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AIRCREW LASER EYE PROTECTION (ALEP)

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This instruction implements Air Force Policy Directive (AFPD) 11-3, *Aircrew Flight Equipment*, and defines the Aircrew Laser Eye Protection (ALEP) program. It describes design criteria used in the development of laser protective devices, operational considerations, training, fit, inspection, maintenance and immediate response procedures to follow after suspected laser exposure. Procedures outlined in this document apply to all Air Force personnel, including air Force Reserve and Air National Guard (ANG) members. Send comments and suggested improvements to this instruction on AF Form 847, *Recommendation for Change of Publication*, through the appropriate MAJCOM. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with AFMAN 37-123 (will convert to AFMAN 33-363), *Management of Records*, and disposed of in accordance with the Air Force Records Disposition Schedule (RDS) located at <https://afrims.amc.af.mil/>. Waivers may not be granted in application of this publication. The use of the name or mark of any specific manufacturer, commercial product, commodity or service in this publication does not imply endorsement by the United States Air Force.

Chapter 1

AIRCREW LASER EYE PROTECTION PROGRAM

1.1. Introduction. Protecting aircrews from harmful lasers is a complex problem involving science, intelligence and medicine in the context of an operational scenario. There are numerous factors that must be considered as part of developmental requirements such as: compatibility with different aircraft cockpit displays, type mission, head gear, night vision devices, vision correction, device weight, field of view and other human system integration issues. An effective program requires a general understanding of laser threats, inherent system hazards, and a coordinated interaction between medical, laser safety experts (bioenvironmental engineers or health physicists), intelligence, aircrew and Aircrew Flight Equipment personnel.

1.1.1. Laser Threat. Aggressive foreign laser development, availability of low cost hazardous commercial devices, growing number of our own laser designators, range finders and hand held pointers continues to increase the chance of exposure. In 1995, Vienna Protocol IV to the 1980 Conference of the States Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons (CCW) was drafted, banning use and transfer of laser weapons whose primary purpose is to permanently blind. Although Protocol IV may be viewed as successful in prohibiting use and transfer of a specific category of anti-personnel weapon, we must prepare for inadvertent exposure and enemies who may not abide by such protocols. For these reasons, the Air Force approved Aircrew Laser Eye Protection (ALEP) Operational Requirements Document in 1996 to begin formal development and acquisition programs.

1.1.2. Laser Hazard. LASER is an acronym for Light Amplification by Stimulated Emission of Radiation. Lasers produce a coherent intense beam of light and under certain circumstances exposure can result in damage to the human eye or skin. The human eye is the most vulnerable to injury from lasers in the visible region (400-700nm wavelengths) but are also vulnerable to longer wavelengths of invisible lasers in the near infrared region (700-1100nm) and shorter wavelengths in the ultra-violet region. Lasers can cause eye injuries at ranges up to several miles and incur a "dazzling" effect at even greater distances, particularly at night. Reflection within the cockpit when using a hand held laser pointer also presents a hazard to aircrew.

1.1.2.1. Lasers damage human eyes at ranges up to several miles and cause a "dazzling" effect at even greater distances (particularly at night). Dazzling occurs when Lasers interact with cockpit illumination and scatter light resulting in the inability of aircrew to perform their mission.

1.1.2.2. Reflective energy released from a hand held Laser pointer in an aircraft cockpit presents a potential hazard to aircrew not wearing appropriate Laser eye protection.

1.2. Acquisition Strategy. Headquarters Air Combat Command (ACC) is the lead command for acquisition of aircrew laser eye protection. ACC/A8SR tasked MAJCOM Aircrew Flight Equipment functional managers to report command requirements for ALEP devices. Aggregate requirements are established and requisitions are programmed to fill unit demands. The acquisition strategy for ALEP is the evolutionary acquisition approach. In this process, a desired capability is identified and threshold objectives are refined through controlled technological demonstrations and risk management with continuous user feedback. Each increment of development provides the user an improved capability. Requirements for future

increments depend on user feedback, threat assessments and technological maturity. The approving authority for use of all aircrew laser eye protective devices is referenced in AFOSH STD 48-139.

1.3. Information/Asset Security. Information disclosing specific characteristics of laser protective devices is classified IAW provisions of the Aircrew Laser Eye Protection Security Classification Guide (77AESG/YACL, 7909 Lindbergh Dr., Brooks AFB, TX 78235-5352, telephone COM (210) 536-5464 or DSN 240-5464). Request for information defining specific characteristics of laser protective devices should be directed to Headquarters Air Combat Command, Flight Operations and Training Branch (ACC/A3TO), Langley AFB Virginia.

1.4. Disposition of Protective Devices. Laser eye protective devices should be secured to prevent pilferage. Units having condemned or otherwise unserviceable spectacles will maintain positive control storing assets until they are physically destroyed or returned to Standard Base Supply System (SBSS).

1.4.1. Destruction of ALEP. The preferred method of disposal for all ALEP is to incinerate the lenses. AFE personnel should crush lenses and hand carry debris to Intel, (or follow specific installation burn procedures as applicable) for burn. Intel has the capability of burning spectacles in a burn bag.

1.5. Responsibilities:

1.5.1. MAJCOM.

1.5.1.1. Will develop a Laser Eye Protection Training course that educates aircrew on the proper wear and protection capabilities of each available device.

1.5.2. Laser Safety Officer (LSO). ANSI Z136.1 specifies any facility using Class 3b or Class 4 lasers or laser systems to designate a Laser Safety Officer to oversee safety for all operational, maintenance and servicing units.

1.5.2.1. Is responsible for establishing a squadron Laser safety training program and ensuring all personnel using hand held Lasers or have a requirement to wear ALEP receive Laser Awareness Training.

1.5.2.2. Will train unit personnel on hazards surrounding an active Laser and appropriate safety equipment available for use when working around or handling an active Laser.

1.5.2.3. In an environment where exposure is possible, LSO duties and responsibilities may be assumed by the Aircrew Flight Equipment Officer (FEO).

1.5.2.4. Consult AFOSH STD 48-139 for further information on LSO duties and responsibilities.

1.5.3. Aircrew Flight Equipment. Aircrew flight Equipment will fit, inspect, maintain and train aircrew on proper use of laser protective devices defined in this instruction.

1.5.4. Aerospace Medicine.

1.5.4.1. Local flight surgeons, in concert with Optometrists, Ophthalmologists, Physiologists and/or Bioenvironmental Engineers will ensure aircrew members are familiar with different effects lasers have on the eye.

1.5.4.2. Flight surgeons will perform laser eye examinations for aircrew as outlined in AFOSH STD 48-139.

1.5.4.3. Optometrists will ensure refractive ALEP devices, when available, meet individual corrective vision specifications and are properly fitted.

1.5.5. Intelligence. Unit intelligence agencies will ensure aircrew is briefed on potential laser threat types and locations. Additionally, intelligence personnel will ensure aircrew receive current threat assessment data during mission profile briefings.

1.5.5.1. Will ensure adequate procedures are in place to capture and promptly disseminate reported incidents of Laser exposure involving aircrew.

1.5.6. Air Force Safety Center (AFSC). AFSC, as chairs of the AF Laser System Safety Review Board (LSSRB), reviews CONOPS, TTPs for operational laser devices and associated use of ALEP, providing guidance as necessary. ALEP use is part of the LSSRB review process ultimately leading to AF Safety certification for lasers, as required by AFOSH-STD 48-139.

Chapter 2

OPERATIONS

2.1. Operational Use of ALEP. ALEP should be worn when there is any risk of a laser exposure. AFI 14-105 ACC Sup1 gives A2 the responsibility to brief aircrew on relevant laser incidents so aircrew can plan accordingly. Based on the threat environment, local commanders have discretionary control over ALEP wear policy for their subordinates. When ALEP is worn together with NVGs, aircrews are advised to perform a preflight and sight adjustment wearing both. This preflight/adjustment will ensure any changes to visual acuity are identified before flight.

2.2. Medical Examination. A medical eye examination is required for personnel who routinely work in a laser hazardous environment. Aircrew who operate in an environment where they could be exposed to any laser are required to get a prescreening eye examination. This examination will document the condition of the eye before working in the Laser hazardous environment. A comparative examination will be conducted upon termination of duties.

2.3. Selecting Appropriate Laser Eye Protection. Laser eye protection is designed to protect aircrew from specific laser irradiation transmitted at visible and invisible wavelengths. Incorrect usage or subjecting laser protective devices to conditions outside specific design capabilities will result in a degradation of performance and potential risk of exposure to harmful laser energy. When selecting an ALEP device consider the following criteria:

2.3.1. Laser Threat. Unit intelligence personnel should provide aircrew information on known laser threats in the current theater of operation. Aircrew should then pass that information to AFE who in-turn will select a Laser protective device capable of countering the threat.

2.3.2. Types of ALEP. Aircrew Flight Equipment personnel should provide aircrew information on the protective characteristics of ALEP available for use. Specific wavelength protection offered by each device is classified and available upon request from ACC/A3TO, DSN 574-3063. Information is also at A3TO and A3TV web pages at: <https://a3.acc.af.mil/dot/index.asp>. Further information about ALEP is available at the Eye Protection Task Force SIPRNET site at <http://www.a3a5.hq.af.smil.mil/a5r/a5re/docs/eyeprotection.htm>.

2.3.3. Side Protection. Some Laser protective devices are available with and without side protection. ALEP with side protection is required when employing hand held laser pointers in the aircraft to prevent exposure to reflective energy. Side protection should also be employed when wearing NVGs. Although NVGs provide a level of laser eye protection from exposures along the axis of the eye, without the proper side protection given by the approved ALEP, there is a chance of incurring an off-axis exposure.

2.4. Suspected Laser Exposure. If exposed to a laser, the aircraft commander will ensure appropriate command and control, intelligence, safety and medical agencies are notified as soon as possible. Aircrew who suspect exposure to laser radiation from either friendly or hostile sources should report to the Flight Surgeon's Office (FSO) or nearest emergency room where individual can be examined by an ophthalmologist immediately upon landing. The FSO will manage and coordinate the event with MAJCOM, USAF-SAM/AFC, 77th AESG/YA and AFRL as directed by AFOSH STD 48-139. More information about

historical incidents and exposure reporting procedures is available on the SIPRNET at: <http://www.naic.wrightpatterson.af.smil.mil/DEW/LE/index.html>.

2.4.1. If exposure comes from a friendly source, the mishap should also be reported through appropriate safety channels, and if required, documented in the Air Force Safety Automation System. Consult AFI 91-204, Safety Investigations and Reports, for further guidance.

2.5. Initial Response. When encountering laser illumination, aircrew should not stare at the laser source, but transition to aircraft instruments and turn away from the threat. Aircrews should recognize the laser may be associated with a weapon posing a greater threat and initiate appropriate evasive action. If a laser threat exists in vicinity of an airfield of intended arrival or departure, ALEP devices should be donned prior to descent from cruise altitude, or prior to takeoff, as applicable. Doffing of ALEP devices after departing a defined laser threat area or after landing is left to discretion of the aircraft commander. The following procedures should be implemented immediately following suspected laser exposure.

2.5.1. Look away from laser source; do not remove night vision goggles.

2.5.2. Transition to aircraft instruments.

2.5.3. In a multi-seat aircraft, if exposed pilot is flying the aircraft, transfer control to unaffected pilot.

2.5.4. Assess visual functionality. If visual disturbance persists for more than 60 seconds, declare in-flight emergency and return to base as soon as practical.

2.5.5. Notify command and control agency of suspected laser incident.

2.5.6. Avoid rubbing eyes.

2.5.7. If vision returns to normal and there is no pain within 3-5 minutes, the Aircraft Commander (AC) will consider the value of continuing the mission against potential loss of a aircrew member who may have sustained eye damage. The AC will determine whether or not to return to base.

2.5.8. Upon return to base, accomplish intelligence debrief and report suspected laser exposure incidents IAW procedures at: <http://www.naic.wrightpatterson.af.smil.mil/DEW/LE/index.html>.

2.5.9. Aircrew who suspect exposure to laser radiation from either friendly or hostile sources should report to Flight Surgeon's Office (FSO) or nearest emergency room where they can be examined by an ophthalmologist immediately upon landing. Also contact the Tri-Service Laser Injury Hotline at 800-473-3549 or laser.safety@brooks.af.mil. For more information see the Laser Safety Website <https://afkm.wpafb.af.mil/LaserHotline>.

Chapter 3

TRAINING

3.1. Laser Safety Training Requirements. General Laser Awareness Training is required for all aircrew as part of Initial Physiological Training. Specific training is required for aircrew using hand held Lasers or operating in an environment where ALEP will worn. Aircrew Flight Equipment personnel maintaining Laser pointers or assigned to an AFE shop maintaining Laser pointers are required to receive General Laser Awareness Training and specific training on relevant equipment within their control.

3.2. Training Curriculum. The LSO will conduct General Laser Awareness Training. Aircrew Flight Equipment will train aircrew on the different types of ALEP available for use against a Laser hazard or threat and limitations of ALEP maintained. ALEP training is the collective responsibility of the Laser Safety Officer, Aircrew Flight Equipment, Intelligence and Aerospace Medical personnel. Training should be conducted upon assignment to laser duties with refresher training accomplished annually using MAJCOM approved academics (AFOSH STD 48-139).

3.3. Initial Training. Initial training will be completed by each aircrew member prior to use of any ALEP device. Specific training requirements are defined in attachment 2, Training Syllabus and Instructor Guide. Units should expand this guide to include unit specific safety training requirements. Training should also cover specific AFE equipment integration issues interfering with proper wear of laser eye protection. Initial training is conducted before an individual is allowed to handle a Laser pointer.

3.4. Refresher Training. ALEP refresher training is accomplished annually and may be combined with AFE equipment event training (LL06). Refresher training may be abbreviated where necessary to focus attention on equipment configuration changes and/or implementation procedures changed during the year.

3.5. Training Documentation. Documentation of training should be consistent with good records keeping, and training events should be recorded in Automated Records Management System (ARMS) or other currency tracking systems.

3.6. Instructor Training Certification. Wing/Unit designated personnel will conduct initial and annual refresher training. A qualified wing or squadron level AFE instructor as defined in AFI 11-301V1, with assistance of representatives from appropriate support agencies listed in **Chapter 1** of this instruction will provide training on the functions, characteristics, capabilities and limitations of unit assigned ALEP. The Master Lesson Plan is maintained on the 361 TRS/TRR CoP at <https://wwwd.my.af.mil/afknprod/ASPs/CoP/OpenCoP.asp?Filter=AE-OP-00-01>. Wings are expected to supplement the Master Lesson Plan as necessary to incorporate known threat related data. The ALEP Instructor Guide will be reviewed and approved annually by ACC/A3TOA Aircrew Flight Equipment . Air National Guard units should route changes through ANG/A3OS. Be aware Instructor Guides containing sensitive information will require a comparable security level control.

Chapter 4

DESCRIPTION, FITTING, INSPECTION AND MAINTENANCE PROCEDURES FOR ALEP DEVICES

4.1. Description, Fitting, Inspection and Maintenance Procedures. Technical guidance for description, fitting, inspection and maintenance of FV-9, Block 0, Block 0+, Block 1 and JCAS (JHMCS Compatible ALEP Spectacle) laser protective devices is defined in this chapter. Aircrew Flight Equipment personnel are responsible for fitting, periodic inspection and routine maintenance of aircrew laser eye protective devices. When not in use, Laser protective devices will be securely stored to prevent theft, damage or unwarranted misuse.

4.2. Glendale FV-9 Santa Cruz Spectacle.

4.2.1. Item Description. The Glendale FV-9 Santa Cruz spectacle consist of a monolithic polycarbonate lens formed through an injection molding process and incorporates an absorptive dye that is designed to absorb laser emissions in near infrared energy spectral region. The FV-9 will protect the wearer from Laser energy emitted from Air Commander's Pointer. For more specific information on wavelength specifications contact ACC/A3TOA Command Aircrew Flight Equipment section.

4.2.2. Capability. The FV-9 transmits 50% of visible light and will protect wearer from Laser energy emitted from militarily significant infrared designators and pointers operating in infrared spectral region. The FV-9 is compatible with NVGs and Heads-Up-Displays. The FV-9 spectacles provide side protection in a wraparound frame design and are authorized for use with handheld lasers.

4.2.3. Warnings and Limitations. FV-9 ALEP devices are designed to protect against specific laser energy wavelength in the non-visible region. Incorrect usage or subjecting spectacles to conditions outside certified specifications may result in a degradation of performance and potential risk of exposing the user to a laser hazard/threat. Never use ALEP to intentionally view a laser.

4.2.4. Fitting. FV-9 spectacles are designed with adjustable temple pieces to allow spectacles to fit close to the face. Expand or contract temple pieces to obtain a close comfortable fit.

4.2.5. Pre-Use Inspection and Maintenance. Inspect ALEP spectacles for visible lens scratches or frame damage. Always store the spectacles in the provided protective case when not in use.

4.2.6. Periodic Inspection and Maintenance. The following inspection requirements are provided to extend serviceability of FV-9 spectacles and will be accomplished by AFE personnel every 180 days. Document inspection in Aircrew Life Support Management System (ALSMS) or other approved electronic tracking system.

4.2.6.1. Visually inspect lenses for scratches and remove from service spectacles displaying scratches in the primary focal region. Surface scratches remove absorptive dyes and reduce optical density. Replacement assets are available through base supply under Federal Stock Number 4240-01-458-5567.

4.2.6.2. Visually inspect to ensure lenses are secure in the frame. Any sign of frame damage is reason to remove spectacles from service.

4.2.6.3. Clean lenses using cloth and plastic lens cleaner supplied with the spectacles.

4.3. Block Zero (CLEPIR) Spectacle.

4.3.1. **Item Description.** Block 0 spectacles are designed to fit in the Air Force Frame and were procured as a COTS item. The spectacle is composed of a thin film containing the laser protective properties bonded between two polycarbonate elements laminated together to form a lens. The lenses are then glazed into the Air Force Frame and temple arm is etched with a serial number. Each spectacle lens is custom fitted to the frame and is not interchangeable.

4.3.2. **Capability.** Block 0 spectacles provide laser protection by reflecting a percentage of incident radiation. The spectacle can minimize temporary effects of dazzle or glare and prevent permanent eye damage from low power lasers in selected visible and invisible spectral regions. Block 0 spectacles are optimized for night operations and may be prone to exhibit signs of reflection or glare when worn during daylight hours. Attachable side shield protection is available for use with Block 0 spectacles from Glendale Technologies. Specific wavelength characteristics of this device are available upon request from ACC/A3TOA, Langley AFB VA.

4.3.3. **Warnings and Limitations.** ALEP devices are designed to protect against specific laser energy wavelengths. Therefore, incorrect usage or subjecting the spectacles to conditions outside certified specifications may result in a degradation of performance and potential risk of exposing the user to a laser hazard/threat. The Aerospace Systems Group, 77 AESG/YA has certified Block 0 spectacles safe for flight during day and night operations. Subsequently, any pair of spectacles viewed as excessively reflective should be annotated and removed from service.

4.3.4. **Fitting.** Spectacles should be properly fitted prior to use in a laser hazard/threat area. They should fit as close to the face as possible maximizing the area of protection. There should be minimal gaps between the frame and side of the nose. Temple's arms should press lightly against side of the head, and earpieces should curve downward following the back of ear to prevent spectacle from sliding out of position.

4.3.5. Pre-Use Inspection and Maintenance.

4.3.5.1. Check spectacle frame for signs of damage.

4.3.5.2. Check to ensure lenses are secure in the frame.

4.3.5.3. Store spectacles in micro fiber cloth bag and hard carrying case when not in use. Basic information on use, storage and cleaning is included in the hard carrying case.

4.3.5.4. Remove dust on optical lens surface with the cleaning bag provided. Ensure cleaning bag is itself clean prior to use. The cloth bag can be cleaned as necessary by hand or machine-washed in water temperatures up to 140°F.

4.3.5.5. Remove mud or grit from lens surface with clean water. Dirt and grime should be removed using a water moistened lens tissue taking care not to trap abrasive matter between the tissue and polycarbonate surfaces. Soap or a mild detergent similar to Ivory Liquid should be used to remove greasy stains or smears. Do not use petroleum spirit or other solvents to clean spectacles. Dry the optical surfaces using a clean dry lens tissue.

4.3.6. Periodic Inspection and Maintenance.

4.3.6.1. Aircrew Flight Equipment personnel will inspect Block 0 spectacles for serviceability upon receipt and every 180 days thereafter. Document inspection in ALSMS or other approved electronic tracking system.

4.3.6.2. Inspect lenses for signs of delamination. Delamination can be verified by carefully looking through the spectacle lenses from a distance of approximately 12 inches. Delamination will look like growth rings on a tree cross-section, a series of partial rings or slight color differences from rest of the lens. Delamination usually starts in the corners of the lens. Except in extreme cases, delamination does not diminish laser protection properties. Do not use if either lens shows signs of delamination between front and rear polycarbonate that affects aircrew vision or exceeds 4mm in any direction.

4.3.6.3. Visually inspect and ensure individual lenses are secure in frame. If the frame is damaged, lenses cannot be recovered for further use because lenses are custom matched to each frame.

4.3.6.4. Remove from service spectacles displaying scratches in primary focal region. Lenses are coated with an anti-reflective coating that does not impact performance of the laser protective properties when scratched. However, scratches may be distracting when appearing in the primary focal region and should be removed from service.

4.4. Block Zero Plus Spectacle (Model B) and Clip-on (Model D)

4.4.1. **Item Description.** Block 0+ laser protective devices were procured as COTS items in FY02 and were available in two configurations; an Air Force Frame spectacle and a clip-on device. The spectacle and clip-on have two lenses constructed of a polycarbonate optical element. There is a polycarbonate element on the outer surface and a polycarbonate optical element on the inner surface. A thin film containing laser protective properties is bonded between polycarbonate elements and laminated together to form the lenses. Lenses are glazed into frame and etched with a serial number. Each spectacle lens is custom fitted to the frame and is not interchangeable.

4.4.2. **Capability.** Block 0+ ALEP devices provide laser protection by reflecting and absorbing a percentage of incident radiation. This device can minimize temporary effects of dazzle or glare and prevent permanent eye damage from lasers in selected visible and invisible spectral regions. Housed in Air Force Frame, Block 0+ ALEP extends capability of Block 0 by adding additional bands of protection. Also, Block 0+ ALEP is provided as a clip-on for aviators who wear prescription spectacles. Clip-on spectacles are attachable to standard medium size 55mm Air Force Frame. For additional information on protective characteristics of this device, contact HQ ACC/A3TOA, Langley AFB VA.

4.4.3. **Warnings and Limitations.** Block 0+ ALEP added protection beyond Block 0 and are certified safe for flight. Wearing Block 0+ may result in a slight change in appearance of some colors. However, any pair of spectacles observed to promote excessive reflection or color shifts should be annotated and removed from service. Spectacles should not be exposed to temperatures below - 4°F or above 131°F.

4.4.4. **Fitting.** Block 0+ spectacles should be fitted using the following procedures.

4.4.4.1. Fit spectacles as close to face as possible with minimal gaps between the frame and side of the nose. The nose pads can be adjusted with needle nose pliers to minimize gaps, reduce entrance of stray radiation and improve comfort. The temple arms should press lightly against side of the head and earpieces should curve downward following back of the ear to prevent spectacles from sliding out of position.

4.4.4.2. Block 0+ Clip-On (Model D) is designed to attach to outer surface of the new AFF (a.k.a. IAS) aircrew spectacle 55mm frame. Clip-on attachment hooks should tightly "grasp" spectacle

frame. Do not attempt to attach the clip-on to older style aircrew frame. Doing so will damage clip-on and create a FOD hazard.

4.4.4.3. Users requiring prescription capability have two options available.

4.4.4.3.1. Option 1: A combination of contact lens and the Model B spectacle.

4.4.4.3.2. Option 2: A combination of aircrew prescription spectacles and Model D clip-on. While this option provides the required capability, it adds additional weight to spectacle, creates additional reflections and some loss of visual acuity.

4.4.5. **Pre-Use Inspection and Maintenance.**

4.4.5.1. Check spectacle frame for signs of damage.

4.4.5.2. Check to ensure lenses are secure in the frame.

4.4.5.3. Store spectacles in micro fiber cloth bag and hard carrying case when not in use. Basic information on use, storage and cleaning is included in hard carrying case.

4.4.5.4. Remove dust on the optical lens surface with cleaning bag provided. Ensure cleaning bag is itself clean prior to use. The cloth bag can be cleaned as necessary by hand or machine-washed in water temperatures up to 140°F.

4.4.5.5. Remove mud or grit from lens surface with clean water. Dirt and grime should be removed using a water moistened lens tissue taking care not to trap abrasive matter between the tissue and polycarbonate surfaces. Soap or a mild detergent similar to Ivory Liquid should be used to remove greasy stains or smears. Do not use petroleum spirit or other solvents to clean spectacles. Dry the optical surfaces using a clean dry lens tissue.

4.4.6. **Periodic Inspection and Maintenance.**

4.4.6.1. Aircrew Flight Equipment personnel will inspect Block 0+ spectacle/Clip-on for serviceability upon receipt and every 180 days thereafter. Document inspection in ALSMS or other approved electronic tracking system.

4.4.6.2. Inspect lenses for signs of delamination. Delamination can be verified by carefully looking through spectacle lenses from a distance of approximately 12 inches. Delamination will look like growth rings on a tree cross-section, a series of partial rings or slight color differences from rest of the lens. Delamination usually starts in the corners of the lens. Except in extreme cases, delamination does not diminish laser protection properties. Do not use if either lens show signs of delamination between front and rear polycarbonate that affects aircrew vision or exceeds 4mm in any direction.

4.4.6.3. Visually inspect and ensure individual lenses are secure in the frame. If the frame is damaged, lenses cannot be recovered for further use because lenses are custom matched to each frame.

4.4.6.4. Lenses are coated with an anti-reflective coating that does not impact performance of laser protective properties when scratched. However, scratches may be distracting when appearing in the primary focal region and may require removed from service.

4.5. **Block One Spectacle.**

4.5.1. **Item Description.** The spectacles consist of a TR-90 nylon front frame, TR-90 nylon temple pieces, a metal nose pad assembly with cushioned nose pads and polycarbonate laser protective lenses.

Eight stainless steel screws secure all parts. In addition, the lenses are secured with a silicone adhesive. Three frame sizes are available to allow correct fitting for different users. The three sizes vary in their interpupillary distance (IPD). IPD is the distance between the centers of the user's pupils, and is measured in millimeters. The three frame sizes available are 57 mm (small), 63 mm (medium) and 69 mm (large). These three sizes allow a +/- 4 mm IPD variation.

4.5.2. Capability. Block 1 spectacles will minimize temporary effects (e.g., dazzle or glare) and permanent eye damage from lasers in selected wavelengths in the visible, Ultraviolet (UV) and Near Infrared (NIR) regions. Spectacle design provides wide-angle protection against off-axis laser threats and accommodates aviators with and without prescription spectacles. Block 1 spectacles are compatible with all AFE equipment with exception of the Joint Helmet Mounted Cueing System and NVGs.

4.5.3. Warnings and Limitations. Wearing Block 1 ALEP may cause some difficulty in determining the actual color of runway/tower lighting. Green runway threshold/tower lights may appear yellow while white lights may pink. Aircrew should receive specific training unique to Block 1 to ensure they can identify runway/tower lighting patterns while wearing the device. Block 1 spectacles are not approved for use with NVGs.

4.5.4. Fitting. Block 1 spectacles must be precisely fitted to user. The technology used to provide wavelength protection is highly "eye centered". If device is not properly fitted when worn, the user may lose some wavelength protection, may not be able to view some instrument displays or may experience some loss of visual acuity. Issuing this device to persons other than the fitted user is highly discouraged. Specific fitting instructions are contained in Block 1 technical manual 14P3-9-51.

4.5.5. Pre-Use Inspection and Maintenance. Consult specific Block 1 technical manual for pre-use inspection and maintenance procedures.

4.5.6. Periodic Inspection and Maintenance.

4.5.6.1. Aircrew Flight Equipment personnel will inspect Block 1 for serviceability upon receipt and every 180 days thereafter. Document inspection in ALSMS or other approved electronic tracking system.

4.5.6.2. Inspect lenses for signs of delamination. Delamination can be verified by carefully looking through spectacle lenses from a distance of approximately 12 inches. Delamination will look like growth rings on a tree cross-section, a series of partial rings or slight color differences from rest of the lens. Delamination usually starts in the corners of the lens. Except in extreme cases, delamination does not diminish laser protection properties. Do not use if either lens show signs of delamination between front and rear polycarbonate that affects aircrew vision or exceeds 4mm in any direction.

4.5.6.3. Refer to 14P4-5-91 for additional inspection criteria.

4.6. JCAS (JHMCS Compatible ALEP Spectacles)

4.6.1. Item Description. The JCAS design is a rapid response effort to provide laser protection for JHMCS users. The required laser protection is contained within a laminated polycarbonate lens structure. The JCAS lenses are housed in the Low Pro Wrap frame providing a one-size-fits-all configuration. Each spectacle is marked with a serial number and identification code on the frame. JCAS is visually compatible with JHMCS (Joint Helmeted Mounted Cueing System) display and designed to work with the 40% JHMCS visor. Required design trades eliminated prescription capability and

reduced field of regard coverage (compared to Block 1) to accommodate fit in limited space behind the JHMCS visor.

4.6.2. Capability. JCAS spectacles implement technologies that reflect or absorb specific laser wavelengths. JCAS will minimize temporary effects (e.g., dazzle or glare) and permanent eye damage from lasers of selected wavelengths in UV, visible, and NIR. JCAS does not provide vision correction for prescription wearers and is not designed for night use. JCAS spectacles are optimized for day use with 40% JHMCS visor and are fit compatible with JHMCS helmet/visor/mask system.

4.6.3. Warnings and Limitations. Wearing JCAS may cause some difficulty in determining actual color of lighting and may cause some color shifts. Aircrew should receive specific training unique to JCAS to ensure they can identify lighting patterns and color shifts while wearing the device. JCAS spectacles are day-only devices optimized for performance and protection with 40% JHMCS visor. JCAS is not intended for night use. Always store JCAS in the protective case to prevent unnecessary solarization of the lenses.

4.6.4. Fitting. JCAS is provided in one size to fit all users. AFE Technicians fit JCAS to pilots by adjusting temple arms and nose pads to accommodate oxygen mask and JHMCS visor while providing optimal lens coverage over each eye. Spectacles must be properly fitted prior to use in a laser hazard/threat area. Specific fitting instructions are contained in the JCAS Technical Manual.

4.6.5. Pre-Use Inspection and Maintenance. Inspect JCAS spectacles for visible lens scratches or frame damage. Use only the cleaning cloth/bag provided or high quality lens tissue for wiping the lens. Always store spectacles in protective case when not in use. Consult JCAS Technical Manual for specific pre-use inspection and maintenance procedures.

4.6.6. Periodic Inspection and Maintenance.

4.6.6.1. Aircrew Flight Equipment personnel will inspect JCAS spectacles for serviceability upon receipt and every 180 days thereafter. Document inspection in ALSMS or other approved electronic tracking system. The JCAS frame and lenses will be inspected for damage or defects.

4.6.6.2. Inspect lenses for signs of delamination. Delamination can be verified by carefully looking through spectacle lenses from a distance of approximately 12 inches. Delamination will look like growth rings on a tree cross-section, a series of partial rings or slight color differences from rest of the lens. Delamination usually starts in the corners of the lens. Except in extreme cases, delamination does not diminish laser protection properties. Do not use if either lens show signs of delamination between front and rear polycarbonate that affects aircrew vision or exceeds 4mm in any direction.

4.6.6.3. Refer to JCAS technical manual for additional inspection criteria.

4.7. Forms Adopted. AFTO Form 334-CG, *Helmet and Oxygen Mask/Connector Inspection Data*, AF Form 1522, *ARMS Additional Training Accomplishment Input* and AF Form 847, *Recommendation for Change of Publication*

DANIEL J. DARNELL, Lt Gen, USAF
DCS, Operations, Plans & Requirements

Attachment 1**GLOSSARY OF REFERENCES, ABBREVIATIONS, ACRONYMS AND TERMS*****References***

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Abbreviations and Acronyms

ACC—Air Combat Command

ACDE—Aircrew Chemical Defense Equipment

ACP—Air Command Pointer

AFE—Aircrew Flight Equipment

AFF—Air Force Frame

AFOSH STD—Air Force Occupational Safety and Health Standard

AFRC—Air Force Reserve Command

AFRL—Air Force Research Laboratory

AFSC—Air Force Safety Center

ALEP—Aircrew Laser Eye Protection

ALSMS—Aircrew Flight Equipment Management System

AFSOC—Air Force Special Operations Command

ARMS—Automated Records Management System

AMC—Air Mobility Command

ANG—Air National Guard

CAF—Combat Air Force

CA/CRL—Customer Authorization/Custody Receipt Listing

CONOPS—Concept of Operations

COTS—Commercial Off the Shelf

CSAF—Chief of Staff, United States Air Force

FEO—Flight Equipment Officer

IPNVG—Integrated Panoramic Night Vision Goggles

IAS—Improved Aircrew Spectacle (also referred to as the Air Force Frame)

IPD—Interpupillary Distance

IR—Infrared

JCAS —JHMCS Compatible ALEP Spectacles

JHMCS —Joint-Helmeted Mounted Cueing System

JSAM—Joint Services Aircrew Mask

LASER—Light Amplification through Stimulated Emission of Radiation

LSO—LASER Safety Officer

LSSRB—Laser System Safety Review Board

MAF—Mobility Air Force

MAJCOM—Major Air Command

MDS—Mission Design Series

NIR—Near Infrared

NVG—Night Vision Goggles

OPSEC—Operational Security

PACAF—Pacific Air Force

Rx—Prescription

SPO—System Program Office

SIPRNET—Secure Internet Protocol Network

USAFE—United States Air Forces in Europe

USAFSAM—United States School of Aerospace Medicine

UV—Ultraviolet

VRAD—Virtual Risk Assessment Database