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CHAPTER 1 – Propulsion System Integrity Management Under the DASR

Major changes for propulsion systems and engine structural integrity under the DASR

The Defence Aviation Safety Regulations (DASR) relating to propulsion system integrity and engines structural integrity are objective based and technology agnostic. As a result, there is no one specific regulation for propulsion system or engine structural integrity. However ensuring propulsion system integrity and engine structural integrity is still required under the DASR.

The ESI section within DAVENG-DASA have complied this guide to provide the ADF propulsion community with guidance as to how to ensure and assure propulsion system integrity under the DASR.

Propulsion System vs. Engine

Historically, Engine Structural Integrity (ESI) was defined as the activities undertaken to constrain the risk of failure of the high energy, non-containable components within the engine. These ESI activities have served the ADF well, noting the healthy culture towards ESI management and a very limited number of in-service critical part failures within the last decade. However, the introduction of DASR has provided an opportunity to move to a broader propulsion system integrity perspective where applicable. As a result ‘Propulsion System’ is now the preferred terminology to holistically describe an aircraft’s engine, drivetrain, accessories, and propeller. The ESI section within DAVENG-DASA believes this broader definition has the potential to improve safety as shown by the 2010 RAAF PC9 aircraft accident. In this instance, a non-redundant main fuel pump failure resulted in a non-recoverable in-flight shutdown in a critical phase of flight. Failure of the fuel pump required aircrew to eject from the aircraft in flight.

In future when speaking in general about ESI, ‘propulsion system integrity’ will be used in its place. When speaking specifically about a particular platforms ESI program, ESI or propulsion system integrity as applicable will be used.

Existing platforms are expected to retain their existing ESI programs unless they desire to expand to a propulsion system integrity program. New acquisitions from Sept 2018 are
expected to implement propulsion system integrity programs utilising all of the changes under the DASR.

**Propulsion System Critical Parts Definition**

The purpose of identifying critical parts within a propulsion system is to ensure that an acceptable level of safety is set at certification and maintained throughout the life of type. This purpose has not changed under DASR, however to align with the expanded definition from engine to propulsion system, ‘engine critical parts’ has been expanded to ‘propulsion system critical parts’. The existing critical component lists identified at type certification are not expected to be updated, however it is recommended that new platforms will use the ‘propulsion system critical parts definition’ to create the critical component list during type certification. However all platforms are expected to use the ‘propulsion system critical parts’ definition when determining unsafe conditions and exercising their DoSA delegations (see **Effective Occurrence Reporting and Management** and **CHAPTER 6 –DoSA Responsibilities** for more information).

The ‘Propulsion system critical parts’ definition now includes any product whose primary failure could result in a hazardous propulsion system effect. Under DASR 21.A.41 GM ‘Hazardous propulsion system effects’ are defined as:

- Non-containment of high-energy debris, including release of the propeller or any major portion of the propeller,
- Concentration of toxic products in the engine bleed air intended for the cabin sufficient to incapacitate crew or passengers,
- Significant thrust in the opposite direction to that commanded by the pilot,
- Uncontrolled fire,
- Failure of the engine mount system leading to inadvertent engine separation,
- Complete inability to shut the engine down,
- Propeller failure resulting in the development of excessive drag, and
- Partial or complete loss of thrust or power for single engine aircraft.

The EASA document ‘**ED Decision 2007/015/R**’ Annex Subpart D pg 125 – 127 contains a more detailed explanation of each of these hazardous effects.

**ESIMP or PSIMP**

The Engine Structural Integrity Management Plan or the Propulsion System Integrity Management Plan (ESIMP or PSIMP) provide a valuable and centralised repository of all
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relevant information relating to a propulsion systems certification and programmatic requirements. These plans currently include the propulsion system description and certification basis, certification activities, critical part identification and limits, usage monitoring systems, performance and health monitoring, as well as summarising roles and responsibilities across Part 145/M/21 domains. Additionally an ESIMP/PSIMP can contain a consolidated list of platform issues and investigations, and through-life support tasks that are required to maintain or improve propulsion system management.

The ESIMP or PSIMP are not mandated artefacts under DASR. However an effective ESIP/PSIP is required under DASR and an ESIMP or PSIMP is an Acceptable Means of Compliance (AMC) to several DASR. Therefore if an organisation wishes to move away from an ESIMP/PSIMP, it is recommended they discuss the alternate plan with the relevant ESI Desk Officer within DAVENG-DASA before it is implemented.

There is no requirement under DASR for the initial or routine approval of the ESIMP/PSIMP. However if the ESIMP/PSIMP is used during initial certification as evidence to support how propulsion system integrity management will be conducted, then DASA-ESI will evaluate this document during initial compliance finding activities. If used, ESIMP/PSIMPs are expected to be maintained and kept accurate over the life of a platform. On-going adequacy and conformance of ESIMPs/PSIMPs will be assessed during Part 21 and CAMO safety assurance activities. If during safety assurance activities an implemented ESIMP/PSIMP is found to be incorrect or deficient, then the applicable Corrective Action Request (CAR), Opportunity For Improvement (OFI) or finding will be raised by the Authority.

**ESI Manager or Propulsion System Integrity Manager**

There is no DASR requirement to appoint an ESI manger (or propulsion system integrity manger). Furthermore, propulsion system integrity management responsibilities are distributed across the AMTCH (or AMTCH delegate), Part 21J, CAMO(s) and Part 145 organisations. The identification of a propulsion system integrity manager has historically proven to be an effective part of the engine management system. It is recommended under DASR to maintain a defined point of contact(s) who can consolidate work and coordinate efforts by all involved parties. There is no requirement for this to be a specific individual within any specific organisation; providing accountability, responsibilities and lines of communication are clear. To this end it is requested that if an organisation wants to move away from their existing ESI manager model, they will discuss the alternate plan with the ESI section before it is implemented.
ESIWG and Propulsion System Integrity Stakeholder Communication

The ESI Working Group (or PSIWG) remains an 'open-forum' to discuss any propulsion-related issues that currently affect, or may in the future affect the platform. It provides an opportunity for key stakeholders to raise any concerns or issues and seek resolution for them within the specific propulsion community. These forums are not mandated by DASR, and are not related to any type of safety assurance activity. However, these working groups are encouraged to continue as they have been shown to be an effective stakeholder communication tool.
CHAPTER 2 – Tenets of PSI

Aligning eADRM propulsion requirements and tenets of PSI to the appropriate DASR.

There are a number of fundamental tenets of propulsion system integrity management. Regardless of the system of regulation used, the tenets of propulsion system integrity management remain the same. The fundamental tenets are identified in Figure 1.

![Figure 1 - Fundamental Tenets of Propulsion System Integrity Management](image)

These fundamental tenets of propulsion system integrity management are supported by requirements detailed in DASR and the AAP7001.054 Airworthiness Design Requirements Manual (eADRM) Sect 3 Chap 13 ‘Propulsion Systems’. Table 1 shows traceability of propulsion system tenets to specific DASR and eADRM regulations and requirements. The DASR cross referenced in this table are neither exhaustive nor independent and assume that propulsion systems will be considered implicitly in other elements of system and organisational compliance.
Critical Part Lifting Policy

In the DASR there is a requirement to identify all propulsion system critical parts whose failure has the potential to result in hazardous propulsion system effects, as defined on page 4. Identified critical parts must be assigned appropriate lifting policy to prevent failures during service, for Australian military propulsion systems this will generally be expressed through the application of:

- **Life Limits.** A retirement or throw-away life of a propulsion system critical part.

- **Damage Factors.** Any factor that is used to modify the rate at which a part consumes life—based on variables such as mission type or type of component. (sometimes referred to as ‘K Factors’, ‘Flight Count Factors’, or ‘Part Factors’).

- **Critical Inspection Requirements.** Inspections that are required during a critical part’s life to prevent hazardous effects or meet life limits. This includes inspections which are required to support a part reaching a safe life limit whilst meeting damage tolerant assessment requirements.

- **Usage Monitoring Algorithms or Equations.** Algorithms or equations that are required to be used to track consumption of critical part life. This must include any relevant fill in factors to account for missing/corrupt data. It is possible for usage monitoring algorithms or equations to require modification to account for deltas in...
ADF CRE from initial OEM design assumptions. OEMs will develop usage monitoring requirements as part of the initial design and certification. Under the ADF military certification process the suitability of the UM system must be assessed to ensure that it remains applicable to ADF CRE. Complex usage monitoring requirements may need to be assessed as part of the initial compliance finding activities.

This information forms part of the type design (DASR 21.A.31) as Airworthiness Limitations (AwL), which form part of the ICA (DASR 21.A.61) and is recorded in the Australian Military Type Certificate (AMTC) (DASR 21.A.41).

**Usage Assessment (Mission Analysis)**

During the design of a propulsion system, OEMs make numerous critical assumptions regarding the intended usage of propulsion systems in order to predict the life of critical parts. These life predictions are performed using complex proprietary lifing models and tools. The usage and design assumptions do not always specifically account for ADF usage.

ADF propulsion system operations historically have been shown to be different, and in some cases more severe that OEM design assumptions. These differences need to be assessed early within a propulsion system’s service life and monitored on an on-going basis. This is captured under DASR 21.A.44(c) which states a requirement for AMTCH or delegate to undertake a propulsion mission analysis, during initial certification and routinely during the in-service life of the propulsion system. Further detailed information is contained within Appendix 1 to GM 21.A.44(c).

**Initial Mission Analysis.** When the aircraft is in the initial airworthiness or acquisition phase, actual usage data is rarely available. It is acceptable to plan for the initial mission analysis to be conducted after a period of representative operation, providing that safe interim propulsion system operations can be assured to the authority. The initial mission analysis should be then followed by a comprehensive in-service mission analysis after an acceptable period of representative operation. The details of the mission analysis should be documented in the mission analysis schedule, which needs to include frequency of occurrence, data required, definition of representative operations, communication channels with the OEM, predicated timeframes for collection of data, data analysis, and implementation of mission analysis results.
On-going Mission Analysis. It is expected that in-service mission analysis are conducted with the direct involvement of the relevant OEM, due to commercial constraints and intellectual property restrictions. Advice from relevant OEMs is to be sought regarding the type and amount of data required to conduct a suitable mission analysis. The scope and complexity of a mission analysis or mission analysis program will be dependent on aircraft application and extent of ADF CRE differences from original type certification. Any platform that plans to conduct a mission analysis without OEM involvement should seek guidance from the Authority (the relevant ESI desk officer within DAVENG-DASA).

During the in-service operation of a platform, a number of operational and systemic changes can influence the validity of previous mission analyses. For military engines, monitoring of usage parameters against life limits alone is insufficient to ensure that engines continue to operate within the type design. These changes can include but are not limited to:

- Changes to individual mission profiles
- Changes to the platform mission mix
- Changes to operating environment
- Capability upgrades to the platform
- Changes to platform roles
- Upgrades to the Usage Monitoring system (UM) or HUMS
- Improvement or refinement in OEM lifing models, and design assumptions

This information may be contained within an SOI or SOIU, but it is anticipated that for propulsion systems the SOI or SOIU will not be sufficiently detailed to be an adequate substitute for an OEM mission analysis. However an update to the SOIU may act as a catalyst to change the mission analysis schedule. More information regarding SOIU can be found on the DASR website.

Usage Monitoring System

The complexities of UM requirements are dependent on aircraft application and level of technology available at the time of engine/propulsion system introduction into service. UM systems can vary from hours based tracking and simple manual cycle counting, in the form of landings or starts (Low Fidelity), through to complex algorithms that accommodate the operator's unique mission severity, and even further to sophisticated real-time physics based computation (High Fidelity). Independent of the UM system fidelity, UM systems are
required to be verified and validated to ensure that data integrity is maintained on-board and off-board.

Additionally, UM systems need to be checked on a routine basis to ensure that captured data remains complete and accurate. Even a previously verified and validated UM system has the potential for missing or erroneous data. Procedures are needed for the application of approved fill-in factors, for lost or erroneous data. Checks for accuracy and completeness can be either automatic or manual, but traceability and records associated with these checks must be kept. It is the responsibility of the CAMO to ensure that an adequate UM system is implemented, which provides complete and accurate usage records IAW the type design (see DASR M.A.301, M.A.302, M.A.305).

**Effective Occurrence Reporting and Management**

Occurrence reporting is an essential activity required to support accident prevention. It forms part of a fundamental input to a generative ‘culture of safety’. Occurrence reporting aims to ensure that unsafe conditions, as a result of identified instances of component failure, malfunctions, or defect, are assessed to ensure that a platforms type design remains safe.

DASR 145 Maintenance Venues (DASR 145.A.60), CAMOs (DASR M.A.202), and 21J Design Organisations (DASR 21.A.3A) each have obligations to report occurrences within 72 hours of being made aware of an unsafe condition. Although each relevant organisation may be required to report on the same occurrence or unsafe condition, they each must report on different aspects relevant to their organisational context. The relevant people and organisations that require notification needs to be determined for each Occurrence Report. A detailed example of occurrence reporting has been provided at Error! Reference source not found..

It is important to note the subtle differences in occurrence reporting obligations for the different organisations. Part 21 organisations are required to ‘collect, investigate and analyse failures, malfunctions and defects or other occurrences’, whereas the CAMO and 145 organisations are only obliged to ‘collect, report and evaluate reportable occurrences’. For a non-comprehensive list of propulsion system reportable occurrences please see Basic Regulation Appendix 1 - Occurrence Reporting.
Approval for Critical Components Operations Outside the Type Design

ADF operations must be conducted within the limits of the type design and stipulated in the type design (includes AwL and ICA). However, there have been historical examples where propulsion system critical parts have received significant life reductions, based on the results of in-service failures, outcomes of mission analyses or reassessment of design models. Immediate adoption of reduced life limits may have a considerable impact on operational capabilities.

Under DASR, any change to an AwL (such as critical component life limits) is classified as a major change to type design (DASR 21.A.91) and requires approval from the Authority (In this case ESI within DAVENG). In emergencies or where there is a compelling operational imperatives, DASR BR.80 Flexibility Provisions allows for Commanders to deviate from operating limitations.

If a major change cannot be approved or if the Commander does not wish to utilise the DASR BR.80, the Authority may approve field management strategies. These strategies will generally lessen the impact of implementing changes, with residual risks to operations being acknowledged and accepted at the appropriate level. Justification to support field management strategies should be provided to the Authority for approval based on advice from relevant OEMs or conservative engineering judgement. For further guidance see AMC and GM to DASR 21.A.3B.

The most likely means of promulgating approved field management strategies will be in the form of Airworthiness Directives (AD). An AD relating to engine critical part lives outside of the type design would not be within the AD delegate’s (DoSA) level and scope. An AD of this nature would require DAVENG-DASA to issue the document.

Condition Monitoring

Condition Monitoring (CM) programs are holistic and encompass the techniques, tools, data, analysis, and decision making support for all condition metrics collected. These metrics are collected from a wide range of sources including, Condition Monitoring (CM) techniques, Health and Usage Monitoring Systems (HUMS), Ageing Aircraft Audits (AAA), onboard sensors and many more.

Engine or propulsion system CM programs fall on a spectrum dependant on the desired support to safety and cost of ownership. At its most basic a platform needs to comply with
condition monitoring requirements as specified in the maintenance instructions for determining serviceability\(^1\). This aspect is the only regulated element of a platforms CM program. However effective CM programs have the potential to increase safety assurance, support reliability programmes and reduce cost of ownership. Therefore it is highly recommended that enhanced CM programs should be investigated, implemented and continually assessed for effectiveness.

**CM techniques.** Condition monitoring techniques focuses on the traditional approaches, such as remote visual inspections (utilising borescope of videoscope equipment), power performance checks, and oil condition analysis. While the minimum CM requirements are those directed by the OEM, it is important to review these for effectiveness to ensure that smart, targeted and complementary CM techniques are employed. Outputs and results from CM techniques should be captured and stored for later access or trending and analysis.

**HUMS.** CM systems can also utilise Health and Usage Monitoring Systems (HUMS). These systems usually consist of data capture from on-board sensors. Effective HUMS have an end to end focus, that considers the on-board data acquisition and also ensures that a complete and effective off-board (ground based) system is established. This allows for data storage, analysis and retrieval which supports effective decision making.

**Trending.** Performance and health analysis trending is a means of tracking propulsion fleet reliability. It is recommended that a routine reporting activity is established that captures in-service failures, occurrences and issues which are holistically analysed to identify trends. This information can be further combined with system management effectiveness metrics such as data capture or automated onboard warning false alarm rates to provide an overall fleet health picture. Reporting of this nature can be used to inform stakeholders and prioritise reliability engineering efforts.

\(^1\) OEM mandated CM requirements are scheduled to prevent in-service failures. They are typically not optimised to minimise cost of ownership or trended in such a way to allow for prediction of impending failures and allow for the scheduling of maintenance accordingly.
CHAPTER 3 – Part 21 Responsibilities

Responsibilities of the Part 21 J Design Organisation for propulsion systems and engine structural integrity under the DASR.

Under DASR, propulsion system management compliance responsibilities will be split across the Delegate of the Safety Authority (DoSA), the Continuing Airworthiness Management Organisation (CAMO), and the relevant Part 145 Maintenance organisations. The specific obligations of the Part 21 are detailed in this chapter.

The initial airworthiness regulations (DASR Part 21) establish the requirements related to the initial airworthiness of military aircraft as well as the requirements for design and production organisations. Further information regarding Part 21 can be found on the DASR website.

During the in-service life of the product², the Part 21J³ organisations are expected to carry out the following activities to assure PSI:

- Establish systems for the collection, investigation and analysis of data related to failures, malfunctions, defects or other occurrences which may adversely affect airworthiness of the product. (DASR 21.A.3A(a))
  - Each 21J must establish this system for the scope of their MDOA (it is listed on your MDOA approval certificate). For example DAVENG is a 21J for the structure and mechanical components of all ADF registered aircraft. Therefore it does not need to collect, investigate and analyse avionics occurrence reports, or corrosion reports on landing gear.
  - The requirement for collection, investigation and analysis of failures, malfunctions and defects only applies to 21 organisations. The CAMO and 145 organisations are only obliged to report occurrences, which may be a much smaller subset.

- Report occurrences within 72 hours of being made aware of an unsafe condition. (DASR 21.A.3A(b))
  - 21J organisations are required to report to the appropriate authority representative and production organisations, on aspects of an unsafe condition that are applicable to their scope of authorisation.

² Please note in this scenario “product” can refer to the engine, gearbox, fuel pump, APU etc.…
³ This list does not refer to all 21, just "subpart J Military Design Organisation Approval" organisations as applicable to PSI.

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For example a 21J with scope of all ADF T700 variants, should assess the impact of the occurrence on the Seahawk, Blackhawk and Romeo platforms as they all share a T700 variant engine. Urgent unsafe conditions should be reported verbally immediately and then followed up with the appropriate paperwork. For example if a CAMO discovered an engine critical component has overflow the life limit, they should immediately telephone the authority (in this case the relevant ESI section desk officer within DAVENG-DASA) or email the Authority Occurrence Reporting group email inbox and then submit the paperwork ASAP, but NLT 72 hours from the discovering the overfly.

There is a non-exhaustive list of the types of ESI or propulsion system occurrences that 21J organisations should report at Appendix I to the Basic Regulation (BR).

For more information please also read the Effective Occurrence Reporting and Management section of this guide.

- Investigate the occurrence and report any findings and rectification actions or plans to the Authority. (DASR 21.A.3A(c))
  - DASA-ESI expects to be kept updated on any unsafe conditions relevant to ESI (changes to critical component life limits, critical component overflies, …)
- Correctly classify changes in type design and repairs. (DASR 21.A.91 and 21.A.435)
  - This privilege is awarded to each 21J organisation individually by DASA and the scope of this privilege is outlined in each 21J’s letter of authorisation.
  - There are examples of major changes to type design and major repairs for propulsion systems on the CASA website at AC-21-12. This is not an exhaustive list and the specific Australian Military circumstances need to be considered in any classification decision.
- Establish and maintain a design assurance system. (DASR 21.A.239)
CHAPTER 4 – Part M Responsibilities

Part M responsibilities for propulsion systems and engine structural integrity under the DASR.

Under DASR, propulsion system management compliance responsibilities will be split across the Delegate of the Safety Authority (DoSA), the Continuing Airworthiness Management Organisation (CAMO), and the relevant Part 145 Maintenance organisations. The specific obligations of the CAMO are detailed in this chapter.

Continuing Airworthiness (Parts M and 145) is focused on ensuring individual aircraft remain airworthy through complying with instructions for continuing airworthiness. DASR Part M Continuing Airworthiness Management Organisations (CAMOs) are being formed within the current Force Element Group (FEGs) with the Director Logistics Capability (DLC) positions being recognised as the Continuing Airworthiness Managers. Further information regarding CAMO’s can be found on the DASR website. In most circumstances these CAMOs do not have the resources or experience to carry out all of the ESI/propulsion structural integrity CAMO tasks, as a result they are parcelling out work as ‘CAM Services’. These services are recorded in the Continuing Airworthiness Services Manual (CASM, also referred to as ‘the handbook’ or ‘the manual’). Although the CAMOs have parcelled out various services, ultimately the CAM is still responsible for ensuring this work is carried out, see DASR M.A.711.

CAMOs or CAM service providers are expected to carry out the following tasks as applicable to ESI/propulsion system integrity:

- Ensure the continuing airworthiness of each tail’s propulsion system. (DASR M.A.301)
- Ensure the AMP is correct, up to date, regularly reviewed and approved by the NMAA. (DASR M.A.302)
- Ensure the AMP is followed by the maintenance organisations. (DASR M.A.302)
- Report occurrences within 72 hours of being made aware of an unsafe condition. (DASR M.A.202)
  - Each relevant organisation is required to report on aspects of an unsafe condition that are applicable to their scope of authorisation.
  - The occurrence reporting objective for the CAMO is a judgment on the potential impact to the fleet. For propulsion system integrity issues this should include an assessment on the effectiveness of existing ESIP/propulsion system integrity program.
For an example and more information please also read the Effective Occurrence Reporting and Management section of this guide.

Urgent unsafe conditions should be reported verbally immediately and then followed up with the appropriate paperwork. For example if a CAMO discovers that an engine critical component has overflown the life limit, they should immediately telephone the authority (in this case ESI) and then submit the paperwork (ASOR, defect report, Form 44 or similar) ASAP, but NLT 72 hours from the discovering the overfly.

- Work closely with the AMITCH delegate in the event of an occurrence. (DASR M.A.202)
- Manage the propulsion system implementing systems, including usage monitoring, condition monitoring and reliability. (DASR M.A 301, M.A.302, M.A.305)
- Establish systems for the collection, investigation and analysis of data. (DASR 21.A.3 and M.A.305)
- Manage and if applicable enact the Mission Analysis plan. (DASR 21.A.44)
- Periodically carry out the Military Airworthiness Review. (DASR M.A.901)
CHAPTER 5 – Part 145 Responsibilities

Responsibilities of the Part 145 for propulsion systems and engine structural integrity under the DASR.

Under DASR, propulsion system management compliance responsibilities will be split across the Delegate of the Safety Authority (DoSA), the Continuing Airworthiness Management Organisation (CAMO), and the relevant Part 145 Maintenance organisations. The specific obligations of the Part 145 are detailed in this chapter.

Part 145 maintenance organisations will be responsible for the conduct of maintenance, any CAM services as per the applicable CASM and data capture to support the broader initial and continuing airworthiness systems.

To ensure ESI/propulsion system integrity, Part 145s are expected to:

- Hold and use current and applicable maintenance data, including procedures, practices and maintenance instructions. (DASR 145.A.45)
- Follow procedure to correct any deficiencies with this maintenance data. (DASR 145.A.45)
- Report occurrences within 72 hours of being made aware of an unsafe condition. (DASR 145.A.60)
  - Each relevant organisation (21J, CAMO, 145) is required to report on different aspects of an unsafe condition that are applicable to their scope of authorisation.
  - For example Part 145 occurrence reporting objectives are speed and detailed information of an unsafe condition. The 145 need to provide the relevant occurrence details to the CAMO and the Authority ASAP and recorded the occurrence in their register. An AMC would be filling out the defect report and emailing it off to the SPO and the authority (for general propulsion system issues email the DoSA for ESI issues email ESI section within DASA) within 72 hours.
  - For more information please also read the Effective Occurrence Reporting and Management section of this guide.
CHAPTER 6 – DoSA Responsibilities

Responsibilities of the DoSA for propulsion systems and engine structural integrity under the DASR.

Under DASR, propulsion system management responsibilities will be split across the relevant Part 21, the Delegate of the Safety Authority (DoSA), the Continuing Airworthiness Management Organisation (CAMO), and the relevant Part 145 Maintenance organisations. The specific obligations of the DOSA are detailed in this chapter.

DoSA have been issued several delegations. For the assurance of propulsion system integrity/ESI, the delegations of ‘AMTCH delegate’, ‘Authorise and release Airworthiness Directives (ADs)’ and ‘Conduct unsafe condition assessments’ are the most pertinent.

To assure ESI/propulsion system integrity, the DoSAs are expected to:

- Assure the type design is maintained. (DASR 21.A.41)
  - The 4 key aspect of maintaining the Type Design for ESI/propulsion system integrity are, ensuring UM, OR and mission analysis are conducted accurately and in a timely manner and identifying when the type design has been (or will be) invalidated.
- Undertake all the obligations of the AMTCH. (DASR 21.A.44)
- Review and assess in-service usage to confirm the ongoing validity of the type design. (DASR 21.A.44(c))
  - This obligation will most likely be met by the OEM conducting a mission analysis using a representative sample of captured ADF data. If this cannot be achieved, an alternate AMC will need to be negotiated with the Authority (DASA-ESI).
  - Refer to the section Usage Assessment (Mission Analysis) for further information.
- Assure that master copies of all manuals required by the applicable type-certification basis are produced, maintained and updated. (DASR 21.A.57)
- Assure that a complete set of instructions for continuing airworthiness are published and updated. A programme showing how changes to the instructions for continuing airworthiness are distributed shall be submitted to the Authority. (DASR 21.A.61)
- Retain all relevant design information to ensure the continued airworthiness of the type. (DASR 21.A.55)
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- For ESI and propulsion systems, this regulation is generally satisfied by having an agreement with the applicable OEM(s) for the Authority to view any information required on request.

- Carry out all delegation responsibilities in accordance with the applicable DoSA delegation minute. (DASR 21.A.3, 21.A.3B, 21.A.44)
  - The scope of this delegation excludes unsafe conditions that are or are likely to result in a hazardous propulsion effect as per the GM in DASR 21.A.41.
Annex A

Occurrence reporting example

DASR 145 Maintenance Venues (DASR 145.A.60), CAMOs (DASR M.A.202), and 21J Design Organisations (DASR 21.A.3A) each have obligations to report occurrences within 72 hours of being made aware of an unsafe condition. Although each relevant organisation may be required to report on the same occurrence, they each must report on different aspects relevant to their organisational context.

The 145 organisation is expected to simply report the facts of the occurrence, when, where and what. For example: Every F404 stage 3 HPC disk (critical component) needs to be inspected for hard alpha inclusions before 8358 ELCF, this is an airworthiness limitation (AwL). If hard alpha is found, then the TAE workshop is required to raise an occurrence report because hard alpha inclusions can directly lead to non-containment of high-energy debris, which is a hazardous propulsion effect. Therefore the 145 must send an occurrence report to the Authority, the CAMO and the organisation responsible for the design of the aircraft or component within 72 hours.

The relevant people and organisations that require notification needs to be determined for each occurrence report. In this case the relevant authority representative is the Chief Engineer, who has the Australian Military Type Certificate Holder (AMTCH) delegation as per the DoSA delegation letter from DASA. The appropriate CAMO is ACG HQ as per the CAME which points to points to the CASM (handbook) which states that TAE are conducting this CAM service on their behalf. And the organisation responsible for the design of the component in this case is GE, however in the ADF due to our ‘orphaned Type Certificates’ the most efficient way to fulfil the intent of this regulation is to tell the local engineering organisation responsible for the engine management, who in this case is TAE, who will in turn tell GE, the OEM.

Back to the example: So the TAE workshop NDT technician that found the flaw emails his NDT report to his supervisor who signs it and send it as an attachment in an email to the AMTCH Delegate (the Authority), ACG HQ (the CAMO) and TAE (CAM services and 21J) stating that this is an OR within 72 hours of finding the flaw. This is AMC to DASR 145.A.60(a)(c)(d)(e), but not (b).

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DASR 145.A.60(b) is satisfied when ACG SI (LOG) 1-6-1 is followed where the equipment section maintain the register of defect reports.

The CAMO (ACG HQ) is obliged to follow DASR M.A.202(a), (c) and (e) and assess the occurrence report for fleet applicability and ability to continuing to conforming with the type design then pass this assessment onto the Authority within 72 hours. The AMC also suggests that the CAMO notify the organisation responsible for the design of the aircraft or component. In this example ACG HQ is the CAMO and they have the responsibility to make sure that this occurs, however TAE are best placed to make these assessments, so they should include ACG HQ on the email distribution list in order to comply with this regulation. The CAMO (ACG HQ) is also obliged to have an occurrence report system to trend occurrences and circulate the information to the appropriate parties as per M.A.202(b).

Even though TAE are not the ‘the organisation responsible for the design of the component’ (this is GE) nor are they the ‘The holder of a the applicable major repair design approval’ (again GE), as per the contractual agreement TAE are also obliged to follow DASR 21.A.3A(b) Therefore they need to report to the authority on ‘implications to ongoing validity of the certified type design’ of this occurrence report within 72 hours of it being identified, not from when they are notified. They are also contractually obliged to have a system for collection, investigation and analysis of data, even though they do not hold the major repair design approval for this particular design as per DASR 21.A.3A(a). Finally they are obliged to investigate the deficiency and report the Authority the results and action taken to correct it DASR 21.A.3A(c).

When the AMTCH (or their staff) receive this occurrence report, they are required to conduct an unsafe condition assessment. However the DoSA’s scope does not include any condition that can result in propulsion system hazardous effects. Therefore in this case, this occurrence report needs to be forwarded to ESI section within DAVENG who will make an unsafe condition assessment and if necessary issue an AD. In this case that would not be necessary in this case as the issue already has an effective management strategy in place.

In this example all of the regulations could be covered off by three steps:

1) A single email from the TAE workshop to the Chief Engineer (the Authority), ACG HQ (the CAMO) and the F404 co-ordinator (21J) and GE (the OEM) within 72
hours that states the basic details, effect on the fleet and impacts on the type design.

2) Results of an investigation passed onto the authority.

3) Recording of the occurrence report in a register (this can be the same register for the 145, CAMO and 21J if desired).