ACT ARC Recommendation 21-5
Flight Standardization Board T Tests

I. Submission

The recommendations below are submitted by the Flight Standardization Board (FSB) Workgroup (FSB WG) for consideration by the Air Carrier Training Aviation Rulemaking Committee (ACT ARC) Steering Committee at its April 28, 2021, meeting. The ACT ARC Steering Committee adopted the recommendations, and they are submitted to the Federal Aviation Administration (FAA) as ACT ARC Recommendation 21-5.

II. Statement of the Issue

The current FSB process uses one or more evaluation processes called T Tests to determine the aircraft type rating and the pilot training and qualification requirements for new, derivative, or modified aircraft, as well as to establish the training and qualification credits stemming from similarities between related aircraft. These T Test processes are described in FAA Advisory Circular (AC) 120–53B, Change 1, Guidance for Conducting and Use of Flight Standardization Board Evaluations (AC 120–53B). The current T Test processes do not, in some cases, allow the FAA and applicants the flexibility to provide end-users with the FSB guidance and recommendations that fully support a safe and efficient introduction of new, derivative, or modified aircraft. Consequently, the FSB WG recommends that the FAA undertake a review of current T Test processes with the goal of improving and expanding the T Test methodologies described in AC 120–53 based on new technologies in aircraft design and training and lessons learned from previous evaluations.

III. Recommendations, Rationale, and Discussion

The ACT ARC recommends the FAA consider revising AC 120–53B to reflect updated guidance regarding T Tests used in FSB evaluations. The FSB WG members were unable to reach full consensus with respect to some portions of its proposed recommendations. For those recommendations, two options are presented, followed by the rationale for each option, and the FSB WG members supporting that option.[1]

1. <u>T Test By Analysis</u>

Recommendation:

Option A:
Clarify and further describe “evaluation by analysis” with respect to its application to both FSB and applicant activities, and its application to both type rating determinations and pilot training and qualification requirements. The definition should also clarify that evaluation by analysis is not restricted to the evaluation of level A and B training, as there are instances when this approach could be safely applied to higher training levels.

[1] The listed supporters do not comprise the full FSB WG membership. Some members abstained from alignment with some or all options.

Option B:
The FAA should consider maintaining its current general policy of only allowing T Test by analysis for Level A or B training and checking. However, it is recognized that there are circumstances where T Test by analysis can be used for levels greater than level B (particularly for T3 Tests not involving a new type design or a novel variant) with an equivalent level of safety which would allow for more effective use of time and resources. The FAA should consider creating and publishing in AC 120–53B a process by which an applicant can submit a proposed alternative evaluation plan and criteria for how the FAA would evaluate such a proposal. Such proposals must maintain an equivalent level of safety to the current T Test process. In addition, the FAA should clarify and further describe "evaluation by analysis."

Rationale:

Option A:
AC 120–53B currently indicates that a technical evaluation by analysis is possible for a type rating determination with Level A and B training, as well as for the T2 test. Option A supporters recommend the FAA clarify that a technical evaluation by analysis is also possible for other T Tests, particularly T3 tests. Option A supporters believe that the FSB can conduct an evaluation by analysis based on various sets of data provided by the applicant, including a design review, simulation or flight results, or any other type of analysis proposed by the applicant.

Option A supporters also believe that evaluation by analysis should also not be limited to Level A or B training. For example, a greater than Level B training aircraft modification may be evaluated by analysis based on a design review comparison with a similar previously evaluated aircraft modification. Another example is evaluation of the training requirement for pilots transitioning from an aircraft with advanced functions to an aircraft where the same maneuvers must be flown more basically; there is no need for an evaluation of these basic procedures that are traditionally part of the type rating program for most aircraft and are always included in initial training. Examples of this situation include evaluation of training requirements related to unreliable airspeed scenarios, and transition from an aircraft equipped with advanced instrumentation (such as angle of attack indicators) to an aircraft which has to be flown with basic pitch and thrust parameters.

The following organizations support Option A:
- Airbus
- Boeing
- Bombardier
- Dassault Aviation
- Embraer

Option B:
Option B generally retains the current AC 120–53B policy of only allowing T Test by analysis for Level A or B differences, but allows for a process by which the FAA could permit exceptions.

For the case of aircraft modifications, Option B supporters believe this situation is generally covered by ACT ARC Recommendation 20-4, FAA Entry Point for Certification Applications with Operational Impacts, item 3a.

Option B supporters recognize that there are circumstances where T Test by analysis may be appropriate and suggest the FAA consider including a description in AC 120–53B of how an applicant can apply for an evaluation to be conducted via analysis. The description could include the requirements for such a proposal, how the applicant would maintain a level of safety equivalent to T Tests, and how the FAA would evaluate such proposals. When considering "evaluation by analysis", the FAA should be mindful of the unique nature of the T Test. It is a holistic approach that uses test subjects representative of the end user to evaluate the end product. Option B supporters recommend that in order to maintain an equivalent level of safety, any data used in the analysis must be representative of the original T Test and representative of the user/industry, not necessarily data from the certification process. Thus, "evaluation by analysis" would not be appropriate for new type designs and/or novel variants.

Option B supporters are concerned that if AC 120–53B contains a generic statement that any evaluation for differences can be conducted via analysis instead of a traditional T Test, a significant number of evaluations would be conducted via analysis. The lack of clear guidance may result in inconsistency in application. This is especially concerning because the evaluation would not be a holistic validation of training and checking requirements, or special emphasis areas. T Test by analysis would also circumvent the use of line pilots as test subjects.

Lastly, Option B supporters believe that given the multitude of research suggesting a degradation in pilot manual flying skills, automation reliance, and the possibility that primary training for new pilots is increasingly more automated (*i.e.,* G1000 integrated flight instrument system), conducting evaluations for pilots transitioning from advanced aircraft to more basic aircraft is critical. In many cases, flying an airplane with less advanced functions is more difficult, and the training outcomes should be evaluated, not extrapolated from data.

The following organizations support Option B:

- Airlines for America (A4A)
- Air Line Pilots Association, International (ALPA)
- CAE
- Regional Airline Association (RAA)

2. FSTD Use in T Tests

Recommendation:

The ACT ARC recommends the FAA provide clear guidance on the use of evaluation devices, qualified or not qualified, that may be used for conducting T Tests as a part of the operational evaluation process. Specifically, the FAA guidance should establish the methodology to determine the suitability of a device proposed for the conduct of an assessment, regardless of whether the device is qualified or not qualified.

The ACT ARC further recommends, to ensure consistency in process, that the FAA consider the application of the same methodology as is proposed in ACT ARC Recommendation 21-10 (Training Differences & Device Levels Requirements) to establish the fidelity criteria requirements for a device that may be used to meet the training requirements resulting from the FSB report.

Any device, including a device other than a Flight Simulation Training Device (FSTD), that has been evaluated, as per the above process, to satisfy the minimum required level of fidelity to support the training difference level proposed by the applicant should be considered adequate to complete the evaluation. When a device other than an FSTD is used, the determination of the device fidelity and the training objectives must be taken into consideration when setting the minimum device requirements for completing the differences training. Furthermore, the applicant may propose to use a device that exceeds the minimum fidelity required for the evaluation of the proposed difference level(s), for example, an FFS with motion off for the evaluation of a task that is not considered to require the use of motion.

Rationale:

Formal FSTD qualification is only required for pilot certification, which is not the primary goal of T Tests. The ACT ARC submits that if the FAA and applicant agree that an evaluation device has the necessary fidelity for a specific level of evaluation gained from the applicant's and/or others' experience with the device, it should be acceptable. Such an agreement should be based on a process agreed in advance between the FAA, including the National Simulator Program (NSP), and the applicant. Further, the use of an evaluation device not fully representative of the minimum device for the Master Differences Requirements (MDR) level to be validated (as specified in AC 120–53B) should be allowed. The use of a device with some functions disabled should be allowed to validate training at a level of fidelity required as the minimum. For example, it should be possible to use a full flight simulator (FFS) in restricted conditions (***e.g.***, motion and visual cues off) to validate a Level D training. Another example is a controlled use of an engineering simulator for validating Level C training. Original equipment manufacturers (OEM) do not have the same training device resources as training organizations and/or FSTD manufacturers and should be allowed to evaluate the training requirements using, to the greatest extent possible, their traditional means of design and integration.

3. <u>FFS for T2:</u>

Recommendation:

The ACT ARC recommends that if available and suitably qualified, an FFS should be permitted as an alternative to the actual candidate aircraft for flying the T2 Test flight profile, if agreed by the FSB.

Rationale:

If an FFS adequately represents the candidate aircraft handling qualities (***e.g.***, an FFS qualified to a Level D), its use should be allowed to conduct the T2 test flight profile as an alternative to the actual candidate aircraft. This flexibility would support the efficient use of applicant and FAA resources in cases when the T2 test is carried out after the candidate aircraft has been put into service. In this case, the applicant may not have an aircraft available for the T2 test but may have an FFS that has been found to adequately represent the candidate aircraft handling qualities.

4. <u>T3 Test:</u>

Recommendation:

Option A:
The ACT ARC recommends an alternative to the current T3 Test process be allowed, provided it achieves an equivalent objective (*i.e.*, validation of the relevant FSBR content, such as Applicant's Master and Operator Difference Requirement (MDR&ODR) tables, Difference tables, Training Area of Special Emphasis (TASE), and pilot prerequisites).

Option B:
The T3 Test process should be generally maintained; however, it is recognized that there are circumstances where T Test by analysis could be used.

Rationale:

Option A:
Instead of a customary T3 Test containing a difference course, proficiency check, and Line-Oriented Flying (LOF), an alternative means that achieves the equivalent objective should be acceptable. Under this proposal, the Applicant could propose exposure to the actual aircraft through flight time, bench sessions, and engineering data, and, if determined to be a sufficient substitute for the T3 evaluation, the FSB could accept the proposal as an alternative to the difference course, proficiency check, and LOF. For example, a T3 evaluation with the base aircraft being an aircraft not yet in service, and the candidate aircraft being an aircraft already in service, cannot be run in accordance with the current T3 Test requirements because no test subject can be experienced on the base aircraft; in this case, the applicant should be permitted to propose an alternative.

The following organizations support Option A:
- Airbus
- Bombardier
- Dassault Aviation
- Embraer

Option B:
Option B generally maintains the current T3 Test as described in AC 120–53B, while allowing for some exceptions as described in paragraph 1 above, provided that any T Tests conducted via analysis maintain a level of safety equivalent to the conduct of an actual T Test. In many cases, the actual T3 Test is critical, as it evaluates the proposed differences and/or related aircraft differences training, checking, and training devices at level B, C, or D, which means that flight training in a Level C or D full flight simulator is not required for a type rating as it normally would be by regulation. Passing a T3 Test may also allow a candidate aircraft to be designated as having the same type rating as the base aircraft.

AC 120–53B contains defined training and checking levels using a variety of commonly used training methods and FSTDs. Option B supporters believe that using means other than those established as industry norms and not commonly available to an air carrier or training center, such as "bench sessions," cannot provide a meaningful and useful validation of FAA established training and checking levels. For example, if the T3 Test

were to be conducted using a "bench session," which is undefined, the question arises of how it could validate a level of training defined in AC 120–53B.

Option B also suggests generally retaining the existing policy for the conduct of the T3 Test because it represents a holistic approach to the evaluation. In most cases, special emphasis training items are also determined during a T3 test. If evaluations are conducted in a fragmented manner or only seek to validate applicant proposed items, it is possible a shortened or less thorough evaluation process may miss something critical. Additionally, Option B supporters believe it is important to involve line pilots in these evaluations (see ACT ARC Recommendation 21-6). Conducting evaluations via analysis would eliminate the use of line pilots as test subjects in those cases.

It is noted that the FAA does not require an applicant to conduct a T3 Test for the purpose of establishing related aircraft differences training between aircraft with different type ratings. The T3 is conducted when requested by an applicant for the purpose of seeking a related aircraft designation, allowing a reduction of training and checking requirements from those prescribed by FAA regulations. As such, the burden associated with validating a reduction in training and checking is on the applicant, as is the case any time a party is seeking regulatory relief.

The following organizations support Option B:

- Airlines for America (A4A)
- Air Line Pilots Association, International (ALPA)
- CAE
- Regional Airline Association (RAA)

5. <u>T4 Test:</u>

Recommendation:

The ACT ARC recommends the FAA clarify the purpose of the T4 Test (currency validation).

Rationale:

Since the T4 test is rarely used and since currency requirements have been removed from MDRs and Difference Tables (DTs) in AC 120–53B, the FAA should reevaluate the need for the T4 test.

6. <u>T5 Test:</u>

Recommendation:

Option A:
The ACT ARC recommends the FAA re-evaluate the purpose and structure of the T5 Test. As currently written, the T5 test is an evaluation of an applicant-proposed, full pilot type rating course. The FSB WG believes that the real purpose of this evaluation should be the evaluation of aircraft type-specific data and their impact on the pilot type rating training course for end-users.

Option B:
The FAA should consider clarifying in AC 120–53B the intent, process, and outputs of the T5 test.

Rationale:

Option A:
The requirements for a T5 course are fully defined in current regulation and its use in FSB processes require that the applicant provide such a course, either using in-house training development experts or enlisting outside training providers. As written in AC 120–53B, the T5 Test is more aligned with the responsibilities of an FAA Training Center Program Manager (TCPM) than the FSB. The goal of the T5 evaluation is not to approve a pilot training course, but rather to evaluate those unique design and handling characteristics that would impact a standard pilot training course. Therefore, this evaluation should not be predicated on or supported by the availability of the pilot type rating training course. Most applicants determine the unique training requirements associated with a specific aircraft (characterized as "Special Emphasis Areas" or "Training Areas of Special Emphasis" (TASE)) throughout the aircraft's certification project. This is accomplished mostly during the design and certification activities such as System Safety Assessments (SSA), Human Factors (HF) evaluations, and by other type certificate documents and reports. The FSB could evaluate those data more efficiently by involving itself throughout the aircraft certification project, concurrent with the type design certification and validation exercises. This is a more timely process then the current T5 test, which occurs shortly before customer pilots must be trained and type rated. Another advantage of this recommendation is that it would enable and reinforce interactions and communication between FAA type design and operational evaluation processes.

The following organizations support Option A:
- Airbus
- Bombardier
- Dassault Aviation
- Embraer

Option B:
Option B is to clarify in AC 120–53B the intent, process, and outputs of the T5 test. Currently the AC states that a T5 test validates the applicant's training course(s) at level E (new type rating). It is appropriate when: a full initial or transition training/checking program requires validation; an applicant seeks training credits between two aircraft with different type ratings (a typical goal under shortened training programs); or T2 or T3 have not been successfully completed.

In the case of a T5 for training credit between two aircraft with different type ratings, the rationale is the same as that above for the T3 test. The rationale regarding the need for a holistic evaluation is also the same as above for the T3 Test.

For the case of a new aircraft type, which is what is understood to be what AC 120–53B currently describes when it states "a full initial or transition training/checking program requires validation," it is suggested that the FAA consider some changes in how it describes this test. Option B supporters agree that, as written, the AC wording sounds as if an actual training program is being evaluated. In practice, the "training program" is the vehicle by which the FSB evaluates training requirements, determines the type rating, and determines

special emphasis training areas for new aircraft types. If the FAA were to explain this in a different manner, the intent of the use of a "training program" for the execution of the T5 Test would be clearer. The FAA should also consider revising AC 120–53B's description of the T5 to include the FSB determination of special emphasis areas of training, the evaluation of part 121 Appendix E training and Extended Envelope Training (14 CFR § 121.423) requirements for airplanes to be used in part 121 operations, and the type rating designation.

Option B supporters believe that, at times, if there is a perception that the T5 is being used to evaluate a specific training program, it is because applicants often combine the T5 test with the TCPM approval of the applicant's associated part 142 training program.

Conducting a T5 test by analysis could allow a new aircraft type to enter service without the FSB observing *any* pilots undergoing the full training necessary to safely operate the candidate aircraft and the use of line pilots as test subjects would be circumvented. Option B supporters believe that a holistic evaluation using line pilots as test subjects is essential. As stated in the Option B rationale for the T3 Test, a fragmented evaluation may miss critical items. The goal of the T5 test is to provide information critical to the development of effective pilot training programs and these goals should not be compromised for efficiency. Option B supporters fully support FSB coordination with certification activities, but not at the expense of a thorough FSB evaluation of pilot training.

The following organizations support Option B:

- Airlines for America (A4A)
- Air Line Pilots Association, International (ALPA)
- CAE
- Regional Airline Association (RAA)

IV. Additional Rationale and Discussion

The FSB WG believes an update of the current FSB evaluation processes reflecting new aircraft design and manufacturing technologies, as well as advancement in training applications and curricula, would be helpful to both the FAA and applicants. Recent evaluations conducted under existing FSB processes have helped to identify opportunities for improvement of current processes and AC 120–53B. Implementation of these ACT ARC recommendations would provide flexibility and facilitate the efficient use of FAA and applicant resources in FSB evaluations. Such improvements would enhance pilot training of new and derivative aircraft and support the highest level of safety during the introduction and use of such aircraft.

Some FSB WG members have cited findings, recommendations, and observations in the Joint Authorities Technical Review (JATR) Boeing 737 MAX Flight Control System in support of the recommendations contained herein:

- Observation O9.2-A: Issue Paper O-6 and FAA Order 8110.4C articulate the AEG's responsibility, among other things, to address Flight Standards considerations such as contribution of operational perspective to engineering activities during the type certification process. The Order specifically requires the AEG's early involvement in the certification process starting at the requirements definition phase of the system's life-cycle.

- Recommendation R9.4: The AEG should have deeper involvement during the certification process and collaborate closely with the FAA's Aircraft Certification Service (AIR) to ensure they have the proper knowledge to make informed decisions about operational suitability issues that may be affected by certification details.

- Observation O9.4-A: Pilots working in the certification process may not have complete knowledge of operational issues, while pilots working in the operational evaluation process may not have complete knowledge of certification issues. This may contribute to a lack of communication between the two processes.

- Finding F9.6-B: AC 25.1302–1, paragraph 1-2(a), Applicability, lists a number of certification roles that the guidance is directed toward, and the list does not include an operational pilot specialist such as an Aviation Safety Inspector from the AEG.

ALPA does not concur that the above cited findings, observations, and recommendations support the recommendation to conduct T Tests by analysis and/or conduct less thorough T Tests. ALPA does, however, believe that the following JATR recommendations are relevant:

- Recommendation R3.13: The FAA should ensure that simulation devices that are used for certification credit have the required level of fidelity for the associated test.

- Recommendation R9.3: Where the assessment of the effectiveness of differences training is not conducted in an aircraft, the FAA should require the AEG to use operational flight crew complements (*e.g.*, line captains and line first officers), with a range of flight experience, as part of the assessment.

- Recommendation R6.12: The FAA should develop a practice of questioning the validity of assumptions made by the applicant and require substantive support for all such assumptions.

V. Background Information

Recommendation 21-5 addresses Items 1 and 3.a-c in the FSB WG Scope of Work and ACT ARC Initiative #43 (see below):

FSB WG Scope of Work:

1. Examine whether the FAA should reconsider its current process of an FAA operational evaluation.
    a. If the WG decides that the FAA should reconsider, the WG should examine the possible alternatives to the current process.

* * *

2. In developing proposed recommendations responsive to (1) and (2), consider, at minimum, the following:
    a. Would the new or improved operational evaluation include some or all of the elements that are currently included in an FAA operational evaluation?
    b. Would the new or improved operational evaluation include elements that are not included in a current FAA operational evaluation?

c. What standards should be used to ensure the consistent conduct of operational evaluations?

ACT ARC Initiatives:

- Initiative #43: Examine how the FAA could improve its current Flight Standardization Board (FSB) Process and product (FSB Report) to meet the interests of all stakeholders.

References:

- FAA AC 120-53B, Change 1
- ACT ARC Recommendation 20-4, FAA Entry Point for Certification Applications with Operational Impacts
- FSB WG Proposed Recommendation FSB-17, FSB Test Subjects and Membership
- FSB WG Proposed Recommendation FSB-21, FSB Training Differences & Device Levels Requirements
- Joint Authorities Technical Review (JATR) Boeing 727 MAX Flight Control System