DEFENCE AVIATION SAFETY AUTHORITY

NOTICE OF PROPOSED AMENDMENT FOR DASR CHANGE PROPOSAL 2023-021 Revision 0

DASR ORO.90

AIRCRAFT PERFORMANCE

References:

A. DFSB ASIR: MRH-90 Engine Failure Resulting In Ditching, Jervis Bay, NSW, 22 Mar 23 (BP41374343)

B. ASR: Aircraft flew with incorrect basic weight and balance figures, C-17, 18 Nov 24 (DEFEV24110767)

C. ASR: MV-22 launch outside STOL weight limits, HMAS Canberra, 16 Aug 23 (DEFEV23080750)

D. ASR: Take-off with incorrect performance data, KC-30A, Bangkok, 29 Apr 19 (DEFEV19041116)

E. ASR: Incomplete Obstacle Data in OPT, Butterworth, 24 Apr 19 (DEFEV19041448)

F. ASR: Incorrect take-off performance calculated PB18, KC-30A, Darwin, 02 Aug 18 (DEFEV18080084)

G. ASR: Data Incorrect on BBJ Weight and Balance, BBJ, 22 Jun 18 (DEFEV16060883)

H. DASA Newsbreak: Deliberate Review of Aviation Operations-Related Implementing Regulations, 20 Aug 21

I. Brief for DG DASA: *New Regulation Concept – DASR ORO.90 Aircraft Performance*, of 3 Jun 24 (BP40383832)

INTRODUCTION

Applicability

1. This proposal is applicable to Military Air Operators (MAOs).

Purpose

2. The purpose of this NPA is to enable community input into the development of DASR ORO.90, ahead of its formal release in Jul 25. DASR ORO.90 addresses the problem of insufficient Defence regulation for the effective management of Aircraft performance-related hazards—as evidenced through:

a. DASA review of Defence OIP

b. aviation safety reporting (see Ref A-G),

c. benchmarking recognised CAA and MAA regulation.

Background

3. DASA conducted a comprehensive review of Aircraft performance regulatory material and OIP, as part of Shift A1 (Ref H refers).[1] The review concluded that Defence has insufficient regulation for the effective management of Aircraft performance-related Aviation Safety Hazards. Ref I provided DG DASA with a proposed amended regulation concept, to address the insufficient regulation for the effective management of Defence Aircraft performance-related Hazards.

4. This NPA forms part of the stakeholder consultation process.

Scope of proposed changes

5. This NPA proposes the addition of *DASR ORO.90 Aircraft performance* regulation consistent with best practice as applied by DASA recognised CAAs and MAAs. The proposed new DASR.ORO.90 *Aircraft performance*, incorporates:

a. MAO obligations for Aircraft performance (including weight and balance) management, including:

- i. using defined Hazard controls
- ii. using approved Aircraft performance OIP
- iii. risk management for performance-related hazards IAW DASR SMS
- iv. ensuring personnel conducting Flight operations are qualified, competent, current and authorised in Aircraft performance management.

b. Regulated Community (RC) suggestions[2]

c. acronyms, terms and definitions specific to the regulation

d. Part, AMC and GM.

Benefits of proposed changes

6. The benefits of this proposal include:

a. strengthening regulatory Hazard controls, enabling MAOs to effectively manage Aircraft performance-related Hazards, leading to improved Aviation Safety

b. alignment to DASA-recognised CAA and MAA Aircraft performance regulation benchmarks.

Effects of proposed changes

7. The proposed regulation increases regulated community compliance obligations through the implementation of *Aircraft performance*-specific Hazard controls, including:

a. approved performance and weight and balance OIP

b. defined minimum safety margins (including minimum obstacle clearance)

c. additional MAO Risk Management (RM) for:

- i. Aircraft performance degradation

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[1] Shift A1 task involves the deliberate review and improvement of Flight operations DASR (excluding Airworthiness). The task includes benchmarking DASR content against exemplar CAA and MAA regulation and guidance material, bow-tie Hazard analysis, Defence OIP, and review of civil and military safety reports.

[2] Raised by ENVCOMD representatives, RC and DASA staff during early consultation of regulation draft.

ii. Aircraft operations without One Engine Inoperative (OEI) Continued Safe Flight and Landing (CSFL) performance capability

iii. operations over populous areas

iv. operations without a Safe Forced Landing (SFL) capability

d. training, Competency and Currency requirements for performance (including weight and balance) planning and operations.

8. DASA does not foresee significant RC impediments to implementing the regulatory Hazard controls.

Proposed regulation

9. The proposed regulation is in Enc 1.

Implementation strategy

10. DASA will release the proposed regulation in Jul 25. DASA proposes a transition[3] timeframe of 12 months from DASR release.

HOW TO SUBMIT COMMENTS ON THIS NPA

Format

11. Record responses to this NPA on the NPA Response Sheet included in Annex A. Submit responses by email to dasa.fltops@defence.gov.au. Hardcopies are not required.

Timing

12. Please forward comments on NPA 2023-021 to DASA by close of business **24 Apr 25**.

Additional information

13. Additional information on this NPA is available from WGCDR Bruce Collenette, DD-FLTOPS (DAVNOPS-DASA), at bruce.collenette@defence.gov.au or (02) 5130 4757.

DISPOSITION OF RESPONSES RECEIVED

14. A Comment Response Document will be prepared and published on the DASA Website. DASA will not individually acknowledge or respond to comments or submissions.

Nicholas PAUSINA Digitally signed by Nicholas PAUSINA Date: 2025.03.12 08:19:04 +11'00'

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GPCAPT
DAVNOPS
Defence Aviation Safety Authority
Tel: (02) 5131 8235

Mar 25

Annex:
A. NPA for DCP 2023-021 Revision 0 – Response Sheet.

Enclosure:
1. NPA for DCP 2023-021 – Proposed DASR ORO.90 *Aircraft Performance*.

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[3] During transition DASA will not enforce compliance with the new regulation—allowing organisations time to implement new requirements.

NPA FOR DCP 2023-021 Revision 0 Response Sheet

DASR ORO.90

AIRCRAFT PERFORMANCE

Please forward this sheet as an email attachment to dasa.fltops@defence.gov.au **by 24 Apr 25. Response formats in MS Excel (preferred) and MS Word can be found at Obj No:** BP34901852 **and** BO3960659 respectively, or alternatively contact DASA.

Please indicate your acceptance or otherwise of this proposal by ticking the appropriate box below. Additional comments, suggested amendments or alternative action are welcome and may be provided on this response sheet or by separate correspondence.

[ ] The proposal is **acceptable without change**.

[ ] The proposal is **acceptable but would be improved if the following changes were made**:

[ ] The proposal is **not acceptable but would be acceptable if the following changes were made:**

LSN	**NPA Reference:** (i.e Regulation number, NPA paragraph etc)	**Comment or suggested change**	**Explanation**
1			
2			
3			
4			
5			

RESOURCE IMPLICATIONS

Please provide specific comment on any significant resource implications that this proposal may have for your organisation, for both its implementation and ongoing compliance. Your comments should address both financial and human resource considerations.

Resource implications – Proposal implementation	
Resource implications – Proposal sustainment	

RESPONDENT DETAILS

Your name:	
Submission date:	
Your organisation:	
Email address:	
Postal address:	
Phone:	
Whose views are represented in your response? **i.e. Is your response the authoritative response from your organisation?**	Responding on behalf of : Individual [ ] Regulated Military entity [ ] Regulated Commercial entity [ ] Wing HQ [ ] Group HQ [ ] ADF Regulatory, Technical or Logistics policy agency [ ] Other commercial entity [ ], Other [ ] Please describe:
Do you consent to your name being published as an NPA respondent within the NPA Summary of Responses:	YES [ ] NO [ ]

NPA 2023-021 REVISION 1

DASR ORO.90 FOR JUL 25 DASR RELEASE

‘AIRCRAFT PERFORMANCE’

Contents

SECTION 1: ADDITIONS TO THE DASP ACRONYMS AND GLOSSARY

1. The following **new** acronyms and definitions are proposed for the DASP Manual Acronyms and Glossary:

Acronyms

Acronym	Expansion
FW	Fixed-wing
RW	Rotary-wing

Glossary

Obstacle Limitation Surfaces (OLS) *(Source: CASA)*

A series of planes, associated with each runway at an aerodrome that defines the desirable limits to which objects or structures may project into the airspace around the aerodrome so that aircraft operations at the aerodrome may be conducted safely.

Fixed-wing (FW) Aircraft * *(Source: tailored from DASP Aeroplane definition)*

A heavier-than-air Aircraft deriving its lift in flight chiefly from aerodynamic reactions on surfaces remaining fixed under given conditions of flight.

Note: Includes variable-geometry wing Aircraft.

Rotary-wing (RW) Aircraft * *(Source: tailored from DASP Helicopter definition)*

A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more rotors on substantially vertical axes.

SECTION 2: NEW DASR ORO.90 PART ONLY

The following is a new DASR ORO.90 Part.

DASR ORO – Organisation Requirements for Air Operations

ORO.90 – AIRCRAFT PERFORMANCE (AUS)

GM1 GM2

(a) The MAO must manage Aircraft performance (including weight and balance) using defined controls to ensure Aviation Safety is not compromised, including:
GM1 GM2 GM3 AMC1 AMC2 AMC3

1. Risk Management controls for Aircraft performance **GM AMC**

2. using approved Aircraft performance OIP **GM AMC**

3. ensuring personnel conducting Flight operations are qualified, competent, current and authorised in Aircraft performance management. **GM AMC**

SECTION 3: NEW DASR ORO.90 PART, AMC and GM

The following is the DASR ORO.90, AMC and GM. AMC is in purple text. GM is in brown text.

ORO.90 – AIRCRAFT PERFORMANCE (AUS)

GM1

GM1 ORO.90 – Purpose statement and context (AUS)

a. **Purpose. (Context)**. Defence Aviation often requires the use of maximum Aircraft performance. **(Hazard)** Ineffective management of Aircraft performance, including weight and balance, can compromise Aviation Safety. **(Defence)** This regulation requires MAOs to use defined controls to manage Aircraft performance-related risks to ensure Aviation Safety.

b. **Background.** DASR ORO.90 *Aircraft Performance* provides regulatory performance-related hazard controls—such as minimum required safety margins. DASR ORO.90 *Aircraft Performance* regulation and AFM performance information—in combination with the Aircraft certification basis, and benchmarking against international best practice—assists MAOs to develop performance policy, procedures and training, supporting safe Flight operations.

c. **DASR ORO.90 GM vs AFM**. AFM limitations, normal and emergency procedures take precedence over DASR ORO.90 guidance material.

d. **Fixed-wing (FW) Aircraft obstacle clearance**. The MAO should use net flight path data and net gradients to meet DASR ORO.90 FW obstacle clearance requirements.

e. **Applicability.** DASR ORO.90 is applicable to powered Fixed-wing (FW) and Rotary-wing (RW) Aircraft excluding UAS (other than as required by DASR UAS).

GM2

GM1 ORO.90 – Acronyms, terms and definitions (AUS)

The following acronyms, terms and definitions are used in DASR ORO.90:

Acronym	Description
AEO	All Engines Operating
ALD	Actual Landing Distance
ASDA	Accelerate-Stop Distance Available
CEF	Critical Engine Failure
CFL	Critical Field Length

Acronym	Description
CSFL	Continued Safe Flight and Landing
D (Fixed-wing)	Horizontal Distance travelled from the end of the TODA
EO	Engine Out
FATO	Final Approach and Take-off
HIGE	Hover In Ground Effect
HOGE	Hover Out of Ground Effect
HLS	Helicopter Landing Site
HV (Diagram)	Height-Velocity (Diagram in Aircraft Flight Manual)
LDA	Landing Distance Available
MAUW	Maximum All Up Weight
MTOW	Maximum Take-off Weight
MLW	Maximum Landing Weight
NTOFP	Net Take-off Flight Path
OEI	One Engine Inoperative
S (Helicopter)	Horizontal distance travelled from the end of the TODA
SFL	Safe Forced Landing
TODA	Take-off Distance Available
TODAH	Take-off Distance Available (Helicopter)
TORA	Take-off Run Available
WAT	Weight, Altitude, Temperature

Term	Definition
Accelerate-Stop Distance Available (ASDA)	The length of the take-off run available plus the length of the stopway if provided.
Accelerate-Stop Distance Required (ASDR)	The distance required to accelerate to decision speed, abort the take-off and come to a stop.
Actual Landing Distance (ALD)	The landing distance required for the actual conditions, using the deceleration devices planned to be used for the landing.
Adequate Aerodrome	An aerodrome that complies with the following: (a) an authorised weather forecast for the aerodrome must be available for the aeroplane's estimated time of use of the aerodrome; (b) the aerodrome's services and facilities must be operational for at least the estimated time of use; (c) the landing distance available for the aeroplane must be at least the landing distance required under these Regulations for the aeroplane's landing at the aerodrome; (d) for an IFR flight—at least one authorised instrument approach procedure that is suitable for use by the aeroplane must be operational for at least the estimated time of use.
Adequate vertical margin	For a helicopter, the minimum vertical distance the helicopter must be from an object during a stage of a flight defined in: (a) the helicopter flight manual, or (b) if (a) does not apply, applicable OIP.
Avoid area of HV envelope (Helicopter)	The area delineated on the height-velocity (HV) envelope diagram in the aircraft flight manual that shows the altitude and airspeed combinations that do not offer auto-rotational landing capability, or OEI capability, in the event of an engine failure.
Balanced field length	The runway length (plus clearway and stopway) where, for the take-off weight, the engine-out accelerate-go distance equals the accelerate-stop distance.
Clearway	A defined rectangular area on the ground or water at the end of a runway in the direction of take-off and under control of the competent authority, selected or prepared as a suitable area over which an aircraft may make a portion of its initial climb to a specified height.
Climb gradient	The ratio, expressed as a percentage, of the change in geometric height divided by the horizontal distance travelled in a given time.

Contaminated runway

A runway is contaminated if more than 25% of the surface area required for a take-off or landing is covered by any of the following:

(a) water or slush more than 3 mm deep;

(b) loose snow more than 20 mm deep;

(c) compacted snow or ice.

Continued Safe Flight and Landing (CSFL) *

In the operational context, an Aircraft, following a system failure or malfunction, is capable of Continued Safe Flight and Landing at a destination or alternate aerodrome, possibly using emergency procedures, without requiring exceptional skill or strength. Upon landing, some Aircraft damage may occur as a result of the failure condition.

Note:

The DASR ORO.90 term Continued Safe Flight and Landing (CSFL) requires a performance capability to clear ground, water and obstacles, and fly not below the minimum applicable safe altitude/height until landing.

Critical engine

The engine whose failure would most adversely affect the performance or handling qualities of an aircraft.

Critical Engine Failure Speed (V_{CEF})

Critical engine failure speed is defined as the speed during the take-off run at which an engine can fail and the same distance is required to either lift-off or stop the air vehicle, for a specified altitude, weight, configuration and thrust (power). Critical engine failure speed cannot be less than ground minimum control speed.

Critical Field Length (CFL) (FAR 25)

FAA definition: The minimum runway length (or runway plus clearway and/or stopway) required for a specific take-off weight. This distance may be the longer of the balanced field length, 115% of the all engine take-off distance, or established by other limitations such as maintaining V_1 to be less than or equal to V_R.

Critical Field Length (CFL) (MIL-STD-3013B)

Military definition: Critical field length is defined as the sum of the distance required to accelerate to critical engine failure speed with all engines operating, plus the distance to accelerate to lift-off speed with the critical engine inoperative or to decelerate to a stop from critical engine failure speed in the same distance for a specified altitude, weight, configuration, and thrust (power) setting.

De-rated take-off thrust

Thrust level less than the maximum thrust approved for take-off, with separate AFM data and operating limits for the reduced thrust.

Ditching	The forced landing of an Aircraft on water.
Dry runway	A runway is dry if the surface area required for a take-off or landing: (a) has no visible moisture; and (b) is not contaminated.
Exposure (Helicopter) Source: ICAO	Any part of a flight during which a system or engine failure leading to a forced landing is likely to result in a hazardous or catastrophic outcome. *Note:* *Hazardous (equates to Critical in the ADF) - failure that would result in serious or fatal injury to an occupant.* *Catastrophic - failure that would result in multiple fatalities, or loss of the helicopter.*
Exposure Time (Helicopter)	The period during which a helicopter flying in still air, with one engine inoperative, may not be able to achieve a safe forced landing or continue the flight safely.
Final Approach and take-off Area (FATO)	Means a defined area for helicopter operations, over which the final phase of the approach manoeuvre to hover or land is completed, and from which the take-off manoeuvre is commenced.
Forced landing	An immediate landing on or off an airport, necessitated by the inability to continue safe flight.
Go-around	A transition manoeuvre from an approach to a stabilised climb. This includes manoeuvres conducted at or above the MDA/H or DA/H, or below the DA/H (rejected landings).
Gross flight path	Means the flight path it is assumed an aeroplane will follow when flown in a particular configuration in accordance with specified procedures in ambient conditions and that is established from the aeroplane's certification performance data representing the average fleet performance of the aeroplane type.
Gross gradient	Gross gradient is the achieved performance of the airplane under specified conditions as demonstrated during certification.
Gross height	The geometric height attained at any point in the take-off flight path using gross climb performance. Gross height is used for calculating actual pressure altitude at which obstacle clearance procedures and wing flap retraction are initiated, and level-off height scheduled.

Harsh environment (Helicopter) (Synonymous with ICAO term 'hostile environment') Source ICAO	An environment in which: a. a safe forced landing cannot be accomplished because the surface and surrounding environment are inadequate; or b. the helicopter occupants cannot be adequately protected from the elements; or c. search and rescue response/capability are not provided consistent with anticipated exposure; or d. there is an unacceptable risk of endangering persons or property on the ground.
Landing Distance Available (LDA)	The length of the runway declared to be available and suitable for the ground run of an aeroplane landing.
Landing Distance Available (LDA) (Helicopter)	The total of the following that are available for the Helicopter to complete the landing from the height above the FATO that is mentioned in the Helicopter's flight manual: (a) the length of the FATO; (b) the length of the area that is available and suitable for the Helicopter to complete a landing on.
Net flight path	The gross flight path reduced in elevation or extended in length by specified margins to allow for factors such as deterioration in aeroplane performance and variations in pilot techniques in relating aeroplane performance to obstacle clearance.
Net gradient	Net gradient is the gross gradient reduced by an increment specified in the regulations.
Net height	The geometric height attained at any point in the take-off flight path using net climb performance. Net height is used to determine the net flight path which must clear any obstacle by at least 35 feet to comply with the regulations.
Operating site	A site, other than an Aerodrome, selected by the operator or pilot-in-command or commander for landing, take-off and/or external load operations.
Populous Area	Includes a city or a town. *Note: A Populous Area is anywhere people are living or gathered for a purpose. If an Aircraft were to malfunction, or an operational error was made that led to a forced landing or crash, and it could pose a risk to the life, safety or property of a person in the area, it is likely the area would be a Populous Area.*

Reduced thrust (eg flex thrust or assumed temperature)	Take-off thrust less than maximum (or de-rated) take-off thrust. Reduced thrust is not an operating limit and thrust may be restored to maximum (or de-rated) thrust at any time.
Refusal Speed (V_{ref}) (Military)	Refusal speed is the maximum speed during take-off from which the air vehicle can stop within the available remaining runway length for a specified altitude, weight, and configuration.
Safe Forced Landing (SFL)	An unavoidable landing or ditching with a reasonable expectancy of no injuries to persons in the aircraft or on the surface.
Stopway	A defined rectangular area on the ground at the end of a runway in the direction of take-off, designated and prepared by the competent authority as a suitable area, in which an aircraft can be stopped in the case of an interrupted take-off.
Suitable aerodrome	An adequate aerodrome where at the expected time of arrival, weather reports or forecasts indicate conditions above the required operating minima, and runway surface condition reports indicate a safe landing is possible.
Take-off Climb Surface	The surface, based on an inclined plane, located beyond the end of the TODA (FATO for helicopter) or clearway, identified for the purpose of determining relevant obstacles for the take-off.
Take-off Distance (Fixed-wing)	The take-off distance as defined in Airworthiness requirements for Aircraft certification, and calculated in accordance with the relevant requirements in the flight manual instructions for the Aircraft (further detailed in GM).
Take-off Distance Available (TODA)	The sum of: (a) the length of the take-off run available; and (b) if clearway is provided — the length of the clearway.
Take-off Flight Path *	The vertical and horizontal path, with the critical engine inoperative, from a specified point in the take-off for aeroplanes to 1500 ft above the take-off surface and for helicopters to 1000 ft above the take-off surface (these altitudes may be reduced to planned operating altitude).
Take-off Run Available (TORA)	The length of runway declared to be available and suitable for the ground run of an aeroplane taking off.
Take-off Splay	The take-off splay or lateral obstacle containment area represents an area surrounding the take-off flight path, within which all obstacles must be cleared, assuming they are all projected on the intended track.

V_1 (Take-off decision speed)	The maximum speed in the take-off at which the pilot must take the first action to stop the aeroplane within the accelerate-stop distance. V1 is also the minimum speed in the take-off, following a failure of the critical engine at VEF, at which the pilot can continue the take-off and achieve the required height above the take-off surface within the take-off distance.
V_2 (Take-off safety speed)	The take-off safety speed which is the target speed to be attained at the 35 ft height following an engine failure after V1. **Note:** The 35 ft height is also known as reference zero, which is also the point at which the take-off distance ends.
V_{OBS} or V_{50FT} ('Obstacle clearance speed'—applicable to MIL-STD-3013B)	Obstacle clearance speed at 50 ft. Defined as the flight path speed, with landing gear extended, at which the air vehicle clears a 50 ft height above the runway during climb out, for a specified altitude, weight, and configuration.
V_{MCA}	The minimum control speed air. The minimum speed that the aircraft is still controllable with the critical engine inoperative while the aircraft is airborne.
V_{REF} ('Landing Reference speed'—applicable to CFR/CS Part 25 certified Aircraft)	The landing reference speed or 50 ft threshold crossing speed. Must be at least $1.3V_{SO}$ or $1.3V_{S1G}$.
V_{REF} ('Refusal Speed'—applicable to MIL-STD-3013B)	The take-off refusal speed. Refusal speed is the maximum speed during take-off from which the aircraft can stop within the available remaining runway length for a specified altitude, weight, and configuration.
V_{S1G} or V_S	The stalling speed or minimum steady flight speed in the clean configuration at 1G.
V_{SO}	The stalling speed or minimum steady flight speed in the landing configuration.
Wet runway	A runway is wet if the surface area required for a take-off or landing: (a) is not dry; and (b) is not Contaminated.

(a) The MAO must manage Aircraft performance (including weight and balance) using defined controls to ensure Aviation Safety is not compromised, including:
▾GM1 ▾GM2 ▾GM3 ▾AMC1 ▾AMC2 ▾AMC3

AMC1 ORO.90(a) – Aircraft performance for all Types (AUS)

General

a. The MAO must establish procedures and performance (including weight and balance) requirements to ensure Aircraft, with All Engines Operating (AEO), can achieve:

i. safe take-off and landing

ii. ground, water and obstacle clearance in all Flight phases

iii. minimum safe heights, minimum sector altitudes and minimum route altitudes (as defined in Defence AIP)

iv. compliance with published Rules of the Air and Aeronautical Information.

b. **Single-engine Aircraft.** The MAO should establish contingency procedures IAW the AFM for engine-failure in any phase of Flight, to ensure safe forced landing or safe ejection (where applicable).

c. **Multi-engine Aircraft.** The MAO should establish contingency procedures IAW the AFM for engine-failure in any phase of Flight, to ensure Aviation Safety is not compromised.

d. **Weight and balance.** MAO policy, procedures and training must enable Aircraft weight and balance determinations for all Flight phases—using AFM data, supplementary data or electronic tools.

e. MAO procedures and training must ensure Aircraft weight and balance remain within AFM limits throughout Flight.

Take-off

f. The MAO should ensure that the take-off weight does not exceed:

i. the maximum take-off weight or maximum all up weight IAW the AFM

ii. a weight that accounts for the factors affecting take-off performance (informing Take-off and Landing Data (TOLD) calculations), including:

(a) Aircraft configuration

(b) serviceability (informed by MEL and CDL where applicable)

(c) runway or site dimensions

(d) slope and surface conditions

(e) environmental conditions

iii. a weight, taking into account planned fuel consumption, that will result in landing above the maximum weight IAW the AFM

iv. a weight that provides Aircraft performance for safe take-off, en route Flight, landing and missed approach—including ground, water, and obstacle clearance in all phases of Fight.

Landing

g. The MAO should ensure that the landing performance includes consideration of:

i. obstacles in the approach Flight path

ii. go-around or missed approach Flight path

iii. Aircraft configuration

iv. landing runway or site, including:

(a) elevation

(b) slope

(c) surface conditions

v. environmental conditions.

h. The MAO should establish parameters (eg stabilised approach criteria) for safe continuance of the approach and landing, and conditions for mandatory go-around.

i. **Landing weight.** The MAO should ensure that, before the Flight commences, the landing weight of the Aircraft, for the estimated time of landing at the destination aerodrome and at any alternate aerodrome, does not exceed:

i. the maximum landing weight or maximum all up weight IAW with the AFM

ii. a weight that allows a safe landing at the planned destination and alternate (if applicable)

iii. a weight that would allow a safe missed approach.

GM1 ORO.90(a) – Aircraft performance for all Types (AUS)

a. **Single-engine Aircraft.** MAO planning and procedures for engine-failure should be IAW the AFM and can include:

i. emergency training for Forced Landings

ii. choosing routes and altitudes to support a SFL or safe ejection (eg selecting a route or altitude providing SFL areas within glide range—such as airstrips, fields, other flat and firm areas suitable for a safe landing by the Aircraft Type, and surface conditions that support survivability until rescue)

iii. minimising long overwater Flights outside glide ranges to a SFL area—when the Aircraft is not certified for water landing or is not fitted with an emergency floatation system

iv. carriage of, and training for the use of, survival equipment

v. provision of a SAR capability for a forced landing (including ditching) or ejection.

b. **Multi-engine Aircraft.** The loss of propulsion in a multi-engine Aircraft does not usually require a forced landing or ejection (where applicable). However, the failure of an engine or multiple engines in a multi-engine Aircraft, may require a forced landing in some situations. MAO planning and procedures for engine(s) failure should be IAW the AFM and can include:

i. OEI performance availability to ensure Continued Safe Flight and Landing (CSFL) when continuing take-off OEI or after an engine failure at any other stage in-Flight

ii. routing for OEI where required to ensure obstacle clearance (either vertical or lateral clearance)

iii. jettison (eg fuel, external stores, cargo) procedures to reduce Aircraft weight

iv. procedures for drift down or descent to OEI altitude

v. provision of SFL areas where OEI CSFL is not guaranteed

vi. carriage of, and training for the use of, survival equipment

vii. provision of a SAR capability where an engine-failure can lead to forced landing (including ditching) or ejection.

c. **Weight and balance.** MAOs may use actual weights for passengers, standard passenger weights (published in *AFAMMAN Part 2 Chapter 1 Table 1–1*) or passenger weights defined in OIP. MAOs should conduct cargo weighing, loading procedures, documentation preparation and handling (eg passenger and cargo manifests) IAW *AFAMMAN* and AFM procedures.

d. **Take-off.** MAO procedures to calculate take-off weight should include consideration of:

i. obstacles in the take-off Flight path

ii. Aircraft configuration for take-off (eg external stores, reduced thrust, tyre pressure etc)

iii. systems affecting take-off performance (eg selection of anti-ice or system unserviceability triggering performance penalties (eg MEL or CDL))

iv. the runway or departure site dimensions, including:

(a) Take-off Distance Available (TODA)

(b) distance available for an aborted (rejected) take-off

(c) take-off runway line-up allowance where applicable

v. surface condition

vi. slope of the runway in the direction of take-off

vii. pressure altitude and temperature (density altitude)

viii. wind velocity (using not more than 50% headwind component or not less than 150% tailwind component—unless already accounted for in performance data)

ix. stopway or clearway (where applicable)

x. weather (eg avoidance of, and actions in the event of encountering weather phenomena such as thunderstorms and microbursts)

xi. obstacles

xii. for a multi-engine Aircraft—OEI performance available to continue a safe take-off (beyond a decision speed) in the event of an engine failure

xiii. performance required to meet published departure procedure (where applicable)

xiv. performance available to reach and maintain a safe altitude or height after take-off.

e. **Landing.** MAO procedures to ensure safe approach and landing, should include consideration of:

i. engine failure occurring at any stage during approach and landing

ii. Aircraft landing weight

iii. Aircraft configuration for landing (eg external stores, flap setting)

iv. systems affecting landing performance (eg anti-ice, thrust reversers, autobrake setting, or system unserviceability triggering performance penalties (eg MEL or CDL))

v. the runway or landing site dimensions, including the Landing Distance Available (LDA)

vi. surface condition (eg contaminated, wet, slippery)

vii. slope of the runway in the direction of landing

viii. pressure altitude and temperature (density altitude)

ix. wind velocity (including the use of speed increments for approach and landing in gusty conditions)

x. weather (eg avoidance of, and actions in the event of encountering weather phenomena such as thunderstorms and microbursts)

xi. obstacles

xii. stabilised approach criteria

xiii. the in-Flight landing performance assessment, including landing safety margin or factoring (eg landing distance calculation for the time of arrival).

f. **Missed Approach (MAP).** A safe missed approach is one that meets the greater of:

i. the published missed approach gradient

ii. at least 2.5%

iii. a gradient required to clear obstacles in the missed approach flight-path.

AMC2 ORO.90(a) – Fixed-wing (FW) Aircraft performance (AUS)

General

a. **Multi-engine.** The MAO should ensure that following an engine failure at any stage of Flight, the FW Aircraft is able to achieve:

i. safe continued take-off or abort

ii. Continued Safe Flight and Landing (CSFL).

Take-off

b. The MAO should ensure FW Aircraft AEO and OEI (multi-engine) take-off performance (including take-off weight and balance); and using a decision speed that enables a safe:

i. abort and stop (accelerate-stop) within the Accelerate Stop Distance Available (ASDA)

ii. continued (accelerate-go) take-off, including ensuring all of the following are met:

(a) take-off run required does not exceed the Take-off Run Available (TORA)

(b) Critical Field Length (CFL) (where applicable) does not exceed the TORA

(c) take-off distance does not exceed the Take-off Distance Available (TODA), including:

(i) the Clearway length does not exceed half the TORA

(ii) the take-off safety speed (ie $V_{2)}$ or safe obstacle climb out speed (ie V_{OBS}, V_{CO}, $V_{50FT)}$ is achieved by the AFM obstacle height (eg 35 ft or 50 ft respectively) at or before the end of the TODA (as applicable)

(iii) for a wet or contaminated runway, the take-of weight is not greater than the maximum weight permissible for take-off on a dry runway for the same conditions

c. **Take-off distance.** The MAO must ensure all FW Aircraft achieve the take-off safety speed (V_2/V_{OBS}/V_{OCS} etc) by the end of the TODA. This includes a multi-engine FW Aircraft suffering critical engine failure from the critical point (V_1/V_{CEF}/V_{REF} etc) during the take-off ground roll.

d. The MAO should ensure take-off performance to enable a Flight path gradient of at least the greater of:

i. net take-off Flight path gradient(s) for regulatory compliance with obstacle clearance

ii. gross climb gradient(s) IAW the AFM and regulatory minimum (where applicable).

e. **Multi-engine**. Additionally, the MAO should ensure the take-off weights allow Continued Safe Flight and Landing (CSFL) with One-Engine Inoperative (OEI).

Take-off obstacle clearance

f. **Multi-engine.** The MAO should ensure available Aircraft OEI performance, and established procedures, provide ground, water and obstacle clearance, on the take-off Flight path, en route or during return Flight to the aerodrome (departure or alternate).

g. The MAO should ensure the Aircraft can avoid obstacles in the net take-off Flight path by at least 35 ft vertically, when within:

   i. 90 m plus (0.125 x D)[1](inline comment) where D is the horizontal distance travelled from the end of the TODA or the turn point if the Flight path includes a turn before the end of TODA) laterally, or

   ii. half the wingspan plus 60 m, plus (0.125 x D)[2] (inline comment) where D is the horizontal distance travelled from the end of the TODA or the turn point if the Flight path includes a turn before the end of TODA) laterally—where the wingspan is less than 60 m

h. The MAO should consider obstacles in the net take-off Flight path, out to the following horizontal limits (take-off splay):

   i. for a straight departure (ie a flight path not exceeding 15° track change):

      (a) 300 m, if the pilot is able to maintain the navigational accuracy of RNP 0.2 or better from the end of the departure runway to the minimum safe altitude

      (b) 600 m, for flights under all other conditions.

   ii. for a turning departure (ie a flight path track exceeding 15° track change):

      (a) 600 m, if the pilot is able to maintain the navigational accuracy of RNP 0.2 or better from the end of the departure runway to the minimum safe altitude

      (b) 900 m, for flights under all other conditions.

i. Notwithstanding AMC2 ORO.90(a)f and g, the MAO should ensure the Aircraft can clear obstacles in the net take-off Flight path vertically by at least:

   i. 35 ft when using 15° AOB or less

   ii. 15 ft when using 15° AOB or less (where the take-off data is calculated for a wet or contaminated runway)

   iii. 50 ft when using greater than 15° AOB

   iv. 30 ft when using greater than 15° AOB (where the take-off data is calculated for a wet or contaminated runway).

En route

j. **Multi-engine.** The MAO should ensure available Aircraft OEI performance, and established contingency procedures that provide ground, water and obstacle clearance, and maintain minimum safe altitude, following critical engine failure at the most critical point, during cruise and the subsequent descent (or drift down) until landing.

k. The MAO should establish contingency procedures for three or four-engine Aircraft, to ensure Continued Safe Flight and Landing (CSFL) in the event two engines become inoperative in Flight.

Landing

l. The MAO should:

i. define procedures for conducting landing performance distance calculations

ii. ensure that the Aircraft Captain conducts an in-Flight assessment of landing performance, including verifying that:

(a) the landing weight of the Aircraft does not exceed:

(i) the Maximum Landing Weight (MLW) IAW with the AFM

(ii) a weight that allows a safe landing on the planned runway, for the planned Aircraft configuration and with the prevailing conditions (eg Take-off and Landing Data (TOLD) calculation)

(b) the Aircraft can land and stop within the runway Landing Distance Available (LDA)

(c) the crosswind during landing will not exceed AFM limitations

(d) the runway width is suitable.

GM2 ORO.90(a) – Fixed-wing (FW) Aircraft performance (AUS)

Take-off

a. **Maximum take-off weight.** The maximum take-off weight is the maximum weight for take-off that guarantees the Aircraft can continue take-off safely within the take-off distance available (including stopway and clearway); or stop safely within the runway length (including stopway) remaining. For small (<5700kg) propeller Aircraft, the AFM factored take-off run should not exceed TORA—where no AFM factor is included in the AFM, the unfactored AFM take-off run should be multiplied by 1.25. For large multi-engine Aircraft, the maximum take-off weight supports continued take-off at or above decision speed, and provides performance for obstacle clearance, following critical engine failure during take-off.

b. **Take-off distance.** Take-off distance is defined through the Type's certification basis. The take-off distance includes the ground and air distance to obstacle clearance height (screen height) of 35 ft or 50ft (as certified) above the runway surface (at V2/take-off safety speed). DASA requires MAOs to ensure take-off distance is no greater than TODA.

c. OEM take-off performance software provided for Aircraft certified under CFR 25 or CS 25 use declared runway distance (from entered TO RWY) information, including TORA, TODA and ASDA, when computing MTOW weight. MTOW ensures the accelerate-go and accelerate-stop (reject/abort) distance remains within the declared distances available. However, military Aircraft, certified under MIL-STD-3013B, use a CFL concept to calculate take-off performance, and provide data to calculate MTOW based on TORA not TODA. The resultant CFL ensures lift off in the runway ground distance available, or a stop in runway ground distance available. MIL-STD-3013B does not consider TODA as a limitation for the MTOW calculation. Therefore, take-off distance (ground roll plus air distance to 50 ft) may exceed TODA. If take-off distance exceeds TODA, obstacle clearance (up to screen height) cannot be guaranteed, and minimum obstacle gradients for instrument departures (calculated from the end of the TODA) may be invalidated. Accordingly, for IFR departures, DASA recommends Aircraft performance to cross the departure end of the runway (or end of declared TODA) at a screen height of 35 ft. In VFR or where MAOs authorise crossing the DER/TODA below 35 ft, risk assessment and mitigations are necessary to ensure obstacle clearance to screen height and during departure.

e. **Gross gradients.** Where obstacles are not limiting, MAOs should ensure take-off weights enable Aircraft performance to achieve minimum gross climb gradients, as specified in OIP (where applicable). OIP minimum gross gradients are provided to ensure a safe climb performance (including OEI for multi-engine Aircraft), minimising risk to personnel in the Aircraft and on the ground. Minimum gross gradients may be required to achieve ATC procedures, airspace requirements, and Aerodrome noise abatement.

Take-off obstacle clearance

f. When determining obstacle clearance, the MAO should consider obstacles in the take-off flight-path, and en route climb (until a safe altitude is reached). Multi-engine Aircraft must be able to achieve a OEI net gradient above the most limiting obstacle gradient. Obstacle clearance can be guaranteed when complying with a published IFR departure procedures such as a SID—if AEO (and OEI for multi-engine Aircraft) performance meets the SID gradients to MSA/LASALT, no additional obstacle planning is required.

g. Where published SIDs are not available, or when unable to meet SID gradients, MAOs should establish procedures to ensure obstacle clearance, until reaching a safe altitude. MAO procedures can include conducting:

   i. visual departures–such that obstacle avoidance can be guaranteed vertically or laterally (with OEI for multi-engine Aircraft)

   ii. IFR departures–obstacle analysis and routing to ensure obstacles in the take-off area/splay can be cleared vertically by at least 35 ft (50 ft turning) (including OEI for multi-engine Aircraft).

h. The MAO should specify take-off weather minima (including a ceiling) if the take-off procedure requires the pilot(s) to see and avoid obstacles on departure—unless using a published IFR departure with published take-off minima. Single-engine Aircraft, or multi-engine (eg CFR/FAR 23 certified light twins) Aircraft without guaranteed OEI CSFL capability, will require a Forced Landing (including a turn back where performance is available) following engine failure after take-off. In such cases, the MAO should establish take-off weather minima that supports a visual turn back or SFL, including obstacle avoidance until landing. Turn backs have a greater potential for an accident than a forced landing to a suitable area that requires less manoeuvring (ie somewhere close to direction of travel). This is primarily due to the potential mishandling of a turn back and Aircraft stall.

i. **EO SIDs.** MAOs may not always find it practical to reduce take-off weights to meet SID gradients for the OEI case. Therefore, MAOs may elect to produce emergency SIDs (eg EO SID), for certain Aerodromes and runways, which guarantee obstacle clearance (at desired AEO take-off weight) in the event of an engine failure during take-off or departure in IMC. Development of emergency EO SIDs can be complex, as it requires detailed analysis of: Aircraft EO performance; aerodrome obstacles; and obstacles on the (SID or EO SID) departure route. Accordingly, EO SID production is best performed by performance engineers. The MAO should ensure Aircrew are trained in the use of EO SIDs. Where the Aircraft navigation system capability exists, navigation data bases should pre-program with EO SIDs, enabling EO SID navigation selection (ie route guidance) in the event of an engine failure during take-off.

j. **Net take-off Flight path.** The MAO and Aircraft Captain, when complying with AMC2 ORO.90(a) *Take-off obstacle clearance*, and when calculating the net take-off Flight path, should:

   i. consider the weight of the Aircraft at the commencement of the take-off run

   ii. consider the pressure altitude and temperature (density altitude) at the aerodrome

   iii. apply not more than 50% of the headwind component or not less than 150% of the tailwind component

   iv. plan on no track changes before the point at which the net take-off flight path has achieved a height equal to one half the wingspan, but not less than 50 ft above the elevation of the end of the TORA—thereafter, up to a height of 400 ft assume that the Aircraft is banked by no more than 15°—above 400 ft height bank angles greater than 15°, but not more than 25° may be scheduled

   v. allow for the effect of bank angle on operating speeds and flight path, including the distance increments resulting from increased operating speeds, the acceleration reduction equivalent to the gross climb gradient reductions

k. Where net flight path data is not published in the AFM, net obstacle clearance can be determined by reducing the AFM gross flight path gradients by the following margins:

   i. for twin-engine Aircraft—0.8%

   ii. for three-engine Aircraft—0.9%

   iii. for four-engine Aircraft—1.0%

l. **Wet or contaminated Runway.** The take-off distance for a wet of contaminated runway is calculated using a 15 ft obstacle height (see take-off distance definition) at the end of the runway. Therefore, when taking off on a wet or contaminated runway and an engine failure occurs at the decision speed (V_1) for a wet or contaminated runway, this implies that the Aircraft can initially be as much as 20 ft below the net take-off flight path and may only clear close-in obstacles by 15 ft. When taking off on wet or contaminated runways, the MAO and Aircraft Captains should exercise care with respect to obstacle assessment, especially if a take-off is obstacle-limited and the obstacle density is high.

m. **Effect of bank angle.** Where the MAO OEI procedures include turns in excess of 15° AOB, an increased vertical obstacle clearance is required (eg 50 ft), and the loss of climb performance (based on AOB) must be taken into account when meeting that clearance. Where the AFM provides a climb gradient correction for a 15° AOB, and unless otherwise specified in the AFM or other performance manuals, the MAO may use Table 1 (below), which provide adequate stall margins and climb gradient corrections, for turns up to 25° AOB.

Bank Angle	Speed	Gradient correction
15°	V2	1 x AFM 15° gradient loss
20°	V2 + 5 KIAS	2 x AFM 15° gradient loss
25°	V2 + 10 KIAS	3 x AFM 15° gradient loss

Table 1 - GM2 ORO.90(a)2 – Effect of bank angles on climb performance

En route

n. **En route.** MAO procedures should consider:

  i. engine failure occurring at any stage en route
  ii. OEI maximum altitude capability (where applicable)
  iii. drift down to OEI altitude (where applicable)
  iv. surface type (ground or water)
  v. surface conditions (eg mountainous, sea state, water temperature)
  vi. terrain elevation
  vii. obstacles
  viii. available landing aerodromes or sites.

o. **Multi-engine.** MAOs should ensure OEI net performance is available to clear all obstacles during cruise and subsequent descent until landing. MAOs should ensure OEI performance is available to maintain:

  i. level at or above 1000 ft above ground, water and obstacles within 5nm of track (10nm if unable to maintain RNP 2.0 or better)
  ii. 2000 ft above obstacles during descent or drift down to OEI stabilising altitude
  iii. 1500 ft above the landing aerodrome.

p. When OEI en route, the Captain should consider: wind; system effects on performance (eg anti-ice); and fuel jettison (maintaining the required reserves at the landing aerodrome).

q. **Three or more engines.** MAOs operating beyond a certain distance (eg greater than 90 minutes at AEO cruise speed) from a suitable Aerodrome should establish procedures to account for two-engines simultaneously failing. Accordingly, MAOs should establish two-engine inoperative terrain clearance, obstacle clearance and drift down procedures.

Landing

r. **Pre-Flight (dispatch) landing calculations.** The maximum landing weight, as calculated during pre-Flight for the estimated time of arrival, is the maximum safe landing weight that ensures the Aircraft can land and stop (including a safety margin) within the Landing Distance Available (LDA). MAOs should use to lowest maximum landing weight calculated considering both: the LDA for the most favourable runway (eg longest landing runway) in still air; and the LDA for most likely assigned runway (based on wind, ATC preferred landing runway for noise abatement and other operational factors).

s. Table 2 (below) provides the method for calculating the landing distance required at pre-Flight (dispatch). MAO pre-Flight landing performance calculations are dependent on the Aircraft type and expected runway surface condition (ie dry, wet or contaminated) at the estimated time of arrival. The actual landing distance (ALD) is derived from the AFM landing performance data. The AFM landing data can also include specific wet and contaminated ALD data. The AFM ALD is then multiplied by a safety factor (to provide a landing safety margin) resulting in the landing distance required (factored). Maximum Aircraft landing weight at the destination or alternate should ensure that the resultant landing distance required is less than or equal to the LDA.

Runway condition	Pre-Flight (Dispatch) - Landing Distance Required
Dry	**Dry runway landing distance required does not exceed LDA. Dry landing distance required calculated as follows:** **Jet**: • 1.67 x ALD (ie ALD ≤ 60% of LDA) **Turbo-prop/propeller**: • 1.43 x ALD (ie ALD ≤ 70% of LDA) **Specific MAO approval**: • 1.25 x ALD (ie ALD ≤ 80% of LDA)

Wet	**Wet runway landing distance required does not exceed LDA. Wet landing distance required calculated as follows:**
	Wet AFM data available, the greater of:
	• Dry landing distance required (above)
	• AFM wet ALD (including a 15% margin)
	Note: Unless otherwise indicated, the AFM wet ALD includes the application of the 115% factor. When the AFM wet ALD is not factored, a safety factor of 15% should be applied.
	No wet AFM data available:
	• 115% x dry ALD:
	  • 1.92 x dry ALD (**Jet**) = 1.15 x 1.67 x dry ALD
	  • 1.64 x dry ALD (**Turbo-prop/propeller**) = 1.15 x 1.43 x dry ALD
	  • 1.43 x dry ALD (**specific MAO approval**)= 1.15 x 1.25 x dry ALD

Contaminated	**Contaminated runway landing distance required does not exceed LDA. Contaminated landing distance required calculated as follows:** **Contaminated AFM data available, the greater of:** • Wet landing distance required (above) • 1.15 x contaminated ALD **Contaminated AFM data not available, the greater of:** • Wet landing distance required (above) • 1.15 x approved contaminated data (where applicable) Note: The 115% factor need not be applied if it is included in the contaminated ALD.

Table 2 – GM2 ORO.90(a)2 - Pre-flight (Dispatch) Landing Distance Computations

t. **In-Flight landing performance assessment.** Calculating maximum landing weight to meet pre-Flight landing requirements does not replace the need for an in-Flight landing performance assessment. The MAO should ensure that an in-Flight landing performance assessment, which includes a landing distance check, is conducted before every landing. The landing distance data (ie AFM ALD) used for a landing performance assessment at time of arrival, establishes an operationally achievable landing distance from 50 ft above runway threshold to full stop. The ALD is then factored by 115% and compared to the LDA for the expected landing runway.

u. Before the approach to land is continued, the LDA for the intended landing runway should be at least 115% of the ALD. When information is not available to calculate in-Flight landing performance, the landing distance should not be greater than the distance calculated in *Table 2 – GM2 ORO.90(a)2 - Pre-flight (Dispatch) Landing Distance Computations*—for the expected weather and runway conditions (dry, wet contaminated), based on in-Flight weather reports or forecasts for the ETA. Further guidance on in-flight check of the landing distance at time of arrival may be found in *ICAO Doc 10064 Aeroplane performance Manual*.

v. MAOs may specify situations where detailed landing distance calculations are not required as part of the landing performance assessment, including:

   i. training activities at a familiar/local Aerodrome (local area operations and circuits)

   ii. multiple landings or Touch and Gos on the same runway(s) (eg during circuits)

   iii. pre-assessed landing weight ranges that provide suitable landing safety margins at a familiar/local Aerodrome, and in suitable weather conditions.

AMC3 ORO.90(a) – Rotary-wing (RW) Aircraft performance (AUS)

General

a. The MAO should ensure that following an engine failure or malfunction at any stage of Flight, RW Aircraft can achieve either:

   i. safe continued take-off or abort (reject)

   ii. Continued Safe Flight and Landing (CSFL)

   iii. Safe Forced Landing (SFL).

b. **Height-Velocity (HV) Diagram (where available).** The MAO should avoid operations in the AFM HV avoid area unless operationally required. The MAO should minimise time in the HV avoid area, where operations in the HV avoid area are required.

Take-off

c. The MAO should:

   i. not exceed the take-off weight, using normal AEO take-off power, that provides the performance required for the intended take-off profile

   ii. define take-off action points (as necessary) that support CSFL or safe abort

iii. calculate and brief a safe OEI speed that guarantees continued OEI Flight, for the planned take-off weight and environmental conditions.

Take-off obstacle clearance

d. The MAO should:

i. ensure ground, water and obstacle clearance using OEI performance on the take-off Flight path, en route or during return Flight to the aerodrome (departure or alternate).

ii. specify the minimum safe vertical and horizontal margins from obstacles for VMC, and a vertical margin from obstacles of not less than 35 ft for IMC.

En route

e. **Multi-engine.** The MAO should ensure available OEI performance, and established contingency procedures, that provide ground, water and obstacle clearance, following critical engine failure at the most critical point, during cruise and the subsequent descent (or drift down) until landing.

Landing

f. The MAO should conduct an in-Flight assessment of landing performance, including verifying that the landing weight of the rotary-wing Aircraft does not exceed:

i. the maximum landing weight IAW the AFM

ii. the maximum weight to ensure a safe landing for the intended landing profile (eg HIGE, HOGE, running landing)—considering the landing site and environmental conditions.

Flexibility provision

g. MAOs may operate outside the requirements of paras a-f when required. MAOs must risk manage such operations IAW DASR SMS.

GM3 ORO.90(a) – Rotary-wing (RW) Aircraft performance (AUS)

a. **Degraded performance.** The MAO performance management system should include methods to ensure a safe outcome following degraded performance (eg engine malfunction or failure, engine shutdown, gearbox failure etc). MAOs operating multi-engine RW Aircraft that suffer a single-engine failure, are more likely to ensure a safe outcome when they operate RW Aircraft at speeds, weights, altitudes and temperatures that support continued Flight on the remaining engine power, or a Safe Forced Landing (SFL) in the event of a total power loss (eg gear box failure). MAOs operating single engine RW Aircraft, or multi-engine RW Aircraft that lack sufficient remaining performance for Continued Safe Flight and Landing (CSFL), can ensure the safest outcome following engine failure or loss of performance, if a SFL (using remaining power or an auto-rotation) is available.

b. **Safe Forced Landing (SFL).** There should be reasonable expectation of no injury to persons in the air, or on the ground, for a forced landing to be considered a SFL. A SFL can result in some damage to the Helicopter. A SFL normally requires a controlled descent to a safe landing—the landing flare, touchdown attitude, rate of descent, and landing surface supports the reasonable expectation of an injury free landing for all occupants and personnel on the ground. Additionally, the MAO should consider post landing survivability. The MAO should ensure that occupants are adequately protected from the elements and search and rescue is accomplished within survival time.

c. Not all forced landings can be SFLs. A SFL is unlikely when a forced landing is conducted in the following situations:

i. remaining performance or energy (eg complete loss of power or OEI when in the HV avoid area) is insufficient to prevent kinetic (high g) landing injuries

ii. a SFL area is unavailable

iii. while operating in a Harsh environment

iv. while operating from elevated heliports or ship helidecks with increased possibility of:

(a) a deck-edge strike if the engine fails early in the take-off or late in the landing

(b) penetration into the HV avoid area during take-off and landing

(c) obstacles on the surface (or harsh environment) below the elevated helideck.

d. **Height-velocity (HV) diagram.** HV diagram (where provided in AFM) provides speed and height combinations, at various weights, that permit a safe emergency landing following engine-failure or power loss. The diagram includes an avoid area. Power loss or engine-failure while operating within the avoid area is likely to result in a critical or catastrophic outcome—a result of insufficient energy to either fly-away or conduct a safe landing. The AFM HV diagram may also display the recommended take-off profile to remain outside the avoid area. A safe forced landing following power loss cannot be guaranteed during operations in the HV avoid area—even though a suitable landing surface may be available. Accordingly, MAOs should avoid continuous operations inside the HV avoid area where possible; or minimise those operations SFARP. However, MAO operations outside the avoid area will guarantee sufficient potential energy for a SFL (assuming a suitable landing surface is available), or in some cases (for a multi-engine Aircraft) a fly-away capability—following engine failure or power loss. Some MAO operations (eg hover at low heights, shipborne take-off and landing) may require infringement of the HV avoid area. The MAO should identify and risk managed such operations.

e. **Exposure.** Exposure is the period or part of the Flight during which a critical or catastrophic outcome would result if an engine failure or system failure lead to a forced landing. Exposure includes any period of Flight where OEI CSFL is not guaranteed and a SFL is not assured. Operating within the avoid area of the HV diagram is considered as operating with Exposure, as neither CSFL or SFL (regardless of the surface below the Aircraft) is possible if the engine(s) fail while in the HV avoid area. MAOs should eliminate Exposure-related risks SFARP, or when unable to eliminate the risks, otherwise minimise those risks SFARP.

Weight and Balance

f. The MAO should ensure that weight and balance is checked before each Flight to ensure it is within AFM limits, and will remain within limits throughout the Flight—including accounting for the mission profile (eg cargo and passenger upload or offload, hoist, external lift etc). MAOs should ensure Aircraft C of G limits are not exceeded, including lateral C of G limits. There is increased possibility of lateral C of G exceedance when using exterior pylon stations, or when hoisting or carrying heavy lateral loads or uneven external loads.

Take-off

g. When determining take-off weight requirements, MAOs should consider the RW Aircraft weight, configuration and environmental conditions at the departure site**.** The MAO should ensure that AEO performance (and engine power margin) is calculated for the WAT conditions, when determining AEO maximum take-off weight, that enables available performance for the intended take-off profile. The MAO should ensure maximum weight for AEO HIGE and HOGE is determined. The take-off profile should normally follow the HV diagram recommended take-off profile (where provided), or otherwise remain outside the HV avoid area where possible (this allows for emergency landing capability in the event of power loss or engine failure). The required take-off profile (eg vertical take-off profile for CA or close in obstacles) can limit take-off MAUW. MAOs may require a power margin check be conducted after take-off (in the hover)—validate take-off performance against expected performance, and determine available excess power. The captain should investigate and resolve any performance discrepancies before the take-off is continued.

h. **Multi-engine.** In addition to AEO performance planning and capability, the MAO should examine OEI performance for each take-off to account for an engine failure during take-off. The take-off WAT will determine the resultant OEI performance. Depending on the WAT for take-off, OEI performance may be sufficient to enable: OEI CSFL (including fly-away and climb out obstacle clearance); OEI level Flight capability. Alternatively, OEI performance may not be sufficient to guarantee continued Flight OEI capability, and therefore a forced landing may be required. The MAUW can be reduced where necessary (and if practicable) to provide a OEI capability during take-off. For example, where there are no SFL areas available in the immediate take-off area, a risk-based decision may be taken to reduce MAUW to provide OEI CSFL capability, rather than accept the Exposure period during the take-off.

i. Defined action points (eg decision point) are pre-calculated speeds or altitudes for abort (reject) take-off or continuing take-off decision. For circumstances where the RW Aircraft is not operating with exposure:

   i. before the defined point the Aircraft can abort the take-off and a safe landing area is available

   ii. at or after the defined point, the Aircraft can continue the take-off and carry the emergency (eg engine failure) airborne.

j. When calculating the defined point following engine failure, a safe OEI speed is required to allow CSFL, or a minimum safe OEI altitude is required to allow acceleration (including height loss to accelerate if needed) to safe OEI speed.

k. The MAO, when determining OEI take-off capability, should consider:

   i. take-off weight (eg MAUW)

   ii. AFM performance data

   iii. RW Aircraft configuration

   iv. environmental conditions (eg WAT)

v. Aerodrome, helipad or take-off site dimensions, surrounding terrain and obstacles.

Take-off obstacle clearance

l. The MAO, when determining obstacle clearance, should take the following into account:

i. obstacles under the take-off Flight path and the initial climb

ii. for shipborne take-offs:

(a) the possibility of deck-edge strike following engine failure early in the take-off

(b) ship obstructions (super-structure, antennas etc)

(c) forced landing with obstacles on the surface below the helideck.

m. **Obstacle margins-vertical or horizontal.** The MAO and Aircraft captain should ensure performance is available to clear all obstacles under the Flight path by a vertical or horizontal margin, until reaching a safe height after take-off; including consideration of available OEI performance for a multi-engine Helicopter. MAOs should refer to *CASA MOS Part 133 para 10.32 'Pre-flight identification of relevant obstacles'* for guidance when defining the (relevant) obstacles to be avoided (ie splay).

n. MAOs should define the method for determining obstacles, and the minimum vertical and horizontal distance to avoid obstacles during the take-off and initial climb (also required for approach, landing and missed approach) stage. The MAO should consider the following when setting minimum vertical and horizontal obstacle margins:

i. size of the Helicopter

ii. Field of View (FOV)

iii. depth perception limitations (day, night, NVIS)

iv. nature of the obstacles

v. environmental conditions (VMC or IMC)

vi. Defence AIP (eg FIHA)

vii. Defence and Service OIP.

o. **VFR departures.** For VMC departures, MAOs should ensure the pilot flying remains in sight of the surface and obstacles during an emergency requiring:

i. an aborted take-off

ii. a SFL

iii. CSFL (when below the IFR safe altitude).

p. The MAO should consider specifying the take-off weather minima (including a ceiling and visibility) for VFR take-off to support maintenance of visual Flight during take-off emergencies.

q. **IFR departures.** MAOs intending to operate IMC below IFR safe altitude, including during climb after take-off, should conduct risk assessments to ensure Aviation Safety is not compromised. Further, the MAO should publish procedures to ensure Flight profiles and Aircraft performance for obstacle clearance can be guaranteed until reaching an IFR safe altitude. Additionally, MAOs should conduct training for such IMC take-offs and departures. MAOs operating IFR without a published IFR departure procedure (eg SID) should ensure:

i. relevant obstacles (para m refers) in the take-off Flight path are assessed

ii. the take-off climb gradient to IFR safe altitude avoids the obstacles under the Flight path by at least 35 ft vertically plus a margin of 0.1 x S (distance from the end of the TODA), until a safe IFR altitude is reached.

r. Where the MAO is unable to satisfy take-off obstacle clearance requirements with the planned operating weights, the MAO should consider either:

i. establishing procedures (eg lateral avoidance) for continued take-off and climb to a safe height

ii. reducing operating weights to meet obstacle clearance requirements.

s. For take-off using a backup (including sideways) procedure, the MAO should ensure the backup distance is free of obstacles, unless adequate clearance from the obstacles can be guaranteed during:

i. the backup manoeuvre

ii. any aborted take-off

iii. the continued take-off profile(s).

En route

t. MAO en route planning and procedures should include consideration of:

i. engine failure occurring at any stage

ii. OEI fly away or OEI altitude (where applicable)

iii. drift down to OEI altitude (where applicable)

iv. surface type (ground or water)

v. surface conditions (eg mountainous, sea state, water temperature)

vi. terrain elevation

vii. obstacles

viii. available landing aerodromes or sites.

Landing

u. The landing weight for AEO landing and approach should be limited to ensure a safe approach, landing and go-around (including obstacle clearance by MAO specified margins). Where OEI continued approach and landing cannot be guaranteed, a SFL option on the remaining engine power should be available. Where a SFL is not available the MAO should conduct RM IAW DASR SMS.

1. Risk Management controls for Aircraft performance ▼GM ▼AMC

AMC ORO.90(a)1 – Aircraft performance Risk Management (AUS)

a. The MAO should define controls to eliminate, or otherwise minimise performance-related risks IAW DASR SMS. The MAO controls should include consideration of:

   i. total loss of propulsion for a single-engine Aircraft, one-engine failure for a multi-engine Aircraft, and double-engine failure for a three and four-engine Aircraft

   ii. tasks or roles with elevated performance-related risks

   iii. the specific Aircraft Type and its associated CRE

   iv. the configuration, environmental conditions or the operation of systems that have an adverse effect on Aircraft performance (eg anti-ice systems)

   v. charting accuracy when assessing obstacles

   vi. carriage of non-MEP on Flights of a hazardous nature IAW DASR AMC ORO.70.A, including Flights with Exposure.

b. **Operations over populous areas.** MAOs conducting operations over populous or congested areas IAW FIHA *ENR 1.1 General Rules, Rules of The Air - ADF Minimum Safe Heights*, should manage the risk to the public in the event of an emergency (eg engine failure or loss of propulsion) resulting in forced landing.

GM ORO.90(a)1 – Aircraft performance Risk Management (AUS)

a. **Elevated performance-related risk.** In addition to the Flights of a hazardous nature as defined in DASR AMC ORO.70.A, MAOs should identify tasks or roles with elevated performance-related risks. Tasks or roles with elevated performance-related risks, are those tasks or roles where the outcome—in the event of a performance degradation or handling error—might be critical or catastrophic. MAOs should conduct RM to treat the hazards associated with such tasks or roles. Task with elevated performance-related risk can include:

   i. single-engine Aircraft operations beyond glide range of a SFL area (includes overwater Flight beyond glide range to land)

   ii. multi-engine Aircraft operations without guaranteed OEI CSFL performance capability and without a SFL area

   iii. operating in AFM avoid areas (eg helicopter HV diagram avoid areas)

   iv. operating at or near AFM performance limits or the edge of the Flight envelope (eg stabilised Flight near V_{SO} or V_{MCA})

   v. RW Aircraft tasks conducted at weights, altitudes, temperatures and speeds that do not provide OEI CSFL capability, nor a SFL capability, in the event of an engine-failure, such as continuous operation in the HV avoid area during:

(a) hoist

(b) external load lift (including humans)

(c) sonar dipping

(d) insertion or extraction

(e) other low speed, low altitude (eg hover) activities in the HV avoid area.

b. **Hazards.** As part of RM the MAO should consider common hazards to Aircraft performance, relevant to the Aircraft type and CRE. Untreated hazards can lead to loss of control, CFIT, forced landing (including ditching) or ejection. Hazards can include:

i. propulsion system failure(s) or malfunction(s)

ii. system malfunctions or failures that can result in:

(a) significant performance degradation

(b) the inability to calculate, monitor or maintain required performance

(c) invalidating performance data for obstacle avoidance (eg loss of navigational tolerances)

iii. Aircraft configuration that can adversely affect performance

iv. the operating environment (eg wind, density altitude, temperature)

v. weather-related hazards (eg thunderstorms, windshear, snow, icing, turbulence)

vi. the runway, heliport or HLS features and condition (eg elevation, dimensions, slope, surface conditions, contamination)

vii. Aerodrome NOTAMS (eg reduced runway length or temporary obstructions)

viii. obstacles in the take-off flight path

ix. high terrain

x. Aircraft systems or capabilities that can affect performance (eg selection of anti-ice or a system unserviceability triggering performance penalties (eg MEL or CDL))

xi. loss of Safety Critical data integrity (eg data missing, corrupted or out of date)

xii. the introduction of performance or weight and balance errors during data entry; such as incorrect input into TOLD or weight and balance calculators.

c. **Operations over Populous Areas.**

i. **All Aircraft types.** Operations over Populous Areas increase the consequences of power loss such as engine failure. These increased consequences may be realised due to the presence of third parties on the ground or critical public infrastructure. IAW FIHA ENR 1.1 General Rules, Rules of The Air - ADF Minimum Safe Heights, operations must be conducted at or above a minimum height when over 'congested areas of cities, towns or settlements'. The minimum height maximises the potential for a safe landing in the event of an emergency requiring immediate landing, such as to allow 'a landing to be made without undue hazard to personnel or property on the surface'.

ii. **Rotary-wing.** MAO operations in Populous Areas without the capability to achieve and a SFL, increases the risk of multiple injuries or deaths in the event of total power failure, engine failure or other emergencies requiring a forced landing. Therefore, MAOs operating over Populous Areas should have OEI CSFL capability for the engine failure scenario, and a SFL area available for other emergencies requiring an immediate forced landing. If OEI CSFL and a SFL is not available (ie Exposure), the MAO must conduct RM, including:

(a) consideration of emergencies requiring a forced landing

(b) route planning over Populous Area to maximise availability of SFL areas

(c) minimising time over Populous Areas without a SFL capability (ie Exposure time)

(d) an engine reliability and monitoring program for Aircraft conducting Flight over Populous Area

(e) the provision of training and procedures for autorotative descents and forced landings into areas with limited access to safe forced landing areas.

d. **Hazard control considerations.** MAO should consider establishing Hazard controls for performance-related risks, including:

i. establishing an engine reliability and monitoring program

ii. using defined engine failure procedures as published in OIP

iii. conducting emergency training (including both initial and ongoing currency training)

iv. where practicable, modifying Aircraft configuration, mission timing or profile, for increased performance, including:

(a) operate with lower AUW (eg reduced fuel and payload only)

(b) operate in day VMC, or night aided VMC, in sight of ground, water and obstacles

(c) routing over ground or water suitable for SFL, ditching or ejection

(d) operating at altitudes and speed to allow CSFL, SFL, or safe ejection

(e) provide contingency routing for OEI (where necessary).

v. consideration of carrying only mission crew and MEP on Flights without both OEI CSFL and a SFL capability (eg Flights with Exposure, such as operating without OEI CSFL in a harsh environment or overwater).

e. **Mission support.** MAOs should consider providing a dedicated performance capability when:

i. operating large multi-engine fixed-wing Aircraft

ii. conducting DLRO

iii. conducting other missions with complex performance; weight and balance; or loading considerations.

f. A dedicated performance capability consists of performance engineers and planning specialists to support safe and efficient Flight operations. A dedicated performance capability can:

i. optimise the use of resources

ii. ensure consistent performance products

iii. reduce performance related planning errors

iv. enhance safety outcomes across the ADF.

g. **Safety margins.** MAOs may increase Aircraft performance margins to reduce performance-related risk, by:

i. using the highest performance standard available in the AFM or OIP (where MAOs use a tiered performance capability)

ii. reducing Aircraft weights (where practicable)

iii. selecting a runway that increases performance margins (eg using the longest, into wind runway)

iv. using increased thrust or power for take-off (where appropriate)

v. avoiding take-off and landing during the hottest period of the day (when operating in hot climates).

h. **Flight Authorisation Officer.** The FLTAUTHO should be satisfied that performance and weight and balance-related risks have been minimised SFARP before authorising the Flight.

i. **Aircraft captain.** The Aircraft captain is responsible for the safety of the Flight IAW DASR ORO.55. Before undertaking the flight, and after considering all relevant performance-related data, operational variables and risks, the captain must be satisfied that the Aircraft performance and weight and balance will ensure Aviation Safety is not compromised.

j. **Safety vs capability.** MAOs should be cautious when trading Aircraft performance safety margins for increased performance capability (eg accepting a reduction in AEO and OEI take-off and climb performance for an increased payload). Reducing performance safety margins can increase risks, and can compromise Aviation Safety in the event of a degradation in Aircraft performance. MAOs should risk manage any approval to reduce safety buffers, margins or factors—for operational reasons—IAW DASR SMS.

2. using approved Aircraft performance OIP ▼ **GM** ▼ **AMC**

AMC ORO.90(a)2 – Aircraft performance OIP (AUS)

a. MAO controls should include:

i. promulgating a list of approved:

(a) performance (including weight and balance) OIP, including:

(i) AFM and Performance Manual (where applicable)

(ii) OEM supplied hardware and software

(iii) third party supplied planning tools, hardware, software and data

(iv) performance-related standards and OIP

(b) personnel or organisations providing Safety Critical Aircraft performance-related services

ii. ensuring Safety Critical performance information and data provided by third party performance tools and software are validated to ensure information and data accuracy, completeness, consistency and validity

iii. OIP for the:

(a) identification, management and rectification of discrepancies in Safety Critical performance information, tools, software and data

(b) validation of uploaded performance software

(c) loading or selection of applicable performance software and data

iv. management of Aircraft performance electronic tools, applications, digital manuals and digital documents, IAW DASR AO.GEN.05

v. using approved performance OIP (including the AFM) for safe Aircraft:

(a) loading

(b) weight and balance calculations

(c) performance management, including:

(i) normal and emergency operations

(ii) obstacle clearance

vi. ensuring approved performance OIP:

(a) is consistent with the AFM performance information—the MAO may augment the AFM with approved supplemental manuals and handbooks (eg performance supplement, loading, operations) (where applicable)

(b) required for pre-flight and in-flight Aircraft performance (applicable to the Flight, the airspace, Aerodromes and operating sites) planning, calculations or reference, is readily available and accessible

(c) is consistent with Defence AIP, and any published procedures and requirements.

b. Where MAO document performance requirements, margins, safety factors or buffers in OIP from an exemplar, these requirements should be adopted from a single DASA recognised CAA/MAA regulation (or standard).

GM ORO.90(a)2 – Aircraft performance OIP (AUS)

a. **List of approved personnel or organisations. The** MAO list of personnel or organisations providing Safety Critical Aircraft performance-related services, should include those approved to:

i. amend or modify performance OIP or databases

ii. conduct performance planning (including obstacle clearance) and calculations

iii. conduct weight and balance calculations

iv. prepare weight and balance documentation

v. load and unload Aircraft

vi. accept and sign load documentation (eg load sheet).

b. **Data integrity. The** MAO should establish a management system to ensure the integrity of data used when calculating performance, weight and balance and obstacle clearance. Any procedures developed may be tailored to account for the level of confidence in the supplied performance information and data. MAOs may not need detailed integrity checks when information and data is provided by DASA-recognised CAA/MAA certified Data Service Providers (DSP), or DASA approved DSPs. However, where the source is not an approved DSP, the MAO should conduct more detailed integrity checks on supplied information or data. This can involve the MAO conducting initial and ongoing (regular interval) database testing (eg via desktop, simulator or Aircraft) or checking that the level of integrity will ensure safe operations.

c. **DASA-approved AFM content.** DASA-approved mandatory sections of the AFM contain information and instructions for the safe operation of Aircraft. DASA-approved sections include: *Operating Limitations; Operating Procedures; Performance* (including *Weight and Balance* and *Loading*). Any changes to these DASA-approved AFM sections, for example changes arising due to a major change to type design, requires DASA approval before publication.

d. **OEM supplied digital performance.** When Aircraft are certified with OEM performance information provided as digital information or data, this may replace or supplement relevant parts of the DASA-approved AFM.

e. **Other MAO-approved OIP**. The MAO may issue OIP defining limitations, policy and standard operating procedures for using AFM derived performance. Additionally, MAO OIP should include policy on the use of EFB applications or other tools, when used for the calculation of TOLD or weight and balance.

f. **Data contingency.** MAOs using electronic methods to calculate performance, or weight and balance, should consider implementing contingency methods to conduct performance calculations. Such contingency methods ensure continued safe capability in the case of equipment failure or data corruption—particularly where OEM supplied performance data can only be extracted by digital means (ie there are no graphs or tables available).

g. **Obstacle data.** The MAO should establish procedures to ensure obstacle data integrity before granting approval for its use. The use of certified DSPs provides a level of assurance, but it does not guarantee data integrity. MAO procedures should include independent validation (eg accuracy and quality) of obstacle data before use. There have been incidents where obstacle databases were missing obstacle data.

h. **Performance standard.** Where multiple standards exist in the AFM, the MAO:

  i. should define the performance standard (eg civil, military, or alternate standard) for use, dependent on operational context

  ii. should detail differences between performance standards, to better inform risk management

  iii. should conduct RM including defining performance procedures in OIP; and conducting any associated training.

i. **Performance criteria.** The MAO should risk manage the use of a performance criteria that can increase performance-related risks. The MAO may manage performance-related risks using the following:

  i. a MAO-approved tiered performance

  ii. a MAO-approved obstacle clearance criteria

  iii. emergency, alternate or combat performance criteria (where applicable).

j. **MAO-approved performance margins.** MAO-approved alternate performance margins (to those in the AFM), may include:

i. take-off safety margins (eg runway distance safety factors)

ii. obstacle clearance margins

iii. landing distance safety margins.

3. ensuring personnel conducting Flight operations are qualified, competent, current and authorised in Aircraft performance management. ▾ **GM** ▾ **AMC**

AMC ORO.90(a)3 – Qualification, competency, Currency and authorisation (AUS)

a. The MAO should:

i. use a Learning Management Package (LMP) tailored for the Aircraft Type, which ensures personnel have the knowledge, skills and attitude to safely:

(a) conduct performance (including weight and balance) planning

(b) use electronic tools, applications, digital manuals or digital documents for performance (including weight and balance) management

(c) perform handling and control procedures during performance-related emergencies

ii. define Aircraft performance (including weight and balance) competency, qualification, Currency and authorisation requirements.

GM ORO.90(a)3 – Qualification, competency, Currency and authorisation (AUS)

a. **Learning Management Package (LMP).** MAO tailored performance training is typically integrated into the Type conversion LMP. Learning items, knowledge requirements and competencies should include:

i. method(s) for calculating Aircraft performance, using MAO-approved Aircraft performance OIP (AMC ORO.90(a)3(a)1 refers)

ii. performance planning and management

iii. the requirements, and method(s), for independent calculation and independent checking of performance output

iv. the requirements and procedures for the application of MAO-approved margins or additional safety factors—knowledge of the assumptions and 'in-built' margins is required for performance graphs, tables or electronic tools, in order to inform the need to apply additional safety factors to the output

v. procedures and methods to input performance variables (eg Aircraft configuration and MEL/CDL performance penalties, environmental conditions, runway surface condition, NOTAMs) into performance tables, graphs or electronic tools IAW the AFM and MAO-approved OIP

vi. obstacle clearance calculations for all Flight phases for Aircraft normal operations, including critical engine failure scenarios for multi-engine Aircraft

vii. the calculation and application of AFM alternate performance data, such as tailored military performance, military obstacle clearance or military climb out Flight path (where approved)

viii. Aircraft performance handling, including:

(a) normal performance operations (in various CRE, including runway or operating site surface conditions)

(b) engine failures in all Flight phases, including Critical Engine Failure (CEF) during take-off (asymmetric take-off handling for continued Flight)

(c) emergencies such as engine failure and system malfunctions that adversely affect performance or handling

(d) other emergencies resulting in a significant adverse effect on Aircraft performance, control or stability (eg hung load or load shift).

(e) tasks with performance-related risk (eg marginal performance operations)

(f) emergencies requiring in-flight engine shutdown (eg engine fire)

b. **Training, qualifications, proficiency and Currency**. The operations or tasks that require additional training, qualifications, proficiency and Currency should include:

i. operations at Aerodrome, runway or landing sites, with hazardous features or in hazardous locations (eg confined area, short runway, one-way runway, shipborne, mountainous etc)

ii. maximum performance, minimum take-off run or short field take-off

iii. maximum angle climb for close in obstacles

iv. emergency, combat or contingency military take-off where obstacle clearance or CSFL cannot be guaranteed in the event of an engine failure; training, qualification and currency should be conducted in the simulator

v. minimum landing distance or short field landings

vi. steep approach (eg obstacles on approach path) to landing

vii. emergency overweight landing

viii. engine-failure during critical Flight phases, or during tasks with elevated performance-related risks, including:

(a) take-off

(b) during operations with Exposure (RW)

(c) during operations in the avoid area of the HV envelope (RW)

(d) during low altitude Flight over populous areas

ix. MAO-approved marginal performance operations

x. MAO-approved tiered performance

xi. maximum Aircraft performance or combat performance operations and manoeuvres.