for Determining Rejected Takeoff and Landing Performance,'' should be applied retroactively to airplanes currently in use or airplanes of existing approved designs that will be manufactured in the future; and b) whether to adopt a requirement for operators to take into account any distance needed to align the airplane on the runway in the direction of takeoff. The standards referenced in (a) revise the method for taking into account the time needed for the pilot to accomplish the procedures for a rejected takeoff; require that takeoff performance be determined for wet runways; and require that rejected takeoff and landing stopping distances be based on worn brakes, but apply only to airplanes whose type certification basis includes Amendment 25-92 (effective March 20, 1998) or equivalent. JAR-OPS 1 requires operators of Performance Class A airplanes to take wet runways and runway alignment distance into account regardless of the type certification basis of the airplane.

Working Group Activity

The Airplane Performance Harmonization Working Group is expected to comply with the procedures adopted by ARAC. As part of the procedures, the working group is expected to:

1. Recommend a work plan for completion of the tasks, including the rationale supporting such a plan, for consideration at the meeting of ARAC to consider air carrier operations issues held following publication of this notice.

2. Give a detailed conceptual presentation of the proposed recommendations, prior to proceeding with the work stated in item 3 below.

3. Draft an appropriate report.

4. Provide a status report at each meeting of ARAC held to consider air carrier operations issues.

Participation in the Working Group

The Airplane Performance Harmonization Working Group is composed of experts having an interest in the assigned tasks. A working group member need not be a representative of a member of the full committee. The working group has formed. However, an individual who has specific expertise in the subject matter and wishes to become a member of the working group should contact the person listed under the caption FOR FURTHER INFORMATION CONTACT expressing that desire, describing his or her interest in the tasks, and stating the expertise he or she would bring to the working group. The request will be reviewed by the assistant chair, the assistant executive director, and the working group chair, and the individual will be advised whether or not the request can be accommodated. To the extent possible, the composition of the working group will be balanced among the aviation interests selected to participate.

The Secretary of Transportation has determined that the formation and use of ARAC are necessary and in the public interest in connection with the performance of duties imposed on the **FAA** by law.

Meetings of ARAC will be open to the public. Meetings of the Airplane Performance Harmonization Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on December 23, 1998.

Quentin J. Smith,
Assistant Executive Director, Air Carrier Operations Issues Group,
Aviation Rulemaking Advisory Committee.

[FR Doc. 98-34765 Filed 12-31-98; 8:45 am]
BILLING CODE 4910-13-M

Recommendation Letter

MC 20021357-0

Action: ARM
cc AIR
AFS

AIR LINE PILOTS ASSOCIATION, INTERNATIONAL

535 HERNDON PARKWAY □ P.O. BOX 1169 □ HERNDON, VIRGINIA 20172-1169 □ 703-689-2270
FAX 703-689-4370

March 12, 2002

Mr. Nicholas Sabatini
Associate Administrator for
Regulation and Certification
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Dear Mr. Sabatini:

The Air Carrier Operations Issues Group of the Aviation Rulemaking Advisory Committee met recently and discussed, among other things, the report of the Airplane Performance Harmonization Working Group. The working group completed their task with, among other work, the development of an advisory circular that has been provided to the FAA for review.

An additional item was discussed concerning the safety margin provided in calculating accelerate-stop distances to account for the time needed for pilots to accomplish the actions needed to stop the airplane during a rejected takeoff. Additional time was provided the issues group for review of this issue with no additional concerns expressed.

The Air Carrier Operations Issues Group is pleased to endorse and approve the report of the Airplane Performance Harmonization Working Group.

AFS-99-130-A
task #2

Sincerely,

W W Edmunds Jr

William W. Edmunds, Jr., Chairman
Air Carrier Operations Issues Group

Acknowledgement Letter

MAY 15 2002

Mr. William W. Edmunds, Jr.
Air Line Pilots Association
P.O. Box 1169
Herndon, VA 20170

Dear Mr. Edmunds:

We have received your March 12 letter announcing the completion of the task assigned to the Airplane Performance Harmonization Working Group. You note that the report of the working group includes an advisory circular (AC), Airport Obstacle Analysis, that has been provided to the FAA for review. In addition, the group has provided recommendations on an additional issue of actions necessary during a rejected takeoff. Although I cannot anticipate a date for finalization of the AC, I recognize the value of the product produced by the working group.

I very much appreciate the time and personal dedication of the working group in completing this task, and I look forward to the future endeavors of the Air Carrier Operations Issues.

I offer my special thanks to you personally for your continued and excellent support of the Aviation Rulemaking Advisory Committee.

Sincerely,
Original Signed By
Margaret Gilligan

Nicholas A. Sabatini
Associate Administrator
for Regulation and Certification

ARM-109:Lwilliams:x79685:05/13/02
DOCS # 17381
CONTROL # 20021357-0

CONCURRENCES		
ROUTING SYMBOL	INITIALS/SIGNATURE	DATE
ARM-109	[handwritten initials]	5-13-02
ARM-100	[handwritten initials]	5/13/02
ARM-1	TF	5/13/02
AVR-1		

Recommendation

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: AIRPORT OBSTACLE ANALYSIS

Date: DRAFT
Initiated By: AFS-400

AC No: 120- OBS-11
Change:

1. PURPOSE. This Advisory Circular (AC) describes acceptable methods and guidelines for developing takeoff and initial climb-out airport obstacle analyses and inflight procedures to comply with the intent of the regulatory requirements of Federal Aviation Regulations (FAR's) Sections 121.177, 121.189, 135.367, 135.379, 135.398 and other associated engine-out requirements relating to turbine engine powered airplanes operated under Parts 121 and 135. The methods and guidelines presented in this AC are neither mandatory nor the only acceptable methods, and operators may use other methods that ensure compliance with the regulatory sections if those methods are shown to provide the necessary level of safety, and are acceptable to the FAA. This AC need not serve as the only sole basis for determining whether an obstacle analysis program meets the intent of the regulations. However, the methods and guidelines described in this AC have been derived from extensive FAA and industry experience and are considered acceptable to the FAA when appropriately used. Mandatory terms used within this AC such as "shall" or "must" are used only in the sense of ensuring applicability of the methods and guidelines when the methods and guidelines described herein are used.

2. FOCUS. This AC applies to operations conducted under FAR part 121, and operations of large transport and commuter category airplanes conducted under FAR part 135, with particular emphasis on transport category turbine and reciprocating engine powered airplanes which meet the certification regulations applicable since August 29, 1959 (SR422B). Airplanes meeting earlier performance requirements or other types of airplanes may use criteria and methods equivalent to those described by this AC, provided they properly account for the performance specified by the Airplane Flight Manual (AFM). Information in this AC may also be used by other operators (e.g., FAR 91 turbojet operators) as applicable to that operator's needs and requirements, as long as the resulting operations are otherwise consistent with applicable FARs.

3. RELATED FAR SECTIONS. FAR Sections 1.1, 25.105, 25.107, 25.111, 25.113, 25.115, part 33, part 77, FAR Sections 91.167, 121.97, 121.141, 121.173, 121.177, 121.189, 121.191, 121.443, 121.445, 135.367, 135.379, 135.381, 135.398, and 152.11.

4. RELATED REFERENCES. Additional information on airport obstacle analysis may be found in the following documents:

a. FAA Documents.

(1) AC 121.445, Pilot-In-Command Qualifications for Special Areas/Routes and Airports, current edition.

(2) FAA Order 8260.38, Civil Utilization of Global Positioning System (GPS), current edition.

(3) FAA Order 8260.40, Flight Management System (FMS) Instrument Procedures Development, current edition.

Documents in paragraph 4a(1), (2), and (3) may be obtained by writing to U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75th Ave., Landover, MD 20785.

(4) AC 150/5300-13, Airport Design.

(5) FAA Order 8260.3, United States Standard for Terminal Instrument Procedures (TERPS), current edition.

(6) FAA Order 8400.10, Air Transportation Operations Inspector's Handbook.

Documents in paragraph 4a(4), (5), and (6) may be purchased from the following address: New Orders, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954.

b. Other Documents.

(1) International Civil Aviation Organization (ICAO) Annex 4, chapters 3, 4, and 5.

(2) ICAO Annex 6, Part 1.

Documents in paragraph 4b(1) and (2) may be purchased from the following address: ICAO Document Sales Unit, 999 University St., Montreal, Quebec, Canada, H3C 5H7.

(3) Airport/Facility Directory (A/FD). The A/FD may be purchased from the National Ocean Service, N/CG33, Distribution Branch, Riverdale, MD. 20737.

5. BACKGROUND. FAR Sections 121.177, 121.189, 135.367, 135.379, and 135.398 specify required takeoff and performance operating limitations. These limitations include determination of the takeoff flight path that meets specified obstacle clearance requirements (both vertical and horizontal) in the event of an engine failure. FAR Sections 121.189, 135.379, and 135.398 specify AFM compliance and Part 25 provides requirements for establishing the AFM performance data. While the AFM provides detailed instructions for determining the vertical clearance, it offers little guidance on the lateral clearance requirements. The objective of this AC is to provide information for determining safe clearance from obstacles for the actual flight path, and to consider the factors, which may cause a divergence of the actual flight path from the intended flight path. This AC provides guidance and acceptable lateral criteria to assist an operator in developing takeoff procedures and allowable weights for operational use.

6. IMPLEMENTATION. Implementation of this AC may be phased in during a 5-year period after its issuance. The 5-year period was chosen to minimize the implementation burden on the operators' resources and because airport obstacles are normally surveyed on a 5 year cycle. The guidelines in this AC should be used for obstacle analysis as new or revised airport obstacle data are published or when service to a new location begins. It is expected that operators will use the best available data for this implementation and will use any improved data as it becomes available. Airports referenced in AC 121.445, which have been identified because of critical terrain or obstacles, should be given the highest priority. It is strongly recommended that airports referenced in AC 121.445 be reviewed or reanalyzed in accordance with this AC within 2 years of its issuance. The phased implementation of this AC is not meant to discourage operators from completing the implementation at the earliest practical opportunity, if they so desire.

7. SOURCES OF OBSTACLE DATA. Operators are expected to use the best and most accurate available obstacle data for a particular airport at the time of analysis. Data sources do not require specific FAA approval. Operators should be aware that an Airport Obstruction Chart (OC), Type A chart, or any

other single source may not include all the pertinent information necessary for doing a takeoff analysis.

8. TERPS CRITERIA VS. ENGINE-OUT REQUIREMENTS:

a. Standard Instrument Departures (SIDS) or departure procedures (DPs) based on U.S. Standards for Terminal Instrument Procedures (TERPS) or ICAO Pans-Ops are based on normal (all-engine) operations. Thus, engine-out obstacle clearance requirements and the all-engine TERPS requirements are independent. Engine-out procedures do not need to meet TERPS requirements. Further, compliance with TERPS climb gradient requirements do not necessarily assure that engine-out obstacle clearance requirements are met. Terminal instrument procedures typically use specified all-engine climb gradients to an altitude, rather than certified engine-out airplane performance. Terminal instrument procedures typically assume a climb gradient of 200 feet per nautical mile (nm) unless a greater gradient is specified. For the purposes of analyzing performance on procedures developed under TERPS or Pans-Ops, it is understood that any gradient requirement, specified or unspecified, will be treated as a plane which must not be penetrated from above until reaching the stated height, rather than as a gradient which must be exceeded at all points in the path. Operators must comply with FAR requirements for the development of takeoff performance data and procedures. There are differences between TERPS and engine-out criteria, including the lateral and vertical obstacle clearance requirements. An engine failure during takeoff is a non-normal condition, and therefore, takes precedence over noise abatement, air traffic, SID's, DPs, and other normal operating considerations.

b. In order for an operator to determine that a departure maintains the necessary obstacle clearance with an engine failure, the operator should consider that an engine failure may occur at any point on the departure flight path.

(1) The most common procedure to maximize takeoff weight when significant obstacles are present along the normal departure route is to use a special engine-out departure routing in the event of an engine failure on takeoff. If there is a separate engine failure departure routing, then the obstacles along this track are used to determine the maximum allowable takeoff weight for that runway.

(2) Consideration must be given to the possibility of an engine failure occurring after passing the point at which the engine-out track diverges from the normal departure track. Judicious selection of this point will simplify the procedure and minimize the difficulty of this analysis. This is generally achieved by keeping the two tracks identical for as far as practicable.

(3) In some cases, two or more special engine-out tracks may be required to accommodate all the potential engine failure scenarios.

(4) Analysis of an engine failure after takeoff may require the use of performance data in addition to that provided in the Airplane Flight Manual. Refer to Section 16. a. (1).

c. When requested by the operators, the FAA may arrange a joint meeting with the operators and other interested parties for discussing all-engine and engine-out requirements at a particular problem airport. Interested parties should include representatives from the Regional Flight Standards Division (RFSD), Certificate Management Organizations (CMO), local and regional Air Traffic Control specialists, Office of Aviation Standards (Flight Procedures and Inspection Division, AVN-200), and affected operators. The operators should bring to the initial meeting a specific departure proposal with alternatives that consider all-engine and engine-out requirements. The operators should attempt to agree on a standard engine-out ground track and the FAA should make every effort to develop the SID, and/or IFR departure procedure to match. The operators should understand that changes to the current SID and/or IFR departure may require a modification in takeoff weather minimums and/or variation in the length of the departure route. Because of the different performance characteristics of various airplanes and airline operational policy, this effort may not result in complete procedure standardization, but it is to the benefit of all parties that the number of unique procedures be minimized.

9. OBSTACLE CONSIDERATIONS:

a. Frangible structures fixed by function with an aeronautical purpose such as antennas, approach lights, and signs need not be considered in an obstacle analysis.

b. Accountability must be made for local temporary or transient obstacles such as ships, cranes, or trains. The clearance height allowances for vehicles above roads, railroads, etc., contained in FAR part 77 and/or on the OC charts shall be used. If the operator has a means to determine the absence of a movable object at the time of takeoff, then it need not be accounted for in the analysis.

c. Reasonable judgment must be used to account for the height of indeterminate objects (objects without recorded height) displayed on topographic maps. Indeterminate objects include such items as trees, buildings, flagpoles, chimneys, transmission lines, etc. The operator needs to use sound judgment in determining the best available data sources when conflicts occur between heights and locations of obstacles in the various sources.

d. If adequate takeoff weights cannot be obtained through the methods of analyses suggested by this AC, an obstacle removal program should be considered. FAR Section 152.11 requires that land grant airports comply with obstacle clearance criteria contained in AC 150/5300-13. In general, these criteria require removal of obstacles that are not required for airport operational safety that are within the "Runway Object Free Area (OFA)" as defined in the referenced AC.

e. Operators should establish an appropriate review cycle to periodically assure the suitability of their performance data and procedures. In addition, operators should evaluate the effect of changes that occur outside of normal information or charting cycles. These changes may occur as a result of issuance of an operationally significant NOTAM, temporary obstacle information, new construction, ATIS procedural constraints, navaid outages, etc. For both periodic reviews and temporary changes, the operator should consider at least the following:

(1) The need for an immediate change versus a routine periodic update.

(2) Use of the best available information.

(3) Any significant vulnerability that may result from the continued use of data other than the most current data, until performance and/or procedures are updated through a routine revision cycle.

(4) Continued suitability of estimates or assumptions used for winds, temperatures, climb gradients, NAVAID performance or other such factors that may affect performance or flight paths.

(5) The review cycles and response times should be keyed to the needs and characteristics of the operator's fleet, routes, airports, and operating environment. No specific time frame is established for an operator to conduct either periodic reviews or short-term temporary adjustments.

10. TERMINATION OF TAKEOFF SEGMENT:

a. For the purpose of the takeoff obstacle clearance analysis, the end of the takeoff flight path is considered to occur when either:

(1) The airplane has reached the minimum crossing altitude (MCA) at a fix, or the minimum enroute altitude (MEA) for a route to the intended destination, or

(2) The airplane is able to comply with enroute obstacle clearance requirements (FAR 121.191, 121.193, 135.381, 135.383), or

(3) The airplane has reached the minimum vectoring altitude, or a fix and altitude, from which an approach may be initiated to the departure airport or departure alternate.

b. When determining the limiting takeoff weight, the obstacle analysis should be carried out to the end of the takeoff segment as defined in paragraph 10a above. Operators should note that the end of the takeoff segment is determined by the airplane's gross flight path but the obstacle analyses must use the net flight path data.

c. In the event that the airplane cannot return to and land at the departure airport, the takeoff flight path should join a suitable en route path to the planned destination or to another suitable airport. It may be necessary to address extended times and alternate fuel requirements when climbing in a holding pattern with reduced climb gradients associated with engine-out turns.

11. METHODS OF ANALYSIS. FAR Sections 121.189, 135.398, and 135.379 require that the net takeoff flight path clears all obstacles by either 35 feet vertically or 200 feet laterally inside the airport boundary, or 300 feet laterally outside the airport boundary. To ensure the required lateral clearance, the operator must account for factors that could cause a difference between the intended and actual flight paths and between their corresponding ground tracks. For example, it cannot be assumed that the ground track coincides with the extended runway centerline without considering such factors as wind and available course guidance (reference paragraph 14). This AC will focus on two methods that may be used to identify and ensure clearance of critical obstacles. These are the "area analysis method" and "flight track analysis method." The two methods may be used in conjunction with each other on successive portions of the analysis. For example, an operator may choose to use an area analysis for the initial portion of the takeoff analysis, followed by a flight track analysis, and then another area analysis.

a. The “area analysis method” defines an obstacle accountability area (OAA) within which all obstacles must be cleared vertically. The OAA is centered on the intended flight track and is acceptable for use without accounting for factors that may affect the actual flight track relative to the intended track, such as wind and available course guidance.

b. The “flight track analysis method” is an alternative means of defining an OAA based on the navigational capabilities of the aircraft. This methodology requires the operator to evaluate the effect of wind and available course guidance on the actual ground track. While this method is more complicated, it can result in an area smaller than the OAA produced by the “area analysis method.”

12. AREA ANALYSIS METHOD:

a. During straight-out departures or when the intended track or airplane heading is within 15° of the extended runway centerline heading, the following criteria apply:

(1) The width of the OAA is 0.0625D feet on each side of the intended track (where D is the distance along the intended flight path from the end of the runway in feet), except when limited by the following minimum and maximum widths.

(2) The minimum width of the OAA is 200 feet on each side of the intended track within the airport boundaries, and 300 feet on each side of the intended track outside the airport boundaries.

(3) The maximum width of the OAA is 2,000 feet on each side of the intended track.
Note: See Appendix 1, Figure 1.

b. During departures involving turns of the intended track or airplane heading of more than 15° from the extended runway centerline heading, the following criteria apply:

(1) The initial straight segment, if any, has the same width as a straight-out departure.

(2) The width of the OAA at the beginning of the turning segment is the greater of:

(i) 300 feet on each side of the intended track.

(ii) The width of the OAA at the end of the initial straight segment, if there is one.

(iii) The width of the end of the immediately preceding segment, if there is one, analyzed by the flight track analysis method.

(3) Thereafter in straight or turning segments, the width of the OAA increases by 0.125D feet on each side of the intended track (where D is the distance along the intended flight path from the beginning of the first turning segment in feet), except when limited by the following maximum width.

(4) The maximum width of the OAA is 3,000 feet on each side of the intended track.
Note: See Appendix 1, Figure 2.

c. The following apply to all departures analyzed with the area analysis method:

(1) A single intended track may be used for analysis if it is representative of operational procedures. For turning departures this implies the bank angle is varied to keep a constant turning radius with varying speeds.

(2) Multiple intended tracks may be accommodated in one area analysis by increasing the OAA width accordingly. In a turn, the specified OAA half-widths (i.e., one-half of the OAA maximum width) should be applied to the inside of the minimum turn radius and the outside of the maximum turn radius. An average turn radius may be used to calculate distances along track.

(3) The distance to an obstacle within the OAA should be measured along the intended track to a point abeam the obstacle.

(4) When the area analysis method is used, the operator is not required to account for crosswind, instrument error or flight technical error within the OAA.

(5) Obstacles prior to the end of the runway need not be accounted for, unless a turn is made prior to the end of the runway.

(6) One or more turns of less than 15° each, with an algebraic sum of not more than a 15° change in heading or track may be analyzed as a straight-out departure.

(7) No accountability is required for the radius of turn or gradient loss in the turn for a turn of 15° or less change in heading or track.

13. <u>FLIGHT TRACK ANALYSIS METHOD.</u> The flight track analysis method involves analyzing the ground track of the flight path. This paragraph discusses factors, which must be considered in performing

a flight track analysis.

a. Pilotage in Turns. The ability of a pilot to initiate and maintain a desired speed and bank angle in a turn must be considered. Assumptions used here must be consistent with pilot training and qualification programs.

b. Winds.

(1) When using the flight track analysis method and course guidance is not available, winds which may cause the airplane to drift off the intended track must be taken into account.

(2) The effect of wind on the takeoff flight path should be taken into account, in addition to making the headwind and tailwind component corrections to takeoff gross weight used in a straight-out departure.

(3) When assessing the effect of wind on a turn, the wind may be held constant in velocity and direction throughout the analysis unless known local weather phenomena indicate otherwise.

(4) If wind gradient information is available near the airport and flight path (e.g., wind reports in mountainous areas adjacent to the flight path), the operator should take that information into account in development of a procedure.

14. COURSE GUIDANCE. Credit may be taken for available course guidance when calculating the lateral location of the actual flight track relative to the intended track as part of a flight track analysis.

a. Allowance for Ground Based Course Guidance.

(1) When ground based course guidance is available for flight track analysis, the following nominal allowances may be used, unless the operator substantiates allowances for specific navigational aids at a particular airport:

LOC - plus/minus 1.25° splay with minimum half-width of 300 feet. (Minimum width governs up to 2.25 nm from LOC).

VOR - plus/minus 3.5° splay with minimum half-width of 600 feet. (Minimum width governs up to 1.6 nm from VOR).

ADF - plus/minus 5° splay with minimum half-width of 1,000 feet. (Minimum width governs up to 1.9 nm from ADF).

DME FIX - plus/minus 1 minimum instrument display increment but not less than plus/minus 0.25 nm.

DME ARC - plus/minus 2 minimum instrument display increments but not less than plus/minus 1 nm.

NOTE: The above splays originate from the navigation facility.

(2) These allowances account for crosswind, instrument error, flight technical error, and normal NAVAID signal inaccuracies. Further allowances should be made for known signal anomalies (see Airport/ Facility Directory).

(3) Ground based course guidance may be used in combination with other forms of course guidance to construct a departure procedure.

b. Allowance for Airplane Based Area Navigation Capabilities.

(1) Airplane based area navigation refers to a system (e.g., FMS, RNAV, RNP, IRS, GPS) that permits airplane operations on any desired course, including a turn expansion for fly-by or fly-over waypoints, within the coverage of (ground or space based) station reference navigation signals or within the limits of self contained system capabilities without direct course guidance from a ground based NAVAID. The credit and consideration given to each system will depend on its accuracy, redundancy, and usability under engine-out conditions.

(2) The minimum allowance is the demonstrated accuracy of the airplane based navigation equipment (or the appropriate value for RNP, if RNP is used), but not less than a half-width of 300 feet.

(3) Airplane based course guidance may be used in combination with other navigational course guidance to construct a departure procedure.

c. Allowance for Visual Course Guidance:

(1) Visual ground reference navigation is another form of course guidance. However, to take advantage of visual course guidance, a flight track analysis must be performed.

(2) The ability to laterally avoid obstacles by visual reference can be very precise, if the obstacles can be seen and are apparent. It is the operator's responsibility to ensure the weather conditions, including ceiling and visibility at the time of operation, are consistent with the use of the visual ground reference points for navigation upon which the obstacle analysis is based.

(3) To take advantage of visual course guidance, the flight crew must be able to continuously determine and maintain the correct flight path with respect to ground reference points so as to provide a safe clearance with respect to obstructions and terrain.

(i) The procedure must be well defined with respect to ground reference points so that the track to be flown can be analyzed for obstacle clearance requirements.

(ii) An unambiguous written and/or pictorial description of the procedure must be provided for crew use.

(iii) The limiting environmental conditions (wind, ceiling, visibility, day/night, ambient lighting, obstruction lighting, etc.) must be specified for the use of the procedure to ensure the flight crew is able to visually acquire ground reference navigation points and navigate with respect to those points.

(iv) The procedure must be within the engine-out capabilities of the airplane with respect to turn radius, bank angles, climb gradients, effects of winds, cockpit visibility, etc.

(4) When visual course guidance is used for flight track analysis, the following minimum allowances (in addition to turn radius) will apply:

(i) If the obstacle itself is the reference point being used for visual course guidance, the minimum allowance is 300 feet for lateral clearance from that obstacle.

(ii) When following a road, railroad, river, valley, etc., for course guidance, the minimum allowance is 1,000 feet each side of the width of the navigation feature. This width should include the meandering and/or curves of the navigation feature being used or the definable center of the valley or river.

(iii) When using a lateral visual reference point to initiate a turn, the minimum allowance is plus/minus 0.25 nm along the track at the turn point.

(iv) When initiating a turn directly over a visual reference point, the minimum allowance is plus/minus 0.50 nm along the track at the turn point.

(v) When initiating a turn to avoid overflight of a visual reference point, the minimum allowance is plus/minus 1 nm along the track at the turn point.

(5) Visual course guidance may be used as part of an IFR procedure (e.g., SID, DP) or in conjunction with IFR flight during that portion of the operation which is in visual meteorological conditions (VMC). The visual course guidance may be used in combination with other forms of course guidance to construct an engine-out departure procedure.

15. ANALYSIS OF TURNS:

a. Temperature Effects on Turns. Temperature usually has a very large effect on turn radius. First, the turn radius is a function of true airspeed (plus wind), which varies with temperature at the same indicated airspeed. Second, the engine-out indicated airspeed (V2 or V2 plus an increment) varies considerably with weight, and limit weight is strongly affected by temperature. The temperature effect on both the maximum and minimum turn radii must be taken into account. However, it is acceptable to do a turn analysis based on a single critical temperature if that temperature produces results which are conservative for all other temperatures.

b. Bank Angle. FAR Sections 121.189, 135.379 and 135.398 assume that the airplane is not banked before reaching a height of 50 feet, and that thereafter, the maximum bank is not more than 15 degrees. Obstacle clearance at certain airports can be enhanced by the use of bank angles greater than 15°. The following bank angles and heights may be used with Operation Specification authorization (in accordance with FAR 121.173 (f)). Any bank angles greater than the values shown below require additional specific FAA authorization:

Maximum Bank Angles

Height (above Departure End of Runway - ft)	Maximum Bank Angle (degrees)
h>400	25
400≥h>100	20
100≥h>50*	15

* = Or 1/2 of wingspan, whichever is higher

(1) The AFM generally provides a climb gradient decrement for a 15° bank. For bank angles less than 15°, a proportionate amount of the 15° value may be applied, unless the manufacturer or AFM has provided other data. Bank angles over 15° require additional gradient decrements.

(2) If bank angles of more than 15° are used, V_2 speeds may have to be increased to provide an equivalent level of stall margin protection and adequate controllability, i.e., V_{MCA} (minimum control speed, air). Unless otherwise specified in the AFM or other performance or operations manuals from the manufacturer, acceptable adjustments to ensure adequate stall margins and gradient decrements are provided by the following:

Bank Angle Adjustments

Bank Angle	Speed	'G' Load	Gradient Loss
15°	V_2	1.035	AFM 15° Gradient Loss
20°	V_2+XX/2	1.064	Double 15° Gradient Loss
25°	V_2+XX	1.103	Triple 15° Gradient Loss

Where 'XX' is the all-engine operating speed increment (usually 10 or 15 knots)

NOTE: On some airplanes, the AFM standard V-speeds may already provide sufficient stall margin protection without additional adjustments.

(3) Bank angles over 25° may be appropriate in certain circumstances but require specific evaluation and FAA Certificate Holding District Office (CHDO) approval.

(4) Accountability for speed increase for bank angle protection may be accomplished by increasing V-speeds by the required increment shown above or by accelerating to the increment above V_2 after liftoff. The following are examples of acceptable methods:

(i) If available, AFM data for "improved climb" or "overspeed" performance may be used to determine weight decrements for the desired increase to V_1, V_R, and V_2.

(ii) Calculate a weight decrement from the weight/V-speed relationship in the AFM for the desired increase in V_1, V_R, and V_2.

(iii) Account for the acceleration above V_2 by trading the climb gradient for speed increase. Integrate this climb gradient loss over the distance required to accelerate to determine an equivalent height increment to be added to all subsequent obstacles.

(5) Gradient loss in turns may be accounted for by increasing the obstacle height by the gradient loss multiplied by the flight path distance in the turn, in order to arrive at an equivalent obstacle height that can be analyzed as a "straight-out" obstacle in the operator's airport analysis programs.

(6) For bank angles greater than 15 degrees, the 35 foot obstacle clearance relative to the net takeoff flight path should be determined from the lowest part of the banked airplane.

16. ADDITIONAL CONSIDERATIONS:

a. Airplane Flight Manual Data:

(1) Unless otherwise authorized, AFM data must be used for engine-out takeoff analysis. It is recognized that many AFM's generally contain only the engine-out performance for loss of an engine at V_1 on takeoff. All-engine performance must also be considered to determine the airplanes flight path in the event of an engine failure at a point on the flight path after V_1. The best available all-engine data should be used consistent with best engineering practices. This data may be found in sources such as community noise documents, performance engineers handbook, flight characteristics manual, manufacturers' computer programs, etc.

(2) Certain airports may present situations outside the boundaries covered by the AFM. AFM data may not be extrapolated without an authorizing deviation specified in FAR Sections 121.173(f) and 135.363(h). Application for such deviation, with supporting data, should be forwarded to AFS-1, through the POI at the FSDO or CMO.

b. Acceleration and Cleanup Altitudes:

(1) For standardization of operating procedures, many operators select a standard cleanup altitude that is higher than that required for obstacle clearance at most airports. With the standard cleanup altitudes, the acceleration and cleanup may be accomplished within the takeoff thrust time limit established in the AFM. The obstacle analysis is usually based on a level off for cleanup, but, there is no operational requirement to level off, except in the rare case of a distant obstacle, which must be cleared in the final segment. Obstacle clearance margins usually are improved by continuing the climb during cleanup.

(2) The terrain and obstacles at certain airports may require a higher than standard cleanup altitude to be used and may still allow acceleration and cleanup to be accomplished within the takeoff thrust time limit.

c. Confirmation Flights:

(1) Consideration should be given to conducting a flight to confirm flight crews' ability to fly actual special engine-out departures and to uncover any potential problems associated with those procedures, if they differ significantly from the all-engine procedures, or if terrain makes course guidance questionable at the engine-out altitudes. It should be emphasized that the purpose of this flight is not to prove the validity of the performance data, nor to demonstrate obstacle clearance. In addition, cockpit workload considerations and minimum control speed characteristics are best evaluated in a simulator. Prior experience gained by another airplane type and/or operator may provide sufficient confirmation of the procedure.

(2) A confirmation flight with a simulated engine failure at V_1 is not recommended. Acceptable techniques used for these flights include:

(i) Initiating the procedure from a low pass over the runway at configurations, speeds, and altitudes that represent takeoff conditions.

(ii) Using a power setting on all engines calculated to give a thrust/weight ratio representative of engine-out conditions or setting one engine to flight idle.

17. PILOT INFORMATION. The development and implementation of unique departure and go around procedures should be coordinated with the Flight Operations department. Flight Crews must receive instructions, through an appropriate means, regarding these procedures. Based on complexity, this could be done through Flight Operations Bulletins, revisions to selected Flight Crew manuals, takeoff charts, Notams or special ground or simulator training.

The operator should advise flight crews of the following: (This may be accomplished as a general policy for all airports with exceptions stated as applicable, or specified for each airport).

a. How to obtain V-speeds consistent with the allowable weights, with particular attention given to the effects of wind, slope, Improved Climb Performance, and contaminants.

b. The intended track with an engine failure. (Some operators have a standard policy of flying runway heading after an engine failure; others routinely assume the all-engine ground track unless specifically stated otherwise. In any case, the intended track should be apparent to the flight crew, and the failure at any point along the track should be taken into account.

c. Speeds (relative to V_2) and bank angles to be flown -- all-engines and engine-out.

d. The points along the flight path at which the flap retraction sequence and thrust reduction are to be initiated.

e. Initial turns should be well defined. ("Immediate" turns should be specified with a minimum altitude for initiation of the turn or a readily identifiable location relative to the runway or navigational fix).

18. MISSED APPROACHES.

a. General

(1) FAR parts 121 and 135 do not specifically require an obstacle clearance analysis for engine-out missed approaches or rejected landings. While it is not necessary to perform such an analysis for each flight, dispatch, or landing weight limitation, it is appropriate to provide information to the flight crews on the safest way to perform such a maneuver should it be required. The intent is to identify the best option or options for a safe lateral ground track and flight path to follow in the event that a missed approach, balked landing, rejected landing or go-around is necessary. To accomplish this, the operator may develop the methods and criteria for the analysis of engine-out procedures which best reflect that operator's operational procedures.

(2) Generally, published missed approach procedures provide adequate terrain clearance; however, further analysis may be required in the following circumstances:

(i) Published missed approach has a climb gradient requirement; or

(ii) Departure procedure for the runway has a published minimum climb gradient; or

(iii) A special engine-out takeoff procedure is required.

(iv) Runways that are used for landing but not for takeoff.

(3) A distinction needs to be made between a missed approach and a rejected landing. An engine-out missed approach from the minimum descent altitude (MDA (H)), decision altitude (height) (DA (H)), or above, can frequently be flown following the published missed approach procedure. A rejected landing from a lower altitude may require some other procedure (e.g., following the same engine-out procedure as used for takeoff). In any case, the pilot should be advised of the appropriate course of action when the published missed approach procedure cannot be safely executed.

b. Assessment Considerations:

(1) Operators may accomplish such assessments generically for a particular runway, procedure, aircraft type, and expected performance, and need not perform this assessment for each specific flight. Operators may use simplifying assumptions to account for the transition, reconfiguration, and acceleration distances following go-around (e.g., use expected landing weights, anticipated landing flap settings).

(2) The operator should use the best available information or methods from applicable aircraft manuals or supplementary information from aircraft or engine manufacturers. If performance or flight path data are not otherwise available to support the necessary analysis from the above sources, the operator may develop, compute, demonstrate or determine such information to the extent necessary to provide for safe obstacle clearance.

(3) The operational considerations should include:

(i) Go-around configuration transitions from approach to missed approach configuration including expected flap settings and flap retraction procedures.

(ii) Expected speed changes.

(iii) Appropriate engine failure and shutdown (feathering if applicable) provisions, if the approach was assumed to be initiated with all engines operative.

(iv) Any lateral differences of the missed approach flight path from the corresponding takeoff flight path.

(v) Suitable balked landing obstacle clearance, until reaching instrument approach missed approach or enroute procedurally protected airspace.

(vi) Any performance or gradient loss during turning flight

(vii) Methods used for takeoff analysis, (such as improved climb), engine-out maximum angle climb, or other such techniques, may be used.

(viii) Operators may make obstacle clearance assumptions similar to those applied to corresponding takeoff flight paths in the determination of net vertical flight path clearance or lateral track obstacle clearance.

c. Assessment Conditions for Balked Landing

(1) A "balked landing" starts at the end of the touchdown zone (TDZ).

(i) A touchdown zone (TDZ) typically is considered to be the first one-third of the available landing distance or 3000' feet, whichever is less. When appropriate for the purposes of this provision, operators may propose to use a different designation for a touchdown zone. For example, alternate consideration of a touchdown zone (TDZ) may be appropriate for runways that:

(a) Are less than 6000' in length and which do not have standard TDZ markings.

(b) Short runways requiring special aircraft performance information or procedures for landing.

(c) Runways for STOL aircraft, or

(d) Runway where markings or lighting dictate that a different TDZ designation would be more appropriate.

(2) An engine failure occurs at the initiation of the balked landing, from an all-engine configuration.

(3) Balked landing initiation speed $\geq V_{REF}$ or V_{GA} (as applicable).

(4) Balked Landing initiation height is equal to the specified elevation of the TDZ.

(5) Balked landing initiation configuration is normal landing flaps and gear down.

(6) At the initiation of the maneuver, all engines are at least in a spooled configuration.

d. “One-Way “Airports or Other Special Situations:

(1) Where obstacle clearance is determined by the operator to be critical, such as for:

(i) Airports in mountainous terrain that have runways that are used predominantly for landing in one direction and takeoff in the opposite direction (“One way in” and “opposite way out”), or

(ii) Runways at which the planned landing weight is greater than the allowed takeoff weight.

(2) The operator should provide the following guidance to the flight crew:

(i) The flight path that provides the best ground track for obstacle clearance.

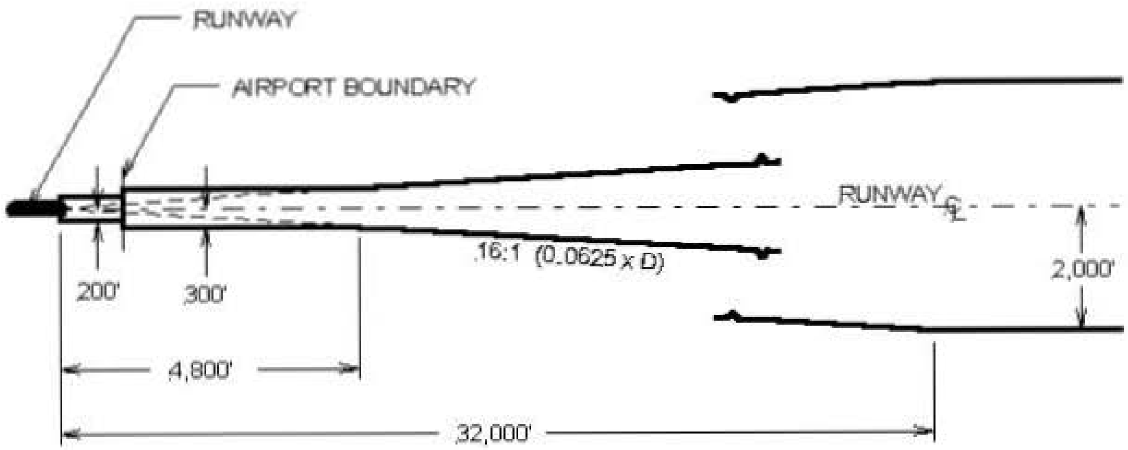
(ii) The maximum weight(s) at which a safe missed approach or rejected landing can safely be accomplished under various conditions of temperature, wind, and aircraft configuration.

(iii) A “commit point” beyond which a safe rejected landing cannot be assured. This should only be used where it is not otherwise possible to identify a safe go-around procedure.

19. ALTERNATE MEANS. The methods and guidelines presented in this AC are not the only acceptable methods. An operator, who desires to use an alternate means, should submit an application to the Certificate Holding District Office (CHDO). The application should describe the alternate assumptions, methods, and criteria to be used along with any other supporting documentation. The CHDO will forward the application through the FSDO (CMO/CMU) to the Director, Flight Standards Service, AFS-1, for review and approval, if appropriate.

Nick Lacey
Director, Flight Standards Service

APPENDIX 1. OBSTACLE ACCOUNTABILITY AREA



NOTE: D IS THE DISTANCE ALONG THE INTENDED FLIGHT PATH FROM THE END OF THE RUNWAY IN FEET

FIGURE 1. STRAIGHT-OUT DEPARTURES

APPENDIX 1. OBSTACLE ACCOUNTABILITY AREA

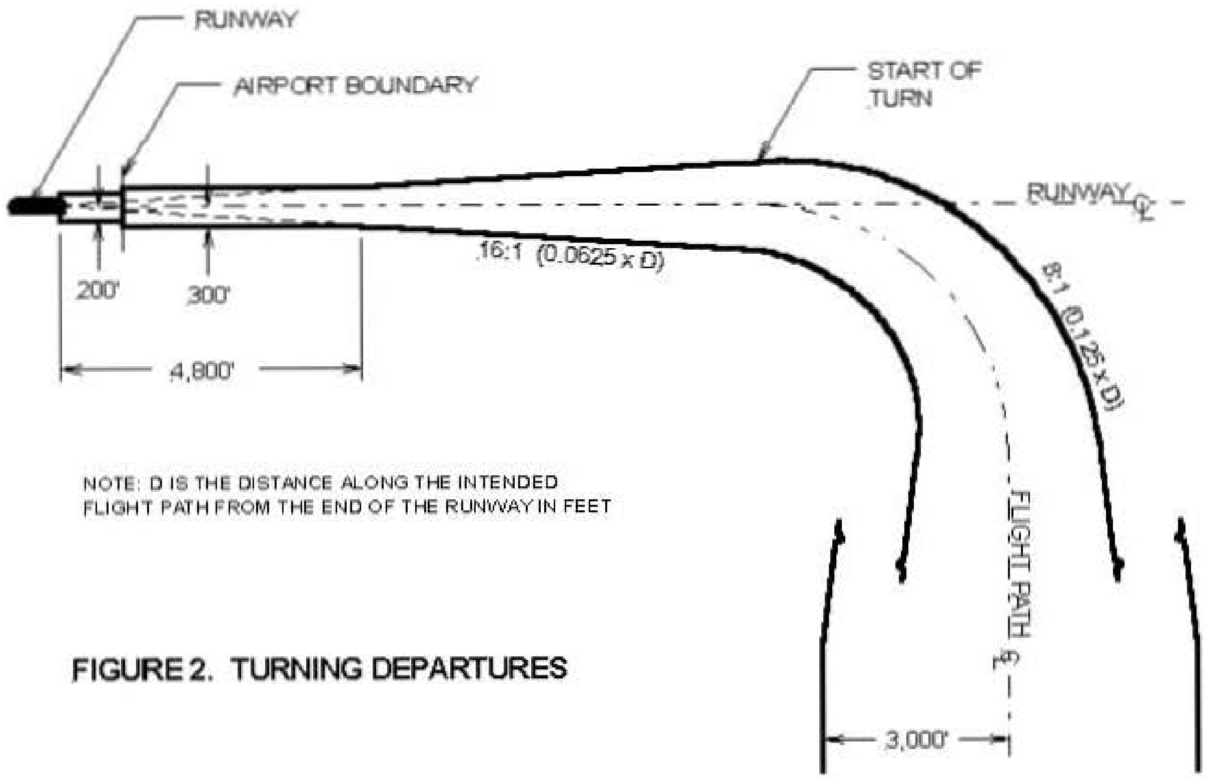


FIGURE 2. TURNING DEPARTURES

(I.) Report from the Airplane Performance Harmonization Working Group

Issue: Miscellaneous Amendments to the General and Applicability rules sections

Rule Sections: §§ 121.171, 121.173, 135.361, and 135.363/JAR-OPS 1.470, 1.475, 1.480, 1.485

1 - What is underlying safety issue to be addressed by the FAR/JAR?
[Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

These FAR paragraphs prescribe the applicability of and general requirements relating to Subpart I, " Airplane Performance Operating Limitations," of Parts 121 and 135. These paragraphs also contain definitions for the terms, "effective length of the runway" and "obstruction clearance plane," which are used in several places in Subpart I.

Subpart I of Parts 121 and 135 contains the performance operating limitations applicable to all airplanes operated under the terms of those parts, including reciprocating-engine-powered, turbo-propeller-powered, and other turbine-engine-powered airplanes. There are different operating limitations that apply to each class of airplane, and it is the purpose of §§ 121.171, 121.173, 135.361, and 135.363 to identify the limitations corresponding to each. Also, §§ 121.173(d) and 135.363(f) require the use of the performance data in the Airplane Flight Manual for determining compliance with the performance operating limitations of Subpart I for transport category airplanes.

The rulemaking proposal contained in this working group report originated from a task to harmonize the performance operating limitations of FAR Parts 121 and 135 with those of JAR-OPS 1.

2 - What are the current FAR and JAR standards relative to this subject?
[Reproduce the FAR and JAR rules text as indicated below.]

<u>Current FAR text</u>:

A. Part 121

§ 121.171Applicability.

(a)This subpart prescribes airplane performance operating limitations for all certificate holders.

(b)For purposes of this part, *effective length of the runway* for landing means the distance from the point at which the obstruction clearance plane associated with the approach end of the runway intersects the centerline of the runway to the far end thereof.

(c)For the purposes of this subpart, *obstruction clearance plane* means a plane sloping upward from the runway at a slope of 1:20 to the horizontal, and tangent to or clearing all obstructions within a specified area surrounding the runway as shown in a profile view of that area. In the plan view, the centerline of the specified area coincides with the centerline of the runway, beginning at the point where the obstruction clearance plane intersects the centerline of the runway and proceeding to a point at least 1,500 feet from the beginning point. Thereafter the centerline coincides with the takeoff path over the ground for the runway (in the case of takeoffs) or with the instrument approach counterpart (for landings), or, where the applicable one of these paths has not been established, it proceeds consistent with turns of at least 4,000 foot radius until a point is reached beyond which the obstruction clearance plane clears all obstructions. This area extends laterally 200 feet on each side of the centerline at the point where the obstruction clearance plane intersects the runway and continues at this width to the end of the runway; then it increases uniformly to 500 feet on each side of the centerline at a point 1,500 feet from the intersection of the obstruction clearance plane with the runway; thereafter it extends laterally 500 feet on each side of the centerline.

§ 121.173General.

(a)Except as provided in paragraph (c) of this section, each certificate holder operating a reciprocating-engine-powered airplane shall comply with §§ 121.175 through 121.187.

(b)Except as provided in paragraph (c) of this section, each certificate holder operating a turbine-engine-powered airplane shall comply with the applicable provisions of §§ 121.189 through 121.197, except that when it operates--

(1)A turbo-propeller-powered airplane type certificated after August 29, 1959, but previously type certificated with the same number of reciprocating engines, the certificate holder may comply with §§ 121.175 through 121.187; or

(2)Until December 20, 2010, a turbo-propeller-powered airplane described in § 121.157(f), the certificate holder may comply with the applicable performance requirements of appendix K of this part.

(c)Each certificate holder operating a large nontransport category airplane type certificated before January 1, 1965, shall comply with §§ 121.199 through 121.205 and any determination of compliance must be based only on approved performance data.

(d) The performance data in the Airplane Flight Manual applies in determining compliance with §§ 121.175 through 121.197. Where conditions are different from those on which the performance data is based, compliance is determined by interpolation or by computing the effects of changes in the specific variables if the results of the interpolation or computations are substantially as accurate as the results of direct tests.

(e)Except as provided in paragraph (c) of this section, no person may take off a reciprocating-engine-powered airplane at a weight that is more than the allowable weight for the runway being used (determined under the runway takeoff limitations of the transport category operating rules of 14 CFR part 121, subpart I) after taking into account the temperature operating correction factors in the applicable Airplane Flight Manual.

(f)The Administrator may authorize in the operations specifications deviations from the requirements in the subpart if special circumstances make a literal observance of a requirement unnecessary for safety.

(g)The ten-mile width specified in §§ 121.179 through 121.183 may be reduced to five miles, for not more than 20 miles, when operating VFR or where navigation facilities furnish reliable and accurate identification of high ground and obstructions located outside of five miles, but within ten miles, on each side of the intended track.

B. Part 135

§ 135.361Applicability.

(a)This subpart prescribes airplane performance operating limitations for all certificate holders.

(b)For purposes of this part, *effective length of the runway* for landing means the distance from the point at which the obstruction clearance plane associated with the approach end of the runway intersects the centerline of the runway to the far end thereof.

(c)For the purposes of this subpart, *obstruction clearance plane* means a plane sloping upward from the runway at a slope of 1:20 to the horizontal, and tangent to or clearing all obstructions within a specified area surrounding the runway as shown in a profile view of that area. In the plan view, the centerline of the specified area coincides with the centerline of the runway, beginning at the point where the obstruction clearance plane intersects the centerline of the runway and proceeding to a point at least 1,500 feet from the beginning point. Thereafter the centerline coincides with the takeoff path over the ground for the runway (in the case of takeoffs) or with the instrument approach counterpart (for landings), or, where the applicable one of these paths has not been established, it proceeds consistent with turns of at least 4,000 foot radius until a point is reached beyond which the obstruction clearance plane clears all obstructions. This area extends laterally 200 feet on each side of the centerline at the point where the obstruction clearance plane intersects the runway and continues at this width to the end of the runway; then it increases uniformly to 500 feet on each side of the centerline at a point 1,500 feet from the intersection of the obstruction clearance plane with the runway; thereafter it extends laterally 500 feet on each side of the centerline.

§ 135.363General.

(a)Each certificate holder operating a reciprocating engine powered large transport category airplane shall comply with §§ 135.365 through 135.377.

(b)Each certificate holder operating a turbine engine powered large transport category airplane shall comply with the applicable provisions of §§ 135.379 through 135.387, except that when it operates a turbopropeller-powered large transport category airplane certificated after August 29, 1959, but previously type certificated with the same number of reciprocating engines, it may comply with §§ 135.365 through 135.377.

(c)Each certificate holder operating a large nontransport category airplane shall comply with §§ 135.389 through 135.395 and any determination of compliance must be based only on approved performance data. For the purpose of this subpart, a large nontransport category airplane is an airplane that was type certificated before July 1, 1942.

(d)Each certificate holder operating a small transport category airplane type shall comply with § 135.397.

(e)Each certificate holder operating a small nontransport category airplane type shall comply with § 135.399.

(f)The performance data in the Airplane Flight Manual applies in determining compliance with §§ 135.365 through 135.387. Where conditions are different from those on which the performance data is based, compliance is determined by interpolation or by computing the effects of changes in the specific variables if the results of the interpolation or computations are substantially as accurate as the results of direct tests.

(g)No person may take off a reciprocating engine powered large transport category airplane at a weight that is more than the allowable weight for the runway being used (determined under the runway takeoff limitations of the transport category operating rules of this subpart) after taking into account the temperature operating correction factors in section 4a.749a-T or section 4b.117 of the Civil Air Regulations in effect on January 31, 1965, and in the applicable Airplane Flight Manual.

(h)The Administrator may authorize in the operations specifications deviations from the requirements in the subpart if special circumstances make a literal observance of a requirement unnecessary for safety.

(i)The ten-mile width specified in §§ 135.369 through 135.373 may be reduced to five miles, for not more than 20 miles, when operating VFR or where navigation facilities furnish reliable and accurate identification of high ground and obstructions located outside of five miles, but within ten miles, on each side of the intended track.

(j)Each certificate holder operating a commuter category airplane shall comply with § 135.398.

Current JAR text:

JAR-OPS 1.470 Applicability

(a)An operator shall ensure that multi-engine aeroplanes powered by turbopropeller engines with a maximum approved passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5700 kg and all multi-engine turbojet powered aeroplanes are operated in accordance with Subpart G (Performance Class A).

(b)An operator shall ensure that propeller driven aeroplanes with a maximum approved passenger seating configuration of 9 or less, and a maximum take-off mass of 5700 kg or less are operated in accordance with Subpart H (Performance Class B).

(c)An operator shall ensure that aeroplanes powered by reciprocating engines with a maximum approved passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5700 kg are operated in accordance with Subpart I (Performance Class C).

(d)Where full compliance with the requirements of the appropriate Subpart cannot be shown due to specific design characteristics (e.g. supersonic aeroplanes or seaplanes), the operator shall apply approved performance standards that ensure a level of safety equivalent to that of the appropriate Subpart.

(e)Multi-engine aeroplanes powered by turbopropeller engines with a maximum approved passenger seating configuration of more than 9 and with a maximum take-off mass of 5700 kg or less may be permitted by the Authority to operate under alternative operating limitations to those of Performance Class A which shall not be less restrictive than those of the relevant requirements of Subpart H.

(f)The provisions of subparagraph (e) above will expire on 1 April 2000.

C. JAR-OPS 1.475 General

(a)An operator shall ensure that the mass of the aeroplane:

(1)At the start of the takeoff;

or, in the event of in-flight replanning

(2)At the point from which the revised operational flight plan applies,

is not greater than the mass at which the requirements of the appropriate Subpart can be complied with for the flight to be undertaken, allowing for expected reductions in mass as the flight proceeds, and for such fuel jettisoning as is provided for in the particular requirement.

(b)An operator shall ensure that the approved performance data contained in the Aeroplane Flight Manual is used to determine compliance with the requirements of the appropriate Subpart, supplemented as necessary with other data acceptable to the Authority as prescribed in the relevant Subpart. When applying the factors prescribed in the appropriate Subpart, account may be taken of any operational factors already incorporated in the Aeroplane Flight Manual performance data to avoid double application of factors. (See AMC OPS 1.475(b) & IEM OPS 1.475(b)).

(c)When showing compliance with the requirements of the appropriate Subpart, due account shall be taken of aeroplane configuration, environmental conditions and the operation of systems which have an adverse effect on performance.

(d)For performance purposes, a damp runway, other than a grass runway, may be considered to be dry.

JAR-OPS 1.480 Terminology

(a)Terms used in Subparts F, G, H, I and J, and not defined in JAR-1, have the following meaning:

(1)*Accelerate-stop distance available (ASDA).* The length of the take-off run available plus the length of stopway, if such stopway is declared available by the appropriate Authority and is capable of bearing the mass of the aeroplane under the prevailing operating conditions.

(2)*Contaminated runway.* A runway is considered to be contaminated when more than 25% of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by the following:

(i)Surface water more than 3 mm (0.125 in) deep, or by slush, or loose snow, equivalent to more than 3 mm (0.125 in) of water;

(ii)Snow which has been compressed into a solid mass which resists further compression and will hold together or break into lumps if picked up (compacted snow); or

(iii)Ice, including wet ice.

(3)*Damp runway.* A runway is considered damp when the surface is not dry, but when the moisture on it does not give it a shiny appearance.

(4)*Dry runway.* A dry runway is one which is neither wet nor contaminated, and includes those paved runways which have been specially prepared with grooves or porous pavement and maintained to retain ‘effectively dry’ braking action even when moisture is present.

(5)*Landing distance available (LDA).* The length of the runway which is declared available by the appropriate Authority and is suitable for the ground run of an aeroplane landing.

(6)*Maximum approved passenger seating configuration.* The maximum passenger seating capacity of an individual aeroplane, excluding pilot seats or flight deck seats and cabin crew seats as applicable, used by the operator, approved by the Authority and specified in the Operations Manual

(7)*Take-off distance available (TODA).* The length of the take-off run available plus the length of the clearway available if such clearway is declared available by the appropriate Authority.

(8)*Take-off mass.* The take-off mass of the aeroplane shall be taken to be its mass, including everything and everyone carried at the commencement of the take-off run.

(9)*Take-off run available (TORA).* The length of runway which is declared available by the appropriate Authority and suitable for the ground run of an aeroplane taking off.

(10)*Wet runway.* A runway is considered wet when the runway surface is covered with water, or equivalent, less than specified in subparagraph (a)(2) above or when there is sufficient moisture on the runway surface to cause it to appear reflective, but without significant areas of standing water.

(b)The terms 'accelerate-stop distance', 'take-off distance', 'take-off run', 'net take-off flight path', 'one engine inoperative en-route net flight path' and 'two engines inoperative en-route net flight path' as relating to the aeroplane have their meanings defined in the airworthiness requirements under which the aeroplane was certificated, or as specified by the Authority if it finds that definition inadequate for showing compliance with the performance operating limitations.

JAR-OPS 1.485 General

(a)An operator shall ensure that, for determining compliance with the requirements of this subpart, the approved performance data in the Aeroplane Flight Manual is supplemented as necessary with other data acceptable to the Authority if the approved performance data in the Aeroplane Flight Manual is insufficient in respect of items such as:

(1)Accounting for reasonably expected adverse operating conditions such as take-off and landing on contaminated runways; and

(2)Consideration of engine failure in all flight phases.

(b)An operator shall ensure that for the wet and contaminated runway case, performance data determined in accordance with JAR 25X1591 or equivalent acceptable to the Authority is used. (See IEM OPS 1.485(b)).

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

There are no differences between the FAA and JAA standards relative to the applicability of the performance operating limitations for turbine engine powered airplanes that are required to be operated under JAR-OPS 1 and FAR Part 121 or 135. The JAA applicability standards are contained in the JAR paragraph on applicability, while the FAA applicability standards are contained in the paragraph on general requirements.

As part of the general requirements, the JAA standards specifically state that the mass (weight) limits imposed by the performance requirements must be complied with at the start of the takeoff, or if in-flight replanning is used, at the point from which the revised flight plan applies. Although the FAA standards of Part 121 are the same, this issue is addressed differently. The standards of Part 135 are different in that the issue of flight replanning is not addressed. Each performance operating limitation in both Parts 121 and 135 states, "No person…may take off that airplane at a weight greater than…," which is considered to be equivalent to the JAR-OPS 1 requirement that the applicable weight limitation must be met at the start of the takeoff. Section 121.631(c) specifies that, if the flight plan is amended, the appropriate subpart I performance limitations must be met at the time of amendment.

Both standards require the approved performance data contained in the Airplane Flight Manual (AFM) to be used to show compliance with the performance operating limitations. However, JAR-OPS 1 recognizes that the AFM may not contain all of the information needed to show compliance with some of the JAR-OPS 1 requirements. In that case, data found acceptable to the regulatory authority may be used to supplement the AFM. The FAA standards do not address the issue of supplementary data.

The JAA standards also note that the operator may take account of any operational factors required by the JAR-OPS 1 performance limitations that are already incorporated in the AFM in order to avoid applying the factors twice. Although the FAA standard is the same, i.e., there is no intent to require double application of the operating factors, neither Part 121 nor Part 135 contain the statement currently in JAR-OPS 1.

JAR-OPS 1 requires “due account” to be taken of any configuration, environmental condition, or system that has an adverse effect on performance. The FAA addresses these issues during the type certification process by ensuring that the performance limitations in the AFM contain such information. Since this information is included as part of the airplane operating limitations, operators are obliged to use it.

JAR-OPS 1.475(d) allows, for performance purposes, a damp runway (other than a grass runway), to be considered dry. In general, the FAA does not allow a damp runway to be considered equivalent to a dry runway for performance purposes. This policy is stated in FAA Order 8400.10, “Air Transportation Operations Inspector’s Handbook,” paragraph 921A: “Any runway which is not dry [or contaminated] is considered to be wet. Standing water, puddles, or continuous rain are not necessary for a runway to be considered wet. Runway braking friction can change when there is a light drizzle. In some cases, even dew or frost which changes the color of a runway will result in a significant change in runway friction…Some newly-surfaced asphalt runway surfaces can be extremely slippery when only slightly wet.” In some cases, the FAA has allowed damp, grooved runways at the destination airport to be considered dry for the purposes of complying with the landing limitations of §§ 121.195 and 135.385.

JAR-OPS 1 contains definitions for numerous terms that are used in the performance requirements, but are not defined in JAR-1. Other than the term “wet runway,” these terms are not used in the FAA standards, and hence are not defined in FAR Parts 121 or 135. For terms that are common to the type certification standards (e.g., JAR-25 and FAR Part 25), both JAR-OPS 1 and FAR Parts 121 and 135 state that the applicable definitions are those defined in the airworthiness requirements under which the airplane was certificated. However, JAR-OPS1 allows the regulatory authority to specify an appropriate definition if it is determined that the definition from the applicable airworthiness requirement is inadequate for showing compliance with the performance operating limitations.

The FAA standards contain definitions for the terms, “effective length of the runway” and “obstruction clearance plane,” which are used in various subpart I operating limitations associated with landing distance. JAR-OPS 1 does not use these terms, and therefore definitions are not provided in the JAR standard.

JAR-OPS 1 requires the operator to ensure that performance data used to show compliance with the wet and contaminated runway performance operating limitations is determined in accordance with a JAR methodology specified in the rule, or its equivalent. Since the FAA standards do not contain operating limitations for wet and contaminated runways, this requirement is not contained in FAR Parts 121 and 135.

The FAA standards allow the Administrator to authorize deviations from the subpart I requirements if special circumstances make a literal observance of a requirement unnecessary for safety. JAR-OPS 1 only allows temporary exemptions to be granted when the regulatory authority is satisfied that there is a need and the operator complies with any supplementary condition the authority considers necessary in order to ensure an acceptable level of safety. There are not thought to be any deviations allowed by the FAA that result in any significant harmonization issues.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

These rule sections set forth the applicability and general requirements associated with the performance operating requirements. There are no specific means of compliance issues associated with them.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The proposed action is to harmonize the sections of these requirements that have an effect on the working group’s task of harmonization of the JAR-OPS 1 performance requirements with those of FAR Parts 121 and 135.

For each proposed change from the existing standard, answer the following questions:

6 - What should the harmonized standard be? [Insert the proposed text of the harmonized standard here]

The proposed amended FAR Parts 121, 135, and JAR-OPS 1 standards are shown below. A description of each proposed change follows the proposed regulatory text.

(II.) FAR Part 121

§ 121.171Applicability.

(a)This subpart prescribes airplane performance operating limitations for all certificate holders.

(b)Except as provided in paragraph (d) of this section, each certificate holder operating a reciprocating-engine-powered airplane shall comply with §§ 121.175 through 121.187.

(c)Except as provided in paragraph (d) of this section, each certificate holder operating a turbine-engine-powered airplane shall comply with the applicable provisions of §§ 121.189 through 121.197, except that when it operates--

(1)A turbo-propeller-powered airplane type certificated after August 29, 1959, but previously type certificated with the same number of reciprocating engines, the certificate holder may comply with §§ 121.175 through 121.187; or

(2) Until December 20, 2010, a turbo-propeller-powered airplane described in § 121.157(f), the certificate holder may comply with the applicable performance requirements of appendix K of this part.

(d)Each certificate holder operating a large nontransport category airplane type certificated before January 1, 1965, shall comply with §§ 121.199 through 121.205 and any determination of compliance must be based only on approved performance data.

§ 121.173General.

(a) The performance data in the Airplane Flight Manual, supplemented as necessary with other data acceptable to the Administrator, applies in determining compliance with §§ 121.175 through 121.197. Where conditions are different from those on which the performance data is based, compliance is determined by interpolation or by computing the effects of changes in the specific variables if the results of the interpolation or computations are substantially as accurate as the results of direct tests.

(b) When applying the operational factors required by the applicable provisions of §§ 121.189 through 121.197, account may be taken of any operational factors already incorporated in the performance data to avoid double application of factors.

(c)Except as provided in § 121.171(d), no person may take off a reciprocating-engine-powered airplane at a weight that is more than the allowable weight for the runway being used (determined under the runway takeoff limitations of the transport category operating rules of 14 CFR part 121, subpart I) after taking into account the temperature operating correction factors in the applicable Airplane Flight Manual.

(d)The Administrator may authorize in the operations specifications deviations from the requirements in the subpart if special circumstances make a literal observance of a requirement unnecessary for safety.

(e)The ten-mile width specified in §§ 121.179 through 121.183 may be reduced to five miles, for not more than 20 miles, when operating VFR or where navigation facilities furnish reliable and accurate identification of high ground and obstructions located outside of five miles, but within ten miles, on each side of the intended track.

(f)For purposes of this part, *effective length of the runway* for landing means the distance from the point at which the obstruction clearance plane associated with the approach end of the runway intersects the centerline of the runway to the far end thereof.

(g)For the purposes of this subpart, *obstruction clearance plane* means a plane sloping upward from the runway at a slope of 1:20 to the horizontal, and tangent to or clearing all obstructions within a specified area surrounding the runway as shown in a profile view of that area. In the plan view, the centerline of the specified area coincides with the centerline of the runway, beginning at the point where the obstruction clearance plane intersects the centerline of the runway and proceeding to a point at least 1,500 feet from the beginning point. Thereafter the centerline coincides with the takeoff path over the ground for the runway (in the case of takeoffs) or with the instrument approach counterpart (for landings), or, where the applicable one of these paths has not been established, it proceeds consistent with turns of at least 4,000 foot radius until a point is reached beyond which the obstruction clearance plane clears all obstructions. This area extends laterally 200 feet on each side of the centerline at the point where the obstruction clearance plane intersects the runway and continues at this width to the end of the runway; then it increases uniformly to 500 feet on each side of the centerline at a point 1,500 feet from the intersection of the obstruction clearance plane with the runway; thereafter it extends laterally 500 feet on each side of the centerline.

(h)For the purposes of showing compliance with § 121.189(e)(3), *runway surface condition* means a dry, wet, or contaminated runway in accordance with the following definitions of those terms:

(1)Contaminated runway. A runway is considered to be contaminated when more than 25 percent of the runway surface area (whether in isolated areas or not) within the required length and the width being used is covered by the following:

(i) Standing water or slush more than 0.125 inches (3 mm)) deep;

(ii) Loose snow more than 0.75 inches (20 mm) deep; or

(iii)Compacted snow or ice, including wet ice.

*(2)*Dry runway. A dry runway is one that is clear of contaminants and visible moisture within the required length and the width being used.

(3)Wet runway. A runway that is neither dry nor contaminated is considered wet.

(i)For the purposes of showing compliance with §§ 121.189, 121.195, and 121.197, the following definitions apply:

(1)*Accelerate-stop distance available.* The length of the takeoff run available plus the length of the available stopway.

(2)*Landing distance available.* The length of the runway that is declared available for the ground run of an airplane landing.

(3)*Takeoff distance available.* The length of the takeoff run available plus the length of the available clearway.

(4)*Takeoff run available.* The length of the runway that is declared available for the ground run of an airplane taking off.

(III.) FAR Part 135

§ 135.361Applicability.

(a)This subpart prescribes airplane performance operating limitations for all certificate holders.

(b) Each certificate holder operating a reciprocating engine powered large transport category airplane shall comply with §§ 135.365 through 135.377.

(c)Each certificate holder operating a turbine engine powered large transport category airplane shall comply with the applicable provisions of §§ 135.379 through 135.387, except that when it operates a turbopropeller-powered large transport category airplane certificated after August 29, 1959, but previously type certificated with the same number of reciprocating engines, it may comply with §§ 135.365 through 135.377.

(d)Each certificate holder operating a large nontransport category airplane shall comply with §§ 135.389 through 135.395 and any determination of compliance must be based only on approved performance data. For the purpose of this subpart, a large nontransport category airplane is an airplane that was type certificated before July 1, 1942.

(e)Each certificate holder operating a small transport category airplane type shall comply with § 135.397.

(f)Each certificate holder operating a small nontransport category airplane type shall comply with § 135.399.

(g)Each certificate holder operating a commuter category airplane shall comply with § 135.398.

§ 135.363General.

(a)The performance data in the Airplane Flight Manual, supplemented as necessary with other data acceptable to the Administrator, applies in determining compliance with §§ 135.365 through 135.387. Where conditions are different from those on which the performance data is based, compliance is determined by interpolation or by computing the effects of changes in the specific variables if the results of the interpolation or computations are substantially as accurate as the results of direct tests.

(b) When applying the operational factors required by the applicable provisions of §§ 135.379 through 135.387, account may be taken of any operational factors already incorporated in the performance data to avoid double application of factors.

(c)No person may take off a reciprocating-engine-powered large transport category airplane at a weight that is more than the allowable weight for the runway being used (determined under the runway takeoff limitations of the transport category operating rules of this subpart) after taking into account the temperature operating correction factors in section 4a.749a-T or section 4b.117 of the Civil Air Regulations in effect on January 31, 1965, and in the applicable Airplane Flight Manual.

(d)The Administrator may authorize in the operations specifications deviations from the requirements in the subpart if special circumstances make a literal observance of a requirement unnecessary for safety.

(e)The ten-mile width specified in §§ 135.369 through 135.373 may be reduced to five miles, for not more than 20 miles, when operating VFR or where navigation facilities furnish reliable and accurate identification of high ground and obstructions located outside of five miles, but within ten miles, on each side of the intended track.

(f)For purposes of this part, *effective length of the runway* for landing means the distance from the point at which the obstruction clearance plane associated with the approach end of the runway intersects the centerline of the runway to the far end thereof.

(g)For the purposes of this subpart, *obstruction clearance plane* means a plane sloping upward from the runway at a slope of 1:20 to the horizontal, and tangent to or clearing all obstructions within a specified area surrounding the runway as shown in a profile view of that area. In the plan view, the centerline of the specified area coincides with the centerline of the runway, beginning at the point where the obstruction clearance plane intersects the centerline of the runway and proceeding to a point at least 1,500 feet from the beginning point. Thereafter the centerline coincides with the takeoff path over the ground for the runway (in the case of takeoffs) or with the instrument approach counterpart (for landings), or, where the applicable one of these paths has not been established, it proceeds consistent with turns of at least 4,000 foot radius until a point is reached beyond which the obstruction clearance plane clears all obstructions. This area extends laterally 200 feet on each side of the centerline at the point where the obstruction clearance plane intersects the runway and continues at this width to the end of the runway; then it increases uniformly to 500 feet on each side of the centerline at a point 1,500 feet from the intersection of the obstruction clearance plane with the runway; thereafter it extends laterally 500 feet on each side of the centerline.

(h)For the purposes of showing compliance with § 135.379(e)(3), *runway surface condition* means a dry, wet, or contaminated runway in accordance with the following definitions of those terms:

(1)Contaminated runway. A runway is considered to be contaminated when more than 25 percent of the runway surface area (whether in isolated areas or not) within the required length and the width being used is covered by the following:

(i) Standing water or slush more than 0.125 inches (3 mm)) deep;

(ii) Loose snow more than 0.75 inches (20 mm) deep; or

(iii)Compacted snow or ice, including wet ice.

*(2)*Dry runway. A dry runway is one that is clear of contaminants and visible moisture within the required length and the width being used.

(3) *Wet runway.* A runway that is neither dry nor contaminated is considered wet.

(i) For the purposes of showing compliance with §§ 135.379, 135.385, and 135.387, the following definitions apply:

(1) *Accelerate-stop distance available.* The length of the takeoff run available plus the length of the available stopway.

(2) *Landing distance available.* The length of the runway that is declared available for the ground run of an airplane landing.

(3) *Takeoff distance available.* The length of the takeoff run available plus the length of the available clearway.

(4) *Takeoff run available.* The length of the runway that is declared available for the ground run of an airplane taking off.

JAR-OPS 1

JAR-OPS 1.470 Applicability

(a) An operator shall ensure that multi-engine aeroplanes powered by turbopropeller engines with a maximum approved passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5700 kg and all multi-engine turbojet powered aeroplanes are operated in accordance with Subpart G (Performance Class A).

(b) An operator shall ensure that propeller driven aeroplanes with a maximum approved passenger seating configuration of 9 or less, and a maximum take-off mass of 5700 kg or less are operated in accordance with Subpart H (Performance Class B).

(c) An operator shall ensure that aeroplanes powered by reciprocating engines with a maximum approved passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5700 kg are operated in accordance with Subpart I (Performance Class C).

(d) Where full compliance with the requirements of the appropriate Subpart cannot be shown due to specific design characteristics (e.g. supersonic aeroplanes or seaplanes), the operator shall apply approved performance standards that ensure a level of safety equivalent to that of the appropriate Subpart.

(e) Multi-engine aeroplanes powered by turbopropeller engines with a maximum approved passenger seating configuration of more than 9 and with a maximum take-off mass of 5700 kg or less may be permitted by the Authority to operate under alternative operating limitations to those of Performance Class A which shall not be less restrictive than those of the relevant requirements of Subpart H.

(f) The provisions of subparagraph (e) above will expire on 1 April 2000.

A. JAR-OPS 1.475 General

(a) An operator shall ensure that the mass of the aeroplane:

(1) At the start of the takeoff;

or, in the event of in-flight replanning

(2)At the point from which the revised operational flight plan applies,

is not greater than the mass at which the requirements of the appropriate Subpart can be complied with for the flight to be undertaken, allowing for expected reductions in mass as the flight proceeds, and for such fuel jettisoning as is provided for in the particular requirement.

(b)An operator shall ensure that the approved performance data contained in the Aeroplane Flight Manual is used to determine compliance with the requirements of the appropriate Subpart, supplemented as necessary with other data acceptable to the Authority as prescribed in the relevant Subpart. When applying the factors prescribed in the appropriate Subpart, account may be taken of any operational factors already incorporated in the Aeroplane Flight Manual performance data to avoid double application of factors. (See AMC OPS 1.475(b) & IEM OPS 1.475(b)).

(c)When showing compliance with the requirements of the appropriate Subpart, due account shall be taken of aeroplane configuration, environmental conditions and the operation of systems which have an adverse effect on performance.

JAR-OPS 1.480 Terminology

(a)Terms used in Subparts F, G, H, I and J, and not defined in JAR-1, have the following meaning:

(1)*Accelerate-stop distance available (ASDA).* The length of the take-off run available plus the length of stopway, if such stopway is declared available by the appropriate Authority.

(2)*Grooved or Porous Friction Course Wet Runway*. A paved runway that has been prepared with lateral grooving or a porous friction course (PFC) surface to improve braking characteristics when wet.

(3)*Landing distance available (LDA).* The length of the runway which is declared available for the ground run of an aeroplane landing by the appropriate Authority.

(4)*Maximum approved passenger seating configuration.* The maximum passenger seating capacity of an individual aeroplane, excluding pilot seats or flight deck seats and cabin crew seats as applicable, used by the operator, approved by the Authority and specified in the Operations Manual

(5)*Runway surface condition.* The runway surface condition means the state of the surface of the runway: either dry, wet, or contaminated.

(i)*Contaminated runway.* A runway is considered to be contaminated when more than 25% of the runway surface area (whether in isolated areas or not) within the required length and the width being used is covered by the following:

(A)Standing water or slush more than 3 mm (0.125 in) deep;

(B)Loose snow more than 20 mm (0.75 in) deep; or

(C)Compacted snow or ice, including wet ice.

(ii) *Dry runway.* A dry runway is one that is clear of contaminants and visible moisture within the required length and the width being used.

(iii) *Wet runway.* A runway that is neither dry nor contaminated is considered wet.

(6)*Take-off distance available (TODA).* The length of the take-off run available plus the length of the clearway, if such clearway is declared available by the appropriate Authority.

(7)*Take-off mass.* The take-off mass of the aeroplane shall be taken to be its mass, including everything and everyone carried at the commencement of the take-off run.

(8)*Take-off run available (TORA).* The length of runway which is declared available for the ground run of an aeroplane taking off by the appropriate Authority.

(b)The terms 'accelerate-stop distance', 'take-off distance', 'take-off run', 'net take-off flight path', 'one engine inoperative en-route net flight path' and 'two engines inoperative en-route net flight path' as relating to the aeroplane have their meanings defined in the airworthiness requirements under which the aeroplane was certificated, or as specified by the Authority if it finds that definition unsuitable for showing compliance with the performance operating limitations.

JAR-OPS 1.485 General

(a)An operator shall ensure that, for determining compliance with the requirements of this subpart, the approved performance data in the Aeroplane Flight Manual is supplemented as necessary with other data acceptable to the Authority in respect of items such as:

(1)Accounting for reasonably expected adverse operating conditions such as take-off and landing on contaminated runways; and

(2)Consideration of engine failure in all flight phases.

(b)For the wet and contaminated runway case, performance data determined in accordance with JAR 25X1591, or other data ensuring a similar level of safety acceptable to the Authority must be used. (See IEM OPS 1.485(b)).

Summary of Proposed Changes:

(1) Re-format §§ 121 and 135 for editorial consistency. Certain of the paragraphs provided as "general" requirements in §§ 121.173 and 135.363 are applicability criteria rather than general requirements. To be consistent with the section titles, §§ 121.173(a) through (c) and 135.363(a) through (e) would be redesignated as 121.171(b) through (d) and 135.361(b) through (f), respectively. Section 135.363(j) would be redesignated 135.361(g). The existing §§ 121.171(b) and (c) and 135.361(b) and (c), which are general requirements, would be redesignated as §§ 121.173(f) and (g) and 135.363(f) and (g), respectively. The existing § 121.173(d) would be redesignated as § 121.173(a), and §§ 121.173(e) through (g) would be redesignated as §§ 121.173(c) through (e). The existing § 135.363(f) would be redesignated as § 135.363(a), and §§ 135.363(g) through (i) would be redesignated as §§ 135.363(c) through (e). All cross-references contained in these paragraphs would be revised accordingly. These changes are editorial only and do not change the stringency or intent of the requirements.

(2) Amend §§ 121.173(a) and 135.363(a) to allow the use of supplementary data acceptable to the Administrator in addition to Airplane Flight Manual (AFM) data to be used in showing compliance to the performance requirements of §§ 121.175 through 121.197 and 135.365 through 135.387, respectively. There are a few cases currently

where information needed to show compliance with the referenced performance requirements is not furnished in the AFM. For example, fuel and oil consumption data are needed to show compliance with §§121.191(a), 121.193(a)(2), 121.193(b)(2), 121.193(c)(2), 121.195(a), 121.195(b), and 121.197. The distance the airplane can travel in 90 minutes with all engines operating at cruising power is needed to show compliance with §§ 121.193(a)(1), 121.193(b)(1), and 121.193(c)(1). For both of these cases, this information is not provided in the AFM, but is provided by the airplane manufacturer in other documentation. Therefore, although the ability to do so is not clearly stated in the requirements, the FAA already accepts certain supplementary data to show compliance with the Parts 121/135 performance requirements.

For most of the new performance requirements being proposed by the Performance Harmonization Working Group (e.g., runway alignment distance, retroactive application of wet runway requirements, contaminated runway requirements), airplane performance data not currently furnished in AFM's will be needed in order to show compliance. While the working group recommends that the subject of AFM data requirements be further investigated by a working group tasked with such Part 25 issues, the working group recommends proceeding with this rulemaking without waiting for that task to be completed. Until that task is completed, operators should be able to show compliance using supplementary data acceptable to the regulatory authority.

The ability to use supplementary data should not be construed as allowing the use of such data in lieu of AFM data. If AFM data exists that is applicable and suitable for use in showing compliance, then it must be used (although it can be reformatted in accordance with § 121.141(b). Supplementary data is defined as data not currently furnished in AFM's that is needed to show compliance with the operating rules. It typically refers to the set of data used to show compliance with the applicable requirements, but also encompasses the processes and methods used to produce it.

This proposed requirement does not increase or reduce the requirements regarding information that must be furnished in the AFM. Information that was formerly required to be in the AFM must still be provided in the AFM, including appendices or supplements that may be added at a later date.

Supplementary data includes data provided by the airplane manufacturer, developed by the operator, developed by a third party, or any other source acceptable to the Administrator. The primary difference between AFM data and supplementary data is the process for its approval (for AFM data) or acceptance (for supplementary data). AFM data undergoes a formal approval process involving the cognizant FAA Aircraft Certification Office (ACO), including signature authority delegated to the Manager of the Flight Test Branch of that office. Supplementary data can be reviewed and accepted by the operator's assigned FAA Principle Operations Inspector. The inspector can use whatever resources needed to review the data for acceptability, including requesting assistance from the ACO. Acceptance of the data may be accomplished through various means, including by letter, verbally, or by taking no action, which indicates there is no FAA objection to use of the data.

Further guidance regarding the use and acceptance of supplementary data will be provided in a proposed Advisory Circular. This guidance will include examples of the types of supplementary data the working group expects to be needed to comply with the proposed new requirements and criteria for acceptance of those data. In general, since the proposed new requirements result from harmonization with JAR-OPS 1, supplementary data used to show compliance with JAR-OPS 1 would be accepted for showing compliance with the proposed new requirements.

(3) Add a new requirement, § 121.173(b)/§ 135.363(b), to clarify that factors required by the operating requirements do not need to be applied if they are already included in the applicable AFM data. This proposal is a clarifying amendment to harmonize with a similar requirement provided in JAR-OPS 1. It is in accordance with standard practice and has no safety impact. However, this proposed clarification would be beneficial in that depending on the certification basis of the airplane, factors proposed to be required by the operating rules may or may not already be included in the AFM data. For example, part 25 requires factors to be applied to headwinds and tailwinds in the AFM takeoff data. Part 23 does not require these factors to be applied. Proposed new §§ 121.189(e)(5) and 135.379(e)(5) would require any airplane operated under those sections to use factored headwinds and tailwinds for determining takeoff performance. Since the factors are already required by part 25, an operator of a part 25 airplane need not apply additional factors.

(4) Add, as a new § 121.173(h)/§ 135.363(h), definitions for runway surface condition. Definitions of dry, wet, and contaminated runways would be added to be used with the proposed new requirement to take into account the runway surface condition (dry, wet, or contaminated) in §§ 121.189(e)(3) and 135.379(e)(3). A contaminated runway would be defined as one that has more than 25 percent of its surface area within the required length and the width being used covered by standing water or slush more than 0.125 inches deep, loose snow more than 0.75 inches deep, or compacted snow or ice, included wet ice of any depth. A dry runway would be defined as a runway that is clear of contaminants and visible moisture. A runway that is not clear of contaminants or visible moisture, but with less than the amounts of standing water, slush, snow, or ice that would require the runway to be considered contaminated would be considered wet for the purposes of this subpart.

The reference to the "required length and the width being used" is intended to restrict the determination of whether a runway is wet or contaminated to the takeoff run and accelerate stop distances and widths required to comply with the takeoff limitations. It is recognized that there are no specific FAA or JAA airplane airworthiness or operating standards pertaining to minimum runway width that must be available for an airplane taking off. The airworthiness standards provide for a maximum 30 foot deviation from the runway centerline after a sudden engine failure during takeoff when establishing the minimum control speed on the ground (V_{MCG}). Other factors, such as airplane size, crosswinds, and runway conditions also come into play in determining the minimum safe runway width. The 30 foot deviation allowed in determining V_{MCG} added to the offset of the landing gear/tires from the runway centerline, including an allowance for an initial misalignment, constitutes a standard for a minimum safe runway width that has been used in special conditions associated with approval for airplane operations on narrow runways. Such an approach may also be applicable to determining "the runway width being used" as referenced in §§ 121.173(h) and 135.363(h).

Runway area beyond that which is required to show compliance with the takeoff limitations need not be considered in making this determination. Draft FAA Advisory Circular (AC) 91-6B (unreleased) advises that when the contaminant is located in the high speed portion of the takeoff roll, the runway should be considered contaminated, regardless of whether it amounts to 25 percent of the runway surface being used. Although this revision to AC 91-6A was never released, this guidance remains good advice and should be contained in any advisory material developed in connection with the contaminated runway takeoff limitations recommended by working group reports 4 and 5.

The dry runway definition is not intended to address contaminants other than snow, slush, water, or ice, such as rubber deposits. That is, the presence of other contaminants, such as rubber deposits, would not require an otherwise dry runway to be considered wet for the purposes showing compliance with the requirements of subpart I. Also, it is not intended to require runways with small isolated damp patches or water puddles in non-critical areas to be considered wet.

(5) Add, as new §§ 121.173(i) and § 135.363(i), definitions for the terms, "accelerate-stop distance available," "landing distance available," "takeoff distance available," and "takeoff run available." These terms would be used in proposed amendments to the takeoff and landing limitations associated with runway length considerations in §§ 121.189, 121.195, and 121.197, and 135.379, 135.385, and 135.387. The definitions for these terms would in each case prescribe the length of the runway that can be used to show compliance with the applicable takeoff or landing limitation. The limitations would relate the runway length available for showing compliance with the particular limitation to the distance needed under the particular conditions, as provided in the Airplane Flight Manual.

The introduction and use of these terms would harmonize the FAR and JAR standards. There would be no change to the stringency or intent of the standards, so there would not be any effect on the level of safety.

(6) Remove JAR 1.475(d). JAR 1.475(d), which allows a damp runway (but not a grass runway) to be treated as dry for performance purposes, would be removed. This change would harmonise with the FAA practice of not permitting a damp runway to be considered equivalent to a dry runway for performance purposes. Research conducted by the FAA and the National Aeronautics and Space Administration shows that a damp runway does not provide an equivalent braking surface as a dry runway.

> Research results comparing braking coefficients on dry, wet, and damp surfaces are provided in the FAA Final Report for Project 308-3X (Amendment No. 1), "Vehicular Measurements of Effective Runway Friction," published in May 1962, NASA Technical Note D-8332, "Behavior of Aircraft Antiskid Braking Systems on Dry and Wet Runway Surfaces," published in

December 1976, and NASA Technical Paper 2917, "Evaluation of Two Transport Aircraft and Several Ground Test Vehicle Friction Measurements Obtained for Various Runway Surface Types and Condition," published in February 1990.

The conclusion provided in the FAA Report for Project 308-3X typifies the results shown by the data in the other reports: "The absolute values of friction coefficient between the low reflective surface (damp) and high reflective surface (wet), where there were no large areas of measurable standing water, were approximately the same." This conclusion is echoed in Engineering Sciences Data Unit Item Number 25, paragraph 5.2.2, which states, "In damp conditions, with the exception of surfaces such as I in Figure 7 [which is a surface with an open macro-texture and harsh micro-texture, such as a grooved or porous friction course surface], the coefficient of friction is noticeably reduced from the dry surface value, the effect becoming most marked on surfaces such as IV in Figure 7 [which is a closed macro-texture, smooth micro-texture surface].

(7) Amend JAR 1.480(a) to use the definitions for runway surface conditions proposed for FAR 121.173(h) and 135.363(h) and add a definition for a grooved or porous friction course wet runway. The existing definitions of dry, wet, and contaminated runway definitions would be replaced by the definitions proposed for §§ 121.173(h) and 135.363(h) as discussed above. This would harmonise the FAR and JAR definitions for these types of runway surface conditions, which is necessary to ensure a harmonised application of the wet and contaminated runway standards proposed in working group report 2 and either of reports 4 or 5.

This change would also remove the JAR-OPS 1 provision to allow specially prepared grooved or porous runways from being considered dry even when moisture is present. Aeroplane performance on grooved and porous friction course runways is specifically addressed in the airworthiness standards of JAR-25. Instead of implying an aeroplane performance capability, which is better addressed through JAR-25, the proposed standard would add a definition for a grooved or porous friction course wet runway. This definition would state that a grooved or porous friction course wet runway is a runway that has been prepared with lateral grooving or a porous friction course (PFC) surface to improve braking characteristics when wet.

JAR-OPS 1.480(a) would be reformatted as necessary to include the changes proposed above. In addition, minor editorial changes would be made to the definitions of accelerate-stop distance available, landing distance available, takeoff distance available, and takeoff run available in that the distances declared available by the appropriate Authority are always assumed to be suitable for the intended use.

(8) Replace the word "inadequate" in JAR OPS 1.480(b) with the word "unsuitable." JAR OPS 1.480(b) currently requires that the meanings of certain terms used in the type certification of the aeroplane be used in the same manner when showing compliance with the JAR OPS 1 performance operating limitations, unless that definition is found to be inadequate. The proposed change recognises that a definition used in type certification may be adequate for use in showing compliance with JAR OPS 1, but it might not be suitable.

(9) Amend JAR OPS 1.485(a) to remove the words, "…if the approved performance Data in the Aeroplane Flight Manual is insufficient." These words, which are intended to indicate when supplementary data are to be used, are unnecessary. The current wording, "supplemented as necessary" already conveys the need to supplement data when AFM data are insufficient to show compliance with the JAR OPS 1 performance operating limitations.

(10) Amend JAR OPS 1.485(b) to revise the requirement for the operator to ensure that the performance data for wet and contaminated runways was determined in accordance with JAR 25 X 1591, or an acceptable equivalent method. These data are normally developed by the aeroplane manufacturer, and the operator typically does not have the means to independently ensure that a method acceptable to the Authority was used. JAR OPS 1.4859(b) would be revised to state that for the wet and contaminated

runway case, performance data determined in accordance with JAR 25X1591, or other data ensuring a similar level of safety acceptable to the Authority must be used.

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]
The proposed standard continues to address the underlying safety issue in the same manner. The changes reflected in the proposed standard are consistent with the changes proposed by the Airplane Performance Harmonization Working Group for the performance operating limitations.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

The proposed standard maintains the same level of safety relative to the current FAR. The reformatting for editorial consistency would have no impact on the actual requirements, and therefore would not affect safety. The proposal to allow the use of data supplementary to the Airplane Flight Manual only applies to cases where such supplementary data are already used, or for showing compliance with additional requirements being proposed elsewhere. The proposal to clarify that factors required by the operating requirements do not need to be applied if they are already included in the applicable AFM data codifies existing practice and has no safety impact. The proposed definitions of dry, wet, and contaminated runways do not, in themselves affect the level of safety. The additional requirements for which these definitions would apply are proposed elsewhere.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

The proposed standard maintains the same level of safety relative to current industry practice for the same reasons noted in the response to item 8.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

The alternatives would be to harmonize on the current FAR standard or retain the current non-harmonized standards. The proposal updates, clarifies, and harmonizes the FAR with the JAR.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Operators, manufacturers, and other parties who engage in the development of operational performance data for transport category airplanes could be affected by the proposed change. For the additional requirements proposed elsewhere, the potential for use of data supplementary to the Airplane Flight Manual could reduce the burden associated with producing and using such data. Airplane Flight Manual data typically costs more to produce and use because it must be specifically approved as part of the type certification process, and usually must meet specific formatting guidelines.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

None.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

Further guidance regarding the use and acceptance of supplementary data would be provided in a proposed Advisory Circular. This guidance would include examples of the types of supplementary data the working group expects to be needed to comply with the proposed new requirements and criteria for acceptance of those data. In general, since the proposed new requirements result from harmonization with JAR-OPS 1, supplementary data used to show compliance with JAR-OPS 1 would be accepted for showing compliance with the proposed new requirements.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

ICAO Annex 6- Part 1, 5.2.5 states, "A flight shall not be commenced unless the performance information provided in the flight manual indicates that the standards of 5.2.6 to 5.2.11 can be complied with for the flight to be undertaken." Paragraph 5.2.6 requires that the condition of the runway (i.e., the presence of water, slush, or ice) be taken into account in determining the maximum takeoff weight for the flight.

The proposed standard would represent a difference from the ICAO standards in that it would allow data supplementary to the Airplane Flight Manual to be used to show compliance with certain operating limitations, including those associated with the maximum takeoff weight on a contaminated runway. The current standards are also different from the ICAO standards in that the FAR does not currently have specific requirements for operators to take into account the effect of contaminated runways.

15 - Does the proposed standard affect other HWGs? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

There are no cost impacts associated with this proposal by itself. The cost impacts associated with the additional requirements being proposed elsewhere are dealt with in the applicable working group reports.

17 - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

N/A

~~18.- -Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, plea~~

18 - Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.

No.

19 – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes.

(IV.) Issue: Accounting for the effect of wet runways on takeoff performance

Rule Section: FAR 121.189, 135.379/JAR-OPS 1.485, 1.490

1 - What is underlying safety issue to be addressed by the FAR/JAR?
[Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

It is fundamental to operational safety that the pilot should be able to either safely complete a takeoff or bring the airplane to a complete stop within the remaining distance available for stopping the airplane, even if power is lost from the most critical engine just before the airplane reaches a defined go/no-go point. This principle has formed the basis of the takeoff performance standards required for the type certification and operation of turbine engine powered transport category airplanes since Special Civil Air Regulation No. SR-422, effective August 27, 1957. As of March 20, 1997, the application of this principle was extended by the "commuter rule" to also cover scheduled passenger-carrying operations conducted in airplanes that have a passenger seat configuration of 10 to 30 passengers and turbojet airplanes regardless of seating configuration.

The defined go/no-go point during the takeoff is provided to the pilot as a speed called V_1. Up to the V_1 speed, the pilot should be able to reject a takeoff and stop within the remaining stopping distance. On a wet runway, the reduced friction degrades an airplane's stopping capability, increasing the distance needed to stop the airplane. If this reduction in stopping capability is not taken into account when determining the maximum takeoff weight and associated V_1 speed, the airplane may not be able to stop within the available stopping distance if the takeoff is rejected from near the V_1 speed.

On a smooth runway surface, the distance needed to stop an airplane when the runway is wet may be characterized as approximately twice the distance that is needed when the runway is dry. (This characterization is intended only as a rough approximation to provide a sense of the magnitude of the effect. The increase in stopping distance can vary considerably, depending on the texture of the runway surface, the effectiveness of the airplane's anti-skid braking system, the amount of water on the runway, the speed of the airplane, the tire tread depth, etc.)

2 - What are the current FAR and JAR standards relative to this subject?
[Reproduce the FAR and JAR rules text as indicated below.]

__**Current FAR text**__:

A.

B. Part 121

FAR 121.189 Airplanes: Turbine engine powered: Takeoff limitations.

(c) No person operating a turbine engine powered airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that listed in the Airplane Flight Manual at which compliance with the following may be shown:

(1) The accelerate-stop distance must not exceed the length of the runway plus the length of any stopway.

(2) The takeoff distance must not exceed the length of the runway plus the length of any clearway except that the length of any clearway included must not be greater than one-half the length of the runway.

(3) The takeoff run must not be greater than the length of the runway.

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(e)In determining maximum weights, minimum distances, and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition (dry or wet). Wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator.

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(g)For the purposes of this section the terms, “takeoff distance,” “takeoff run,” “net takeoff flight path,” and “takeoff path” have the same meanings as set forth in the rules under which the airplane was certificated.

C. Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

(c)No person operating a turbine engine powered large transport category airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that listed in the Airplane Flight Manual at which compliance with the following may be shown:

(1) The accelerate-stop distance must not exceed the length of the runway plus the length of any stopway.

(2) The takeoff distance must not exceed the length of the runway plus the length of any clearway except that the length of any clearway included must not be greater than one-half the length of the runway.

(3) The takeoff run must not be greater than the length of the runway.

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(e)In determining maximum weights, minimum distances, and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition (dry or wet). Wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator.

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(g)For the purposes of this section the terms, "takeoff distance," "takeoff run," "net takeoff flight path," and "takeoff path" have the same meanings as set forth in the rules under which the airplane was certificated.

Current JAR text:

(V.) JAR-OPS 1.480Terminology

(b)The terms 'accelerate-stop distance', 'take-off distance', 'take-off run', 'net take-off flight path', 'one engine inoperative en-route net flight path' and 'two engines inoperative en-route net flight path' as relating to the aeroplane have their meanings defined in the airworthiness requirements under which the aeroplane was certified, or as specified by the Authority if it finds that definition inadequate for showing compliance with the performance operating limitations

(VI.)

(VII.) JAR-OPS 1.485General

(b)An operator shall ensure that, for the wet and contaminated runway case, performance data determined in accordance with JAR 25X1591 or equivalent acceptable to the Authority is used. (See IEM OPS 1.485(b).)

JAR-OPS 1.490Take-off

(b) An operator must meet the following requirements when determining the maximum permitted take-off mass:

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(5)On a wet or contaminated runway, the takeoff mass must not exceed that permitted for a take-off on a dry runway under the same conditions.

(c) When showing compliance with sub-paragraph (b) above, an operator must take account of the following:

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(3) The runway surface condition and the type of runway surface (see IEM OPS 1.490(c)(3));

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue] N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

The FAA standards currently require that wet runways be taken into account for takeoff only for those airplanes that have operating limitations for wet runway takeoff distances. Since only airplanes that have Amendment 25-92 or equivalent in their type certification basis are required to have such operating limitations and Amendment 25-92 became effective on March 20, 1998, only the most recently certificated airplane types are covered by the FAA standard. For older airplanes, the FAA standards do not require operators to take into account the effect of wet runways when determining maximum takeoff weights and V_1 speeds.

At the time that Amendment 25-92 was adopted, the FAA considered making the standards retroactive to all airplanes operating under Parts 121 and 135. Many comments were received on the FAA's rulemaking proposals at that time, both for and against retroactive application of the wet runway standards. Due to the controversial nature of this issue, the FAA elected to issue the amendment without retroactive application of the standards and add the issue of wet runway takeoff performance for older airplanes to the FAA/JAA harmonization work program. The Performance Harmonization Working Group was tasked with recommending whether the standards adopted by the FAA in the "Improved Standards for Determining Rejected Takeoff and Landing Performance" (*64 Federal Register 202*) should be applied retroactively to all airplanes being operated under Parts 121 and 135.

In contrast to the FAA requirements, JAR-OPS 1 requires operators to account for the effects of wet runways on takeoff performance for all Performance Class A airplanes used in commercial air transportation. (Performance Class A airplanes include multi-engine turbopropeller airplanes with a maximum approved passenger seating configuration of more than 9 seats or a maximum takeoff mass exceeding 5700 kilograms, and all multi-engine turbojet powered airplanes.) In addition, JAR-OPS 1 requires operators to ensure that the wet runway data being used has been developed in accordance with certain criteria provided in JAA advisory material or their equivalent.

On a smooth runway surface, the distance needed to stop an airplane when the runway is wet may be characterized as approximately twice the distance that is needed when the runway is dry. (This characterization is intended only as a rough approximation to provide a sense of the magnitude of the effect. The increase in stopping distance can vary considerably, depending on the texture of the runway surface, the effectiveness of the airplane's anti-skid braking system, the amount of water on the runway, the speed of the airplane, the tire tread depth, etc.) Grooving the runway or applying a porous friction coarse (PFC) surface treatment significantly improves the wet runway stopping capability. However, the effectiveness of the surface treatment in improving wet runway braking friction depends on the manner in which the runway is designed, constructed, and maintained. The FAA has published standards for the measurement, construction, and maintenance of skid-resistance pavement surfaces in Advisory Circular 150/5320-12C.

The standards adopted by the FAA in the "Improved Standards for Determining Rejected Takeoff and Landing Performance" allow operators to take credit for the improved stopping capability on wet runways that are grooved or treated with a PFC overlay, but only if such data are provided in the Airplane Flight Manual and the operator has determined that the runway is designed, constructed, and maintained in a manner acceptable to the Administrator.

Rejected takeoff statistics presented in the Takeoff Safety Training Aid, developed jointly by the aviation industry and the FAA in 1992, show that approximately one-quarter of the rejected takeoff accidents for which runway conditions were reported occurred on wet runways. (Runway conditions were not reported for 28 percent of the rejected takeoff accidents.) (These data, which covered rejected takeoff safety statistics from 1960 to 1990 for all western-built jet transport airplanes, were recently updated by Boeing to extend the database through 1999.) Since it is estimated that less than 10 percent of takeoffs are made from wet runways (see the discussion of the Final Regulatory Evaluation for Amendment 25-92 in item 16 below for the source of this estimate), the risk of a rejected takeoff accident is disproportionately greater on a wet runway than on a dry runway.

According to the updated database maintained by Boeing, there have been an estimated 365,950,917 departures of western-built jet transports in the period from 1960-1999. Assuming that 6 percent of these departures occurred on wet runways (in accordance with the FAA's Final Regulatory Evaluation for Amendment 25-92 to part 25 as discussed under Item 16 of this report), there were an estimated 343,993,862 dry runway takeoffs and 21,957,055 wet runway takeoffs. Of the 94 rejected takeoff overruns, 37 occurred on runways reported as dry and 22 occurred on runways reported as wet. Thus, the in-service data shows accident rates of .10756 per million takeoffs on dry runways and 1.00196 per million takeoffs on wet runways, which means the accident rate on wet runways has been more than 9 times the rate on dry runways.

Retroactively applying the "Improved Standards for Determining Rejected Takeoff and Landing Performance" would increase the safety of takeoffs from wet runways by increasing the runway length required for takeoff. For flights that are operating at the maximum allowable weight for the given runway (i.e., the flight is field-length-limited) under dry conditions, this requirement could lead to a loss in revenue in wet conditions. Because the runway length is fixed (unless a longer runway is available for use at that airport), the airplane's takeoff weight would have to be reduced to offset the decrease in stopping capability. If the number of passengers or amount of cargo to be carried must be reduced to reduce the airplane's takeoff weight, an airplane operator would suffer a loss of revenue.

The "Improved Standards for Determining Rejected Takeoff and Landing Performance" contain a number of provisions to lessen the economic impact associated with the wet runway requirements. First, the required height over the end of the takeoff distance was reduced from the 35 feet required for dry runways to 15 feet for wet runways. Second, the effect of using reverse thrust to assist in stopping the airplane can be taken into account on wet runways, but not on dry runways. Third, credit may be taken for the increased braking friction available on grooved and PFC runways.

The JAR standards provide a higher level of safety than the FAR when operating from wet runways. In achieving this higher level of safety, the JAR standards impose an economic burden on JAR operators that is not borne by FAR operators.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

The differences in the means of compliance are due to the differences in the standards. Where the standards are the same (i.e., wet runway accountability for new airplane types), the means of compliance are the same.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The Performance Harmonization Working Group recommends that wet runway requirements be added to Parts 121 and 135, and harmonization achieved with JAR-OPS 1, subject to the following conditions:

1. Maximum use is made of currently available data (i.e., minimize any need for development of new data).
2. One-engine-inoperative takeoff distance is based on a 15-foot screen height.
3. Performance credit may be taken for available reverse thrust.
4. Performance credit may be taken for the better stopping capability of grooved and PFC runways without requiring airplane operators to make the determination that the runway surface treatment has been adequately designed, constructed, and maintained.
5. Except for airplanes certificated under the current Part 25 wet runway requirements, the wet runway performance information used to show compliance with these proposed requirements would be considered supplementary data under the proposed § 121.173(a)/135.363(a).
6. Exemptions would be available for out-of-production airplanes for which there is no wet runway takeoff performance information available.

This action would harmonize the JAR and the FAR and would require all operations under JAR-OPS 1 and FAR Parts 121 and 135 to comply with the wet runway requirements, regardless of the type certification basis of the airplane. Although this would be similar to applying the wet runway requirements of the “Improved Standards for Determining Rejected Takeoff and Landing Performance” retroactively, there would be several differences that would apply to airplanes not certificated under the current Part 25 wet runway standards. The working group recommends use of the following criteria to determine data acceptability:

1. The braking coefficient used to determine the wet runway stopping distance need not be based on the methodology used in the current Part 25 standards. For the wet runway braking coefficient, data based on the current Part 25 methodology, the JAR AMJ 25X1591 methodology, one-half the dry runway braking coefficient, or equivalent would be acceptable.
2. The wet runway performance information need not be furnished in the Airplane Flight Manual. This information would be considered supplementary data under the proposed revision to § 121.171(a)/135.363(a).
3. One-engine-inoperative takeoff distances may be based on a 15-foot screen height.
4. Consistent with the current Part 25 wet runway requirements, performance credit for clearways in combination with a 15-foot screen height would not be allowed.
5. Performance credit may be taken for the use of available reverse thrust in the same manner as the current Part 25 wet runway standards.

For each proposed change from the existing standard, answer the following questions:

6 - What should the harmonized standard be? [Insert the proposed text of the harmonized standard here]

A. Part 121

FAR 121.189 Airplanes: Turbine engine powered: Takeoff limitations.

(c)No person operating a turbine engine powered airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that at which compliance with the following may be shown for the runway to be used:

(1)The accelerate-stop distance must not exceed the accelerate-stop distance available.

(2)The takeoff distance must not exceed the takeoff distance available with any clearway distance not exceeding half of the takeoff run available.

(3)The takeoff run must not be greater than the takeoff run available.

[Note: The working group did not reach consensus on the following paragraph (see Working Group Reports 4 and 5)]:

For contaminated runway accountability on a one-engine-inoperative performance basis:

(4) The same value of V_1 must be used to show compliance with paragraphs (c)(1) through (c)(3) of this section.

For contaminated runway accountability on all engines-operating performance basis:

(4)For runways that are dry or wet, the same value of V_1 must be used to show compliance with paragraphs (c)(1) through (c)(3) of this section. For contaminated runways, V_{Stop} must be used to show compliance with paragraph (c)(1) of this section.

(5) On a wet or contaminated runway, the takeoff weight must not exceed that permitted for takeoff on a dry runway under the same conditions.

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(e)In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for–

(1) The pressure altitude at the airport;

(2) The ambient temperature at the airport;

(3) The runway surface condition (dry, wet, or contaminated) and the type of runway surface (paved or unpaved);

(4) The runway slope in the direction of takeoff; and

(5) Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component; and

(6) The loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff.

(f)Wet runway accelerate-stop distances associated with grooved or porous friction course runways may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay.

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(j)For the purposes of this section the terms, “accelerate-stop distance,” “takeoff distance,” “takeoff run,” “net takeoff flight path,” “takeoff path,” “one-engine-inoperative en route net flight path,” and “two-engines-inoperative en route net flight path” have the same meanings as set forth in the rules under which the airplane was certificated, or as specified by the Administrator if that definition is found unsuitable for showing compliance with the performance operating limitations.

B. Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

(c) No person operating a turbine engine powered large transport category airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that at which compliance with the following may be shown for the runway to be used:

(1)The accelerate-stop distance must not exceed the accelerate-stop distance available.

(2)The takeoff distance must not exceed the takeoff distance available with any clearway distance not exceeding half of the takeoff run available.

(3)The takeoff run must not be greater than the takeoff run available.

[Note: The working group did not reach consensus on the following paragraph (see Working Group Reports 4 and 5)]:

For contaminated runway accountability on a one-engine-inoperative performance basis:

(4) The same value of V_1 must be used to show compliance with paragraphs (c)(1) through (c)(3) of this section.

For contaminated runway accountability on all engines-operating performance basis:

(4)For runways that are dry or wet, the same value of V_1 must be used to show compliance with paragraphs (c)(1) through (c)(3) of this section. For contaminated runways, V_{Stop} must be used to show compliance with paragraph (c)(1) of this section.

(5)On a wet or contaminated runway, the takeoff weight must not exceed that permitted for takeoff on a dry runway under the same conditions.

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(e)In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for–

(1) The pressure altitude at the airport;

(2) The ambient temperature at the airport;

(3) The runway surface condition (dry, wet, or contaminated) and the type of runway surface (paved or unpaved);

(4) The runway slope in the direction of takeoff; and

(5) Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component; and

(6) The loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff.

(f)Wet runway accelerate-stop distances associated with grooved or porous friction course runways may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay.

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(j)For the purposes of this section the terms, “accelerate-stop distance,” “takeoff distance,” “takeoff run,” “net takeoff flight path,” “takeoff path” have the same meanings as set forth in the rules under which the airplane was certificated, or as specified by the Administrator if that definition is found unsuitable for showing compliance with the performance operating limitations.

JAR-OPS 1

(VIII.) JAR-OPS 1.480Terminology

(b)The terms ‘accelerate-stop distance’, ‘take-off distance’, ‘take-off run’, ‘net take-off flight path’, ‘one engine inoperative en-route net flight path’ and ‘two engines inoperative en-route net flight path’ as relating to the aeroplane have their meanings defined in the airworthiness requirements under which the aeroplane was certified, or as specified by the Authority if it finds that definition unsuitable for showing compliance with the performance operating limitations

JAR–OPS 1.485General

(b) For the wet and contaminated runway case, performance data determined in accordance with JAR 25X1591, or other data ensuring a similar level of safety acceptable to the Authority must be used. (See IEM OPS 1.485(b)).

JAR-OPS 1.490Take-off

(b) An operator must meet the following requirements for the runway to be used when determining the maximum permitted take-off mass:

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(2) On a wet or contaminated runway, the take-off mass must not exceed that permitted for a take-off on a dry runway under the same conditions.

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(c) When showing compliance with subparagraph (b) above, an operator must take account of the following:

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(3)The runway surface condition and the type of runway surface (See IEM OPS 1.490(c)(3)).

IEM No. 2 OPS 1.490(c)(3) – Type of Runway Surface (Grooved and Porous Friction Course).

Where an identified paved runway has been prepared and maintained with a grooved or porous friction course (PFC) in accordance with a standard such as FAA AC 150/5320-12A, or other equivalent acceptable to the Authority, performance credit may be taken, provided that approved performance data is in the AFM and is identified as appropriate for use in conjunction with a grooved or PFC runway.

Summary of Proposed Changes:

[Note: The proposed changes discussed below include more than just the changes associated directly with the issue of retroactive application of wet runway takeoff performance requirements. This was done for completeness and clarity due to the many changes being proposed for the rule sections that address takeoff limitations. Therefore, some of the proposed changes described below will either be repeated or more fully explained in other working group reports.]

(1) Amend §§ 121.189(c) and 135.379(c) to remove the words "listed in the Airplane Flight Manual." Currently, §§ 121.189(c) and 135.379(c) require that the Airplane Flight Manual (AFM) must be used to determine the maximum takeoff weight for which compliance is shown with the field length requirements of those sections. As noted in Working Group Report 1, for most of the new performance requirements being proposed by the Performance Harmonization Working Group (e.g., runway alignment distance, retroactive application of wet runway requirements, contaminated runway requirements), airplane performance data not currently furnished in AFM's will be needed in order to show compliance. While the working group recommends that the subject of AFM data requirements be further investigated by a working group tasked with such part 25 issues, the working group recommends proceeding with this

rulemaking without waiting for that task to be completed. Until that task is completed, operators should be able to show compliance to the proposed wet runway takeoff limitations using supplementary data acceptable to the regulatory authority.

Removing the words “listed in the Airplane Flight Manual” from §§ 121.189(c) and 135.379(c) would leave the proposed §§ 121.173(a) and 135.363(a) (i.e., as proposed in Working Group Report 1), respectively, as the applicable requirements regarding the source of data for showing compliance with §§ 121.189(c) and 135.379(c). The proposed §§ 121.173(a) and 135.363(a) state that the performance data in the Airplane Flight Manual, supplemented as necessary with other data acceptable to the Administrator, applies in determining compliance with §§ 121.175 through 121.197 and §§ 135.365 through 135.387, respectively.

(2) Amend §§ 121.189(c) and 135.379(c) to add the words “for the runway to be used” to clarify that compliance with this requirement must be shown for the runway to be used. This is a clarifying change only.

(3) Amend §§ 121.189(c)(1), (c)(2), and (c)(3) and §§ 135.379(c)(1), (c)(2), and (c)(3) to use the terms “accelerate-stop distance available,” “takeoff distance available,” and “takeoff run available,” which would be defined in the proposed new §§ 121.173(i) and 135.363(i). (See Working Group Report 1 for proposed accompanying amendments to §§ 121.173 and 135.363). This change would harmonize the wording of the JAR and FAR standards, but would not change the requirement.

(4) Add, as a new § 121.189(c)(4) and new § 135.379(c)(4), a requirement that the same value of V_1 must be used to show compliance with the accelerate-stop, takeoff run, and takeoff distance limitations. This requirement would ensure that, from a single defined go/no-go point (i.e., the V_1 speed), the takeoff can either be safely completed, or the airplane can be brought to a stop within the remaining distance available for stopping the airplane. Although the current FAR requires this capability through the interaction of the part 25 definitions for takeoff and accelerate-stop distances and the associated operating requirements, adding the proposed paragraph would make this requirement more explicit. With the addition of the proposed takeoff limitations for operations from wet runways, the proposed §§ 121.189(c)(4) and 135.379(c)(4) would clarify that these limitations must include accountability for failure of the critical engine. (See the additional discussion on this issue in Working Group Reports 4 and 5. Note that the working group did not reach consensus on whether this requirement should apply to takeoffs from contaminated runways. This lack of consensus is addressed in Working Group Reports 4 and 5.) This change would also harmonize the FAR with the current JAR standard.

(5) New §§ 121.189(c)(5) and 135.379(c)(5) would be added to require that the takeoff weight on a wet or contaminated runway not exceed the takeoff weight permitted on a dry runway under the same conditions. It would be inappropriate, from a safety standpoint, to allow a higher maximum takeoff weight from a wet runway than from a dry runway under otherwise identical conditions. Without the proposed requirement, this situation could potentially occur due to differences in the methods for determining the distances used in establishing the maximum allowable takeoff weight. (In determining the wet runway distances, unlike for dry runway distances, credit can be taken for reverse thrust for stopping the airplane during a rejected takeoff. Also, for a continued takeoff, the airplane can be at a height of 15 feet over the end

of a wet runway, but must be at a height of 35 feet (if there is no clearway) for a dry runway.) [Note: Because contaminated runways would also be covered by this proposed change, this proposal is repeated in the Working Group Reports 4 and 5, which address proposed new standards for contaminated runways.]

(6) Reformat §§ 121.189(e) and 135.379(e) to list, in separate sub-paragraphs, each of the items for which correction must be made. Currently, §§ 121.189(e) and 135.379(e) require correction made to the maximum weights, minimum distances, and flight paths under paragraphs §§ 121.189(a) through (d) and §§ 135.379(a) through (d), respectively, for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition (dry or wet). Sections 121.189(e) and 135.379(e) also state that wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator.

Under this proposal, §§ 121.189(e) and 135.379(e) would be revised to state, “In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for–.” “The pressure altitude at the airport” would be listed in new §§ 121.189(e)(1) and 135.379(e)(1). The use of pressure altitude instead of elevation is consistent with changes being proposed throughout this subpart. It reflects the practice that the determination of takeoff weights are normally done on the basis of pressure altitude, and that Airplane Flight Manual performance information is provided as a function of pressure altitude. The words “at the airport” would replace “of the airport,” and are intended to allow correction for pressure altitude of the specific runway. The words “of the airport” imply the use of the pressure altitude of the airport itself, which is that of the highest touchdown zone of any runway at the airport.

New §§ 121.189(e)(2) and 135.379(e)(2) would list “the ambient temperature at the airport.” New §§ 121.189(e)(3) and 135.379(e)(3) would list “the runway surface condition (dry, wet, or contaminated) and the type of runway surface (paved or unpaved).” This proposed change would require correction to be made for wet runways regardless of whether operating limitations exist in the AFM for wet runways. (For a discussion of the addition of correcting for contaminated runways, see Working Group Reports 4 and 5.)

The proposed new §§ 121.189(e)(3) and 135.379(e)(3) would also add a requirement to correct for the type of runway surface (paved or unpaved). This new requirement is intended to ensure that the applicable takeoff limitations for approved operations on unpaved runway surfaces, such as grass or gravel runways, are based on performance data appropriate to the type of runway surface. This proposal would codify current FAA practice, which permits operations on unpaved runway surfaces through special operational approvals under the authority of § 121.173(f). It would also harmonize this issue with JAR-OPS 1. In accordance with FAA policies developed for these special operational approvals, the limitations, procedures, and performance information for unpaved runway operation must be presented in the Airplane Flight Manual (usually in an appendix or supplement). Airworthiness certification guidance to support approval for unpaved runway operations is provided in FAA Advisory Circular 25-7A, “Flight Test Guide for Certification of

Transport Category Airplanes."

New §§ 121.189(e)(4) and 135.379(e)(4) would list "The runway slope in the direction of takeoff." This item is currently listed in §§ 121.189(e) and 135.379(e) as "the effective runway gradient." The wording change would harmonize the wording with that of the JAR standard and is not intended to change the existing requirement regarding the effect of runway slope.

New §§ 121.189(e)(5) and 135.379(e)(5) would list "Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component." This would replace the criterion, "wind component at the time of takeoff," currently listed in §§ 121.189(e) and 135.379(e). The proposed wording is intended to clarify that the total wind (i.e., wind speed and direction), not just the headwind or tailwind component, must be considered. For corrections to takeoff distances, only the headwind or tailwind component is relevant. However, for flight path considerations, the total wind must be taken into account. (Note: This issue is addressed in Working Group Report 6.)

The proposed wording also includes the factors applied to the headwind and tailwind components ("not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component") that are currently required by the airworthiness type certification requirements of part 25. The working group proposes that these wind factors should be applied to all operations conducted under §§ 121.189 and 135.379, regardless of the certification basis of the airplane.

New §§ 121.189(e)(6) and 135.379(e)(6) would list the new requirement proposed in Working Group Report 3, "The loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff." (See that working group report for the reasons for this change.)

These proposed changes to §§ 121.189(e) and 135.379(e) would harmonize the requirements contained in those sections with JAR-OPS 1.490, when amended as proposed later in this report.

(7) <u>Replace the existing §§ 121.189(e)/135.379(e) requirements related to grooved and PFC runways with new §§ 121.189(f)/135.379(f) (and renumbering the remaining paragraphs of §§ 121.189 and 135.379 accordingly) to state, "Wet runway distances associated with grooved or porous friction course runways may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay."</u> This proposed revision would remove the requirement for operators to determine that these surface treatments are designed, constructed, and maintained in a manner acceptable to the Administrator. The working group recommends that this concern be addressed through appropriate changes in applicability and enforcement of existing airport design standards. (Note that § 91.605(b)(3), which is equivalent to the existing §§ 121.189(e) and 135.379(e), should also be revised to eliminate the requirement for operators to determine that the grooved or PFC runway surfaces are designed, constructed, and maintained in a manner acceptable to the Administrator.)

(8) <u>Redesignate existing §§ 121.189(g) and 135.379(g) as §§ 121.189(j) and 135.379(j), respectively, revise these paragraphs to add the term "accelerate-stop distance," to the list of terms that, for the purposes of this section, have the same meaning as set forth in the rules under which the airplane was certificated, and add a provision to enable use of definitions for those terms other than</u>

as set forth in the rules under which the airplane was certificated. The addition of the term "accelerate-stop distance" would be made for completeness and to harmonize with the JAR standard. Adding the capability to use definitions for those terms other than as set forth in the rules under which the airplane was certificated is necessary to allow, for example, the use of a 15-foot screen height for wet runways in the definition of the one-engine-inoperative takeoff distance for airplanes that were certificated under rules that defined the one-engine-inoperative takeoff distance with a 35-foot screen height. This change would also harmonize with the JAR standard.

Although the equivalent JAR-OPS 1 standard also contains the terms "one-engine-inoperative en route net flight path" and "two-engines-inoperative en route net flight path" in the list of terms for which the definition is the same as set forth in the certification rules, we do not propose to add these terms to the FAR standard. Sections 121.189(j) and 135.379(j) only apply to the terms used in §§ 121.189 and 135.379, respectively, and those terms are not used in these sections. Also, the terms used in the applicable section of parts 121 and 135 refer to the "one (or two)-engine(s)-inoperative net en route flight path data," which does not need further definition.

The JAA considered adding the term "takeoff flight path" to the list of terms given in JAR 1.480(b), but elected not to do so. This term is listed in the existing §§ 121.189(g) and 135.379(g) (and will be carried over to the proposed §§ 121.189(j) and 135.379(j)) because of the need to address airplanes certificated under Special Civil Air Regulation No. SR-422. The term "net takeoff flight path" had not been introduced at the time of SR-422, and the takeoff obstacle clearance limitations in the operating rules referenced the "takeoff flight path." Since there are still airplanes certificated under SR-422 that are operating under parts 121 and 135, and the operating limitations appropriate to those airplanes have been retained (e.g., § 121.189(d)(1)), there is a need to retain this term in the proposed §§ 121.189(j) and 135.379(j). Since JAR-OPS 1 does not have provisions for application to SR-422 certificated airplanes, there is no need to add this term to JAR-OPS 1.480(b).

(9) Amend JAR-OPS 1.480 to replace the word "inadequate" with "unsuitable." This provision allows the use of definitions for the terms listed in the paragraph other than those used in the rules under which the airplane was certificated. The intent of this provision is to allow, for example, the use of a 15-foot screen height for wet runways where the rules under which the airplane was certificated define the takeoff distance with a 35-foot screen height. However, the definition of takeoff distance in the rules under which the airplane was certificated in this situation is better described as unsuitable rather than inadequate.

(10) Amend JAR OPS 1.485(b) to revise the requirement for the operator to ensure that the performance data for wet and contaminated runways was determined in accordance with JAR 25 X 1591, or an acceptable equivalent method. These data are normally developed by the aeroplane manufacturer, and the operator typically does not have the means to independently ensure that a method acceptable to the Authority was used. JAR OPS 1.4859(b) would be revised to state that for the wet and contaminated runway case, performance data determined in accordance with JAR 25X1591, or other data ensuring a similar level of safety acceptable to the Authority must be used.

(11) Amend JAR-OPS 1.490(b) to add

the words "for the runway to be used" to clarify that compliance with this requirement must be shown for the runway to be used. This is a clarifying change only.

(12) Amend JAR-OPS 1.490(b)(4) to revise the text to read, "Compliance with this paragraph must be shown using the same value of V_1 for the rejected and continued take-off." This change would replace the current words "…single value of V_1…" with the words "…same value of V_1." This change is a clarification in that there may be a range of V_1 speeds to choose from, but the intent is that the same one must be used for both the rejected and continued takeoff analyses.

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

The proposed standard addresses the underlying safety issues by requiring operators to take into account the effect of wet runways on takeoff performance for all turbine powered airplanes operated under Parts 121 or 135. For the JAA, the proposed standard continues to require operators to take into account the effect of wet runways for all Performance Class A airplanes. Although the text of the FAA and JAA standards would not be identical, the requirements would be harmonized.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

In general, the proposed standard increases the level of safety relative to the current FAR. It would add a requirement that does not currently exist such that operators of airplanes not certificated under the provisions of Amendment 25-92 or equivalent would be required to take into account the effects of wet runways on takeoff performance. For runways with well maintained grooved or porous friction course surfaces, the proposed standard is not expected to increase or decrease the level of safety.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

Industry practice varies, but in general, many operators already take wet runways into account when determining maximum takeoff weights and V_1 speeds. For those operators, the proposed standard would maintain the existing level of safety. For those operators who currently do not account for wet runways, the proposed standard would generally increase the level of safety, as noted in the response to item 8 above.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

The alternatives would be to harmonize on the current FAR standard or retain the current non-harmonized standards. The former option was not selected because it was considered unacceptable to continue to allow the older airplane types to operate at the lower level of safety. The latter option was not selected because it would continue the current situation in which the JAR standard requires a higher level of safety and results in an economic advantage for FAR operators over common route with common equipment.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Operators of transport category airplanes could be affected by the proposed change because they may have to carry out additional analyses for takeoffs from wet runways and may realize a loss in revenue if the payload must be reduced in order to comply with the wet runway requirements. Manufacturers of transport category airplanes could be affected because they generally develop the data to perform the wet runway analysis.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

None.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

Advisory material, in the form of an AC, should be adopted to provide guidelines and an acceptable means of compliance with the proposed standard. The advisory material should be consistent with the working group's recommendation to make maximum use of existing data, minimizing any need for developing new data. The means of compliance for airplanes not certificated under Amendment 25-92 (or an equivalent means) should include the following criteria to determine data acceptability:

1. The braking coefficient used to determine the wet runway stopping distance need not be based on the methodology used in the current part 25 standards. For the wet runway braking coefficient on smooth runways, data based on the current part 25 methodology, the JAR AMJ 25X1591 methodology, one-half the dry runway braking coefficient, or equivalent would be acceptable. For grooved or PFC runways, 70 percent of the dry runway braking coefficient may be used, consistent with the current part 25 requirements.
2. The wet runway performance information (including grooved/PFC data, if provided) need not be furnished in the Airplane Flight Manual. This information would be considered supplementary data under the proposed revision to §§ 121.173(a) and 135.363(a). (See Working Group Report 1 for a description of the proposed revision to §§ 121.173(a) and 135.363(a).)
3. One-engine-inoperative wet runway takeoff distances may be based on a

15-foot screen height.

4. Consistent with the current part 25 wet runway requirements, performance credit for clearways would not be allowed in combination with 15-foot screen heights for wet runway takeoffs.
5. Performance credit may be taken for the use of available reverse thrust in the same manner as the current part 25 wet runway standards.

Regulatory implementation of items 3-5 would be through the use of the proposed capability to allow use of definitions of takeoff distance and accelerate-stop distance different than those used by the rules under which the airplane was certificated if that definition is found unsuitable for showing compliance with the performance operating limitations.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

ICAO Annex 6 (Operation of Aircraft), Chapter 5, 5.2.6 states, "In applying the Standards of this chapter, account shall be taken of all factors that significantly affect the performance of the aeroplane (such as: mass, operating procedures, the pressure-altitude appropriate to the elevation of the aerodrome, temperature, wind, runway gradient and condition of runway, i.e. presence of slush, water and/or ice, for landplanes, water surface condition for seaplanes). Such factors shall be taken into account directly as operational parameters or indirectly by means of allowances or margins, which may be provided in the scheduling of performance data or in the comprehensive and detailed code of performance in accordance with which the aeroplane is being operated."

The current FAR does not comply with this ICAO standard in that the FAR does not require the runway condition, in terms of the presence of slush, water and/or ice to be taken into account for the scheduling of takeoff performance data. The proposed standard would bring the FAR closer to compliance with the ICAO standard by requiring the effect of wet runways to be taken into account.

15 - Does the proposed standard affect other HWG's? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

There is not expected to be a cost impact for those operators who currently take wet runways into account when determining maximum takeoff weights and V_1 speeds. Operators who do not take wet runways into account could suffer a loss of payload for each flight in which the takeoff weight must be reduced to comply with the proposed standard. Also, these operators will incur costs for modifying their takeoff analysis procedure to include consideration of wet runways.

For runways where wet runway performance associated with grooved or porous friction course surface treatments can be used, the cost impact is expected to be minimal. An overwhelming majority of primary commercial service airports in the United States, which account for over 99 percent of commercial emplanements, have grooved or PFC runways available. To take advantage of the improved performance available on grooved or PFC runways, however, airplane manufacturers will incur costs associated with generating the performance data. For airplanes certificated prior to Amendment 25-92, such data generally does not exist.

If grooved or PFC performance credit is not available, the annual costs of the proposed standard for 6 major U.S. air carriers who are not currently accounting for the effect of wet runways on takeoff performance are estimated to be about $ 25 million. This cost estimate used an assumption that runways are wet about 20% of the time.

In the Final Regulatory Evaluation for Amendment 25-92 to Part 25, the FAA estimated the costs of complying with the wet runway requirements of that amendment without grooved or PFC runway credit to be approximately $2,700 per airplane per year, or $68,000 per airplane over its service life. This cost estimate was based on 31% of departures being conducted on wet runways. The percentage of departures being conducted on wet runways was determined as follows. “In a sample of 83 major U.S. cities, it was found that, on average, measurable precipitation fell on 114.5 days per year (31.3 percent). It is estimated that wet runway conditions exist, on average, 20 percent of the time on days having measurable precipitation. Thus, about 6 percent (20 percent of 31 percent) of all takeoffs actually occur on wet runways. However, this analysis conservatively assumes that costs associated with the wet runway requirements will apply on any day having measurable precipitation, while the benefits will only apply to actual wet runway takeoffs. This follows since it is assumed that operators would not risk using dry runway calculations under the threat of precipitation.”

17 - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

N/A

18 - Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.]

No.

19 – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes.

(IX.) Report from the Airplane Performance Harmonization Working Group

Issue: Runway Alignment Distance

Rule Section: FAR 121.189, 135.379/JAR-OPS 1.490

1 - What is underlying safety issue to be addressed by the FAR/JAR?
[Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

Where the airplane must be turned onto the active runway at or in front of the runway threshold, some of the runway length that would otherwise be available for the takeoff run must be used to align the airplane in the proper direction for takeoff. The portion of the runway behind the airplane is no longer available for use as part of the takeoff or accelerate-stop distance. If this alignment distance is not taken into account when showing compliance with the applicable takeoff limitations, the airplane could be taken off at weights for which the remaining runway length does not provide the intended safety margins for a takeoff or rejected takeoff.

This issue has been discussed and debated many times over the last 10-15 years. The FAA has received recommendations and advice from the U. S. National Transportation Safety Board (NTSB) and an industry/regulatory authority task force to require that runway alignment distance be taken into account when showing compliance with the takeoff limitations. Following an investigation of a runway overrun accident that occurred on May 21, 1988, the NTSB recommended that the FAA "require that operators of large turbojet transport category airplanes add the distance required for runway turn-on and takeoff alignment to the field length distances as determined from data in the approved flight manuals."

A Rejected Takeoff Safety Enhancement task force consisting of airplane operators and manufacturers, regulatory authorities, and pilots issued a recommendation in 1990 for the FAA to issue "an Advisory Circular to delineate various ways of accounting for runway alignment distance." A Takeoff Safety Training Aid developed jointly by the FAA and industry, and made available in 1994 by FAA Advisory Circular 120-62, states, "Correction to the available runway length can be made to the takeoff analysis on those runways where it is not possible to position the airplane at the beginning of the published distance." Data are provided in the training aid for making this correction. In addition, FAA order 8400.10, "Air Transportation Operations Inspector's Handbook," notes that "[a] significant error may be introduced if this distance is not subtracted from the available runway distance when takeoff performance is computed." Inspectors are advised to ensure that operators have appropriate guidance for flightcrews.

During the rulemaking process leading up to the adoption of the "Improved Standards for Determining Rejected Takeoff and Landing Performance" (63 *Federal Register* 8298), the FAA had considered adding a requirement for Part 121/135 operators to take runway alignment distance into account when determining the maximum allowable takeoff weight from a given runway. Due to the controversial nature of this issue, the FAA decided to promulgate the final rule without including the runway alignment distance provision, and to add this issue to the FAA/JAA harmonization work program. The Performance Harmonization Working Group was tasked with recommending whether to adopt a requirement for operators to take into account any distance needed to align the airplane on the runway in the direction of takeoff (*64 Federal Register 202*).

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

Current FAR text:

A. Part 121

FAR 121.189 Airplanes: Turbine engine powered: Takeoff limitations.

(e)In determining maximum weights, minimum distances, and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition (dry or wet). Wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator.

B. Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

(e)In determining maximum weights, minimum distances, and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition (dry or wet). Wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator.

Current JAR text:

JAR-OPS 1.490 Take-off

(c)When showing compliance with sub-paragraph (b) above, an operator must take account of the following:

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(6)The loss, if any, of runway length due to alignment of the aeroplane prior to take-off.

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

Currently, the Part 121/135 operating rules do not specifically require that the distance required to align the airplane on the runway for takeoff be taken into account in determining allowable takeoff weights. In contrast to the FAA requirements, JAR-OPS 1 does specifically require operators to take into account the loss, if any, of runway length due to alignment of the airplane prior to takeoff.

Taking into account the runway alignment distance may result in reducing the maximum weight that can be taken off from that runway. Because the runway length is fixed (unless a longer runway is available for use at that airport), the airplane's takeoff weight may have to be reduced due to the decrease in available runway length. If the number of passengers or amount of cargo to be carried must be reduced to reduce the airplane's takeoff weight, an airplane operator would suffer a loss of revenue.

The JAR standards provide a higher level of safety than the FAR when operating from runways where a portion of the runway distance must be used to align the airplane on the runway. In achieving this higher level of safety, the JAR standards impose an economic burden on JAR operators that is not borne by FAR operators.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

N/A – The FAR does not contain a standard for runway alignment distance, so there is no applicable means of compliance.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The proposed action is to harmonize to the JAR standard. The requirement for operators to take into account the distance needed to align the airplane on the runway for takeoff would be added to Parts 121 and 135 of the FAR. Sections 121.189(e) and 135.379(e) would be reformatted to list each of the items for which correction must be made in separate subparagraphs. Sections 121.189(e)(1) and 135.379(e)(1) through 121.189(e)(4) and 135.379(e)(4) would contain items currently in §§ 121.189(e) and 135.379(e), respectively, except for the amendments related to wet and contaminated runways and other minor changes proposed in Working Group Reports 2, 4, and 5.

This proposal would add, as a new §§ 121.189(e)(5) and 135.379(e)(5), a requirement to correct for the loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff. Although this text is somewhat different than the JAR text, it carries the same intent. The text proposed for the FAR is more consistent with the wording used in §§ 121.189(c) and 135.379(c) for which this correction applies. Also, depending on runway configuration, the correction may not be the same for each of the applicable distances (the takeoff run available, takeoff distance available, and accelerate-stop distance available).

For each proposed change from the existing standard, answer the following questions:

6 - What should the harmonized standard be? [Insert the proposed text of the harmonized standard here]

The proposed amended FAR Parts 121, 135, and JAR-OPS 1 standards are shown below. (Note: No changes are being proposed for the JAR.)

(X.) FAR Part 121

FAR 121.189 Airplanes: Turbine engine powered: Takeoff limitations.

(e)In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for:

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(6)The loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff.

(XI.) FAR Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

(e)In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for:

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(6)The loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff.

JAR-OPS 1

JAR-OPS 1.490 Take-off

(c)When showing compliance with sub-paragraph (b) above, an operator must take account of the following:

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(6)The loss, if any, of runway length due to alignment of the aeroplane prior to take-off.

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

The proposed standard continues to address the underlying safety issue in the same manner. The changes reflected in the proposed standard are consistent with other changes proposed by the Airplane Performance Harmonization Working Group for the performance operating limitations.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

The proposed standard would increase the level of safety relative to the current FAR for takeoffs from runways where part of the runway length must be used to align the airplane on the runway for takeoff. Currently, the FAR does not require operators to take into account the loss of distance available to perform the takeoff. The proposed standard would require operators to take this loss of available runway length into account when determining the maximum weight that can be taken off from a given runway.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

Industry practice varies. Some operators already consider runway alignment distance using one of the methods described in the proposed advisory material. For these operators, the proposed standard would maintain the same level of safety. For operators who do not consider the effects of runway alignment distance and do not add comparable safety margins that are not otherwise required by the FAR, the proposed standard would increase the level of safety.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

The alternatives would be to harmonize on the current FAR standard or retain the current non-harmonized standards. Harmonizing on the current FAR standard would involve removing the runway alignment distance requirement from the JAR. This was unacceptable to the JAA, as it would result in a decrease in safety relative to the current JAR. Retaining the current non-harmonized standards was unacceptable because it would not address the unlevel playing field issue of an economic burden on JAR operators that is not borne by FAR operators. Also, it would be inappropriate from a safety standpoint to not take into account the distance used, if any, to align the airplane on the runway for takeoff.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Operators and manufacturers of transport category airplanes could be affected by the proposed change. Airplane manufacturers would be requested by operators to provide data from which runway alignment distances could be determined. Airplane operators would need to adjust their takeoff analyses to include the consideration of runway alignment distances. Specific operations may be affected in that the airplane's takeoff weight may need to be reduced in order to comply with the proposed requirement.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

None.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

To fully realize the benefits of harmonization, an acceptable means of compliance should be clearly identified and described in appropriate guidance material. The means of compliance should be simple to apply, allow flexibility in the specific manner of implementation, be applicable to any airplane that may be operated under Parts 121 or 135 on any runway/taxiway configuration to be encountered, and provide a reasonably accurate approximation of the distance that will be needed to align the particular airplane on the particular runway for takeoff.

Proposed Advisory Circular material addressing an acceptable means of compliance is included as an attachment to this working group report and is summarized below.

When determining a runway lineup distance correction, the position of the takeoff threshold, the runway/taxiway geometry, and the taxi maneuvering characteristics of the particular airplane type should be considered. Manufacturers typically provide alignment distance increments for 90 and 180 degree turns onto the takeoff runway. For airplanes for which the manufacturer has not provided such data, or for runway/taxiway configurations not represented by the manufacturer's data, the operator should use the best data available (e.g., airplane geometry or suitable adjustments to manufacturer-supplied data) to determine the appropriate runway alignment distance.

The alignment distance correction can be made directly to the available runway length, or can be taken into account in any other manner selected by the operator that gives equivalent results. For example, if an operator chooses to not take credit for the potential takeoff weight benefit for available clearway, and the effect of the uncredited clearway on takeoff weight is equal to or greater than the effect of the runway alignment distance correction, no additional correction is necessary. The presence of runway safety areas and other features that are not considered part of the declared takeoff or accelerate-stop distances, however, cannot be used to comply with the proposed requirement.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

ICAO Annex 6- Part 1, 5.2.8.1 states, "In determining the length of the runway available, account shall be taken of the loss, if any, of runway length due to alignment of the aeroplane prior to takeoff." The proposed standard would incorporate the ICAO standard into FAR Part 121 and 135. The current FAR standards do not explicitly address this issue.

15 - Does the proposed standard affect other HWG's? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

There would not be a cost impact for those operators who currently take runway alignment distance into account when determining maximum takeoff weights. Operators who do not take runway alignment distance into account could suffer a loss of payload for each flight in which the takeoff weight must be reduced to comply with the proposed standard. Also, these operators will incur costs for modifying their takeoff analysis procedure to include consideration of runway alignment distance.

The annual costs of the proposed standard for 7 major U.S. air carriers who are not currently accounting for the effect of runway alignment distance on takeoff performance are estimated to be $ 29.9 million. This cost estimate is based on a 90 degree turn on to the runway with a minimum radius turn to align the airplane on the runway.

17 - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

N/A

18 - Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.]

No.

19 – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes.

Attachment: Proposed Advisory Material for Runway Alignment Distance

Sections 121.189(e)(5)/135.379(e)(5) require correction for the loss, if any, of runway length due to alignment of the airplane prior to takeoff. No correction is needed for runways with displaced takeoff thresholds or turning aprons where there is enough room to align the airplane before crossing the takeoff threshold. Whenever the taxiway access to the runway to be used for takeoff does not allow positioning of the nose gear of the airplane at the runway threshold, a lineup correction must be made. The alignment distance correction can be made directly to the available runway length, or can be taken into account in any other manner selected by the operator that gives equivalent results.

For example, if an operator chooses to not take credit for the potential takeoff weight benefit for available clearway, and the effect of the uncredited clearway on takeoff weight is equal to or greater than the effect of the runway alignment distance correction, no additional correction is necessary. The presence of runway safety areas and other features that are not considered part of the declared takeoff or accelerate-stop distances, however, cannot be used to comply with the requirement to correct for runway alignment distance.

It is acceptable to determine the runway alignment distance from the taxiway/runway geometry, the airplane geometry, and the airplane taxi maneuvering characteristics. Because the takeoff distance/takeoff run are defined relative to the main gear position and the accelerate-stop distance is defined relative to the nose gear position, the runway length corrections can be different for showing compliance with the operating requirements related to takeoff distance/takeoff run and accelerate-stop distance. The runway length adjustment associated with the takeoff distance/takeoff run should be based on the initial distance from the main gear to the takeoff threshold. The runway length adjustment associated with the accelerate-stop distance should be based on the initial distance from the nose gear to the takeoff threshold.

Some manufacturers have provided distance adjustments for 90 and 180 degree turns onto the takeoff runway. These data are based on minimum turn radii consistent with the manufacturer's recommended turn procedures. Operators can use these data to develop lineup distance corrections appropriate to any runway turn geometry. For airplanes for which the manufacturer has not provided such data, the operator may use the best data available (e.g., airplane geometry and minimum turn radii) to determine the appropriate correction for runway alignment distance.

(XII.) Report from the Airplane Performance Harmonization Working Group

(XIII.) Issue: Accounting for the effect of snow, slush, standing water, and ice-covered runways on takeoff performance (with engine failure accountability)

Rule Section: FAR 121.189, 135.379/JAR-OPS 1.485, 1.490

1 - What is the underlying safety issue to be addressed by the FAR/JAR?
[Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

It is fundamental to operational safety that the pilot should be able to either safely complete a takeoff or bring the airplane to a complete stop within the remaining distance available for stopping the airplane, even if power is lost from the most critical engine just before the airplane reaches a defined go/no-go point. This principle has formed the basis of the takeoff performance standards required for the type certification and operation of turbine engine powered transport category airplanes since Special Civil Air Regulation No. SR-422, effective August 27, 1957. As of March 20, 1997, the application of this principle was extended by the "commuter rule" to also cover scheduled passenger-carrying operations conducted in airplanes that have a passenger seat configuration of 10 to 30 passengers and turbojet airplanes regardless of seating configuration.

The defined go/no-go point during the takeoff is provided to the pilot as a speed called V_1. Up to the V_1 speed, the pilot should be able to reject a takeoff and stop the airplane within the remaining stopping distance. After V_1, the pilot should be able to safely continue the takeoff, even if an engine fails just prior to V_1.

The presence of snow, slush, ice, or standing water on the runway has a significant effect on an airplane's takeoff performance capability. Snow, slush, or standing water can greatly reduce an airplane's acceleration capability due to the drag caused by the tires running through the contaminant (displacing it), and by the impingement of the contaminant spray on the airplane. All four types of contaminant seriously reduce the capability of the airplane to stop in the event of a rejected takeoff and all but ice will reduce the acceleration capability of the airplane. These degradations of airplane performance capability significantly erode the safety margins that would exist if the runway were clear and dry. If these performance effects are not taken into account when determining the maximum takeoff weight and associated V_1 speed, the airplane may not be able to stop within the available stopping distance if the takeoff is rejected from near the V_1 speed, or safely continue the takeoff if an engine fails near the V_1 speed.

2 - What are the current FAR and JAR standards relative to this subject?
[Reproduce the FAR and JAR rules text as indicated below.]

Current FAR text:

A. Part 121

FAR 121.189 Airplanes: Turbine engine powered: Takeoff limitations.

~~(c)~~(d) No person operating a turbine engine powered airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that listed in the Airplane Flight Manual at which compliance with the following may be shown:

~~(1)~~(4) The accelerate-stop distance must not exceed the length of the runway plus the length of any stopway.

~~(2)~~(5) The takeoff distance must not exceed the length of the runway plus the length of any clearway except that the length of any clearway included must not be greater than one-half the length of the runway.

~~(3)~~(6) The takeoff run must not be greater than the length of the runway.

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(e)In determining maximum weights, minimum distances, and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition (dry or wet). Wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator.

B. Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

~~(c)~~(d)No person operating a turbine engine powered large transport category airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that listed in the Airplane Flight Manual at which compliance with the following may be shown:

~~(1)~~(4) The accelerate-stop distance must not exceed the length of the runway plus the length of any stopway.

~~(2)~~(5) The takeoff distance must not exceed the length of the runway plus the length of any clearway except that the length of any clearway included must not be greater than one-half the length of the runway.

~~(3)~~(6) The takeoff run must not be greater than the length of the runway.

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(e)In determining maximum weights, minimum distances, and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition (dry or wet). Wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator.

Current JAR text:

(XIV.)JAR-OPS 1.485General

(a)An operator shall ensure that, for determining compliance with the requirements of this subpart, the approved performance data in the Aeroplane Flight Manual is supplemented as necessary with other data acceptable to the Authority if the approved performance data in the Aeroplane Flight Manual is insufficient in respect of items such as:

(1) Accounting for reasonably expected adverse operating conditions such as take-off and landing on contaminated runways; and

(2) Consideration of engine failure in all flight phases.

(b)An operator shall ensure that, for the wet and contaminated runway case, performance data determined in accordance with JAR 25X1591 or equivalent acceptable to the Authority is used. (See IEM OPS 1.485(b).)

JAR-OPS 1.490Take-off

~~(b)~~(d) An operator must meet the following requirements when determining the maximum permitted take-off mass:

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~~(5)~~(6)On a wet or contaminated runway, the takeoff mass must not exceed that permitted for a take-off on a dry runway under the same conditions.

~~(c)~~(e) When showing compliance with sub-paragraph (b) above, an operator must take account of the following:

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~~(3)~~(4) The runway surface condition and the type of runway surface (see IEM OPS 1.490(c)(3));

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and

what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

Currently, the Part 121/135 operating rules do not specifically require that runway surface contamination in the form of ice, snow, slush, or standing water be taken into account in determining allowable takeoff weights. FAA Advisory Circular (AC) 91-6A provides information, guidelines, and recommendations for conducting turbojet operations on runways covered by water, snow, or slush, but as with any AC, compliance with its recommendations is not mandatory. FAA order 8400.10, "Air Transportation Operations Inspector's Handbook," notifies FAA Operations Inspectors to consult AC 91-6A for operations on runways that have snow, slush, ice, or standing water because such conditions "typically require corrections for takeoff calculations." Although Inspectors are advised that the effects of contaminated runways, must be accounted for, there is no FAR that explicitly requires this.

In contrast to the FAA requirements, JAR-OPS 1 requires runway surface contamination in the form of ice, snow, slush, or standing water to be taken into account in determining allowable takeoff weights for all Performance Class A airplanes used in commercial air transportation. (Performance Class A airplanes include multi-engine turbopropeller airplanes with a maximum approved passenger seating configuration of more than 9 seats or a maximum takeoff mass exceeding 5700 kilograms, and all multi-engine turbojet powered airplanes.) In addition, JAR-OPS 1 requires operators to ensure that the contaminated runway data being used has been developed in accordance with certain criteria provided in JAA advisory material or their equivalent. The JAR standard takes into account a failure of the most critical engine just before the airplane reaches a defined go/no-go point, just like for the dry or wet runway case. JAR-OPS 1 also requires the operator to ensure that the approved performance data in the Airplane Flight Manual (AFM) is supplemented as necessary with other data acceptable to the Authority if the AFM lacks contaminated runway data, including the consideration of engine failure.

The JAR standards provide a higher level of safety than the FAR when operating from runways contaminated by standing water, slush, ice, or snow. In achieving this higher level of safety, the JAR standards impose an economic burden on JAR operators that is not borne by FAR operators.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

The FAR does not contain a standard for takeoff performance limitations from contaminated runways, so there is no applicable means of compliance. Guidance published by the FAA in AC 91-6A for operations on contaminated surfaces differs from the compliance criteria used by the JAA in that it does not provide a specific methodology for determining an airplane's takeoff performance on contaminated surfaces. Also, examples are provided of contaminated runway performance data determined without consideration of engine failure, which would not be permitted under the JAR standard.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The working group did not reach a consensus on this issue. Because the performance effects of runway contamination can be severely penalizing when considered in combination with a possible engine failure, the economic impact of taking them into account can be significant. Takeoff weight can be severely restricted, which can lead to a loss of revenue if the cargo or passenger payload must be reduced. In some cases, operations may no longer be economically viable. Some members of the working group considered the resulting economic penalty to be too large in relation to the potential safety benefit to recommend harmonization to the JAR standard.

The working group investigated the potential for reducing this economic burden while maintaining the safety benefits, including data analysis, presentation, and performance calculation methods, differentiation of contaminant types, depths, and frequency of occurrence, and runway clearing and condition reporting practices. Subgroups were formed to examine each of these issues and report to the working group. The subgroups' conclusions regarding each of these issues are provided separately (Subgroup reports 1 and 2), but the end result was that there was little likelihood of significantly reducing the economic burden associated with accounting for the effects of contaminated runways on takeoff performance when engine failure accountability is included.

Therefore, the working group is submitting two different reports regarding rulemaking proposals for this issue. One report (this one), supported by the majority of working group members, proposes harmonizing to the JAR standard, including accountability for engine failure. The other report proposes adopting contaminated runway takeoff limitations into the FAR that would not include engine failure accountability.

While those members of the working group who support harmonizing to the JAR standard also recognize the potential economic impact of the proposed standard, we also know that many U. S. operators already voluntarily account for the effects of contaminated runways on takeoff performance, including engine failure accountability. Some operators do this for all of the airplane types in their fleet, while others do so only for certain airplane types. In general, the performance penalties associated with accounting for contaminated runways were appreciably lower for more recently certified airplane types than for older airplane types. As the older airplane types are retired, the economic burden of complying with contaminated runway standards will be reduced. This suggests that a delayed compliance date could be used to take advantage of the safety benefit currently realized by voluntary compliance and provide a path to eventual use of a single, improved standard.

Also, adopting contaminated runway standards with a delayed compliance date would provide additional time to investigate methods of reducing the economic impact of the proposed standards. For example, research currently being conducted regarding the performance effects of contaminated runways may result in refinements in the methods used to determine performance penalties under such conditions. These refinements may reduce the performance penalties associated with accounting for an engine failure on contaminated runways. Increasing the stringency of airport requirements for snow and ice control, better coordination between airport and airplane operators regarding snow and ice control plans, and airplane operators' consideration of contaminated runway performance in their winter fleet planning and usage are other ways that could reduce the economic burden imposed by the proposed standard.

To achieve the goals identified in the preceding paragraph, it is important that only the compliance date of the proposed standard be delayed, not the adoption of the proposed standard itself. Adoption of a standard would enable the affected parties to make the long term plans and commitments needed to provide maximal benefit at minimum cost.

Harmonizing to the JAA requirements espoused in JAR-OPS 1, including accountability for an engine failure during the takeoff, is proposed for the following reasons:

1. Harmonization of this issue is an important safety and economic issue. Safety margins are seriously degraded by the presence of slush, snow, ice, or standing water on the runway. Without harmonization, the same type of airplane taking off from the same runway under the same conditions could have significantly different safety margins and revenue generating capability, subject to whether it is being operated by a FAR or JAR operator. This significant difference in safety and revenue generating capability is precisely what the Performance Harmonization Working Group was tasked to try to eliminate.

2. Statistics presented in the Takeoff Safety Training Aid, developed jointly by the aviation industry and the FAA in 1992, and supplemented by Boeing in 2000 (Boeing *Aero* Magazine, July 2000) show that 9 percent of the rejected takeoff accidents/incidents for which runway conditions were reported occurred on contaminated runways. (Runway conditions were not reported for 29 percent of the rejected takeoff accidents.) Since it is estimated that significantly fewer than 9 percent of takeoffs are made from contaminated runways (see item 16 of this report), the risk of a rejected takeoff accident is disproportionately greater on a contaminated runway than on a dry runway. Although it is inconclusive whether the standards proposed in this report would have prevented or minimized the effects of the known accidents/incidents, the proposed standards would increase the level of safety for all takeoffs from contaminated runways.

3. In Working Group Report 5 (which recommends contaminated runway accountability without accounting for engine failure), it is suggested that engine failure accountability might be ignored on a probability basis. Not accounting for an engine failure on a probability basis, however, treats a contaminated runway condition in the same manner as a failure condition, or other randomly occurring variable. But runway contamination is a readily identifiable nonrandom operating condition, no different than other variables that are fully taken into account for takeoff, such as wind, runway slope, temperature, pressure altitude, etc. Not accounting for an engine failure on contaminated runways would be akin to not accounting for engine failure on extremely hot days, or at very high altitude airports.

   Also, as stated in the preamble of Notice of Proposed Rulemaking 93-8 (58 FR 36738), "it is fundamental to operational safety that the pilot should be able to either safely complete the takeoff, or bring the airplane to a complete stop if a decision is made to reject the takeoff no later then the V_1 speed, even if power is lost from the most critical engine just before V_1." This principle is part of the underlying safety objective of both the FAR and the JAR to provide safety margins for an engine failure occurring at any point in the flight. To accept that an engine failure need not be taken into account for contaminated runway takeoffs would undermine this philosophy.

   If takeoff performance is based on all engines operating throughout the takeoff, there would be an exposure period for runway-limited takeoffs such that the pilot would be unable to either safely complete the takeoff if power were lost from the critical engine or to reject the takeoff and bring the airplane to a complete stop within the remaining runway. In this situation, the maximum speed from which the airplane could be brought to a complete stop on the runway would be lower than the minimum speed from which the airplane could takeoff and reach a height of 15 feet over the end of the runway after an engine failure. Attempting to stop for any reason during this exposure period would result in an overrun, while continuing the takeoff if an engine fails during the exposure period would likely result in the airplane being unable to safely complete the takeoff.

In addition to violating the basic principle of retaining the capability to either takeoff or stop on the runway in the event of an engine failure, there is the question of what information to provide to the pilot if takeoff limitations were based on all engines operating throughout the takeoff. Currently, pilots are provided with a V_1 speed, which is defined as "the maximum speed in the takeoff at which the pilot must take the first action (e.g., apply brakes, reduce thrust, deploy speed brakes) to stop the airplane within the accelerate-stop distance [and] the minimum speed in the takeoff, following a failure of the critical engine at V_{EF}, at which the pilot can continue the takeoff and achieve the required height above the takeoff surface within the takeoff distance." The V_1 concept would no longer be valid for takeoffs in which an engine failure is not taken into account. Maximum "stop" and minimum "go" speeds could be provided, which would be the maximum speed from which the airplane could be stopped on the runway, and the minimum speed from which a takeoff could be safely continued after an engine failure, respectively. But this would be a significant departure from what pilots are accustomed to for typical day-in day-out operations, and there would be the further question of what to recommend to the pilot for a problem occurring in the exposure period between these speeds. If only the maximum stop speed is provided, the pilot is likely to attempt to continue the takeoff if an engine fails above but near that speed, which could prove disastrous.

4. In general, contaminated runway operations are infrequent and transitory, which tends to mitigate the economic burden. Also, unlike many other variables adversely affecting takeoff performance, like pressure altitude and temperature, action can usually be taken to remove or reduce the level of runway contaminant. The economic penalty can be reduced or eliminated by waiting until the runway is cleared or conditions otherwise improve.

   In Working Group Report 5 it is suggested that introducing engine-inoperative contaminated runway accountability may actually decrease safety by diverting passengers from air travel to automobile travel when flights are delayed or canceled due to contaminated runway conditions. However, it is difficult to envisage a situation where a significant number of passengers would, when faced with a flight delay due to severe winter conditions, be prepared to and choose to drive under those conditions. In addition, as indicated by the examples cited in Report 5, it is typically the longer range flights, where it would be impractical to drive instead of flying, that would be impacted most severely in terms of potential passenger offloads, delays, or flight cancellations.

   The impact of one-engine-inoperative contaminated runway requirements, in terms of flight delays and cancellations, is unlikely to be anywhere near as great as those already occurring as a result of other severe weather conditions (e.g., summer thunderstorms or dense fog), mechanical problems, or air traffic scheduling constraints.

5. Of the different types of runway surface contamination, slush causes a considerably larger performance penalty. The greater the depth of contaminant, the larger the penalty (an exception being when the maximum allowable takeoff weight is limited by minimum control speed considerations). In general, however, slush is the least frequently occurring condition and is the most transitory type of runway contaminant. Yet, those opposed to engine failure accountability on contaminated runways continue to cite takeoff weight penalties associated with the maximum depth of slush for which a takeoff can be made combined with being at or near the maximum allowable weight allowed for the runway length in dry conditions. This use of the data overstates the potential revenue impact of the harmonized standards proposed in this working group report.

   The only complete revenue impact analysis of actual operating data during winter conditions was supplied by one operator and included as an attachment to this report. These data show that out of a total of 446,015 departures for this operator, 0.10 percent were from runways with one-quarter inch of contaminant and 0.02 percent were from runways with one-half inch of contaminant. Out of a total operating revenue of $4,735,587,000 in 1999, $190,739 (0.004% of operating revenue) was lost due to accounting for contaminated runways on a one-engine-inoperative basis. Restricting the analysis to the ten airports with the highest number of operations from contaminated runways, which included Detroit-Metro, Baltimore-Washington International, Chicago Midway, and Cleveland Hopkins, less than one-half of one percent of takeoffs were from runways with one-quarter inch of contaminant and less than one-tenth of one percent were from runways with one-half inch of contaminant.

6. Harmonization would “level the playing field” not only between FAR and JAR operators, but also among different FAR operators. Since the FAR does not currently require that contaminated runway conditions be taken into account, there are a variety of practices being employed in regards to contaminated runway takeoff performance.

7. Many of the same issues were dealt with during the process leading up to adoption of the JAR-OPS 1 contaminated runway requirements. The overall experience after adoption of these requirements has thus far not borne out projections of operations being curtailed because of the magnitude of the payload reductions, and has in some cases engendered a closer working relationship between airplane and airport operators to safely conduct operations under adverse weather conditions. The majority of the authors of this working group report do not consider the operating environment of FAR operators to be unique or significantly different than that of JAR operators as far as contaminated runway operations are concerned. From the standpoint of harmonizing the standards to reduce competitive disparities, FAA/JAA operators competing on similar routes experience the same operating environment.

8. Except for very few instances of certain out-of-production airplanes, the data are readily available for operators to use to show compliance with the proposed harmonized requirements, including accounting for an engine failure. Even in these few instances, producing acceptable data is not considered to be a significant obstacle. This issue has already been addressed by the existence of the JAR-OPS 1 requirement to account for contaminated runway conditions on a one-engine-inoperative basis. Manufacturers produced appropriate data packages so that operators could show compliance with these requirements. It is intended that these same data packages would be acceptable to show compliance with the FAR requirements proposed in this report.

Although the availability of data needed to show compliance with the proposed standard is not expected to be a problem, it is recognized that existing data has been produced to differing standards, which, as noted in Subgroup Report 1, can have a large impact on the takeoff weight capability of an airplane on contaminated runways. Although different sets of data produced to differing standards may both be acceptable from a regulatory (safety) standpoint, the resulting airplane performance, and hence cost impact to operators, may be significantly different. There will be a strong desire by the operators for manufacturers to revise data that has been produced to standards more stringent than are necessary to be accepted by the regulatory authority. Revising the existing data will result in an additional cost to the airplane manufacturers, but, in turn, it would reduce the revenue impact of the proposed standards to operators. Presumably, any revision of existing data will only be undertaken if it will lessen the penalty to operators and can be provided for a positive net “cost.” Therefore, although the adoption of the harmonized standards proposed in this report may result in the need to revise existing data, it can be assumed that such revisions will only occur if they result in a net benefit by lowering the potential revenue loss incurred by the adoption of the proposed contaminated runway takeoff performance limitations.

9. The Working Group notes that expeditiously removing snow, slush, ice, and standing water from runways is a more effective manner of improving the safety of operations than by imposing airplane operating limitations alone. Therefore, the working group strongly recommends that the FAA task ARAC with exploring the feasibility of developing more stringent regulatory standards for runway clearing and condition reporting. Although § 139.313 currently requires “prompt removal or control, as completely as practical, of snow, ice, and slush on each movement area,” this standard does not provide the consistent level of safety that is desired, and puts extreme pressure on operators and pilots to operate in conditions where the precise airplane performance capability cannot be known. The working group recommends that the FAA update the requirements of § 139.313 to require that runways, stopways, high-speed turnoffs, and taxiways be maintained in a “no worse than wet” condition (consistent with the guidance provided in AC 150/5200-30A). Such a requirement will provide an additional incentive to airport operators to aggressively seek the tools, methods, and cooperation they need with all affected parties to enhance the safety of winter operations.

   These concerns remain regardless of whether or not the standard proposed in this report is adopted. Another ARAC Working Group should be tasked with an examination of runway surface reporting and clearing criteria.

History of Contaminated Runway Requirements in Europe

Some European operators accounted for engine failure on contaminated runways even before JAR-OPS 1 was adopted by JAA in 1995. These standards were introduced because: 1.) The European operators recognized that safety dictated that engine failure should be accounted for on contaminated runways, and 2.) In Europe, the frequency that runways are actually contaminated, resulting in a weight penalty, is very small.

The U.K. operating rules equivalent to FAR 121, Air Navigation (General) Regulations, paragraph 7, were already in place in 1974 to require that account be taken for the surface condition of the runway, and that a proper V_1 should be used, including full engine failure accountability under all conditions. However, at that time the U.K. certification basis, British Civil Air Regulations Section D, only required the scheduling of all engines contaminated runway data. This was permitted because contaminated conditions are fairly infrequent and short-lived in the U.K. Emphasis was placed on waiting for the runway to be cleared, or for conditions to improve. The notable exception to the lack of engine failure data was Concorde, which had full engine failure accountability since its entry into service in 1976.

As JAR 25 Change 13 certification rules (which provided detailed engine failure accountability criteria for contaminated runways) became effective (18 October 1988), engine failure data has been more widely available, enabling full compliance with the U.K. Air Navigation (General) Regulations. In general, with the increased use of de-rated thrust and reduced thrust takeoffs, the need for all-engines-operating performance to get airborne is reduced. It became unreasonable to perpetuate the old position, born of necessity, and recognize that today's aircraft generally have one-engine-inoperative (OEI) capability on contaminated runways. Since 1996, CAA in the U.K. has been encouraging operators to make the transition to JAR-OPS 1.

In Germany, Lufthansa has accounted for OEI on contaminated runways since 1972. Up to this time, the German regulations only specified taking contaminated runways into account, and did not specify if this was for all engines operating or OEI.

In France, contaminated runway accountability has been required since 1974, but the regulations did not specify whether it was based on all-engines-operating performance or OEI performance. However, if an AFM contains engine-out data for contaminated runways, the operators are required to use it. Air France has accounted for OEI on contaminated runways since 1972.

The availability of OEI data in the AFM depends on whether or not the type certification regulations require it in the country where the airplane is certified. For example, all Airbus models are delivered with OEI contaminated runway performance data in the JAA AFM in compliance with JAR-25 requirements. (Per FAA requirements, these data may be provided as guidance information in the unapproved section of the FAA AFM, but as guidance are not required to be used by the operator.) Embraer provides data in the AFM for both all-engines-operating and OEI performance on contaminated runways to JAA operators. For FAA certification of the EMB 135/145, there is no approved data for contaminated conditions, since the FAR does not require it. Boeing provides OEI contaminated runway performance in the JAA approved AFM's for the 747-400, 777-200, 757-300, and 737-600/700/800 since these models were certified to JAR-25. For Boeing models that were not certified to JAR-25, but need to operate in compliance with JAR-OPS 1, supplementary OEI contaminated runway performance data has been made available to the operators.

At present, there are 33 member states in the JAA, and 16 member states in the European Union. Since JAR-OPS 1 was adopted by JAA in 1995, there were questions about how it could become law in those individual countries. Legal issues regarding implementation of JAR-OPS 1 in the countries of the European Union have been resolved, and it is anticipated that these requirements will become law in those countries as “EU-OPS 1” in the near future.

Conclusions and Recommendations of “Aircraft Take-off Performance and Risks for Wet and Contaminated Runways in Canada,” a report prepared for Transport Canada in May 1994 by Sypher:Mueller International Inc.

The purpose of this study was to develop recommendations to improve operational safety for Canadian aircraft taking off from wet runways, or runways contaminated with snow, slush, or ice. The study found that as a result of increased drag, reduced friction, and reduced directional control, accident risks on takeoffs from wet and contaminated runways are greater than acceptable and that the JAR standards reduce these risks. Although the costs were found to typically exceed the benefits if the passenger payload must be reduced to include engine failure accountability for contaminated runway conditions, the risks involved in takeoffs from wet and contaminated runways without accounting for the conditions were found to be unacceptably high. Costs and the impact on the air carriers were not found to be economically unreasonable.

The study also surveyed six operators in Germany, France, Scandinavia, the United Kingdom, and Japan to review their practices in accounting for wet and contaminated runways for takeoff. All six carriers were required by their respective regulatory authority to use approved performance data for operations from wet and contaminated runways. None of the carriers use the V_{go}/V_{stop} concept associated with not accounting for an engine failure (i.e., no single V_1 speed from which the pilot can either safely continue the takeoff or stop the airplane within the remaining stopping distance available). The carriers viewed the V_{go}/V_{stop} concept as too complicated from an operational point of view.

The study recommended that Canada take action to reduce the risks associated with operations from wet and contaminated runways by requiring wet and contaminated runway conditions to be taken into account with an engine failure. Based on the additional risk associated with the use of the V_{go}/V_{stop} concept, and the concerns raised by the carriers surveyed, it was recommended that the V_{go}/V_{stop} concept not be permitted in Canada.

For each proposed change from the existing standard, answer the following questions:

6 - What should the harmonized standard be? [Insert the proposed text of the harmonized standard here]

NOTE: The Working Group recommends the following standard be adopted and further recommends that mandatory compliance with the requirement to account for contaminated runways be delayed until January 1, 2010.

A. Part 121

(XV.) FAR 121.171 Applicability.

(c) Except as provided in paragraphs (d) and (e) of this section, each certificate holder operating a turbine-engine-powered airplane shall comply with the applicable provisions of §§ 121.189 through 121.197, except that when it operates –

(1) A turbopropeller powered airplane type certificated after August 29, 1959, but previously type certificated with the same number of reciprocating engines, the certificate holder may comply with §§ 121.175 through 121.187; or

(2) Until December 20, 2010, a turbopropeller powered airplane described in § 121.157(f), the certificate holder may comply with the applicable performance requirements of Appendix K of this part.

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(e) The requirement of § 121.189(e)(3) to correct for contaminated runway surface conditions becomes effective on January 1, 2010.

FAR 121.189 Airplanes: Turbine engine powered: Takeoff limitations.

~~(c)~~(d) No person operating a turbine engine powered airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that at which compliance with the following may be shown for the runway to be used:

~~(1)~~(4) The accelerate-stop distance must not exceed the accelerate-stop distance available.

~~(2)~~(5) The takeoff distance must not exceed the takeoff distance available with any clearway distance not exceeding half of the takeoff run available.

~~(3)~~(6) The takeoff run must not be greater than the takeoff run available.

~~(4)~~(7) The same value of V_1 must be used to show compliance with paragraphs (c)(1) through (c)(3) of this section.

~~(5)~~(8) On a wet or contaminated runway, the takeoff weight must not exceed that permitted for takeoff on a dry runway under the same conditions.

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~~(e)~~(f) In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for–

~~(1)~~(6) The pressure altitude at the airport;

~~(2)~~(7) The ambient temperature at the airport;

~~(3)~~(8) The runway surface condition (dry, wet, or contaminated) and the type of runway surface (paved or unpaved);

~~(4)~~(9) The runway slope in the direction of takeoff;

~~(5)~~(10) Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component; and

(6) The loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff.

(f) Wet runway accelerate-stop distances associated with grooved or porous friction course runways may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay.

A. Part 135

(XVI.)FAR 135.1 Applicability.

(b)The requirement of § 135.379(e)(3) to correct for contaminated runway surface conditions becomes effective on January 1, 2010.

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

~~(c)~~(d) No person operating a turbine engine powered large transport category airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that listed in the Airplane Flight Manual at which compliance with the following may be shown for the runway to be used:

(1) The accelerate-stop distance must not exceed the accelerate-stop distance available.

(2) The takeoff distance must not exceed the takeoff distance available with the any clearway distance not exceeding half of the takeoff run available.

(3) The takeoff run must not be greater than the takeoff run available.

~~(4)~~(5)The same value of V_1 must be used to show compliance with paragraphs (c)(1) through (c)(3) of this section.

~~(5)~~(6) On a wet or contaminated runway, the takeoff weight must not exceed that permitted for takeoff on a dry runway under the same conditions.

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~~(e)~~(g)In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for–

(1) The pressure altitude at the airport;

(2) The ambient temperature at the airport;

(3) The runway surface condition (dry, wet, or contaminated) and the type of runway surface (paved or unpaved);

(4) The runway slope in the direction of takeoff; and

(5) Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component; and

(6) The loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff.

(f) Wet runway accelerate-stop distances associated with grooved or porous friction course runways may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay.

JAR-OPS 1

JAR 1.485General

(a)An operator shall ensure that, for determining compliance with the requirements of this subpart, the approved performance data in the Aeroplane Flight Manual is supplemented as necessary with other data acceptable to the Authority in respect of items such as:

(1) Accounting for reasonably expected adverse operating conditions such as take-off and landing on contaminated runways; and

(2) Consideration of engine failure in all flight phases.

~~(b)~~(c)For the wet and contaminated runway case, performance data determined in accordance with JAR 25X1591, or other data ensuring a similar level of safety acceptable to the Authority must be used. (See IEM OPS 1.485(b)).

JAR 1.490Take-off

~~(b)~~(d)An operator must meet the following requirements for the runway to be used when determining the maximum permitted take-off mass:

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~~(2)~~(3) On a wet or contaminated runway, the take-off mass must not exceed that permitted for a take-off on a dry runway under the same conditions.

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~~(c)~~(e)When showing compliance with subparagraph (b) above, an operator must take account of the following:

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~~(3)~~(4)The runway surface condition and the type of runway surface (See IEM OPS 1.490(c)(3)).

IEM No. 2 OPS 1.490(c)(3) – Type of Runway Surface (Grooved and Porous Friction Course).

Where an identified paved runway has been prepared and maintained with a grooved or porous friction course (PFC) in accordance with a standard such as FAA AC ISO/5320-12A, or other equivalent acceptable to the Authority, performance credit may be taken, provided that approved performance data is in the AFM and is identified as appropriate for use in conjunction with a grooved or PFC runway.

Summary of Proposed Changes:

[Note: The proposed changes discussed below include more than just the changes associated directly with the issue of contaminated runway takeoff performance with engine failure accountability. This was done for completeness and clarity due to the many changes being proposed for the rule sections that address takeoff limitations. Therefore, some of the proposed changes described below will either be repeated or more fully explained in other working group reports.]

~~(1)~~(13)Amend §§ 121.189(c) and 135.379(c) to remove the words "listed in the Airplane Flight Manual." Currently, §§ 121.189(c) and 135.379(c) require that the Airplane Flight Manual (AFM) must be used to determine the maximum takeoff weight for which compliance is shown with the field length requirements of those sections. As noted in Working Group Report 1, for most of the new performance requirements being proposed by the Performance Harmonization Working Group (e.g., runway alignment distance, retroactive application of wet runway requirements, contaminated runway requirements), airplane performance data not currently furnished in AFM's will be needed in order to show compliance. While the working group recommends that the subject of AFM data requirements be further investigated by a working group tasked with such part 25 issues, the working group recommends proceeding with this rulemaking without waiting for that task to be completed. Until that task is completed, operators should be able to show compliance to the proposed contaminated runway takeoff limitations using supplementary data acceptable to the regulatory authority.

Removing the words "listed in the Airplane Flight Manual" from §§ 121.189(c) and 135.379(c) would leave the proposed §§ 121.173(a) and 135.363(a) (as proposed in Working Group Report 1), respectively, as the applicable requirements regarding the source of data for showing compliance with §§ 121.189(c) and 135.379(c). The proposed §§ 121.173(a) and 135.363(a) state that the performance data in the Airplane Flight Manual, supplemented as necessary with other data acceptable to the Administrator, applies in determining compliance with §§ 121.175 through 121.197 and §§ 135.365 through 135.387, respectively.

~~(2)~~(14)Amend §§ 121.189(c) and 135.379(c) to add the words "for the runway to be used" to clarify that compliance with this requirement must be shown for the runway to be used. This is a clarifying change only.

~~(3)~~(15)Amend §§ 121.189(c)(1), (c)(2), and (c)(3) and §§ 135.379(c)(1), (c)(2), and (c)(3) to use the terms "accelerate-stop distance available," "takeoff distance available," and "takeoff run available," which would be defined in the proposed new §§ 121.173(i) and 135.363(i). (See Working Group Report 1 for proposed accompanying amendments to §§ 121.173 and 135.363). This change would harmonize the wording of the JAR and FAR standards, but would not change the requirement.

~~(4)~~(16)Add, as a new § 121.189(c)(4) and new § 135.379(c)(4), a requirement that the same value of V_1 must be used to show compliance with the accelerate-stop, takeoff run, and takeoff distance limitations. This requirement would ensure that, from a single defined go/no-go point (i.e., the V_1 speed), the takeoff can either be safely completed, or the airplane can be brought to a stop within the remaining distance available for stopping the airplane. Although the current FAR requires this capability through the interaction of the part 25 definitions for takeoff and accelerate-stop distances and the associated operating requirements, adding the proposed paragraph would make this requirement more explicit. With the addition of the proposed takeoff limitations for operations from contaminated runways, the proposed §§ 121.189(c)(4) and 135.379(c)(4) would clarify that these limitations must include accountability for failure of the critical engine. This clarification is considered beneficial because of the widespread availability and use of all-engines-operating data for operations on contaminated runways that will no longer be accepted for use under the proposed standard. This proposed change would also harmonize the FAR with the current JAR standard. The use of all-engines-operating data, as proposed in Working Group Report 5, would not provide the capability to meet the requirements of §§ 121.189(c)(1) through (c)(3) with the same V_1 speed, and therefore would not comply with the §§ 121.189(c)(4) and 135.379(c)(4) proposed in this report.

~~(5)~~(17)Add new §§ 121.189(c)(5) and 135.379(c)(5) to require that the takeoff weight on a wet or contaminated runway not exceed the takeoff weight permitted on a dry runway under the same conditions. It would be inappropriate, from a safety standpoint, to allow a higher maximum takeoff weight from a contaminated runway than from a dry runway under otherwise identical conditions. Without the proposed requirement, this situation could potentially occur due to differences in the methods for determining the distances used in establishing the maximum allowable takeoff weight. (In determining the contaminated runway accelerate-stop distances under this proposal, credit can be taken for the use of reverse thrust for stopping the airplane. Reverse thrust credit is not permitted in determining dry runway accelerate-stop distances. For a continued takeoff, the airplane can be at a height of 15 feet over the end of a wet or contaminated runway, but must be at a height of 35 feet (if there is no clearway) for a dry runway.) [Note: Because both wet and contaminated runways would be covered by this proposed change, this proposal is repeated in the Working Group Report 2.]

~~(6)~~(18)Reformat §§ 121.189(e) and 135.379(e) to list, in separate sub-paragraphs, each of the items for which correction must be made. Currently, §§ 121.189(e) and 135.379(e) require correction made to the maximum weights, minimum distances, and flight paths under paragraphs §§ 121.189(a) through (d) and §§ 135.379(a) through (d), respectively, for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition (dry or wet). Sections 121.189(e) and 135.379(e) also state that wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator.

Under this proposal, §§ 121.189(e) and 135.379(e) would be revised to state, “In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for–.” “The pressure altitude at the airport” would be listed in new §§ 121.189(e)(1) and 135.379(e)(1). The use of pressure altitude instead of elevation is consistent with changes being proposed throughout this subpart. It reflects the practice that the determination of takeoff weights are normally done on the basis of pressure altitude, and that Airplane Flight Manual performance information is provided as a function of pressure altitude. The words “at the airport” would replace “of the airport,” and are intended to allow correction for the pressure altitude of the specific runway. The words “of the airport” imply the use of the pressure altitude of the airport itself, which is that of the highest touchdown zone of any runway at the airport. New §§ 121.189(e)(2) and 135.379(e)(2) would list “the ambient temperature at the airport.” New §§ 121.189(e)(3) and 135.379(e)(3) would list “the runway surface condition (dry, wet, or contaminated) and the type of runway surface (paved or unpaved).” This change would add contaminated runway surfaces to the list of runway surface conditions for which correction must be made.

The proposed new §§ 121.189(e)(3) and 135.379(e)(3) would also add a requirement to correct for the type of runway surface (paved or unpaved). This new requirement is intended to ensure that the applicable takeoff limitations for approved operations on unpaved runway surfaces, such as grass or gravel runways, are based on performance data appropriate to the type of runway surface. This proposal would codify current FAA practice, which permits operations on unpaved runway surfaces through special operational approvals under the authority of § 121.173(f). It would also harmonize this issue with JAR-OPS 1. In accordance with FAA policies developed for these special operational approvals, the limitations, procedures, and performance information for unpaved runway operation must be presented in the Airplane Flight Manual (usually in an appendix or supplement). Airworthiness certification guidance to support approval for unpaved runway operations is provided in FAA Advisory Circular 25-7A, “Flight Test Guide for Certification of Transport Category Airplanes.”

New §§ 121.189(e)(4) and 135.379(e)(4) would list “The runway slope in the direction of takeoff.” This item is currently listed in §§ 121.189(e) and 135.379(e) as “the effective runway gradient.” The wording change would harmonize the wording with that of the JAR standard and is not intended to change the existing requirement regarding the effect of runway slope.

New §§ 121.189(e)(5) and 135.379(e)(5) would list “Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component.” This would replace the criterion, “wind component at the time of takeoff,” currently listed in §§ 121.189(e) and 135.379(e). The proposed wording is intended to clarify that the total wind (i.e., wind speed and direction), not just the headwind or tailwind component, must be considered. For corrections to takeoff distances, only the headwind or tailwind component is relevant. However, for flight path considerations, the total wind must be taken into account. (Note: This issue is addressed in Working Group Report 6.)

The proposed wording also includes the factors applied to the headwind and tailwind components (“not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component”) that are currently required by the airworthiness type certification requirements of part 25. The working group proposes that these wind factors should be applied to all operations conducted under §§ 121.189 and 135.379, regardless of the certification basis of the airplane.

New §§ 121.189(e)(6) and 135.379(e)(6) would list the new requirement proposed in working Group Report 3, “The loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff.” (See that working group report for the reasons for this change.)

New §§ 121.189(f)/135.379(f) would contain the requirement related to operating on grooved and porous friction course wet runways currently contained in §§ 122.189(e) and 135.379(e). See Working Group Report 2 for proposed changes to this requirement.

These proposed changes to §§ 121.189(e) and 135.379(e) would harmonize the requirements contained in those sections with JAR-OPS 1.490, when amended as proposed below.

~~(7)~~(19) Amend JAR-OPS 1.490(b) to add the words "for the runway to be used" to clarify that compliance with this requirement must be shown for the runway to be used. This is a clarifying change only.

~~(8)~~(20) Amend JAR-OPS 1.490(b)(4) to revise the text to read, "Compliance with this paragraph must be shown using the same value of V_1 for the rejected and continued take-off." This change would replace the current words "…single value of V_1…" with the words "…same value of V_1." This change is a clarification in that there may be a range of V_1 speeds to choose from, but the intent is that the same one must be used for both the rejected and continued takeoff analyses.

(XVII.)Summary of Recommendations

(1) The Working Group recommends that the FAA establish a harmonization working group or equally diverse body to oversee research and analysis efforts aimed at improving the data and analysis methods associated with determining contaminated runway takeoff performance capabilities for current and future airplanes operated under JAR-OPS1 and FAR parts 121 and 135. Although there are ongoing as well as previous research efforts in the area of winter runway operations, there has been inadequate oversight and participation by the parties most affected by the use of this research. Participation by the affected parties, including airlines, regulatory agencies, and manufacturers, would greatly increase the usability of the results. It is anticipated that adopting the contaminated runway standards proposed in this report will provide an increased incentive for the affected parties to actively participate as well as provide better focus for the research efforts. Better understanding of the effects of runway contaminants on airplane performance may allow current payload penalties to be reduced, while maintaining the level of safety intended by the proposed standard.

(2) The Working Group recommends that the FAA task an appropriate harmonization working group with exploring the feasibility of developing more stringent regulatory standards for runway clearing and condition reporting. International groups such as the ICAO Annex 14 Airport Services Group and Meteorological Reporting Group should be involved in this effort. Although § 139.313 currently requires "prompt removal or control, as completely as practical, of snow, ice, and slush on each movement area," this standard does not provide the consistent level of safety that is desired, and puts extreme pressure on operators and pilots to operate in conditions where the actual airplane performance capability cannot be known. The working group recommends that the FAA update the requirements of § 139.313 to require that runways, stopways, high-speed turnoffs, and taxiways be maintained in a "no worse than wet" condition (consistent with the guidance provided in AC 150/5200-30A). Such a requirement will provide an additional incentive to airport operators to aggressively seek the tools, methods, and cooperation they need with all affected parties to enhance the safety of winter operations.

The proposed harmonization working group should also explore the feasibility of improving the manner in which runway conditions are determined and reported to pilots and dispatchers. Runway condition reports must be timely, accurate, and provided in a manner consistent with how it will be used by operators to schedule takeoff performance. Procedures should be established to allow flight crews to identify weight critical flights to Air Traffic Control, so that the best available runway can be used during contaminated runway operations.

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

The proposed standard addresses the underlying safety issues by requiring operators to take into account the effect of contaminated runways (including engine failure accountability) on takeoff performance for all turbine powered airplanes operated under Parts 121 or 135. For the JAA, the proposed standard continues to require operators to take into account the effect of contaminated runways for all Performance Class A airplanes.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

The proposed standard would increase the level of safety relative to the current FAR. It would add a requirement to take into account the effects of contaminated runways, including consideration of engine failure, on takeoff performance.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

Industry practice varies, but some operators already take contaminated runways into account with engine failure accountability (or plan to do so regardless of whether this proposed standard is adopted) when determining maximum takeoff weights and V_1 speeds. Examples of operators who fit into this category include American, United, Delta, Southwest, America West, American Trans Air, and Federal Express. For these operators, the proposed standard would maintain the existing level of safety.

Other operators currently take contaminated runways into account with engine failure accountability on a portion of their fleet. Examples of operators in this category include US Airways, United Parcel Service, and Air Canada. For these operators, the proposed standard would maintain the existing level of safety for a portion of the fleet, but raise the level of safety for the portion of the fleet where engine-out contaminated runway accountability is not being applied.

For those operators who currently do not account for contaminated runways on an engine failure basis for any of their airplanes operated under parts 121 or 135, the proposed standard would increase the level of safety for takeoffs from contaminated runways, as noted in the response to item 8 above.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

The alternatives would be to harmonize on the current FAR standard, retain the current non-harmonized standards, or recommend that contaminated runways be accounted for on an all-engines-operating basis. The first option was not selected because there was a consensus that improved standards are needed to address an identified safety risk. The second option was not selected because, in addition to the reason given in the preceding sentence, it would also continue the current situation in which the JAR standard requires a higher level of safety and results in an economic advantage for FAR operators over common route with common equipment. Working Group Report 5 has been prepared in support of the third option.

Some members have proposed exempting smaller airplanes from the standards for engine failure accountability on contaminated runways. Other members are opposed to any such exemption for the following reasons. Smaller airplanes are no less susceptible to the performance penalties associated with operating on contaminated runways. In fact, they may be affected to a greater degree because of their size and performance characteristics. With their lower wing heights relative to the runway, smaller airplanes may be more susceptible to impingement drag caused by spray kicked up by the airplane's wheels running through the contaminant. And since smaller regional and business jets typically do not have the performance margins of the larger airplanes, relative to the performance effects of runway contamination, the safety risk is higher. Because smaller airplanes represent a very large fleet of airplanes in the U.S., and operate into airports where runways are not aggressively cleared of contaminants, exempting these airplanes from one-engine-inoperative requirements would not provide the appropriate level of safety.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Operators of transport category airplanes could be affected by the proposed change because they may have to carry out additional analyses for takeoffs from contaminated runways and may realize a loss in revenue if the payload must be reduced or certain operations curtailed in order to comply with the contaminated runway requirements. Manufacturers of transport category airplanes could be affected because they generally develop the data to perform the contaminated runway analysis. However, most of these data have already been generated in order to comply with the current JAR standard.

There has not been a uniform set of assumptions regarding the effects of the runway contaminant on drag and braking capability used to produce the existing data. Some of these data have been produced using more stringent assumptions than would be necessary to show compliance with the standards proposed in this report. As a result, there may be commercial, rather than regulatory pressures for some manufacturers to revise some of the existing data. It is expected that some manufacturers will be requested by operators to revise data in cases where the adopted calculation standard results in improved takeoff performance. In addition, the existing takeoff performance on contaminated runways provided by some manufacturers could be improved by a refinement of the data presentation. Revising the existing data will result in an additional cost to the airplane manufacturers, but, in turn, it would reduce the revenue impact of the proposed standards to operators. Presumably, any revision of existing data would only be undertaken if it will lessen the penalty to operators and can be provided for a positive net "cost." Therefore, although the adoption of the harmonized standards proposed in this report may result in the need to revise existing data, it has been assumed that such revisions will only occur if they result in a net benefit by lowering the potential revenue loss incurred by the adoption of the proposed contaminated runway takeoff performance limitations.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

None.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

The existing Advisory Circular 91-6A is inadequate. Advisory material, in the form of an AC (or a revision to AC 91-6A) should be adopted to provide guidelines and an acceptable means of compliance with the proposed standard for taking into account the effects of contaminated runways on takeoff performance. The advisory material should allow maximum use of existing data, thus minimizing the need for developing new data. The means of compliance should include the following criteria to determine data acceptability:

~~1.~~6. The performance methodology for determining the effects of the contaminant on airplane braking and acceleration parameters should be based on industry standard methods, and be in accordance with JAA AMJ 25X1591 or equivalent.

~~2.~~7. For airplanes currently in use or airplanes of existing approved designs that will be manufactured in the future, the contaminated runway performance information need not be furnished in the Airplane Flight Manual. This information would be considered supplementary data under the proposed revision to §§ 121.171(a) and 135.363(a). [Another ARAC working group should be tasked with determining whether the airworthiness type certification requirements should be amended to require contaminated runway performance information to be included in the AFM. That working group should also be tasked with identifying and addressing any airworthiness type certification criteria associated with determining contaminated runway performance.]

~~3.~~8. Consistent with the current wet runway requirements, performance credit for clearways would not be allowed for contaminated runway takeoffs.

~~4.~~9. One-engine-inoperative takeoff distances may be based on a 15-foot screen height.

~~5.~~10. Performance credit may be taken for the use of available reverse thrust in the same manner as the current Part 25 wet runway standards.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

ICAO Annex 6 (Operation of Aircraft), Chapter 5, 5.2.6 states, "In applying the Standards of this chapter, account shall be taken of all factors that significantly affect the performance of the aeroplane (such as: mass, operating procedures, the pressure-altitude appropriate to the elevation of the aerodrome, temperature, wind, runway gradient and condition of runway, i.e. presence of slush, water and/or ice, for landplanes, water surface condition for seaplanes). Such factors shall be taken into account directly as operational parameters or indirectly by means of allowances or margins, which may be provided in the scheduling of performance data or in the comprehensive and detailed code of performance in accordance with which the aeroplane is being operated."

The current FAR does not comply with this ICAO standard in that the FAR does not require the runway condition, in terms of the presence of slush, water and/or ice to be taken into account for the scheduling of takeoff performance data. The proposed standard would bring the FAR in compliance with the ICAO standard for landplanes by requiring the effect of slush, snow, water, or ice on the runways to be taken into account.

Paragraph 5.2.8 of the same ICAO Annex and Chapter states, "The aeroplane shall be able, in the event of a critical power-unit failing at any point in the take-off, either to discontinue the take-off and stop within the accelerate-stop distance available, or to continue the take-off and clear all obstacles along the flight path by an adequate margin until the aeroplane is in a position to comply with 5.2.9."

The proposed standard, which requires engine failure accountability for takeoffs from contaminated runways, would allow full compliance with this ICAO standard.

15. – Does the proposed standard affect other HWG's? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

There is not expected to be a cost impact for those operators who currently take contaminated runways into account, including engine failure accountability, when determining maximum takeoff weights and V_1 speeds. Operators who do not take contaminated runways into account in this manner could suffer a loss of payload for each flight in which the takeoff weight must be reduced to comply with the proposed standard. Also, these operators will incur costs for modifying their takeoff analysis procedure to include consideration of contaminated runways.

Some operators currently account for contaminated runways with engine failure accountability for all of the airplane types in their fleets. Others account for contaminated runways, but without engine failure accountability. For others, there is a mixture of whether contaminated runways are accounted for, and whether or not it is on an engine failure basis, depending on the type of airplane. The annual costs of the proposed standard for 3 major U.S. air carriers are estimated to be about $ 10 million. One Canadian carrier has estimated annual costs of $ 39 million associated with the proposed standard.

One major U.S. carrier that accounts for contaminated runways with engine failure accountability, Southwest Airlines, analyzed the economic impact of this practice for the time period of November 1999 through May 2000. Out of a total of 446,015 departures, 0.10 percent were from runways with one-quarter inch of contaminant and 0.02 percent were from runways with one-half inch of contaminant. Out of a total operating revenue of $4,735,587,000 in 1999, $190,739 was lost due to accounting for contaminated runways on an engine-out basis. Restricting the analysis to the ten airports with the highest number of operations from contaminated runways, which included Detroit-Metro, Baltimore-Washington International, Chicago Midway, and Cleveland Hopkins, less than one-half of one percent of takeoffs were from runways with one-quarter inch of contaminant and less than one-tenth of one percent were from runways with one-half inch of contaminant.

In a regulatory analysis prepared to support potential rulemaking on this issue in the 1990 time period, the FAA projected the potential economic impact based on U.S. climatological data. For its projection, the FAA used data from the National Climactic Data Center, which collects and reports data for the average number of days per year where one inch or more of snow or sleet falls. For a representative sample of 83 major U.S. cities, it was determined that these snow events occurred an average of 9.6 days per year, or 2.6 percent of the total number of days in a year. It was then assumed that takeoffs under contaminated runway conditions would exist 50 percent of the time on days when an inch or more of snow or sleet fell, resulting in an estimate that 1.3 percent of all takeoffs in the U.S. occur on contaminated runways.

It is important to note that the need for offloading weight due to accounting for contaminated runways depends on whether the available runway length limits the takeoff weight for the actual operation. For takeoffs that would be runway length limited or nearly so under dry conditions, a weight offload would be required under this proposal when the runway is contaminated. A weight offload may also be required if the takeoff weight is limited by obstacles, although the offload will be less than if the takeoff weight is limited by runway length. Data provided by the Air Transport Association of America in a letter dated April 23,1971 indicated that the takeoff weight is limited by runway length approximately 0.5 percent of the time under dry conditions. Combined with the weather data noted in the previous paragraph, in its regulatory analysis of the proposed contaminated runway requirements, the FAA expected weight offloads to be necessary for less than 0.01 percent of departures.

It should be noted that TWA has determined that takeoff weights for their year 1997 operations are limited by runway length approximately 5 percent of the time under dry conditions, rather than the 0.5 percent figure provided by United in the 1971 ATA letter quoted above. In contrast, Federal Express, Southwest, and American confirmed that the 0.5 percent figure was appropriate for their operations.

Costs will be imposed on airplane manufacturers to develop and obtain approval of the data needed to allow operators to show compliance with the proposed harmonized standard. In general, it is assumed that data packages developed for JAR operators to facilitate compliance with JAR-OPS 1 would be acceptable to the FAA. However, there would still be costs involved in obtaining FAA approval of these data packages. Also, for airplanes not currently being operated under JAR-OPS 1, but operated under parts 121 or 135 of the FAR, new data packages would need to be developed.

Boeing estimates that it would cost $24 million to provide contaminated runway data that would be acceptable to all their affected operators. This estimate includes: (1) the revision of data in cases where the adopted calculation standard results in improved takeoff performance relative to the existing data, (2) the development of contaminated runway data for those airframe/engine combinations that are not presently supported, and (3) to extend, as necessary, the FAA AFM dry runway data to accommodate the determination of the maximum allowable takeoff weight on a contaminated runway where contaminated runway data are provided as weight adjustments from the dry runway data.

17. - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

Non-consensus on this issue is indicated by the submittal of two separate proposals – this report and Working Group Report 5.

18. – Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.]

No.

19. – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes.

The Working Group did not reach a consensus on this issue. The following working group members support the harmonized standards proposed in this report:

1. Name	2. Organization
Don Stimson, Jim McDonald, Glenn Dail	U.S. Federal Aviation Administration (FAA)
Terry Lutz, David Hayes, Charles Ayers	Airline Pilots Association (ALPA)
Charles Prophet, John Matthews, Graham Skillen, Pierre Chevasson	Joint Aviation Authorities (JAA)
Detlef Gützlaff	Lufthansa Aeronautical Services
Ken Hurley	Spirent Systems
Brian Gleason	Southwest Airlines
David Arthur	American Airlines
Jim Brooks	Delta Air Lines
Christian Santiccioli	Air France
Nico van Eijk	KLM Royal Dutch Airlines
Hélio Tarquinio, Jr	CTA – Brazil
Aljosa Rapajic	Monarch Airlines
Graeme Catnach	British Airways

Richard Elliott[1], Paul Schmid[*], C. J. Turner[*]	The Boeing Company
Franck Iannarelli[*]	EADS Airbus France
Ginger Eades[*], Wayne Soverns[*]	Trans World Airlines

[1] Support by these members is contingent upon the implementation date being no sooner than that recommended in this report -- January 1, 2010.

Southwest Airlines Runway Surface Condition Survey
November 1999 - May 2000

Airports with Highest Number of Contaminated Runway Operations

		Total # of Operations	Dry	Wet Good	Wet Fair	Wet Poor	0.25" Clutter	0.50" Clutter	# of Daily Departures	Equivalent Days of Clutter
1	BWI	17093	14753	2180	70	15	59	16	105	0.71
2	MDW	20379	16651	3491	153	17	66	1	116	0.58
3	MCI	12910	11776	974	96	17	41	6	72	0.65
4	BDL	2275	1724	476	32	5	36	2	13	2.92
5	CLE	3834	2954	745	90	11	31	3	21	1.62
6	PVD	4129	3314	708	69	11	25	2	23	1.17
7	GEG	2825	2011	725	51	12	24	2	16	1.63
8	OKC	3989	3621	327	14	3	9	15	22	1.09
9	DTW	3311	2724	536	30	4	14	3	19	0.89
10	MHT	2300	1827	416	35	6	15	1	13	1.23
	Systemwide	446015	408430	35690	1216	157	445	77	2516	0.21

Airports with Highest Percentage of Contaminated Runway Operations

		Total # of Operations	Dry	Wet Good	Wet Fair	Wet Poor	0.25" Clutter	0.50" Clutter	# of Daily Departures	Equivalent Days of Clutter
1	BDL	2275	75.78%	20.92%	1.41%	0.22%	1.58%	0.09%	13	2.92
2	GEG	2825	71.19%	25.66%	1.81%	0.42%	0.85%	0.07%	16	1.63
3	CLE	3834	77.05%	19.43%	2.35%	0.29%	0.81%	0.08%	21	1.62
4	MHT	2300	79.43%	18.09%	1.52%	0.26%	0.65%	0.04%	13	1.23
5	PVD	4129	80.26%	17.15%	1.67%	0.27%	0.61%	0.05%	23	1.17
6	CMH	2389	80.28%	18.50%	0.59%	0.00%	0.59%	0.04%	14	1.07
7	OKC	3989	90.77%	8.20%	0.35%	0.08%	0.23%	0.38%	22	1.09
8	RDU	2685	87.11%	11.88%	0.37%	0.11%	0.41%	0.11%	16	0.88
9	DTW	3311	82.27%	16.19%	0.91%	0.12%	0.42%	0.09%	19	0.89
10	ISP	2495	83.81%	14.75%	0.92%	0.08%	0.40%	0.04%	15	0.73
	Systemwide		91.57%	8.00%	0.27%	0.04%	0.10%	0.02%	2516	0.21

Notes:

Total # of Operations = Total number of takeoffs during period
# of Daily Departures = Average scheduled daily departures
Equivalent Days of Clutter = Total number of contaminated runway operations / # of Daily Departures

Lost Revenue due to Engine-out Accountability

Total Estimated Weight Loss		428,456 lb
Equivalent Passengers		2316
1999 SWA Annual Report		
Passengers Carried	57,500,213	
Operating Revenue	$ 4,735,587,000	
Revenue / Passenger		$ 82.36
Lost Revenue	**$ 190,739**	

Report from the Airplane Performance Harmonization Working Group

(XVIII.)Issue: Accounting for the effect of snow, slush, standing water, and ice-covered runways on takeoff performance (with all-engine accountability)

Rule Section: FAR 121.189, FAR 135.379/JAR-OPS 1.485, 1.490

1. Introduction

This report recognizes the safety benefit of requiring accountability for contaminated runways. The position of this report is that the costs of harmonizing to engine-out accountability far outweigh the safety benefits, evidenced by the historical safety record. All-engine accountability provides an acceptable balance between the theoretical enhancement to safety that engine-out accountability on contaminated runways provides, and the significant cost to industry that it would impose.

The Terms of Reference for the Working Group, set out in WP1-1 make it clear that the focus of the HWG was to resolve the competitive and economic issues that were raised by different performance rules between Europe and the United States and read, in part:

> "HARMONIZATION TERMS OF REFERENCE
>
> TITLE OF INITIATIVE: Airplane Performance Operating Limitations
>
> STATEMENT OF ISSUE: <u>European and U.S. air carriers operating identical airplanes at a common airport are, currently, subject to different performance operating rules. Although all conditions and equipment are alike, application of the applicable FAR/JAR may result in different load capabilities. Therefore, the Airplane Performance Harmonization Working Group (PERF HWG) objectives are:</u>
>
> 1. Review FAA and JAA airplane operational performance requirements (FAR 121/FAR 135/JAR-OPS and develop a list of differences between the two sets of requirements. (Use should be made of preliminary work on the task carried out by industry). During this review, if differences are identified in the associated certification requirements, such differences should be reported to the Aviation Rulemaking Advisory Committee (ARAC) and the HMT by the FAA and JAA contacts;
>
> 2. When the first step is complete, explore the feasibility of harmonization of each identified difference in the following order of priority: Performance Class A, Class B, and Class C;
>
> 3. Within one year of the publication of the ARAC task in the Federal Register, develop recommendations for common (harmonized) operational performance requirements for those items identified under item 2 above as being feasible for harmonization. If the HWG determines FAA rulemaking is required, that determination must be forwarded to the FAA for consideration of rulemaking priority, resource allocation, and additional tasking to ARAC, as appropriate.
>   …"

1 – What is the underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

For the past 40 years there has been no uniform FAR requirement for considering the effect of runway contaminants on takeoff runway length requirements. Despite the lack of a uniform requirement, many operators have adopted methods for adjusting their maximum allowable takeoff weight for contaminated runway conditions: Some have applied adjustments for the effect of degraded acceleration using all-engine performance, while others have applied adjustments for both degraded acceleration and degraded deceleration with engine-out stop accountability. It is unknown if there are some airlines that do not made any adjustments for the effects of contaminated runway conditions.

Compared to a dry (or wet) runway, snow, slush, or standing water can reduce an airplane's acceleration capability due to the drag caused by the tires running through the contaminant (displacing it), and by the impingement of the contaminant spray on the airplane. The reduction in acceleration capability results in a requirement for a longer distance to accelerate to lift-off for a given takeoff weight. Alternatively, the takeoff weight can be reduced to adjust the acceleration capability to the runway length available.

The presence of a runway contaminant will also reduce the capability of the airplane to stop (compared to the dry runway case) in the event of a rejected takeoff. The traditional consideration has been to account for the accelerate-stop on a dry runway surface due to an engine failure at the critical point, and the stop to be initiated by the V1 speed. More recently the engine-out accelerate-stop criteria for new certifications was extended to wet runways as well.

The need to consider stopping capability (i.e. a rejected takeoff (RTO) due to an engine failure) on a contaminated runway was introduced into the harmonization discussion by the JAR-OPS 1 requirement to account for engine failure for all takeoffs using a single V1 (Go/No Go) speed. <u>There is no service history demonstrating engine failure/RTO accountability will benefit public safety for takeoffs from contaminated runways.</u>

Both all-engine and engine-out considerations necessitate a reduction in limit weight for a takeoff from a contaminated runway. For the worst of the contaminated runway conditions (1/2 inch slush or standing water), the weight offload for the engine-out consideration can be considerably greater than for the all-engine consideration. In example 1 section 5 item 7 - Performance Penalties the all-engine penalty would result in a 300 lb. offload, while engine-out penalty would result in a 12,480 lb. offload, 41.6 times as great as the all-engine case. In rare instances, the engine-out consideration can reduce the payload capability so severely that flights may be canceled. The present record of incidents and accidents does not justify the extreme penalties that would be imposed by a mandatory requirement for engine out accountability.

Imposing a requirement for engine out accountability may very well have a *negative* effect on safety. In a perfect world, a clear and clean runway requirement would be mandated at all airports with snow and slush. However if we accept the fact that this is a desirable, but unattainable standard, it must be considered that some passengers, at least on cancelled short-haul flights, will seek other modes of transportation.

Air travel by both major and commuter airlines is significantly safer than traveling by road and a switch to road would result in additional road accidents, injuries and deaths. Estimates of the comparative safety in the U.S. state that "automobile travel remains far more dangerous, at least 30 times so in terms of death rates per mile traveled, than air travel by all scheduled (large and commuter) airlines"[2]

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

Current FAR text:

Currently, the Part 121/135 operating rules do not specifically require that runway surface contamination in the form of ice, snow, slush, or standing water be taken into account in determining allowable takeoff weights. FAA Advisory Circular 91-6A provides information, guidelines, and recommendations for conducting turbojet operations on runways covered by water, snow, or slush. It does not prescribe a methodology to follow in developing contaminated runway advisory data. It does include sample data presentations for all-engine and engine-inoperative cases.

B. Part 121

FAR 121.189 Airplanes: Turbine engine powered: Takeoff limitations.

(f)In determining maximum weights, minimum distances, and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition **(dry or wet)**. Wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator. [Emphasis added].

C. Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

(f)In determining maximum weights, minimum distances, and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition **(dry or wet).** Wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator. [Emphasis added].

Current JAR text:

[2] *Discussion on Ending the Free Airplane Rides of Infants: A Myopic Method of Saving Lives*, by R.B. McKenzie and D.R. Lee, Cato Institute Briefing Paper No. 11 Aug 30 1990.

(XIX.)JAR-OPS 1.485General

(a) An operator shall ensure that, for determining compliance with the requirements of this subpart, the approved performance data in the Aeroplane Flight Manual is supplemented as necessary with other data acceptable to the Authority if the approved performance data in the Aeroplane Flight Manual is insufficient in respect of items such as:

(1) Accounting for reasonably expected adverse operating conditions such as take-off and landing on contaminated runways; and

(2) Consideration of engine failure in all flight phases.

(b)An operator shall ensure that, for the **wet and contaminated** runway case, performance data determined in accordance with JAR 25X1591 or equivalent acceptable to the Authority is used. (See IEM OPS 1.485(b).).

JAR-OPS 1.490Take-off

(f) An operator must meet the following requirements when determining the maximum permitted take-off mass:

.
.
.

(7)On a wet or contaminated runway, the takeoff mass must not exceed that permitted for a take-off on a dry runway under the same conditions.

(g) When showing compliance with sub-paragraph (b) above, an operator must take account of the following:

.
.
.

(5) The runway surface condition and the type of runway surface (see IEM OPS 1.490(c)(3));

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

There is no current FAR standard for operations from contaminated runways. Many operators have voluntarily adopted manufacturers advisory data. FAA Advisory Circular 91-6A provides guidance material however, there is no mandatory requirement to account for contaminated runways (see Part 3, below).

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

Currently, FAR 121/135 operating rules do not specifically require that runway surface contamination in the form of ice, snow, slush, or standing water be taken into account in determining allowable takeoff weights. FAA Advisory Circular 91-6A provides information, guidelines, and recommendations for conducting turbojet operations on runways covered by water, snow, or slush, <u>but it does not provide a uniform methodology</u> to follow in developing contaminated runway data. It does include sample data presentations for both all-engine and engine-inoperative cases.

In contrast to the FAA requirements, JAR-OPS 1 requires runway surface contamination and engine failure to be taken into account in determining allowable takeoff weights for all Performance Class A airplanes used in commercial air transportation. (Performance Class A airplanes include multi-engine turboprop airplanes with a maximum approved passenger seating configuration of more than 9 seats or a maximum takeoff mass exceeding 5700 kilograms, and all multi-engine turbojet powered airplanes.) In addition, JAR-OPS 1 requires operators to ensure that the contaminated runway data being used has been developed in accordance with criteria provided in AMJ25X1591, or equivalent.

A number of North American operators have made it clear that movement to the JAA standard would impose significant financial hardship on their operations, without a compensating enhancement to safety. Examples which follow (see part 5, below) will illustrate the potentially huge reductions in payload that could be imposed on the U. S. commercial aviation industry. In some cases operations may have to be cancelled with all the attendant inconvenience to passengers, lost revenue, and cost that would entail; all for no demonstrated enhancement to the safety of current operations.

At no time during the Working Group's deliberations was there any suggestion that the safety record for either trading partner was superior to the other's. Discussions on safety therefore tended to focus on each individual rule's potential to enhance safety, against the cost to implement that rule. The differences between the proposed engine-out and all-engine rules amounts to a *theoretical* enhancement to safety that has not been borne out by an examination of the available safety data (see part 5, below).

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

The FAR does not contain a standard for takeoff performance limitations from contaminated runways, so there is no applicable means of compliance. Guidance published by the FAA in AC 91-6A for operations on contaminated surfaces differs from the compliance criteria used by the JAA in that it does not provide a specific methodology for determining an airplane's takeoff performance on contaminated surfaces, nor does it mandate engine out accountability.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The Performance Harmonization Working Group agreed that specific FAR Standards need to be created to account for the performance effects of a takeoff on a contaminated runway. The Working Group however did not reach consensus on the all-engine/engine-out issue for takeoffs from contaminated runways. Therefore, the working group is submitting two different reports regarding rulemaking proposals for this issue. This report proposes adopting contaminated runway takeoff limitations into the FAR that would include all-engine accountability. The other report proposes harmonizing on the JAR standard, which includes accountability for engine failure.

The performance effects of contaminated runways are severe, and the economic impact can be significant. Takeoff weight is most severely restricted by an engine-out accountability consideration, which can lead to a large reduction in passengers and cargo. In some cases, operations would no longer be economically viable. Some members of the working group considered the resulting economic penalty to be too large in relation to the potential safety benefit to recommend harmonization to the JAA requirements.

The working group investigated the potential for reducing the engine-out accountability economic penalty, including data analysis, presentation, and performance calculation methods, differentiation of contaminant types, depths, and frequency of occurrence, and runway clearing and condition reporting practices. Two subgroups were formed to examine each of these issues and report to the working group. The subgroups' conclusions regarding each of these issues are provided separately, but the end result was that there was little likelihood of significantly reducing the economic burden associated with accounting for the effects of contaminated runways on takeoff performance when engine failure accountability is included. The complete report from each of the sub-groups is attached[3].

The following considerations support the recommendations contained in this report:

9. Service History

Statistics presented in the Takeoff Safety Training Aid, developed jointly by the aviation industry and the FAA in 1992, and supplemented by Boeing in 2000 (Boeing *Aero* Magazine, July 2000) show that 9% of the rejected takeoff overrun accidents/incidents for which runway conditions were reported occurred on contaminated runways. Runway conditions were not reported for 29 percent of the rejected takeoff accidents in the database. [This data base includes all western built jet aircraft with a maximum gross weight greater than 60,000 lbs and does not include commuter airline operations.] There are no accurate records of how many takeoffs are made from contaminated runways. The Working Group Report 4 suggests that since 9% of RTO accidents occurred on contaminated runways, the exposure is greater (on contaminated runways), since it is probably accurate to assume that less than 9% of operations are from contaminated runways. However, when these events (eight overrun accidents) are reviewed in greater detail, it is shown that in seven of the events, the RTO was initiated after V1. Engine failure was a factor in only one of these seven events. There was no stop initiation speed reported in the eighth event. Engine failure was a factor in only one event and that event was one of the seven where the reject speed was reported to be greater than V1. There has been only one engine failure RTO overrun incident/accident reported during takeoff from a contaminated runway (out of a total of 365,951,330 takeoffs through 1999). Thus, there is not even one event in this data base for the entire 40 years of service history of commercial jet operation in the Western World where there has been an RTO overrun accident where the RTO was known to have been initiated before or at V1 (whether due to engine failure or other reasons) and the runway conditions were reported as snow, ice or slush. Imposing engine-out performance standards would not have prevented any of the known accidents/incidents for takeoffs from contaminated runways.

10.Probability

The low probability of an engine failure occurring during the time period that could possibly prevent the airplane from either taking off or stopping on the runway, justify consideration of using all-engine accountability. The exposure time period can be zero for a light weight takeoff from a long runway or up to 10 seconds for a takeoff weight limited by runway length.

11.Exposure to Contaminants

Of the different types of surface contaminants, slush and standing water cause the largest performance penalties. Although slush conditions are infrequent, when slush is present, it may be impractical to "wait until tomorrow". Waiting causes flight delays that are spread throughout the system that cause significant economic penalties to the operator, and distress to the traveling

[3] See Contaminated Runway Subgroup 1 Report (WP 13-22), and Contaminated Runway Subgroup 2 Report(WP 10-4)

public. For example, flights cancelled or delayed in Chicago owing to slush can cause delays or cancellations of flights out of Washington.

12.Negative Effect on Domestic Operations

While harmonization with JAR-OPS standards would "level the playing field' for International FAR/JAR competitors, uniform application would adversely impact many US domestic or North American services where there are no FAR/JAR competitive issues. A uniform all-engine standard would "level the playing field" between FAR operators, since the FAR does not currently specify a uniform method for accounting for contaminated runway conditions.

13.Operating Environment

The operating environment of US and Canadian operators is seen as being significantly different than that of European operators, as far as contaminated runway operations are concerned. Implementation of engine-out slush accountability has not caused a significant financial hardship for European operators. The authors of this report believe that:

- There is less infrastructure in North America to support treating runways (sanding) or cleaning to a "black" condition.
- There are more "remote" services needed in the northern US, Canada and Alaska than in Europe.
- There are fewer train or road alternatives in North America than in Europe.
- In North America there are longer distances to travel by road than in Europe if that is the only alternative.

14.Performance Data Availability

Data available today for operators to use to show compliance with the proposed harmonized requirements accounting for an engine failure is based on standards and assumptions that varied over the years and varied between manufacturers. If engine-out accountability were mandated for FAA operators, the magnitude of the variation in existing data would demand that data be re-done to a new standard to minimize economic impact. This is a substantial task and the cost would be borne by the traveler.

15.Performance Penalties

In situations where the airplane is normally operated near its dry runway field length limit weight, the required takeoff weight reduction for runway contaminant, especially slush, can be significant. An example of the approximate takeoff weight reduction required is provided in the table below.

Takeoff Weight Reduction with Slush Penalties - %

Model	All-Engines ¼ Inch	Engine-Out ¼ Inch	All-Engines ½ Inch	Engine-Out ½ Inch
737-200	5%	16%	10%	23%
767-300	0	13%	3%	17%
747-400	0	10%	0	13%

Such penalties can impose severe economic hardship on the operator since a full passenger payload may only represent 10 % of the takeoff weight for a design range mission.

In general, the highest economic penalties associated with engine-out accountability would accrue to operations that are runway length limited on a dry runway. For example a wide variety of operations would be affected by the requirement to move from all-engines data on ½ inch of slush, to engine-out accountability.

Example 1 – Domestic Flight

On a 727-200 flight[4] from Washington National to Cincinnati (454 nautical miles), where there is no contamination, the aircraft could easily operate with a full passenger load of 145 passengers and 1,500 lbs. of freight. On the same flight with ½ inch of slush on the runway at takeoff, the aircraft could operate with 145 passengers and 1,200 lbs. freight using all-engines accountability, but only 97 passengers using engine-out accountability.

Example 2 – International Flight

Accountability would also impact longer-haul flights. For example, on a B767-300 flight[5] from JFK to Tel Aviv (4626 Nautical Miles), where there is no contamination, the aircraft could operate with a full passenger load of 233 and 14,000 lbs. of freight. On the same flight with ½ inch of slush on the runway at takeoff, the aircraft could operate with no loss of payload using all-engines accountability, but only 150 passengers and no freight using engine-out accountability.

Example 3 – Domestic Transcon Flight

On a domestic B757-200 flight[6] from Washington National to LAX, where there is no contamination, the aircraft could operate with a full passenger load of 180 and 5,300 lbs freight. On the same flight with ½ inch of slush on the runway at takeoff, the aircraft could operate with 158 passengers using all-engines accountability, but only 64 passengers using engine-out accountability.

16.Commuter Operations

The effect of snow, slush and standing water on smaller jet (i.e commuter) airplanes, is disproportionately higher than on larger airplanes because of smaller tires and more significant impingement of the contaminant on the airframe. The contaminant performance adjustments due to drag can be so high, with engine failure

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[4] B727-200, Runway 01 (6,869 Ft.), zero wind, JT8D-9 engines, 25 degrees flap, 32 degrees F, 60 minutes reserve fuel, typical passenger configuration 20F/125Y.

[5] B767-300, Runway 13R (14,572 Ft.), zero wind, PW4060 engines, 5 degrees flap, 32 degrees F, International reserve fuel, typical passenger configuration 30F/203Y.

[6] B757-200, Runway 01 (6,869 Ft.), zero wind, PW2037 engines, 15 degrees flap, 32 degrees F, 60 minutes reserve fuel, typical passenger configuration 22F/158Y.

accountability, that the aircraft can no longer be operated economically. Smaller airplanes represent a very large fleet of airplanes in the U.S. and Canada, and do not compete directly with European operators. The adoption of engine-out requirements in the interest of harmonization will impose severe operating limitations on commuter airline operators that do not operate in a competitive situation where harmonization has competitive implications for our trading partners. Thus, requiring engine failure accountability for slush and standing water will seriously curtail commuter airline service without affecting the competitiveness between U. S. and European operators.

17. Airport Issues

Central to the debate concerning contaminated runway accountability is the ability of the airport operator to remove contaminants and provide a timely and accurate report of runway surface condition to dispatch and flight crews in need of that information. It was clear to everyone on the Working Group that these issues were key to reaching consensus on the accountability issue. The survey results, available as WP 10-4, and set out in Appendix B, made it clear that:

1. The ability of airport operators to remove snow in a timely manner seems to vary according to the equipment and personnel available. To reduce down-time, operators claimed that they need more of both;
2. Most airports strive for a “black runway” condition. However, lead time required for snow removal varied considerably, and could radically affect the levels of contaminant on the runway before removal operations could begin;
3. Reports on contamination depth and condition take place on an irregular basis and depths of contaminant may vary considerably depending on the location that the measurement was taken. Generally measurements taken by the airport operator are not precise enough to make their use by flight crews reliable from an aircraft performance perspective;
4. Contaminant depth may vary along the length of one runway;
5. Flight load planning usually takes place 1-1 ½ hours prior to push-back. The conditions which exist during the take-off roll, which may occur 5-30 minutes later than push-back (possibly due to a long taxi, line-ups, or de-icing) may not resemble the reported contamination at the time that critical planning takes place;
6. Flight Crews as a rule, must make a final assessment of the contamination at the runway threshold immediately prior to take-off, frequently without the benefit of accurate and up-to-date contaminant reporting from the airport operator;
7. The “trigger” to begin snow removal at airports varies considerably, and could be any where from a one-half an inch, to two inches of contaminant.
8. Most airports have runway friction testing equipment, but the airport operators do not fully understand the impact of contaminants on airplane take-off performance. Most of the emphasis from an airports perspective seems to be on landing issues.

In short, there is very little consistency in contaminant removal and runway condition standards across airports in Canada and the U.S. The tools for airport operators and air operators to measure and communicate the information to flight crews in a timely way are not available today.

The authors of this report recommend that an appropriate harmonization working group should be tasked with exploring the feasibility of developing more stringent regulatory standards for runway clearing and condition reporting. Although § 139.313 currently requires "prompt removal or control, as completely as practical, of snow, ice, and slush on each movement area," this standard does not provide the consistent level of safety that is desired, and puts extreme pressure on operators and pilots to operate in conditions where the actual airplane performance capability cannot be known. The working group recommends that the FAA update the requirements of § 139.313 to require that runways, including runway ends, stopways, high-speed turnoffs, and taxiways (consistent with AC150/5200-30A, and where the highest number of departures occur), be maintained in a ~~"no worse than wet" condition~~ to a specific, high, predetermined standard, developed in consultation with the airport community. That will also provide the incentive to airport operators to aggressively seek the tools, methods, and cooperation they need with all parties to enhance the safety of winter operations.

The proposed harmonization working group should also explore the feasibility of improving the manner in which runway conditions are determined and reported to pilots and dispatchers. Runway condition reports must be timely, accurate, and provided in a manner consistent with how it will be used by operators to schedule takeoff performance.

At present, Airport Operators do not consider AC 150/5200-30A any more than simply guidance. Until the FAA regulates the condition of runways as a function of safety, we will continue to operate in winter with widely varying runway conditions. This is not the consistent level of safety we all desire, and puts extreme pressure on operators and pilots to operate when exact runway performance cannot be guaranteed. The FAA should update the requirements of FAR 139.313 to require that runways, including runway ends, high-speed turnoffs, and taxiways (consistent with the AC, and where the highest number of departures occur), be maintained in a "no worse than wet" condition. Only then will Airport Operators aggressively seek the tools, methods, and cooperation they need with all parties to enhance the safety of winter operations.[7]

These concerns extend to prospective all-engines standards or engine-out regulatory standards. Another ARAC Working Group should be tasked with an examination of runway surface reporting and clearing criteria.

For each proposed change from the existing standard, answer the following questions:

6 - What should the revised standard be? [Insert the proposed text of the revised standard here]

[7] Appendix B of this report

(XX.) Part 121

(XXI.)

(XXII.)FAR 121.189 Transport category airplanes: Turbine engine powered; takeoff limitations.

(c) No person operating a turbine engine powered transport category airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that at which compliance with the following may be shown:

(1) The accelerate-stop distance must not exceed the length of the runway plus the length of any stopway.

(2) The takeoff distance must not exceed the length of the runway plus the length of any clearway except that the length of any clearway included must not be greater than one-half the length of the runway.

(3) The takeoff run must not be greater than the length of the runway.

(6) For runways that are dry or wet, the same value of V1 must be used to show compliance with paragraphs (c)(1) through (c)(3) of this section. For contaminated runways, V Stop must be used to show compliance with paragraph (c)(1) of this section.

[Note: The definitions of accelerate-stop distance, takeoff distance and takeoff run currently in FAR Part 25 will need to be modified to recognize that contaminated runway performance is based only on all-engines operating.]

(5) On a wet or contaminated runway, the takeoff weight must not exceed that permitted on a dry runway under the same conditions.

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(h) In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for:

(1) The pressure altitude at the airport;

(2) The ambient temperature at the airport;

(3) The runway surface condition (dry, wet or contaminated), and the type of runway surface (paved or unpaved).

(4) The runway slope in the direction of takeoff; and

(5) Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component; and

(6) The loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff.

(XXIII.)Part 135

(XXIV.)FAR 135.379 Large transport category airplanes: Turbine engine powered; Takeoff

(XXV.) limitations.

(c) No person operating a turbine engine powered large transport category airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that at which compliance with the following may be shown:

(1) The accelerate-stop distance must not exceed the length of the runway plus the length of any stopway.

(2) The takeoff distance must not exceed the length of the runway plus the length of any clearway except that the length of any clearway included must not be greater than one-half the length of the runway.

(3) The takeoff run must not be greater than the length of the runway.

(4) For dry and wet runways, the same value of V1 must be used to show compliance with paragraphs (c)(1) through (c)(3) of this section.

[Note: The definitions of accelerate-stop distance, takeoff distance and takeoff run currently in FAR Part 25 will need to be modified to recognize that contaminated runway performance is based only on all-engines operating.]

(5) On a wet or contaminated runway, the takeoff weight must not exceed that permitted on a dry runway under the same conditions.

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(d) In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for-

(1) The pressure altitude at the airport;

(2) The ambient temperature at the airport;

(3) The runway surface condition (dry, wet or contaminated) and the type of runway surface (paved or unpaved).

(4) The runway slope in the direction of takeoff; and

(5) Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component; and

(6) The loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff.

Summary of Proposed Changes:

[Note: The proposed changes discussed below include more than just the changes associated directly with the issue of contaminated runway takeoff performance. This was done for completeness and clarity due to the many changes being proposed for the rule sections that address takeoff limitations. Therefore, some of the proposed changes described below will either be repeated or more fully explained in other working group reports.]

(1) Amend §§ 121.189(c) and 135.379(c) to remove the words "listed in the Airplane Flight Manual." Currently, §§ 121.189(c) and 135.379(c) require that the Airplane Flight Manual (AFM) must be used to determine the maximum takeoff weight for which compliance is shown with the field length requirements of those sections. As noted in Working Group Report 1, for most of the new performance requirements being proposed by the Performance Harmonization Working Group (e.g., runway alignment distance, retroactive application of wet runway requirements, contaminated runway requirements), airplane performance data not currently furnished in AFM's will be needed in order to show compliance. While the working group recommends that the subject of AFM data requirements be further investigated by a working group tasked with such Part 25 issues, the working group recommends proceeding with this rulemaking without waiting for that task to be completed. Until that task is completed, operators should be able to show compliance to the proposed contaminated runway takeoff limitations using supplementary data acceptable to the regulatory authority.

Removing the words "listed in the Airplane Flight Manual" from §§ 121.189(c) and 135.379(c) would leave the proposed §§ 121.173(a) and 135.363(a) (as proposed in a Working Group Report 1), respectively, as the applicable requirements regarding the source of data for showing compliance with §§ 121.189(c) and 135.379(c). The proposed §§ 121.173(a) and 135.363(a) state that the performance data in the Airplane Flight Manual, supplemented as necessary with other data acceptable to the Administrator, applies in determining compliance with §§ 121.175 through 121.197 and §§ 135.365 through 135.387, respectively.

(2)Amend §§ 121.189(c) and 135.379(c) to add the words "for the runway to be used" to clarify that compliance with this requirement must be shown for the runway to be used. This is a clarifying change only.

(3) Amend §§ 121.189 (c)(1), (c)(2) and (c)(3) and §§ 135.379(c)(1), (c)(2), and (c)(3) to use the terms "accelerate-stop distance available," "takeoff distance available" and "takeoff run available," which would be defined in the proposed new §§ 121.173(i) and § 135.363(i). (See Working Group Report 1 for proposed accompanying amendments to §§ 121.173 and 135.363). This change would harmonize the wording of the JAR and the FAR standards, but would not change the requirement.

(4) Add, as a new §§ 121.189(c)(4) and new §§ 135.379(c)(4), a requirement for dry and wet runways that the same value of V_1 must be used to show compliance with the accelerate-stop, takeoff run, and takeoff distance limitations, and a V_{Stop} be defined for contaminated runways. This requirement would ensure that, on a dry or wet runway, from a single defined go/no-go point (i.e. the V_1 speed), the takeoff can either be safely completed, or the airplane can be brought to a stop within the remaining distance available for stopping the airplane. With the addition of the proposed takeoff limitations for operations from contaminated runways, the concept of V_{Stop} is introduced, which will ensure that the airplane can be brought to a stop within the remaining distance available.

(5) Add new §§ 121.189(c)(5) and 135.379(c)(5) to require that the takeoff weight on a wet or contaminated runway not exceed the takeoff weight permitted on a dry runway under the same conditions. It would be inappropriate, from safety standpoint, to allow a higher maximum takeoff weight from a wet or contaminated runway than from a dry runway under otherwise identical conditions.

(6) Reformat §§ 121.189(e) and 135.379(e) to list, in separate sub-paragraphs, each of the items for which correction must be made. Currently, §§ 121.189(e) and 135.379(e) require correction made to the maximum weights, minimum distances, and flight paths under paragraphs §§ 121.189(a) through (d) and §§ 135.379(a) through (d), respectively, for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition (dry or wet). Sections 121.189(e) and 135.379(e) also state that wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator.

Under this proposal, §§ 121.189(e) and 135.379(e) would be revised to state, “In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for–.” “The pressure altitude at the airport” would be listed in new §§ 121.189(e)(1) and 135.379(e)(1). The use of pressure altitude instead of elevation is consistent with changes being proposed throughout this subpart. It reflects the practice that the determination of takeoff weights are normally done on the basis of pressure altitude, and that the Airplane Flight Manual performance information is provided as a function of pressure altitude. New §§ 121.189(e)(2) and 135.379(e)(2) would list “the runway surface condition (dry, wet, or contaminated) and the type of runway surface (paved or unpaved).” This change would add contaminated runway surfaces to the list of runway surface conditions for which correction must be made. It would also add a requirement to correct for the type of runway surface (paved or unpaved). This new requirement is intended to ensure that the applicable takeoff limitations for approved operations on unpaved runway surfaces, such as grass or gravel runways, are based on performance data appropriate to the type of runway surface.

New §§ 121.189(e)(3) and 135.379(e)(3) would list “The runway slope in the direction of takeoff.” This item is currently listed in §§ 121.189(e) and 135.379(e) as “the effective runway gradient.” The wording change would harmonize the wording with that of the JAR standard and is not intended to change the requirement in any way.

New §§ 121.189(e)(4) and 135.379(e)(4) would list “Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component.” This would replace the criterion, ”wind component at the time of takeoff,” currently listed in §§ 121.189(e) and 135.379(e). The proposed wording is intended to clarify that the total wind (i.e., wind speed and direction), not just the headwind or tailwind component, must be considered. For corrections to takeoff distances, only the headwind or tailwind component is relevant. However, for flight path considerations, the total wind must be taken into account. (Note: This issue is addressed in Working Group Report 6.)

The proposed wording also includes the factors applied to the headwind and tailwind components (“not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component”) that are currently required by the airworthiness type certification requirements of part 25. The working group proposes that these wind factors should be applied to all operations conducted under §§ 121.189 and 135.379, regardless of the certification basis of the airplane.

New §§ 121.189(e)(5) and 135.379(e)(5) would list the new requirement proposed in Working Group Report 3, "The loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff." (See that working group report for the reasons for this change.)

7 - How does this proposed standard address the underlying safety issue? (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

The proposed standard addresses the safety issues by requiring FAA operators to take into account the effect of decreased acceleration capability for takeoffs from contaminated runways for all turbine powered airplanes operated under Parts 121 or 135.

Takeoff performance based on all-engines operating throughout the takeoff, does lead to an exposure period of up to ten seconds, such that the airplane would be unable to safely complete the takeoff or complete the stop <u>if</u> power were lost from the critical engine during this period of time. In this situation, the maximum speed from which the airplane could be brought to a stop on the runway would be lower than the minimum speed from which the airplane could takeoff and reach a height of 15 feet over the end of the runway. However, there is no evidence in 40 years of in-service experience that an engine failure during this exposure period has ever occurred.

In addition there is the question of what information to provide to the pilot if takeoff limitations were based on all-engines operating throughout the takeoff. Currently, pilots are provided with a V_1 speed, which is defined as "the maximum speed in the takeoff at which the pilot must take the first action (e.g., apply brakes, reduce thrust, deploy speed brakes) to stop the airplane within the accelerate-stop distance [and] the minimum speed in the takeoff, following a failure of the critical engine at V_{EF}, at which the pilot can continue the takeoff and achieve the required height above the takeoff surface within the takeoff distance." The V_1 concept would not be valid for takeoffs in which an engine failure is not taken into account. However, a maximum "stop" speed would be provided, which would be the maximum speed from which the airplane could be stopped on the runway. This would be a departure from what pilots are accustomed to for typical day-in day-out operations, but appropriate training should overcome this issue.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

The proposed standard would increase the level of safety relative to the current FAR. It would codify a requirement to account for contaminated runways.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

Industry practice varies across the FAA regulated operators. Some operators do not account for contaminated runways. Some operators already take contaminated runways into account with all-engine weight adjustments. Others use engine failure accountability when determining maximum takeoff weights. For those operators who currently do not account for contaminated runways, the proposed standard would increase their level of safety. For those operators already using all-engine adjustments, the proposed standard would maintain the existing level of safety. Operators currently using engine-out adjustments could choose to continue their company practice.

Consideration must be given to other changes in regulations that will be forthcoming from this ARAC Working Group. Agreement to harmonization on the use of runway alignment distance has been achieved by this ARAC Working Group. Nine of the 14 ATA carriers surveyed do not at present account for alignment distance.[8] Acceptance of this regulation at considerable cost to the operators would enhance safety for all runway conditions; dry, wet or contaminated.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

The alternatives would be to harmonize to the FAR standard (i.e. no accountability for contaminated runways), or harmonize on the JAR-OPS requirement that contaminated runways be accounted for on an engine-out basis. The first option was not selected because there was a consensus that a standard needed to be developed to address an identified safety risk. The second option was not recommended because there is no evidence in the historical service experience database that engine failure accountability would have prevented even one RTO overrun, and because the cost to implement it is substantial.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Operators of transport category airplanes could be affected by the proposed change because they may have to carry out additional analyses for takeoffs from contaminated runways and may realize a loss in revenue if the payload must be reduced or certain operations curtailed in order to comply with the contaminated runway requirements. Manufacturers of transport category airplanes could be affected because they develop the data to perform the contaminated runway analysis. However, some data has already been generated by some manufactures.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

None.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

Advisory material, in the form of an AC, should be developed to provide guidelines and

[8] See Appendix A for FAA/JAA HARMONIZATION REVENUE LOSSES (WP 13-2)

an acceptable means of compliance with the proposed standard for taking into account the effects of contaminated runways on takeoff performance. The advisory material should allow maximum use of existing data, thus minimizing the need for developing new data. The means of compliance should include the following criteria to determine data acceptability:

11. The performance methodology for determining the effects of the contaminant on airplane acceleration parameters should be based on industry standard methods.

12. For airplanes currently in use or airplanes of existing approved designs that will be manufactured in the future, the contaminated runway performance information need not be furnished in the Airplane Flight Manual. This information would be considered supplementary data under the proposed revision to §§ 121.171(a) and 135.363(a). [Another ARAC working group should be tasked with determining whether the airworthiness type certification requirements should be amended to require contaminated runway performance information to be included in the AFM. That working group should also be tasked with identifying and addressing any airworthiness type certification criteria associated with determining contaminated runway performance.]

13. Takeoff distance should be based on a 35-foot screen height.

14. Performance credit may be taken for the use of available reverse thrust.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

ICAO Annex 6 (Operation of Aircraft), Chapter 5, 5.2.6 states, “In applying the Standards of this chapter, account shall be taken of all factors that significantly affect the performance of the aeroplane (such as: mass, operating procedures, the pressure-altitude appropriate to the elevation of the aerodrome, temperature, wind, runway gradient and condition of runway, i.e. presence of slush, water and/or ice, for landplanes, water surface condition for seaplanes). Such factors shall be taken into account directly as operational parameters or indirectly by means of allowances or margins, which may be provided in the scheduling of performance data or in the comprehensive and detailed code of performance in accordance with which the aeroplane is being operated.”

The current FAR does not comply with this ICAO standard in that the FAR does not require the runway condition, in terms of the presence of slush, water and/or ice to be taken into account for the scheduling of takeoff performance data. The proposed standard would bring the FAR closer to compliance with the ICAO standard by requiring the effect of slush, standing water, snow or ice on the runway to be taken into account.

ICAO Annex 6, Paragraph 5.2.8 states that “The aeroplane shall be able, in the event of a critical power-unit failing at any point in the take-off, either to discontinue the take-off and stop within the accelerate-stop distance available, or to continue the take-off and clear all obstacles along the flight path by an adequate margin until the aeroplane is in position to comply with 5.2.9.” The current FAR does not comply with this ICAO standard for contaminated runway operations. The proposed standard would not bring the FAR into compliance.

15 - Does the proposed standard affect other HWGs? [Indicate whether the proposed standar should be reviewed by other harmonization working groups and why]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

The proposed standard would carry with it additional costs for operators and manufacturers.

A standard for developing all-engines data needs to be created. Manufacturers would have to create new data to meet that standard, since the existing all-engines data is not to a consistent standard. Boeing would have to generate data to address the V_{Stop} issues arising from this proposal. Airbus does not produce any all-engines data, and would be obliged to generate new all-engines data. The non-recurring cost to the industry to generate data to a uniform standard, to support all-engines accountability has been estimated to be roughly $24M. By comparison, the cost to develop engine-out data to a uniform data standard would be comparable.

For those operators who currently use all-engine accountability for contaminated runways, there would be no additional cost. However, by comparison, the cost of using engine-out data would be significant. For example, three major U.S. operators indicated that there would be a total annual cost of $10M. A number of other U.S. operators were unable to provide a cost estimate associated with engine-out accountability, but indicated that they would be affected by the proposal. One Canadian operator reported cost estimates of between $22M and $48M, when the prospective rule was examined across three years of operation (These figures considered the payload reduction during the period 1996-1998).[9]

None of the cost estimates included any associated costs, such as downstream scheduling problems; additional crew and aircraft positioning costs, hotels and meals for stranded passengers, and lost goodwill, etc.

To be clear, the cost of creating data is comparable for all-engines and engine-out, however the operational costs of contaminated runway accountability are significantly higher for engine-out.

17 - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

Non-consensus on this issue is indicated by the submittal of two separate proposals – this report and Working Group Report 4.

18 - Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.

No.

19 – Does the HWG want to review the draft NPRM prior to publication in the Federal

[9] See Appendix A for FAA/JAA HARMONIZATION REVENUE LOSSES (WP 13-2)

Register?

Yes.

The Working Group did not reach consensus on this issue. The following Working Group members support the all-engine standard for FAA operators for takeoff from contaminated runways as proposed in this report.

Name	Organization
Christian Camihort	Dassault Aviation
Jon Quail, Gordon Gregg, Gene Nimetz	Air Canada
a) Fred Jones	Air Transport Association of Canada

(XXVI.)

(XXVII.)

(XXVIII.)

(XXIX.)

(XXX.)

(XXXI.)

(XXXII.)

(XXXIII.)

(XXXIV.)

(XXXV.)

(XXXVI.)

(XXXVII.)APPENDIX A

(XXXVIII.) FAA/JAA HARMONIZATION REVENUE LOSSESWP 13-2

(Annual Cost in Millions of Dollars)

	NBR OF A/C	DRAFT AC 120-XXX	>15° BANK	LINE UP	WET RWY	LINE UP & WET	ENG OUT SLUSH	TOTAL
TW	183	4.7	*	3.0	2.1	7.1	***4.7	16.5
AA	650	A	11.1	8.0	6.0	16.3	A	27.4
UA	570	ICAO	N/A	A	5.0	5.0	A	5.0
DL	570	A	N/A	2.0	A	2.0	A	2.0
NW	415	A	*	1.9	4.0	6.0	0.34	6.34
CO	364	A	**	5.0	4.0	9.0	3.5	12.5
US	420	ICAO	?	8.0	4.0	12.0	P	12.0
WN	300	.6	N/A	A	A	A	A	.6
HP	115	A	N/A	A	A	A	A	
UPS	250	ICAO	N/A	A	N	N	P	
ATA	48	?	?	N	N	N	A	
FX	301	ICAO	N/A	2.0	3.5	5.5	A	5.5
AC	158	ICAO	*	A	N	N	P	
CP	80	ICAO	?	N	N	N	39.1	39.1
TOTAL		5.3	11.1	29.9	28.6	62.9	47.64	126.94

* Could not service St. Maarten. Cost unknown

** RNO new service. Cost unknown.

*** Slush cost updated with new Boeing/Douglas engine out data

A = already accountingN = no figures available, not accounting
P = done on part of the fleetN/A = not applicable - no situation exists

Economic Impact of Performance Harmonization Issues

Titles across the top of the chart indicate items considered at Jan 12, 1999 ATA meetings as having an economic impact. An additional item is mentioned in the text of this report.

DRAFT AC 120-xxxUse of draft AC 120-xxx for obstacle clearance analysis. Two airlines (TW and WN) use the FAR splay currently. Others use the draft AC unless noted as “ICAO”.

>15° BANKUse of JAR OPS 1.495 turn procedure limitations. JARs state “bank angles of greater than 15 degrees are not allowed”. Further, special approval (a temporary non-renewable approval) “to increase bank angles for not more than 20 degrees between 200 feet and 400 feet, or not more than 30 degrees above 400 feet” can be granted.

LINE UPInclusion of line-up distance in runway analysis. Assume a 90 degree turn and line up at minimum distance.

WET RWYAccounting for wet runways with engine out. Required by JAR OPS, not required by FARs. If wet runway data is published in the AFM, most US airlines will account for it

ENG OUT SLUSHUse of engine-out data for contaminated runways. Not required in the FARs. However most US airlines make some accounting for this condition

TOTALthe combined estimate of Draft AC, Bank Angle, Line-up and Slush.

TW - Trans World Airlines

TWA estimates the economic impact their operation would be:.

1Use of draft AC 120-xxx for obstacles4.7 million
2.St. Maarten could not be serviced
3.Accountability for line-up distance3 million
4.Wet runway accountability (20% wet days assumed)2.1 million
Wet runway done for 717
5. Contaminated runway with engine out4.7 million
Currently uses data about half way between all engine and engine out
6.Line-up and wet combined7.1 million
7.Combined draft AC, Line-up, wet and contaminated16.5 million
TWA operates 183 aircraft

Economic impact issues were discussed at recent ATA meeting. The following are figures given by other airlines.

AA - American Airlines
Turn procedure limitations11.1 million
Accountability for line up distance previously reported8 million
Wet runway accountability (20% wet days assumed)6 million
Wet runway and line-up distance combined16.3 million
AA already uses the draft AC obstacle splay
Combined total27.4 million
AA operates about 650 aircraft

UA - United Airlines
Doing line-up distance
Only Reno affected by bank angle greater than 15°. B727 payload reduced to 91% load factor. However,average load factor is 75%, so economic impact is zero.
Estimate of wet runway accountability4 to 6 million
Using engine out data for contaminated runways.
Doing ICAO splay
UA operates 570 aircraft.

DL - Delta Airlines
Accountability for line-up distance2 million
Already do wet runway with engine out
Use draft AC120-xxx for obstacle
Delta operates 570 aircraft.

NW - Northwest Airlines
Uses draft AC120-xxx for obstacle clearance
Could not service St Maarten
Accountability for line-up distance1.9 million
Wet runway accountability (15% wet days assumed)4 million
Contaminated runways with engine out$340,000
(currently not done on DC9 and DC10 fleet)
Wet and line-up combined estimated at 6 million
which would be understated.6 million
Combined total6.34 million
NW operates about 375 aircraft

CO - Continental Airlines
Line-up distance 5 million
Doing wet runway accountability on 737NG and 777.
Estimate for doing other fleets4 million
This could be decreased by analysis of using a different flap setting.
Contaminated runways do engine out for DC-10
cost of doing other fleets3.5 million
Combined total12.5 million
CO operates 350 aircraft.

US - US Airways
US is making a change in the takeoff system. They have gone to the SABER system just a month ago. Under
their old system they accounted for wet runway on Airbus only. Estimate an increase of 4 Million to do for all aircraft.
Line-up distance was not accounted for and estimate an increase of 8 Million to do that.
Already using ICAO splay.
Using engine out contaminated runway data on Airbus only. However they are moving toward that with the remaining aircraft.
Combined total12 million
US Airways operates about 420 aircraft.

WN - Southwest Airlines
Already accounting for line-up distance
Already accounting for wet runway
Uses FAA obstacle splay converting draft AC estimate$600,000
SWA operates about 300 aircraft

HP - America West
Using the Draft AC
Not using bank angles greater than 15º
Accounting for line-up distance
Accounting for west runway
Doing engine out contaminated runways
HP operates 115 aircraft

UPS -United Parcel Service
Already doing line-up distance
Do engine out on contaminated runway for some aircraft. No estimate on those not done.
(Manufacturer's data incomplete and inconsistent.)
Do not do wet runway with engine out. UPS is having programs developed to provide wet runway data
One time cost$250,000
Already use the ICAO splay
Major concern is dispatching to icy runways and accounting for icy landing data
Estimated yearly cost10.8 Million
UPS operates 250 aircraft.

ATA - American Trans Air
Do contaminated runway with engine out.
Still assessing wet runway and line-up. Midway Airport will have severe penalties, however.
ATA operates 48 aircraft. This will increase to 60 by end of '99.

FX - Federal Express
Line-up distance2 million.
Using ICAO splay
No wet runway corrections, estimate3.5 million
Combined total5.5 million
Fed Ex operates 301 aircraft.

AC - Air Canada
Uses a fixed line-up distance of 200 ft regardless of aircraft type.
Could not service St Maarten with JAR OPS turn requirements
No wet runway corrections, no estimate of cost.
Uses engine out data for contaminated runway except on DC9 and B767 aircraft,
Uses the ICAO splay.
Changes in line-up distance accountability and use of draft AC120-xxx would be an economic benefit to AC.
AC operates 158 aircraft.

CP - Canadian Airlines
Do not do line-up distance, no estimate
Do not do wet runway. Think the penalties will be on 737-200 and 767-200 fleets.
Doing engine out on contaminated runways for Airbus and 747 fleets.
Estimate the cost of doing engine out contaminated runway accountability will fall on 737-200 and 767-300 fleets. Looked at the cost if it had been done in 1996, 1997 and 1998 and would have been a 22 million to 48 million cost for those years. CA already is doing all engine contemned runway accountability. The figures are not the delta differences. CA did mention the penalty on the 737-200 (?) raises from 8,000 pounds of weight loss to 20,000 pounds between all engine and engine out.
Using the ICAO splay.
CP operates 80 aircraft.

United Airlines noted that the above economic impact studies only considered the loss of revenue due to reduction in weight. It did not consider other costs such as putting up passengers in a hotel, food, etc.

Report from the Airplane Performance Harmonization Working Group

(XXXIX.)Issue: Obstacle Accountability Area

Rule Section: FAR 121.189/JAR-OPS 1.495

1 - What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

It is fundamental to operational safety that the pilot should be able to safely complete a takeoff and clear all obstacles beyond the runway end, even if power is lost from the most critical engine just before the airplane reaches a defined go/no-go point. This principle has formed the basis of the takeoff performance standards required for the type certification and operation of turbine engine powered transport category airplanes since Special Civil Air Regulation No. SR-422, effective August 27, 1957. As of March 20, 1997, the application of this principle was extended by the "commuter rule" to also cover scheduled passenger-carrying operations conducted in airplanes that have a passenger seat configuration of 10 to 30 passengers and turbojet airplanes regardless of seating configuration.

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

Current FAR text:

A. Part 121

FAR 121.189 Airplanes: Turbine engine powered: Takeoff limitations.

(d) No person operating a turbine-engine-powered airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual-

(2) In the case of an airplane certificated after September 30, 1958 (SR422A, 422B), that allows a net takeoff flight path that clears all obstacles either by a height of at least 35 feet vertically, or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing the boundaries.

(g)In determining maximum weights, minimum distances, and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, ……

B. Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

(d) No person operating a turbine-engine-powered large transport category airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual-

(2) For an airplane certificated after September 30, 1958 (SR422A, 422B), that allows a net takeoff flight path that clears all obstacles either by a height of at least 35 feet vertically, or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing the boundaries.

(e)In determining maximum weights, minimum distances, and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, ……

Current JAR text:

JAR-OPS 1.495Take-off Obstacle Clearance

(a) An operator shall ensure that the net take-off flight path clears all obstacles by a vertical distance of at least 35 ft or by a horizontal distance of at least 90 m plus 0.125 x D, where D is the horizontal distance the aeroplane has travelled from the end of the take-off distance available or the end of the take-off distance if a turn is scheduled before the end of the take-off distance available. For aeroplanes with a wingspan of less than 60 m a horizontal obstacle clearance of half the aeroplane wingspan plus 60 m, plus 0.125 x D may be used.:

.
.
.

(d)When showing compliance with sub-paragraph (a) above for those cases where the intended flight path does not require track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:

(1) 300 m if the pilot is able to maintain the required navigational accuracy through the obstacle accountability area. (see AMC OPS 1.495(d)(1)&(e)(1); or);

(2) 600 m for flights under all other conditions.

(e)When showing compliance with sub-paragraph (a) above for those cases where the intended flight path does require track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:

(3) 600 m if the pilot is able to maintain the required navigational accuracy through the obstacle accountability area. (see AMC OPS 1.495(d)(1)&(e)(1); or);

(4) 900 m for flights under all other conditions.

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

The FAA and JAA operating rules have identical vertical obstacle clearance requirements. Both require that the net takeoff flight path, as defined by the airworthiness rules, clear obstacles vertically by the same margin. This results in obstacle clearance that expands vertically with increasing distance from the runway end. The differences arise from the way in which the horizontal obstacle clearance requirements are specified in the respective rules.

Currently, the Part 121/135 operating rules do not define a specific obstacle accountability area, but rather the horizontal margin by which obstacles must be cleared and the conditions under which such clearance must be demonstrated. Any obstacles that come within the horizontal margin must be cleared vertically.

In contrast to the FAA requirements, JAR-OPS 1 defines a horizontal obstacle accountability area which must be used in determining allowable takeoff weights for all Performance Class A airplanes used in commercial air transportation. (Performance Class A airplanes include multi-engine turbopropeller airplanes with a maximum approved passenger seating configuration of more than 9 seats or a maximum takeoff mass exceeding 5700 kilograms, and all multi-engine turbojet powered airplanes.) The obstacle accountability area, which is based on ICAO recommendations, expands laterally with increasing distance from the end of the runway in order to account for the drift of the airplane in a crosswind. Pressure altitude, temperature, speed and bank angle variations, as well as flight technical and navigation guidance tolerances are also assumed to be accounted for. The maximum width of the obstacle accountability area is dependent upon whether track changes greater than 15° are required and upon available navigational accuracy. All obstacles within this area must be cleared vertically.

It could be argued (based on interpretation) that the FAR is more stringent, and provides a higher level of safety than the JAR, because the FAR requires accountability of the wind, including crosswind, and does not specify a maximum width. The JAR defines a horizontal obstacle accountability area that could, in theory, be insufficient to cover the most adverse crosswind. However, as explained in item 4 below, the JAR is commonly viewed as the more stringent and safer regulation because of ambiguities in the FAR.

4 - What, if any, are the differences in the current means of compliance?
[Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

The FAR, while theoretically more stringent, has traditionally been interpreted by some as not requiring crosswind accountability. The phrase “wind component” in FAR 121.189(e) and 135.379(e) is interpreted by some to mean wind along the runway and, as such, does not have a crosswind component. The result of this interpretation has been the use of an obstacle accountability “corridor” which is 200 feet on either side of the extended runway centerline within the airport boundaries and 300 feet on either side of the extended runway centerline outside the airport boundaries. It is interesting to note that the use of the “corridor” is not limited to airplane operators in their obstacle clearance analyses; the FAA itself has used the “corridor” as the basis for regulating obstacle construction around airports.

The difference between the fixed-width “corridor” and the expanding horizontal obstacle accountability area in the JAR can be a source of significant differences in allowable takeoff weight between North American and European operators of the same aircraft on the same runways.

Beginning in 1992, an effort was made to standardize procedures used by U. S. operators to analyze obstacles at certain mountainous airports. This effort evolved into a draft Advisory Circular (120-XXX) that addressed obstacle clearance methods for all airports. The authors of AC 120-XXX made it clear that the effect of crosswind was to be considered in the obstacle clearance analysis and included an expanding horizontal obstacle accountability area. This area expands to a maximum width of 4000 feet, considerably greater than the presently interpreted “600 feet corridor”, but still roughly half the size of the ICAO standard used in the JAR. The obstacle accountability area in the draft AC expands at a rate of 0.0625 x D, where D is the distance along the intended flight path from the end of the runway. The minimum half-width within the airport boundaries is 200 feet and outside the airport boundaries is 300 feet. However, the lateral expansion rate becomes 0.125 x D (same as the JAR) whenever track changes of more than 15° are required.. Many U.S. operators currently use the area defined by the draft AC, despite the fact that it was never approved and published and some U.S. operators use the ICAO obstacle accountability area.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The U.S. operators on the Performance Harmonization Working Group proposed at the outset that AC 120-XXX become the basis for harmonization; however, the working group did not reach a consensus on this issue. The economic impact associated with obstacle clearance can be significant. Takeoff weight can be severely restricted if obstacles must be cleared vertically, which can lead to a loss of revenue if the cargo or passenger payload must be reduced. In some cases, operations would no longer be economically viable. Some members of the working group considered the resulting economic penalty to be too large in relation to the potential safety benefit to recommend harmonization to the JAA requirements.

On the other hand, the JAA would not reduce the size of their obstacle accountability area without a significant amount of data justifying the perceived reduction in safety. Additionally, many JAA member states comply strictly with ICAO standards, meaning that ICAO would have to designate the AC as an acceptable means of compliance with their obstacle clearance requirements. This was seen as a time consuming task. Also, the JAR-OPS 1 rules are harmonized with ICAO provisions for obstacle restriction and removal (Annex 14 specified takeoff climb surface) and the provisions for publication of ICAO Type A obstacle charts/data (Annex 4).

The working group ultimately decided that the obstacle accountability area itself was not the core issue for harmonization as long as both FAA and JAA rules provide the maximum credit for airplane and ground-based course guidance and a well-balanced economic impact on operators. The airplane types being used on competing routes between Europe and North America have advanced course guidance technology and the same ground-based course guidance is available to all operators. The issue of a specific horizontal obstacle accountability area in the current “expanding cone” shape may, or would become, unnecessary when analyzing these airplane types since they are able to accurately fly specific ground tracks in various wind conditions. (However, in their provisions for RNAV departure and approach procedures, both FAA and ICAO continue to use obstacle accountability areas in the form of obstacle identification surfaces.) Operators of airplanes without adequate course guidance capabilities would continue to use the current obstacle accountability area. The working group undertook to revise AC 120-XXX to include specific ground-based navigational tolerances and allow credit for the latest airborne course guidance technologies.

It should be noted, however, that while the Working Group did reach consensus on this approach, the JAA members felt that it would be very difficult to revise JAR-OPS 1.495 to allow greater credit for navigational accuracy. This is because the JAA regulations are closely tied to ICAO standards.

For each proposed change from the existing standard, answer the following questions:

6 - What should the revised standard be? [Insert the proposed text of the harmonized standard here]

(XL.) Part 121

(g)In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for–

(5) Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component; and

(XLI.) Part 135

(e) In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for–

(5) Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component; and

(XLII.) Summary of Changes

1. <u>Reformat §§ 121.189(e) and 135.379(e) to list, in separate sub-paragraphs, each of the items for which correction must be made.</u> Currently, §§ 121.189(e) and 135.379(e) require correction made to the maximum weights, minimum distances, and flight paths under paragraphs §§ 121.189(a) through (d) and §§ 135.379(a) through (d), respectively, for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff

2. New §§ 121.189(e)(5) and 135.379(e)(5) would list "Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component." This would replace the criterion, "wind component at the time of takeoff," currently listed in §§ 121.189(e) and 135.379(e). The proposed wording is intended to clarify that the total wind (i.e., wind speed and direction), not just the headwind or tailwind component, must be considered. For corrections to takeoff distances, only the headwind or tailwind component is relevant. However, for flight path considerations, the total wind must be taken into account.

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

The proposed standard addresses the underlying safety issues by eliminating any confusion with regard to wind accountability. The proposed standard, along with AC 120-XXX, would define obstacle accountability methods that address crosswind effects on the airplane's flight path.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

While it does not change the original intent of the existing standard, the proposed standard is intended to remove any ambiguity in the current standard with respect to wind accountability. Therefore, it could be argued that the proposed standard increases the level of safety.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

Relative to current industry practice, the proposed standard increases the level of safety. Those operators interpreting the current standard as not requiring crosswind and using the fixed-width obstacle accountability "corridor" would be required to account for the effect of crosswind on the airplane's flight path.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

The alternatives would be to harmonize on the current FAR standard, retain the current non-harmonized standards, harmonize to a general obstacle clearance requirement like ICAO or harmonize to the JAR standard.

The first option was not chosen because of the JAA's reluctance to accept a rule that is perceived to be less safe and is not perfectly clear in its intent. The FAA also recognized that current interpretations of the FAR are not acceptable and that some change may be necessary to clarify its intent.

The second option was not seriously considered because the working group recognized the importance of this issue and the members overwhelmingly wanted to work towards consensus.

The third option was not chosen because it did not appear to solve the problem. Some members of the working group suggested that both the FAA and JAA adopt the basic language from ICAO Annex 6 which states that the aircraft must clear all obstacles only by an "adequate margin," and leave the definition of the margin to advisory material. In this way, the operating rules would be harmonized, even though acceptable compliance methods might be different. Other members saw this as only hiding the issue.

The fourth option was not chosen because of the economic impact associated with introducing the JAR (ICAO) obstacle accountability area at many U.S. airports. During the drafting of AC 120-XXX, it was determined using the FAA digital obstacle database that 48% more obstacles would be introduced if the ICAO obstacle accountability were introduced versus an increase of 15% for the obstacle accountability area prescribed by the AC. The lack of a national standard for obstacle construction, and apparent differences of interpretation of the FARs by various FAA divisions, has allowed obstacles to be constructed up to the edge of the fixed-width "corridor" at many airports. At the time the AC was being drafted, the economic impact to U.S. operators of introducing the ICAO obstacle accountability area was estimated to be $190 million per year.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Operators who interpret the current standard as allowing use of the fixed-width obstacle accountability "corridor" would be affected since that interpretation would no longer be permitted unless suitable course guidance could be demonstrated.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

N/A

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

AC 120-XXX should be published to ensure harmonization on the proper interpretation of FAR 121.189 by U.S. operators.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

N/A

15. – Does the proposed standard affect other HWG's? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

Those operators currently interpreting FAR 121.189 as requiring obstacle accountability only within the "corridor" would incur costs to comply with the expanding obstacle accountability area defined in AC 120-XXX. These costs have been estimated at approximately $5.3 million annually for the major ATA members.

No cost impact is expected for those operators already using the AC or ICAO obstacle accountability areas.

17. - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

AC 120-XXX to be provided.

18. – Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.]

No.

19. – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes.

A. Report from the Airplane Performance Harmonization Working Group

(XLIII.)Issue: Bank Angles for Takeoff

Rule Section: FAR 121.189, FAR 135.379/JAR-OPS 1.495

1 - What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

Currently Part 121 and Part 135 FAR's assume the airplane is not banked before reaching a height of 50 feet, and thereafter, the maximum bank is not more than 15 degrees. Obstacle clearance at certain airports can be improved by the use of bank angles greater than 15 degrees. At present, an operator can request the use of greater bank angles per the requirements in FAR 121.173(f) or 135.363(h). This process may entail providing substantiation of an ~~equivalent~~ acceptable level of stall margin protection at the greater bank angles to justify it. Authorization for the greater bank angle will be provided through the Operations Specification.

Currently, JAR-OPS 1 describes the conditions when bank angles greater than 15 degrees can be used. This includes having adequate allowances for the effect of bank angle on operating speeds.

The Performance Harmonization Working Group (PHWG) task is to identify differences in the FAR/JAR rules and recommend changes which will lead to harmonization of the two sets of rules.

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

Current FAR text:

(XLIV.)Part 121

FAR 121.189 Transport category airplanes: Turbine engine powered; takeoff limitations.

(f) For the purposes of this section, it is assumed that the airplane is not banked before reaching a height of 50 feet, as shown by the takeoff path or net takeoff flight path data (as appropriate) in the Airplane Flight Manual, and thereafter that the maximum bank is not more than 15 degrees.

(XLV.) Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

(f) For the purposes of this section, it is assumed that the airplane is not banked before reaching a height of 50 feet, as shown by the takeoff path or net takeoff flight path data (as appropriate) in the Airplane Flight Manual, and after that the maximum bank is not more than 15 degrees.

Current JAR text:

JAR-OPS 1.495 Take-off Obstacle Clearance

(c) When showing compliance with subparagraph(a) above:

(1) Track changes shall not be allowed up to the point at which the net take-off flight path has achieved a height equal to one half the wingspan but not less than 50 ft above the elevation of the end of the take-off run available. Thereafter, up to a height of 400 ft it is assumed that the aeroplane is banked by no more than 15 degrees. Above 400 ft height bank angles greater than 15 degrees, but not more than 25 degrees may be scheduled.

(3) An operator must use special procedures subject to the approval of the Authority, to apply increased bank angles of not more than 20 degrees between 200 ft and 400 ft, or not more than 30 degrees above 400 ft (See Appendix 1 to JAR-OPS 1.495(c)(3)).

(4) Adequate allowance must be made for the effect of bank angle on operating speeds and flight path including the distance increments resulting from increased operating speeds. (See AMC OPS 1.495(c)(4)).

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

Both the FAA and JAA operating rules stipulate when to start the bank and what the basic bank angle shall be. The differences are that the JAA rule allows the use of bank angles greater than the basic value and it identifies added requirements for the use of the increased bank angles.

The current Part 121/135 rules state the airplane is not banked before reaching 50 feet and thereafter the maximum bank is not more than 15 degrees. The rules do not define acceptable means of using greater bank angles.

JAR-OPS 1 rules state the airplane track is not changed until the net take-off flight path achieves a height equal to one half the wingspan but not less than 50 ft. Thereafter, up to 400ft the airplane is banked by no more than 15 degrees. Above 400 ft bank angles greater than 15 degrees but not more than 25 degrees may be scheduled.

Furthermore, JAR-OPS 1 states the operator may use increased bank angles of not more than 20 degrees between 200 ft and 400ft, or not more than 30 degrees above 400 ft with the approval of the Authority.

The JAR requires that adequate allowance must be made for the effect of bank angle on operating speeds and the increase in distance resulting from increased speeds. The FAR has no corresponding requirement.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

Some US operators have used bank angles greater than 15 degrees at certain airports to improve obstacle clearance. This was done by obtaining a deviation from the 15 degrees bank requirement per FAR Part 121.173(f) or 135.363(h). This is usually accompanied by substantiation that the ~~equivalent~~ acceptable stall margin is maintained at the higher bank angle. The deviation authorization was shown as a special airport procedure in the operations specification.

When comparing the rules it seems the current FAR is more stringent because it requires authorization for any bank angle greater than 15 degrees. The JAR allows certain bank angles greater than 15 degrees above 400 ft. without first getting special authorization.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

A description of how to utilize bank angles greater than 15 degrees has previously been described in the draft AC 120-XXX . This AC was developed to explain acceptable methods for airport obstacle analysis to comply with the intent of FAR's 121.189 and 135.379. The U.S. operators on the PHWG felt the bank angle discussion in the AC was a good basis for ~~generating a re-wording of the present FAR~~harmonizing the FAR and JAR. ~~The result should be to get both rules to agree on the use of bank angles greater than 15 degrees. If this could be accomplished then the two rules could be harmonized on bank angle useage.~~

The basic premise for the ~~wording of the rules seemed to~~changes to the FAR and JAR would be to allow certain bank angles greater than 15 degrees without requiring special prior approval from the ~~administrator~~regulatory authority as long as appropriate methods are used to account for the effects of bank angle. It should be possible to use even greater bank angles with special approval from the regulatory authority.~~It became apparent early on in the PHWG meetings that wording changes would also be required to the JAR to get harmonization~~.

The proposed change to 121.189(f)/135.379(f), renumbered as 121.189(h)/135.379(h), would allow bank angles up to 15 degrees below 100 feet, up to 20 degrees between 100 feet and 400 feet, and up to 25 degrees above 400 feet if approved methods are used to account for the effects of increased bank angle. Draft AC 120-XXX, as updated by the Working Group, would provide an approved method as referenced in the proposed 121.189(h)/135.379(h). Larger bank angles could only be used if approved by the Administrator.

JAR-OPS 1.495(c)(1) would be revised to match the proposed FAR text.

The following is a brief summary of some of the relevant discussions that took place over the history of the PHWG meetings.

~~First meeting.~~ There was technical consensus that turns should not be initiated below 50 ft. or one-half the airplane's wingspan, whichever is higher. Then for turns below 400 feet, one operator indicated they have at least one turn procedure where a bank in excess of 15 degrees is initiated below 400 feet. The U.S. operators took an action item to survey ATA members for existing procedures that would be affected by the JAA limitations. In general, the U.S. operators welcomed the increased bank angle capability offered by JAR-OPS, but were concerned the altitude limits could impact existing procedures. The FAA indicated there is concern in the pilot community and within the FAA, Operations discipline, with operating at bank angles in excess of 15 degrees early in the takeoff maneuver (below 400 ft.).

~~Third meeting.~~ Results were reported from a survey of ATA members on questions about rule changes related to bank angle. Several airlines reported on revenue loss and possible loss of operations if not able to use 20 degrees bank at a height of 100 ft. at St. Maarten. On the issue of acceptable minimum altitude for the initiation of turns with 20 degrees of bank, the majority voted for 100 ft. or one-half the airplane's wingspan, whichever was greater.

~~Fourth meeting.~~ After lengthy discussions on the different bank angles and turning heights in the JAR and AC text it was proposed to change the JAR-OPS text to read: "……increased bank angles of not more than 20 degrees between <u>100 ft or half the wingspan whichever is greater</u> and 400 ft,…..etc." and draft a new FAR requirement or expand FAR 121.189(f).

~~Fifth meeting.~~ JAA indicated that the PERF SC has discussed the proposal for increased bank angles. They could accept 20 degrees banked turns as low as 100 ft, but would require the data to be "contained in the AFM".

~~Tenth meeting.~~ The draft harmonization document was reviewed. It was reported that FAR 121.189 new (h) has been adapted to provide the use of higher bank angles after reaching a specified height. It states that approved methods are to be used to account for the effects of bank angle. These approved methods will have to be put into advisory material. For higher bank angles than specified, a special approval by the Administrator is necessary. Furthermore approval by the Administrator is only applicable for bank angles of more than 20 degrees between 100 and 400 ft and more than 25 degrees above 400 ft whereas the JAR requires approval for even the lower bank angles. JAA PERFSC to look at possibility of harmonizing with FAR wording.

~~Eleventh meeting.~~ With regard to bank angles, the JAA stated the PERFSC agreed to harmonize with the proposed FAR with respect to increased bank angles and the associated limiting heights. ALPA expressed concern that the start-of-turn altitudes permitted by the proposed rule are too low.

~~Twelfth meeting.~~ ALPA recounted a discussion from the ~~last~~ <u>11th</u> PHWG meeting concerning a potential mismatch between airline FOMs and special procedures. An ALPA survey of several airlines indicated most advise flight crews not to begin turns below 400 ft. and to limit bank angles to 15 degrees. None of the respondents train crews to begin turns at 50 ft. Overall conclusion of the ALPA survey was there is indeed a mismatch between the operators' FOMs and their special procedures. One operator's response to ALPA's conclusions stated engine failures are special cases and may require special takeoff procedures at some airports(e.g. 121.445 airports) which ~~are~~ may not be found in FOM normal procedures. A specific description of the special procedure is provided on a special page for that airport and if necessary, due to differences from normal procedures, training may be provided for that specific runway. In other words, looking at the general procedures in a FOM will not show where special procedures or possibly special training may be required for a specific runway. These concerns were addressed by revising the draft AC 120-XXX to involve pilots in the planning process for the development of such procedures.

For each proposed change from the existing standard, answer the following questions:

6 - What should the harmonized standard be? [Insert the proposed text of the harmonized standard here]

Proposed FAR text:

A. Part 121

FAR 121.189 Transport category airplanes: Turbine engine powered; takeoff limitations.

(h) For the purposes of this section, the airplane shall not be banked before reaching a height equal to one half the wingspan, but not less than 50 feet, as shown by the takeoff path or net takeoff flight path (as appropriate) in the Airplane Flight Manual. Thereafter bank angles up to 15 degrees below 100 feet~~–~~, up to 20 degrees between 100 feet and 400 feet, and up to 25 degrees above 400 feet may be used if approved methods are used to account for the effects of bank angle. Larger bank angles may not be used unless approved by the Administrator.

B. Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

(h) For the purposes of this section, the airplane shall not be banked before reaching a height equal to one half the wingspan, but not less than 50 feet, as shown by the takeoff path or net takeoff flight path (as appropriate) in the Airplane Flight Manual. Thereafter bank angles up to 15 degrees below 100 feet~~–~~, up to 20 degrees between 100 feet and 400 feet, and up to 25 degrees above 400 feet may be used if approved methods are used to account for the effects of bank angle. _Larger bank angles may not be used unless approved by the Administrator

Proposed JAR text:

C. JAR-OPS 1.495 Take-off Obstacle Clearance

(c) When showing compliance with subparagraph_(a) above:

(1) Track changes shall not be allowed up to the point at which the net take-off flight path has achieved a height equal to one half the wingspan but not less than 50 ft above the elevation of the end of the take-off run available. Thereafter, up to a height of 400 ft it is assumed that the aeroplane is banked by no more than 15 degrees. Above 400 ft height bank angles greater than 15 degrees, but not more than 25 degrees may be scheduled.

(3) An operator must use special procedures subject to the approval of the Authority, to apply increased bank angles of not more than 20 degrees between 100 ft and 400 ft, or not more than 30 degrees above 400 ft (See Appendix 1 to JAR-OPS 1.495(c)(3)).

(4) Adequate allowance must be made for the effect of bank angle on operating speeds and flight path including the distance increments resulting from increased operating speeds. (See AMC OPS 1.495(c)(4)).

7 - How does this proposed standard address the underlying safety issue (identified under #1)? (Explain how the proposed standard ensures that the underlying safety issue is taken care of).

Obstacle clearance can be improved by using bank angles greater than 15 degrees. This requires having an ~~equivalent~~ acceptable level of stall margin protection at the greater bank angles and accountability of the effect of bank angle on operating speeds. The bank angle increase is limited to 20 degrees between 100 ft. and 400 ft., and up to 25 degrees above 400 ft.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

The proposed standard would maintain the level of safety but would provide a standardized method of accounting for banked turns above 15 degrees which would allow a greater change to an airplane flight path to better avoid significant obstacles. Also the proposed standard specifically identifies the combination of bank angles (greater than 15) and heights that can be used when approved methods are employed to account for the effects of bank angle. Previously the operator could request greater bank angles as a deviation per the requirements in FAR 121.173(f) or 135.363(h) but there were no bank angle/height limits specified or performance substantiation required.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

Relative to industry practice, the proposed standard would increase the level of safety for those operators now using bank angles greater than 15 degrees by identifying the combination of bank angles and heights that can be used. This is based on the use of approved methods to account for the effects of increased bank angle. For those operators using only 15 degrees bank turns today it will provide an improved option for avoiding significant obstacles in the future.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

An alternative would be to leave the FAR as it is today. This would require operators to continue to request deviations for the use of bank angles greater than 15 degrees and the current FAR standard would not be harmonized with the JAR. It was not acceptable to the JAA to remove the capability to use increased bank angles from their standard. Not harmonizing the two standards could result in an economic disadvantage for FAA operators if they are limited to using special procedures based on using 15 degrees or less of bank. The present FAA draft AC 120-XXX explains the usage of bank angles greater than 15 degrees so the best alternative seemed to be to harmonize the FAR and JAR standards.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Both operators and manufacturers would be affected by the proposed change. Operators would be able to use bank angles greater than 15 degrees in special takeoff procedures without first requesting a regulatory deviation. For some operators not previously using larger bank angles this could result in a flight path that avoids an obstacle laterally instead of clearing it vertically with the possible result of a payload increase. Manufacturers would be requested by operators to provide performance data ~~to be used to develop~~consistent with "approved methods" to account for the effects of increased bank angle.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

~~A section of FAA draft AC 120-XXX describes the use of bank angles greater than 15 degrees. This AC, even though it's presently a draft, has served as reference information to U. S. operators on the use of bank angles greater than 15 degrees. The AC is currently worded to address the existing FAR standard and the requirement to get an Operations Specification authorization to use bank angles greater than 15 degrees. The draft AC provides performance adjustments to account for increased bank angles. This material should be referenced in the rule preamble as an explanation of how bank angles greater than 15 degrees have been handled.~~N/A.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

There is currently no existing advisory material. The FAA draft AC 120-XXX, which has existed since 1992, has been updated as a result of the harmonization effort and is ~~for the most part, is~~ adequate advisory material. The AC, at present, addresses the existing FAR standard. This portion of the AC will be revised in the future after the FAR standard is revised. This revision will replace the requirement to get an Operations Specification authorization with the wording contained in the revised standard for the use of bank angles greater than 15 degrees at specific heights. The Working Group recommends that ~~The~~ the draft AC ~~should~~ be ~~implemented~~ approved and published as soon as possible, without waiting for the proposed rule changes.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

ICAO Annex 6 Attachment C provides examples to illustrate the performance requirements for various airplane categories as intended by the provisions of Chapter 5. Under 3. "Take-off obstacle clearance limitations," it states,.....In determining the allowable deviation of the net take-off flight path in order to avoid obstacles by at least the distance specified, it is assumed that the aeroplane is not banked before the clearance of the net take-off flight path above obstacles is at least 15.2m (50 ft.) and that the bank thereafter does not exceed 15 degrees. The ICAO standard is comparable to the current FAR standard. Neither one explicitly addresses bank angles greater than 15 degrees. (Do not know if ICAO has a provision for requesting deviations.)

15. – Does the proposed standard affect other HWG's? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

Manufacturers may have a small cost increase for doing an engineering analysis to develop the performance adjustments to account for the effects of bank angles greater than 15 degrees. Operators also may have a small cost increase for developing special takeoff procedures based on bank angles greater than 15 degrees and evaluating the performance adjustments to account for the effects of the greater bank angles. This should be offset significantly by the benefit of possible payload increase for a special procedure based on a bank angle greater than 15 when compared to a procedure using a bank angle of 15 degrees.

17 - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

Draft AC 120-XXX is being submitted as part of the ARAC Performance Harmonization process. It has not been harmonized with the JAR standards because the obstacle analysis splay and the missed approach analysis is not accepted by the JAA. The contents of the AC have been reviewed and revised by the Working Group and judged to provide adequate advisory material for the existing FAR standards. When the FAR standards are revised the AC will be revised where necessary. In the meantime it is recommended the draft AC be implemented as soon as possible.

18. – Does the HWG wish to answer any supplementary questions specific to this project? (If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.)

The Working Group is concerned that the revised standards could be used as a justification for allowing the construction of obstacles in close proximity to airports. The revised standards would make it easier for an operator to develop special obstacle avoidance procedures utilizing low altitude turns and increased bank angles. The FAA should not consider this capability when deciding whether or not to approve construction of obstacles near airports. Likewise, applicants should not be permitted to use this capability as an argument supporting such construction.

19. – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes.

(XLVI.)Issue: Additional Vertical Obstacle Clearance When Bank Angle Exceeds 15°

Rule Section: FAR 121.189, FAR 135.379 / JAR-OPS 1.495

1 - What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

It is fundamental to operational safety that the pilot should be able to safely complete a takeoff and clear all obstacles beyond the runway end, even if power is lost from the most critical engine just before the airplane reaches a defined go/no-go point. This principle has formed the basis of the takeoff performance standards required for the type certification and operation of turbine engine powered transport category airplanes since Special Civil Air Regulation No. SR-422, effective August 27, 1957. As of March 20, 1997, the application of this principle was extended by the “commuter rule” to also cover scheduled passenger-carrying operations conducted in airplanes that have a passenger seat configuration of 10 to 30 passengers and turbojet airplanes regardless of seating configuration.

The takeoff performance standards specify both horizontal and vertical obstacle clearance requirements. Meeting the vertical obstacle clearance requirements can, in some cases, result in significant payload penalties, especially when mountainous terrain is a factor. An operator faced with such payload penalties will often develop a special turning departure procedure that avoids over-flight of the limiting obstacles. In rare cases, the bank angle required to avoid over-flight of the limiting obstacles exceeds 15°. (The airplane must still meet the vertical obstacle clearance requirements for the obstacles under the turning flight path.)

The net takeoff flight path data in the Airplane Flight Manual is based on the lowest part of the airplane with zero (no) bank and accommodates bank angles up to 15°. When bank angles exceed 15°, the lowest part of the airplane may be lower than that used in the definition of the net takeoff flight path data. In order to maintain the 35 foot vertical obstacle clearance required by the takeoff performance standards in such cases, the net takeoff flight path must clear obstacles vertically by an additional amount.

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

Current FAR text:

FAR 121 and FAR 135 do not specifically address this issue.

Current JAR text:

JAR-OPS 1.495Take-off Obstacle Clearance

(c) When showing compliance with subparagraph (a) above:

(2) Any part of the net take-off flight path in which the aeroplane is banked by more than 15° must clear all obstacles within the horizontal distances specified in subparagraphs (a), (d) and (e) of this paragraph by a vertical distance of at least 50 ft, and

2a – If no FAR or JAR standard exists, what means have been used to ensure

this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

Historically, FAA operators have obtained special approval for all turn procedures that require bank angles in excess of 15°. Additional vertical clearance requirements have been addressed on an as-needed basis, although perhaps with more flexibility than would be permitted under the proposed rule. However, since the vast majority of such procedures are designed to avoid obstacles laterally, the result is that additional vertical clearance has rarely, if ever, been required.

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

The FAA takeoff performance standards do not specifically address the issue; however, FAA policy has been to grant special approvals for departure procedures requiring bank angles in excess of 15°. The special approval process has included an evaluation of the impact of increased bank angles on vertical obstacle clearance.

The JAA standards require an additional 15 foot vertical obstacle clearance requirement (total vertical clearance of 50 feet) for the portion of the net takeoff flight path where the bank angle exceeds 15°.

While the JAA standard requires a fixed amount of additional vertical obstacle clearance, which may be more than is actually needed in some cases, there is no significant difference in the level of safety provided by these different policies.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

The differences in compliance are due to the differences in standards and/or policy. The FAA does not require an additional vertical obstacle clearance margin if analysis shows that it is not necessary. The JAR, on the other hand, requires a fixed additional margin all the time.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The Performance Harmonization Working Group proposes to harmonize on a modified version of the JAR. Both standards would require an operator to address the additional vertical obstacle clearance issue by conducting an analysis to determine whether the increased bank angle results in the lowest part of the airplane being lower than that used for the establishment of the net takeoff flight path and, if so, using the lowest part of the banked airplane for showing vertical obstacle clearance.

For the FAA, this would codify and standardize what has historically been addressed through special approvals.

For the JAA, this would allow flexibility while maintaining an adequate safety margin.

For each proposed change from the existing standard, answer the following questions:

6 - What should the harmonized standard be? [Insert the proposed text of the harmonized standard here]

1. FAR text

(XLVII.)FAR 121.189 Airplanes: Turbine Engine Powered: Takeoff Limitations

Add the following:

(i) When a bank angle of more than 15 degrees is used to show compliance with paragraph (d)(2) of this section, the vertical obstacle clearance requirement for that portion of the net flight path in which the bank angle is greater than 15 degrees shall be at least 35 ft relative to a net takeoff flight path corresponding to the lowest part of the banked airplane.

(XLVIII.)FAR 135.379 Large Transport Category Airplanes: Turbine Engine Powered: Takeoff Limitations.

Add the following:

(i) When a bank angle of more than 15 degrees is used to show compliance with paragraph (d)(2) of this section, the vertical obstacle clearance requirement for that portion of the net flight path in which the bank angle is greater than 15 degrees shall be at least 35 ft relative to a net takeoff flight path corresponding to the lowest part of the banked airplane.

1. JAR text

JAR-OPS 1.495Take-off Obstacle Clearance

(c) When showing compliance with subparagraph (a) above:

(2) Any part of the net take-off flight path in which the aeroplane is banked by more than 15° must clear all obstacles within the horizontal distances specified in subparagraphs (a), (d) and (e) of this paragraph by a vertical distance of at least 35 feet relative to the lowest part of the banked aeroplane, and

Summary of Changes:

1) Add sections 121.195(i) and 135.379(i).

2) In JAR-OPS 1.495(c)(2), replace “50 feet” with “35 feet relative to the lowest part of the banked aeroplane.”

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

The proposal would require operators to ensure that the net takeoff flight path meets the 35 foot vertical obstacle clearance requirement at all times, even when the airplane is banked more than 15 degrees.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

The proposal maintains the existing level of safety. It simply codifies what has historically been addressed through special approvals.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

See item #8.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

Since the policies and practices used in both the FAA and JAA environments already address the issue, no other alternatives were explored.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Operators who currently hold special FAA approvals for increased bank angles may be affected in that they would be expected to show compliance specifically in accordance with retaining a 35 foot margin from the net flight path corresponding to the lowest part of the banked airplane.

Airplane manufacturers may be affected. The analysis to determine the lowest part of a banked airplane can be very complex. The airplane has a positive pitch angle, is banked, and is subject to aerodynamic loads that cause wing bending. The data required to conduct such an analysis is generally not available to airplane operators; therefore, it may be necessary for airplane manufacturers to provide acceptable data for their respective models, for those cases where a simple geometric analysis is not acceptable.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

N/A

13 - Is existing FAA advisory material adequate? If not, what advisory material should be

adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

As stated in item 11 above, the analysis to determine the lowest part of a banked airplane can be very complex. This is especially true for large airplanes with low wings and wing-mounted engines. On the other hand, airplanes with short wingspans, relatively stiff wings and/or high mounted wings may require nothing more than a simple geometric analysis.

Guidance material should be developed indicating the conditions under which a simple analysis is adequate and the items that should be considered when undertaking a more detailed analysis.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

The relevant ICAO standards for the "Operation of Aircraft" (Annex 6) require that obstacles be cleared horizontally and vertically by an adequate amount. This proposal is in compliance with that general requirement

15. – Does the proposed standard affect other HWG's? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

The major cost of complying will be to produce acceptable data by the airplane manufacturers. The cost to operators is expected to be negligible.

17. - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

N/A

18. – Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.]

No.

19. – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes.

(XLIX.)Report from the Airplane Performance Harmonization Working Group

(L.) Issue: Engine Failure Contingency Procedures

(LI.) Rule Section: FAR 121.189,135.379/JAR-OPS 1.495

1 – What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

The pilot should be able to safely complete a takeoff and clear all obstacles beyond the runway end, even if power is lost from the most critical engine after the airplane passes the defined V1 go/no-go point. The most common procedure, to maximize takeoff weight when significant obstacles are present along the normal departure route, is to turn to a special engine out departure route in the event of an engine failure. The point, at which separation from the normal departure route is to occur, is pre-determined by an analysis of the climb out. Obstacles along this modified track (normal/ engine-out) are used to determine the maximum allowable takeoff weight for that runway.

Although the current FAR 121/135 requires that obstacles are to be cleared at all points by the net takeoff flight path, Part 25 rules determining the AFM flight path are based on engine failure at V1 and the assumption that the all engine and engine out flight paths are over the same track. Because the all-engine and engine-out tracks may not be the same, an engine failure should be considered at any point on the intended departure flight path when computing the maximum takeoff weight.

2 – What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below]

<u>Current FAR text:</u>

(LII.) Part 121

FAR 121.189 Airplanes: Turbine engine powered: Takeoff itations.

(d)No person operating a turbine engine powered airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual.

(2)In the case of an airplane certificated after September 30, 1958 (SR422A, 422B), that allows a net takeoff flight path, that clears all obstacles either by a height of at least 35 feet vertically, or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing the boundaries.

(LIII.) Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered:

Takeoff limitations.

(d) No person operating a turbine engine powered airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual.

(2) In the case of an airplane certificated after September 30, 1958 (SR422A, 422B), that allows a net takeoff flight path, that clears all obstacles either by a height of at least 35 feet vertically, or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing the boundaries.

Current JAR text:

(LIV.) JAR-OPS 1.495 Take-off Obstacle Clearance

(a) An operator shall ensure that the net take-off flight path clears all obstacles by a vertical distance of at least 35 feet or by a horizontal distance of at least 90 m plus 0.125 x D, where D is the horizontal distance the aeroplane has traveled from the end of the take-off distance available or the end of the take-off distance if a turn is scheduled before the end of the take-off distance available. For aeroplanes with a wingspan of less than 60 m a horizontal obstacle clearance of half the aeroplane wingspan plus 60 m, plus 0.125 x D may be used. (See IEM OPS 1.495(a).)

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(f) An operator shall establish contingency procedures to satisfy the requirements of JAR-OPS 1.495 and to provide a safe route, avoiding obstacles, to enable the aeroplane to either comply with the en-route requirements of JAR-OPS 1.500, or land at either the aerodrome of departure or at a take-off alternate aerodrome (See IEM OPS-1.495(f)).

2A – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 – What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

The FAR implies that obstacle clearance should be provided at all points by the net takeoff flight path but only addresses an engine failure at the V1 go/no-go point. Also, the Airplane Flight Manual only addresses takeoff with engine failure at the V1 go/no-go point. Consequently, most FAA operators do not consider an engine failure beyond V1 when analyzing departures.

The JAR is more specific in requiring operators to provide contingency procedures to ensure a safe route, avoiding obstacles, to enable the compliance with departure or en-route rules. JAR-OPS 1.485 also requires the operator to ensure that performance data, acceptable to the Authority, is available for consideration of engine failure in all flight phases.

4 – What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

The FAR does not contain a specific standard for takeoff performance with an engine failure occurring beyond V1, therefore, there is no means of compliance. However, the FAA draft AC 120.XXX does provide a means of compliance that is basically the same as the JAR by specifying development of special engine-out departure procedures.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The proposed action is to harmonize to the JAR standard. The requirement, for operators to take into account obstacle clearance following an engine failure at any point on the intended takeoff flight path, would be added to Parts 121 and 135 of the FAR.

The proposal would add, as a new 121.189(g) and 135.379(g), a requirement to establish procedures to maintain the obstacle clearance specified by 121.189(d)(2) and 135.379(d)(2) following an engine failure occurring at any point on the intended takeoff flight path. Although this text is different than the JAR text, the intent and the results are the same.

For many airports with no particular high obstacle vulnerabilities (e.g. Dallas-Ft Worth, Minneapolis, Amsterdam), there may not be a need to perform a detailed analysis or develop special procedures. For others with limited vulnerability (e.g. Denver, Milan), the operator might have to provide a simple procedure to turn the airplane away from the terrain. In other cases (e.g. Reno, Innsbruck), a detailed analysis may be required to determine critical engine failure points and escape routes along the intended takeoff flight path.

For each proposed change from the existing standard, answer the following questions:

6 – What should the harmonized standard be? [Insert the proposed text of the harmonized standard here]

The proposed amended FAR Parts 121, and 135 standards are specified below. (Note: No changes are being proposed for the JAR.)

(LV.) FAR Part 121

FAR 121.189 Airplanes: Turbine engine powered: Takeoff limitations.

(d) No person operating a turbine engine powered airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual.

(2) In the case of an airplane certificated after September 30, 1958 (SR422A, 422B), that allows a net takeoff flight path, that clears all obstacles either by a height of at least 35 feet vertically, or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing the boundaries.

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(g) No person operating a turbine engine powered airplane may take off that airplane unless procedures have been established to maintain the obstacle clearance required by 121.189(d)(2) following an engine failure occurring at any point on the intended takeoff flight path.

(LVI.)FAR Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

(d) No person operating a turbine engine powered airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual.

(2) In the case of an airplane certificated after September 30, 1958 (SR422A, 422B), that allows a net takeoff flight path, that clears all obstacles either by a height of at least 35 feet vertically, or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing the boundaries.

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(g) No person operating a turbine engine powered airplane may take off that airplane unless procedures have been established to maintain the obstacle clearance required by 135.379(d)(2) following an engine failure occurring at any point on the intended takeoff flight path.

7 – How does this proposed standard address the underlying safety issue (identified under # 1)? **[Explain how the proposed standard ensures that the underlying safety issue is taken care of.]**

The proposed standard requires the operator to account for obstacle clearance, following an engine failure at any point on the takeoff flight path. The operator may need to reduce the takeoff weight at certain airports or schedule a turn when planning an engine failure beyond V1.

8 – Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

The proposed standard would increase the level of safety by mandating the consideration of an engine failure anywhere along the intended takeoff flight path.

9 – Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

The proposed standard would increase the level of safety, especially, at airports where high terrain is a problem. Although FAR operators do plan an engine failure at the V1 go/no-go point by use of the Airplane Flight Manual, most do not consider an engine failure beyond V1. For operators who currently apply the standards written in the FAA draft AC 120.XXX, the level of safety would remain the same.

10 – What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

The alternatives would be to harmonize on the current FAR standard or retain the non-harmonized standards. Harmonizing on the current FAR standard would involve removing the contingency procedure requirement from the JAR. This was unacceptable to the JAA, as it would result in a decrease in safety relative to the current JAR. Retaining the current non-harmonized standards was unacceptable because it would not address the economic issue of the non-level playing field. Also, it is recognized in the FAA draft AC 120.XXX that it is necessary to account for an engine failure at any point on the intended flight path, thus, showing consensus on this issue.

11 – Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Operators and manufacturers of transport category airplanes would be affected by the proposed change. Airplane manufacturers would be requested by operators to provide supplemental performance data not currently carried in the Airplane Flight Manual. Airplane operators would need to reanalyze airports with high terrain and man made obstacles to determine the critical engine failure point occurring on the flight path beyond V1. Some operators would need to either reduce the takeoff weight or provide a special turn procedure to comply with the proposed rule change.

12 – To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

None.

13 – Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

Current FAA advisory material is non-existent. An Advisory Circular should be provided that contains instructions on the development of “all engine” and “engine out” takeoff flight paths. These same instructions should also be incorporated into the appropriate JAA IEM to ensure harmonization. The instructions should include an “all engine” gross flight path to an engine failure point beyond V1, then continuing on an “engine out” net flight path to clean up and complete the final segment to the en-route altitude. Other variations should be considered such as initiating a turn at the engine failure point to deviate from the normal departure route to a special engine failure route where obstacles are safely avoided or cleared vertically. The option to return for a landing rather than continue on the flight path should also be considered in the instructions.

Where the normal departure route is not well defined with a departure procedure or standard instrument procedure and is controlled by ATC through the use of radar vectors, it is assumed that ATC is responsible from that point on for safely guiding the aircraft over the terrain to the en-route altitude or to return for a landing. But, up to the point of receiving a radar vector the operator is still responsible for development of the takeoff flight path.

Supplemental “all engine “ performance data such as provided in the aircraft manufacturers Community Noise Documents, Performance Engineers Manuals, and SCAP Programs may need to be updated and expanded to support the proposed standard. All engine performance should remain as supplemental data and not be published in the Airplane Flight Manual.

Because the FAR proposed standard requires obstacle analysis to be performed for distances far in excess of current practice, it will not be possible to fully comply with the rule until all regulatory agencies provide “takeoff runway surveys” and “special topographical charts”, equivalent to ICAO Type A and Type C obstruction charts.

14 – How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

The proposed FAR standard complies with the relevant ICAO standards in Annex 6.

15 – Does the proposed standard affect other HWG’s? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]

N/A

16 – What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

There would not be a cost impact for those operators who currently account for the proposed FAR standard. The operational cost to operators, who do not account for the proposed standard, would be small because most of the time a turn procedure can be scheduled to avoid obstacles. However, there is the possibility of a loss in payload at certain critical airports with high terrain. Other costs would include the purchase of performance data, obstruction charts, and manpower to program and analyze takeoff flight paths. The cost impact to airplane manufacturers would be for updating and expanding or developing new supplemental performance data to comply with the rule change. The cost impact to the regulatory agencies would be for providing takeoff runway surveys at all airports and the development of special topographical charts at airports where significantly high terrain or man made obstacles exist.

17 – If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

The FAA draft AC 120.XXX is to be submitted concurrently. It contains advisory material to support the proposed standard.

18 – Does the HWG wish to answer any supplementary questions specific to this project? **[If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.]**

The proposed standard requires an operator to ensure adequate obstacle clearance along the intended takeoff flight path up to the point where the airplane can comply with the en-route limitations. Where the actual flight path differs from the intended flight path due to ATC vectoring, it is assumed that ATC is responsible for ensuring adequate obstacle clearance. The Working Group is concerned that this may not be a valid assumption.

19 – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes. Review by the HWG is most important.

a) Report from the Airplane Performance Harmonization Working Group

(LVII.)Issue: En Route Limitations

Rule Sections: FAR 121.191, 121.193, 135.381, 135.383/JAR-OPS 1.500, 1.505

1 - What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

The en route performance operating limitations ensure that airplanes operated under parts 121 and 135 or JAR-OPS 1 take off at weights that will allow safe clearance of all en route terrain, even if an engine fails at the most critical point en route. For airplanes with three or more engines operating on routes with a point more than 90 minutes away from an alternate airport, there is a further limitation to ensure that the takeoff weight would allow safe clearance of all en route terrain if two engines fail at the most critical point en route.

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

<u>**Current FAR text**</u>:

A. Part 121

FAR 121.191 Transport category airplanes: Turbine engine powered: En route limitations: One engine inoperative.

(a) No person operating a turbine engine powered transport category airplane may take off that airplane at a weight, allowing for normal consumption of fuel and oil, that is greater than that which (under the approved, one engine inoperative, en route net flight path data in the Airplane Flight Manual for that airplane) will allow compliance with paragraph (a) (1) or (2) of this section, based on the ambient temperatures expected en route:

(1) There is a positive slope at an altitude of at least 1,000 feet above all terrain and obstructions within five statute miles on each side of the intended track, and, in addition, if that airplane was certificated after August 29, 1959 (SR 422B) there is a positive slope at 1,500 feet above the airport where the airplane is assumed to land after an engine fails.

(2) The net flight path allows the airplane to continue flight from the cruising altitude to an airport where a landing can be made under § 121.197, clearing all terrain and obstructions within five statute miles of the intended track by at least 2,000 feet vertically and with a positive slope at 1,000 feet above the airport where the airplane lands after an engine fails, or, if that airplane was certificated after September 30, 1958 (SR 422A, 422B), with a positive slope at 1,500 feet above the airport where the airplane lands after an engine fails.

(b) For the purposes of paragraph (a)(2) of this section, it is assumed that—

(1) The engine fails at the most critical point en route;

(2) The airplane passes over the critical obstruction, after engine failure

at a point that is no closer to the obstruction than the nearest approved radio navigation fix, unless the Administrator authorizes a different procedure based on adequate operational safeguards;

(3) An approved method is used to allow for adverse winds:

(4) Fuel jettisoning will be allowed if the certificate holder shows that the crew is properly instructed, that the training program is adequate, and that all other precautions are taken to insure a safe procedure;

(5) The alternate airport is specified in the dispatch or flight release and meets the prescribed weather minimums; and

(6) The consumption of fuel and oil after engine failure is the same as the consumption that is allowed for in the approved net flight path data in the Airplane Flight Manual.

Sec. 121.193 Transport category airplanes: Turbine engine powered: En route limitations: Two engines inoperative.

(a) Airplanes certificated after August 26, 1957, but before October 1, 1958 (SR 422). No person may operate a turbine engine powered transport category airplane along an intended route unless he complies with either of the following:

(1) There is no place along the intended track that is more than 90 minutes (with all engines operating at cruising power) from an airport that meets the requirements of § 121.197.

(2) Its weight, according to the two-engine-inoperative, en route, net flight path data in the Airplane Flight Manual, allows the airplane to fly from the point where the two engines are assumed to fail simultaneously to an airport that meets the requirements of § 121.197, with a net flight path (considering the ambient temperature anticipated along the track) having a positive slope at an altitude of at least 1,000 feet above all terrain and obstructions within five miles on each side of the intended track, or at an altitude of 5,000 feet, whichever is higher.

For the purposes of paragraph (a)(2) of this section, it is assumed that the two engines fail at the most critical point en route, that if fuel jettisoning is provided, the airplane's weight at the point where the engines fail includes enough fuel to continue to the airport and to arrive at an altitude of at least 1,000 feet directly over the airport, and that the fuel and oil consumption after engine failure is the same as the consumption allowed for in the net flight path data in the Airplane Flight Manual.

(b) Aircraft certificated after September 30, 1958, but before August 30, 1959 (SR 422A). No person may operate a turbine engine powered transport category airplane along an intended route unless he complies with either of the following:

(1) There is no place along the intended track that is more than 90 minutes (with all engines operating at cruising power) from an airport that meets the requirements of § 121.197.

(2) Its weight, according to the two-engine-inoperative, en route, net flight path data in the Airplane Flight Manual, allows the airplane to fly from the point where the two engines are assumed to fail simultaneously to an airport that meets the requirements of § 121.197, with a net flight path (considering the ambient temperatures anticipated along the track) having a positive slope at an altitude of at least 1,000 feet above all terrain and

obstructions within 5 miles on each side of the intended track, or at an altitude of 2,000 feet, whichever is higher.

For the purposes of paragraph (b)(2) of this section, it is assumed that the two engines fail at the most critical point en route, that the airplane's weight at the point where the engines fail includes enough fuel to continue to the airport, to arrive at an altitude of at least 1,500 feet directly over the airport, and thereafter to fly for 15 minutes at cruise power or thrust, or both, and that the consumption of fuel and oil after engine failure is the same as the consumption allowed for in the net flight path data in the Airplane Flight Manual.

(c) Aircraft certificated after August 29, 1959 (SR 422B). No person may operate a turbine engine powered transport category airplane along an intended route unless he complies with either of the following:

(1) There is no place along the intended track that is more than 90 minutes (with all engines operating at cruising power) from an airport that meets the requirements of § 121.197.

(2) Its weight, according to the two-engine inoperative, en route, net flight path data in the Airplane Flight Manual, allows the airplane to fly from the point where the two engines are assumed to fail simultaneously to an airport that meets the requirements of § 121.197, with the net flight path (considering the ambient temperatures anticipated along the track) clearing vertically by at least 2,000 feet all terrain and obstructions within five statute miles (4.34 nautical miles) on each side of the intended track. For the purposes of this subparagraph, it is assumed that—

(i) The two engines fail at the most critical point en route;

(ii) The net flight path has a positive slope at 1,500 feet above the airport where the landing is assumed to be made after the engines fail;

(iii) Fuel jettisoning will be approved if the certificate holder shows that the crew is properly instructed, that the training program is adequate, and that all other precautions are taken to ensure a safe procedure;

(iv) The airplane's weight at the point where the two engines are assumed to fail provides enough fuel to continue to the airport, to arrive at an altitude of at least 1,500 feet directly over the airport, and thereafter to fly for 15 minutes at cruise power or thrust, or both; and

(v) The consumption of fuel and oil after the engine failure is the same as the consumption that is allowed for in the net flight path data in the Airplane Flight Manual.

B. Part 135

FAR 135.381 Large transport category airplanes: Turbine engine powered: En route limitations: One engine inoperative.

(a) No person operating a turbine engine powered large transport category airplane may take off that airplane at a weight, allowing for normal consumption of fuel and oil, that is greater than that which (under the approved, one engine inoperative, en route net flight path data in the Airplane Flight Manual for that airplane) will allow compliance with paragraph (a) (1) or (2) of this section, based on the ambient temperatures expected en route.

(1) There is a positive slope at an altitude of at least 1,000 feet above all terrain and obstructions within five statute miles on each side of the

intended track, and, in addition, if that airplane was certificated after August 29, 1958 (SR422B), there is a positive slope at 1,500 feet above the airport where the airplane is assumed to land after an engine fails.

(2) The net flight path allows the airplane to continue flight from the cruising altitude to an airport where a landing can be made under § 135.387 clearing all terrain and obstructions within five statute miles of the intended track by at least 2,000 feet vertically and with a positive slope at 1,000 feet above the airport where the airplane lands after an engine fails, or, if that airplane was certificated after September 30, 1958 (SR422A, 422B), with a positive slope at 1,500 feet above the airport where the airplane lands after an engine fails.

(b) For the purpose of paragraph (a)(2) of this section, it is assumed that—

(1) The engine fails at the most critical point en route;

(2) The airplane passes over the critical obstruction, after engine failure at a point that is no closer to the obstruction than the approved radio navigation fix, unless the Administrator authorizes a different procedure based on adequate operational safeguards;

(3) An approved method is used to allow for adverse winds;

(4) Fuel jettisoning will be allowed if the certificate holder shows that the crew is properly instructed, that the training program is adequate, and that all other precautions are taken to ensure a safe procedure;

(5) The alternate airport is selected and meets the prescribed weather minimums; and

(6) The consumption of fuel and oil after engine failure is the same as the consumption that is allowed for in the approved net flight path data in the Airplane Flight Manual.

§ 135.383 Large transport category airplanes: Turbine engine powered: En route limitations: Two engines inoperative.

(a) Airplanes certificated after August 26, 1957, but before October 1, 1958 (SR422). No person may operate a turbine engine powered large transport category airplane along an intended route unless that person complies with either of the following:

(1) There is no place along the intended track that is more than 90 minutes (with all engines operating at cruising power) from an airport that meets § 135.387.

(2) Its weight, according to the two-engine-inoperative, en route, net flight path data in the Airplane Flight Manual, allows the airplane to fly from the point where the two engines are assumed to fail simultaneously to an airport that meets § 135.387, with a net flight path (considering the ambient temperature anticipated along the track) having a positive slope at an altitude of at least 1,000 feet above all terrain and obstructions within five statute miles on each side of the intended track, or at an altitude of 5,000 feet, whichever is higher.

For the purposes of paragraph (a)(2) of this section, it is assumed that the two engines fail at the most critical point en route, that if fuel jettisoning is provided, the airplane's weight at the point where the engines fail includes enough fuel to continue to the airport and to arrive at an altitude of at least 1,000 feet directly over the airport, and that the fuel and oil consumption after engine failure is the same as the consumption allowed for in the net flight path data in the Airplane Flight Manual.

(b) Airplanes certificated after September 30, 1958, but before August 30, 1959 (SR422A). No person may operate a turbine engine powered large transport category airplane along an intended route unless that person complies with either of the following:

(1) There is no place along the intended track that is more than 90 minutes (with all engines operating at cruising power) from an airport that meets § 135.387.

(2) Its weight, according to the two-engine-inoperative, en route, net flight path data in the Airplane Flight Manual allows the airplane to fly from the point where the two engines are assumed to fail simultaneously to an airport that meets § 135.387 with a net flight path (considering the ambient temperatures anticipated along the track) having a positive slope at an altitude of at least 1,000 feet above all terrain and obstructions within five statute miles on each side of the intended track, or at an altitude of 2,000 feet, whichever is higher.

For the purpose of paragraph (b)(2) of this section, it is assumed that the two engines fail at the most critical point en route, that the airplane's weight at the point where the engines fail includes enough fuel to continue to the airport, to arrive at an altitude of at least 1,500 feet directly over the airport, and after that to fly for 15 minutes at cruise power or thrust, or both, and that the consumption of fuel and oil after engine failure is the same as the consumption allowed for in the net flight path data in the Airplane Flight Manual.

(c) Aircraft certificated after August 29, 1959 (SR422B). No person may operate a turbine engine powered large transport category airplane along an intended route unless that person complies with either of the following:

(1) There is no place along the intended track that is more than 90 minutes (with all engines operating at cruising power) from an airport that meets § 135.387.

(2) Its weight, according to the two-engine-inoperative, en route, net flight path data in the Airplane Flight Manual, allows the airplane to fly from the point where the two engines are assumed to fail simultaneously to an airport that meets § 135.387, with the net flight path (considering the ambient temperatures anticipated along the track) clearing vertically by at least 2,000 feet all terrain and obstructions within five statute miles on each side of the intended track. For the purposes of this paragraph, it is assumed that—

(i) The two engines fail at the most critical point en route;

(ii) The net flight path has a positive slope at 1,500 feet above the airport where the landing is assumed to be made after the engines fail;

(iii) Fuel jettisoning will be approved if the certificate holder shows that the crew is properly instructed, that the training program is adequate, and that all other precautions are taken to ensure a safe procedure;

(iv) The airplane's weight at the point where the two engines are assumed to fail provides enough fuel to continue to the airport, to arrive at an altitude of at least 1,500 feet directly over the airport, and after that to fly for 15 minutes at cruise power or thrust, or both; and

(v) The consumption of fuel and oil after the engines fail is the same as the consumption that is allowed for in the net flight path data in the Airplane Flight Manual.

JAR-OPS 1.500 En-route – One Engine Inoperative (See AMC OPS 1.500) (a)An operator shall ensure that the one engine inoperative en-route net flight path data shown in the Aeroplane Flight Manual, appropriate to the meteorological conditions expected for the flight, complies with either subparagraph (b) or (c) at all points along the route. The net flight path must have a positive gradient at 1500 ft above the aerodrome where the landing is assumed to be made after engine failure. In meteorological conditions requiring the operation of ice protection systems, the effect of their use on the net flight path must be taken into account.

(b)The gradient of the net flight path must be positive at least 1000 ft above all terrain and obstructions along the route within 9.3 km (5 nm) on either side of the intended track.

(c)The net flight path must permit the aeroplane to continue flight from the cruising altitude to an aerodrome where a landing can be made in accordance with JAR-OPS 1.510 and 1.515 or 1.520 as appropriate, the net flight path clearing vertically, by at least 2000 ft, all terrain and obstructions along the route within 9.3 km (5 nm) on either side of the intended track in accordance with subparagraphs (1) to (4) below:

(1)The engine is assumed to fail at the most critical point along the route;

(2)Account is taken of the effects of winds on the flight path;

(3)Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome where the aeroplane is assumed to land after engine failure with the required reserves of JAR-OPS 1.255 appropriate to an alternate aerodrome, if a safe procedure is used, and

(4)The aerodrome where the aeroplane is assumed to land after engine failure must meet the following criteria:

(i) The performance requirements at the expected landing mass are met; and

(ii) Weather reports or forecasts, or any combination thereof, and field condition reports indicate that a safe landing can be accomplished at the estimated time of landing.

(d)When showing compliance with JAR-OPS 1.500, an operator must increase the width margins of subparagraphs (b) and (c) above to 18.5 km (10 nm) if the navigational accuracy does not meet the 95% containment level.

JAR-OPS 1.505 En-route – Aeroplanes with Three or More Engines, Two Engines Inoperative

(a)An operator shall ensure that at no point along the intended track will an aeroplane having three or more engines be more than 90 minutes at the all engines long range cruising speed, at standard temperature in still air, away from an aerodrome at which the performance requirements applicable at the expected landing mass are met unless it complies with subparagraphs (b) to (f) below.

(b)The two engines inoperative en-route net flight path data must permit the aeroplane to continue the flight, in the expected meteorological conditions, from the point where two engines are assumed to fail simultaneously, to an aerodrome at which it is possible to land and come to a complete stop when using the prescribed procedure for a landing with two engines inoperative. The net flight path must clear vertically, by at least 2000 ft all terrain and obstructions along the route within 9. 3 km (5 nm) on either side of the intended track. At altitudes and in meteorological conditions requiring ice protection systems to be operable, the effect of their use on the net flight path data must be taken into account. If the navigational accuracy does not meet the 95% containment level, an operator must increase the width margin given above to 18.5 km (10 nm).

(c)The two engines are assumed to fail at the most critical point of that portion of the route where the aeroplane is more than 90 minutes, at the all engines long range cruising speed at standard temperature in still air, away from an aerodrome at which the performance requirements applicable at the expected landing mass are met.

(d)The net flight path must have a positive gradient at 1500 ft above the aerodrome where the landing is assumed to be made after the failure of two engines.

(e)Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required fuel reserves, if a safe procedure is used.

(f)The expected mass of the aeroplane at the point where the two engines are assumed to fail must not be less than that which would include sufficient fuel to proceed to an aerodrome where the landing is assumed to be made, and to arrive there at least 1500 ft directly over the landing area and thereafter to fly level for 15 minutes.

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

The JAR explicitly requires that in meteorological conditions requiring the operation of ice protection systems, the effect of their use on the net flight path must be taken into account. Although the FAR does not explicitly state this requirement in parts 121 or 135, it is effectively required by the FAA through policies associated with FAA-approved Airplane Flight Manuals (AFM's). FAA policies require the en route net flight path data provided in the AFM to include the effects of the operation of anti-ice systems. Since these data are operating limitations, operators are required to abide by them.

The JAR requires a path width of 5 nautical miles on each side of the intended track to be considered when determining compliance with the vertical obstacle clearance requirements. The FAR path width is 5 statute miles on either side of the intended track. Since the FAR path width is slightly narrower, terrain that must be considered under the JAR requirement may not have to be considered under the FAR. Therefore, the JAR is more stringent.

The FAR requires that the obstacle clearance analysis assume that the airplane passes over the critical obstruction after an engine failure at a point that is no closer to the obstruction than the nearest approved radio navigation fix, unless the Administrator authorizes a different procedure based on adequate operational safeguards. The JAR requires the path width over which obstacle clearance must be shown to be increased from 5 to 10 nautical miles if the navigational accuracy does not meet the 95% containment level. The FAR requirement limits the procedural means that may be used to comply with the en route obstacle clearance requirements, while the JAR requirement increases the area under the flight path for which the required terrain clearance must be shown if the navigational accuracy does not support the narrower path width.

The JAR requires account to be taken of the effects of winds on the flight path, while the FAR only requires the effect of adverse winds to be taken into account. The only difference is that the JAR requires favorable, in addition to adverse winds to be taken into account. Since the effect of favorable winds would never be more limiting than a zero wind case, the extra JAR requirement is neither more stringent nor less stringent than the FAR.

The JAR requires that the airport where the aeroplane is assumed to land after engine failure must meet the following criteria: (1) the performance requirements at the expected landing mass are met and (2) weather reports or forecasts, or any combination thereof, and field condition reports indicate that a safe landing can be accomplished at the estimated time of landing. The FAR requires that the alternate airport where the airplane is assumed to land is specified in the dispatch or flight release and meets the prescribed weather minimums. The FAR landing limitations of § 121.195 require that the performance requirements at the expected landing weight are met at the alternate airport. The FAR and JAR standards are similar although the applicable issues are handled differently within the standards.

The FAR requires that the consumption of fuel and oil after engine failure used to show compliance with the en route limitations is the same as the consumption that is allowed for in the approved net flight path data in the Airplane Flight Manual. The JAR does not contain such a requirement. Because the FAR contains a requirement not in the JAR, it could be said that the FAR is more stringent. However, because the same AFM data are used to show compliance with the FAR and JAR requirements, there are no practical differences resulting from the differences in the standards.

Both the FAR and the JAR require safe obstacle clearance after failure of two engines unless the airplane is always within 90 minutes of an acceptable alternate airport. The JAR restricts the applicability of this requirement to airplanes with three or more engines, but the FAR does not. Therefore, this FAR standard effectively prohibits two-engine airplanes from operating on routes that do not at all times remain within 90 minutes from an acceptable alternate airport. This consequence was noted in the preamble material associated with Amendment 1 to SR-422B, (27 FR 12399):

“Pursuant to the en route limitations. . ., airplanes are precluded from flying along an intended route if any place along the route is more than 90 minutes from a suitable airport unless compliance is shown with the two-engine-inoperative en route limitations. . . These requirements automatically prohibit two-engine airplanes from flying such routes.”

The advent of Extended Range Operations with Two-Engine Airplanes (ETOPS) has superceded this requirement for airplanes authorized to operate on such routes, although the working group was unable to locate any documentation stating this. It is considered reasonable to assume that the FAA did not intend for ETOPS authorizations involving routes more than 90 minutes away from an acceptable alternate airport to be prohibited by § 121.193.

The JAR specifies the 90 minute distance as that resulting from 90 minutes at the all engines long range cruising speed. For the FAR, the 90 minute distance is that resulting from 90 minutes with all engines operating at cruising power. The JAR is more stringent in that it specifies the speed that must be used to show compliance with this requirement. The FAR is more flexible in only specifying the engine power level that must be assumed, but allowing an operator to propose the use of any appropriate speed that can be achieved with cruising power on the engines.

When safe obstacle clearance must be shown with two engines inoperative, the JAR specifies that the two engines are assumed to fail at the most critical point of that portion of the route where the airplane is more than 90 minutes away from an airport that meets the landing distance performance requirements.

The FAR requires the two engine failures to be assumed to occur at the most critical point en route, regardless of the distance from an airport.

The JAR requires that the expected mass of the airplane at the point where the two engines are assumed to fail must not be less than that which would include sufficient fuel to proceed to an airport where the landing is assumed to be made, and to arrive there at least 1500 ft directly over the landing area and thereafter to fly level for 15 minutes. The FAR requirement is the same, except that the 15 minutes of flight after arriving at the destination are at cruise power or thrust, rather than in level flight.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

There are no differences in the means of compliance other than those resulting from the differences in the standards.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The proposed action is to harmonize the standards by selecting portions of each standard to become the harmonized standard.

For each proposed change from the existing standard, answer the following questions:

6 - What should the harmonized standard be? [Insert the proposed text of the harmonized standard here]

FAR 121.191 Airplanes: Turbine-engine-powered: En route limitations: One engine inoperative

(a)No person operating a turbine engine powered airplane may take off that airplane at a weight, allowing for normal consumption of fuel and oil, that is greater than that which (under the approved, one engine inoperative en route net flight path data in the Airplane Flight Manual for that airplane) will allow compliance with paragraphs (a)(1) or (2) of this section, based on the ambient temperatures and meteorological conditions expected en route.

(1)There is a positive slope at an altitude of at least 1,000 feet above all terrain and obstructions within five nautical miles on each side of the intended track, and, in addition, if that airplane was certificated after August 29, 1959 (SR422B) there is a positive slope at 1,500 feet above the airport where the airplane is assumed to land after an engine fails.

(2)The net flight path allows the airplane to continue flight from the cruising altitude to an airport where a landing can be made under section 121.197, clearing all terrain and obstructions within five nautical miles on each side of the intended track by at least 2,000 feet vertically and with a positive slope at 1,000 feet above the airport where the airplane lands after an engine fails, or, if that airplane was certificated after September 30, 1958 (SR422A, 422B), with a positive slope at 1,500 feet above the airport where the airplane lands after an engine fails.

(b)For the purposes of paragraph (a)(2) of this section, it is assumed that -

(1)The engine fails at the most critical point en route;

(2)An approved method is used to account for the effect of winds;

(3)Fuel jettisoning will be allowed if the certificate holder shows that the crew is properly instructed, that the training program is adequate, and that all other precautions are taken to ensure a safe procedure;

(4)The alternate airport where the airplane is assumed to land is specified in the dispatch or flight release and meets the prescribed weather minimums.

§ 121.193 Airplanes: Turbine engine powered: En route limitations: Two engines inoperative.

* * *

(c) Aircraft certificated after August 29, 1959 (SR422B). No person may operate a turbine engine powered airplane along an intended route unless that person complies with either of the following:

(1) There is no place along the intended track that is more than 90 minutes (with all engines operating at cruising power) from an airport that meets § 121.197.

(2) Its weight, according to the two-engine-inoperative, en route net flight path data in the Airplane Flight Manual, allows the airplane to fly from the point where the two engines are assumed to fail simultaneously to an airport that meets § 121.197, with the net flight path (considering the ambient temperatures and meteorological conditions anticipated along the track) clearing vertically by at least 2,000 feet all terrain and obstructions within five nautical miles on each side of the intended track. For the purposes of this paragraph, it is assumed that—

(i) The two engines fail at the most critical point of that portion of the route where the airplane is more than 90 minutes (with all engines operating at cruising power) from an airport that meets the requirements of § 121.197;

(ii) The net flight path has a positive slope at 1,500 feet above the airport where the landing is assumed to be made after the engines fail;

(iii) Fuel jettisoning will be approved if the certificate holder shows that the crew is properly instructed, that the training program is adequate, and that all other precautions are taken to ensure a safe procedure;

(iv) The airplane’s weight at the point where the two engines are assumed to fail provides enough fuel to continue to the airport, to arrive at an altitude of at least 1,500 feet directly over the airport, and after that to fly for 15 minutes at cruise power or thrust, or both; and

FAR 135.381 Large transport category airplanes: Turbine engine powered: En route limitations: One engine inoperative.

(a) No person operating a turbine engine powered large transport category airplane may take off that airplane at a weight, allowing for normal consumption of fuel and oil, that is greater than that which (under the approved, one engine inoperative, en route net flight path data in the Airplane Flight Manual for that airplane) will allow compliance with paragraph (a) (1) or (2) of this section, based on the ambient temperatures and meteorological conditions expected en route.

(1) There is a positive slope at an altitude of at least 1,000 feet above all terrain and obstructions within five nautical miles on each side of the intended track, and, in addition, if that airplane was certificated after August 29, 1958 (SR422B), there is a positive slope at 1,500 feet above the

airport where the airplane is assumed to land after an engine fails.

(2) The net flight path allows the airplane to continue flight from the cruising altitude to an airport where a landing can be made under § 135.387 clearing all terrain and obstructions within five nautical miles of the intended track by at least 2,000 feet vertically and with a positive slope at 1,000 feet above the airport where the airplane lands after an engine fails, or, if that airplane was certificated after September 30, 1958 (SR422A, 422B), with a positive slope at 1,500 feet above the airport where the airplane lands after an engine fails.

(b) For the purpose of paragraph (a)(2) of this section, it is assumed that—

(1) The engine fails at the most critical point en route;

(2) An approved method is used to account for the effect of winds;

(3) Fuel jettisoning will be allowed if the certificate holder shows that the crew is properly instructed, that the training program is adequate, and that all other precautions are taken to ensure a safe procedure;

(5) The alternate airport is selected and meets the prescribed weather minimums.

§ 135.383 Large transport category airplanes: Turbine engine powered: En route limitations: Two engines inoperative.

* * *

(c) Aircraft certificated after August 29, 1959 (SR422B). No person may operate a turbine engine powered large transport category airplane along an intended route unless that person complies with either of the following:

(1) There is no place along the intended track that is more than 90 minutes (with all engines operating at cruising power) from an airport that meets § 135.387.

(2) Its weight, according to the two-engine-inoperative, en route net flight path data in the Airplane Flight Manual, allows the airplane to fly from the point where the two engines are assumed to fail simultaneously to an airport that meets § 135.387, with the net flight path (considering the ambient temperatures and meteorological conditions anticipated along the track) clearing vertically by at least 2,000 feet all terrain and obstructions within five nautical miles on each side of the intended track. For the purposes of this paragraph, it is assumed that—

(i) The two engines fail at the most critical point of that portion of the route where the airplane is more than 90 minutes (with all engines operating at cruising power) from an airport that meets the requirements of § 135.387;

(ii) The net flight path has a positive slope at 1,500 feet above the airport where the landing is assumed to be made after the engines fail;

(iii) Fuel jettisoning will be approved if the certificate holder shows that the crew is properly instructed, that the training program is adequate, and that all other precautions are taken to ensure a safe procedure;

(iv) The airplane's weight at the point where the two engines are assumed to fail provides enough fuel to continue to the airport, to arrive at an altitude of at least 1,500 feet directly over the airport, and after that to fly for 15 minutes at cruise power or thrust, or both; and

JAR-OPS 1.500 En-route – One Engine Inoperative (See AMC OPS 1.500) (a)An operator shall ensure that the one engine inoperative en-route net flight path data shown in the Aeroplane Flight Manual, appropriate to the meteorological conditions expected for the flight, complies with either subparagraph (b) or (c) at all points along the route. The net flight path must have a positive gradient at 1500 ft above the aerodrome where the landing is assumed to be made after engine failure. In meteorological conditions requiring the operation of ice protection systems, the effect of their use on the net flight path must be taken into account.

(b)The gradient of the net flight path must be positive at least 1000 ft above all terrain and obstructions along the route within 9.3 km (5 nm) on either side of the intended track.

(c)The net flight path must permit the aeroplane to continue flight from the cruising altitude to an aerodrome where a landing can be made in accordance with JAR-OPS 1.510 and 1.515 or 1.520 as appropriate, the net flight path clearing vertically, by at least 2000 ft, all terrain and obstructions along the route within 9.3 km (5 nm) on either side of the intended track in accordance with subparagraphs (1) to (4) below:

(1)The engine is assumed to fail at the most critical point along the route;

(2)Account is taken of the effects of winds on the flight path;

(3)Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome where the aeroplane is assumed to land after engine failure with the required reserves of JAR-OPS 1.255 appropriate to an alternate aerodrome, if a safe procedure is used, and

(4)The aerodrome where the aeroplane is assumed to land after engine failure must meet the appropriate landing minima of JAR-OPS 1.297:

(d)When showing compliance with JAR-OPS 1.500, an operator must increase the width margins of subparagraphs (b) and (c) above to 18.5 km (10 nm) if the navigational accuracy does not meet the 95% containment level.

JAR-OPS 1.505 En-route – Aeroplanes with Three or More Engines, Two Engines Inoperative

(a)An operator shall ensure that at no point along the intended track will an aeroplane having three or more engines be more than 90 minutes with all engines operating at cruising power, at standard temperature in still air, away from an aerodrome at which the performance requirements applicable at the expected landing mass are met unless it complies with subparagraphs (b) to (f) below.

(b)The two engines inoperative en-route net flight path data must permit the aeroplane to continue the flight, in the expected meteorological conditions, from the point where two engines are assumed to fail simultaneously, to an aerodrome at which it is possible to land and come to a complete stop when using the prescribed procedure for a landing with two engines inoperative. The net flight path must clear vertically, by at least 2000 ft all terrain and obstructions along the route within 9. 3 km (5 nm) on either side of the intended track. At altitudes and in meteorological conditions requiring ice protection systems to be operable, the effect of their use on the net flight path data must be taken into account. If the navigational accuracy does not meet the 95% containment level, an operator must increase the width margin given above to 18.5 km (10 nm).

(c)The two engines are assumed to fail at the most critical point of that portion of the route where the aeroplane is more than 90 minutes, with all engines operating at cruising power at standard temperature in still air, away from an aerodrome at which the performance requirements of JAR-OPS 1.515 or 1.520 at the expected landing mass are met, and where the landing distance available is not less than the unfactored two-engine-inoperative landing distance.

(d)The net flight path must have a positive gradient at 1500 ft above the aerodrome where the landing is assumed to be made after the failure of two engines.

(e)Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required fuel reserves of sub-paragraph (f) below, if a safe procedure is used.

(f)The expected mass of the aeroplane at the point where the two engines are assumed to fail must not be less than that which would include sufficient fuel to proceed to an aerodrome where the landing is assumed to be made, and to arrive there at least 1500 ft directly over the landing area and thereafter to fly for 15 minutes at cruise power or thrust.

Summary of Proposed Changes:

As a minor editorial change to § 121.193(c), the word “he” would be replaced by “that person.” This proposed change, which is consistent with the wording of the existing § 135.383(c), would remove the presumption that the operator is of the male gender.

In §§ 121.191(a), 121.193(c)(2), 135.381(a), and 135.383(c)(2), the words, “and meteorological conditions” would be added to the requirement to base compliance with these requirements on the ambient temperatures en route. The intent of adding these words is to ensure that the effects of ice protection systems (including, if provided in the Airplane Flight Manual, residual ice that may remain after the operation of the ice protection system), as reflected in the Airplane Flight Manual en route climb performance data, are taken into account when showing compliance to this requirement. This change is in accordance with current industry practice and FAA policy, and would harmonize the FAR with JAR-OPS 1.

The path width for showing adequate obstacle clearance in §§ 121.191(a)(1), 121.191(a)(2), 121.193(c)(2), 135.381(a)(1), 135,381(a)(2), and 135.381(c)(2) would be changed from five statue miles to five nautical miles. This change, which would increase the stringency of the existing FAR, is consistent with current industry practice and would harmonize this requirement with that of JAR-OPS 1.

The requirement in §§ 121.191(b)(2) and 135.381(b)(2) for the engine failure point to be assumed to be no closer to the obstruction than the nearest radio navigation fix would be removed. With the advanced navigation capabilities and cockpit displays of position available on modern airplanes, this requirement is no longer considered necessary. The requirement to assume that the engine fails at the most critical point en route is considered to be sufficiently stringent to meet the safety intent.

The existing §§ 121.191(b)(3) and 135.381(b)(3) would be revised from requiring operators to allow for adverse winds to require operators to account for the effect of winds. Although, as noted earlier, this change would have no safety impact, it would harmonize the FAR with the JAR and clarify that operators may take into account the effect of any favorable winds.

The existing §§ 121.191(b)(6), 121.193(c)(2)(v), 135.381(b)(6), and 135.383(c)(2)(v) which require the consumption of fuel and oil assumed after engine failure to be the same as the consumption that is allowed for in the approved net flight path data in the Airplane Flight Manual (AFM), would be removed. Typically, the AFM provides climb gradient data as a function of airplane weight, and does not include fuel and oil consumption information. If net en route flight path data that includes fuel and oil consumption are provided in the AFM, operators would be required to use these data, including any fuel and oil consumption inherent in the data, regardless of whether or not an operating rule specifically calls this out. This proposal would harmonize the FAR with the JAR.

The section title for § 121.193 would be changed to add the words "for airplanes with three or more engines." This proposed change would clarify that § 121.193 apply only to airplanes with three or more engines. Since § 121.161(a) restricts two-engine airplanes to routes remaining within 60 minutes of an adequate airport at the one-engine-inoperative cruising speed, application of the § 121.193 requirement to two-engine airplanes would never be limiting. Also, removing applicability of this requirement from two-engine airplanes would clarify that ETOPS authorizations are not meant to be limited by this requirement. Because part 135 does not have a requirement equivalent to § 121.161, nor are the ETOPS considerations applicable, there is not a corresponding proposal to change § 135.383.

Sections 121.193(c)(2)(i) and 135.383(c)(2)(i) would be revised to require consideration of a dual engine failure only during that portion of the route where the airplane is more than 90 minutes away from an airport that meets the requirements of §§ 121.197 and 135.387, respectively. This change would harmonize this requirement with the JAR standard and would be consistent with the existing FAR requirements in §§ 121.193(c) and 135.383(c) that a dual engine failure need only be considered if there is a point in the flight where the airplane is more than 90 minutes away from an airport that meets the requirements of §§ 121.197 and 135.387, respectively.

JAR-OPS 1.500(c)(4) would be revised to replace sub-paragraphs (i) and (ii) with a requirement to meet the appropriate landing minima of JAR-OPS 1.297. This change would continue to address the safety intent and would effectively harmonize the JAR with the FAR.

The reference to "at the all-engines long range cruising speed" in JAR-OPS 1.505(a) and (c) would be changed to "with all engines operating at cruising power" to harmonize with the FAR. This change would allow additional flexibility to operators who can substantiate the use of a speed other than the long range cruising speed to show compliance with this requirement. The long range cruise speed has a generally accepted definition within aviation of being a speed that provides 99 percent of the maximum range capability.

JAR-OPS 1.505(c) would additionally be changed to replace "the performance requirements applicable" to "the performance requirements of 1.515 or 1.520" to clarify what the applicable performance requirements are for the airport where the ensuing landing would be made. An additional performance requirement would be added to JAR-OPS 1.505(c) to further require that the landing distance available not be less than the unfactored two-engine-inoperative landing distance. This requirement was considered for addition into the FAR, but an examination of existing airplanes showed that it would never be limiting. The normal all-engines-operating landing limitations, including the landing distance safety margin applied under §§ 121.195, 121.197, 135.385, and 135.387 ensure that the landing distance will not be less than the unfactored two-engine-inoperative landing distance.

JAR-OPS 1.505(e) would be revised to reference sub-paragraph (f) as providing the fuel reserve requirements that must be present at the alternate airport. JAR-OPS 1.505(f) would be revised to replace the fuel allowance associated with flying level for 15 minutes with that required to fly for 15 minutes at cruise power or thrust." Specifying the thrust or power level is more appropriate to establishing a fuel consumption requirement and would harmonize the JAR with the FAR.

7 - How does this proposed standard address the underlying safety issue

(identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

The proposed standard continues to address the underlying safety issues in the same manner as the existing standard.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

The proposed standard would maintain approximately the same level of safety relative to the current FAR. The increase in path width for determining compliance with the obstacle clearance requirements could result in an increase in the level of safety relative to the existing FAR requirements.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

The proposed standard would maintain the same level of safety relative to the current FAR. The current industry practice is to use the 5 nautical mile path width.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

The option that was selected appeared to provide the maximum benefit from harmonization with minimal cost impact. For the one item that remains unharmonized, the JAR requirement relating obstacle clearance path width to navigational capability, there does not appear to be a compelling reason to harmonize. The airplanes expected to be operating on competing routes between European and U.S. operators would meet the 95 percent containment level requirement of the JAR, and hence would be subject to the 5 nautical mile path width requirement that is harmonized between the FAR and the JAR.

In addition, the working group considered updating the two-engine-inoperative en route limitations to better reflect the safety, reliability, and capability of modern airplanes and engines. Under the proposed harmonized standards, three and four engined airplanes may be prohibited from operating on certain routes available to twinjets. For example, an operator found that operating the 727 from the U.S. West Coast to Hawaii would not be economically viable due to the § 121.193 fuel loading requirements associated with two-engine-inoperative flight. However, the same operation under ETOPS criteria with a twinjet is economically viable. On other routes, the terrain clearance requirements of § 121.193 prohibit three and four engine airplanes from operating on routes open to twins operating under ETOPS authority. Considering that § 121.193 is concerned with the consequences of multiple engine failures, where the three and four engine airplanes inherently have an advantage, such outcomes do not appear to be completely rational. Also, the enhanced navigational capabilities of modern jet transports are not fully taken into account.

Because such an update to § 121.193 is beyond the scope of simply harmonizing the FAR and JAR standards, the working group did not pursue this option. However, the working group recommends tasking ARAC to update § 121.193 so that it is more applicable to the modern jet transport fleet – regardless of the number of engines on the airplane.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Operators of transport category airplanes could be affected by the proposed change.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

None.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

No additional advisory material is necessary.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

The applicable ICAO standard is contained in Annex 6, "Operation of Aircraft," Chapter 5, "Aeroplane Performance Operating Limitations," Paragraph 5.2.10, reproduced as follows:

En Route – two power-units inoperative. In the case of aeroplanes having three or more power-units, on any part of a route where the location of en-route alternate aerodromes and the total duration of the flight are such that the probability of a second power-unit becoming inoperative must be allowed for if the general level of safety implied by the Standards of this chapter is to be maintained, the aeroplane shall be able, in the event of any two power-units becoming inoperative, to continue the flight to an en-route alternate aerodrome and land.

The proposed standard would remain in compliance with the ICAO standard.

15 - Does the proposed standard affect other HWGs? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

Any cost impact is expected to be negligible.

17 - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.
N/A

18 - Does the HWG wish to answer any supplementary questions specific to this project?
[If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.
No.

19 – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?
Yes.

(LVIII.)Issue: Go-Around Obstacle Clearance

Rule Section: FAR 121.195/JAR-OPS 1.510

1 - What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

It is fundamental to operational safety that the pilot should be able to safely execute a go-around upon arrival at the destination and alternate airports. This principle has formed the basis of the performance standards required for the type certification and operation of turbine engine powered transport category airplanes since Special Civil Air Regulation No. SR-422, effective August 27, 1957. As of March 20, 1997, the application of this principle was extended by the "commuter rule" to also cover scheduled passenger-carrying operations conducted in airplanes that have a passenger seat configuration of 10 to 30 passengers and turbojet airplanes regardless of seating configuration.

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

Current FAR text:

A. Part 121

FAR 121.195 Airplanes: Turbine Engine Powered: Landing Limitations: Destination Airports

(a) No person operating a turbine-engine-powered airplane may take off that airplane at such a weight that (allowing for normal consumption of fuel and oil in flight to the destination or alternate airport) the weight of the airplane on arrival would exceed the landing weight set forth in the Airplane Flight Manual for the elevation of the destination or alternate airport and the ambient temperature anticipated at the time of landing.

B.

C.

D. Part 135

FAR 135.385 Large Transport Category Airplanes: Turbine Engine Powered: Landing Limitations: Destination Airports

(a) No person operating a turbine engine powered large transport category airplane may take off that airplane at a weight that (allowing for normal consumption of fuel and oil in flight to the destination or alternate airport) the weight of the airplane on arrival would exceed the landing weight in the Airplane Flight Manual for the elevation of the destination or alternate airport and the ambient temperature anticipated at the time of landing.

Current JAR text:

JAR-OPS 1.510 Landing – Destination and Alternate Aerodromes (See AMC OPS 1.510 and 1.515)

(a) An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) does not exceed the maximum landing mass specified for the altitude and the ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome.

(b) For instrument approaches with decision heights below 200 ft, an operator must verify that the approach mass of the aeroplane, taking into account the take-off mass and the fuel expected to be consumed in flight, allows a missed approach gradient of climb, with the critical engine failed and with the speed and configuration used for go-around of at least 2.5%, or the published gradient, whichever is the greater. The use of an alternative method must be approved by the Authority. (See IEM OPS 1.510(b)).

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

FAR 121.195(a), FAR 135.385(a) and JAR-OPS 1.510(a) are, for all practical purposes, identical. Each requires that the weight of the airplane upon arrival at the destination and alternate airports (based on the takeoff weight and the expected fuel consumption en route) not exceed the maximum allowable landing weight shown in the Airplane Flight Manual (AFM) (typically referred to as WAT limits) for the altitude of the airport and the temperature expected at arrival time. The landing weight limitations provided in the AFM ensure only that the airplane can meet certain climb gradient requirements established by the respective certification rules (FAR 25, JAR 25) and, as such, do not guarantee obstacle clearance during a go-around.

JAR-OPS 1.510(b) has no counterpart in FAR 121 or FAR 135. It requires additional climb gradient capability for some instrument approaches. It was introduced because most airports used by JAR operators have instrument approach procedures which are designed in accordance with ICAO PANS-OPS criteria, FAA TERPS or similar, and which are intended to ensure adequate obstacle clearance during both the approach and missed approach phases. For the latter, these procedures are normally based on a nominal missed approach climb gradient of 2.5%, (ICAO and TERPS criteria) though at some airports that are surrounded by significant obstacles, a higher climb gradient is specified (PANS-OPS criteria only). The desired obstacle clearance during a missed approach with an engine out, when the published procedure is flown, could be inadequate if the aircraft's performance does not enable climb at the specified gradient.~~,~~ Additionally, the requirement to show compliance with the climb gradient using data based on the speed and configuration actually used for go-around is intended to ensure consistency between the airplane performance capability and the procedures used by the operator. (For some airplanes the AFM approach climb gradient is computed with a configuration that is not the same as the recommended go-around configuration.)

While not specifically addressed in the FARs, the FAA has expected operators to show adequate obstacle clearance during a missed approach at certain airports with particularly difficult terrain issues. The FAA's approach historically has been to require the operator to develop missed approach procedures to provide obstacle clearance rather than impose a weight penalty at the time of dispatch. Only in the most extreme cases would a weight penalty be required. Approval of such procedures was done on an individual operator basis. Recently, as part of the All Weather Operations Harmonization effort, the FAA revised Advisory Circular 120-29 (now AC 120-29A) to, among other things, include considerations for the development of missed approach procedures. The purpose was to consolidate and standardize the various methods used by operators to show obstacle clearance in the past. Included in the considerations for development of missed approach procedures is a requirement to consider the failure of an engine at all points along the approach path down to touchdown.

The ICAO PANS-OPS procedures (which the JAA follows), as well as FAA TERPS procedures, do not consider the loss of an engine beyond the missed approach point due to the remote possibility of such an occurrence.

The Working Group discussed the practical problems with a dispatch rule intended to provide obstacle clearance during a go-around. Currently, operators comply with dispatch landing requirements on the basis of the best available weather reports and/or forecasts. The operator often does not know the specific runway the airplane will use for landing when it arrives at the destination or alternate airport. This is especially true for long flights where many hours may pass between the time of dispatch and the time of arrival. Thus, the operator may base the dispatch weight on a runway with no obstacles in the missed approach area and actually land on a different runway with significant obstacles. The landing distance requirements address this issue by including both the “most favorable runway” and the “most suitable runway” and have large built-in safety factors. The JAR addresses obstacle clearance only for instrument approaches and the operator may not know what the exact conditions will be upon arrival. Again, the operator may base the dispatch weight on not expecting to conduct an instrument approach, and may have different conditions when arriving.

On the other hand, the specific runway to which the airplane was dispatched is not as critical in the FAA’s approach. The FAA would require operators to have procedures in place, where appropriate, to ensure obstacle clearance when the missed approach is actually flown.

The additional requirements of JAR-OPS 1.510(b) may impose a takeoff weight penalty for JAR operators that is not required for FAA operators when operating under the same conditions with the same airplanes.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

The differences in the means of compliance are due to the differences in the standards. Where the standards are the same (i.e. application of AFM weight limits), the means of compliance are the same.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The Working Group could not reach consensus on JAR-OPS 1.510(b), primarily because of the wide differences in philosophy between the FAA and JAA; therefore, this issue cannot be recommended for full harmonization.

The FAA’s position is based on the principle that the potential for a go-around at any point between the initiation of the approach and touching down on the runway should be addressed, including consideration of an engine failure. This issue may be handled procedurally (initially through AC 120-29A, and finally through AC 120-XXX) and does not require a dispatch rule. For many airports with no particular go-around safety vulnerabilities (e.g. Dallas-Ft Worth, Phoenix, Amsterdam), there may not be a need to perform a detailed analysis or develop special procedures. For others, the operator might have to show that their current missed approach procedure avoids any obstacles laterally, and is robust enough to handle the conditions that they are approved to operate in. Another option would be for the operator to show that the obstacles can be cleared vertically, or with some combination of lateral/vertical clearance using their current procedures. In other cases, the operator may want to use the corresponding takeoff procedures for that runway and show that the transition to the takeoff flight path can be made. In other cases, a unique procedure may need to be developed, using whatever combination of lateral/vertical clearance, navigational capabilities, etc. may be necessary.

The FAA and U.S. operators are concerned that the JAA requirement could subject operators to a weight offload for any approach with a decision height under 200 feet, regardless of whether there is any appreciable terrain in the airport vicinity. For airports where terrain may be an issue, there may also be a weight penalty, but a safe go-around (even with all engines operating) is not assured after the missed approach point is passed.

Under the FAA proposal, there will not be any weight offloads when there is no appreciable terrain in the airport vicinity, and also not in other cases if obstacle clearance can be assured by a combination of procedural and performance means. However, safety is addressed all the way to touchdown (actually until the engines are spooled down), and considers an engine failure. The FAA does not envisage requiring comprehensive data to be provided in the AFM, but operators will need some additional performance data from the manufacturers whenever a more detailed performance assessment might be necessary.

The JAA is convinced that obstacle accountability during go-around warrants an operating rule for consideration at dispatch. The JAA has remained unconvinced that advisory circular material in the absence of an operating rule will be consistently applied._The JAA is satisfied that the possibility of an engine failure beyond the missed approach point is too remote to require consideration. Additionally, the JAA is concerned that a mismatch between AFM approach climb gradient data for some airplanes and the recommended go-around procedures has serious safety implications. In the JAA’s opinion, the FAA’s proposal is too stringent in requiring consideration of an engine failure at all points along the approach path, but is also inadequate by not incorporating a dispatch requirement.

One minor aspect of the rules recommended for harmonization is to replace elevation (FAR 121.195(a) and FAR 135.385(a)) and altitude (JAR-OPS 1.510(a)) with pressure altitude and add a statement to allow the use of elevation when the pressure altitude cannot be determined. This is being done because the maximum landing weight charts in the AFM are presented as a function of pressure altitude. The provision to use elevation when pressure altitude is not known was added because typical weather forecasts do not include pressure altitude. It is intended, however, that an operator use pressure altitude when it can be determined.

During the harmonization discussions, the JAA recognized that further strengthening of JAR-OPS 1.510 was needed and, having taken note of the discussions outlined, proposed changes_which were under development at that time. These changes are being introduced to ensure that the approved performance data and the recommended procedures are consistent with each other and also with the instrument approach procedures in which the airplane is operated.

The JAA justification for developing and retaining an operational rule is based upon the following :

1) JAR-OPS 1.510(b) is intended to ensure that minimum climb gradients commensurate with obstacle clearance requirements are met.

2) An operating rule to be considered at dispatch will ensure adequate and uniform accountability.

3) The rule shall apply to all instrument approaches, not just those with decision heights below 200 feet.

4) Compliance with the rule shall be tied to approved recommended go-around procedures.

5) The JAR is based upon standards set out in the ICAO Airworthiness Technical Manual Doc 9051-AN/896.

6) The intention of the regulation is aimed at keeping the aircraft within a confined and regulated airspace free from obstacles. Consequently it avoids the significant burden which would otherwise be placed upon operators associated with the need to conduct a detailed analysis matching the aircraft's flight path to the particular obstacle environment. Such data is currently not available to the operators.

7) Removal of the minimum gradient requirement of 2.5% in the absence of obstacles.

8) It is intended that compliance with the JAR will be by means of climb gradients associated with the approach climb and scheduled in the AFM. This aspect will greatly simplify the compliance finding with the regulation and help the operator to avoid the problems associated with lack of suitably approved performance information.

9) Consideration of the go-around from the decision height and not below reflects the ICAO standard which has been in use for many years. The JAR has the flexibility to allow a balancing between obstacle clearance altitudes/heights and required gradients to best suit a particular set of operational circumstances.

10) PERF HWG WP 11-1 (see attachment 1) has shown that protracted low altitude flight is required to achieve the flap configuration and/or speed associated with the AFM approach climb WAT limit. The intention of the JAR is to address this significant operational concern by establishing a WAT limit with the specified go-around flap and limiting the acceleration required to achieve the specified go-around speed to no more than 10 knots above the landing threshold speed.

11) Issues of obstacle data availability and the reality that at most airports air traffic controllers are not aware of an individual operator's emergency procedures and routes (same is the case with take-off contingency procedures).

Reference shall be made in the rule to "The use of an alternative procedure and/or method must be accepted by the Authority." This will provide accommodation for compliance using other means should the applicant seek to retain currently certificated procedures which do not comply with use of approach flap and speeds no greater than the landing threshold speed plus 10 knots. In addition in the interest of harmonization other means possibly based upon the FAA proposed standard could be considered should the relevant Authority agree.

Also, during the discussions it was decided to revise the wording in FAR 121.195(a) and 135.385(a) to remove reference to the alternate airport. This was done because the titles of each of these paragraphs specifically refer to Destination Airports. FAR 121.197 and FAR 135.387 will be revised to include the appropriate requirements for alternate airports.

The Working Group recommends that the sections of draft AC 120-29A dealing with specific go-around obstacle clearance procedures be removed at the earliest convenient time and placed in AC 120-XXX. This would serve to consolidate all obstacle-related issues (takeoff and landing) into a single document that is more commonly used by the operators' performance experts.

6 - What should the ~~harmonized~~ revised standard be? [Insert the proposed text of the ~~harmonized~~ revised standard here]

E. Part 121

FAR 121.195 Airplanes: Turbine Engine Powered: Landing Limitations: Destination Airports

(a) No person operating a turbine-engine-powered airplane may take off that airplane at such a weight that (allowing for normal consumption of fuel and oil in flight) the weight of the airplane on arrival would exceed the landing weight set forth in the Airplane Flight Manual for the pressure altitude of the destination airport and the ambient temperature anticipated at the time of landing. When the pressure altitude at the anticipated time of landing cannot be determined from weather forecasts or reports, the elevation of the airport shall be used.

F.

G.

H. Part 135

FAR 135.385 Large Transport Category Airplanes: Turbine Engine Powered: Landing Limitations: Destination Airports

(a) No person operating a turbine engine powered large transport category airplane may take off that airplane at a weight that (allowing for normal consumption of fuel and oil in) the weight of the airplane on arrival would exceed the landing weight in the Airplane Flight Manual for the pressure altitude of the destination airport and the ambient temperature anticipated at the time of landing. When the pressure altitude at the anticipated time of landing cannot be determined from weather forecasts or reports, the elevation of the airport shall be used.

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

For the FAA, the underlying safety issue will be addressed by the application of advisory material (initially through AC 120-29A, and finally through AC 120-XXX). The proposed FAA standard does not provide any significant change relative to the existing practice.

For the JAA, the underlying safety issue is addressed by strengthening the standard. The JAA Performance Sub-Committee intends to propose a revision to JAR-OPS 1.510(b) for consideration by the JAA Operations Committee.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

The proposed FAA standard maintains the same level of safety.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

The proposed FAA standard maintains the same level of safety. The inclusion of considerations for the development of missed approach procedures in AC 120-29A and, ultimately, in AC 120-XXX will increase the level of safety by standardizing the procedures used by operators.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

Harmonization was considered, but not selected, due to the reasons given in item #5.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

JAA operators may be affected by the changes to JAR-OPS 1.510. The impact is expected to be minor.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

N/A

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

As explained in item #5, the Working Group recommends that the sections of AC 120-29A dealing with specific go-around obstacle clearance procedures be removed at the earliest convenient time and placed in AC 120-XXX. This would serve to consolidate all obstacle-related issues (takeoff and landing) into a single document that is more commonly used by the operators' performance experts.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

The relevant ICAO standards for the "Airworthiness of Aircraft" (Annex 8) and "Operation of Aircraft" (Annex 6) do not contain standards for obstacle clearance during a go-around. The JAR is based on guidance material provided in the ICAO "Procedures for Air Navigation Services – Aircraft Operations" (PANS-OPS), and the ICAO Airworthiness Technical Manual Document 9051-AN/896.

15. – Does the proposed standard affect other HWG's? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

N/A

17. - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

N/A

18. – Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.]

The Working Group has identified a related issue pertaining to the FAR/JAR Part 25 airworthiness requirements and makes the following recommendation:

The discussions within the Working Group with respect to go-around related issues have highlighted a number of related issues with respect to compliance with JAR/FAR 25.121(d) which are discussed below.

1) Approach Climb Limit Weight Assumptions in Relation to Recommended Procedures.

JAR/FAR 25.101(g) states : "Procedures for the execution of balked landings and missed approaches associated with the conditions prescribed in JAR/FAR 25.119 and JAR/FAR 25.121(d) must be established." Consequently the speeds and flap configuration assumed in the scheduling of landing WAT limits to comply with the minimum climb gradient requirements of JAR/FAR 25.121(d) need to reflect those arising from the recommended procedures. Certification experience has shown that compliance with this regulation has not been consistently achieved. In order to enhance approach climb limit weights, particularly for turbo-jet designs, higher speeds and lesser flap angles have been assumed in comparison with those promulgated in the recommended procedures section of the flight manual. This has resulted in a disconnect between procedures and compliance assumptions associated with 25.121(d). (See PHWG Paper 10-5).

JAR/FAR 25.121(d) permits the use of a climb speed established in connection with normal landing procedures, but not more than 1.5 V_S. This can lead to accelerations of more than 30 knots between the initiation of go-around and achieving the climb speed assumed when showing compliance with JAR/FAR 25.121(d). In the engine-out case at a WAT condition this will result in a protracted exposure to flight at very low altitude covering appreciable distances until the point at which the minimum climb gradient in JAR/FAR 25.121(d) is achieved. (See Attachment 1).

2) Acceptability Of Procedures.

JAR /FAR 25.101(h) states : "The procedures established under sub-paragraphs (f) and (g) of this paragraph must-

(1) Be able to be consistently executed in service by crews of average skill,
(2) Use methods or devices that are safe and reliable, and
(3) Include allowance for any time delays in the execution of the procedures, that may reasonably be expected in service."

In the absence of additional guidance consistent and adequate compliance with this requirement is questioned in the context of demonstrating a go-around which incurs a protracted low altitude acceleration as described in paragraph 1.

3) JAR-AWO 243.

This JAR regulation requires a go-around climb gradient of at least 2.5% associated with operations involving decision heights below 200 ft and there is no FAR equivalent rule.
Test work by CAA during validation of various US aircraft identified a problem that for a go-around on a twin-engine airplane with an engine failure at decision height, and with the remaining engine being accelerated from flight idle, could cause a loss of height greater than that available, resulting in ground impact. This was considered to be due to the need to accelerate to a speed considerably in excess of the approach speed, as permitted by 25.121(d), but with this speed not necessarily being stated in the procedures. The above could mean either the aircraft could hit the ground or that there was a protracted low altitude acceleration to achieve the scheduled gradient, neither result being satisfactory. Consequently CAA introduced a new approach climb limit weight of 2.5% gradient, irrespective of the number of engines, 2.5% being the PANS-OPS obstacle identification value. The above position has been essentially read across to JAR-AWO and JAR-OPS 1.

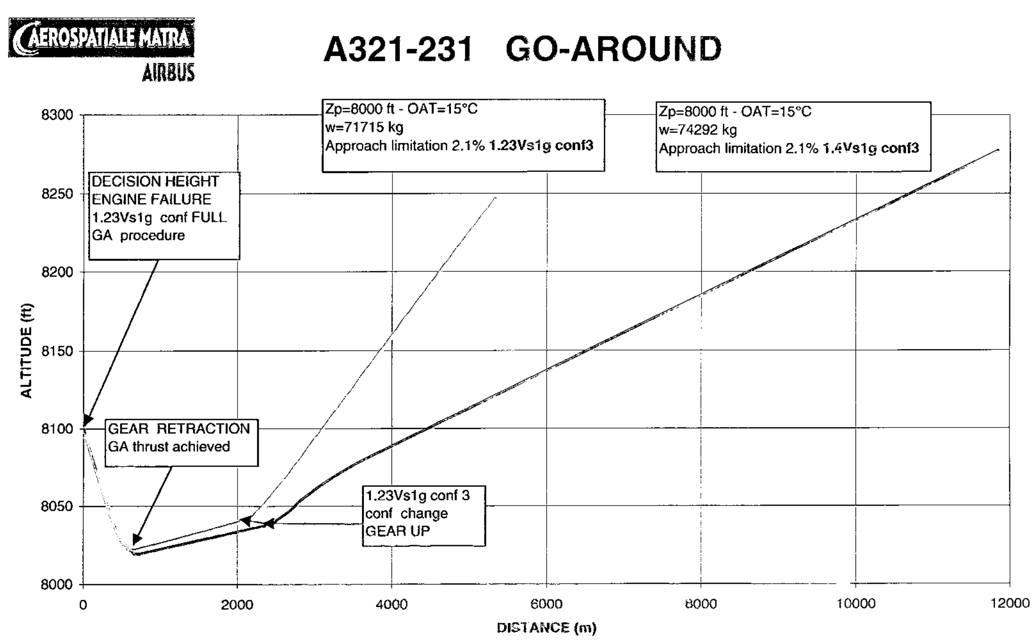
4) Recommendations.

It is recommended that additional guidance is developed for incorporation in the AC 25-7A, "Flight Test Guide for Certification of Transport Category Airplanes," which would be intended to emphasize the need to ensure that the speeds and flap configuration assumed in the scheduling of approach climb weight limits to comply with the minimum climb gradient requirements of JAR/FAR 25.121(d) need to reflect those arising from the recommended go-around procedures. It is also recommended that the speed range permitted to show compliance with FAR/JAR 25.121(d) is revised to avoid protracted exposure to flight at very low altitude covering appreciable distances until the point at which the minimum climb gradient in JAR/FAR 25.121(d) is achieved. In addition JAA should consider deletion of JAR-AWO 243 in parallel with strengthening the compliance methodology relating to JAR/FAR 25.121(d).

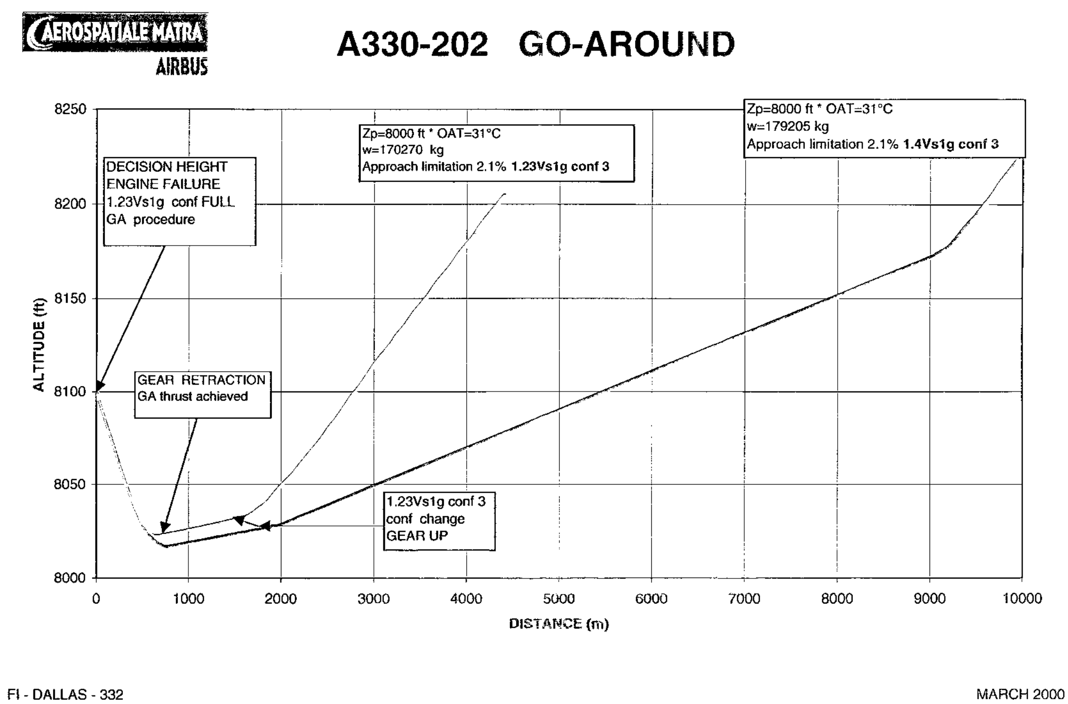
19. – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes.

Attachment 1 to PERF HWG Report 11



Attachment 1 to PERF HWG Report 11



Attachment 2 to PERF HWG Report 11

Normal Landing and Go-Around
Flap Configuration and Airspeed

Model	Landing Flap	G/A Flap	G/A Airspeed	Flap Retraction Time-sec	AFM Approach Climb Flap	AFM Airspeed	Flap Retraction Time-sec
777-200/300	30	20	Vref30 + 5	21	20	1.4 Vs1g	
	25	20	Vref25 + 5	14	20	1.4 Vs1g	
767-200/300	30	20	Vref30 + 5	9/10	15	1.4 Vs1g	12/13
	25	20	Vref25 + 5	12/13	5	1.4Vs1g	16/14
757-200	30	20	Vref30 + 5	9	20	1.5 Vs	
	25	20	Vref25 + 5	5	15	1.5 Vs	8
757-300	30	20	Vref30 + 5	9	20	1.4 Vs1g	
	25	20	Vref25 + 5	5	20	1.4 Vs1g	
747-400	30	20	Vref30 + 5	6	20	1.4 Vs1g	
	25	20	Vref25 + 5	3	20	1.4 Vs1g	
747-200	30	20	Vref 30+ 10	6	20	1.5 Vs	
	25	20	Vref30+ 15	3	20	1.5 Vs	
737-6/7/8	40	15	Vref40	12	15	1.4 Vs1g	
	30	15	Vref30	8	15	1.4 Vs1g	
	15	15	Vref15 + 5	0	1	1.4 Vs1g	18
737-3/4/5	40	15	Vref40	9	15	1.4 vs1g	
	30	15	Vref30	5	10	1.4 Vs1g	11
	15	15	Vref 5 + 5	0	1	1.4 Vs1g	29
737-200Adv	40	15	Vref40	6	10	1.5 Vs	8
	30	15	Vref30	3	10	1.5 Vs	5
	15	15	Vref15 + 5	0	2	1.5 Vs	12
727-200	40	25	Vref40	6	25	1.5 Vs	
	30	25	Vref40 + 4	2	15	1.5 Vs	5

Paul Schmid
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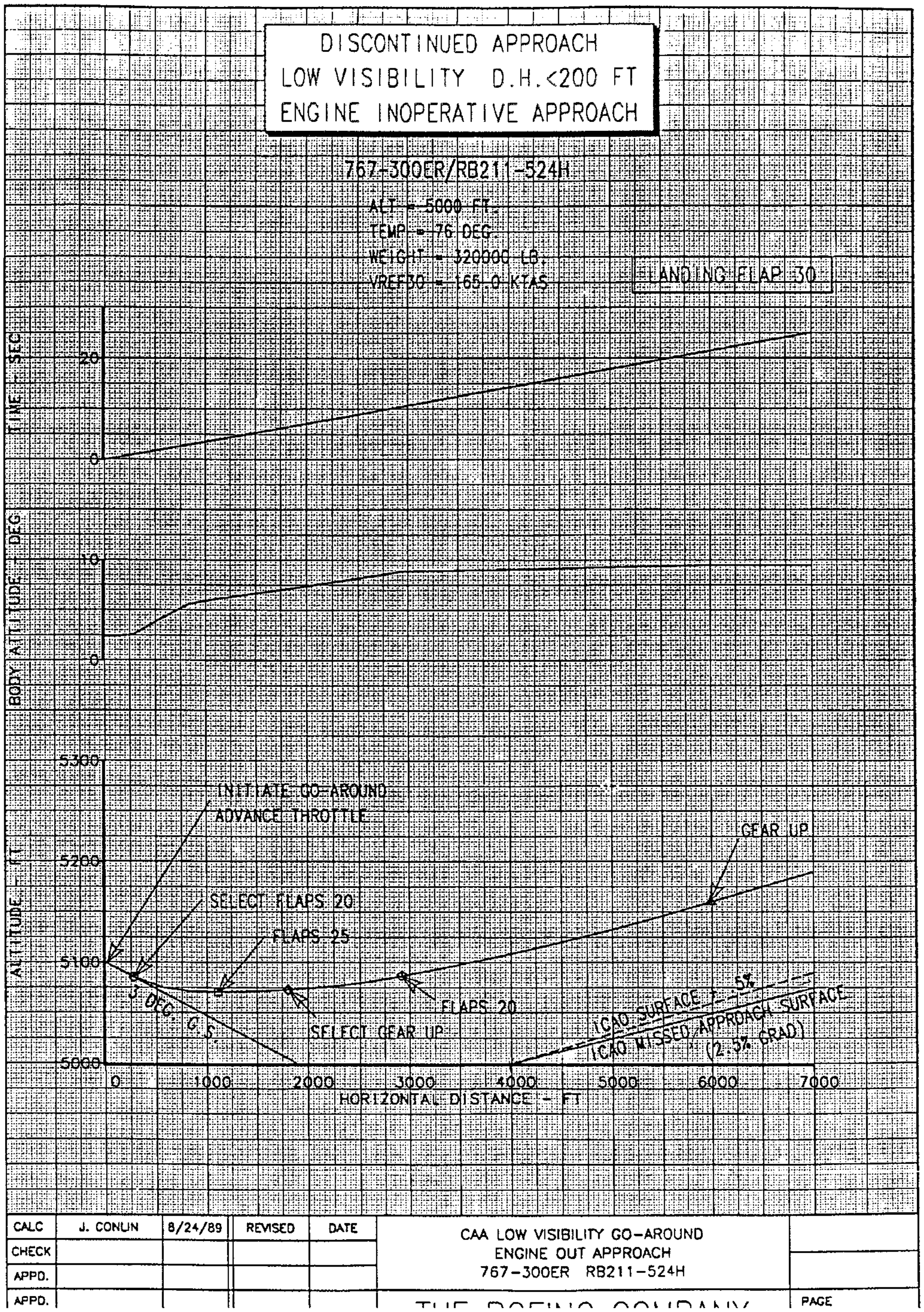
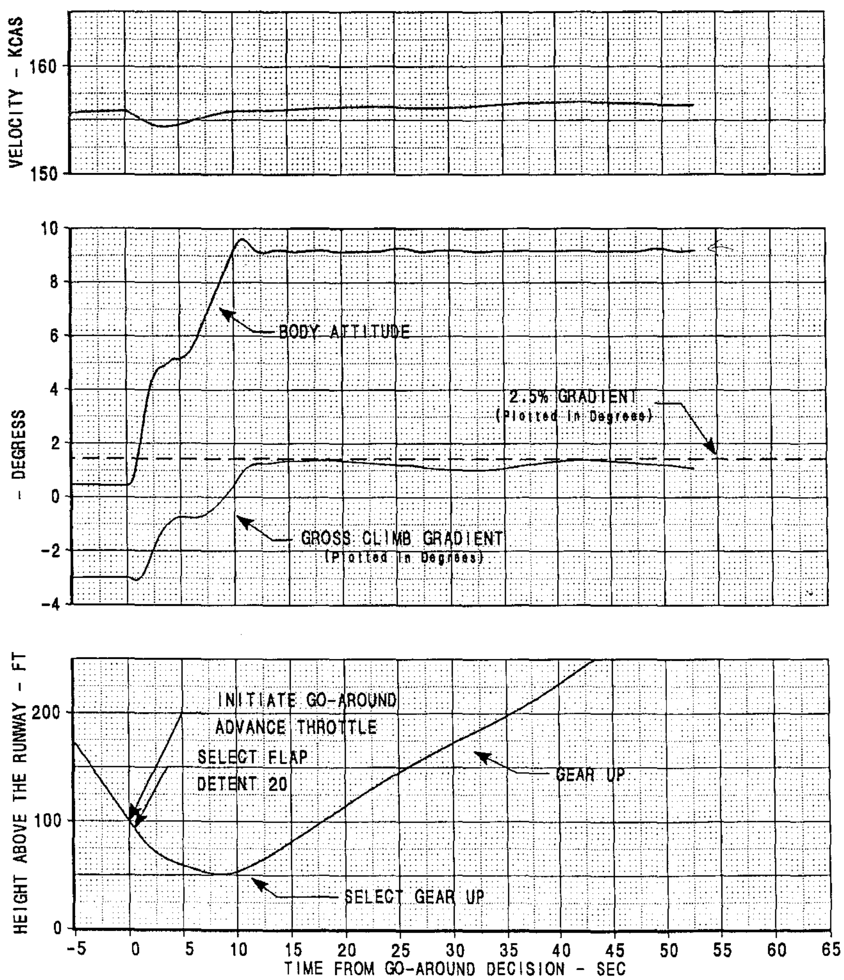

DISCONTINUED APPROACH
LOW VISIBILITY D.H.<200 FT
ENGINE INOPERATIVE APPROACH
767-300ER/RB211-524H
ALT = 5000 FT.
TEMP = 76 DEG.
WEIGHT = 320000 LB.
VREF30 = 165.0 KTAS
LANDING FLAP 30
TIME - SEC
BODY ATTITUDE - DEG
ALTITUDE - FT
INITIATE GO-AROUND
ADVANCE THROTTLE
SELECT FLAPS 20
FLAPS 25
GEAR UP
FLAPS 20
SELECT GEAR UP
3 DEG. G.S.
ICAO SURFACE + .5%
ICAO MISSED APPROACH SURFACE
(2.5% GRAD)
HORIZONTAL DISTANCE - FT
CALC
J. CONLIN
8/24/89
REVISED
DATE
CHECK
APPD.
APPD.
CAA LOW VISIBILITY GO-AROUND
ENGINE OUT APPROACH
767-300ER RB211-524H
PAGE

BOEING

777-300 One Engine Inoperative Go-Around Capability
Pratt & Whitney PW4090 Engines
Sea Level Pressure Altitude

- 524,000 LB Landing Weight (MLW)
- Sea Level Pressure Altitude
- ISA+31.4° C Airport Temperature
- $V_{ref_{30}}$+5 Approach Speed (156 KEAS)
- Forward Limit CG (8.5% MAC)
- 3° Approach Glideslope
- 100 Ft Decision Height
- Engine Failure at 100 Feet
- Landing Flap Detent 30
- Go-Around Flap Detent 20



Altitude Loss (Feet) – Automatic Go-around

Flight Test Demonstrated

G/A Initiation Feet	737-6/7/800	747-400	757-2/300	767-2/300	777-2/300
100 to 70	26	40			
100 to 50				39	27
100 to 40			40		
60	21	35			
50	20	30			
40	18	24		29	22
30	11	19	28	23	20
20	3	12	18	15	10
10	2.5	6	9	9	5
5			5	5	

Reference: Airplane Flight Manual

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(LIX.) Report from the Airplane Performance Harmonization Working Group

Issue: Miscellaneous Amendments to the Landing Limitations

(LX.) Rule Section: FAR 121.195, 121.197, 135.385, 135.387, JAR-OPS 1.510, 1.515, 1.520

1 - What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

The landing limitations ensure that the airplane is taken off at a weight that would allow either a safe landing or a safe go-around at both the destination and alternate airports. The landing limitations take into account the conditions at the destination and alternate airports, and must allow for differences between the conditions existing or forecast at the time of takeoff and the conditions at the time of landing.

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

<u>Current FAR text</u>:

A. Part 121

§ 121.195 Airplanes: Turbine engine powered: Landing limitations: Destination airports.

(a)No person operating a turbine engine powered airplane may take off that airplane at such a weight that (allowing for normal consumption of fuel and oil in flight to the destination or alternate airport) the weight of the airplane on arrival would exceed the landing weight set forth in the Airplane Flight Manual for the elevation of the destination or alternate airport and the ambient temperature anticipated at the time of landing.

(b)Except as provided in paragraph (c), (d), or (e) of this section, no person operating a turbine engine powered airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight (in accordance with the landing distance set forth in the Airplane Flight Manual for the elevation of the destination airport and the wind conditions anticipated there at the time of landing), would allow a full stop landing at the intended destination airport within 60 percent of the effective length of each runway described below from a point 50 feet above the intersection of the obstruction clearance plane and the runway. For the purpose of determining the allowable landing weight at the destination airport the following is assumed:

(1) The airplane is landed on the most favorable runway and in the most favorable direction, in still air.

(2) The airplane is landed on the most suitable runway considering the probable wind velocity and direction and the ground handling characteristics

of the airplane, and considering other conditions such as landing aids and terrain.

(c) A turbopropeller powered airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section, may be taken off if an alternate airport is specified that meets all the requirements of this section except that the airplane can accomplish a full stop landing within 70 percent of the effective length of the runway.

(d) Unless, based on a showing of actual operating landing techniques on wet runways, a shorter landing distance (but never less than that required by paragraph (b) of this section) has been approved for a specific type and model airplane and included in the Airplane Flight Manual, no person may takeoff a turbojet powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may be wet or slippery at the estimated time of arrival unless the effective runway length at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.

(e) A turbojet powered airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section may be taken off if an alternate airport is specified that meets all the requirements of paragraph (b) of this section.

§ 121.197 Airplanes: Turbine engine powered: Landing limitations: Alternate airports.

No person may list an airport as an alternate airport in a dispatch or flight release for a turbine engine powered airplane unless (based on the assumptions in § 121.195 (b)) that airplane at the weight anticipated at the time of arrival can be brought to a full stop landing within 70 percent of the effective length of the runway for turbopropeller powered airplanes and 60 percent of the effective length of the runway for turbojet powered airplanes, from a point 50 feet above the intersection of the obstruction clearance plane and the runway. In the case of an alternate airport for departure, as provided in § 121.617, allowance may be made for fuel jettisoning in addition to normal consumption of fuel and oil when determining the weight anticipated at the time of arrival.

B. Part 135

§ 135.385 Airplanes: Large transport category airplanes: Turbine engine powered: Landing limitations: Destination airports.

(a)No person operating a turbine engine powered large transport category airplane may take off that airplane at such a weight that (allowing for normal consumption of fuel and oil in flight to the destination or alternate airport) the weight of the airplane on arrival would exceed the landing weight set forth in the Airplane Flight Manual for the elevation of the destination or alternate airport and the ambient temperature anticipated at the time of landing.

(b)Except as provided in paragraph (c), (d), or (e) of this section, no person operating a turbine engine powered large transport category airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight (in accordance with the landing distance set forth in the Airplane Flight Manual for the elevation of the destination airport and the wind conditions anticipated there at the time of landing), would allow a full stop landing at the intended destination airport within 60 percent of the effective length of each runway described below from a point 50 feet above the intersection of the obstruction clearance plane and the runway. For the purpose of determining the allowable landing weight at the destination airport the following is assumed:

(1) The airplane is landed on the most favorable runway and in the most favorable direction, in still air.

(2) The airplane is landed on the most suitable runway considering the probable wind velocity and direction and the ground handling characteristics of the airplane, and considering other conditions such as landing aids and terrain.

(c) A turbopropeller powered airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section, may be taken off if an alternate airport is specified that meets all the requirements of this section except that the airplane can accomplish a full stop landing within 70 percent of the effective length of the runway.

(d) Unless, based on a showing of actual operating landing techniques on wet runways, a shorter landing distance (but never less than that required by paragraph (b) of this section) has been approved for a specific type and model airplane and included in the Airplane Flight Manual, no person may takeoff a turbojet powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may be wet or slippery at the estimated time of arrival unless the effective runway length at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.

(e) A turbojet powered airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section may be taken off if an alternate airport is specified that meets all the requirements of paragraph (b) of this section.

§ 135.387 Airplanes: Large transport category airplanes: Turbine engine powered: Landing limitations: Alternate airports.

No person may select an airport as an alternate airport for a turbine engine powered large transport category airplane unless (based on the assumptions in § 135.385 (b)) that airplane, at the weight anticipated at the time of arrival, can be brought to a full stop landing within 70 percent of the effective length of the runway for turbopropeller-powered airplanes and 60 percent of the effective length of the runway for turbojet powered airplanes, from a point 50 feet above the intersection of the obstruction clearance plane and the runway.

Current JAR text:

JAR-OPS 1.510 Landing – Destination and Alternate Aerodromes (See AMC OPS 1.510 and 1.515)

(a) An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) does not exceed the maximum landing mass specified for the altitude and the ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome.

(b)For instrument approaches with decision heights below 200 ft, an operator must verify that the approach mass of the aeroplane, taking into account the take-off mass and the fuel expected to be consumed in flight, allows a missed approach gradient of climb, with the critical engine failed and with the speed and configuration used for go-around of at least 2.5%, or the published gradient, whichever is the greater. The use of an alternative method must be approved by the Authority. (See IEM OPS 1.510(b).).

JAR-OPS 1.515 Landing – Dry Runways (See AMC OPS 1.510 and 1.515)

(a)An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) for the estimated time of landing at the destination aerodrome and at any alternate aerodrome allows a full stop landing from 50 ft above the threshold:

(1) For turbo-jet powered aeroplanes, within 60% of the landing distance available; or

(2) For turbo-propeller powered aeroplanes, within 70% of the landing distance available.

(3) For Steep Approach procedures the Authority may approve the use of landing distance data factored in accordance with subparagraphs (a)(1) and (a)(2) above as appropriate, based on a screen height of less than 50 ft, but not less than 35 ft. (See Appendix 1 to JAR-OPS 1.515(a)(3).).

(4) When showing compliance with sub-paragraphs (a)(1) and (a)(2) above, the Authority may exceptionally approve, when satisfied that there is a need (see Appendix 1), the use of Short Landing Operations in accordance with Appendices 1 and 2 together with any other supplementary conditions that the Authority considers necessary in order to ensure an acceptable level of safety in the particular case.

(b)When showing compliance with subparagraph (a) above, an operator must take account of the following:

(1)The altitude at the aerodrome.

(2)Not more than 50% of the head-wind component or not less than 150% of the tailwind component; and

(3)The runway slope in the direction of landing if greater than +/-2%.

(c)When showing compliance with subparagraph (a) above, it must be assumed that:

(1)The aeroplane will land on the most favourable runway, in still air; and

(2)The aeroplane will land on the runway most likely to be assigned considering the probable wind speed and direction and the ground handling characteristics of the aeroplane, and considering other conditions such as landing aids and terrain. (See IEM OPS 1.515(c).).

(d)If an operator is unable to comply with sub-paragraph (c)(1) above for a destination aerodrome having a single runway where a landing depends upon a specified wind component, an aeroplane may be dispatched if 2 alternate aerodromes are designated which permit full compliance with sub-paragraphs (a), (b) and (c). Before commencing an approach to land at the destination aerodrome the commander must satisfy himself that a landing can be made in full compliance with JAR-OPS 1.510 and subparagraphs (a) and (b) above.

(e)If an operator is unable to comply with sub-paragraph (c)(2) above for the destination aerodrome, the aeroplane may be dispatched if an alternate aerodrome is designated which permits full compliance with sub-paragraphs (a),

(b) and (c).

JAR-OPS 1.520 Landing – Wet and Contaminated Runways

(a)An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be wet, the landing distance available is at least 115% of the required landing distance, determined in accordance with JAR-OPS 1.515.

(b)An operator shall ensure that when the appropriate weather reports or forecasts, or combination thereof, indicate that the runway at the estimated time of arrival may be contaminated, the landing distance available must be at least the landing distance determined in accordance with sub-paragraph (a) above, or at least 115% of the landing distance determined in accordance with approved contaminated landing distance data or equivalent, accepted by the Authority, whichever is greater.

(c)A landing distance on a wet runway shorter than that required by sub-paragraph (a) above, but not less than that required by JAR-OPS 1.515(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on wet runways.

(d)A landing distance on a specially prepared contaminated runway shorter than that required by sub-paragraph (b) above, but not less than that required by JAR-OPS 1.515(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on contaminated runways.

(e)When showing compliance with sub-paragraphs (b), (c) and (d) above, the criteria of JAR-OPS 1.515 shall be applied accordingly, except that JAR-OPS 1.515(a)(1) and (2) shall not be applied to sub-paragraph (b) above.

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

[Note: The differences in landing distance margins required for turbopropeller engine airplanes between the FAR and JAR are addressed in Working Group Report 13 and will not be discussed here. Similarly, the differences in the manner in which go-around capability and obstacle clearance are addressed are discussed in Report 11, and differences pertaining to steep approach and short landing issues are discussed in Reports 14 and 15, respectively. Working group recommendations associated with contaminated runway landing limitations and the capability to use a wet runway landing distance shorter than 115 percent of the dry runway landing distance, as allowed by §§ 121.195(d), 135.385(d), and JAR-OPS 1.520(c), are located in Report 16.]

In FAR Parts 121 and 135, the limitations associated with landing distance reference the effective length of the runway from a point 50 feet above the intersection of the obstruction clearance plane and the runway. The terms “effective length of the runway” and “obstruction clearance plane” are defined in §§ 121.171 and 135.361. The JAR-OPS landing distance limitations are relative to the landing distance available from a height of 50 feet above the threshold, with JAR-OPS 1.480(a)(5) providing a definition for the term “landing distance available.” Despite these wording differences, the intent of the two standards is the same, and the wording differences have not resulted in any known differences in application.

JAR-OPS 1.515(b)(3) has an additional requirement, not included in the FAR, to consider runway slope in the direction of landing if it is greater than 2% uphill or downhill.

The JAR standards reference the altitude at the aerodrome where this is necessary for determining the associated landing limitation, while the corresponding FAR's reference the elevation of the airport. This difference would not usually result in large differences in the resulting landing limitations, but could be important when the pressure altitude of the airport differs significantly from its elevation. The JAR standard allows the pressure altitude to be used, whereas the FAR does not.

In JAR-OPS, the landing limitations applicable to wet and slippery runways apply to both destination and alternate airports. In Parts 121 and 135, these limitations apply only to the destination airport. The JAR standard is more stringent and provides a higher level of safety for landings on wet and slippery runways at alternate airports. It may result in fewer alternate airports being available for a given flight, but it is not likely to result in a significant cost impact. Operators are not likely to reduce payload as a result of this difference unless there are few suitable alternate airports available for a particular flight.

JAR-OPS 1.515(d) allows an airplane to be dispatched that would be unable to show compliance with the landing distance requirements for the most favorable runway in still air if the destination airport has only one runway where a specified wind component must exist to allow a landing to be made. In such a case, there must be two alternate airports for which full compliance can be shown with JAR-OPS 1.515(a), (b), and (c), and the pilot-in-command must be satisfied, before commencing an approach to land, that a landing can be made in full compliance with JAR-OPS 1.510 and 1.515 (a) and (b). There is no corresponding FAR requirement. Because of the JAR standard only applies to a rare and unique set of circumstances, this difference between the FAR and JAR standards is not expected to result in any significant harmonization concerns. Since the FAA can already address such special circumstances through the authority granted by § 12.173(f), the working group agreed that there is no need to harmonize this requirement.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

Although the FAR does not contain an explicit requirement relating to operations on runways with slopes exceeding 2 percent, the FAA has generally required operators to obtain special approvals for such operations. Advisory Circular (AC) 25-7A (Flight Test Guide for Certification of Transport Category Airplanes) provides specific information on gaining approval for operation on runways with slopes exceeding 2%, including specific testing and analysis validation for the effects of higher slopes. The pertinent section of AC 25-7A is attached at the end of this report.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The proposed action is to harmonize the landing limitations to the maximum extent practicable, especially where the differences in the standards lead to competitive disparities between FAR and JAR operators over common routes. A description of each proposed change follows the proposed regulatory text.

For each proposed change from the existing standard, answer the following questions:

6 - What should the harmonized standard be? [Insert the proposed text of the harmonized standard here]

The proposed amended FAR Parts 121, 135, and JAR-OPS 1 standards are shown below.

(LXI.) FAR Part 121

§ 121.195 Airplanes: Turbine engine powered: Landing limitations: Destination airports.

(a) No person operating a turbine engine powered airplane may take off that airplane at such a weight that (allowing for normal consumption of fuel and oil in flight) the weight of the airplane on arrival would exceed the landing weight set forth in the Airplane Flight Manual for the pressure altitude of the destination airport and the ambient temperature anticipated at the time of landing. When the pressure altitude at the anticipated time of arrival cannot be determined from weather forecasts or reports, the elevation of the airport shall be used.

(b) Except as provided in paragraph (d) of this section, no person operating a turbine engine powered airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight, would allow a full stop landing in accordance with the landing distance set forth in the Airplane Flight Manual at the intended destination airport within 60 percent of the landing distance available described below from a point 50 feet above the landing threshold. For the purpose of determining the allowable landing weight, the following is assumed:

(1) The airplane is landed on the most favorable runway and in the most favorable direction, in still air; and

(2) The airplane is landed on the runway most likely to be used considering the probable wind velocity and direction and the ground handling characteristics of the airplane, and considering other conditions such as landing aids and terrain.

(c) For the purposes of showing compliance with paragraph (b) of this section, the following conditions must be taken into account:

(1) The pressure altitude of the airport, or, if the pressure altitude at the anticipated time of arrival cannot be determined from weather forecasts or reports, the elevation of the airport;

(2) Not more than 50 percent of the headwind component or not less than 150 percent of the tailwind component; and

(3) The runway slope in the direction of landing if greater than 2 percent uphill or downhill.

(d) An airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section, may be taken off if an alternate airport is specified that meets all of the requirements of this section.

(e)No person may take off a turbine engine powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may not be dry at the estimated time of arrival unless the landing distance available at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.

(f)A landing distance on a wet runway with a landing distance available shorter than that required by paragraph (e) of this section, but not less than that required by paragraph (b) of this section, may be used if a shorter wet runway landing distance has been approved for a specific type and model airplane and included in the Airplane Flight Manual.

§ 121.197 Airplanes: Turbine engine powered: Landing limitations: Alternate airports.

(LXII.)

(a)No person may list an airport as an alternate airport in a dispatch or flight release for a turbine engine powered airplane unless the requirements of § 121.195 are met at the alternate airport.

(b)In the case of an alternate airport for departure, as provided in § 121.617, allowance may be made for fuel jettisoning in addition to normal consumption of fuel and oil when determining the weight anticipated at the time of arrival.

(LXIII.)FAR Part 135

§ 135.385 Airplanes: Large transport category airplanes: Turbine engine powered: Landing limitations: Destination airports.

(a)No person operating a turbine engine powered large transport category airplane may take off that airplane at such a weight that (allowing for normal consumption of fuel and oil in flight) the weight of the airplane on arrival would exceed the landing weight set forth in the Airplane Flight Manual for the pressure altitude of the destination airport and the ambient temperature anticipated at the time of landing. When the pressure altitude at the anticipated time of arrival cannot be determined from weather forecasts or reports, the elevation of the airport shall be used.

(b)Except as provided in paragraph (d) of this section, no person operating a turbine engine powered large transport category airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight, would allow a full stop landing in accordance with the landing distance set forth in the Airplane Flight Manual at the intended destination airport within 60 percent of the landing distance available described below from a point 50 feet above the landing threshold. For the purpose of determining the allowable landing weight, the following is assumed:

(1) The airplane is landed on the most favorable runway and in the most favorable direction, in still air; and

(2) The airplane is landed on the runway most likely to be used considering the probable wind velocity and direction and the ground handling characteristics of the airplane, and considering other conditions such as

landing aids and terrain.

(c)For the purposes of showing compliance with paragraph (b) of this section, the following conditions must be taken into account:

(1) The pressure altitude of the airport, or, if the pressure altitude at the anticipated time of arrival cannot be determined from weather forecasts or reports, the elevation of the airport;

(2) Not more than 50 percent of the headwind component or not less than 150 percent of the tailwind component; and

(3) The runway slope in the direction of landing if greater than 2 percent uphill or downhill.

(d)An airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section, may be taken off if an alternate airport is specified that meets all of the requirements of this section.

(e)No person may take off a turbine engine powered large transport category airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may not be dry at the estimated time of arrival unless the landing distance available at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.

(f)A landing distance on a wet runway with a landing distance available shorter than that required by paragraph (e) of this section, but not less than that required by paragraph (b) of this section, may be used if a shorter wet runway landing distance has been approved for a specific type and model airplane and included in the Airplane Flight Manual.

§ 135.387 Airplanes: Large transport category airplanes: Turbine engine powered: Landing limitations: Alternate airports.

(LXIV.)

No person may select an airport as an alternate airport for a turbine engine powered large transport category airplane unless the requirements of § 135.385 are met at the alternate airport.

JAR-OPS 1

JAR-OPS 1.510 Landing – Destination and Alternate Aerodromes

An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) does not exceed the maximum landing mass specified for:

(a)The pressure altitude and the ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome. When the pressure altitude at the anticipated time of arrival cannot be determined from weather forecasts or reports, the elevation of the destination or alternate airport shall be used.

(b)For all instrument approaches, an operator must verify that the landing mass of the aeroplane, taking into account the take-off mass and the fuel expected to be consumed in flight, allows a gradient of climb of at least 2.5%, or the published gradient, whichever is the greater, with the critical engine failed at a speed established in accordance with approved procedures but not exceeding V_{REF} + 10 kts, and in a configuration in which the stall speed does not exceed 110% of the stall speed in the related landing configuration used to show compliance with JAR-OPS 1.515 and 1.520 as appropriate. The use of an alternative method must be approved by the Authority. (See IEM OPS 1.510(b).).

JAR-OPS 1.515 Landing – Dry Runways (See AMC OPS 1.510 and 1.515)

(a)An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) for the estimated time of landing at the destination aerodrome and at any alternate aerodrome allows a full stop landing from 50 ft above the landing threshold:

(1)For turbo-jet powered aeroplanes, within 60% of the landing distance available; or

(2)For turbo-propeller powered aeroplanes, within 70% of the landing distance available.

(3)For Steep Approach procedures the Authority may approve the use of landing distance data factored in accordance with subparagraphs (a)(1) and (a)(2) above as appropriate, based on a screen height of less than 50 ft, but not less than 35 ft. (See Appendix 1 to JAR-OPS 1.515(a)(3).).

(4)When showing compliance with subparagraphs (a) (1) and (a)(2) above, the Authority may exceptionally approve, when satisfied that there is a need (see Appendix 1), the use of Short Landing Operations in accordance with Appendices 1 and 2 together with any other supplementary conditions that the Authority considers necessary in order to ensure an acceptable level of safety in the particular case.

(b)When showing compliance with subparagraph (a) above, an operator must take account of the following:

(1)The pressure altitude at the aerodrome, or, if the pressure altitude at the anticipated time of arrival cannot be determined from weather forecasts or reports, the elevation of the aerodrome.

(2)Not more than 50% of the head-wind component or not less than 150% of the tailwind component; and

(3)The runway slope in the direction of landing if greater than +/- 2%.

(c)When showing compliance with JAR-OPS 1.510 and subparagraph (a) above, it must be assumed that:

(1)The aeroplane will land on the most favourable runway, in still air; and

(2)The aeroplane will land on the runway most likely to be used considering the probable wind speed and direction and the ground handling characteristics of the aeroplane, and considering other conditions such as landing aids and terrain. (See IEM OPS 1.515(c).).

(d)If an operator is unable to comply with subparagraph (c)(1) above for a destination aerodrome having a single runway where a landing depends upon a specified wind component, an aeroplane may be dispatched if 2 alternate aerodromes are designated which permit full compliance with subparagraphs (a), (b) and (c). Before commencing an approach to land at the destination aerodrome the commander must satisfy himself that a landing can be made in full compliance with JAR-OPS 1.510 and subparagraphs (a) and (b) above.

(e)If an operator is unable to comply with subparagraphs (c)(2) above for the destination aerodrome, the aeroplane may be dispatched if an alternate aerodrome is designated which permits full compliance with subparagraphs (a), (b) and (c).

JAR-OPS 1.520 Landing – Wet and Contaminated Runways

(a)An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be wet or contaminated, the landing distance available is at least 115% of the required landing distance, determined in accordance with JAR-OPS 1.515.

(b)A landing distance on a wet or specially prepared runway shorter than that required by subparagraph (a) above, but not less than that required by JAR-OPS 1.515(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on wet runways.

Summary of Proposed Changes:

[Note: See Working Group Report 13 for a discussion of the proposed changes to remove the differences between the treatment of turbojet and turbopropeller powered airplanes for the landing distance margin required at the alternate airport and the requirement to account for non-dry runways. Although these proposed changes are included in the proposed regulatory text in this working paper, they are discussed in Working Group Report 13. Similarly, working group recommendations associated with go-around capability and obstacle clearance will be addressed in Report 11 and those associated with steep approach, short landing issues are addressed in Reports 14 and 15, respectively. Working group recommendations associated with contaminated runway landing limitations and the capability to use a wet runway landing distance shorter than 115 percent of the dry runway landing distance, as allowed by §§ 121.195(d), 135.385(d), and JAR-OPS 1.520(c), are located in Report 16.]

(11) Amend §§ 121.195(b) and 135.385(b) to replace the terms “effective length of the runway” and “intersection of the obstruction clearance plane with the runway” with “landing distance available” and “landing threshold,” respectively. This change would harmonize the text of the FAR and JAR relative to the terms used to define the available landing distance and better reflect current practice. This change would not change the stringency of the standards, is consistent with current practice, and would not have any effect on the level of safety.

The newly introduced term, “landing distance available,” would be defined in §§ 121.173(i)(2) and 135.363(i)(2) (see Working Group Report 1 for the complete text of §§ 121.173 and 135.363) as “the length of the runway that is declared available for the ground run of an airplane landing.” It is equivalent in intent to “effective length of the runway,” the term it would replace.

The term “landing threshold” would replace the phrase, “intersection of the obstruction clearance plane and the runway.” Not only would this change harmonize the standards, but it would also recognize that declared distances and the siting of thresholds for takeoff or landing (i.e., the beginning of the runway available for takeoff or landing) are determined not by the airplane operator, but by the airport operator, and then accepted by the regulatory authority. In addition, the siting of the landing threshold may be dictated by reasons other than obstacle considerations, which would not be adequately addressed by the current wording.

Airplane operators do not normally make independent assessments of the obstruction clearance plane to determine the beginning of the effective runway length for landing (i.e., the landing distance available). They depend on the declared distances provided on airport charts or provided in airport Notices To Airmen (NOTAMs). Standards and recommendations relative to airport layout, including the declaration of distances referenced in the takeoff and landing limitations and the siting of runway thresholds, are provided in Advisory Circular (AC) 150/5300-13, “Airport Design.” The standards provided in that AC relative to the siting of the landing threshold are based on the same criteria as the use of the obstruction clearance plane in the current Part 121/135 landing limitations. Therefore, the proposed change in terminology would not affect the distances used to show compliance with the landing limitations. Also, the definition and usage of the terms in the proposed standard are consistent with those used in AC 150/5300-13.

(2) Amend JAR_OPS 1.515(a) by adding the word "landing" in front of the term "threshold." This amendment would clarify, in the case of different thresholds for takeoff and landing, that it is the landing threshold that is relevant for showing compliance to this requirement.

(3) Amend §§ 121.195(a) and 135.385(a) to reference the pressure altitude of the airport instead of the elevation of the airport. Sections 121.195(a) and 135.385(a) would be further revised to state that if the pressure altitude cannot be determined from weather forecasts or reports, the elevation of the airport shall be used. The use of pressure altitude, when available, instead of elevation, is consistent with changes being proposed throughout this subpart. It reflects the practice that the determination of takeoff and landing weights are normally done on the basis of pressure altitude, and that Airplane Flight Manual performance information is provided as a function of pressure altitude.

(4) Amend JAR-OPS 1.510(a) to reference the pressure altitude of the aerodrome instead of the altitude of the aerodrome. JAR-OPS 1.510(a) would be further revised to state that if the pressure altitude cannot be determined from weather forecasts or reports, the elevation of the airport shall be used. This change would clarify that the pressure altitude must be used unless it is not available. This change would harmonize the proposed JAR standard with the proposed FAR standard in this respect.

(5) Amend §§ 121.195(b) and 135.385(b) to list the conditions under which the Airplane Flight Manual landing weight must be determined in new §§ 121.195(c) and 135.385(c), respectively. This change is editorial in nature, simplifying the text and better aligning it with the format adopted for JAR-OPS 1. Specifically, the references to elevation and wind conditions at the airport in the parenthetical expression in the current §§ 121.195(b) and 135.385(b) would be moved to a new §§ 121.195(c) and 135.385(c), respectively. In addition, the remaining words in the parenthetical expression, "in accordance with the landing distance set forth in the Airplane Flight Manual," would be shifted to a position further on in the same sentence (without the parentheses) for editorial reasons.

The new §§ 121.195(c) and 135.385(c) would state that for the purpose of showing compliance with paragraph (b) of the corresponding section, the following conditions must be taken into account. Sections 121.195(c)(1) and 135.385(c)(1) would list the pressure altitude of the airport, or if the pressure altitude cannot be determined from weather forecasts or reports, the elevation of the airport. The use of pressure altitude, when available, instead of elevation, is consistent with changes being proposed throughout this subpart. It reflects the practice that the determination of takeoff and landing weights are normally done on the basis of pressure altitude, and that Airplane Flight Manual performance information is provided as a function of pressure altitude.

Sections 121.195(c)(2) and 135.385(c)(2) would list the wind conditions and would further require that not more than 50 percent of the headwinds nor less than 150 percent of the tailwinds may be taken into account. This factoring of the headwind and tailwind components is currently required for transport category airplanes by the part 25 airworthiness requirements, but the working group proposes to make it applicable to any airplane operated under these part 121 and 135 operating rules.

(3) Add a new §§ 121.195(c)(3) and 135.385(c)(3) to require landing distance accountability for runway slopes greater than 2 percent uphill or downhill. This proposed change would harmonize the FAR standard with the JAR standard in the treatment of slope accountability for landing distance. It would also codify existing FAA practice with respect to special operational approvals for the use of such runways. Existing FAA policy, contained in Advisory Circular (AC) 25-7A, "Flight Test Guide for Certification of Transport Category Airplanes," is provided as an attachment to this report. In addition to the policy guidance provided in that AC, it is not intended to allow performance credit for the effects of uphill runway slopes greater than 2 percent in determining the ground run portion of the landing distance. In some cases, takeoff operations may be restricted to the downhill direction,

and landing operations may be restricted to the uphill direction.

(6) Amend §§ 121.197 and 135.387 to make the proposed landing limitations for destination airports equally applicable to alternate airports. The existing § 121.197 would be replaced by § 121.197(a) to state that the requirements of § 121.195 must be met at the alternate airport in order to list that airport as an alternate airport in the dispatch or flight release. The provision for allowing fuel jettison to be taken into account in the case of an alternate airport for departure in the existing § 121.197 would be retained, but moved to a new § 121.197(b). Similar to the proposal for § 121.197, § 135.387 would be revised to state that the requirements of § 135.385 must be met at the alternate airport before that airport can be selected as an alternate airport.

> This change would introduce accountability for non-dry runways to the landing limitations applicable to alternate airports. It would harmonize the FAR and JAR standards with respect to the limitations for turbojet airplanes on non-dry runways. From a safety standpoint, the applicable limitations at the alternate airport should not be less stringent than those that apply to the destination airport. At one time, there may have been concerns that applying these limitations to the alternate airport would severely limit the choice of alternate airports available, but this is no longer felt to be a concern that should override the safety considerations.

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

For the most part, the proposed standard continues to address the underlying safety issue in the same manner as the existing standards. In some areas, the proposed changes are intended to make the standard more consistent with current industry practice and FAA policy, as well as to harmonize with the JAR standard. The proposal to require accountability for non-dry runways at the alternate airports would address this safety issue on a consistent basis with how it is addressed at the destination airport.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

The proposed standard would increase the level of safety relative to the current FAR for operations involving turbojet airplanes where the runways are forecast to not be dry at the alternate airport and the airplane diverts to that alternate airport.
For operations on runways with a slope greater than 2 percent, the proposed standard would increase the safety margins by requiring accountability for the effects of the slope.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

The proposed standard would increase the level of safety relative to the current FAR for operations involving turbojet airplanes where the runways are forecast to not be dry at the alternate airport and the airplane diverts to that alternate airport. The other proposed changes are generally in line with current industry practice and would therefore maintain the same level of safety relative to current industry practice.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

No other options were considered.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Operators of transport category airplanes could be affected by the proposed change.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

None.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

Yes.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

Paragraph 2.2.3 if ICAO Annex 8 ("Airworthiness of Aircraft") requires performance data to be determined and scheduled for the landing surface gradients over the range for which the airplane is to be certificated. Paragraph 5.2.6 of ICAO Annex 6 ("Operation of Aircraft") requires taking into account the runway gradient when applying the landing distance standards of that Annex.

For runway slopes equal to or less than 2 percent, both the FAR and the JAR standards rely on the landing distance safety margins applied to the AFM landing distances when determining the operating limitations associated with landing distance. For runway slopes greater than 2 percent, the current JAR standard requires slope to be accounted for directly, in addition to the landing distance safety margins already required by the operating limitations. The current FAR does not specifically address runway slopes greater than 2 percent. Since the proposed standard for runway slope is the same as the current JAR standard, it will comply with the ICAO standards in the same manner as the current JAR standard.

The ICAO standards do not explicitly address the issue of landing limitations at alternate airports. Therefore, the proposed change to require non-dry runway accountability does not affect compliance with the ICAO standards. The remainder of the proposed standard continues to compare to the ICAO standard in the same manner as the current standard.

15 - Does the proposed standard affect other HWGs? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

The cost impact, if any, is expected to be negligible.

17 - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

N/A

18 - Does the HWG wish to answer any supplementary questions specific to this project?
[If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.

No.

19 – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes.

ATTACHMENT: AC 25-7A, Chapter 8, paragraph 230

230. RUNWAY GRADIENTS GREATER THAN ± 2 PERCENT.

a. Applicable Regulations. Sections 25.105, 25.115, 25.119, 25.121, 25.125, 25.1533 and 25.1587 of the Federal Aviation Regulations (FAR).

b. Explanation. The sections of Part 25 of the FAR, referenced above, require accounting for the effects of runway gradient. Typically, performance limitations and information are determined for runway gradients up to ±2 percent in the Airplane Flight Manual (AFM) expansion of test data. Though these gradient extremes are adequate for addressing the majority of runways, there are a number of airports frequented by transport category airplanes that have runway slopes greater than ±2 percent. Consequently, approvals have been granted for operations on runways with slopes exceeding ±2 percent with specific testing and analysis validation for the effects of the higher slopes. Additional concerns, beyond runway slope effect on acceleration and braking and proper accounting of elevations during obstacle clearance analysis, include takeoff flare from liftoff to 35 feet, minimum takeoff climb gradients, minimum approach and landing climb gradients, landing flare distances, and unique operating procedures.

c. Procedures.

(1) Takeoff Flare from Liftoff to 35 Feet. The AFM expansion of the takeoff data should account for the effect of the runway slope on the portion of the takeoff distance after liftoff. At climb performance-limiting thrust-to-weight ratios, the average gradient of climb will be on the order of 2.0 to 3.0 percent. On a downhill runway of sufficient magnitude, the airplane could attain a height of 35 feet above the runway and have a positive gradient of climb relative to it, but its flight path may continue to descend beyond that point. The transition from liftoff to climbing flight, in the sense of an ascending flight path, should be adequately addressed with respect to obstacle clearance analysis data.

(2) Minimum Takeoff Climb Gradients. At limiting thrust-to-weight ratios, the transition to free air (i.e., out of ground effect) takeoff climb could result in steep uphill runways rising faster than the airplane's ability to climb. The minimum second segment takeoff climb gradient should maintain the same margin, relative to the increased maximum uphill runway slope, that exists between the minimum gradient specified in § 25.121 and a two percent uphill runway.

(3) Minimum Approach and Landing Climb Gradients. Balked landing go-arounds, at climb limited landing weights, could also result in an uphill runway rising faster than the airplane's ability to climb. The minimum approach and landing climb gradients should maintain the same margins, relative to the increased maximum uphill runway slope, that exist between the minimum gradients specified in §§ 25.119 and 25.121 and a two percent uphill runway.

(4) Landing Technique and Distance. Final approaches to steep uphill runways will require early flare initiation, to avoid hard landings, and landing flare air distances will be increased for approaches to steep downhill runways using normal approach descent angles. The AFM operating procedures should describe any special piloting technique required for landing on steep runways. The AFM expansion of landing distances should account for the effect of runway gradient, including any expected increase in flare distances, from 50 feet to touchdown, for steep downhill runways.

(5) Operating Procedures. Operating procedures should be provided in the AFM for operations on runways with gradients greater than ± 2 percent. Guidance should be provided on takeoff rotation and landing flare techniques.

(6) Operational Considerations. For runway slopes greater than ± 3 percent,

the specific airport(s) should be investigated relative to runway lengths and surrounding terrain and obstacles. Airport-specific operating limitations may be necessary, such as: direction of takeoff and landing, takeoff flap restrictions, prohibition of overspeed takeoffs on downhill runways, requirement for the anti-skid system to be operative and on, and restrictions on engine bleed air and power extraction.

(7) Flight Test Requirements. For approval of certification data for runway slopes exceeding ± 3 percent, operational flight tests should be conducted to verify the proposed procedures and performance information.

Report from the Airplane Performance Harmonization Working Group

Issue: Turboprop Landing Distance Factor

Rule Section: FAR 121.195/197, FAR 135.385/387 / JAR-OPS 1.515

1 - What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

The FAR and the JAR landing limitations include safety margins for landing performance such that the landing distance determined in accordance with FAR/JAR 25.125 must be less than the runway length available by a specified amount. The amount is specified in terms of a percentage (less than 100%) of the full length of the available runway. That is, the aircraft must be able to perform a landing to a complete stop in less than the full length of the runway. This requirement provides a safety margin for variations in performance, runway surface, pilot technique, differences between conditions existing at the time of dispatch and the time of landing, etc. The greater the percentage applied, the closer the landing distance required gets to the runway length available. Therefore a larger percentage represents a smaller margin.

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

Current FAR text:

A. Part 121

FAR 121.195 Airplanes: Turbine engine powered: Landing limitations: Destination airports.

(c) No person operating a turbine engine powered airplane may take off that airplane at such a weight that (allowing for normal consumption of fuel and oil in flight to the destination or alternate airport) the weight of the airplane on arrival would exceed the landing weight set forth in the Airplane Flight Manual for the elevation of the destination or alternate airport and the ambient temperature anticipated at the time of landing.

(d) Except as provided in paragraph (c), (d), or (e) of this section, no person operating a turbine engine powered airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight (in accordance with the landing distance set forth in the Airplane Flight Manual for the elevation of the destination airport and the wind conditions anticipated there at the time of landing), would allow a full stop landing at the intended destination airport within 60 percent of the effective length of each runway described below from a point 50 feet above the intersection of the obstruction clearance plane and the runway. For the purpose of determining the allowable landing weight at the destination airport the following is assumed:

(1) The airplane is landed on the most favorable runway and in the most favorable direction, in still air.

(2) The airplane is landed on the most suitable runway considering the probable wind velocity and direction and the ground handling characteristics of the airplane, and considering other conditions such as landing aids and terrain.

(c) A turbopropeller powered airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section, may be taken off if an alternate airport is specified that meets all the requirements of this section except that the airplane can accomplish a full stop landing within 70 percent of the effective length of the runway.

(d) Unless, based on a showing of actual operating landing techniques on wet runways, a shorter landing distance (but never less than that required by paragraph (b) of this section) has been approved for a specific type and model airplane and included in the Airplane Flight Manual, no person may takeoff a turbojet powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may be wet or slippery at the estimated time of arrival unless the effective runway length at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.

(e) A turbojet powered airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section may be taken off if an alternate airport is specified that meets all the requirements of paragraph (b) of this section.

FAR 121.197 Airplanes: Turbine engine powered: Landing limitations: Alternate airports.

No person may list an airport as an alternate airport in a dispatch or flight release for a turbine engine powered airplane unless (based on the assumptions in § 121.195 (b)) that airplane at the weight anticipated at the time of arrival can be brought to a full stop landing within 70 percent of the effective length of the runway for turbopropeller powered airplanes and 60 percent of the effective length of the runway for turbojet powered airplanes, from a point 50 feet above the intersection of the obstruction clearance plane and the runway. In the case of an alternate airport for departure, as provided in § 121.617, allowance may be made for fuel jettisoning in addition to normal consumption of fuel and oil when determining the weight anticipated at the time of arrival.

B. Part 135

FAR 135.385 Airplanes: Large transport category airplanes: Turbine engine powered: Landing limitations: Destination airports.

(c) No person operating a turbine engine powered large transport category airplane may take off that airplane at such a weight that (allowing for normal consumption of fuel and oil in flight to the destination or alternate airport) the weight of the airplane on arrival would exceed the landing weight set forth in the Airplane Flight Manual for the elevation of the destination or alternate airport and the ambient temperature anticipated at the time of landing.

(d) Except as provided in paragraph (c), (d), or (e) of this section, no person operating a turbine engine powered large transport category airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight (in accordance with the landing distance set forth in the Airplane Flight Manual for the elevation of the destination airport and the wind conditions anticipated there at the time of landing), would allow a full stop landing at the intended destination airport within 60 percent of the effective length of each runway described below from a point 50 feet above the intersection of the obstruction clearance plane and the runway. For the purpose of determining the allowable landing weight at the destination airport the following is assumed:

(1) The airplane is landed on the most favorable runway and in the most favorable direction, in still air.

(2) The airplane is landed on the most suitable runway considering the probable wind velocity and direction and the ground handling characteristics of the airplane, and considering other conditions such as landing aids and terrain.

(c) A turbopropeller powered airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section, may be taken off if an alternate airport is specified that meets all the requirements of this section except that the airplane can accomplish a full stop landing within 70 percent of the effective length of the runway.

(d) Unless, based on a showing of actual operating landing techniques on wet runways, a shorter landing distance (but never less than that required by paragraph (b) of this section) has been approved for a specific type and model airplane and included in the Airplane Flight Manual, no person may takeoff a turbojet powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may be wet or slippery at the estimated time of arrival unless the effective runway length at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.

(e) A turbojet powered airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section may be taken off if an alternate airport is specified that meets all the requirements of paragraph (b) of this section.

FAR 135.387 Airplanes: Large transport category airplanes: Turbine engine powered: Landing limitations: Alternate airports.

No person may select an airport as an alternate airport for a turbine engine powered large transport category airplane unless (based on the assumptions in § 135.385 (b)) that airplane, at the weight anticipated at the time of arrival, can be brought to a full stop landing within 70 percent of the effective length of the runway for turbopropeller-powered airplanes and 60 percent of the effective length of the runway for turbojet powered airplanes, from a point 50 feet above the intersection of the obstruction clearance plane and the runway.

Current JAR text:

JAR-OPS 1.515 Landing – Dry Runways (See AMC OPS 1.510 and 1.515)

(b) An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) for the estimated time of landing at the destination aerodrome and at any alternate aerodrome allows a full stop landing from 50 ft above the threshold:

(5) For turbo-jet powered aeroplanes, within 60% of the landing distance available; or

(6) For turbo-propeller powered aeroplanes, within 70% of the landing distance available.

(7) For Steep Approach procedures the Authority may approve the use of landing distance data factored in accordance with subparagraphs (a)(1) and (a)(2) above as appropriate, based on a screen height of less than 50 ft, but not less than 35 ft. (See Appendix 1 to JAR-OPS 1.515(a)(3).).

(8) When showing compliance with sub-paragraphs (a)(1) and (a)(2) above, the Authority may exceptionally approve, when satisfied that there is a need (see Appendix 1), the use of Short Landing Operations in accordance with

Appendices 1 and 2 together with any other supplementary conditions that the Authority considers necessary in order to ensure an acceptable level of safety in the particular case.

(c) When showing compliance with subparagraph (a) above, an operator must take account of the following:

(4) The altitude at the aerodrome.

(5) Not more than 50% of the head-wind component or not less than 150% of the tailwind component; and

(6) The runway slope in the direction of landing if greater than +/-2%.

(d) When showing compliance with subparagraph (a) above, it must be assumed that:

(3) The aeroplane will land on the most favourable runway, in still air; and

(4) The aeroplane will land on the runway most likely to be assigned considering the probable wind speed and direction and the ground handling characteristics of the aeroplane, and considering other conditions such as landing aids and terrain. (See IEM OPS 1.515(c).).

(f) If an operator is unable to comply with sub-paragraph (c)(1) above for a destination aerodrome having a single runway where a landing depends upon a specified wind component, an aeroplane may be dispatched if 2 alternate aerodromes are designated which permit full compliance with sub-paragraphs (a), (b) and (c). Before commencing an approach to land at the destination aerodrome the commander must satisfy himself that a landing can be made in full compliance with JAR-OPS 1.510 and subparagraphs (a) and (b) above.

(g) If an operator is unable to comply with sub-paragraph (c)(2) above for the destination aerodrome, the aeroplane may be dispatched if an alternate aerodrome is designated which permits full compliance with sub-paragraphs (a), (b) and (c).

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

The FAR requires both turbojet and turbopropeller airplanes to be able to perform a full stop landing at the destination airport within 60 percent of the available landing distance. For alternate airports, turbopropeller airplanes need only be capable of coming to a full stop landing within 70 percent of the available landing distance. The JAR requirement for both destination and alternate airports is that turbojet airplanes must be able to perform a full stop landing at within 60 percent of the available landing distance, but turbopropeller airplanes are only required to come to a full stop landing within 70 percent of the available landing distance.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

N/A – The Working Group is recommending changes to the FAR only, therefore differences in means of compliance are not pertinent.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The proposed action applies to the FAR only. Harmonization of the FAR and JAR is not considered practical at this time. The operational arena in Europe has significant differences from that of North America. These differences include fleet mix, typical distances to alternates, typical airport configuration, typical stage profiles, and meteorological factors, all of which affect the safety impact of the proposed action. As a result, the magnitude of safety improvements that can realistically be expected is less for Europe than North America. That notwithstanding, the Working Group proposes to modify the FAR to provide identical requirements for all ~~turbine powered~~turbine-powered aircraft (either turbojet or turbopropeller). The performance characteristics and design characteristics of modern air carrier aircraft are such that large turbopropeller types operate with similar performance characteristics to smaller turbojet types, so the distinction based on powerplant is no longer valid.

For each proposed change from the existing standard, answer the following questions:

6 - What should the harmonized standard be? [Insert the proposed text of the harmonized standard here]

Overall, the issue was not considered for harmonization because the existing disharmony creates no economic imbalance between US and European operators. NOTE: The proposed FAR standard shown below reflects changes concerning issues other than the subject of this report. The proposed FAR standard follows. Specific changes are summarized and explained following each section:

(b)Except as provided in paragraph (d) of this section, no person operating a turbine engine powered airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight, would allow a full stop landing in accordance with the landing distance set forth in the Airplane Flight Manual at the intended destination airport within 60 percent of the landing distance available described below from a point 50 feet above the landing threshold. For the purpose of determining the allowable landing weight, the following is assumed:

(1)The airplane is landed on the most favorable runway and in the most favorable direction, in still air; and

(2)The airplane is landed on the runway most likely to be used considering the probable wind velocity and direction and the ground handling characteristics of the airplane, and considering other conditions such as landing aids and terrain.

SUMMARY OF CHANGES:
Relative to the existing FAR, the term "landing threshold" would replace "the intersection of the obstruction clearance plane and the runway" and the phrase "runway most likely to be used" would replace "most suitable runway". These proposed changes are discussed in Working Group Report 12. In addition, the references to paragraphs that make exceptions to the above rule are changed. The current FAR text refers to exceptions in subparagraphs (c), (d), and (e). In the proposed FAR text, the exceptions are changed as noted below~~, and a new subparagraph (c) is added~~.

(d)An airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section may be taken off if an alternate airport is specified that meets all the requirements of paragraph (b) of this section.

(e)No person may take off a turbine engine powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may not be dry at the estimated time of arrival unless the landing distance available at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.

(f)A landing distance on a wet runway with a landing distance available shorter than that required by paragraph (e) of this section, but not less than that required by paragraph (b) of this section, may be used if a shorter wet runway landing distance has been approved for a specific type and model airplane and included in the Airplane Flight Manual.

SUMMARY OF CHANGES:
Relative to the FAR, the proposed wording in new subparagraphs (d), (e) and (f) collectively replace existing (c), (d) and (e) eliminates distinctions between turbojet and turbopropeller aircraft with respect to allowing alleviation from the requirements of b(2). and also with respect to wet runway accountability. The proposed wet runway accountability also harmonizes the FAR with the JAR. The JAR retains differences in the requirements for turbopropeller aircraft compared to turbojets. It is not considered feasible to harmonize this provision for the reasons outlined in item 5 above.

FAR 121.197 Airplanes: Turbine Engine Powered: Landing Limitations: Alternate Airports

(b)No person may list an airport as an alternate airport in a dispatch or flight release for a turbine engine powered airplane unless (based on the assumptions in section 121.195(b) and the conditions in § 121.195(c)) that airplane at the weight anticipated at the time of arrival can be brought to a full stop within 60 percent of the landing distance available, from a point 50 feet above the landing threshold.

a) SUMMARY OF CHANGES

The proposed wording reflects elimination of the distinction (with respect to alternate airport landing distance requirements) between turbopropeller and turbojet aircraft as noted above for destination airports. In addition, use of the landing threshold (vice the intersection of the runway and obstacle clearance plane) is introduced as noted for destination airports.

(c)No person may list as an alternate airport in a dispatch or flight release for a turbine powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the alternate airport may not be dry at the estimated time of arrival unless the landing distance available at the alternate airport is at least 115 percent of the landing distance required under paragraph (b) of this section.

b) SUMMARY OF CHANGES

This new proposed paragraph harmonizes the FAR with the JAR by requiring wet runway accountability at alternate airports for all turbine powered aircraft. The existing FAR has this provision only for turbojets at the destination airport.

(d)An alternate airport with a landing distance available shorter than that required by paragraph (c) of this section, but not less than that required by paragraph (b) of this section, may be listed in a dispatch or flight release if a shorter wet runway landing distance has been approved for a specific type and model airplane and included in the Airplane Flight Manual.

c) SUMMARY OF CHANGES

The proposed wording harmonizes the FAR with the JAR and allows use of an approved AFM landing distance shorter than that specified by the basic requirement for alternates in the same manner as it is currently allowed for destination airports.

(e) In the case of an alternate airport for departure, as provided in section 121.617, allowance may be made for fuel jettisoning in addition to normal consumption of fuel and oil when determining the weight anticipated at the time of arrival.

d) SUMMARY OF CHANGES

This requirement is the same as the existing FAR, and is restated in a separate subparagraph for clarity.

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

The proposed standard provides equal safety margins for all turbine powered aircraft, either turbopropeller or turbojet.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

Because increased required runway lengths and wet runway accountability are required by the proposed standard but not the current standard, safety margins are improved for some aircraft and held the same for others. Therefore, the overall level of safety is increased. In addition, the level of safety is made the same for all turbine engine powered aircraft. The following factors were considered in making this determination:

(a) Speed – Approach speed for aircraft such as the L-188, CV-580, and DHC-8-300/400 may actually be faster than comparable turbojets, such as the BAe-146.

(b) Speed Control – While it may be true that speed control is more precise with a turboprop aircraft, it depends on the propeller rpm being used on final approach. Some airlines, as standard operating procedure, require 900 rpm on final, which decreases thrust response to throttle input. To mix well with large turbojet aircraft, additional speed carried on final, which may create 700-1000' of float.

(c)Eye Height – The eye height of the CV580, HS 748, and DHC-7 are close to the eye height of some smaller jets, like the DC-9 and B-737. Also, some of the smaller jets, like the CRJ and EMB-145, have eye heights similar to the Saab 340 and other smaller turboprops.

(d)Reverse Thrust – Some turboprops use "disking" in their landing distance calculations, so selection of prop settings different from this could increase the landing distance. Interlocks that prevent selection of below flight idle rpm have been installed as safety measure on some aircraft. And some turboprops have only a "ground fine" position, and no reverse.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

Current industry practice is a mix of compliance with the existing standard and the proposed, more stringent standard. Thus, relative to industry practice, the level of safety is increased. In addition, the level of safety is made the same for all turbine engine powered aircraft.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

The only other option considered was maintenance of the existing standard. This was not selected due to the discrimination, determined to be no longer valid, based on performance characteristics presumed because of differences between turbopropeller and turbojet powered aircraft.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Operators of turbopropeller aircraft currently complying with the existing standard but not the proposed, more stringent standard, would be affected. The greatest impact is anticipated for operations in areas where runways are frequently wet, where the distance between alternates (in compliance with the revised standard) is relatively long, or for which the aircraft are operated near the maximum weight for the runway used.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

N/A

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

Existing material is adequate.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

ICAO Annex 6, chapter 5, attachment C, example 3, paragraph 5.1.1 requires only that the landing performance permit the aircraft to be brought to a stop within the effective runway length. Thus, the margins provided by the proposed standard are more conservative than the ICAO standard.

15. – Does the proposed standard affect other HWG's? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

The cost impact is most significant in areas where runways are frequently wet, where the distance between alternates (in compliance with the revised standard) is relatively long, or for which the aircraft are operated near the maximum weight for the runway used. In other areas, the cost is considered minimal.

17. - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

N/A

18. – Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.]

No.

19. – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes.

Report from the Airplane Performance Harmonization Working Group

Issue: Steep Approach Operations

1 - What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

For the purpose of dispatching an aircraft to a destination airport, the FAR requires that the aircraft can be brought to a full stop within 60% of the available runway length, assuming a 50 ft threshold crossing height. The JAR requires an operator to obtain special approval to use an approach angle greater than or equal to 4.5 degrees, and optionally base the landing field length limited weight on a threshold crossing height less than 50 ft, but not less than 35 feet.

The JAR provides this relief in order to accommodate some of the existing commuter aircraft operations in Northern Europe. These operations onto extremely short airfields with steep approaches would not be possible without the relief provided by the JAR.

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

<u>Current FAR text</u>:

C. Part 121

§ 121.195 Airplanes: Turbine engine powered: Landing limitations: Destination airports.

(b) Except as provided in paragraph (c), (d), or (e) of this section, no person operating a turbine engine powered airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight (in accordance with the landing distance set forth in the Airplane Flight Manual for the elevation of the destination airport and the wind conditions anticipated there at the time of landing), would allow a full stop landing at the intended destination airport within 60 percent of the effective length of each runway described below from a point 50 feet above the intersection of the obstruction clearance plane and the runway.

§ 121.197 Airplanes: Turbine engine powered: Landing limitations: Alternate airports.

No person may list an airport as an alternate airport in a dispatch or flight release for a turbine engine powered airplane unless (based on the assumptions in § 121.195 (b)) that airplane at the weight anticipated at the time of arrival can be brought to a full stop landing within 70 percent of the effective length of the runway for turbopropeller powered airplanes and 60 percent of the effective length of the runway for turbojet powered airplanes, from a point 50 feet above the intersection of the obstruction clearance plane and the runway. In the case of an alternate airport for departure, as provided in § 121.617, allowance may be made for fuel jettisoning in addition to normal consumption of fuel and oil when determining the weight anticipated at the time of arrival.

D. Part 135

§ 135.385 Airplanes: Large transport category airplanes: Turbine engine powered: Landing limitations: Destination airports.

(b) Except as provided in paragraph (c), (d), or (e) of this section, no person operating a turbine engine powered large transport category airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight (in accordance with the landing distance set forth in the Airplane Flight Manual for the elevation of the destination airport and the wind conditions anticipated there at the time of landing), would allow a full stop landing at the intended destination airport within 60 percent of the effective length of each runway described below from a point 50 feet above the intersection of the obstruction clearance plane and the runway.

§ 135.387 Airplanes: Large transport category airplanes: Turbine engine powered: Landing limitations: Alternate airports.

No person may select an airport as an alternate airport for a turbine engine powered large transport category airplane unless (based on the assumptions in § 135.385 (b)) that airplane, at the weight anticipated at the time of arrival, can be brought to a full stop landing within 70 percent of the effective length of the runway for turbopropeller-powered airplanes and 60 percent of the effective length of the runway for turbojet powered airplanes, from a point 50 feet above the intersection of the obstruction clearance plane and the runway.

Current JAR text:

JAR-OPS 1.515 Landing – Dry Runways (See AMC OPS 1.510 and 1.515)

~~(a)~~(c)An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) for the estimated time of landing at the destination aerodrome and at any alternate aerodrome allows a full stop landing from 50 ft above the threshold:

~~(1)~~(9)For turbo-jet powered aeroplanes, within 60% of the landing distance available; or

~~(2)~~(10)For turbo-propeller powered aeroplanes, within 70% of the landing distance available.

~~(3)~~(11)For Steep Approach procedures the Authority may approve the use of landing distance data factored in accordance with subparagraphs (a)(1) and (a)(2) above as appropriate, based on a screen height of less than 50 ft, but not less than 35 ft. (See Appendix 1 to JAR-OPS 1.515(a)(3).).

Appendix 1 to JAR-OPS 1.515(a)(3) Steep Approach Procedures

(a) The Authority may approve the application of Steep Approach procedures using glideslope angles of 4.5° or more and with screen heights of less than 50 ft but not less than 35 ft, provided that the following criteria are met:

(1) The Aeroplane Flight Manual must state the maximum approved glideslope angle, any other limitations, normal, abnormal or emergency procedures for the steep approach as well as amendments to the field length data when using steep approach criteria;

(2) A suitable glidepath reference system comprising at least a visual glidepath indicating system must be available at each aerodrome at which steep approach procedures are to be conducted; and

(3) Weather minima must be specified and approved for each runway to

be used with a steep approach. Consideration must be given to the following:

(i)The obstacle situation;
(ii)The type of glidepath reference and runway guidance such as visual aids, MLS, 3D-NAV, ILS, LLZ, VOR, NDB;
(iii)The minimum visual reference to the required at DH and MDA;
(iv)Available airborne equipment;
(v)Pilot qualification and special aerodrome familiarisation;
(vi)Aeroplane Flight Manual limitations and procedures; and
(vii)Missed approach criteria.

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

Currently, the Part 121/135 operating rules do not specifically address landing field length performance for a steep approach. Unless otherwise authorized by the Administrator in accordance with § 121.173(f), the performance calculation must be based on a 50 ft threshold crossing height. In contrast to the FAA requirements, the JAR does specifically require operators obtain approval for approach angles greater than 4.5 degrees. In addition, the operator may take a landing distance credit for using a threshold crossing height that is less than 50 ft, but not less than 35 ft.

The landing distance credit allowed by the JAR would result in a higher field length limit weight for the JAR operator. However, it is recognized that a FAR operator would never be operating the same aircraft into the same airport as the JAR operator, and therefore there is no competitive economic advantage for a JAR operator (or economic disadvantage for an FAA operator).

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

N/A – The FAR does not contain a standard for determining field length landing performance based on a steep approach, so there is no applicable means of compliance.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The proposed action is to not harmonize to the JAR standard. This requirement was added to the JAR regulation to address approach angles which are steeper than those which are considered by the certification requirements, in recognition of the limited number of steep approaches that were being encountered by European operators. These are mainly a very limited number of commuter aircraft operations occurring in the Northern European countries. Within the US, an operator could request an exemption in order to achieve the lower landing criteria, however, unlike the JAR, there is no requirement that the landing distance credit be contained within the AFM. While the JAR is not necessarily limited to short runways or commuter aircraft, the main beneficiaries of this rule are commuter operations onto extremely short runways with higher than normal approach angles. Therefore there is no competitive benefit to be lost or gained by adopting this rule into the FAR.

Report from the Airplane Performance Harmonization Working Group

Issue: Short Landing Operations

1 - What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

For the purpose of dispatching an aircraft to a destination airport, the FAR requires that the aircraft can be brought to a full stop within 60% of the available runway length, assuming a 50 ft threshold crossing height. The JAR allows an operator to receive special approval to base the landing field length weight on a 50 ft crossing height over a runway safety area prior to reaching the runway threshold. This is essentially a clearway used for landing, which would allow the touchdown to occur prior to the normal touchdown point on the runway.

The JAR provides this relief in order to accommodate some of the existing commuter aircraft operations onto extremely short runways, which would not be possible without the relief provided by the JAR.

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

<u>Current FAR text</u>:

E. Part 121

§ 121.195 Airplanes: Turbine engine powered: Landing limitations: Destination airports.

(b) Except as provided in paragraph (c), (d), or (e) of this section, no person operating a turbine engine powered airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight (in accordance with the landing distance set forth in the Airplane Flight Manual for the elevation of the destination airport and the wind conditions anticipated there at the time of landing), would allow a full stop landing at the intended destination airport within 60 percent of the effective length of each runway described below from a point 50 feet above the intersection of the obstruction clearance plane and the runway.

§ 121.197 Airplanes: Turbine engine powered: Landing limitations: Alternate airports.

No person may list an airport as an alternate airport in a dispatch or flight release for a turbine engine powered airplane unless (based on the assumptions in § 121.195 (b)) that airplane at the weight anticipated at the time of arrival can be brought to a full stop landing within 70 percent of the effective length of the runway for turbopropeller powered airplanes and 60 percent of the effective length of the runway for turbojet powered airplanes, from a point 50 feet above the intersection of the obstruction clearance plane and the runway. In the case of an alternate airport for departure, as provided in § 121.617, allowance may be made for fuel jettisoning in addition to normal consumption of fuel and oil when determining the weight anticipated at the time of arrival.

F. Part 135

§ 135.385 Airplanes: Large transport category airplanes: Turbine engine powered: Landing limitations: Destination airports.

(b) Except as provided in paragraph (c), (d), or (e) of this section, no person operating a turbine engine powered large transport category airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight (in accordance with the landing distance set forth in the Airplane Flight Manual for the elevation of the destination airport and the wind conditions anticipated there at the time of landing), would allow a full stop landing at the intended destination airport within 60 percent of the effective length of each runway described below from a point 50 feet above the intersection of the obstruction clearance plane and the runway.

§ 135.387 Airplanes: Large transport category airplanes: Turbine engine powered: Landing limitations: Alternate airports.

No person may select an airport as an alternate airport for a turbine engine powered large transport category airplane unless (based on the assumptions in § 135.385 (b)) that airplane, at the weight anticipated at the time of arrival, can be brought to a full stop landing within 70 percent of the effective length of the runway for turbopropeller-powered airplanes and 60 percent of the effective length of the runway for turbojet powered airplanes, from a point 50 feet above the intersection of the obstruction clearance plane and the runway.

Current JAR text:

JAR-OPS 1.515 Landing – Dry Runways (See AMC OPS 1.510 and 1.515)

~~(a)~~(d)An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) for the estimated time of landing at the destination aerodrome and at any alternate aerodrome allows a full stop landing from 50 ft above the threshold:

~~(1)~~(12)For turbo-jet powered aeroplanes, within 60% of the landing distance available; or

~~(2)~~(13)For turbo-propeller powered aeroplanes, within 70% of the landing distance available.

~~(3)~~(14)For Steep Approach procedures the Authority may approve the use of landing distance data factored in accordance with subparagraphs (a)(1) and (a)(2) above as appropriate, based on a screen height of less than 50 ft, but not less than 35 ft. (See Appendix 1 to JAR-OPS 1.515(a)(3).).

~~(4)~~(15)When showing compliance with sub-paragraphs (a)(1) and (a)(2) above, the Authority may exceptionally approve, when satisfied that there is a need (see Appendix 1), the use of Short Landing Operations in accordance with Appendices 1 and 2 together with any other supplementary conditions that the Authority considers necessary in order to ensure an acceptable level of safety in the particular case.

Appendix 1 to JAR-OPS 1.515(a)(4) Short Landing Operations

(a) For the purpose of JAR-OPS 1.515(a)(4), the distance used for the calculation of the permitted landing mass may consist of the usable length of the declared safety area plus the declared landing distance available. The Authority may approve such operations in accordance with the following criteria:

~~(1)~~(4)Demonstration of the need for Short Landing Operations. There must be a clear public interest and operational necessity for the operation, either due to the remoteness of the airport or to the physical limitations relating to extending the runway.

~~(2)~~(5)Aeroplane and Operational Criteria.

~~(i)~~(viii)Short landing operations will only be approved for aeroplanes where the vertical distance between the path of the pilot's eye and the path of the lowest part of the wheels with the aeroplane established on the normal glide path does not exceed 3 metres.
~~(ii)~~(ix)When establishing aerodrome operating minima the visibility/RVR must not be less than 1.5 km. In addition, wind limitations must be specified in the Operations Manual.
~~(iii)~~(x)Minimum pilot experience, training requirements and special aerodrome familiarisation must be specified for such operations in the Operations Manual.

~~(3)~~(6)It is assumed that the crossing height over the beginning of the usable length of the declared safety area is 50 ft.

~~(4)~~(7)Additional Criteria. The Authority may impose such additional conditions as are deemed necessary for a safe operation taking into account the aeroplane type characteristics, geographic characteristics in the approach area, available approach aids and missed approach/balked landing considerations. Such additional conditions may be, for instance, the requirement for VASI/PAPI-type visual slope indicator system.

Appendix 2 to JAR-OPS 1.515(a)(4) Airfield Criteria for Short Landing Distance

(a) The use of the safe area must be approved by the airport authority.
(b) The usable length of the declared safe area under the provisions of 1.515(a)(4) and this Appendix must not exceed 90 metres.
(c) The width of the declared safe area shall not be less than twice the runway width or twice the wing span, whichever is greater, centred on the extended runway centre line.
(d) The declared safe area must be clear of obstructions or depressions which would endanger an aeroplane undershooting the runway and no mobile objects shall be permitted on the declared safety area while the runway is being using for short landing operations.
(e) The slope of the declared safety area must not exceed 5% upward nor 2% downward in the direction of landing.
(f) For the purpose of this operation, the bearing strength requirement of JAR-OPS 1.480(a)(5) need not apply to the declared safety area.

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

Currently, the Part 121/135 operating rules do not allow the use of a landing clearway when calculating landing field length performance. The performance calculation must be based on a 50 ft crossing height at the runway threshold. In contrast to the FAA requirements, the JAR does specifically allow operators to take credit for a 50 ft crossing height prior to reaching the threshold of the runway, provided that it occurs over a well-defined runway safety area.

The FAR standards provide a higher level of safety than the JAR when operating to shorter runways, although this higher standard may prevent operations altogether by not allowing a particular aircraft to operate at all to an extremely short runway. However, this regulation only applies to commuter aircraft, and therefore there is no competitive economic advantage for a JAR operator (or economic disadvantage for an FAA operator) since an FAR operator would never be operating the same aircraft into the same airport as the JAR operator.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

N/A – The FAR does not contain a standard for determining field length landing performance based on a landing clearway, so there is no applicable means of compliance.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The proposed action is to not harmonize to the JAR standard. This requirement was added to the JAR regulation to cover commuter aircraft operations that were already occurring within some of the European countries. According to the JAA, an operator would need to show the authority that there is a strong economic need to using a short landing operation to service an airport. Within the US, an operator could request an exemption in order to achieve the lower landing criteria. Since this addresses a very narrow operational scope (small aircraft into small airports), there is no competitive benefit to be lost or gained by adopting this rule into the FAR.

Report from the Airplane Performance Harmonization Working Group

(LXV.)Issue: Landing on Contaminated Runways

Rule Section: FAR 121.195, 135.385 / JAR-OPS 1.520

1 - What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

It is fundamental to operational safety that the airplane must be able to land and stop in the available distance upon arrival at the airport of intended landing. The landing distance standards ensure that the airplane is taken off at a weight that would allow a safe landing at both the destination and alternate airports. The standards take into account the conditions at the destination and alternate airports, and must allow for differences between the conditions existing or forecast at the time of takeoff and the conditions at the time of landing. Since the time of takeoff may be considerably different from the time the airplane actually lands, the standards are conservative. For dry runways, the available landing distance must be 67% more than the demonstrated dry landing distance shown in the Approved Airplane Flight Manual (AFM), and for wet runways, the available landing distance must be 92% more.

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

Current FAR text:

A. Part 121

FAR 121.195 Airplanes: Turbine Engine Powered: Landing Limitations: Destination Airports

(d) Unless, based on a showing of actual operating landing techniques on wet runways, a shorter landing distance (but never less than that required by paragraph (b) of this section) has been approved for a specific type and model airplane and included in the Airplane Flight Manual, no person may take off a turbojet powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may be wet or slippery at the estimated time of arrival unless the effective runway length at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.

B.

C. Part 135

FAR 135.385 Large Transport Category Airplanes: Turbine Engine Powered: Landing Limitations: Destination Airports

(d) Unless, based on a showing of actual operating landing techniques on wet runways, a shorter landing distance (but never less than that required by paragraph (b) of this section) has been approved for a specific type and model airplane and included in the Airplane Flight Manual, no person may take off a turbojet powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may be wet or slippery at the estimated time of arrival unless the effective runway length at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.

Current JAR text:

1. JAR-OPS 1.520 Landing – Wet and Contaminated Runways

| ~~(a)~~(f)An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be wet, the landing distance available is at least 115% of the required landing distance, determined in accordance with JAR-OPS 1.515.

| ~~(b)~~(g)An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be contaminated, the landing distance available must be at least the landing distance determined in accordance with subparagraph (a) above, or at least 115% of the landing distance determined in accordance with approved contaminated landing distance data or equivalent, accepted by the Authority, whichever is greater.

| ~~(c)~~(h)A landing distance on a wet runway shorter than that required by subparagraph (a) above, but not less than that required by JAR-OPS 1.515(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on wet runways.

| ~~(d)~~(i)A landing distance on a specially prepared contaminated runway shorter than that required by subparagraph (b) above, but not less than that required by JAR-OPS 1.515(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on contaminated runways.

When showing compliance with subparagraphs (b), (c) and (d) above, the criteria of JAR-OPS 1.515 shall be applied accordingly except that JAR-OPS 1.515(a)(1) and (2) shall not be applied to subparagraph (b) above.

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

FAR 121.195(d), FAR 135.385(d) and JAR-OPS 1.520(a) are similar as far as wet runways are concerned. Each requires that the available landing distance be 115% of that required for dry runways unless a shorter distance (but not less than that for dry runways) is provided in the AFM. They differ in that the FARs require the shorter distance to be based on a showing of actual operating landing techniques on wet runways and provided in the AFM, whereas the JAR requires only that the shorter distances be provided in the AFM. This does not result in any differences in safety margins.

FAR 121.195(d) and FAR 135.385(d) do not specifically address contaminated runways, but rather slippery runways, and do not require any additional landing distance over that for wet runways. JAR-OPS 1.520(b) requires that the available landing distance on contaminated runways be the greater of that required for wet runways or 115% of that determined in accordance with approved contaminated landing distance data or equivalent. (The 67% conservative factor does not apply to contaminated runway landing distances.) Except for the most slippery runway conditions, which are rarely encountered, the wet landing distance requirements are generally longer than 115% of the contaminated landing distances; therefore, there is no appreciable difference in safety margins between the rules.

JAR-OPS 1.520(d) allows operators to use landing distances appropriate for specially prepared contaminated runways if they are provided in the AFM. This paragraph was introduced to account for the special runway surface conditions sometimes employed in Northern European countries, such as Scandinavia, that are sanded to improve their friction characteristics when contaminated with packed snow or ice, etc. There is no similar provision in the FARs.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

The differences in the means of compliance are due to the differences in the standards. Where the standards are the same (i.e. application of wet runway limits), the means of compliance are the same.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The Working Group proposes to harmonize to the FAR requirements. This means that the requirement to consider specific runway contamination conditions at the time of dispatch would be removed from JAR-OPS 1.

The landing distance standards apply at the time of takeoff because there is generally no practical way to significantly reduce weight once the airplane arrives at the airport of intended landing. Certainly there is no way to reduce payload once the airplane has taken off. Fuel jettisoning is not intended to be used for this purpose and, in fact, may not be possible if the airplane is not equipped with a fuel jettisoning system. Consumption of excess fuel is both wasteful and time consuming. The normal method of complying with the landing standards is to determine the maximum weight that satisfies all of the landing requirements and add the expected en-route fuel consumption to arrive at a limiting takeoff weight. The landing standards are commonly referred to as dispatch requirements.

The Working Group discussed the practical problems with a dispatch rule requiring consideration of actual runway condition. Currently, operators comply with dispatch landing requirements on the basis of the best available weather reports and/or forecasts. The operator often does not know the specific runway conditions that will exist when the airplane arrives at the airport of intended landing. This is especially true for long flights where many hours may pass between the time of dispatch and the time of arrival. Thus, the operator may base the dispatch weight on a report or forecast indicating that the runways may be contaminated only to find the runways clear when the airplane actually arrives. An unnecessary payload reduction could result. The reverse situation, in which the dispatch weight is based on dry runways but the runways are actually contaminated upon arrival, is addressed by FAR 121.551/553/601/603 and JAR-OPS 1.400. These sections, which are reproduced below, require that the dispatcher notify the pilot of any changes in conditions that could affect the safety of the flight and that the operator restrict or suspend operations if hazardous conditions exist (in the case of the FARs) or that the pilot is assured that a safe landing can be made (in the case of JAR-OPS).

FAR 121.551 Restriction or suspension of operation: Domestic and flag operations.

When a certificate holder conducting domestic or flag operations knows of conditions, including airport and runway conditions, that are a hazard to safe operations, it shall restrict or suspend operations until those conditions are corrected.

FAR 121.553 Restriction or suspension of operation: Supplemental operations.

When a certificate holder conducting supplemental operations or pilot in command knows of conditions, including airport and runway conditions, that are a hazard to safe operations, the certificate holder or pilot in command, as the case may be, shall restrict or suspend operations until those conditions are corrected.

FAR 121.601 Aircraft dispatcher information to pilot in command: Domestic and flag operations.

(c) During a flight, the aircraft dispatcher shall provide the pilot in command any additional available information of meteorological conditions (including, adverse weather phenomena, such as clear air turbulence, thunderstorms, and low altitude wind shear), and irregularities of facilities and services that may affect the safety of the flight.

FAR 121.603 Facilities and services: Supplemental operations.

(b) During a flight, the pilot in command shall obtain any additional available information of meteorological conditions and irregularities of facilities and services that may affect the safety of the flight.

a) JAR-OPS 1.400 Approach and Landing Conditions

Before commencing an approach to land, the commander must satisfy himself that, according to the information available to him, the weather at the aerodrome and the condition of the runway intended to be used should not prevent a safe approach, landing or missed approach, having regard to the performance information contained in the Operations Manual.

For the JAA, this agreement was contingent on the modification of JAR-OPS 1.400. The JAA wants to retain the 115% conservatism for contaminated runway landing distances and, therefore, requires that JAR-OPS 1.400 refer to this factor.

The following proposal for JAR-OPS 1.400 was drafted by the JAA Performance Subcommittee and will be sent to the JAA OPS Procedures Study Group.

JAR-OPS 1.400 Approach and Landing Conditions
(See IEM OPS 1.400)

(a) Before commencing an approach to land, the commander must satisfy himself that, according to the information to him, including the weather at the aerorome, the condition of the runway intended to be used, and considering any inflight failures of systems which affect the landing distance should not prevent a safe approach, landing or missed approach, having regard to the performance information contained in the Operations Manual.

(b) If the condition of the runway intended to be used for landing is contaminated, the landing distance must be at least the landing distance determined in accordance with JAR-OPS 1.520(a), or at least 115% of the landing distance determined in accordance with approved contaminated landing distance data or equivalent, accepted by the Authority, whichever is greater.

(c) If the aeroplane was dispatched in accordance with JAR-OPS 1.515(d), the commander must, in addition, satisfy himself before commencing an approach to land at the destination aerodrome that a landing can be made in full compliance with JAR-OPS 1.510 and JAR-OPS 1.515(a) and (b).

The Working Group also discussed the practical aspects of the FAR requirement that any wet runway landing distances less than 115% of those required for dry runways must be based on a showing of actual landing techniques on wet runways. This essentially requires an operator to know the basis for data provided in the AFM, something operators do not generally know. This requirement was placed in the operating regulations because it does not appear in the airworthiness regulations. The Working Group proposes to remove this requirement from FAR 121.195/135.385 and place a requirement in FAR/JAR Part 25 to address the issue.

6 - What should the harmonized standard be? [Insert the proposed text of the harmonized standard here]

D. Part 121

FAR 121.195 Airplanes: Turbine Engine Powered: Landing Limitations: Destination Airports

(e) No person may take off a turbine engine powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may not be dry at the estimated time of arrival unless the landing distance available at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.

(f) A landing distance on a wet runway with a landing distance available shorter than that required by paragraph (f) of this section, but not less than that required by paragraph (b) of this section, may be used if a shorter wet runway landing distance has been approved for a specific type and model airplane and included in the Airplane Flight Manual.

E.

F. Part 135

FAR 135.385 Large Transport Category Airplanes: Turbine Engine Powered: Landing Limitations: Destination Airports

(e) No person may take off a turbine engine powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may not be dry at the estimated time of arrival unless the landing distance available at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.

(f) A landing distance on a wet runway with a landing distance available shorter than that required by paragraph (f) of this section, but not less than that required by paragraph (b) of this section, may be used if a shorter wet runway landing distance has been approved for a specific type and model airplane and included in the Airplane Flight Manual.

1. JAR-OPS 1.520 Landing – Wet and Contaminated Runways

(a) An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be wet or contaminated, the landing distance available is at least 115% of the required landing distance, determined in accordance with JAR-OPS 1.515.

(b) A landing distance on a wet or specially prepared runway shorter than that required by subparagraph (a) above, but not less than that required by JAR-OPS 1.515(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on wet runways.

Summary of Changes:

(1) Redesignate §§ 121.195(d) and 135.385(d) as §§ 121.195(e) and 135.385(e). This is required because of the addition of §§ 121.195(c) and 135.385(c), which were added to align the FAR and JAR.

(2) Amend newly designated §§ 121.195(e) and FAR 135.385(e) to remove the words “Unless, based on a showing of actual operating landing techniques on wet runways, a shorter landing distance (but never less than that required by paragraph (b) of this section) has been approved for a specific type and model

airplane and included in the Airplane Flight Manual." This would remove the requirement for the airplane operator to know the certification basis for data contained in the AFM. A requirement to base shorter wet runway landing distances on actual landing techniques should be added to FAR Part 25.

(3) Amend newly designated §§121.195(e) and 135.385(e) to replace the words "wet or slippery" with "not dry." Since damp runways are to be treated as wet, this brings the landing standards into alignment with the revised definitions of runway conditions in FAR 121.171.

(4) Add a new paragraph, FAR 121.195(f), allowing the use of wet runway landing distances shorter than 115% of dry runway landing distances, provided the data are contained in the AFM. This section aligns the FAR and JAR and provides essentially the same provisions as the wording removed in item (2) above.

(5) Delete JAR-OPS 1.520(b) and (d) and the paragraph following (d). Redesignate JAR-OPS 1.520(c) as JAR-OPS 1.520(b). This would harmonize with the FAR by requiring runways to be addressed only as "dry" or "not dry" at the time of dispatch.

(6) Add "or specially prepared" to the requirements of JAR-OPS 1.520(b). This is required because of the deletion of JAR-OPS 1.520(d).

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

For the FAA, the underlying safety issue will be addressed in the same manner as it is currently.

For the JAA, the underlying safety issue is addressed by strengthening the standard requiring the pilot to assure himself that a safe landing can be made.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

The proposed FAA standard maintains the same level of safety.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

The proposed FAA standard maintains the same level of safety.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

The Working Group easily reached consensus on this issue and did not consider any other options.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

No one is expected to be adversely affected by the proposed change.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

N/A

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

N/A

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

The proposed standard is in compliance with the relevant ICAO standards for the "Operation of Aircraft" (Annex 6)

15. – Does the proposed standard affect other HWG's? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

There is no cost impact associated with the proposed standard.

17. - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

N/A

18. – Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.]

No.

19. – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes.

Report from the Airplane Performance Harmonization Working Group

Issue: Performance Class B & C Aircraft

1 - What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

The FAR provides aircraft performance criteria based on the type of commercial operation that is being conducted (Part 121 or 135) and aircraft engine type (reciprocating or turbine). The JAR categorizes performance criteria based on the aircraft engine, passenger seating configuration, and maximum allowable takeoff weight. In the JAR, any multi-engine turbojet aircraft is considered a Class A aircraft. In addition, any multi-engine turboprop aircraft with more than 9 passenger seats or a maximum takeoff weight of greater than 5700 kg (12,500 lbs) is also considered a Class A aircraft.

The JAR defines a Class B aircraft as any propeller-driven aircraft with a maximum approved passenger seating configuration of 9 passengers or less, and a maximum takeoff weight of 5700 kg (12,500 lbs) or less.

The JAR defines a Class C aircraft is any aircraft that is powered by reciprocating engines that has more than 9 passenger seats or a maximum takeoff weight of greater than 5700 kg (12,500 lbs).

The Performance Harmonization Working Group was tasked with recommending whether or not to harmonize on aircraft categories to ensure that all FAR and JAR commercial aircraft operations are conducted to an equivalent level of safety.

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

Current FAR text:

G. Part 121

§ 121.173 General.

(a) Except as provided in paragraph (c) of this section, each certificate holder operating a reciprocating-engine-powered airplane shall comply with §§ 121.175 through 121.187.

(b) Except as provided in paragraph (c) of this section, each certificate holder operating a turbine-engine-powered airplane shall comply with the applicable provisions of §§ 121.189 through 121.197, except that when it operates -

(1) A turbo-propeller-powered airplane type certificated after August 29, 1959, but previously type certificated with the same number of reciprocating engines, the certificate holder may comply with §§ 121.175 through 121.187; or

(2) Until December 20, 2010, a turbo-propeller-powered airplane described in § 121.157(f), the certificate holder may comply with the applicable performance requirements of appendix K of this part.

(c) Each certificate holder operating a large nontransport category airplane type certificated before January 1, 1965, shall comply with §§ 121.199 through 121.205 and any determination of compliance must be based only on approved performance data.

(d) The performance data in the Airplane Flight Manual applies in determining compliance with §§ 121.175 through 121.197. Where conditions are different from those on which the performance data is based, compliance is determined by interpolation or by computing the effects of changes in the specific variables if the results of the interpolation or computations are substantially as accurate as the results of direct tests.

(e) Except as provided in paragraph (c) of this section, no person may take off a reciprocating-engine-powered airplane at a weight that is more than the allowable weight for the runway being used (determined under the runway takeoff limitations of the transport category operating rules of 14 CFR part 121, subpart I) after taking into account the temperature operating correction factors in the applicable Airplane Flight Manual.

(f) The Administrator may authorize in the operations specifications deviations from the requirements in the subpart if special circumstances make a literal observance of a requirement unnecessary for safety.

(g) The ten mile width specified in §§ 121.179 through 121.183 may be reduced to five miles, for not more than 20 miles, when operating VFR or where navigation facilities furnish reliable and accurate identification of high ground and obstructions located outside of five miles, but within ten miles, on each side of the intended track.

[Amdt. 121-251, 60 FR 65928, Dec. 20, 1995]

§ 121.175 Airplanes: reciprocating engine powered: Weight limitations.

(a) No person may takeoff a reciprocating engine powered airplane from an airport located at an elevation outside of the range for which maximum takeoff weights have been determined for that airplane.

(b) No person may takeoff a reciprocating engine powered airplane for an airport of intended destination that is located at an elevation outside of the range for which maximum landing weights have been determined for that airplane.

(c) No person may specify, or have specified, an alternate airport that is located at an elevation outside of the range for which maximum landing weights have been determined for the reciprocating engine powered airplane concerned.

(d) No person may takeoff a reciprocating engine powered airplane at a weight more than the maximum authorized takeoff weight for the elevation of the airport.

(e) No person may takeoff a reciprocating engine powered airplane if its weight on arrival at the airport of destination will be more than the maximum authorized landing weight for the elevation of that airport, allowing for normal consumption of fuel and oil enroute.

(f) This section does not apply to large nontransport category airplanes operated under § 121.173(c).

[Amdt. 121-251, 60 FR 65928, Dec. 20, 1995]

§ 121.177 Airplanes: Reciprocating engine powered: Takeoff limitations.

(a) No person operating a reciprocating engine powered airplane may takeoff that airplane unless it is possible -

  (1) To stop the airplane safely on the runway, as shown by the accelerate-stop distance data, at any time during takeoff until reaching critical engine failure speed;

  (2) If the critical engine fails at any time after the airplane reaches critical engine failure speed V1, to continue the takeoff and reach a height of 50 feet, as indicated by the takeoff path data, before passing over the end of the runway; and

  (3) To clear all obstacles either by at least 50 feet vertically (as shown by the takeoff path data) or 200 feet horizontally within the airport boundaries and 300 feet horizontally beyond the boundaries, without banking before reaching a height of 50 feet (as shown by the takeoff path data) and thereafter without banking more than 15 °.

(b) In applying this section, corrections must be made for the effective runway gradient. To allow for wind effect, takeoff data based on still air may be corrected by taking into account not more than 50 percent of any reported headwind component and not less than 150 percent of any reported

tailwind component.
(c) This section does not apply to large nontransport category airplanes operated under § 121.173(c).

[Doc. No. 6258, 29 FR 19198, Dec. 31, 1964, as amended by Amdt. 121-159, 45 FR 41593, June 19, 1980; Amdt. 121-251, 60 FR 65928, Dec. 20, 1995]

§ 121.179 Airplanes: reciprocating engine powered: Enroute limitations: all engines operating.

(a) No person operating a reciprocating engine powered airplane may takeoff that airplane at a weight, allowing for normal consumption of fuel and oil, that does not allow a rate of climb (in feet per minute), with all engines operating, of at least 6.90 VS0 (that is, the number of feet per minute is obtained by multiplying the number of knots by 6.90) at an altitude of at least 1,000 feet above the highest ground or obstruction within ten miles of each side of the intended track.
(b) This section does not apply to airplanes certificated under Part 4a of the Civil Air Regulations.
(c) This section does not apply to large nontransport category airplanes operated under § 121.173(c).

[Amdt. 121-251, 60 FR 65928, Dec. 20, 1995]

§ 121.181 Airplanes: Reciprocating engine powered: Enroute limitations: One engine inoperative.

(a) Except as provided in paragraph (b) of this section, no person operating a reciprocating engine powered airplane may takeoff that airplane at a weight, allowing for normal consumption of fuel and oil, that does not allow a rate of climb (in feet per minute), with one engine inoperative, of at least

0.079 - (0.106 / N) * VS02

(where N is the number of engines installed and VS0 is expressed in knots) at an altitude of at least 1,000 feet above the highest ground or obstruction within 10 miles of each side of the intended track. However, for the purposes of this paragraph the rate of climb for airplanes certificated under Part 4a of the Civil Air Regulations is 0.026 VS02.

(b) In place of the requirements of paragraph (a) of this section, a person may, under an approved procedure, operate a reciprocating engine powered airplane, at an all engines operating altitude that allows the airplane to continue, after an engine failure, to an alternate airport where a landing can be made in accordance with § 121.187, allowing for normal consumption of fuel and oil. After the assumed failure, the flight path must clear the ground and any obstruction within five miles on each side of the intended track by at least 2,000 feet.
(c) If an approved procedure under paragraph (b) of this section is used, the certificate holder shall comply with the following:
(1) The rate of climb (as prescribed in the Airplane Flight Manual for the appropriate weight and altitude) used in calculating the airplane's flight path shall be diminished by an amount, in feet per minute, equal to

0.079 - (0.106 / N) * VS02

(where N is the number of engines installed and VS0 is expressed in knots) for airplanes certificated under Part 25 of this chapter and by 0.026 VS02 for airplanes certificated under Part 4a of the Civil Air Regulations.

(2) The all engines operating altitude shall be sufficient so that in the

event the critical engine becomes inoperative at any point along the route, the flight will be able to proceed to a predetermined alternate airport by use of this procedure. In determining the takeoff weight, the airplane is assumed to pass over the critical obstruction following engine failure at a point no closer to the critical obstruction than the nearest approved radio navigational fix, unless the Administrator approves a procedure established on a different basis upon finding that adequate operational safeguards exist.

(3) The airplane must meet the provisions of paragraph (a) of this section at 1,000 feet above the airport used as an alternate in this procedure.

(4) The procedure must include an approved method of accounting for winds and temperatures that would otherwise adversely affect the flight path.

(5) In complying with this procedure fuel jettisoning is allowed if the certificate holder shows that it has an adequate training program, that proper instructions are given to the flight crew, and all other precautions are taken to insure a safe procedure.

(6) The certificate holder shall specify in the dispatch or flight release an alternate airport that meets the requirements of § 121.625.

(d) This section does not apply to large nontransport category airplanes operated under § 121.173(c).

[Amdt. 121-251, 60 FR 65928, Dec. 20, 1995]

§ 121.183 Part 25 airplanes with four or more engines: Reciprocating engine powered: Enroute limitations: Two engines inoperative.

(a) No person may operate an airplane certificated under Part 25 and having four or more engines unless -

(1) There is no place along the intended track that is more than 90 minutes (with all engines operating at cruising power) from an airport that meets the requirements of § 121.187; or

(2) It is operated at a weight allowing the airplane, with the two critical engines inoperative, to climb at 0.013 VS02 feet per minute (that is, the number of feet per minute is obtained by multiplying the number of knots squared by 0.013) at an altitude of 1,000 feet above the highest ground or obstruction within 10 miles on each side of the intended track, or at an altitude of 5,000 feet, whichever is higher.

(b) For the purposes of paragraph (a)(2) of this section, it is assumed that -

(1) The two engines fail at the point that is most critical with respect to the takeoff weight:

(2) Consumption of fuel and oil is normal with all engines operating up to the point where the two engines fail and with two engines operating beyond that point;

(3) Where the engines are assumed to fail at an altitude above the prescribed minimum altitude, compliance with the prescribed rate of climb at the prescribed minimum altitude need not be shown during the descent from the cruising altitude to the prescribed minimum altitude, if those requirements can be met once the prescribed minimum altitude is reached, and assuming descent to be along a net flight path and the rate of descent to be 0.013 VS02 greater than the rate in the approved performance data; and

(4) If fuel jettisoning is provided, the airplane's weight at the point where the two engines fail is considered to be not less than that which would include enough fuel to proceed to an airport meeting the requirements of § 121.187 and to arrive at an altitude of at least 1,000 feet directly over that airport.

[Amdt. 121-251, 60 FR 65928, Dec. 20, 1995]

§ 121.185 Airplanes: Reciprocating engine powered: Landing limitations: Destination airport.

(a) Except as provided in paragraph (b) of this section no person operating a reciprocating engine powered airplane may takeoff that airplane, unless its weight on arrival, allowing for normal consumption of fuel and oil in flight, would allow a full stop landing at the intended destination within 60 percent of the effective length of each runway described below from a point 50 feet directly above the intersection of the obstruction clearance plane and the runway. For the purposes of determining the allowable landing weight at the destination airport the following is assumed:

(1) The airplane is landed on the most favorable runway and in the most favorable direction in still air.

(2) The airplane is landed on the most suitable runway considering the probable wind velocity and direction (forecast for the expected time of arrival), the ground handling characteristics of the type of airplane, and other conditions such as landing aids and terrain, and allowing for the effect of the landing path and roll of not more than 50 percent of the headwind component or not less than 150 percent of the tailwind component.

(b) An airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (a)(2) of this section may be taken off if an alternate airport is specified that meets all of the requirements of this section except that the airplane can accomplish a full stop landing within 70 percent of the effective length of the runway.

(c) This section does not apply to large nontransport category airplanes operated under § 121.173(c).

[Amdt. 121-251, 60 FR 65928, Dec. 20, 1995]

§ 121.187 Airplanes: Reciprocating engine powered: Landing limitations: Alternate airport.

(a) No person may list an airport as an alternate airport in a dispatch or flight release unless the airplane (at the weight anticipated at the time of arrival at the airport), based on the assumptions in § 121.185, can be brought to a full stop landing, within 70 percent of the effective length of the runway.

(b) This section does not apply to large nontransport category airplanes operated under § 121.173(c).

H. Part 135

§ 135.363 General.

(a) Each certificate holder operating a reciprocating engine powered large transport category airplane shall comply with §§ 135.365 through 135.377.

(b) Each certificate holder operating a turbine engine powered large transport category airplane shall comply with §§ 135.379 through 135.387, except that when it operates a turbopropeller powered large transport category airplane certificated after August 29, 1959, but previously type certificated with the same number of reciprocating engines, it may comply with §§ 135.365 through 135.377.

(c) Each certificate holder operating a large nontransport category airplane shall comply with §§ 135.389 through 135.395 and any determination of compliance must be based only on approved performance data. For the purpose of this subpart, a large nontransport category airplane is an airplane that was type certificated before July 1, 1942.

(d) Each certificate holder operating a small transport category airplane shall comply with § 135.397.

(e) Each certificate holder operating a small nontransport category airplane shall comply with § 135.399.

(f) The performance data in the Airplane Flight Manual applies in determining compliance with §§ 135.365 through 135.387. Where conditions are different from those on which the performance data is based, compliance is determined by interpolation or by computing the effects of change in the specific

variables, if the results of the interpolation or computations are substantially as accurate as the results of direct tests.
(g) No person may takeoff a reciprocating engine powered large transport category airplane at a weight that is more than the allowable weight for the runway being used (determined under the runway takeoff limitations of the transport category operating rules of this subpart) after taking into account the temperature operating correction factors in section 4a.749a-T or section 4b.117 of the Civil Air Regulations in effect on January 31, 1965, and in the applicable Airplane Flight Manual.
(h) The Administrator may authorize in the operations specifications deviations from this subpart if special circumstances make a literal observance of a requirement unnecessary for safety.
(i) The 10 mile width specified in §§ 135.369 through 135.373 may be reduced to 5 miles, for not more than 20 miles, when operating under VFR or where navigation facilities furnish reliable and accurate identification of high ground and obstructions located outside of 5 miles, but within 10 miles, on each side of the intended track.
(j) Each certificate holder operating a commuter category airplane shall comply with § 135.398.

[Doc. No. 16097, 43 FR 46783, Oct. 10, 1978, as amended by Amdt. 135-21, 52 FR 1836, Jan. 15, 1987]

§ 135.365 Large transport category airplanes: Reciprocating engine powered: Weight limitations.

(a) No person may takeoff a reciprocating engine powered large transport category airplane from an airport located at an elevation outside of the range for which maximum takeoff weights have been determined for that airplane.
(b) No person may takeoff a reciprocating engine powered large transport category airplane for an airport of intended destination that is located at an elevation outside of the range for which maximum landing weights have been determined for that airplane.
(c) No person may specify, or have specified, an alternate airport that is located at an elevation outside of the range for which maximum landing weights have been determined for the reciprocating engine powered large transport category airplane concerned.
(d) No person may takeoff a reciprocating engine powered large transport category airplane at a weight more than the maximum authorized takeoff weight for the elevation of the airport.
(e) No person may takeoff a reciprocating engine powered large transport category airplane if its weight on arrival at the airport of destination will be more than the maximum authorized landing weight for the elevation of that airport, allowing for normal consumption of fuel and oil enroute.

§ 135.367 Large transport category airplanes: Reciprocating engine powered: Takeoff limitations.

(a) No person operating a reciprocating engine powered large transport category airplane may takeoff that airplane unless it is possible -
   (1) To stop the airplane safely on the runway, as shown by the accelerate-stop distance data, at any time during takeoff until reaching critical engine failure speed;
   (2) If the critical engine fails at any time after the airplane reaches critical engine failure speed V1, to continue the takeoff and reach a height of 50 feet, as indicated by the takeoff path data, before passing over the end of the runway; and
   (3) To clear all obstacles either by at least 50 feet vertically (as shown by the takeoff path data) or 200 feet horizontally within the airport boundaries and 300 feet horizontally beyond the boundaries, without banking before reaching a height of 50 feet (as shown by the takeoff path data) and after that without banking more than 15 degrees.
(b) In applying this section, corrections must be made for any runway

gradient. To allow for wind effect, takeoff data based on still air may be corrected by taking into account not more than 50 percent of any reported headwind component and not less than 150 percent of any reported tailwind component.

§ 135.369 Large transport category airplanes: Reciprocating engine powered: Enroute limitations: All engines operating.

(a) No person operating a reciprocating engine powered large transport category airplane may takeoff that airplane at a weight, allowing for normal consumption of fuel and oil, that does not allow a rate of climb (in feet per minute), with all engines operating, of at least 6.90 VS0 (that is, the number of feet per minute obtained by multiplying the number of knots by 6.90) at an altitude of a least 1,000 feet above the highest ground or obstruction within ten miles of each side of the intended track.
(b) This section does not apply to large transport category airplanes certificated under Part 4a of the Civil Air Regulations.

§ 135.371 Large transport category airplanes: Reciprocating engine powered: Enroute limitations: One engine inoperative.

(a) Except as provided in paragraph (b) of this section, no person operating a reciprocating engine powered large transport category airplane may takeoff that airplane at a weight, allowing for normal consumption of fuel and oil, that does not allow a rate of climb (in feet per minute), with one engine inoperative, of at least (0.079 - 0.106 / N) VS02 (where N is the number of engines installed and VS0 is expressed in knots) at an altitude of least 1,000 feet above the highest ground or obstruction within 10 miles of each side of the intended track. However, for the purposes of this paragraph the rate of climb for transport category airplanes certificated under Part 4a of the Civil Air Regulations is 0.026 VS02.
(b) In place of the requirements of paragraph (a) of this section, a person may, under an approved procedure, operate a reciprocating engine powered large transport category airplane at an all engines operating altitude that allows the airplane to continue, after an engine failure, to an alternate airport where a landing can be made under § 135.377, allowing for normal consumption of fuel and oil. After the assumed failure, the flight path must clear the ground and any obstruction within five miles on each side of the intended track by at least 2,000 feet.
(c) If an approved procedure under paragraph (b) of this section is used, the certificate holder shall comply with the following:
(1) The rate of climb (as prescribed in the Airplane Flight Manual for the appropriate weight and altitude) used in calculating the airplane's flight path shall be diminished by an amount in feet per minute, equal to (0.079 - 0.106 / N) VS02 (when N is the number of engines installed and VS0 is expressed in knots) for airplanes certificated under Part 25 of this chapter and by 0.026 VS02 for airplanes certificated under Part 4a of the Civil Air Regulations.
(2) The all engines operating altitude shall be sufficient so that in the event the critical engine becomes inoperative at any point along the route, the flight will be able to proceed to a predetermined alternate airport by use of this procedure. In determining the takeoff weight, the airplane is assumed to pass over the critical obstruction following engine failure at a point no closer to the critical obstruction than the nearest approved radio navigational fix, unless the Administrator approves a procedure established on a different basis upon finding that adequate operational safeguards exist.
(3) The airplane must meet the provisions of paragraph (a) of this section at 1,000 feet above the airport used as an alternate in this procedure.
(4) The procedure must include an approved method of accounting for winds and temperatures that would otherwise adversely affect the flight path.
(5) In complying with this procedure, fuel jettisoning is allowed if the certificate holder shows that it has an adequate training program, that proper instructions are given to the flight crew, and all other

precautions are taken to ensure a safe procedure.
(6) The certificate holder and the pilot in command shall jointly elect an alternate airport for which the appropriate weather reports or forecasts, or any combination of them, indicate that weather conditions will be at or above the alternate weather minimum specified in the certificate holder's operations specifications for that airport when the flight arrives.

§ 135.373 Part 25 transport category airplanes with four or more engines: Reciprocating engine powered: Enroute limitations: Two engines inoperative.

(a) No person may operate an airplane certificated under Part 25 and having four or more engines unless -
(1) There is no place along the intended track that is more than 90 minutes (with all engines operating at cruising power) from an airport that meets § 135.377; or
(2) It is operated at a weight allowing the airplane, with the two critical engines inoperative, to climb at 0.013 VS02 feet per minute (that is, the number of feet per minute obtained by multiplying the number of knots squared by 0.013) at an altitude of 1,000 feet above the highest ground or obstruction within 10 miles on each side of the intended track, or at an altitude of 5,000 feet, whichever is higher.
(b) For the purposes of paragraph (a)(2) of this section, it is assumed that -
(1) The two engines fail at the point that is most critical with respect to the takeoff weight;
(2) Consumption of fuel and oil is normal with all engines operating up to the point where the two engines fail with two engines operating beyond that point;
(3) Where the engines are assumed to fail at an altitude above the prescribed minimum altitude, compliance with the prescribed rate of climb at the prescribed minimum altitude need not be shown during the descent from the cruising altitude to the prescribed minimum altitude, if those requirements can be met once the prescribed minimum altitude is reached, and assuming descent to be along a net flight path and the rate of descent to be 0.013 VS02 greater than the rate in the approved performance data; and
(4) If fuel jettisoning is provided, the airplane's weight at the point where the two engines fail is considered to be not less than that which would include enough fuel to proceed to an airport meeting § 135.377 and to arrive at an altitude of at least 1,000 feet directly over that airport.

§ 135.375 Large transport category airplanes: Reciprocating engine powered: Landing limitations: Destination airports.

(a) Except as provided in paragraph (b) of this section, no person operating a reciprocating engine powered large transport category airplane may takeoff that airplane, unless its weight on arrival, allowing for normal consumption of fuel and oil in flight, would allow a full stop landing at the intended destination within 60 percent of the effective length of each runway described below from a point 50 feet directly above the intersection of the obstruction clearance plane and the runway. For the purposes of determining the allowable landing weight at the destination airport the following is assumed:
(1) The airplane is landed on the most favorable runway and in the most favorable direction in still air.
(2) The airplane is landed on the most suitable runway considering the probable wind velocity and direction (forecast for the expected time of arrival), the ground handling characteristics of the type of airplane, and other conditions such as landing aids and terrain, and allowing for the effect of the landing path and roll of not more than 50 percent of the headwind component or not less than 150 percent of the tailwind component.
(b) An airplane that would be prohibited from being taken off because it could

not meet paragraph (a)(2) of this section may be taken off if an alternate airport is selected that meets all of this section except that the airplane can accomplish a full stop landing within 70 percent of the effective length of the runway.

§ 135.377 Large transport category airplanes: Reciprocating engine powered: Landing limitations: Alternate airports.

No person may list an airport as an alternate airport in a flight plan unless the airplane (at the weight anticipated at the time of arrival at the airport), based on the assumptions in § 135.375(a)(1) and (2), can be brought to a full stop landing within 70 percent of the effective length of the runway.

Current JAR text:

1. JAR-OPS 1.470 Applicability

(a) An operator shall ensure that multi-engine aeroplanes powered by turbopropeller engines with a maximum approved passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5700 kg. and all multi-engine turbojet powered aeroplanes are operated in accordance with Subpart G (Performance Class A).

(b) An operator shall ensure that propeller driven aeroplanes with a maximum approved passenger seating configuration of 9 or less, and a maximum take-off mass of 5700 kg or less are operated in accordance with Subpart H (Performance Class B).

(c) An operator shall ensure that aeroplanes powered by reciprocating engines with a maximum approved passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5700 kg are operated in accordance with Subpart I (Performance Class C).

SUBPART H - PERFORMANCE CLASS B

JAR-OPS 1.525. General.

(a)An operator shall not operate a single-engine aeroplane:
(1)At night; or
(2)In Instrument Meteorological Conditions except under Special Visual Flight Rules.
Note: Limitations on the operation of single-engine aeroplanes are covered by JAR-OPS 1.240(a)(6).
(b) An operator shall treat two-engine aeroplanes which do not meet the climb requirements of Appendix 1 to JAR-OPS 1.525(b) as single-engine aeroplanes.

JAR-OPS 1.530. Take-off.

(a)An operator shall ensure that the take-off mass does not exceed the maximum take-off mass specified in the Aeroplane Flight Manual for the pressure altitude and the ambient temperature at the aerodrome at which the take-off is to be made.
(b)An operator shall ensure that the unfactored take-off distance, as specified in the Aeroplane Flight Manual does not exceed:
(1)When multiplied by a factor of 1.25, the take-off run available; or
(2)When stopway and/or clearway is available, the following:
(i) The take-off run available;
(ii) When multiplied by a factor of 1.15, the take-off distance available; and
(iii) When multiplied by a factor of 1.3, the accelerate-stop distance available.

(c) When showing compliance with sub-paragraph (b) above, an operator shall take account of the following:
   (1) The mass of the aeroplane at the commencement of the take-off run;
   (2) The pressure altitude at the aerodrome;
   (3) The ambient temperature at the aerodrome;
   (4) The runway surface condition and the type of runway surface (see AMC OPS 1.530(c)(4) & IEM OPS 1.530(c)(4));
   (5) The runway slope in the direction of take-off (see AMC OPS 1.530(c)(5)); and
   (6) Not more than 50% of the reported head-wind component or not less than 150% of the reported tail-wind component.

JAR-OPS 1.535.Take-off Obstacle Clearance - Multi-Engined Aeroplanes. (See IEM OPS 1.535)

(a) An operator shall ensure that the take-off flight path of aeroplanes with two or more engines, determined in accordance with this sub-paragraph, clears all obstacles by a vertical margin of at least 50 ft, or by a horizontal distance of at least 90 m plus 0.125 x D, where D is the horizontal distance travelled by the aeroplane from the end of the take-off distance available or the end of the take-off distance if a turn is scheduled before the end of the take-off distance available except as provided in sub-paragraphs (b) and (c) below. When showing compliance with this sub-paragraph (see AMC OPS 1.535(a) & IEM OPS 1.535(a)) it must be assumed that:
   (1) The take-off flight path begins at a height of 50 ft above the surface at the end of the take-off distance required by JAR-OPS 1.530(b) and ends at a height of 1500 ft above the surface;
   (2) The aeroplane is not banked before the aeroplane has reached a height of 50 ft above the surface, and that thereafter the angle of bank does not exceed 15°;
   (3) Failure of the critical engine occurs at the point on the all engine take-off flight path where visual reference for the purpose of avoiding obstacles is expected to be lost;
   (4) The gradient of the take-off flight path from 50 ft to the assumed engine failure height is equal to the average all-engine gradient during climb and transition to the en-route configuration, multiplied by a factor of 0.77; and
   (5) The gradient of the take-off flight path from the height reached in accordance with sub-paragraph (4) above to the end of the take-off flight path is equal to the one engine inoperative en-route climb gradient shown in the Aeroplane Flight Manual.

(b) When showing compliance with sub-paragraph (a) above for those cases where the intended flight path does not require track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:
   (1) 300 m, if the flight is conducted under conditions allowing visual course guidance navigation, or if navigational aids are available enabling the pilot to maintain the intended flight path with the same accuracy (see Appendix 1 to JAR - OPS 1.535(b)(1) & (c)(1)); or
   (2) 600 m, for flights under all other conditions.

(c) When showing compliance with sub-paragraph (a) above for those cases where the intended flight path requires track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:
   (1) 600 m for flights under conditions allowing visual course guidance navigation (see Appendix 1 to JAR-OPS 1.535(b)(1) & (c)(1));
   (2) 900 m for flights under all other conditions.

(d) When showing compliance with sub-paragraphs (a), (b) and (c) above, an operator must take account of the following:
   (1) The mass of the aeroplane at the commencement of the take-off run;
   (2) The pressure altitude at the aerodrome;
   (3) The ambient temperature at the aerodrome; and
   (4) Not more than 50% of the reported head-wind component or not less than

150% of the reported tail-wind component.

JAR-OPS 1.540. En-Route - Multi-engined aeroplanes. (See IEM OPS 1.540)

(a) An operator shall ensure that the aeroplane, in the meteorological conditions expected for the flight, and in the event of the failure of one engine, with the remaining engines operating within the maximum continuous power conditions specified, is capable of continuing flight at or above the relevant minimum altitudes for safe flight stated in the Operations Manual to a point 1000 ft above an aerodrome at which the performance requirements can be met.

(b) When showing compliance with sub-paragraph (a) above:

(1)The aeroplane must not be assumed to be flying at an altitude exceeding that at which the rate of climb equals 300 ft per minute with all engines operating within the maximum continuous power conditions specified; and

(2)The assumed en-route gradient with one engine inoperative shall be the gross gradient of descent or climb, as appropriate, respectively increased by a gradient of 0.5%, or decreased by a gradient of 0.5%.

JAR-OPS 1.542. En-Route - Single-engine aeroplanes. (See IEM OPS 1.542)

(a)An operator shall ensure that the aeroplane, in the meteorological conditions expected for the flight, and in the event of engine failure, is capable of reaching a place at which a safe forced landing can be made. For landplanes, a place on land is required, unless otherwise approved by the Authority.

(b)When showing compliance with sub-paragraph (a) above:

(1)The aeroplane must not be assumed to be flying, with the engine operating within the maximum continuous power conditions specified, at an altitude exceeding that at which the rate of climb equals 300 ft per minute; and

(2)The assumed en-route gradient shall be the gross gradient of descent increased by a gradient of 0.5%.

JAR-OPS 1.545. Landing - Destination and Alternate Aerodromes. (See AMC OPS 1.545 & 1.550)

An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) does not exceed the maximum landing mass specified for the altitude and the ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome.

JAR-OPS 1.550. Landing - Dry runway. (See AMC OPS 1.545 & 1.550)

(a)An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) for the estimated time of landing allows a full stop landing from 50 ft above the threshold within 70% of the landing distance available at the destination aerodrome and at any alternate aerodrome. The Authority may approve the use of landing distance data factored in accordance with this paragraph and based on a screen height of less than 50 ft, but not less than 35 ft, for Steep Approach and Short Landing procedures. (See Appendix 1 to JAR-OPS 1.550(a).)

(b)When showing compliance with sub-paragraph (a) above, an operator shall take account of the following:

(1)The altitude at the aerodrome;

(2)Not more than 50% of the head-wind component or not less than 150% of the tail-wind component.

(3)The runway surface condition and the type of runway surface (see AMC OPS 1.550(b)(3)); and

(4)The runway slope in the direction of landing (see AMC OPS 1.550(b)(4));

(c)For despatching an aeroplane in accordance with sub-paragraph (a) above, it must be assumed that:

(1)The aeroplane will land on the most favourable runway, in still air; and

(2)The aeroplane will land on the runway most likely to be assigned considering the probable wind speed and direction and the ground handling characteristics of the aeroplane, and considering other conditions such as landing aids and terrain. (See IEM OPS 1.550(c).)

(d) If an operator is unable to comply with sub-paragraph (c)(2) above for the destination aerodrome, the aeroplane may be despatched if an alternate aerodrome is designated which permits full compliance with sub-paragraphs (a), (b) and (c) above.

JAR-OPS 1.555. Landing-Wet and Contaminated Runways

(a) An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be wet, the landing distance available is equal to or exceeds the required landing distance, determined in accordance with JAR - OPS 1.550, multiplied by a factor of 1.15.

(b) An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be contaminated, the landing distance, determined by using data acceptable to the Authority for these conditions, does not exceed the landing distance available.

(c) A landing distance on a wet runway shorter than that required by sub-paragraph (a) above, but not less than that required by JAR - OPS 1.550(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on wet runways.

SUBPART I - PERFORMANCE CLASS C

JAR-OPS 1.560. General.

An operator shall ensure that, for determining compliance with the requirements of this Subpart, the approved performance Data in the Aeroplane Flight Manual is supplemented, as necessary, with other Data acceptable to the Authority if the approved performance Data in the Aeroplane Flight Manual is insufficient.

JAR-OPS 1.565. Take-off.

(a) An operator shall ensure that the take-off mass does not exceed the maximum take-off mass specified in the Aeroplane Flight Manual for the pressure altitude and the ambient temperature at the aerodrome at which the take-off is to be made.

(b) An operator shall ensure that, for aeroplanes which have take-off field length data contained in their Aeroplane Flight Manuals that do not include engine failure accountability, the distance from the start of the take-off roll required by the aeroplane to reach a height of 50 ft above the surface with all engines operating within the maximum take-off power conditions specified, when multiplied by a factor of either:

   (1) 1.33 for aeroplanes having two engines; or
   (2) 1.25 for aeroplanes having three engines; or
   (3) 1.18 for aeroplanes having four engines,

   does not exceed the take-off run available at the aerodrome at which the take-off is to be made.

(c) An operator shall ensure that, for aeroplanes which have take-off field length data contained in their Aeroplane Flight Manuals which accounts for engine failure, the following requirements are met in accordance with the specifications in the Aeroplane Flight Manual:

   (1) The accelerate-stop distance must not exceed the accelerate-stop distance available;
   (2) The take-off distance must not exceed the take-off distance available, with a clearway distance not exceeding half of the take-off run available;
   (3) The take-off run must not exceed the take-off run available;
   (4) Compliance with this paragraph must be shown using a single value of V1

for the rejected and continued take-off; and

(5) On a wet or contaminated runway the take-off mass must not exceed that permitted for a take-off on a dry runway under the same conditions.

(d) When showing compliance with sub-paragraphs (b) and (c) above, an operator must take account of the following:

(1) The pressure altitude at the aerodrome;
(2) The ambient temperature at the aerodrome;
(3) The runway surface condition and the type of runway surface (see IEM OPS 1.565(d)(3));
(4) The runway slope in the direction of take-off (see AMC OPS 1.565(d)(4));
(5) Not more that 50% of the reported head-wind component or not less than 150% of the reported tail-wind component; and
(6) The loss, if any, of runway length due to alignment of the aeroplane prior to take-off.

JAR-OPS 1.570. Take-off Obstacle Clearance.

(a) An operator shall ensure that the take-off flight path with one engine inoperative clears all obstacles by a vertical distance of at least 50 ft plus 0.01 x D, or by a horizontal distance of at least 90 m plus 0.125 x D, where D is the horizontal distance the aeroplane has travelled from the end of the take-off distance available.

(b) The take-off flight path must begin at a height of 50 ft above the surface at the end of the take-off distance required by JAR-OPS 1.565(b) or (c) as applicable, and end at a height of 1500 ft above the surface.

(c) When showing compliance with sub-paragraph (a), an operator must take account of the following:

(1) The mass of the aeroplane at the commencement of the take-off run;
(2) The pressure altitude at the aerodrome;
(3) The ambient temperature at the aerodrome; and
(4) Not more than 50% of the reported head-wind component or not less than 150% of the reported tail-wind component.

(d) When showing compliance with sub-paragraph (a) above, track changes shall not be allowed up to that point of the take-off flight path where a height of 50 ft above the surface has been achieved. Thereafter, up to a height of 400 ft it is assumed that the aeroplane is banked by no more than 15°. Above 400 ft height bank angles greater than 15°, but not more than 25° may be scheduled. Adequate allowance must be made for the effect of bank angle on operating speeds and flight path including the distance increments resulting from increased operating speeds. (See AMC OPS 1.570(d).)

(e) When showing compliance with sub-paragraph (a) above for those cases which do not require track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:

(1) 300 m, if the pilot is able to maintain the required navigational accuracy through the obstacle accountability area; or
(2) 600 m, for flights under all other conditions.

(f) When showing compliance with sub-paragraph (a) above for those cases which do require track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:

(1) 600 m, if the pilot is able to maintain the required navigational accuracy through the obstacle accountability area; or
(2) 900 m for flights under all other conditions.

(g) An operator shall establish contingency procedures to satisfy the requirements of JAR - OPS 1.570 and to provide a safe route, avoiding obstacles, to enable the aeroplane to either comply with the en-route requirements of JAR - OPS 1.570, or land at either the aerodrome of departure or at a take-off alternate aerodrome.

JAR-OPS 1.575. En-Route-All Engines Operating.

(a) An operator shall ensure that the aeroplane will, in the meteorological conditions expected for the flight, at any point on its route or on any planned diversion therefrom, be capable of a rate of climb of at least 300 ft per minute with all engines operating within the maximum continuous power conditions specified at:

(1) The minimum altitudes for safe flight on each stage of the route to be flown or of any planned diversion therefrom specified in, or calculated from the information contained in, the Operations Manual relating to the aeroplane; and

(2) The minimum altitudes necessary for compliance with the conditions prescribed in JAR - OPS 1.580 and 1.585, as appropriate.

JAR-OPS 1.580. En-Route-One Engine Inoperative. (See AMC OPS 1.580)

(a)An operator shall ensure that the aeroplane will, in the meteorological conditions expected for the flight, in the event of any one engine becoming inoperative at any point on its route or on any planned diversion therefrom and with the other engine or engines operating within the maximum continuous power conditions specified, be capable of continuing the flight from the cruising altitude to an aerodrome where a landing can be made in accordance with JAR-OPS 1.595 or JAR-OPS 1.600 as appropriate, clearing obstacles within 9.3 km (5 nm) either side of the intended track by a vertical interval of at least:

(1)1000 ft when the rate of climb is zero or greater; or

(2)2000 ft when the rate of climb is less than zero.

(b)The flight path shall have a positive slope at an altitude of 450 m (1500 ft) above the aerodrome where the landing is assumed to be made after the failure of one engine.

(c)For the purpose of this sub-paragraph the available rate of climb of the aeroplane shall be taken to be 150 ft per minute less than the gross rate of climb specified.

(d)When showing compliance with this paragraph, an operator must increase the width margins of sub-paragraph (a) above to 18.5 km (10 nm) if the navigational accuracy does not meet the 95% containment level.

(e)Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required fuel reserves, if a safe procedure is used.

JAR-OPS 1.585. En-Route-Aeroplanes With Three Or More Engines, Two Engines Inoperative.

(a)An operator shall ensure that, at no point along the intended track, will an aeroplane having three or more engines be more than 90 minutes at the all-engine long range cruising speed at standard temperature in still air, away from an aerodrome at which the performance requirements applicable at the expected landing mass are met unless it complies with sub-paragraphs (b) to (e) below.

(b)The two-engines inoperative flight path shown must permit the aeroplane to continue the flight, in the expected meteorological conditions, clearing all obstacles within 9.3 km (5 nm) either side of the intended track by a vertical interval of at least 2000 ft, to an aerodrome at which the performance requirements applicable at the expected landing mass are met.

(c)The two engines are assumed to fail at the most critical point of that portion of the route where the aeroplane is more than 90 minutes, at the all engines long range cruising speed at standard temperature in still air, away from an aerodrome at which the performance requirements applicable at the expected landing mass are met.

(d)The expected mass of the aeroplane at the point where the two engines are assumed to fail must not be less than that which would include sufficient fuel to proceed to an aerodrome where the landing is assumed to be made, and to arrive there at an altitude of a least 450 m (1500 ft) directly over the landing area and thereafter to fly level for 15 minutes.

(e)For the purpose of this sub-paragraph the available rate of climb of the aeroplane shall be taken to be 150 ft per minute less than that specified.

(f)When showing compliance with this paragraph, an operator must increase the width margins of sub-paragraph (a) above to 18.5 km (10 nm) if the navigational accuracy does not meet the 95% containment level.

(g)Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required fuel reserves, if a safe procedure is used.

JAR-OPS 1.590. Landing-Destination and Alternate Aerodromes. (See AMC OPS 1.590 and 1.595)

An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) does not exceed the maximum landing mass specified in the Aeroplane Flight Manual for the altitude and, if accounted for in the Aeroplane Flight Manual, the ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome.

JAR-OPS 1.595. Landing-Dry Runways. (See AMC OPS 1.590 and 1.595)

(a) An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) for the estimated time of landing allows a full stop landing from 50 ft above the threshold within 70% of the landing distance available at the destination and any alternate aerodrome.
(b) When showing compliance with sub-paragraph (a) above, an operator must take account of the following:
   (1) The altitude at the aerodrome;
   (2) Not more than 50% of the head-wind component or not less than 150% of the tail-wind component;
   (3) The type of runway surface (see AMC OPS 1.595(b)(3)); and
   (4) The slope of the runway in the direction of landing (see AMC OPS 1.595(b)(4)).
(c) For despatching an aeroplane in accordance with sub-paragraph (a) above it must be assumed that:
   (1) The aeroplane will land on the most favourable runway in still air; and
   (2) The aeroplane will land on the runway most likely to be assigned considering the probable wind speed and direction and the ground handling characteristics of the aeroplane, and considering other conditions such as landing aids and terrain. (See IEM OPS 1.595(c).)
(d) If an operator is unable to comply with sub-paragraph (b)(2) above for the destination aerodrome, the aeroplane may be despatched if an alternate aerodrome is designated which permits full compliance with sub-paragraphs (a), (b) and (c).

JAR-OPS 1.600. Landing-Wet and Contaminated Runways.

(a) An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be wet, the landing distance available is equal to or exceeds the required landing distance, determined in accordance with JAR - OPS 1.595, multiplied by a factor of 1.15.
(b) An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be contaminated, the landing distance determined by using data acceptable to the Authority for these conditions, does not exceed the landing distance available.

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

Currently, the Part 121/135 Subpart I airplane performance operating rules differentiate between two types of aircraft: reciprocating engine powered and turbine engine powered. The JAR recognizes three different airplane performance categories:

Class A: All Multi-engine turbojets aircraft, and any multi-engine turbopropeller aircraft with a maximum approved passenger seating configuration of more than 9, or a maximum takeoff weight exceeding 5700 kg (12,566 lb).

Class B: Any propeller driven aircraft with a maximum approved passenger seating configuration of 9 or less, and a maximum takeoff weight of 5700 kg (12,566 lb).

Class C: Any aircraft powered by reciprocating engines with a maximum approved passenger seating configuration of more than 9 or a maximum takeoff weight exceeding 5700 kg (12,566 lb).

The FAR divides performance requirements based on the engine type, whereas the JAR considers engine type, seating configuration and maximum allowable takeoff weight. The FAR is the more stringent because both the Part 121 and 135 performance rules apply to all aircraft, regardless of size or seating configuration. The focus of the harmonization effort was on matching the 121/135 rules with the JAR Class A aircraft requirements. It was the decision of the Performance Harmonization Working Group to not create a separate Class B and Class C category within the FAR. The Class B and Class C aircraft are commuter aircraft, and therefore there is no real competitive economic advantage for a JAR operator verses an FAA operator since the two operators would never be operating the same aircraft into the same airport.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

N/A – For certain types of commuter aircraft, there is a difference in the performance requirements between the FAR and JAR, however, the decision by the Performance Harmonization Working Group was to not harmonize on these differences since there is no competing operations of these aircraft types.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The proposed action is to not harmonize to the JAR standard. The harmonization of the FAR and JAR performance operating rules is based on providing a level economic playing field. Since JAR Class B and Class C aircraft do not compete against US operators, there is no competitive benefit to be lost or gained by adopting this change into the FAR.

(LXVI.)Report from the Airplane Performance Harmonization Working Group

(LXVII.)Issue: Retroactive application of standards adopted by the final rule, "Improved Standards for Determining Rejected Takeoff and Landing Performance," to all airplanes in service

Rule Sections: FAR 25.101, 25.109, 121.189, 135.379/JAR 25.101, 25.109, JAR-OPS 1.490

1 - What is the underlying safety issue to be addressed by the FAR/JAR?
[Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

The standards referenced in the working group's task statement contained three requirements that were applicable only to new airplane type certifications:

1. A revision to the method of accounting for the time needed by the pilot to accomplish the actions needed to rejected takeoff;

2. Requirements to account for wet runway takeoff performance; and

3. Requirements to account for worn brakes.

During the rulemaking process leading to the adoption of the "Improved Standards for Determining Rejected Takeoff and Landing Performance" (Amendment Nos. 1-48, 25-92, 91-256, 121-268, 135-71), the FAA considered making these standards retroactive to all airplanes in service. As stated in the preamble to that final rule, due to the controversial nature of the issue of retroactivity, the FAA decided to: (1) proceed with the proposed rules without requiring retroactive application of these standards; and (2) recommend that the issues of retroactive application of these standards and requiring operators to take into account runway alignment distance be added to the FAA/JAA harmonization work program.

The harmonization work program is the formal method developed by the FAA and the JAA to harmonize regulations and policies. Tasks on the harmonization work program are assigned to FAR/JAR harmonization working groups in accordance with the respective rulemaking procedures of the FAA and the JAA. The Airplane Performance Harmonization Working Group was tasked with making recommendations to address the issues of retroactivity of the subject standards and requiring operators to take into account runway alignment distance. This report addresses the issue of retroactivity of the subject standards.

Taking each of the three requirements that were applicable only to new airplane type certifications in turn:

(LXVIII.)<u>Item 1</u>

The underlying safety issue for item 1 concerns the safety margin provided in calculated accelerate-stop distances to account for the time needed for pilots to accomplish the actions needed to stop the airplane during a rejected takeoff. These calculated accelerate-stop distances are provided in the Airplane Flight Manual (AFM) and are used to comply with the takeoff operating limitations of §§ 121.189 and 135.379, and JAR-OPS 1.490 and 1.495. The longer the time interval assumed for the pilots to accomplish the rejected takeoff procedures, the longer the accelerate-stop distance that must be available for the takeoff and the greater the safety margin in the event of a rejected takeoff. If the longer accelerate-stop distance is not available (i.e., the takeoff is field-length-limited), the airplane takeoff weight must be reduced in order to comply with the takeoff operating limitations. When takeoff weight must be reduced, if this weight reduction is achieved by reducing payload, there is a revenue loss.

The FAA requires applicants to demonstrate, by flight test, the time needed by the pilot to accomplish the actions necessary to stop the airplane during a rejected takeoff. Because the test pilots know that they are going to reject the takeoff, whereas in actual operations the rejected takeoff maneuver is unexpected, the time measured during these flight tests are increased to account for this difference when the accelerate-stop distances are calculated for the AFM. This is intended to allow sufficient time (and distance) for a pilot, in actual operations, to accomplish the procedures for stopping the airplane.

The method of determining this adjustment has varied over the years, but the objective has always been the same – to provide enough time and distance for a pilot to accomplish the procedures for stopping the airplane. Prior to Amendment 25-42, a one-second increment was added to the time interval between each pilot action occurring after V_1. For most transport category airplanes, performing a rejected takeoff involves three separate pilot actions. The pilot applies the brakes, reduces the thrust or power, and raises the spoilers. The applicant defines the order in which the actions occur, but must demonstrate that the resulting procedures do not require exceptional skill to perform. Since the test pilot's first action determines V_1, there are typically two pilot actions (for airplanes without automatic spoiler deployment during a rejected takeoff) occurring after V_1. Therefore, usually two seconds of additional time (and the resulting distance) were added to the time intervals determined by the certification flight tests.

Amendment 25-42 changed the method of applying these time increments. The provisions added by Amendment 25-42 require the AFM accelerate-stop distance to be calculated by inserting a two-second time increment after V_1, but before the pilot takes the first action to stop the airplane. During this two-second time increment, the airplane continues to accelerate. No further time increments are added to each time interval between the actions taken by the pilot to stop the airplane.

The standards adopted by the final rule, "Improved Standards for Determining Rejected Takeoff and Landing Performance" changed the method of applying this two second time increment to a method similar to that existing prior to Amendment 25-42. However, the method adopted uses a distance increment rather than a time increment to clarify that no credit should be taken during this time period for changes in airplane system states (e.g., engine spindown, brake pressure ramp-up, etc.). Also, unlike the manner in which the pre-Amendment 25-42 method was implemented by some applicants prior to an FAA policy change in 1981, no credit can be taken for airplane deceleration during this two second time period. (In 1981, the FAA issued policy that no longer allowed applicants to take credit for airplane deceleration during the assessed time delays.)

It should be noted that a large percentage of current technology transport category airplanes incorporate autospoiler and autobrake systems that automatically raise the spoilers and activate the brakes if the thrust levers are brought to the idle position during a takeoff. Use of these automatic systems can shorten the time needed to configure the airplane for a rejected takeoff and help to ensure that none of the actions is inadvertently missed.

Amendment 25-42 also added the requirement to consider rejected takeoffs with all engines operating. Under this requirement, the accelerate-stop distance used to determine the allowable takeoff weight must be the longer of the one-engine-inoperative and all-engines-operating accelerate-stop distances. Amendment 25-92 retained this provision, so retroactive application of Amendment 25-92 would also mean retroactive application of the all-engines-operating accelerate-stop distance requirements for those airplanes certificated under the pre-Amendment 25-42 standards.

(LXIX.)<u>Item 2</u>

The Airplane Performance Harmonization Working Group's task associated with item 2 above was completed with the delivery of Working Group Report 2 ("Accounting for the effect of wet runways on takeoff performance") to the Air Carrier Operations Issues Group.

a) Item 3

On May 21, 1988, a DC-10 overran runway 35L at Dallas-Fort Worth International Airport during a rejected takeoff (RTO). Eight of the ten wheel brakes failed during the RTO, and the airplane departed the runway at 97 knots. The brakes that failed had been worn to near the replacement limits prior to the accident. The U.S. National Transportation Safety Board (NTSB) determined that the probable cause of the accident was that the FAA failed to require the airplane manufacturer to set appropriate brake wear replacement limits that would permit the DC-10-30 airplane to stop from a maximum energy RTO and that the manufacturer failed to use available flight test data to set appropriate brake wear limits.

As a result, the NTSB issued the following safety recommendations to the FAA:

<u>A-90-31</u>. Require airplane manufacturers to conduct tests and analyses to determine the increase in the stopping distance for all turbojet transport category airplanes currently in service attributed to the difference between the use of new brakes and the use of brakes worn to the replacement limits without credit for the use of reverse thrust.

<u>A-90-32</u>. Require the appropriate airplane manufacturers to determine by tests, simulation, and/or analyses the accelerate-stop distances for all turbojet transport category airplanes currently in service as required by 14 CFR 25.109 (pre-amendment 42) using demonstrated certification stopping performance data from worn brakes and current procedures prescribed for rejected takeoffs. Account for demonstrated pilot reaction times and for deceleration device reaction times, such as engine spool-down time and brake force ramp-up time in the determination of accelerate-stop distances and add a distance safety margin for in-service variations as described in Advisory Circular 25-7 (chapter 2, paragraphs 11.c.12.iv and vii) to be equivalent to at least a distance traveled in 2 seconds at an appropriate brake-on speed or V_1 speed.

<u>A-90-33</u>. Revise, as appropriate, the accelerate-stop data in the approved flight manuals of all turbojet transport category airplanes currently in service to include the increase in stopping distance attributed to worn brakes (determined in accordance with Safety Recommendation A-90-31) and to include the proper application of safety margins for in-service variations (determined in accordance with Safety Recommendation A-90-32).

<u>A-90-035</u>. Revise 14 CFR 25.109 to require that the stopping distance capabilities of brake assemblies at the allowable "maximum brake wear" limit are included in the requirement for determining the accelerate-stop distances

for certification of new airplanes, without credit for the use of reverse thrust.

The FAA responded by issuing Airworthiness Directives (AD's) for all in-service part 25 airplanes with U.S. type certificates and a maximum gross weight over 75,000 pounds. For new airplane designs, the FAA adopted the "Improved Standards for Determining Rejected Takeoff and Landing Distances," which amended part 25 (Amendment 25-92) to address this issue during the type certification process. The AD's established brake wear limits such that the brakes, when fully worn, would be capable of absorbing the energy from a maximum brake energy RTO. Credit for the use of reverse thrust, which is normally not permitted in determining RTO performance on dry runways, was permitted in determining the amount of energy that would need to be absorbed by the brakes in the fully worn condition.

The FAA published dynamometer test guidelines to be used for determining the airplane brake wear limits referenced in the AD's and for use in airplane certification programs prior to the adoption of Amendment 25-92. These guidelines specified that the effect of engine reverse thrust could be used in determining the dynamometer RTO maximum energy level "following normal procedures for power setting, cutback speed, and the recommended number of reversers to be used with a critical engine inoperative." The guidelines also state that "the effect of inoperative thrust reversers due to Minimum Equipment List (MEL) dispatch must also be accounted for."

The FAA declined to apply the "Improved Standards for Determining Rejected Takeoff and Landing Distances" retroactively, and allowed the use of reverse thrust credit for determining the wear pin length mandated by the AD's primarily due to concerns regarding the costs of implementing the NTSB recommendations.

The "Improved Standards for Determining Rejected Takeoff and Landing Distances" went beyond the requirements of the AD's by not permitting reverse thrust credit for determining worn brake energy requirements and by requiring all stopping distances in the Airplane Flight Manual to be determined with all brakes worn to the replacement or overhaul limit.

The tasking to examine retroactive application of the "Improved Standards for Determining Rejected Takeoff and Landing Distances," essentially tasks the Airplane Performance Harmonization Working Group with recommending, in regards to in-service airplanes not certificated to the more recent standards, whether reverse thrust credit should be removed from the maximum brake energy requirement associated with a fully worn brake, and whether stopping distances should be changed to reflect stopping distances with all brakes fully worn.

2 - What are the current FAR and JAR standards relative to this subject?
[Reproduce the FAR and JAR rules text as indicated below.]

Current FAR text:

B. Part 25

C.

D. FAR 25.101

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

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(h) The procedures established under paragraphs (f) and (g) of this section must –

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

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

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

E.

(i) The accelerate-stop and landing distances prescribed in §§ 25.109 and 25.125, respectively, must be determined with all the airplane wheel brake assemblies at the fully worn limit of their allowable wear range.

F. FAR 25.109

(a) The accelerate-stop distance on a dry runway is the greater of the following distances:

(1) The sum of the distances necessary to –

(i) Accelerate the airplane from a standing start with all engines operating to V_{EF} for takeoff from a dry runway;

(ii) Allow the airplane to accelerate from V_{EF} to the highest speed reached during the rejected takeoff, assuming the critical engine fails at V_{EF} and the pilot takes the first action to reject the takeoff at the V_1 for takeoff from a dry runway; and

(iii) Come to a full stop on a dry runway from the speed reached as prescribed in paragraph (a)(1)(ii) of this section; plus

(iv) A distance equivalent to 2 seconds at the V_1 for takeoff from a dry runway.

(2) The sum of the distances necessary to –

(i) Accelerate the airplane from a standing start with all engines operating to the highest speed reached during the rejected takeoff, assuming the pilot takes the first action to reject the takeoff at the V_1 for takeoff from a dry runway; and

(ii) With all engines still operating, come to a full stop on a dry runway from the speed reached as prescribed in paragraph (a)(2)(i) of this section; plus

(iii) A distance equivalent to 2 seconds at the V_1 for takeoff from a dry runway.

(b) The accelerate-stop distance on a wet runway is the greater of the following distances:

(1) The accelerate-stop distance on a dry runway determined in

accordance with paragraph (a) of this section; or

(2) The accelerate-stop distance determined in accordance with paragraph (a) of this section, except that the runway is wet and the corresponding wet runway values of V_{EF} and V_1 are used. In determining the wet runway accelerate-stop distance, the stopping force from the wheel brakes may never exceed:

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(i) A flight test demonstration of the maximum brake kinetic energy accelerate-stop distance must be conducted with not more than 10 percent of the allowable brake wear range remaining on each of the airplane wheel brakes.

G. Part 121

FAR 121.189 Airplanes: Turbine engine powered: Takeoff limitations.

(e) No person operating a turbine engine powered airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that listed in the Airplane Flight Manual at which compliance with the following may be shown:

(7) The accelerate-stop distance must not exceed the length of the runway plus the length of any stopway.

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H. Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

(e) No person operating a turbine engine powered large transport category airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that listed in the Airplane Flight Manual at which compliance with the following may be shown:

(7) The accelerate-stop distance must not exceed the length of the runway plus the length of any stopway.

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Current JAR text:

I. JAR 25.101

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

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(h) The procedures established under paragraphs (f) and (g) of this section must –

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

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

(3) Included allowance for any time delays, in the execution of the procedures, that may reasonably be expected in service. (See ACJ 25.101(h)(3).)

(i) The accelerate-stop and landing distances prescribed in JAR 25.109 and 25.125, respectively, must be determined with all the airplane wheel brake assemblies at the fully worn limit of their allowable wear range. (See ACJ 25.101(i).)

J.

K. JAR 25.109

(a) The accelerate-stop distance on a dry runway is the greater of the following distances:

(1) The sum of the distances necessary to –

(i) Accelerate the aeroplane from a standing start with all engines operating to V_{EF} for takeoff from a dry runway;

(ii) Allow the aeroplane to accelerate from V_{EF} to the highest speed reached during the rejected takeoff, assuming the critical engine fails at V_{EF} and the pilot takes the first action to reject the takeoff at the V_1 for takeoff from a dry runway; and

(iii) Come to a full stop on a dry runway from the speed reached as prescribed in sub-paragraph (a)(1)(ii) of this paragraph; plus

(iv) A distance equivalent to 2 seconds at the V_1 for takeoff from a dry runway.

(2) The sum of the distances necessary to –

(ii) Accelerate the aeroplane from a standing start with all engines operating to the highest speed reached during the rejected takeoff, assuming the pilot takes the first action to reject the takeoff at the V_1 for takeoff from a dry runway; and

(iv) With all engines still operating, come to a full stop on a dry runway from the speed reached as prescribed in sub-paragraph (a)(2)(i) of this paragraph; plus

(v) A distance equivalent to 2 seconds at the V_1 for takeoff from a dry runway.

(b) (See ACJ 25.109(a).) The accelerate-stop distance on a wet runway is the greater of the following distances:

(3) The accelerate-stop distance on a dry runway determined in accordance with sub-paragraph (a) of this paragraph; or

(4) The accelerate-stop distance determined in accordance with sub-paragraph (a) of this paragraph, except that the runway is wet and the corresponding wet runway values of V_{EF} and V_1 are used. In determining the wet runway accelerate-stop distance, the stopping force from the wheel brakes may never exceed:

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(i) A flight test demonstration of the maximum brake kinetic energy accelerate-stop distance must be conducted with not more than 10 percent of the allowable brake wear range remaining on each of the aeroplane wheel brakes.

JAR-OPS 1.490 Take-off

(i) An operator must meet the following requirements when determining the maximum permitted take-off mass:

(8) The accelerate-stop distance must not exceed the accelerate-stop distance available;

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2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.] There are no differences in FAA and JAA standards or policy for these issues (except for retroactive application of the wet runway standards, which is addressed by Working Group Report 2).

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.] N/A

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The proposed action is to take no further action to retroactively apply the standards adopted by the final rule, “Improved Standards for Determining Rejected Takeoff and Landing Performance,” to all airplanes in service. The reasons for this recommendation are provided in the discussion that follows. However, the working group recommends that the FAA take appropriate steps to ensure that the effect of inoperative thrust reversers for Minimum Equipment List (MEL) dispatch is accounted for on airplane types where reverse thrust credit was used to determine the brake wear pin length.

(LXX.)Item 1

The new time delay methodology is less stringent than that imposed by Amendment 25-42, approximately equal to the methodology used by most applicants after 1981 and prior to Amendment 25-42, and more stringent than the methodology used by some airplane manufacturers on some airplane models prior to 1981. Table 1 summarizes the time delay methodologies used to determine the accelerate-stop distances for transport category airplanes manufactured by Boeing and Airbus.

Table 1. Time Delay Methodologies by Airplane (Boeing and Airbus)

	Pre-Amendment 25-42 (Deceleration during additional time delay)	Pre-Amendment 25-42 (Constant speed during 2-second time delay)	Amendment 25-42 (Continued acceleration during 2-second time delay)
Boeing	707, 727, 737-100/200, 747-100/200/300/SP	757-200*/300, 767-200*/300*/400, 747-400*, 737-300*/400*/500*, DC-8, DC-9, DC-10, MD-80, MD-90, MD-11, 717-200	777-200/300
Airbus	A310, A300-600	A319, A321, A330, A340	A320

* 2 seconds at the speed at which the full braking configuration is first achieved

Amendment 25-42 imposed a two second delay after V_1 prior to any pilot action to stop the airplane during a rejected takeoff. Under this method, the airplane continues to accelerate during this two second time period. Under the "Improved Standards for Determining Rejected Takeoff and Landing Performance" final rule, the method of applying the two second time delay replaces the two seconds of continued acceleration with a distance increment equal to two seconds at the V_1 speed (constant speed). Although its effects vary, the FAA estimated at the time the new method was adopted that it would reduce, on average, the runway length needed for takeoff by 150 feet from that required under the Amendment 25-42 methodology.

Prior to 1981, some airplane manufacturers used a methodology for applying the two second increment for some airplanes where the airplane was decelerating during the time delay period. This methodology results in a shorter distance increment than one based on either a constant speed or continued acceleration. The difference in the distance increment varies from approximately 130 to 400 feet. Through a policy letter, the FAA discontinued this practice such that for certification projects after this date, deceleration was not permitted during the two second time delay period.

After 1981 and prior to Amendment 25-92, some applicants implemented the two second delay time at a constant speed of V_1, while others applied the time delay at the speed at which the full braking configuration (e.g., brakes on and spoilers extended) is first achieved. Since the speed at which the full braking configuration is first achieved may be slower than V_1, the corresponding distance increment may be shorter. The 2-second distance at the speed at which the full braking configuration is first achieved is between 60 and 100 feet shorter than the corresponding distance at V_1 speed.

Interestingly, retroactive application of the Amendment 25-92 rejected takeoff standards would include certain other provisions that were added by Amendment 25-42 that were not affected by the adoption of Amendment 25-92. These provisions include the consideration of an all-engines-operating accelerate-stop distance, and the elimination of the ability to consider less than a 2-second delay time (which had been possible with the use of automatic spoiler deployment). These provisions have a larger effect on rejected takeoff distances than changing the manner of taking into account pilot action time delays, but since they were not added by Amendment 25-92, they were not included in the list of specific issues to be considered in determining whether the “Improved Standards for Determining Rejected Takeoff and Landing Performance” final rule should be applied retroactively to all airplanes in service. However, these provisions would effectively be included in retroactive application of the Amendment 25-92 standards, and this was considered by the working group.

Retroactive application of the time delay methodology from the “Improved Standards for Determining Rejected Takeoff and Landing Performance” final rule would require airplane manufacturers to update the accelerate-stop distance performance information in the Airplane Flight Manuals of all affected airplanes. Both manufacturers and operators would then need to revise operational performance information, including manuals and software, such as Flightcrew Operating Manuals, Quick Reference Handbooks, dispatch programs, and other onboard manuals and software containing airplane performance information. Considering that the costs of doing so appear to substantially outweigh any potential safety benefits, and that those airplane types that be most affected are nearing the end of their service life, the working group recommends that no further action be taken on this issue.

(LXXI.)Item 2

Retroactive application of the wet runway requirements contained in the “Improved Standards for Determining Rejected Takeoff and Landing Performance” final rule has been recommended for adoption in Working Group Report 2 under Tasks 1 – 3 assigned to the Airplane Harmonization Working Group.

(LXXII.)Item 3

The analysis of the May 21, 1988 DC-10 RTO overrun accident showed that there are two aspects to the worn brake issue. The first is the reduction of the brake’s energy absorption capability, while the second is the reduction in brake force (or torque) capability. The first aspect results in a reduction in the maximum weight/V_1 speed for the maximum energy condition. The second aspect results in longer stopping distances throughout the airplane’s operating envelope.

The FAA issued Airworthiness Directives (AD's) establishing maximum brake wear limits for all transport category airplanes with a maximum takeoff weight greater than 75,000 pounds. The AD’s were intended to ensure that the brakes, when fully worn, would be capable of absorbing the energy from a maximum brake energy RTO. Credit for the amount of reverse thrust, as recommended for use with the critical engine inoperative, was permitted in determining the amount of energy that would need to be absorbed by the brakes in the fully worn condition. The AD action assured brake integrity by matching the brake wear limits and the maximum brake energy limitations in the AFM. The brake force (or torque) issue was not directly addressed by the AD’s.

Estimates have been made of the effect on airplane stopping distance capability of the reduction in brake force (or torque) due to brake wear. For those airplanes equipped with carbon brakes, there is no effect on stopping distance due to brake wear. For those airplanes equipped with steel brakes, stopping distance increases are generally less than 100 feet with all brakes fully worn. The use of reverse thrust would, at the least, offset any reduction in stopping capability caused by brake wear.

Another issue discussed within the working group was whether stopping performance penalties should be required for inoperable thrust reverser(s) for airplanes where reverse thrust credit was used to determine the brake wear limit established through the AD action. Worn brake dynamometer testing guidelines published by the FAA for determining the wear limits for the AD's stated that "the effect of inoperative thrust reversers due to Minimum Equipment List (MEL) dispatch must also be accounted for." The working group is aware of only one airplane type for which this was done – the DC-10. The working group considers it appropriate to provide suitable MEL adjustments to the AFM brake energy limitations for thrust reverser(s) inoperative dispatch. Therefore, the working group recommends that the FAA take appropriate steps to ensure that its earlier guidance (i.e., that "the effect of inoperative thrust reversers due to Minimum Equipment List (MEL) dispatch must also be accounted for") is complied with for affected airplane types.

The major safety issue associated with the worn brake issue is brake integrity, as represented by the brake's energy absorption capability. This aspect was addressed and brake integrity at high energy was assured by the AD's. The second effect is reduced aircraft stopping performance due to brake wear. To retroactively apply the worn brake requirements from the "Improved Standards for Determining Rejected Takeoff and Landing Performance" final rule, airplane manufacturers would be required to update the maximum brake energy and accelerate-stop distance performance information in the Airplane Flight Manuals of all affected airplanes. Both manufacturers and operators would need to then revise operational performance information, including manuals and software, such as Flightcrew Operating Manuals, Quick Reference Handbooks, dispatch programs, and other onboard manuals and software containing airplane performance information. Depending on the methodology accepted for compliance with determining brake energy capability without reverse thrust credit and for determining accelerate-stop distances, significant additional testing, either by brake dynamometer or airplane tests, or both might be necessary. Considering that the major safety issue has been addressed, that the costs of retroactively applying the new standards appear to substantially outweigh any additional potential safety benefits, and that the affected airplane types are nearing the end of their service life, the working group recommends no further action on this issue, except in regards to the MEL considerations for thrust reverser(s) inoperative dispatch (see previous paragraph).

For each proposed change from the existing standard, answer the following questions:

6 - What should the harmonized standard be? [Insert the proposed text of the harmonized standard here]

N/A (no change to existing standard)

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

N/A (no change to existing standard)

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

N/A (no change to existing standard)

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

N/A (no change to existing standard)

10 - What other options have been considered and why were they not selected? [Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

The options that were considered were whether to recommend retroactively applying the standards contained in the "Improved Standards for Determining Rejected Takeoff and Landing Performance" final rule or not. The rationale for recommending no further action, other than to implement previous guidance regarding MEL considerations for thrust reverser(s) inoperative dispatch, is provided in the working group's response to question 5.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

The recommendation to ensure that any effect of thrust reverser(s) inoperative dispatch on maximum brake energy limitations is addressed in the MEL could materially affect manufacturers and operators of transport category airplanes.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

None.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

N/A

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

N/A

15. – Does the proposed standard affect other HWG's? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]

N/A (no change to existing standard)

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

The recommendation to ensure that any effect of thrust reverser(s) inoperative dispatch on maximum brake energy limitations is addressed in the MEL could entail costs to the manufacturers for determining the effect and revising MEL's to incorporate this information. It could also impose costs on operators where this MEL information results in a reduction of payload, or otherwise affects an operation.

17. - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

N/A

18. – Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.]

No.

19. – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

N/A