

Certification Memorandum

Helicopter Night Vision Imaging System

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Regulatory requirement(s): FAA AC 29-2C Change 2 MG16

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Log of issues

Issue	Issue date	Change description
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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

It is intended that the following reference materials be used in conjunction with this Certification Memorandum:

Reference	Title	Code	Issue	Date
AC MG 16	Advisory Circular AC 29-2C Change 2 and AC 27-1B Change 2 MG16, or future applicable revisions	---	---	2006

1.3. Abbreviations

AC	Advisory Circular
AP DOA	Alternative Procedures to Design Organisation Approval
CM	Certification Memorandum
CRI	Certification Review Item
DOA	Design Organisation Approval
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration
ICA	Instructions for Continued Airworthiness
MMEL	Master Minimum Equipment List
NAA	National Aviation Authority
NVG	Night Vision Goggle(s)
NVIS	Night Vision Imaging System
RFSM	Rotorcraft Flight Manual Supplement
STC	Supplemental Type Certificate
TC	Type Certificate
TCDS	Type Certificate Data Sheet



2. Background

This Certification Memorandum provides guidance to Night Vision Imaging System initial certification and later additional changes.

3. EASA Certification Policy

3.1. General

The NVIS certification has been increasing in recent years. Existing advisory guidance is dated 2006, and additional advice is required to address means of demonstrating compliance and continued airworthiness and to cover advances in technology. Prior to this Certification Memorandum, additional guidance was provided on a case by case basis to each European applicant intending to perform a NVIS certification project through dedicated Certification Review Items (CRI). This Certification Memorandum complimentary to AC MG16, provides information contained within the CRIs and from the design approval holder.

3.2. Classification of Changes

3.2.1. First modifications of non NVIS approved helicopters

Any new modification that changes an aircraft from non NVIS to NVIS-compliant is considered a major change under Part 21.A.91¹ because it has an appreciable effect on the operational characteristics of the aircraft. Additionally, NVIS lighting modifications are considered major due to the inherent characteristics of NVIS technology and the fundamental effect the use of NVGs has on visual perception.

3.2.2. Modifications of already NVIS approved helicopters

For changes to already approved NVIS helicopters, 21.A.91 defines the criteria for minor vs. major changes. For NVIS approved helicopters, it has been found that some changes that initially appear to be minor according to 21.A.91 may have a significant effect on the cockpit lighting characteristics and thus on pilot vision through the NVGs. For example, a radio installation could shine directly in the NVG if the screen is not NVG compatible, or a cable cutter could reflect external lighting and affect the pilot NVG aided vision. Therefore, the change classification should take into account the effects on cockpit/cabin lighting characteristics and the NVIS. It is difficult to provide a list of minor vs. major lighting changes, primarily because 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 pilot NVG aided vision. Due to this, EASA has historically agreed since years that each TC/STC holder of an NVIS approval should propose their own criteria for classification of lighting changes having only limited impact on the NVIS approval, and therefore to be considered minor. This list depends greatly on the experience and knowledge of the specific organisation and the NVIS approval requested.

The classification logic of changes according to 21.A.91 can be complemented by the following questions:

1st question: Does the change affects the internal and/or external lighting, reflections or Human Machine Interface?

- If no, then apply current 21.A.91 policy. The NVIS approval will not be affected.
- If yes, then the change requires a NVIS check according to MG 16 of AC 27/29. In this case the following should be considered:

¹ Annex I Part 21 to Commission Regulation (EU) No. 748/2012 of 3 August 2012 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations



2nd question: Has the applicant agreed with the Agency how to classify changes for their effect on NVIS approved helicopters?

- If yes, then the change is classified according to the agreement and may be minor.
- If no, then the change is deemed to be major.

In both cases after the necessary testing a statement needs to be made in the approval/ICA/RFM (if applicable) highlighting that the changes to the NVIS original approval have been positively assessed under current certification rules.

While the number and types of helicopters that are NVIS approved is growing constantly, the awareness concerning the risk of installation of changes that could have a major impact on the NVIS and to the pilot is still not sufficiently developed. It is therefore important that the final users of the helicopters – the operators – consider carefully this aspect, since ultimately they will make the decision to change an equipment or not. The operators, through the NVIS approval have the complete aircraft configuration. They should carefully verify that any change in the configuration does not affect the NVIS approval.

This is particularly important where the change is made by a Company other than the original NVIS TC/STC holder.

The following is a list of possible procedural approaches for gaining approval of NVIS cockpit lighting modification.

3.2.2.1. Minor and major changes made by the original (NVIS) STC/TC holder

The existing helicopter NVIS configuration (usually in the ICA) should be amended to include the new change.

3.2.2.2. Minor and major changes made by applicants different from the original NVIS STC/TC holder

- DOA/AP DOA with the appropriate NVIS capability explicitly mentioned in their exposition published in the EASA internet. For approvals issued directly by the DOA (minor changes), the operator documentation (certificate and RFM/ICA as applicable) will need to include proof of the NVIS check.
- DOA/AP DOA without NVIS capability , and applicants not holding a DOA or AP DOA (typically operators): either the NVIS assessment is performed with the assistance of a DOA having NVIS capability (and the subsequent change approval highlights a positive NVIS assessment), or the new change approval certificate and RFM/ICA should stipulate that no NVIS compatibility assessment has been conducted, therefore invalidating the original NVIS approval. In this case, it will be the responsibility of the operator, when installing the change, to seek a re-validation of the NVIS approval, prior to release to service for NVIS operations.

3.3. DOA NVIS scope of approval

Existing holders of a DOA/AP DOA can apply for an extension to include NVIS within the scope of their approval. For DOA holders, this extension will entitle the holder to directly classify and approve minor NVIS changes in accordance with 21.A.95 and 21.A.263(c)(1) and (c)(2).



3.4. Configuration Control

3.4.1. First modifications of non NVIS approved helicopters

Applicants seeking an initial NVIS approval of a helicopter already Night VFR approved, should establish a procedure that allows clear identification and assessment of each specific cockpit-cabin lighting configuration. This will form the basis on which future modifications or repairs done by third parties will be assessed for any impact on NVG compatibility and the overall initial NVIS approval. A configuration file should be established and made available to the operator and to the maintenance facility as it will be used to check the conformance of the existing helicopter configuration to the NVIS approved configuration. The configuration file is typically provided as an Appendix of the ICA, detailing the applicable serial number(s) having the same configuration. Refer to paragraph 3.6 and to Annex 2 for an example configuration file. Adequate measures should also be put in place 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 for dedicated statements to be inserted in the certificate approval, RFM and ICA. The same guidance material also highlights additional considerations for MMEL and compatibility with other helicopter kits.

3.4.2. Follow-up 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 examine carefully what is already existing as NVIS configuration file, RFM and ICA.

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

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 pilot procedures to be applied. For these reasons the applicant of a NVIS STC/major change should propose a plan to cover dedicated RFM supplement for each serial number(s). A possible solution would have a RFM structured in two parts. The first covering the basic helicopter configuration, having the generic normal procedures and limitations. An example RFM supplement is provided in MG16 of AC27/29. The second part should be an Appendix, specific to applicable helicopter serial number(s), containing any modified or additional limitations or procedures relative to any specific configurations or optional equipment installed, and including reference to the specific helicopter serial number(s) configuration file. An example RFM Appendix is provided in Annex 3. Refer to chapter 3.6 and Annex 2 an example configuration file.

3.6. Maintenance

3.6.1. 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 should update maintenance manual(s) to include a dedicated NVIS paragraph and instructions in order to cover the following occurrences:

- Scheduled and unscheduled maintenance instructions including cockpit disassembly.
- Repairs on NVIS components.
- An inspection to check if the existing cockpit and external lights conform to the approved NVIS certification, to be conducted following the change/repair of any NVIS equipment, or regularly



within the period of time not exceeding 2 years. Any discrepancies must be communicated to the NVIS STC/TC holder. In order to confirm the NVIS certification assumptions, all differences need to undergo NVIS assessment.

- The maintenance instruction should include also 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 been degraded since approval. The ICA should indicate that the assessment 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 intended to be used (including cabin) during NVG operations.
- Light leakage 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 document as part of the ICA:
 - 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 in daylight conditions.
 - All NVIS bezel lights / map lights/ post lights/ should be checked for condition and security.
 - Wiring diagrams should be updated to include any changes.

Annex 1 contains an example of daylight and night light leakage check that could be incorporated into the ICA.

Annex 2 contains an example configuration file and cover page as ICA appendix including applicability to specific configuration or helicopter serial numbers.

3.6.2. First Installation on a multiple helicopter serial number approval.

The ICA should highlight that the first NVIS installation and/or the first NVIS maintenance activities such as:

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

should be done with the collaboration of the NVIS TC/STC holder in case the part 145 (or the maintenance facility) has no previous or recent experience with NVIS modified rotorcrafts.

It is also recommended that the NVIS TC/STC holder train the operator to perform an appropriate level of NVIS assessment depending on their organisation and personnel competencies. Training should include as a minimum, light leak checks, lighting harmonisation and detection of NVG incompatibilities. This will ensure the operator to be able to communicate to the TC/STC holder if a degradation is perceived in the NVIS compatibility such to impair safe flight.



3.7. Who this Certification Memorandum Affects

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

- DOA with the appropriate NVIS capability, explicitly mentioned in their Terms of Approval;
- Applicants for NVIS minor changes (with or without AP to DOA; 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 or fax +49 (0)221 89990 4459.
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5. Annexes

Annex 01. Example of Maintenance NVIS Inspection Checklist

Annex 02. Example of ICA NVIS configuration appendix

Annex 03. Example of NVIS RFM appendix

