

## 12.0 OPHTHALMOLOGY

### 12.1 CATARACT

**AEROMEDICAL CONCERNS:** Cataracts reduce visual acuity (VA). When the cataract involves the visual axis, visual acuity is most affected in bright sunlight and conditions of glare.

**WAIVER:** The condition is considered disqualifying. Once vision has deteriorated to less than 20/20 correctable or the patient has a positive Glare test, the flier should be disqualified from flying until successful surgical removal of the cataract. Waiver to SG1 may be considered after surgery provided the VA returns to 20/20 corrected, is within refraction limits, and the Glare test is negative (normal).

**INFORMATION REQUIRED:**

1. Ophthalmology consultation is required for initial waiver request.
2. Because of the potential for deterioration, ophthalmologic follow-up may be needed every 6 months until surgery is deemed necessary.
3. Prior to and after surgery, a Mentor Brightness Acuity Test (BAT, a glare-testing device) should be performed with VA documented for each eye separately at the low, medium and high settings.
4. Confirmation is needed of exclusion of underlying pathology such as Wilson's disease, diabetes or hypoparathyroidism.

**TREATMENT:** Surgery with an intraocular lens (IOL) implant usually provides a sufficiently acceptable VA result for military flying duties. Consultation with NOMI ophthalmology prior to surgery is recommended.

**DISCUSSION:** The visual effect of a cataract depends on its encroachment on the visual axis and the proximity to the nodal point. A posterior subcapsular cataract can have a devastating effect on vision. 2 to 3 episodes of serious dehydration can increase the risk of developing a cataract 21 fold. Surgical success of greater than 90% in achieving a 20/40 best corrected VA after 1 year has been reported. The RAF restricts the flying of personnel with IOL from high performance aircraft and helicopters. This is because of the risk of pressure on ciliary body blood vessels under high Gz or vibration and because of the unknown long term effect on the corneal epithelium.

**ICD-9 CODES:**

**366 Cataract**

**366.1 Posterior Sub-Capsular Cataract (senile)**

**366.20 Traumatic Cataract**

**366.45 Drug induced Cataract**

**743.30 Congenital Cataract**

## 12.2 COLOR VISION ABNORMALITIES

**AEROMEDICAL CONCERNS:** Normal color vision is required to accurately identify warning lights and color visual displays in the cockpit, external visual cues including airfield lighting, the Fresnel lens, and aircraft formation lights. Interactions with other optical devices, such as laser and protective visors may compound a given problem.

**WAIVER:** Applicants are CD, no waiver. Waivers have been granted for flight surgeons, aerospace physiologists and other selected Class II aircrew on a case-by-case basis. Waivers for a change in color vision in designated personnel are usually granted if not due to ocular pathology.

### INFORMATION REQUIRED:

1. Based on a conference with the U.S. Air Force on vision standards and procedures, the Pseudo-Isochromatic Plates (PIP) are considered the preferred primary test.
  - a. For the Navy, 12 of 14 correctly identified plates constitute a passing score. The preferred lighting is the MacBeth lamp. If one is not available, a daylight fluorescent bulb may be used. Do not use incandescent lighting as this may allow persons with mild deuteranomalous (green weak) deficiencies to pass. Passing criteria is 12 or more plates correctly read, i.e., no more than 2 errors. Record the findings as the number of plates correctly read out of 14. For example: PIPs 13/14 correct "PASS" or PIPs 9/14 correct "FAIL."
2. If member cannot pass the PIP, the FALANT may be administered as an alternative, if available.
  - a. Passing criteria for FALANT remains 9/9 or 16/18 correct responses.
3. If a designated crewmember fails both tests, evaluation is required to screen for acquired pathology, as well as a test of demonstrated ability, usually performed with the flight surgeon and safety officer as observers.

**TREATMENT:** N/A.

**DISCUSSION:** Defective color vision is usually congenital. In Caucasians, approximately 8% of males have inherited color defective vision and approximately 2% are dichromats with severe deficiency. The largest group is actually trichromatic, actually color weak rather than color deficient. Dichromatics are protanopes if they have a red-green deficiency related to red-sensitive cone loss, deuteranopes if they are red-green deficient related to green-sensitive cone loss and tritanopes if they have blue-yellow deficiency related to blue-sensitive cone loss. Deuteranopes and protanopes have difficulty interpreting VASI lights' red-white color relationship. Protanopes have difficulty interpreting red high speed taxiway exit and runway end marker lights. At night, dichromats may be further reduced to monochromaticity when the physiological phenomenon of small field tritanopia is added; this is of relevance in distinguishing navigation and anti-collision lights. Color vision can be affected after optic neuritis or in macular degeneration, central serous retinopathy, and multiple sclerosis or as a sequela to heavy metal poisoning. Some color vision deficiencies are acceptable, but the most problematical being red-green abnormalities.

**ICD-9 CODES:**

**368.5 Color Vision Abnormalities**

## 12.3 DECREASED VISUAL ACUITY

**AEROMEDICAL CONCERNS:** Decreased visual acuity degrades lookout and target acquisition.

**WAIVER:** A waiver for visual acuity less than standards may be considered in designated individuals, provided the central and peripheral retina is normal and all other visual standards are met.

Category	Unaided Visual Acuity	Refractive Limits	NATOPS Restrictions
<b>SG1</b>	20/100 or better each eye	No refractive error limits	None
<b>SG2</b>	20/200 or better each eye	None	* Restricted from shipboard duties including VSTOL  * Helicopters OK
<b>SG3</b>	20/400 or better each eye	None	* Dual Controlled only  * Requires SG1 or 2 onboard  * Separate Pilot in Command Waiver required

Consider whether a waiver is actually required. An aviator whose vision is worse than 20/400 will need a waiver to fly in any Service Group. A clear justification is required, including primary type of aircraft in which he or she will be flying and the number of hours in that type of aircraft. Remind your aviators that SG3 Pilot in Command waivers are addressed to CNO (N889) and are valid only for the current command. Refer to OPNAVINST 3710.7 Chapter 8 Section 5 for further details.

### INFORMATION REQUIRED:

1. Optometry or ophthalmology consults for any waiver request for refractive error.
2. Ophthalmology consult required for cases of decreased visual acuity not due to simple myopia, hyperopia, astigmatism or presbyopia.
3. Obtain retinal evaluation at corrections greater than -5.50 diopters.
4. Progressive astigmatism should be evaluated to exclude keratoconus.

**TREATMENT:** Refraction by spectacles within the limits set by MANMED Chapter 15. Contact lenses are permissible for aviation personnel, but spare clear spectacles must be carried in flight and the aviator must demonstrate 20/20 with contact usage. Radial keratotomy, LASIK, or other corneal surgical procedures for the correction of myopia is CD, no waiver. NAMI

ophthalmology should be consulted for applicants who have had or are suspected of having excimer laser photorefractive keratotomy (PRK).

**DISCUSSION:** Myopia is usually a progressive condition, stabilizing around age 30. Significant myopia is complicated by considerable visual distortion at the periphery of corrective lenses. Individuals with significant myopia may see halos or flares around bright lights at night and are more at risk for night blindness. Elongated globes are at an increased risk of retinal detachment and of lattice degeneration. Whenever a prescription is changed, aircrew should be warned about transient visual distortion and counseled on the period of adjustment. Evidence suggests that there is no difference in civil accident rates or in naval carrier landing accidents in pilots who require visual correction. Severe myopia tends to be a problem pertaining to Class II personnel since the entry requirements for other pilots tend to be sufficiently stringent to exclude those whose vision would deteriorate that much. The risk of retinal detachment in normals is 0.06% over 60 years compared to 2% in 5 diopter myopes. Beyond -9.75 diopters, the risk increases to 24%. Recent studies of radial keratotomy suggest that the procedure leaves 28% of the eyes with unstable refraction and nearly all with glare problems.

**ICD-9 CODES:**

**367.9 Decreased Visual Acuity**

**367.9 Ametropia [Includes Myopia and Hyperopia]**

**367.95 Ametropia, exceeding standards**

**368.0 Amblyopia**

## 12.4 DEFECTIVE DEPTH PERCEPTION

**AEROMEDICAL CONCERNS:** Although many visual cues regarding the relative positions of objects in space (depth perception) are monocular. The binocular visual reflex of stereopsis is an important indicator of normal visual acuity in each eye, with normal ocular alignment and normal binocular visual development. Defective stereopsis may make certain piloting duties such as formation flying and aerial refueling more difficult.

**WAIVER:** No waivers shall be recommended for any candidate or designated Class I duty involving actual control of aircraft. Class II and III personnel must meet standards for depth perception except when remarked as "not required" under types of aviation duty specified under MANMED Articles 15-87 through 15-99.

### INFORMATION REQUIRED:

1. Valid tests of stereopsis include:
  - a. **Armed Forces Vision Tester (AFVT)**
  - b. **Verhoeff Stereoptor**
  - c. **Stereoacuity Plates** used with polarized viewers such as the Stereo Optical or Titmus Optical **Stereo Fly** or **Randot**. A randomized version of these tests may be used if the examiner deems it necessary.
2. Although the devices test stereopsis at optical infinity, intermediate or near distance-respectively, a pass of any one test meets the stereopsis standard. The tests must be administered and results recorded as specified in MANMED and elsewhere in the ARWG.
3. Recent loss of stereopsis in a designated Class I naval aviator is usually due to a change in refraction or onset of presbyopia, but may also be a sign of cataract, macular or optic nerve disease or new motility disturbance.
4. New failures to meet the stereopsis standard must be evaluated by an ophthalmologist including completion of the [ocular motility worksheet](#) as specified by the attached instructions found elsewhere in the ARWG.

**TREATMENT:** Correct any underlying refractive error or eye disease.

**DISCUSSION:** Defective stereopsis is typically innate and due to abnormal visual development prior to the age of 9. Causes of defective stereopsis include abnormal ocular muscle balance, amblyopia, anisometropia, microtropia, and monofixation syndrome.

### ICD-9 CODES:

**368.33 Defective Depth Perception**

## 12.5 HISTORY OF STRABISMUS SURGERY

**AEROMEDICAL CONCERNS:** Single, fused, simultaneous binocular vision in all versions at all times with the stereopsis reflex active is a requirement for safe and effective duty involving actual control of aircraft. Congenital or acquired defects of ocular alignment as well as any surgery to correct ocular misalignment present a grave hazard to normal binocular vision.

**WAIVER:** History of strabismus surgery is considered disqualifying for all aviation duty. A waiver will not be considered for an SNA applicant. A waiver for aviation duty other than an SNA applicant will be considered on a case-by-case basis no sooner than six months after a successful and stable strabismus surgery if post-operatively, the member otherwise meets the visual standards appropriate for his or her duty.

### INFORMATION REQUIRED:

1. Submission must include an [ocular motility worksheet](#) completed at the time of waiver request by a provider qualified to measure all required data.
2. Include copies of all eye exams and operative report(s) with AMS.

**TREATMENT:** Strabismus surgery involves enhancing or retarding the action of one or more extraocular muscles in either or both eyes. An extraocular muscle tendon may be shortened (resection) to strengthen its action, or the insertion of the muscle moved posteriorly on the globe (recession) to weaken its action. Suspending the tendon on hangback sutures is an alternative to traditional recession surgery. Adjustable sutures may be employed to fine tune ocular alignment in the perioperative period. A spacer may be inserted in the muscle tendon with unusual forms of vertical muscle surgery. In general, vertical muscle strabismus surgery is more complex and problematic than horizontal muscle surgery for simple eso- or exotropia.

**DISCUSSION:** Ocular misalignment is always the consequence of disease and never a normal finding. Surgery on extraocular muscles is imprecise and has a risk of regressing to the original state of misalignment or progressing in effect and causing sequential overcorrection. Multiple surgeries are frequently necessary for congenital misalignment. Scarring of the globe and adnexa after muscle surgery may lead to restricted ductions. Vertical muscle surgery often causes or does not fully correct cyclotorsional misalignment.

Realignment of the eyes with muscle surgery does not resolve the underlying disorder in congenital misalignments and while peripheral binocular function may be partially enhanced, normal central binocular visual development and stereopsis are rarely achieved. Even after satisfactory surgical alignment in congenital esotropia, residual comorbidities such as latent nystagmus and dissociated vertical deviations are often seen. The desirable cosmetic result after strabismus surgery is 10 or fewer prism diopters of misalignment since this relatively small degree of tropia is not noticeable to casual observation of the eyes. Asymptomatic vision with tropia less than 10 prism diopters meets the NOHOSH standard for Class II and III.

### ICD-9 CODES:

**H153 Surgery for strabismus or ocular muscle imbalance**

## 12.6 EXCESSIVE PHORIAS

**AEROMEDICAL CONCERNS:** Excessive phorias are frequently associated with defective stereopsis and/or diplopia, a devastating state if this occurs during a critical phase of flight.

**WAIVER:** CD for Class I aviators. No waivers are considered.

### **INFORMATION REQUIRED:**

1. Evaluation by an eye professional or an ophthalmologically proficient flight surgeon is necessary.
2. The consult should address any history of diplopia or previous eye surgery, and include all the studies requested on the accompanying [ocular motility worksheet](#).

### **ICD-9 CODES:**

**378.4 Excessive Phorias**

**378.41 Esophoria**

**378.42 Exophoria**

**378.43 Hyperphoria**

## 12.7 RETINAL DETACHMENT

**AEROMEDICAL CONCERNS:** A detached or torn retina can lead to visual impairment, the seriousness of which depends on the part of the retina involved and the success of therapy. Routine exposure to slow-onset G forces has not been shown to increase the risk of retinal detachment.

**WAIVER:** Waiver will usually be considered on a case by case basis and will often require three months of recovery time if surgical treatment is indicated.

**INFORMATION REQUIRED:** Please submit all relevant eye examinations and operative reports to include a Humphrey Visual Field, detailed retinal drawings, motility exam if scleral buckling is performed and a glare testing if a pneumatic retinopexy or vitrectomy is performed.

**TREATMENT:** Surgical intervention is required in most cases. The best approach will usually be determined by the operative surgeon and may consist of one or more of the following techniques cryotherapy, laser retinopexy, pneumatic injection, scleral buckling, or vitrectomy.

**DISCUSSION:** Visual acuity and visual field loss, changes in refractive error, motility disorders, and cataracts are possible (and not infrequent) outcomes of this disease.

### **ICD-9 CODES:**

**361.0 Retinal Detachment with retinal defect**

## 12.8 GLAUCOMA & OCULAR HYPERTENSION

**AEROMEDICAL CONCERNS:** The most common types of glaucoma (open angle) are usually asymptomatic. Gradual, almost imperceptible loss of peripheral visual field is typically the earliest manifestation with loss of central vision occurring only in the most advanced stages. Elevated eye pressure is not always present in patients losing vision from open angle glaucoma. Roughly a third of those presenting with glaucoma have intraocular pressures (IOPs) less than 21 mm Hg and many will continue to lose substantial amounts of vision even with significant lowering of IOP.

The less common acute angle closure types of glaucoma will present in a much different manner with symptoms such as eye pain or decrease in central vision with halos around lights. Signs may include a red eye with a hazy cornea and a mid-dilated poorly reactive pupil.

Both types require referral to the eye clinic with the latter requiring urgent referral through the local emergency room to reduce the risk of severe vision loss. Both types are considered disqualifying because loss of peripheral visual field to a significant degree is incompatible with flight duties.

Ocular hypertension (high pressure in the eye without visual field loss and with normal optic nerves and gonioscopy) is not equivalent to a diagnosis of glaucoma. In fact, most people with what is often considered to be high pressure (>21 mm Hg) never develop vision loss. This population, nonetheless, is at higher risk of developing glaucoma and so this condition is also considered disqualifying.

**WAIVER:** For the purposes of Naval Aviation, any IOP consistently (on at least 2 different exams on different days) and accurately measured above 22 mm Hg by a method other than non-contact tonometry is considered disqualifying whether or not the diagnosis is simply ocular hypertension or glaucoma.

Any diagnosis of glaucoma is considered disqualifying regardless of IOP.

**Designated:** Waivers are considered on a case by case basis.

**Applicants:** Waivers are usually not considered.

### INFORMATION REQUIRED:

#### Initial Evaluation:

A complete eye exam must include the following:

1. IOP by Goldmann applanation tonometer or Tonopen
2. Central Corneal Thickness
3. Dilated fundus examination (to include comment on the cup-to-disc ratio and description of the nerve)
4. Automated visual field testing (30-2)

5. Slit lamp examination
6. Gonioscopy
7. Retinal nerve fiber layer analysis (using a GDX, OCT, HRT, etc.), is desirable, but is not required.

**Annual Waiver Evaluation:**

A complete eye exam must include all of the above except:

1. Central corneal thickness
2. Gonioscopy, except when indicated.

**TREATMENT:**

The following are acceptable topical agents:

1. Prostaglandin analogs
2. Beta blockers
3. Carbonic anhydrase inhibitors
4. Sympathomimetics

Miotic drugs are incompatible with night operations due to the inability of the pupil to dilate to admit sufficient light. Beta blockers, if used, must NOT cause any reduction in circulatory or respiratory function. Practitioners must be mindful of the unique cardio-respiratory demands of the aviation environment.

**DISCUSSION:**

Waivers may be granted if visual field loss is minimal and stabilized either with an acceptable topical agent as listed above or with laser trabeculoplasty. Filtration or tube shunt surgery is usually not considered compatible with safe flight operations. Continuation of the waiver requires only annual submission, but eye examinations are usually conducted more frequently as determined by the treating eye doctor.

**ICD-9 CODES:**

**365 Glaucoma & Ocular Hypertension**

**365.04 Ocular hypertension**

**365.10 Open angle glaucoma**

**365.20 Closed angle glaucoma**

## 12.9 KERATOCONUS

**AEROMEDICAL CONCERNS:** Keratoconus is a degeneration of the cornea leading to its progressive thinning and irregular deformation. Visual acuity may be reduced in such a way that it cannot be corrected to 20/20 with spectacle lenses. Other symptoms may include diplopia, ghosting of images or reduced ability to discern low contrast images.

**WAIVER:** A waiver is usually not recommended for applicants, but may be considered in designated personnel if correctable to 20/20 with spectacles.

### **INFORMATION REQUIRED:**

1. Current ophthalmologic/optometric exam to include:
  - a. Corneal Topography
  - b. Best corrected visual acuity (BCVA) with contact lenses if used
  - c. BCVA with spectacles
2. Annual submission is required.

**TREATMENT:** Contact lenses are often necessary to achieve the best vision. Advanced disease management may include corneal transplant. Corneal refractive surgery is contraindicated in the presence of keratoconus. Contact lens use in any aviator requires specific authorization on the aeromedical clearance form (up-chit). Please refer to section 12-16, Naval Aviation contact lens policy.

**DISCUSSION:** The syndrome is usually bilateral but may rarely affect one side only. The symptoms usually start in the teens. The condition has been reported to be slowly progressive in 22.5% of cases but stabilization can occur at any time. It is very difficult to diagnose keratoconus in the early stages unless a corneal topographic mapping apparatus is used. Aviators with rapidly increasing myopia or astigmatism may warrant such testing.

### **ICD-9 CODES:**

**371.6 Keratoconus**

**12.10 TOPIC IN REVIEW**

## 12.11 RETINAL VEIN OCCLUSION

**AEROMEDICAL CONCERNS:** Symptoms range from mild peripheral visual blurring to severe visual field loss.

**WAIVER:** The granting of a waiver will depend on the resultant visual acuity and the absence of other pathology.

**INFORMATION REQUIRED:**

1. Ophthalmology consultation is necessary with confirmation that the visual acuity meets standards and that neovascular glaucoma has not developed.
2. Exclusion of other pathology such as hypertension, diabetes, blood dyscrasias, multiple myeloma and dysgammaglobulinemia is required.

**TREATMENT:** Photocoagulation is sometimes useful in central retinal vein thrombosis and in long-standing cases of branch retinal vein occlusion.

**DISCUSSION:** Macular edema occurs in 57% of cases of occlusion of the temporal branch of the retinal vein. Visual acuity improves in 60% of patients with branch retinal vein occlusion and 50% achieve visual acuity of 20/40 or better within 1 year. In central retinal vein occlusion, neovascular glaucoma develops in 15% of cases.

**ICD-9 CODES:**

**362.3 Retinal Vein Occlusion**

## 12.12 UVEITIS

**AEROMEDICAL CONCERNS:** Anterior intraocular eye inflammation (often referred to as iritis) can result in mild to severe eye pain, photophobia, excessive tearing, and blurred vision. Although it is usually an isolated, auto-immune condition, there may be an associated underlying systemic diagnosis. Further testing may be indicated required to determine this.

**WAIVER:** A waiver can be considered for a single episode of anterior uveitis that resolves without complication and is not associated with any underlying systemic condition. A waiver is usually not recommended for recurrent uveitis or for more posterior inflammation in applicants. Any associated underlying diagnoses should be considered accordingly.

### **INFORMATION REQUIRED:**

1. Eye consultation
2. Appropriate referral as necessary for any underlying systemic condition.

**TREATMENT:** Treatment for uveitis depends on the portion of the uvea that is affected. Anterior uveitis is usually successfully treated with topical steroids and cycloplegics.

**DISCUSSION:** Uveitis is an inflammation of the uveal layer inside the eye. The uvea consists of the choroid, ciliary body, and iris. It provides most of the blood supply to the retina. Uveitis may be unilateral or bilateral and occurs most frequently in people ages 20-50.

Anterior uveitis, or an inflammation of the iris, is often termed iritis and is the most common form. These patients usually report a deep aching of the eye and orbit, mild redness (circumlimbal injection), and sensitivity to light. Vision may or may not be affected, however, some patients will report a 'haziness' to their vision. The hallmark signs of anterior uveitis are "cells and flare" in the anterior chamber. White blood cells and iris protein strands are liberated into the anterior chamber as an inflammatory response. Other signs include circumlimbal injection, and possible corneal edema. In more severe cases, patients may present with keratic precipitates (white blood cell collections on the posterior corneal surface) and posterior synechiae (iris adhesions to the anterior lens capsule). Acute iritis is most commonly a result of blunt ocular trauma, however, many cases are idiopathic. It can also be the result of an autoimmune disorder, infection, or exposure to toxins. A single episode of iritis is generally not an indication for further testing to determine a systemic cause, however, recurrent, or persistent iritis warrants further work up.

Posterior uveitis is an inflammation of the choroid and/or ciliary body (inflammation of the ciliary body, or pars planitis, is often termed intermediate uveitis, however, will be grouped with posterior uveitis for the purpose of this discussion). Patients with this type of inflammation may complain of ocular pain and/or floaters, however, are quite often asymptomatic. Comprehensive slit lamp examination may reveal an inflammatory response ("cells and flare") in the posterior chamber. The severity of the response may result in a "snow banking" or "snowball" appearance, and resultant scarring can form leading to areas of vision loss.

Possible underlying conditions may include:

Toxoplasmosis

Histoplasmosis

Tuberculosis

Sarcoidosis  
CMV  
Herpes Zoster  
Reiter Syndrome

Syphilis  
Ulcerative colitis  
Ankylosing Spondylitis  
Lyme Disease

AIDS  
Rheumatoid Arthritis  
Behcet Syndrome

Standard lab tests include:

CBC with differential  
RF  
FTA-ABS

ANA  
ACE  
Lyme titer (if appropriate)

HLA-B27  
PPD  
RPR

**ICD-9 CODES:**

**364.3 Uveitis**

## 12.13 PTERYGIUM

**AEROMEDICAL CONCERNS:** A pterygium is an elevated patch of subconjunctival tissue that extends from the medial canthus to the border of the cornea or beyond, with the apex pointing towards the pupil. The progressive encroachment of a pterygium upon the cornea may lead to progressive astigmatism and refractive error that does not correct with common spectacles. Pterygia may also cause irritation of the corneal and/or conjunctival surface resulting in complaints of a scratchy, itchy, or dry eye. The use of UV protective lenses may reduce the likelihood of disability from pterygium growth and/or inflammation.

**WAIVER:** Asymptomatic pterygia up to and including 1.0 mm corneal invasion (measured from the limbal border) are NCD for both applicants and designated aviation personnel, provided vision corrects to 20/20 with spectacles. Designated aviation personnel with symptomatic pterygia or pterygia greater than 1.0 mm are CD but a waiver will be considered if vision corrects to 20/20 with spectacles and symptoms, if present, are controlled with conservative measures such as artificial tears. If a pterygium requires surgical removal, a waiver may be considered when the member's vision has stabilized and is correctable to 20/20, post-op complaints have resolved, and the member is returned to full duty by the operating surgeon. Aviation applicants with pterygia greater than 1.0 mm are NPQ with waiver not recommended.

### **INFORMATION REQUIRED:**

1. Ophthalmology or optometry consult to include:
  - a. Drawing or clear description of the pterygium and the amount of encroachment on the cornea.
  - b. Manifest refraction documenting visual acuity corrects to 20/20 with spectacles.
  - c. Documentation of any symptoms (e.g. tearing, scratchiness, etc...) and treatments.
2. Post-op patients also must submit:
  - a. Operative report
  - b. Clearance for full duty by operating surgeon
  - c. Post-op manifest refraction documenting visual acuity corrects to 20/20 with spectacles
  - d. Documentation of absence of post-op complications or complaints

### **ICD-9 CODES:**

**372.4 Pterygium**

## 12.14 OCULAR MOTILITY WORKSHEET

OCULAR MOTILITY WORKSHEET											
<b>Pertinent history</b>											
Distance VA OD 20/ OS 20/	Manifest Refraction OD _____ Corr to 20/ OS _____ Corr to 20/										
Cycloplegic Refraction OD _____ Corr to 20/ OS _____ Corr to 20/	Habitual Rx OD _____ Corr to 20/ OS _____ Corr to 20/										
Correction used for remainder of examination <input type="checkbox"/> Habitual <input type="checkbox"/> Manifest <input type="checkbox"/> None											
<b>Cover Test</b>											
Far (all gazes)	<table border="1" style="border-collapse: collapse; width: 100px; height: 100px;"> <tr><td style="width: 33px; height: 33px;"></td><td style="width: 33px; height: 33px;"></td><td style="width: 33px; height: 33px;"></td></tr> <tr><td style="width: 33px; height: 33px;"></td><td style="width: 33px; height: 33px;"></td><td style="width: 33px; height: 33px;"></td></tr> <tr><td style="width: 33px; height: 33px;"></td><td style="width: 33px; height: 33px;"></td><td style="width: 33px; height: 33px;"></td></tr> </table>										Near (all Gazes)
Extraocular Motility	Maddox Rod @ 20 ft distance	Stereopsis (Verhoeff)									
Worth 4 Dot @ 20 ft distance	Vectograph (anti-suppression)	Stereopsis (Randot)									
4 Δ Base Out (microstrab)	Other test results (as applicable)	Stereopsis (AFVT)									
Impression:		Is Patient NOHOSH? (No Obvious Heterotropia or Symptomatic Heterophoria) <input type="checkbox"/> Yes <input type="checkbox"/> No									
Optometrist/Ophthalmologist's name and phone number		Date									
Patient Name		SSN									
Rank/Rate	Unit/Address										

IF YOU HAVE ANY QUESTIONS REGARDING THE EXAMINATION OR HOW TO FILL OUT THIS WORKSHEET, PLEASE CALL NOMI OPHTHALMOLOGY AT DSN 922-4558 OR COMMERCIAL (904) 452-4558.

**PERTINENT HISTORY:** Explain why the work-up is being done. For example: "scored 7 esophoria on AFVT" or "muscle surgery OS at age 6 years."

**REFRACTION:** SNAs and SNA applicants need a cycloplegic refraction recorded, all others require a manifest refraction. SNAs and SNA applicants who see less than 20/20 unaided also require a manifest refraction recorded.

**HABITUAL RX:** Record the subject's habitual Rx here if different from the manifest. If none is used, or the subject wears contact lenses, please note on the form.

**COVER TEST:** Report **numerical** values. Use a prism bar or loose prisms. Do horizontal and/or vertical as applicable to the case. Horizontal limits are approximately 45 degrees to the left and right of center. Vertical limits are approximately 25 degrees above and 35 degrees below center. Limits may need to be modified as dictated by the size of the nose and brow.

**EXTRAOCULAR MOTILITY:** Give description, such as "Smooth and full."

**MADDOX ROD/VON GRAEFE:** Report **numerical** values for **both** horizontal and vertical phorias. Fixation target must be at 20 feet.

**STEREOPSIS:** Verhoeff, done at 1 meter in a normally lit room, is currently the only acceptable test. Neither the device nor the patient should move during the test.

**WORTH 4 DOT:** Perform at **both** distance and near. Report "fusion," "diplopia," or "suppression OD/OS."

**VECTOGRAPH:** Test on the 20/40 (V O C S R K 4) line of the A.O. Vectographic slide. Report any suppression, and which eye is suppressing. If there is no suppression, state so.

**RED LENS TEST:** Test all 9 position of gaze, just like the cover test. Report any diplopia. If no diplopia is reported, state so.

**4D BASE OUT TEST:** Used to augment the A.O. Vectograph in the diagnosis of microstrabismus. This test is not always applicable and may be left blank if not used.

**NOHOSH = No Obvious Heterotropia or Symptomatic Heterophoria.** Answer this question if the subject is NPQ (Not Physically Qualified for SNA (Student Naval Aviator), but would consider applying for the SNFO (Student Naval Fight Officer) program.

**PROVIDER PHONE NUMBER:** Indicate **both** DSN and commercial.

## 12.15 CORNEAL REFRACTIVE SURGERY (PRK/LASIK)

### AEROMEDICAL CONCERNS:

#### Definitions:

**Corneal Refractive Surgery (CRS):** A laser is used to reshape the anterior corneal surface reducing refractive error and reliance on spectacles or contact lenses. A “wavefront-guided” (WFG) or “custom” procedure uses wavefront analysis technology, and may improve the visual outcome of the procedure.

**Photorefractive Keratectomy (PRK) or Laser-Assisted Epithelial Keratectomy (LASEK) :** Laser energy is applied to the anterior corneal surface after the epithelium is temporarily displaced or removed. No corneal flap is created. PRK variants include LASEK (epithelium is preserved), and Epi-LASIK (epithelial flap is created). Pain can be moderate to severe, and visual recovery can take months.

**Laser in-situ keratomileusis (LASIK):** A cornea stromal flap is created with a surgical blade or infrared laser after which, an excimer laser is used to reshape the exposed corneal stroma. The corneal flap is then repositioned. Pain is minimal and vision recovery is much faster than PRK.

**All forms of refractive surgery are disqualifying for aviation duty, but waivers are readily granted if the member meets all waiver guide policy guidelines.** Designated members who undergo refractive surgery shall be grounded at the time of surgery, but a grounding physical is not required. Designated members shall not return to flight duty until a Local Board of Flight Surgeons (to include one eye provider) recommends a waiver via an Aeromedical Summary (AMS) and issues a ninety-day temporary aeromedical clearance notice.

**Both PRK and LASIK are waivable at this time (see specific sections below).**

**All other forms of refractive surgery, or any vision or corneal manipulation or surgery, including RK (radial keratotomy), LTK (laser thermal keratoplasty), ICR (intracorneal ring), ICL (intraocular corrective lens), and clear lens extraction, are permanently disqualifying (CD/WNR) for all aviation duty Class I, II and III personnel.** The prior use of orthokeratology (rigid contact lens corneal reshaping) is NCD provided that it is permanently discontinued prior to obtaining flight status and all appropriate refractive standards are met with stable topography.

## **PRK AND LASIK GENERAL GUIDELINES (applicants and designated personnel)**

1. Post-operatively, the member must still pass all MANMED vision standards for their class or applicant status, and must wear corrective lenses while flying, if required, to achieve the vision standard.
2. Refractive stability and a satisfactory postoperative slit lamp exam is required. Trace peripheral haze or scarring that is considered stable by the eye care provider, and not visually significant, is not a hindrance to waiver.
3. There must be no symptoms that would be cause for concern when considering the performance of the member's usual flight duties, including, but not limited to, severe dry eye, recurrent corneal erosions and visually significant glare, haloes, or central scarring.
4. A subsequent PRK or LASIK enhancement or "touch-up" must meet the same timeframe and clinical guidelines, and requires a second waiver submission package and AMS.
5. Wavefront-guided, or "custom", PRK or LASIK is preferred, but in no way is required for a waiver recommendation. This custom treatment may increase visual acuity and final vision outcomes significantly, but not all patients are candidates for custom treatments.
6. Copies of all pre-operative, and post-operative examination paperwork, including the laser treatment reports, are required for waiver considerations. NAMI may request additional information as deemed medically necessary to make a waiver determination.
7. For PRK and LASIK waiver renewal, submission is as stated in the member's BUMED waiver letter. In general, those enrolled in the LASIK studies require annual submission. All others only require routine five-year submission.

### **Applicants only:**

1. All applicants for Naval aviation must satisfy the above general guidelines and the following more specific guidelines:
2. Civilian applicants must obtain PRK or LASIK at their own expense at a civilian refractive surgery center. Active duty applicants may apply for waiver whether their surgery was performed at a civilian refractive surgery center prior to joining the military, or at a military RSC. The minimum wait time before submitting a waiver request for applicants is six months from the date of surgery. All paperwork and operative reports must be available and submitted for waiver consideration. **See section 12.15B for additional information and requirements for LASIK in Student Naval Aviators.**
3. SNA applicants: pre-operative refractive error must not exceed -8.00 to + 3.00 (SE) and 3.00 diopters of cylinder, with no more than 3.50D of anisometropia. They must additionally have a post-operative cycloplegic refraction using cyclopentolate performed at a military installation.

## **SPECIFIC PRK AND LASIK GUIDELINES (cont):**

### **Active duty designated aviation personnel only:**

1. Designated aviation personnel must satisfy all the above general guidelines and the following guidelines:
2. A PRK waiver request may be submitted for:
  - a. myopia -6.00 diopters or less spherical equivalent (SE): 3 months
  - b. myopia greater than -6.00 diopters SE: 6 months
  - c. hyperopia SE: 6 months
3. A LASIK waiver request may be submitted for:
  - a. myopia: 2 weeks
  - b. hyperopia and mixed astigmatism: 4 weeks
4. If still requiring prescription topical medication (Restasis or cyclosporine drops excluded) then restriction of flight activities to the local area is recommended.
5. Class I aviators, specifically, must undergo PRK or LASIK treatment at one of the USN designated refractive surgery centers (includes Tripler AMC and Keesler AFB, which have Navy ophthalmology support). (See section 12.15A for additional information)
6. Class II, III, and other flight personnel (e.g. select passengers) may undergo PRK or LASIK at any DoD refractive surgery center.
7. For PRK, there are no pre-operative refractive limits for already designated personnel within their aviation class. For LASIK, waivers may be granted for myopia up to -11.5D spherical equivalent with no more than 3.5D of astigmatism, and hyperopia up to +3.75D spherical equivalent with no more than 2.75D of astigmatism.
8. Regardless of prior designated aviation class, any personnel applying for SNA status must abide by all MANMED and waiver policy guidelines and refractive limits for SNA applicants.
9. The [CRS/PRK AMS template](#) (available on the NAMI website) may serve as a Local Board of Flight Surgeons, following review and endorsement by two flight surgeons, plus an eye care provider (military optometrist or ophthalmologist), and commanding officer approval. A ninety-day aeromedical clearance notice may be issued at that time, pending BUPERS waiver approval. Submit the AMS and waiver package immediately to NAMI to avoid unnecessary delays in obtaining BUPERS final approval.
10. No deployment for at least three months following PRK and one month following LASIK surgery (per BUMED policy).

## **SPECIFIC PRK AND LASIK GUIDELINES (cont):**

### **Select Reserve designated aviators:**

1. Reservists must satisfy all the above general guidelines and the following guidelines:
2. May obtain PRK or LASIK at their expense from civilian sources of care.
3. A pre-operative evaluation is strongly encouraged to be submitted to NAMI Ophthalmology before corneal refractive surgery is performed. Contact NAMI Ophthalmology at 850-452-2933 or NOMI-EyeDept@med.navy.mil.
4. Final approval to proceed with PRK or LASIK requires written permission from the unit commander and unit flight surgeon.

## **REFRACTIVE SURGERY DISCUSSION:**

The goal of corneal refractive surgery is to reduce or eliminate dependence on spectacles or contact lenses, which can be bothersome at times while flying. Refractive surgery has been studied extensively in the aviation environment and has yielded highly satisfying results. More than 95% of Naval Aviators reported “increased effectiveness” after undergoing refractive surgery.

Wavefront guided (WFG), or “custom”, refractive surgery has been evaluated by the Naval Refractive Surgery Center and yielded results that are superior compared to conventional treatment. Based on this analysis, aviation personnel should undergo a wavefront-guided or custom procedure, if possible. Some patients are not candidates for a wavefront-guided treatment for various reasons, and a conventional treatment remains a viable option. As with any surgical procedure, there are inherent risks, such as quality of vision deficits (e.g. halos and glare at night) and persistent eye discomfort (e.g. dry eye or recurrent erosions). A detailed description of the risks, benefits, and alternatives should be discussed and consented between the patient and their refractive surgeon.

History of PRK or LASIK does not guarantee qualification for an aviation duty waiver. The member must meet pre-operative standards in MANMED and this waiver policy guide. Post-operatively the applicant must meet all MANMED vision standards appropriate to their aviation class.

When obtaining corneal refractive surgery it is incumbent upon the member and the member’s commanding officer and flight surgeon to be aware of corneal refractive surgery waiver recommendations at the time of the surgery and subsequent submission. Rapidly evolving technology results in changes to waiver guidelines when appropriate. Every effort will be made to publish new regulations widely, but the only valid source of current recommendations shall remain the Manual of the Medical Department. When in doubt, NAMI ophthalmology remains available for consultation through phone or email:  
850-452-2933 ; NOMI-EyeDept@med.navy.mil

### **Medical Codes:**

**P1177 / H1177 PRK**

**P1171 / H1171 LASIK**

## 12.15A LASIK IN DESIGNATED AVIATORS STUDY

**Class I, Class II:** The LASIK Study for designated Class I and Class II personnel has been closed. Be aware that Class I personnel are required to have their LASIK procedure performed at one of the DoN Refractive Surgery Centers (including Tripler AMC and Keesler AFB, which have Navy ophthalmology support). Class II personnel may have LASIK performed at any DoD refractive surgery center. For designated personnel previously enrolled in the study, annual submission is required for renewal with supporting documentation per the LASIK study protocol.

## 12.15B LASIK IN STUDENT AVIATORS STUDY

**AEROMEDICAL CONCERNS:** The goals of this study are to evaluate safety, efficacy, and visual performance of LASIK in student naval aviators, flight officers and aircrew.

**WAIVER:** At this time, waivers for LASIK in Class I aviation applicant personnel require enrollment in the LASIK in student aviators study. For more information on study enrollment and inclusion criteria contact [NMCSD Refractive Surgery Center](http://www.med.navy.mil/sites/nmcsc/Patients/Pages/RefractiveSurgeryCenter.aspx) at : <http://www.med.navy.mil/sites/nmcsc/Patients/Pages/RefractiveSurgeryCenter.aspx>. For Class II and III aviation applicant personnel, waivers will be considered without study enrollment.

### GENERAL GUIDELINES:

1. Pre-LASIK refractive error measured under cycloplegia must not exceed -8.00 to +3.00 (spherical equivalent, SE) and 3.00 diopters of cylinder. Anisometropia shall not exceed 3.50 diopters (using SE for each eye).
2. At least three months have elapsed since surgery or re-treatment and evidence of stable refractive error.
3. Applicant must have screening vision exam performed at one of 10 participating screening sites:
  - NH Bremerton
  - NH Camp Pendleton
  - NMC San Diego
  - WRNMMC (Bethesda, MD)
  - NMC Portsmouth
  - NH Camp Lejeune
  - NH Jacksonville
  - BMC Newport
  - BMC Annapolis
  - NAMI (Pensacola, FL)

Applicant requirements for waiver consideration:

- a. Total post-operative higher order RMS aberrations less than or equal to 0.70 microns as measured by a Hartmann-Shack aberrometer, and adjusted for pupil size per nomogram.

- b. Best-corrected mesopic (low-light) visual acuity better than or equal to 0.50 logMAR as measured on a Precision Vision 25% low contrast visual acuity chart.
- c. Submission of detailed pre-operative, operative print-outs, and post-operative LASIK follow-up records.
- d. Demonstrate refractive stability.
- e. Submission of aviation physical examination (including Standard Form 2808 and SF507)
- f. Free of significant complaints (glare, haloes, starbursts, ghosting, excessive dry eye syndrome, pain, photophobia, etc.)
- g. Not requiring topical ophthalmic medications, aside from occasional artificial tear use.
- h. Have a normal postoperative slit lamp exam, with no visually significant complications (ectasias, epithelial ingrowth, central scarring, etc.)
- i. Meet refractive, cycloplegic, and vision standards post-operatively as defined by MANMED for aviation class.
- j. Annual submission is required for renewal with supporting documentation per the LASIK study protocol.

**Discussion:** “All-laser” LASIK is preferred, which utilizes two types of lasers to create the LASIK flap and perform the vision correction. The laser is preferred over a metal keratome blade to reduce the risk of operative complications and enhance post-op stability. “Wavefront-guided” or “custom” LASIK is also preferable, if available and the patient is a candidate for such. “All-laser, custom LASIK” gives a better visual outcome over conventional treatments. This has been borne out by repeated Navy research studies. Please note that no specific method of LASIK is mandatory for waiver consideration, as long as all pre- and post-op study criterion are met.

**Medical Codes:**  
**P1171 / H1171 LASIK**

## **12.16 NAVAL AVIATION CONTACT LENS POLICY**

All classes of Naval aviation personnel shall be allowed to wear contact lenses during duty involving flight when the following requirements have been met as outlined below. A notation from the flight surgeon authorizing contact lens use is required on the aeromedical clearance notice (up-chit) NAVMED 6410/2. Contact lens use is not disqualifying. A waiver for their use is not required.

### **REQUIREMENTS:**

1. Visual requirements specific to each class and service group must continue to be met while wearing contact lenses.
2. Near visual acuity must be 20/20 in each eye. Presbyopic personnel may use spectacles over their contacts to achieve this standard.
3. There must be no symptoms incompatible with safe flight, e.g. fluctuating vision, reduction in vision at night or under glare conditions, or discomfort.
4. Must have worn contact lenses on a daily basis without complication for a minimum of one month before their use can be authorized on the "up-chit".
5. The prescribing eye doctor must note in the patient's record that a good fit has been achieved and that no further changes are planned.
6. SCLs are not to be worn overnight while in flight training or flight status unless operationally mandated. If extended contact lens wear (greater than 24 hours) is an operational requirement, lenses may be worn for a maximum of seven consecutive days. Personnel are encouraged to limit extended wear to the shortest period possible. A minimum 12 hour recovery period, during which no contact lenses are worn, shall follow each extended wear period. Rigid gas permeable lenses shall not be used overnight.
7. During aviation duties, it is the responsibility of all contact lens wearers to carry clear spectacles in a readily accessible protective case which correct the wearer's vision to all applicable standards.
8. Follow-up examinations for personnel wearing contact lenses shall be conducted at least annually by a Navy optometrist or ophthalmologist.

### **APPROVED CONTACT LENSES:**

1. Only nationally available, FDA approved lenses and solutions are allowed.
2. Lenses of first choice shall be FDA approved silicone hydrogel contact lenses. Rigid gas permeable lenses are permissible, but strongly discouraged.
3. The following are NOT authorized:
  - a. Bifocal/multifocal contact lenses.
  - b. Cosmetically tinted contact lenses.
  - c. Sports tinted contact lenses (e.g. amber or green).
  - d. Contact lens wear for corneal refractive therapy (ortho-K).
4. The following are only authorized with an appropriate waiver:
  - a. Combinations of rigid and soft contact lenses.
  - b. Contact lens use for therapeutic reasons such as keratoconus or basement membrane dystrophies.

For any other questions regarding specific brands of contact lenses or waiver issues, please contact NAMI Ophthalmology Department.

<http://www.med.navy.mil/sites/navmedmpte/nomi/nami/clinical/Pages/Ophthalmology.aspx>

## 12.17 ALLERGIC CONJUNCTIVITIS

**AEROMEDICAL CONCERNS:** The condition can cause blurred vision, ocular itching, burning, tearing/discharge, eyelid edema, and photophobia. These signs and symptoms, along with the use of medications with unacceptable side effects, have the potential for in-flight incapacitation and prolonged periods of grounding.

**WAIVER:** Chronic allergic conjunctivitis is CD for all applicants according to the MANMED. Perennial and seasonal allergic conjunctivitis in designated personnel is NCD. The member shall be grounded while symptomatic. A waiver is not required if the member is treated with an approved medication. If the condition is associated with rhinitis, see chapter 6.1, ALLERGIC/VASOMOTOR RHINITIS.

**TREATMENT:** Mild symptoms of allergic conjunctivitis may be relieved by cool compresses and artificial tears to flush away the antigens. Moderate to severe symptoms may require, in addition to cool compresses and artificial tears, ophthalmic antihistamines and/or mast cell stabilizers. **Only prescription ophthalmic antihistamines and mast cell stabilizers are approved;** OTC or prescription ophthalmic vasoconstrictors/ decongestants, NSAIDS, and corticosteroids are **not approved**. Note that ophthalmic antihistamines containing vasoconstrictors/decongestants are **not approved**. If necessary, oral non-sedating antihistamines may also be used, see 6.1 ALLERGIC/VASOMOTOR RHINITIS for an approved list of medications.

**DISCUSSION:** Two forms of allergic conjunctivitis are quite common: seasonal (SAC) and perennial (PAC). SAC tends to be seasonal or multi-seasonal and coincides with pollen blooms (e.g., ragweed). PAC may occur at anytime or even year round (e.g., exposure to cat dander or dust mites). The most effective treatment is elimination or avoidance of the potentially offending allergen, although this may not always be possible or practical. Due to the potential chronicity of SAC/PAC, long term use of medication may be necessary to keep the member asymptomatic for aviation duties. Ophthalmic antihistamines and/or mast cell stabilizers have minimal side effects and are approved for use in aviation personnel. Contact lenses may exacerbate the condition and should not be worn until the member is asymptomatic.

### ICD-9 CODES:

**372.14 Chronic Allergic Conjunctivitis**

**372.05 Acute Atopic Conjunctivitis**