الطيران المدني
Civil Aviation
الإدارة العامة للطيران المدني - دولة الكويت
Directorate General of Civil Aviation - State of Kuwait

Kuwait Civil Aviation Safety Regulations

KCASR 8 - AIRWORTHINESS OF AIRCRAFT AND CONTINUOUS AIRWORTHINESS

PART GEN AIR
GENERAL REQUIREMENTS FOR AIRWORTHINESS - AMC

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Amendment Record

Amendment No	Date of Issue	Remarks
1	June 2018	Part Rename

Control of this Document

DC.1 Introduction

DC.1.1 Pursuant to Law No (30) of the year 1960 and subsequent Ministerial Decisions No (3) of the year 1986, No (18) of the year 1990, and No (3) of the year 1996, based upon that Law and as reflected in the Preamble to the Kuwait Civil Aviation Safety Regulations, Issue 3, Rev.0, August 2013, the President of the Kuwait Directorate General of Civil Aviation is empowered to adopt and amend Kuwait Civil Aviation Safety Regulations. In accordance herewith, the following AMC is hereby established for compliance by all persons concerned. This AMC shall be known as KCASR 8 - Part GEN AIR General Requirements for Airworthiness Acceptable Means of Compliance (AMC) Material and any reference to this title shall mean referring to these regulations governing the requirements to be met for the additional airworthiness requirements for aircraft.

DC.2 Authority for this Regulation

DC.2.1 This KCASR 8 - Part GEN AIR General Requirements for Airworthiness Acceptable Means of Compliance (AMC) Material is issued on the authority of the President of the Kuwait Directorate General of Civil Aviation.

DC.3 Applicability

DC.3.1 This KCASR 8 - Part GEN AIR General Requirements for Airworthiness Acceptable Means of Compliance (AMC) Material is applicable to the aviation industry of the State of Kuwait.

DC.4 Scope

DC.4.1 KCASR 8 – Part GEN AIR AMC Material contains acceptable means of compliance in support of the additional airworthiness requirements introduced by KCASR 8 - Part GEN AIR.

DC.5 Definitions

DC.5.1 Terms not defined shall have the meaning given to them in the relevant legal instruments or international legal instruments in which they appear, especially as they appear in the Convention and its Annexes.

AMC 1 to CAW 001 Personnel Certification for Non-Destructive Testing of Aircraft, Engines, Components and Materials

1 Qualification Standards

The Kuwait DGCA recognises the following independent qualifications as appropriate for the position of Nominated Level 3:

(a) EN4179 Level 3 as administered by a BINDT accredited Outside Agency

(b) PCN/AERO Level 3

(c) ASNT Level 3

2 Acceptable NDT Bodies

An acceptable body for ensuring NDT qualification is the UK NANDT Board. Other equivalent bodies may be acceptable to the Kuwait DGCA.

2.1 The UK NANDT Board is responsible for but not limited to:

(a) control and support of the implementation of applicable standards covering qualification, certification and authorisation of NDT personnel;

(b) formulation of the necessary qualification policy framework;

(c) maintaining an overview of the implementation of its policy and approving the methods and levels of any charges in connection thereof;

(d) having the authority to set up working groups and committees, establish their terms of reference and set out the procedures whereby they report to the UK NANDTB;

(e) advising industry and regulatory authorities on training and qualification applicable to new and emerging NDT technologies not covered by EN4179.

2.2 The UK NANDTB also provides a mechanism for maintaining an overview of EN4179 and PCN/AERO qualification examinations.

2.3 The UK NANDTB policies and procedures can be found on the following web site: http://www.bindt.org/NANDTB/NANDTB.html.

AMC 1 to 24-001 Electrical Generation Systems – Aircraft below 5700 kg MTWA

1 Battery Capacity - Additional Information

1.1 When determining that the installed aircraft battery capacity is adequate for compliance with paragraph 2.3 of GEN-AIR 24-001, the following loads should be taken into account:

(a) Attitude information (where applicable in accordance with paragraph 2.4 of GEN-AIR 24-001).

(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 by paragraph 2.6 of GEN-AIR 24-001.

1.2 In order to ensure that the essential services, taken into account in accordance with paragraph 1.1 of this AMC, 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 1.1 and 1.2, will consideration have to be given to the fitment of additional, or larger capacity, batteries to particular aircraft.*

1.3 Applications for the approval of modifications necessary to ensure compliance with General Requirement 24-001 should be made in the manner specified in KCASR 8, Part 21 Subpart D.

AMC 1 to 24-002 Electrical Generation Systems – Bus-Bar Low Voltage Warning Single-Engined Aircraft with a Kuwait Certificate of Airworthiness

1 Low Voltage Warning Additional Information

1.1 The recommended voltage levels for operating the warning required under paragraph 2.2 of this General Requirement 24-002 are 25 volts to 25·5 volts for a nominal 24 volt dc system and 12·5 volts to 13 volts for a nominal 12 volt dc system.

1.2 The battery duration should be sufficient to make a safe landing and should be not less than 30 minutes, subject to the prompt completion of any drills. This duration need only be a reasonable estimate and not necessarily calculated by a detailed electrical load analysis. However, when making this estimate, only 75% of the battery nameplate capacity should be considered as available because of loss of battery efficiency during service.

1.3 Owners and operators are recommended to contact the aircraft manufacturer or main Aircraft dealing agent for information regarding suitable means of compliance with General Requirement 24-002.

1.4 Owners and operators may, on application, submit proposals for their own means of compliance and should refer to the guidelines laid down in AMC 2 to General Requirement 24-002.

AMC 2 to 24-002 Electrical Generation Systems – Bus-Bar Low Voltage Warning Single-Engined Aircraft with a Kuwait Certificate of Airworthiness

1 Introduction

This AMC 2 provides guidance material to achieve compliance with General Requirement 24-002 and provides a list of acceptable low voltage units currently available.

2 Low Voltage Units

2.1 General Requirement 24-002 requires a single-engined aircraft equipped with an engine driven electrical generating system to be provided with a clear and unmistakable warning to the pilot that the alternator or DC generator output voltage has fallen to a level where the battery is supplying power to the electrical loads. However, the requirement is waived where an aircraft is equipped only to operate under day VMC conditions and where the loss of generated power could not prejudice continued safe flight and landing.

2.2 Service experience in other states has shown that the following alternator/generator failure warnings will NOT be acceptable for compliance with General Requirement 24-002:

(a) Warnings sensed within the generator/alternator windings because they will not detect failures between the output terminals and distribution bus. This method of failure detection is known to be used on many models of Piper single-engined aircraft, and

(b) Warnings which rely upon wide voltage differentials because they will only operate when the output voltage is well below that of the battery, thus when the warning illuminates the battery may have lost a significant proportion of its capacity.

Note: *Aircraft currently equipped with such systems should therefore be modified to comply with General Requirement 24-002.*

3 Equipment

3.1 An acceptable means of compliance would be to provide a red bus bar low volts warning, similar to the 12 volt or 24 volt units, which were designed and manufactured for installation in multi-engined aircraft, for compliance with the requirements of General Requirement 24-001.

The following units have been found acceptable for satisfying the requirements of General Requirement 24-002:

(a) Avionics Mobile Ltd units: AM–LV14–00 and AM–LV28–00

(b) LRE GmbH units: L403–450–12 and L403–450–24

(c) Rogers Aviation units: RLV/14/28

(d) CSE units: BVM14 and BVM28

(e) Bradford units – from McAlpines:

(1) 3025–12/3025–14 (flashing)

(2) 3026–12/3026–24 (flashing, light dims when cancelled)

(3) 3027–12/3027–24 (steady, non-dimming, non-cancellable)

Advice may be sought from the Airworthiness Section of the Kuwait DGCA Aviation Safety on the suitability of other devices which may be available.

3.2 It is recognised that other manufacturers or individuals may wish to produce similar devices and for this reason the following specification is issued as general guidance on a standard which would be acceptable to the Kuwait DGCA in the first instance based on the adoption of state of design requirements:

Specification

Indication:	Red warning light – steady or flashing.
Flash Rate:	50 to 100 cycles per minute.
(Optional)	
Dimming:	Not acceptable unless automatic reset is provided.
Trigger Voltage:	The warning lamp should illuminate decreasing voltage at: (i) 25.0 to 25.5 volts for 24 volt DC systems. (ii) 12.5 to 13.0 volts for 12 volt DC systems.
Resetting:	The warning should reset automatically to extinguish the lamp on a rising voltage 0.5 volts above these settings.
Voltage Ranges:	33.0 to 18 volts DC or 16.5 to 9 volts DC.
Environmental Conditions:	Generally, qualified in accordance with British Standards BS3G100 or EUROCAE ED-14 (RTCA DO-160), for example as follows:
Operating Temperature Range:	–10°C to 40°C
Mechanical Loads:	Units should be capable of withstanding typical shock and vibration loads found in service.
Moisture:	The unit should either be encapsulated or shown to be capable of withstanding ingress of moisture. A simple water spray test would be sufficient to show compliance.
Fire and Smoke Hazard:	Unit should not be capable of producing toxic fumes or smoke under fault conditions, neither should it be capable of supporting combustion.
Radio Interference:	The unit should not create interference on radio communication or navigation equipment.
Compass Interference:	The safe compass distance should be specified.

Identification:	The unit should carry an identification of the manufacturer, its part number and serial number.
Testing:	The unit should be subjected to an endurance test of not less than 2 hours under normal conditions (i.e. warning not lit) and 1 hour with the warning operating.
Acceptance:	The specification, drawings and test evidence should be submitted to the Kuwait DGCA as a modification in accordance with KCASR 8, Part 21 Subpart D in the first instance for acceptance before the unit is fitted to any aircraft (see also paragraph 7).
Release:	The manufacturing release of any associated equipment to comply with General Requirement 24-002 should be in accordance with a NAA acceptable to the Kuwait DGCA stated in KCASR 8, Part 21, Subparts K, and D.

4 Installation

The following information should be used:

4.1 The warning lamp should be mounted where it will be readily seen by the pilot. Steady lights will normally need to be mounted in the vicinity of the primary flight instruments whereas those which flash may be acceptable in a less central location.

4.2 The low bus voltage warning detector should be connected to the bus system through its own individual fuse or circuit breaker or to one of a suitable rating already fitted to the aircraft for a non-essential service such as a cigar lighter or cabin lighting, etc.

4.3 This AMC No 2 has concentrated on low bus volts monitoring because it is considered the simplest and most effective method, but other means of providing an acceptable alternative could be engineered and these will have to be assessed on an individual basis.

5 Pilot's Instructions

Instructions should be provided in the appropriate manual, such as the Pilot's Operating Handbook on the operation of the system and the pilot actions to be taken should the warning operate. A suggested format is attached AMC No 3 to General Requirement 24-002. It is recommended that the minimum battery endurance available is specified following the warning and for practical purposes it should be not less than 30 minutes (see Paragraph 6 below).

6 Battery Duration

6.1 Battery endurance can be estimated from either a practical test which involves applying typical aircraft loads for a period of time or by calculation. In either case, only 72% of the name plate capacity should be considered available because of loss of battery efficiency during service and its state of charge. The recommended statement is only intended to give the pilot an estimate of the battery endurance and conditions under which it can be achieved. Furthermore, because it is a relatively broad band estimate it should only be necessary to amend it if a refit with extra electrical loads is carried out.

6.2 An example of how to calculate the duration is given below:

(a) Check the nameplate capacity of the battery and assume 72% is available, e.g. 12 amp-hour = 720 amp-mins.

Thus 72% = 518.4 amp-mins.

(b) Estimate the normal or pre-load shed cruise consumption,
e.g. 15 amps (15 amps x 5 mins = 75 amp-mins).

Assuming 5 minutes for pilot to shed essential loads following the low voltage warning.

(c) Estimate the minimum cruise load needed to maintain flight after the generator/alternator has failed,
e.g. 10 amps.

(d) Estimate the consumption required during the landing approach,
e.g. 20 amps for 5 minutes (100 amp-mins).

The **cruise** duration is therefore:

$$\frac{\text{Battery Capacity (a)} - [\text{Pre-load Shed (b)} + \text{landing load (d)}}{\text{Cruise Load (c)}}$$

$$\frac{518.4 - (75 + 100)}{10} = \frac{343.4}{10} = 34.3 \text{ min}$$

Total duration= pre-load shed cruise time + cruise duration + landing time

= 5 + 34.3 + 5

= 44.3 mins

7 Modification Status

7.1 Installations can normally be approved in accordance with a modification in accordance with KCASR 8, Part 21 Subpart D.

7.2 Should any organisation or individual wish to produce a modification to install a suitable low bus voltage warning detection unit for general use in compliance with General Requirement 24-002, it will be necessary for all documentation to be submitted in the first instance to the Kuwait Aviation Safety Department for acceptance of the unit in accordance with KCASR 8, Part 21 Subpart D. The individual or organisation should retain the documentation with the aircraft records.

8 Applicability

8.1 The requirements will be applicable to aircraft equipped with an engine driven electrical generating system.

AMC 3 to General Requirement 24-002

<ORGANISATION IDENTIFICATION>

Flight Manual/Pilot's Operating Handbook Reference: <xxxxxxxxxxx>

Supplement No. <xxxxx> **Issue:** <xx>

Aircraft Type: <xxxxxxxx>

Registration Mark: <xxxxxx> **Aircraft Serial No:** <xxxxxxx>

ADDITIONAL LIMITATIONS AND INFORMATION FOR CERTIFICATION

The limitations and information contained herein either supplement or in the case of conflict override those in the flight manual/POH

LOW BUS VOLTS WARNING

A steady/flashing warning light is installed which will illuminate if the generator/ alternator output reduces to a level where the battery supplies power to the bus-bar.

Before engine start

Check Low Volts warning: ON

After engine start

Check Low Volts warning: OFF

If warning illuminates during flight

Reduce Electrical Load

Battery duration approx. ..... mins

Land as soon as possible

Note: Warning may illuminate with low engine rpm. Check it goes out when rpm increased.

Approved as part of applicants modification no. <xxxxxxx>

Kuwait DGCA Approval no. <xxxxxxxxx>

Date:

AMC 1 to 24-003 Emergency Power Supply for Electrically Operated Gyroscopic Bank and Pitch Indicators (Artificial Horizons)

1.1 Under conditions of widespread adverse weather, or heavy traffic density at airports, a period of 30 minutes may be a less than desirable time for flight to a suitable airfield and landing, and clearly this period by itself is inadequate for long range aircraft.

(a) The certification basis of the State of design of all long range, and of certain short/medium range, aircraft types is that after a period of interruption of electrical supplies it will be possible for the crew to re-establish sufficient normal, or emergency, generated power to support all necessary essential services, including the instrument covered by General Requirement 24-003, for the remainder of the flight. The prescribed period of 30 minutes is considered to be adequate to allow for appropriate crew action for this class of aircraft.

(b) For those shorter range aircraft that are totally dependent on battery power to support all essential services to the completion of the flight, a period of 30 minutes assuming a crew delay time of 10 minutes, is the mandatory minimum endurance of the emergency supply for the horizon instrument prescribed in this General Requirement 24-003.

(c) It is, however, strongly recommended that in circumstances where the crew do take prompt and correct actions in response to warning indications of the interruption of all generated electrical power, the aircraft installation should include adequate battery capacity to provide a 60 minute supply for both the subject instrument and the other services essential to complete the flight and make a landing.

1.2 A number of aircraft types already comply with the requirements of General Requirement 24-003, or incorporate other special features which have been considered and accepted by the Kuwait DGCA at Type Acceptance as providing an equivalent level of safety.

1.3 In the case of aircraft types, which do not comply or not accepted by the Kuwait DGXA as complying, the Owners and Operators of such aircraft are, therefore, recommended to contact the Aircraft Manufacturer (Constructor) concerned for information regarding suitable modifications.

AMC 1 to 24-004 Electrical Power Supplies for Aircraft Radio Systems Interpretation for Compliance

1 In examining electrical feeder arrangements to establish compliance with paragraph 2, of General Requirement 24-004 the examination for likely single failures should include:

(a) the mechanical and electrical aspects of the supply circuit, including the return path of the electrical supply;

(b) the location within the electrical circuit of fuses, circuit breakers and power switching relays, their physical location in the aircraft and the manner in which they are interconnected; and

(c) panels for integrated control of radio systems, audio integration systems, and dimmer control equipment for electronic displays.

AMC 1 to 25-003 Improved Flammability Test Standards for Cabin Interior Materials

1 Additional Information

1.1 For the purpose of General Requirement 25-003, the term 'substantially complete cabin interior renewal', has been used to cover the renewal of all sidewall panels, ceiling panels and/or overhead stowages, whether this is done at one refurbishment or progressively over a period of time as part of a planned cabin interior renewal programme.

1.2 The requirements of General Requirement 25-003 are not applicable to individual cabin interior components which are refurbished or have to be replaced due to unserviceability, e.g. individual sidewall or ceiling panels or overhead stowage doors.

However, where these components are newly manufactured the Kuwait DGCA strongly recommends that they should meet the appropriate requirements of General Requirement 25-003.

1.3 The requirements of General Requirement 25-003 are not normally applicable to the internal structures of galleys and overhead stowages, floor panels and floor coverings, transparent or translucent components such as lenses used in interior lights, illuminated signs and window anti-scratch panels, and other small cabin items such as door and window mouldings, curtains, window shades, seat trays, arm rests and parts of the passenger service units. However, these requirements would be applicable to large surface panels of passenger service units.

1.4 If there is any uncertainty as to the applicability of General Requirement 25-003 the Kuwait DGCA's Aviation Safety Department should be consulted for clarification.

AMC 1 to 25-005 Helicopter Emergency Escape Facilities

1 Liferafts

1.1 Para 4 of General Requirement 25-005 requires helicopter liferafts to have a high level of damage tolerance. This can be provided in part by design of the liferaft, but action is also necessary to minimise the chances of liferaft damage while the liferaft is on the water adjacent to the helicopter, due to projections on the exterior of a helicopter.

1.2 Examples of projections which should be considered include:

(a) aerials,

(b) overboard vents,

(c) unprotected split pin tails,

(d) guttering and any projection sharper than a three dimensional right angled corner.

1.3 It is recommended that all projections likely to cause damage in a zone delineated by boundaries which are approximately 1·22 m (4 ft) above and 0·61 m (2 ft) below the established static water line, should be modified or suitably protected to minimise the likelihood of their causing damage to a deployed liferaft, and that all relevant approved maintenance schedules should be amended to ensure that such protection remains effective.

1.4 While the boundaries specified in paragraph 1.3 of this AMC are intended as a guide, the total area which should be considered should also take into account the likely behaviour of the liferaft after deployment in all sea states up to the maximum in which the helicopter is capable of remaining upright.

1.5 Operators and maintenance organisations are reminded that wherever a modification or alteration is made to a helicopter within the boundaries specified, consideration should be given to affording such protection as may be required to prevent the modification or alteration causing damage to a deployed liferaft.

1.6 Particular care should also be taken during routine maintenance to ensure that additional hazards are not introduced by, for example, leaving inspection panels with sharp corners proud of the surrounding fuselage surface, or allowing door sills to deteriorate to a point where sharp edges become a hazard.

1.7 The same considerations apply in respect of emergency flotation equipment.

1.8 Operators should ensure that the maintenance of on board flotation equipment is addressed in the helicopter's maintenance programmes and their MELs.

AMC 1 to 26-001 Fire Precautions - Aircraft Toilets

1 Interpretation of Requirements

1.1 State of Design requirements such as JAR 25.853(h), CS 25.853(h) and BCAR Section D, Chapter D4-3 paragraph 6.4.1 state that all receptacles for used towels, papers and waste shall be constructed of materials resistant to fire. The receptacles shall incorporate covers or other provisions for containing fires if started in the receptacle.

1.2 For compliance to be shown, such receptacles (but see 1.4 of this AMC for towel dispensers) should be constructed of materials which are flame resistant (Note 1) , and which in addition, will retain sufficient mechanical properties as to contain such a fire as may develop by burning of materials such as paper towels, as may be within the receptacle. (It should be noted that although a thermoplastic material may be flame resistant it would not necessarily retain adequate mechanical properties in the case of a fire). The receptacle should be completely enclosed with the exception of a self-closing entry flap or door, which itself should be rigid, and when closed, form as airtight a seal as is practicable. Entry flaps or doors should be designed so that they remain self-closing even after exposure to a fire within the receptacle.

Note 1: *Suitable methods for flame resistance testing are contained in EASA- CS 25/ JAR-25 Appendix F.*

1.3 It is, however, permissible for receptacles to be open topped provided that they are mounted in a cabinet which itself complies with 1.2 of this AMC. In this instance, the door of the cabinet should be of a robust construction and such as to ensure an adequate seal and to withstand misuse in service. Such cabinets should not contain other flammable materials, potential fire sources (e.g. electrical apparatus) or apertures which would either allow air to feed a fire or permit a fire to spread beyond the cabinet (e.g. through apertures provided for services).

1.4 It is accepted that some receptacles, e.g. paper towel dispensers, cannot readily be designed to meet the above requirements. In such instances they should be so designed and positioned within the compartment to ensure that:

(a) the likelihood of the depositing of cigarette ends, etc., into them is minimised, and

(b) a fire, which could be expected to start in another container, cannot readily spread to them; for example, a paper towel dispenser must not be positioned adjacent to, or immediately above, either the entry flap or door of a waste container or an ashtray provided in the compartment.

AMC 1 to 32-001 Tyre Bursts in Flight - Inflation Media

1 Supporting Information

1.1 State of Design requirements such as CS 25.734, JAR 25.729(f), BCAR Chapter D4-5 paragraph 1.2 and TSS Standard 5-6 paragraph 9, require equipment to be protected from the effects of tyre burst. In addition the Kuwait DGCA requires the operational hazards due to tyre bursting in flight be minimised.

1.2 The majority of in-flight tyre bursts have been attributed to the tyre carcass being weakened by foreign object damage, scuffing, etc., such that a rapid release of pressure takes place. Such failures are usually experienced when the gear has been retracted for some time and the effects of brake heat transfer, internal tyre temperature and differential pressure are combined.

1.3 A fatal accident involving cabin decompression and fire has highlighted another mode of tyre failure in flight where a tyre may fail explosively without any significant prior degradation. A tyre inflated with air and subjected to excessive heating, possibly caused by a dragging brake, can experience a chemical reaction resulting in release of volatile gases. Such a chemical reaction in the presence of the oxygen in the contained air may result in a tyre explosion in a landing gear bay and/or an in-flight fire since it appears that the protection normally afforded by conventional pressure relief devices in the wheel would be incapable of responding adequately to the rapid increases in temperature and gas pressure associated with auto-ignition.

1.4 Laboratory material and tyre burst testing indicates that the risk of auto-ignition can be reduced by using an inert gas for tyre inflation and servicing.

1.5 Other potential benefits may accrue from the use of Nitrogen as it will tend to reduce wheel corrosion, tyre fatigue and the risk of fire when fusible plugs melt due to brake overheating.

AMC 1 to 51-001 Painting of Aircraft

1 Additional Information

1.1 Examples of likely damage and hazards that must be avoided when painting include:

(a) Damage caused during preparation work which could adversely affect the structural integrity of the aircraft, such as:

(1) reduction in fastener head size by uncontrolled use of power tools and abrasive media;

(2) surface scratching by use of paint scrapers;

(3) use of incorrect tools and equipment to remove paint and aerodynamic sealant from lap and butt joints;

(4) degrading of composite or plastic surfaces by abuse of particle blasting techniques;

(5) aluminium surface contamination by steel wool particles; and

(6) use of incorrect chemical paint strippers.

(b) Damage to transparencies, composites and sealants by solvent and paint removers, due to inadequate protection and/or the retention of these products in crevices.

(c) Inadvertent deletion of placards and markings, failure to renew them, or failure to comply with the required specification for, e.g. Registration Marks, mandatory door markings and break in zone identification.

(d) Blockage of vents, drains and other openings by debris, masking tape and residues of paint remover, paint or particle blast material; the possible ingress of water into fuel tanks through vent apertures or past filler cap seals when using high pressure hoses for washing down.

(e) Loss of correct mass balance moments on flight control surfaces.

(f) Uncontrolled variations to aircraft basic weight.

(g) Variation to surface profile and aerodynamic smoothness at critical points such as surface leading edges, by the uncontrolled use of fillers or excessive paint thickness.

(h) Inadequate knowledge of the manufacturers' finishing schemes for antennas and radomes.

(i) Overly aggressive paint stripping which could damage the sealant around air data ports/orifices on RVSM compliant aircraft (air flow over these areas is critical for the height keeping capability of the aircraft).

(j) For fabric coverings, special procedures which ensure proper adhesion and protection from the effects of ultra-violet light. Aggressive removal of the old finish may cause fabric damage. The exposed fabric should be assessed for its serviceability prior to refinishing. The advice published by the manufacturer of synthetic fabric would have to be made available and complied with in full as well as that of the aircraft manufacturer.

(k) The effects of excessive paint thickness on the application of non-destructive testing techniques using eddy current and ultrasonic methods.

(l) Jamming of flight control and landing gear mechanisms by preparation treatments and paint.

1.2 Examples of finishing work that would require the issue of a Certificate of Release to Service (CRS):

(a) Complete repainting from bare metal or fabric, or overcoating an existing finish.

(b) Reversion from paint finish to polished metal.

(c) Repainting or reversion to bare metal on flying control surfaces or supercritical lifting surfaces.

(d) Extensive polishing of bare metal finish using abrasive polishes where skin thickness or fastener head dimensions are critical, particularly where polishing is to be a repetitive requirement.

(e) Finishing of radomes, antennas and composite materials used in Primary and Secondary structure.

(f) Painting in areas involving critical orifices or mandatory markings.

(g) Any alteration to the finish of Helicopter main rotor and tail rotor blades or any other critical parts.

1.3 It is recommended that aircraft issued with a Permit to Fly should be subject to the same principles of compliance with this Generic Requirement, although there is no legal requirement for the issue of a Certificate of Release to Service.

1.4 Operators and maintenance organisations are reminded that the use of self-adhesive decals as an alternative to painting may totally preclude both visual and eddy current inspections. Operators and maintenance organisations need to address the impact on structural inspection tasks when using such decals and ensure that the aircraft maintenance programme requires their removal at the appropriate time.

AMC 1 to 52-001 Cargo Containment

1 Background Information

1.1 In view of the increase in the carriage of livestock, DGCA has adopted the state of design requirements for the means of restraint being used for this and other cargo and the ways in which compliance has been established. The state of design requirements include JAR 23.787, JAR 25.787, JAR 27.787, JAR 29.787, and BCAR Section D, Chapter D4-3, paragraph 2,as appropriate.

1.2 The appropriate state of design requirements require that cargo compartments and the means provided for the restraint of the cargo should have sufficient strength to restrain the cargo under flight and ground conditions to prescribed acceleration factors. In addition, unless the compartment and cargo are so located that in the event of the cargo breaking loose in emergency alighting conditions it is unlikely to cause injury to the occupants of the aircraft, damage fuel tanks or lines, or to nullify any of the escape facilities, the compartment and the means provided for restraint of the cargo should also comply with the emergency alighting conditions of CS/JAR 23.561, CS/JAR 25.561,CS/ JAR 27.561, CS/JAR 29.561, and BCAR Chapter D3-8 as appropriate.

1.3 Past surveys of containers (such as pens and horseboxes) has shown that usually the restraint of the animals depends on the containers themselves and that these are not always of adequate design and construction to enable the requirements to be met.

2 Procedure

2.1 When a container is designed for use only in a particular type of aircraft, the container and its installation will be considered to be a modification to the aircraft. The approval of the modification should be in accordance with the modification requirements of KCASR 8, Part 21 Subpart D.

2.2 A container designed for use on various types of aircraft will be considered as an Accessory/part. The approval procedure for the part should be in accordance with the requirements of KCASR 8, Part 21, Subpart K.

(a) The manner of installation into any particular aircraft will need to be certificated as being in compliance with the appropriate requirements and with the associated equipment Declaration of Design and Performance, under the Modification requirements of KCASR 8, Part 21, Subpart D.

Note: *A container produced in compliance with JAR-TSO C90c or FAA TSO C90c (FAR 37.199) will be accepted on the basis of having been manufactured to procedures equivalent to those referenced in paragraph 4.2.*

3 Additional Information

3.1 Kuwait DGCA approval will be limited to the airworthiness features of the container with regard to the aircraft, flight crew and other persons present on the flight. It will not cover the safeguarding of the cargo or, in the case of livestock, its welfare.

3.2 It is recommended that containers should be sufficiently robust and simple that assembly and/or installation into the aircraft would not constitute work necessitating the signing of a Certificate of Release to Service.

3.3 It is strongly recommended that, in view of the mishandling to which such equipment may be subjected, the instructions provided in accordance with paragraph 2.3 of General Requirement 52-001 should also contain advice as regards tolerable damage and any resulting load limitations.

3.4 Operators are reminded that they are responsible for safeguarding the aircraft structure and equipment against the effects of corrosive liquids and any other materials which could cause damage or malfunction.

3.5 Where restraint of the cargo and container is provided by approved nets, bulkheads, etc. and no reliance is placed on the strength of the container, then such containers will not be subject to the above requirements.

AMC 1 to 52-002 Access to and Opening of Type III and Type IV Emergency Exits

1 Background

1.1 From a review of accidents, where rapid evacuation of the aeroplane was a critical factor governing passenger survival, experience has shown that mid-cabin Type III emergency exits, although only rated for a relatively small number of passengers, could, in certain circumstances, become a major escape route.

1.2 Following experience in other ICAO states it has been decided to extend the applicability of this General Requirement to include Type IV exits and to specify the requirements for face-to-face seating configurations.

1.3 Current Requirements governing the access to Type III and Type IV emergency exits do not quote specific dimensions for the minimum width of access to such exits between adjacent seat rows. Tests have demonstrated that, with typical economy class seats, seat pitches down to approximately 30 inches have little or no effect on the rate of exit egress. The major constraint on the location of seats relative to such exits is the need to ensure that the seats do not impede the removal and disposal of the exit hatches.

1.4 The Kuwait DGCA believes that Type III and Type IV emergency exits need to be made more effective and in line with other international aviation regulators is seeking to adopt improvements in access to and ease of opening of such exits.

Accordingly, this General Requirement has been issued to ensure effective opening, handling and disposal of the hatch and to define the additional minimum access requirements for Type III and Type IV emergency exits.

2 Additional Information

2.1 When measuring the minimum access width between seat rows leading to Type III emergency exits, seat pans (if able to tip up) are to be down and seat backs must be in the upright (take-off and landing) position.

2.2 No alleviation to these requirements will be granted on the basis of deformable soft furnishings, except that, for Type III emergency exits only, some projection of the seat cushion above the lower sill height may be permitted, provided that this projection does not impede the rapid opening of the exit. Such configurations will be the subject of individual evaluation.

2.3 Where a particular emergency exit is larger than the defined measurements of state of design requirements such as EASA CS and BCAR, it is permissible when establishing compliance with paragraph 3.3 of GEN-AIR 52-002, to assume the required minimum exit size and the maximum step-up and step-down limitations of the state of design requirements provided that this required minimum exit size, when superimposed on the actual emergency exit, falls within the boundary of the actual emergency exit aperture. If this results in a vertical overlap between seat squab and lower sill it should be shown that the resulting interference will not restrict the removal and disposal of the exit hatch.

2.4 For seating configurations where there is a dual access route to a Type III exit, or a single or dual access route to a Type IV exit, from the cabin aisle, a vertically projected access width of at least 6 inches should be provided. Small reductions in this access may be considered where there is evidence to demonstrate that the features of the specific configuration can achieve equivalent ease of access to, and egress rate through, the exit.

2.5 It is a requirement that fold-up meal tables are correctly stowed for take-off and landing. If, however, having increased the seat pitch, particular seat back meal tables are no longer used, they must either be removed from the seat, or their function inhibited to ensure that they cannot inadvertently obstruct the access to the exit.

Where tables are retained for use at seats adjacent to the access route, the latches should be sufficiently reliable and adequately protected against inadvertent release.

2.6 For the more conventional forward facing seating layout, the instruction placards, indicating the correct method of opening and disposal of the exit hatch, should be fixed at approximately eye level to the seated occupant on each seat immediately forward of the access route either on the upper seat back itself or on the outer face of the stowed meal table (where fitted). Where face-to-face seating makes such a location ineffective, placards, again at approximately eye level to the seated occupant, mounted on either side of the exit and visible to the occupants of the affected seat rows would be acceptable. Where such seating is not symmetrical about the exit centre line it may be necessary to locate an additional placard on the exit itself, to ensure good visibility to the seated passengers. Wherever possible, a pictorial instruction placard, comparable with that contained in the Cabin Safety Leaflet, should be used. (See paragraph 2.9 of this AMC).

2.7 Where break forward facilities are provided on seat backs in seat rows bounding access routes, it is recommended that, wherever practicable, this feature should be retained but limited in travel only to an extent necessary to ensure compliance with paragraph 3.3 of this GEN-AIR 25-002.

2.8 The assessment of potential entrapment should be made both with and without the seat cushions in place. Ideally the seat upholstery and seat suspension should be free of any gaps into which it would be possible to place a foot, hand or arm in such a way as to delay or hamper free movement of passengers to the exit. Where gaps are unavoidable, their location and shape should be evaluated subjectively to assess the likely hazard. Any gap of greater than one inch into which a hand or foot may enter is considered to be unacceptable.

2.9 All modifications to seats, or to their installation, necessary to achieve compliance with the GEN-AIR 52-002 should be the subject of the appropriate modification approval procedure. The Instruction Placards required by paragraph 3.2 of the General Requirement together with the associated Cabin Safety Leaflet should be submitted to the DGCA Operations Inspectorate for agreement prior to the modification being submitted to the Kuwait DGCA's Airworthiness Department.

AMC 1 to 72-001 Light Aircraft Piston Engine Maintenance Requirements For Operation Beyond Manufacturers' Recommended Overhaul Periods

1 This Document gives guidance on the procedures which are necessary for a light aircraft piston engine to be accepted as being in a condition that will allow operation beyond the recommended overhaul period under the terms of General Requirement 72-001.

2 A piston engine that has reached the end of its normal overhaul period may be expected to have suffered some wear to cylinders, pistons, valves, bearings and other moving parts, but an engine that has been carefully operated and maintained may still be in a condition suitable for a further period of service.

2.1 Many factors affect the wear that takes place in an engine, the most important of these include: the efficiency of the air intake filter, the techniques used in engine handling, particularly during starting, the quality of the fuel and oil used in the engine and the conditions under which the aircraft is housed when not in use. Conditions of operation are also relevant; the length of flights, the atmospheric conditions during flight and on the ground, and the type of flying undertaken. Many of these factors are outside the province of the maintenance engineer, but meticulous compliance with the approved Maintenance Programme and any instructions provided in the form of service bulletins or constructor's recommendations will undoubtedly help to prolong the life of an engine.

2.2 The inspections and tests that may be necessary to assess the condition of an engine in compliance with General Requirement 72-001 are detailed in the following paragraphs.

3 Inspection and Maintenance

A number of items included in the normal scheduled maintenance of an engine may be repeated to determine the condition of an engine at the end of its normal overhaul period, and additional inspections may also be specified.

3.1 External Condition. The engine should be examined externally for obvious defects such as a cracked crankcase, excessive play in the propeller shaft, overheating and corrosion, which would make it unacceptable for further use.

3.2 Internal Condition. Significant information concerning the internal condition of an engine may be obtained from an examination of the oil filters and magnetic plugs, for metal particle contamination. These checks may be sufficient to show that serious wear or breakdown has taken place and that the engine is unacceptable for further service.

3.3 Oil Consumption. Since the oil consumption of an engine may have increased towards the end of its normal overhaul period, an accurate check of the consumption over the last 10 flying hours would show whether it is likely to exceed the maximum recommended by the constructor, if the overhaul period were to be extended.

3.4 Compression Check. Piston ring or cylinder wear, or poor valve sealing could, in addition to increasing oil consumption, result in a significant loss of power. A cylinder compression check is a method of determining, without major disassembly, the standard of sealing provided by the valves and piston rings. This should be carried out in accordance with the manufacturer's recommendations. In the absence of any published recommendations for a particular engine type, one of the methods of (a) to (c) should be used.

(a) On engines with a small number of cylinders, a simple compression check may be carried out by rotating the engine by hand and noting the resistance to rotation as each cylinder passes through its compression stroke. The check should normally be made shortly after running the engine while a film of oil remains on the rubbing surfaces, to assist sealing and prevent scoring the working parts. If this is not possible, the constructor may recommend that oil is introduced into each cylinder and the engine turned through a number of revolutions before making the test.

This method may be used to determine serious loss of compression on a single cylinder or the difference between the compressions of individual cylinders, but may not accurately show a similar partial loss of compression on all the cylinders of an engine.

An alternative method, which will give a more accurate result, is to fit a pressure gauge (reading up to 1400 kPa (200 lbf/in2)) in place of one sparking plug in each cylinder in turn and note the reading as the piston passes through top dead centre (TDC) on the compression stroke.

(b) Another method of carrying out a direct compression test is by the use of a proprietary type of compression tester equipped with a means of recording cylinder pressure on a graph card. One set of plugs should be removed immediately after an engine run, and the compression tester fitted to each cylinder in turn while rotating the engine by means of the starter motor. The effectiveness of combustion charge sealing can be judged by assessment of the graph records obtained.

(c) A further method of checking engine compression is the differential pressure test. In this test a regulated air supply (normally 560kPa (80 lbf/in2)) is applied to each cylinder in turn and a pressure gauge used to record the actual air pressure in the cylinder. Since some leakage will normally occur, cylinder pressure will usually be less than supply pressure and the difference will be an indication of the condition of the piston rings and valves. By listening for escaping air at the carburettor intake, exhaust and crankcase breather, a defective component may be located. As with the previous tests, it is usually recommended that the differential pressure test is carried out as soon as possible after running the engine.

4 Power Output of Aeroplane Engines

The power developed by an aeroplane engine after initial installation is established in the form of a reference engine speed, which is recorded in the appropriate log book so that a comparison can be made during subsequent power checks. The reference engine speed is the observed engine speed obtained using specified power settings and conditions, corrected, by means of graphs supplied by the engine constructor, to the figure which would be obtained at standard sea-level atmospheric temperature and pressure; changes in humidity do not produce large changes of power and are ignored for the purpose of establishing a reference engine speed or subsequently checking engine power. Power checks should be corrected in the same way.

4.1 Power Checks. The majority of light aeroplane piston engines are air-cooled and rely on an adequate flow of air for proper cooling of the cylinders. This condition can only be obtained during flight, and ground runs should, therefore, be as brief as possible.

Cooling can be assisted by facing the aircraft into wind, but high wind conditions must be avoided when making power checks, as they will significantly affect the results obtained. Before running the engine at high power the normal operating temperatures should be obtained (not the minimum temperatures specified for operation) and during the test careful watch should be kept on oil and cylinder temperatures to prevent the appropriate limitations being exceeded.

(a) Normally-aspirated engines are tested at full throttle and, where a controllable-pitch propeller is fitted, with fully fine pitch selected. The changes in barometric pressure affecting engine power are considered to be balanced by changes in propeller load, so that only a temperature correction is necessary. This correction factor may be obtained from a graph supplied by the engine constructor. The observed full throttle speed multiplied by the correction factor will give the corrected speed.

(b) Although normally-aspirated engines are often fitted with variable-pitch propellers, the engine speed obtained at full throttle is usually less than the governed speed and the propeller remains in fully fine pitch. With supercharged engines, however, the propeller is usually governed to a constant speed at high power settings and small changes in power will not affect engine speed. The power of a supercharged engine is, therefore, checked by establishing a reference speed at prescribed power settings.

(1) Since a supercharged engine is run at a specified manifold pressure regardless of the atmospheric pressure, corrections must be made for both temperature and pressure variations from the standard atmosphere.

(2) The procedure is to run the engine until normal operating temperatures are obtained, open up to maximum take-off manifold pressure, decrease power until a fall in engine speed occurs (denoting that the propeller blades are on their fine pitch stops), then throttle back to the manifold pressure prescribed by the constructor and observe the engine speed obtained.

(3) The correction factor to be applied to the observed engine speed of a supercharged engine may be obtained from graphs supplied by the engine constructor.

(c) Although the engine speed obtained during a check of engine power is corrected as necessary for atmospheric temperature and pressure, no correction is made for humidity, ambient wind conditions or instrument errors and, consequently, the corrected engine speed is seldom exactly equal to the reference speed even if engine condition is unchanged. However engine power may usually be considered satisfactory if the corrected speed obtained during a power check is within 3% of the reference speed.

(d) If it is not possible to assess power deterioration by means of a power check (e.g. due to fitting a different propeller), a rate-of-climb flight test should be carried out.

6 Power Loss

If the power check (paragraph 4 of this AMC 1) or normal engine operation reveal an unacceptable loss of power or rough running, it may be possible to rectify this by carrying out certain normal servicing operations or by replacement of components or equipment. The replacement of sparking plugs, resetting of tappets or magneto contact breaker points, or other adjustments to the ignition or carburetion systems, are all operations that may result in smoother running and improve engine power.

7 Servicing

If the engine proves to be suitable for further service, a number of servicing operations will normally be due, in accordance with the approved Maintenance Programme. Unless carried out previously (paragraph 6 of this AMC 1) these operations should be completed before the engine is returned to service.

8 Log Book Entries

A record of the checks made, and any rectification or servicing work, must be entered and certified in the engine log book before the engine is cleared to service for its recommended or extended life under the provision of this GR. The log book entry made should also specify any restriction on further use (see paragraph 3.1.(b) of General Requirement 72-001).

9 Maintenance Schedule and Programme Amendments

The aircraft maintenance programme should reflect the maintenance requirements required and their periodicity, to operate the aircraft engine beyond its recommended overhaul period as detailed in General Requirement 72-001.