



U.S. Department
of Transportation
**Federal Aviation
Administration**

Policy Statement

Subject: Guidance for Hazard
Classifications of Failure Conditions that
Lead to Runway Excursions

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PS-ANM-25-11

Initiated By:
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Summary

This policy statement provides guidance for acceptable methods of establishing the hazard classifications of airplane system failure conditions leading to runway excursions during takeoff or landing. The severity of runway excursions depends on many factors, such as airplane kinetic energy and configuration, environmental conditions, and other threats in the airport environment (e.g., collision with other airplanes or objects, running off a cliff, or running down a steep slope). Issue papers have been used on recent certification programs in an attempt to develop a standardized approach to identify and analyze the complexity and diversity of safety risks associated with runway excursions. Lessons learned from these issue papers and public comments on a draft of this policy statement were incorporated into this policy statement. If applicants follow the guidance in this policy statement, issue papers regarding runway excursions may not be necessary for most certification projects.

Definition of Key Terms

In the text below the terms “must,” “should,” and “recommend” have a specific meaning that is explained in Appendix 1.

A runway excursion is considered to occur when any landing gear first departs the runway during a given excursion scenario.

Current Regulatory and Advisory Material

The regulations applicable to hazard classifications of runway excursions are Title 14, Code of Federal Regulations (14 CFR) 25.671(c), 25.901(c), and 25.1309(b). These sections share the common objective that a catastrophe must not be caused by a single failure or any combination of failures that are not shown to be extremely improbable. Sections 25.901(c) and 25.1309(b) also include additional requirements for less severe outcomes.

Note 1: Section 25.735(b)(1) specifically requires that, when subjected to certain single failures of the braking system, it is possible to bring the airplane to rest with a braked roll stopping distance of not more than two times the landing distance prescribed in § 25.125. In current practice, such failures are typically not required to meet the requirement of § 25.1309(b), if the effect of the failure is limited to a reduction in deceleration capability with no associated adverse influence on lateral runway excursions. This exception is applicable to the policy stated herein.

Guidance related to hazard classifications and runway designs are discussed in the following advisory circulars (ACs): AC 25.1309-1A, *System Design and Analysis*, dated June 21, 1988; and AC 150/5300-13A, *Airport Design*, dated September 28, 2012.

Note 2: In addition to the current AC 25.1309-1A, the FAA has allowed the use of Aviation Rulemaking Advisory Committee (ARAC) recommended AC 25.1309-Arsenal, *System Design and Analysis*, dated June 10, 2002, if the applicant requests an equivalent level of safety finding to § 25.1309 in accordance with policy statement PS-ANM100-00-113-1034.

Relevant Past Practice

The service history of transport category airplanes indicates that runway excursions can be catastrophic. However, the service history also indicates that excursions at low speed and low thrust conditions usually result in no injuries or damage to the airplane. A catastrophic event (in terms of multiple fatalities, usually with the loss of the airplane) is less probable at low speed because of lower airplane kinetic energy, a higher survivability margin for the airplane, and a higher controllability margin to avert the excursion or to lessen its severity. Therefore, the FAA has acknowledged that uniformly imposing a catastrophic hazard classification for all runway excursions is inappropriate. However, because assigning a hazard classification of catastrophic is a conservative approach, the FAA has accepted this classification when proposed by applicants without requiring substantiation.

Failure in certain systems, including flight controls, nose or main landing gear, brakes, and propulsion, could cause a runway excursion (either off the side or the end of the runway). In assessing the criticality of a failure condition, the safety analyst typically considers intensifying factors in accordance with the guidance in AC 25.1309-1A. These factors include, but are not limited to, atmospheric conditions expected to be encountered in service, such as wind and rain and the associated effects on runway surface conditions. Weather could also influence the off-runway surface conditions (e.g., flooded ground, mud, or snow, including snow banks and berms), which could affect the stopping distance and structural loads on the landing gear.

Besides the airplane configuration (e.g., low-slung engines), and the manner and level of energy with which it exits the runway, the features and characteristics of the airports at which the airplane operates may also influence the risk of an excursion. Examples of these features are runway dimensions and surface conditions, presence or absence of runway safety areas capable of supporting the airplane model, off-runway wet surface load bearing capability, types and locations of critical terrain features that an airplane could interact with such as a body of water, a cliff, or the presence of other aircraft and ground vehicles. Such external factors could intensify or alleviate the risk of an excursion, beyond the risk associated solely with excursion speeds.

With so many parameters and unknowns involved, the criticality of a failure condition that results in a runway excursion is difficult to predict. To circumvent this difficulty, applicants proposed a wide variety of speed criteria to be used as the primary means to classify failure conditions leading to runway excursions. Typically, such criteria were loosely based on a selected history of excursions, but without correlation to the specific airplane model being certified. Further, the FAA has found it incorrect to infer that by meeting certain crashworthiness rules (such as §§ 25.561, 25.562, 25.721, 25.963, or 25.994) that the airplane would be fully protected from catastrophic conditions following a runway excursion. For applicants that proposed the use of speed as the primary parameter in their hazard classification, the FAA used issue papers to convey its concerns and to share the guidance it developed to help them substantiate their use of speed for hazard classification. The policy below consolidates the outcome from these issue papers and public comments submitted to the FAA.

The principal safety objective in the policy is to ensure systems are designed so that their failures would not cause the airplane to inadvertently exit the runway, regardless of the speed at which an excursion could occur. In establishing the criteria for determining a failure condition is not catastrophic, historically we have accepted the rationale that the airplane's energy and its dynamic behaviors at the high end of the taxi speeds would be low enough to have confidence in the flightcrew's ability to keep the failure condition from becoming catastrophic. It is not feasible to establish a single, safe taxiing speed. What is reasonable and prudent under some conditions may be imprudent or hazardous under others. The primary objectives for safe taxiing are positive control, the ability to recognize potential hazards in time to avoid them, and the ability to stop or turn where and when desired, without undue reliance on the brakes. Pilots are typically advised to taxi at the rate where movement of the airplane is dependent on the throttle. That is, slow enough so when the throttle is closed, the airplane can be stopped promptly. For transport category airplanes, the high end of taxi speeds is approximately 30 knots.

Policy

The diversity of potential threats that an airplane is exposed to during runway excursions makes it impracticable to safely accommodate all foreseeable excursion scenarios by means of design crashworthiness. In general, we expect airplane systems to be designed to the extent practicable to prevent failures that would cause runway excursions.

- 1 If an applicant classifies a failure condition that would cause a runway excursion to be catastrophic, the FAA will accept that classification without further substantiation. The relevant systems must then be designed according to that classification in accordance with § 25.1309(b)(1).
- 2 If an applicant classifies a failure condition that would cause a runway excursion to be hazardous, the applicant should substantiate the classification. However, the applicant is not required to provide a detailed analysis of potential airport physical and environmental conditions. In addition, if any failure condition causes a runway excursion above high taxi speeds it should be considered catastrophic.
- 3 If the applicant wishes to propose hazard classifications other than those shown above, acceptable justification including simulation or flight test data that show the flightcrew is able to avert possible excursions due to the failure conditions, or installation of design features that effectively limit the failure condition and facilitate the flightcrew's timely recovery from the failures must be provided.

Effect of Policy

The general policy stated in this document does not constitute a new regulation. Agency employees and their designees and delegations must not depart from this policy statement without appropriate justification and concurrence from the FAA management that issued this policy statement.

Whenever a proposed method of compliance is outside this established policy, the project aircraft certification office has to coordinate it with the policy-issuing office using an issue paper. Similarly, if the project aircraft certification office becomes aware of reasons that an applicant's proposal that meets this policy should not be approved, the office must coordinate its response with the policy-issuing office. Applicants should expect that certificating officials would consider this information when making findings of compliance relevant to new certificate actions. In addition, as with all guidance material, this policy statement identifies one means, but not the only means, of compliance.

Implementation

This policy discusses compliance methods that should be applied to type certificate, amended type certificate, supplemental type certificate, and amended supplemental type certification programs. The compliance methods apply to those programs with an application date that is on or after the effective date of the final policy. If the date of application precedes the effective date of the final policy, and the methods of compliance have already been coordinated with and approved by the FAA or its designee, the applicant may choose to either follow the previously acceptable methods of compliance or follow the guidance contained in this policy.

Conclusion

The FAA will consider revising the intent and content of this policy statement if other data are presented that are contrary to the guidance contained in this document.

/s/

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Terms

Table A-1 defines the use of key terms in this policy statement. The table describes the intended functional impact.

Table A-1 Definition of Key Terms

	Regulatory Requirements	Acceptable Methods of Compliance (MOC)	Recommendations
Language	Must	Should	Recommend
Meaning	Refers to a regulatory requirement that is mandatory for design approval	Refers to instructions for a particular MOC	Refers to a recommended practice that is optional
Functional Impact	No Design Approval if not met	Alternative MOC has to be approved by issue paper	None because it is optional