

NVIS/NVG COCKPIT COMPATIBILITY CHECKLIST: GROUND

NVIS Safety Evaluation Checklists:

Aircraft Make-Model: _____

S/N: _____

Registration Number: _____

NVG Make Model/SN: (ITT 4949) (Northrop Grumman/Litton M949) SN: _____

Are there post-NVIS lighting installation modifications on the aircraft that modified the cockpit or cabin lighting? Y/N

If Yes, please list them.

Modification:	Type of Approval (STC, FA, etc)	Date Modified

NVIS Lighting System Ground Evaluation: Daylight Readability

Objectives of Evaluation:

- Evaluate instruments modified by the alternate lighting system, especially those which have been filtered.
- Ensure instruments/gauges are legible under daylight conditions. The NVIS modification should not upset the integrity of the basic aircraft.
- Ensure that color integrity is maintained; that “like” colors are uniform (i.e., there should not be different shades of Red, Amber, Green); and that “different” colors are distinguishable from one another. The NVIS modification should not cause confusion in identifying what type of segment light is illuminated (Warning vs. Caution, Caution vs. Advisory). In some cases, mixing NVIS colors with filtered displays results in different shades of the same colors. For instance, use of “NVIS Red” on Warning panels, together with “Aviation Red” on filtered display/instruments may result in the NVIS Red lights appearing orange or amber. Likewise, use of “NVIS Yellow” for Cautions with existing Amber caution lights creates confusion whether or not a light is a Warning or Caution. Additionally, some NVIS Yellow

NVIS/NVG COCKPIT COMPATIBILITY CHECKLIST: GROUND

filters make Yellow or Amber caution lights have a green tinge that could be confusing with Green status lights.

Test Set-Up:

- The aircraft should be placed in full sunlight, preferably during late afternoon or early morning. The aircraft should be positioned such that the sun shines directly onto the instrument panel.
- The evaluator should familiarize himself with aircraft switch positions, locations, and functionality (such as battery/external power, navigation, communication, interior/exterior lighting, mission equipment, etc.) in preparation for the night evaluation.

NVIS/NVG COCKPIT COMPATIBILITY CHECKLIST: GROUND

TABLE 1: Daylight Readability Checklist

#	Item	Remarks/Comments
	<p>NVIS Lighting System: A. Flood with Filters? B. Filtered Basic aircraft lighting? C. Post Lights? PHOTOGRAPH THE INSTRUMENT PANEL AND CONSOLES</p>	
1.	<p>PRIMARY FLIGHT/NAVIGATION DISPLAYS (§§2x.1321, 1323, 1381, 1543, 1545)</p> <p>All displays are legible from pilot station(s) with sunlight shining on the display. Evaluate with sun shining on the displays from different angles. Photograph the displays</p>	
2.	<p>WARNING, CAUTION, & ADVISORY LIGHTS (2X.1322)</p> <p>a. Filtered Master Warning and CAWS warning lights that use NVIS Red are distinguishable as “Red” (not orange/amber) compared to other lights on the instrument panel</p> <p>b. Filtered Master Caution and CAWS Caution lights are distinguishable as amber/yellow compared to NVIS Red lamps. These lights should not appear green, white or orange.</p> <p>c. All CAWS lighting is bright and distinguishable enough to capture pilot's attention at daylight levels and all sun angles.</p> <p>Photograph the CAWS panel and Master C/W lights</p>	
3.	<p>POWER AND POWERPLANT INSTRUMENTS (§§2x.1337, 1381, 1549)</p> <p>Gauges with filtered material are legible including any colored arcs or limit markings with sun shining on them from different angles. The colors must be distinguishable through the filter material. Photograph filtered displays with questionable readability</p>	
4.	<p>COMM / NAV / OTHER DISPLAYS</p> <p>All filtered displays should be legible from pilot station(s) with sunlight shining on the displays from different angles. Photograph filtered displays with questionable readability</p>	
5.	<p>GENERAL</p> <p>Colors are uniform – there are not different shades of Red, Amber, Yellow, Green amongst lit annunciators. Photograph lights if there are differences</p>	

NVIS/NVG COCKPIT COMPATIBILITY CHECKLIST: GROUND

NVIS Lighting System Ground Evaluation: Night Unaided Readability and NVG Compatibility

Objectives of Evaluation:

- Evaluate unaided visual performance of the lighting system to assess compliance with 14 CFR Part 27/29 requirements.
- Evaluate instruments modified by the alternate lighting system, especially those that have been filtered.
- Ensure instruments/gauges are legible under unaided night conditions. The NVIS modification should not upset the lighting integrity of the basic aircraft. “Unaided” refers to the ability to read the instruments/gauges/switch-control labels using the NVIS lighting system, not the basic aircraft, non-NVG compatible, lighting system.
- Ensure that color integrity is maintained; that “like” colors are uniform (i.e., there should not be different shades of Red, Amber, Yellow); and that “different” colors are distinguishable from one another. (See discussion in Daylight Readability Evaluation.)
- Ensure the NVIS modification is compatible with NVG (i.e., does not interfere with NVG performance).

Test Set-Up and Equipment:

For all night tests...

- The aircraft should be placed in a facility that can be sealed from all light sources and external light leaks.
- Allow a minimum of 10 minutes for night adaptation.
- All evaluators should be familiar with aircraft switch positions, locations, and functionality (such as battery/external power, navigation, communication, interior/exterior lighting, mission equipment, etc.) in preparation for the NVG-compatibility evaluation.
- Evaluation of the lighting system is dependent on the type of NVIS modification. For example, some NVIS modifications may result in one lighting configuration, which is compatible with both NVG and unaided flight. Other modifications may result in two lighting configurations: “Night,” which may be used for unaided flight (but is not compatible with NVG); and “NVG,” which is compatible for use with the NVG, and which may augment the “Night” lighting. Consequently, the checklist should be tailored to ensure all night lighting configurations are evaluated.

NVIS/NVG COCKPIT COMPATIBILITY CHECKLIST: GROUND

- It may be necessary to block/cover portions of the cockpit (e.g., caution panel, navigation display, etc.) to aid in the evaluation. In these situations, having a piece of cardboard or duct tape may be helpful.
- NOTE: During ground tests, the applicant should ensure that the appropriate voltage is provided to represent flight conditions

For NVG-compatibility evaluations...

- One set of serviceable NVG (that meets TSO-C164 or RTCA/DO-275 specifications) should be used. It is preferable to use the same type/model of NVG approved for use in the applicant's Ops Specs.
- All tests conducted with NVG ON and in viewing position.
- Tests should be conducted from both cockpit seats, if a certification requirements/Ops Specs require more than one crewmember to use NVG.

NVIS/NVG COCKPIT COMPATIBILITY CHECKLIST: GROUND

TABLE 2: Night NVIS Lighting Readability – Without viewing through NVG

**** - Item of emphasis**

#	Item	Basic Aircraft Lighting Remarks/Comments	NVIS Lighting Remarks/Comments
	<p>Set the NVIS lighting to brightness levels used for viewing instrument panel from under the NVG. Photograph the instrument panels and consoles Evaluate the following from all pilot seating positions:</p>		
1.	<p>Alternate lighting design and controls allow for balanced illumination of each portion of the instrument panel Photograph the panel with lighting set and balanced</p>		
2. **	<p>If overlays are used, they do not obscure instrument/gauge markings, symbols or limit/range markings. Assess at different seating heights Photograph instruments that are questionable or do not meet criteria</p>		
3. **	<p>If post or flood lights are used, all instruments are sufficiently illuminated so that the entire instrument/instrument panel is legible, to include all limit/range markings and colors. Photograph instruments that are questionable or do not meet criteria.</p>		
4.	<p>Post lights / Flood lights do not cause excessive glare or reflections off the gauges, instruments, or windscreen / windows. Photograph instruments that are questionable or do not meet criteria</p>		
5.	<p>Independent lighting systems (such as Standby/Whiskey compass, Stby ADI, and associated placards) illuminate the instruments and do not cause excessive glare or distracting reflections off other gauges, instruments, windscreens/windows. Photograph instruments that are questionable or do not meet criteria</p>		
6.	<p>Map / Emergency lights do not cast shadows that obscure instrument markings, switches, or labels, nor do they shine in pilots' eyes or cause distracting reflections. Photograph instruments that are questionable or do not meet criteria</p>		
7. **	<p>WARNING, CAUTION, & ADVISORY LIGHTS (2X.1322)</p> <p>a. Filtered Master Warning and CAS warning lights that use NVIS Red are distinguishable as "Red" (not orange/amber) compared to other lights on the instrument panel</p> <p>b. Filtered Master Caution and CAS Caution lights are distinguishable as amber/yellow compared to NVIS Red lamps. These lights should not appear green, white or orange.</p> <p>c. All WCA lighting is bright and distinguishable enough to capture pilot's attention at night lighting levels. Photograph instruments that are questionable or do not meet criteria Photograph the WCA panel and Master C/W lights</p>		

NVIS/NVG COCKPIT COMPATIBILITY CHECKLIST: GROUND

TABLE 3: NVG Compatibility Checklist

#	Item	Comment/Remark
	<p>NVIS LIGHTING (Instrument, Map, Emergency, Flood lights / COMM, NAV, Mission Equipment – Set to NVG OPERATIONAL LIGHTING LEVEL.</p>	
<p>1 **</p>	<p>Record and assess any reflections/glare created by the NVIS lighting viewed through the NVG.</p> <p>Pay attention to Warning/Failed/OFF flags, Marker Beacons and other lights associated with IFR equipment, ELT, or other lighting that might illuminate, potentially degrading NVG performance or creating unnecessary pilot distraction.</p> <p>Assess looking straight ahead, Cross-Cockpit, and out the pilot’s side windows.</p> <p>Describe any “blooming” or “veiling” glare seen in the NVG</p>	
<p>2 **</p>	<p>WARNING, CAUTION, & ADVISORY LIGHTS – ON (use test switches as appropriate).</p> <p>Evaluate readability, glare, and blooming. Some degradation in NVG performance may be acceptable since caution/warning lights are designed to attract pilot attention. The acceptability is dependent on NVIS lighting system and the pilot’s primary FOV when wearing the NVG.</p> <p>Describe any “blooming” or “veiling” glare seen in the NVG</p>	
<p>4.</p>	<p>Repeat Steps 1 / 2 above with the Aft / Cabin compartment light set ON and adjusted to an NVG operational level. If the Aft/ Cabin lights are not NVG compatible, blackout curtains should be installed, or limitations restricting use of Cabin lighting should be included in the RFMS.</p> <p>Assess looking straight ahead, Cross-Cockpit, and out the pilot’s side windows.</p> <p>Describe any “blooming” or “veiling” glare seen in the NVG</p>	