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GOVERNMENT OF INDIA
OFFICE OF THE DIRECTOR GENERAL OF CIVIL AVIATION
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CIVIL AVIATION REQUIREMENTS
SECTION 2 – AIRWORTHINESS
SERIES ‘I’ PART II
24th APRIL, 1992

EFFECTIVE: FORTHWITH

SUBJECT: AIRCRAFT EQUIPMENTS AND INSTRUMENTS

1. PURPOSE:

Rule 57 of the Aircraft Rule 1937, requires that every aircraft shall be fitted and equipped with instruments and equipment, including radio apparatus as may be specified according to the use and circumstances under which the flight is to be conducted, in order to enable the flight crew to control the flight path of aircraft, carry out required procedural manoeuvres and observe the operating limitation of the aircraft in the expected operating conditions.

Civil Aviation Requirements Section 2 Series ‘O’ provide the minimum instruments and equipment including Communication and Navigation equipment, which are to be installed on aircraft depending on their operation.

This part of Civil Airworthiness Requirements lays down the minimum instruments and equipment including Communication and Navigation Equipment, which are to be installed on aircraft engaged in Flying Club and Aerial Work operations and gliders.

This CAR is issued under the provision of Rule 133A of the Aircraft Rules, 1937.

2. DEFINITIONS:

Aerial work. An aircraft operation in which an aircraft is used for specialized services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, aerial advertisement, etc but does not include an aircraft used for public transport.

Commercial air transport operation. An aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire.

General aviation operation. An aircraft operation other than a commercial air transport operation or an aerial work operation.

Glider means a non-power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight;

3. GENERAL REQUIREMENTS

- 3.1 In addition to the minimum equipment necessary for the issuance of a certificate of airworthiness, the instruments, equipment and flight documents prescribed in the following paragraphs shall be installed or carried, as appropriate, in aircraft according to the aircraft used and to the circumstances under which the flight is to be conducted.
- 3.2 All instruments and equipment and their installation shall be of approved type.
- 3.3 All instrument dials shall have the operating range marked as specified by the manufacturer of the aircraft..
- 3.4 Instruments/equipment fitted shall be kept in serviceable condition and that they should be so at the time of take off unless their unserviceability for any particular flight condition has been permitted by Director General of Civil Aviation.
- 3.5 When a flight is conducted with unserviceable instruments/ equipment in accordance with para 3.4 the affected equipment/ instrument shall be placarded as "unserviceable" and additionally rendered ineffective or removed from aircraft so as not to interfere with other serviceable systems. The pilot in charge of the aircraft must also be informed of the same by the maintenance personnel responsible for releasing the aircraft.
- 3.6 The radio equipment shall be installed and operated with a licence issued under the Indian Telegraph Act of 1885 and the rules made thereunder as amended from time to time and in a manner approved by DGCA.

4. Aeroplane Instruments and Equipment – Commercial Air Transport Operation

See "CAR Section 2 Series 'O' Part II - Operation of Commercial Air Transport – Aeroplanes" for instruments and equipments.

5. Aeroplane Communication and Navigation Equipment – Commercial Air Transport operation

See “CAR Section 2 Series ‘O’ Part II - Operation of Commercial Air Transport – Aeroplanes” for Communication and Navigation equipment.

6. Aeroplanes Instruments and Equipment – General Aviation operation

See “CAR Section 2 Series ‘O’ Part III - Operation of Operation of General Aviation Aeroplanes” for instruments and equipments.

7. Aeroplane Communication And Navigation Equipment – General Aviation operation

See “CAR Section 2 Series ‘O’ Part III - Operation of Operation of General Aviation Aeroplanes” for Communication and Navigation equipment.

8. Helicopter Instruments and Equipment – Commercial Air Transport operation

See “CAR Section 2 Series ‘O’ Part IV - Operation of Commercial Air Transport – Helicopters” for instruments and equipments.

9. Helicopter Communication And Navigation Equipment – Commercial Air Transport operation

See “CAR Section 2 Series ‘O’ Part IV - Operation of Commercial Air Transport – Helicopters” for Communication and Navigation equipment.

10. Helicopter Instruments and Equipment – General Aviation operation

See “CAR Section 2 Series ‘O’ Part V - Operation of General Aviation Helicopters” for instruments and equipments.

11. Helicopter Communication And Navigation Equipment – General Aviation operation

See “CAR Section 2 Series ‘O’ Part V - Operation of General Aviation Helicopters” for Communication and Navigation equipment.

12. Instruments And Equipment Required For Navigator

For flights on which licensed Navigator is required according to Rules, following instruments/ equipment are required:

(a) Drift Indicator for machines with seating capacity of more than five persons, according to Certificate of Airworthiness/ Flight Manual.

(b) Chart table

(c) Navigators Instrument

(d) Navigators Air Speed Indicator

(e) Navigators Altimeter

(f) Navigators Compass

As may be required by the duties and location of the Navigator.

13. Aircraft Instruments and Equipment – Flying Club and Aerial Work Operation

13.1 All Aircraft on all flights

13.1.1 General

In addition to the minimum equipment necessary for the issuance of a certificate of airworthiness, the instruments and equipment prescribed in the following paragraphs shall be installed or carried, as appropriate, in aircraft according to the aircraft used and to the circumstances under which the flight is to be conducted.

13.1.2 Instruments

An aircraft shall be equipped with instruments which will enable the flight crew to control the flight path of the aircraft, carry out any required procedural maneuver, and observe the operating limitations of the aircraft in the expected operating conditions.

13.1.3 Equipment

All aircraft on all flights shall be equipped with:

- a) an accessible first-aid kit in accordance with CAR Sec 2 Series 'X' Part III;
- b) portable fire extinguishers of a type which, when discharged, will not cause dangerous contamination of the air within the aircraft. At least one shall be located in the pilot's compartment;
- c) a seat belt for each seat; and

- d) a safety harness for each flight crew member seat.

Note.- Safety harness includes shoulder strap(s) and a seat belt which may be used independently.

13.2 All aircraft operated as Visual Flight Rules (VFR)

All aircraft when operated as VFR flights shall be equipped with:

- (a) Air Speed Indicator (all aircraft with speed limitations expressed in terms of Mach Number shall be equipped with a Mach Number Indicator).
- (b) Pressure Altimeter
- (c) Magnetic Compass
- (d) RPM indicator for each engine
- (e) Out side air temperature indicator on aircraft on engine having provision for carburetor heat control in case carburetor Air Temperature Gauge is not installed.
- (f) Oil pressure indicator for each engine
- (g) Oil quantity indicator for each tank (instead of an instrument, it may be a dip stick).
- (h) CHT indicator for each air cooled engine having rated BHP above 250.
- (i) Temperature gauge for determining the temperature of the coolant for each liquid cooled engine.
- (j) Oil temperature gauge for each air cooled engine having rated BHP above 250.
- (k) Manifold pressure gauge for each engine, fitted with variable pitch propeller and/or is super charged.
- (l) Fuel Gauge indicating the quantity of fuel in each tank.
- (m) Landing gear position indicator for the aircraft fitted with retractable landing gear.
- (n) An accurate time piece, indicating time in hours, minutes and seconds., and
- (o) such other items / equipment as may be prescribed by the manufacturer/DGCA for particular installation.

- Note – 1.** *On aircraft below 2,000 Kgs. AUW, in lieu of time piece reference item (n), the use of personal watch worn by pilot is acceptable provided it is accurate and shows the time in hours, minutes and seconds. However this fact should be recorded by the Pilot in Command on the Pilots acceptance certificate.*
- Note – 2.** *The aircraft used for cloud seeding operation shall be fitted with 'G' meter as per DGCA /Misc./18.*
- Note – 3.** *The aircraft engaged in agro- operation are to be painted with day glow paint at the wing tips.*
- Note – 4.** *When operated in icing condition aircraft shall have means of preventing malfunctioning of air speed indicating system due to either condensation or icing*

13.3 All aircraft operated at night

All aircraft operated during night shall have the following instruments/equipment installed:

- (a) Instrument / equipment as required for VFR flight.
- (b) Position lights (navigation lights) (An unobstructed red light on the left side and green on the right near the wing tips and a white light near the tail).
- (c) Two landing lights each fitted with single filament lamps or light having dual filament lamp with separately energised filaments.
- (d) Adequate source of electrical energy for all installed electrical equipment.
- (e) Hand torches for each crew station.
- (f) Instrument for knowing fore and aft as well as the lateral attitude of the aircraft. (applicable to aircraft issued with C of A for first time after 31-12-1984 only)
- (g) All the flight instruments and equipment necessary for night flying shall be properly illuminated.
- (h) Light in all passenger compartments and in cockpit.
- (i) An anti-collision light intended to attract attention to the aircraft (applicable to aircraft issued with C of A for first time after 31-12-1984 only)

13.4 All aircraft operated in accordance with the instrument flight rules(IFR)

All aircraft when operated in accordance with the instrument flight rules or when the aircraft cannot be maintained in a desired attitude without reference to one or more flight instruments, shall be equipped with:

- a) a magnetic compass;
- b) an accurate timepiece indicating the time in hours, minutes and seconds;
- c) a sensitive pressure altimeter;

Note. – Due to the long history of misreading, the use of drum-pointer altimeters is not recommended.

- d) airspeed indicator ,

Note. – When operated in icing condition aircraft shall have means of preventing malfunctioning of air speed indicating system due to either condensation or icing

- e) a turn and slip indicator;
- f) an attitude indicator (artificial horizon);
- g) a heading indicator (directional gyroscope);

Note. – The requirements of e), f) and g) above, may be met by combinations of instruments or by integrated flight director systems provided that the safeguards against total failure, inherent in the three separate instruments, are retained.

- h) means of indicating whether the supply of power to the gyroscopic instruments is adequate;
- i) a means of indicating in the flight crew compartment the outside air temperature;
- j) a rate-of-climb and descent indicator; and
- k) such additional instruments or equipment as may be prescribed by the appropriate authority.

Note. – the aircraft should have been type certified for IFR flights.

13.5 All aircraft on flight over water

13.5.1 Seaplanes

All seaplanes for all flights shall be equipped with:

- a) one life jacket, or equivalent individual floatation device, for each person on board, stowed in a position readily accessible from his seat or berth;
- b) equipment for making the sound signals for Preventing Collisions at Sea, where applicable;
- c) one anchor;
- d) one sea anchor (drogue), when necessary to assist in maneuvering.

Note. – "Seaplanes" includes amphibians operated as seaplanes.

13.5.2 Landplanes

13.5.2.1 Single-Engine aircraft.

All single-engine landplanes when flying en- route over water beyond gliding distance from the shore should carry one life jacket or equivalent individual floatation device for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided.

Note.- "Landplanes" includes amphibians operated as landplanes.

13.5.3 All aircraft on extended flights over water

All aircraft when operated on extended flights over water shall be equipped with:

- a) when the aircraft may be over water at a distance of more than 50 NM (93 km) away from land suitable for making an emergency landing:

one life jacket or equivalent individual floatation device for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided;

- b) when over water away from land suitable for making an emergency landing at a distance of more than 100 NM (185 km), in the case of single-engine aircraft, and more than 200 NM (370 km), in the case of multi-engine aircraft capable of continuing flight with one engine inoperative:

- (i) life-saving rafts in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in emergency, provided with such lifesaving equipment including means of sustaining life as is appropriate to the flight to be undertaken; and

- (ii) equipment for making the pyrotechnical distress signals described in ICAO Annex 2.

13.6 Ground Proximity Warning System (GPWS)

Aircraft so defined in CAR Section 2 Series "I" Part VII shall be fitted with Ground Proximity Warning System (GPWS).

13.7 Flight Recorders

Aircraft so defined in CAR Section 2 Series "I" Part V and VI shall be fitted with Flight Data Recorder and Cockpit Voice Recorder (CVR) respectively.

13.8 Aircraft required to be equipped with Pressure Altitude Reporting Transponder

Aircraft so defined in the CAR Section 2 Series 'R' Part IV shall be fitted with Pressure Altitude Reporting Transponder.

13.9 Aircraft required to be equipped with Airborne Collision Avoidance System (ACAS)

Aircraft so defined in the CAR Section 2 Series 'I' Part VIII shall be fitted with Airborne Collision Avoidance System (ACAS).

13.10 Emergency locator transmitter (ELT)

All aircraft shall be fitted with an ELT meeting the requirements as laid down in FAA TSO C-91a operating on frequency of 121.5 MHz for a minimum period of 48 hours which should be of the type as given below:

- (i) For all aircraft flying over land the ELT should be capable of being activated due to impact of 'G' load as specified in FAA TSO C-91a . However ELT to TSO C91 may also continue to be used if already installed on the aircraft.
- (ii) For all aircraft flying over water the ELT should be of water activated type.
- (iii) All aircraft operating over water beyond a distance of 100 NM from the sea shore shall be equipped with at least two water activated ELT.

Note 1: *The above requirement is not applicable to aircraft engaged in training flights/ research and development work operating within 50 nm of the vicinity of the airport. For cross-country flights the aircraft should be fitted with ELT either portable or fixed type.*

Note 2: *Each ELT must be attached to the airplane in such a manner that the probability of damage to the transmitter in the event of crash impact is minimised. The ELT must be installed on the aircraft as far as aft, as practicable.*

13.11 All aircraft on flights over designated land areas

Aircraft when operated across land areas which have been designated by Airports Authority of India as areas in which search and rescue would be especially difficult, shall be equipped with such signaling devices and life-saving equipment (including means of sustaining life) as may be appropriate to the area overflown.

13.12 All aircraft on high altitude flights

- a) All aircraft intended to be operated at high altitudes shall be equipped with oxygen storage and dispensing apparatus capable of storing and dispensing the sufficient oxygen supplies required for crew members and passenger.
- b) Pressurized aircraft intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa shall be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurization.

14. Aircraft Communication and Navigation Equipment – Flying Club and Aerial Work Operation

14.1 Communication equipment

- (a) All aircraft to be operated in accordance with the instrument flight rules or at night shall be provided with radio communication equipment. Such equipment shall be capable of conducting two-way communication with those aeronautical stations and on those frequencies prescribed by the appropriate authority or the appropriate foreign authority when abroad.
- (b) All aircraft to be operated in accordance with the visual flight rules, but as a controlled flight, shall, unless exempted by DGCA be provided with radio communication equipment capable of conducting two-way communication at any time during flight with such aeronautical stations and on such frequencies as may be prescribed by the appropriate authority.
- (c) All aircraft to be operated on a extended flights over water or flight over designated land areas shall, unless exempted by DGCA, be provided with radio communication equipment capable of conducting two-way communication at any time during flight with such aeronautical stations and on such frequencies as may be prescribed by the appropriate authority / DGCA.
- (d) The radio communication equipment required in accordance with (a) to (c) shall provide for communication on the aeronautical emergency frequency 121.5 MHz.

14.2 Navigation equipment

- (a) All aircraft shall be provided with navigation equipment which will enable it to proceed:
- (i) in accordance with the flight plan,
 - (ii) in accordance with prescribed Required Navigation Performance (RNP) types, and
 - (iii) in accordance with the requirements of air traffic services;
- except when, if not so precluded by DGCA, navigation for flights under the visual flight rules is accomplished by visual reference to landmarks at least every 60 NM (110 km).
- (b) On flights in which it is intended to land in instrument meteorological conditions, an aircraft shall be provided with radio equipment capable of receiving signals providing guidance to a point from which a visual landing can be effected. This equipment shall be capable of providing such guidance for each aerodrome at which it is intended to land in instrument meteorological conditions and for any designated alternate aerodromes.

15 Instruments And Equipment For Gliders:

15.1 Gliders not certified for cloud flying shall at least be provided with the following instruments and equipment:

- (a) Approved first aid kit;
- (b) Safety Harness for each occupant;
- (c) Air speed indicator;
- (d) Altimeter;
- (e) Variometer; and
- (f) Turn and bank indicator.

15.2 Gliders intended to be certificated for cloud flying shall have the following instrument and equipment in addition to those mentioned in para 15.1 above.

- (a) Artificial horizon
- (b) Parachute for each occupant.

- Note. – 1. Parachutes shall be inspected and packed by persons specifically approved for the purpose, by DGCA before carriage on board.*
- 2. No passenger will be carried on board a glider during planned/ international cloud flying.*
- 3. All pilots and trainees when undertaking "Cloud flying" shall be made familiar with the use of parachute, before the flight is undertaken.*

15.3 In addition, the glider shall be fitted with a magnetic compass and watch when engaged in cross country flight.

15.4 Sufficient oxygen for each occupant shall be provided when the glider is flown at altitude of 10,000 ft and above.

16. Instrument And Equipment For Powered Gliders (Motor Gliders).

All powered gliders shall be equipped with instruments and equipment as indicated for gliders in paragraph 13 above and in addition shall have the following installed at all times.

- (a) Tachometer
- (b) Fuel quantity indicator
- (c) Oil pressure indicator
- (d) Cylinder Head temperature indicator
- (e) Out side air temperature indicator (unless a separate carburetor air temperature gauge is installed).



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