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Government Notice

MINISTRY OF WORKS, TRANSPORT AND COMMUNICATION

No. 159 2003

NAMIBIA CIVIL AVIATION TECHNICAL STANDARDS
NAM-CATS-AR "CERTIFICATION PROCEDURES FOR PRODUCTS AND PARTS AND AIRCRAFT AIRWORTHINESS"

The Director: Civil Aviation has under regulation 11.03.5 of the Namibian Civil Aviation Regulations, 2001 and in consultation with the Civil Aviation Regulations Committee issued the technical standards in the Schedule. These technical standards shall come into operation on 1 August 2003.

REPUBLIC OF NAMIBIA

CIVIL AVIATION

DOCUMENT NAM-CATS-AR
(AIRWORTHINESS REQUIREMENTS)

NAMIBIAN CIVIL AVIATION TECHNICAL STANDARDS RELATING TO CERTIFICATION PROCEDURES FOR PRODUCTS AND PARTS AND AIRCRAFT AIRWORTHINESS

1. GENERAL

Section 22A of the Aviation Act, 1962 (as amended by section 5 of the Aviation Amendment Act, 1998) empowers the Director: Civil Aviation to issue technical standards for civil aviation on the matters which are prescribed by regulation.

The Director: Civil Aviation has pursuant to the empowerment mentioned above, on 1 August 2003 issued technical standards relating to airworthiness requirements to be known as Document NAM-CATS-AR.

2. PURPOSE

Document NAM-CATS-AR contains the standards, rules, requirements, methods, specifications, characteristics and procedures which are applicable in respect of airworthiness requirements.

Each reference to a technical standard in this document, is a reference to the corresponding regulation in the Namibian Civil Aviation Regulations, 2001, for example, technical standard 21.02.2 refers to regulation 2 of Subpart 2 of Part 21 of the Regulations.

The abbreviation "CAR" is used throughout this document when referring to a regulation. The abbreviation "ATS" refers to any technical standard.

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21.01.3 REPORTING OF FAILURES, MALFUNCTIONS AND DEFECTS

1. Occurrences

The occurrences referred to in CAR 21.01.3(1)(a), which must be reported, are the following:

(1) Fires caused by a system or equipment failure, malfunction, or defect.

(2) An engine exhaust system failure, malfunction, or defect which causes damage to the engine, adjacent aircraft structure, equipment or components.

(3) The accumulation or circulation of toxic or noxious gases in the crew compartment or passenger cabin.

(4) A malfunction, failure or defect of a propeller control system.

(5) A propeller or rotorcraft hub or blade structural failure.

(6) Flammable fluid leakage in areas where an ignition source normally exists.

(7) A brake system failure caused by structural or material failure during operation.

(8) A significant aircraft primary structural defect or failure caused by any autogenous condition (fatigue, understrength, corrosion, etc.).

(9) Any abnormal vibration or buffeting caused by a structural or system malfunction, defect or failure.

(10) An engine failure.

(11) Any structural or flight control system malfunction, defect or failure which causes an interference with normal control of the aircraft or which derogates the flying qualities.

(12) A complete loss of more than one electrical power generating system or hydraulic power system during a given operation of the aircraft.

(13) A failure or malfunction of more than one attitude, airspeed or altitude instrument during a given operation of the aircraft.

2. Exceptions

The provisions of CAR 21.01.3 do not apply to the following:

(1) Failures, malfunctions or defects which the holder of a type certificate, production certificate, supplemental type certificate, NAM-PMA or NAM-TSO authorisation -

(a) determines were caused by improper maintenance, or improper usage;

(b) knows were reported to the Director by another person; or

(c) has already reported in terms of Part 12 of the CARs.

(2) Failures, malfunctions or defects in products, parts or appliances manufactured by a foreign manufacturer under a type acceptance certificate issued in terms of Part 21 of the CARs.

21.02.2 APPLICATION FOR TYPE CERTIFICATE OR AMENDMENT THEREOF

1. Form of application

The form referred to in CAR 21.02.2(1)(a), in which application must be made for the issuing of a type certificate for a Class I product, or an amendment thereof, is contained in Annexure A.

21.02.3 AIRWORTHINESS DESIGN STANDARDS

1. Gliders and motor gliders

(1) Gliders and motor gliders must be designed to and comply with the following standards for the issuing of a type certificate:

Joint Airworthiness Requirements Part 22 : Sailplanes and powered sailplanes.

(2) Gliders and motor gliders imported from a foreign country and assembled here must meet the above requirements or similar requirements prescribed by an appropriate authority and have been certified and released for export by an appropriate authority as such to qualify for the issuing of a type acceptance certificate.

2. Microlight aeroplanes

(1) Microlight Aeroplanes must be designed to and comply with the following standards for the issuing of a type certificate:

Joint Airworthiness Requirements - Very light aeroplanes.

(2) Microlight aeroplanes imported from a foreign country and assembled in Namibia must meet the above requirements or its equivalent and have been certified and released for export by an appropriate authority as such to qualify for the issuing of a certificate of airworthiness.

3. Aeroplanes

(1) Compliance for type certification must be shown with the Federal Aviation Administration (FAA) airworthiness requirements as stated in FAR Part 23 or FAR Part 25, as the case may be (as amended on the date of application for certification).

(2) Aeroplanes imported from a foreign country and assembled there must meet at least FAR Part 23 or FAR Part 25, or equivalent, and have been certified by an appropriate authority and released for export as such.

4. Rotorcraft

(1) Compliance for type certification must be shown with the Federal Aviation Administration (FAA) airworthiness requirements as stated in FAR Part 27 or FAR Part 29, as the case may be (as amended on the date of application for certification).

(2) Rotorcraft imported from a foreign country must meet at least the FARs as stated above or equivalent and have been certified by an appropriate authority and release for export as such.

5. Manned free balloons

(1) Manned free balloons must be designed to and comply with the following standards:
Federal Aviation Administration FAR Part 31 : Airworthiness Standards: Manned free balloons, for the issuing of a type certificate.

(2) Manned free balloons imported from a foreign country must meet the above or its equivalent and have been certified and released for export by an appropriate authority as such to qualify for the issuing of a certificate of airworthiness.

6. Non-rigid airships

(1) Non-rigid airships must be designed to and comply with the following standards:

(a) FAR 21 - Design Handbook;

(b) British Civil Airworthiness Requirements : Section Q, Non-rigid airships (Gust requirements),

for the issuing of a type certificate.

(2) Non-rigid airships imported from a foreign country must meet the above standard or its equivalent and have been certified and released for export by an appropriate authority as such as to qualify for the issuing of a certificate of airworthiness.

7. Rigid airships

(Reserved.)

8. Remotely piloted aircraft

(Reserved.)

9. Engines

(1) Compliance for type certification must be shown with the Joint Airworthiness Requirements JAR E (Engines) or Federal Aviation Administration (FAA) Airworthiness Requirements as stated in FAR Part 33. (as amended on the date of application for certification).

(2) Engines imported from a foreign country and assembled in Namibia must meet at least the JARs as stated above or equivalent and have been certified by an appropriate authority and released as such. Engines manufactured to requirements other than the JARs may be accepted by the Director, if considered practical as regards language, standard, etc.

10. Propellers

(1) Compliance for type certification must be shown with the Federal Aviation Administration (FAA) Airworthiness Requirements as stated in FAR Part 35 or Joint Airworthiness Requirements JAR-P (Propellers) (as amended on the date of application for certification).

(2) Propellers imported from a foreign country and assembled in Namibia must meet at least the FARs as stated above or equivalent and have been certified by an appropriate authority and released as such. Propellers manufactured to requirements other than the FARs may be accepted by the Director, if considered practical as regards language, standard, etc.

11. Avionics

(1) Compliance for type certification must be shown with the Federal Aviation Administration (FAA) Airworthiness Requirements as stated in FAR Part 21 (as amended on the date of application for certification).

(2) Avionics imported from a foreign country must meet at least the FARs as stated above or equivalent and have been certified by an appropriate authority and released as such.

(3) Radio equipment to be installed in an aircraft must be of a type approved by appropriate authority in the State of Design.

12. Equipment

(1) Any other component, instrument, appliance, material, etc. installed or intended to be installed or used in or on an aircraft is considered as equipment. Note that Unit Load Devices (ULD) are included in this group.

(2) Compliance must be shown with FAA standards and test procedures as stated in FAR Part 21 or Joint Airworthiness Requirements JAR 21 (as amended on the date of application for certification).

(3) Equipment imported from a foreign country and assembled in Namibia must meet at least the FARs as stated above or Joint Airworthiness Requirements and have been certified by an appropriate authority and released as such.

13. Amateur-built aircraft

(1) Design criteria

In the design of an aircraft, the following conditions must be met:

(a) The aircraft must be able to withstand the maximum loads to be expected in service without any permanent deformation or any deformation which may interfere with the safe operation of the aircraft. See sub-paragraph (5) Static tests.

(b) The aircraft structure must be designed to be able to withstand ultimate loads, that is the limit loads multiplied with a safety factor as specified in the subgroups.

(c) The aircraft must not have any apparent unsatisfactory features of design and construction and the use of unsuitable materials shall be avoided.

(d) Approved aircraft components such as engines, propellers, wheels and similar items, should be used wherever possible and structural components of other aircraft that are still airworthy, may also be used.

(e) The constructor is fully responsible for the integrity of the aircraft. Any inspections made, are done to determine at the time of the inspection and with the information given by the constructor to the inspector, as well as by careful study of the relevant drawings, that such component/aircraft has been built from acceptable materials and in accordance with normal aircraft construction procedures.

(f) The materials used in the primary structure, in control systems and in any stressed part must be suitable in all respects for the purpose for which they are intended. Where materials not normally acceptable for aircraft construction are used, the constructor must prove that they have characteristics which make them suitable in all respects for the purpose for which they are intended.

(g) Protrusions, knobs, sharp corners and other objects likely to cause serious injury to the pilot or passenger in the event of an accident, must be reduced to a minimum. Where removal is impracticable, consideration should be given to the use of padding.

(h) Approved types of safety belts or harnesses for each seat, must be installed in accordance with FAA AC 43-13.2A.

(i) Suitable means, consistent with the size and complexity of the aircraft, must be provided to minimize fire hazards. A fireproof bulkhead (firewall) must be provided for isolating the engine compartment from the remainder of the aircraft.

(j) Any engine or propeller may be used, provided no adverse characteristics of the engine, propeller or engine-propeller combination are evident.

(k) Suitable means should be provided to minimize the possibility of carburettor icing.

(l) The complete powerplant installation, including the propeller as installed in the aircraft, must satisfactorily undergo at least one hour of ground operation from idling to full power prior to the first flight. Any time interval at the various speeds may be used.

(m) Only fuel of a grade which will not cause destructive detonation and will minimize the possibility of vapour locks, must be used.

(n) A prospective builder of a new design must first submit the plans and the substantiation data (design specifications and stress analysis that show compliance with items (a) and (b) to the Director, or body or institution designated in terms of Part 149 of the CARs, for evaluation and approval. The applicant must submit the letter of approval from the Director or the body or institution designated in terms of Part 149 of the CARs, as well as a copy of the plans and substantiation data together with all the required documentation when registering such an aircraft.

(2) Construction

(a) The materials used in the construction of the aircraft must be those normally accepted for aircraft use or their equivalents. If other materials are used, the constructor must be satisfied that they are in all respect satisfactory for the purpose for which they are intended and such constructor shall supply information to the Director on their qualities if called upon to do so. When wood is used, careful selection of quality is essential and particular attention should be paid to the direction of the grain.

(b) The workmanship used in the construction of the aircraft must be of the highest standard and constructors must use recognised aeronautical workshop practices. Refer to AC 43-13.

(c) All welding must be done by appropriately qualified person. The welder's particulars must be noted in the aircraft logbook.

(d) The builder/owner of the aircraft shall keep during the construction process, full details of the process, the materials used and the dimensions of the parts and components. This is called the build standard of the aircraft.

(3) Instruments, equipment and placards

The following placards must be installed, except where exempted by the Director.

(a) In a prominent position in full view of the pilot and all passengers, and in capital letters of not less than 3 mm high:

"AMATEUR-BUILT AIRCRAFT".

(b) On the instrument panel/s:

(i) OPERATE UNDER VMC ONLY

(ii) MAXIMUM PERMISSIBLE AIRSPEED mph/kts IAS

(iii) MAXIMUM PERMISSIBLE ENGINE SPEEDrpm

(iv) MAXIMUM PERMISSIBLE MASS kg

(v) Any additional limitation indication such as temperature, pressure, which the Director deems necessary.

(c) A fireproof plate on the instrument panel, containing the following information:

(i) Name of the constructor;

(ii) aircraft type and model;

(iii) aircraft registration letters and serial number.

(4) Determining the mass of the aircraft

The empty mass of the aircraft (including the mass of equipment and instruments necessary for the safe operation of the aircraft) and its centre of gravity must be determined and recorded. The maximum allowable mass and centre of gravity range must also be recorded before any appropriate certificate of airworthiness will be issued by the Director.

(5) Static tests

(a) Static tests must be carried out on the aircraft before the aircraft may be flown.

(b) The aircraft structure must be tested to the limit loads after the aircraft has been registered.

(c) The owner/builder must submit a test plan to the Director for approval before commencing with the static test. The test plan must include the method of testing the structure for aerodynamic loads, tail bending loads, occupants and baggage loads.

(d) The static test must be witnessed by a person for the purpose by the Director designated.

(e) The aircraft may not have any detrimental permanent deformation or any deformation during and after the static test which may interfere with the safe operation of the aircraft. In addition, there must be full and free movement of the controls while under maximum limit loads.

(f) A static test report must be submitted to the Director with the relevant documentation for the application of an appropriate special certificate of airworthiness referred to in CAR 21.08.1 (4). The witnesses must endorse the test report.

(6) Performance, handling and strength substantiation tests

(a) On conclusion of the proving flight program, each aircraft must undergo performance, handling and strength substantiation tests to the extent outlined below.

(b) Such flight tests must be carried out by the holder of at least an appropriately rated commercial pilot licence, or by the holder of an appropriately rated private pilot licence whose experience is considered satisfactory by the Director.

(c) The tests must be conducted with the aircraft loaded to within 2% of the aircraft's proposed MAUM in order to determine the following:

(i) The climb performance;

(ii) the altitude at which the rate of climb falls to 50 feet per minute. For multi-engined aircraft, firstly with all engines operating and then with the critical engine feathered or stopped, as the case may be;

(iii) lateral, longitudinal and directional stability and stalling characteristics;

(iv) the maximum level flight speed attainable;

(v) the engine operating conditions (temperatures, carburettor icing tendencies);

(vi) the accuracy of the airspeed indicating system; and

(vii) such other factors as the Director considers necessary.

(d) The results obtained above must be entered in the airframe logbook. This information must be as complete as possible in order to provide sufficient data to the new owner in case of a change of ownership.

(e) A final flight test must be carried out at the maximum airspeed (Vne) for which the owner wants the aircraft to be approved. The aircraft structure must then be subjected to the maximum acceleration forces (limit loads), for which it was designed.

(f) For these tests, the following must be carried out:

(i) A recording accelerometer to be installed.

(ii) The aircraft must be loaded to within 2% of its MAUM.

(iii) As the tests make severe demands on the aircraft, the pilot must wear a parachute.

(iv) Arrangements must also be made to permit easy evacuation of the aircraft in the case of a mishap.

(v) The Director may insist on the installation of a ballistic parachute for the aircraft in certain cases.

(g) The maximum airspeed may be chosen by the owner but must at least be 10% in excess of the maximum level flight speed attainable.

(h) The maximum acceleration chosen varies with the type of operation to be conducted, and the minimum acceptable to the Director will be in accordance with the limit loads as stated for each subgroup of aircraft.

There are several ways of doing these tests. Probably the most common is to nose the aircraft down slightly to pick up a little excess speed and then pull up. Another method is to use a steep turn of spiral, keeping the nose just low enough to maintain the desired speed. This is faster than the nosedive method, as the load can be increased or decreased at will.

It is recommended that instead of attempting to reach maximum G loads the first time, the load be applied gradually; e.g. suppose the desired load is + 3,8 G, start with + 2,5 G first attempt, then + 3, then + 3,5 and finally + 3,8 G.

(7) Imported amateur-built aircraft

Note: This paragraph will apply where the owner requests Namibian registration.

(a) Prospective owners must first consult the Director and obtain approval before importing such an aircraft.

(b) Only aircraft which have been registered and issued with an appropriate certificate of airworthiness from the appropriate authority of country of registration, may be imported into Namibia.

(c) Proof of the above must be submitted to the Director with the documents required for Namibian registration.

(d) The proving flight hours required, are at the discretion of the Director, but will not be less than 20 hours.

Note: Typical documentation required to show compliance with the above will be the foreign certificates of registration and other certificates as well as the standards and substantiation to which the aircraft was built and approved.

14. Production-built aircraft

(1) General

(a) Only aircraft of which the type, the local/foreign manufacturing organisation and local assembling organisation or agent has been approved by the Director may be built or imported and flown within Namibia.

(b) Kits or components, locally manufactured or imported, are included in the definition of production-built aircraft.

(c) The cost incurred by the DCA for approving local or foreign organisations i.e. travel, accommodation and subsistence, will be at the expense of the applicant/manufacturer/agent.

(d) Production-built aircraft may not be delivered to the public by a manufacturer/agent unless the aircraft has been registered in the name of the new owner.

Note: The Director may consider a foreign manufacturing organisation as Director approved if that facility was approved by an appropriate authority.

(2) Aircraft/Kit/Component type approval

(a) The aircraft must be designed and built in accordance with the acceleration and gust loads as specified in the paragraphs of each sub-group of aircraft.

(b) The requirements for the construction, design, flight performance, powerplant, operational and continued airworthiness must be based on either the FAR, the BCAR, or the JAR requirements as listed in each subgroup. Equivalent requirements will also be acceptable.

(c) A complete build standard (complete manufacturing drawings, processes, specifications) of an imported unit must be submitted with the documents for registration of the aircraft. This build standard is considered confidential information and the foreign manufacturer may send it directly to the Director.

(d) Static tests of the unit must be carried out where applicable, to the ultimate loads and especially to structural and ground resonance loads.

(e) The unit must be evaluated for a period of 50 hours or as prescribed by the Director. Proving flights as prescribed by Feder Aviation Administration (FAA) Advisory Circular AC 90-89 must be carried out.

(f) The complete built standard of a local manufactured unit and possible revisions to the built standard of an imported unit must be submitted after the evaluation period.

(g) An inspection of the unit must be carried out in accordance with the build standard. Depending on the outcome of the inspection a final satisfactory flight test must be carried out by an independent appropriately rated pilot.

Note: Use of an aircraft for self protection by owners is considered as operation in category "f" (private category).

(3) Aircraft documentation

(a) The manufacturer must submit to the Director for approval, aircraft documentation in the form of an aircraft flight manual, maintenance manual and a repair manual. These must be submitted after all static and flight tests were carried out satisfactorily.

(b) A copy of the approved manuals together with the aircraft logbooks must accompany the aircraft on its delivery to the customer.

(c) The flight manual must describe the flight control and flight characteristics of the aircraft and will cover both normal and emergency procedures. Performance specifications and flight limitations must be included. The contents should be in the following order:

(i) General

(ii) Limitations

(iii) Normal procedures

(iv) Emergency procedures

(v) Performance data

(vi) Mass and balance

(vii) Optional equipment and changes to above sections due to incorporation of optional equipment.

(d) The general section must contain a colour photo of the particular aircraft showing the nationality and registration marks, and the following information as well:

(i) Aircraft make

(ii) Aircraft model

(iii) Aircraft serial number

(iv) Aircraft registration number

(v) Original constructor of the aircraft.

(e) The maintenance manual must contain an illustrated part list, inspection procedures, service life of the parts, acceptable repair methods as well as detailed drawings of the aircraft showing the various components and items to be inspected during preflight and annual inspections.

15. Power-driven aeroplanes (recreational)

(1) General

(a) Fixed-wing aeroplanes must comply with either the provisions of amateur-built aircraft or production-built aircraft.

(b) The words "amateur-built aeroplane" or "production-built aeroplane" must be substituted for the words "amateur-built aircraft".

(2) Design loads

(a) The load conditions and requirements of FAR 23 Subpart C - Structure (or its equivalent) must be considered in the design of the aircraft.

(b) FAR Part 23 paragraphs 23.303, 23.333, 23.335, 23.337 and 23.341 must be complied with. The words “semi-aerobatic aeroplane” must be substituted for the words “utility category airplanes”.

16. Gliders and motor gliders (recreational)

(1) General

(a) Gliders must comply with either the provisions of amateur-built aircraft or production-built aircraft.

(b) The word “amateur-built glider” or “production-built glider” must be substituted for the words “amateur-built aircraft”.

(c) The proving flight period must be at least for 25 hours. The powerplant of a motor glider must be operative for 5% of this period in addition to the ground round period of the powerplant.

(2) Design loads

(a) The load conditions and requirements of JAR-22 Subpart C : Structure (or its equivalent) must be considered in the design of the aircraft.

(b) JAR-22 paragraphs 22.333, 22.335, 22.337 and 22.341 must be complied with except that the words "semi-aerobatic aeroplane" must be substituted for the words "utility category airplanes".

17. Microlight aeroplanes (recreational)

(1) General

(a) Microlights must comply with either the standards for amateur-built aircraft or production-built aircraft.

(b) The word "amateur-built microlight" or "production-built microlight" must be substituted for the words "amateur-built aircraft".

(c) In addition to the annual inspection, microlights in the training category (e) will have an inspection equivalent to the annual inspections every 50 flying hours where training is for the registered owners only and every 25 flying hours where the microlight is being used in an approved aviation training organisation.

(2) Mass shift microlights

Applicants with mass shift microlights must provide the centre of gravity and the height difference or angle between the front wheel and the main gear. This is usually done by hanging the aeroplane using the attachment point between wing and the rest of the fuselage.

(3) Design loads

(a) The load conditions and requirements of BCAR section S (or its equivalent) must be considered in the design of the microlight.

(b) The owner/builder must approach the Director to determine the maximum flight loads that may be expected in service which will depend on the type of microlight.

(c) During flight testing, the maximum acceleration forces obtainable at Vne must exceed the calculated limit loads.

Note: 1. The Director may still approve the amateur-built microlight if it has no permanent deformation after the flight test.

2. The Director may still approve the production-built microlight if it can be shown through the ultimate static test that the safety factor still equals or exceeds 1.5.

(4) Equipment

Equipment and instruments for the safe operation of the microlight and/or as required by the Director must be installed. All required equipment must be calibrated before installation and calibrated annually thereafter.

18. Rotorcraft (recreational)

(1) General

(a) Only rotorcraft that comply with the provisions of either paragraph 15 or 16 are allowed to be registered and flown in Namibia.

(b) The words "amateur-built rotorcraft" or "production-built rotorcraft" must be substituted for the words "amateur-built aircraft".

(2) Design loads

(a) The load conditions and requirements of FAR 27 Subpart C - Strength requirements (or its equivalent) must be considered in the design of the aircraft.

(b) FAR Part 27 paragraphs 27.301, 27.309, 27.321, 27.337, 27.339, 27.344, 27.361, 27.547 and 27.549 must be complied with.

(3) Equipment

Paragraph 19(4) is applicable in addition to paragraph 15(3).

19. Gyroplanes (recreational)

(1) General

(a) Gyroplanes must comply with either the provisions of paragraph 15 or 16.

(b) The words "amateur-built aircraft" or "production-built gyroplanes" must be substituted for the words "amateur-built aircraft".

(c) A rotor brake and rotor RPM gauge must be installed.

(2) Design loads

Design load requirements shall be specified by the Director.

(3) Equipment

Equipment requirements shall be specified by the Director.

20. Manned free balloons (recreational)

(1) General

(a) Balloons must comply with either the provisions of amateur-built aircraft or production-built aircraft.

(b) The words "amateur-built balloon" or "production-built balloon" must be substituted for the words "amateur-built aircraft".

(2) Design loads

The load conditions and requirements of FAR 31 Subpart C : Strength requirements (or its equivalent) must be complied with.

(3) Equipment

(a) The following equipment is required as standard equipment for all flights:

(i) Approved sensitive altimeters;

(ii) a rate of climb indicator;

(iii) a fire extinguisher.

(b) In addition for hot air balloons the following are required:

(i) A fuel quantity gauge;

(ii) an envelope temperature indicator.

(c) The applicable equipment must be calibrated before first installation and calibrated annually thereafter.

21. Non-rigid airships (recreational)

(1) Reserved.

22. Gas turbine-powered aircraft (recreational)

(1) The requirements of paragraph 15 or 16, depending on the specific aircraft type, must be complied with.

(2) The Director may prescribe any other additional requirements that he/she deems necessary to ensure satisfactory airworthiness and safety. The prospective builder/owner(s) should first obtain these additional requirements before considering building or importing this type of aircraft.

21.02.7 FLIGHT TESTS

1. Requirements

The requirements referred to in CAR 21.02.7(3), according to which flight tests must be carried out, are the following:

1.1 **Flight tests**

(1) Each applicant for an aircraft type certificate must take the tests listed in subparagraph (2) of this paragraph. Before making the tests the applicant must show -

(a) compliance with the applicable structural requirements;

(b) completion of necessary ground inspections and tests;

(c) that the aircraft conforms with the type design; and

(d) that the Director received a flight test report from the applicant containing the results of the tests.

(2) Upon showing compliance with subparagraph (1) the applicant must make all flight tests that the Director finds necessary -

(a) to determine compliance with the applicable requirements; and

(b) to determine whether there is reasonable assurance that the aircraft, its components, and its equipment are reliable and function properly.

(3) Each applicant must show for each flight test (except in the case of a glider or a manned free balloon) that adequate provision is made for the flight test crew for emergency egress and the use of parachutes.

(4) Except in gliders and manned free balloons, an applicant must discontinue flight tests until the applicant shows that corrective action has been taken, whenever -

(a) the applicant’s test pilot is unable or unwilling to make any of the required flight tests; or

(b) items of non-compliance with requirements are found that may make additional test data meaningless or that would make further testing unduly hazardous.

(5) The flight tests prescribed in subparagraph (2)(b) must include -

(a) for aircraft incorporating turbine engines of a type not previously used in a type certificated aircraft, at least 300 hours of operation with a full complement of engines that conform to a type certificate; and

(b) for all other aircraft, at least 150 hours of operation.

1.2 **Flight test pilot**

Each applicant for normal, utility, aerobatic or transport category aircraft type certificate must provide a person holding an appropriate pilot licence and rating to make the flight tests required.

1.3 **Flight test instrument calibration and correction report**

(1) Each applicant for a normal, utility, aerobatic or transport category aircraft type certificate must submit a report to the Director showing the computations and tests required in connection with the calibration of instruments used for test purposes and in the correction of test results to standard atmospheric conditions.

(2) Each applicant must allow the Director to conduct any flight tests that he or she finds necessary to check the accuracy of the report submitted under subparagraph (1).

21.02.9 FORM OF TYPE CERTIFICATE

1. Form of certificate

The form referred to in CAR 21.02.9, on which a type certificate is issued, is contained in Annexure B.

21.04.2 APPLICATION FOR TYPE ACCEPTANCE CERTIFICATE

1. Form of application

The form referred to in CAR 21.04.2(a), in which application must be made for the issuing of a type acceptance certificate for a Class I product, is contained in Annexure C.

21.04.4 DATA REQUIREMENTS

1. Standards for flight manual

(Reserved.)

21.04.6 FORM OF TYPE ACCEPTANCE CERTIFICATE

1. Form of certificate

The form referred to in CAR 21.04.6, on which a type acceptance certificate is issued, is contained in Annexure D.

21.05.2 APPLICATION FOR SUPPLEMENTAL TYPE CERTIFICATE

1. Form of application

The form referred to in CAR 21.05.2(a), in which application must be made for the issuing of a supplemental type certificate, is contained in Annexure E.

21.05.4 FORM OF SUPPLEMENTAL TYPE CERTIFICATE

1. Form of certificate

The form referred to in CAR 21.05.4, on which a supplemental type certificate is issued, is contained in Annexure F.

21.06.2 PRODUCTION INSPECTION SYSTEM

1. Procedures for making determinations

The procedures for making determinations referred to in CAR 21.06.2(2), must provide a means for determining at least the following:

(1) Incoming materials, and bought or subcontracted parts, used in the finished product, must be specified in the type design data, or must be suitable equivalents.

(2) Incoming materials, and bought or subcontracted parts, must be properly identified if their physical or chemical properties cannot be readily and accurately determined.

(3) Materials subject to damage and deterioration must be suitably stored and adequately protected.

(4) Processes affecting the quality and safety of the finished product must be accomplished in accordance with acceptable industry specifications.

(5) Parts and components in process must be inspected for conformity with the type design data at points in production where accurate determinations can be made.

(6) Current design drawings must be readily available to manufacturing and inspection personnel, and used when necessary.

(7) Design changes, including material substitutions, must be controlled and approved before being incorporated in the finished product.

(8) Rejected materials and parts must be segregated and identified in a manner that precludes installation in the finished product.

(9) Materials and parts that are withheld because of departures from design data or specifications, and that are to be considered for installation in the finished product, must be processed through the Materials Review Board. Those materials and parts determined by the Board to be serviceable, must be properly identified and re-inspected if rework of repair is necessary. Materials and parts rejected by the Board must be marked and disposed of to ensure that they are not incorporated in the final product.

2. Materials Review Board

(1) The Materials Review Board referred to in CAR 21.06.2(3), must include representatives from the inspection and engineering departments of the manufacturing organisation.

(2) All records of Materials Review Board action must be maintained by the manufacturing organisation for a period of two years.

(3) All inspection records must be maintained, identified with the completed product where practicable, and retained by the manufacturing organisation for a period of at least two years.

21.06.3 TESTS FOR AIRCRAFT

1. Production flight test procedure

The production flight test procedure referred to in CAR 21.06.3, must include the following:

(1) An operational check of the trim, controllability, or other flight characteristics to establish that the production aircraft has the same range and degree of control as the prototype aircraft.

(2) An operational check of each part or system operated by the flight crew while in flight to establish that, during flight, instrument readings are within normal range.

(3) A determination that all instruments are properly marked, and that all placards and required flight manuals are installed after flight test.

(4) A check of the operational characteristics of the aircraft on the ground.

(5) A check on any other items peculiar to the aircraft being tested that can best be done during the ground or flight operation of the aircraft.

21.06.4 TESTS FOR AIRCRAFT ENGINES

1. Test run

(1) The test run referred to in CAR 21.06.4, must include the following:

(a) Break-in runs that include a determination of fuel and oil consumption and a determination of power characteristics at the rated maximum continuous power or thrust and, if applicable, at rated take-off power or thrust;
(b) at least five hours of operation at rated maximum continuous power or thrust. For engines having a rated take-off power or thrust higher than rated maximum continuous power or thrust, the five-hour run must include 30 minutes at rated take-off power or thrust.

(2) The test run may be made with the engine appropriately mounted and using current types of power and thrust measuring equipment.

21.07.2 APPLICATION FOR PRODUCTION CERTIFICATE OR AMENDMENT THEREOF

1. Form of application

The form referred to in CAR 21.07.2(a), in which application must be made for the issuing of a production certificate, or an amendment thereof, is contained in Annexure G.

21.07.4 FORM OF PRODUCTION CERTIFICATE

1. Form of certificate

The form referred to in CAR 21.07.4, on which a production certificate is issued, is contained in Annexure H

21.08.2 APPLICATION FOR CERTIFICATE OF AIRWORTHINESS OR AMENDMENT THEREOF

1. Application for issuing of standard or restricted certificate of airworthiness

The form referred to in CAR 21.08.2(2)(a), in which application must be made for the issuing of a standard or restricted certificate of airworthiness, or an amendment thereof, is contained in Annexure I.

2. Application for issuing of experimental certificate

The form referred to in CAR 21.08.2(3)(a), in which application must be made for the issuing of an experimental certificate, or an amendment thereof, is contained in Annexure J.

3. Application for issuing of special flight permit

The form referred to in CAR 21.08.2(4)(a), in which application must be made for the issuing of a special flight permit, or an amendment thereof, is contained in Annexure K.

21.08.7 FORM OF CERTIFICATE OF AIRWORTHINESS

1. Standard or restricted certificate of airworthiness

The form referred to in CAR 21.08.7, on which a standard or restricted certificate of airworthiness is issued, is contained in Annexure L.

2. Experimental certificate

The form referred to in CAR 21.08.7, on which an experimental certificate is issued, is contained in Annexure M.

3. Special flight permit

The form referred to in CAR 21.08.7, on which a special flight permit is issued, is contained in Annexure N.

21.08.11 RENEWAL OF CERTIFICATE OF AIRWORTHINESS

1. Form of application

The form referred to in CAR 21.08.11(1)(a), in which an application for the renewal of a certificate of airworthiness must be made, is -

(1) in the case of the renewal of a standard or restricted certificate of airworthiness, contained in Annexure I;

(2) in the case of the renewal of an experimental certificate, contained in Annexure J; and

(3) in the case of the renewal of a special flight permit, contained in Annexure K.

21.08.12 VALIDATION OF CERTIFICATE OF AIRWORTHINESS ISSUED BY APPROPRIATE AUTHORITY

1. Form of application

The form referred to in CAR 21.08.12(1), in which application must be made for the validation of a foreign certificate of airworthiness, is contained in Annexure O.

2. Requirements and conditions

(Reserved.)

3. Form of validation

The form referred to in CAR 21.08.12(3)(c), on which a foreign certificate of airworthiness is validated, is contained in Annexure P.

4. Renewal of validation

The form in which application must be made for the renewal of a validation, is contained in Annexure O.

21.09.2 INSPECTIONS AND TESTS

1. Manufacturing inspection system

The manufacturing inspection system referred to in CAR 21.09.2(3), must include the following:

(1) Incoming materials used in the finished part must be as specified in the design data.

(2) Incoming materials must be properly identified if their physical and chemical properties cannot otherwise be readily and accurately determined.

(3) Materials subject to damage and deterioration must be suitably stored and adequately protected.

(4) Processes affecting the quality and safety of the finished product must be accomplished in accordance with acceptable specifications.

(5) Parts in process must be inspected for conformity with the design data at points in manufacturing where accurate determination can be made. Statistical quality assurance procedures may be employed where it is shown that a satisfactory level of quality will be maintained for the particular part involved.

(6) Current design drawings must be readily available to manufacturing and inspection personnel, and used when necessary.

(7) Major changes to the basic design must be adequately controlled and approved before being incorporated in the finished part.

(8) Rejected materials and components must be segregated and identified in such a manner as to preclude their use in the finished part.

(9) Records produced under the manufacturing inspection system shall be maintained, identified with the completed product or part and are held at the disposal of the Director and retained by the manufacturer in order to provide the information necessary to ensure continued airworthiness.

21.09.3 APPLICATION FOR NAM-PMA

1. Form of application

The form referred to in CAR 21.09.3(2)(a), in which application must be made for the issuing of a NAM-PMA, is contained in Annexure O.

21.11.2 APPLICATION FOR EXPORT AIRWORTHINESS APPROVAL

1. Form of application

The form referred to in CAR 21.11.2(3)(a), in which application must be made for the issuing of an export airworthiness approval, is contained in Annexure Q.

2. Mass and balance documentation

(1) The mass and balance documentation referred to in CAR 21.11.2(3)(b)(ii)(bb), must include at least the following information:

(a) Aircraft nationality and registration letters, make, model and serial number;

(b) the date on which the mass was determined and centre of gravity computed;

(c) the datum point used; and

(d) the necessary calculations.

(2) Specimen mass and balance documentation is contained in FAA Advisory Circular AC 43.13-1A.

21.11.4 FORM OF EXPORT AIRWORTHINESS APPROVAL

1. Export certificate of airworthiness

The form referred to in CAR 21.11.4(1), on which an export certificate of airworthiness is issued, is contained in Annexure S.

2. Export airworthiness approval tag

The form referred to in CAR 21.11.4(2), on which an export airworthiness approval tag is issued, is contained in Annexure T.

21.12.1 NAM-TSO MARKING

1. NAM-TSO performance standards

The appropriate NAM-TSO performance standards with which an article must comply, is contained in FAA Advisory Circular AC 20-110.

21.12.2 APPLICATION FOR NAM-TSO AUTHORISATION

1. Form of application

The form referred to in CAR 21.12.2(2)(a), in which application must be made for the issuing of a NAM-TSO authorisation, is contained in Annexure U.

21.12.8 NAM-TSO DESIGN APPROVAL FOR APPLIANCES: IMPORT

(Reserved.)

SCHEDULE 1: MICROLIGHT MINIMUM SPEED

Any aeroplane qualifies as a microlight when its maximum gross mass, useful load and minimum speed complies with the requirements as stated below.

1. A one or two seat aeroplane whose minimum speed at gross mass is less than 65 km/h (or 35.1 knots or 40.39 mph) and having a maximum gross mass of:

- 300 kg for a landplane, single-seater
- 350 kg for an amphibian, or a pure seaplane, single-seater
- 450 kg for a landplane, two-seater
- 500 kg for an amphibian or a pure seaplane, two-seater.

2. The minimum speed will be calculated by taking into account the wing area, the possible presence of high-lift devices and the gross weight, according to the provisions of paragraph 6.

3. The aeroplane may also qualify as a microlight by a flight demonstration of minimum level speed at gross weight (in this case, it must fly over a 500 m course). The measured speed will be the average of the timed speed in both directions. The component of the wind perpendicular to the course must not exceed 10 km/h. The measured speed will be corrected for air density (15^0C, 1013.2 mb, Om).

4. The useful weight to be considered must be at least equal to 90 kg per seat and

   - a full charge of fuel or 15 kg, whichever is less, for a single-seater, or
   - a full charge of fuel or 22 kg, whichever is less, for a two-seater.

   The useful weight as defined in the present paragraph will be called "nominal FAI useful weight".

5. If the real useful weight of an aeroplane is less than the nominal FAI useful weight, the aeroplane may qualify as a microlight if its minimum speed is less than the following:

   Min speed limit =

$$\sqrt{\frac{\textit{empty weight} + \textit{real useful weight}}{\textit{empty} + \textit{nominal FAI useful weight}}} \; x\ 65km / h$$

   (Weights in kg).

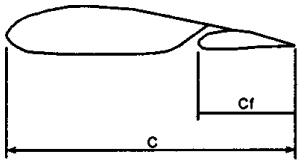
6. **CALCULATED MINIMUM SPEED**

   Min speed =

$$\sqrt{\frac{207.6 \times \text{gross weight}}{C_L \times 2}} \quad \textit{(km / h)}$$

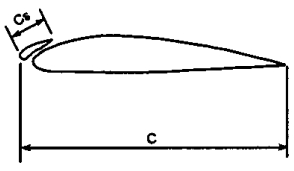
   (weights in kg - area in m5).

7. **CALCULATION FOR C_L FOR COMBINATIONS OF HIGH-LIFT DEVICES**



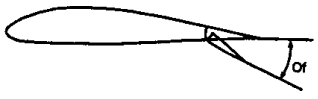
FLAP

To be considered, flap chord should be such that
$0.05 \leq \frac{Cf}{C} \leq 0.025$



SLAT

To be considered, slat chord Cs should be such that
$0.04 \leq \frac{Cs}{C} \leq 0.15$



of considered

30^0 max for a normal flap
20^0 max if flap is also used for roll control ("flaperon")

SCHEDULE 1: MICROLIGHT MINIMUM SPEED

Lifting surface	C_L	Maximum value
Airfoil alone	1.45	1.45
Airfoil + plain flap	$1.45 + 0.0875 \frac{Cf}{C} X O_f$	2.10
Airfoil + split flap	$1.45 + 0.1125 \frac{Cf}{C} X O_f$	2.29
Airfoil + slotted flap	$1.45 + 0.1000 \frac{Cf}{C} X O_f$	2.20
Slat + airfoil	1.95	1.95
Slat + airfoil + plain flap	$1.45 + 0.10635 \frac{Cf}{C} X O_f$	2.75
Slat + airfoil + split flap	$1.45 + 0.0875 \frac{Cf}{C} X O_f$	2.61
Slat + airfoil + sloeted flap	$1.45 + 0.1250 \frac{Cf}{C} X O_f$	2.89

8. **DETERMINATION OF C_L X S**

8.1 **Aeroplanes with no aerodynamic devices for pitch control (this includes weight-shift aeroplanes)**

S = horizontal projection of all lifting surfaces (m5)
C_L = 1.45.

8.2 **Other aeroplanes (including canard, tandem, flying wings, "classical", ...)**

- All calculations are done on the horizontal projections of all lifting surfaces, (lift being positive or negative). The global projection will be divided into elements (S_1, S_2, ... S_n) according to the presence or not of high-lift devices (see example). C_L for all possible combinations are defined in paragraph 7.
- The surface affected by a high-lift device is the lifting surface directly comprised within the span of this high-lift device.
- Moving surface used for pitch control will not be considered as high-lift devices.
- Relative chord of flaps (Cf/C) will not be considered higher than 0.25.
- Deflection of flaps (O_f) will not be considered more than 30^0C.
- In case of flaperons (flaps used for roll control), only symmetrical deflection up to 20^0 will be considered.

$C_L X S = 0.80 (C_{L1} X S_1 + C_{L2} X S_2 + ... + C_{Ln} X S_N)$.

8.3 **About the wing area**

There are so many different and interesting ways to design a flying machine that it is almost impossible to define a special rule for each.

It should be noted that some parts of the total wing area produce no additional lift but add manoeuvrability and stability.

This is the reason for the 0.80 factor in the formula for D_L X s.

9. EXAMPLES

9.1 **Trike (weight shifts), single-seater**

wing area	10,0 m5
empty weight, equipped	110 kg
fuel tank 25 litres	
gross weight	200 kg

(a) Minimum speed limit (see paragraph 5)

$$\sqrt{\frac{110 + 90}{110 + 105t}} \text{ x } 65 = 0.964 \text{ x } 65 = 62.7 \text{ km / h}$$

(b) Calculated minimum speed (see paragraph 6)

$$V_{mini} = \sqrt{\frac{207.6 + 200}{1.45 \text{ x } 10}} = 53.5 \text{ km / h}$$

accepted as microlight

9.2 **Classical aircraft, two-seater, no high-lift devices**

wing area	12,2 m^5
empty weight, equipped	250 kg
fuel tank	28 litres
declared gross weight	360 kg
minimum speed	65 km/h (calculated)

(a) Minimum speed limited

$$\sqrt{\frac{250 + 110}{250 + 200}} \text{ x } 65 = 58.14 \text{ Km / h}$$

(b) Calculated minimum speed

$$V_{mini} = \sqrt{\frac{207.6 + 360}{1.45 \text{ x } 12.2}} = 65 \text{ km / h}$$

NOT accepted as microlight

This aircraft is a "false' two-seater, as the declared gross weight will obviously be exceeded in flight. Any attempt of exaggerated empty weight versus gross weight will be discouraged by the provisions of paragraphs 5 and 6.

9.3 **Classical aircraft, single-seater**

wing area (total)	9,26 m^5
empty weight, equipped	160 kg
fuel tank	30 litres
useful weight	105 kg
gross weight	265 kg

(a) Minimum speed limit

$$\sqrt{\frac{160 + 105}{160 + 105}} \text{ x } 65 = 65 \text{ km / h}$$

(b) Calculated minimum speed (see illustration)

elements of area	**S_1 area**	**CL_1**	**DL_1 X S_1**
S_1: wing + slat	3.40	1.95	6.630
S_2: wing + slat + plain flap (*)	1.20	2.75	3.300
S_3: wing + plain flap (*)	2.80	2.1	5.880
S_4: wing into fuselage	0.6	1.45	0.870
S_5: tailplane	1.26	1.45	1.827
	9.26		

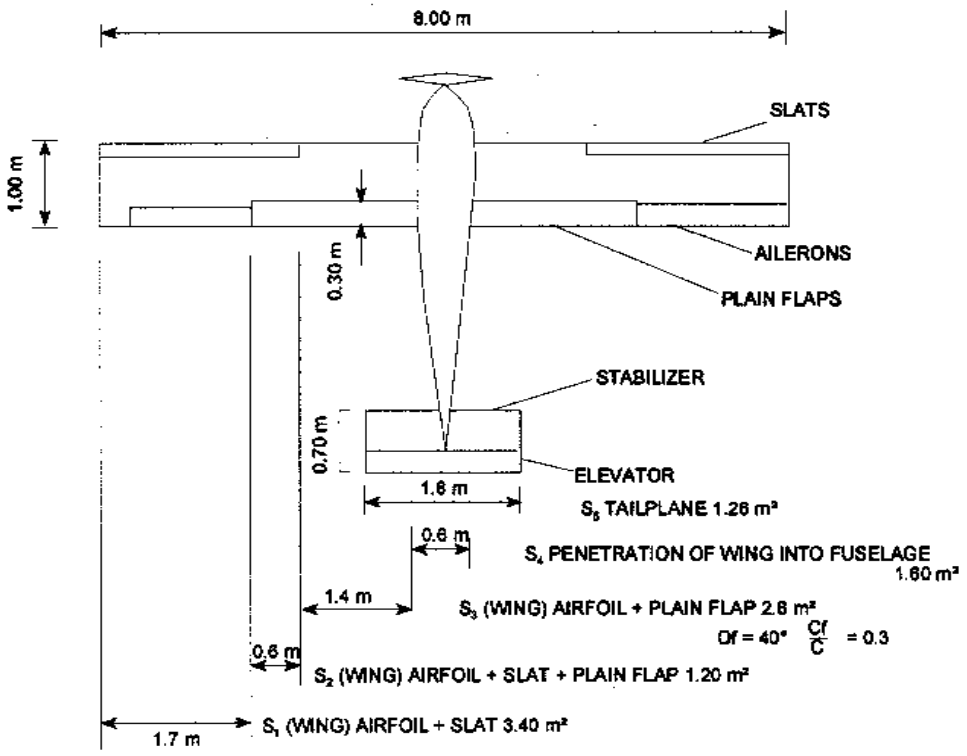
(*) $\frac{Cf}{C}$ = 0.30 (0.25 considered)

$O_f = 40^0$ (30^0 considered)

C_L X S = 0.80 (6.63 + 3.39 + 5.88 + 0.87 + 1.827) = 14.806 m^5

$$V_{mini} = \sqrt{\frac{207.6 + 265}{14.806}} = 61 \text{ km / h}$$

accepted as microlight.


8.00 m
SLATS
1.00 m
0.30 m
AILERONS
PLAIN FLAPS
STABILIZER
0.70 m
ELEVATOR
1.6 m
S_5 TAILPLANE 1.26 m²
0.6 m
S_4 PENETRATION OF WING INTO FUSELAGE 1.60 m²
1.4 m
S_3 (WING) AIRFOIL + PLAIN FLAP 2.8 m²
Of = 40° Cf/C = 0.3
0.6 m
S_2 (WING) AIRFOIL + SLAT + PLAIN FLAP 1.20 m²
1.7 m
S_1 (WING) AIRFOIL + SLAT 3.40 m²