FAA Ophthalmology
Updates and Prevention of Eye Disease
Phoenix Air Cartersville GA

- AME since 2010
- North Georgia
Mr. Mark H. Thompson  
President of Phoenix Air Group, Inc.  
100 Phoenix Air Drive, S.W.  
Cartersville, Georgia 30120

Dear Mr. Thompson:

Thank you for your team’s hard work and courage during our critical mission to the Democratic People’s Republic of Korea. The efforts of the logistics staff, pilots, and medical team were instrumental in securing the release and return of Otto Warmbier. I especially want to highlight the work of Dr. Flueckiger. His impeccable medical knowledge, patience, and calm under pressure were on full display in Pyongyang, ensuring the success of our mission. Please extend my personal gratitude to Dr. Flueckiger.

The safety and well-being of our citizens abroad is a top priority of the Department of State. Your team’s professionalism, composure, and compassion throughout the duration of the mission exemplified the best qualities and values of the United States.

Sincerely,

Rex W. Tillerson  
Secretary of State
WHEN VISION WORKS & WHEN IT DOES NOT

US Airways Flight 1549, Hudson River, NYC, 1/15/2009
NTSB AAR1003

Delta Airlines Flight 554, Laguardia Airport, NYC, 10/19/1996
NTSB AAR-97/03

NTSB AAR-04-02

Cessna 172K, N251JM, Fresno, California, 12/26/2013
NTSB WPR14FA078
Cataracts May Be Symptomatic Even at 20/20

Symptoms depend on type of cataract

- Halos at night
- Glare in bright light
- Loss of contrast at dusk
- Dimming of colors
- Difficulty reading
The vast majority of my pre-operative cataract patients could easily pass the vision requirements for a 3rd Class FAA Medical Certificate.
• Many US patients undergo cataract surgery while their vision is 20

• Cataract surgery with lens replacement is our most accurate refractive surgery

• Quality of vision is the major determinant determining the need for
What do dental hygienists, WWII pilots and Marcus Welby have to do with innovation and improvement in cataract surgery?
The first intraocular lens for the treatment of cataract was implanted by Mr. HAROLD RIDLEY FRSE at St. Thomas' Hospital on 8th February 1950.
Posterior Chamber IOL
Multifocal and Accommodative IOLs (Cataract Replacement) 3 months, meets standard, 8500-7
“Symphony”
“Extended Range of Vision”
Multifocal Devices

- **Multifocal/Accommodating Intraocular Lens Implants**
  - 3 month wait post op

- **Multifocal/Bifocal contact lenses**
  - 1 month wait
  - Corrects for all distances unlike monovision contact lenses
  - Patients love them or hate them - convenient or blurred all distances

- Multifocal devices must be FDA approved
- Must be well tolerated, no disabling visual symptoms
- Get FAA Eye Form 8500-7, current status report
Regarding multifocal implants - there are two groups of patients that love their surgeon

1. Among well screened patients - they love the implanting surgeon

2. Among more perfectionistic and demanding patients - they love the consulting surgeon who removes and exchanges the multifocal IOL
“Doctor, I love this new implant, I can see far away and I can even read without my reading glasses. But most of all, you have made the moon so so so beautiful with that amazing ring that I see around it every clear night”
LASER Cataract Surgery ??
How good must a pilot see?
Who are these guys?
<table>
<thead>
<tr>
<th>Medical Certificate Pilot Type</th>
<th>First-Class Airline Transport Pilot</th>
<th>Second-Class Commercial Pilot</th>
<th>Third-Class Private Pilot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distant Vision</td>
<td>20/20 or better in each eye separately, with or without correction.</td>
<td>20/40 or better in each eye separately, with or without correction.</td>
<td></td>
</tr>
<tr>
<td>Near Vision</td>
<td>20/40 or better in each eye separately (Snellen equivalent), with or without correction, as measured at 16 inches.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate Vision</td>
<td>20/40 or better in each eye separately (Snellen equivalent), with or without correction at age 50 and over, as measured at 32 inches.</td>
<td>No requirement.</td>
<td></td>
</tr>
</tbody>
</table>
• Near Vision Acuity is determined for each eye separately and for both eyes together
• If the airman cannot pass the FAA vision standard with the best glasses available, it is reasonable to obtain an eye exam and
  reassess rather than defer. (Within 14 days)
Contact Lenses
MUST wear a rigid contact lens

- Advanced keratoconus - progressive ectasia and steepening of cornea
- Orthokeratology - for nearsightedness, The use of a rigid contact lens to temporarily reshape cornea and improve uncorrected vision
Presbyopia

• Age 40 and older
• Dependence on reading correction alone or in addition to distance correction
• Drug store Readers
• Bifocal or Progressive Glasses
• Bifocal or Multifocal Contact Lenses
• Near Vision Contact Lens
Monovision Question 17b

17.b. Do You Ever Use Near Vision Contact Lens(es) While Flying? □ Yes □ No

(If more space is required, see 17. a. on the instruction sheet).
WHEN VISION WORKS & WHEN IT DOES NOT

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Monovision

- October 19, 1996, McDonnell Douglas MD-88
- Descent below visual glidepath and collision with terrain
- Monovision from contact lenses implicated by NTSB
• It is disqualifying for a pilot to we
Acquired Monovision

• **Result of refractive surgery**
  – Vision without correction - one eye sees distance and the other can read (less than required distance vision)

• **Acquired monovision pilot can fly with correction to meet binocular distance standard.**

• **To fly uncorrected, FAA requires 6 month adaptation, 8500-7, Medical Flight Test, SODA**
• New Procedures for Near Vision

Kamra Implant  
Raindrop Implant
Monocular Patient

- One eye fails FAA visual acuity standards
- Result of eye trauma or pathology
- Must defer
- FAA Decision and Medical Flight Test
- At least six months adaptation following loss of binocular status
Monocularity

- 6 month adaptation period
- 8500-7
- **Defer to FAA**
- Requires Medical Flight Test
- SODA because defect is permanent
- Absolute loss of eye or eye failing FAA vision standard get 6 month wait and MFT
Monocular “One Eyed” Pilots

- Six months adaptation
- Defer
- Medical flight test required
- SODA
- 3,000 - 4,000 certified monocular pilots
Prevention
Sun and UV Protection

Ordinary UV protective Sunglasses
No Photochromic
No Polaroid!!
Aircraft Windshields not UV protective
U.S. DEPARTMENT OF TRANSPORTATION – FEDERAL AVIATION ADMINISTRATION

REPORT OF EYE EVALUATION

2A. NAME OF AIRMAN (Last, First, Middle) 2B. DATE OF BIRTH (Month, Day, Year) 2C. SEX (M or F)

3. ADDRESS OF AIRMAN (No. Street, City, State, Zip Code)

4. HISTORY – Record pertinent past and present history concerning visual problems, eye surgical procedures, and medical conditions.

5. HETEROPHORIA – Record phorias and tropias (specify which), in prism dioptries, with and without best lens correction in place.

<table>
<thead>
<tr>
<th></th>
<th>AT 20 FEET</th>
<th>AT 16 INCHES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. WITHOUT CORRECTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXO.</td>
<td>ESO.</td>
<td>HYPER.</td>
</tr>
<tr>
<td>B. WITH CORRECTION (If any)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXO.</td>
<td>ESO.</td>
<td>HYPER.</td>
</tr>
</tbody>
</table>

OMB Control No. 2120-0034
Expires 08/31/2014
LASIK and Cataract Surgery

• > 2 years ago
  – Meets standard and no adverse symptoms
  – Issue

• < 2 years ago
  – Obtain 8500-7 Eye Consultation form from operating surgeon
Color Vision
• No reason to defer based on color vision. Use easier approved screening test or issue with light gun/night flying limitation.
Abnormal Color Vision

FedEx 727 Accident

26 July 2002
Tallahassee, Florida
(NTSB Report: AAR-04/02)
Color Deficiency

- 8% of males
- X-linked
- 0.1% females
- Red/Green deficiency
Ishihara and similar tests
Farnsworth Lantern FALANT
FAA Color Vision Testing Flowsheet (Google it)
Operational Color Vision Testing
Color Vision Testing

• If airman passes color vision test
  – Mark “Pass” in box 52 and issue no restriction

• If airman does not pass color vision screening test
  – Mark “Fail” in Box 52 and issue the restriction
    • Not Valid for Night Flying or by Color Signal Control

• (Or utilize “easier” screening test)
If airman fails office based color vision screening test and desires an UNRESTRICTED 1st or 2nd Class Medical Certificate:

1. Pass Daytime OCVT
2. Pass Color Vision Medical Flight Test
Options Available to Applicant who fails the Screening Test (usually a student Pilot)

• Pass an alternate test (best option)
• Accept the limitation
• FSDO arranged testing to have the limitation removed
Applicant Fails Color Vision Screening

Select Night Vision, Light Gun signal restriction
Allow airman to take alternative screening test and obtain written documentation of result eg. Another local AME has FALANT
Lots of discussion
## FAA Approved Tests: Pseudoisochromatic plates

<table>
<thead>
<tr>
<th>Test</th>
<th>Edition</th>
<th>Plates</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>American Optical Company AOL</strong></td>
<td>1965</td>
<td>1-15</td>
<td>≥ 7 errors</td>
</tr>
<tr>
<td>AOC-HRR</td>
<td>2nd</td>
<td>1-11</td>
<td>Any error in test plates 7-11</td>
</tr>
<tr>
<td>Dvorine</td>
<td>2nd</td>
<td>1-15</td>
<td>≥ 7 errors</td>
</tr>
<tr>
<td>Ishihara</td>
<td>14 plate</td>
<td>1-11</td>
<td>≥ 6 errors</td>
</tr>
<tr>
<td>Ishihara</td>
<td>24 plate</td>
<td>1-15</td>
<td>≥ 7 errors</td>
</tr>
<tr>
<td>Ishihara</td>
<td>38 plate</td>
<td>1-21</td>
<td>≥ 9 errors</td>
</tr>
<tr>
<td>Richmond</td>
<td>1983</td>
<td>1-15</td>
<td>≥ 7 errors</td>
</tr>
</tbody>
</table>
## Acceptable Substitutes

<table>
<thead>
<tr>
<th>Test</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPTEC 900 Vision tester Farnsworth Lantern test</td>
<td>an average of &gt; than 1 error per series of 9 color pairs in series 2 and 3</td>
</tr>
<tr>
<td>LKC Technologies, Inc. APT-5 Color Vision Tester</td>
<td>The letter must be correctly identified in at least 2 of the 3 presentations of each test condition</td>
</tr>
<tr>
<td>Richmond-HRR, 4th edition</td>
<td>2 or more errors on plates 5-24</td>
</tr>
</tbody>
</table>
FSDO Testing

• 3rd Class
  – Operational Color Vision Test - OCVT
    • Office test regarding aeronautical charts, etc.
    • Day signal light test
  – If passes, restriction removed and Letter of Evidence issued indicating that airman passed
    • Bring to all subsequent flight physicals
  – If fails completely, can never retake the test
  – If passes map reading but fails the daylight light gun test, may take light gun test at night
    • If passes at night, may fly at night but not by color light signal during the day
Color Vision Test Restrictions

– SLT failed in daylight
  • “Not Valid for Night Flying or by Color Signal Controls”

– Took SLT at night, and passed
  • “Not Valid for Flight During Daylight Hours by Color Signal Control”
To Upgrade to Class 1 or 2

• Must pass OCVT and day SLT and a medical flight test (MFT) at night
• MFT
  – Much harder and more complicated than previously
Color Vision Medical Flight Test

Visual approach slope indicator

Precision approach path indicator

Taxiway lights

Runway approach lights

Colored lights of other aircrafts
Color Vision - Important

– Advise airman to contact CAMI/RFS to authorize operational testing if unable to pass any alternate approved office-based test.

– Airman should advise CAMI/RFS as to which FSDO he wishes to employ.
– Gain some **flight experience** before taking MFT

– Ask for one employing the **newer LED SLT**
Glaucosa and Visual Field
Types of Visual Fields

- **Tangent Screen**
  - Manual

- **Goldmann Field**
  - Manual, Kinetic/Static

- **Humphrey and Octopus Field**
  - Automated

- **Confrontation Field and Amsler Grid**
Prevention
Open Angle Glaucoma

• No symptoms in early stages
• Gradual loss of peripheral vision
• Disease is typically advanced once patients are symptomatic
• Importance of screening for early detection and treatment
Prevention Glaucoma

- Progressive and characteristic optic atrophy
- Usually but not always elevated eye pressure
- Open vs closed angle
Glaucmatous Optic Nerve

Healthy Optic Nerve

Optic Nerve in Eye with Glaucoma
B Optic disc with increased cup-to-disc ratio (0.9)
Glaucma

Optic Nerve Changes:
s with impaired vision can pass a
Prevention

Glaucoma

• **Characteristic damage = glaucoma.**

• **Primary Open Angle Commonest**
  – Normal IOP values: 10-21 mm Hg
  – Secondary, Narrow Angle, Low Tension Glaucoma

• **Damage to Optic Nerve**
  – Cupping, heme
  – Visual Field defects
Glaucoma

- **Severe Glaucoma**
  - Annual review by FAA, some get MFT without SODA

- **Mild-moderate**
  - AASI, visual fields and 8500-14/status report

- **Mild**
  - CACI
    - Treating ophthalmologist finds the condition stable on current regimen and no changes recommended…**Yes**
    - Age at diagnosis…**40 or older**
# Ophthalmological Evaluation for Glaucoma

**U.S. Department of Transportation**  
**Federal Aviation Administration**

## 1. Date

## 2A. Name of Airman (Last, First, Middle)  
2B. Date of Birth (Month, Day, Year)  
2C. Sex (M or F)

## 3. Address of Airman (No. Street, City, State, Zip Code)

## 4. History -- Record pertinent history, past and present, concerning general health and visual problems.

## 5. Family History of Glaucoma

## 6. Diagnosis

<table>
<thead>
<tr>
<th>Type (Check One)</th>
<th>Simple, Wide Angle, Open</th>
<th>Closed Angle, Narrow Angle, Angle Closure</th>
</tr>
</thead>
</table>
AME Assisted Special Issuance, AASI

- After initial authorization
- **AME may issue**
  - If meets standards
  - There is no significant worsening of the visual fields
  - The pressure is controlled without medication side effects
  - 8500-14 must be submitted along with current fields
- **AME must defer if the above is not true**
- Only for open angle glaucoma and ocular hypertension
## GLAUCOMA CACI

<table>
<thead>
<tr>
<th>Treating ophthalmologist finds the condition stable on current regimen and no changes recommended.</th>
<th>[ ] Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at diagnosis</td>
<td>[ ] 40 or older</td>
</tr>
<tr>
<td>FAA Form 8500-14 or equivalent treating physician report that documents the considerations below:</td>
<td>[ ] Yes</td>
</tr>
</tbody>
</table>

**Acceptable types of glaucoma**

- Open Angle being monitored and stable, Ocular Hypertension or Glaucoma Suspect being monitored and stable, or previous history of Narrow Angle/Angle Closure Glaucoma which has been treated with iridectomy /iridotomy (surgical or laser) and is currently stable.

**NOT acceptable:** Normal Tension Glaucoma, secondary glaucoma due to inflammation, trauma, or the presence of any other significant eye pathology (e.g. neovascular glaucoma due to proliferative diabetic retinopathy or an ischemic central vein occlusion or uveitic glaucoma)
<table>
<thead>
<tr>
<th>Documented nerve damage or trabeculectomy (filtration surgery)</th>
<th>[ ] No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medications</td>
<td>[ ] None or Prostaglandin analogs (Xalatan, Lumigan, Travatan or Travatan Z), Carbonic anhydrase inhibitor (Trusopt and Azopt), Beta blockers (Timoptic, etc), or Alpha agonist (Alphagan). Combination eye drops are acceptable</td>
</tr>
<tr>
<td><strong>NOT acceptable:</strong> Pilocarpine or other miotics, cycloplegics (Atropine), or oral medications</td>
<td></td>
</tr>
<tr>
<td>Medication side effects</td>
<td>[ ] None</td>
</tr>
<tr>
<td>Intraocular pressure</td>
<td>[ ] 23 mm Hg or less in both eyes</td>
</tr>
<tr>
<td>ANY evidence of defect or reported Unreliable Visual Fields</td>
<td>[ ] No</td>
</tr>
</tbody>
</table>
AME MUST NOTE in Block 60 one of the following:

[ ] CACI qualified glaucoma.

[ ] Not CACI qualified glaucoma. Issued per valid SI/AASI. (Submit supporting documents.)

[ ] NOT CACI qualified glaucoma. I have deferred. (Submit supporting documents.)

Last revision date: 04/29/2015
Glaucoma

- **CACI (continued)**
  - Documented nerve damage or trabeculectomy (filtration surgery)…**No**
  - Medications…**None or Prostaglandin analogs** (Xalatan, Lumigan, Travatan, or Travatan Z), Carbonic anhydrase inhibitor (Trusopt and Azopt), Beta blockers Timoptic. Etc, or Alpha agonist (Alphagan). Combination eye drops are acceptable
  - Not acceptable: Pilocarpine or other miotics, cycloplegics, cycloplegics (Atropine) or oral medications
Glaucoma

• CACI (continued)
  – Medication side effects... **None**
  – Intraocular pressure... **23 mm Hg or less in both eyes**
  – ANY evidence of defect or reported Unreliable Visual Fields... **No**
  – Acceptable visual field tests: Humphrey 24-2 or 30-2 (either SITA or full threshold), Octopus (either TOP or full threshold). Other formal visual field testing may be acceptable but you must call for approval. **Confrontation or screening visual field testing is not acceptable**
**Glaucoma**

- **CACI (continued)**
  - AME MUST NOTE in Block 60 one of the following:
    - AME meets certification criteria for glaucoma
    - Airman had a previous Special Issuance for this condition and now meets the regular issuance certification criteria for glaucoma
    - Airman does NOT meet certification criteria for glaucoma. I have deferred this exam. (Mail the supporting documents to FAA identifying which criteria were not met)
Phoria / Muscle Balance
Phorias vs Tropias

• **Tropias**
  – Eyes always deviated
    • Esotropia, Exotropia, Hypertropia
    • Diplopia maybe
      – Not usually if onset in early childhood, suppression

• **Phorias**
  – Eyes may deviate under stress
    • Esophoria, Exophoria, Hyperphoria
    • Occur when fusion has been broken
    • Diplopia when deviated
      – Visual confusion, may learn to ignore second image
• Amphetamines are not thought to worsen latent phorias leading to diplopia
Phoria

- No phoria standards for Third class.
- For 1\textsuperscript{st} or 2\textsuperscript{nd} Class
  - Eso or Exo exceeds 6
  - Hyperphoria exceeds 1
  - Absent symptoms of visual fatigue or double vision, OK to issue
- FAA may ask for ophthalmic consultation
Visual Incapacitation
Malicious Laser of Aircraft

- Stunned and distracted
- Difficulties controlling the aircraft
  - Particular in helicopter pilots
- Complaints can persist for several hours
- Pain, Foreign Body Sensation, Corneal Abrasion if Rub Eye
- Pressure feeling up to 48 hours after the attack
- Permanent retinal/visual damage very unlikely
Refractive Surgery??
Refractive Options

- Most FDA-approved options are acceptable for all classes of medical certification
- RK, LASIK, PRK, LASEK, Epi-LASIK, CK
- “Blade-less” surgery
- Wavefront correction
Refractive Surgery and Certification

• **AME may issue:**
  - If surgery was more than 2 years ago
    - If standards are met
    - Without 8500-7
    - AME evaluation is sufficient, issue
  - If surgery was less than 2 years ago
    - AME may still issue with 8500-7 and documentation of stable vision, lack of complications, etc.
    - If meets standards
Refractive Surgery

LASIK, PRK and variants, current status from treating physician or a completed 8500-7 if within 2 years

Post Op Stability and absence of adverse symptoms

Some are special issuances
  • Conductive keratoplasty, 6 month wait
  • Implantable Collamer Lenses (ICL), Intacs, Clear lens extraction
Retina
Dry Macular Degeneration
Wet Macular Degeneration

- Subretinal neovascularization with subretinal hemorrhage and exudation
Treatment of Macular Degeneration

Anti-VEGF agents
Injected into center of eye
Vision stabilized in more than 90%
Vision improves in up to 40%
Diabetic and “Vascular” Retinopathy
Thank You!