GR No. 4 Electrical Generation Systems – Aircraft Not Exceeding 5,700 kg Maximum Authorised Weight

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1 Introduction

1.1 Investigations into accidents and incidents involving total loss of generated electrical power to aircraft, the maximum authorised weight of which does not exceed 5,700 kg, have shown certain inadequacies in the standard of failure warnings and indications provided. Experience has shown that the loss of generated electrical power can remain undetected for a significant period of time, resulting in the serious depletion of the available battery capacity and reduced duration of supplies to essential services under these conditions.

1.2 This Generic Requirement is for the retrospective modification of certain aircraft to ensure that a clear and unmistakable warning of loss of generated electrical power is given, and to preserve or provide sufficient electrical energy to operate essential services for an adequate period of time in the event of such a loss occurring.

2 Requirement

2.1 For all multi-engined aircraft, the maximum authorised weight of which does not exceed 5,700 kg, compliance with paragraphs 2.2, 2.3, 2.4 and 2.5 of this Requirement, or with a CAA or EASA approved alternative (as appropriate) providing an equivalent level of airworthiness, is required.

2.1.1 Where it can be shown that an aircraft is fitted with such limited electrical and radio equipment, or is certificated to operate under such limited conditions (e.g. VMC day only) that the loss of generated electrical power would not significantly prejudice safe flight, the CAA will, on application, waive this Generic Requirement where it is satisfied that compliance would not be justified in the circumstances of a particular case.

2.2 Clear visual warning shall be provided, within the pilot's normal line of sight, to give indication of, either:

a) reduction of the generating system voltage to a level where the battery commences to support any part of the main electrical load of the aircraft, or

b) loss of the output of each engine driven generator at the main distribution point or busbars.

2.3 The battery capacity shall be such that, in the event of a complete loss of generated electrical power, adequate power will be available for a period of not less than 30 minutes following the failure, to support those services essential to the continued safe flight and landing of the aircraft, (see paragraph 3.1). This includes an assumed period of not less than 10 minutes from operation of the warning specified in paragraph 2.2, for completion of the appropriate drills. This delay period may be reduced to not less than five minutes if the warning system is provided with attention getting characteristics (e.g. a flashing light). For the purpose of calculations it shall be assumed that the electrical load conditions at the time of failure warning are those appropriate to normal cruising flight at night (see paragraph 3).

2.4 Where all gyroscopic attitude reference instruments, i.e. bank and pitch indicator(s) and turn and slip indicator(s), are dependent on electrical power for their operation, at least one of these instruments shall continue to operate without crewaction for the prescribed 30 minute period.

NOTES 1 For certain aircraft types a turn and slip indicator may not be acceptable as the sole remaining attitude reference instrument.

2 Certain aircraft are equipped with both electrically operated and air driven attitude reference instruments. In such cases the air driven instrument(s) will be accepted as providing the emergency attitude information provided that the requirements of paragraph 2.4.1 are met.

2.4.1 The instrument(s) with which the requirement of paragraph 2.4 will be met shall be clearly designated, and:

a) shall be so located on the instrument panel that it will be visible to, and usable by, the pilot from his normal position;

b) shall be provided with means of indicating that the power supply to the instrument is operating correctly.

2.5 Precise drills covering crew action in the event of electrical generation system failures and malfunctions shall be included in the appropriate aircraft manual(s), together with a statement of the battery endurance under specified load conditions.

3 Additional Information

3.1 When ascertaining that the installed aircraft battery capacity is adequate for compliance with paragraph 2.3, the following loads should be taken into account:

a) Attitude information (where applicable in accordance with paragraph 2.4).

b) Essential Radio Communication.

NOTE: For the purpose of calculations it will normally be accepted that intermittent use of a single VHF communication equipment satisfies this requirement. Utilisation on the basis of a total of 15 minutes reception plus 3 minutes transmission in the 30 minute period would be an acceptable interpretation.

c) Essential cockpit lighting.

d) Pitot Head Heater (applicable only to those aircraft certificated for flight in icing conditions).

e) Any other services essential for the continued safe flight and landing of the particular aircraft.

f) Those services that cannot readily be shed when carrying out the drills required under paragraph 2.5.

3.1.1 In order to ensure that the essential services, taken into account in accordance with paragraph 3.1, will function adequately for the prescribed period, the calculation of the duration of battery supply should normally be based on the following assumptions:

a) Only 75% of the 'name plate' rating of the battery is available (this is to take into consideration loss of capacity with age, and a realistic state of charge).

b) The voltage/time discharge characteristic of the battery, appropriate to the load of the listed services, is not extended beyond a battery terminal voltage of 21·5 volts on a 24 volt system, pro rata for 12 volt systems, (this is to ensure that the voltage

available throughout the prescribed period is adequate for the satisfactory operation of the services).

NOTE: Only where compliance with this Requirement cannot be shown within the criteria of paragraphs 3.1 and 3.1.1, will consideration have to be given to the fitment of additional, or larger capacity, batteries to particular aircraft.

3.2 Applications for the approval of modifications necessary to ensure compliance with this Generic Requirement should be made in the manner specified in BCAR Sections A and B, Chapters A2-5 and B2-5, or Part 21 as appropriate.