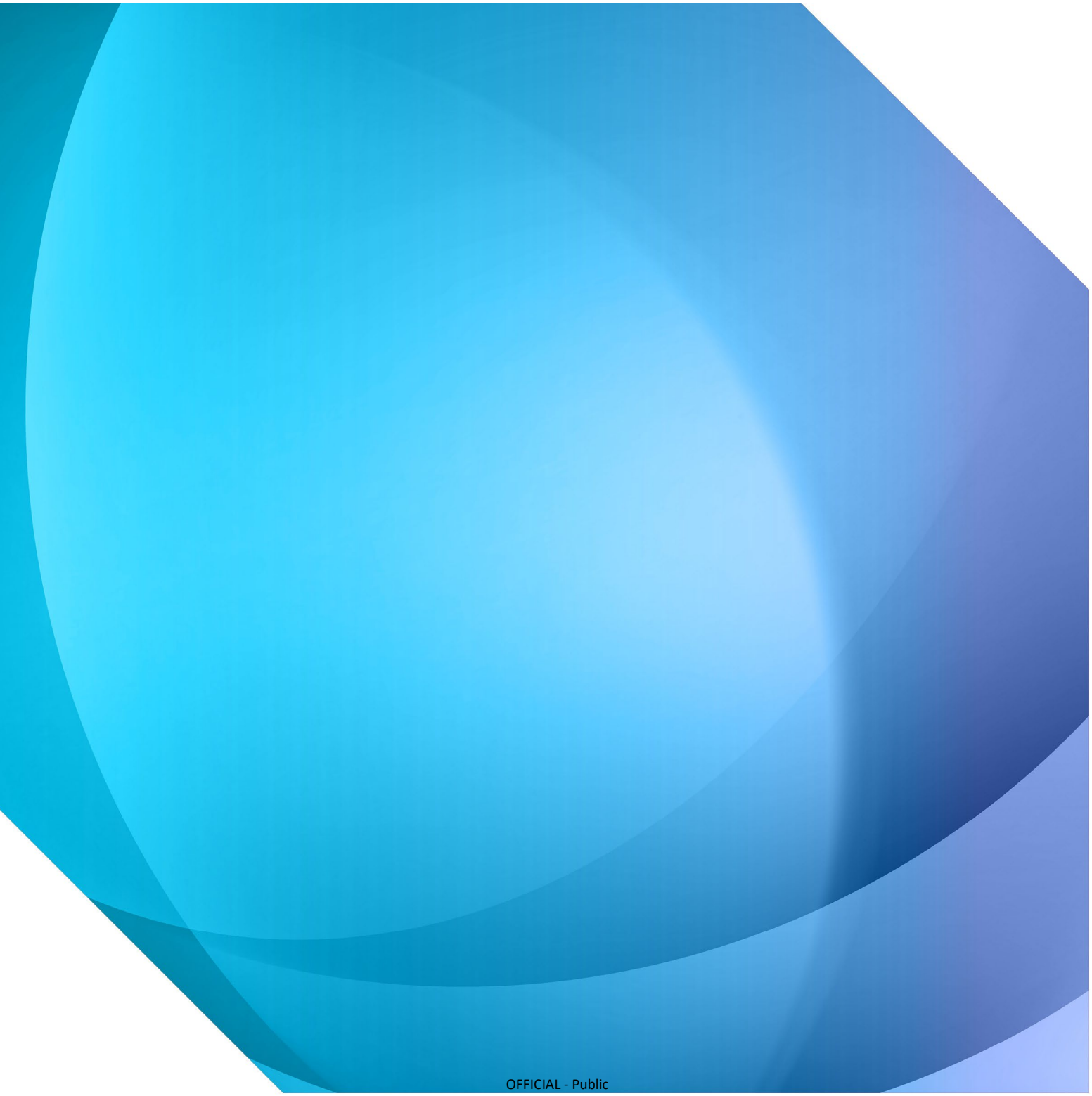
UK Civil Aviation Authority

Guidance for use of web-based training, distance learning, simulation and virtual reality

CAP 1933



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Contents

Contents **3**
Revision history **5**
Introduction **6**
Submission Guidance **6**
Chapter 1 **7**
Distance Learning & Methods **7**
Synchronous 7
Asynchronous 7
Lecturing 7
Assisted Learning (Mentoring) 7
Electronic learning 7
Blended Learning 8
Mobile learning 8
Computer-based training (CBT) 8
Multimedia-Based training (MBT) 8
Virtual Learning Environment 8
Learning Management Systems 8
Chapter 2 **9**
Web Based Systems **9**
What is a web-based system? 9
Session Delivery 9
Maximum Number of Participants 10
Subjects that may be delivered 10
Quality Oversight 10
Chapter 3 **11**
Simulation / Synthetic Training Devices **11**
Simulation 11
Synthetic Training Devices 11

Use of simulators for Engineers 11
Chapter 4 12
Virtual Reality 12
What is 'Virtual Reality'? 12
Use of Virtual Reality for training 12
Maximum percentage that VR can be permitted 12
VR for On the Job Training 13
Creation of a VR package for an aircraft type 13
Chapter 5 14
Practical Training 14
Practical Training in a Basic Part 147 Organisation 14
Practical Training in a Type Part 147 Organisation 14
Chapter 6 15
Procedure for Approval of Distance Learning/Virtual Reality 15
Chapter 7 17
Examinations 17
Chapter 8 18
Training Needs Analysis (TNA) 18
References 19
Abbreviations 19
Checklists 20

Revision history

Revision Number	Revision Type	Summary of Revision	Date
01	Major	Initial Issue	October 2020
02	Major	Post EU Exit	January 2024
03	Minor	Minor changes	November 2025

Introduction

This CAP provides guidance in line with UK Regulation (EU) No 1321/2014, on how the distance learning privilege can become permanent under UK Part 147.A.145, in a similar way to remote site approval. This supports the introduction of AMC 147.A.130(a) Training procedures and quality system.

The intent of this document is to provide an agreed standard to the UK Part 147 Sector for the following areas:

- Web-based training (WBT) / Distance learning
- Simulators
- Synthetic training aids
- Virtual reality

This document is subject to periodic revision and documented in the revision history.

NOTE: This information only applies to UK CAA approved Part 147 Maintenance Training Organisations, who have initiated training, and a period of compliance has been audited by the CAA. It is not intended that the distance learning privilege be issued to organisations who have not yet exercised the privileges of their approval.

Submission Guidance

Any changes or variations to an organisations' Part 147 approval must be notified to the UK CAA via SRG 1019 and submitted to apply@caa.co.uk.

Organisations Maintenance Training Expositions (MTOE's) should define the definitions and extent of use of their training systems, as well as, how they intend to conduct their audit oversight.

Chapter 1

Distance Learning & Methods

AMC 147.A.130(a) Training procedures and quality system, provides details of the different methodologies and tools which could be deployed in distance learning. There are clear differences in certain methods; this section does not intend to repeat the content of the tables in the AMC; however, it does attempt to provide additional clarity on the more common themes.

Synchronous

Synchronous learning is if the instructor and the students interact at the same time (real time). i.e. classroom sessions, presentations, or symposiums, this is the way the most classroom-based training has been carried out and is the most commonly used method for distance learning.

Asynchronous

Asynchronous learning is if the instructor and the students do not interact at the same time. i.e., Instructor assigns the student work which they complete at a later point in time. This is often seen as assignments within specific course work.

Lecturing

Instructor led (face to face). The practice of face-to-face delivery of training and learning material between an instructor and students, either individuals or groups. This usually forms part of the synchronous learning.

Assisted learning (Mentoring)

Assisted learning, often referred to as mentoring, involves guidance and support provided by an experienced instructor or mentor to learners. This method typically includes one-to-one or small group sessions, where the mentor helps students to understand complex topics, develop practical skills, and progress through their training at an individual pace. Assisted learning may be structured or informal, depending on the needs of the learners and the objectives of the course.

This is usually overseen by the training organisation.

Electronic learning

E-learning is the training via a network or electronic means, with or without the support of instructors (e-tutors).

Blended learning

Blended learning is a mix of learning methodologies used to deliver a course. i.e. an organisation may choose to use a mix of classroom and online distance learning sessions when delivering a course. This must be reflected in the course Training Needs Analysis (TNA) and Course Approval Form (SF), with a clear break down as to which methodology is applied to which subject or ATA chapter.

Mobile learning

M-learning is any sort of learning that happens when the student is not at a fixed, predetermined location, using mobile technologies. This may be for self-study, assignments as well as revision purposes.

Computer-based training (CBT)

CBT is any interactive means of structured training using a computer to deliver a content. (Note: Not to be confused with competency-based training that also uses the acronym ‘CBT’).

Multimedia-based training (MBT)

Multimedia based training (MBT) can be any combined use of different training media.

Virtual learning environment

A Virtual learning environment (VLE) refers to a system that offers instructors digitally based solutions aimed at creating interactive, active learning environments. VLEs can help instructors create, store, and disseminate content, plan courses and lessons and foster communication between student and Instructor (in the form of e-mails and discussions), even in real-time. Virtual learning environments may include some of the technologies previously discussed i.e. Microsoft Teams or other such platforms.

Learning management systems

Learning management systems (LMS).

Learning, because it is used it to deliver education courses or training programs.

Management, because it helps organise courses i.e. (create them, change them, assign them to students, grade them, etc).

System, in this case, is just a word that translates to ‘software’. An LMS is simply a computer program.

An LMS is a software program that helps you create, manage, and deliver **eLearning** courses.

Chapter 2

Web Based Systems

What is a web-based system?

As per Table 2 in the AMC, a web-based system is a software or programme that permits the host user to deliver presentations, lessons, or webinars over the internet. The following are examples of these:

- Skype for Business
- Microsoft Teams
- GoTo Meeting
- Zoom Webinars

NOTE: The UK CAA does not recommend or endorse any particular platform. It is down to the individual organisation to identify a platform that works within their infrastructure, that meets the intent of this CAP.

The chosen platform should be private and secure from external access. Once a training session has begun, participants should be able to fully interact with their instructor, as well as being able to see the shared data, hear any audio and ask any questions relating to the subject.

Most of the platforms above, have an Instant Messaging (IM) chat function or service, so that questions can be asked openly or privately, without interrupting the instructor.

Session Delivery

Typically, the user will be invited to attend the meeting or session via a dedicated secure link or dial in via the meeting host which utilises a Meeting ID and password to log in. This will provide a secure route into the subject session.

The UK CAA must be provided access to any session for the purposes of ensuring continued oversight and compliance. This may be done by invitation to the session, defined login or other such means that permits full access. Any session not made available to the UK CAA may not be recognised or accredited.

Students must have their camera on at all times and be in a location and time zone that is conducive to learning.

Maximum Number of Participants

For theory lessons, the maximum number of students is 28 (dependent upon the size of the facility).

It has been indicated to the CAA, by industry partners, that ideally there should be no more than 20 students per session, due to the increased difficulty for students to ask questions and interact with their instructor during the sessions.

With the inclusion of the distance learning elements, additional factors must also be considered:

- The strength of the internet connections must be enough to support the class size, from both the MTO's and student's perspectives.
- The software must be capable of supporting the class size.
- How will the MTO monitor student engagement. Will this be done by the instructor? Will they be supported by another staff member in ensuring all students remain on camera and engaged?

Subjects that may be delivered

When using the reference tables from the AMC 147.A.130(a), (Table 1, Table 2 and Table 3), the following applies:

- Table 1 covers the different training tools.
- Table 2 defines and explains each of the training tool methodologies.
- Table 3 demonstrates how the training tools can be applied to each of the training methods.
- Not all ATA's may be eligible for certain formats so the organisation will have to justify to the CAA the use, where requested.

Quality oversight

Organisations should ensure, that prior to any application to the UK CAA for online training, that their Quality Assurance (QA) departments have fully audited and tested the processes, procedures and software to be used to ensure the proposed course meets with the requirements and that it is stable enough for the duration of the course.

The QA deptartment and CAA must have full access to the courses and any student feedback provided, as well as ensuring that they regularly sit in on delivered sessions and undertake periodic audits, recording any findings / observations. Any non-compliance should be addressed in the usual manner.

Chapter 3

Simulation / Synthetic Training Devices

Simulation

The use of simulators is becoming increasingly used, most notably with aircraft flight or fixed base simulators, which provide flight crews and engineers with a realistic look and feel of an aircraft flight deck and its functions.

Synthetic training devices

Synthetic training devices are items of equipment that enable instructors to demonstrate to students the working of a component or sub-system.

Synthetic training devices are usually called simulators in the aviation industry and can be extremely valuable in the maintenance training environment. They are useful in both fundamental knowledge and skill set training. They often link to training aids themselves i.e. specific components or parts when explaining the system architecture, design, and function.

Examples of Synthetic Training Devices are:

- NOSTRA - Network Operator Switching Training Aid.
- B737 VLab - Simulation of main B737 subsystems (electrical, hydraulic etc.).
- Part-66 Basic Vlabs - Virtual Labs to reinforce fundamental principles.

Manufacturers are now required to develop synthetic / software technology to allow engineers to replicate real time defect scenarios, to follow the troubleshooting procedures and rectify the fault. Any such software should be a direct representation of the physical aircraft and offer, as close as possible, a real-world alternative.

Use of simulators for engineers

Engineers currently use simulators for Engine Ground Run (EGR) training and in support of some type training. Some manufacturers are beginning to develop technology to allow engineers to replicate real time defect scenarios so that the engineers can follow the troubleshooting and investigative process to rectify the fault(s). Any such software should be a direct representation of the physical aircraft and offer as close as possible to the real-world environment.

Chapter 4

Virtual Reality

What is 'Virtual Reality'?

Virtual Reality (VR) is:

'The computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors.

Virtual reality is the newest technological developments in the training world and takes the use of a simulator one step closer to the real world by allowing the user to 'interact' with the aircraft, engine, or system that they have been studying. The user can see in real time the effects the interaction may have and why certain steps must be carried out in the process. It is a safe way of giving a student the confidence of using a system without risk of injury to themselves or damage to the aircraft or system.

Use of Virtual Reality for training

Similar, to practical training, the use of Virtual Reality is still developing and as such it still has limitations.

Basic Part 147 organisations may **not** use VR in their practical sessions as the students are required to grasp the basic concepts, handling of tools, understanding and familiarity with tasks, which VR could not provide.

Type Part 147 organisations may use VR to compliment or assist practical training as well as re-enforcing theory training, but it cannot replace it fully. There still needs to be an element of 'hands on' practical on the real subject aircraft, however this may be balanced with the support of VR. The most crucial outcomes of any VR training are that:

- The use of VR can demonstrate the learning effectiveness against a live assessment.
- The use of any VR for an individual is reviewed against their individual background and training needs to ensure it is suitable to deliver the training objective.

Maximum percentage that VR can be permitted

The maximum permissible use of VR is 50% (refer to Chapter 5 Practical Training for more details), dependent upon many factors, such as: aircraft type, age in service and manufacturers support.

For example, the Boeing 757 aircraft was never designed with VR in mind, however the Boeing 787 has a very different training methodology and its core systems, maintenance documentation and support, lend itself to be a candidate for VR. The submitted course application should define in the course TNA the training methodology and the extent that simulation and VR are to be used, justifying course durations and conduct. The rapid progress within VR technology means that these will be reviewed on a case-by-case basis, considering all of the above.

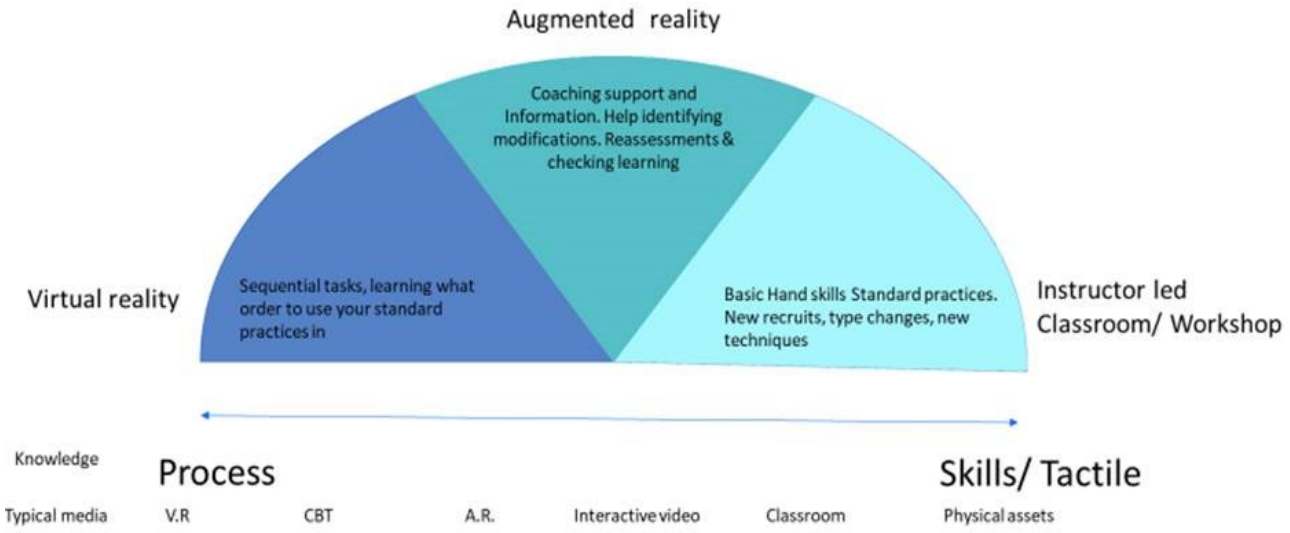
VR for On-the-Job training

On the Job Training (OJT) must be conducted in the real engineering environment (i.e. Part 145) with all the associated hazards and risks that typically a Part 66 engineer would be exposed to on a daily basis. These cannot be simulated so the OJT must be conducted in the live operational environment (i.e. on aircraft).

Creation of a VR package for an aircraft type

To create a VR programme for a specific aircraft type, an organisation would need to work with experienced individuals or companies to develop the relevant software, graphics and modelling. The UK CAA have no direct involvement and are unable to recommend any organisation. Some manufacturers are now looking to develop VR software to complement their existing training platforms.

Below is a typical break down of the use of VR, when compared against practical and classroom-based training.



Chapter 5
Practical Training

Practical Training in a Basic Part 147 organisation

Currently there is no provision to conduct any practical training via distance learning within Part 147 Basic Training organisations. This is due to the extensive fundamental 'handskills' and competency that the students are required to master during practical training. This will be subject to ongoing review and revision.

Practical Training in a Type Part 147 organisation

The use of distance learning within a Part 147 Type Practical course is permitted with the following as examples (but not limited to):

- Damage assessment and mapping
- Component location and identification
- Use of MEL (de-activation / re-activation of systems)
- Component removal & re-fitment
- Troubleshooting

The above may be completed by distance learning methodologies where the method is deemed a suitable alternative to completion of the task in the 'real-world' maintenance environment, refer to AMC 147.A.130(a), table 3. Such use must be recorded in the TNA.

In all cases, a maximum of 50% of practical training tasks can be replaced by a suitable alternative in accordance with table 3.

Organisations may use pre-prepared training videos or interactive solutions in these areas.

Chapter 6

Procedure for Approval of Distance Learning/Virtual Reality

Approved UK Part-147 training providers will be required to submit details of proposed changes to existing training methods and technologies to the CAA in the form of an application in accordance with 147.A.150. This should be supported by appropriate documentation; training material; TNA's; Course Approval (SF) forms; draft MTOE encompassing the new distance learning procedures; details of the instructor/s online training competency and a satisfactory compliance report endorsed by the organisation's quality department.

The CAA will review the submitted change application and any supporting data that establishes the proposed training complies with Appendix III to UK Part-66. This may include an on-site visit and / or demonstration of the revised training methods and technologies.

When satisfied with the proposed changes to the training organisation's processes, procedures and training methodologies, the CAA will approve the revision by approval of the MTOE, TNA(s), and Course Approval (SF) forms, as appropriate. If the proposed change includes new aircraft type or change of scope to a basic training approval, then this will require a change to the organisation's approval certificate (CAA Form 11) in accordance with current procedures.

This privilege cannot be demonstrated at the time of an initial approval, therefore, a Distance Learning privilege, cannot be detailed in the MTOE before the organisation has initiated training and a period of compliance has been audited by the CAA.

For an organisation wishing to be granted approval for distance learning / virtual reality, then they should have an MTOE section (or separate linked procedure / supplement) that covers the following:

- Identification of a secure platform or software that allows the organisation to share, interact and discuss the relevant modules/ATA chapters that are required to be completed. This should cover, the instructor teaching from the approved training material and uses a separate slide/document to illustrate the individual process/stages of workings out.
- Students having access to the appropriate technology to ensure interaction with instructor and that the platform can be used remotely. A procedure should define what will occur in the event of failure of the software/internet.
- Verification that full access to each training course for the UK CAA has been established, prior to delivery.

- Satisfactory demonstration of instructional staff competence to use web-based applications, i.e. Skype, WebEx, ZOOM, MS Teams or specific VR software etc.
- Validation of the means of monitoring student attendance during any distance learning sessions, to ensure the 90% attendance is maintained as well as the student's ability to understand, read and write in English and identity verification.
- Maximum student capacity is as per the regulation (i.e. 28 Students); however, organisation would be advised to limit their class size to approx. 20 students or less due to the limitations of the technologies and strength of internet access. This will be reviewed on a case-by-case basis by the UK CAA.
- Maximum number of training hours per day (6) with defined and regular break periods, considering the extensive use of monitors, PC's and tablets. Therefore, additional breaks are required.
- Student / instructor interaction should include verification of student's understanding of the specific software and engagement including demonstrations if required and appropriate.

  Note: It is the responsibility of the training organisation to be satisfied that the students remain engaged during the training session.
- The student is to be in an area that is conducive to receiving such online training where they will not be disturbed or interrupted during the process.

  Note: It is the responsibility of the training organisation to be satisfied that the above conditions remain throughout the training session.
- How the requirements of 147.A.115(d) can be delivered whilst training is provided via distance learning.
- Organisation's quality system's oversight including audit compliance verification.
- Potential time zone differences between students and instructors, including considering any Human Factors issues / considerations.
- Instructional environment i.e. training delivery will normally only be from approved facilities listed within the exposition. However, if instructors are delivering training from their homes or elsewhere, this will require a remote site application supported with an internal QA audit (onsite or desktop).
- Organisation's quality and compliance system should be able to demonstrate initial and continuing oversight of these systems and processes whilst considering any student feedback from delivered courses.
- Certificates of Recognition to be issued in accordance with current approved procedures only when qualification by the student has been achieved.

Approval will only normally be granted after satisfactory demonstration to the UK CAA (usually via trial period or verified audit assessment).

NOTE: As this is a privilege that exists within 147.A.145, it may be withdrawn at any time due to organisation poor performance or as part of limitations placed upon the organisation as part of mitigation of risk in response to findings.

Chapter 7
Examinations

The regulation 147.A.145(b) currently states:

> *Training, knowledge examinations and practical assessments may only be carried out at the locations identified in the approval certificate and/or at any location specified in the maintenance training organisation exposition.*

The UK CAA **does not** permit examinations via distance-based learning to be carried out at this time. This is different to any current approved electronic examination process that may currently be approved, the UK CAA reserves the right to review this periodically.

Examinations carried out at locations not listed within the MTOE will require a remote site application supported with an internal QA Audit (onsite or desktop).

Chapter 8

Training Needs Analysis (TNA)

As with any course delivered under UK Part 147 the proposed course must be supported by a valid Training Needs Analysis (TNA) and associated Course Approval (SF) form. The completed SF forms should be placed in Section 4 of the organisations MTOE and refer to the respective TNA.

The TNA for courses using distance learning, Web Based, VR etc. must be either updated or have a separate TNA which clearly identifies the differences from the main classroom-based course, furthermore the TNA and SF forms should clearly note the training aids being used and should define the durations in time for each respective element.

It is important to detail when access to the aircraft will be planned as per 147.A.115 (d).

It is accepted that distance-based courses will typically be of a longer duration than that of their classroom counterparts, due to the ability of interaction whilst using such format. The UK CAA will not accept any course duration that falls below the standard classroom duration detailed in either Appendix I to Annex IV (Part 147) (Basic Course) or Appendix III to Part 66 (Type Training) without the necessary justification.

The SF Form can be found at the link below under ‘What to include with your application’:

- Course Approval (SF) Forms

References

Abbreviations

CBT	Computer Based Training
DfT	Department of Transport
FSTD	Flight Simulation Training Device
LMS	Learning Management Systems
MBT	Multimedia Based Training
MSTD	Maintenance Simulation Training Device
MTD	Maintenance Training Device
MTOE	Maintenance Training Organisation Exposition
SF	Standardisation Form
STD	Synthetic Training Devices
TNA	Training Needs Analysis
UK CAA	United Kingdom Civil Aviation Authority
VLE	Virtual Learning Environment
VR	Virtual Reality
WBT	Web Based Training

Checklists

No.	Question	Answer / MTOE Ref:	Quality Verification
1	Which communication medium are you using? Skype / ZOOM / etc.		
2	Have you tried any other mediums and what influenced your decision?		
3	What will the maximum class size be? - How have you validated this as satisfactory?		
4	How do you implement student monitoring?		
5	How is the requirement for access to aircraft or components catered for?		
6	Digital alternatives planned student visits, etc?		
7	How is the virtual classroom designed, standardised and maintained? E.g. the image / stage that the student physically sees on the screen.		
8	Student attendance – how is this monitored during the entire lesson, especially important for basic training and the minimum attendance requirement?		
9	Have the original course TNAs / SF forms been altered?		
10	How is the training material accessed by the student?		
11	How will students be able to access the MTO's training resource library? Will there be access during out of tuition periods?		
12	What is the minimum standard for the Student's IT equipment? Camera, broadband speed, hard drive capacity, etc.		
13	What additional training have the instructors undertaken? Bespoke course, etc.		
14	Will you be planning to deliver any asynchronous content? Will this be a pre-recorded lesson, as opposed to a live instruction?		

15	How will the standard of engagement between the student / instructor interactions be maintained?		
16	Student identification – how is this established, especially for remote type training where you may not have met the student?		
17	Student engagement – how will a student ask a question or engage directly with the instructor?		
18	How is the instructor engagement and mentoring being achieved?		
19	What has been put in place to ensure that the instructor will be able to assess student/s cognition and understanding?		
20	How is quality oversight conducted and how does the CAA access the training?		
21	What are the proposals for aircraft visits / practical training? How will they be conducted and by who?		
22	What provisions are in place for typical component demonstrations etc?		
23	What is the organisation's provision for examinations? Phased weekly exams? How will the final exam to be conducted and where? What gap between theory training and examination will be permitted?		
24	Following an exam failure, how will re-training be conducted?		
25	With respect to examination security has a risk analysis been carried		

Organisations should use the MTOA Distance Based Learning Checklist, available on the CAA Website.

SRG2140: Distance Learning Compliance Check List | UK Civil Aviation Authority