



GOVERNMENT OF INDIA
DIRECTOR GENERAL OF CIVIL AVIATION
TECHNICAL CENTRE, OPP SAFDURJUNG AIRPORT, NEW DELHI

CIVIL AVIATION REQUIREMENTS
SECTION 2 - AIRWORTHINESS
SERIES 'T', PART II
1st APRIL, 1976

EFFECTIVE: FORTHWITH

F. No. 11-690/T-II/2017-AI(2)

Subject: Flight testing of aircraft for which a Certificate of Airworthiness has previously been issued.

1. APPLICABILITY:

1.1 This Civil Aviation Requirements specifies the conditions for the flight testing of aircraft for which a Certificate of Airworthiness has previously been issued.

2. DEFINITIONS:

(a) "Approved" means approved by Director General of Civil Aviation.

(b) "Flight Test" means the flying of an aircraft, without any passenger on board, for the purpose of ensuring that: -

- (i) the aircraft handling characteristics have not deteriorated with time;
- (ii) the aircraft performance remains as scheduled; and
- (iii) aircraft and its equipment function properly.

3. CIRCUMSTANCES NECESSITATING FLIGHT TESTING:

3.1 An aircraft shall be flight tested under the circumstances mentioned below:

(a) At the time of issue of Airworthiness Review Certificate (ARC) of aircraft operated by operators and subsequent to a major inspection schedule/ as specified by the manufacturer in case of scheduled airlines.

Note: The scheduled airlines, which have a system (vide para 7 of this part of the CAR) of meticulous flight monitoring of each revenue flight, for the guidance of their operating crew and also have a flight performance evaluation cell in their

engineering organisation, acceptable to DGCA, need not subject individual aircraft to test flight for the purpose of issue of ARC except under the circumstances detailed below in sub-paras (b) to (e). The Continuing Airworthiness Manager should furnish a certificate during every issue of ARC certifying that the aircraft performance has been continuously monitored and the performance is satisfactory. The procedures to be adopted by the performance evaluation cell shall be documented in the organization approved CAME.

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- (b) Subsequent to maintenance, repair, or modification which affect operational or flight characteristics of the aircraft.
- (c) For the purpose of evaluation in respect of fuel consumption engine power and performance of radio/ radar/ navigational equipment or instruments whenever these are doubted and cannot be satisfactorily checked on ground.
- (d) Subsequent to change of engine.
 - (i) On a twin engined aircraft a test flight after an engine change may not be carried out provided satisfactory engine ground testing procedure subsequent to an engine change and acceptable to Director General of Civil Aviation is evolved prior to availing of this relaxation. However, if two engines are changed a test flight is necessary.
 - (ii) On three engined aircraft, after a single engine change a test flight may not be carried out provided satisfactory engine ground testing procedure subsequent to an engine change and acceptable to Director General of Civil Aviation is evolved prior to availing of this relaxation. However more than one engine change will require a Test Flight.
 - (iii) On a four engine aircraft, after one or two engine changes, a test flight may not be carried out provided satisfactory engine ground testing procedure subsequent to engine change and acceptable to Director General of Civil Aviation is evolved prior to availing of this relaxation. However if more than two engines are changed, a test flight is necessary.

Note: - Engine change would mean removal of any engine and its replacement by :

- (i) an overhauled engine
 - (ii) an engine removed from any other position of the same aircraft or any other aircraft.
- (Reinstallation of the same engine on the same aircraft in its original position would not constitute an engine change for this purpose, provided the engine

has already been flight proven and the entire installation of the engine is double-checked and certified.)

(e) To satisfactorily determine the cause of a defect so as to assess the maintenance required to rectify the defect.

3.2 Notwithstanding the circumstances mentioned in para 3.1 above, DGCA may require any aircraft or any type of aircraft to undergo such flight-testing and at such frequency as considered necessary.

3.3 Operator of an aircraft shall, for each type of aircraft operated by it, specify in its approved Continuing Airworthiness Management Exposition / Maintenance Organisation Manual (CAME / MOM), the circumstances under which a flight test is to be performed. This shall not only include the circumstances laid down in para 3.1 above, but also any other currently known. Further procedures to be observed by maintenance personnel for the flight testing shall also be included in the exposition/ manual.

3.4 Whenever the performance of an aircraft during the flight test or at other occasions, is adversely commented upon by the flight crew, the same shall be reported to Regional Airworthiness Office promptly, along with the remedial measures envisaged to rectify the situation.

3.5 An appropriately authorized certifying staff issue the Certificate of Release to Service (CRS) as per CAR 145 / CAR M of an aircraft, shall prior to certifying, determine whether or not the circumstances are such that a flight test is necessary.

4. CERTIFICATION BEFORE FLIGHT TEST:

4.1 Before a flight test is made, the documents covering the maintenance repair, modification and inspection shall be completed in all respects and certified in accordance with the approved procedures listed in (CAME / MOM) and shall be produced before the pilot of the aircraft, if required.

4.2 When the requirements of para 4.1 have been met, and before the test flight, a certificate, to the effect that the aircraft is fit for the flight, shall be issued in duplicate on a proforma, by an authorized certifying staff who is permitted to issue Certificate of Release to Service. One copy shall be delivered to the pilot test flying the aircraft and the other copy shall be retained by the operator.

4.3 The certifying staff who signs the pre test flight certification documents shall also ensure that the document shows the purpose of test flight and the information required to be observed/ recorded during the test flight by the flight crew. The pilot test flying the aircraft shall also be briefed on these aspects.

5. PROCEDURE DURING TEST FLIGHT:

- 5.1 Operators shall, for each type of aircraft operated by them, provide in an approved routine test flight schedule, the detailed procedure to be followed/ observed while performing the flight test.
- 5.2 It shall be the responsibility of the operator to keep the test flight schedule, vis-a-vis manufacturer's/ DGCA's requirements, up-to-date.
- 5.3 As far as practicable, the routine test flight will be conducted at maximum all-up-weight, authorised for the type of aircraft, keeping in view the limitation imposed by the factors like aerodrome altitude/ temperature, runway length etc.
- 5.4 The routine test flight procedure will at least ensure: -
- (i) that “all-engine-operating climb performance is within acceptable limits, specified by the manufacturer/ DGCA, while effecting climb at the "best climbing speed".
 - (ii) that the cruise speed at the cruising engine power, is within the range specified;
 - (iii) that the stalling speed has not increased beyond the figure specified by the manufacturer.
 - (iv) that through normal operating range of the aircraft no abnormal vibrations exist;
 - (v) that flight controls operate and respond normally and satisfactorily.

Note: - The stalling characteristics of the aircraft if required to be checked, must be checked at a safe altitude.

- (vi) The radio/ radar equipment functions correctly as installed in the aircraft and the operating range is satisfactory.

6. FLIGHT TEST REPORT:

- 6.1 A flight test report appropriate to the flight test performed shall be completed by the pilot- in-command or by any other flight crewmember of the aircraft, authorised by the operator. The report shall detail the result of the flight test and record all defects experienced and adjustments made during the flight, besides recording of instruments readings as called for in the report (schedule).
- 6.2 The pilot-in-command shall be responsible for recording the result of the test flight and for making such comments in writing as considered necessary for a further test flight.

6.3 A flight test report and record of defects and adjustments shall be made in the flight logbook of the aircraft or other equivalent document approved by the Director General.

7. MONITORING OF FLIGHT PERFORMANCE OF AIRCRAFT OPERATED BY SCHEDULED AIRLINES:

7.1 The scheduled airlines may evolve a system within their "Operations Section" preparing flight plans, for the convenience of operating crew, for conducting each revenue flight, based on the performance data documented by the manufacturers. Under this system, operating crew should be expected to report back on the actual performance of aircraft during flight vis-a-vis the prepared plan. Significant variations in aircraft's performance shall be investigated by the operator so that corrective measures are initiated promptly.

7.2 Additionally, scheduled airlines will have aircraft performance monitoring cell in their CAMO for keeping the performance of each aircraft under continuous surveillance by regularly analysing the flight data like ROC, cruising speed, fuel consumption, range of Radio/ Radar equipment etc., collected from revenue flight reports for detecting any persisting shortfall in the performance of any aircraft.

7.3 In consultation with the manufacturers of aircraft/ DGCA, scheduled airlines shall specify in their Continuing Airworthiness Management Exposition the acceptable "shortfall for the guidance of maintenance staff.

7.4 On learning of the "shortfall" DGCA may order such further flight test or such other corrective action as considered necessary.

8. EVALUATION OF TEST FLIGHT REPORTS:

8.1 The "Rate of Climb" figure read off the aircraft instrument, during the climbing phase of the test flight, is related to test conditions, viz., mean altitude, mean temperature and mean weight. This will be termed as "observed actual climb performance" figure.

8.2 The "expected climb performance" figure corresponding to test conditions (mean altitude, mean temperature and mean weight) shall be obtained from the relevant manual of the aircraft, like Flight Manual, Operations Manual, Pilot's notes.

8.3 The "observed actual climb performance" figure (para 8.1) shall be within the limit prescribed by TC holder. In case this is not provided by the TC holder, then the climb performance shall not be lower by more than 3% (in terms of ft. per minute) of the "expected climb performance" figure (para 8.2) for the purpose of acceptance of test flight report.

- 8.4 In case necessary graphs for deriving "expected climb performance" figure corresponding to test conditions are not readily available, then appropriate "ROC correction factor" graph (Appendix to this CAR) be used either graph meant for constant speed propellers or for fixed pitch propellers, as applicable for determining the correction factor corresponding to mean altitude and mean temperature test conditions, stipulated in Flight Manual/ Operations Manual/ Pilots' notes, before ROC, thus corrected partly, is further corrected for test conditions of mean weight as described in the following para 8.5.
- 8.5 As the mean weight of the aircraft at the test conditions is invariably different from the maximum authorised all-up-weight for which ROC is specified in Flight Manual/ Operations Manual/ Pilots' notes, the following expression may be used for applying weight correction to obtain the finally corrected 'expected climb performance' figure:

$$\text{Expected R.O.C. (finally corrected)} = \frac{\text{R.O.C (Partly corrected, after applying correction factor obtained from Approx.)} \times \text{Maximum AUW}}{\text{Mean weight (at test condition)}}$$

- 8.6 The finally corrected "expected climb performance" figure shall then be compared with "observed actual climb performance" figure as described in para 8.3 above, for the purpose of acceptance of test flight report.

9. CERTIFICATION AFTER FLIGHT TEST:

- 9.1 When a satisfactory flight test has been performed and subsequent defects, if any, are rectified and certified an endorsement to this effect shall be made in the Pilot's Defect Report/ Maintenance documents/ aircraft log book by certifying staff responsible for issuing Certificate of Release to Service (CRS) as per CAR 145 / CAR M.
- 9.2 Thereafter the usual Certificate of Release to Service (CRS) may be issued.

10. FLIGHT CREW REQUIREMENTS:

For the purpose of flight tests, the number of flight crew to be carried on board shall be as specified in the flight manual.

The flight crew requirements for the purpose of flight test shall be as follows:

10.1 PASSENGER AND AERIAL WORK AIRCRAFT

The pilot carrying out the flight test shall be in possession of:-

10.1.1 FOR SINGLE ENGINED AIRCRAFT

- (i) a valid Commercial Pilot's Licence Airline Transport Pilot Licence endorsed for the type of aircraft; with
- (ii) at least 500 hours total flying time as Pilot-in-Command (PIC) which shall include :
 - (a) atleast 100 hours as PIC on type; of which
 - (b) at least 10 hours shall be as PIC on type or similar aircraft types within a period of six months immediately preceding the date of flight test.

10.1.2 FOR TWIN ENGINED AIRCRAFT

- (i) a valid Commercial Pilot's Licence Airline Transport Pilot Licence endorsed for the type of aircraft; with
- (ii) at least 1000 hours total flying time which shall include :
 - (a) atleast 500 hours flying time as PIC on twin engined aircraft; of which
 - (b) at least 100 hours shall be as PIC on type; and
 - (c) atleast 10 hours as PIC on type or similar aircraft types within a period of six months immediately preceding the date of flight test.

10.2 PRIVATE CATEGORY AIRCRAFT

10.2.1 The pilot carrying out flight test of aircraft fitted with Piston engine with Maximum Take-off Weight (MTOW) not exceeding 3000 kgs. and categorised as private aircraft in the C of A, shall be in possession of:-

- (a) atleast a valid Private Pilot's licence (PPL) endorsed for the type of aircraft; with

(b) at least 500 hours total flying experience which shall include:-

(i) atleast 200 hours as PIC, of which

(ii) at least 100 hours shall be on type; and

(iii) atleast 10 hours as PIC on type or similar aircraft types within a period of six months immediately preceding the date of flight test.

10.2.2 Test flight of aircraft other than piston engined aircraft having maximum take-off weight exceeding 3000 kgs shall be carried out as per the para 10.1.

10.2.3 Notwithstanding what has been specified, here in before, DGCA may consider permitting private owners to carry out the flight test on their own aircraft, after considering their total flying experience and type, thereof.

10.3 Gliders: Test flight of gliders including powered gliders shall be conducted by Glider Pilot licence (GPL) holders with current Flight Instructor Rating on the relevant type.

10.4 Notwithstanding the above, any other suitable pilot may be permitted to carry out test flights with the prior approval of DGCA.

11. SUBMISSION OF CERTIFICATE AT THE TIME OF ISSUE OF AIRWORTHINESS REVIEW CERTIFICATE.

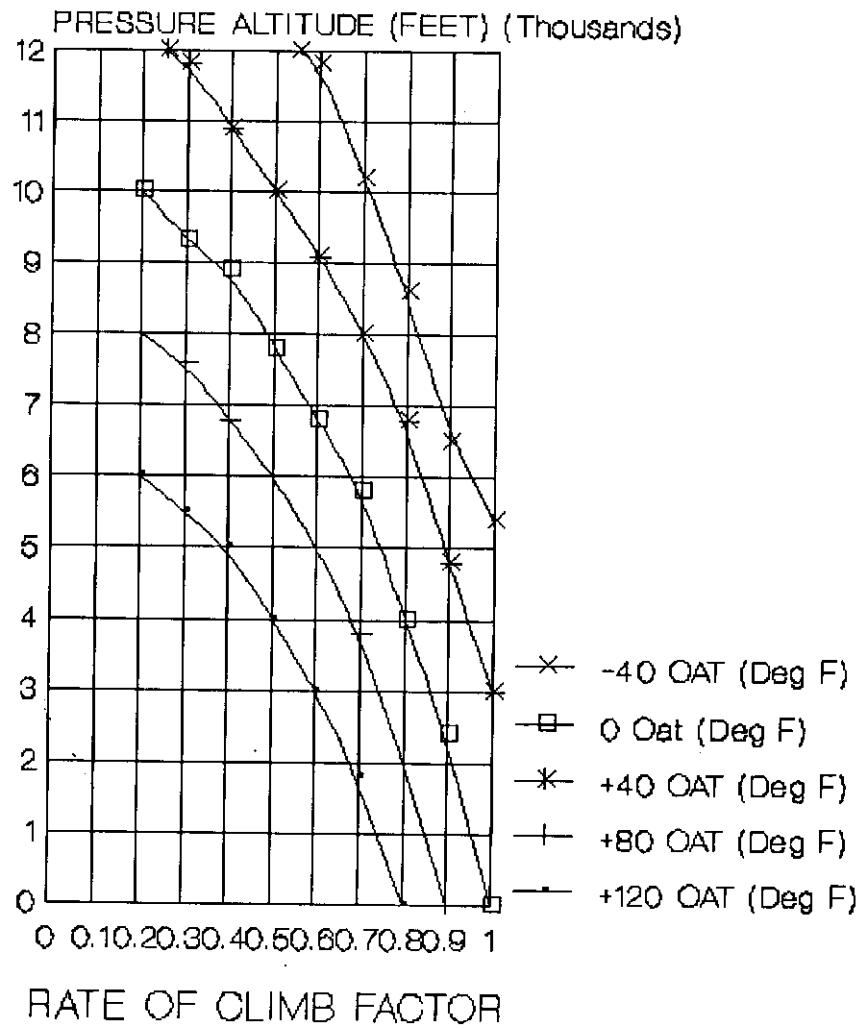
11.1 The Chief Instructor / Continuing Airworthiness Manager of an approved organisation shall submit a certificate to the Regional Airworthiness Office at the time of issue of ARC of the aircraft, stating that Test Flight/ Evaluations of revenue flights were carried out as and when required vide this part of CAR Series 'T' and the flight results did not reveal any deterioration in aircraft's performance/revealed deterioration in aircraft's performance which was within acceptable limits.



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APPENDIX I

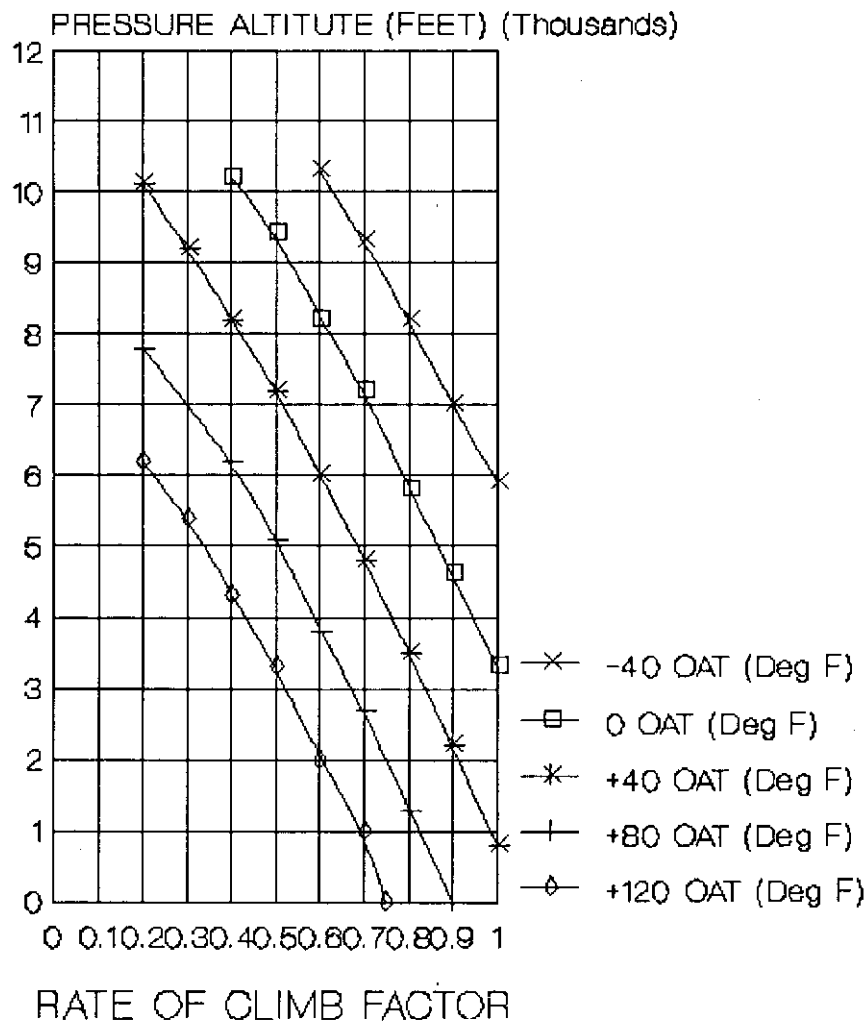
RATE OF CLIMB
 (FOR CONSTANT SPEED PROPELLERS)



T641

APPENDIX II

RATE OF CLIMB
 (FOR FIXED PITCH PROPELLERS)



T642