

GM1 ORA.ATO.135(b) Training aircraft and FSTDs**ADEQUACY OF FSTDs**

In order to determine the adequacy of an FSTD for a particular training programme the ATO needs to consider not only the FSTD qualification but also the capabilities of the specific device.

FSTD Qualification

The qualification of an FSTD, its specification and guidance information for training, testing and checking are recorded on the FSTD qualification certificate issued to the FSTD operator (Appendix IV to Part-ARA). The qualification certificate is issued when the competent authority has established that the FSTD meets the minimum requirements for the level of qualification sought. Issue of a qualification certificate does not indicate that the device is suitable or approved for any particular course of training.

FSTD Approval

It is the responsibility of an ATO applying for approval of a training programme to establish which specific FSTDs are adequate to be used on each part of the training programme based on the capability of the specific FSTDs and to demonstrate such adequacy to the competent authority. The list of FSTDs approved for each training programme is shown on the attachment to the ATO certificate issued to the ATO (Appendix III to Part-ARA).

FSTD qualification levels

Devices having a particular level of FSTD qualification are required for certain courses of training; for example type rating training in accordance with AMC1 ORA.ATO.125(j) requires training in a full-flight simulator (FFS). This does not imply that any device qualified as an FFS is adequate for any type rating programme. When selecting an FSTD to be used for type rating training the ATO will ensure that the capabilities of the specific device are suitable to meet the training objectives of each part of the programme on which it will be used as well as verifying that the device is qualified as an FFS. For other training courses the type of FSTD is not specified; for example PPL training in accordance with FCL.205.A allows up to five hours of instruction in an FSTD but does not state the specific level of FSTD qualification required. In this case the training organisation will select a device that is suitable to meet the training objectives of the parts of the programme on which it is to be used as well as verifying that the device is qualified as an FSTD (i.e. any of FFS, FTD, FNPT or BITD).

The extent to which systems, controls and aerodynamics are modelled will vary between different devices having the same qualification and according to the qualification of the device.

TYPE-SPECIFIC TRAINING

Any training programme that is specific to a particular aircraft type, such as type-rating training or type-specific UPRT, needs use an FSTD that replicates the characteristics of the specific aircraft type. Flight Training Devices (FTD) and Full Flight Simulators (FFS) are designed using flight test data, that is actual aircraft data obtained by the aircraft manufacturer (or another supplier of acceptable data). In order for a device to be qualified as FTD or FFS the operator of the device (FSTD Operator) must demonstrate that the performance of systems, controls and aerodynamic programming are in accordance with the flight test data for the aircraft type. Other FSTDs (e.g. BITD and FNPT) may be qualified on the basis of representing the performance of a class of aircraft. The only FSTDs acceptable for type-specific training are, therefore, FTD and FFS.

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SELECTION OF FSTDs FOR PARTICULAR TRAINING PROGRAMMES

- (a) The FSTDs to be used for any particular course of training are determined on the basis of the simulation features and level of fidelity required for each training task within the training course. Figure 1 describes a method to determine which FSTDs could be used for a particular training course.
- (b) The following notes relate to the different stages of the selection process as numbered on the flow chart in Figure 1.
1. The training tasks for a particular training course are determined from the training objectives. Appendix A to ICAO Document 9625 gives examples of training tasks for certain training courses.
 2. The device features and level of fidelity required are determined by the course designer according to the training tasks. Fidelity levels could be described as specific (S) or representative (R) as summarised in Table 1¹.

The device features may be considered in the following categories:

- (i) Cockpit layout and structure. Defines the physical structure and layout of the cockpit environment, instrument layout and presentation, controls and pilot, instructor and observer seating.
- (ii) Flight model (aero and engine). Defines the mathematical models and associated data to be used to describe the aerodynamic and propulsion characteristics required to be modelled in the FSTD.
- (iii) Ground handling. Defines the mathematical models and associated data to be used to describe the ground handling characteristics and runway conditions required to be modelled in the FSTD.
- (iv) Aircraft systems. Defines the types of aircraft systems simulation required to be modelled in the FSTD. The course designer will need to specify the particular systems in terms of ATA chapter definitions (e.g. hydraulic power, fuel, electrical power) and which normal, abnormal or emergency procedures need to be accomplished.
- (v) 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 required to be modelled in the FSTD.
- (vi) Sound cue. Defines the type of sound cues required to be modelled. Such sound cues are those related to sounds generated externally to the cockpit environment such as sound of aerodynamics, propulsion, runway rumble and weather effects, and those internal to the cockpit.
- (vii) Visual cue. Defines the type of out-of-cockpit window image display (e.g. collimated or non-collimated) and field of view (horizontal and vertical) that is required to be seen by the pilots using the FSTD from their reference eyepoint. Technical requirements such as contrast ratio and light point details are also described. HUD and EFVS options are also addressed.

¹ ICAO Document 9625 refers to three levels of fidelity, specific, representative or generic. For simplicity only two levels are considered in this guidance. When using tables from 9625 for reference the generic level (G) may be substituted by representative (R).

- (viii) Motion cue. Defines the type of motion cueing required that may be generated by the aircraft dynamics and from other such effects as airframe buffet, control surface buffet, weather and ground operations.
- (ix) Environment - ATC. Defines the level of complexity of the simulated Air Traffic Control environment and how it interacts with the flight crew under training in the FSTD. The focus of this feature is on the terminal area maneuvering, not on the in-flight cruise phase of flight.
- (x) Environment - Navigation. Defines the level of complexity of the simulated navigation aids, systems and networks with which the flight crew members are required to operate, such as GPS, VOR, DME, ILS or NDB.
- (xi) Environment - Weather. Defines the level of complexity of the simulated ambient and weather conditions, from temperature and pressure to full thunderstorm modelling, etc.
- (xii) Environment - Aerodromes and terrain. Defines the complexity and level of detail of the simulated aerodrome and terrain modelling required. This includes such items as generic versus customized aerodromes, visual scene requirements, terrain elevation and EGPWS databases.
- (xiii) Miscellaneous. Defines criteria for miscellaneous feature technical requirements such as the instructor operating station (IoS).

Appendix C to ICAO document 9625 describes the fidelity levels required for certain training tasks associated with a variety of training programmes.

3. For some courses, the qualification level for FSTDs is specified in implementing rules or AMC. For these courses, it is necessary for this level of device to be used, but this does not absolve the ATO from the responsibility to select a device adequate for the proposed training.
4. The minimum qualification requirements for a particular level of FTSD are specified in CS-FSTD. Course designers should be aware that each individual FSTD will have been qualified against the requirements that were in place when the device was first commissioned. It will be necessary to review the certification specifications against which the device was originally qualified.
- 5/6. The FSTD(s) selected for the course must deliver all of the required features at the required level of fidelity. Where the minimum qualification requirements for a particular level of FTSD qualification include all of the required features at the required level of fidelity then any device qualified to that level should be adequate for the training course. In most cases additional features will be required so the ATO will need to select a device that exceeds the minimum qualification requirements. In some cases, it may be necessary or expedient to use more than one FSTD during the course so that the most suitable device can be used for each part of the training programme. If no suitable device exists then it may be necessary to include some 'on-aircraft' training in the training programme.
7. A device that accurately represents a type of aircraft may not necessarily represent the variant of aircraft to be operated by the crew under training or the equipment and instruments installed on that aircraft. In this situation, it may be necessary for trainees to complete to undergo differences training.
8. Selection of an FSTD for a training course, or a change to the FSTDs used for training courses delivered by an ATO, are 'changes requiring prior approval'. The ATO will need to demonstrate to the Competent Authority that the selected FSTD are suitable for the

course of training and to receive approval, in the form of an amended attachment to the ATO certificate, before implementing the change.

- (c) Table 2 shows an example presentation of training tasks and fidelity levels for different device features. Such a table could be used to record FSTD requirements for a particular training course. In order to demonstrate that a specific FSTD was adequate for the training course it would be necessary to show that the selected device had all of the required features at the required level of fidelity.

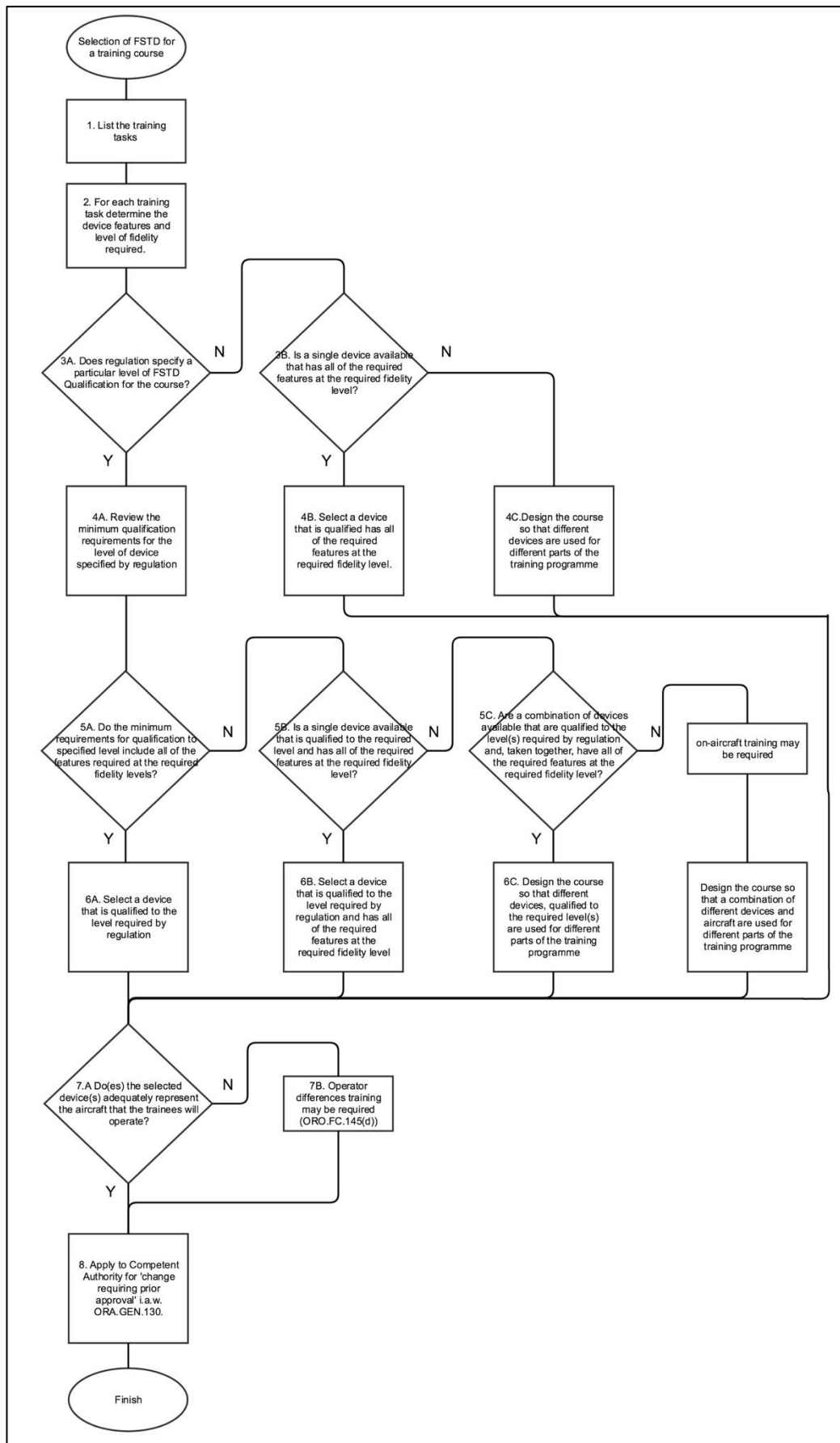


Figure 1: Example FSTD selection methodology

Table 1: Fidelity levels

Level	Aircraft simulation	Cueing simulation	Environment simulation
Specific (S)	Replicates the specific aeroplane type	<i>Applicable to visual cueing only:</i> replicates the real world visual environment and (infinity) perspective.	Replicates the real world environment as far as possible for any specific location.
Representative (R)	Representative of an aircraft category and class (e.g., four engine turbo-fan aeroplane). Does not have to be type specific.	<i>For sound and motion cueing:</i> Replicates the aircraft to the maximum extent possible (current technology currently provides representative, not specific, cues. <i>For visual cueing:</i> Representative of the real world visual environment and perspective.	Representative of the real-world environment.
None (N)	Not required		

Table 2: Example of training tasks vs. fidelity levels

	Cockpit layout and structure	Flight Model (aero and engine)	Ground handling	Aircraft systems	Flight controls and forces	Sound cue	Visual cue	Motion cue	Environment - ATC	Environment - Navigation	Environment - Weather	Environment - Aerodromes and terrain
Training item												
<i>Perform rejected take-off</i>	S	S	S	S	S	R	R	N	R	S	R	R
<i>Perform standard instrument departure</i>	S	S	N	S	S	R	N	N	R	S	R	N
<i>Perform 2D approach operation</i>	S	S	N	S	S	R	R	N	R	S	R	R