NOTICE OF PROPOSED DASR AMENDMENT
NPA 2022-007 Revision 0

DASR SPA.55

NIGHT VISION IMAGING SYSTEM (NVIS)

References:

A. DFSB ASIR: *MRH90 Formation Near Collision, Townville FTA* of 11 Nov 20 (BP23672880)
B. DFSB ASIR (under investigation): *MH60-R CFIT on approach to HMAS Brisbane 13 Oct 21*
C. Brief for Delegate of the Defence Aviation Authority – Through DG DASA: *Proposed New Regulation Concept: DASR SPA.55 'Night Vision Imaging System' (NVIS)* of 20 May 22 (BP245151584)
D. DASA Newsbreak: *Deliberate Review of Aviation Operations-Related Implementing Regulations – Aug 21 Update* of 20 Aug 21

INTRODUCTION

Applicability

1. This proposal is applicable to Military Air Operators (MAOs) and Sponsors of Non-Defence Registered Aircraft.

Purpose

2. The purpose of this NPA is to enable community input into the development of DASR SPA.55, ahead of its formal release in Feb 2023, to address the:

a. relevant recommendations and findings from Refs A-C

b. principles of Ref D.

Background

3. This NPA addressed Refs A-D, with a view to improving aviation safety. This NPA forms part of the stakeholder consultation process.

4. Following events detailed in Refs A and B, DASA conducted a review of Defence regulation related to NVIS. The review included benchmarking against National Aviation Authority (NAA) and Military Aviation Authority (MAA) NVIS regulations. The review concluded that Defence had insufficient regulation for the effective management of NVIS-related aviation safety hazards. At Ref C the Def AA endorsed the creation of a new DASR SPA.55.

Scope of proposed changes

5. This NPA proposes the addition of NVIS regulation—consistent with best practice as applied by DASA-recognised NAAs and MAAs. The proposal incorporates DASR hazard controls by defining:

a. MAO and Sponsor NVIS management system accountabilities

b. NVIS hazard controls.

6. The proposal incorporates the principles of Ref D by:

a. defining terms specific to the regulation

b. providing a standard structure and content to Implementing Regulation (IR), Acceptable Means of Compliance (AMC) and Guidance Material (GM).

Benefits of proposed changes

7. The benefits of this proposal include:

a. improved regulatory accountability and support of oversight

b. defined aviation safety controls to the hazard of compromised Suitability For Flight during NVIS operations

c. alignment to DASA-recognised NAA and MAA NVIS regulation benchmarks

d. improved standardisation of Defence NVIS Flight operations.

Effects of proposed changes

8. The proposed regulation increases regulated community compliance obligations (via the implementation of NVIS-specific IR controls) as follows:

a. Aircraft and equipment design, integration and maintenance requirements

b. Flying Management System integration requirements

c. Statement of Operating Intent and Usage (SOIU) alignment requirements

d. Aircrew and instructor NVIS qualifications, Currency and training requirements

e. Safety and risk management controls relevant to NVIS operations, including:

(1) Flight Authorisation

(2) fatigue management

(3) environmental and illumination minimums for Aircraft Types

(4) minimum NVIS equipment for aided Flight operations

f. Aircrew normal and emergency training requirements

g. additional controls for high risk, high workload, and complex NVIS roles and tasks.

Proposed regulation

9. The proposed regulation is in Enclosure 1.

Implementation strategy

10. DASA will release the proposed regulation in Feb 23. DASA proposes a transition[1] timeframe of 12 months from DASR release.

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

HOW TO SUBMIT COMMENTS ON THIS NPA

Format

11. Record responses to this NPA on the NPA *Response Sheet* included in Annex A and submit responses by email to DASA. Hardcopies are not required.

Timing

12. Please forward comments on NPA 2022-007 to DASA by close of business 26 Aug 22.

Additional Information

13. Additional information on this NPA is available from WGCDR Chris Pouncey, DD-FLTOPS (DAVNOPS-DASA), at chris.pouncey@defence.gov.au or (03) 5169 8204.

DISPOSITION OF RESPONSES RECEIVED

14. DASA will publish a Comment Response Document on the DASA Website. DASA will not individually acknowledge or respond to comments or submissions.

david.smith12
Digitally signed by david.smith12
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GPCAPT
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Defence Aviation Safety Authority
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Aug 22

Annex:
A. NPA 2022-007 Revision 0 – DASR SPA.55 Response Sheet.

Enclosure:
1. NPA 2022-007 Revision 0 – Proposed DASR SPA.55.

NPA 2022-007 Revision 0 Response Sheet

DASR SPA.55 'Night Vision Imaging System (NVIS)'

Please forward this sheet as an email attachment to DASA by 26 Aug 22. A word version of this response sheet can be found via obj no: BO3960659 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 2022-007 REVISION 0

PROPOSED DASR SPA.55

NIGHT VISION IMAGING SYSTEM (NVIS)

Contents

SECTION 1: NEW (OR RELEVANT) DEFINITIONS

1. The following **extant** Australian Defence Glossary definitions are relevant to this regulation and will be added to the DASR Glossary.

Night aided. Flight at night using night vision device.

Night unaided. Flight at night without the use of a night vision device.

Night Vision Device (NVD). Any electro-optical device that is used to detect visible and infrared energy and provide a visible image**.**

Night Vision Goggles (NVG). An electro-optical image intensifying device that detects visible and near-infrared energy, intensifies the energy, and provides a visible image for night viewing.

Notes:
1. Night vision goggles can be either hand-held or helmet-mounted.
2. Plural form refers to a binocular equipment and the singular form refers to a monocular equipment.

Safety Critical. Applied to a condition, event, operation, process, or item whose proper recognition, control, performance, or tolerance is essential for safe system operation or use; eg safety critical function, safety critical path, safety critical component.

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2. The following **new** (including modified) definitions are proposed to be added to the DASR Glossary.

Degraded Visual Environment (DVE). Environmental conditions that impair the visual orientation of Aircrew during take-off, flight and landing. DVE includes circumstances wherein weather, obscurants or obstacles impede the ability of Aircrew to see properly or accurately know where they are in relation to surrounding terrain. Conditions include brown-out, white-out, night glare, fog and mist (and any combinations of these). DVE can lead to reduced situation awareness, increased Aircrew workload, and the partial or total loss of aircraft control.[2]

Night Vision Imaging System (NVIS). A system in which all of the elements required to operate an Aircraft successfully and safely using NVDs are integrated, including NVDs, NVIS compatible lighting, Aircraft components and equipment, training and currency, operating procedures and continuing airworthiness.[3]

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[2] Definition developed from AAP 7210-023-16 *Aircraft Standardisation Manual MRH90.*

[3] Definition developed from the corresponding EASA definition and definition in the ATSB Aviation Research Report 'Night Vision Goggles in Civil Helicopters', of Apr 05.

Primary Flight Reference (PFR). Display(s), instrument(s) or system(s) providing critical flight information necessary for Aircraft control.[4]

3. The following extant Australian Defence Glossary terms are **relevant** to this regulation and will added to the DASR Acronym List.

DVE: Degraded Visual Environment

IAW: In accordance with

LSALT: Lowest Safe Altitude

MRP: Mission Risk Profile

NVD: Night Vision Device

NVG: Night Vision Goggles

NVIS: Night Vision Imaging System

4. The following **new** terms are proposed to be added to the DASR Acronym List.

KGS: Knots Ground Speed

mlx: millilux [5]

PFR: Primary Flight Reference

[4] Definition developed from the description of Primary Flight Reference in US DOD MIL-HDBK-516C, of 28 Feb 2008.
[5] International System of Units (SI) for illumination - equating to one thousandth of a lux.

SECTION 2: NEW DASR SPA.55 IR ONLY

The following is new DASR.

SPA.55 – NIGHT VISION IMAGING SYSTEM (NVIS)

▸ **GM**

(a) The MAO or Sponsor must utilise a defined NVIS management system to ensure Suitability For Flight for Defence Aircraft when using NVIS as a Primary Flight Reference; or as the primary means of vision for Safety Critical tasks. The NVIS management system must include:

1. Aircraft Type Design compatibility IAW DASR 21

2. compliance to ADRM requirements ▸ **GM**

3. integration with DASR ORO.10 Flying Management System (FMS) ▸ **GM** ▸ **AMC**

4. NVIS equipment applicable to each Aircraft Type, which meets the: ▸ **GM** ▸ **AMC**

   i. requirements of DASR ORO.40

   ii. NVIS maintenance requirements of OIP approved by the MAO or Sponsor.

5. NVIS Aircrew composition, qualifications, Currency and training defined IAW DASR AIRCREW.10 ▸ **GM** ▸ **AMC**

6. Flight Authorisation system risk controls IAW DASR ORO.30 ▸ **GM**

7. Safety Management System (SMS) controls which incorporate: ▸ **AMC**

   i. risk management IAW DASR SMS ▸ **GM**

   ii. fatigue management IAW DASR AVFM.20

   iii. utilising defined environmental minimums for Aircraft Type's roles and tasks ▸ **GM** ▸ **AMC**

   iv. utilising defined minimum NVIS equipment required for aided flight operations. ▸ **AMC**

8. OIP that details:

   i. illumination level(s) below which additional Aircrew training, qualifications and hazard controls are required ▸ **GM** ▸ **AMC**

   ii. normal and emergency procedures for the Aircraft Type's roles and tasks ▸ **GM** ▸ **AMC**

   iii. instructions and limitations for the Aircraft Type's roles and tasks. ▸ **AMC**

(b) The MAO or Sponsor must conduct NVIS operations IAW the approved Statement of Operating Intent and Usage (SOIU).

SECTION 3: NEW DASR SPA.55 IR, AMC and GM

The following is the DASR SPA.55 IR, AMC and GM. AMC in purple text. GM in brown text.

SPA.55 – NIGHT VISION IMAGING SYSTEM (NVIS)

▼ **GM**

GM SPA.55 – Night Vision Imaging System (NVIS) (AUS)

a. **Purpose**. **(Context)** The safe and effective delivery of military aviation capabilities is enhanced by exploiting evolving Night Vision Imaging System (NVIS) technologies. However, these technologies have limitations, particularly in military aviation applications, when used as the Primary Flight Reference or as the primary means of vision for Safety Critical tasks. **(Hazard)** Suitability For Flight can be compromised by ineffective management of NVIS equipment and operations. **(Defence)** This regulation requires the MAO or Sponsor to establish an NVIS management system that ensures Suitability For Flight when used as the Primary Flight Reference or as the primary means of vision for Safety Critical tasks.

b. **Applicability**. This regulation applies to MAOs or Sponsors operating Aircraft crewed by NVIS-qualified Aircrew (including Mission Crew) utilising Night Vision Devices (NVDs):

i. as the Primary Flight Reference for Aircraft control (ie managing the Aircraft flight path) during: taxi, take-off, cruise, in-flight manoeuvring, approach, and landing

ii. as the primary means of vision while performing Safety Critical tasks—where Safety Critical tasks in the NVIS context include terrain and obstacle avoidance, Aircraft separation, visual navigation, and other tasks where direction, spacing, distance or rate of closure information is obtained from the NVIS.

c. **NVIS-specific terminology.** In this regulation:

i. ‘NVIS equipment’ includes items such as: NVD, NVD Head Up Display (HUD), optical cueing device, Helmet Mounted Sight and Display (HMSD), and any other aviation night vision enhancing technology or equipment that delivers an image directly, or indirectly (ie from single, multiple or blended sources) to Aircrew

ii. ‘Visual acuity’ is the ability of the eye to distinguish shapes and the details of objects at a given distance (Note, use of the term ‘visual acuity’ is synonymous with ‘visual definition’, as referred to in extant MAO and Sponsor OIP).

(a) The MAO or Sponsor must utilise a defined NVIS management system to ensure Suitability For Flight for Defence Aircraft when using NVIS as a Primary Flight Reference; or as the primary means of vision for Safety Critical tasks. The NVIS management system must include:

1. Aircraft Type Design compatibility IAW DASR 21

2. compliance to ADRM requirements ▼ **GM**

GM SPA.55(a)2 – Type Design and certification (AUS)

NVIS equipment is categorised as ALSE. Accordingly, the ADRM '*Aeronautical Life Support Equipment'* chapter prescribes NVIS equipment design and integration requirements. NVIS Aircraft and aerodrome lighting design requirements are also found in the ADRM *'Lighting Systems'* chapter and *'Aerodrome Design Requirements'* chapter respectively. NVIS integration requirements (equipment integration with Aircraft and aircrew) may be included in the DASR 21 Aircraft Type design and certification process, whereas NVIS equipment design (eg NVD) is not normally part of the Aircraft Type design. NVIS ALSE equipment (eg NVD) is approved IAW ORO.40. The ADRM prescribes NVIS equipment design requirements, minimum operational performance standards, and key considerations for the introduction of NVIS, or modification of existing configurations.

3. integration with DASR ORO.10 Flying Management System (FMS) ▼**GM** ▼**AMC**

AMC SPA.55(a)3 – NVIS integration with the Flying Management System (FMS) (AUS)

a. The MAO or Sponsor must ensure the FMS:

i. integrates NVIS operations IAW DASR ORO.10

ii. includes NVIS Aircraft crewing and captaincy risk controls IAW DASR ORO.50 and DASR ORO.55

iii. where applicable, includes NVIS specific:

(a) training IAW DASR AIRCREW.55

(b) low flying risk controls IAW DASR SPA.20

(c) formation flying risk controls IAW DASR SPA.05

(d) procedures for operating with third parties, such as other Aircraft, Aerodromes, ships, Shipborne Heliports, vehicles or personnel at landing zones; and their respective equipment, considering:

(i) lighting type(s), levels, and light discipline during NVIS operation

(ii) communication requirements (aural or visual), standard terminology, signals, and back-up procedures

(iii) hazard controls.

GM SPA.55(a)3 – NVIS integration with the Flying Management System (FMS) (AUS)

a. When planning NVIS operations with friendly third parties (and where practicable), every effort should be made to coordinate and standardise procedures in an effort to minimise the risk of the third party (inadvertently) introducing a hazard to Aircrew using NVIS, especially during Aircrew performance of a Safety Critical task while on NVDs. The intent of third party coordination procedures is to prevent recurrence of past aviation safety incidents. Third party (eg ship, tanker Aircraft, Aerodrome, etc) use of NVD incompatible light(s) during critical phases of flight (eg landing approach or AAR) have resulted in the loss of Aircrew NVD vision, and compromised

Suitability For Flight. In one case, the loss of Aircrew vision contributed to an Aircraft CFIT.

b. There will remain situations where planning or coordination with third parties is not feasible (eg non-cooperative third parties, covert and combat missions or training scenarios requiring combat realism). When it is not feasible to coordinate with third parties, or attain their cooperation, MAOs or Sponsors should identify and treat NVIS related hazards from third party interactions in order to minimise risk SFARP.

4. NVIS equipment applicable to each Aircraft Type, which meets the: ▼**GM** ▼**AMC**

AMC SPA.55(a)4 – NVIS equipment management (AUS)

a. The MAO or Sponsor should:

i. manage and maintain NVD ALSE (eg NVD and helmet mount equipment) IAW DASR ORO.40

ii. manage and maintain NVIS Aircraft components such as Aircraft lighting, instruments, Aircraft HUD, windshield and transparencies, IAW approved OIP

iii. ensure NVIS equipment is assessed to be serviceable and correctly set up for use prior to Flight, and Aircrew conduct NVD performance checks and calibration pre-flight or at intervals recommended by the OEM

iv. define NVIS equipment unserviceability reporting requirements.

GM SPA.55(a)4 – NVIS equipment management (AUS)

a. **NVIS equipment approval and maintenance**. The MAO or Sponsor should consider approval of NVIS equipment (eg NVD, helmet, helmet mount and HMSD) for use by Aircrew after a test and evaluation process, including technical assessments IAW standards prescribed by Aeronautical Life Support Logistics Management Unit (ALSLMU). Qualified ALSE personnel should maintain NVIS equipment (designated as ALSE) IAW MAO or Sponsor approved OIP.

b. **NVD pre-flight checks**. Pre-flight checking of NVD serviceability and calibration (typically by Aircrew) normally involves a serviceability check conducted in a specially-fitted darkened room, and a field check (outdoors or in the Aircraft). In the absence of an approved pre-flight checking facility, NVD pre-flight checks should be conducted IAW OEM manual(s) and as approved by the MAO or Sponsor.

c. **Minimum Equipment List (MEL).** The MAO or Sponsor may choose to add unserviceability deferral or relief options (if applicable) for aircraft NVIS equipment into the DASA approved aircraft MEL.

d. **Eye protection**. Where the helmet visor cannot be worn with NVDs, the MAO or Sponsor should consider providing Aircrew with protective eyewear IAW the Defence Health Manual (DHM). The ADRM defines the required standards to be met for protective eyewear.

e. **Vision correction.** The DHM details the policy and guidelines for selection and use of Aircrew optical aids. RAAF IAM report '*Guidelines for the Selection and Use of Spectacles and Contact Lenses by Aircrew'* of 25 July 2016 provides AVMOs and Aircrew with additional guidance on implementation of DHM policy, including optical aids' integration considerations with ALSE such as NVDs.

f. **Personal Protective Equipment (PPE).** The ADRM defines the requirements for certification of PPE such as safety goggles, Helicopter Aircrew Respiratory System (HARS), immersion suits, Chemical, Biological, Radiological and Nuclear (CBRN) suits or other protective equipment. If an NVD is to be used in conjunction with PPE, ALSLMU (or other appropriate organisation) should be consulted to inform MAOs and Sponsors of NVD compatibility.

i. requirements of DASR ORO.40

ii. NVIS maintenance requirements of OIP approved by the MAO or Sponsor.

5. NVIS Aircrew composition, qualifications, Currency and training defined IAW DASR AIRCREW.10 ▾ **GM** ▾ **AMC**

AMC SPA.55(a)5 – NVIS Aircrew composition, qualification, Currency and training (AUS)

a. The MAO or Sponsor should define in OIP the minimum Crew composition, qualification, Currency and training requirements for NVIS roles and tasks—including for both normal and low light operations.

b. The MAO or Sponsor should define Currency requirements for the enablers to NVIS flight and instruction. Currency in the following Flight disciplines should be met prior to NVIS flight:

i. Instrument Flight (IF)

ii. day flight

iii. night (unaided) flight.

c. The MAO or Sponsor should provide Aircrew and instructor NVIS training IAW DASR AIRCREW.10, including:

i. an Aircrew and instructor NVIS Learning Management Plan (LMP)

ii. training OIP

iii. qualification, Currency, refresher and differences (or gap) training (where differences training addresses significant changes, modifications or updates to NVIS equipment or the HMI—which impacts existing Aircraft capabilities, function(s), procedures or causes operational impacts to Aircrew).

iv. Aircrew training and standards for the award of:

(a) an NVIS qualification

(b) a MAO or Sponsor-specified NVIS low illumination level qualification.

v. Aircrew NVIS initial training, and methods of maintaining and regaining currency, including:

(a) actions during critical flight phases for NVD faults, failures or events that result in NVD vision degradation or loss

(b) formation flying (including procedures to ensure intra-formation de-confliction in the event a pilot loses visual on other Aircraft in formation

(eg the requirement to establish positive vertical or lateral deconfliction))

(c) transition to and from aided flight

(d) weather-related loss of visibility or entry into IMC during critical phases of flight

(e) Aircraft non-normal and emergency actions while operating on NVDs

(f) unusual attitude recovery.

c. **FSTD Training.** The MAO or Sponsor should (where feasible) minimise or eliminate emergency training in the Aircraft through utilisation of the FSTD (if suitable) for emergency training. The FSTD (where feasible and adds value) should also be used to complement training for normal NVIS operations. MAOs or Sponsors should consider utilising virtual mission training systems, and other ground based training aids (eg physical or virtual terrain boards) to the maximum extent possible to complement NVIS training.

d. **In-flight emergency training.** The MAOs or Sponsor should not permit intentional NVD shutdown in flight for the purpose of emergency training, unless the training benefit cannot be achieved by any other simulated failure method in flight, and appropriate controls are in place to minimise risk SFARP.

e. Where single pilot NVIS operations are conducted below LSALT, MAOs or Sponsors should apply additional procedural controls to the risk of CFIT—due to the loss of NVIS redundancy and increased aircrew workload.

f. Flying supervisors should ensure Aircrew complete Institute of Aviation Medicine (IAM) NVD training IAW DASR MED.05 before commencement of NVIS qualification training.

GM SPA.55(a)5 – NVIS Aircrew composition, qualification, Currency and training (AUS)

a. **Crew composition**. The MAO or Sponsor should consider the increased safety risk mitigation provided by multi-crew operations (in comparison to single pilot operations) when establishing the minimum Crew for NVIS operation below LSALT, or for other high workload tasks. However, the MAO or Sponsor may still approve single-pilot NVIS operations below LSALT. Where multi-pilot NVIS operations are mandated, single-pilot flight below LSALT may be continued in an emergency situation, or during a return to base or diversion, following a non-normal situation, where remaining below LSALT is considered the safest option.

b. **Qualification, Currency and training.** The MAO or Sponsor should consider including physiology and NTS associated with NVIS operations in initial and refresher training courses. The MAO or Sponsor should consider the following roles and tasks when setting NVIS qualification, Currency and training requirements:

i. instruction

ii. formation

iii. low-level or terrain flight

iv. air drop

v. air land

vi. air intercepts

vii. air to air refuelling

viii. weapon employment

ix. helicopter operations such as:

(a) hoisting

(b) confined area approaches

(c) special operations approaches

(d) embarked operations.

c. **Learning Management Plan (LMP).** A stand-alone NVIS LMP is not required where NVIS training is incorporated into existing approved LMPs (eg Flying Instructor course, conversion course, or refresher course).

d. **Difference (or gap) training**. Differences training may be tailored to the situation, dependent on the scale or impact of system change. However, training should normally consist of both theory (eg self-study, briefs, presentations, or CBT) and practical elements. Significant modifications and equipment changes may require FSTD or Flight training with an Aircrew instructor for qualification award.

e. **Prerequisites for NVIS Flight**. NVIS operations require Flight Crew to have a solid foundation in Instrument Flying (IF), night unaided flying, and day flight. IF and night unaided flight currency is particularly important in case of reversion to unaided flight or inadvertent entry into IMC. Many tasks performed with NVD (eg low level flight or formation) may require Aircrew prerequisite qualifications and equivalent task day or night unaided Currency.

6. Flight Authorisation system risk controls IAW DASR ORO.30 ▾ **GM**

GM SPA.55(a)6 – NVIS Flight Authorisation (AUS)

a. Flight Authorisation Officer (FLTAUTHO) NVIS qualification may support improved hazard identification through a better appreciation of factors affecting NVIS operations, including: Crew composition, qualifications, Currency, environmental aspects (illumination, weather and visibility), task complexity, NVIS and supporting systems' (eg NVD, FLIR, IR searchlight, HMSD, Aircraft lighting) limitations, and associated risks and controls.

b. **Formation flying authorisation.** FLTAUTHOs should consider existing Mission Risk Profile (MRP) controls, formation complexity, weather, visibility, illumination, Crew composition, NVIS equipment, formation experience and Currency, and contingency plans for loss of visual reference and collision avoidance. Additional procedural controls may be necessary for low illumination conditions.

7. Safety Management System controls which incorporate: ▾ **AMC**

AMC SPA.55(a)7 – NVIS safety management (AUS)

a. The MAO or Sponsor should define NVIS safety management controls, including:

i. the establishment of Mission Risk Profiles (MRPs) for NVIS operations, IAW DASR AIRCREW.65 and DASR SMS

ii. NVIS fatigue management IAW DASR AVFM—including consideration of NVIS Human Factors when establishing Flight duty limitations

iii. reporting and investigation of NVIS related hazards, faults, failures, incidents and accidents IAW DASR SMS

iv. the establishment of weather, visibility and illumination minimums based on the combination of NVIS equipment and Aircraft performance, roles and tasks; and Aircrew experience levels

v. Aircraft external lighting requirements for Aerodrome operations and controlled airspace operations as per Flight Information Handbook Australia (FIHA) - Enroute (ENR)

vi. identification of risks associated with NVIS operations below LSALT and the implementation of controls reducing risk of CFIT SFARP

vii. identification of risks associated with NVIS operations in formation and the implementation of controls reducing risk of collision SFARP.

i. risk management IAW DASR SMS ▾ **GM**

GM SPA.55(a)7i – NVIS risk management (AUS)

a. The MAO or Sponsor should consider (and mitigate where necessary) the following NVIS characteristics and limitations which may impact NVIS operations:

i. **Reduced Field Of View (FOV).** NVDs that utilise Image Intensifying Tubes (IITs) can have a significantly reduced FOV (approximately 40° cone) compared to normal unaided FOV (approximately 200° horizontal and 140° vertical). In order to compensate for the significantly reduced NVD FOV, pilots flying aided must increase head movement and scan rates. The Field Of Regard (FOR) may also be reduced compared with unaided flight due to narrow FOV combined with physical limitations of head movement, and may be restricted by cockpit obstructions such as canopy bows, frames, etc.

ii. **Visual acuity and contrast**. Although visual acuity with NVIS is greater than that obtained unaided at night, NVIS does not turn ‘night into day’. Visual acuity obtained with NVD is approximately 50% less than that which can be obtained with the naked eye in equivalent daytime conditions. This reduced NVD visual acuity can be further degraded by atmospheric and environmental factors (eg illumination, weather, obscurants, and low contrast terrain). Low illumination increases NVD background noise and results in reduced visual acuity as image contrast is reduced. High illumination or exposure to incompatible or bright light sources (visual or IR) can cause image ‘blooming’ or result in activation of automatic gain reduction features, resulting in reduced visual acuity.

iii. **Resolution.** Resolution is an objective measure of the ability to distinguish a separation between two objects. Resolution decreases with low illumination due to increases in NVD image background noise. This a design limitation of NVDs based primarily on the number of channels in the microchannel plate, optics and inherent video noise.

iv. **Fatigue.** In addition to physiological fatigue resulting from night operations, the use of NVIS equipment can result in additional physical fatigue, neck muscle strain or injury, asthenopia (eye fatigue), and headaches. Physical

fatigue and muscle strain is largely dependent on NVD weight, position on helmet, head movement, and g-forces encountered during flight. The establishment of NVIS-specific fatigue control measures will support the reduction of fatigue or injury SFARP, and can include training, physical fitness and conditioning programs, adaption, and rest and recovery aided by duty cycle management. Flight time limits on NVIS may also vary for Aircraft Type and equipment combinations, and for different roles and tasks.

v. **Spatial disorientation.** Spatial disorientation can result when the task loading increases to a point where the outside scene, or the flight instruments, are not properly scanned or interpreted. With NVDs, peripheral vision can be significantly degraded. In these cases, the pilot must rely on focal vision to interpret the NVD image, as well as the information from Flight instruments, in order to maintain spatial orientation and situational awareness. When the NVD image becomes degraded to the point where the horizon is not visual, or ground reference is lost (or significantly degraded), transition to flight on instruments will be required until adequate external visual references can be re-established. Making this transition quickly and effectively is critical in order to avoid spatial disorientation. Spatial disorientation can be mitigated to some extent through effective training and experience.

vi. **Reduced depth perception and distance estimation accuracy**. Binocular NVD systems are well-known for reduced depth perception and reduced accuracy in distance estimations, particularly for objects at close range. This is primarily due to eye physiology (eg stereopsis) and NVD optical performance, but can also be impacted by a degraded NVD image due to environmental factors (such as illumination and obscurants). Hyper-stereopsis can also result when using indirect (Type II) view NVD imaging systems (eg Top Owl) where the Image Intensifier Tubes (IITs) are not aligned directly with the pilot's eyes. This can create a situation where objects appear closer when viewed through the NVD, or with a slight image shift compared to unaided vision, or to an image provided by other sensors.

vii. **Night vision recovery**. Following the removal of NVDs, and during transition to unaided flight, human eyes can take several minutes to adapt to 'natural' dark conditions. Safe transition from aided to unaided flight is best achieved by allowing sufficient time at a safe Flight altitude, under low workload, for the eyes to adapt.

b. **Hazard identification.** Although NVIS enhances the safety of night operations through increased night vision and situational awareness, NVIS operations also present unique challenges, limitations and hazards compared to day or night unaided operations. The creation of MRPs for specific NVIS roles and tasks will aid identification of NVIS hazards and risks controls required to eliminate, or where not possible, otherwise minimise risk SFARP. The conduct of additional risk assessments before each Flight will aid identification of contextual hazards and will provide an opportunity to implement additional controls. These additional risk assessments would be based on, for example, MRP controls; Crew composition, experience and Currency; knowledge of NVD characteristics and limitations; and environmental and weather conditions for the specific role and task.

c. **Risk assessments**. The MAO or Sponsor should consider conducting risk assessments for all NVIS operations. Additional preventative controls may be required for high risk NVIS activities such as those conducted in reduced visibility, low illumination, or in close proximity to terrain and other Aircraft. The MAO's or Sponsor's risk assessments should consider:

i. existing MRPs (including consideration of tactics, techniques and procedures; and other risk controls, employed in similar operations by other Defence and global operators)

ii. illumination variations expected during the task

iii. weather (such as cloud, visibility, obscurants)

iv. Crew composition, NVIS qualifications, experience and Currency

v. Aircrew fatigue levels as the task progresses

vi. NVD performance

vii. role and task to be conducted, and associated NVIS hazards

viii. Mission complexity

ix. Role Equipment

x. extant Aircraft unserviceability effects on NVIS operations

xi. Aerodrome and Aircraft lighting requirements

xii. Light discipline and procedures for operations with third parties

xiii. emergency procedures.

d. **Environmental threats**. NVIS performance depends on the availability of light and environmental visibility. Any atmospheric condition which absorbs, scatters, or refracts illumination, either before or after it strikes terrain, may reduce the usable energy available to the NVD. Although latest generation NVDs can provide improved performance in low illumination conditions, they still require some available light, favourable atmospheric and environmental conditions, terrain contrast and reflectivity. The MAO or Sponsor should consider the following environmental aspects when planning NVIS operations:

i. **Weather.** Light rain, mist and thin fog may be difficult to detect with NVD. These weather phenomena (despite not being visible to pilot on NVD) can reduce depth perception and contrast, affect distance estimation, mask terrain, and mask signs of impending IMC—creating a potential hazard to NVIS operations. Precipitation (eg snow, rain), hail and obscurants (eg fog, dust, and smoke) can also degrade NVD performance and create a hazard to NVIS operations.

ii. The MAO or Sponsor should consider the following controls relating to weather when planning NVIS operations:

(a) **Preventative controls**.

(i) **NVD knowledge and pre-flight planning.** NVD performance predictions can be improved during the mission planning stage, through knowledge of:

(A) NVD-specific characteristics and limitations

(B) the prevailing environmental conditions in anticipated operating areas (eg terrain features and contrast)

(C) accurate weather forecasts that include illumination levels and weather (eg cloud amount and level, precipitation, obscurants), and briefings which include consideration of the impacts of forecast conditions on NVD performance

(D) defined weather, visibility and illumination minimums.

(ii) **In-flight weather detection**. As some obscurants and weather cannot be easily detected with NVDs, Aircrew should remain alert to changes or degradation in NVD performance. Weather, visibility or illumination deterioration may be indicated by the presence of halos, scintillation, loss of scene definition, or image degradation. It may be necessary to periodically look under NVDs, or assign a Crew member to periodically scan for weather unaided. Use of weather radar or FLIR will assist in detection and avoidance of rain and thunderstorms.

(iii) **Cockpit environmental control**. Appropriate use of cockpit environmental control systems can assist to minimise NVD fogging. Fogging can occur with exposure to high humidity in a cold soaked cockpit (eg exposure to outside air via the opening of Aircraft doors or windows in Flight or on the ground).

(b) **Recovery controls**.

(i) IFR Aircraft and Aircrew qualified and current in IF

(ii) carriage of a cleaning cloth for NVD fogging situations

(iii) emergency recovery procedures for inadvertent IMC entry

(iv) designated LSALT or visual manoeuvring altitudes and procedures

(v) unusual attitude recovery procedures (eg spatial disorientation).

iii. **Terrain and obstacles.** Visual acuity of terrain and obstacles is dependent on a number of factors, including NVD performance, illumination, in-flight meteorological visibility, and contrast and reflectivity of terrain or water. The contrast of terrain being overflown will vary depending on topography and illumination, including cultural lighting and the angle of the moon. Mountainous terrain may be more perceptible than flat terrain with low reflection or low contrast. When flying over low contrast or low reflectivity featureless terrain, or over water, it may be difficult to judge height without reference to a RADALT. Without the use of an IR searchlight or supplemental IR or EO vision system (eg FLIR) it may also be difficult to detect objects and terrain in shadows or in low illumination conditions when flying over low contrast areas. Other appropriate controls may include:

(a) Preventative controls as follows:

(i) use of minimum visual manoeuvring altitudes in low illumination conditions

(ii) route surveys conducted prior to aided low level or terrain flight

(iii) utilising topographical map (electronic or physical)

(iv) use of the Automatic Flight Control System (AFCS) (eg autopilot or flight directors with RADALT or altitude hold) for over water flights

(v) use of terrain awareness and avoidance equipment, including:

(A) RADALT for all operations below LSALT, especially for night low level aided flight over low contrast terrain or over water

(B) Terrain Awareness and Warning System (TAWS), Enhanced Ground Proximity Warning Systems (EGPWS), Ground Proximity Warning Systems (GPWS), and Ground Collision Avoidance system (GCAS) to provide advance alert and warning of terrain or obstacles

(C) ground mapping and millimetre-wave radar that provide a radar presentation of terrain and reflective obstacles

(D) IR searchlights and landing lights to illuminate terrain ahead of the Aircraft

(E) IR and EO vision systems (eg FLIR)

(F) Synthetic Vision Systems (SVS) or equivalent, to provide a digital terrain graphic on MFD or NVDs.

(vi) defined scanning techniques, co-ordinated between Crew, scanning for terrain and obstacles while at low level; and including 'look under', or intervals of non-flying pilot unaided scan for obstacles (such as LED lit masts that may be undetected on NVIS).

(vii) Crew coordination and communication skills, and defined Aircrew roles and responsibilities during Safety Critical operations

(viii) the application of defined Aircraft performance parameters (eg speed and configuration) to provide emergency terrain or obstacle avoidance manoeuvre capabilities.

(b) Recovery controls as follows:

(i) terrain threat recognition training, including:

(A) RADALT minimum height excursion recovery procedures

(B) TAWS, EGPWS, GPWS, GCAS, caution and warning activation recovery procedures

(C) visual terrain and obstacle threat recovery training.

(ii) IF training, including procedures to recover to LSALT when entering IMC from below LSALT.

ii. fatigue management IAW DASR AVFM.20

iii. utilising defined environmental minimums for Aircraft Type's roles and tasks ▾ **GM** ▾ **AMC**

AMC SPA.55(a)7iii – Environmental minimums (AUS)

a. **Illumination Level.** To aid operational planning, risk decision making, OIP development, authorisation, and to improve standardisation across Defence, the MAO or Sponsor should define illumination levels for all Defence NVIS operations IAW Table 1.

	Defence Illumination Levels		
	Illumination Level	**Illumination (mlx)**	**Night Sky[1]**
Normal Light (NL)	1-Very Light	≥ 40	Full Moon
	2-Light	10 to <40	≥½ Moon
Low Light (LL)	3-Intermediate	2 to <10	<½ Moon
	4-Dark	0.7 to <2	No Moon + starlight
	5-Very Dark	< 0.7	No Moon + overcast

Note 1: Indicative Night Sky conditions for equivalent illumination level shown. Many factors such as Moon elevation, environmental conditions and cultural lighting affect illumination levels.

Table AMC SPA.55(a)7iii – 1: Standardised Defence Illumination Levels

b. The MAO or Sponsor should establish environmental minimums consistent with NVIS capability as determined for Aircraft Type, roles and tasks. MAOs or Sponsors may define environmental minimums applicable to all NVIS operations, or define minimums for individual roles and tasks. Environmental minimums should include all of the following:

i. defined weather

ii. visibility

iii. illumination level.

c. The MAO or Sponsor should ensure Aircrew operate NVIS in VMC (as defined in FIHA ENR 1.2) and additionally, for operations below LSALT—in sight of ground or water.

d. **Reduced Visibility and Special VFR.** NVIS operations in visibility below VMC increase risks of disorientation, traffic confliction, inadvertent entry into IMC and CFIT. However, notwithstanding para c above, the MAO or Sponsor may approve NVIS operations below VMC in exceptional circumstances, such as high priority missions (eg search and rescue, combat, SO), provided risk can be reduced SFARP. The MAO or Sponsor should limit use of Special VFR and reduced visibility (less than VMC) NVIS approvals to not less than:

i. **for aeroplanes** – 3000m visibility for operations above LSALT, and 3000m visibility for departures or recoveries below LSALT IAW Special VFR

ii. **for helicopters** - 3000m visibility for operations above 700ft AGL or ASL. 800m visibility for operations below 700ft AGL or ASL. 800m visibility IAW Special VFR.

GM SPA.55(a)7iii – Environmental minimums (AUS)

a. **Minimum weather and visibility.** The MAO or Sponsor should consider establishing weather and visibility minimums based on the fundamental requirement for NVIS operations to remain in VMC. Defining weather minimums for the conduct and continuance of NVIS Flights for training and operations will assist to reduce the risk of CFIT, collision, and inadvertent entry into IMC. Night aided flight should normally be conducted in VMC, clear of cloud, and clear of obscurants (eg fog, smoke, haze, dust) likely to reduce visibility below VMC, or to reduce NVD visual acuity below that required for the safe conduct of the task.

b. The MAO or Sponsor should consider defining the environmental conditions for which additional qualifications, Currency, controls, and authorisations are required, and any other limitations for operations in those specified conditions. Aircrew should remain vigilant for signs of deteriorating visibility during Flight and ensure visual conditions remain suitable for NVIS operations, and within authorised limits.

c. The MAO or Sponsor should therefore consider defining:

i. the maximum cloud cover (oktas) and minimum cloud base for low level or terrain flight

ii. limitations and procedures for operating in reduced visibility caused by precipitation (rain, drizzle, snow, hail) or obscurants (mist, fog, dust, sand, smoke, ash, haze)

iii. thunderstorm avoidance criteria.

d. **Visual acuity.** When establishing weather minimums, the MAO or Sponsor should consider the effect of weather, visibility and illumination may have on NVIS performance, and specifically the likely resultant visual acuity. Defined minimums increases safety by establishing the parameters where an operating environment is considered to have the appropriate visual acuity, enabling Aircrew to identify terrain and obstacles with ample time for detection, reaction and avoidance. In most circumstances, visual acuity out to a distance equivalent to a minimum of 30 seconds flight time is sufficient for Aircrew to identify and avoid terrain or obstacles.

e. **Minimum visual acuity.** MAO or Sponsor defined minimums may not always guarantee the required visual acuity to safely conduct roles and tasks. To ensure conditions remain safe for NVIS operations, a continuous airborne assessment of the actual visual acuity experienced by Aircrew is necessary. Actual visual acuity may be significantly less than anticipated, based forecast weather and illumination conditions. Visual acuity may also be degraded by obscurants such as dust, haze, fog, smoke or sea spray; or NVD performance degradation (eg activation of automatic gain reduction when subjected to bright light sources). The reduction of flying speeds with decreasing visual acuity may reduce the risks of CFIT, but it may not be tactically sound, or may compromise Aircraft safety by reducing aerodynamic performance. Defining a minimum visual acuity based on low level operating speed ranges will increase safety and reduce the CFIT threat. Based on the requirement to maintain VMC, and achieve sufficient visual acuity for the identification of terrain and obstacles out to a minimum of 30 seconds flight time, the following guidance for minimum visual acuity is recommended:

i. Helicopter not less than 800m (0.5nm*) (*rounded up to nearest 0.5nm) for ground speeds (GS) up to 60KTS to meet minimum helicopter VMC criteria. A speed increase above 60KGS requires greater visual acuity distance minimums (eg based on 30 seconds flight time, 120KGS increases visual acuity minimums to 1800m or 1nm).

ii. Aeroplane not less than 5000m (3nm*) (*rounded up to nearest 0.5nm) for ground speeds (GS) up to 360KTS meets minimum aeroplane VMC criteria. A speed increase above 360KGS requires a greater visual acuity distance minimums (eg based on 30 seconds flight time, 420KGS increases visual acuity minimums to 6500m or 3.5nm).

f. **Illumination minimums.** Defined minimum illumination levels should support the visual acuity necessary for safe operations of NVIS roles and tasks. Roles and tasks which require a higher degree of Crew skill, or involve elevated risk, may require higher illumination minimums.

g. **Forecasts.** The MAO or Sponsor should define requirements to obtain forecast weather, visibility and illumination in the area of operations, and on intended route, for the period of planned NVIS operations. Forecast illumination should be obtained from tools which incorporate the effect of cloud cover on illumination, such as the Bureau of Meteorology's Meteorology Office Night Illumination Model (MONIM). If using Flight Planning tools such as Solar Lunar Analysis Tool (SLAT), Solar Lunar Analysis Planner (SLAP), or other MAO-approved sources, the MAO or Sponsor should define and utilise procedures to account for the impact of:

i. cloud cover

ii. moon phase

iii. moon rise and set

iv. ambient and cultural lighting.

h. Illumination levels should be determined for the Flight—en-route, in the area of operations, and during the period of operation. Illumination level should be categorised (see Table 1 in AMC SPA.55(a)7iii) to ensure Aircrew qualifications, Competency and Currency (when combined with anticipated NVIS performance) will meet the requirements for the intended operation to be conducted.

i. **Actual conditions in Flight**. Actual illumination or light level may be determined by an approved light meter where available. However, Aircrew judgement will be necessary in Flight, as it is generally impractical to measure illumination levels once airborne. While airborne, Aircrew should ensure illumination levels provide the visual acuity required for safe operation.

j. **Aircraft role or task minimums.** The MAO or Sponsor should consider defining minimum weather and illumination required for the following Aircraft roles and tasks (where applicable):

i. **Training.** The minimum illumination or night levels required for initial qualification (ab-initio), recurrent and refresher training.

ii. **Low Level or Terrain Flight**. The minimum weather, visibility and illumination conditions for low level or terrain flight, including the following considerations:

(a) **Visual acuity**. The weather, visibility and illumination combinations to provide the minimum NVD visual acuity to enable terrain or obstacle identification and avoidance.

(b) **Operation in <2mlx illumination**. Additional controls (eg use of a visual safe altitude, IR Search light, formation limitations, training Flight limitations) to be considered and applied.

iii. **Formation**. The minimum weather, visibility and illumination conditions for formation flight, including the following considerations:

(a) **Visual acuity**. The weather, visibility and illumination combinations (including the use of formation lights) to provide the minimum NVD visual acuity to enable Aircraft identification, position keeping and collision avoidance.

(b) **Operations in <2mlx illumination**. Additional controls (eg formation limitations, reduced formation complexity, procedural controls) to be considered and applied.

iv. **Specialised helicopter operations.** IR searchlight and landing light availability and performance should be considered when establishing illumination minimums for low level Flight and approaches. The MAO or Sponsor should consider defining minimum weather, visibility and illumination required for specialised helicopter operations, roles and tasks, such as those with increased risk and requiring additional Aircrew training and skills, including:

(a) low level or terrain flight

(b) formation

(c) confined area approaches

(d) special operations approaches

(e) embarked operations

(f) hoisting.

iv. utilising defined minimum NVIS equipment required for aided flight operations. ▼ **AMC**

AMC SPA.55(a)7iv – Minimum NVIS equipment (AUS)

a. **Aircraft and Aircrew equipment required.** The MAO or Sponsor should define the minimum Aircraft equipment required for NVIS Flight. Minimum serviceable equipment to be available for NVIS operations should include:

i. For all NVIS operations:

(a) the NVD type and configuration permitted to be worn by Flight Crew

(b) the NVD type and configuration permitted to be worn by Mission Crew

(c) a spare or back-up power source or battery pack for NVDs (where applicable)

(d) compatible internal and external Aircraft lighting

(e) Aircrew NVIS compatible role equipment light(s) (eg torch, finger light, lip light or cyalume stick)

(f) instruments and equipment required for IFR operations

(g) a weather radar (where fitted).

ii. For NVIS Operations below LSALT:

(a) a RADALT capable of visual and audio warnings when below the minimum set height

(b) an autopilot (with the helicopter autopilot capable of RADALT or Barometric height hold) for overwater operations

(c) a topographical map with hazards and obstacles annotated (electronic or physical)

(d) a ground mapping radar (where fitted)

(e) TAWS or EGPWS or GPWS (where fitted)

(f) IR searchlight and IR landing light (required for Helicopters, and as applicable to fixed-wing aircraft)

(g) FLIR or other EO or IR device (where fitted)

(h) NVIS HUD, helmet mounted display or Aircraft HUD (where fitted).

8. OIP that details:

i. illumination level(s) below which additional Aircrew training, qualifications and hazard controls are required ▼ **GM** ▼ **AMC**

AMC SPA.55(a)8i – NVIS low illumination (AUS)

a. The MAO or Sponsor should provide OIP which defines:

i. the illumination level(s) (in mlx) below which Aircraft roles, tasks or activities require additional controls to minimise risk SFARP

ii. low illumination levels by role, task or activity where multiple high risk, specialised or complex NVIS operations are conducted (or alternatively, the MAO or Sponsor may choose to define one low illumination level applicable to all NVIS operations, below which additional controls are required for all roles and tasks)

iii. additional qualifications, training, and hazard controls required for the safe conduct of roles and tasks below the defined low illumination level(s).

GM SPA.55(a)8i – NVIS low illumination (AUS)

a. NVIS requires natural light (moonlight, starlight, sky glow) or artificial light (searchlights, cultural lights) to produce an image. Weather and illumination will normally be evaluated during Flight planning, immediately pre-flight, and continuously in Flight. NVIS operations should not commence, or continue, when actual environmental conditions may compromise Suitability For Flight. NVIS ab-initio, initial qualification, and refresher training should ideally be conducted in good

weather and illumination conditions, thereby allowing trainees to build confidence and competence before being exposed to low illumination or poor weather conditions. Weather limits defined for training should be more conservative than those for operational activities (which are crewed by qualified and current Aircrew, none of whom are under training).

b. **Low illumination level(s).** The MAO or Sponsor should define the low illumination level(s) for Aircraft roles and tasks below which additional qualification, training and risk controls are necessary. When defining low illumination level(s), the following factors should be considered:

i. NVIS performance in low illumination

ii. type of operations conducted using NVIS, and associated risk

iii. Aircrew experience levels

iv. other aircraft systems and controls in place to support NVIS safety in low illumination condition.

ii. normal and emergency procedures for the Aircraft Type's roles and tasks ▼ **GM** ▼ **AMC**

AMC SPA.55(a)8ii – Normal and emergency procedures (AUS)

a. The MAO's or Sponsor's documented NVIS normal and emergency procedures should include:

i. transition to and from aided Flight, and minimum transition altitude

ii. loss of visibility and inadvertent entry into IMC

iii. NVD fault or failure (including optical degradation such as blooming) actions during critical Flight phases

iv. unusual attitude recovery

v. Aircrew and third party actions and responsibilities.

GM SPA.55(a)8ii – Normal and emergency procedures (AUS)

a. The MAO or Sponsor is responsible for the provision of OIP detailing training, policy and procedures for the management of non-normal and emergency conditions while flying aided. MAO or Sponsor training and procedures should include:

i. guidance as to whether to remain on NVDs or transition to unaided flight following defined faults, failures or emergencies

ii. immediate actions (drills) to be conducted following NVD failure (or vision impairment or loss) during critical Flight phases such as take-off, approach, landing and low level flight.

iii. instructions and limitations for the Aircraft Type's roles and tasks. ▼ **AMC**

AMC SPA.55(a)8iii – Role and task instructions and limitations (AUS)

a. The MAO or Sponsor should define additional procedures and limitations for the following (where applicable):

i. operations below LSALT and low flying

ii. emergency procedures (including procedures for NVD faults, failures or events that result in NVD vision degradation or loss during critical Flight phases)

iii. formation (including procedures for loss of visual contact)

iv. Air to Air Refuelling (AAR)

v. weapons employment

vi. Air Intercepts (AI) and Air Combat Manoeuvring (ACM)

vii. aerodrome, Ship deck, Heliport and other landing zones

viii. embarked operations

ix. hot refuelling and Forward Arming and Refuelling Point (FARP) tasks

x. transition from aided to unaided, and unaided to aided Flight

xi. use of Aircraft lighting

xii. Aircrew and ATC communication.

GM SPA.55(a)8iii – Role and task instructions and limitations (AUS)

a. When defining instructions and limitations for NVIS Aircraft Type roles and tasks, the MAO or Sponsor should consider the following:

i. **Operations below LSALT and low flying**. NVIS Low flying operations should be conducted IAW DASR SPA.20, specifically:

(a) **Visibility**. Minimum visibility should be expressed in metres—not less than VMC.

(b) **Weather**. Weather minimums should support the requirement to remain VMC, clear of cloud and in continuous visual contact with the ground or water.

(c) **Visual acuity**. Minimum visual acuity should enable terrain and obstacle detection and avoidance—providing enough time for Aircrew detection, recognition and avoidance.

(d) **Illumination or Light**. Minimum illumination or light levels (expressed in mlx)—should support the requirement for a minimum visual acuity, and include consideration of NVD performance, IR searchlight or landing light performance (where applicable), Aircraft role(s) and Aircrew experience.

(e) **Safety altitudes**. Definitions, methods for calculation, and use of visual and non-visual safety altitudes during NVIS operations.

(f) **Minimum level**. Minimum height permitted above terrain, water or obstacles when using NVIS as the primary flight reference.

(g) **Degraded Visual Environment (DVE).** (Synonymous with Restricted (or Reduced) Visual Operations (RVO)). Operations in a DVE—commonly caused by dust (brown out), snow (white out), low illumination, precipitation (eg rain) or obscuration (eg fog).

(h) **Speed restrictions**. Speed flown should allow sufficient reaction time for weather, obstacle, terrain and collision avoidance; while maintaining adequate Aircraft aerodynamic performance.

(i) **Navigation tolerance**. Navigation criteria, position keeping, required accuracy and tolerances (ie maximum distance allowable off track) for continued NVIS operations below LSALT.

(j) **Equipment.** Minimum Aircraft equipment for flight below LSALT, including low level or terrain Flight, or Flight at defined operational or tactical safety altitudes.

(k) **Formation**. NVIS low level formation OIP including:

(i) formation type, composition, positions and limitations

(ii) minimum Aircrew complement

(iii) minimum visibility and illumination, and procedures in the event of loss of formation visual contact

(iv) minimum height above terrain.

ii. **Formation.** Formation procedures and limitations, including:

(a) **Aircraft lights**. Use of external lighting such as IR lights, navigation, formation, anti-collision and strobe lights.

(b) **Minimum illumination levels**. Minimum illumination levels required for NVIS formation should allow for safe formation join (or rejoin) and position keeping. Formation in low illumination conditions requires consideration of additional risk controls due to the increased potential for collision.

(c) **Formation positions**. Day formation positions and procedures should be adapted to account for NVIS limitations such as reduced peripheral vision (narrow FOV), reduced field of regard (FOR), reduced depth perception and difficulty in accurately assessing closure rates.

iii. **Air to Air Refuelling (AAR).** Training, policy and procedures for the conduct of AAR with NVIS, including AAR normal and emergency procedures while on NVIS.

iv. **Weapons employment**. Procedures and limitations for use of weapons or expendables that may degrade NVD performance (such as IR flares, missiles or high explosive munitions).

v. **Air intercepts (AI) and Air Combat Manoeuvring (ACM).** Procedures and limitations for air interception or air combat manoeuvres during NVIS Flight.

vi. **Aerodrome, Ship deck, Heliport or other landing zones**. Procedures and limitations for various landing site(s), including but not limited to:

(a) aerodrome and ATC coordination and lighting requirements

(b) deck landings and integration with ship procedures and NVIS lighting

(c) contingencies and procedures for DVE

(d) confined area landing procedures.

vii. **Embarked operations**. Integration, policy and procedures for NVIS embarked operations.

viii. **Hot refuelling and Forward Arming and Refuelling Point (FARP).** Safety protocols, lighting, normal and emergency procedures, and Aircrew and ground Crew and ATC and Rescue and Fire Fighting (RFF) communication and coordination.

ix. **Transition procedures**. Requirements for the conduct of transition to or from aided flight at a safe altitude, including minimum altitudes, and goggle-up (donning) or de-goggle (doffing) procedures for normal and emergency conditions.

x. **Lighting.** NVIS lighting requirements and configurations for Aircraft interior and exterior, including formation exterior lighting configurations, and controls for contingencies such as light interference from internal (cockpit) or external sources.

xi. **Communication.** NVIS procedures for Crew communication and coordination, including common terms for use in emergency situations, to avoid miscommunication or delays.

xii. **Reporting.** In-flight and post-flight reporting requirements IAW DASR SMS.

(b) The MAO or Sponsor must conduct NVIS operations IAW the approved Statement of Operating Intent and Usage (SOIU).