Australian Government
Department of Defence

ADVISORY CIRCULAR

AC 003 / 2018

RISK MANAGEMENT IN THE DEFENCE AVIATION SAFETY PROGRAM

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An Advisory Circular is issued by the Authority to promulgate important information to the Defence Aviation community, but does not mandate any action. This includes informing the community on aviation safety / airworthiness matters, information that enhances compliance understanding for existing regulation, or policy guidance for aviation issues not yet regulated that requires further understanding.

Audience

This Advisory Circular (AC) 003/2018 is relevant to:

- all organisations within the DASR regulated community.

Purpose

The purpose of this Advisory Circular (AC) is to provide guidance on conducting aviation safety related risk management activities within the DASR framework. The AC describes the key elements of safety risk management that must be implemented by organisations to ensure compliance with the *Work Health and Safety Act 2011* (WHS Act). It is not intended to replicate the full detail contained in the Act.

Further information

For further information on this AC, contact: DAVREG-DASA.

Status

This AC will remain current until cancelled by DASA.

Version	Date Approved	Approved By	Details
1.0	27 Sep 2018	DG DASA	Initial release

Contents

1 Reference material

1.1 Acronyms

The acronyms and abbreviations used in this AC are listed in the table below.

Acronym	Description
AAP	Australian Air Publication
AC	Advisory Circular
AFSM	Air Force Safety Manual
AMC	Acceptable Means of Compliance
CP	Certification Programme
CPP	Certification Programme Plan
CRE	Configuration, Role & Environment
DASP	Defence Aviation Safety Program
DASR	Defence Aviation Safety Regulations
GM	Guidance Material
HoC	Hierarchy of Controls
ISO	International Organisation for Standardisation
MAA	Military Airworthiness Authority
MAO	Military Air Operator
MCRI	Military Certification Review Item
MPTF	Military Permit To Fly
MTC	Military Type-Certificate
NAA	National Airworthiness Authority
OEM	Original Equipment Manufacturer
OIP	Orders, Instructions, Procedures
SFARP	So Far As is Reasonably Practicable
SMS	Safety Management System
SRM	Safety Risk Management
RM	Risk Management
TCB	Type Certification Basis
TCDS	Type Certificate Data Sheet
WHS	Work Health and Safety

1.2 Definitions

Terms that have specific meaning within this AC are defined in the table below.

Term	Definition
Airworthiness	The ability of an aircraft, or other airborne equipment or system, to operate in flight and on ground without significant hazard to aircrew, ground-crew, passengers (where relevant) or to other third-parties.

1.3 References

1.3.1 AAP 8000.011 Defence Aviation Safety Regulations

1.3.2 Work Health and Safety Act 2011

1.3.3 Defence Officer Framework (http://drnet/People/WHS/Documents/WHSOfficerFramework.pdf)

Unless specified otherwise, all regulation references in this AC refer to the Defence Aviation Safety Regulation (DASR).

2 BACKGROUND

2.1 Safety Legislation in Australia

2.1.1 The former Occupational Health and Safety Act 1991 (OHS Act) existed harmoniously with the Defence aviation safety framework for over twenty years, allowing Defence to employ international standards in risk management, and adopt civil aviation conventions for risk management in the safe operation of State aircraft. However, the OHS Act was replaced with the *Work Health and Safety Act 2011(WHS Act 2011)*, which tightened certain provisions that significantly impinge on Defence and have driven significant changes in the Defence aviation safety framework. These include:

2.1.1.1 Individual accountability of Officers and Workers.

2.1.1.2 Due diligence obligations.

2.1.1.3 Process for determining the objective measure of care (reasonably practicable).

2.1.1.4 Risk management;

a. A legislated two-step gated process of risk elimination, followed by risk minimisation where risk elimination is not possible.

b. A regulated three-layer precedence in the application of safety controls.

2.1.1.5 Civil and criminal penalties for breaches under the WHS Act 2011.

2.1.2 Personnel making risk decisions as part of their roles or responsibilities have a clear duty of care under the Act. Importantly, the objective measure of care (owed to another person) has been defined strictly in sections 17 and 18 of the WHS Act 2011. The objective measure of ‘reasonableness’ has been lifted from the Court and published specifically in legislation; and published in the simple language of a practitioner (no legalese) so that the obligation can be easily understood and strictly enforced.

2.1.3 The WHS Act 2011 requires risks to be eliminated *so far as is reasonably practicable* and if elimination is not reasonably practicable (substantiated through a gross disproportionality argument – see para 3.62) then risk must be minimised *so far as is reasonably* practicable*.* Risk minimisation requires all available and suitable controls to be applied, in a regulated order of precedence, unless substantiated through a gross disproportionality argument.

2.1.4 The legislated risk management process applies irrespective of the level of safety risk, so the historical concepts of 'as low as reasonably practicable'; risk tolerability and risk acceptance do not apply. If followed, these common risk management concepts can lead a person into error, by ceasing risk reduction prematurely and resulting in a breach of sections 17 and 18 of the WHS Act 2011. Similarly, the lack of a two-step gated process in ISO31000 can lead a person into error, by missing the strict obligation to eliminate a hazard so far as is reasonably practicable, under Section 17a, before commencing risk minimisation activities under Section 17b.

2.2 Defence Aviation Safety Framework

2.2.1 The Defence aviation safety framework[1] has been established to work harmoniously with the WHS Act and provides comprehensive regulation that 'amplifies' certain provisions of that Act for management of hazards and risks associated with airworthiness and safe flight of State aircraft. While a Court will look to WHS Act 2011, Regulation and Codes of Practice to ascertain the duty to protect persons against generic work place hazards, the Court will likely look to specialist safety management regimes to protect persons against unique hazards; such as, looking at the DASR to protect persons against the hazards and risks associated with airworthiness and safe flight of State aircraft.

2.2.2 In response to the amplification of certain provisions, DASA has developed an updated Risk Management (RM) process for use within the Defence Aviation Safety Program (DASP). The process is implemented through ICAO-based DASR Safety Management System regulation with Acceptable Means of Compliance (AMC) and Guidance Material (GM) based on the WHS Act 2011 and expressed through a seven-step risk management process. This Advisory Circular aims to provide further information on the application of the seven-step process, in particular elaborating on the interactions between sections 17 and 18 of the WHS Act 2011 and regulation 36 of the WHS regulations.

2.3 Safety is a Command Responsibility

2.3.1 The requirement that Command comply with the DASP and DASR as part of meeting their duty under the WHS legislation reinforces the tenet that the **ensure** of 'aviation safety is a Command responsibility'[2].

[1] Includes establishment of a Defence Aviation Safety Authority, Implementation of a Defence Aviation Safety Program, and promulgation of effective Defence Aviation Safety Regulations.

[2] Advisory Circular 2/16, *Aviation Command Responsibilities under the Defence Aviation Safety Regulation*, of 5 Sep 16 provides a comprehensive explanation of key safety appointments and responsibilities across Defence aviation.

2.3.2 Personnel within DASR approved organisations comply with compliant instructions and processes removing, for most of the time, the need to make individual risk-based decisions. This is because the risks are well known and have already been treated in the normal operating environment through the development of policies and procedures. However, if instructions, policies or procedures are insufficient or not suited to the circumstances of a task or activity then personnel may be required to make risk-based decisions through applying the Safety Risk Management (SRM) process.

2.3.3 For instance, members at the lower level of an organisation may, in practice, make fewer RM decisions and predominately work in an environment where established policies and procedures must be complied with. In contrast, members at higher levels of an organisation must also comply with established policies and procedures, but will likely take a more active role in participating in, and making decisions that may affect the health and safety of other people. Annex A lists examples of decisions within the implementing regulations that may require the application of the SRM process.

2.3.4 In establishing WHS compliant SRM requirements within the DASR Safety Management System (SMS), DASA recognises that the DASR SMS may be integrated with the functions of a number of other organisational management systems (e.g. Occupational Health and Safety Management Systems, Quality Management Systems, etc.). While the DASR requires RM practices related to airworthiness / aviation safety risks to be addressed through the implementing regulations, this does not exclude the use of an organisation’s integrated management systems in the management of these risks. Annex B explores some specific examples of hazards and associated risks to provide clarity on the scope of DASR aligned risks.

3 SAFETY RISK MANAGEMENT (SRM) PROCESS

3.1 DASR SRM process

3.1.1 The DASR SRM process consists of seven steps displayed in Figure 1 and listed below, and further detailed in this AC:

- Step 1. Establish hazard and risk context.
- Step 2. Be reasonably informed of the risk and all possible controls.
- Step 3. Eliminate risk SFARP.
- Step 4. Minimise risk SFARP.
- Step 5. Characterise risk.
- Step 6. Decision-to-proceed.
- Step 7. Continuous risk monitoring and review.

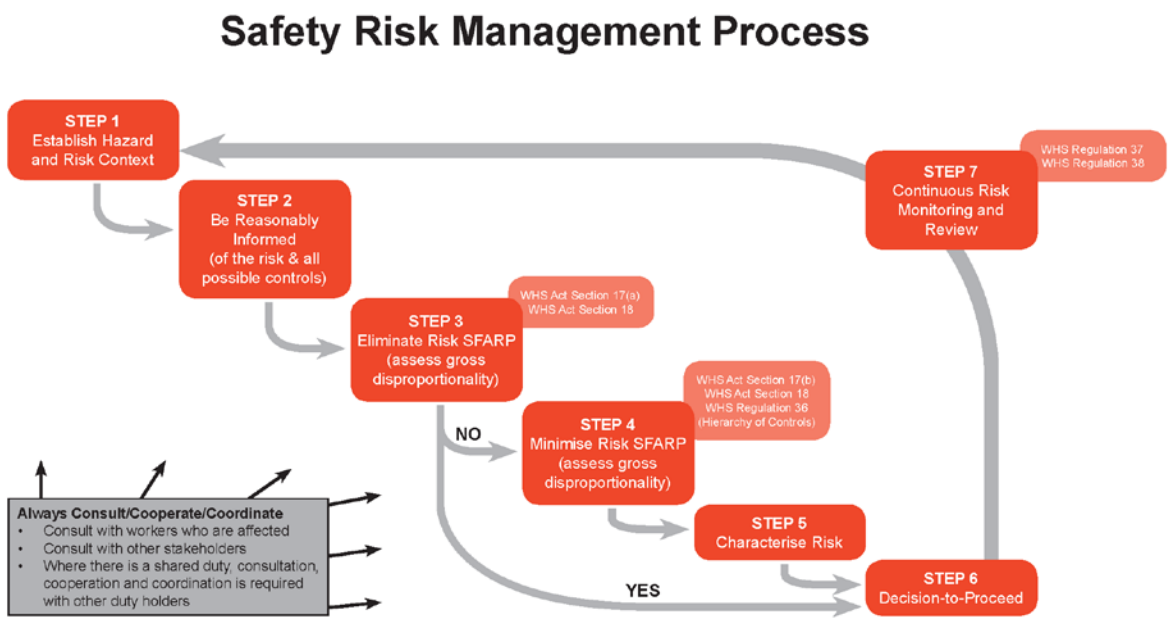

Figure 1: Safety Risk Management Process model.

3.2 Means of compliance

3.2.1 The WHS Act 2011 imposes a legal obligation on all workers and decision-makers to ensure health and safety by:

3.2.1.1 eliminating risks to health and safety, SFARP[3]; and

3.2.1.2 if it is not reasonably practicable to eliminate risks to health and safety, to minimise those risks SFARP[4].

3.2.2 Where it is not reasonably practicable to eliminate risks to health and safety, the hierarchy of controls (HoC) must be implemented to minimise risks SFARP[5].

3.3 Reasonably practicable

3.3.1 Reasonably practicable[6], in relation to the duty to ensure health and safety, means that which is, or was at a particular time, reasonably able to be done in relation to ensuring health and safety, taking into account and weighing up all relevant matters including:

3.3.1.1 the likelihood of the risk or hazard concerned occurring; and

3.3.1.2 the degree of harm that might result from the hazard or risk; and

3.3.1.3 what the person concerned knows, or ought reasonably to know, about:

a. the hazard or the risk; and

b. ways of eliminating or minimising the risk; and

3.3.1.4 the availability and suitability of ways to eliminate or minimise the risk; and

3.3.1.5 after assessing the extent of the risk and available ways of eliminating or minimising the risk, the cost associated with available ways of eliminating or minimising the risk, including whether the cost is grossly disproportionate to the risk.

3.4 STEP 1 – ESTABLISH HAZARD AND RISK CONTEXT

3.4.1 The first step in the SRM process is to clearly describe and understand the hazard and risk context before moving onto further steps. The context is a detailed description of the operating environment in which the task/activity will be conducted and includes consideration of the following:

3.4.1.1 **Activity Objectives.** These are clear, concise statements regarding the desired outcome(s) of the task/activity being considered, including:

a. its purpose;

[3] WHS Act (2011) Section 17a and WHS Regulations (2011) Part 3.1 Regulation 35a
[4] WHS Act (2011) Section 17b and WHS Regulations (2011) Part 3.1 Regulation 35b
[5] WHS Regulations (2011) Part 3.1 Regulation 36
[6] WHS Act (2011) Section 18

b. identifying whether it is a new or existing task/activity;

c. determining whether the task/activity is discretionary/non-discretionary based on organisational priorities; and

d. determining the urgency of the task/activity, and its importance and benefit to the delivery of organisational output.

3.4.1.2 **Activity Significance.** What is the strategic, operational and tactical significance of the task/activity? The significance of a task/activity will have a direct bearing on the reasonably practicable judgement, including consideration of:

a. the depth of risk assessment required, commensurate with the complexity of the task/activity and the associated hazard/s and risk/s; and

b. the primary purpose of the organisation; this could vary between a commercial design or production organisation developing products, to a Military Air Operator (MAO) conducting work up tasks/activities to support force assignment to operations controlled by CJOPS.

3.4.1.3 **Identify Stakeholders.** Stakeholders are individuals, units or entities that may have an interest in, effect on, or be affected by, the task/activity being considered. Stakeholders that may be engaged in the SRM process include:

a. Defence (ADF/APS) members and organisations;

b. Members with specific safety appointments such as MTC holders, CAMOs, MAOs or Responsible managers;

c. Operators of the same or similar plant, substances or structures;

d. Designers of plant, substances or structures such as CASG, E&IG and/or Defence Industry;

e. Manufacturers of plant, substances or structures, including, who would be contacted through CASG or other appropriate Defence business units;

f. Importers of plant, substances or structures;

g. Suppliers of plant, substances or structures;

h. Contractors; and

i. General public.

3.4.1.4 **Reference Material.** All related reference information is identified, including:

a. OEM documentation, type-design data, OIP, Technical Manuals, Flight Manuals, Standing Instructions (SI), and Bench Level Instructions (BLI);

b. Airworthiness documentation from other National Airworthiness Authorities (NAAs) or Military Airworthiness Authorities (MAAs);

c. Local Chain of Command (CoC) or technical directives and orders;

d. Other risk assessments which relate to this task/activity; and

e. Any other reference information considered relevant.

3.4.1.5 **Nominal Conditions / Assumptions / Limitations.** Consideration must be given to other factors, including:

a. **Task requirements.** Detail the scope of the task/activity being conducted, or consider any differences in conditions and objectives compared with previous tasks/objectives.

b. **Equipment.** What equipment is being used, such as consumables, support equipment, materials and Personal Protective Equipment (PPE), including configuration and serviceability state.

c. **Personnel.** Attributes of the members involved in the task/activity, including qualifications, competency and currency, training and experience, team or crew composition.

d. **Environment.** The physical environment in which the task/activity is being conducted, including location, lighting, temperature, noise, work areas, distractions.

e. **Other.** Other conditions, assumptions or limitations relevant to the task/activity.

3.5 STEP 2 – BE REASONABLY INFORMED OF THE RISK/S AND ALL POSSIBLE CONTROLS

3.5.1 Those involved in conducting risk management must be reasonably informed of all aspects of the task/activity being considered. They must have knowledge about the hazard or risk and any ways of eliminating or minimising the risk. This will be what is known, and what a reasonable person in the circumstances (e.g. a person in the same industry) ought reasonably to know. This is also referred to as reasonable knowledge.

3.5.1.1 **Knowledge about the hazard or risk.** Those involved in the SRM process must:

a. Proactively take steps to identify reasonably foreseeable hazards within their organisation before those hazards contribute to or cause an

incident, injury or illness. This must be done before the task/activity is undertaken or the circumstances occur that result in the risk.

b. Understand the nature and degree of harm that an identified workplace hazard may cause, how the harm could occur, and the likelihood of the harm occurring.

3.5.1.2 Those involved must also consider and understand how other factors may cause or increase hazards and risks, including:

a. human error or misuse, spontaneity, panic, fatigue or stress;

b. potential failure of plant, equipment, systems of work or safety measures;

c. provision of goods and services by third party organisations e.g. designs, leased equipment, contracted labour, substances and parts; and

d. interaction between multiple hazards that may, together, cause different risks.

3.5.1.3 **Gaining reasonable knowledge.** There are various ways of gaining reasonable knowledge, including[7]:

a. consulting workers and others in the industry;

b. analysing previous incidents;

c. considering relevant Regulations, CoPs and other sources of information such as:

i. the regulator and its inspectors,

ii. credible technical standards, such as those published by Standards Australia and International Standards,

iii. industry publications, and

iv. published scientific and technical literature.

d. undertaking risk assessments. Annex C contains guidance on tools that may be appropriate for gaining reasonable knowledge and undertaking assessments for specific aircraft design risk.

3.5.1.4 **Knowledge about ways of eliminating or minimising the risk.** Knowledge must be gained about ways of eliminating risks to health and safety SFARP or minimising risk SFARP. There may be different ways of eliminating or minimising risks. The RM process requires members to gain reasonable

[7] For design organisations, AAP 7001.054 *Aircraft Design Requirements Manual*, Section 1, Chapter 2 contains further detail on exercising reasonable knowledge in aircraft design.

knowledge of all relevant controls in order to identify those which are available and suitable. The methods described in sub-para c above are all applicable for identifying controls. Additionally, consideration may also include:

a. **Specialist Advice.** Within Defence the MTC Holder, design organisations with access to type-design data, and aviation domain Subject Matter Expertise (SME) organisations provide an integral resource in gaining knowledge on potential treatments, limitations and other controls for management of safety risks.

b. **Aviation regulation and certification standards.** The management of aviation safety and airworthiness risk is largely controlled through the application of the DASR and DASA-approved certification standards applied to the design of aircraft and development of limitations and instructions that control the production, maintenance and operation of aircraft. As such, reference to certification standards, design data and OEM or aviation domain SME publications provides industry best-practice ways of eliminating risk SFARP or minimising risk SFARP. Other credible standards include approved design standards such as published Australian Standards and International Standards.

c. **Codes of Practice (CoP).** An approved CoP provides practical guidance on how to achieve the standards of work health and safety legislated under the WHS Act and effective ways to identify hazards and manage risks. Following an approved CoP will assist in achieving compliance with duties in relation to the subject matter of the CoP. Like regulations, CoP deal with particular issues and may not cover all relevant hazards or risks. CoPs are admissible in court proceedings under the WHS Legislation. Courts may regard a CoP as evidence of what is known about a hazard, risk, risk assessment or risk control and may rely on the CoP in determining what is reasonably practicable in the circumstances to which the CoP relates.

3.5.1.5 **Bow Tie.** The Bow Tie is a useful tool that can be used to visualise risks and their controls. It is also referred to as a Threat Block Diagram, which consolidates a ‘fault tree’ and an ‘event tree’ either side of a Loss of Control (LOC) point, or ‘Top Event’. The Bow Tie analysis is useful for communicating what types of controls should be considered for managing certain types of hazards and related risks, and to avoid a critical situation, which could lead to harmful consequences.

3.5.2 **Identify all Possible Controls.** To prevent prematurely discarding controls, there is a requirement to document the full list of the possible risk controls identified while completing Step 2 – Be Reasonably Informed of the Risk/s and All Possible Controls. This list of possible controls can then be used as

inputs to Steps 3 and 4; with every control on the list being worked through the SFARP standard in order to make determinations if they're reasonably practicable to implement or not.

3.6 STEP 3 – ELIMINATE RISK SFARP

3.6.1 There is an explicit requirement to eliminate risks to health and safety SFARP in the first instance. Elimination of risks does not necessarily mean ceasing a task/activity as this is not always the expected outcome. For example consider a situation involving an unserviceable seat restraint in a passenger aircraft. Elimination of the risks associated with the unserviceable passenger seat restraint does not always mean cancelling all tasks for that aircraft. Elimination of that risk may be achieved by removing the seat (if it is reasonably practicable to do this) until repairs can be effected.

3.6.2 In assessing whether a hazard or risk can be eliminated SFARP, those involved in the SRM process must demonstrate for each hazard or risk that they have:

3.6.2.1 Determined the likelihood of the hazard or risk occurring; and

3.6.2.2 Determined the degree of harm that might result from the hazard or risk; and

3.6.2.3 Identified ways to eliminate the hazard or risk; and

3.6.2.4 Determined the availability and suitability of the ways to eliminate the hazard or risk that were identified in 3.6.2.4 (refer to para's 4.1 and 4.2 for additional guidance on Availability and Suitability); and

3.6.2.5 Determined the cost of implementing available and suitable elimination options from 3.6.2.4; and

3.6.2.6 Assessed that the cost of elimination in 3.6.2.5 was/was not grossly disproportionate to the extent of the risk (refer to para's 5.1 to 6.1 for additional guidance on Grossly Disproportionate Assessments).

3.6.3 **Elimination of hazards and risks is NOT reasonably practicable.** If it is not reasonably practicable to eliminate the hazards and risks associated with the task/activity, the reasons for that rationale must be documented specifically addressing each of the factors in para 3.6.2 before proceeding to Step 4 Minimise Risk SFARP.

3.6.4 **Elimination of hazards and risks IS reasonably practicable.** If it IS reasonably practicable to eliminate the hazards and risks associated with the task/activity, then the organisation must do so before proceeding to Step 6 Decision-to-Proceed.

3.6.5 Additionally, it is important to document the reasons and supporting rationale for determining the reasonably practicable controls used to eliminate the risks so they can be considered in future monitoring and review (Step 7) of the hazards and risks.

3.7 STEP 4 – MINIMISE RISK SFARP

3.7.1 In circumstances where it is not reasonably practicable to eliminate the risk/s, there is a legislated requirement to minimise the risk/s SFARP. Minimising risk SFARP must be conducted through application of the HoC.

3.7.2 **Hierarchy of Controls.** The HoC must only be implemented where it is not reasonably practicable to eliminate risks to health and safety. The HoC depicted in Figure 2, provides a consistent process for identifying controls with the highest benefit to risk minimisation first.

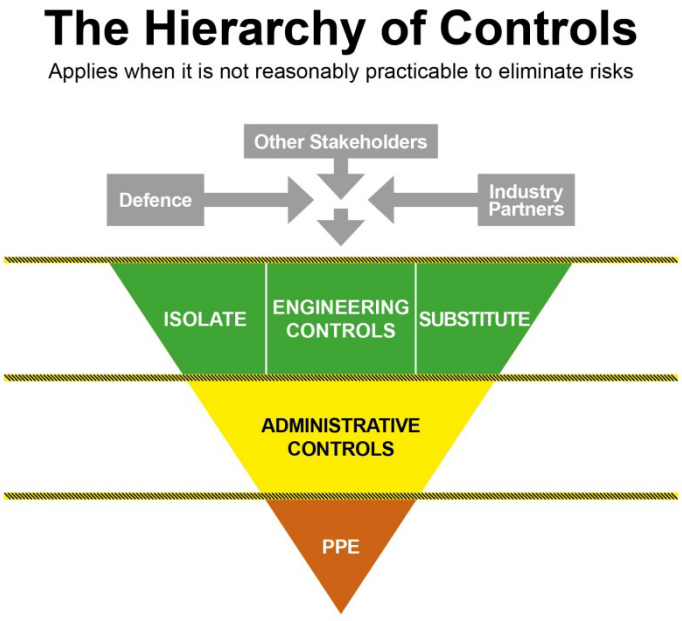

Figure 2: Hierarchy of Controls.

3.7.3 In minimising risks SFARP, members must consider the risk control measures in accordance with the HoC and ensure those available and suitable controls (that are assessed as being reasonably practicable) are applied in the sequence set out within Figure 2. This ensures application of the most effective controls (substitution, isolation, engineering) is considered first, before working through the less effective alternatives (administrative and PPE). A combination of the controls set out in this AC may be used to minimise risks, so far as is reasonably practicable, if a single control is not sufficient for the purpose.

3.7.3.1 **Substitution, Isolation and Engineering Controls** – Members must minimise risks, SFARP by implementing one or more of the following:

a. **Substituting** (wholly or partially) the hazard giving rise to the risk with something that gives rise to a lesser risk – e.g. replacing solvent-based paints with water-based paints.

b. **Isolating the hazard** from any person exposed to it. This involves physically separating the source of harm from people, such as via distance or utilising barriers – e.g. mandating minimal crew to ferry a damaged aircraft to a maintenance facility (under a MPTF authority).

c. **Implementing engineering controls** – an engineering control is a control measure that is physical in nature, including a mechanical device or process such as designing and installing a modification to an aircraft re-fuelling system to reduce instances of aviation fuel splashes, design and installation of redundant systems, or installing residual current devices (electrical safety switches).

3.7.3.2 **Administrative controls** – If a risk then remains, that risk must be minimised SFARP by implementing administrative controls. Administrative controls include work methods or procedures designed to minimise exposure to a hazard / minimise the occurrence of the risk. An example could be placarding an unserviceable seat as ‘out of use’, documenting and communicating the limitation.

3.7.3.3 **PPE** – If a risk then remains, the remaining risk must be minimised SFARP by ensuring the provision and use of suitable PPE.

3.7.4 **Immediately Implementable.** If it is reasonably practicable to minimise the risks associated with the task/activity using one or more immediately implementable HoC measure, the SRM process requires members to:

3.7.4.1 Verify that the selected control measure(s) will be effective in reducing the likelihood and degree of harm of the risk occurring; and

3.7.4.2 Consider the cost associated with implementing each available and suitable control measure and determine if the cost of minimisation is or is not grossly disproportionate to the extent of the risk (refer to para’s 5.1 to 5.6 for additional guidance on Grossly Disproportionate Assessments).

3.7.5 **Not immediately implementable.** Where an identified control measure cannot be immediately implemented (for example due to procurement or developmental timeframes) or where the control strategy is complex in nature with multiple interdependencies on other stakeholders/ duty holders, those involved in the SRM process must:

3.7.5.1 consider if the SFARP judgment is still valid and the task/activity can proceed without the more effective control(s), i.e. consider the risks associated with undertaking the task/activity with the less effective control(s) and determine if

it is/is not grossly disproportionate to wait until the more effective control(s) can be implemented;

3.7.5.2 if the decision is to proceed with the task/activity, determine if it is appropriate to impose special conditions and/or limitations (for example, operating restrictions or additional controls such as inspections) to be enforced in the intervening period; and

3.7.5.3 document the strategy for monitoring future implementation of the identified more suitable controls within the intervening time.

3.7.6 **Additional Considerations.** Once all available and suitable control measures have been identified, consideration must be given to:

3.7.6.1 **Hazards and Risks arising from Control Measures.** Occasionally controls implemented to minimise one risk may introduce new hazards and risks. Consideration must be given to all such hazards and risks; they must be addressed by using the SRM process described in this AC.

3.7.6.2 **Implementing controls.** The control measures selected will usually require changes to the way work is carried out. In these situations, it is necessary to support the control measure with mechanisms such as:

a. **Work procedures** – a safe work procedure that describes the task/activity, identifies the hazards and documents how the task/activity is to be performed to minimise the risks.

b. **Training** – Train workers in work procedures to ensure that they are able to perform the task/activity safely. Training must cover the nature of the work, the associated risks and the control measures to be implemented. Training should require workers to demonstrate that they are competent in performing the task/activity according to the procedure and must be provided in a form that can be understood by all workers. It is insufficient to simply give a worker the procedure and ask them to acknowledge that they understand and are able to perform it.

c. **Instruction and information** – Information and instruction may also need to be provided to others who enter the workplace, such as customers or visitors and must be provided in a form that can be understood by all parties.

d. **Supervision** – The level of supervision required will depend on the level of risk and the experience and training of the workers involved. High levels of supervision are necessary where less experienced workers are expected to follow new procedures or carry out difficult and critical tasks/activities.

e. **Maintenance** – Control measures need regular monitoring and maintenance to ensure they remain effective by determining what is required when the control is implemented and establishing a schedule for routine checks and maintenance appropriate to the controls.

3.7.6.3 **Monitoring Risk Control Effectiveness.** The requirement for monitoring risk control effectiveness involves the maintenance, review and as necessary, the revision of the risk control measures. Monitoring is to be continuous and it is prudent at this stage of the process to identify how continuous monitoring and detection of risk control failures may be achieved in preparation for Step 7.

3.8 STEP 5 – CHARACTERISE RISK

3.8.1 Unless all hazards and risks associated with the task/activity have been eliminated, there will be some level of risk remaining after all reasonably practicable control measures have been applied; this is the residual risk.

3.8.2 The WHS Act mandates that more than one person can have a duty for the same matter[8], and each must discharge that duty to the extent that they have the capacity to influence and control the matter. For example, a design organisation may identify an EMI/EMC risk related to the installation of a modification onto an aircraft; however the extent of their available SFARP treatments is unable to fully eliminate the risk without affecting the capability. To address the downstream residual risk SFARP, an MAO may apply treatments options that are not available to the design organisation, such as restricting where the modification is operated or limiting the concurrent use of other susceptible equipment.

3.8.3 To support authorised personnel in making risk decisions, and also to support downstream duty holders in meeting their obligations, residual risk must be characterised and communicated. The level of residual risk is to be characterised utilising the most appropriate characterisation means for the context.

3.8.4 The DASR does not constrain how initial / continuing airworthiness and operational risks are characterised, however operators are likely to use a characterisation tool mandated by their relevant service or organisation that suits their circumstances or broader organisation requirements. The Defence Harmonised Risk Matrix is an example of such a tool for operational risks. Where characterisation of a design risk is conducted through a design

[8] Section 16 of the Act states that each person "... must discharge the person's duty to the extent to which the person has the capacity to influence and control the matter ...". Section 46 of the Act adds that, "... each person with the duty must, so far as is reasonably practicable, consult, co-operate and co-ordinate activities with all other persons who have a duty in relation to the same matter".

specific approach, the design organisation should assist downstream duty holders, who share a duty for the residual risk, in understanding that risk within their operational environment.

3.8.5 **Reverse engineering.** Reverse engineering of risk assessments must not occur, as such an approach may potentially mislead decision-makers into making risk decisions that are not commensurate with their obligations as WHS duty holders.

3.8.6 Annex D provides further detail on risk characterisation tools, and includes guidance for design organisations and MTC holders to improve communication of residual risks to downstream duty-holders.

3.9 STEP 6 – DECISION-TO-PROCEED

3.9.1 The decision-to-proceed (or not to proceed) with an activity after Risk Characterisation must be made at a level of authority within the organisation commensurate with the level of the residual risk. These levels are at the discretion of the organisation, as required by DASR SMS 'Safety accountability and responsibilities'[9]. The decision-to-proceed is to be documented, and should record whether the assessments on which the decision is based have been reviewed and agreed with by the decision-maker.

3.9.2 **Safety First.** Nothing requires or permits a worker to take any action, or to refrain from taking action, that would be or could be reasonably expected to be prejudicial to the health and safety of workers and/or other persons. For example, it would be contrary to the intent of the WHS Act where immediate action was required to save life, but those involved considered inaction was needed in order to comply with the Safety Risk Management process.

3.9.3 **Making a Decision.** In deciding whether to proceed with the task or activity, the decision maker shall take into account and weigh up all relevant matters including:

3.9.3.1 confirm they have the authority to make both a decision-to-proceed and a decision to implement the risk control measures required (including resources); and

3.9.3.2 verify of the hazard and risk context including the correctness of the assessment relating to task/activity objectives, significance and nominal considerations, assumptions and limitations; and

3.9.3.3 verify the reasonable knowledge that underpins the risk assessment including confirmation of worker and stakeholder engagement and utilisation

[9] DASR GM SMS.A.25(b)1.2. – Safety accountability and responsibilities (AUS)

of appropriate information sources such as CoPs, Bow Ties or credible standards; and

3.9.3.4 verify of the correctness of the risk assessment, including whether reasonably practicable judgements and grossly disproportionate assessments are sound and appropriately articulated; and

3.9.3.5 confirm that risk cannot be eliminated SFARP noting the gross disproportionate assessment – or reject where necessary; and

3.9.3.6 confirm that risk is minimised SFARP, noting the gross disproportionate assessment – or reject where necessary; and

3.9.3.7 Where appropriate, impose special limitations/conditions on proceeding with the task/activity. These might include limitations on time, location or specific circumstances.

3.9.4 If, after taking into account and weighing up all relevant matters that were able to be done in relation to ensuring health and safety from Steps 1 through 5, the decision maker still considers that the level of residual risk outweighs the significance of the task/activity, then the task/activity should not proceed.

3.10 STEP 7 – CONTINUOUS RISK MONITORING AND REVIEW

3.10.1 The management of health and safety risks is legislated as an ongoing process that requires the continuous monitoring and review of the workplace, its hazards, risks and their associated control measures.

3.10.2 **Review of control measures.** Any control measure(s) that is implemented to eliminate or minimise risks to health and safety must be regularly reviewed so that the control measure(s) is and remains:

3.10.2.1 fit for purpose;

3.10.2.2 suitable for the nature and duration of the task/activity; and

3.10.2.3 installed, set-up and used correctly.

3.10.3 **Change in Context.** If the established context of a safety risk assessment has been changed, there are potential impacts for the entire assessment. A significant change in the context would likely require a full review of the safety risk assessment.

3.10.4 **Continuous monitoring and review of the workplace for hazards and risks.** The control measures put in place must be reviewed regularly to make sure they work as planned. It is too late to review a control measure after something has gone wrong. As a minimum, control measures must be reviewed:

3.10.4.1 when the control measure is not effective in controlling the risk;

3.10.4.2 before a change at the workplace that is likely to give rise to a new or different health and safety risk that the control measure may not effectively control;

3.10.4.3 if a new hazard or risk is identified;

3.10.4.4 if the results of consultation indicate that a review is necessary;

3.10.4.5 if members filling safety positions and/or the business unit's WHS Committee identify the need for a review; or

3.10.4.6 when an incident is reported.

3.10.5 **Rule of Three (RoT) and People, Environment, Actions, Resources (PEAR).** The RoT and PEAR processes are assessment methods that may be used during the conduct of tasks/activities to continuously monitor and review risk control measure(s). These processes enable members of organisations to maintain risk awareness and assist managers to ensure compliance with all of the identified and present risk control measures during tasks/activities. Having workers use these, or equivalent, tools for every task or activity can assist greatly in meeting the requirements of this step.

3.10.6 **Periodic Review.** All formal RM outcomes must be reviewed periodically according to the nature of the risk. For noteworthy risks, this period should not exceed 12 months and for other risks, the period should not exceed 24 months.

4 ADDITIONAL GUIDANCE – AVAILABILITY AND SUITABILITY

4.1 Availability of Control Measures

4.1.1 Availability of controls can be interpreted as follows:

4.1.1.1 It can be purchased, made to suit or be put in place;

4.1.1.2 It is provided on the open market or is possible to manufacture; and

4.1.1.3 It is feasible to implement.

4.2 Suitability of Control Measures

4.2.1 A way of eliminating or minimising a risk is regarded as suitable if it:

4.2.1.1 will work properly given the workplace conditions, work process(es) and the workers;

4.2.1.2 is effective in eliminating or minimising the likelihood or degree of harm from a hazard or risk;

4.2.1.3 does not introduce a new and higher risk in the circumstances; and

4.2.1.4 is practicable to implement and is immediately implementable in the circumstances in which the hazard or risk exists.

4.3 Justification

4.3.1 Ultimately, any decision regarding Availability or Suitability is required to be justified and, therefore, documented. Note that Courts will review a decision according to the circumstances at the time of that decision, and not with a benefit of hindsight approach.

5 ADDITIONAL GUIDANCE – GROSSLY DISPROPORTIONATE ASSESSMENT

5.1 Legislating that a grossly disproportionate assessment is to be made reflects a clear presumption in favour of the safety of workers and other persons, and the objectives of the WHS legislation.

5.2 Grossly disproportionate assessments are qualitative and need to be informed by common sense and professional judgement. This requires consideration of the extent of the risk weighed up against the cost of implementing the suitable and available risk control measure.

5.3 Judgements must be made on a case-by-case basis rather than comparing with precedents set by other organisations or operators with similar circumstances. When making a determination whether the cost of implementing a control is reasonable in the circumstances or is grossly disproportionate, the following must be considered:

5.3.1 **Benefit gained.** The benefits gained from implementing controls are realised in the reduction of the risk (likelihood and/or degree of harm) plus any savings attributed to fewer incidents, injuries and illnesses and productivity/capability improvements.

5.3.2 **The cost of implementation.** The costs of implementing a particular control may include costs of purchase, installation, maintenance and operation of the control measure, and any impact on productivity/capability as a result of the introduction of the control measure.

5.4 **Cost.** The WHS Act does not define cost. Therefore, cost must not be viewed as purely financial; it may include members resources, time, mission objectives and relevant other matters such as:

5.4.1 **Initial costs** - Includes people, time and money required for the design, manufacture and installation of the control measure.

5.4.2 **Ongoing costs** - Includes people, time and money required for the maintenance, monitoring, decommissioning and disposal of the control measure.

5.4.3 **Cost of missed opportunities/failed objectives** - Includes all repercussions for the delay and non-completion of organisational objectives and missions. This includes other tasks/activities that may be affected

through resource constraints or that are dependent on the completion of the task/activity that **is currently being assessed**.

5.4.4 **Potential savings** - Includes potential reductions in incidents, injuries, illnesses, staff turnover and damaged reputation as well as long-term production benefits that may result from the implementation of the control measure.

5.5 **Not a Cost vs Benefit analysis.** Cost must not be considered as something that is relative to the current resources available to the organisation. Additionally, an assessment of whether the cost of implementing a control measure is grossly disproportionate to risk must never be viewed or treated as a cost versus benefit assessment. The WHS Act is clearly in favour of safety over cost. Two common misinterpretations that must be avoided are:

5.5.1 Assuming that available control measures are to be implemented only when the cost of the outcome (risk is realised) is grossly disproportionate to the cost of the control measure.

a. The grossly disproportionate assessment is instead saying that all available and suitable control measures must be implemented unless their cost is assessed to be grossly disproportionate to the risk.

5.5.2 Assuming the control measure need not be implemented where the cost of implementation is assessed as grossly disproportionate to the risk and the ability of the service or organisation to afford the cost.

a. There should always be the assumption that the organisation has ample resources to pay for the implementation of the control measure.

b. Where the required resources are not available, those involved in the SRM process should consult the CoC to request additional funding.

c. Where additional funding is not available:

i. the outcome must be documented as a part of a grossly disproportionate assessment, and

ii. the task/activity should not proceed.

5.6 **Not based on a formula.** Grossly disproportionate assessments must not include a consideration of the average monetary cost of realising the risk, i.e. the average cost that injury or death has on a business or undertaking based on injury data across Australian workforces. It is inappropriate to use this average cost of injury data because it does not meet with the requirement to consider assessments on a case-by-case basis. Also it is highly unlikely that this data would carry much weight in a Court proceeding for an organisation such as Defence and contractors to Defence. Similarly, any reliance on a formula or use of 'Disproportionality Factors' for determining the degree of disproportionality has a tendency to replace the exercise of professional judgment and common sense in respect of each unique set of circumstances.

5.7 **Decisions in writing with supporting rationale.** Commensurate to the level of risk any decisions to reject identified control measures based on availability, suitability and/or cost must be documented and include all supporting rationale. In circumstances where documented outcomes cannot reasonably be achieved immediately, all decisions and supporting rationale must be documented as soon as practicable after the fact.

6 ADDITIONAL GUIDANCE – RECORD KEEPING

6.1 Documenting risk assessment outcomes is essential for creating an auditable decision making trail and for retaining corporate knowledge. Well documented safety risk assessments include:

6.1.1 Identified hazards, assessed risks and chosen control measures (including any hazard checklists, worksheets and assessment tools used in working through the SRM process);

6.1.2 Details of how and when the control measures were implemented, monitored and reviewed;

6.1.3 Relevant training records;

6.1.4 Documented evidence of communication and consultation with SMEs in external agencies as well as internal to the organisation; and

6.1.5 Where possible, reference to any plans for changes which communicate a strategy for implementing additional or more effective controls in the future.

6.2 The format for documenting risk assessment outcomes will depend upon the safety risk assessment methodology utilised.

Original Signed

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Director General – Defence Aviation Safety Authority

Annexes

A. Direct application of risk management within DASR

B. Aviation safety and wider workplace WHS hazards and risks

C. Gaining reasonable knowledge on aircraft design risk

D. Characterisation and communication of design risk to operators

Annex A: Direct application of risk management within DASR

A.1 Individuals or organisations with appropriate privilege, authority or approval within the regulated community may be required to directly use a risk management process to make a risk judgement pertaining to aircraft safety and/or airworthiness.

Table A1: DASR instances requiring direct risk management decisions.

DASR Ref:	Regulation and associated AMC and GM description
21.A.3A(c) Investigation of reported occurrences	A holder is obliged to establish a system for the collection of failure, malfunction and defect information and analysis of that information for safety consequences related to the certified design (or repair etc). Where a condition is identified that meets occurrence reporting thresholds (as detailed in BR Appendix 1 – Occurrence reporting), the holder must propose, to the DASA, a course of action to address the safety shortfall. The corrective action and proposed implementation timeframe should ensure that any risks are eliminated or otherwise minimised SFARP IAW DASR SMS.A.25(b)2.2.
21.A.3B Airworthiness Directives (AD) and Unsafe conditions	Where DASA has identified a need for release of an Airworthiness Directive to address an condition assessed as unsafe (as detailed in 21.A.3B(b) *Determination of an unsafe condition*), the holder is required to develop appropriate corrective actions and/or inspections to achieve that outcome. The corrective action and proposed implementation timeframe should ensure that any risks are eliminated or otherwise minimised SFARP IAW DASR SMS.A.25(b)2.2.
21.A.21 Issue of a Type Certificate	When seeking agreement for non-compliances against the TCB Issue via an 'exception' Military Certification Review Item (MCRI) the applicant will need to staff an Airworthiness Issue Paper (AwIP) to ensure elimination or minimisation SFARP IAW DASR SMS.A.25(b)2.2, for the risks associated with the particular design deficiency.
AMC 21.A.143 (a)(13) and 21.A. 243(a)(1) Flight test operations	Where a production or design organisation hold a privilege to issue Military Permit to Fly (MPTF) for the purpose of flight tests and will conduct those tests within their own organisation, the flight test operations manual shall include a policy for risk and safety management and associated methodologies[10].

[10] This scenario is extremely unlikely to be encountered in the ADF as very few DASR 21J or 21G organisations design or produce entire aircraft under the DASR organisation approval.

	The flight test operations manual must ensure that any risks are eliminated or otherwise minimised SFARP IAW DASR SMS.A.25(b)2.2.
21.A.709(b)(3) Military Permit to Fly – declaration of Safety	In applying for approval of flight conditions to support a MPTF the applicant must declare that the conditions to ensure a safe flight, within the context of the MPTF, can be achieved. The process through which a safe flight declaration is made must ensure that any risks are eliminated or otherwise minimised SFARP IAW DASR SMS.A.25(b)2.2.
SPA.10 – Command Clearance	In processing a Command Clearance, the MAO or delegate is required to conduct a risk assessment to ensure risks are eliminated or otherwise minimised SFARP IAW DASR SMS.A.25(b)2.2.

Annex B: Aviation safety and wider workplace WHS hazards and risks

B.1 Aviation safety risks affecting aircraft operations should be managed via DASR regulated systems or via the application of direct risk management processes. Where there is an overlap between Aviation Safety risks and wider WHS risks to personnel, the DASR does not constrain the management of the wider WHS risks within the organisation's other WHS systems in place (e.g. an organisation's health and medical plan may be better placed to manage long term aircrew health issues than via an Aviation Safety Reporting framework).

Table B1: Examples of common aviation hazards categorised into Aviation Safety and wider WHS risks.

Hazard	Wider WHS risk to personnel	Aviation safety risk to aircraft operation
Aviation fuel splash	An aircraft refuel worker is splashed with fuel during an aircraft refuel. The interaction with a hazardous chemical (i.e. through inhalation, absorption, ingestion, etc.) may result in short and long term adverse health effects.	The aircraft is splashed with fuel during an aircraft refuel. The interaction with hazardous chemical (i.e. through corrosion or ignition) may result in damage to the aircraft.
Worker Fatigue	An engineer in a design organisation worker is subject to continuous long working hours and suffers from fatigue and degradation in health.	Aircraft designs are subject to errors made by fatigued designer in a design organisation, which expose the aircraft to greater levels of risk during operation.
Smoke and fumes in cockpit	Aircrew interaction with smoke and fumes resulting in short and/or long term adverse health effects.	Direct risk to airworthiness – cause of smoke and fumes may indicate failure of aircraft systems or potential for on-board fire. Smoke and fumes may impair aircrew ability to safely operate the aircraft.
Bird strike	Maintenance workers removing bird remains from aircraft may be exposed to infection/disease.	Direct risk to airworthiness – foreign object damaging engine or other aircraft structure.

Annex C: Gaining reasonable knowledge on aircraft design risk

C.1 Within the design context, determining which tools are most appropriate for risk assessment and risk characterisation will depend upon the nature of the design deficiency being managed including:

C.1.1 Design deficiencies in systems that fail probabilistically (mostly aircraft avionic systems and some mechanical systems);

C.1.2 Design deficiencies in aircraft structures and engines;

C.1.3 Design deficiencies in systems that do not fail probabilistically (e.g. software);

C.1.4 Design deficiencies in systems with simple failure modes that cannot be determined probabilistically or deterministically; and

C.1.5 Design deficiencies in systems that are not included in the certification basis (e.g. hazardous materials and other non-specified design deficiencies).

C.2 **Design deficiencies in systems that fail probabilistically.** System safety programs (SSPs) provide a range of tools for analysing, assessing and (following measures to eliminate risk and where not practicable to do so, minimise risk) subsequently characterising risk of failures in systems that fail probabilistically. The Hazard Risk Index (HRI) matrix, for example, can be a particularly useful tool for characterising safety risks when a design fails to meet the aircraft Certification Basis. The HRI approach is primarily applicable to systems whose failure can be probabilistically determined on a usage scale such as 'failures per flight hour'. Most often, these are the same systems that were designed to meet a Failure Probability Objective (FPO) by the OEM during initial aircraft design. These FPOs are extremely small, typically in the order of 10^{-6} to 10^{-9} failures per flight hour, depending on the type of aircraft, criticality of a particular function, and the requirements of the certificating authority. FPOs are used by designers to demonstrate that a particular upper level aircraft function will satisfy the overall safety goals of the aircraft, during both normal and degraded operations. Consequently, FPOs and the HRI can be a particularly useful tool for characterising the safety risk due to an observed in-service design deficiency.

C.3 A common mistake, however, is to use these tools for systems whose failure cannot be probabilistically modelled. Another common mistake is to use these same tools for systems that are used infrequently. For example, characterising risk on an annual basis for a system that is used either rarely

(e.g. ejection seats, crash protection measures) or only a few times per year (e.g. chaff/flares systems, aerial refuelling) is likely to be grossly misleading. Characterising these risks through the HRI will almost inevitably, and misleadingly, result in an assessment of 'low' risk regardless of the severity of the latent defect. Such systems pose hazards that are better assessed on a per usage basis (or perhaps the total number of uses through to aircraft Planned Withdrawal Date), rather than per flight hour.

C.4 Summarised, the system safety tools and framework are only appropriate for characterising risks for certain aircraft systems and functions. For the remainder, different approaches are needed to assess/analyse, characterise and communicate the risk.

C.5 **Design deficiencies with Structure and Engines.** Primary aircraft structure, including critical engine/airframe dynamic components, have a catastrophic failure condition by virtue of their role, and defects such as cracks, corrosion and dis-bonds cannot be easily or reliably statistically modelled. Progression to failure is also very sensitive to flight and ground usage, and as such, the risk cannot always be well characterised into the future. Given the complexity in making such judgements, and the potentially catastrophic consequences of incorrect assumptions and actions, DAVENG-DASA engagement is mandatory in all risk determinations and treatments for primary structure and critical engine/airframe dynamic components.

C.6 **Design deficiencies in systems that do not fail probabilistically.** This includes systems such as software or other system hazards that arise systematically from logic failures of a design, not component failures. These risks are best characterised through the consequences of their failure, or through a framework such as the MIL-STD-882E Software Control Category. Assistance is available from DAVCERT-DASA if required.

C.7 **Design deficiencies in systems with simple failure modes that cannot be determined probabilistically or deterministically.** Technologies such as oxygen delivery systems will reliably fulfil their role, but can quickly degrade due to a variety of external factors. This degradation is usually controlled through on-condition maintenance and inspection, or provision of emergency/backup systems. Similar to the above, HRI’s may be misleading if used to characterise the risk posed by a particular design deficiency. A qualitative assessment against the original design standard might be more appropriate.

Annex D: Characterisation and communication of design risk to operators

D.1 Within the Defence aviation community, generic operational risks are usually characterised and communicated via a Risk Matrix tool mandated by their relevant service or organisation that suits their circumstances or broader organisation requirements. Such risk characterisation tools are commonly based on the Defence Safety Manual (SafetyMan) defined Work Health and Safety Risk Matrix[11], with the Defence Harmonised Risk Matrix, displayed in Figure D1, being an example.

Figure D1: Defence Harmonised Risk Matrix.

Likelihood \ Consequence		Minor (A) Minor injury or illness that is treatable in the workplace (first aid) or by a registered health practitioner, with no follow up treatment required.	Moderate (B) Injury or illness causing no permanent disability, which requires non-emergency medical attention by a registered health practitioner OR 10 or more injuries or illnesses catergorised as 'minor'.	Major (C) Serious inury or illness requiring immediate admission to hospital as an inpatient and/or permanent partial disability OR 10 or more injuries/ illnesses categorised as 'moderate'.	Critical (D) Single fatality and/or permanent total disability OR 10 or more injuries or illnesses categorised as 'major'.	Catastrophic (E) Multiple fatalities OR 10 or more injuries/illnesses categorised as 'critical'.
Almost certain (5)	**System:** Expected to occur several times a year or often during the system life-cycle. Is known to occur frequently in similar systems being used in the same role and operating environment. **Activity:** Expected to occur during the planned activity. Is known to occur frequently in similar activities.	(A5) LOW	(B5) MEDIUM	(C5) HIGH	(D5) VERY HIGH	(E5) VERY HIGH
Probable (4)	**System:** Expected to occur one or more times per year or several times in the system life cycle. Is known to occur previously but is not certain to occur. **Activity:** Expected to occur in most circumstances, but is not certain. Is known to have occurred previously in similar activities.	(A4) LOW	(B4) MEDIUM	(C4) HIGH	(D4) HIGH	(E4) VERY HIGH
Occasional (3)	**System:** Expected to occur less than once per year or infrequently during system life cycle. **Activity:** Not expected to occur during the planned activity. Sporadic but not uncommon.	(A3) VERY LOW	(B3) LOW	(C3) MEDIUM	(D3) HIGH	(E3) HIGH
Improbable (2)	**System:** Not expected to occur, but possible to experience one or more events during the system life cycle. **Activity:** Not expected to occur during the planned activity. Occurrence conceivable but considered uncommon.	(A2) VERY LOW	(B2) VERY LOW	(C2) LOW	(D2) MEDIUM	(E2) MEDIUM
Rare (1)	**System:** Only expected to occur in rare or exceptional circumstances or no more than once during the system life cycle. **Activity:** Not expected to occur during the planned activity. Occurrence conceivable but not expected to occur.	(A1) VERY LOW	(B1) VERY LOW	(C1) VERY LOW	(D1) LOW	(E1) LOW
Eliminated (0)	THE HAZARD/RISK HAS BEEN ELIMINATED					

D.2 In order to improve communication of residual risk to downstream duty holders, any risk characterisation methodology employed by a design organisation or MTC holder should seek to implement a set of criteria to effectively communicate risk that can be understood within the context of the Defence Harmonised Risk Matrix. The following criteria represent a minimum

[11] Defence Safety Manual (SafetyMan) Part 2 - Work Health and Safety Risk Management Procedure 04 -Work Health and Safety Risk Matrix

set of information that would be beneficial to inform operational risk assessment and treatment:

D.2.1 **Hazard description.** A description of the hazard or undesirable event that may occur. This will sometimes be different from the base hazard that was not able to be fully treated by design. For example, consider a ground proximity warning system that erroneously produces false altitude alerts. In this circumstance, the description should focus on the effects of a false altitude alert (and not controlled flight into terrain).

D.2.2 **Possible consequences.** Technical staff should describe how a hazard might manifest during flying operations. Technical staff should cover the range of possible outcomes, from the worst-credible to the most-likely outcomes. Where possible this information should be informed by operational advice to improve understanding. If this advice was not available, technical staff should make clear any assumptions that were made in developing consequence advice.

D.2.3 **Consequence and likelihood.** The consequence and likelihood of the hazard or undesirable event occurring may be expressed, where possible, in Defence Harmonised Risk Matrix terms for the purpose of informing operational stakeholders, however, this should also be presented alongside the consequence and likelihood expressed via the risk characterisation methodology that best suits the design deficiency.

D.2.4 **Treatments implemented.** A list of design treatments that have already been applied to the hazard should be provided. Identify which elements in the safety order of precedence have been addressed by proposed treatments. That is, each treatment should be identified as being a: design treatment, safety device, warning device or procedural treatment. This ensures operational understanding of the controls that have already been implemented within the technical domain, and their effect. This will also assist to clarify the extent of any gap between design treatments implemented and risk remaining that requires further assessment and operational treatment.

D.2.5 **Assumptions and constraints.** A list of assumptions and constraints that were applied during risk assessment and treatment should be provided. This is particularly important when using the segregated model, where assumptions made during risk analysis about how the aircraft is operated, aircrew response times, crew workload, and so forth may not be evident in the description.