



EUROPEAN AVIATION SAFETY AGENCY  
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# Helicopter Performance with NVG

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# Introduction

- NVG use becoming widespread for Police and HEMS
- Airworthiness Requirements and certification well understood
- Operational requirements not so well standardised as yet
- Some NAA's requiring Cat A for HEMS



# Category A Helicopters

- Cat A is an *airworthiness* concept
- 2 fundamental aspects:
  - Performance capability
  - Engineering standard



# Performance

- Aircraft can cope with an engine failure at any stage of the flight:
    - Carry out a rejected take off if the engine fails early
      - Land within the distance available
    - Continue the take off if the engine fails after decision point
      - Miss any obstacles within T.O. flight path
    - Balk an OEI approach
    - Carry out an OEI landing
- Implies a surveyed site available



# Critical considerations

- Satisfactory OEI power available
- Correctly determined WAT (weight/altitude/temperature)
- Acceptable pilot workload
- Visual cue environment
- Night approvals
- Site assumed to be “properly” surveyed and illuminated airfields/helipads etc

- Engine isolation
  - No singles
- Engine and systems integrity
  - Fuel supply
  - Electrics
  - Hydraulics



# Class 1 Performance

- Performance Class 1 has the same objective as Category A
  - *Aircraft can cope with an engine failure at any stage of the flight*
- Requirement to operate Class 1 (or 2 or 3) is regulated at an Ops level.
- If Ops demand Class 1 performance, this can only be delivered by an aircraft with a full Category A approval



# Class 1 Performance

- NAA's have required Class 1 for HEMS operations
- STC applicants have requested Cat A approval to be included in an NVG approval
- Assumption that, as RFM Cat A supplement does not prohibit NVG, it is automatically approved





# NVG Assumptions

- DO275 NVIS MOPS
- 1.6.2 NVIS Operational Assumptions
- 1. NVG enhanced vision is not equivalent to daytime vision.
- 2. The pilot can maintain VFR flight in the event NVG imagery is lost or degraded.
- 3. ....
- 4. The NVG does not provide adequate imagery under all lighting conditions, scene contrast, and atmospheric conditions.



# NVG Assumptions

- **Airworthiness standard is found in FAR/CS29 MG16**
- The primary tenet of the use of NVG in Civil flight operations is that they are an aid to night VFR
- NVG are not intended to expand the operational envelope or operational capabilities



# NVG Assumptions

## **MG16 states in respect of Cert basis:**

- (3) Certification Basis. The NVIS lighting design, not including the NVG, must comply with the same certification basis as that of the aircraft. The NVIS lighting design should not adversely affect other design approvals (e.g., Category A and IFR).
- Note: Category A profiles are not certificated for use with NVGs unless evaluating the profiles with NVGs. Other flight operations that require special training and approval (such as agricultural and external load operations) are beyond the scope of this MG. Approval of such operations with NVIS will require additional coordination with both aircraft certification and aircraft operations civil authorities to determine the scope of the effort



# NVG Assumptions

- Anything done with NVGs should be also be capable of being done without NVGs
- It is quite unlikely that a Cat A T/O and landing was done in the basic certification on an unimproved site
- If an operator decides to perform Cat A T/O and landing to an unimproved site, this site should satisfy the conditions of what was done in certification. If not, he is not guaranteed the Cat A results and he is doing "lookalike" Cat A profile.
- This 'lookalike ' profile should have been tested during the EASA evaluation (at least while doing STCs) with and without NVGs.



# EASA Position

- Cat A under NVG is not automatically accepted, just because it is not specifically prohibited
- MG16 identifies need for dedicated investigation
- NVG degrades external FoV
- Cat A is very dependent on external cues
- Cat A/NVG could be acceptable to fully approved and illuminated airfields & helipads
- Flight testing at limiting conditions necessary to ensure that degraded visual environment is not detrimental



# EASA Position (cont<sup>d</sup>)

- Testing should also include goggle failure at critical point of each procedure



# EASA Position (cont<sup>d</sup>)

- Ad hoc (“Unimproved”) sites
- Not appropriate for Perf Class 1
- Not formally surveyed for distance, surface qualities, obstacle environment
- Illumination may not be to acceptable standards for night ops.
- Ad hoc illumination using e.g. police car headlights is inadequate
- Ops rule does not mandate Class 1 for HEMS. Class 1 required where possible



# EASA Position (cont<sup>d</sup>)

- **Ad hoc sites**
- Not appropriate for airworthiness Cat A
  - External visual cue environment using goggles well below that assumed for normal unaided vision
  - Field of view greatly reduced
  - Low level of external illumination means goggles are essential for conduct of operation
  - Goggle failure at critical point could be catastrophic





# EASA Position (cont<sup>d</sup>)

- **Acceptable procedures for ad hoc sites**
- No requirement to mandate a take off procedure for Cat B
- Should remain clear of HV curve
- Operator can define best practice
- Cat A take off procedure is known to remain clear of HV
- Cat A procedure is best for dealing with an engine failure
- OK to fly Cat A procedures and profiles
- **This does not guarantee Class 1 Perf**



# Summary

- Class 1 operations can only be performed by Cat A certificated helicopters
- Cat A is limited by distance available for rejected or continued take offs
- Performance margins and visual cue quality are directly related
- This assumes that you can see where you are going, including at night
- Lack of a formal prohibition (of anything) in a Flight Manual does not mean that it is permitted by default.



# Summary

- Cat A, and Class 1, could be acceptable to a correctly illuminated airfield, but a formal flight investigation would be needed
- Operations to ad-hoc, unimproved, sites would rely on the use of NVG's.
- This is at variance with the basic assumption for civil NVG approvals - no credit to be taken for the goggles
- Cat A, and hence Class 1, approval using goggles not acceptable to such sites
- Cat A TO and Landing profiles acceptable for Cat B & Class 2/3 operations



*That's all*