ACT ARC Recommendation 21-10
Flight Standardization Board Training Differences & Device Levels Requirements

I. Submission

The recommendations below are submitted by the Flight Standardization Board 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 21-10.

II. Statement of the Issue

FAA Advisory Circular (AC) 120–53B, Change 1 (AC 120–53B), Guidance for Conducting and Use of Flight Standardization Board (FSB) Evaluations, provides guidance for evaluating newly manufactured or modified aircraft to determine pilot training and qualification requirements, as well as guidance to determine differences in training and qualification between aircraft with the same or different type certificates.

This recommendation proposes revisions to AC 120–53B's guidance with respect to difference levels and associated training methods and device requirements. The current guidance does not reflect changes in training methodologies and flight simulation technology. The prescriptive nature of much of the current guidance has the effect of limiting or preventing operators' or applicants' use of new and emerging technologies or alternatives to qualified devices, in developing training programs that appropriately address training objectives.

The boundaries between training levels are not always clear, and the current guidance does not provide a consistent and uniform approach for establishing training media or device requirements. For example, Level A and Level B difference training requirements are stated in terms of the instructional method (*i.e.*, self-instruction or aided instruction) to satisfy the knowledge (competence) requirement. For Level C and Level D difference training, the requirements are stated in terms of device requirements to support the skill (competence) requirements. Similarly, the use of Level E difference training to prescribe the use of a full flight simulator (FFS) for equipment such as enhanced vision system (EVS) or head-up display (HUD) requirements is not consistent with the type rating determination guidance in AC 120–53B that states, "aircraft of the same make that have level E training difference requirements will be assigned a different type rating" (Appendix 2, paragraph 4.c.(4)).

A review of past Flight Standardization Board Reports often reveals a limiting approach to the device requirements. For example:

1. The devices recommended to support the training difference levels are, in some cases, narrowly defined as those that are used during the operational evaluation. This may exclude other suitable devices (qualified or otherwise) that could meet the training requirements.

2. The recommended use of certain devices considered to be suitable to support Level C and Level D differences training may be interpreted by the training program approval authority (TPAA) (*i.e.*, the Principal Operations Inspector (POI) or Training Center

Program Manager (TCPM)) as the only means by which these training difference levels can be successfully trained.

3. In AC 120–53B's existing guidance, the device requirements are specified for completion of initial training only; the guidance does not address currency requirements. Therefore, it could be interpreted to limit the use of other devices that might otherwise be deemed suitable to meet currency requirements.

4. The WG believes that there should be the possibility to differentiate the minimum training device required for "initial training" from those applicable to "recurrent training".

III. Recommendations

The ACT ARC recommends the FAA consider revising the training differences and device level requirements contained in Appendix 2 to AC 120–53B with the objective of differentiating training requirements from device requirements. The definition of the requirements should include well defined training objectives based on competencies, and should provide a methodology to guide applicants/training providers and operators in the establishment of the appropriate device fidelity requirements to support the training objectives:

The ACT ARC recommends that the FAA consider restructuring the basis for requirements guidance in accordance with the following principles:

1. Revise the "Difference Level" description to clearly define the requirement for each difference level based on the competency objective.

2. Define and provide the methodology by which the training objectives are to be established for each of the areas assessed.

3. Define the methodology by which the device fidelity requirements that meet the training objectives are established. Specifically, the FAA should consider the principles of ICAO Doc 9625, 4th Edition, which defines the method to establish the simulation fidelity level, for each simulation feature, based on the training objective. A qualified device may not be the only means to satisfy the training of level C and level D differences, and the ACT ARC recommends the FAA consider the acceptability of alternatives to qualified devices that have the required fidelity to support the training objective.

IV. Rationale and Discussion

The ACT ARC believes that the recommendations described above would provide the FAA with an improved, more efficient, and less prescriptive framework to establish the differences in training and qualification between related aircraft with the same type certificate as well as with different type certificates. This methodology would also improve the process of establishing appropriate training media for difference levels and, if adopted, provide applicants, operators and training providers with a consistent methodology to develop pilot training and qualification programs based on defined training objectives that are easily understood and more suitable for a myriad of industry applications.

V. Background Information

Recommendation 21-10 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.

3. 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
- FAA Order 8900.1
- ICAO Doc 9625 – Manual of Criteria for the Qualification of Flight Simulation Training Devices, 4th Edition.

Attachment

- Appendix 1 – Supplementary Information to Support the Recommendation.

Appendix 1 – Supplementary Information to Support the Recommendation

This appendix is included to provide supplementary information to give context to the approach proposed in the body of the recommendation. It is not part of the recommendation and is not intended to prescribe any specific solution to address the recommendation. It is included simply to help establish an understanding of the underlying concept proposed by the ACT ARC.

1. PRINCIPLES OF THE SOLUTION

- The training levels and the associated minimum training methods and/or means are applicable with respect to initial training only. The requirement for recurrent training is addressed by the currency levels.
- The training levels are a direct function of the competence (knowledge and skills) objectives needed to master the difference in terms of design, procedures, and/or handling. The minimum acceptable training means or device is not a criterion to differentiate the training levels.
- The need for a qualified (Flight Simulation Training Device (FSTD) for Level C and D training is not prescribed. In lieu of this requirement, a more specific and detailed FSTD fidelity criteria should be established by the FSB to complement the Level C and D training requirements, although in certain cases, the FSB may require the use of a qualified device. The FSTD criteria need not represent exactly the training devices used during the FSB evaluation.
- Equipment like HUD, synthetic vision systems (SVS), and EVS are addressed through FSTD criteria rather than a Level E training.

2. COMPETENCE (KS) CRITERIA

KS definitions (by Benjamin Bloom)

- **Knowledge** involves recall or recognition of specific facts and concepts that will help develop intellectual skills or abilities.
- The **Skills** process focuses on the psychomotor domain including coordination. These are skills that require practice such as speed, distance, precision, *etc*.

Additional KS criteria are needed to determine training difference levels.

- The **Complex knowledge** criterion applies to the training of knowledge of a system architecture or a procedure content made up of many combined elements that are not self-explanatory at first glance. A **complex knowledge** differs from a **basic knowledge** that is easy to understand.

- The **Interrelated skills** criterion applies to the training of interrelated skills necessary for mastering full task differences between related aircraft. For aircraft certified for Multi-Crew Operation (MCO), training of interrelated skills requires a full crew. The interrelated skills criteria does not apply to the acquisition of the **independent skills** that are sufficient for mastering part task differences. Independent skills could be acquired by a pilot alone (even for aircraft certified for MCO).
- The **Complex skills** criterion applies to the training of complex skills necessary for mastering significant full task differences between related aircraft. Training of complex

skills requires a training device in which the tasks are physically and mentally perceived by the flight crew in a way similar to the aircraft environment (*e.g.* aircraft acceleration/deceleration or stress). The complex skills criterion applies mainly when a major aircraft handling quality difference has been identified between the base aircraft and the candidate aircraft.

3. FSTD CRITERIA:

This section describes features and fidelity levels of FSTDs, following the principles of ICAO Doc 9625 Ed3 and Ed4.

An FSTD may be characterized by the fidelity level of each of the simulation features listed below. The set of Features and associated fidelity levels for an FSTD may be called the FSTD Capability Signature (FCS).

FSTD Simulation Features:

Category	Features	Definitions
Aircraft simulation	Flight deck layout and structure	Defines the physical structure and layout of the cockpit environment, instrument layout and presentation, controls, and pilot, instructor and observer seating.
	Flight model	Defines the mathematical models and associated data to be used to describe the aerodynamic and propulsion characteristics
	Ground handling	Defines the mathematical models and associated data to be used to describe the ground handling characteristics and runway conditions.
	Aeroplane systems	Defines the types of aircraft systems simulation.
	Flight controls and forces	Defines the mathematical models and associated data to be used to describe the flight controls and flight control force and dynamic characteristics.
Cueing simulation	Sound cues	Defines the type of sound cue and associated data.
	Visual cues	Defines the type of out-of-cockpit window image and field of view that is required to be seen by the pilots using the FSTD from their reference eyepoint.
	Motion cues	Defines the type of motion cueing and associated data that may be generated by the aircraft dynamics and from other such effects as airframe buffet, control surface buffet, weather and ground operations.
Environment simulation	Environment — ATC	Defines the level of complexity of a fully automated simulated Air Traffic Control environment
	Environment — navigation	Defines the level of complexity of the simulated navigation aids, systems and networks
	Environment — atmosphere and weather	Defines the level of complexity of the simulated weather conditions
	Environment — aerodromes and terrain	Defines the complexity and level of detail of the simulated aerodrome and terrain modelling

FSTD Simulation Feature Fidelity Levels:

FSTD Simulation Feature Fidelity Levels' means the level of realism assigned to each of the defined FSTD features, it establishes the minimum level of fidelity required for the simulation feature under consideration.

Fidelity levels	Description
S (specific)	Highest level of required fidelity for a given FSTD feature
R (representative)	Intermediate level of required fidelity for a given FSTD feature
G (generic)	The lowest level of required fidelity for a given FSTD feature
N (none or not required)	Feature is not required

4. TRAINING DIFFERENCE LEVELS CRITERIA

The following KS table provides an example of how to differentiate the training difference levels based on the main competence (KS) objective.

KS Criteria				**Main KS objective**	**Difference Training Level**
Complex knowledge	Independent skills	Interrelated skills	Complex Skills		
N	N	N	N	Basic knowledge	**A**
Y	N	N	N	Complex knowledge	**B**
N/A	Y	N	N	Independent skills	**C**
N/A	Y	Y	N	Interrelated skills	**D**
N/A	Y	Y	Y	Complex skills	**E**

Y: Yes, N: No, N/A: Not determining factor.

5. TRAINING METHOD AND FSTD

5.1 LEVEL A AND B TRAINING DIFFERENCE

There is no proposed change in the management of the Level A, Level B training differences:

- The training level (A or B) is specified in the Difference tables (DT) or Operator Difference Requirements (ODR) tables.
- A recommended training method (*e.g.,* video) may be added. It is not systematic and is at the FSB's determination.
- The examples of training methods for Level A and B training, as proposed in the AC, as well as the FSBR template should be improved to reflect current state of the art training methods and means.
- The AC and the Appendix 1 FSBR template should also be changed for Level A training to remove the two following conditions of use of Level A training:

(1) “Minor or no procedural changes required”, and
(2) “No safety impact if information is not reviewed or is forgotten”.

The difference between Level A and Level B only lies in the “complex” criterion, *i.e.*, the way to teach the difference. It has no relation with the safety impact of the difference (if forgotten) or the magnitude of the procedural change. For instance, a change in an Airplane Flight Manual (AFM) limitation may have an important safety impact but may not be complex to train: reading the AFM may be enough to retain this information.

5.2 LEVEL C & D TRAINING DIFFERENCE

As currently written in the AC, the training objectives of Level C training difference items is to “focus on mastering individual systems, procedures, or tasks” as opposed to “performing highly integrated flight operations and maneuvers” for Level D training difference items.

5.2.1 Level C Training

Level C training items typically pertain to difference in the Human Machine Interface (HMI), *i.e.*, the cockpit controls and displays.

Two types of **independent skills** are typically involved in Level C training items:

- Mastering the interactivity mode of a specific HMI, *i.e.*, mastering a system operation requiring pilot inputs and providing complex outputs, such as multiple computations, multimodal displays, *etc.*
- Mastering the tactile/kinesthetic features of a specific cockpit control for which the “touch feeling” has an influence when using it.

The various types of skills involved in Level C training items imply a variety of types of training means or devices necessary to achieve the training objective. As such, when appropriate, the original equipment manufacturer (OEM) and the FAA should have the opportunity to indicate in the DT or ODR table the minimum specification of the training means so that the appropriate independent skills are trained and acquired properly.

Therefore, it is proposed for Level C training difference:

- Specify a “system” training device capable of training the independent skills pertaining to the difference. The “system” training device should be functionally representative of the difference. *I.e.*, it should behave in a way that is similar to the aircraft in reaction to the tasks made by the flight crew.
- Do not specify a recommended minimum qualified FSTD. *I.e.*, remove the need for a Level 4 or higher FTSD from AC 120–53 Change 1.
- Indicate that the use of a qualified FSTD for training level C difference should be at the discretion of the operator or the training organization.
- Specify the minimum training device capability using the FSTD criteria (feature and fidelity) even if the training device is not qualified. See proposal below.
- Allow the FSB to specify supplementary minimum training device capability using the FSTD criteria (feature and fidelity).

- Update the examples of training methods and means acceptable for Level C training as proposed in the AC depending on the training skills objective.

5.2.2 Level D Training

Level D training items apply to the training of interrelated skills necessary for mastering full task differences between related aircraft. For aircraft certified for Multi-Crew Operation (MCO), training of interrelated skills requires a full crew.

It is proposed for Level D training difference:

- Specify a “maneuver” training device capable of training the interrelated skills pertaining to the difference. The “maneuver” training device should be: (1) functionally representative of the difference, *i.e.*, it should behave in a way that is similar to the aircraft in reaction to the tasks made by the flight crew and (2) capable of full task training with a full crew.
- Do not specify a recommended minimum qualified FSTD. *I.e.*, remove the need for a Level 6 or higher FTSD from the AC 120–53, Change 1. The minimum acceptable “maneuver” training device for Level D training may range from a flat panel trainer capable of full task difference training with a full crew up to qualified Flight Training Device (FTD) Level 6 or 7.
- Indicate that the use of a qualified device for training level D difference may be mandated by the FSB. It may also be used at the discretion of the operator or the training organization.
- Specify the minimum training device capability using the FSTD criteria (feature and fidelity) even if the training device is not qualified. See proposal below.
- Allow the FSB to specify supplementary minimum training device capability using additional FSTD criteria (feature and fidelity).
- Update the examples of training methods and means acceptable for Level D training as proposed in the AC.
- Address the introduction of equipment like HUD, SVS or EVS by specifying minimum training device capability using additional FSTD criteria (feature and fidelity), *e.g.*, visual cues.

5.2.3 Minimum FSTD criteria for Level C and D training levels

The following table provides the minimum FSTD fidelity levels to train the Level C and D differences between the base and candidate aircraft, stated using the four fidelity levels of a simulation feature:

- none or not required (N);
- generic (G);
- representative (R); and
- specific (S).

The aircraft feature that has not changed between the base and candidate aircraft may be proposed at a lower fidelity level on the training device provided that the training objective is still be achieved.

Category	FSTD Feature	Minimum Level C	Minimum Level D
Aircraft simulation	Flight deck layout and structure	N	R
	Flight model	N	R
	Ground handling	N	N
	Aeroplane systems	S	S
	Flight controls and forces	N	R
Cueing simulation	Sound cues	N	G
	Visual cues	N	N
	Motion cues	N	N
Environment simulation	Environment — ATC	N	N
	Environment — navigation	N	R
	Environment — atmosphere and weather	N	G
	Environment — aerodromes and terrain	N	R

5.3 LEVEL E TRAINING

It is proposed to limit the use of Level E for specifying significant full task differences between separate type ratings (similarly to European Union Aviation Safety Agency (EASA) policy). Level E training should not be used for equipment like HUD, SVS or EVS. The acceptable training means for Level E training difference remains an FFS or the aircraft.