TECHNICAL AIRWORTHINESS ADVISORY CIRCULAR

DIRECTORATE GENERAL TECHNICAL AIRWORTHINESS

GUIDANCE FOR AIRCRAFT STRUCTURAL INTEGRITY MANAGEMENT PLAN (ASIMP)

INTRODUCTION

1. Technical Airworthiness Advisory Circular (TAAC) is a document issued by the TAR to provide instructions and means for compliance with technical airworthiness regulations.

2. Aircraft Structural Integrity (ASI) Programs is an integral part of ensuring the continuing airworthiness of an aircraft and it consists of Aircraft Structural Integrity Management Plan (ASIMP), Procedures to Maintain ASI and Procedures to Support Continuing Assessment of ASI. This requirement is stated in MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Program (MSTAP) – PU 2103.

3. The first part of this TAAC provides a new format and guidance for writing ASIMPs, which consists of a consolidated reference for key structural such as relevant airworthiness design requirements and standards, certification outcomes and the definition and source for the critical part and Airworthiness Limitation (AwL).

4. The second part of this TAAC will amplify the understanding of implementing Fatigue Management by providing guidelines to conduct annual usage assessments for monitoring and assessing aircraft usage and structural life. It also strengthens the knowledge of implementing Environmental Degradation Management (EDM) by providing guidelines to conduct the annual structure condition assessment activity.

5. This TAAC needs to be read together with relevant regulation in MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Program – PU 2103 including its relevant Acceptable Means of Compliance (AMC) and Guidance Material (GM) respectively.

6. Under the MSTAP framework, the established ASIMP will be preserved for existing weapon systems and established for new acquisitions. Responsibility for the execution of ASI Programs elements will then be divested among the MSTAR 21 (DOA), MSTAR M (CAMO) and MSTAR 145 (AMO).

REFERENCE

7. DGTA, Technical Airworthiness Management Manual (TAMM) – PU 2103 Regulation 3.5.4 Aircraft Structural Integrity (ASI) Management and TAMM Part 3 Chapter 11 – ASI.

8. DASA, ADRM, Section 3 Chapter 12 - Aircraft Structural Integrity. [https://defence.gov.au/DASP/Docs/Manuals/ADRM/ADRMWeb/index.htm] [Accessed on 01 August 2022].

9. DASA AC 005/2021, Structural and Propulsion Integrity Programs in the DASP.[https://defence.gov.au/DASP/DASR-Regulations/AdvisoryCirculars.asp] [Accessed on 01 August 2022].

SUPERSEDURE

10. This Advisory Circular supersedes TAAC-E-005 Revision 1 dated 16 December 2022.

PURPOSE

11. The ASIMP guidance is to provide the Configuration Item (CI) Manager and the ASI Manager appointed by SAO with the minimum requirement for the contents of an ASIMP.

12. Fatigue Management guidelines provide CI Manager and the ASI Manager appointed by SAO to conduct annual usage assessments for monitoring and assessing aircraft usage and structural life.

13. The guidelines on Environmental Degradation Management (EDM) is to provide CI Manager and the ASI Manager appointed by SAO by giving guidelines to conduct the annual structure condition assessment activity.

ORGANISATION AFFECTED

14. This TAAC is applicable both to State Aircraft Operator (SAO)/State Registered Aircraft Operator (SRAO). The ASIMP is prepared by ASI Manager appointed by SAO and approved by the TAR after being reviewed through their respective CAMO or DAR prior to the Design Acceptance of the aircraft type or design change.

15. The ASI Management requirements for company-owned aircraft, are subjected to SAO's policy.

16. For new aircraft acquisitions, DGTA expects an appointed ASI manager / OEM to develop a basic ASIMP (Volume 1, Section 2 Chapter 1-5 only). For in-service aircraft, ASIMP shall be further developed by an ASI Manager and reviewed periodically to ensure it is accurate and relevant.

EFFECTIVITY

17. The instructions are effective upon receiving this TAAC. These documents can be accessed through the DGTA portal.

18. SAOs are to comply and implement not later than 01 June 2025.

19. Commercial organisations who provide leased aircraft, under State Registered Aircraft, may opt-to comply with this TAAC and implement not later than 01 June 2025.

20. Implementation of Fatigue Management (FM) and Environment Degradation Management (EDM) as stipulated in this TAAC may commence at the earliest date but not later than 01 June 2025.

FIRST PART – GUIDANCE FOR THE WRITING OF AN ASIMP

21. The guidance for ASIMP writing shall be but is not limited to, as stated in **Annex A** of this TAAC and it is proposed that a single document be created to manage ASIMP.

22. The ASIMP Volume 1 shall consist of two (2) sections: Section 1 consists of Chapter 1 and Chapter 2, Section 2 will consist of 13 chapters, while Volume 2 shall consist of 4 chapters. **However, ASIMP Volume 2 will not be implemented for now, and the guidance for Volume 2 is for future reference.**

SECOND PART – GUIDELINES FOR FATIGUE MANAGEMENT (FM) AND ENVIRONMENT DEGRADATION MANAGEMENT (EDM)

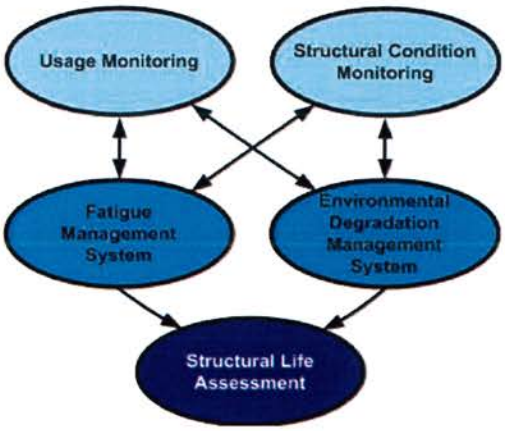

Figure 1 – Primary Information Flow in ASIP Task 5

23. MSTAR 21 Regulation 21.A.44(c), MSTAR M Regulation M.A.302(d) and MSTAR 145 Regulation 145.A.45 and their respectives AMC and GM briefly introduces **Fatigue Management**, as shown in Figure 1 with inputs from Usage Monitoring and Structural Conditioning Monitoring. This TAAC will amplify the understanding of the Fatigue Management System, which consists of:

a. Guidelines for Health and Usage Monitoring System Validation Report

(HUMSVR). This report documents any propulsion system, dynamic component or airframe health, fatigue life usage or operational loads monitoring system. Refer to **Annex B** for further information.

b. Guidelines for Routine Usage Status Reports (RUSR). This report documents analyses and presents a summary of the quality of the aircraft fleet usage data collected since the last RUSR. Refer to **Annex C** for further information.

c. Guidelines for Fatigue Assessment Report (FAR). This report documents the annual fatigue assessment activity. Refer to **Annex D** for further information.

24. MSTAR 21 Regulation 21.A.44(c), MSTAR M Regulation M.A.302(d) and MSTAR 145 Regulation 145.A.45 and their respectives AMC and GM briefly introduces **Environmental Degradation Management** as shown in Figure 1 with inputs from Usage Monitoring and Structural Conditioning Monitoring. This TAAC will amplify the understanding of the Environmental Degradation Management system which consists of:

a. Guidelines for Structural Condition Assessment Report (SCAR). The Structural Condition Assessment Report (SCAR) documents the annual structural condition assessment activity (for each aircraft and the SAO fleet) to support the continuing assessment of aircraft structural integrity. Refer to **Annex E** for further information.

b. Guidelines for Environmental Degradation Assessment (EDA). The report is to provide a formal means by which ED may be measured and assessed, thus permitting informed conclusions and recommendations to be made regarding the adequacy of the existing Environmental Degradation Management System (EDMS) and maintenance program. Refer to **Annex F** for further information.

25. **REPORTS INTERVAL**. The reports interval for the various report required under this ASI Management System is summarised in the table as shown below:

Nos.	Type of Report	Intervals
(a)	(b)	(c)
1	Health and Usage Monitoring System Validation Report (HUMSVR) (If Equipped)	Six Monthly
2	Routine Usage Status Reports (RUSR)	Six Monthly
3	Structural Condition Assessment Report (SCAR)	Six Monthly
4	Fatigue Assessment Report (FAR)	Annually
5	Environmental Degradation Assessment (EDA)	Annually
6	Structural Life Assessments (SLA)	Every 5 years
7	Ageing Aircraft Audits	Every 15 years or mid-life which is sooner

Table 1 – Summary of Reports Interval

DEVELOPING AND UPDATING ASIMP

26. As ASIMP is intended to be a living document, ASI Manager appointed by SAO needs to develop ASIMP during aircraft acquisitions while in-service, the ASI Manager needs to review and update ASIMP during major modification programs, routine design changes and repairs and recovering structural integrity (re-certification) to ensure it remains relevant and accurate.

27. DGTA expects Fatigue Management and Environmental Degradation Management are detailed in ASIMP based on the guidelines given in this TAAC.

28. SAOs are advised to consult AAER-ASDR Desk Officer in DGTA at the earliest opportunity during the developing phase and updating of ASIMP.

29. The TAR approves all updates to the ASIMP prior to their incorporation and implementation.

02 August 2024

DIRECTOR GENERAL
TECHNICAL AIRWORTHINESS AUTHORITY

List of Annexes:

A. ASIMP Structure Guidance.
B. Guidelines For Health and Usage Monitoring System Validation Report.
C. Guidelines For Routine Usage Status Reports (RUSR).
D. Guidelines For Fatigue Assessment Report.
E. Guidelines For Structural Condition Assessment Report (SCAR).
F. Guidelines For Environmental Degradation Assessment (EDA).

ASIMP STRUCTURE GUIDANCE

INTRODUCTION

1. The Aircraft Structural Integrity Management Plan (ASIMP) provides a basis for the State Aircraft Operator (SAO) to conduct and management of an in-service Aircraft Structural Integrity Program (ASIP) for the subject aircraft to achieve the required design service life.

2. General requirements of the ASIMP are as follows:

a. To articulate the Certification Structural Design Standard (CSDSTD), which provides a basis for establishing, evaluating and substantiating the structural integrity of the aircraft structure (including the airframe strength, stiffness and damage tolerance and durability) to ensure the risk of operations remains within that defined in the CSDSTD.

b. To be the authoritative source of the instructions for continuing airworthiness (ICAs) by either; referencing the documents that define the TAR-authorised Safety-by-Inspection (SBI) program and/or life limited items, or defining these details in Volume 2 of the ASIMP.

Note: ASIMP Volume 2 for SAO aircraft will not be implemented for now and will be developed in near future.

c. To detail weapon system specific in-service management systems (particularly usage monitoring, structural condition data recording, fatigue management and environmental degradation management systems) required to provide continual assessment against the basis established, including the roles and responsibilities of the various agencies involved.

d. To define the allowable extent of structural degradation, in terms of cracking, corrosion or other structural damage, before impinging upon the structural warranty as defined in the Acquisition Contract.

e. To provide a basis for determining logistics planning requirements (e.g. maintenance, inspections, spares, rotation of aircraft and future requirements).

f. To provide a high level plan detailing both the routine and development tasks required to ensure continued structural integrity.

ASIMP VOLUME 1 CONTENT REQUIREMENTS

3. The ASIMP volume 1 should consist of two Sections. Based on this description, the structure of the ASIMP is the following:

a. Section 1.

(1) Chapter 1 – Introduction.

(2) Chapter 2 – ASIP Master Plan.

b. Section 2.

(1) Chapter 1 – General Aircraft Description.

(2) Chapter 2 – Aircraft Design Information.

(3) Chapter 3 – Structural Verification.

(4) Chapter 4 – Critical Structure.

(5) Chapter 5 – Certification Information.

(6) Chapter 6 – In-service Operations.

(7) Chapter 7 – Usage Monitoring.

(8) Chapter 8 – Condition Data Recording.

(9) Chapter 9 – Fatigue Management.

(10) Chapter 10 – Environmental Degradation Management.

(11) Chapter 11 – Major Projects Information.

(12) Chapter 12 – Structural Life Assessment.

(13) Chapter 13 – Index of ASI Documents.

Introduction (Section1, Chapter 1)

4. This chapter provides an overview of the ASI management philosophy applicable to the subject aircraft and high level details of the approach to ASI management to set the scene for the specific subject aircraft ASI requirements. This chapter also includes highlights of major ASI issues and details of the ASIP Manager for the subject aircraft.

ASIP Master Plan (Section 1, Chapter 2)

5. This chapter details the ASIP Master Plan, which lists what activities are required for the ASIP (tasks), justifies why each task needs to be performed, and shows when each task needs to occur (schedule) and how each task is to be achieved (resources).

6. The quality of the ASIP is assured, in part, by routine planning which ensures that all in MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Manual – PU 2103 ASIP elements are addressed.

7. A Gantt chart should be included in this section, covering all high level ASIP tasks that are to be covered for the subject aircraft.

General Aircraft Description (Section 2, Chapter 1)

8. This chapter shall include a general description of the subject aircraft. The description should include historical development, the main operating features and roles and the physical and functional characteristics of the aircraft, with specific focus on the structure. This chapter should include general details on the structural arrangement, which should include supporting diagrams and pictures.

Aircraft Design Information (Section 2, Chapter 2)

9. This chapter is to provide details of the original aircraft structural design information, that is, the design standard(s) which form(s) the CSDSTD (the structural elements of the certification basis). In particular, the section shall identify the salient aspects of the CSDSTD that will enable Design Organisation Approval (DOA), and others who design repairs or minor modifications for the type, to satisfy MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Manual – PU 2103, which requires all structural repairs and modifications to conform to the CSDSTD. Accordingly, for each design element, a clear statement on the authoritative design standard, including the applicable revision status and a reference to the appropriate source document that details satisfaction of the design requirement is to be included. This chapter is expected to reference sources of information with only salient aspects to be detailed herein. The elements that shall be addressed are:

a. **Aircraft design specification.** Provide details of the design specification(s).

b. **Certification structural design standard.** Provide summary details of the standard(s) that form the CSDSTD, including the revision status.

c. **Design philosophy.** Provide a brief description of the overarching design philosophy applied to the aircraft, specifically to what degree the structure is managed under a safe life, fail-safe and/or damage tolerance philosophy.

d. **Design service life and design usage.** A short summary of the design service life criteria and expected in-service design usage is required.

e. **Structural design criteria.** Provide details of the static strength criteria (load factors, minimum margin of safety where no test substantiation was carried out, etc.); crashworthiness design criteria; bird-strike design criteria; and fatigue requirements, including residual strength criteria. If the design standard was not met, the basis for certification is to be stated and an overview of the equivalent safety finding (civil) or deviations/waivers (military) from these standards provided. The agency that certified this element is to be stated.

f. **Fatigue analysis.** Provide details of any analysis carried out to substantiate the ability of the structure to comply with the specified design

service life, the design spectra for this analysis and verification of the analysis results.

g. **Corrosion prevention and control.** State the corrosion prevention and control design standard(s) applied to the subject aircraft type. Details are to be provided on: design requirements for selection of material type, temper and form; manufacturing, surface finish and assembly processes and design features to exclude moisture and contaminating fluids and ensure suitable drainage. Provide an explanation of the processes to maintain corrosion prevention and control throughout the service life of the aircraft, including; the standards for the selection of corrosion prevention finishes and corrosion prevention compounds; and the choice of structural and fuel tank sealants and surface finishes, including the requirements for their re-application.

h. **Structural build.** Data is required on acceptable flaws and defect tolerances associated with manufacturing, fabrication and assembly processes. Provide references to the permanent record of build quality, covering production non-compliances and how issues at production were processed. Critical structure is the key focus, with a summary to be included of any significant production non-conformities.

i. **Selection of and allowable for materials, joints and processes.** Provide details on the design standard(s) and design criteria.

j. **Non-destructive testing (NDT).** Provide details on design standard, design criteria applied for critical structure; overall approach to assure adequate NDT of in-service structural components; the basis to assess NDT technique reliability, and an overview of the validation process applied to ensure that NDT procedures using new technology provide adequate reliability. NDT requirements peculiar to the subject aircraft are to be identified and the requirement for their uniqueness provided.

k. **Weapons effects.** Content should include design standard(s) and design criteria for ballistic damage; details of the design standard(s), and design criteria for battle damage repair. If the design standard was not met, the basis for certification is to be stated and an overview of the deviations/waivers from the standard(s) provided. The agency that certified this element is to be stated.

l. **Loads analysis.** Provide details on the design standard; design criteria, including flight and ground loads; Vn diagrams (with configuration details); airspeed-altitude diagrams; the loads validation process (eg. wind tunnel, simulation, flight test) and results of this. If the design standard(s) was not met, the basis for certification is to be stated and an overview of the equivalent safety finding (civil) or deviations/waivers (military) from the standard(s) provided.

m. **Service life, design and test spectra.** Provide a summary of the criteria used to determine the design service life and details of the usage spectra. This description shall cover, as a minimum, the planned usage, mission profiles and design service loads spectra as developed from the SOI and specification, as well as those used in the design of the manufacturer's baseline aircraft (if applicable). For test spectra, include details of the usage assumed, the source of loads information (eg. flight test, FEM etc.) and the development of the

following: gust/manoeuvre loads, dynamic loading (buffet), ground and pressurisation loads. The testing information in this section relates to fatigue testing carried out for the subject aircraft type and any subsequent testing required for certifying the RMAF subject aircraft type configuration.

n. **Stress analysis.** Content should include: design standards; design criteria; overview of analysis process (e.g. FEM simulation, classical analysis, etc.); validation of analysis procedures, especially simulation (eg. comparison with data from flight test and/or design development testing); validation of analysis results; and differences to prior variants. If the design standard was not met, the basis for certification is to be stated and an overview of the deviations/waivers (military) from these standards provided. The agency that certified this element is to be stated.

o. **Aero-acoustic durability analysis, vibration and flutter.** Content for each should include design standards (revision status to be stated); design criteria; analysis technique used and its validation (design analysis and development tests); verification of analysis results (for example, comparison with test results), and differences to prior variants. If the design standard was not met, the basis for certification is to be stated and an overview of the deviations/waivers (military) from these standards provided. The agency, which certified this element, is to be stated.

p. **Mass properties.** Provide details on: the centre of gravity envelope; weight information used in design (for example, maximum take-off weight, gross weight, maximum landing weight and zero fuel weight).

q. **Design development testing.** Content should include details of any supplemental development testing conducted, for example: to support a change of role, a performance enhancement or life extension.

Structural Verification (Section 2, Chapter 3)

10. This chapter shall include the following information:

a. **Static Tests.** A summary of any static tests (full-scale, sub-assembly and component), and the results of these tests, used to verify structural integrity of the subject aircraft, including static design margins and residual strength results/margins. Include details on the structural configuration tested.

b. **Fatigue Tests.** A summary of any fatigue tests (full-scale, sub-assembly and component), and the results of these tests, used to verify structural integrity of the subject aircraft. State any safety and scatter factors applied to the test results. Include details on the structural configuration tested.

c. **Other Tests.** The results of aero-acoustic, flutter and vibration tests made on full-scale and/or sub-assembly aircraft structures, in flight and on the ground, used to confirm the dynamic characteristics of the airframe.

d. **Analysis.** A summary of any analysis or modelling used to support the structural verification of the subject aircraft. This shall cover new structure, any

baseline structure that has been modified and any baseline structure for which the loads have been altered due to modifications.

e. **Interpretation and Evaluation of Results.** A summary of how existing verification results from the other variants support the subject aircraft role, configuration and environment. For regions of the structure which the manufacturer proposes be managed on either a safety-by-inspection or safe life basis, information on how analysis programs were validated must be included. Analysis programs include those used by the designer to set initial inspection thresholds, recurring intervals and the program supplied to the SAO to track individual aircraft fatigue, be it for a SBI program or safe life.

f. **Documentation.** Documents which contain the test program, test description, test results and test interpretation shall be referenced in this section.

Critical Structure (Section 2, Chapter 4)

11. Provide an explanation of the definition of critical structure as applied to the subject aircraft and an explanation of the methods used to determine which items are critical, such as analysis, static test, fatigue test, flight test or in-service experience.

12. The ASIMP shall, as a minimum, contain information on the following:

a. A summary of structural details of the aircraft that are assessed as critical structure.

b. A summary of data supporting the assessment of all identified critical structure (whether from analysis, testing or in-service experience).

c. A summary of any elements of structure needed to bring the baseline subject aircraft to the SAO required configuration, which is assessed as critical.

d. A summary of any elements of the baseline subject aircraft structure assessed as critical as a result of changes in the baseline aircraft necessary to bring the aircraft to the SAO required configuration.

e. Reference the documents that contain the detailed, certified information from which the above summaries have been drawn, including the document(s) containing the Instructions for Continuing Airworthiness (ICA).

13. The details on the systems to manage primary or critical structure are not to be provided in this chapter (refer to the Fatigue Management and Environmental Degradation Management chapters). However, historical details in support of individual locations deemed to be critical structure may be provided in this chapter.

Certification Information (Section 2, Chapter 5)

14. The ASIMP should summarise the certification basis for the subject aircraft, including the amendment level of all applied airworthiness standards.

15. If the State Aircraft Operator (SAO) are acquiring a civil aircraft that has received prior certification from an internationally recognised Airworthiness Authority (eg. FAA, JAA or USAF) and is to be modified for the State Aircraft Operator (SAO) use, the following additional information is to be documented in the ASIMP:

a. Details of the original design specification of the baseline aircraft.

b. Details of the design standards applied to both the baseline subject aircraft and the modifications to the baseline subject aircraft to arrive at the certification basis for the post-modified subject aircraft configuration. If the standards are Contractor standards rather than airworthiness authority or military standards, then provide details of the approval of the Contractor standards by an airworthiness authority.

c. If the baseline subject aircraft are used or refurbished aircraft, then the Contractor should give details of the common structural standard to which the aircraft have been brought before conversion to the SAO required configuration.

d. Details on any previous type certifications by other airworthiness authorities.

In-Service Operations (Section 2, Chapter 6)

16. This chapter shall include a summary of the aspects of the SOI relevant to ASI, including the revision status of the SOI. The chapter shall provide a clear definition of each distinct pattern of flying and the associated configuration and any other parameters relevant to fatigue consumption. The following shall also be included:

a. Roles.

b. Type of flight codes, including all information necessary to enable aircrew to categorise each mission when completing post flight documentation.

c. An outline of the process used to develop the type of flight codes.

d. Mission mix, both forecast and historical (if unclassified).

e. Fleet distribution (by base and operating Squadron(s)), including aircraft that have crashed, been retired or otherwise disposed of; and

f. Information on other fleets, with identification of world leaders in respect of the relevant measures for fatigue accumulation (such as hours, landings, etc.).

Usage Monitoring (Section 2, Chapter 7)

17. The ASIMP should, as a minimum, contain information on the following:

a. A description of the philosophy of the Usage Monitoring (UM) system and the Operational Loads Measurement (OLM) system for the aircraft,

detailing how the systems support the assessment of fatigue and environmental degradation for the subject aircraft during its life-of-type.

b. A description of the type, extent, performance and role of the UM system. This shall briefly detail the elements of the system used to record, store and output the usage parameters that are deemed necessary in assessing the structural degradation of the subject aircraft. The parameters to be recorded and why those parameters were selected are to be articulated in this section.

c. A description of the type, extent, performance and role of the OLM system. This shall briefly detail the elements of the system used to record, store and output OLM data deemed necessary to support the fatigue degradation assessment of the subject aircraft. The locations chosen for recording OLM data, including diagrams as necessary, and the philosophy behind the selection of these locations is to be articulated in this section.

d. A brief description of the methods used to validate the UM and OLM systems.

e. A description of the calibration requirements of the UM and OLM systems.

f. A brief description of the methodology, and associated infrastructure, for processing UM and OLM data to provide inputs into fatigue management and environmental degradation management activities.

g. A description of the requirement for annual Usage Assessment Reports (UAR).

Condition Data Recording (Section 2, Chapter 8)

18. Provide a description of the philosophy of the condition data system for the aircraft, where the system is used to record, store and process the condition data that describes the in-service structural degradation of the airframe and the repairs, rework and modification action carried out to address the degradation. Forms of structural degradation include corrosion, fatigue cracking, stress corrosion cracking and damage to composite structure due to impact, environmental attack or operational loading.

19. The ASIMP should include the following details:

a. The forms of structural degradation that will be recorded during service.

b. The mechanism for capturing the structural degradation and the information that will be recorded, such as type, location, dimensions and proximity to critical structural locations or existing repairs.

c. The outputs to be provided and how these will be used to support the fatigue and environmental degradation systems described in the following sections (Fatigue Management, Environmental Degradation Management and Structural Life Assessments).

d. The proposed condition data recording system shall be compared against the requirements of MSTAR 21 Regulation 21.A.3(a), MSTAR M Regulation M.A.202(a), MSTAR 145 Regulation 145.A.60(a) and their respectives AMC and GM. Where discrepancies exist, justification shall be provided.

e. Data analysis. This chapter should present relevant summary results of condition data recording programs, in support of assessments for both fatigue and environmental degradation. Relevant structural condition data from other operators (eg. tear down data) may be included.

f. A description of the requirement for an annual Structural Condition Assessment Report (SCAR).

Fatigue Management (Section 2, Chapter 9)

20. Describe the philosophy of the fatigue management system developed for the subject aircraft, including how it: meets the objective of fatigue management; utilises the necessary input data, and; meets the requirements of MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Manual – PU 2103.

21. The ASIMP should also include the following details:

a. A description of the fatigue management system for the subject aircraft. Provide a schematic that illustrates the key aspects of the system.

b. A description of the methods used to validate the fatigue management system during certification and ensure it remains valid throughout the service life.

c. A description of the outputs from the fatigue management system.

d. A description of the methodologies and techniques used to generate the inspection intervals and/or safe factored lives summarised under the Critical Structure section that form the basis of the ICAs.

e. A description of the requirement for an annual Fatigue Assessment Report (FAR).

22. **Specific management requirements.** In the case of individual structural items that are subject to specific management requirements, such as components where fatigue enhancement techniques (such as cold working and shot peening) have been used, details are to be provided in this chapter. The historical background to the identification of the individual locations should be provided in the Critical Structure section, with this chapter detailing the specific management requirements, including:

a. The structure to be managed.

b. The techniques to be used.

c. More detailed information, such as stress level at the treatment area in the absence of fatigue enhancement treatment.

d. Validation methods and results.

Environmental Degradation Management (Section 2, Chapter 10)

23. Describe the philosophy of the environmental degradation management system developed for the subject aircraft, including how it: meets the objective of environmental degradation management; utilises the necessary input data and; meets the requirements of MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Manual – PU 2103. The objectives of environmental degradation management is to ensure that the strength, both static and fatigue, of all primary structure continues to meet the design standard. An environmental degradation management system utilises condition data and usage data to monitor, assess and adjust the environmental degradation management throughout the specified LOT.

24. The ASIMP should also include the following details:

a. A description of the environmental degradation management system for the subject aircraft. Provide a schematic that illustrates the key aspects of the system.

b. A description of any Corrosion Prevention and Control Program (CPCP) developed to minimise corrosion problems throughout the specified LOT.

c. A description of any programs developed to minimise problems associated with the environmental degradation of composite structure and adhesively bonded structure throughout the specified LOT.

d. A description of the extent to which environmental factors are considered in the design of repairs provided in the Standard Repair Manual (SRM).

25. **Special Management Requirements.** In the case of individual structural items that are subject to specific management requirements, such as components where stress corrosion cracking continues to be a significant ongoing threat, details are to be provided in this chapter. The historical background to the identification of the individual locations should be provided in the Critical Structure section, with this section detailing the specific management requirements.

Major Project Information (Section 2, Chapter 11)

26. This chapter should include a summary of major projects with a direct ASI relevance (such as fatigue tests or an acquisition project that has ASI implications, eg. new role equipment) and is to be separated into on-going, future and historical projects. This section shall describe the impact of the project on the ASI management of the subject aircraft type fleet and include a project outline, detail who is responsible forthe project and a reference to the planning documentation for the project. For on-going projects, this section shall identify any tasks that arise out of the project that

should be included in the ASIP plan. Where information is excessive, references to external documents containing the details of the project is recommended.

Structural Life Assessment (Section 2, Chapter 12)

27. A fundamental function of an Aircraft Structural Integrity Program (ASIP) is to conduct Structural Life Assessments (SLA). A SLA will establish the structural LOT, and compare it to the Planned Withdrawal Date (PWD). This section shall detail overall structural life management information, such as the design service life, the initially established structural LOT, the PWD and the economic LOT for this subject aircraft, where relevant.

28. The ASIMP should also include the following details:

a. A description of how the specified design service life will be met and verified in order to meet Malaysian State Technical Airworthiness environment.

b. A description of how the structural LOT will be continually monitored and verified throughout the specified LOT. This is to include how the outputs from the fatigue assessments and environmental degradation assessments are used in the SLA

c. A description of the limiting factor or structural component that defines the achievable LOT.

Index of ASI Documents (Section 2, Chapter 13)

29. The ASIMP should contain a list of documentation needed to support the in-service ASIP for the aircraft. For each document the list shall contain the number, title and version or approval date, as well as the source of any documents not available through normal SAO channels.

ASIMP VOLUME 2 CONTENT REQUIREMENTS

30. The ASIMP Volume 2 should be divided into four chapters. The structure of the ASIMP Volume 2 is the following:

a. Chapter 1 – Introduction

b. Chapter 2 – Background

c. Chapter 3 – Structural Inspection Program

d. Chapter 4 – Structural Life Limited Items

Introduction (Chapter 1)

31. This chapter provides the scope and content of ASIMP Volume 2, as well as providing a brief overview of the fatigue management requirements necessary to ensure continued structural airworthiness of the subject aircraft fleet.

Background (Chapter 2)

32. This chapter provides the detailed background behind the structural inspection program, the interrelationship of the UM system (eg. HUMS if applicable) and structural life limited components.

Structural Inspection Program (Chapter 3)

33. This chapter articulates the specific structural locations and the attendant inspection requirements that comprise the structural inspection program for the SAO subject aircraft fleet. Specific inspection requirements for sub-fleets or individual aircraft are to be included in this chapter.

34. An example of the level of detail that is to be promulgated in this chapter for individual structural inspection locations is provided at Annex A. The salient aspects that are to be documented are the basis for the inspection program and the details of the inspection program as implemented in the specific Aircraft Maintenance Program (AMP) (or equivalent document).

35. For each individual structural location, the resource and manhour requirements for each inspection requirement are also to be provided. Sufficient detail is to be provided to enable the SAO to determine the cost of the inspection of each structural location as an independent inspection activity, or as part of a major servicing.

Structural Life Limited Items (Chapter 4)

36. This chapter articulates the specific structural locations that are life-limited for the SAO subject aircraft fleet.

Note: ASIMP Volume 2 for aircraft will not be implemented for now and will be developed if required. However, the guidelines to develop ASIMP Volume 2 which is stipulated in this ASIMP guideline are for future reference.

GUIDELINES FOR HEALTH AND USAGE MONITORING SYSTEM VALIDATION REPORT

INTRODUCTION

1. A Health and Usage Monitoring Systems (HUMS) (if equipped) is a sensor-based real-time diagnostic system which collects data from numerous critical points of mechanical structure such as engines, rotors, gearboxes and drive shafts and processes the data using a predefined algorithm.

2. The Health and Usage Monitoring System Validation Report (HUMSVR) describes the ASI Manager's results for validating any 'system(s)' to determine the health, fatigue life usage monitoring or operational loads measurement (OLM) of the; propulsion system, dynamic components or airframe components.

3. The SAO will use the HUMSVR to assess the acceptability of the validation activity undertaken for the system offered by the ASI Manager. Any outsourced contractor may provide separate validation reports tailored for discrete systems. Where the system has already undergone prior validation, the HUMSVR can be used to describe the prior validation activity and demonstrate how the prior activity meets the intent of these guidelines.

4. Where the system OEM is not the prime contractor, the prime contractor must ensure contractual coverage to ensure the data required for certification and validation is available for SAO review.

Specific Content

5. The HUMSVR shall describe any propulsion system, dynamic component or airframe health, fatigue life usage or operational loads monitoring system.

6. The HUMSVR shall detail the results of the following validation activities:

a. **Electromagnetic Compatibility (EMC)**. Ensure the electromagnetic compatibility (EMC) of the system with aircraft.

b. **Environmental Effects**. Ensure that the system is not adversely affected by environmental effects such as; temperature, vibration, humidity, salt spray, dust and sand conditions.

c. **Software Design**. Ensure that all embedded software is developed to meet appropriate software assurance objectives as defined by an appropriate software assurance standard and the overall platform system safety goals. As for other HUMS elements, prior acceptance may be recognised. Normally, use

of an appropriate assurance level of DO178B would satisfy the software validity requirement.

d. **Lifing Algorithm Validation**. Ensure the accuracy of any algorithms required to calculate damage accrual and summation of damage. For all algorithms, the contractor shall perform validation testing. This testing should include synthetic missions exercising the extremes of the flight envelope and real missions to ensure satisfactory operation with transient operational data. The linkage of these algorithms to those used in the establishment of aircraft or engine components safe lives or inspection call outs are to be explicitly stated. Where the algorithms differ (from those used in the establishment of said lives or inspections) evidence is to be provided that satisfactory comparable results are produced when representative data is processed through both algorithms.

Note: Fatigue is the most common usage-driven failure mode, and throughout this document the term 'cycle' is used to denote the basic unit of OEM-defined fatigue life. Logically, other failure modes such as creep have equivalent requirements that must also be addressed.

e. **Condition Monitoring Algorithm Validation**. Ensure the accuracy and efficacy of algorithms used to assess the condition (serviceability) of components and systems. The contractor shall provide evidence of validation testing and analysis for all systems. This testing should include synthetic missions exercising the extremes of the flight envelope and real missions to ensure satisfactory operation with transient operational data. The linkage of these algorithms to those used in the establishment of aircraft or engine component conditions or inspections call outs are to be explicitly stated.

f. **Data Sampling Rates**. Ensure that data sampling rates are appropriate for each parameter whilst maintaining a manageable level of data.

g. **Raw Data Integrity**. Ensure the integrity of raw data by addressing the following, as a minimum:

(1) **Ground Cycle Counts**. Ensure during ground runs, cycle counts are accurately recorded by the system. If ground cycle counts are not required, the HUMSVR shall include the engine and aircraft OEM's usage assumptions for the ground run.

(2) **Flight Cycle Counts**. Ensure that cycle counts are accurately recorded by the system during flight. For the engines, this should include ensuring that in-flight shutdowns result in the correct number of cycles being counted on the correct engines. For the airframe, this should include ensuring that touch-and-go landings are counted in an appropriate and consistent manner.

(3) **Cycle trigger**. Ensure that the system is consistent with the OEM definitions for engine and aircraft flight and fatigue cycles

(4) **Hours**. Ensure that the engine hours and flight hours reported by the system reflect actual ground run and flight times.

(5) **Engine and Flight Parameters**. Ensure the accuracy of engine and flight parameters such as; engine gas temperatures, pressures, revolutions per minute, airspeed, altitudes, Nz and other applicable aircraft performance data.

h. **Strain Gauges**. Where strain gauges are utilised, a description of all locations and installation procedures are to be provided.

i. **Calibration**. Ensure that all sensors and devices used in the system are appropriately calibrated and that a process for on-going assessment and re-calibration is verified and provided.

j. **Functionality Tests.** The HUMSVR shall describe validation of the system's function, as required and defined by the engine and aircraft OEM. Depending on the system specification, this may include:

(1) Cycle counts;

(2) Engine hours;

(3) Airframe flight hours;

(4) Applicable exceedances (e.g. rpm, temperature and vibration, Nz);

(5) Alerting the ground operator of any invalid data;

(6) Calculating any performance margins that drive on-condition maintenance activities such as engine removals; and

(7) Applicable condition monitoring data; e.g. rpm histories, vibration spectra, performance histories.

k. **Life Usage Indices (LUI).** Ensure the validity of any system reported LUIs.

l. **Lifing Database.** Ensure the integrity of all data.

m. **Lifing Database Design and Storage.** Verification of the design and data storage functions of the ground-based lifing database. As a minimum, the following shall be assessed:

(1) The storage medium has adequate capacity to accommodate the database as it grows;

(2) Raw data sets are identified;

(3) There is a back-up process adequate to ensure complete redundancy, and it is fully implemented; and

(4) The retrieval of data sets has been tested and proven.

n. **HUMS Data Management Procedures.** Ensure that a controlled Data Management Procedure exists for the system and ensure that it addresses the following:

(1) Data flow management processes from the aircraft to the final lifing database for operational and deeper maintenance;

(2) Data flow management processes for any condition monitoring program that requires the use of data collected by the HUMS;

(3) Database security;

(4) Database access;

(5) Database backup procedures;

(6) Database archiving procedures;

(7) Management of missing/invalid data; and

(8) Management of exceedances in parameters such as temperature, pressure, rpm and Nz.

o. **Management of Significant Events (Invalid, Missing and Exceedance Data).** Ensure that the following is addressed:

(1) The system generates appropriate alert messages to maintenance staff when significant events occur, such as invalid raw data and exceedances.

(2) The integrity of the process used to manage invalid data, i.e. whether the system accounts for invalid data automatically or needs to be manually accounted for by maintenance staff.

(3) The percentage of invalid data is within the engine or aircraft OEM's acceptable limits. These limits are to be stated.

p. **Fill-in Factors.** Ensure that any 'fill-in' or conversion factors used to manage missing/invalid data are appropriate. Justification for the chosen 'fill-in' or conversion factors shall be provided and shall reflect ADF mission types and mission mix as documented in the approved Statement of Operating Intent (SOI).

q. **Configuration Changes.** Ensure usage cycles are correctly tracked when a configuration change occurs, such as engine removal and installation, engine component replacements, new component configurations. Similarly, ensure that when configuration changes occur on the aircraft (for components that require usage cycles to be tracked by HUMS, such as control surfaces) that the HUMS correctly accounts for this.

r. **Software Upgrades.** Ensure that a process exists for modifying the system software and any of its default parameters. This process should include the requirement to state if historical data needs to be reprocessed with the modified software/default parameters, or if only new data needs to be processed using the new software/default parameters.

s. **Computer-Aided Maintenance Management system (CAMM) Interfaces.** It is desirable that the system database interfaces with CAMM. Verify functionality and ensure that lifing parameters tracked on CAMM correspond to the parameters tracked on the system.

GUIDELINES FOR USAGE ASSESSMENT REPORT (UAR)

INTRODUCTION

1. The Usage Assessment Report (UAR) documents the annual usage assessment activity as part of the requirements for monitoring and assessing aircraft usage and structural life, as specified by MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Manual – PU 2103.

PREPARATION GUIDELINES

General Instructions

2. This guideline provides instructions for the preparation of a Usage Assessment Report as required by the MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Manual – PU 2103.

3. The ASI Manager shall develop and maintain a specification for the production and control of the reports as required by these guidelines. The specification shall be subject to review and approval by the SAO.

4. The ASI Manager is to ensure that all data used for the production of the UAR is available to the SAO. Any software required to read or process data supplied is to be made available by the contractor.

5. The UAR will contain a usage assessment of the subject aircraft fleet covering a period of 12 months unless specifically noted otherwise or requested by DGTA.

6. A draft of the UAR is to be provided within 100 days of the end of the period noted in clause 5. In conjunction with the draft report, the contractor (if applicable) is to provide an electronic copy of all raw and processed usage data for the reporting period.

7. Allowance is to be made for amendment and inclusion of data at the request of the SAO and ASI Manager undertaking clause 3. Once the data and draft UAR are deemed adequate by the SAO, then the final report is to be issued within 60 calendar days.

8. The UAR is to be documented as a Design Organisation Approval (DOA) or equivalent approved organisation approved report. That is a report developed, reviewed and approved in accordance with the process and requirements specified in MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Manual – PU 2103 and the DOA's Design Organisation Exposition (DOE).

9. The annual usage assessment (and resultant UAR) is intrinsic to the conduct of the annual fatigue assessment.

UAR CONTENT REQUIREMENT

10. The UAR is to analyse and present a summary of the quality of the aircraft usage data collected since the last UAR.

11. The UAR is to state whether the data quality appears adequate for the assessment. Comment should be made on any detected bias in the data, for example, a considerable proportion of fill-in data being used during the reporting period.

12. The UAR is to include a trend analysis (for the 12 month period and all time) of data quality and assess for indications of present or future variation outside of control limits.

13. The UAR is to analyse and present the usage data for individual aircraft, the fleet, and if relevant, sub fleets over both the usage period and for all time. The data analysis should also consider the effect of the data sample size and quality on the validity of the result. Usage data to be reviewed and trended should cover all data presented.

14. The UAR is to review each data parameter, using statistical analysis where appropriate, to address the distribution of the data set for individual aircraft within the SAO fleet and the aircraft fleet and the change of relevant parameters with respect to previous recording periods.

15. The UAR is to analyse the data for variation in the mission profiles with respect to previous UARs and the SOI for individual aircraft and the fleet.

16. The UAR is to perform an assessment of the aircraft usage severity in comparison with the baseline spectrum usage severity.

17. The UAR is to provide an explanation for any apparent anomalies or significant trend variations in recorded data.

18. The UAR is to list recommendations for any improvements that may be made to the usage data recording and collection.

19. The UAR is to comment on the usefulness and adequacy of the available data and the systems used in its preparation.

GUIDELINES FOR FATIGUE ASSESSMENT REPORT (FAR)

INTRODUCTION

1. The Fatigue Assessment Report (FAR) documents the annual fatigue assessment activity, being part of satisfaction of the requirements for ongoing monitoring and assessment of aircraft structural integrity as specified by MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Manual – PU 2103.

PREPARATION GUIDELINES

General Instructions

2. These guidelines provide instructions for the preparation of a FAR as required by the MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Manual – PU 2103.

3. The ASI Manager shall develop and maintain a specification for the production and control of the reports as required by these guidelines. The specification shall be subject to review and approval by the SAO.

4. The ASI Manager is to ensure that all data used to produce the FAR is available to the SAO. Any software required to read or process data supplied is to be made available by the contractor (if applicable).

5. The FAR will contain a fatigue assessment of the SAO aircraft fleet covering a period of 12 months unless specifically mentioned otherwise or requested by DGTA.

6. A draft FAR is to be completed within 100 calendar days of the preparing agency receiving the draft UAR (and any amendments to the draft UAR).

7. The final FAR is to be released within 30 days of receipt by the preparing agency of the final UAR, providing the final UAR contains no new information beyond that previously discussed between the ASI Manager, SAO and the agency responsible for performing the FAR.

8. The FAR is to be documented in an Authorised Engineering Organisation (AEO) or equivalent approved organisation-approved report. That is a report developed, reviewed and approved in accordance with the process and requirements specified in MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Manual – PU 2103 and the DOA's Design Organisation Exposition (DOE).

FAR CONTENT REQUIREMENT

9. The FAR is to contain a section that details the requirement for the fatigue assessment, describes the aircraft Fatigue Management System (FMS) and the status

of the aircraft FMS, and any changes made to the system since the last fatigue assessment.

10. The FAR is to document an independent assessment of the aircraft usage severity compared to the baseline spectrum usage severity. The severity comparisons are to be cognisant of fatigue accrual rates and other parametric measures. Assessment of usage severity is to be confirmed (if possible) with fleet condition data (from the associated SCAR).

11. The FAR addresses the extent to which usage severity varies for individual aircraft, sub fleets or the SAO fleet. The fatigue assessment assesses the impact of variations in usage severity across individual aircraft, sub-fleets or the SAO fleet.

12. The FAR is to include a review of the condition aspects that may affect the fatigue management system. The FAR is to report on condition data from critical structure during the period and provide a summary of the data reviewed. One aim of the condition data is to establish the impact on fatigue management due to individual damage occurrences and condition deterioration within the reporting period and due to long-term condition trends.

13. The FAR shall address the impact of current period and accumulated aircraft usage and condition with respect to the structural LOT and the feasibility of achieving PWD.

14. The FAR shall comment on and establish the validity of the results of the aircraft fatigue assessment given the assumption made and taking into account the quality of the input data and any usage variations from the baseline. The FAR shall address the impact of the difference between current mission profiles and mix and the mission profiles and mix of previous assessments. Further, the FAR shall make recommendations for improvements to data recording and processing if they will improve the fatigue assessment validity.

15. The FAR shall address the impact of aircraft usage and condition on the validity and effectiveness of the current maintenance program with respect to assuring ongoing airworthiness. A comment shall be made on the effect of the usage and condition for the period on the overall fatigue management of the aircraft. Any airworthiness issues, structural limit issues, inspection interval and location issues arising from usage, condition and structural configuration changes shall be identified.

16. The FAR shall list recommendations for any improvements that may be made to the aircraft Fatigue Management System and comment on the usefulness and adequacy of the available data and the systems used in the preparation of the UAR and SCAR.

GUIDELINES FOR STRUCTURAL CONDITION ASSESSMENT REPORT (SCAR)

INTRODUCTION

1. The Structural Condition Assessment Report (SCAR) documents the annual structural condition assessment activity (for each individual aircraft and the aircraft fleet) in support of the continuing assessment of aircraft structural integrity for the purposes of maximising the safety, minimising the cost of ownership and maximising aircraft availability. The SCAR also provides an opportunity to identify limitations and propose improvements to the in-service structural management programs.

PREPARATION GUIDELINES

General Instructions

2. These guidelines provide instructions for the preparation of a Structural Condition Assessment Report (SCAR) as required by MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Manual – PU 2103.

3. The ASI Manager shall develop and maintain a specification for the production and control of the SCAR, as required by these guidelines. The specification shall be subject to review and approval by the SAO.

4. The ASI Manager is to ensure that all data used for the production of the SCAR is available to the agency preparing the Fatigue Assessment (FA). This data will be used in the FAR to establish any impact on the fatigue management of individual aircraft of the fleet due to specific damage occurrences within the reporting period and due to long term condition trends.

5. Any software required to read or process data supplied is to be made available by the outsourced contractor (if applicable).

6. The Contractor (if applicable) shall provide a SCAR on an annual basis. The report shall cover a period of 12 months unless specifically noted otherwise or requested by DGTA. For trending purposes, the SCAR shall cover all-time data up to the end of the reporting period. The SCAR is to be delivered in conjunction with the Usage and Fatigue Assessment Reports.

7. The contractor shall provide a draft SCAR within two months of the end of the period noted in clause 6. In conjunction with the draft report, the contractor shall provide an electronic copy of all raw and processed condition data for the reporting period.

8. Allowance is to be made for amendment and inclusion of data at the request of the SAO. Once the data is deemed sufficient by the SAO, then a final certified report is to be issued within 60 calendar days.

9. The SCAR is to be documented in an Authorised Engineering Organisation (AEO) or equivalent approved organisation-approved report. That is a report

developed, reviewed and approved in accordance with the process and requirements specified in MSTAR 21, MSTAR M and MSTAR 145 of the Malaysian State Technical Airworthiness Manual – PU 2103 and the DOA's Design Organisation Exposition (DOE).

10. The annual structural condition assessment (and resultant SCAR) is intrinsic to the conduct of the annual fatigue assessment (FAR).

SCAR CONTENT REQUIREMENTS

11. The SCAR shall contain a section detailing the assessment requirement. The SCAR shall include a section that describes the aircraft's Structural Condition Management system and any changes since the last SCAR.

12. The SCAR shall review and report on condition data and provide a summary of the data reviewed. Source data for this section shall include all relevant data that defines the structural condition of the aircraft. This includes data retrieved from the maintenance records such as the aircraft post Deeper Maintenance Reports (DMR) detailed in DID-DMR, inspection findings, details of repairs and modifications undertaken to primary structural elements and results from environmental degradation and condition management programs, such as the Corrosion Prevention and Control Program (CPCP) or its equivalent. The review shall include available and applicable condition data originating from other operators, both military and commercial (where applicable), and all relevant Technical Airworthiness Alert Information, such as service bulletins, service letters and Airworthiness Directives.

13. The SCAR shall review the collected condition data. The analysis shall be performed to identify any trends, both short and long-term, in the data. The trending analysis should be presented separately for critical and non-critical structures.

14. To maintain airworthiness, the minimum requirements for data assessment and trending analysis for the critical structure shall include:

a. Identifying their susceptibility to corrosion;

b. Identifying their susceptibility to multiple-site damage; and

c. Identifying any evidence of, or potential for, adverse interaction of adjacent repairs.)

15. Additional requirements for data assessment and trending analysis, to maximise availability and minimise cost of ownership, shall include as a minimum:

a. Those requirements listed in clause 14, but for primary and secondary structure (on a cost benefit basis);

b. Identifying susceptibility to degradation of adhesive bonds;

c. Assessing and trending logistic costs;

d. Assessing and trending maintenance costs; and

e. Assessing and trending aircraft downtime (in days).

16. The SCAR shall consider and discuss factors that influence condition data such as aircraft base locations, extended deployment periods, and routine maintenance activities.

17. The SCAR shall analyse and present a summary of the quality of the subject aircraft condition data collected since the last assessment. It shall also include an analysis of trends in data quality for the reporting period and all time, and assess for indications of present or future variation outside of control limits. Any issues with the quality of data recorded while aircraft were on significant deployments shall be recorded.

18. The SCAR shall state whether the data quality and quantity appear adequate for the purposes of the assessment. A comment shall be made on any detected bias or anomaly in the data, for example, data not being distributed over the entire period under study.

19. The SCAR shall review each data parameter, using statistical analysis where appropriate, to address the distribution of a particular parameter for individual aircraft within the subject aircraft fleet, and for the fleet as a whole, and the change of the relevant parameter with respect to previous recording periods.

20. The SCAR shall include comments on the usefulness and adequacy of the data available and the systems used in its preparation.

21. The SCAR shall identify any significant structural work carried out on the aircraft during the reporting period. Any structural rework as a result of an unacceptable condition shall be summarised. An assessment shall be made to determine if the work performed is likely to have any noticeable effect on the data recorded or presented.

22. The SCAR shall assess the nature and extent of any effect that the data collected and analysed in this report has on the assumptions and the resultant inspections for the baseline structural inspection program. Any variation to the baseline inspection program that is required as a result of the impact of the structural condition of the fleet shall be detailed in the SCAR, with appropriate justification.

23. The SCAR shall assess the nature and extent of any effect that the data collected and analysed in this report has on structural condition management programs other than the baseline inspection program. This shall include, but not be limited to, the CPCP (or its equivalent) and routine maintenance activities. This assessment shall consider the impact of the structural condition on design assumptions and results for the fleet as a whole and also the impact that any variation within the fleet, at either individual aircraft or at a sub-fleet level, has on the applicability of structural condition management programs.

24. The SCAR shall address the impact of current period and accumulated structural condition degradation with respect to both the structural and economic life-of-type (LOT) and the feasibility of achieving the planned withdrawal date (PWD).

GUIDELINES FOR ENVIRONMENTAL DEGRADATION ASSESSMENT (EDA)

INTRODUCTION

1. Fatigue and environmental degradation are the two prime mechanisms by which aircraft structure deteriorates. The ongoing integrity of aircraft structure in the face of this degradation is assured through the Aircraft Structural Integrity Program (ASIP) as documented in the ASI Management Plan (ASIMP). This program is required to maintain an aircraft's airworthiness to the Planned Withdrawal Date (PWD). A robust ASIP features an assessment of adequacy and effectiveness of management activities.

2. Assessment of fatigue degradation management is accomplished within the Annual Fatigue Assessment (AFA). The Environmental Degradation Assessment (EDA), a crucial component of a robust closed loop system, is intended to be the formal assessment process for the management of environmental damage. It is envisaged that EDAs will be undertaken periodically by each Configuration Manager to analyse the Environmental Degradation (ED) on their respective aircraft and to recommend, where required, improvement to management and maintenance practices on the aircraft.

3. The EDA is intended to provide a formal means by which ED may be measured and assessed, thus permitting informed conclusions and recommendations to be made regarding the adequacy of the existing Environmental Degradation Management System (EDMS) and maintenance program, including the Corrosion Prevention and Control Program (CPCP). In conjunction with existing usage and condition monitoring activities, The EDA will provide the data and analysis to support the fleet's Structural Life Assessments (SLA).

4. The objective of an EDA is to:

   a. Critically assess the quality and validity of the usage and condition data collected and used for ED management of the type;

   b. Summarise the usage, condition, cost and availability data relevant to ED management of the type;

   c. Provide feedback regarding the efficacy of the EDA process, including cost and time savings garnered from preventative maintenance work,

   d. Assess the ED severity based on usage and condition evidence and identify trends;

   e. Validate the assumptions and basis of ED management of the type;

   f. Identify opportunities for improvement of the EDMS and consequent gains for the cost of ownership and availability as highlighted by a review of usage, condition, cost and availability data.

g. Identify any airworthiness issues as revealed by the assessment;

h. Where appropriate, comment on the impact of the ED and its management on the structural Life of Type (LOT) and risk to the achievement of PWD.

5. This document aims to provide detailed guidelines to SAO in the form of an Engineering Specification for writing EDAs for their respective platforms. This will maximise the effectiveness of the EDA process and serve to capture lessons learned from SAOs who have conducted EDAs to date. These EDA specification guidelines contain material that will provide the following benefits to the ADF:

a. Enable platform specific EDAs to be more easily generated.

b. Promulgate best practices for undertaking EDAs to the SAOs.

c. Identify and address potential ED issues more rapidly and effectively.

d. Effectively and efficiently utilise SAO's resources in the management of aircraft corrosion including reducing unnecessary maintenance practices.

6. The outputs of an EDA will include the following:

a. The primary observations and findings of the platform usage monitoring, condition data and EDA.

b. A statement of the implications of these findings for the ED management of the platform.

c. A corrosion costs and savings summary.

d. Recommendations to address issues identified by the EDA.

PREPARATION GUIDELINES

General Instructions

7. This document provides instructions for preparing a FAR as required by the Contract/Statement of Work.

8. The Contractor (if applicable) shall develop and maintain a specification for producing and controlling the reports as required by this document. The specification shall be subject to review and approval by the SAO.

9. The Contractor (if applicable) is to ensure that all data used for the production of the FAR is available to the Commonwealth. Any software required to read or process data supplied is to be made available by the contractor.

10. The FAR will contain a fatigue assessment of the SAO aircraft fleet covering a period of 12 months unless specifically noted otherwise or requested by DGTA.

11. A draft FAR is to be completed within 100 calendar days of the preparing

agency receiving the draft UAR (and any amendments to the draft UAR).

12. The final FAR is to be released within 30 days of receipt by the preparing agency of the final UAR, providing the final UAR contains no new information beyond that previously discussed between the contractor, SAO and the agency responsible for performing the FAR.

13. The FAR is to be documented in an Design Organisation Approval (DOA) or equivalent approved organisation-approved report. That is a report developed, reviewed and approved in accordance with the process and requirements specified in the DOA's Design Organisation Exposition (DOE).

FAR CONTENT REQUIREMENT

14. The FAR is to contain a section that details the requirement for the fatigue assessment, describes the aircraft Fatigue Management System (FMS) and the status of the aircraft FMS, and any changes made to the system since the last fatigue assessment.

15. The FAR is to document an independent assessment of the aircraft usage severity compared to the baseline spectrum usage severity. The severity comparisons are to be cognisant of fatigue accrual rates and other parametric measures. Assessment of usage severity is to be confirmed (if possible) with fleet condition data (from the associated SCAR).

16. The FAR addresses the extent to which usage severity varies for individual aircraft, sub fleets or the SAO fleet. The fatigue assessment assesses the impact of variations in usage severity across individual aircraft, sub-fleets or the SAO fleet.

17. The FAR is to include a review of the condition aspects that may affect the fatigue management system. The FAR is to report on condition data from critical structure during the period and provide a summary of the data reviewed. One aim of the condition data is to establish the impact on fatigue management due to individual damage occurrences and condition deterioration within the reporting period, and due to long-term condition trends.

18. The FAR shall address the impact of current period and accumulated aircraft usage and condition with respect to the structural LOT and the feasibility of achieving PWD.

19. The FAR shall comment on and establish the validity of the results of the aircraft fatigue assessment given the assumption made and taking into account the quality of the input data and any usage variations from the baseline. The FAR shall address the impact of the difference between current mission profiles and mix, and the mission profiles and mix of previous assessments. Further, the FAR shall make recommendations for improvements to data recording and processing if they will improve the fatigue assessment validity.

20. The FAR shall address the impact of aircraft usage and condition on the validity and effectiveness of the current maintenance program with respect to assuring ongoing airworthiness. Comment shall be made on the effect of the usage and condition for the period on the overall fatigue management of the aircraft. Any

airworthiness issues, structural limit issues and inspection intervals and location issues arising from usage, condition and structural configuration changes shall be identified.

21. The FAR shall list recommendations for any improvements that may be made to the aircraft Fatigue Management System and make comment on the usefulness and adequacy of the data available and the systems used in the preparation of the UAR and SCAR.