CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

Advisory Circular
AC19-1

Revision 1

Test Pilot Approvals

XX yy 2017

General

Civil Aviation Authority advisory circulars contain guidance and information about standards, practices, and procedures that the Director has found to be an **acceptable means of compliance** with the associated rules and legislation.

However the information in the advisory circular does not replace the requirement for participants to comply with their own obligations under the Civil Aviation rules, the Civil Aviation Act 1990 and other legislation.

An advisory circular reflects the Director's view on the rules and legislation. It expresses CAA policy on the relevant matter. It is not intended to be definitive. Consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate advisory circular. Should there be any inconsistency between this information and the rules or legislation, the rules and legislation take precedence.

An advisory circular may also include **guidance material** generally, including guidance on best practice as well as guidance to facilitate compliance with the rule requirements. However, guidance material must not be regarded as an acceptable means of compliance.

An advisory circular may also include **technical information** that is relevant to the standards or requirements.

Purpose

This advisory circular provides material intended to assist in understanding the requirements for approval as a test pilot for experimental flying or testing of a prototype aircraft.

Related Rules

This advisory circular relates specifically to Civil Aviation Rule Part 19-*Transition Rules* Subpart I, and Part 21-*Certification of Products and Parts* Subpart B.

Change Notice

Revision 1 replaces advisory circular AC19-1 Revision 0.

Published by
Civil Aviation Authority
PO Box 3555
Wellington 6140

Authorised by
Manager International & Regulatory Strategy

Draft for Public Comment

Table of Contents

Draft for Public Comment

Introduction

This advisory circular describes the acceptable means of compliance by which pilots may demonstrate their competency to be approved as a test pilot in accordance with rule 19.405 to carry out flight testing or evaluation flying of aircraft[1] that are operating under a *special category-experimental* certificate of airworthiness. It defines the various categories of experimental flying and specifies the qualifications and experience that pilots are expected to have in order to be approved as a test pilot for each category.

Background

Historically, pilots have been approved by the Director to undertake experimental flight testing in New Zealand on an 'ad-hoc' basis, after consideration of their qualifications and experience. While this process has previously been acceptable, the significant increase in experimental flying activity in relation to prototype, amateur built, non-certificated and warbird aircraft in recent years and the potential for growth in relation to experimental flying of large UAS dictates that formalisation of the process is required to ensure sufficient rigour and transparency. The CAA has an obligation to ensure that experimental flying is performed in accordance with internationally accepted standards and procedures, and to ensure that pilots performing experimental flying are appropriately competent.

The Role and Responsibility of an Approved Test Pilot

Prior to the Director approving an individual as a test pilot it is essential for the individual to recognise the importance of the role and responsibility that accompanies this approval.

The primary role of a test pilot is to provide the vital link between the engineers who design and manufacture aircraft and the pilots who will operationally use the aircraft once it is certified. The test flying activities undertaken, the quantitative data captured and the qualitative assessments made by test pilots combine to form the basis on which engineering, operational and safety decisions are made. This requires test pilots to blend the art of flying an aircraft with the science of aeronautical engineering in order to safely and effectively plan, execute, and report upon their flight testing activities.

In order for a test pilot to be able to declare that a new aircraft design or design change shows compliance with the applicable airworthiness requirements the test pilot must apply their flying skills, experience, knowledge and professional judgement in a methodical, meticulous and dispassionate manner. Test pilots must also be aware of their own capabilities so that they know when they are approaching the limits of their own personal levels of competence.

Test pilots operate in an environment that can be inherently risky and prone to external pressures. Therefore, test pilots must be able to recognise the risks associated with their test flying activities and ensure there are adequate systems, procedures and mitigations in place to ensure the flying activities they conduct are undertaken in the safest possible manner. They must also comprehensively and faithfully capture the quantitative data

[1] For the purpose of this AC 'aircraft' includes 'large unmanned aircraft'as described in AC102-1 (i.e MTOW of 150kg or above). While the activities and requirements described in this AC are focussed on the approval of test pilots for experimental flying of manned aircraft they would be tailored to suit individual applications related to the experimental flying of large UAS.

Draft for Public Comment

observed and qualitative assessments made during a flight and not be affected by 'commercial pressure' or an expedient to achieve a 'required result'. If an aircraft undergoing test flying fails a particular test point then the result must be accurately recorded as such so that the reasons for the failure can be examined and addressed before any re-test is undertaken and subsequent claim of compliance is made.

Only by adopting such an approach can a test pilot fulfil their responsibilities to the Director and ensure that a safe and certifiable outcome is achieved as a result of their test flying activities.

Terminology

For the purposes of this advisory circular, the following terms are described:

Experimental Flight Testing

Experimental flight testing(also referred to as test flying) is a piloted airborne activity that is performed in order to qualitatively and quantitatively evaluate, determine, validate, verify and/or demonstrate an aircraft's (or its related systems) airworthiness, handling qualities, performance and/or mission suitability and utility. Experimental flight testing is conducted on aircraft operating under a *special category-experimental* certificate of airworthiness and which may be concept demonstrators, research platforms, prototype aircraft (i.e. a new type or model), or already certified aircraft which have prototype design changes embodied that are in the process of being developed and approved. Typical experimental flight testing is conducted in accordance with documented test plans and associated safety plans. These plans have been developed, reviewed and approved by appropriately qualified flight operations and engineering individuals, typically from a Part 146 *Design Organisation* or the CAA.

All experimental flight testing is conducted for one of the following purposes:

(a) **Engineering, research and developmental flight testing:** These are critical and exporatory testing activities undertaken by a participant in order to investigate the design concept of a prototype aircraft or prototype design change, new operating techniques and new uses for aircraft. It is also undertaken in order to determine the likelihood of an aircraft design or design change being able to demonstrate compliance with the applicable airworthiness requirements. This is typically an iterative activity[2] undertaken for the purpose of informing the applicant during their design process[3].

[2] For example: Determining aflight envelope for a new aircraft type would require engineering, research and developmental flight testing consisting of an extensive test point matrixcovering a wide range of test conditions and configurations. Test execution would build-up from the lowest risk test points well within the to-be-certified envelope and concluding with test points that are the highest risk and are beyond the to-be-certified envelope. As a result of flight test data design changes may be required to correct anomalies or to improve the results achieved. Engineering, research and developmental flight testing provides the participant with sufficient information to create a commercially viable product and be confident that compliance can subsequently be shown with the applicable requirements.

[3] Engineering, research and developmental flight testing activities are expected to be conducted in accordance with a test plan and safety plan so that the test flying is conducted in support of a defined purpose and is not nugatory. However, it may not be necessary for this plan to be approved by the CAA.

Draft for Public Comment

(b) **Certification flight testing:** These are test flying activities undertaken by a participant after the completion of engineering, research and developmental flight testing in order to demonstrate that a prototype aircraft type design or prototype design change meets the applicable airworthiness requirements contained in the New Zealand Civil Aviation Rules[4]. The CAA may also undertake certification flight testing to independently verify the flight testing results and statements of compliance declared by a participant[5].

(c) **Evaluation flying:** Evaluation flying is any flight testingactivity undertaken on an aircraft issued with a *special category-experimental* airworthiness certificate for the purpose of demonstrating its airworthiness prior to the issue of another sub-category of special airworthiness certificate (specifically amateur-built, LSA, limited and exhibition). Further information regarding the evaluation flying of these aircraft can be found in advisory circulars AC21-3 and AC21-4.

Experimental Flight Testing Categories

Due to the potential scope of experimental flight testing activities it is appropriate for them to be divided into several categories (each with corresponding test pilot competence requirements) based on the level of risk and potential complexity associated with the flight testing being conducted. The content of the flight test being undertaken determines its category, and the flight test category determines the required level of approval for the test pilot.

The definitions of each category below should be read in conjunction with the examples provided in Annex A.

Category 1 experimental flight testing: This category encompasses the experimental flight testing activities that present the highest levels of risk which are critical and/or exploratory in nature and require advanced pilot techniques, flight test crew rehearsals and dedicated engineering support, such as that required for a new or substantially changed aircraft design undergoing type or supplemental type certification.[6]

Category 2 experimental flight testing: This category covers test flying not classified as category 1 on aircraft which are:

(a) Not yet type certified, or

(b) Are type certified and have undergone a design change which is yet to be approved, the extent of which may:

Draft for Public Comment

[4] Flight testing to show compliance would typically be conducted after developmental flight testing has proven to the participant that compliance with the applicable requirements can be shown. The applicable NZ CAR requirements may cross refer to the FAA Federal Aviation Regulations (FARs), EASA Certification Specifications (CS's) or other acceptable airworthiness requirements.

[5] CAA flight testing activities would normally only be undertaken as part of a type certification project or a complex supplemental type certification project.

[6] Flight testing of an aircraft that is undergoing a type certification programme should be considered either as Category 1 or Category 2 flight testing until the type has been certified. Flight testing of a design change to an already certified type may be Category 1, 2 or 3, depending on the extent of the testing required.

i. require the application of special flight test techniques to critically assess the aircraft handling qualities, performance or other flight characteristics, or

ii. require as assessment of basic crew procedures, or

iii. require intential flight outside of the operational envelope but within the bounds of the previously investigated envelope.

Category 3 experimental flight testing: This category covers experimental flying required on previously type certified aircraft designs which are subject to design changes that are expected to have no effect on aircraft handling, performance or other flight characteristics, but still require airborne verification in order to show compliance with the applicable airworthiness requirements. Category 3 test flights are conducted entirely within the established flight manual limits. Should any changes to handling, performance or other flight characteristics be anticipated during design or discovered during developmental flight testing then the activity should be undertaken by at least a category 2 test pilot.

Category 4 experimental flight testing: This category exclusively covers evaluation flying undertaken on an aircraft issued with a *special category-experimental* airworthiness certificate for the purpose of demonstrating its airworthiness prior to the issue of another sub-category of special airworthiness certificate (specifically amateur-built, LSA, limited and exhibition). Category 4 test flights are conducted entirely within the bounds of published limitations.

Test Pilot Qualifications and Experience Requirements

Category 1 Test Pilot

An individual approved to plan and conduct category 1 experimental flight testing will be expected to meet the following competency requirements:

Qualifications

(a) graduation from an appropriate course[7] from a recognised test pilot school[8] (or equivalent[9])

(b) commercial pilot licence, in the case of FAR 23 aircraft or FAR 27 helicopters

(c) airline transport pilot licence for FAR 25 aircraft or FAR 29 helicopters

[7] "Graduation from an appropriate course" does not necessarily mean an applicant must have graduated from a 12 month long test pilot's course. Graduation from a shorter course would be acceptable if it can be shown that the course is is directly applicable to and sufficient for the test flying activity to be undertaken. Alternatively, graduation from a longer course is accepted as providing a knowledge base upon which competence in a broader range of test flying actvities can be demonstrated.

[8] Test Pilot Schools recognised by the CAA are Empire Test Pilots' School (ETPS), UK, National Test Pilot School (NTPS), USA, US Air Force Test Pilot School (USAFTPS), USA, US Naval Test Pilot School (USNTPS), USA, International Test Pilots School (ITPS), Canada and EPNER (École du Personnel Navigant d'Essais et de Reception (EPNER), France, Escola de Formacao em Ensaios em Voo (EFEV), Brazil, and Indian Air Force Test Pilot's School (IAFTPS), India.

[9] Test pilot schools other than those listed above may by considered "equivalent" on a case-by-case basis.

Draft for Public Comment

(d) an instrument rating if appropriate

(e) multi-engine rating if appropriate

(f) extensive formation flying experience if appropriate

(g) an aerobatic rating if appropriate.

Experience

(a) a minimum of 1000 flight hours across a diverse range of applicable aircraft types and models, with at least 400 hours as pilot-in-command

(b) previous experimental flying experience

(c) experience in flight test programmes in the category for which the candidate is seeking approval to conduct test flying

(d) recent flying experience of at least 100 flight hours in the previous 12 months, of which 20 hours must be actual flight testing or documented flight test technique proficiency in any category of aircraft. In lieu of the flight hour requirements, currency can be demonstrated by having undertaken a experimental test pilot initial or refresher training course within 24 months of the previous approval being issued.

Additional requirements

(a) a class 1 medical certificate

(b) an acceptable level of understanding of aeronautical engineering principles and the applicable certification requirements, demonstrated by the provision of relevant and acceptable flight test plans and reports and a successful interview with CAA (see below)

(c) an acceptable standard of technical writing ability, demonstrated by the provision of relevant and acceptable flight test plans and/or reports.

Category 2 Test Pilot

An individual approved to plan and conduct category 2 experimental flying would be expected to meet the same competency requirements for category 1 test pilots, except that:

Qualifications

(a) While formal training as a test pilot will still be expected, graduation from an appropriate course from a recognised test pilot school need only be applicable for the extent of category 2 experimental flight testing required to be undertaken[10].

Experience

(a) The previous experience requirements under category 1 are applicable.

[10] Many of the recognised test pilot schools offer short-courses which can be tailored to meet specific needs. Graduation from such a course may be considered acceptable for the extent of Category 2 experimental flight testingrequired to be undertaken.

Draft for Public Comment

Additional requirements

(a) The additional requirements under category 1 are applicable in relation to the specific certification project.

Category 3 Test Pilot

It is expected that an individual applying to carry out category 3 experimental flying would meet the following minimum requirements:

Qualifications

(a) commercial pilot licence

(b) applicable rating for the general configuration of aircraft to be tested (which may include, but not limited to; aeroplane, helicopter, instrument rating; tailwheel rating; acrobatic rating; float-plane rating; gas turbine rating; etc.)

(c) a class 1 medical certificate

(d) attendance at an introductory level flight test short-course appropriate for the flight testing to be conducted.

Experience

(a) a minimum of 500 flight hours pilot-in-command

(b) flight testing experience proportionate to the activity envisaged.

Additional requirements

(a) An acceptable level of understanding of aeronautical engineering principles and the certification requirements applicable to the testing being undertaken.

Category 4 Test Pilot

It is expected that an individual applying to carry out evaluation flying of special category aircraft would meet the following minimum requirements.

Qualifications

(a) private pilot licence or recreational pilot licence

(b) a minimum of 200 flight hours pilot in command.

Experience

(a) applicable rating for the general configuration of aircraft to be tested which may include, but not limited to; aeroplane, helicopter, instrument rating; tailwheel rating; acrobatic rating; float-plane rating; gas turbine rating; etc.)

(b) be in current flying practice in aircraft of the same configuration and performance of the aircraft being evaluated.

Additional requirements

(a) Have a thorough knowledge of FAA advisory circular AC90-89B *Amateur-built & Ultralight Flight-Testing Handbook.*

Draft for Public Comment

General Notes

Approval of company test pilots

An applicant for a test pilot approval for category 1 or 2 experimental flying is expected to be employed as a test pilot by a Part 146 *Design Organisation* or a Part 148 *Manufacturing Organisation*, or acting as a sub-contractor or specialist consultant specifically authorised by those organisations.

Part 146 and Part 148 organisations that are type certificate holders may employ company test pilots as full-time employees or sub-contractors for the purpose of undertaking developmental test flying in relation to further development of the existing certified products identified in their exposition. These individuals will be expected to hold a company authorisation for those activities.

Test pilot approvals for co-pilots

When undertaking experimental flying of aircraft whose normal operation requires a pilot and co-pilot, the co-pilot should hold a test pilot approval for at least the next lower category of experimental flying being undertaken (For example: For category 1 experimental flying, while the pilot-in-command must hold a category 1 approval, the co-pilot should hold at least a category 2 test pilot approval).

Flight test risk management

FAA Order 4040.26 Appendix C, while written for the FAA Aircraft Certification Directorate, documents what is considered to be acceptable guidance relating to risk management practices for experimental flight testing activities. This information should be tailored by participants to reflect the specific test flying activities being undertaken.

Type ratings

As aircraft undergoing flight testing are operating under a *special category-experimental* certificate of airworthiness test pilots approved under rule 19.405 need not be rated on the specific aircraft type to carry out experimental or evaluation flying activities.

Test Pilot Approval Process

Approval as a test pilot follows a specific process which is dependant upon the category of the experimental flying required to be undertaken. The normal sequence of events is as follows:

Submission of Application

CAA form 24019/04 – *Application for Test Pilot Approval* must be completed and submitted to the Director. Form 24019/04 can be obtained from the CAA web site: http://www.caa.govt.nz/Forms/24019-04.pdf.

If the application is in respect of a special category amateur-built aircraft, CAA form 24019/03 should be used. Form 24019/04 can be obtained from the CAA web site: http://www.caa.govt.nz/assets/legacy/Forms/24019-03.pdf. Also refer to advisory circular AC21-4.

Applicants must describe the nature of the proposed experimental flying as completely as possible. In determining which category of test pilot approval to apply for, applicants should first determine if the flight test falls within the definition of category 1 before moving sequentially through the definitions of categories 2 and 3, until the correct category

Draft for Public Comment

is determined. Depending upon the extent of experimental flying needing to be conducted it may be possible that different categories of test flying can be undertaken during the same certification project.[11]

Supporting documentation such as resumes, certificates, test plans, engineering documents or proposals should be attached with the application.

Review of Application

Once a complete application is received then CAA's review process involves:

(a) review of the proposed experimental flying to ensure the test pilot category classification is appropriate for the activity being applied for

(b) review of the applicant's qualifications and experience against the minimum requirements specified for the category of experimental flying applied for

(c) notification to applicants who meet the minimum requirements specified for category 1 or 2 experimental flying as appropriate for the experimental flying to be undertaken, and arrangements made for the applicant to undergo an interview and check flight (if required)

(d) notification to applicants who meet the minimum requirements specified for a category 3 experimental flying as appropriate for the experimental flying to be undertaken. An interview may not be necessary for a category 3 application

(e) notification to applicants who do not meet the requirements for any of the 4 categories of experimental flying, with details of those areas where the applicant is deficient.

Interview

Every applicant for a test pilot approval for category 1 and normally all applicants for a category 2 test pilot approval will be interviewed by the CAA or designated representative. The venue and method of interview will be agreed between the applicant and the CAA.

A range of questions relevant to the activity may be asked but it is likely the applicant will be required to outline a proposed experimental flying programme and describe the anticipated procedures, techniques, potential flight safety risks and the management of these. The applicant's knowledge of the applicable certification requirements will be examined, as will their experience, qualifications and overall competence to hold the approval requested.

Based on the interview, CAA will assess whether or not the applicant is suitable for the proposed activity. If the applicant is unsuccessful at the interview stage the applicant will be informed accordingly.

[11] For example, demonstration of some requirements could be considered to be Category 1 experimental flying while other requirements for the same project may be Category 2. Because of this, the CAA may allow test pilots of differing categories to conduct specific aspects of the test flying programme for the same certification project.

Draft for Public Comment

Practical Evaluation

Following successful completion of the interview stage, an applicant for a test pilot approval for category 1 or 2 experimental flight testing may be required to undergo a practical simulator or flight evaluation with the CAA in order to ascertain the applicant's technical and flying proficiency for the proposed experimental flight testing. It is the responsibility of the applicant to provide a simulator or aircraft that is suitable to be used for the practical evaluation and the applicant will be the pilot-in-command throughout the practical evaluation. CAA will provide a reasonable flight test scenario for the applicant to prepare for.

The practical will be conducted on an aircraft type that the applicant is rated on and familiar with and be of similar configuration to that planned for the experimental flying for which the applicant is seeking approval. The applicant will be asked to demonstrate skills or techniques that will be required during that experimental flight testing and an assessment of the applicant's airmanship, practical application of flight testing principles and of flight test risk management practices will be made. It is probable that the applicant will be required to prepare a flight test plan prior to the check flight and provide a verbal debrief and written flight test report documenting the results of the practical evaluation afterwards.

An applicant for a test pilot approval for category 1 or 2 experimental flight testing who is a graduate of a recognised test pilot school may not be required to undertake the check flight, depending on the applicant's experience. However, CAA will still require evidence of technical writing ability, typically in the form of test plans or test reports, to be submitted.

Approval

Once the process detailed above has been completed satisfactorily, the Director may approve the applicant as a test pilot by issuing an approval in written form. If an application is unsuccessful, the applicant will be informed of the decision in writing with the reasons stated.

All test pilot approvals will be issued for a maximum period of 2 years. Test pilot approvals issued by CAA may include limitations in duration and/or scope as is deemed appropriate (For example: In relation to a specific activity or programme for a specifc aircraft registration and will expire when that activity had been completed, or after a maximum period of 2 years, whichever occurs first).

Dependant upon the application, approvals for test pilots employed by Part 146 or Part 148 organisations who are type certificate holders or for test pilots who regularly undertake category 4 evaluation flying may be issued in relation to a specific certification project or be more general in scope.

Once approved as a test pilot under rule 19.405 the pilot may perform that experimental flying for which the pilot is approved, subject to CAA oversight and audit as necessary.

Renewal of a test pilot approval would initially involve a review of activities undertaken during the preceding period, and then as much of the normal issue process as is appropriate based on the review.

Draft for Public Comment

CAA Audit of Experimental Flight Testing

The grant of a test pilot approval does not provide carte blanche authority to the approval holder to perform prototype testing or experimental flying, without appropriate CAA involvement in the design approval process and showing of compliance with the applicable provisions of Parts 21 and 91. The CAA may audit any experimental flying activities conducted in support of certification projects in order to verify the accuracy and quality of the reported data, adherence to agreed plans and the management of flight test risks. The size and scope of these audits will be determined by the nature and complexity of the particular certification project and also the quality, accuracy and reliability of the reports submitted to the CAA for review.

These audits may include, but not be limited to:

(a) review of flight test plans and procedures

(b) review of flight test risk management plans, practices and implementation of risk mitigation strategies

(c) CAA witnessing of test flights

(d) review of test reports and data presented

(e) CAA flight testing, which may comprise of a re-test of selected test points through to a complete re-test of the entire flight test programme (A complete re-test would only be required in cases where the submitted data is unacceptable due to it being found either incomplete, inaccurate, or potentially misleading or false)[12].

Flight Testing not requiring a Test Pilot Approval

The activities listed below, while test flying by their very nature, are not conducted on aircraft operating under a *special category-experimental* airworthiness certificate and therefore, a test pilot approval for these activities is not required under rule 19.405. However, when undertaking these activities there is still a greater potential of encountering problems than in normal day-to-day flying activities. Therefore, methodical planning and thorough risk management is essential to ensuring that safety is maintained during the conduct of these activities.

Production flight testing: Also known as post-production or acceptance test flying, this activity is flight testing of newly-manufactured type certificated aircraft with the aim of demonstrating that they conform to their certified type design. As the aircraft type is already certified, the behaviour of the aircraft is known. Production test flying is to be carried out in accordance with documented procedures which should be detailed in the Part 148 organisation's approved exposition. A production test pilot will require a licence and rating appropriate to the aircraft type and it is expected that they will be competent and formally authorised by the Part 148 organisation to undertake the defined flight testing.

Post-maintenance flight testing: Also referred to as an 'operational flight check' (refer rule 91.613) or a 'maintenance check flight', post-maintenance test flying is conducted under a release-to-service for the specific flight test activity. Post-maintenance flight testing should be carried out in accordance with instructions issued by the aircraft

[12] As required, the CAA may employ a test pilot to provide specific flight testing expertise for the conduct of CAA flight testing.

Draft for Public Comment

manufacturer or in accordance with company procedures in the case of a maintenance organisation or an air operator.

As a minimum, a pilot undertaking an operational flight check must be appropriately licensed and rated for the subject aircraft. However, for Part 119/125 or 119/121 operators, pilots undertaking post-maintenance flight testing will be expected to hold a company authorisation for those activities.

The flight safety foundation's "functional flight check compendium" is considered to provide relevant information for companies and individuals conducting operational flight checks.

Correspondence and forms

Correspondence relating to prototype testing or experimental flying and test pilot approval can be sent to the CAA at the following address marked for the attention of the Airworthiness Unit. The forms referred to in this advisory circular can be obtained from either the Airworthiness Unit or from the CAA web site: www.caa.govt.nz.

Charges

Applications for test pilot approvals will be assessed in accordance with the Civil Aviation Charges Regulations (No.2) 1991.

Draft for Public Comment

Annex A: Examples of Categories 1, 2, 3 and 4 Flight Testing

This annex presents a non-exhaustive list of test flying examples to assist an applicant determine what category their test pilot approval application should be for. These examples should be viewed in conjunction with the definitions of each category provided in the body of this advisory circular. In determining which category of test pilot approval to apply for, applicants for categories 1, 2 or 3 should first determine if the flight test falls within the definition and examples of category 1 before moving sequentially through the definitions and examples of categories 2 and 3, until the correct category is determined.

Category 1 flight testing examples:

- Full aero-servo-elastic and flying qualities envelope expansion of a new type where the flight envelope has not yet been established, or is in the process of being opened beyond that previously investigated limits.
- Fixed-wing aircraft: Initial high speed taxi, high-speed aborts, first flights, V_{MCG}, V_{MU}, initial stalls, departure and spins.
- Rotary-wing aircraft: Determination of H/V diagrams and category A takeoff and landing profiles.
- All types: Where encounter of surprising or even hazardous flight characteristics can be expected such as assessing failures or degradation of critical systems.
- Aircraft handling and initial performance flight testing in conditions where one or more of the following parameters is approaching the previously investgated limits of the aircraft envelope: altitude, attitudes, weights, CG, speed/Mach, stalls, temperature, engine and aerofoil performance.
- Where the embodiment of new systems is anticipated to significantly affect the aircraft's airworthiness, flying qualities or performance characteristics.
- When the crew of the chase aircraft has the duty to assist the prototype aircraft crew in recovering from a critical flight situation (i.e. assist the spinning aircraft crew in assessing the spin or triggering recovery actions).

Category 2 flight testing examples:

- Flight testing within an envelope that has already been opened and it has been demonstrated that the general behaviour of the aircraft is adequately safe and there are no unsafe flight characteristics.
- All-engines-operating climb performance.
- Cruise performance.
- Static stability demonstration.
- Function and reliability flights.
- Systems tests of autopilot or guidance/warning systems such as terrain awareness and warning system (TAWS) or airborne collision avoidance system (ACAS),

Draft For Public Comment

when the modes themselves are tested, requiring operating the aircraft by deviating from the standard operational procedures.

Note: *In the case of embodiment of such systems on an already certified aircraft, when the system integration in an existing cockpit requires a more global crew procedure assessment (for example: the system has been integrated in cockpit screens and a centralised warning system which requires a new cockpit procedure assessment) some tests may fall under category 3; see below.*

Category 3 flight testing examples:

- Those test flights required to demonstrate compliance of 'yet to be approved design changes' with the applicable airworthiness requirements which should not affect the behaviour of the aircraft in any way and do not require the aircraft to be flown outside of the already approved flight manual envelope and limitations.
- Interior/cabin conversion/installations.
- Emergency locator transmission (ELT) installation.
- New/upgraded in-flight entertainment system installation.
- SATCOM and telephone installation.
- New radio equipment installation.
- Guidance/warning systems which are not category 2 and for which demonstration of correct functioning in-flight is required.

Note: *There may be design changes whose tests, despite the fact that they have no influence on the behaviour of the aircraft, require flying in conditions which deviate significantly from the standard operational use of the aircraft. These unusual flight test conditions may require classifying the flight as category 2.*

For example: A design change made to an already certified TAWS system which requires flight testing at very low altitude and/or towards high terrain. Such testing can be classified as category 3 flight on a light aeroplane or helicopter because the flight test is performed in the normal operating domain of the aircraft. Whereas the same flight performed with a transport category aircraft, especially if it needs to be flown in clean configuration significantly below gear and flaps warning heights, should be classified as category 2 because such a flight does not correspond to the normal use of the aircraft, and needs to adopt specific testing procedures that a category 3 test pilot is unlikely to have competence in.

Category 4 flight testing:

- Evaluation flying of amateur-built, LSA, limited and exhibition aircraft conducted entirely within published limitations.

Draft for Public Comment