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AERONAUTICAL DESIGN STANDARD

STANDARD PRACTICE

U.S. ARMY

AIRCRAFT LIGHTING

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STANDARD PRACTICE

U.S.ARMY AIRCRAFT LIGHTING

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| | ✓ | Standard Practice |
| | | Design Standard |
| | | Test Method Standard |
| | | Process Standard |
| Handbook | | Handbook (non-mandatory use) |
| Alternative Action | | |

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1.0 SCOPE

1.1 Purpose. Adherence to the provisions of this standard is intended to:

- a. Outline the requirements for aircraft crewstation and cabin lighting for day, night unaided, and night aided (night vision goggle (NVG) operations).
- b. Outline the requirements to achieve a low infrared (IR) signature for the aircraft crewstation and cabin areas.
- c. Outline the requirements for aircraft exterior, visible, and IR (Covert) lights.

1.2 Scope. This standard establishes the lighting requirements for military aircraft including intensity, wavelength, reflection, and coverage angles of the aircraft interior and exterior lights. It will also provide general requirements for the control of light sources and for conformance verification. ADS-74-SP references other approved military standards and specifications for detailed information. Only information which is not available or is ambiguous in the existing military standards and specifications will be detailed in this document.

1.3 Application. This specification provides the baseline by which the developer and the user of the aircraft can verify their lighting requirements are realistic during the development, testing, and operation of military aircraft. It is applicable to the design of all systems, subsystems, component hardware, and equipment that contributes to the aircraft's lighting environment.

2.0 APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this standard, whether or not they are listed.

2.2 Government documents

2.2.1 Specifications, standards and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those to be cited in solicitations and contracts.

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| | |
|--------------|---|
| JSSG-2010-5 | Crew System, Aircraft Lighting Handbook |
| MIL-STD-3009 | Lighting, Aircraft, Night Vision Imaging System (NVIS) Compatible |
| MIL-STD-1472 | Design Criteria Standard, Human Engineering |

(Copies of these documents are available online at <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FAA FAR Part 23 Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes.

FAA FAR Part 25 Airworthiness Standards: Transport Category Airplanes.

FAA FAR Part 27 Airworthiness Standards: Normal Category Rotorcraft.

FAA FAR Part 29 Airworthiness Standards: Transport Category Rotorcraft.

(Copies of these documents are available from the United States Army Aviation and Missile Command, Aviation Engineering Directorate, Redstone Arsenal, Alabama.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3.0 DEFINITIONS

3.1 Acronyms

| | |
|-------|--------------------------------------|
| ADS | Aeronautical Design Standard |
| ANVIS | aviation night vision imaging system |
| ATTC | Army Technical Test Center |
| FAA | Federal Aviation Administration |
| FAR | Federal Aviation Regulation |
| fc | foot-candle |
| fL | foot-lambert |

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| | |
|------|-----------------------------------|
| IR | infrared |
| JSSG | Joint Service Specification Guide |
| NRI | NVIS Radiance Intensity |
| NVG | night vision goggles |
| NVIS | Night Vision Imaging System |
| TOP | Test Operational Procedure |
| USAF | United States Air Force |

4.0 GENERAL REQUIREMENTS

4.1 Box-Level Verification. The aircraft interior and exterior lighting equipment shall be verified by test and analysis to assure that it meets all applicable requirements. The evaluation shall include, but shall not limited to, light intensity, luminance, chromaticity, radiance, reflection, coverage angles, and flashing patterns

4.2 Aircraft Level Verification. A qualitative evaluation shall be conducted at the aircraft level to verify and demonstrate that the lighting systems meet the defined requirements. The verification shall include, but are not limited to, Class A NVG compatibility, sunlight readability, reflections, light leakage, minimum and maximum viewing distances for exterior lighting, and coverage angles for exterior lights. The NVG compatibility evaluation shall be conducted using Class A NVGs (with a 625 nm cutoff filter), a medium contrast 1951 USAF Resolution Test Chart, and a 10,000 fc sun-gun. The U.S. Army Technical Test Center (ATTC) Test Operations Procedure (TOP) 7-2-513 may be used as a guide for conducting NVG compatibility and sunlight readability evaluations.

5.0 DETAILED REQUIREMENTS

Aircraft lighting shall include interior lights, exterior lights, displays, and light controls.

5.1 Interior Lighting. The aircraft interior lighting includes, but is not limited to, displays, console, emergency, warning/caution/advisory, utility, controls, compartment, map, work and inspection, and jump lights. The aircraft interior lighting shall meet the 10,000 foot-candle (fc), direct sunlight requirement and the 2,000 foot-lambert (fL) specular requirement (from a glare source such as reflection from clouds or equipment in the aircraft) in accordance with Appendix C of MIL-STD-3009. The interior lighting shall be compatible with MIL-STD-3009 for Type I, Class A NVGs. The JSSG-2010-5 may be used as an additional guidance to achieve the aircraft interior lighting requirements.

5.1.1 Chromaticity. The aircraft interior light chromaticity shall comply with MIL-STD-3009 for Type I, Class A NVGs.

5.1.2 Luminance. The aircraft interior light luminance shall comply with MIL-STD-3009.

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5.1.3 Radiance. The aircraft interior light radiance shall comply with MIL-STD-3009 for Type I, Class A NVGs.

5.1.4 Contrast. The aircraft interior light contrast shall comply with MIL-STD-3009.

5.1.5 Reflection. The aircraft interior light reflection shall comply with MIL-STD-3009.

5.1.6 Sunlight Readability. All aircraft lighting and displays shall meet the 10,000 fc direct sunlight requirement and the 2,000 fL specular readability requirements in accordance with Appendix C of MIL-STD-3009.

5.2 Exterior Lighting. The aircraft exterior lighting shall include dual-mode (visible and IR) anti-collision lights, dual-mode Position/Navigation lights, dual-mode Formation lights, dual-mode Search lights, and dual-mode Taxi lights. All visible exterior lighting shall comply with the applicable FAA FAR referenced in paragraph 2.2.2 and MIL-STD-3009. All IR exterior lighting shall comply with MIL-STD-3009.

5.2.1 Anti-Collision Lights

5.2.1.1 Visible Mode. The visible mode anti-collision lights shall comply with the applicable FAA FAR as referenced in paragraph 2.2.2 based on the aircraft category. The lights shall also meet the requirements given in MIL-STD-3009.

5.2.1.2 IR Mode. The IR mode of the anti-collision lights shall comply with MIL-STD-3009. Also, the IR anti-collision lights field of coverage shall be at least 30 degrees above and -30 degrees below the centerline of the aircraft and provide a 360-degree ring of coverage (horizontally) around the aircraft. The lights field of coverage may go beyond -30 degrees below the centerline of the aircraft; however, its absolute cutoff point shall be at -45 degrees.

5.2.1.3 White/Daylight Anti-Collision Light. A daylight anti-collision light shall be installed. The daylight, high intensity, anti-collision light shall provide a minimum of 3,500 effective candlepower of white light.

5.2.2 Position/Navigation Lights

5.2.2.1 Visible Mode. The visible mode position lights shall comply with the applicable FAA FAR as referenced in paragraph 2.2.2 based on the aircraft category. The lights shall also meet the ANVIS "friendly" requirement given in MIL-STD-3009.

5.2.2.2 IR Mode. The IR mode of the position lights shall comply with MIL-STD-3009. Also, the IR position lights field of coverage shall be at least 30 degrees above and -30 degrees below the centerline of the aircraft and provide a 360-degree ring of coverage (horizontally) around the aircraft. The lights field of coverage may go beyond -30

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degrees below the centerline of the aircraft; however, it's absolute cutoff point shall be at -45 degrees.

5.2.3 Formation Lights

5.2.3.1 Visible Mode. The aircraft shall be equipped with a formation lighting system that will provide visual, unambiguous orientation information regarding the attitude and position of the lead aircraft to the pilots of aircraft in the formation. The lights shall also meet the ANVIS "friendly" requirement given in MIL-STD-3009

5.2.3.2 IR Mode. The IR mode of the formation lights shall comply with MIL-STD-3009. Also, the IR formation lights shall be viewable through ANVIS at a distance of at least 500 feet (approximately 7 main rotor disk diameters.) The lights shall not be visible below the centerline of the aircraft.

5.2.4 Search Light

5.2.4.1 Visible Mode. The visible mode search/landing lights shall have a minimum intensity of 200,000 peak candle-power with a beam spread of 15 degrees \pm 5 degrees.

5.2.4.2 IR Mode. The IR mode of the search/landing lights shall have a minimum intensity of 10 NVIS Radiance Intensity (**NRI**) with a beam spread of 20 degrees \pm 5 degrees and possess a wavelength of 875 ± 75 nm.

5.2.4.3 Dimming. The dual-mode search/landing lights shall provide lamp dimming in both the visible and the IR modes from 0% to 100% intensity.

5.2.4.4 Extended Angle. The search/landing lights shall have an extended angle from 0 to 120 degrees vertically from its fully stowed position.

5.2.4.5 Rotation Angle. The search/landing lights shall have a rotation angle of 360 degrees horizontally at 60 to 120 degrees vertically extended angles.

5.2.5 Taxi/Landing Light

5.2.5.1 Visible Mode. The visible mode taxi/landing lights shall comply with the applicable FAA FAR as referenced in paragraph 2.2.2 based on the aircraft category. The lights shall also meet the ANVIS- friendly requirement given in MIL-STD-3009.

5.2.5.2 IR Mode. The IR mode of the taxi/landing lights shall comply with MIL-STD-3009.

5.3 Controls. The lighting system controls shall comply with MIL-STD-1472.

6.0 NOTES