



ESWATINI CIVIL AVIATION AUTHORITY

# Advisory Circular

CAA-AC-AWS012

April 2021

---

## AIRWORTHINESS OF AGING AIRCRAFT

### 1.0 PURPOSE

This Advisory Circular (AC) is issued to provide information and guidance on the civil aviation regulatory requirements concerning airworthiness of aircraft which have reached or crossed their design service objective (DSO) commonly known as operational design life (ODL).

### 2.0 DEFINITIONS

**Accidental Damage-** A damage caused to an aircraft structure due to discreet sources caused by birds, uncontained engine failure, damage due to wrong handling of ground equipment occurring during routine inspection of the aeroplane.

**Ageing Aircraft** – Aircraft which have completed DSO are classified as Ageing Aircraft.

**Damage Tolerant-** Ability of a structure to withstand reasonable loads without failure when fatigue cracks, corrosion, accidental or discrete source damage occurs on the primary member and until the damage is detected through planned inspection and repaired.

**Design Service Objective (DSO)** – A point of reference used by manufacturer as a baseline for a crack free operation of an aeroplane. Generally, this is known as design economic life and maintenance of aircraft in airworthy condition beyond this is possible but it will require much greater attention and care. It is a convenient threshold for supplementary maintenance programs. A chart giving design economic life of various transport aircraft is given in Appendix 1 of this AC.

**Environmental Damage-** Damage due to environment is in the form of corrosion, stress corrosion and may be or may not be time or usage dependent.

**Fatigue-crack initiation threshold** - A point in time for a detectable crack to develop under normal operating conditions. Due to the inherent scatter in the prediction of fatigue –crack initiation, high reliability and confidence levels are required for a durable and maintainable airframe.

**Fatigue Damage-** Is damage caused to a metal structure characterized by initiation of the crack subsequent propagation and as a result of continuous process whose effect is cumulative with respect of aircraft usage.

**Multiple site damage-** The presence of secondary damage (cracking) dependent or independent of the primary damage (crack)

### **MPD-Maintenance Planning Document**

**Principal Structural Element (PSE)** - Elements that contribute significantly to carrying flight, ground and pressurization loads and whose failure could result in catastrophic failure of the aircraft.

**Structural Significant Items (SSI)** – Any detail, element, or assembly that contributes significantly to carrying flight, ground and pressure loads and whose failure could affect the structural integrity necessary for safety of the aircraft.

## **3.0 REFERENCES**

- a. The Civil Aviation (Operation of Aircraft) Regulations, 2008.
- b. The Civil Aviation (Airworthiness) Regulations 2008.
- c. Regulation 22 of the Civil Aviation (Airworthiness) Regulations 2008: States the requirements for continuing airworthiness.
- d. Paragraph 3.3.5 of Advisory Circular number ESWACAA-AC-AIW003- Issue of certificate of airworthiness.

## **4.0 APPLICABILITY**

This AC applies to, other than general aviation, all Eswatini registered aircraft and foreign registered aircraft leased by Eswatini Air Operator Certificate holders and foreign registered aircraft operated by foreign AOC holders intending to operate into Eswatini.

## **5.0 BACKGROUND**

5.1 Part IV of Eswatini Civil Aviation (Airworthiness) Regulations lays down the conditions for continuing airworthiness of an aircraft and also continued validity of the Certificate of airworthiness. To ensure continuing airworthiness, the operators are required to maintain their aircraft to prescribe / approved maintenance schedules wherein inspections are required to be carried out on hour/ calendar period basis. The maintenance programmers have been prescribed by the manufacturers taking into account the normal utilization of the aircraft and its operational environment. Aircraft which have arrived or crossed their DSO, a number of associated problems due to age creep in because of fatigue, environmental corrosion and accidental damage are experienced during the

service. These damages if not properly detected and repaired in time, can cause catastrophic failure of aircraft structural members. To ensure continued airworthiness of aircraft, aircraft manufacturers have issued documents prescribing supplementary structural inspections beyond DSO (or Operational Design Life-ODL) time limit:

- 5.1.1 Service Bulletins (SBs) requiring structural inspections of specific areas at certain intervals,
  - 5.1.2 Supplementary Structural Inspection Document (SSID),
  - 5.1.3 Aging Aircraft Repair and Modification Programme,
  - 5.1.4 Corrosion Prevention and Control Programme (CPCP),
  - 5.1.5 Repair Assessment Programme (RAP) and,
  - 5.1.6 Applicable Airworthiness Directives (AD) relating to structural inspections including CPCP.
- 5.2 This part of the notice is applicable to aging aircraft and details the procedure which will be followed for complying with the normal maintenance programme to ensure the continued airworthiness of ageing aircraft. This circular further provides the guidance for the maintenance of all aircraft including private aircraft which have crossed DSO.
- 5.3 Considering the above continued airworthiness requirements, air operators who go for ageing aircraft because the Lesser or seller offers **pseudo- attractive low lease rates or sell price** must appreciate operational costs, down time, flight disruptions, high maintenance costs will eventually swallow the seemingly low lease rate. Many air operators are retiring or shunning “aging aircraft” in favor of new aircraft. Reduced structural integrity due to fatigue, cracking, corrosive attacks and deteriorating insulation material of electrical and lighting wiring are some of the things that have immensely contributed to numerous accidents worldwide.

## 6.0 REQUIREMENTS

### .6.1.1 Eswatini Registered Aircraft and Foreign registered aircraft leased by local operators.

#### .6.1.1.1 Acceptance of Aged Aircraft

It is not in the interest of ESWACAA to accept for registration, leasing or commercial operation of aircraft that have arrived or crossed the DSO.

Nevertheless, should an operator consider registering, leasing or commercially operating “aged aircraft”, ESWACAA declares **mandatory** the inspections required under paragraph 6.1.1.1.1 Below.

- .6.1.1.1.1 To ensure continued airworthiness of the aircraft, owners/ operators (including private operators) are required to comply with SBs requiring structural inspections of specific areas at certain intervals, SSID, Ageing Aircraft Repair and Modification Programme, CPCP , RAP and other prescribed inspections determined from time to time. Each owner or operator shall have a dedicated and appropriately trained person to be in charge of the aging

aircraft maintenance programme.

.6.1.1.1.2 To ensure continued structural integrity of all aircraft including private aircraft, which have crossed DSO the following procedures are required to be followed:

1. For each Certificate of Airworthiness renewal or, for leased aircraft, at inception of the lease and subsequent biannually, a status report of CPCP and the structural report shall be forwarded to ESWACAA for assessment and acceptance. Both pre and post amendment 45 certified aero planes shall have a corresponding classification of structure table together with a list of SSI and PSE. All pre-amendment 45 (amendment requiring incorporation DTR standards) certified aircraft shall have Damage Tolerance Rating (DTR) for all identified SSI. The DTR shall determine check levels and repeat intervals on SSIs. For aircraft on MSG3 (Maintenance Steering Group-3) maintenance, this shall be determined from Airworthiness Limitations (AWL) document.
2. The items of structural significance as given in the MPD/ Manufacture's Documents and SSI list and included in the approved maintenance program, shall be subject to Supplementary inspections as approved by the Authority.
3. All structural inspections required to be accomplished as per SSID, CPCP, Aging Aircraft Program, ESWACAA Required Action Items (SRAI) and mandatory modifications, may continue to be carried out at the thresholds given in the relevant documents, such as SBs/ADs, SSID, CPCP, Aging Aircraft Program etc
4. Life of major components should be closely monitored to ensure that the life recommended by the manufacturer and approved by the Authority is achieved. If it is observed that there is a wide variation between the approved life and average life achieved, in which case, and then the approved life shall be downgraded to the average life achieved. Otherwise the exact reason for reduction in the approved life should be analysed and appropriate steps taken in the form of compliance with SBs, procurement of spares from reputable sources and refresher training of personnel to improve the quality of workmanship.
5. All minor and major fatigue related defects should be thoroughly analyzed and exact reason to the cause of the defect established. Appropriate corrective action should be taken to ensure that the defects are not repeated and the occurrence of defects minimized. Comprehensive report on the findings and restorative maintenance shall be submitted to ESWACAA.
6. A separate **airframe damage logbook** shall be in place and all airframe damages and repairs shall be recorded therein and copies of logbook certificates shall be submitted to ESWACAA.
7. Any structural repairs to flight controls and pressurized areas shall have supplementary inspections added to the approved maintenance program and the former shall be submitted to ESWACAA for approval.

**.6.1.1.1.3 A list and status of time and cycle controlled components- Airframe, Engines, APU, Landing Gear and Accessories.**

- Operators of aging aircraft shall, at every Certificate of Airworthiness renewal, provide a list and status of time and cycle controlled LLPs (Life Limited Parts) - Airframe, Engine, APU and landing gear. List must provide traceability of all LLPs, if not will have to replace any LLP without traceability. If the aircraft is received without LLP traceability a side agreement should be arranged to return the parts to the supplier.
- A report certifying time/ cycles on Airframe, Engines, LLPs, time controlled items, hard time items, landing gear, APU etc.
- A list of condition monitored (CM) and on condition components and status.
- A list of all installed components (LRU's) showing part number, serial number and manufacturer, avionics modification levels and accumulated time and cycles.
- For leased aircraft, - a summary and status of Airworthiness Directives, - including engines, APU and equipment and the methods of accomplishment (i.e. repetitive inspections, interim fix, or terminating action). All ADs falling due within six months (with no repetitive inspections) required to be accomplished (AD termination). No alternative means of compliance accepted. The lease contract shall also specify the lessee as responsible for accomplishment of ADs during the lease period and, per the above, after the lease terminates, lease will not be responsible for providing ADs due before the aircraft acceptance having been accomplished by previous lessees, but will furnish records received from the previous lessee to the lesser.
- For leased aircraft- report detailing any major incidents and or accidents involving aircraft or aircraft components.
- For leased aircraft- report detailing any leased or loaned components installed on the aircraft.
- Report of hard time components and their current status.
- For leased aircraft proof of transfer of SSID program to new operator and state of operator

.6.1.1.1.4 At every Certificate of Airworthiness anniversary, a detailed inspection report on wire bundles condition is required.

.6.1.1.1.5 To eliminate possible fuel tank explosion, a tank unit inspection report shall be submitted to the Authority at every certificate of airworthiness renewal.

**Approved by Director General  
Civil Aviation Authority**

**APPENDIX 1**

Table below shows some of the aircraft that have crossed their Design Service Objective (DSO) also known as Operational Design Life (ODL).

Airplane Model	Minimum DSO / ODL		
	Flights (Cycles)	Hours - Flight time	Calendar Time
	000	000	
Boeing 707 / 720	20	60	20 years
Boeing 727	60	50	20 years
Boeing 737	75	51	20 years
Boeing 747	20	60	20 years
Boeing 757	50	50	20 years
Boeing 767	50	50	20 years
Boeing 777	40	60	20 years
DC-8	25	50	20 years
DC-9	40	30	20 years
DC-10-10	42	30	20 years
DC-10-30/-40	42	60	20 years
MD-11	20	60	20 years
MD-80	50	50	20 years
MD-90	60	90	20 years
Airbus aircraft*			
Lochheed L1011*			
Fokker F28*			
Bae BAC 1-11*			
Note: * Manufacture guidance required for each type.			