

Preface

- i. **Intent:** This document is intended to assist approved Design Organisations (DOA) and Production Organisations (POA) in the production of a Flight Test Operations Manual (FTOM). It is a guide, not a template, and while organisations may choose to follow the format or structure, the document should not be simply copied and pasted.
- ii. **Compliance:** While every attempt has been made to observe the current regulation in compiling this document, it may not follow the latest amendments to the regulations. In addition, an FTOM needs to be tailored both to the size of the company and to the complexity of the flight test activity; thought needs to be applied to its content. As a result, following this guide cannot, of itself, guarantee compliance with the regulation. In addition to considering their own organisation's requirements, authors should consult the latest amendments to check proper compliance.
- iii. **Status:** This guide does not replace the regulation, does not seek to impose additional regulation and should not be regarded as AMC material. This guide may be regarded as being at the level of Guidance Material.
- iv. **Presentation:** Material in this guide is presented in the following manner:

Regulation: Requirements from the regulation and AMC are presented first in each section in boxed text. The primary regulation for the FTOM is 21.A.143 or 21.A.243 (it is also invoked by other regulations). These regulations apply to POA and DOA respectively but the requirements are exactly the same. In addition, both regulations share the same AMC.

Interpretation: The EASA interpretation of the regulation is presented second in each section in normal text. This is intended to help authors with an amplification of the requirement. This interpretation is not binding and if authors are in any doubt then advice should be sought from the DOA department in the Agency.

Advice: EASA Flight Test experts' advice is presented in italic text. This may reflect current experience from audits, from incidents or from considerations for future regulatory requirements.

Note that FTOM examples are deliberately NOT provided. This is to prevent organisations from simply copy-and-pasting the EASA Guide. If an organisation does not consider that it has the

expertise required to author its own FTOM then consideration should be given to obtaining training to fill the knowledge gap.

v. **General Guidance for the FTOM:** The FTOM is an operations manual for the flying organisation in the same way as a normal operations manual is for any other flying organisation. As such, the general principles of the Air Operations regulation¹ relating to operations manuals should apply:

- The FTOM may vary in detail depending on the complexity of the operation;
- The FTOM should be such that all parts of the manual are consistent and compatible in form and content;
- The FTOM should be such that it can be readily amended;
- The FTOM content and amendment status should be both controlled and clearly indicated;
- The FTOM should include a description of its amendment and revision process, specifying: the person(s) who may approve amendments or revisions, and the methods by which personnel are informed of the changes.

vi. **Scope of the Regulation:** When drafting the FTOM, organisations should bear in mind that when an aircraft is operated under a Permit to Fly (PtF), the operation is regulated completely by Part-21. Other normal regulations, such as Part-FCL or Part-CAT, do not apply. This is through Article 4 of the Basic Regulation 216/2008. For crew qualification, Part-21 Appendix 12 refers to the relevant paragraphs of Part-FCL so that those elements apply. No other regulations are imported in this way. Therefore the organisation needs to consider how to cover the areas that would normally be covered by the regulation but which are not defined by Part-21. This may be by simply referring to the other regulations or by defining specific elements pertinent to the flight test operation. For example, the flight time limitations in Air Operations do not apply. The organisation should define its own flight time limitations for flight test (refer to the relevant section of this guide for further advice) and/or may opt to simply apply the relevant regulations of Part-CAT (e.g. for ferry flights, or for function and reliability flights).

¹ EU Regulation 965/2012 and amendments

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1. Organisation

1.1. Organisation, Roles and Responsibilities

The FTOM shall describe the organisation's policies and procedures in relation to flight test. The FTOM should include a chart indicating the structure of the organisation and, more specifically, the functional links of the people in charge of flight test activities. It should also mention the coordination between all departments affecting flight test (e.g. Design, Production and Maintenance), in particular coordination for the establishment and update of a Flight Test Programme

The FTOM shall include a description of the flight test organisation's involvement in the process to issue a Permit to Fly. It should describe the flight test organisation's (or team's) involvement in the process for the approval of flight conditions.

The overall aim of this regulation is for the company to assure itself that:

- there is a simple organisation with clear lines of responsibility for flight test activity;
- those responsible for risk and safety management are appropriately independent of the flight test and management teams;
- the flight test organisation is properly integrated into the overall organisation.

The description of the organisation should show both the internal lines of responsibility of the flight test organisation and how the flight test organisation is integrated into the broader company. The description should not be at the level of the test team during flight test, although this may also be included in the FTOM if desired.

The organisation should also ensure that there is a functional link to the [Accountable Manager/Head of Design Organization](#) so that he is aware of the risks associated with flight test activity and of his responsibility to provide necessary resources. This is part of the larger corporate context (refer to GM21.A.145(c)(2) Responsible Managers and/or 21.A.145(c)).

A key feature of this section will be an illustration of how communication is facilitated between Design, Airworthiness, Maintenance, Flight Test and Production areas (as a function of the privileges of the organisation). This is necessary to facilitate certification, to ensure smooth transition from design to flight test to production and to allow a holistic approach to safety and risk management. The regulation specifically identifies the need for the flight test team to be involved in the development of the proposed flight conditions for the PtF. The aim is to ensure that operational aspects are considered and that proposed limitations are both sensible and observable.

A list of the key personnel in the flight test organisation should be provided, with a description of each post's roles and responsibilities, and a list of essential qualifications. This will help the company to ensure that it has suitably qualified and experienced personnel in its flight test organisation (similar to the requirement² for the company statement of qualifications and experience of management staff responsible for making decisions affecting airworthiness/compliance).

The FTOM should describe the process and procedures in relation to flight test. The description should include how flight test is organised, from identification of a requirement for flight test, through the process to conduct flight test, to reporting the test results and demonstrating certification compliance. The integration of all of the relevant strands (design, maintenance, airworthiness, flight test operations, safety management) should be clearly described.

² The requirement is in Part-21 21.A.243(d),21.A.143(a)(2)

Key personnel may include the post of a Safety Manager. This post is not required by Part 21, but organisations performing regular flight test activities might consider including this appointment. The Safety Manager's main responsibilities would be to:

- develop and maintain the Safety Management System (this may be at the company or the flight test organisation level, see Section 2.1 Safety Management).
- facilitate hazard identification, risk analysis and risk management;
- monitor the implementation of actions taken to mitigate risks as listed in the safety action plan;
- provide periodic reports on safety performance;
- ensure maintenance of safety management documentation;
- ensure that there is safety management training available and that it meets acceptable standards;
- provide advice on safety matters;
- ensure initiation and follow-up of internal occurrence/accident investigations.

The Safety Manager would be the focal point for collecting and analysing hazards and maintaining a register of hazards, risks, and risk controls (mitigations).

2. Safety and Risk Management

2.1. Safety Management

The FTOM shall include a policy for safety management and associated methodologies. The FTOM should describe the organisation's policy in relation to safety management, mitigation and associated methodologies.

The EASA European Plan for Aviation Safety 2017-2021 states that 'management of safety in a systematic and proactive way enables authorities and organisations to set up management systems that take into consideration potential hazards and associated risks before aviation accidents occur. This global move is at the core of ICAO Annex 19, which entered into force in November 2013.'

One method of achieving this objective is to develop a Safety Management System (SMS), as described in ICAO Document 9859, Safety Management Manual.

The broader company should develop a SMS; Part-21 requires that the flight test organisation develop an SMS. Where a company SMS exists, the flight test organisation should be integrated with the company SMS.

2.2. Risk Management

The FTOM shall include a policy for risk management and associated methodologies. The FTOM should describe the organisation's policy in relation to risk management, mitigation and associated methodologies.

Flight test risk management complements, but is not the same as, safety management. Safety management, as implemented by a SMS, is a continuous and strategic system, encompassing occurrence reporting, investigation, trend analysis, and so on. The flight test risk management process is set up to address hazards relating directly to flight test activity and to specific flight tests. As an

example of the delineation, flight test involves continuous risks in common with other flight activity: bird strike; mid-air collision; CFIT etc. These risks would be managed under the SMS. However, a specific flight test may introduce specific risks associated with that particular flight test. For example, a minimum control speed test introduces a risk of loss of directional control leading to loss of the aircraft. This risk is only valid for flights with that activity and the level of risk will depend on the aircraft characteristics and so could not be read across from project to project. Alternatively, a risk managed by the SMS (for example, CFIT) could be greatly increased by the flight test (for example, testing of a TAWS that requires extended and deliberate flight towards terrain at low altitude). These project- or flight-specific risks should be managed under the flight test risk management system.

The organisation's policy and methodologies should be described in the FTOM. The process and the personnel involved should be presented, ensuring that people with the right competencies are involved. The organisation should consider how it wishes to define the levels of risk and likelihood and this should be presented in the FTOM; standard definitions of risk level and likelihood are available in the ICAO Safety Management Manual. The level of approval of risk within the organisation should be set according to the risk level.

Flight test risk automatically implies commercial risk. In addition, there may be financial implications associated with mitigations. As a result, a link to the responsible managers (Accountable Manager/Head of Design Organization) should be established and maintained.

The methodology should follow the standard thread:

- *Identification of test points; Identification of hazards associated with individual test points.*

Then, for individual test points:

- *list of potential causes of the hazards;*
- *subjective risk assessment of each hazard (likelihood vs effect);*
- *identify applicable mitigations; re-evaluate risk assessment with mitigations in place.*

Then, for each flight:

- *determine the overall risk level as a function of the scheduled test points.*

During this process, it is good practice to engage personnel who are not directly involved in the project or in the flight. This can serve to prevent group-think and to add a useful external perspective.

It has been observed that many organisations refer uniquely to the FAA Order 4040 list of potential hazards, without having established any independent analysis. It is the EASA Flight Test view that this is a mis-use of the order; a 'checklist' approach to hazard identification is very strongly discouraged. While a list of hazards such as that provided by FAA Order 4040 can be a useful stimulation for ideas after the test team has exhausted its own imagination, its use as the initial brain-storming activity will constrain the identification of hazards and may result in potential hazards not being identified. Notwithstanding this caveat, the methodologies proposed in both FAA Order 4040 and the ICAO Document 9859 are a good starting point for an organisation to develop its own risk management methodology.

The organisation should also consider how to record and present its risk assessments and how to integrate this into the planning and pre-flight briefing processes so that risk mitigations are properly incorporated into the operation.

3. Operations

3.1. Categorisation of Test Flights and Crew Composition

The FTOM shall include crewing policy, including competency, in accordance with Appendix 12 to Part-21. According to the flight test category, the FTOM should describe the organisation's policy on crew composition (including the need to use a Lead Flight Test Engineer (LFTE)). This should include the competency of the flight test crew members and procedures for appointing crew members for each specific flight.

The aim of this regulation is to ensure that the organisation follows the principle set out in Appendix 12 of Part-21: the content of the flight determines its category and the flight test category determines the required competency of the crew.

The first step in this process is to decide whether an operation is a flight test. The definitions of flight test are set out in Part-21 Appendix 12 'Definitions'. The second step is to categorise the flight test. Part-21 Appendix 12 provides the definitions of the flight test categories as well as guidance material (GM No.1 to Appendix 12). However, it is impossible to define all cases and judgement is required. For example, Category 1 flight testing includes flights on an aircraft whose 'handling qualities may have been significantly modified'; deciding what is 'significant' requires a professional judgement. It is essential, therefore, that the organisation employ suitably qualified flight test personnel in this process.

The FTOM should describe the thread between the test points being proposed by the design office, being analysed by appropriate personnel in the flight test organisation, their content considered and the correct flight test category applied. This should then be recorded so that when the flight test order for the specific flight is generated, the crew with the correct qualifications will be assigned to the flight. This process should encompass pilots, LFTEs and FTEs. The definitions of LFTE and FTE are in Part-21 Appendix 12.

Organisations that only ever complete flights in one category (e.g. Category 4) can have a simplified process for determining flight test category and that process need not be repeated for every test point. However, a periodic review should be completed, for example at the beginning of each new project, to check that the proposed modification does not exceed the assumed, normal flight test category.

Flight test category should not be conflated with flight test risk. The two are separate concepts. It is perfectly possible for a Category 2 flight test to be high risk and for a Category 1 flight test to be low risk. Flight test category relates only to flight test competence, as gained through training and experience.

The need to carry a LFTE may arise from a specific risk mitigation associated with the test, from the desire to reduce test pilot workload, or simply to increase flight test efficiency through his increased skill set. Further advice on LFTEs is provided below.

Note that Category 4 flight tests relate essentially to modifications to the aircraft cabin interior and associated equipment, or to minor cockpit changes such as new radios (with no change to form or fit). Guidance and alerting systems may also be included in this category as long as the test is only a non-regression test (correct functioning only) and there is no requirement to fly outside normal AFM limitations, or to deviate significantly from standard procedures.

Lead Flight Test Engineers (LFTE) are specifically trained to operate as part of a flight test crew, assisting the PIC in the management of the test flight and manipulating the flight test equipment (which, depending on the flight test instrumentation fitted, may intrude on safety-critical areas such as the flight control system or engines). Their competences allow them to take a directive role in-flight, which can significantly relieve the test pilot's workload. Their competencies also allow them to substitute for many of the duties of a test pilot on the ground. In Part-21 Appendix 12 the term 'Flight Test Engineers' (FTE) refers to any engineer with a role in flight test. It should be noted, however, that neither LFTE nor FTE is the same as an engineer who is qualified to operate as the 'Flight Engineer' on a 3-man flight deck with a station specifically-designed for him to operate aircraft systems. LFTEs and FTEs are normally engineers with a formal qualification in an engineering discipline and experience in flight test (noting that there are no EASA requirements for FTE qualification). 'Flight Engineers' who are approved to operate on functional check flights are confusingly sometimes referred to as Flight Test Engineers, but this is not the same as an FTE (or LFTE).

Chase flights are those operated in support of the flight test of another aircraft for which external observation may be required. Chase flying, which requires competence in formation flying, introduces particular hazards. Test pilots who have received formal flight test training at a dedicated approved training organisation will normally have received training in chase flying; extreme caution should be exercised with pilots who have not received such training.

There is no requirement for the FTOM to contain a copy-paste of the Part-21 Appendix 12 Flight Test Category definitions. This practice is discouraged, except where it is used to support a description of a process (for example).

3.2. Provision for EASA Flight Crew Participation in Flight Test Activity

Part-21 21.A.33 states: 'The applicant shall allow the Agency to review any report and make any inspection and to perform or witness any flight and ground test necessary to check the validity of the declaration of compliance submitted by the applicant under point 21.A.20(d) and to determine that no feature or characteristic makes the product unsafe for the uses for which certification is requested.'

There shall be nothing in any of the organisation's manuals that prevents compliance with the above provision. The organisation must ensure that there are no obstructions to EASA participation in flight test activity. Aspects such as risk level, insurance, training and any other company considerations shall not be considered as barriers to EASA flight crew participation.

The majority of the material that follows concerns EASA flight test crews (i.e. test pilots and flight test engineers). However, consideration should also be given to making provision for EASA OSD pilots to fly on the aircraft before certification for the purpose of verifying/determining compliance with the OSD Flight Crew requirements under Part-21.

GM 21.A.33 states that the applicant should have performed subject tests before the Agency tests. This is not a hard rule, however. In fact, it is often practical for EASA to participate in high-cost test points, or tests requiring specific environmental conditions, in parallel with the company in order to avoid repeating the test points for certification (V_{MCG} testing and maximum crosswind testing are good examples of this). For such testing, it is prudent to include the EASA pilot (and LFTE) in any build-up testing.

Notwithstanding the legal right for EASA flight crew to participate in any flight test for compliance demonstration or validation, the EASA flight test team is pragmatic. Safe operation is the key priority.

As a result, the company should consider an appropriate level of training and/or participation in build-up testing to allow EASA flight crew to conduct the required test flights safely. This should then be proposed to the Agency for discussion. In considering this training, the following factors should be considered:

- The EASA pilot will not be PIC, unless the aircraft is not fitted with dual controls;
- The EASA pilot will fly the test points as handling pilot from the captain's seat;
- The EASA pilot is a test pilot with a Category 1 FTR with an IR and is in current flying practice (compliance with the company's specific currency requirements should not be mandated);
- An EASA LFTE will participate in the flight test and may need to operate the FTI in order to take data;
- The risk level of the flight should not determine EASA participation;
- Where specific training has been applied as part of the test risk mitigation for the company flight test crews, this should be considered for the EASA flight test crew (for example, company pilots may be required to rehearse test procedures and CRM for V_{MCG} testing as standard practice – if so, the EASA test crew should also complete such training with the company crews);
- The EASA pilot will not be familiar with the company's operating procedures or operating environment;
- Adequate pre-flight briefing should be provided, to include the aircraft configuration;
- Relevant publications (interim AFM, QRH) and any interim safety procedures or limitations specific to the test aircraft should be available in English and the working language between flight crew members should be English;
- Major emergencies requiring immediate crew action in critical flight phases should be briefed and the associated switches and controls shown to the EASA pilot in the cockpit;
- On the aircraft, provision should be made for all EASA flight crew members to listen to and speak on intercom without requiring intervention by another crew member;
- A safety briefing should be given in English and should cover emergency egress, use of on-board oxygen systems, and use of life-jackets, lifeboats and other survival equipment. In addition, test aircraft particularities such as unusual doors, unprotected sharp edges, egress routes, etc. should also be briefed
- PF/PNF duties should be clearly briefed and understood, and procedures for handover/takeover of control of the aircraft should be briefed;
- The company FTOM (or equivalent document) should be made available to the EASA flight crew prior to testing;
- EASA-specific flight crew training will be at the company's expense.

Above all, the company flight test organisation is encouraged to discuss EASA participation with the EASA flight test team as early as possible.

The EASA pilot should not be expected to complete a Type-Rating course. If a simulator is available, consider its inclusion as part of the EASA flight crew training, both for type familiarisation and to rehearse test points and establish CRM. If pilot briefing guides or other summaries of the aircraft systems and operation are available, it is useful to make these available to the EASA flight crew in advance of the familiarisation flights/simulator sessions.

3.3. Carriage of Personnel other than Crew Members

The FTOM shall include procedures for the carriage of persons other than crew members and for flight test training, when applicable. The FTOM should describe the organisation's policy, taking into account the flight test category, in relation to the presence and safety on-board of people other than crew members (i.e. with no flying duties). People other than crew members should not be allowed on board for Category 1 flight tests.

The aim of the regulation is to ensure that organisations give due consideration to the carriage of personnel other than crew members on test flights. By definition, aircraft undergoing flight test are not approved for normal use and the normal safety levels for the carriage of unqualified people cannot be assumed.

For this document only, to make for easier reading, the term 'passenger' is used to refer to 'personnel other than crew members'; it does not refer to fare-paying passengers.

As a first step, the organisation should consider whether it wishes, as a policy, to carry 'passengers' on any test flights at all.

The organisation should then consider what risk level is appropriate for the carriage of 'passengers'. Part-21 recommends that 'passengers' should not be carried on Category 1 flight tests. This is because such testing normally involves manoeuvres and exercises at the edge of the flight envelope, that are uncomfortable to endure and that carry an increased level of risk in the context of 'passengers' (even if in the flight test domain they may be considered low-risk).

The process for approving the carriage of 'passengers' should then be described, allowing for increased levels of approval for increased levels of risk. The process may differentiate between persons in company employment (for whom there may be a duty-of-care) and persons from outside the company (for whom there may be an insurance implication).

The policy should also describe the training and briefing that may be required by 'passengers' approved to fly and who should deliver that training. This should take into account at least the following areas:

- Normal ingress/egress;
- Emergency egress;
- Use of seatbelts and seatbelt policy;
- Aeromedical aspects;
- Use of on-board oxygen systems;
- Use of intercom and intercom discipline;
- Use of life-jackets, lifeboats and other survival equipment;
- Test aircraft specifics (e.g. unusual doors, unprotected sharp edges, egress routes etc).

The organisation should consider carefully who it wishes to be considered as 'crew members'. Note that such personnel are in addition to 'flight crew' members, who constitute the minimum crew necessary to operate the aircraft. Depending on the maturity of the aircraft, the LFTE could be considered to be part of the flight crew, if his presence is essential to the safe operation of the aircraft. FTEs are not automatically considered as crew members by the regulation; the organisation may wish to establish a specific policy for FTEs who fly regularly. In addition, company policy for pilots (such as customer pilots) or other licensed personnel who are being carried in an observational role should be developed.

The FTOM refers to flight test training. Internal training of LFTEs is permitted by the regulation. In addition, student test pilots from external training organisations may fly on the organisation’s aircraft, or the organisation may train its own test pilots³ under the umbrella of an approved training organisation as part of an approved syllabus. The company policy should consider the carriage of the extra personnel associated with this activity and its appropriateness to the aircraft configuration and escape facilities. For example, a trainee LFTE will require a mentor, or a student test pilot may require the presence of an observer from the approved training organisation. Such cases should also be addressed by the company policy.

3.4. Instruments and Equipment

The FTOM shall include procedures to identify the instruments and equipment to be carried. The FTOM should list, depending on the nature of the flight, the specific safety-related instruments and equipment that should be available on the aircraft or carried by people on-board. The FTOM should contain provisions to allow flights to take place in case of defective or missing instruments or equipment.

The regulation addresses two distinct areas: flight test instrumentation (FTI, not to be confused with Flight Test Instructor) and safety equipment.

As part of the preparation of a flight test programme, the organisation should consider what safety equipment will need to be provided to assure the safety of its personnel on-board. This may include items that are part of the ‘standard’ fit of the aircraft, such as lifejackets, oxygen masks, emergency escape slides, first aid kits, and so on. However it may also include extra devices fitted to reduce the risk in particular circumstances. This may include non-standard escape hatches, parachutes, anti-spin parachutes, liferafts or flame-retardant flight suits for the crew. These items may have been identified as requirements during the risk assessment process (see Section 2.2). The process for identifying the requirement and then making the provision for it should be described in the FTOM, as well as the personnel involved. The maintenance of such equipment should also be considered. Since these provisions inevitably involve a financial burden, the link to the appropriate Responsible Manager (Accountable Manager/Head of Design Organization) should be demonstrated.

In addition, consideration needs to be given to when items of safety equipment will be mandatory for a given flight and when they are optional. This needs to be clearly recorded and implemented so that the aircraft is not inadvertently dispatched with inadequate safety equipment and so that the flight crew is clear on what is necessary for both crew and non-crew members (see Section 3.2). Limitations may need to be imposed in the event of equipment unserviceability (e.g. flight over land only in the event of liferaft unserviceability/non-availability). The organisation should also consider what provision should be made for training in the use of specialist or non-standard safety equipment. The FTOM should describe the process for defining these requirements and the personnel involved.

The organisation should also consider what FTI needs to be fitted to the aircraft. This will be driven primarily by the data-recording requirements of the flight test activity. Occasionally, however, flight test instrumentation may be assumed as part of the risk mitigation. Any such assumptions should be carefully recorded so that risks associated with defective FTI are considered and properly authorised (in essence, a similar philosophy to MMEL should be applied where appropriate). The FTOM should describe the process for deciding the FTI fit, the links to the risk assessment process, and the personnel involved.

³ Defined in this document as pilots holding a flight test rating.

3.5. Flight Time Limitations

The FTOM shall include crewing policy, including flight time limitations. A flight time limitation policy should be established.

Flight test operations are outside the scope of the assumptions behind the Air Operations regulations. Test flights vary enormously in the demands that they place on the flight crew, depending on the flight duration, the difficulty of the test points, the number of test points, and the risk level. In addition, flight test crew may be involved in many other activities outside their flying duties: simulator assessments; participation in design meetings; review of documents; participation in safety or risk processes and so on. Equally, production flight test activities may be relatively routine and test flights can also include operations similar to Part-CAT, with long flight times over multiple time zones (such as function and reliability test flights). As a result of this broad spectrum of possible activity it is not possible to apply a single, simple set of flight time limitations to all organisations or even to all flight test operations within an organisation. The organisation should define its own flight time limitations regulation, taking due account of the principles in ICAO Document 9966 and, if relevant, the standard Air Operations regulation⁴. The FTOM should define:

- the duty period, rest periods, weekly, monthly and annual maximum flight time limitations, taking into account the working time that flight test crews spend working on non-flight activities;
- flight time limitations for operations across different time zones;
- the process for extending duty periods, how long they may be extended for, adjustment of the ensuing rest period, and who can authorise the extensions;
- the process for extending weekly, monthly and annual maximum flight time limitations, how much they may be extended and who can authorise the extensions;
- modified duty periods and rest periods for higher-risk or highly-demanding test flights;
- how flight time limitations for individual crew members are tracked and taken into account by the supervisory system and by operational planning.

3.6. Miscellaneous Operations Elements

Bearing in mind that operations under Part-21 means that the 'standard regulations' (Part-FCL, Air Operations, etc) do not apply (see Introduction, paragraph vi), organisations may wish to consider including sections in their FTOM to cover those areas. This requirement could be considered to be implied by the general requirement in 21.A.143 and 21.A.243 for the FTOM to 'define the organisation's policies and procedures in relation to flight test'. Elements for inclusion could include:

- *Weather limits (home base and alternates);*
- *Accident/Incident considerations (definitions; responsibilities of personnel; forms to be completed; departments/authorities/other organisations to be notified, how and in what sequence; notification of next-of-kin; procedures for submission of reports for ACAS RA, birdstrikes, internal reporting procedures; procedures for preservation of records following a reportable event);*
- *Use/Protection of FDR/CVR records;*

⁴ EU Regulation 965/2012 and amendments.

- *Criteria and responsibilities for determining adequacy of aerodromes to be used (including rescue services);*
- *Fuel policy, determination of minimum fuel (when not specified by flight test requirements);*
- *Incapacitation of crew members;*
- *Dangerous goods;*
- *Selection, nomination and fuel for alternate aerodromes;*
- *Aerodrome operating minima;*
- *Flight planning;*
- *Instruments/Data/Equipment (VFR/IFR/Night operations, flight and navigation instruments).*

4. Flight Crew

4.1. Qualifications

The FTOM shall include the crewing policy, including competency in accordance with Part-21 Appendix 12. According to the competence level required by the flight test category, pilots shall comply with the requirements of Part-FCL. LFTEs shall receive an authorisation from the organisation that employs them detailing the scope of their functions within the organisation. FTEs on board the aircraft shall have an amount of experience commensurate with the tasks assigned to them as crew members. According to the flight test category, the FTOM should describe the organisation's policy on the competency of its flight test crew members, including appointing crew members for each specific flight. All crew members should be listed in the FTOM.

The aim of the regulation is to ensure that the organisation recruits personnel who are appropriately qualified for the intended flight test activity. At the same time, this element is the other half of the equation of flight test category versus flight test competence.

The FTOM should explain how the qualifications and experience levels required in Part-21 Appendix 12 are both met and tracked by the organisation. Note that this applies to pilots, LFTEs and FTEs, all of whom have a qualification requirement and/or an experience requirement. For aircraft with a MTOW less than 2000kg the flight test regulations do not apply. Organisations conducting flight test on such aircraft should consider carefully what experience and qualifications may be required of their pilots and other crew members; of course, nothing excludes the employment of pilots holding flight test ratings on these aircraft.

The FTOM should also describe how personnel are selected to act as FTEs, who is involved in the process and how the FTE experience requirements are defined.

When personnel from outside the organisation are involved in the flight test activity, the FTOM should describe how their qualifications and experience are verified as being compliant with both the company's policy and Part-21. See also Section 3.2 regarding EASA participation in company flight test and Section 5.2 regarding sub-contractors.

All flight test crew members should be listed in the FTOM (this may be placed in an appendix) with a clear description of their role (test pilot, pilot, LFTE, FTE), qualification (Flight Test Rating, Pilot with Category 3/Category 4 approval, LFTE authorisation) and competence level (1-4, in accordance with Part-21 Appendix 12).

It may be assumed that EASA flight test personnel have the appropriate qualifications and experience to participate in all company flight test activity.

4.2. Training

The FTOM shall include the crewing policy, including competency in accordance with Part-21 Appendix 12. According to the competence level required by the flight test category, LFTEs shall comply with the requirements of Part-21 Appendix 12 (LFTE training). FTEs on board the aircraft shall have an amount of training commensurate with the tasks assigned to them as crew members. The FTOM should describe how training for flight test is organised. The FTOM should specify the requirements for a refresher training in order to ensure that crew members are sufficiently current to perform the required flight test activity.

This regulation is intended to ensure that the organisation maintains the levels of competence that its personnel need to conduct safe flight test. The FTOM should describe the training that is put in place in order to maintain competence.

Pilots holding a Flight Test Rating must complete initial training at an Approved Training Organisation in accordance with Part-FCL.

For all other training (pilots, LFTEs, FTEs), the FTOM should describe:

- the process for selecting personnel for training and who is involved;
- the process for determining what training is required and who is involved;
- how the training will be carried out and who will be involved.

The training should all be in accordance with Part-21 Appendix 12. Given that training requires resources, the link to the appropriate Responsible Manager (Accountable Manager/Head of Design Organization) should be demonstrated. For LFTEs, the FTOM should describe who approves the LFTE authorisation once training is complete.

The FTOM should also describe how needs for refresher training are established, how often such training is required and what resources are put in place; the link to the appropriate Responsible Manager should be demonstrated.

Finally, the organisation should consider what safety and survival training it wishes to provide for its flight crew. This may include hypoxia training, decompression training, training in the use of survival equipment such as liferafts, smoke hoods and oxygen masks, underwater escape training and so on. The FTOM should define the requirement for initial safety and survival training and for refresher training and the link to the appropriate Responsible Manager should be demonstrated.

It should be noted that the Appendix 12 training requirements represent the minimum training required. In order to mitigate the risk that a closed culture with inappropriate techniques or philosophies may develop, it is strongly encouraged that training (and particularly LFTE initial training) be completed at an independent ATO. In addition, the organisation may wish to consider initial or periodic CRM refresher training.

4.3. Currency

The FTOM shall include the crewing policy, including currency in accordance with Part-21 Appendix 12. According to the flight test category, the FTOM should describe the organisation's policy on the currency of its flight test crew members, including the procedures for appointing crew members for each specific flight. Currency of the flight test crew may be ensured either through recent experience or refresher training.

The aim of the regulation is to ensure that all crew members (not just pilots) maintain a minimum level of currency appropriate to the flight test activity they are expected to perform. Part-21 Appendix 12 sets out the minimum regulatory currency requirements for pilots and LFTEs. The FTOM should describe the organisation's minimum currency requirements for all flight test crew members, how the currency will be tracked and how any lapse in currency will be regained.

Currency may be considered not only in terms of number of flights or flying hours, but also in terms of competency. In addition to considering the minimum amount of flying experience that needs to be provided per year to its flight test crew members, the organisation should consider currency with respect to particular flight test techniques or domains. For example, if a test pilot is expected to conduct minimum control speed testing on an aircraft but he has not flown that test technique for a long period, refresher training in the technique could be considered. Some of these specific requirements may emerge from the risk mitigation process; some may arise regularly in the cycle of the organisation's activity (for example, a flight test training organisation may complete a specific exercise annually). Alternatively, the organisation may consider a periodic review of its personnel's flight test experiences and add training to 'fill the gaps'. The FTOM should describe how currency in specific competencies is monitored, how it is reviewed and who is responsible for reviewing it, and how training to regain specific competence is organised; the link to the appropriate Responsible Manager should be demonstrated.

4.4. Medical

The FTOM shall include the crewing policy, including currency of its flight crew members. LFTEs shall only be appointed for a specific flight if they are physically and mentally fit to safely discharge their assigned duties and responsibilities. Before the organisation issues and authorisation for an LFTE, the LFTE should undergo an initial medical examination and assessment. Afterwards the LFTE should be regularly (typically every 2 years) re-assessed to ensure that they will remain physically and mentally fit to discharge their duties. These examinations and assessments should take due account of the actual flight environment of the intended flight test activity.

Medical requirements for pilots are contained in Part-FCL and Part-MED. The medical requirements for LFTEs are contained in Part-21 Appendix 12. As part of the crewing policy, the FTOM should describe how the medical fitness of its flight crew personnel is assured, tracked and recorded.

Bearing in mind that operations under Part-21 means that the 'standard regulations' (Part-FCL, Air Operations, etc) do not apply (see Introduction, paragraph vi), organisations may wish to consider including sections in their FTOM to cover those areas. This requirement could be considered to be implied by the general requirement in 21.A.143 and 21.A.243 for the FTOM to 'define the organisation's policies and procedures in relation to flight test'. Elements for inclusion in the medical area could include crew health (see Air Ops Part-ORO AMC3 ORO.MLR.100, paragraph 6).

5. Administration

5.1. Documents

The FTOM shall include a list of documents that need to be produced for flight test. The FTOM should list the documents to be produced for flight test and include (or refer to) the procedures for their issue, update and follow-up to ensure the documents' configuration control. The FTOM should list the documentation and information to be carried on the aircraft for flight test.

Depending on the scale of the operation and the activity performed, the list of documents required for flight test may include:

- Certification Programme (as defined by Part-21 – individual organisations may have their own nomenclature for the document);
- Flight test programme (the elements derived from the Certification Programme that involve the flight test organisation);
- Flight Order (as defined in Part-21);
- Flight Crew Report (the report produced by the flight test crew after each flight, detailing the results of the test flight);
- Flight Test Guide, or Standard Operating Procedures for flight test operations;
- FTOM;
- Permit to Fly and associated approved Flight Conditions;
- Interim AFM and QRH (with normal and abnormal procedures)

The FTOM should describe how the PtF Flight Conditions, including aircraft limitations that may change regularly during the flight test programme, are incorporated into the FTO. In addition, the FTOM should describe how safety considerations (risk and risk mitigations), crew competence, aircraft configuration and other such critical items are linked to the FTO. The FTOM should also describe how the aircraft technical status is communicated to, and accepted by, the PIC prior to an individual flight (i.e. an equivalent function to the Aircraft Technical Log).

The FTOM should describe the processes involved in the production of these documents, who is involved, and who approves their issue. The follow-up should include the feedback mechanism for safety and test information into the relevant documents. For example, how does the organisation incorporate feedback from test flights into the risk management and safety management processes? How do the Flight Crew Reports feed into the relevant MoC6 compliance documents?

The organisation should consider what documents and information should be carried on the aircraft for flight test. This should take into account what would normally be expected under the Air Ops regulations, as well as what is necessary for safe and efficient flight test operation.

5.2. Sub-Contractors

When flight tests are performed by contractors or sub-contractors, they should comply with the FTOM of the primary organisation, unless they have established an FTOM in compliance with Part-21, the use of which has been agreed between the two organisations.

The FTOM should describe the process by which the organisation verifies that contractor or sub-contractor flight test crew comply with the requirements of Part-21.

For the circumstances in which the organisation may agree the use of the FTOM of the contracted/sub-contracted organisation, the FTOM should describe the process by which the organisation verifies that the FTOM of the contracted/sub-contracted organisation complies with the requirements of Part-21.

It should be noted that under certain circumstances involving third country aircraft (See Part-21 Subpart P), the PtF may be issued by the third country and the flight crew may not be required by that country to comply with the Part-21 competence requirements. However, where data gathered from flights flown by the contracted flight test crews is to be used for compliance demonstration, the flight test crew should meet the competence levels required by Part-21 Appendix 12.

Careful consideration should be given to the employment of freelance test pilots, LFTEs and FTEs in company flight test. It is good practice to ensure that these personnel are fully-integrated in the planning, execution and reporting of flight test activity.

5.3. Record-Keeping

The FTOM should describe the policy relative to record-keeping. The FTOM may make reference to other documents to cover record-keeping policy.

The FTOM should, either of itself or by reference to other company documents, describe the organisation's policy and methods for record-keeping. This should cover at least the following:

- Flight crew licences;
- Flight crew medical certificates;
- Flight crew ratings;
- LFTE authorisations;
- Recording and tracking flight crew currency;
- Recording and tracking flight crew competency and refresher training;
- Recording flight crew initial training (if applicable);
- Tracking flight time limitations;
- Flight test reports and other data

Abbreviations & Definitions

| | |
|------------------|--|
| AFTTO | Approved Flight Test Training Organisation |
| AFM | Aircraft Flight Manual |
| QRH | Quick Reference Handbook |
| ATO | Approved Training Organisation |
| Cat 3/4 Pilot | A pilot not holding a Flight Test Rating but approved to fly Category 3 or 4 flight tests. |
| Category | The flight test category, as defined in Part-21 Appendix 12. |
| CFIT | Controlled Flight Into Terrain |
| Competence level | The minimum competence required to complete the associated category of flight test activity, as defined in Part-21 Appendix 12. |
| CRM | Crew Resource Management |
| DOA | Design Organisation Approval |
| DOH | Design Organisation Handbook |
| EASA | European Aviation Safety Agency |
| FAA | Federal Aviation Administration |
| Flight Test | Flights for the development phase of a new design (aircraft, propulsion systems, parts and appliances); flights to demonstrate compliance with certification basis or conformity to type design ('production flight test'); flights intended to experiment new design concepts, requiring unconventional manoeuvres or profiles for which it could be possible to exit the already-approved envelope of the aircraft; flight test training flights. |
| FTC | Flight Test Card |
| FTE | Flight Test Engineer (any engineer involved in flight test operations either on ground or in-flight, see Section 3.1) |
| FTI | Flight Test Instrumentation (may also be Flight Test Instructor in other documents) |
| FTO | Flight Test Order |
| FTOM | Flight Test Operations Manual |
| ICAO | International Civil Aviation Organisation |
| IR | Instrument Rating |
| LFTE | Lead Flight Test Engineer (a FTE assigned for duties in an aircraft for the purpose of conduction flight tests or assisting the pilot in the operation of the aircraft and its systems during flight test activities, see Section 3.1) |
| MTOW | Maximum Take-Off Weight |
| OEM | Original Equipment Manufacturer |
| Passenger | For this document only: personnel other than crew members |
| PIC | Pilot in Command |
| POA | Production Organisation Approval |
| PtF | Permit to Fly (part-21 Sub-Part P) |
| SMS | Safety Management System |
| TAWS | Terrain Avoidance Warning System |
| Test Pilot | For the purpose of this document: A pilot holding a Flight Test Rating in accordance with Part-FCL |