

GOVERNMENT OF INDIA
OFFICE OF DIRECTOR GENERAL OF CIVIL AVIATION
OPPOSITE SAFDERJUNG AIRPORT
NEW DELHI-110 003

AIRCRAFT ENGINEERING ADVISORY CIRCULAR No. 01 of 2016

DATED: April, 2016

Subject: Issue of Registration and Permit to Fly for Prototype Aircraft.

1. INTRODUCTION:

1.1 The activities related to design and development of aircraft and its associated parts/system in India is not new to the aviation industry. To safeguard the interest of aviation industry and public safety as well, regulations have been promulgated and amended from time to time by the DGCA.

1.2 However, need to augment the prevailing regulations, providing better clarity and defining the working process arises in order to streamline the process of developmental activities vis-à-vis enhancing public safety.

1.3 With the increase in aviation activities world over and challenges being faced by stakeholders, the Standard and Recommended Practices (SARPs), guidance on the suggested content of various State airworthiness regulations, etc. developed by ICAO are providing much relief to the contracting member States in developing their own regulations in order to meet their state obligations and compliance demonstration of ICAO SARPs.

1.4 This advisory circular is being issued for the guidance of organisations engaged in design and development of aircraft for test purpose to identify the potential hazard and limitations of prototype before commencement of actual certification test flight demonstration for issue of type certificate.

2. APPLICABILITY:

2.1 This advisory circular is applicable to prototype aircraft having weight categories eligible for issue of type certificate under the provisions of CAR 21.

2.2 Registration for prototype aircraft under experimental category and Permit to fly can be granted only to:

- a) a citizen of India; or
- b) a company or a body corporate provided that:
 - i) it is registered and has its principal place of business within India;

- ii) its Chairman and at least two-third of its Directors are citizens of India; and,
- iii) its substantial ownership and effective control is vested in Indian nationals.

2.3 Security clearance of the owner/board of directors/organisation from MHA, as applicable.

2.4 Clearances from Central/State Governments, as applicable, for setting up of specific type of industry.

3. GUIDELINES:

3.1 General:

3.1.1 Every organisation engaged in the design & manufacture of aeronautical products and their test flights aspects shall establish and maintain Safety Management System and prepare a Safety Management System Manual as per the applicable provisions of CAR 21 and submit the same to the DGCA for approval.

3.1.2 The DGCA may, at any reasonable time, inspect the Safety Management System. The concerned organisation/key personnel shall co-operate with the DGCA for conduct of such inspection.

3.1.3 The accountable manager and key personnel of the design team should have adequate knowledge on rules and regulations issued by the DGCA related to design, manufacturing and prototype flight testing aspect of the aircraft.

3.2 Procedure for Registration:

3.2.1 For aircraft registration, the owner of the prototype aircraft would require to submit certification plan to the DGCA Headquarters with regard to the design data, material properties and various aircraft systems. The Aircraft Engineering Directorate of DGCA will be the focal point of contact for this purpose.

3.2.2 Consequent upon submission of the certification plan, the applicant shall submit following documents to the Director, AED, DGCA Headquarters, New Delhi along with application for registration of prototype aircraft in CA-28 Form (revised 2015) prescribed by Directorate of Airworthiness of DGCA and applicable fee in accordance with Rule 35 of the Aircraft Rules 1937:

- a) Proof of ownership of the prototype aircraft such as bill of entry for procurement of material, engine, propeller, rotor, instrument/equipment, parts & appliances, etc. and assembly of the aircraft.
- b) Copy of project feasibility report.
- c) Compliance to applicable design requirements as per Annexure -1.
- d) Draft Pilot Operating Handbook.
- e) Prototype flight test plan along with duration of test plan, limitations of flight, airport identified for test plan, procedure to seek ATC and air defence clearance for the proposed test flight.

- f) Details of trained crew and their familiarisation plan to ensure that operational test aspect of test flying is as per the “Aero Engineering Division Handbook of Procedures, Part 10”.
- g) Draft compliance report to mandatory operational and navigational instrument/equipment as per the Aircraft Rules/CARs.
- h) Draft Aircraft Maintenance Manual and maintenance program along with details of infrastructure and personnel for aircraft maintenance.
- i) Insurance of sufficient amount in order to meet owner’s liability in the event of accidental damage to the property and life.
- j) Security arrangement/plan to ensure protection from hijacking of the prototype aircraft.

Note:

1. *The applicant is required to apply for W/T licence seeking approval/permission from WPC, Ministry of Communication.*
2. *The engine and/or propeller certified by foreign civil aviation authority, for installation on the prototype aircraft, would require type validation in accordance with CAR, Section 6, Series A, Part I.*

3.2.3 On completion of satisfactory evaluation of documents at Para 3.2.2 and verification of factual information by joint team of AED and DAW of DGCA with regard to the assembly of prototype aircraft to roll out stage and safety management system, AED shall forward application for registration along with documents specified at 3.2.2 (h) & (i) to DAW for issue of the registration mark.

3.3 Issue of Permit to Fly:

3.3.1 Application for permit to fly shall be made to AED, DGCA in CA-22 Form and in the manner as specified under the provisions of Sub-Part P, CAR 21.

3.3.2 On evaluation of the submissions made by the applicant in respect of the areas which do not comply with the applicable airworthiness requirements and safety management system of the applicant, permit to fly may be issued stipulating operating conditions and limitations.

(M. Sathiyavathy)
Director General of Civil Aviation

DESIGN REQUIREMENTS

- A1.1 ICAO SARPs specifies that there shall be an approved design consisting of such drawings, specifications, reports and documentary evidence as are necessary to define the design of the aircraft and to show compliance with the design aspects of the appropriate airworthiness requirements. The aircraft shall be subjected to such inspections, ground and flight tests, as deemed necessary, by the State to show compliance with the design aspects of the appropriate airworthiness requirements.
- A1.2 DGCA has promulgated CAR 21 in order to meet the State obligations. The CAR specifies the applicable airworthiness standards for different class of aircraft. For example, aeroplanes with all-up-weight above 5700 Kg are required to demonstrate compliance for transport category as specified in FAR 25/CS 25 regulations, aeroplanes with all-up-weight above 750 Kg and upto 5700 Kg are required to demonstrate compliance for small/normal category as specified in FAR 23/CS 23 regulations, aeroplanes having all-up-weight up to 750 Kg are required to demonstrate compliance for very small category as specified in CS VLA. Similarly, FAR/CS-29, FAR/CS-27 and CS VLR regulations are applicable for weight categories of rotorcraft.

A1.3 Aeroplane/Helicopter design data required to be submitted are as follows:

AEROPLANE:

- a) **General**
- i. Load distribution limits.
 - ii. Weight limits.
 - iii. Empty weight and corresponding center of gravity.
 - iv. Removable ballast.
 - v. Propeller speed & pitch limits.
- b) **Performance:**
- i. Stalling speed.
 - ii. Takeoff speeds.
 - iii. Takeoff performance.
 - iv. Accelerate-stop distance.
 - v. Takeoff path.
 - vi. Takeoff distance and takeoff run.
 - vii. Takeoff flight path.
 - viii. Climb: All engines operating.
 - ix. Takeoff climb: One-engine inoperative.
 - x. Climb: One engine inoperative.
 - xi. Enroute climb/descent.
 - xii. Glide: Single-engine airplanes.
 - xiii. Reference landing approach speed.
 - xiv. Landing distance.
 - xv. Balked landing.

- c) **Controllability and Manoeuvrability :**
 - i. Longitudinal control.
 - ii. Directional and lateral control.
 - iii. Minimum control speed.
 - iv. Acrobatic maneuvers.
 - v. Control during landings.
 - vi. Elevator control force in maneuvers.
 - vii. Rate of roll.
- d) **Stability, trim, Stalls & Spinning**
 - i. Static longitudinal stability, Static directional and lateral stability and Dynamic stability, Trim.
 - ii. Wings level stall, Turning flight and accelerated turning stalls and Stall warning & Spinning characteristics. Ground & water handling Characteristics.
- e) **Loads:**
 - i. Ground and air loads acting on aircraft structure at design speeds limits, Flight loads, Factor of safety, Control surface loads, etc.
 - ii. Gust conditions.
- f) **Fabrication:**
 - i. Fabrication methods and material strength properties and design values.
 - ii. Proof of strength of airframe structure including landing gear, flight controls, etc.
 - iii. Operability & inspectability of systems, Signage & placards.
 - iv. Ventilation, safeguards/protection means for emergency landing conditions.
- g) **Fire Protection & Electrical bonding:**
 - i. Fire extinguisher.
 - ii. Thermal/acoustic insulation materials.
 - iii. Flammable fluid fire protection.
 - iv. Fire protection of flight controls, engine mounts, and other flight structure.
 - v. Electrical bonding and lightning protection powerplant installation.
- h) **Powerplant:**
 - i. Engine & Propeller Installation.
 - ii. Turbocharger systems.
 - iii. Propeller clearance.
 - iv. Engine installation ice protection.
 - v. Powerplant operating characteristics.
 - vi. Air induction system.
 - vii. Exhaust system.
 - viii. Powerplant controls.
 - ix. Designated fire zones.
 - x. Fire extinguishing systems
- i) **Fuel System and oil system:**
 - i. Fuel system lightning protection.
 - ii. Fuel flow.
 - iii. Fuel tank tests, Fuel tank installation & expansion space.

- iv. Fuel tank vents and carburetor vapor vents.
 - v. Fuel system lines, fittings and Fuel system components.
 - vi. Oil tanks tests, Oil lines & fittings, Oil system drains and Oil radiators.
- j) **Cooling:**
- i. Cooling tests & Coolant tank tests.
 - ii. Cooling test procedures for turbine/reciprocating engine powered airplanes.
- k) **Equipment:**
- i. Function and installation of Flight and navigation, Powerplant instruments, Electrical and electronic system lightning protection.
 - ii. High-intensity Radiated Fields (HIRF) Protection.
 - iii. Equipment, systems, and installations.
 - iv. Arrangement and visibility.
 - v. Warning, caution, and advisory lights.
 - vi. Position light system installation & Anti-collision light system.
- l) **Operating Limitations and Information:**
- i. Operating limitations, Operating procedures, Performance information, Kinds of operation, Maximum operating altitude, etc.
 - ii. Instructions for Continued Airworthiness.

Helicopter:

a) **General:**

- i. Weight limits.
- ii. Centre of gravity limits.
- iii. Main rotor speed and pitch limits.

b) **Performance:**

- iv. Performance at minimum operating speed.
- v. Climb: all engines operating.
- vi. Climb: one engine inoperative.
- vii. Autorotation performance.
- viii. Height-speed envelope.

c) **Flight Characteristics:**

- ix. Controllability and manoeuvrability.
- x. Flight controls and Trim control.
- xi. Static longitudinal stability and Static directional stability.
- xii. Taxiing condition and Ground resonance.

d) **Loads & fabrication:**

- xiii. Strength and deformation, Factor of safety; Proof of structure.
- xiv. Design limitations.
- xv. Limit manoeuvring load factor; Resultant limit manoeuvring loads;
- xvi. Gust loads; Yawing conditions.
- xvii. Engine torque.
- xviii. Control system; Limit pilot forces and torques; Dual control system.
- xix. Ground clearance; Tail rotor guard.
- xx. Unsymmetrical loads, Ground loading conditions and Assumptions
Tires and Shock absorbers. Landing gear arrangement. Level

- landing conditions. Tail-down landing conditions. One-wheel landing conditions. Lateral drift landing conditions. Braked roll conditions.
- xxi. Ground loading conditions: landing gear with tail wheels. Ground loading conditions: landing gear with skids. Ski landing conditions.
 - xxii. Float landing conditions, Main rotor structure Fuselage, landing gear, and rotor pylon structures.
 - xxiii. Emergency landing dynamic conditions; Structural ditching provisions; Damage Tolerance and Fatigue Evaluation of Composite Rotorcraft Structures; Critical parts; Materials.
 - xxiv. Lightning and static electricity protection. Material strength properties and design values. Pressure venting and drainage of rotor blades. Rotor blade clearance. Ground resonance prevention means, Stability augmentation, automatic, and power-operated systems. Primary flight control. Control system details. Emergency exits. Ventilation.
- e) Powerplant & transmission system:**
- xxv. Power plant, rotor drive system, fuel system, fire protection system, Fuel system crash resistance. Fuel system independence. Fuel system lightning protection.
 - xxvi. Fuel System Components, Oil System Cooling, Induction System, Exhaust System, Power plant Controls and Accessories Power plant Fire protection equipment function and installation.
- f) Equipment:**
- xxvii. Flight and navigation instruments. Power plant instruments. Electrical Systems and Equipment Lights, Safety Equipment,
- g) Operating limitations & information:**
- xxviii. Operating Limitations and Information, operating procedure, Markings and Placards, Rotorcraft Flight Manual.

A2.4 The above mention data, as applicable, should be submitted along with substantiation documents like definition document/analysis and/or ground test reports.