

Flight Simulation Training Device Qualification Guidance

NSP Guidance on the Application of Non-Flight Test Tolerances to Engineering Simulator Validation Data

FSTD Guidance Bulletin 09-01

Purpose: This bulletin provides sponsor guidance in the application of the non-flight test tolerance guidelines as published in 14 CFR Part 60 as well as previously accepted alternate means of compliance for flight simulator training device (FSTD) qualification.

Background: Part 60 and other recent international flight simulator standards include provisions for the use of aircraft manufacturer provided engineering simulator validation data under certain circumstances. The use of such validation data is typically authorized only where the aircraft manufacturer supplies the aerodynamic, engine, flight control, and/or ground models to be used in the training simulator. Additional criteria for the use of engineering simulator validation data, is published in Part 60. Since the validation data is derived from the same aircraft manufacturer supplied models as employed in the training simulators, an “essential match” should be shown in the QTGs of the training simulators to ensure the correct implementation of these models. To assist FSTD manufacturers and regulatory authorities in the evaluation of an essential match, a 20% of flight test data reduced tolerance guideline was published in Part 60 and other international simulator standards.

While the NSP agrees with the essential match concept as published in the simulator standards, in practice, defining a reduced tolerance has proven problematic for several reasons. It is recognized that there are many legitimate reasons why excursions from the 20% guideline may be acceptable, such as ground model differences, aircraft hardware differences, iteration rates, and integration methods used in the implementation of the various models. Additionally, differences in the QTG drive methods (end-to-end vs. surface driven) may cause differences in test results outside of the 20% guideline. Furthermore, some FSTD manufacturers and sponsors choose to implement automatic evaluation of QTG test results with the reduced tolerances. While the NSP prefers the automatic grading of QTG test results to the reduced tolerances, this further complicates evaluation (by both sponsor and regulator) due to out of tolerance test results which may be acceptable with engineering judgment.

In 2006, an industry working group was assembled by the Royal Aeronautical Society to update the ICAO 9625 simulator standards. This working group consisted of industry experts and regulatory authorities from all segments of the flight simulator industry. It was determined by the group, due to the above described issues, that a more appropriate

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definition of an essential match would be 40% of flight test tolerances as opposed to the existing 20% guideline. As a result, the final version of the recommended update to the ICAO 9625 *Manual of Criteria for the Qualification of Flight Simulators* as published by the RAeS working group was to change this engineering simulator guideline as described above. Furthermore, it is the intent of the FAA to adopt the majority of this ICAO document as a future change to the U.S. simulator standards under 14 CFR Part 60.

Authority: It is important to note that since 14 CFR Part 60 became effective, simulator standards became regulatory and are not subject to an alternate means of compliance as routinely applied under an advisory circular system. As a result, the NSPM has limited authority in allowing deviations to the published rule. The Part 60 document is organized into three types of published material¹:

- **Rule Language (§60.1, §60.2, etc.):** Regulatory material in which the NSPM is not authorized to grant deviations without a rule change.
- **QPS Requirement:** Regulatory material contained in the appendices which provides details regarding compliance with the rule. This material is also not subject to NSPM approved deviations.
- **Information:** Advisory material found in the appendices intended to be permissive in nature to provide general information about the regulation.

As a result, the NSPM cannot grant deviations to anything in rule language or QPS requirement unless a change is made to Part 60 rule. Material in information is considered advisory in nature and is not a requirement under the rule. The existing “20% of flight test tolerances” guideline for engineering simulator validation data is published as information in Part 60².

Evaluation Guidelines: Effective upon the publication of this guidance bulletin, the NSP will use the following criteria to evaluate QTG test results using engineering simulator validation data with respect to the applied tolerances. This criteria will be applicable to all newly qualified simulators under Part 60 as well as alternate means of compliance under the grace period defined in §60.15.

1. An essential match³ to the validation data must be demonstrated. Test should be driven from the pilot control without significant offsets present in the input channel(s). The output parameters should be well within the flight test tolerances and exhibit identical trends to that of the validation data.
2. Test results presented during initial or recurrent evaluations must clearly indicate any deviation from the 40% guideline. Automatically evaluated test results are

¹ See 14 CFR Part 60, Appendix A, Section 1.a. for further information.

² 14 CFR Part 60, Appendix A, Section 11.a.(1) (Information)

³ 14 CFR Part 60, Appendix A, Section 9.d.(3) (QPS Requirement).

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- the preferred method for presentation at both recurrent and initial evaluations, however, the operator may manually evaluate the results at their discretion.
3. Rationale explaining any deviation from the 40% guideline must be included in the text of the Master QTG. This rationale is required for the NSPM to apply engineering judgment on any case that exceeds the 40% guideline.

Sponsors wishing to apply this guidance to previously qualified FSTDs should contact the NSPM concerning making approved changes to the Master QTG.