

## Certification Memorandum

# Helicopter Night Vision Imaging Systems

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**Regulatory requirement(s): GM 21.A.91, GM 21.A.112B, Part 21 Appendix XII, AMC 27 General (MG16), AMC 29 General (MG16)**

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## Log of issues

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## 1. Introduction

### 1.1. Purpose and scope

The purpose of this Certification Memorandum is to provide specific clarification and additional guidance for certification of Night Vision Imaging System (NVIS) on helicopters.

### 1.2. References

The following reference material is used in conjunction with this Certification Memorandum:

| Reference      | Title   | Code  | Issue    | Date       |
|----------------|---|---|----------|------------|
| Part-21        | Certification of aircraft and related products, parts and appliances, and of design and production organisation | Annex I to Commission Regulation EU No 748/2012                             | ---      | 03.08.2012 |
| AC 29-2C MG 16 | Certification Procedure for Rotorcraft Night Vision Imaging Systems (NVIS) Equipment                            | Advisory Circular, AC 29-2C, Certification of Transport Category Rotorcraft | Change 7 | 04.02.2016 |
| AC 27-1B MG16  | Certification Procedure for Rotorcraft Night Vision Imaging Systems (NVIS) Equipment                            | Advisory Circular, AC 27-1B, Certification of Normal Category Rotorcraft    | Change 7 | 04.02.2016 |
| Part-SPA.NVIS  | Helicopter Operations with Night Vision Imaging Systems   | Commission Regulation EU 965/2012   | ---      | 05.10.2012 |
| Part-FCL       | Flight Crew Licensing   | Commission Regulation EU 1178/2011  | ---      | 03.11.2011 |
| ETSO-C164      | Night Vision Goggles (NVG)  | CS-ETSO   | Amdt 8   | 12.07.2013 |
| RTCA DO-275    | Minimum Operational Performance Standards for Integrated Night Vision Imaging System Equipment                  | ---   | ---      | 12.10.2001 |



### 1.3. Abbreviations

|              |  |
|--------------|--|
| <b>AC</b>    | <b>A</b> dvisory <b>C</b> ircular  |
| <b>AMC</b>   | <b>A</b> cceptable <b>M</b> eans of <b>C</b> ompliance   |
| <b>AFM</b>   | <b>A</b> ircraft <b>F</b> light <b>M</b> anual   |
| <b>APDOA</b> | <b>A</b> lternative <b>P</b> rocedures to <b>D</b> esign <b>O</b> rganisation <b>A</b> pproval |
| <b>CM</b>    | <b>C</b> ertification <b>M</b> emorandum   |
| <b>CRI</b>   | <b>C</b> ertification <b>R</b> evision <b>I</b> tem  |
| <b>CS</b>    | <b>C</b> ertification <b>S</b> pecification  |
| <b>DH</b>    | <b>D</b> ecision <b>H</b> eight  |
| <b>DOA</b>   | <b>D</b> esign <b>O</b> rganisation <b>A</b> pproval   |
| <b>EASA</b>  | <b>E</b> uropean Union <b>A</b> viation <b>S</b> afety <b>A</b> gency                          |
| <b>EU</b>    | <b>E</b> uropean <b>U</b> nion   |
| <b>FAA</b>   | <b>F</b> ederal <b>A</b> viation <b>A</b> dministration  |
| <b>GM</b>    | <b>G</b> uidance <b>M</b> aterial  |
| <b>ICA</b>   | <b>I</b> nstructions for <b>C</b> ontinued <b>A</b> irworthiness                               |
| <b>LOI</b>   | <b>L</b> evel <b>O</b> f <b>I</b> nvolvement   |
| <b>MG</b>    | <b>M</b> iscellaneous <b>G</b> uidance   |
| <b>MMEL</b>  | <b>M</b> aster <b>M</b> inimum <b>E</b> quipment <b>L</b> ist                                  |
| <b>NAA</b>   | <b>N</b> ational <b>A</b> viation <b>A</b> uthority  |
| <b>NVG</b>   | <b>N</b> ight <b>V</b> ision <b>G</b> oggle  |
| <b>NVIS</b>  | <b>N</b> ight <b>V</b> ision <b>I</b> maging <b>S</b> ystem                                    |
| <b>RFM</b>   | <b>R</b> otorcraft <b>F</b> light <b>M</b> anual   |
| <b>RFMS</b>  | <b>R</b> otorcraft <b>F</b> light <b>M</b> anual <b>S</b> upplement                            |
| <b>STC</b>   | <b>S</b> upplemental <b>T</b> ype <b>C</b> ertificate  |
| <b>TC</b>    | <b>T</b> ype <b>C</b> ertificate   |
| <b>TCDS</b>  | <b>T</b> ype <b>C</b> ertificate <b>D</b> ata <b>S</b> heet                                    |

### 1.4. Definitions

**Aided flight.** A flight in which the flight crew uses NVG imagery as references to assist visual flight.

**Cultural lighting.** Light emitted from cities, towns, residences, streetlights, or other artificial sources. Cultural lighting may help or hinder the pilot's external view through NVGs depending on intensity, reflection off cloud cover, landing zone, and topography.

**Lighting component.** Any component that emits or transmits light; within the cockpit, the cabin, or is attached to the aircraft exterior.



**NVG-compatible.** Aircraft internal and external lighting is NVG-compatible when it does not adversely affect the NVG image.

**NVG-friendly (as applicable to external lights).** NVG-friendly exterior lights are lights that can be viewed by the unaided eye, meet the position light requirements of CS 27/29, and do not significantly interfere with NVG performance. An NVIS-friendly exterior light emits more NVG detectable (usually infrared (IR)) wavelengths of energy compared to lights that are completely NVIS-compatible.

**Night Vision Imaging System (NVIS).** A system that integrates all elements (including the NVG, windshield, and lighting system) required to operate an aircraft successfully and safely with the aid of NVGs. For specific operational aspects of the NVIS, also refer to the definition provided in the SPA.NVIS.140 GM1.

**NVIS lighting component.** Any component intended for use with NVGs that emits or transmits light within the cockpit or the cabin, or is attached to the aircraft exterior, and does not degrade NVG performance.

**NVIS lighting system.** An aircraft lighting system that is modified or designed to incorporate NVIS lighting components. It provides adequate illumination, under day and night conditions, of instruments, displays, and controls for the unaided eye without degrading NVG performance. NVIS lighting systems must meet CS-29 and CS-27 lighting requirements.

**Unaided flight.** A flight in which the flight crew does not use NVG imagery as a reference.

## 2. Background

The number of NVIS certification projects has been increasing in recent years. Existing material in AC 27 and AC 29 MG 16 gives essential advice to address means of demonstrating compliance and continued airworthiness. However, additional guidance is needed in order to comply with Part-21 requirements, to address advances in technology and the differences between EASA and FAA certification practices. Therefore, this Certification Memorandum provides additional information to AC MG 16.

Issue 2 of this Certification Memorandum encompasses the latest amendments of the EU regulations and related means of compliance and guidance material. It also implements the lessons learnt during certification projects run since its first publication in 2014.

Issue 3 of this Certification Memorandum reflects A CS 27 and 29 Amendment 6 where AMC MG16 has been included. It also includes guidance on the classification of NVIS design changes, as well as more detailed instructions on the certification and configuration control of NVGs.

## 3. EASA Certification Policy

### 3.1. Classification of Changes

#### 3.1.1. Non-NVIS approved helicopters

According to point 21.A.91, any modification that has an appreciable effect on the operational characteristics of the aircraft is a major change. In this context, changes to an aircraft from non-NVIS to NVIS-certified are considered to be major changes. Additionally, design changes needed to achieve NVIS certification are considered as major changes as they affect functions whose failure could have a hazardous effect during NVIS operations.



### 3.1.2. Helicopters with NVG-compatible lighting

Some helicopters have lighting systems that are referred to as being ‘*NVG compatible*’, since all external and internal lights are such that NVG performance is not affected. In most cases, single items of equipment are qualified for light emitting sources against NVIS standard (e.g. MIL-STD-3009, MIL-L-85762, SAE-AS7788, MIL-S-22885). However, these helicopters do not hold any NVIS approval and appropriate certification activity has to be accomplished in order to have those helicopters approved for NVIS. NVIS approval of helicopters equipped with NVG compatible lighting should also be classified as a major design change due to the considerable extent of new substantiation data necessary to comply with the applicable certification specifications. Moreover, applicants should exercise caution in ensuring that, in this case, the configuration of the helicopter proposed for certification has not been changed by means of subsequent modification or maintenance activities from the one that has been initially declared as NVG compatible. In case the configuration has been modified, a proper evaluation should be performed in order to identify the effects of the modifications on the NVIS operation capability. The extent of evaluation and re-design needed could lead to a case of non-NVIS helicopter as described in paragraph 3.1.1.

### 3.1.3. Modifications of already NVIS approved helicopters

Point 21.A.91 defines the criteria for changes classification (minor vs. major changes). For NVIS approved helicopters, experience has shown that some changes, which are classified as minor by applying these criteria for unaided flight, may nonetheless have an appreciable effect on the cockpit/cabin lighting characteristics and thus on crew vision through the NVGs. For example, a radio installation could emit light that could shine directly in the NVG if the panel is not NVG compatible or a cable cutter could reflect external lighting and affect the crew NVG aided vision. Therefore, the classification of changes should take into account the effects on cockpit/cabin lighting characteristics and the NVG performance. It is acknowledged that each helicopter will exhibit different lighting characteristics due to the cockpit layout and the location and type of instruments fitted and this will have a bearing on crew NVG aided vision. For this reason, historically EASA has agreed that each TC/STC holder of an NVIS approval should propose their own criteria for classification of lighting changes that only have a limited impact on the NVIS approval and therefore can be considered minor. These criteria depend greatly on the:

- experience and knowledge of the specific organisation acquired in previous NVIS projects,
- type/model affected,
- extent and effect of the modification
- kind of NVIS technology applied, and
- scope and operating limitations of the helicopter NVIS approval.

For those companies having a Design Organisation Approval (DOA) with NVIS capability in their Terms of Approval, the DO Handbook should contain these classification criteria. The following list provides guidelines for the classification of changes in relation to NVIS.

A design change should be classified as “major” when one of the following conditions is met:

- The installation or exchange of external lighting sources that are not qualified as being NVG friendly.
- The installation of external equipment or parts with reflecting surfaces (e.g. mirrors, external structures) in the front part of helicopter fuselage or such that the reflection could impact the NVG image.
- The installation or exchange of equipment or parts in the cockpit with reflecting surfaces (e.g. map holders) or such that the reflection could impact the NVG image.



- The installation or exchange of equipment or parts with light emitting sources that are non-NVIS compatible in the entire cockpit area.
- The installation of new equipment with light emitting sources that are NVIS compatible within the primary field of view of the pilots.
- The installation or exchange of equipment or parts in the cabin with high luminance light emitting sources (e.g. medical equipment, cabin lights) that are non-NVIS compatible where no physical separation exists between the cockpit and the cabin.
- The addition to a specific NVIS approval of NVG models, whose optical or mechanical performance with regards to the performance standards laid down in DO-275 and ETSO C-164 are not equal to or better than the ones already certified with that NVIS approval.
- The first introduction of a white phosphor NVG, unless it can be demonstrated that the new NVG is of the same model and make as a previous approved NVG, that the only difference from this one is the phosphor screen colour, and that this guarantees equal or better performance with regards to the performance standards laid down in DO-275 and ETSO C-164 (see paragraph 3.8.2).

These modifications of the existing NVIS approved configuration are deemed to have an appreciable effect on the pilot's visual perception with NVIS, thus affecting the airworthiness of the product.

The above criteria are not intended to be exhaustive and deviations could be accepted by the Agency, where these are properly justified. It is also important to note that other design changes to a NVIS approved helicopter, although not related to internal or external lighting, could invalidate its NVIS certification and thus requiring reinvestigation as per MG 16 and further approval.

On the other hand, operators and their CAMOs that hold the complete information about each aircraft configuration should be provided with clear installation and maintenance instructions that could allow them to properly verify that the installation of any design change does not affect the NVIS approval. This is particularly important when installing a design change (Minor Change, Major Change, or STC) designed and produced by a company other than the original NVIS TC/STC holder. ICA and RFM(S) provided by the NVIS approval holder should provide clear indication of the items that need to be removed or added as part of the NVIS configuration when the helicopter is to be configured for NVIS operations.

## 3.2. Eligibility

### 3.2.1. APDOA and DOA NVIS scope of approval

NVIS modification design and implementation on an aircraft could involve many disciplines and specialised expertise. Companies need to have significant resources available (such as; a dark hangar, tri-bar charts and illuminators, qualified test pilot) and appropriate procedures to manage them. Initial assessment and continuous oversight and personnel competencies are required in order to give assurance that these resources and procedures are maintained at an acceptable level in compliance with Part-21.

Organisations using APDOA and DOAs that intend to perform NVIS changes need to apply for the introduction of the NVIS capability in the company's Scope of Work or Terms of Approval, in order to identify the capability and, for DOAs only, the level of competence in this area. Lack of this capability will lead to limitations in the ability to perform NVIS related design changes as specified in paragraph 3.2.2.

It should be noted that organisations using APDOAs have the possibility to apply and conduct certification activities related to NVIS, but no associated privileges are granted or implied.





For DOA holders, this extension will also entitle the holder to directly classify and approve minor NVIS changes in accordance with point 21.A.95 on the basis of their privilege granted under point 21.A.263(c)(1) and (c)(2).

### 3.2.2. Eligibility criteria for NVIS approvals and design changes

The need to hold a DOA for NVIS projects should be determined by taking into account the classification criteria explained in paragraph 3.1 and the level of complexity characterising the different kind of NVIS design changes. The Agency will apply the following eligibility criteria for modifications that result in an NVIS approval :

- 1) Only companies holding a DOA with NVIS capability are eligible to apply for a NVIS approval (major change or STC) of Non-NVIS helicopters. Organisations using APDOA are not eligible for such changes. Therefore, organisations using APDOA that are already holders of NVIS STC are expected to apply for a DOA before application of further NVIS STC of the same kind.
- 2) DOA or organisations using APDOA with NVIS capability are eligible to apply for:
  - a) The NVIS approval of a helicopter with NVG compatible cockpit and NVG friendly exterior lighting (refer to paragraph 3.1.2 for specific conditions applicable to this case).
  - b) Design changes classified as Major with respect to NVIS (see paragraph 3.1.3) to previously approved NVIS helicopters, and for which NVIS approval is to be retained. Caution should be exercised in this case, since if the change is extensive, the design change could constitute a new NVIS approval itself, thus requiring a DOA.
- 3) Applicants not holding a DOA or not using APDOA (typically operators), as any legal person, can only apply for Minor Changes to previously approved NVIS helicopters.

In case 3), the applicant should perform an NVIS impact assessment acceptable to the Agency and the subsequent change approval should indicate that a positive NVIS assessment has been performed. It is highly advised that the NVIS assessment is carried out with the assistance of a DOA or an organisation using APDOA having NVIS capability. If this is not the case, then the new change approval certificate and RFM/ICA should stipulate that no NVIS compatibility assessment has been conducted, therefore invalidating the original NVIS approval. This limitation should be made clearly visible to the flight crew by means of the installation of a placard in the cockpit stating that NVIS operations are not allowed. In this case, it will be the responsibility of the operator, when installing the change, to seek the re-approval of the NVIS certification, prior to release to service for NVIS operations, if needed.

The following matrix summarises what is presented above.

*Table 1 – Eligibility Criteria for NVIS approvals and design changes*

|                                 | <b>New NVIS design and approval of non-NVIS helicopters</b> | <b>NVIS approval of helicopters with NVG compatible cockpit and NVG friendly external lighting</b> | <b>Major Changes to NVIS helicopters</b> | <b>Minor Changes to NVIS helicopters</b> |
|---------------------------------|---|--|--|--|
| <b>DOA with NVIS capability</b> | YES   | YES  | YES                                      | YES                                      |



|   |       |     |     |         |
|---|-------|-----|-----|---------|
| <b>Organisations using APDOA with NVIS capabilities</b> | NO(*) | YES | YES | YES     |
| <b>Any legal person</b>                                 | NO    | NO  | NO  | YES(**) |

(\*) organisations using APDOA already holders of NVIS STC of Non-NVIS helicopters are expected to apply for a DOA before application of further NVIS STC of the kind thereof.

(\*\*) NVIS impact assessment should be performed.

### 3.2.3. Applicant personnel qualifications

#### 3.2.3.1. Compliance Verification Engineers and Engineering Personnel

The showing and verification of NVIS compliance affects various certification requirements under the responsibility of different disciplines. For DOA holders, there is no requirement to have a dedicated CVE NVIS within the design organisation or to spread the responsibility among all CVEs of the involved disciplines. Although the choice is left to the company and its specific organisation, it must be recognised that NVIS design and compliance showing may require specific skills to be developed and maintained over time. Therefore, EASA recommends that personnel appointed as CVE or responsible for NVIS projects are specifically trained and have extensive experience in NVIS design and certification.

Engineering personnel who support the NVIS design and certification activities, should receive appropriate training even though they are not flying personnel. Operational NVIS training of ground personnel can be found in the GM2 to Part-SPA.NVIS.130(f).

#### 3.2.3.2. Flight Test Personnel

In accordance with the definitions given in Part-21 Appendix XII, flight tests for development and certification of helicopters with initial NVIS modification (including full NVIS approval of helicopters with NVIS friendly lighting) should be classified as Category 2, as the NVIS will require a re-assessment of the basic crew procedures. Similarly, NVIS flight tests for changes to previously NVIS approved helicopters that will have a major impact on NVIS capabilities should be classified as Category 2. Therefore, for these cases, flight test pilots and lead flight test engineers should have at least a competence level 2, as indicated in the same Appendix XII. Flight test for NVIS compliance within a design change classified minor on NVIS aspects can be classified as Category 4.

In addition to the above-mentioned requirements, the Company FTOM should establish the minimum NVIS operational and/or flight test experience in development and certification programmes. When establishing these minimum requirements the SPA.NVIS.130 and related AMC and GM may be taken as a reference.

## 3.3. Compliance showing

### 3.3.1. NVIS approval of helicopters with NVG compatible lighting

TC holders may design and deliver helicopters with NVIS compatible lighting but with no NVIS certification. Cockpit and/or exterior lighting of such helicopters may be similar (if not the same) to the ones delivered with NVIS approval, since they use equipment with the same P/N. When third parties pursue full NVIS approval of such helicopters, they should be reminded that, while modification design could be significantly lower than in a full NVIS approval project, certification activities should not be less than a full NVIS



certification of non-NVIS helicopters. Therefore, unless proof of demonstration of compliance is provided by means of a proper arrangement established with the TC holder in accordance with point 21.A.113(b), a full investigation of the NVIS lighting design is expected by the Applicant.

### 3.3.2. Flight Testing

In application of Part-21 and AMC 21.B.100(a) and 21.A.15 (b) (6), EASA Flight Test Team may deem it necessary to perform a ground and/or flight evaluation in a NVIS project. This is to be expected at least for, but not limited to, NVIS certification projects of non-NVIS helicopters or major changes to TC/STC involving extensive cockpit and/or external light configuration changes. This activity often requires significant logistic coordination, as it should be performed with appropriate weather (i.e. clear sky, no moon) and environmental (i.e. an area with little or no cultural lighting) conditions. Therefore, although this should already be in any Certification Programme, it is essential that the Applicant provides a thorough detailed planning of the ground and flight test activities, so that the EASA Flight Test Team can easily identify and properly de-conflict their availability.

Ground and Flight Test Programme/Plan should be agreed and accepted by EASA or by a DOA in accordance with the LOI, as applicable, before company flight test takes place; Flight Test Report or preliminary company flight test results should be provided to the EASA Flight Test Team prior to their evaluation visit.

### 3.3.3. Compliance showing for Night Vision Goggles

As per the provisions of MG 16, applicants for NVIS certification projects should provide evidence that the NVG to be used with the NVIS certified helicopter have been granted an authorisation in accordance with ETSO-C164. Alternatively, the NVG can be compliant with RTCA DO-275, which constitutes the minimum operating performance specification for the aforementioned ETSO. If the NVG are not granted an ETSO authorisation, evidence should be provided that the NVG before installation are compliant at least with the requirements of DO-275 Section 2 and 5.

In all cases, the effective and safe integration of the specific NVG under evaluation with the NVIS configuration must be verified by demonstration of acceptable NVG installed performance, human factor characteristics, inter-system interface and mechanical installation.

In particular, evidence should be gathered of compatibility with cockpit and external lighting under any foreseeable operating condition, in order to ascertain that pilot visibility and workload are not impaired, and that NVG susceptibility to halo, reflections and glares remains acceptable. Both ground and inflight NVIS/NVG aided evaluation should be conducted in support of this assessment.

Specific paragraphs in RTCA DO-275 Section 4 provide an acceptable means of compliance for this aspect.

## 3.4. Configuration Control

### 3.4.1. Non-NVIS approved helicopters

Applicants seeking a NVIS approval of a helicopter that has already been Night VFR approved should establish a procedure that allows clear identification and assessment of each cockpit-cabin lighting configuration. A configuration file should be prepared and made available to the operator and to the maintenance organisation, to be used to check the conformity of each helicopter configuration to the NVIS approved configuration. The configuration file can be provided as an Appendix of the ICA or of the master Drawing List (MDL), detailing the applicable serial number(s) having the same configuration. Refer to paragraph 3.6 and to Annex 1 for an example of configuration file. The approval holder should also put in place adequate



measures to inform operators of the need for caution when incorporating future modifications that could invalidate the original NVIS approval. Refer to MG16 of AC 27/29 as referenced in AMC 27 General or 29 General for dedicated statements to be inserted in the RFM and ICA. The same guidance material also highlights additional considerations regarding the compatibility with other helicopter kits. To the same objective, the following statement, similar to the one reported in the MG16 at paragraph h.(2)(iii), will be provided in all the NVIS approval certificates (Major Change or STC):

*“Rotorcraft modified by this design change employs Night Vision Imaging System lighting, commonly named NVIS lighting, which has been certified to ensure the aircraft is compatible with Night Vision Goggles (NVG). For this reason, any deviation from the cockpit or cabin configuration specified in this design change may affect the compatibility of the NVIS lighting and may require a re-evaluation for NVG compatibility, substantiated by further approval. Once the aircraft is modified with this design change, any future modification that adds or changes systems that emit or reflect light have the potential to alter or change the NVIS lighting vs NVG compatibility, and therefore may require further approval.”*

### 3.4.2. Modifications of already NVIS approved helicopters

Applicants seeking to introduce changes to already approved NVIS kits for which they do not hold the original TC/STC should carefully examine the existing NVIS configuration file, RFM and ICA.

Any supplementary information should be presented in the same format as the existing data in order to facilitate the work of the operator and CAMO/maintenance organisation in reviewing the initial NVIS configuration and successive NVIS approved minor or major changes.

### 3.4.3. Configuration control of Night Vision Goggles

NVGs are part of the NVIS configuration and therefore this item will be under responsibility of the NVIS approval holder for the configuration control. The list of approved NVG models shall be included in the RFM Limitation Section and should also be included in the configuration file and ICA. Any change or addition of new NVG models are to be considered as a change to the existing approval. The change shall be classified in accordance with the guidance given in paragraph 3.1.3.

## 3.5. Rotorcraft Flight Manual Supplement (RFMS)

For NVIS approvals not limited to specific helicopter serial numbers, it is probable that there will be a variety of different pre-existing cockpits on which the same STC will be applied. This may require different limitations or crew procedures to be applied. For these reasons, the applicant of a NVIS STC/major change should provide a dedicated RFM supplement for each group of helicopter configurations having the same operating limitations and crew procedures. As an alternative, the RFMS can be structured in two parts. The first covering the basic helicopter configuration, having the general crew procedures and limitations. The second part could be an Appendix, containing any modified or additional limitations or procedures related to any specific configurations or optional equipment installed and possibly including reference to the specific helicopter serial number(s) configuration file. An example RFM supplement is provided in MG16 of FAA AC27/29. An example RFM Supplement Appendix is provided in Annex 2.

### 3.5.1. Night Vision Goggles in the RFM

As stated above, the list of approved NVGs shall be included in the RFM limitation sections. Each NVGs shall be unmistakably identified. Unless other means are available, the following shall be provided: make, model part number(s), type, generation, and screen colour of the image identifier tubes (green or white).



In accordance with the Part-SPA.NVIS.110(e), all crew members should use NVGs of the same model, type and generation. According to EASA's interpretation this should include the image intensifier type, given the different image quality and perception among the two types of intensifiers. Therefore, the RFM limitation section should give instructions so that all crewmembers use the same NVG image intensifier type (white or green phosphor).

Applicants are also advised that a recent policy adopted by the FAA requires US applicants to limit NVG use only to those having been granted with a TSO-C164a authorisation. On the other hand, the FAA approved RFM Supplements for NVIS certified helicopters report in the limitation sections a statement for which any NVG that meet TSO-C164a is allowed on that specific aircraft.

This is not the approach taken by EASA. EASA considers that a TSO authorisation does not constitute per se a demonstration of installed performance of the NVG on the specific helicopter configuration and, moreover, does not provide sufficient evidence that systems interfaces and human factor characteristics do not impair the airworthiness of the helicopter.

### 3.6. Instructions for Continued Airworthiness (ICA)

Routine continued airworthiness tasks such as scheduled maintenance or non-routine tasks such as repairs that affect NVIS cockpit compatibility could compromise the initial approval. The Applicant of a NVIS STC/major change is expected to update the maintenance manual(s) to include a dedicated NVIS paragraph and instructions in order to cover, at least, the following occurrences:

- Scheduled and unscheduled maintenance instructions including cockpit disassembly.
- Repairs on NVIS components.
- An inspection to check if the cockpit and external lights conform to the approved NVIS configuration, to be conducted following the change/repair of any NVIS equipment, or regularly. Any discrepancies must be communicated to the NVIS STC/TC holder.
- The maintenance instructions should also include a NVIS light leak check to be conducted as part of the NVIS inspection. The NVIS light leak check should verify that the NVIS lighting has not degraded since its approval. The ICA should indicate that this check is to be conducted by appropriate personnel capable of assessing the existing cockpit compared to the one initial NVIS certified configuration. The assessment should be conducted from all crew stations that are intended to be used (including cabin, if applicable) during NVG operations.
- Light leak checks should also be conducted after a hard landing or after any lightning strike.
- The following are maintenance items typical to NVIS that should be considered in the scheduled maintenance:
  - Change the windshield/transparencies if crazed or cracked in a manner to impair vision when using NVGs.
  - If the NVIS configuration includes removable filters, they should be checked for condition, cleanliness, security, crazing and moisture between the filter and instrument glass. No cracks, crazing or moisture should be allowed. A day light inspection of the filtered avionics should be conducted to ensure that the filter has not degraded in a way to impair readability or colour identification in daylight conditions.
  - All NVIS bezel lights / map lights/ post lights/ should be checked for condition and security.

Annex 3 contains an example of daylight and night light leak checks that could be incorporated into the ICA.

Annex 1 contains an example of configuration file and cover page as ICA appendix, including applicability to specific configurations or helicopter serial numbers.



The ICA should also highlight that, in case the part 145 (or the maintenance) organisation has no previous or recent maintenance experience with NVIS modified rotorcraft, for the first NVIS installation and/or the first NVIS maintenance activity of a NVIS approved design change, the followings should be carried out with the collaboration of the NVIS TC/STC holder:

- light leak check,
- compatibility inspections,
- functional system checks, and
- conformity inspections of the configuration

It is important to note that the applicant is also responsible for providing ICAs that encompass scheduled and unscheduled maintenance as well as regular checks of the NVGs approved for the NVIS configuration. Indeed, the NVGs are to be considered as part of the approved NVIS configuration and as such cannot be excluded from the ICA. Lack of such information provided by the NVG manufacturer should not lead to lack of ICA for NVGs. It is also reminded that, as per the provisions of MG 16, the NVG that are proposed for NVIS certification on a certain helicopter configuration are expected to be compliant with the RTCA DO-275. Paragraph 5 of RTCA DO-275 gives guidance on the minimum requirements for NVIS configuration guidance, including NVGs.

### 3.7. Operational Suitability Data

Commission Regulation (EU) 69/2014 has introduced the Operational Suitability Data in Part-21. Based on this regulation, as of 19 December 2016, all applications for Minor or Major change to Type Certificate or Supplemental Type Certificate shall also assess the impact on the approved Operational Suitability Data and develop supplements to the affected OSD constituents, as necessary.

As NVIS installation constitutes an optional specific equipment to be used for specialised operations, applicants for NVIS approvals and NVIS related design changes are required to assess if their design change has an effect on the approved Operational Suitability Data, with particular regard to Flight Crew Data (FCD) and Master Minimum Equipment List (MMEL). In such a case, in order to satisfy the applicable EU operational requirements as contained in Commission Regulation (EU) 965/2012, applicants should also consider the OSD constituents in the frame of their NVIS certification project. Book 2 of CS-FCD and CS-MMEL also contain specific guidance and consideration for NVIS related matters.

### 3.8. Miscellanea

#### 3.8.1. Some clarifications on MG 16

The AMC for NVIS certification is constituted by MG 16, which has been first introduced in FAA AC 27-1B and AC29-2C change 4. With the recent publication of change 7 of both AC 27-1B and AC29-2C, FAA has introduced a thorough revision of MG 16. AC 27-1B and AC 29-2C Change 7 have been endorsed in Book 2 of CS-27 and CS-29 respectively since amendment 6, with a specific AMC MG 16. However, this latest amendment of MG 16 represents the most advanced guidance for certification of helicopters for NVIS operations. Therefore applicants are encouraged to use AMC MG 16 included since amendment 6 in CS 27 and 29 as an AMC for their certification projects even if the certification basis applicable to their project is at an earlier amendment of the applicable certification specifications.

#### 3.8.2. White Phosphor NVGs

White phosphor NVGs are the latest development in goggle technology. Whilst traditional goggles use P-43 (green) phosphor screen, by means of which the night-time image is depicted in green and black colour, the



so called “white phosphor NVGs” use a P-45 (white) phosphor screen, allowing the scene to appear in black and white. Studies have demonstrated that, in general black and white vision is more natural for the human eye and therefore enhances the overall scene recognition, while providing equal or better performance in terms of contrast, reduction in night blindness, and eye strain.

Based on an assessment of the current market, it appears that certain NVG manufacturers have designed and produced the same NVG model, with both the white or green phosphor screen, without making any differentiation in the model name or number for both types. For this reason, it is important that the identification of NVG that is included in the RFM is such that the information regarding the image intensifier colour type is always included.

The first introduction of a white phosphor NVG in an already NVIS certified helicopter should be classified as a major change, unless it can be demonstrated that the new NVG is of the same model and make as a previous approved NVG, that the only difference from this one is the phosphor screen colour, and that this guarantees equal or better performance.

### 3.9. Who this Certification Memorandum affects

Applicants for and approval holders of minor changes, STCs and major changes concerning NVIS certification approval and more specifically:

- TC holders, DOA and organisations using APDOA with the appropriate NVIS capability, explicitly mentioned in their Terms of Approval;
- Applicants for NVIS minor changes: legal person or company using or not using APDOA and DOA without NVIS capability.

## 4. Remarks

1. Suggestions for amendment(s) to this EASA Certification Memorandum should be referred to the Certification Policy and Safety Information Department, Certification Directorate, EASA. E-mail [CM@easa.europa.eu](mailto:CM@easa.europa.eu).
2. For any question concerning the technical content of this EASA Certification Memorandum, please contact:

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## 5. Annexes

Annex 01. Example of ICA NVIS configuration appendix

Annex 02. Example of NVIS RFM appendix

Annex 03. Example of Maintenance NVIS Inspection Checklist

