

NIGHT FLYING GUIDELINES

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SUMMARY

Purpose: Provide guidelines for the use of aircraft at night on emergency incidents to enhance safety, operational effectiveness, and fiscal prudence.

Scope: This document provides information for Pilots, Agency Aviation Managers, and Incident Command Personnel.

Authority: This document is designed to be a component of the recommendations from the Governor's 2004 Blue Ribbon Commission section 1: Jurisdictional and Operational Barriers; Multi-Jurisdictional Recommendations; Item 5: The Commission Recommends that all federal, state and local forest firefighting agencies review their aircraft operation cut-off time and determine if there can be a window of flexibility to expand incident operations times, while at the same time taking into consideration flight crew safety. Additionally, these agencies should review technological capabilities to extend available aerial emergency response capabilities.

Background: Lives, property, and natural resource values are threatened on a 24 hour basis. In specific situations night vision image technology can be applied to aviation missions performed by public safety and natural resource agencies. Risk assessment and risk management principles coupled with the use of night vision image technology can reduce the risk factors and increase the mission effectiveness of night flying aircraft. It is the intent of this document to provide informational guidelines for agencies so that decisions can be developed in two categories:

1. Decide whether to develop or not to develop a night flying operation.
 - a. If the decision is to develop a night flying operation, criteria for development is provided.
 - b. If the decision is not to develop a night flying operation, operational assessment, risk assessment and risk management justification is provided.
2. If a night flying operation will be or has been developed, risk assessment and risk management guidelines are provided so mission go/no-go decisions can be formulated. The material and reference sources contained in this guideline will assist agencies in developing night training manuals or methods to update their current operations manual. Agencies that have already developed night flying operations may also be willing to provide their local night operations manual. Night Vision Goggle training companies are prime source of training material.

Recommendations: Agencies should evaluate their need to fly at night. If a night flying operation can be justified, used the information contained in this document for program development. Agencies that desire to develop a night flying operation should also consult with agencies that are currently involved in night flying operations for specific policy and procedural documents that may apply.

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G. Night Flying Guidelines (NFG) Appendixes: <i>Click on the blue title to access appendix.</i>	
1. Spectral Sensitivity (Display of the light spectrum and NVG sensitivity. The graph is related to operational issues that result from spectral sensitivity)	
2. Federal Aviation Administration Technical Standards Order TSO-C164 For Night Vision Goggles (Contains the minimum standards for Night Vision Goggles. The information can be used to develop purchase contract technical standards)	
3. Training Syllabus (Sample of Los Angeles County Fire Department NVG training syllabus)	

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4. [Federal Aviation Administration Order 8400.10 Accident Avoidance Programs](#)
(This document contains information on Helicopter Emergency Medical Services Loss of Control and Controlled Flight into Terrain Accident Avoidance Programs. The information can be used to develop night flying policy, procedures, and training manuals)
5. [Guidance for Helicopter EMS Safety Inspections](#) (This notice provides updated Guidance for aviation safety inspectors. The information can be used to help develop night flying policy, procedures, and training manuals)
6. [Helicopter Emergency Medical Service Safety Alert](#) (Summarizes safety issues relating to night flight. Also contains a good list of internet source material for safety programs)
7. [Operational Risk Assessment Programs For Helicopter Emergency Medical Services](#) (This document can be used for the development helicopter risk assessment programs. Included are risk assessment matrixes and FAA GO/NO-GO Decision Matrixes. The principals contained in this document can be applied to agency specific mission profiles)
8. [USFS Go/No-Go Checklist](#) (This appendix is the Night NVG Helicopter Go/No-Go Checklist that the USFS developed when they contracted for Day/Night Exclusive Use Helicopters)
9. [NVG Mission Preflight Go/No-Go Checklist](#) (This checklist from the San Diego City Fire Department is an example of an abbreviated checklist that covers the major points)
10. [Large Fire Go/No-Go Checklist](#) (This checklist from the San Diego City Fire Department is an example of a detailed checklist that covers numerous items)
11. [Budgeted Items](#) (If an agency is considering developing a NVG program, this Appendix provides a list of items that will need to be purchased)
12. [Pilot Night Flying Training And Experience For All Hazard Operations](#) (Contains minimum training, experience, and flight hours for pilots to operate on multi-agency night flying operations)

Note: Some of the Appendixes are Federal Aviation Administration (FAA) PDF documents which have their own Appendixes and cannot be edited. Therefore the Night Flying Guidelines (NFG) Appendixes Headers will be labeled as NFG APPENDIX # in the header area to isolate from the FAA PDF documentation format.

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A. Inter-Agency Pre-Planning Issues.

1. Agencies need to evaluate and organize their individual approach to night flying so their mission statements are served and their jurisdictional authority is not compromised.
2. The primary issue to resolve is how agencies will react with each other when there are differing policy and procedural issues.
 - i. Geographic responsibilities may result in aircraft night flying over another agencies jurisdictional area due to initial action zone overlap.
 - ii. Functional responsibilities may be overlapping. (Such as emergency medical night flight provided by a county in federal land) This may occur away from initial action zones.
 - iii. In federal and state lands, significant legal issues may be created.
3. It is recommended that night flying policy and procedural conflicts be resolved by executive staff members with input from agency legal departments. Night flight policy and procedural issues should be codified with cooperating agencies so incident operations are not impaired. Methodologies that can be considered are:
 - i. Pre-Attack Plans.
 - ii. Memorandums of Understandings.
 - iii. Letters of Agreement.
 - iv. Changes in agency policy and procedure manuals.
 - v. In Section F of this guideline, Night Operations Position Checklist for the Field Operations Manual ICS 420-1 is provided to help resolve issues during incident operations.

B. Night Vision Technology Standards

1. Aircraft Lighting Modifications.
 - a. Modifying aircraft lighting to be compatible with the Night Vision Goggles (NVG) can be the most expensive and detailed component of implementing a night flying program. Because the NVG can amplify some light frequencies up to 25,000 times, incompatible light sources must be eliminated from the aircraft. Professional and competent aircraft conversion companies are required to survey the aircraft and design the lighting conversion kit. Do not compromise on this issue and install cheap and quick fixes. Use proven professionals. See [NFG Appendix 1 Spectral Sensitivity](#).
 - b. The companies that modify aircraft lighting should be F.A.A. certified repair stations that provide F.A.A. Form 8130 Authorized Release Certificate upon completion of lighting modifications.
 - c. The lighting modification companies may also be able to design kits for in- house installation.
 - d. Civil aircraft lighting modifications should comply with the Radio Technical Commission for Aeronautics (RTCA) DO-275 Minimum Operational Performance for Integrated Night Vision Imaging Systems RTCA DO-275 is available at RTCA.org for \$187.50.
 - e. *Important point.* RTCA DO-275 are *minimum* standards.

Web Site

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- f. Military Federal Excess Property aircraft that have been modified for NVG will need to have Military Specification (MILSPEC) compatibility with the generation of NVG being used. Goggle manufacturers and NVG training companies may be useful in determining compatibility.

2. Night Vision Goggles. (NVG)

a. Technical Standards.

- I. Generation III NVG are vastly superior to all categories of previous editions. **Go to [NFG Appendix 1 Spectral Sensitivity](#)** and compare.
- II. The RTCA technical standards contained in DO-275 are used by the FAA for the NVG. FAA Technical Standard Order TSO-C164 discusses the issue of NVG technical standards. **(See [NFG Appendix 2 FAA Technical Standards Order TSO-C164](#))**
- III. Be very careful with goggle resolution. The low level environment that is operate in requires the highest resolution goggles for safety reasons. Goggle resolution is measured in line pairs/millimeter. Purchase contract specification should dictate NVG resolution minimum of 64 line pairs/millimeter. DO-275 and TSO-164 allow for a resolution that is less than 64 line pairs/millimeter.

b. Maintenance Procedures.

- I. It is recommended that the NVG be maintained per manufacturer recommendations by an FAA or Military maintenance facility. FAA certified repair stations should provide FAA Form 8130 for all maintenance performed on the NVG.
- II. Typically a six month maintenance interval is standard.
- III. Maintenance should follow manufacturer's recommendations.
Typical 6 month maintenance checks are:

- Power Pack Check
- System Current Draw Test
- Tube Inspection
- Gain Test
- Infinity Focus
- Resolution Test
- Collimation Test
- Purge System With Nitrogen

c. Flight Helmet Modifications.

- I. Flight helmets need to be modified to accommodate the NVG.
- II. The NVG manufacture or agent can provide the necessary parts.
- III. Some NVG mounts are permanently installed on the helmet visor. Experience has shown that crewmembers may occasionally break the mount due to their physical activity. Recommendation is that all crewmembers have a removable NVG mount system for their flight helmets.

NFG [Appendix 11 Budgeted Items](#) includes flight helmet modification items)

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C. Pilot and Crewmember Training Standards.

1. General Experience Level.
 - a. Night flying helicopters low level in wilderness and urban areas is extremely difficult and potentially hazardous.
 - b. Recent pilot daylight knowledge of the terrain and flight hazards is crucial.
 - c. Overall pilot experience in total flight hours, night flight hours, time in type aircraft, and recent flight time are important factors to consider.
 - d. The less experience the Pilot staff has will require more management controls over training, recurrence, mission planning, and mission execution.
 - e. NFG [Appendix 12](#) is a summary of recommended pilot training and experience. It is based on the Federal contract pilot standards and modified for night operations.
2. NVG Initial Training.
 - a. Initial NVG training should be performed by a FAA authorized instructor pilot.
 - b. Pilot and crewmember initial ground training should include the following as a minimum:
 - I. Crew Resource Management
 - II. Aero Medical Factors
 - III. Night Vision Goggle Operations
 - IV. Aircraft Lighting Systems
 - V. NVG Night Terrain Interpretation
 - VI. Agency Specific Procedures
 - c. Pilot initial flight instruction should include the following as a minimum:
 - I. Pilot Basic Flight Maneuvers.
 - II. Pilot Emergency Procedures
 - III. Agency Specific Missions.
 - IV. Pilot Check Flight.
3. NVG Recurrent Training.
 - a. Recurrence training should be conducted frequently if there are few night missions or if the night flying is seasonal. Set individual agency policy for this issue. Recommendation is for recurrent training if there have not been night flights for 30 nights.
 - b. Consider contracting an outside agency NVG training vendor that has FAA authorized instructors for annual check rides.
4. For current NVG and equipment standards go up the FAA web site www.faa.gov/library/manuals. Select the 2004 Flight Standards Handbook for Air Transportation (HBAT). HBAT 04-02A amended 10-02-06 is current at the time of this writing.
5. It is recommended that Helicopter Pilot NVG training standards conform to the FAA Commercial Pilot Practical Test Standards for Rotorcraft FAA-S-8081-16 available at www.faa.gov/training. **(A sample training syllabus is provided in NFG [Appendix 3](#))**
6. Agencies that have already developed night flying operations may also be willing to provide their local night operations manual. Night Vision Goggle training companies are also a prime source of training material.
7. **NFG [Appendix 11](#) contains a list of training items that will need to be budgeted.**

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D. Operational Guidelines.

1. Initial Attack.
 - a. Initial attack planning should be accomplished prior to the incident so that night operations can focus on the mission, not extraneous issues.
 - b. Pilots should not be expected to fly at night in terrain that they are not intimately familiar with. Individual agencies need to define what they will consider as Pilot familiarity.
 - c. Agencies that cover smaller geographic areas (Cities & Counties) may want to consider local recent daytime flight experience as sufficient familiarity. Flight hazards must be considered.
 - d. Agencies that cover large geographic areas may want their Pilots to perform a detailed daylight recognizance of the operational area prior to night operations. This would by default preclude most initial attack due to travel times.
 - e. Another consideration is not to fly at night at all because values threatened do not justify the risk of night flying. The aviation risk assessment and risk management will cover this issue in detail with Section E.
2. Extended Attack.
 - a. Extended attack night operations will require extensive flight crew, maintenance, and logistical support.
 - II. Aircraft availability will be more difficult to manage if day and night operations are required.
 - III. The logistical issues are compounded for agencies that are operating a considerable distance from their maintenance support base.
 - IV. Experience has demonstrated that pilots will suffer severe fatigue after three active night operational periods. Agency policy and risk management should reflect this limitation.
3. Helicopter Emergency Medical Services (HEMS).
 - a. There have been so many fatal accidents in the HEMS field that the FAA has spent considerable time investigating the causes. (We will use much of the FAA work in HEMS safety and apply it night flying guidelines) There have been two categories of fatal accidents.
 - i. Uncontrolled flight. The Pilot loses reference with the earth and therefore loses control of the aircraft.
 - ii. Controlled flight into terrain. In this case the Pilot cannot see the terrain due to darkness and flies into the terrain.
 - b. The NVG are supremely suited for preventing the most common type of nighttime helicopter flying accidents. **Review NFG [Appendix 4 FAA Order 8400.10 Accident Avoidance Program](#) and NFG [Appendix 5 Guidance for Helicopter EMS Safety Programs](#)**
 - c. In NFG [Appendix 6 HEMS Safety Alert](#) the FAA recommends the use of NVG. This document also provides weather, training, and operational considerations.

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- d. Key ground operational areas that can mitigate hazards and enhance safety.
 - i. Use pre-designated helispot locations when possible.
 - ii. Assign ground personnel to the helispot to provide dust abatement and traffic control.
 - iii. The Pilots must have air to ground communications to coordinate landing, loading, and departure information. The medical personnel must also get essential medical information from the rescue scene.

E. Risk Assessment and Risk Management.

This section will be in three parts. The first part will be Night Flying Operational Assessment. This is where agencies can determine if night flying operations are practical for their unique situations. The second part will be the Risk Assessment Matrix. The third part will be Go/No-Go Procedures. The Go/No-Go Procedures are the last step in formally administrating risk management.

1. All flights entail some risk. One of our management issue is to determine if the gain derived from the flights exceed the risk and expense. In some regards Night Flying Operational Assessment is the first step in mitigating risk. In this Guideline “Mission Required” are conditions that justify conducting actual night flying missions. “Program Development” means to create and support a night flying program. Because most of this documents support data is based on the FAA HEMS material in the appendixes, this section is developed with wildland fire information independent of the FAA.

a. Agencies can develop Night Flying Operational Assessment as follows:

Lives are or will be threatened.	ONE OF THESE FOUR ITEMS ARE REQUIRED
Structures are or will be threatened.	
Resources of significant economic value are, or will be threatened.	
Excessively high suppression cost will be prevented.	
Agency has sufficient personnel to staff a night operation.	MISSION REQUIRED
Probability of mission success is high.	MISSION REQUIRED
The above conditions will occur often enough that pilot and crewmember proficiency will be maintained.	REQUIRED FOR NIGHT PROGRAM DEVELOPMENT
The above conditions will occur at a frequency that the cost of a night flying operation can be justified.	REQUIRED FOR NIGHT PROGRAM DEVELOPMENT

- b. If the above required conditions are not realized as indicated, agencies should not plan on developing and implementing a wildland fire night flying operation.
 - c. If the above conditions can be realized, there is justification for developing and implementing a wildland fire night flying operation.
2. This section is based on [NFG Appendix 7 Operational Risk Assessment Programs For Helicopter Emergency Medical Services](#). Please review NFG Appendix 7 now. There are several methods of risk assessment. In the firefighting world, there is a balance of risk verses gain. Individual agencies are encouraged to take this information and modify it for their unique circumstances.

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This is an example of a Risk Assessment Matrix.

RISK ASSESSMENT MATRIX				
	Severity			
Likelihood	Negligible	Marginal	Critical	Catastrophic
Frequent				
Probable				<i>High</i>
Occasional			<i>Serious</i>	
Remote		<i>Medium</i>		
Improbable	<i>LOW</i>			

Severity Scale Definitions	
Catastrophic	Results in fatalities and/or loss of the system.
Critical	Results in severe injury and/or major system damage.
Marginal	Results in minor injury and/or minor system damage.
Negligible	Results in less than minor injury and/or less than minor system damage.

3. Go/No-Go Procedures

The objective is to mitigate as much risk as possible. There are many management options available. Go/No-Go checklists are often used. Agencies have developed their own and these may be available upon request. A starting point is with the FAA Go/No-Go Decision Matrix that comes from NFG Appendix 7. Note that it is not very well suited for wildland fire. However it is the conditions that should be considered. Any agency that desires to develop a night flying operation is encouraged to develop a Go/No-Go checklist for their particular need. Agencies are encouraged to develop scoring standards that match their operating environment.

NFG [Appendix 8](#) is an example from the USFS Region 5 Go/No-Go checklist.

NFG [Appendix 9](#) is NVG Mission Preflight Go/No-Go Checklist is a shortened Version developed by San Diego City Fire Department.

NFG [Appendix 10](#) is a large fire Go/No-Go checklist also from San Diego City Fire Department.

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FAA GO/NO-GO DECISION MATRIX

STATIC RISK FACTORS		SCORE
< 6 mos. on Current Job	+1	_____
< 1 yr. in EMS	+1	_____
< 200 hrs. in Type	+1	_____
> 500 hrs. in Type	-1	_____
Last Flight > 30 Days	+1	_____
Last Night Flight > 30 Days (night requests only)	+1	_____
6 mos. Since Check Ride	+2	_____
Cockpit Not Configured for Inadvertent IMC	+1	_____
Navigation or Radio Item on MEL	+1	_____
Back-up Aircraft	+1	_____
Newly-installed Equipment (i.e., satellite phone, avionics, GPS)	+1	_____
Night Vision Goggles (NVG) Equipped	-1	_____
< 3 NVG Flights in the Last 120 Days	+1	_____
Medical Crew < 1 yrs. Experience (both crewmembers)	+1	_____
IFR Program	-4	_____
VFR Program	+1	_____
External Stresses (divorce, illness, family/work issues/conflicts)	+1	_____
Total Static Score		<input type="text"/>

DYNAMIC RISK FACTORS		
Ceiling within 200' of Program Minimums	+1	_____
Visibility within 1 Mile of GOM Minimums	+1	_____
Precipitation with Convective Activity	+1	_____
Convective Activity with Frontal Passage	+1	_____
Deteriorating Weather Trend	+1	_____
High Wind or Gust Spread Defined by Operations Manual	+2	_____
Moderate Turbulence	+2	_____
Temperature/Dew Point < 3 Degrees F	+1	_____
Forecast Fog, Snow, or Ice	+2	_____
Weather Reporting at Destination	-1	_____
Mountainous or Hostile Terrain	+1	_____
Class B or C Airspace	+1	_____
Ground Reference Low	+1	_____
Ground Reference High	-1	_____
Night Flight	+1	_____
90% of Usable Fuel Required (not including reserve)	+1	_____
Flight Turned Down by Other Operators Due to Weather (if known)	+4	_____

Control Measures

Delay Flight	-1	_____
Avoid Mountainous/Hostile Terrain	-1	_____
Utilize Pre-Designated LZs for Scene Requests	-1	_____
Plan Alternate Fuel Stop	-1	_____
Familiarization Training (self-directed)	-1	_____

Total Dynamic Score

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F. Night Operations Position Checklist/Field Operations Guide ICS 420-1 Supplements

The tendency is for local city and county agencies to have more active night flying operations than state and federal land management agencies. This makes sense when you factor in pilot local area familiarity, frequency of night flight missions (which also increases currency and proficiency), more concentrated tax base, and multi-mission uses. (Fire, law, HEMS and government administration) Potential conflicts can arise when State or Federal Incident Management Teams operate on incidents where local agencies have jurisdictional authority to conduct a night flying operation. Therefore this section has two goals:

- Give Incident Management Teams guidelines on how the strategy, tactics, and incident objectives can be managed in context of a night flying operation.
- Give all agency personnel guidelines on additional responsibilities that ICS positions may have to perform when night operations will be conducted.
 1. Incident Commander
 - a. Approve night flying operations within jurisdictional authority.
 2. Information Officer
 - a. Obtain information on the night flying operation such as number and type of aircraft, areas of operation, and mission objectives.
 - b. Disseminate information as required.
 3. Safety Officer
 - a. Insure that the night flying operation is justified in risk versus gain and will be essential in the accomplishment of the incident objectives.
 - b. Address safety concerns of participating agencies.
 4. Liaison Officer
 - a. Coordinate with Command and General Staff personnel on procedural and operational issues of the night flying operation.
 - b. Resolve inter-agency policy issues that arise from night flying operations by consultation with agency representatives.
 5. Agency Representative
 - a. Advise Liaison Officer of agreement with, or objection to, a night flying operation.
 - b. Coordinate night flying issues with home agency personnel and the Incident Command Staff.
 6. Operations Section Chief
 - a. Approve night flying operations in conjunction with the Incident Commander.
 - b. Advise Branches and Division of night flying missions.
 - c. Confirm that policy and procedural issues between agencies have been resolved by consultation with the Liaison Officer and the Air Operations Branch Director.
 - d. Insure that the night flying missions are justified and essential to accomplishing the incident objectives.

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7. Air Operation Branch Director
 - a. Advise the Operations Section Chief if night flying operations are available.
 - b. Perform risk assessment and risk management as the situation dictates.
 - c. Confirm that compatible night flying policy and procedures are being applied by the agency(ies) that intend to fly at night. This may include Go/No-Go checklists and/or clearly defined areas of operation.
 - d. Coordinate and resolve inter-agency policy/procedural issues with the incident staff prior the commencing night flying operations.
8. Air Support Group Supervisor
 - a. Develop a shift plan for the aircraft and helitack crews.
 - b. Insure that the aircraft have 24 hour logistical support.
9. Air Tactical Group Supervisor/Helicopter Coordinator
 - a. Insure that positive air traffic control can be maintained.
 - b. Monitor air to ground and air to air for proper radio discipline.
 - c. Keep ground unit expectations in touch with reality. Do not let high expectations pressure the pilots.
 - d. If the night flying missions are not effective, coordinate with the Air Operations Branch Director/Operations Section Chief to change the mission Operational area or terminate the night flying operation.
10. Helibase Manager/Helispot Manager
 - a. Complete Go/No-Go checklist if required by agency policy.
 - b. Insure that the Takeoff and Landing Controller (TOLC) has communications with the assigned aircraft and is equipped with NVG.
 - c. Provide for extra security at the Helibase/Helispot. This should include vehicle traffic, civilians and assigned personnel travel routs.
 - d. Provide for Helibase/Helispot light controls. This includes landing pad marking and flashlight, headlamp, and headlight control measures.
**(Reference NFG [Appendix 1 Spectral Sensitivity](#) item A
Headlights/Flashlights)**
 - e. Conduct all operations at a slower more methodical pace. Be observant for signs of fatigue in personnel as you work through the night.