Clinical application of the new civil airman vision standards and certification procedures

Van B. Nakagawara, O.D. and Kathryn J. Wood, Opt. T.R.

Federal Aviation Administration, Civil Aeromedical Institute, Oklahoma City, Oklahoma

Introduction: The final rule revising the civil airman medical standards became effective September 16, 1996. The purpose of this study was to review changes in the vision standards and procedures and how they relate to the clinical optometrist.

Methods: *Revision of Airman Medical Standards and Certification Procedures and Duration of Medical Certificates; Final Rule,* (14 CFR, Parts 61 and 67) and the *Guide for Aviation Medical Examiners,* published by the Federal Aviation Administration's Office of Aviation Medicine, were reviewed, and those parts pertaining to the clinical optometrist were summarized.

Discussion: The uncorrected distance visual acuity standards for first- and second-class airmen have been deleted. New equivalent near-vision standards were established for all classes of airmen. A major change—for pilots ≥ 50 years of age—was the addition of an intermediate vision requirement of 20/40 or better at 32 inches for both first- and second-class medical certificate holders. Although the third-class medical certificate is still valid for 24 months after the date of examination for those ≥ 40 years of age, the certificate is now valid for 36 months for those < 40 years of age.

Conclusion: The new vision standards primarily affect the elderly pilot. Ophthalmic considerations in the application of the new vision standards are reviewed.

Key Words: Civil airman medical standards, vision standard, visual acuity

The Federal Aviation Administration (FAA) is responsible for the medical certification of all United States and some international civil airmen. To accomplish this, the FAA is authorized to determine if an applicant is medically qualified to perform the duties pertaining to the position for which the medical certificate is sought. The FAA certification sets terms, conditions, limitations, periodic or special examinations, tests of physical fitness, etc., to ensure aviation safety. All U.S. civilian pilots must maintain a current medical certificate of the appropriate class in order to exercise their pilot certificate. Medical standards are contained in Part 67 of the *Federal Aviation Regulations* (FAR)[1] and, to assist Aviation Medical Examiners (AMEs), the FAA publishes a *Guide for Aviation Medical Examiners*,[2] which provides procedural guidelines for testing pilot applicants. There are three classes of medical certificates: *first-class*, required to exercise the privileges of an airline transport pilot; *second-class*, required to exercise the privileges of a commercial pilot; and *third-class*, required to exercise the privileges of a private pilot.

An applicant for a medical certificate who is unable to meet the standards may be issued a certificate on a discretionary basis. The Federal Air Surgeon may request that a special flight test, practical test, or medical evaluation be conducted to determine if airman duties can be performed—with appropriate limitations or conditions—without endangering public safety. If this determination can be made, a medical certificate may be issued with appropriate safety limitations. Historically, approximately 99% of all applicants ultimately receive a medical certificate.[1]

A new rule (14 Code of Federal Regulations [CFR] Parts 61 and 67: Revision of Airman Medical Standards and Certification Procedures and Duration of Medical Certificates) revises airman medical standards and medical certification procedures.

Nakagawara VB and Wood KJ. Clinical application of the new civil airman vision standards and certification procedures. J Am Optom Assoc 1998;69:144-50.

Table 1. Summary of new vision standards and certification duration

	First-class	Second-class	Third-class
Distant vision	Distant visual acuity of 20/20 or better in each eye separately, with or without corrective lenses. If corrective lenses (spectacles or contact lenses) are necessary for 20/20 vision, the person may be eligible only on the condition that corrective lenses are worn while exercising the privileges of an airman certificate.		Distant visual acuity of 20/40 or better in each eye separately, with and without corrective lenses. If corrective lenses (spectacles or contact lenses) are necessary for 20/40 vision, the person may be eligible only on the condition that corrective lenses are worn while exercising the privileges of an airman certificate.
Near vision	Near vision of 20/40 or better, Snellen equivalent, at 16 inches in each eye separately, with or without corrective lenses.		
Intermediate vision	If ≥ 50 years of age, vision of 20/40 or better, Snellen equivalent, at 32 inches in each eye separately, with or without corrective lenses.		No standard.
Hyperphoria	Maximum of 1 diopter.		No standard.
Esophoria and exophoria	Maximum of 6 diopters of esophoria or exophoria.		No standard.
Color	Ability to perceive those colors necessary for the safe performance of airman duties.		
Field of vision	Normal fields of vision.		Same as Pathology Standard below.
Pathology	No acute or chronic pathological condition of either eye or adnexa that interferes with the proper function of an eye, that may reasonably be expected to progress to that degree, or that may reasonably be expected to be aggravated by flying.		
Duration of certificate	6 months after the month of the examination	12 months after the month of the examination	36 months after the month of the examination for persons < 40 years of age at date of the examination; or 24 months after the month of the examination for persons ≥ 40 years of age at date of the examination

These revisions—which became effective September 16, 1996—are the result of an agency review of Part 67 and recommendations from a report prepared for the FAA by the American Medical Association (AMA). The AMA presented its report, *Review of Part 67 of the FARs and the Medical Certification of Civilian Airmen*, on March 26, 1986, which detailed the results of a comprehensive review of the standards for airman medical certification and of their application.[3] Before publishing its final rule, the FAA also evaluated comments received from the public and during meetings attended by aviation representatives.

The FAA stated that revising the standards for airman medical certification and associated administrative procedures was necessary for aviation safety and to reflect current medical knowledge, practice, and terminology.[1] The purpose of this study is to review pertinent changes in the vision standards

and procedures for civil airmen and relate these changes to the clinical optometrist, who often examines and treats these pilots.

Methods

Revision of Airman Medical Standards and Certification Procedures and Duration of Medical Certificates; Final Rule (14 CFR, Parts 61 and 67) was reviewed, specifically looking at the changes in vision standards. The *Guide for Aviation Medical Examiners* was examined to note procedural differences in the testing of pilot vision. Those changes pertinent to vision and the clinical optometrist are summarized.

Current Status

The following is a summary of the revisions in vision standards and procedures in medical certification pertinent to vision (*see* Table 1)

1. Distance visual acuity requirements for first-and second-class medical certification were changed to delete the uncorrected acuity standards. As in the previous standard, each eye must be corrected to the Snellen equivalent of 20/20 or better [Final 67.103(a) and 67.203(a)].

2. For third-class medical certification, the 20/50 uncorrected or 20/30 corrected distance visual acuity standard was changed to 20/40 or better, in each eye, with or without correction [Final 67.303(a)].

3. Near visual acuity for first- and second-class medical certification requirements was specified in terms of Snellen equivalent (20/40), corrected or uncorrected, in each eye at 16 inches. This replaced the old first-class standard of v = 1.00 at 18 inches and the second-class standard of enough accommodation to read official aeronautical maps. An intermediate visual acuity standard of 20/40 or better at 32 inches, corrected or uncorrected, was added to the first- and second-class visual requirements for persons ages 50 or older [Final 67.103(b) and 67.203(b)].

4. For third-class medical certification, a near visual acuity standard of Snellen equivalent of 20/40 or better, corrected or uncorrected, in each eye, at 16 inches was added to their requirements [Final 67.303(b)].

5. Color vision requirements for all classes were amended to read "ability to perceive those colors necessary for safe performance of airman duties." This replaced the previous standards, which required "normal color vision" for first-class and the "ability to distinguish aviation signal colors" for second- and third-class applicants [Final 67.103(c), 67.203(c), and 67.303(c)].

6. The first-class standard was modified to read "no acute or chronic pathological condition of either eye or adnexa that interferes with the proper function of an eye, that may reasonably be expected to progress to that degree, or that may reasonably be expected to be aggravated by flying." This modification was applied to both the new second- and third-class standards. The previous standards were "no pathology of the eye" for second-class and "no serious pathology of the eye" for third-class [Final 67.203(e) and 67.303(d)].

A Statement of Demonstrated Ability (SODA) may be available for applicants who do not meet the published standards of Part 67. A SODA is issued with no expiration date to applicants whose disqualifying conditions are static or nonprogressive and who have been found capable of performing airman duties without endangering public safety.

A change in the duration of third-class medical certificates will be of interest to clinicians whose patients are civil airmen. Third-class medical certificates issued before September 16, 1996, expire at the end of the twenty-fourth month after the date of examination shown on the certificate. On or after September 16, 1996, third-class medical certificates expire at the end of the thirty-sixth month if the person has not reached his/her fortieth birthday on or before the date of the examination. For those applicants ≥ 40 years of age, the duration of the medical certificate is as in the original standard, 24 months (*see* Table 1).

Discussion

The FAA practice for many years has been to grant a SODA to first- and second-class medical certificate applicants—regardless of uncorrected distant acuity—if the required corrected vision is achieved through conventional ophthalmic lenses, there is no evidence of significant eye pathology, and the person is otherwise eligible. Thousands of airmen have safely performed their duties while using corrective lenses for distant visual acuity that was poorer than 20/100 without correction in each eye.

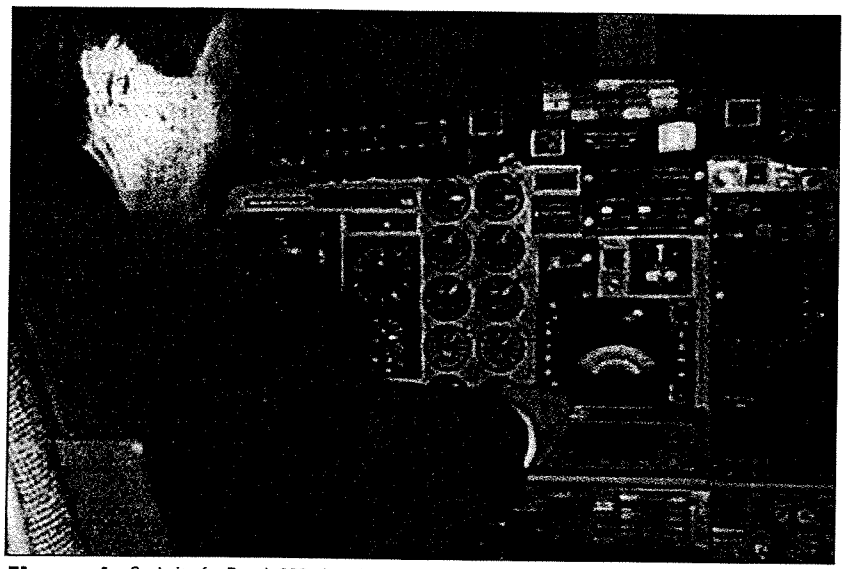

Figure 1 Cockpit of a Beech 300 aircraft. Demonstration of different visual distances and color challenges in the cockpit.

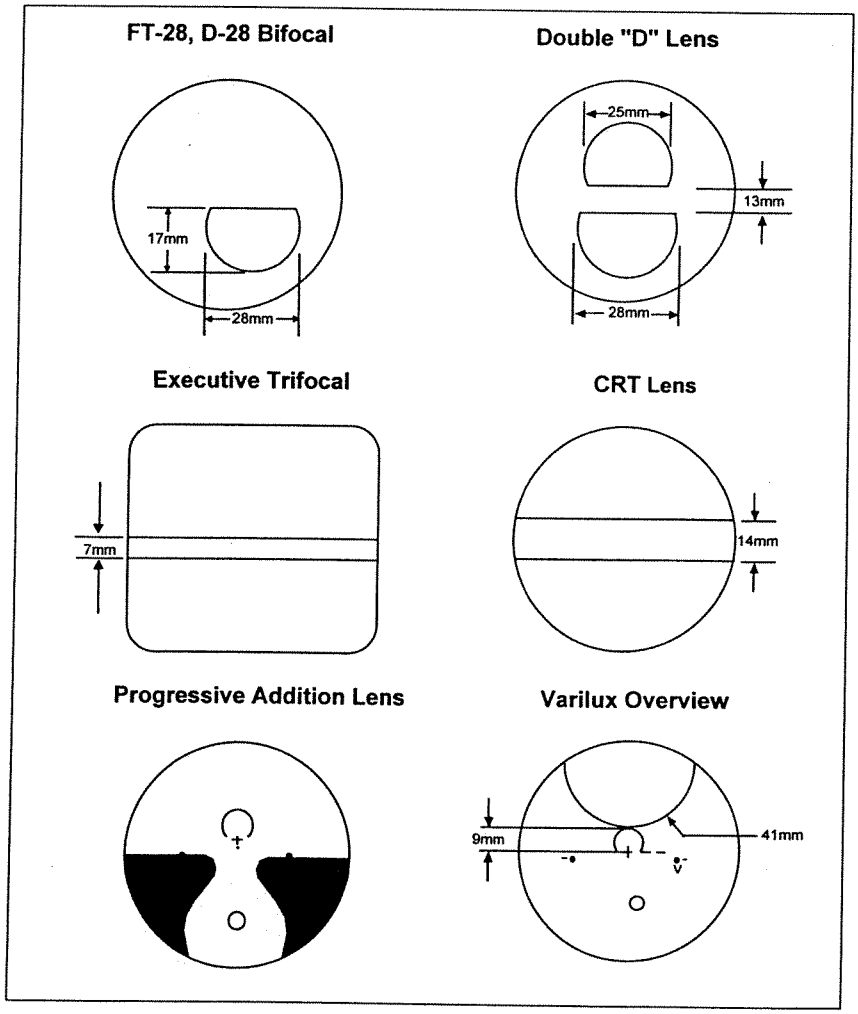

Figure 2 Ophthalmic lens designs. Different lens designs that may be used by presbyopic civil airmen in the cockpit.

On the basis of this observation, it was determined that the requirements for uncorrected distant visual acuity could be relaxed. It was felt this revision would streamline the process of medical certification by not requiring a SODA for persons who could not meet an uncorrected distant acuity standard. The SODA will now be used primarily for airmen who are aphakic, amblyopic, monocular, etc. Patients who have had refractive surgery (e.g., radial keratotomy and photorefractive keratectomy) may be certified with special eye evaluations. Those applicants who have had refractive surgery and meet the required vision standards do not require a SODA.

The FAA agreed with the AMA Report recommendation that all classes of medical certificates should have the same near visual acuity standard. This change eliminated the antiquated terminology that appeared in the previous standards for first-class medical certification and corrected the inconsistency between standards and practice for second-class medical certification. An important change of interest to clinicians was the institution of a near-vision standard for third-class medical certificates. These airmen must now meet the same level of visual performance as first- and second-class certificate holders. The more stringent near acuity standard for third-class airmen will require clinicians to monitor more closely the accommodative abilities of their older pre-presbyopic and presbyopic pilot patients. Ophthalmic lenses, such as half-eye reading lenses or multifocal designs, should be considered for these airmen. Single-vision full-view lenses for reading should be avoided, since they may reduce distance acuity.

Table 2. Approved and acceptable alternative near-vision tests

Manufacturer/ distributor	FAA-approved equipment	Cost	Near visual acuity	Intermediate visual acuity
	FAA Form 8500-1 Near Vision Acuity Test Card	N/C	Yes	Yes
	Acceptable alternatives			
MAST/KEYSTONE 4673 Aircenter Circle Reno, Nevada 89502 (702) 324-2799	Keystone Orthoscope (No longer manufactured)	N/A	Yes	No*
	Keystone Telebinocular with Slide Sets	$1,060.00	Yes	No*
	*Intermediate Testing Card with Scale Bar for either unit	$35.00	N/A	Yes
	*Intermediate Testing Card with Scale Bar Upgrade for either unit	$30.00	N/A	Yes
Reichart-Leica P.O. Box 123 Buffalo, New York 14240-0123 (716) 686-4550	Bausch & Lomb Orthorator (No longer manufactured)	N/A	Yes	No
	AOC Site Screener (No longer manufactured)	N/A	Yes	No
Titmus P.O. Box 191 Petersburg, Virginia 23804 (800) 446-1802	Titmus Optical Vision Tester T2A (automatic)	$1,899.00	Yes	No*
	Titmus Optical Vision Tester T2S (manual)	$1,549.00	Yes	No*
	*Intermediate lens for either unit to test at 80 cm or 31.48 inches	$46.00	N/A	Yes
Stereo Optical 3539 North Kenton Ave. Chicago, Illinois 60641 (800) 344-9500	OPTEC 2000 with peripheral vision testing	$1,630.00	Yes	No*
	OPTEC 2000 without peripheral vision testing	$1,499.00	Yes	No*
	*Intermediate lens for either unit to test at 80 cm or 31.48 inches	$61.34	N/A	Yes

A major change in the vision standards was the new requirement for intermediate visual acuity for first- and second-class medical certificate holders ≥ 50 years of age, as a result of the aging eye's diminishing ability to accommodate at intermediate viewing distances.[1] The FAA determined that airline transport and commercial pilots needed adequate intermediate vision to monitor aircraft instruments and other cockpit equipment, which are at a distance of about 30+ inches (*see* Figure 1). This standard is consistent with the International Civil Aviation Organization standards, and was recommended in the AMA Report and by the National Transportation Safety Board.[1]

If a pilot is ≥ 50 years of age, clinicians should consider ophthalmic lenses that provide clear vision at intermediate distances. For example, bifocal lenses may provide clear vision at distance and near, but may result in blurred vision at intermediate distances. The clinician may prescribe multifocal lens designs, progressive addition lenses, or task-specific

Table 3. Color vision testing

Manufacturer	FAA-approved equipment	Applicant does not meet the standard if testing reveals:
	Pseudo-isochromatic plates	
American Optical Company (AOC)	1965 edition	7 or more errors on plates 1 through 15
	AOC-HHR, 2nd edition	Any error in test plates 7 through 11
Dvorine	2nd edition	7 or more errors on plates 1 through 15
Ishihara	14-Plate edition	6 or more errors on plates 1 through 11
	24-Plate edition	7 or more errors on plates 1 through 15
	38-Plate edition	9 or more erros on plates 1 through 21
Richmond	1983 edition, 15-Plate	7 or more errors on plates 1 through 15
	Acceptable substitutes	
Farnsworth	Farnsworth Lantern	An average of more than 1 error per series of 9 color pairs in series 2 and 3
MAST/KEYSTONE	Keystone Orthoscope	Any errors in the 6 plates
	Keystone Telebinocular	Any errors in the 6 plates
LKC Technologies, Inc.	APT-5 Color Vision Tester	Letter must be correctly identified in at least 2 of the 3 presentations of each test condition
Stereo Optical	OPTEC 2000	Any error in the 6 plates
Titmus	Titmus Vision Tester	Any error in the 6 plates
	Titmus II Vision Tester (model nos. TII and TIIS)	Any error in the 6 plates
	Titmus 2 Vision Tester (model nos. T2A and T2S)	Any error in the 6 plates

occupational lenses (Double-D, Varilux "Overview," or CRT designs), dependent on the configuration of the controls and instrument panel of the patient's aircraft (*see* Figure 2).

To test for intermediate vision, the FAA issued a new near-vision card to all AMEs (*see* Figure 3). This card has directions for use at the near (16 inches) and intermediate (32 inches) testing distances. The *Guide for Aviation Medical Examiners* also allows for alternative tests for near vision. These vision-screening instruments were reviewed for their applicability to the new intermediate testing requirement (*see* Table 2). Titmus Optical's Vision Tester and Stereo Optical's OPTEC 2000 can be modified for intermediate testing with the addition of lenses that test at an acceptable 31.48 inches. The Keystone's Telebinocular can be modified with an intermediate card and scale bar. However, Keystone's Orthoscope, AOC Site Screener, and Bausch & Lomb Orthorator are no longer being manufactured, and parts or upgrades are unavailable for these instruments.

Applicants for certification previously had their color vision tested using the standard pseudoisochromatic plates or other approved devices. Failure to respond accurately to any of these tests indicated a color deficiency and required that issuance of an airman medical certificate be conditional, prohibiting flight at night or by color signal control. This restriction could be removed by successful completion of a practical field (i.e., signal light test) or a medical flight test, as appropriate for the class of medical certificate sought and the level of aviation experience of the applicant. The new rule for all classes of medical certificates now allows applicants to obtain a certificate without obtaining a SODA, as long as they demonstrate an "ability to perceive those colors necessary for the safe performance of airman duties." The new criteria for color vision testing of first-class applicants, as listed in the current AME Guide, are the same as those used previously for second- and third-class airmen applicants (*see* Table 3).

The FAA determined that extension of the length of time between examinations for third-class medical certificates of persons < 40 years of age to 36 months should not result in any significant increase of undetected pathology between exami-

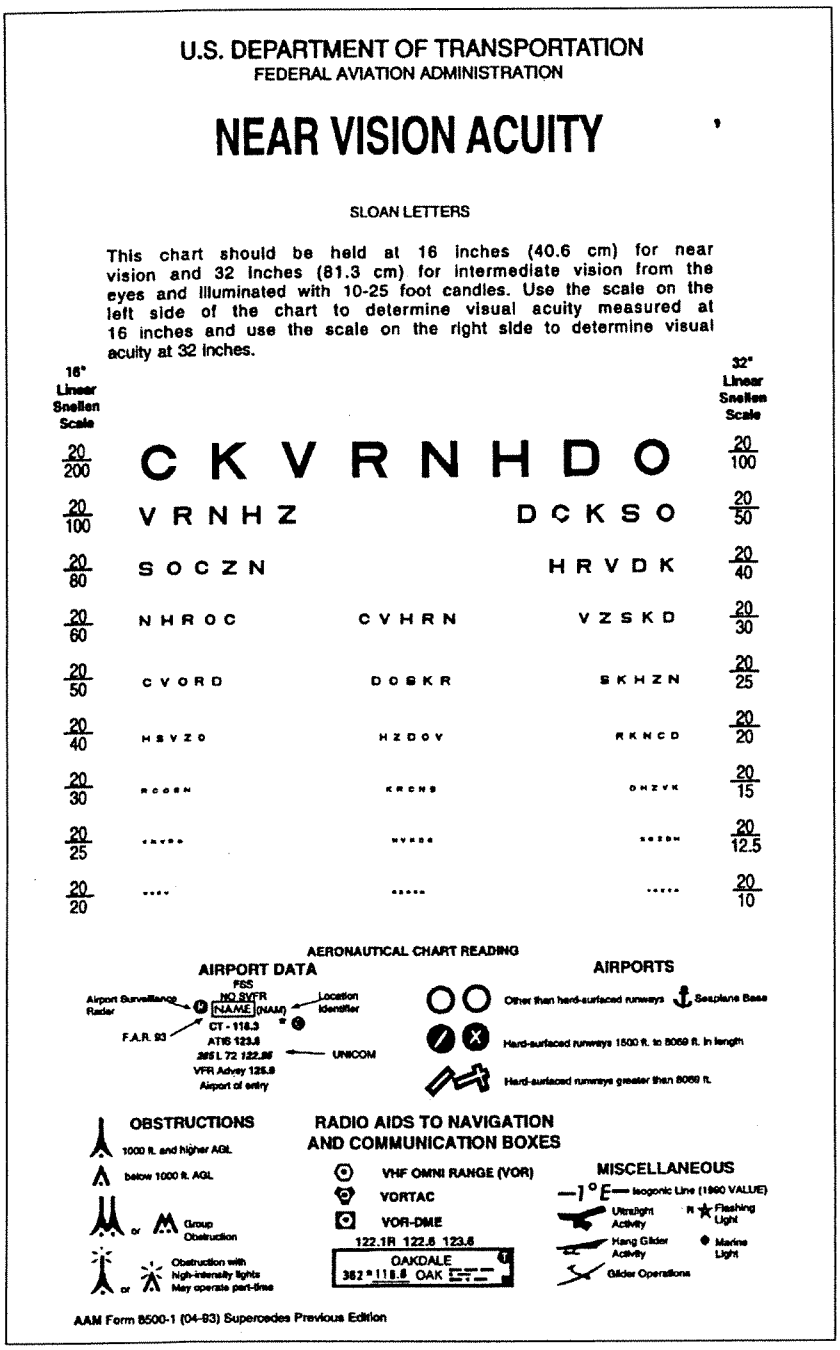

Figure 3 New FAA Near Vision Acuity Chart may be used to test for both near and intermediate vision.

nations. It was further determined that there should be no increase in safety risk, as younger airmen are less likely to experience medical incapacitation. Airmen ≥ 40 years of age retained the 24-month period between examinations, because of an increased incidence of pathology with aging. Pilots should be encouraged to have yearly examinations by their clinicians to ensure optimal ocular health and vision performance.

Conclusion

In summary, the purpose of the new medical standards is to reflect the current medical knowledge, practice, and terminology. The modifications that are specific to vision standards included changes in uncorrected and corrected visual acuity, near-vision requirements, a new intermediate vision requirement for commercial pilots ≥ 50 years of age, and some adjustments regarding color vision and pathological conditions of the eye. The ophthalmic considerations of these new standards primarily affect the elderly pilot patient.

References

1. 14 CFR, Parts 61 and 67: Revisions of airman medical standards and certification procedures and duration of medical certificates; final rule. *Federal Register*. March 19, 1996;61: 11238-63.
2. Department of Transportation/Federal Aviation Administration. *Guide for aviation medical examiners*. Washington, DC: FAA Office of Aviation Medicine, 1996.
3. Engelberg AL, Gibbons HL, Doege TC. A review of the medical standards for civilian airmen. *JAMA* 1986;255:1589-99.

Van B. Nakagawara, O.D.
Federal Aviation Administration
Civil Aeromedical Institute
Vision Research Team, AAM-610
P.O. Box 25082
Oklahoma City, Oklahoma 73125