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REVIEW OF PART 67 OF THE FEDERAL AIR REGULATIONS
AND THE MEDICAL CERTIFICATION OF CIVILIAN AIRMEN

Volume I

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APR 03 1986
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Submitted to the Federal Aviation Administration
under Contract #DTFA01-83-C-20066

by the
American Medical Association

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Review of Part 67 Federal Air Regulations Medical Standards

Foreword

This document is the product of a two-year, comprehensive review of the medical standards for civilian airmen, presently codified as Part 67 of the Federal Air Regulations (FAR). The work was done under Contract Number DTF-A01-83-C-20066 between the Federal Aviation Administration (FAA) and the American Medical Association (AMA). In the Statement of Work that was assigned to the AMA, the FAA requested that the final report detail

"...the results of a total and comprehensive review of the medical standards for airman medical certification and their application to enable the FAA to determine the medical fitness of applicants for exercise of airman privileges, and

"The report must consider pertinent advances in the field of medicine since 1959, and determine what changes in FAA medical standards, if any, are warranted, and the rationale for such changes. *to include 7 criteria*

In reviewing the process of medical certification, it became clear to the AMA staff that, as important as the actual Part 67 standards are, they are but one part of the medical certification system. No standards, no matter how comprehensive, can be written to cover all medical conditions and levels of fitness and impairments. But, many medical decisions are based upon clinical judgments, for which guidelines may be written. Guidelines represent the best thinking about clinical conditions that may significantly affect aviation safety, but guidelines must not be interpreted rigidly and adhered to strictly; there must always be room for a final determination of an airman's

ability to fly an aircraft, which is based upon the unique medical and nonmedical circumstances that the airman presents to the FAA.

Also, there are different levels of decision-making to which a comprehensive review must be addressed: the Aviation Medical Examiners (AMEs); the Regional Flight Surgeons of the FAA, located throughout the United States; the Aeromedical Certification Branch of the FAA, AAC-130, in Oklahoma City; the Aeromedical Standards Branch of the FAA in Washington, DC; and the Federal Air Surgeon, the final medical authority in the airman medical certification process.

To assist the decision-makers at all levels, we have produced a document with the following five sections:

- 1) Recommended medical standards for first, second and third class airmen
- 2) Recommended changes to Form 8500-8, the medical history and examination form that is used routinely by the AME
- 3) Recommended changes in the AME Guide
- 4) Rationale for the recommended standards and guidelines to the AME; further clinical recommendations to the FAA, especially regarding special issuances and medical follow-up of persons certified by special issuance.
- 5) Recommendations for future research

Recommended Standards

The consultants were asked to review the Part 67 standards that now exist, and to recommend changes if necessary. They were not told that all standards needed to be changed, and in fact, some standards were not changed. The consultants produced standards that were comprehensive, yet simple enough to direct the AMEs and the FAA toward the proper medical evaluation and disposition of persons with a history of, or a clinical diagnosis of, medical conditions or abnormal physical findings that are thought to

increase the risk of untoward events. Such events might be brought about through suddenly or gradually occurring incapacitation or through sudden death.

The recommended standards may be regarded as an "executive summary" of the entire report, in that everything that follows represents an enlargement of and rationale for the standards.

Recommended Changes to Form 8500-8

This is the standard form that is used by the AME at the routine examination for the issuance of a medical certificate. The consultants reviewed only the medical items on this form and recommended the deletion, addition or changing of items to bring the examination up to date. Important new items include questions about family history and questions about cigarette smoking habits.

Recommended Changes in the AME Guide

In general, each panel of consultants found the format of the present AME Guide acceptable but the contents outdated. The only major change of format to which all panels agreed was combining all medical guidance about a given organ system into one section of the Guide. Thus, guidance concerning the medical history questions, physical examination and special testing of, for example, the visual system, are presented in one complete section, rather than as separate entities tied to the numbering of questions on Form 8500-8. In presenting guidance to the AME in this manner, we hope that the Guide becomes a mini-textbook of clinical aviation medicine as well as a practical guide to the conduct of examinations.

Rationale for Standards and Guidelines

The fourth and largest section of the report provides the rationale for the recommended standards and for the guidelines that are presented in the proposed AME Guide. This section also provides guidance to the FAA concerning the certification of individuals with specific medical conditions, who require more-than-routine evaluation and, probable special issuance certification with individualized medical follow-up. No set format was given to the various panels for this section; each panel set its own goals to complete this part of the assignment. Some committees, such as the one that reviewed gastrointestinal disorders, felt that the common problems of the gastrointestinal organs are understood well enough by most practicing physicians, so that the section on gastrointestinal conditions in the proposed AME Guide is sufficient; rare or complicated gastrointestinal problems require a specialist's consultation and need not be elaborated upon in this report. Other committees, such as the committees on visual, mental and behavioral, and cardiovascular disorders, produced large documents to expand upon their recommendations.

Special examination forms, such as for cardiovascular, endocrine, mental and behavioral, and visual disorders, were also reviewed, and recommended changes are provided in this section.

Recommendations for Future Research

The consultants realized that there are few hard data on the efficacy of either the present or recommended standards, guidelines, and testing techniques. Although the FAA did not request guidance for future research, we are providing some suggestions to the FAA. This section is brief because it is not a major focus of this comprehensive

review.

Special Concerns

Certain crucial issues arose in one or more committees that had a great impact on the final product.

1. **Agreements among committees.** Certain medical conditions are diagnosed and treated, and certain therapeutic modalities are used, by the specialists in more than one field of medicine. To the extent possible, we attempted to gain agreement on issues that cut across committee lines. For example, all committees whose members use oral glucocorticosteroid medications for various medical disorders, agreed that doses up to 10 mg of prednisone per day, or the equivalent, are "replacement," and doses over 10 mg per day are "therapeutic." However, we did not attempt to force agreements where they were not possible. We could not agree upon the disposition of persons with certain solid tumors; therefore, the report contains the recommendations of the medical oncologists, who generally tend to be conservative, and the organ-system specialists, who tend to be more liberal, about the issuance of certificates to persons with solid tumors.
2. **The concept of "crew redundancy."** The primary concern of this review was to enhance the safety of all those who are affected by the performance of an airman's duties. Clearly, in every given instance more persons are affected by the holders of Class I medical certificates, who generally are the pilots in command of passenger airplanes, and holders of Class II medical certificates, who include a large and varied group of pilots, flight engineers, and some air traffic controllers. In the interest of enhancing the public's safety while

fostering the continued ability of airmen holding Class I and II certificates to perform their duties, the cardiovascular committee included in its recommendations for persons with some disorders, that they be permitted to perform their duties only in situations in which there is "crew redundancy." That is, there must be at least one other person who is capable of performing all the duties of the airman in the cockpit (or tower, in the case of the few air traffic controllers who are governed by the Part 67 standards). We realize that the concept that the operational milieu ties in with certain medical conditions may cause some legal and administrative difficulties, especially with regard to persons with Class I certificates (see Delta Airlines, Inc vs United States 490 F. Supp. 907 (ND Ga 1980) - the "Delta" case), yet we feel that this concept is a valid one.

3. Nature of the routine examination. In its statement of work to the AMA, the FAA requested that:

"Current concepts in the determination of risk for adverse medical events, such as stroke or myocardial infarction and other incapacitating conditions, and the usefulness of diagnostic and prognostic techniques in the determination of body system functioning and of qualification for airman medical certification, must be addressed. Suggestions should be developed for the inclusion of such techniques in the standards if deemed appropriate and feasible."

To address this issue we empaneled a risk factor committee, whose function was to review the state of medical risk factor analysis and to make recommendations about where risk factor detection might play a role in the

certification process. Because our knowledge of risk of disease has expanded greatly in the last quarter century, and impacts nearly all clinical specialties, many of the other committees, whose charge was to review the diagnoses and treatments of diseases and disorders that may affect flight safety, also discussed risk factors for diseases.

As a result of these concerns, the committees and the AMA staff discussed in general terms the nature of the AME examination. At present it is one that is designed primarily to detect overt illness that may diminish flight safety. Should it remain that way, or should it become a "preventive medicine" examination as well? After much discussion we concluded that the basic nature of the examination should remain as it is, namely, a "safety" examination. However, our recommendations include some risk factor identification items related to cardiovascular, pulmonary and visual disorders. These items add to the safety factor for which the examination is designed; they also increase the likelihood that pilots who pay attention to these risk factors will be able to enjoy flying aircraft for more years.

Thus, we found that a "preventive medicine" examination and a "public safety" examination are not mutually exclusive, although not all the attributes of the former could be incorporated into the latter. Therefore, some clinical techniques that are clearly wise to include in a routine medical examination, such as breast examinations or testicular examinations, are not mandated in our proposed routine AME examination.

4. Terminology of the medical certification procedure. Many terms are used to describe actions taken either by the AME or the FAA in the medical

certification process. Some of these, such as "special issuance," relate to specific language in the Part 67 standards. Others, such as "denial," are more ambiguous. To assist the reader of this report we have prepared the following set of terms.

- a. Pilot and pilot applicant. For the sake of more pleasurable reading, we have often substituted other terms for "airman," which is the legal term for the persons who are covered by the Part 67 standards. When we use the terms "pilot," "pilot applicant" or "applicant," we are not excluding any other persons, such as flight engineers or some air traffic controllers who are specifically covered by the Part 67 standards. Also, the term "airman" includes persons of both sexes.
- b. Federal Aviation Administration. Often we recommend that an evaluation of an airman with a specific medical condition be requested or directed by the "FAA." This term describes any of the entities of the medical department of the FAA, including the Federal Air Surgeon, the Aeromedical Certification Branch, and the Regional Flight Surgeons, and we leave it to the administrative policies of the FAA to determine in any given case which entity actually requests and performs the evaluation.
- c. Denial. A "denial" is a written document that constitutes a refusal to issue a medical certificate. A denial can take place at many levels, from the AME to the Federal Air Surgeon, who acts on behalf of the Administrator of the FAA. Generally, in this report we use the term "denial" or any of its variants when we feel that a medical condition is of such concern that a person who has it should be evaluated

thoroughly prior to the issuance of a certificate, and in general, should be given a certificate on a special issuance basis, if at all, and possibly with restrictions and with more comprehensive medical follow-up. Those medical conditions that are specifically mentioned in the proposed standards would warrant a "denial" at some level in the certification process. An applicant must have received a denial in order to request a reconsideration, special issuance or other such action.

- d. Deferral. AMEs are allowed not only to "deny" a pilot a medical certificate, but also to "defer" this adverse ruling to the FAA. To do so, the AME checks the box on Form 8500-8, "No certificate issued--further evaluation required."
- e. Disqualifying. This adjective relates to medical conditions that may not be mentioned specifically in the recommended standards, but which are mentioned in the proposed AME Guide or in the section on further recommendations to the FAA, and which are sufficiently severe enough to affect flight safety so that certification should be denied until further medical evaluation is done. Thus, "disqualifying" relates to the process of "denial" or "deferral." "Absolutely disqualifying" or "permanently disqualifying" refers to physical and mental conditions that in the opinion of our consultants are so severe and whose prognosis for sudden or subtle incapacitation is so adverse as to make persons with these conditions unfit to perform safely the duties of an airman. We recommend that under no conditions should such persons be granted a medical certificate by the FAA. This term

does not imply any suggestion that the discretion of the Federal Air Surgeon be limited, or that a person with a "permanently disqualifying" condition be denied any rights of appeal, such as to the Federal Air Surgeon or to the National Transportation Safety Board.

- f. Special issuance. The "special issuance" procedure is spelled out in Section 67.19 of the FARs. Our use of the term relates directly to this section.

- g. Statement of Demonstrated Ability (SODA). This term is used to describe the issuance of a medical certificate for a physical deficiency that is static and unlikely to change dramatically or quickly, and because of which an airman has taken a medical flight test or practical test to demonstrate his or her ability to perform the duties of an airman. The airman need not repeat the test unless the Federal Air Surgeon determines that the physical deficiency has become more pronounced. Although the term, "SODA," is not specifically used in Part 67, its concept is spelled out in Section 67.19(e).

The Review Process

In designing the procedure for the review, AMA staff proposed to form thirteen working committees of approximately five members each. Twelve committees were organ-system based (visual, respiratory, cardiovascular, etc) and one was to deal solely with risk factors. The chairmen of the committees, plus the AMA's special consultant, the AMA's project director and the director of AMA's Department of Public Health

Policy, constituted a steering committee that reviewed the draft and the final reports of the working committees. The risk factor committee, comprised entirely of former presidents of the Aerospace Medical Association and who are board-certified in aerospace medicine, acted as a final review committee of the early drafts of the final report.

Upon receiving the contract, the AMA staff immediately contacted most of the specialty societies that were mentioned in the FAA's Statement of Work and any other appropriate specialty societies, asking them to provide names of qualified, capable individuals who could serve as chairmen or members of the working committees. From this list of names, the project director selected as chairmen those with proper credentials and skills who he thought would be best able to carry out the tasks of discussion, review and writing. The chairmen met as a steering committee in December 1983, at which time they were introduced to the project, to FAA representatives and to invited guests of other organizations that have medical personnel with interests in the civilian airman medical certification process. At this meeting, we rearranged the number of persons on the working committees to give weight to those committees that would deal with the larger issues, such as cardiovascular diseases and mental and behavioral problems. Each chairman was asked to submit names to the project director of possible committee members; the project director then selected individuals, in consultation with the chairmen, who could devote the time, showed high interest, and had the expertise that was required. The intent was to constitute committees of consultants who blended strong clinical knowledge with an understanding of the unique environments of civilian aviation medicine.

These committees met at least twice between January 1984 and August 1984, at which time their initial draft reports were discussed by the Steering Committee. At each working committee meeting, either the AMA's project director or the special consultant was present to monitor progress and to participate in the discussions. The

working committees met at least one more time between August 1984 and February 1985, at which time the steering committee met for a third time to discuss the final committee reports. From February 1985 to August 1985 the AMA staff and the special consultant revised and edited the committee reports into the final product. In May and June 1985 the risk factor committee, acting now as a mini-review committee of the final drafts, met to discuss the recommendations.

Participants in the Review Process

The AMA acknowledges the fine contributions of the working committees and the special consultant, whose efforts are largely responsible for the preparation of this report.

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Part 67 PROPOSED MEDICAL STANDARDS

The section includes the recommendations for First Class, Second Class and Third Class medical standards, which if adopted would change the present Parts 67.13, 67.15 and 67.17, respectively. Our recommendations are presented in an outline form, and we leave it to the FAA to change the format of the recommendations to that of the Code of Federal Regulations. We recommend no specific changes to Part 67.19, since we conclude that the special issuance procedure should be maintained.

Mental and Behavioral

For Classes I, II, and III:

- A.** An applicant shall have no established medical history or clinical diagnosis of any of the following:
- o Substance abuse, substance dependence and related substance use disorders, including but not limited to those associated with alcohol; barbiturates; other sedative/hypnotics; muscle relaxants; anxiolytics; opioids; central nervous system stimulants such as cocaine and amphetamines; and hallucinogens such as phencyclidine, cannabis and volatile solvents and gases.
 - o Schizophrenic disorders, including disorganized, catatonic, paranoid, undifferentiated and residual subtypes.
 - o Paranoid disorders, including paranoia, shared paranoid disorder, acute paranoid disorder and atypical paranoid disorder.
 - o Psychotic disorders not elsewhere classified, including schizophreniform disorder, brief reactive psychosis, schizoaffective disorder and atypical psychosis, infantile autism, childhood onset pervasive developmental disorder, and atypical pervasive developmental disorder.
 - o Major affective disorders, including bipolar disorder and major depression.
 - o Anxiety disorders, including panic disorders.
 - o Dissociative disorders, including psychogenic amnesia and fugue, multiple personality, depersonalization disorder and atypical dissociative disorder.
 - o Disorders of impulse control, including intermittent and isolated

explosive disorder.

- o Personality disorders, including paranoid, schizoid, schizotypal, histrionic, narcissistic, antisocial and borderline.
- o Disorders that are usually first evident in infancy, childhood and adolescence.
- o Organic brain syndrome.

B. An applicant shall have no other organic, psychotic, substance use, affective, anxiety, dissociative, psychosexual, impulse control, adjustment, pervasive developmental or personality disorder, or other mental disorder that the Federal Air Surgeon finds:

- o makes the applicant unable to perform safely the duties or exercise the privileges of the airman certificate that he or she holds or for which he or she is applying; or
- o may reasonably be expected, within two years after the findings, to make the applicant unable to perform those duties or exercise those privileges; and the findings are based on the case history and appropriate qualified medical judgment relating to the condition involved.

C. At the discretion of the Federal Air Surgeon, a certificate may be issued to an applicant who does not meet the provisions above if there is established clinical evidence of recovery satisfactory to the Federal Air Surgeon in accordance with the following criteria:

- o Substance abuse, substance dependence and related substance use disorders: Sustained total abstinence from alcohol for not less than the preceding two years, and other substances of abuse for not less

than the preceding five years, associated with stable social and occupational functioning; and absence of mental disorder or psychopathology as demonstrated by psychiatric evaluation and psychological testing. For alcohol abuse and dependence, the required two year period of abstinence may be reduced by the Federal Air Surgeon for cases in which an appropriate level of medical and operational monitoring has been established.

- o Psychotic disorders not elsewhere classified: After a single episode, sustained freedom from all signs and symptoms of the disorder for the preceding year for brief reactive psychosis, and for the preceding two years for schizophreniform disorder, while taking no medication, and associated with stable social and occupational functioning; and absence of other mental disorder or psychopathology as demonstrated by psychiatric evaluation and psychological testing.
- o Major depression: After a single episode, sustained freedom from all symptoms and signs of the illness for not less than the preceding one year, associated with stable social and occupational functioning; and absence of other mental disorder or psychopathology as demonstrated by psychiatric evaluation and psychological testing.
- o Panic disorders: Sustained freedom from any symptoms that would represent a hazard to flying safety, with no use of anti-anxiety or other psychotropic medication, for not less than two years, associated with stable social and occupational functioning; and absence of other mental disorder or psychopathology as demonstrated by psychiatric evaluation and psychological testing.
- o Personality disorders other than paranoid, schizoid, schizotypal, histrionic, narcissistic, antisocial and borderline: Sustained freedom

from any behavior that reflects impaired judgment or creates legal or disciplinary problems for not less than the preceding five years, associated with stable social and occupational functioning; and absence of other mental disorder or psychopathology as demonstrated by psychiatric evaluation and psychological testing.

- D. Individuals with any of the disqualifying conditions listed in paragraphs A and B, except as provided for in paragraph C above, are not usually eligible for certification. However, an applicant may still seek reconsideration by the Federal Air Surgeon who, acting on behalf of the administrator, will continue to issue medical certificates to applicants who are able to perform airman duties without endangering safety. In making this decision, the Federal Air Surgeon considers the natural history and severity of the problem, the period of satisfactory recovery since manifestation of the problem, and treatment and continuing requirements for treatment. Other factors the Federal Air Surgeon considers include: 1) any current or recent psychiatric symptoms, aberrant behavior, or psychiatric or other medical findings; 2) the need for, or use or abuse of, any clinical agents, for either therapeutic or recreational purposes; 3) any personality traits or other recognized factors involving the risk of future recurrence of the problem or the risk of adverse effects; and 4) the current psychiatric functional status and stability of the applicant, as determined by appropriate evaluative techniques.

Musculoskeletal System

For Classes I, II, and III:

An applicant must have no medical history or clinical diagnosis of the following:

- o Quadriplegia.

- o Hemiplegia or hemiparesis secondary to brain disease, regardless of cause.
- o Collagen vascular disease with central nervous system involvement.
- o Progressive neurologic disorders.

Ear, Nose, Throat and Equilibrium

For Classes I, II, and III:

A. An applicant shall:

- o Demonstrate an acceptable understanding of speech as determined by audiometric speech discrimination testing to a score of at least 70% obtained in one ear or in a sound field environment, or;
- o Provide acceptable results of audiometric testing of unaided acuity according to the following table, using the standards of the American National Standards Institute, 1969:

<u>Frequency (Hz)</u>	<u>500 Hz</u>	<u>1000 Hz</u>	<u>2000 Hz</u>	<u>3000 Hz</u>
Better Ear (dB)	35	30	30	40
Poorer Ear (dB)	35	50	50	60

B. An applicant shall have:

- o No disease of the middle or internal ear that will cause acute paroxysms or unpredictable attacks of vertigo.
- o No disease or malformation of the nose, oral cavity, pharynx or larynx that might interfere with, or be aggravated by, flying.
- o No disease or malformation of the oral cavity, pharynx or larynx that would interfere with clear and effective speech communication.

Visual System

For Classes I and II:

An applicant must meet the following standards:

- o Distant visual acuity of 20/20 or better in each eye separately, without correction; or of at least 20/200 in each eye separately, corrected to 20/20 or better with conventional corrective lenses (glasses or contact lenses), in which case the applicant shall be qualified only on the condition that he or she wear those corrective lenses while exercising the privileges of the airman certificate.
- o Near vision of the 20/40 Snellen equivalent or better at 16 inches in each eye separately, with or without corrective lenses. After age 50 years, near vision of the 20/40 Snellen equivalent or better at both 16 inches and 32 inches in each eye separately, with or without corrective lenses. If corrective lenses are required to meet this standard, the applicant may be qualified only on the condition that he or she wear those corrective lenses while exercising the privileges of the airman certificate.
- o Normal color vision.
- o Normal fields of vision.
- o No acute or chronic pathological condition of either eye or adnexa that might interfere with its proper function, might progress to that degree, or might be aggravated by flying.
- o Bifoveal fixation and vergence-phoria relationships sufficient to prevent a break in fusion under conditions that may reasonably occur in performing airman duties. Tests for these factors are not required except for applicants found to have more than one prism diopter of

hyperphoria, six prism diopters of esophoria, or six prism diopters of exophoria. If these values are exceeded, the Federal Air Surgeon may require the applicant to be examined by a qualified eye specialist to determine if there is bifoveal fixation and adequate vergence-phoria relationship. However, if the applicant is otherwise qualified, he or she is entitled to a medical certificate pending the results of the examination.

- o Intraocular pressure of no more than 25 mm Hg as measured by tonometry in either eye in every applicant over age 40 years, or in any applicant with a family history of glaucoma in a first degree relative. The difference between the intraocular pressure in the two eyes must not be greater than 5 mm Hg. If intraocular pressure measures greater than 25 mm Hg in either eye, or if the intraocular pressure difference between the two eyes is greater than 5 mm Hg, ophthalmological evaluation is necessary to rule out glaucoma. If the applicant is otherwise qualified, he or she is entitled to a medical certificate pending the results of the ophthalmological evaluation.

For Class III:

An applicant must meet the following standards:

- o Distant visual acuity of 20/40 or better in each eye separately, without correction; or if the vision in either or both eyes is poorer than 20/40, and is corrected to 20/30 or better in each eye with conventional corrective lenses (glasses or contact lenses), the applicant may be qualified on the condition that he or she wear those corrective lenses while exercising the privileges of the airman certificate.
- o Near vision of at least 20/40 Snellen equivalent or better with or

without correction at 16 inches; after age 50 years, near vision of 20/40 or better at both 16 inches and 32 inches with or without correction. If corrective lenses are required to meet this standard, the applicant may be qualified only on the condition that he or she wear those corrective lenses while exercising the privileges of the air certificate.

- o Ability to distinguish aviation signal red, aviation signal green and aviation signal white.
- o No acute or chronic pathological condition of either eye or adnexa that might interfere with its proper function, might progress to that degree, or might be aggravated by flying.
- o Intraocular pressure of no more than 25 mm Hg as measured by tonometry in either eye in every applicant over the age of 40 years, or in any applicant with a family history of glaucoma in a first degree relative. The difference between intraocular pressure in the two eyes must not be greater than 5 mm Hg. If the intraocular pressure measures greater than 25 mm Hg in either eye, or if the intraocular pressure difference between the two eyes is greater than 5 mm Hg, ophthalmological evaluation is necessary to rule out glaucoma. If the applicant is otherwise qualified, he or she is entitled to a medical certificate pending the results of the ophthalmological examination.

Nervous System

For Classes I, II and III:

A. An applicant shall have no established medical history or clinical diagnosis of the following:

- o Epilepsy

- o A single seizure
 - o An impairment of consciousness and/or transient loss of control of nervous system function(s) without satisfactory medical explanation of the cause.
- B. An applicant shall have no other convulsive disorder, disturbance of consciousness or neurologic condition that the Federal Air Surgeon finds:
- o makes the applicant unable to perform safely the duties or exercise the privileges of the airman certificate that he or she holds or for which he or she is applying, or
 - o may reasonably be expected, within two years after its diagnosis, to make him or her unable to perform those duties or exercise those privileges; and the findings are based on case history and appropriate, qualified medical judgment relating to the condition involved.

Endocrine System

For Classes I, II, and III:

The applicant shall have no established medical history or clinical diagnosis of diabetes mellitus that requires insulin for control.

Respiratory System

For Classes I, II, and III:

- A. At the first examination after the 40th birthday the applicant must demonstrate the absence of severe lung disease by the performance of spirometry. Severe lung disease is defined as a forced vital capacity (FVC) equal to or less than 50% predicted, or a forced expiratory volume in one second (FEV₁) equal to or less than 50% predicted, or a forced expiratory

volume in one second/forced vital capacity percent ($FEV_1/FVC\%$) equal to or less than 50%. Spirometry shall be repeated every 6 years in order to demonstrate the continued absence of severe lung disease.

B. An applicant shall have no established medical history or clinical diagnosis of:

- o Lung disease that is severe enough to produce, or likely to produce, chronic hypoxia to a level of PaO_2 less than or equal to 65 mm Hg while breathing room air at sea level.
- o Poorly controlled asthma. As used in this section, poorly controlled asthma is defined as chronic wheezing or recurrent acute episodes of wheezing occurring at least once weekly despite administration of bronchodilator medications.
- o Hypersomnolence sleep apnea syndrome or hypoventilation syndrome.
- o Chronic pulmonary hypertension as defined by a mean pulmonary artery pressure greater than or equal to 35 mm Hg.
- o Recurrent unilateral pneumothorax or bilateral pneumothoracies occurring separately or simultaneously, unless surgical or chemical pleurodesis has been performed.
- o Recurrent pulmonary emboli.
- o Metastatic carcinoma of the lung, and surgically unresectable carcinoma of lung not yet proven to be metastatic.

Cardiovascular System

For Classes I, II, and III:

A. An applicant shall have no established medical history or clinical diagnosis of:

- o Myocardial infarction.
- o Angina pectoris.
- o Coronary heart disease that has required treatment or, if untreated, is or has been symptomatic or clinically significant.
- o Any form of heart or arterial surgery, including coronary angioplasty or permanent pacemaker insertion.
- o Any form of congenital heart disease.
- o Any significant heart murmur or valvular heart disease.
- o Any evidence of pericarditis or cardiomyopathy.
- o Any significant disturbance of heart rhythm or conduction.
- o A sitting blood pressure equal to or greater than 150/95 mm Hg, or a systolic blood pressure greater than 160 mm Hg, or a history of any antihypertensive medication within the last year, or any history of surgery or angioplasty for the treatment of hypertension.
- o Any evidence of significant peripheral arterial-vascular obstructive disease or aneurysm, or a history of surgery for these conditions.

B. The applicant's sitting blood pressure must not exceed 150/95 mm Hg.

For Classes I and II only:

C. For airmen who fly in single-crew cockpit operations, at age 50 years, the applicant must have a total serum cholesterol of less than 300 mg/dl.

For Class I only:

D. On initial certification, and at age 35 years, at age 40 years, and annually after age 40 years, the applicant must demonstrate an absence of any significant electrocardiographic abnormality, including myocardial infarction. An electrocardiogram, made according to acceptable standards and techniques 30 days or less before an examination for a first class

certificate, is accepted at the time of the physical examination.

For Class II only:

- D. On initial certification, and at age 35 years, at age 40 years, and every two years thereafter, the applicant must demonstrate an absence of any significant electrocardiographic abnormality, including myocardial infarction. An electrocardiogram made according to acceptable standards and techniques within 30 days before an examination for a second class certificate is accepted at the time of the physical examination.

For Class III only:

- D. On initial certification, and at age 40 years, and at a minimum every 6 years thereafter, the applicant must demonstrate an absence of any significant electrocardiographic abnormality, including myocardial infarction. An electrocardiogram made according to acceptable standards and techniques within 30 days before an examination for a third class certificate is accepted at the time of the physical examination.

Hematology/Oncology

For Classes I, II and III:

At the first examination after the fortieth birthday the applicant must demonstrate the absence of severe disorders of red blood cells by a hematocrit determination.

Hematocrit values must fall between 32% and 55% for issuance of a certificate.

For Classes I and II only:

Hematocrit determinations must be repeated annually.

For Class III only:

Hematocrit determinations must be repeated at the time of the routine examination.

RECOMMENDED CHANGES IN FAA FORM 8500-8

Introduction

Each working committee was asked to review the medical history questions on the obverse side of Form 8500-8, and the physical examination check-list and special test entries on the reverse side. The purpose of the review was to propose a new series of questions and examination procedures that would more specifically guide the Aviation Medical Examiner (AME) in detecting disorders that might interfere with the ability of the airman to perform flight duties. Realizing that comprehensive lists of history questions and examination procedures could increase the amount of time to conduct a medical recertification examination and increase paper work, the committees were instructed to limit the number of questions and procedures to the minimum that they concluded would provide adequate screening information.

The following sets of history questions and examination and special procedures are longer than sets on the present 8500-8 form. We did not attempt to review the non-medical data that is requested on 8500-8 to recommend which of these data may be eliminated. However, we recommend that the FAA itself revise the amount of non-medical data it collects at each examination.

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Medical History Questions - Considerations

On the obverse side of 8500-8, the medical questions of specific interest to our reviewers were #15, 21 and 23. We recommend that #23, "Medical Treatment within the past 5 years," remain on the form, but that it precede the other two questions. The reviewers concluded that very useful information can be obtained from the answers to this question, and it should not be placed on the bottom of the page almost as an afterthought. Furthermore, to conform to the explanation of the use of this question that we are proposing, we suggest the question be changed to "Visits to Health Professionals within past 5 years."

The reviewers strongly recommend that the space below #21, "Remarks (If no changes since last report, so state)" be revised to delete the part in parenthesis. This change would require the applicant to complete the list of questions in #21 each time he or she is examined for recertification. The reviewers concluded that it is essential that an airman report all pertinent history information at each examination because: 1) an airman may not remember which conditions he or she had reported previously, and may erroneously believe that a medical condition that arose after the last examination and that had been stable since it was diagnosed was "unchanged," and, 2) an airman enjoys the option of selecting any qualified AME and therefore may visit more than one AME in the course of a career as pilot, and AMEs have no method by which they can check on the progress or stability of medical conditions that are not explicitly reported to them.

Recommended Medical History Questions (presently #21a-x)

Have you ever had or do you now have any of the following?

- o Nervous trouble of any sort

- o Encephalitis or meningitis
- o Dizziness, unsteadiness, or fainting spells
- o Motion sickness requiring drugs
- o Frequent or severe headaches
- o Unconsciousness for any reason
- o Epilepsy or fits
- o Any drug or narcotic habit
- o Excessive drinking habit
- o Record of traffic convictions
- o Record of other convictions
- o Heart trouble or vascular disease
- o Chest discomfort, irregularities of the heart, or palpitations
- o High blood pressure
- o Shortness of breath
- o A heart murmur
- o Diabetes mellitus
- o Kidney stone or blood in urine
- o Any abnormalities of the blood, hemoglobin, white blood cells, blood platelets, sickle cell trouble or bleeding disorder
- o Malignant tumors, cysts or cancers of any sort
- o Ear or hearing trouble
- o Nose or sinus trouble
- o Voice or speech disorders
- o Hayfever
- o Asthma, emphysema or other lung conditions
- o Collapsed lung
- o Eye trouble except glasses

- o Heartburn
- o Severe vomiting, diarrhea or constipation
- o Bleeding from the rectum
- o Weight loss
- o Disease of the stomach, duodenum, intestine, gall bladder, liver or pancreas
- o Syphilis
- o Hives
- o Medical rejection from or for military service; military medical discharge; rejection for life insurance
- o Admission to hospital
- o Other illness or disability

Recommended Changes to Questions on Medications (#15)

- o Use of any prescription and nonprescription medications taken within the last three months (including eye drops): _____ Yes _____ No
 if yes, Name(s) _____; _____; _____
 Dosages _____; _____; _____
 Purposes _____; _____; _____

New Series of Questions on Smoking

- o Do you now smoke cigarettes? _____ Yes _____ No
 - o Have you ever smoked cigarettes regularly? _____ Yes _____ No
- If yes to either question, how many years did (have) you smoke(d)? _____ yrs
- How many packs per day on the average: _____ packs per day

Family History Questions

- o Family member with diabetes mellitus
- o Family member with glaucoma
- o Family member with epilepsy
- o Heart disease in family member less than 50 years of age

Medical Examination and Testing - Considerations

The list of items under the physical examination (present items #25-48) is left essentially intact. Some clarifying examination pointers are added to or changed in some items ("ears," "heart," "vascular system"); one item is eliminated ("anus and rectum"); one is separated into two ("skin," "lymphatics"); and one is greatly expanded ("psychiatric" to "appearance," "behavior," "mood," "communication," "memory," "cognition").

The number of tests is increased and the types of tests are changed from the present procedures. This is a reflection of the increasing availability of medical tests that can more accurately quantitate the functioning of organs and organ systems that may affect a person's ability to perform airman's duties. However, the reviewers are also concerned that the monetary and time costs of the examination be kept to a minimum and that results be available immediately, so that a decision about approval of certification or deferral or denial of certification can be made by the AME at the time of the examination, without a delay. The tests that are recommended can be done by the AME or his or her staff, using instruments that are commonly available for routine office practice today.

Recommended List of Items for the Medical Examination

(presently Items 25-48)

- o Head, face, neck and scalp
- o Nose
- o Sinuses
- o Mouth and throat
- o Ears, general (including external canals)
- o Drums (perforation)
- o Eyes, general
- o Ophthalmoscopic
- o Pupils (equality and reaction)
- o Ocular motility (associated parallel movements, nystagmus)
- o Lungs and chest (including breasts)
- o Heart (precordial activity, rhythm, sounds, murmurs)
- o Vascular system (pulse amplitude and character, arms and legs)
- o Abdomen and viscera (including hernias)
- o G-U system
- o Upper and lower extremities (strength, range of motion)
- o Spine, other musculoskeletal
- o Skin
- o Identifying body marks, scars or tattoos
- o Neurologic (tendon reflexes, equilibrium, senses, cranial nerves, coordination, etc)
- o Appearance
- o Behavior

- o Mood
- o Communication
- o Memory
- o Cognition
- o Lymphatics
- o Endocrine system
- o General system

Recommended Tests

- o Blood pressure - record all blood pressure observations

Sitting

Standing

- o Pulse at rest (beats/minute)
- o Speech Discrimination

Right Ear ____%

Left Ear ____%

Sound Field ____%

- o Audiometry (ANSI 1969)

	500 Hz	1000 Hz	2000 Hz	3000 Hz	4000 Hz	6000
					(not req)	(not :)

Right ear (dB)

Left ear (dB)

note: The AME may select either the speech discrimination test or the audiometric test.

- o Distant Vision
 - Right eye 20/ corrected to 20/
 - Left eye 20/ corrected to 20/
 - Both eyes 20/ corrected to 20/
- o Near Vision
 - Right eye 20/ corrected to 20/
 - Left eye 20/ corrected to 20/
 - Both eyes 20/ corrected to 20/
- o Intermediate vision (age 50 years and older)
 - Right eye 20/ corrected to 20/
 - Left eye 20/ corrected to 20/
 - Both eyes 20/ corrected to 20
- o Tonometry (over age 40 years, and/or personal or family history of glaucoma)
 - Right eye
 - Left eye
- o Color Vision (test used, number of plates missed)
- o Field of vision (Classes I and II)
 - Right eye
 - Left eye
- o Heterophoria diopters (Classes I and II)
 - Distance
 - Esophoria
 - Exophoria
 - Hyperphoria
- o Urinalysis
 - Albumin

Sugar

Specific gravity

Occult blood

Bilirubin, if available (not required)

o Fasting plasma glucose (after age 40 years)

o Spirometry (over age 40 years, and every 6 years thereafter)

FVC (percent of predicted) _____

FEV₁ (percent of predicted) _____

FEV₁/FVC (as percent) _____

o ECG (date)/(at initial application; ages 35 years, 40 years and annually for Class I; ages 35 years and 40 years and biannually for Class II; age 40 years and every 6 years for Class III)

o Hematocrit _____%

o Other tests

WBC, if available (not required)

Platelets, if available (not required)

MCV, if available (not required)

Serum cholesterol (required on initial examination and at age 50 years)

Fasting (minimum 12-hour fast) serum triglycerides (required on initial examination only)

o Mini-mental status

Examination and Testing Procedures Recommended to be Eliminated

o Anus and Rectum (item #39)

o Psychiatric (item #47; replaced by specific signs of psychiatric problems)

- o Whispered voice test (replaced by speech discrimination or audiometric tests for all Classes)
- o Tactile intraocular pressure examination (replaced by instrument tonometry for all Classes)
- o Right and left hyperphoria (replaced by hyperphoria)
- o Recumbent blood pressure (replaced by at least three sitting blood pressure determinations)
- o Exercise and post-exercise pulses

Recommendations Concerning Form 8500-9

FAA Form 8500-9, the certificate that is given to the airman, states: "OPERATION DURING PHYSICAL DEFICIENCY: The holder of this certificate is governed by the provisions of FAR Sections 61.53, 63.19, and 65.49(d) relating to physical deficiency." Few if any airmen know what these sections contain, or can obtain copies of these sections. We recommend that this statement on 8500-9 be modified to include a synopsis of the pertinent requirements of these sections.

RECOMMENDED CHANGES TO THE AVIATION MEDICAL EXAMINERS GUIDE

General Considerations

The consultants were asked to review the Aviation Medical Examiner (AME) Guide for format and content. The consultants concluded that a major function of the Guide is to educate the AME about current clinical practice, as well as to guide the AME through the examination process. The consultants found that the present format, which separates discussions of medical history from discussions of physical examination and laboratory findings, is inadequate in educational value. Therefore, we recommend that the medical portion of the Guide be rearranged to place all pertinent medical information into one section.

In the following recommended AME Guide we have created such a section. It may be viewed as a mini-textbook of clinical aviation medicine, arranged by organ system. For each system there is an introduction, a review of pertinent recommended standards, a guide to the handling of positive answers on the medical history, a guide to the conduct of the physical examination and laboratory tests that are pertinent to each organ system, and a guide to the disposition of the applicant based on all relevant medical findings.

There are many nonmedical sections to the present AME Guide. We did not consider it to be our function to revise these sections, unless they impacted in some way on the medical review. We leave it to the FAA to decide what nonmedical information should be required.

Use of Any Medications in the Past Three Months

(revision of present question #15)

If the applicant checks yes, the type, dosage and purpose of each medication should be reported. The examiner should specifically review with the airman his or her use of nonprescription medications. Some nonprescription medications, such as cold preparations, have obvious central nervous system effects that may affect judgment. Chronic use of others, such as aspirin, suggests that the airman is feeling symptoms that may be a result of serious disease that may otherwise go unreported.

Certain cardiovascular drugs affect vasoregulatory mechanisms, central nervous system performance, and alter serum potassium all of which might precipitate serious cardiac arrhythmias. A list of all such drugs is required.

The examiner must defer issuance of a certificate to any airman who is undergoing continuous treatment with antihistamines, narcotics, barbiturates, tranquilizers and other mood-changing medications, steroids, anti-emetics, anti-hypertensive medications or medications for cardiac disorders, unless the airman documents to the satisfaction of the examiner that the continuous treatment has met the approval of the FAA, or unless the treatment is specifically mentioned as acceptable in this Guide.

The examiner should also remind the applicant that at those times when the aforementioned medications are required to treat acute illnesses, the applicant is obligated not to perform the duties of an airman until he or she receives clearance from the AME or FAA.

Visits to Health Professionals within Past 5 Years

(revision of present question #23)

The applicant is instructed to list all visits to health professionals within the past 5 years. The term "health professional" includes any professional who evaluates and/or treats persons for a fee. All visits should be reported, even if no "treatment" was provided.

The applicant should list all visits each time he or she fills out the medical form. The examiner should review the information, noting visits for newly reported medical conditions, and provide a comment to the FAA about his or her knowledge of and understanding of the reasons for these visits on the reverse side of form 8500-8.

Series of Questions on Smoking

The most common and serious threat to the health of the cardiovascular and respiratory systems is cigarette smoking. Eighty percent of deaths from coronary heart disease below the age of 45 years in males are attributable to smoking, as are 25% of deaths in males between the ages of 45 and 64 years. Smoking associated with even minor elevations of the blood pressure and/or elevated cholesterol carries a risk to the vascular system as potent as those of severe hypertension and severe hyperlipidemia alone. In the interest of keeping an airman in excellent health so that he or she can enjoy flying for many years, the AME should actively encourage a pilot who smokes to seek assistance in quitting. The AME should be aware of the many smoking-cessation programs that are in operation in communities around the country. Pilots who work for airline companies or other corporations should be encouraged to inquire whether their employers offer smoking-cessation clinics through health promotion programs, and if so, to participate in these programs. The AME should refer to the sections on the

Cardiovascular System and on Risk Factors in this Guide.

The debilitating effects of cigarette smoking on the lungs also has an effect on aviation safety. Chronic, heavy cigarette smoking can diminish the ability of the lungs to oxygenate the blood, which can have serious effects on higher mental functions, such as judgment. For this reason, the AME should calculate the "pack-years" of smoking that an applicant reports by multiplying the average number of packs smoked per day by the number of years smoking, and if "pack-years" is 20 or greater, the AME should obtain pulmonary function studies (spirometry) prior to issuing a certificate, to assure that the applicant's lung function is not severely impaired. The AME should refer to the section on the Respiratory System in this Guide.

Mental and Behavioral
Recommended Standards

For Classes I, II, III:

- A. An applicant shall have no established medical history or clinical diagnosis of any of the following:
- o Substance abuse, substance dependence and related substance use disorders, including but not limited to those associated with alcohol; barbiturates; other sedative/hypnotics; muscle relaxants; anxiolytics; opioids; central nervous system stimulants such as cocaine and amphetamines; and hallucinogens such as phencyclidine, cannabis and volatile solvents and gases.
 - o Schizophrenic disorders, including disorganized, catatonic, paranoid, undifferentiated and residual subtypes.
 - o Paranoid disorders, including paranoia, shared paranoid disorder, acute paranoid disorder and atypical paranoid disorder.
 - o Psychotic disorders not elsewhere classified, including schizophreniform disorder, brief reactive psychosis, schizoaffective disorder and atypical psychosis, infantile autism, childhood onset pervasive developmental disorder and atypical pervasive developmental disorder.
 - o Major affective disorders, including bipolar disorder and major depression.
 - o Anxiety disorders, including panic disorders.
 - o Dissociative disorders, including psychogenic amnesia and fugue, multiple personality, depersonalization disorder and atypical dissociative disorder.

- o Disorders of impulse control, including intermittent and isolated explosive disorder.
- o Personality disorders, including paranoid, schizoid, schizotypal, histrionic, narcissistic, antisocial and borderline.
- o Disorders that are usually first evident in infancy, childhood and adolescence.
- o Organic brain syndrome.

B. An applicant shall have no other organic, psychotic, substance use, affective, anxiety, dissociative, psychosexual, impulse control, adjustment, pervasive developmental or personality disorder, or other mental disorder that the Federal Air Surgeon finds:

- o makes the applicant unable to perform safely the duties or exercise the privileges of the airman certificate that he or she holds or for which he or she is applying; or
- o may reasonably be expected, within two years after the findings, to make the applicant unable to perform those duties or exercise those privileges; and the findings are based on the case history and appropriate qualified medical judgment relating to the condition involved.

C. At the discretion of the Federal Air Surgeon, a certificate may be issued to an applicant who does not meet the provisions above if there is established clinical evidence of recovery satisfactory to the Federal Air Surgeon in accordance with the following criteria:

- o Substance abuse, substance dependence and related substance use disorders: Sustained total abstinence from alcohol for not less than

the preceding two years, and other substances of abuse for not less than the preceding five years, associated with stable social and occupational functioning; and absence of mental disorder or psychopathology as demonstrated by psychiatric evaluation and psychological testing. For alcohol abuse and dependence, the required two year period of abstinence may be reduced by the Federal Air Surgeon for cases in which an appropriate level of medical and operational monitoring has been established.

- o Psychotic disorders not elsewhere classified: After a single episode, sustained freedom from all signs and symptoms of the disorder for the preceding year for brief reactive psychosis, and for the preceding two years for schizophreniform disorder, while taking no medication, and associated with stable social and occupational functioning; and absence of other mental disorder or psychopathology as demonstrated by psychiatric evaluation and psychological testing.
- o Major depression: After a single episode, sustained freedom from all symptoms and signs of the illness for not less than the preceding one year, associated with stable social and occupational functioning; and absence of other mental disorder or psychopathology as demonstrated by psychiatric evaluation and psychological testing.
- o Panic disorders: Sustained freedom from any symptoms that would represent a hazard to flying safety, with no use of anti-anxiety or other psychotropic medication, for not less than two years, associated with stable social and occupational functioning; and absence of other mental disorder or psychopathology as demonstrated by psychiatric evaluation and psychological testing.

- o Personality disorders other than paranoid, schizoid, schizotypal, histrionic, narcissistic, antisocial and borderline: Sustained freedom from any behavior that reflects impaired judgment or creates legal or disciplinary problems for not less than the preceding five years, associated with stable social and occupational functioning; and absence of other mental disorder or psychopathology as demonstrated by psychiatric evaluation and psychological testing.

D. Individuals with any of the disqualifying conditions listed in paragraphs A and B, except as provided for in paragraph C above, are not usually eligible for certification. However, an applicant may still seek reconsideration by the Federal Air Surgeon who, acting on behalf of the administrator, will continue to issue medical certificates to applicants who are able to perform airman duties without endangering safety. In making this decision, the Federal Air Surgeon considers the natural history and severity of the problem, the period of satisfactory recovery since manifestation of the problem, and treatment and continuing requirements for treatment. Other factors the Federal Air Surgeon considers include: 1) any current or recent psychiatric symptoms, aberrant behavior, or psychiatric or other medical findings; 2) the need for, or use or abuse of, any clinical agents, for either therapeutic or recreational purposes; 3) any personality traits or other recognized factors involving the risk of future recurrence of the problem or the risk of adverse effects; and 4) the current psychiatric functional status and stability of the applicant, as determined by appropriate evaluative techniques.

Introduction

The diagnostic terminology used in the Mental Disorders section of Part 67 conforms to that used in the Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM III), American Psychiatric Association, 1980. DSM III is a descriptive classification that differs significantly from previous classifications in several respects that are relevant to the FAA.

The syndromes are no longer divided into several major categories, such as psychoses, neuroses, and personality disorders. Hence, the current FAR's no longer list a major category such as "psychotic disorders" as disqualifying. Rather, each syndrome is treated individually. This does not imply that "psychosis" is no longer a valid or useful concept. As defined in the American Psychiatric Association's Psychiatric Glossary, a psychosis is a major mental disorder "in which the individual's ability to think, respond emotionally, remember, communicate, interpret reality and behave appropriately is sufficiently impaired so as to interfere grossly with his capacity to meet the ordinary demands of life." Function that is impaired to this degree is clearly a significant hazard to aviation safety. However, from a regulatory standpoint, symptoms of psychosis are now handled with respect to specific disorders, rather than as a class. Disorders in which symptoms of psychosis are a central feature, or are occasionally seen, include organic disorders, schizophrenia, paranoid disorders, affective disorders, and some personality disorders, including schizotypal and borderline.

A second feature of DSM III concerns its listing of explicit criteria that are required for each diagnosis. For example, a diagnosis of schizophrenic disorder requires that, along with the presence of specified signs and symptoms, the illness must be present continuously for at least 6 months. This requirement achieves one of the goals of DSM III—an increased reliability of psychiatric diagnosis—that is invaluable in research and treatment outcome studies. However, it presents potential problems when used for

other purposes. This was recognized by the authors of DSM III: an introductory paragraph cautions that for some legal and administrative purposes, the use of DSM III must be examined critically within the appropriate context.

In addition to the specific diagnostic criteria, DSM III includes a general description of the essential and associated features, course, impairment and complications of each disorder. These descriptions are clinically useful, and the Aviation Medicine Examiner or consultant should not hesitate to make a clinically appropriate diagnosis based upon these general features and his or her own clinical judgment, even though not all the specific diagnostic criteria may be met in a given case. As is stated in DSM III, the specific criteria "are offered as useful guides," and "for most of the categories the criteria are based on clinical judgment, and have not yet been fully validated."

Another feature of DSM III that is significant for aviation medicine is the elimination of the term "alcoholism" and the substitution of the terms "substance abuse" and "substance dependence." Although the FARs conform to DSM III in using the latter terms, these syndromes may be considered synonymous with the term "alcoholism" as used previously. The essential feature for the diagnosis of substance abuse is a pattern of pathological use that causes impairment in social and occupational functioning, and that continues despite these consequences. Depending upon the substance, there may be a need for daily use of the substance for adequate functioning, an inability to cut down or stop use, repeated efforts at controlled use through periods of temporary abstinence or restriction of use to certain times of day, or continuation of substance abuse despite a serious physical disorder that the individual knows is exacerbated by the use. Social impairment is manifested by the individual's failure to meet important obligations to friends and family, by displays of erratic and impulsive behavior and by inappropriate expression of aggressive feelings. Legal difficulties that result from behaviors while intoxicated often arise and impairment of occupational functioning is manifest by

absenteeism or inability to function effectively.

"Loss of control" is not a universal finding in alcohol and drug abuse. Some heavy drinkers maintain considerable control over their drinking, such as by not drinking more than a certain amount per day, or by not drinking on certain days. Complete loss of control is a late and unusual finding. Deleterious effects on physical health are frequently absent in the earlier years or even the first decade of alcohol abuse and dependence. It is often seen in the alcoholic person over the age of 50 years but often not seen before age 40 years.

Responses to Mental and Behavioral Questions in the Medical History

- o **Nervous trouble of any sort**

The term "nervous trouble" will mean either psychiatric or emotional illness or neuromuscular disorders to the applicant. The presence of some other organic disorders, such as hyperthyroidism, may only be known through the "nervous trouble" that results.

An affirmative answer to this question requires a thorough supplemental history-taking. The examiner should ask the applicant about memory difficulties; difficulties with concentration; depression, suicidal thoughts and attempted suicide; thinking difficulties; sleep disturbances; weight changes and changes in appetite; difficulties at work or home; and any questions that could lead to an organic basis for the nervousness, including exposures to toxic substances. Dispositions will vary according to the details that are obtained and to the results of the physical and mental status examinations.

- o **Any drug or narcotic habit**

The examiner must deny or defer certification to any applicant with an

established history of substance abuse or dependence, no matter how remote that history may be. If in doubt as to the significance of any drug "habit" to aviation safety, the Examiner should not hesitate to defer and send the application to the FAA for further consideration. Any applicant denied or deferred because of a drug history can be assisted by the examiner if documents relating to the history are acquired for FAA review. If a delay of over two weeks in acquiring these records is anticipated, the examiner should forward the completed FAA Form 8500-8 to the FAA with a notation that medical records will be sent under separate cover.

o Excessive drinking habit

A history of alcoholism, alcohol abuse, or alcohol dependence is cause for denial regardless of how remote that history may be. Excessive use of alcohol is not always considered to be synonymous with alcoholism, alcohol abuse or dependence. The episodic drinker may drink in excess on infrequent occasions without necessarily meeting the criteria that are discussed below. If the examiner is in doubt that the diagnosis of alcoholism has been established medically, the examiner should defer rather than deny certification. In all cases of alcoholism, alcohol abuse, and alcohol dependence, the examiner can assist the applicant who wishes further consideration by helping to gather all pertinent medical records for FAA review.

o Attempted Suicide

A history of suicidal attempts or suicidal gestures requires special evaluation. The ultimate decision as to eligibility for medical certification rests with the FAA. The examiner should take a supplemental history as

indicated, assist in the gathering of all medical records related to the incident(s) and, if the applicant agrees, assist in obtaining psychiatric and/or psychological examinations.

o Record of traffic convictions

The applicant must report all moving vehicle convictions. Since not all citations result in convictions, only convictions are reported. Traffic convictions do not disqualify an applicant, but they may raise questions about the applicant's fitness for certification. Repeated convictions related to alcohol raise a suspicion of alcohol abuse, alcohol dependence, or alcoholism.

o Record of other convictions

The applicant must report the date, place and circumstances for each. The medical meaning of these convictions is similar to that discussed in the question immediately above.

Examination for Mental and Behavioral Disorders

- o Other than a mini-mental status exam, no psychological tests or other special instruments are required for the psychiatric evaluation. A good history is essential.

The FAA does not expect the examiner to perform an extensive psychiatric interview. However, the examiner should obtain sufficient information to form a general impression of the applicant's emotional stability and level of functioning. Evaluation of the applicant's history may alert the examiner to gather further important factual information. Much information about the

individual may be found in items related to age, pilot time, and class of certificate for which the applicant is applying. Information about the length of time that the applicant has been at his or her present occupation and with his or her employer also may be important. Finally, previous medical denials or aircraft accidents may be related to psychiatric problems.

Psychiatric information can be derived from the individual items in the medical history. Any affirmative answers to "nervous trouble of any sort" are significant. Reporting symptoms like headaches or dizziness, or even heart or stomach trouble, may indicate anxiety rather than a primary medical problem. Any admission of alcohol or drug problems deserves follow-up. A record of traffic violations may reflect certain personality problems or indicate an alcohol problem. Affirmative answers related to rejection from military service or medical discharge require elaboration. If any psychotropic drugs are being used, follow-up questions are appropriate. An assessment of the applicant's current level of social and occupational functioning should be made. Some information can be derived from the casual conversation that occurs during the physical examination. This may reveal information about the family, the job, and special interests. Specific questions about job and avocational interests including flying are appropriate. Inquiry should be made about problems at home and work. Reasons for lack of employment, job changes, or poor social functioning should be sought.

Specific inquiry should be made about any difficulties with memory, concentration, or thinking; changes in appetite, sleep pattern or weight; and a history of suicidal thoughts or attempts. Any history of hospitalization for

emotional problems or past or present use of "tranquilizer" or sedative drugs should be noted. A positive response to any of these questions should prompt the examiner to obtain additional history and all available medical records. Often applicants report their previous diagnoses incorrectly, either because they don't know or because they choose to minimize past difficulties. If there was an admission to hospital for any emotionally-related problem, it will be necessary to obtain the entire record.

- o The examiner should check for the following signs of mental disorder:
 - a. Appearance (abnormal if dirty, disheveled, odoriferous, unkempt).
 - b. Behavior (abnormal if uncooperative, bizarre or inexplicable).
 - c. Mood (abnormal if excessively angry, sad, euphoric or labile).
 - d. Communication (abnormal if incomprehensible, does not answer questions directly).
 - e. Memory (abnormal if unable to recall recent events).
 - f. Cognition (abnormal if unable to engage in abstract thought, or if delusional or hallucinating).

- o Signs that may indicate the presence of substance abuse even in the absence of a positive history include:
 - ENT - Trauma to head, perforation of the nasal septum, poor oral hygiene, gingivitis, pyorrhea.
 - Eye - nystagmus, reddened conjunctivae.
 - Cardiopulmonary - coarse rales or rhonchi, tachycardia, hypertension, irregular pulse.
 - Gastrointestinal - enlarged or tender liver.
 - Neurologic - unexplained epilepsy with adult onset, headache, tremor,

dysarthria, ataxia, poor coordination.

If any significant problems are identified, the examiner should defer issuance of the medical certificate and report the suspicions to the FAA. This could be accomplished by contacting the Regional Flight Surgeon or the Aeromedical Certification Branch, AAC-130.

- o For the purpose of screening for defects in an applicant's cognitive functions, the AME should include a brief "mini-mental status" examination, consisting of four questions of a complexity that is appropriate for a pilot population. Examples of these questions are given below, but the AME should change the specific items in each question so that an applicant will not "learn" the appropriate answers at each examination:

1. Name three items (eg, house, horse, apple, table, penny), ask the applicant to repeat them, and then ask the applicant to remember them, since at the end of the mini-mental status you will ask the applicant to state them again.
2. Ask the applicant to subtract a double digit number, such as 13, 17, or 19, from a triple digit number, such as 100, 200 or 250. The applicant should attempt three serial subtractions.
3. Show the applicant one of the two cards in Figure 1; take the card away and ask the applicant to draw what he or she saw.
4. State a series of 6 numbers and ask the applicant to repeat them.
5. Ask the applicant to recall and repeat the original three items in question 1.

The applicant should get all four parts of the mini-mental status exactly correct. If he or she does not, then the AME should follow-up with the Mini-

mental Status Examination of Folstein, Folstein and McHugh, which is in the appendix.

This is a standardized examination of cognitive function that includes 11 questions, and can be administered in 5-10 minutes. The questions are asked in the order listed and can be scored immediately. It is divided into 2 sections. The first section requires oral responses only and covers orientation, memory and attention; the maximum score is 21. The second part tests the ability to name, follow verbal and written comments, write a sentence spontaneously and copy a complex figure; the maximum score is 9. Maximum total score is 30. Applicants who score below 27 should be deferred and referred for psychiatric evaluation and psychological testing. A copy of the Folstein Mini-mental status examination is found in the Appendix.

Disposition

o **General considerations**

It must be pointed out that concerns for aviation safety are not the same as concerns for emotional health in everyday life. There are some considerations that may have only slight impact on the overall capacities of an individual and the quality of his or her life, but nevertheless have great impact on safety. Conversely, there are many emotional problems that are of therapeutic and clinical concern, but have no impact on safety.

The fact that an applicant has seen a mental health professional needs to be followed up, but it may be found to have no significance for medical certification. For instance, growth and adjustment problems requiring

psychotherapy are usually not considered significant for safety when there are no vocational disruptions or use of medications. This might include marital counselling or psychotherapy for identity problems or issues of growth and personal fulfillment. A history of brief situational problems resulting from such life events as marital disruption, business problems, and the death of loved ones may likewise not be significant. Also, sexual behavior that does not reflect upon overall judgment and self control are not concerns for safety.

o Disqualifying conditions

The FAA has concluded that the presence of or past history of certain psychiatric conditions is sufficient to suggest a potential threat to flying safety. It is therefore incumbent upon the examiner to be aware of any indications of these conditions currently or in the past, and to deny or defer issuance of the medical certificate to an individual who has a history of these conditions. The disqualifying conditions are listed in Part 67 Mental and Behavioral Standards. Persons who have a history of any of these conditions may petition the Federal Air Surgeon and the medical certification may be issued if the applicant shows to the satisfaction of the Federal Air Surgeon that the duties authorized by the medical certificate can be performed without endangering air commerce during the period in which the certificate is in force.

The substance abuse disorders affect judgment and behavior and manifest themselves in impaired social and occupational functioning, and deterioration in physical and psychological functioning. The pattern of pathological use implies some degree of loss of control, with a need to

continue to use the substance despite adverse consequences. Some individuals come to the attention of the FAA because of problematic drug use that would not qualify as a substance abuse diagnosis, perhaps because social or occupational impairment has not yet occurred. Thus, each case of a substance use problem should be evaluated individually. If there were only one brief episode in the distant past with minor consequences, a certificate might be issued without further assessment. Recent repeated or lengthy episodes with adverse consequences requires further assessment. In cases in which the applicant has an established medical history or clinical diagnosis of substance abuse or dependence, including alcoholism, the factors considered for special issuance would include: 1) the period of the applicant's abstinence from alcohol; 2) the severity of the problem and how long it has existed; 3) the number of times treatment was sought and relapse occurred; 4) the quality of the final treatment efforts; 5) the presence of residual medical complications, especially neurologic manifestations; 6) progress in marital, social, vocational and educational rehabilitation, as appropriate; 7) commitment to rehabilitation by virtue of continuing contacts with social or professional agencies, or both, and the nature of their opinions and recommendations; 8) any underlying personality difficulties that would either be disqualifying independently or adversely affect sustained abstinence, and; 9) the findings of a recent psychiatric and psychological evaluation.

Schizophrenic, paranoid and other psychotic disorders adversely affect functioning as a result of major disturbances in thought, emotions and behavior. Disruption of an accurate appraisal of reality and major disturbances in content and form of thought are seen in disorganized, illogical thinking; persecutory and other delusions; and preoccupation with

overvalued, grandiose, or pseudophilosophic ideas. Blunted, flattened, labile or inappropriate affect, and inappropriate behavior, also reflect the individual's distorted perception of reality. A history of hospitalization for psychiatric reasons is an indication for deferral, pending receipt and evaluation of all hospital records. Any current or past evidence of a psychosis is cause for psychiatric and psychological evaluation before certification is considered.

Affective disorders are characterized by disorders of mood, either depression or elation. Major depressions adversely affect functioning through the individual's preoccupation with feelings of worthlessness and inadequacy, exaggerated self reproach, and pervasive feelings of inability to function. In those individuals with a bipolar affective disorder, the manic episodes, characterized by elation, hyperactivity, distractability, pressured speech, inflated self-esteem and poor judgment, represent an even greater hazard to flying safety. The major affective disorders are often recurrent. A history of an affective disorder, particularly if hospitalization and somatic treatment was necessary, or a history of suicidal preoccupation or attempt, requires complete evaluation before certification is considered.

Anxiety disorders interfere with functioning because of preoccupation with feelings of apprehension and dread and the fear of being incapacitated. The experience of an appropriate level of anxiety is universal, and serves the adaptive functions of maintaining awareness and vigilance to prevent or respond to danger, and maintain adherence to group rules and expectations. However, excessively high levels of anxiety interfere with adaptive functioning and impair both thinking and behavior. A history of these

disorders is cause for deferral and complete evaluation. Abnormally low levels of anxiety can also severely impair performance, such as aviation, which requires careful attention to rules and standard procedures. Very low levels of anxiety may lead to little motivation for following rules, lack of sufficient vigilance, and inappropriate risk-taking behaviors. Unfortunately, individuals with inappropriately low levels of anxiety are not readily identified but strong indications of this problem should lead to deferral and complete evaluation.

Of the anxiety disorders, acute panic disorder and agoraphobia are particularly significant, because of the incapacitating nature of the symptoms and their unpredictable occurrence in situations that cannot easily be avoided by the individual. Panic disorder is manifest by the usually unpredictable, sudden onset of intense apprehension or terror, often associated with feelings of impending doom. Between attacks the individual often develops some degree of nervousness and apprehension. Agoraphobia is a marked fear of being in public places, such as elevators and public transportation, from which escape might be difficult or help might not be available in case of sudden incapacitation. The individual learns to constrict activities as fears and avoidance behavior dominate daily life. The presence of, or history of, either panic disorder or agoraphobia is disqualifying.

In contrast to the incapacitating symptoms experienced in panic disorders and agoraphobia, the simple phobias are manifest by a persistent irrational fear of, or a compelling desire to avoid, a specific and circumscribed object and situation. The individual recognizes that his or her fear is excessive or unreasonable. Impairment may be minimal if the phobic object is rare and

easily avoided. The natural history of simple phobias is that they usually arise in childhood or adolescence and rarely have an onset after early adulthood. Consequently, there is a high likelihood that either conscious malingering or unconscious secondary gain play an important role when a pilot seeks economic compensation on the basis of "fear of flying." A pilot who claims to develop a fear of flying should not be forced to fly; however, since simple phobias can usually be treated successfully with behavior therapy, the thrust of policy in this area should be toward vigorous treatment and return to duties, and away from compensation for disability.

The dissociative disorders include psychogenic amnesia, fugue, multiple personality and depersonalization disorder. These disorders adversely affect functioning as a result of a sudden, temporary alteration in the normally integrated functions of consciousness, identity or motor behavior. Psychogenic amnesia is characterized by a sudden inability to recall important personal information, often associated with perplexity, and disorientation. In psychogenic fugue, there is sudden, unexpected travel away from home or customary work locale with assumption of a new identity and an inability to recall one's previous identity. The person may assume a completely new identity during the fugue, usually marked by more gregarious and uninhibited traits than those that characterized the former personality. The individual's travel and behavior appear more purposeful than in the confused wandering that may be seen in psychogenic amnesia. Multiple personality is manifested by the existence within the individual of two or more distinct personalities, each fully integrated with unique memories and behavior patterns, each of which dominates at a particular time. Depersonalization disorder involves an alteration in the perception or

experience of the self with feelings of self-estrangement or unreality. It may be accompanied by the feeling that one is functioning in a "mechanical" manner or as though in a dream. The dissociative disorders or a history thereof are cause for disqualification.

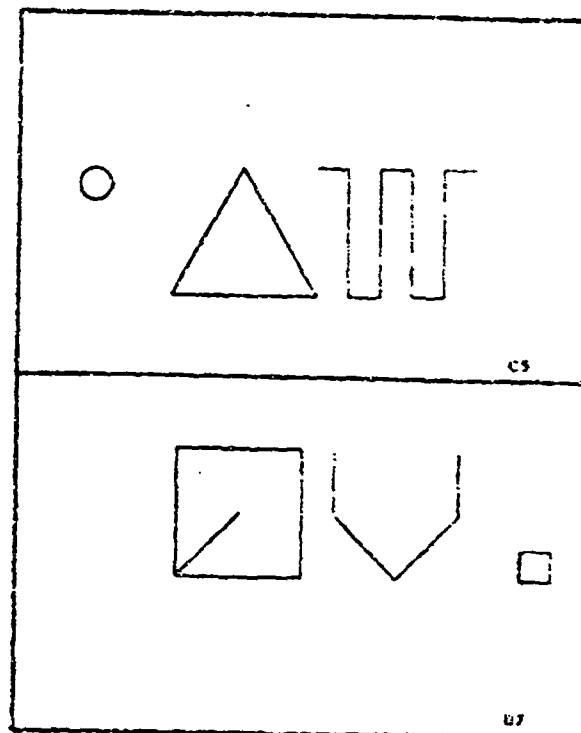
Disorders of impulse control include five categories: pathological gambling, kleptomania, pyromania, intermittent explosive disorder and isolated explosive disorder. Many of these disorders have associated personality disturbances, and should be deferred for further evaluation. The explosive disorders are particularly significant because of the occurrence of serious aggressive behavior that is grossly out of proportion to the precipitating circumstance.

Personality disorders are enduring, maladaptive patterns of perceiving, relating to and thinking about the environment and oneself. They are exhibited in a wide range of important social and personal contexts, and cause significant impairment in social or occupational functioning. The basic hallmark of personality disorders is disordered behavior, and the diagnosis is based upon observed behavior rather than formal mechanisms of cognition, perception, and affect. Thus, diagnostic assessment and prognosis is based upon the history of a person's aberrant behavior in response to ongoing life events. The aberrant behavior is the final common pathway of deficits in the appropriate processing of internal and external stimuli. One of two major responses occurs: an immediate response leading to "impulsive behavior," or a stereotyped, programmed response, which ignores the uniqueness of the situation. Both the impulsive, unpredictable behavior or the rigid, predictable, nonconforming behavior can pose a serious problem

for pilot performance and aviation safety. No arbitrary line can be drawn between the normal variations in personality organization or style and a psychopathological personality disorder. Individuals who have either a diagnosis of a personality disorder, or who have a history of problematic behavior that has impaired social and occupational functioning or has created legal or disciplinary problems should be deferred pending further evaluation.

Although not all can be mentioned specifically in Part 67, a wide variety of mental disorders are associated with functional impairments that may result in a finding that the applicant is unable to perform the duties safely or exercise the privileges of the airman certificate that he or she holds or for which he or she is applying. Examples would include adjustment disorders with temporary significant impairment; drug use, which is problematic, but which does not meet all the criteria for a diagnosis of substance abuse or dependence; anxiety, depression and somatiform disorders of less than major proportions, which nonetheless create impairment in cognitive, affective or behavioral function; and mild deficits in intellectual functioning, which create disruption in skilled performance despite adequate day-to-day social and occupational functioning. In addition, disorders that in themselves might not create significant impairment may be disqualifying if they are treated with various psychoactive drugs, including sedative, anti-anxiety, or antidepressant agents. The examiner should not issue a certificate in any of these circumstances, but should defer issuance and forward the medical records to the Aeromedical Certification Branch, AAC-130, Oklahoma City.

FIGURE 1



Two representative items of the Benton Visual Retention Test.

Source: Benton AL: The Revised Visual Retention Test (ed 4). New York, The Psychological Corporation, 1974

"MINI-MENTAL STATE"**A PRACTICAL METHOD FOR GRADING THE COGNITIVE
STATE OF PATIENTS FOR THE CLINICIAN*****MARSHAL F. FOLSTEIN, SUSAN E. FOLSTEIN**

and

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*(Received 17 December 1973; in revised form 25 November 1974)***INTRODUCTION**

EXAMINATION of the mental state is essential in evaluating psychiatric patients.¹ Many investigators have added quantitative assessment of cognitive performance to the standard examination, and have documented reliability and validity of the several "clinical tests of the sensorium".²⁻³ The available batteries are lengthy. For example, WITKINS and HINTON's test includes 33 questions and requires about 30 min to administer and score. The standard WAIS requires even more time. However, elderly patients, particularly those with delirium or dementia syndromes, cooperate well only for short periods.⁴

Therefore, we devised a simplified, scored form of the cognitive mental status examination, the "Mini-Mental State" (MMS) which includes eleven questions, requires only 5-10 min to administer, and is therefore practical to use serially and routinely. It is "mini" because it concentrates only on the cognitive aspects of mental functions, and excludes questions concerning mood, abnormal mental experiences and the form of thinking. But within the cognitive realm it is thorough.

We have documented the validity and reliability of the MMS when given to 206 patients with dementia syndromes, affective disorder, affective disorder with cognitive impairment "pseudodementia"^{5,6}, mania, schizophrenia, personality disorders, and in 63 normal subjects.

DESCRIPTION OF THE MMS

The MMS is shown in the appendix. Questions are asked in the order listed and scored immediately. The tester (psychiatric resident, nurse, or volunteer) is instructed first to make the patient comfortable, to establish rapport, to praise successes, and to avoid

*Reprint request to M.F.F. now at Department of Psychiatry and Behavioral Science, Johns Hopkins Hospital, Baltimore, Md. 21205.

pressing on items which the patient finds difficult. In this setting most patients cooperate, and catastrophic reactions are avoided.

The MMS is divided into two sections, the first of which requires vocal responses only and covers orientation, memory, and attention; the maximum score is 21. The second part tests ability to name, follow verbal and written commands, write a sentence spontaneously, and copy a complex polygon similar to a Bender-Gestalt Figure; the maximum score is nine. Because of the reading and writing involved in Part II, patients with severely impaired vision may have some extra difficulty that can usually be eased by large writing and allowed for in the scoring. Maximum total score is 30. The test is not timed. Detailed instructions for administration are given in the appendix.

METHODS

The MMS was given to two groups of people that we will refer to as Samples A and B. In Sample A (Table 1) are 69 patients chosen specifically as clear examples of clinical conditions (29 with dementia syndromes due to a variety of brain diseases, 10 with affective disorder, depressed type with clinically recognizable cognitive impairment, 30 with uncomplicated affective disorder, depressed type) and 63 normal, elderly persons similar in age to the patients. All the patients were tested shortly after admission to the New York Hospital Westchester Division, a private psychiatric hospital and the normal subjects were tested at a Senior Citizens Center and at a retirement apartment complex. Thirty-three of the 69 patients in Sample A were retested after treatment. The patients with dementia were treated according to their clinical conditions. They occasionally received tricyclic antidepressants or phenothiazines as well as treatment for medical illnesses. The patients with depression were treated with antidepressants and/or ECT. They also may have received medical treatments.

Sample B (Table 2) is a patient group formed by taking consecutive admissions to the hospital and giving them the MMS shortly after admission. It was intended to be a standardization sample and came eventually to consist of 137 patients (9 patients with dementia, 31 patients with affective disorder, depressed type, 14 patients with affective disorder, manic type, 24 with schizophrenia, 32 with personality disorder with drug abuse, and 27 with neurosis). These diagnoses were made by M.F. on review of the hospital chart employing the diagnostic criteria described below and without knowledge of the MMS scores. Subsets of patients from both Samples A and B were extracted for age-matched studies (Table 1B) concurrent validity (Table 3) and test-retest reliability (Table 4).

The following diagnostic criteria were used for both Sample A and B:

Dementia. A global deterioration of intellect in clear consciousness.

Affective disorder, depressed type, with cognitive impairment. A sustained feeling of depression with an attitude of hopelessness, worthlessness or guilt accompanied by disturbances in orientation and memory which occurred after the onset of the depression.

Affective disorder, depressed type, uncomplicated. A sustained feeling of depression with an attitude of hopelessness, worthlessness or guilt and with no notable cognitive defect.

Affective disorder, manic type. A sustained feeling of elevated mood with an attitude of overconfidence or exaggerated self-importance.

Schizophrenia. Either Schneider's first rank symptoms in the absence of affective symp-

TABLE 1.

Sample 1

Mini Mental State Scores on Admission								
Diagnosis	N	Age	Sex M/F	MMSE			Rank-Summary U	P
				Mean	S.D.	Range		
Dementia	29	80.8	12/17	9.6	5.8	0-22	45	<.001
Depression with cognitive impairment	10	74.5	7/3	19.0	6.6	9-27	45.8	<.001
Affective Dis., Depressed	30	49.8	9/21	25.1	5.4	9-30	1178 (246)	<.001
Normal	63	71.9	27/36	27.6	1.7	24-30		

B. Mini Mental Scores on Admission: Age-Matched Sample

Diagnosis	N	Age	Age Range	Sex M/F	MMSE			Rank-Summary U	P
					Mean	S.D.	Range		
Dementia	7	76	73-79	2/5	6.9	4.7	1-14	4	<.001
Depressed with cognitive impairment	8	76	72-85	5/3	18.4	5.7	9-27	8.5	<.006
Affective Dis., Depressed	8	74	63-79	1/7	25.1	4.4	17-30		

C. Mini Mental State Scores of Patients Tested Before and After Treatment

Diagnosis	N	Age	Sex M/F	MMSE			MMSE	1 day before treat			Wilcoxon T (2-tail)	P
				Mean	S.D.	Range	Mean	S.D.	Range			
Dementia	17	81.4	4/13	10.5	5.8	0-22	11.7	5.7	1-20	79	27	.25
Depression with cognitive impairment	7	75.0	3/4	18.3	5.7	13-27	23.4	2.6	21-28	35	1.0	<.025
Affective Dis., Depressed	12	54.9	3/9	25.5	5.0	14-30	27.2	1.7	14-30	51	13.3	<.025

TABLE 2.

Sample 2

Diagnosis	N	Age	Sex M/F	MMSE		
				Mean	S.D.	Range
Dementia	9	71.4	3/6	12.2	6.7	1-22
Depression	5	57.2	15/15	25.9	4.2	9-30
Mania	14	33.5	6/8	26.6	1.5	25-30
Schizophrenia	24	44.6	14/10	24.5	6.6	1-30
Personality disorder with Drug Abuse	22	34.2	17/15	25.0	2.5	19-30
Normal's	17	25.2	15/12	27.6	2.4	21-30

ptoms or the presence of a personality deterioration associated with thought disorder and emotional incongruence without first rank symptoms.

Personality disorder with drug abuse. Absence of all above symptoms with a history of drug abuse, including alcohol.

Neuroses. Presence of psychological symptoms appearing to arise from the combination of a particular life situation and vulnerable character but with the specific absence of symptoms characteristic of the other syndromes.

TABLE 3.

Sample for MMS - IQ Correlation

Diagnosis	N	Age	Sex M/F
Dementia	7	78	3/4
Depression with cognitive impairment	8	76	6/2
Depression	8	55	3/5
Schizophrenia	2	68	1/1
Neurosis	1	22	0/1

TABLE 4.

Test-Retest Reliability

Type of Reliability	Sample Composition	N	Age	Sex M/F	MMS 1			MMS 2			# days between tests	Wilcoxon T	P	Pearson r	P
					X	S.D.	Range	X	S.D.	Range					
24 hr. retest (1 tester)	various types of depressive symptoms	22	41.2	12/10	24.2	7.1	2-30	25.3	7.0	1-30	1	45	NS	0.987	<.0001
24 hr. retest (2 testers)	various types of depressive symptoms	19	45.6	7/12	23.8	4.7	13-30	25.2	5.1	13-30	1	22	NS	0.987	<.0001
20 day retest clinically stable patients	Dementia, depression, schizophrenia	23	70.1	6/17	19.3	10.0	1-30	19.2	9.2	1-29	27.7	42	NS	0.988	<.0001

RESULTS

Validity

The MMS separated the three diagnostic groups in Sample A from one another and from the normal group. Of a total possible score of 30, the mean score for patients with dementia was 9.7, depression with cognitive impairment 19.0, and uncomplicated affective disorder, depressed 25.1. The mean score for normals was 27.6. Thus, the MMS scores agreed with the clinical opinion of the presence of cognitive difficulty and as the cognitive difficulty is usually less in depression than in dementia the scores dispersed in a fashion agreeing with the severity of the difficulty.

To be sure that these scores were not due to age effects and unrelated to clinical conditions an age-matched group was drawn from Sample A and showed an identical dispersal of scores according to diagnosis (Table 1b). Mean initial Mini-Mental Status score for

patients with depression under 60 yr-of-age was 24.5 and for patients over 60 was 25.7. These scores were not significantly different.

Thirty-three patients in Sample A were tested prior to and after treatment appropriate to their conditions. Patients with dementia most of whom have uncorrectable brain disease could be expected to show little change in a valid test of cognitive state, whereas those with depression and an associated cognitive difficulty (pseudo dementia) should show a considerable gain with treatment. These expectations are borne out in the results. There is no significant change in the MMS of dementia, a small but significant increase in the depressed patients, and a large and significant increase in those depressed patients with symptoms of cognitive difficulty.

Graphs charting the change-over time in the Mini-Mental State in three patients with improving cognitive states illustrate its usefulness serially and are further examples of how the MMS changes with the clinical state. The examples include a patient recovering from a head injury (Fig. 1), a patient recovering from a metabolic delirium (Fig. 2), and a patient recovering spontaneously over 2½ months from a depression accompanied by severe cognitive impairment (Fig. 3).

Sample B was drawn in order to improve the impression of validity by standardizing the

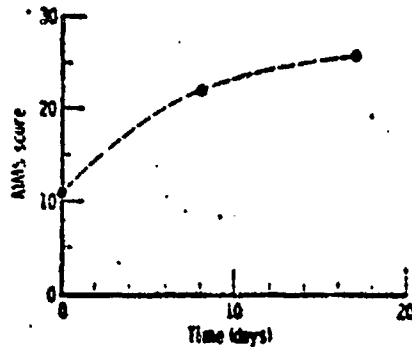


FIG. 1. Serial Mini-Mental State Scores of a patient recovering from a head injury.

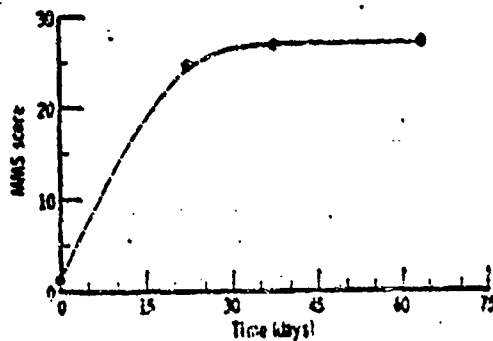


FIG. 2. Serial Mini-Mental State Scores of a patient recovering from a metabolic delirium.

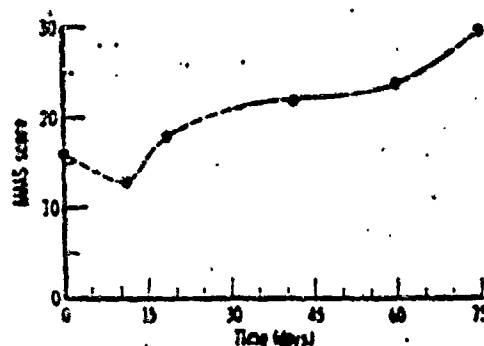


FIG. 3. Serial Mini-Mental State Scores of a patient recovering spontaneously from a depression accompanied by severe cognitive impairment.

MMS in a consecutive series of admission. One hundred and thirty-seven consecutive admissions were examined. Their mean MMS scores were: dementia 12.2; affective disorder, depressed 25.9; mania 26.6; schizophrenia 24.6; personality disorder with drug abuse 26.8; and neuroses 27.6. The minor differences in mean scores between Sample A and B for dementia and depression are not significant. In Sample B the means are similar for all diagnostic groups except dementia. However, amongst the groups with similar means those with depression and schizophrenia had a much wider range of scores than the other diagnostic groups or normal subjects in Sample A. Scores below 20 were found only in functional psychosis or dementia with but one exception; a score of 19 in a patient who had a history of drug abuse.

Concurrent validity was determined by correlating MMS scores with the Wechsler Adult Intelligence Scale, Verbal and Performance scores in a group of patients selected from Sample A and B because they had both a MMS and WAIS Performance in the same week. See Table 3 for the diagnostic and age distribution of this group. For Mini-Mental Status vs Verbal IQ, Pearson r was 0.776 ($p < 0.0001$). For Mini-Mental Status vs Performance IQ, Pearson r was 0.660 ($p < 0.001$).

Reliability

The MMS is reliable on 24 hr or 28 day retest by single or multiple examiners. When the Mini-Mental Status was given twice, 24 hr apart by the same tester on both occasions, the correlation by a Pearson coefficient was 0.887. Scores were not significantly different using a Wilcoxon T . To note examiner effect on 24 hr test: retest reliability the MMS was given twice, 24 hr apart by two examiners. The Pearson r remained high at 0.827. The scores did not change; Wilcoxon T was not significant (Table 4). Thus the scores seem stable even when multiple examiners are used, the practice effect is small.

When elderly depressed and demented patients chosen for their clinical stability were given the Mini-Mental Status twice, an average of 28 days apart, there was no significant difference in these scores by the Wilcoxon T and the product moment correlation for test 1 vs test 2 was 0.98. (See Table 4.)

DISCUSSION

The MMS is a valid test of cognitive function. It separates patients with cognitive disturbance from those without such disturbance. Its scores follow the changes in cognitive state when and if patients recover. Its scores correlate with a standard test of cognition, the Wechsler Adult Intelligence Scale (WAIS).

Before considering its uses, it is an elementary but important point that as with any examination of cognitive performance, the MMS cannot be expected to replace a complete clinical appraisal in reaching a final diagnosis of any individual patient. Cognitive difficulties arise in a number of different clinical conditions. This is demonstrated by the overlapping of scores on the MMS in several categories here. Accurate diagnosis, including appraisal of the significance of cognitive disabilities documented in the MMS, depends on evidence developed from the psychiatric history, the full mental status examination, the physical status and pertinent laboratory data.

But the MMS does have a number of valuable features for clinical practice even though it cannot carry alone the diagnostic responsibility. As it is a quantified assessment of cognitive state of demonstrable reliability and validity, it makes more objective what is commonly a vague and subjective impression of cognitive disability during an assessment of a patient. It can provide this quantification easily requiring only a few minutes to complete. It can be repeated during an illness and shows little practice effect. Thus it is ideal for initial and for serial measurements of this important aspect of mental functioning and can demonstrate worsening or improvement of this feature over time and with treatment.

As with any other quantified assessment of cognitive function such as the WAIS with which it correlates so well, the MMS permits comparisons to be drawn between intellectual changes and other aspects of mental functioning. We have found it particularly useful in documenting the cognitive disability found in some patients with affective disorder (Post's pseudodementia) and the improvement of this symptom with appropriate therapy for the mood disorder. Other applications that demand a quantitative assessment of cognitive function might be expected.

The MMS as it is extracted from the clinical examination has an advantage in assessment of patients and clinical problems not so obvious in tests such as the WAIS that are designed for other purposes such as prediction of school or occupational performance. Thus failures in the MMS on orientation, memory, reading and writing have much clearer implications than do failures in digit symbol, picture completion or vocabulary subtests of the WAIS in terms of a patient's capacity to care for himself. These implications from the MMS score are easily appreciated by other professionals such as lawyers, judges and social workers concerned with such issues as the patient's competency to manage his daily affairs. It can therefore aid in bringing to the patient the social supports that he needs.

Finally we have found the MMS useful in teaching psychiatric residents to become skilful in the evaluation of the cognitive aspects of the mental status. It provides them with a standard set of questions replacing what is often a bewildering variety of individual approaches. Those questions that it employs have obvious clinical pertinence and cover most of the categories of cognitive disability. Since it can be done quickly and gives a score it draws the resident's attention to global improvements or declines in cognitive state. It also though because special attention is focused on memory and language functions will reveal

the partial cognitive disabilities seen in the aphasic and the amnesic syndromes. As it becomes a routine, we have found an increase in resident interest and competence in assessing and managing the conditions that affect cognitive functioning such as dementia and delirium.

SUMMARY

A short, standardized form was devised for the serial testing of the cognitive mental state in patients on a neurogeriatric ward, as well as for consecutive admission to a hospital. It was found to be quick, easy to use, and acceptable to patients and testers.

When given to 69 patients with dementia, depression with cognitive impairment, and depression (Sample A), the test proved to be valid and reliable. It was able to separate the three diagnostic groups, it reflected clinical cognitive change, it did not change in patients thought to be cognitively stable, and it was correlated with the WAIS scores. Standardization of the test by administration to 63 normal elderly subjects and 137 patients (Sample B) indicated that the score of 20 or less was found essentially only in patients with dementia, delirium, schizophrenia or affective disorder and not in normal elderly people or in patients with a primary diagnosis of neurosis and personality disorder. The Mini-Mental Status was useful in quantitatively estimating the severity of cognitive impairment, in serially documenting cognitive change, and in teaching residents a method of cognitive assessment.

Acknowledgement—Supported in part by the general research funds, University of Oregon, Health Sciences Division.

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APPENDIX

Patient.....
Examiner.....
Date.....

"MINI-MENTAL STATE"

Maximum
Score Score

ORIENTATION

- 5 () What is the (year) (season) (date) (day) (month)?
5 () Where are we: (state) (county) (town) (hospital) (door).

REGISTRATION

- 3 () Name 3 objects: 1 second to say each. Then ask the patient all 3 after you have said them. Give 1 point for each correct answer. Then repeat them until he learns all 3. Count trials and record.

Trials

ATTENTION AND CALCULATION

- 3 () Serial 7's. 1 point for each correct. Stop after 5 answers. Alternatively spell "world" backwards.

RECALL

- 3 () Ask for the 3 objects repeated above. Give 1 point for each correct.

LANGUAGE

- 9 () Name a pencil, and watch (2 points)
Repeat the following "No ifs, ands or buts." (1 point)
Follow a 3-stage command:

"Take a paper in your right hand, fold it in half, and put it on the floor"
(3 points)

Read and obey the following:

CLOSE YOUR EYES (1 point)

Write a sentence (1 point)

Copy design (1 point)

_____ Total score

ASSESS level of consciousness along a continuum_____

Alert Drowsy Stupor Coma

INSTRUCTIONS FOR ADMINISTRATION OF MINI-MENTAL STATE EXAMINATION

ORIENTATION

- (1) Ask for the date. Then ask specifically for parts omitted, e.g., "Can you also tell me what season it is?" One point for each correct.
(2) Ask in turn "Can you tell me the name of this hospital?" (town, county, etc.). One point for each correct.

REGISTRATION

Ask the patient if you may test his memory. Then say the names of 3 unrelated objects, clearly and slowly, about one second for each. After you have said all 3, ask him to repeat them. This first repetition determines his score (0-3) but keep saying them until he can repeat all 3, up to 6 trials. If he does not eventually learn all 3, recall cannot be meaningfully tested.

ATTENTION AND CALCULATION

Ask the patient to begin with 100 and count backwards by 7. Stop after 5 subtractions (93, 86, 79, 72, 65). Score the total number of correct answers.

If the patient cannot or will not perform this task, ask him to spell the word "world" backwards. The score is the number of letters in correct order. E.g. dlrow = 5, dlrow = 3.

RECALL

Ask the patient if he can recall the 3 words you previously asked him to remember. Score 0-3.

LANGUAGE

Naming: Show the patient a wrist watch and ask him what it is. Repeat for pencil. Score 0-2.

Repetition: Ask the patient to repeat the sentence after you. Allow only one trial. Score 0 or 1.

3-Stage command: Give the patient a piece of plain blank paper and repeat the command. Score 1 point for each part correctly executed.

Reading: On a blank piece of paper print the sentence "Close your eyes", in letters large enough for the patient to see clearly. Ask him to read it and do what it says. Score 1 point only if he actually closes his eyes.

Writing: Give the patient a blank piece of paper and ask him to write a sentence for you. Do not dictate a sentence, it is to be written spontaneously. It must contain a subject and verb and be sensible. Correct grammar and punctuation are not necessary.

Copying: On a clean piece of paper, draw intersecting pentagons, each side about 1 in., and ask him to copy it exactly as it is. All 10 angles must be present and 2 must intersect to score 1 point. Tremor and rotation are ignored.

Estimate the patient's level of sensorium along a continuum, from alert on the left to coma on the right.

239. Have you ever had occasion to talk to a doctor about problems with your memory?

No ①
Yes ②

DECK 11

Let me ask you a few questions to check your concentration and your memory. Most of them will be easy.
ENTER ANSWER AND THEN CODE.

		CORRECT	ERROR
240. What is the year?	YEAR: _____	①	② 60/
241. What season of the year is it?	SEASON: _____	①	② 61/
242. What is the date?	DATE: _____	①	② 62/
243. What is the day of the week?	DAY: _____	①	② 63/
244. What is the month?	MONTH: _____	①	② 64/
245. Can you tell me where we are right now? For instance, what state are we in?	STATE: _____	①	② 65/
246. What county are we in?	COUNTY: _____	①	② 66/
247. What (city/town) are we in?	CITY: _____	①	② 67/
248. A. What floor of the building are we on?	FLOOR: _____	①	② 68/
B. What is this address (IF INSTITUTIONALIZED: or name of this place)?	ADDRESS/NAME: _____	①	② 69/

BEGIN DECK 12

249. I am going to name 3 objects. After I have said them, I want you to repeat them. Remember what they are because I am going to ask you to name them again in a few minutes.

"Apple"

"Table"

"Penny"

Could you repeat the 3 items for me? SCORE FIRST TRIAL.

	CORRECT	ERROR
a. Apple	①	② 69/
b. Table	①	② 69/
c. Penny	①	② 69/

INTERVIEWER: [REDACTED] [REDACTED] [REDACTED]

☐ Tell you to stop?
 COUNT ONLY 1 ERROR IF SUBJECT MAKES SUBTRACTION ERROR; BUT SUBSEQUENT ANSWERS ARE 7 LESS THAN THE ERROR.

	CORRECT	ERROR	SAYS CAN'T DO	OTHER REFUSAL
a. (93) _____	①	③	⑦	⑨
b. (86) _____	①	③	⑦	⑨
c. (79) _____	①	③	⑦	⑨
d. (72) _____	①	③	⑦	⑨
e. (65) _____	①	③	⑦	⑨

STOP

251. Now I am going to spell a word forwards and I want you to spell it backwards. The word is WORLD.
☐ W-O-R-L-D. Spell "WORLD" back 1s. REPEAT SPELLING IF NECESSARY.

	NUMBER OF ERRORS	REFUSED	
_____ D L R O W	① ② ③ ④ ⑤ ⑥	⑦	1

252. Now what were the 3 objects I asked you to remember?

	CORRECT	ERROR	
a. Apple:	①	③	1
b. Table:	①	③	11
c. Penny:	①	③	15

253. INTERVIEWER: SHOW WRIST WATCH.

☐ A. What is this called? INTERVIEWER: SHOW PENCIL B. What is this called?	Watch: Pencil:	① ①	③ ③	20 21
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254. I'd like you to repeat a phrase after me:
☐ "No if's, and's, or but's"
 ALLOW ONLY 1 TRIAL. CODE 1 REQUIRES AN ACCURATELY ARTICULATED REPETITION.

① ③ 22

255. Read the words on this page and then do what it says.
☐ INTERVIEWER: HAND CARD B.
 CODE 1 IF RESPONDENT CLOSSES EYES

① ③ 23

256. INTERVIEWER: READ FULL STATEMENT BELOW AND THEN HAND RESPONDENT A PIECE OF PAPER.

DO NOT REPEAT INSTRUCTIONS OR COACH.

I am going to give you a piece of paper. When I do, take the paper in your right hand, fold the paper in half with both hands, and put the paper down on your lap.

	CORRECT	ERR OR
a. Takes paper in right:	⊙	⊙
b. Folds paper in half:	⊙	⊙
c. Puts paper down on lap:	⊙	⊙

257. Write any complete sentence on that piece of paper for me.

SENTENCE SHOULD HAVE A SUBJECT AND A VERB AND MAKE SENSE. SPELLING AND GRAMMATICAL ERRORS ARE OK.

⊙ ⊙

258. Here's a drawing. Please copy the drawing on the same paper.

INTERVIEWER: HAND CARD C.

CORRECT IF 2 CONVEX FIVE-SIDED FIGURES AND INTERSECTION MAKES A FOUR-SIDED FIGURE.

⊙ ⊙

INTERVIEWER: DID YOU SKIP TO THIS SECTION (BEGINNING WITH Q. 240) FROM Q. 30 OR LATER QUESTIONS?

⊙

NO (ASK Q. 259)..... ⊙

YES (GO TO A) ⊙

A. ARE 12 OR MORE "S"s CODED IN Qs. 240 THRU 249 AND 252 THRU 253?

⊙

NO ... (RETURN TO Q. LAST ASKED BEFORE SKIPPING AND

CONTINUE, BUT NOT MORE THAN 3 HOURS TOTAL) ⊙

YES (ASK Q. 259) ⊙

259. As you can see, I've tried to ask you about a lot of different kinds of emotional problems, memory problems, and habits that people might have. But of course, everyone is different, and I might have skipped something that has been important to you. Have you had any problems that I should have covered but didn't?

RECORD VERBATIM.

Hematology/Oncology

Recommended Standard

For Classes I, II and III:

At the first examination after the fortieth birthday the applicant must demonstrate the absence of severe disorders of the red blood cells by a hematocrit determination. Hematocrit values must fall between 32% and 55% for issuance of a certificate.

For Classes I and II only:

Hematocrit determinations must be repeated annually.

For Class III only:

Hematocrit determinations must be repeated at the time of routine examination.

Introduction

General Hematologic Conditions

The ability of blood to transport oxygen effectively to tissues is dependent upon an adequate hemoglobin concentration and on the ability of blood to perfuse organs. Abnormalities of this function are important in aviation safety for two reasons: 1) they affect the transport of oxygen from the lung to tissues, and 2) they affect blood rheology such that debilitating or incapacitating organ infarcts can occur.

The AME must be aware that hemoglobin is only one link in the oxygen transport chain. The presence of anemia, polycythemia, or abnormal hemoglobins must be placed in context with the other links. These include pulmonary function, cardiac output and its regulation, and end-organ oxygen utilization. For example, anemic states can be compensated by increased cardiac output in normal persons, but the limit of compensation will vary, depending upon the presence or absence of heart disease and lung disease. Thus, it is impossible to establish rigid criteria for acceptable hemoglobin

concentrations in the context of such interacting conditions, and as a result, it is difficult to state exact criteria for denials and exemptions for medical certification of individuals with abnormalities of the hematologic system. Instead, general guidelines are provided that bring to medical attention the existence of potentially dangerous conditions that need further evaluation:

1. The hematocrit must not fall outside the range stated in the standard for issuance of a certificate without further evaluation. The etiology of any abnormality that leads to hematocrit values outside of this range must be established and documented.
2. Some hematocrits that fall within the acceptable range, but that are still low, should be evaluated further before a certificate is issued.
3. When abnormalities or diseases of other organ systems lead to hematological abnormalities, the standards and guidelines established for those conditions must be met as well as those established for the hematological abnormalities.
4. When an applicant's medical history suggests a previous or present abnormality of red blood cells, white blood cells or blood platelets, the AME must defer certification to the FAA for further evaluation.

Hematologic Neoplasia

Since hematologic neoplasias are serious systemic disorders and often are associated with chronic and sudden incapacitation, certification of an applicant with hematologic neoplasia should be denied by the AME and decisions regarding fitness for flying should be made by the Federal Air Surgeon with appropriate consultation from specialists. Individuals with a history of hematologic neoplasia not requiring continuous therapy may be certified. However, adequate follow-up and reassessment is necessary because of the risk of relapse and/or progression. Individuals receiving cytotoxic

chemotherapy should be declared unfit for certification; the use of cytotoxic chemotherapy implies a serious, progressive disorder. Also, cancer chemotherapy itself can cause anemia, thrombocytopenia, and granulocytopenia, all of which could precipitate an acute incapacitating event. Thus, risk of sudden incapacitation in an individual taking cancer chemotherapy is too great to permit certification. Similarly, the use of any amount of glucocorticosteroids as therapeutic agents in hematologic disorders should preclude certification. Pharmacologic doses of corticosteroids often lead to incapacitation, such as cerebral toxicity, that may cause sudden and unexpected alterations in mood and mentation. Also, when corticosteroids are used to suppress lymphoid malignancies and to control autoimmune thrombocytopenia and anemia, control can be lost and acute anemia or thrombocytopenia with bleeding can occur suddenly.

Nonhematologic Malignancies

In the interest of aviation safety malignant disorders must be considered individually according to the predictability (or lack thereof) of incapacitating events associated with the disease or its treatment. Basic to the understanding of the natural history of malignant disorders is proper classification and staging. The Manual for Staging of Cancer, Second Edition, American Joint Commission of Cancer (AJCC) states: "A classification scheme for cancer must encompass all attributes of the tumor that define its life history. The AJCC classification is based on the premise that cancers of similar histology or site or origin share similar patterns of growth and extension." For the majority of nonhematologic malignancies, the concept of a cancer's origination in a particular location, with extension locally by direct extension, regionally via lymphatics and distantly by blood and lymphatics provides a workable framework upon which a simple classification scheme can be constructed. This scheme can provide a framework for the AME for gathering and assembling data about an applicant with a history of malignancy. The following is a summary of the AJCC staging scheme.

With most tumors the untreated primary cancer or tumor is first classified according to its size, which is designated by the capital letter "T" with various subscripts.

The presence or absence of regional lymph node involvement is indicated by the use of a capital "N" with subscripts. Distant metastasis is indicated by a capital letter "M" with a subscript and descriptions of involved organs. For example, a small 1.5 cm breast cancer nodule would be classified as T_1 . If it is fixed to underlying pectoral fascia or muscle, it is classified as T_1B . If no regional lymph nodes can be palpated and no nodes seem to be suspicious for tumor, the "N" classification would be N_0 . If, however, on chest radiograph pulmonary nodules indicative of metastatic disease are seen, the "M" classification would be M_1 (PUL), for pulmonary. If the metastatic evaluation were negative, the "M" classification would be M_0 . The clinical stage of the tumor for the T_1B , N_0 , M_0 breast tumor would be Stage I. For the T_1B , N_0 , M_1 tumor with the presence of metastatic disease in the lung, the clinical stage would be Stage IV.

For many tumors the histologic grades of well-differentiated, poorly- and very-poorly differentiated provide some idea as to virulence and potential for relapse, and have a bearing on expected clinical course. Cancer staging schemes can be reported solely upon clinical measurement, in which case the T, N, M classification is preceded by the small letter "c." The breast cancer example above would be Stage I clinically, or cT_1B , N_0 , M_0 .

After surgical treatment a pathological staging system can be used. In addition, there is a surgical-evaluative staging system, a retreatment staging classification system, and an autopsy staging system.

The natural biological history of cancer is based upon the theory that at some point in the person's life an event occurred that created a malignancy and the cancer process began. Generally, there is a silent or latent period during which tumor growth occurs and tumor burden and tumor size increase. Often, prior to the period of clinical

manifestation, primary lymph node involvement occurs, invasion of blood vessels and lymphatics begins, and microscopic dissemination occurs. As the period of clinical manifestation proceeds, tumor burden can increase, and distant metastases manifest themselves.

With early cancer detection the malignant process can be ascertained by physical examination or diagnostic study early in the period of clinical manifestation. When a malignant process appears to be localized according to the T, N, M clinical staging process, the majority of cancer treatments are directed toward "local control," which, depending upon tumor size, location, and histologic type, may consist of surgical treatment, radiation treatment, or a combination of the two. With certain localized tumor types of more advanced size, chemotherapeutic agents may be used preoperatively or postoperatively in combination with radiation.

In addition to "local control," some persons with malignant disease that has a high likelihood of local or distant relapse may be given adjunctive radiation or chemotherapy. This is commonly seen in patients with Stage II or higher carcinomas of the breast.

Therefore, the assessment of the impact that a malignant process may have on a pilot applicant requires not only consideration of the organ of origin and the clinical or surgical stage, but also the treatments that are being or have been used to accomplish the "local control."

Most surgical procedures for cancer should disqualify an applicant for aviation flight duties for a variable time, depending upon the extent of surgery and the site of operation. Individuals should not be considered qualified for piloting of any type for at least one to two months following any craniotomy, thoracotomy, or opening of the abdominal cavity, even for nonmalignant lesions. In the reduced atmospheric pressure at flight altitudes, small, usually insignificant collections of air, gas, or hematomas could cause pain or incapacitation. Otherwise, after complete healing, assuming that major

organ dysfunction does not exist, a surgical procedure itself should not be considered disqualifying for flight. The condition for which the surgery was performed, however, might be disqualifying.

The use of cytotoxic chemotherapeutic agents should be considered incompatible with flying. Such chemotherapy indicates a serious underlying disorder. The therapy itself can lead to anemia, thrombocytopenia, and granulocytopenia, which could precipitate an incapacitating event while flying. In addition, nausea and vomiting are well-recognized, widely-accepted and predictable side effects of cancer chemotherapy that may create difficulty in performing flight duties.

As with hematologic neoplasias, the use of corticosteroids for solid tumors, regardless of dose, should be disqualifying. Unpredictable toxicities can occur with pharmacologically high doses of female or male hormones.

Radiation therapy is generally delivered to a localized area over a finite period of time. The immediate side effects of nausea, blood count depression, and other dose-related toxicities usually disappear within a few weeks after the completion of radiation treatment. Thus, during the course of radiation therapy, and for a reasonable time thereafter, an individual should be considered unfit to fly.

Responses to Hematology/Oncology Medical History Questions

- o Any abnormalities of the blood, hemoglobin, white blood cells, blood platelets, sickle cell trouble, or bleeding disorders.

Certain abnormalities of the blood, hemoglobin, white blood cells, and blood platelets, are benign, and self-limiting, and not likely to recur. For example, an applicant may have had elevated white blood cell counts or depressed white blood cell counts due to infection, viremia, mononucleosis, drug

reactions, etc. If the abnormality occurred as a single isolated event related to a known etiology that is not likely to recur, and if the AME is satisfied that he or she has adequate documentation and explanation, the AME may consider issuing a certificate. However, the AME should order a full hematologic profile, including hemoglobin and hematocrit, white blood cell count with a differential, platelet count, and red blood cell indices. The AME should gather all pertinent historical documents as well. If the hematologic profile is within normal limits, the AME may certify the applicant, and send all information to the FAA.

Positive responses to "bleeding disorders" are frequently given by individuals who have had a hemorrhage related to a documented self-limited and non-recurring condition, such as tonsillectomy, trauma, or surgery. The circumstances surrounding the hemorrhagic event should be evaluated carefully and reported to the FAA. If the bleeding is fully explained and not likely to recur, the AME may certify the applicant.

A positive response to the question "sickle cell trouble" should result in deferral of certification to the FAA; the AME should obtain and send all available records, consultations, reports and laboratory tests to the FAA for review.

o Malignant tumors, cysts or cancers of any sort.

With the exception of malignancy of the skin, excluding melanoma, any applicant with a history of, or presence of, malignant disease should be denied certification. Certification should be granted only by appeal to the Federal Air Surgeon. The risk of sudden incapacitation is quite variable,

depending upon the stage of the malignancy at the time of the diagnosis, therapeutic modality(ies) utilized and the disease-free interval since diagnosis and initial treatment. This risk should be re-evaluated at specific periods, depending upon the stage of the malignancy, aggressiveness of the malignancy, response to therapy and the disease-free periods. The examiner should deny issuance and submit the application with any available medical records and specialty reports to the FAA.

Physical Examination and Laboratory

o Lymphatics

A brief but complete examination of the lymphatic system can be accomplished by palpation of all accessible lymph node-bearing areas, examination of Waldeyer's Ring, and careful palpation for enlargement of the liver and spleen.

There are a variety of disorders that are characterized by generalized lymphadenopathy and/or splenomegaly, some of which are not abnormalities of leukocytes or immunoglobulins, such as various non-neoplastic disorders, infections, inherited immune deficiency diseases, acquired immune deficiency diseases and other reactive processes. Therefore, persistently enlarged lymph nodes in any area, generalized lymphadenopathy, or a palpable spleen should cause the AME to defer issuance of a certificate and submit all appropriate medical reports to the FAA for ascertainment of etiology.

o Laboratory Evaluation

Mandatory testing includes only hematocrit (Hct) determinations. Were the

AME to use an automated laboratory device for Hct that would also provide a white blood cell count (WBC), mean corpuscular volume (MCV), and platelet count, submitting this information to the FAA would be helpful. However, it is not required. Yet abnormal values of these indices must be taken into account and acted upon in the clinical assessment of the applicant.

If a centrifuge is used for the hematocrit, the centrifuge and its speed, and the time of centrifugation should conform to the recommendations of the National Committee for Clinical Laboratory Schools. If an automated instrument is used, and the hematocrit is calculated from measurement of cell size and hemoglobin concentration, the instrument should be calibrated according to the specifications of manufacturer.

WBC and platelet counts may be done manually or by automated methods. If the latter is used, the instrument must be calibrated to the specifications of the manufacturer.

Hematocrit values outside of the range of 38-55% for men and 36-55% for women should be evaluated further. The lowest permissible hematocrit for certification is 32%, and only after satisfactory diagnosis of the cause and appropriate therapeutic intervention. The highest permissible hematocrit is 55%. Levels above this may increase blood viscosity to the point of decreasing oxygen supply to tissues, which may affect higher brain functioning, especially at altitudes. WBC counts should fall within the range of 3,500 to 12,000 cells/mm³. Granulocyte counts of less than 750/mm³ are a cause of permanent denial of certification. The platelet count should be in

the range of $75,000/\text{mm}^3$ to $750,000/\text{mm}^3$.

Disposition

- o Certification should be denied for the following:
 - 1. Hematocrit values above 55% or below 32%.
 - 2. History or presence of hematologic neoplasia.
 - 3. History or presence of malignant tumor, cyst or cancer of any sort, with the exception of malignancies of the skin, excluding melanoma.
 - 4. Granulocyte count (if available) of less than $750 \text{ cells}/\text{mm}^3$.

- o Certification should be deferred to the FAA for the following:
 - 1. Hematocrits between 32% and 38% for men and 32% and 36% for women.
 - 2. Hematologic abnormalities caused by disorders of other organ systems, unless the hematologic abnormalities and the disorders of the other organ systems meet standards or recommended guidelines.
 - 3. History of previous or present abnormalities of red blood cells, white blood cells or blood platelets; WBC counts outside the range of 3,500 to $12,000 \text{ cells}/\text{mm}^3$ and platelet counts outside the range of $75,000$ to $750,000/\text{mm}^3$.
 - 4. Persistent enlargement of lymph nodes in one area, or generalized lymphadenopathy, or a palpable spleen.

Visual System

Introduction

The visual system is evaluated by examining all the functions of that system and comparing the levels of function to quantitative standards or guidelines. The examination contains seven points: (1) General eye examination; (2) distant vision; (3) near vision; (4) intraocular tension; (5) color vision; (6) visual fields, and; (7) motility.

General Eye Examination

Recommended Standards

- o For Classes I, II, and III

No acute or chronic pathologic condition of either eye or adnexa that might interfere with its proper function, might progress to that degree, or might be aggravated by flying.

Examination Procedure

- o Equipment

For general evaluation of the eye, including anterior segment evaluation, external examination, and ophthalmoscopic examination, the examiner needs a ophthalmoscope of good quality and another light source of moderate intensity.

- o Questions of visual symptoms

The examination of the eye is directed toward the discovery of deformities due to heredity, injury, disease or aging that may cause a failure in visual function while flying, or discomfort sufficient to interfere with the safe performance of airman duties.

The manifestations of ocular abnormalities can be categorized as follows:

1. Decreased visual acuity.
2. Ocular pain or discomfort.
3. Change in external appearance of the eye, lids, or orbit.
4. Diplopia.
5. Abnormal tearing or discharge.
6. Abnormal visual field.
7. Surgery.
8. Medications.

The AME should ask the applicant questions pertaining to each of these categories.

1. Visual Acuity

- a. Have you noticed any changes in sharpness of vision? Are the changes for near vision, distant vision, or at all distances?

Change for only near or for only far vision suggests presbyopia, or a refractive error. A general change in sharpness of vision could also result from a refractive error, but the possibility of ocular pathology must be excluded.

- b. Does your vision fluctuate?

Fluctuating vision is commonly a presenting symptom of diabetes mellitus. Fluctuation in blood sugar with intermittent hyperglycemia affects the lens of the eye, leading to fluctuating visual acuity. After radial keratotomy, a surgical procedure to correct myopia, there may also be visual fluctuation.

- c. Is there a difference in vision between the two eyes? Is your vision worse in bright lights or dim lights?

Decreased acuity in either bright or dim lights is a common finding in patients with incipient cataracts. Retinal abnormalities may cause decreased acuity in dim light ("night blindness").

d. Do you have any distortion of vision?

Distortion of vision may be due to astigmatism, cataracts, or macular disorders.

e. Do you ever see halos or rings around lights?

Incipient cataracts or corneal abnormalities are the usual causes of this symptom.

f. Do you ever see "spots" in front of your eyes?

These usually represent vitreous floaters, a benign process, but if accompanied by photopsia, or flashing lights, they may be a sign of retinal tears, holes, or detachment. Chronic uveitis with vitreous involvement may be another cause of this symptom.

2. Ocular Pain or Discomfort

a. Do your eyes ever ache?

This may be a symptom of refractive error, especially uncorrected hyperopia, presbyopia, or astigmatism. Motility disorders may also give this symptom.

b. Do your eyes ever itch or burn?

This may be associated with ocular allergy, or blepharitis, which is chronic inflammatory lid disease. Dry eye syndrome also gives these complaints.

c. Are your eyes ever sensitive to light and glare?

These symptoms may be seen with cataract or corneal abnormalities. Photophobia, or painful light sensitivity, is the cardinal symptom of iritis, or anterior uveitis.

d. Do you ever experience sharp pain in your eyes?

Sharp pain is usually related to corneal disease, with surface erosion. Dry eye syndrome and recurrent corneal erosion syndrome are two common disease processes that produce sharp pain.

3. Change in External Appearance of the Eye and Orbit

a. Have you noticed drooping of an eyelid?

Ptosis may be related to trauma, intracranial abnormalities, myasthenia gravis, aging, recurrent lid swelling, or hereditary ophthalmoplegia.

4. Diplopia

a. Have you ever experienced double vision?

If the applicant answers yes, it is important to differentiate between monocular and binocular diplopia. Binocular diplopia is relieved by closing one eye, and suggests a disorder of the extraocular muscles. Monocular diplopia occurs with only one eye open, and may be seen with changes in the cornea, such as keratoconus or corneal scarring, cataracts, and occasionally with macular disorders.

5. Abnormal Tearing or Discharge

a. Do your eyes ever water excessively?

Tearing may be due to either irritation or inflammation of the external eye, which stimulates the lacrimal apparatus to hypersecrete.

Lacrimal obstruction, originating anywhere from the punctum to the nasolacrimal duct, can also result in tearing.

Trichiasis, or malposition of the lashes resulting in contact with the globe, can also cause tearing.

b. Do your eyes have matter or discharge in them?

Chronic mucoid discharge is caused by external ocular inflammation or infection. Dry eye syndrome is often associated with mucoid discharge.

6. Visual Field Abnormalities

a. Have you noticed any permanent or transient changes in your field of vision? Have you ever temporarily lost all or part of your vision in one eye?

Transient visual field loss, especially bilateral, is commonly found in migraine; it may or may not be followed by headache. Permanent field loss, when bilateral, suggests intracranial pathology. Transient loss of vision in one eye, either partial or total, suggests carotid occlusive disease.

7. Have you ever had surgery on your eyes, eyelids, or orbits?

If so, explain what type and when performed.

If any abnormalities are uncovered through these kinds of questions then the

AME should mark "abnormal" under the general eye evaluation and elaborate under "remarks."

8. Medications

a. Are you currently taking any drugs or medications?

This is a crucial question and should be asked even if the applicant stated on the front of form 8500-8 that he or she has taken no medication in the last three months. Many problems requiring the attention of the FAA, which may delay the processing of applications, are caused by the failure of the applicant or the examiner to fully disclose and explain medications presently in use.

o Examination techniques

A routine should be established for the systematic general examination of the eyes and adnexa.

1. Lids, External Examination

Evaluate the palpebral fissures. Look for any asymmetry of the lids, such as lid retraction, ptosis, ectropion, or entropion. Evaluate for the presence or absence of proptosis or exophthalmos.

2. Cornea, Conjunctiva

Observe for any irregularity in the surface of the cornea or conjunctiva. Examine for the presence or absence of contact lenses. Observe the conjunctiva for redness, which may be a sign of infection or chronic ocular inflammation, and for jaundice.

3. Pupils and Iris

Examine the pupils for size and their reaction to light and accommodation to near vision. Observe for any disparity in size or reaction to light.

4. Anterior Segment

Examine the anterior chamber for its depth and clarity.

5. Lens

Examine the lens for clarity. Also note the presence of an implanted lens, or the absence of the lens.

6. Vitreous

Note clarity, floaters, or strands with the ophthalmoscopic observation of the red reflex.

7. Optic Nerve

Observe for pallor. Note the appearance of disc margins. The nerve should have a healthy pink color throughout the temporal half, although the temporal half of the nerve may be slightly less pink than the nasal half. The nasal disc border may be normally less crisp, or more obscured, than the temporal border.

Observe the cup-disc ratio. The ratio of the diameter of the physiologic cup in the center of the optic nerve to the diameter of the optic disc should range between 0.2 to 0.4. Ordinarily, the physiologic

cup should be less than half the diameter of the optic nerve head. Distinct vertical elongation of the cup, distinct enlargement of the cup, distinct nasal position of the major vessels, or definite inequality of the cup-disc ratio between the two eyes is suggestive of glaucomatous cupping.

8. Retina and Choroid

Examine for evidence of coloboma, pigment disturbance, appearance of the vessels, and evidence of diabetic retinopathy, such as hemorrhages and exudates. It is not unusual for hypertension to be detected first through abnormalities in the retinal vasculature.

9. Ocular Motility

Motility can be assessed by having the applicant follow a point light source with both eyes, while the examiner moves the light into right, left, upper and lower quadrants and observes the individual's eye movements. The examiner then drops the light to the straight-ahead position, advancing it toward the nose and observes for convergence. The examiner should look for nystagmus; a few beats of horizontal nystagmus on extremes of lateral gaze is not considered to be significant. It need not be reported.

Disposition

The AME should defer the certification of applicants with abnormalities that are reported or found during the general eye examination, pupil examination, examination of ocular motility, and ophthalmoscopic examination. Examples include applicants with cataracts who have undergone surgery with or without lens

implants, who have retinal detachment with surgical correction, open angle glaucoma with adequate control, or narrow angle glaucoma following surgical or laser therapy. Consideration by the FAA may be expedited if the AME collects pertinent medical records and secures an ophthalmologic evaluation using FAA Form 8500-7 as appropriate. If there is a question regarding the need for a current specialty evaluation, the examiner should not obtain the evaluation, but send the completed application form (8500-8) and any available medical records to the Aeromedical Certification Branch, AAC-130, Oklahoma City.

Distant Vision

Recommended Standard

o For Classes I and II

Distant visual acuity of 20/20 or better in each eye separately, without correction; or of at least 20/200 in each eye separately, corrected to 20/20 or better with conventional corrective lenses (glasses or contact lenses), in which case the applicant shall be qualified only on the condition that he or she wear those corrective lenses while exercising the privileges of the airman certificate.

o For Class III

Distant visual acuity of 20/40 or better in each eye separately, without correction; or if the vision in either or both eyes is poorer than 20/40, and is corrected to 20/30 or better in each eye with conventional corrective lenses (glasses or contact lenses), the applicant may be qualified on the condition that he or she wear those corrective lenses while exercising the privileges of the airman certificate.

Examination

o Equipment

1. Snellen 20 foot eye chart.
2. Acceptable substitutes:
 - a. Reverse Snellen eye chart to be used with a mirror in a 10-12 foot room.
 - b. A projector chart projecting letters subtending five minutes of arc (20/20) at any distance between 14 and 20 feet.
 - c. Keystone orthoscope; Bausch and Lomb orthorator; American Optical Co. sight-screener; Titmus optical vision screener; Keystone telebinocular.
 - d. Any other visual testing device currently authorized by the FAA.

o Examination techniques

1. Each eye will be tested separately and both eyes will be tested together.
2. Snellen eye charts are used as follows:
 - a. The Snellen chart should be illuminated by a 100-watt incandescent bulb placed four feet in front and to the side so as not to cause a glare in the applicants eye.
 - b. The chart is placed 20 feet from the eyes of the applicant and the 20/20 line is placed at the eye level if the applicant is seated in a chair, or approximately 5 ft 4 in above the floor if the applicant is standing.
 - c. A metal, opaque plastic, or cardboard occluder should be used

to cover the eye not being examined.

- d. The examining room should not be pitch black, since this will make it more difficult to observe the patient for possible squinting. It is possible to have subdued lighting throughout the room and have proper illumination of the chart itself.
- e. If the applicant is wearing corrective lenses, the uncorrected acuity should be determined first in each eye separately and then in both eyes together. This is then followed by a determination of acuity with the lenses in place, once again in each eye separately, then with both eyes together.

It is recommended that the examiner's receptionist ask applicants if they use contact lenses and, if so, to advise them to remove the lens for 24 hours before appearing for examination if at all possible. This procedure serves to overcome the difficulty in determining uncorrected visual acuity that would have been altered by corneal molding from the wearing of contact lenses. When there has been a recent examination by an eye specialist, the examiner may wish to contact that specialist for pertinent information. The examiner should indicate on the report of FAA physical examination (FAA Form 8500-8) how the uncorrected distant visual acuity values were obtained, and the length of time lapse between removal of the lenses and testing.

f. Common errors:

- 1. Allowing direct glare of the light into the applicants eyes.
- 2. Permitting the applicant to view the chart with both eyes when he or she is supposed to be viewing it with each eye separately.

3. Failing to observe the applicant for squinting or narrowing the lid fissure, which can improve the acuity by several lines. This can be difficult to observe, and should be carefully looked for, especially when using vision screeners. Pupillary constriction is introduced by high intensity illumination, and can improve acuity in patients with an uncorrected refractive error.
4. Using Snellen charts that subtend five minutes of arc at 20 feet in rooms that are not 20 feet in length.
5. If using a projector, failing to focus sharply or to measure the overall size of the projected letters, or the distance at which the projector is placed. No matter what distance the applicant is standing from the chart to have the acuity checked, the letters must subtend five minutes of arc on the retina. For instance, at 20 feet or 6 meters distance, the overall height of the 20/20 letter is 9 mm. At the reading distance of 14 inches, approximately 1/3 meter, the overall height of that letter is approximately 1/2 mm. In either case these letters subtend five minutes of arc on the retina.
6. Failing to note and require the applicant to remove contact lenses, especially when soft contact lenses are worn. They are very difficult to see on the sclera without magnification.

Disposition

- o When correcting lenses are required to meet the standards, an appropriate

limitation must be placed on the medical certificate. For example, when lenses are needed for distant vision only:

"Holder shall wear correcting lenses while exercising the privileges of the airman certificate."

For a combined defect in distant and near vision, the appropriate limitation is:

"Holder shall wear lenses that correct for both distant and near vision while exercising the privileges of the airman certificate."

- o Applicants who fail to meet these standards and have no Statement of Demonstrated Ability (SODA) that covers the extent of visual acuity defect found on examination, may obtain further consideration by the FAA for certification by submitting a report of an eye evaluation. The examiner can help to expedite the review procedure by attaching to the application form (FAA Form 8500-8) a copy of FAA Form 8500-7, "Report of Eye Evaluation," after its completion by an eye specialist. If submission of the examination report (FAA Form 8500-8) to Oklahoma City will be delayed for 14 days or more in order to attach the "Report of Eye Evaluation," it is recommended that the two forms be mailed to the FAA separately.
- o FAA Form 8500-7, "Report of Eye Evaluation," is not stocked by physicians other than Aviation Medical Examiners. The form is for special use, and is not routinely required for applicants. Applicants with visual acuity problems may be referred to either an optometrist or ophthalmologist. Applicants with eye disease should be referred only to an ophthalmologist.
- o Aphakia: Since there is no acuity limit for the uncorrected vision of the

third class applicant, the examiner may issue a medical certificate to an aphakic third-class applicant, if:

1. The applicant has recovered fully from the operation and is stable.
2. There is no other pathology of the eye.
3. The visual standard for distance of 20/40 is achieved in the aphakic eye(s) with corrective contact lenses, intraocular lenses, or spectacles, and near vision corrects to 20/40.

First- and second-class applicants who have had cataract surgery should be deferred issuance of a certificate and all reports should be submitted to the FAA for further consideration.

- o Contact Lenses: Presbyopic contact lens wearers who are corrected adequately for distance with contact lenses should be required to wear a reading aid for seeing charts and/or the instrument panel, either in a half-eye configuration, or in a bifocal lens.

"Mono vision" contact lens wear is prohibited in presbyopic pilots. "Mono vision" contact lens wear consists of wearing contact lenses correcting one eye for distance, and the other eye for near. Such a configuration will disturb the pilot's stereopsis, depth perception, and phoria status.

- o Monocularity

Detailed procedures have long existed to allow the one-eyed pilot to demonstrate his or her ability to compensate for the loss and to perform airman duties without threat to aviation safety. The examiner may not issue a medical certificate for any class to a monocular applicant unless he or she presents written evidence of prior clearance by the FAA for the

monocularity. The Examiner may assist the applicant in the initial steps toward obtaining such clearance by submitting a "Report of Eye Evaluation," FAA Form 8500-7, along with the application, FAA Form 8500-8, and any other available information from the applicant's attending ophthalmologist. An airman is considered to have monocular vision if the best corrected central visual acuity in an eye is 20/200 or worse.

If the loss of the eye occurred within the past 6 months, the applicant with monocular vision should be advised to postpone his or her efforts to qualify for medical certification. A waiting period of at least 6 months is recommended to assure stability and to permit an adequate adjustment period for developing the ability to compensate for monocular vision.

Depending upon the visual acuity of the good eye (uncorrected distant visual acuity must not be worse than 20/200), the applicant who is otherwise qualified may be issued a medical certificate by the FAA with a limitation "Valid for Student Pilot Purposes Only." When the applicant meets the flight experience requirements for the pilot certificate, a medical flight test will be authorized by the FAA. This test may be conducted along with the regular flight check for a pilot's license. When the student's instructor believes that he or she is about ready for testing, the student should request, in writing, the authorization for the flight test from the Aeromedical Certification Branch, AAC-130, Oklahoma City. The student should indicate the General Aviation District Office he or she wishes to use (may be an Air Carrier District Office for first-class applicants).

If the applicant is able to demonstrate adequate compensation for

monocularity, a Statement of Demonstrated Ability (SODA) and the appropriate medical certificate will be issued without the student pilot limitation.

The one-eyed pilot is not restricted to private pilot status. With flight experience the airman may qualify for additional pilot certificates and ratings. Appropriate medical flight tests may be given, usually in conjunction with the corresponding checkride.

o Sunglasses

Airmen should be encouraged to use sunglasses in bright daylight but must also be cautioned that, under conditions of low illumination, they may compromise vision. Sunglasses are not acceptable as the only means of correction to meet visual standards, but may be used for backup purposes if they provide the necessary correction.

o Intraocular Lens Implants

The AME should defer the certification of applicants for Classes I or II who have lens implants, unless the applicant has a Statement of Demonstrated Ability (SODA) or other written notice that he or she has been approved by the FAA. An applicant with an implant not previously reported may be considered by the FAA for possible issuance upon receipt of the results of a complete ophthalmological evaluation.

The AME may certify applicants for third-class certificates without a Statement of Demonstrated Ability if the intraocular lens implant corrects vision to standards for the third-class certificate. The applicant must have

had surgery at least two months before the FAA visual examination.

Near Vision

Recommended Standards

o For Classes I and II:

Near vision of 20/40 Snellen equivalent or better at 16 inches in each eye separately, with or without corrective lenses. After age 50 years, near vision of 20/40 Snellen equivalent or better at 16 inches and 32 inches in each eye separately, with or without corrective lenses. If corrective lenses are required to meet this standard, the applicant may be qualified only on the condition that he or she wear those corrective lenses while exercising the privileges of the airman certificate.

o For Class III:

Near vision of at least 20/40 Snellen equivalent or better with or without correction at 16 inches; after age 50 years, near vision of 20/40 or better at both 16 inches and 32 inches with or without correction. If corrective lenses are required to meet this standard, the applicant may be qualified only on the condition that he or she wear those corrective lenses while exercising the privileges of the airman certificate.

Examination Procedures

o Equipment

The FAA Form 8500-1, "Near Vision Acuity Test Card," should be used as the standard method for testing near vision acuity. It is calibrated for use at 16 in. It could also easily be used at the recommended 32-inch distance by

simply doubling the distance to 32 in and doubling the letter size. For example, if an applicant is reading the 20/40 line at 16 in, he or she should be able to read the 20/80 line at 32 in in order to satisfy the recommended near vision standard of 20/40 vision for a second class certificate.

There should be no substitutes for this card.

o Examination techniques

1. Near visual acuity is determined for each eye separately and for both eyes together. Test values are recorded both with and without correcting glasses when glasses are worn or required to meet the standards. Bifocal contact lenses or contact lenses that correct for near visual acuity only are not considered acceptable.
2. FAA Form 8500-1, "Near Vision Acuity Test Card," should be used as follows:
 - a. All applicants must be tested with a constant source of illumination, such as a 75-watt bulb behind and approximately four feet from the near vision test card. Accommodation can be affected significantly by lighting that is either too dim or too bright, as pupil size changes under various levels of illumination.
 - b. The applicant holds the card 16 in from the eyes in such a position as to provide uniform illumination. To assure the card is held at exactly 16 in from the eyes, it is suggested that a string of that length be attached to the card. When examining patients over age 50 years, a 32-inch string should be used.

- c. Each eye is tested separately, with the other eye covered. Both eyes are then tested together.
- d. The smallest type correctly read with each eye separately and both eyes together is recorded in linear value. In performing the test using FAA Form 8500-1, the level of visual acuity will be recorded as the line of smallest type the applicant reads most accurately. The applicant should be allowed no more than two misread letters on any line.
- e. Common errors:
 - 1. Inadequate illumination of the test card, or a soiled test card.
 - 2. Failure to hold the card at the appropriately specified distance from the eye. Strings calibrated to 16 in and 32 in would be helpful for examination purposes.
 - 3. Failure of the examiner to assure that the untested eye is covered. It is important to have the untested eye covered with an opaque occluder.
 - 4. Failure to determine uncorrected and corrected acuity when the applicant wears glasses.

Disposition

- o Lenses and limitations

When correcting glasses are required to meet the near vision standards, an appropriate limitation will be placed on the medical certificate. Contact lenses that correct only for near visual acuity are not considered acceptable for aviation duties.

For all classes the appropriate wording for the near vision limitation is "Holder shall wear lenses that correct for near vision while exercising the privileges of the airman certificate."

For combined defective distant and near visual acuity, the appropriate limitation is "Holder shall wear lenses that correct for both distance and near vision while exercising the privileges of the airman certificate."

Intraocular Tension

Recommended Standards

- o For Classes I, II, and III:

Intraocular pressure of no more than 25 mm Hg as measured by tonometry in either eye in every applicant over age 40 years, or in any applicant with a family history of glaucoma in a first degree relative. The difference between the intraocular pressure in the two eyes must not be greater than 5 mm Hg. If intraocular pressure measures greater than 25 mm Hg in either eye, or if the intraocular pressure difference between the two eyes is greater than 5 mm Hg, ophthalmological evaluation is necessary to rule out glaucoma. If the applicant is otherwise qualified, he or she is entitled to a medical certificate pending the results of the ophthalmological evaluation.

Examination Procedure

- o Equipment

Since 1954 the evaluation technique for measuring intraocular pressure has been referenced to the Goldmann applanation tonometer. Because this instrument is expensive, complex, and requires a slit lamp for its

implementation, the Aviation Medical Examiner may use as acceptable substitutes the following instruments:

1. Schiotz indentation tonometer.
2. Grolman American Optical air-puff tonometer (non-contact tonometer).
3. Any other correlated instrument measurement that is referenced to the Goldmann applanation reading.

o Examination technique

1. Instrument tonometry must not be done if there is a present ocular infection or a recent intraocular injury.
2. The hand-held Schiotz or similar indentation tonometer may be used to measure intraocular pressure. This tonometer is also the most inexpensive of the recommended instruments.
3. The examiner should instruct the applicant to remove contact lenses, including soft lenses.
4. The applicant should be in a reclining position with no constricting collar or clothing about the neck, as these can falsely elevate intraocular pressure due to elevated venous pressure.
5. Sterile topical anesthetic solutions, such as 0.5% Ophthane, Ophthetic, or Pontacine may be used. Cocaine, because of its effect on the corneal epithelium, is not to be used.
6. Drops are instilled twice and the applicant is allowed a brief period to relax from the mild coldness and irritation created by the instillation of the solution.
7. The examiner should check that the tonometer piston moves freely within the cylinder.

8. The applicant is then instructed to extend one arm overhead in front of his or her face and to fix on the tip of an extended finger. The examiner carefully avoids any digital pressure on the eyeball or the lids, but may retract the lids against the bony orbital rims at approximately 12 and 6 o'clock, avoiding all contact with the globe.
9. The tonometer is centered above the cornea and the footplate is gently lowered into contact with the cornea.
10. In synchrony with each cardiac beat the indicator needle should move through approximately one scale point. The midpoint of the oscillations of the indicator tip is noted and read directly from the instrument in the scaled units. To reduce inaccuracies at low or high scale readings, an appropriate weight (the usual 5.5 gram or the accessory 7.5 gram) should be used to obtain scaled readings between three and seven units. The applicant is cautioned not to hold his or her breath, which would also increase intraocular pressure readings.
11. Results are noted by conversion of scale units to mm Hg.
12. Goldmann applanation readings or Goldmann air puff readings, where available, are also acceptable.
13. Common errors:
 - a. The topical anesthetic solution should not be used if it is outdated.
 - b. The air-puff tonometer may give readings of greater than a 5 mm Hg difference in pressure, depending upon when the puff of air is administered in relation to a blink. If a large difference in pressure is noted, the puffs should be reported.

Disposition

- o If an intraocular pressure of 25 mm Hg is recorded in either eye, or if there is a difference of 5 mm Hg or greater between the two eyes, the AME should defer certification and refer the applicant to an ophthalmologist. FAA Form 8500-14, "Ophthalmological Evaluation for Glaucoma," should be provided for completion by the ophthalmologist.

- o Special issuance

Special issuance by the FAA is made on an individual basis. Since secondary glaucoma is due to known ocular pathology such as uveitis or trauma, eligibility must depend upon the underlying pathology. Secondary glaucoma is often unilateral; if the cause of the glaucoma is not active and the other eye remains normal, certification is likely.

In primary open-angle glaucoma, the applicant may be certified by and followed by the FAA when a current ophthalmological report states that pressures are under adequate control, there is minimal or no visual field loss or other complications, and the applicant tolerates small to moderate doses or allowable medications. Open-angle glaucoma controlled by epinephrine-type drugs or beta-blocking drugs, such as topical timolol maleate, is not disqualifying.

Uncontrolled intraocular pressure above 25 mm Hg or open-angle glaucoma requiring oral carbonic anhydrase inhibitors such as Diamox, or pupil constricting drugs such as Pilocarpine, is disqualifying.

Any evidence of narrow-angle glaucoma or acute congestive glaucoma is disqualifying unless surgical or laser intervention has clearly reduced the applicant's intraocular pressure to normal for a period of at least three months without the use of miotic drugs. These applicants will require a special issuance by the FAA on an individual basis.

Color Vision

Recommended Standards

- o For Classes I and II
Normal color vision.

- o For Class III
Ability to distinguish aviation signal red, aviation signal green and aviation signal white.

Examination Procedures

- o Equipment
 - 1. Pseudo-isochromatic plates of Dvorine, Second edition, American Optical Company; Revised edition, Richmond Plates; American Optical Company - Hardy, Rand, Rittler (AOC-HRR); Ishihara, 16, 24, or 37 plate editions.
 - 2. Acceptable substitutes:
 - a. Keystone orthoscope.
 - b. Keystone telebinocular.
 - c. Titmus Optical Vision Tester.
 - d. School of Aviation Medicine Color Threshold Tester (SAM-

CTT).

e. Farnsworth lantern.

o Examination techniques

The following conditions absolutely must be assured when testing with pseudoisochromatic plates:

1. The test book must be at 30 in from the applicant with plates tilted so that the plane of paper is at right angles to the line of vision.
2. Illumination: The plates are designed to be utilized in a room which is lit adequately by daylight. The introduction of direct sunlight or electric light will produce discrepancy in results. Adequate artificial substitutes include a 100-watt blue daylight bulb or Macbeth lamp, which is also known as the New London Easel Lamp (American Optical Company catalog number 1368).
3. Three seconds are allowed for the applicant to interpret and respond to each given plate.
4. The plates to be demonstrated for each of the approved pseudoisochromatic tests are:

	Test	Edition	Plates
a.	AOC	Revised	1-14
b.	Dvorine	Second	1-15
c.	Isihara	16 plate	1-8
d.	Isihara	24 plate	1-15

e.	Isihara	38 plate	1-21
f.	AOC-HRR	Second	1-6
g.	Richmond (formerly AOC)		1-14

5. Testing procedures for the Keystone orthoscope, telebinocular, SAM-CTT, and Titmus Optical Vision Tester accompany the individual instruments.
6. The test used and results (pass or fail) are recorded.

Disposition

o Classes I, II and III

1. AOC pseudoisochromatic plates or Richmond pseudoisochromatic plates (revised edition 14 plates): an applicant who makes five or more errors on the 14-plate series is classified as color deficient.
2. Dvorine pseudoisochromatic plates (second edition, 14 plates): an applicant who makes three or more errors on the 14-plate series is classified as color deficient.
3. AOC-HRR pseudoisochromatic plates (second edition, 20 plates): an applicant who makes one or more errors in plates 1-6, but none in 7-20, must be given plates 1-6 a second time. If the applicant now gives correct responses to all 6, he or she is felt to have normal color vision. If the applicant does not correctly respond to plates 1-6, he or she is classified as color deficient.

4. Isihara pseudoisochromatic plates: an applicant who makes two or more errors on plates 1-8 of the 16 plate edition, two or more errors on plates 1-15 of the 24 plate edition, or four or more errors on plates 1-21 of the 38 plate edition of the Isihara pseudoisochromatic plates is classified as color deficient.
5. School of Aviation Medicine Color Threshold Tester (SAM-CTT): an applicant who scores 49 or less fails this examination, resulting in a classification of color deficient.
6. Titmus Vision Tester: an applicant who makes any error on the test plates is considered a failure, resulting in a classification of color deficient. The examiner should refer to the instruction booklet.
7. Keystone Orthoscope/Telebinocular: the applicant must identify numbers correctly in two of three presentation circles. If not, he or she is considered color deficient.

o Certification limitation

If an applicant for a Class I or Class II certificate is found to be color deficient as interpreted above, but is otherwise qualified, a medical certificate may be issued bearing the limitation, "not valid for night flying or flying by color signal control." If an applicant for a Class III certificate is found to be color deficient, a certificate may be issued bearing the limitation, "not valid for night flying or flying by color signal control," or the AME may defer issuance pending the results of a signal light gun test.

o Special issuance

An applicant who holds a medical certificate bearing a color vision limitation may request in writing re-evaluation or special issuance; the request should be sent to the Aeromedical Certification Branch, AAC-130, Oklahoma City. Upon demonstration of the ability to pass the color vision tasks, a medical certificate without limitation is issued with a Statement of Demonstrated Ability (SODA).

Demonstration of ability to perform color vision tasks that is appropriate to the certificate for which the applicant applied may entail a medical flight test or a signal light test. Authorization for these tests comes from the FAA. The signal light test may be given at any time during flight training. The medical flight test is usually given in conjunction with the flight test that is required for a pilot's certificate after the pilot has accumulated the necessary flight experience. The medical flight test is most often required of an airman with borderline color vision who wishes to be considered for an upgrading of his or her certificate.

o X-chrome lens

This lens is not acceptable to the FAA as a means for correcting pilots' color deficiencies.

o Yarn tests

Yarn tests are not acceptable methods of testing for the FAA medical certificate.

Fields of Vision

Recommended Standards

- o For Classes I and II
Normal fields of vision.
- o For Class III, no visual field requirement is recommended.

Examination Procedures

- o Equipment

The Goldmann illuminated 30 cm bowl perimeter has been the reference standard of visual field since its introduction in 1945; the standard screening Goldmann target is the III 4 e. There are other table models and hand held arc perimeters that correlate with the Goldmann standard. Table model instruments usually have a matte gray or black arc 33 cm in radius and rotate through 360°. Smaller hand held perimeters, such as the Schweigger or Spiller, are also acceptable. Where available, automated instruments, such as the Fieldmaster, are also acceptable.

Tangent screens, the 50-inch square black matte surface wall unit with center white fixation point, give adequate information within the limits of 30 degrees from fixation. Tangent screen perimeters may also elicit a significant number of peripheral defects of the visual field, but are not acceptable for accurate analysis of early peripheral field loss. The tangent screen may be used as an element in critical evaluation of glaucoma, which commonly causes extension of the physiological blind spot, or arcuate defects within 15-20 degrees from fixation.

Acceptable substitutes:

Confrontation procedures with the applicant and examiner seated in the eye-to-eye position will be accepted when appropriate perimetry equipment is not available.

o Examination technique

1. Perimetry

- a. The applicant should be seated comfortably utilizing the chin rest of a table model perimeter, or in such a position that the examiner may stand in front of him while holding a hand held arc perimeter.
- b. An occluder is placed over the left eye so that the eyes are tested separately; by convention the right eye is tested first.
- c. The examiner should instruct the applicant to keep the eye being tested into focal alignment of the fixation point of the perimeter.
- d. A 3 mm white test object is moved from the peripheral or outside border of the test arc toward the seeing area of the visual field. The practical outer limits of the field are best established by moving the test target from the non-sighted to the sighted area. Visual perseveration, or any delay in the examinee's response, may artificially enlarge the visual field if the target is moved from the seeing to the non-seeing area. The field is first tested along the horizontal meridian, and then successively at intervals of 45 degrees by rotating the perimeter arc. If a scotoma other than the normal blind spot is noted, the field test is abnormal.

- e. Extent of the visual field will be recorded on a worksheet as the number of degrees from the fixation point on each radius at which the white target is first identified by the applicant.
- f. Repeat the test with the right eye occluded and the left eye focusing on the fixation point.

2. Alternate procedure

- a. Confrontation visual field examination may be done as a relatively gross screening procedure. This avoids complex and expensive equipment, permits easy and continuous monitoring of the applicant's visual fixation, and is particularly useful in detecting defects caused by neurologic disorders.

The applicant should be seated with his or her back toward the window or with light sources adjusted so that they do not flood directly into the applicant's eyes. The examiner is seated directly in front of the applicant in such a way that the eyes are level between the two individuals. Head positions should be about 40 in apart. The examiner may use a wiggling finger or a cotton-tipped applicator moving in from the periphery or non-sighted areas to the first point at which the applicant recognizes the test stimulus. This compares the examinee's visual field with the normal field of the examiner. Each eye is examined individually in direct fixation with the examiner's eye.

- b. The Goldmann illuminated 30 cm radius bulb perimeter with a III 4 e target approximates and supersedes the 3 cm white

target on an arc perimeter of 33 cm radius. The Goldmann perimeter provides better controlled background illumination and contrast levels. Acceptable similar bulb perimeters are the Topcon, the Nikon, the Harms-Aulhorn Tubinger tabletop instrument, the Marco projection perimeter, or the more sophisticated and automated perimeters. Acceptable automated perimeters include the Synemed Fieldmaster, the Autofield CD, the Coherent Ocuplot, and similar devices.

- c. The tangent screen is not an acceptable substitute perimeter. Only the central 30 degrees of visual field are tested with a tangent screen, and therefore this is not an instrument which is capable of testing for abnormal visual field.

Disposition

If an applicant for a Class I or II certificate fails to identify the 3 mm diameter white test target on a 33 cm radius arc or equivalent instrument within the following acceptable minimal limits, the examiner must defer certification and request an evaluation by an ophthalmologist:

Temporally in a horizontal line	95°
Down and temporally	90°
Directly downward in a vertical line	55°
Down and nasally	50°
Nasally in a horizontal line	60°
Up and nasally	55°
Directly upward in a vertical line	50°
Up and temporally	60°

These figures have a tolerance of $\pm 5^\circ$.

FAA Form 8500-14, "Ophthalmological Evaluation for Glaucoma" should be provided by the examiner to the applicant for use by the ophthalmologist if glaucoma is suspected as the etiology of visual field loss.

If the applicant refuses further evaluation, the examiner should enter "Abnormal" on Form 8500-8, defer issuance of the certificate, and forward the application with an explanation to the Aeromedical Certification Branch, AAC-130, Oklahoma City.

Ocular Motility (Heterophoria Diopters)

Recommended Standards

o For Classes I and II

Bifoveal fixation and vergence-phoria relationships sufficient to prevent a break in fusion under conditions that may reasonably occur in performing airman duties. Tests for these factors are not required except for applicants found to have more than one prism diopter of hyperphoria, six prism diopters of esophoria, or six prism diopters of exophoria. If these values are exceeded, the Federal Air Surgeon may require the applicant to be examined by a qualified eye specialist to determine if there is bifoveal fixation and an adequate vergence-phoria relationship. However, if the applicant is otherwise qualified, he or she is entitled to a medical certificate pending the results of the examination.

o For Class III, there is no recommended standard.

Examination Procedures

o Equipment

1. Red Maddox rod with handle.
2. Horizontal prism bar with graduated prisms beginning with 1 prism diopter and increasing in power to at least 8 prism diopters.
3. Acceptable substitutes:
 - Maddox rod and Risley rotary prism.
 - Maddox rod and individual prisms.
 - Keystone orthoscope.
 - Bausch and Lomb Orthorator.
 - AOC Site-Screener.
 - Titmus Optical Vision Screener.
 - Keystone Telebinocular.

o Examination techniques

Test procedures accompany most of these instruments. If the examiner requires specific instructions for use of the horizontal prism bar and red Maddox rod, he or she may obtain these from the Regional Flight Surgeon. Aphoria (heterophoria), or latent deviation of the eyes, is not detected until the eyes are dissociated, which disrupts the fusion mechanism. Fusion can be disrupted with the "alternate-cover" test, in which the occluder is moved rapidly from one eye to the other, while the applicant fixates on a target. The rapid motion disrupts binocular fixation, and results in only monocular fixation on the target. The eye that is uncovered will take up fixation. If this eye quickly moves inward, in order to fixate, then an exophoria is present. If the eye moves outward to fixate, then an esophoria is present. If

the eye moves downward, then a hyperphoria is present. If the eye moves upward, then a hypophoria is present. If no movement is detected, the applicant is orthophoric.

A tropia, or manifest deviation of the eye, can be detected by the "cover-uncover" test. The applicant fixates on a target. The occluder is used to cover, for example, the right eye. If any movement of the left eye is detected, in order to take up fixation, then a tropia is present. For example, if the left eye moves inward, a left exotropia is present. Next, with both eyes fixating, the left eye is covered with the occluder. If any movement of the right eye is detected, then a right tropia, in the appropriate direction, is noted.

When testing with the Maddox rod, one places the rod in front of one of the applicant's eyes. The applicant is then asked to fixate on a point light source 6 m away. The eyes are dissociated by distorting the image seen by one eye, thus disrupting any fusion between the two eyes. The cylinders of the Maddox rod cause a streak, which runs perpendicular to their axes, to be visualized by one eye. To test for a horizontal phoria, the examiner positions the Maddox rod cylinders horizontally in front of one of the eyes. The applicant sees a vertical streak in one eye, and a point light source in the other. If the applicant has an exophoria, with the Maddox rod in front of the right eye he or she will visualize a vertical line to the left of the point light source. If the applicant has an esophoria, with the Maddox rod in front of the right eye he or she will visualize a vertical line to the right of the point light source.

To measure the degree of heterophoria, the examiner should use horizontal or rotary prisms until the line and light intersect. When the line and light intersect, after being neutralized by graduated prisms, one can then measure the amount of phoria in diopters.

To test for a vertical phoria, the Maddox rod is held vertically in front of one eye; the applicant then sees a horizontal line. When the Maddox rod is placed in front of the right eye if the horizontal line is visualized below the point light source, then a right hyperphoria is present. When the Maddox rod is placed in front of the right eye if the horizontal line is visualized above the point light source, then a right hypophoria is present. As with horizontal testing, graduated prisms are used until the line and light intersect. At this point, the vertical phoria has been neutralized and can be measured by the number of prism diopters it takes to align the light source and the line induced by the Maddox rod.

The use of visual screeners simplifies this testing procedure, since the amount of heterophoria can be read directly from the instrument. Although the Maddox rod is used to detect phorias, actually one cannot distinguish a phoria from a tropia using this rod.

Disposition

- o Class III applicants are not required to undergo heterophoria testing. However, if there is a strabismus, or a history of diplopia, the examiner should test for heterophorias, as described in this section.
- o Classes I and II: When the heterophoria standards are exceeded but there is

no other pathology of the eye, and all other aspects of the ocular examination and history are favorable, the examiner should not withhold the medical certificate. Rather, the applicant should be advised that the FAA may require further examination by a qualified eye specialist.

Ninety-six percent of the general population will fall within the heterophoria standards that are presently required. It is reasonable for the other 4% to undergo a more comprehensive examination by a qualified eye specialist, to rule out the absence of an ocular motility problem that might compromise a pilot's capabilities while flying.

- o Diplopia: Any applicant with a history of diplopia should be deferred unless the applicant provides written evidence that the FAA previously considered the condition and determined that this special circumstance is not adverse to flight safety.

Musculoskeletal System

Recommended Standard

An applicant must have no medical history or clinical diagnosis of the following:

- o Quadriplegia.
- o Hemiplegia or hemiparesis secondary to brain disease, regardless of cause.
- o Collagen vascular disease with central nervous system involvement.
- o Progressive neurologic disorders.

Examination Procedures

- o Equipment

No special equipment is required.

- o Examination techniques

The examiner should evaluate the gross integrity of the applicant's musculoskeletal system, noting the following:

1. Weakness: Evidence of local or generalized weakness or paralysis and the degree and amount of functional loss. Evidence of atrophy, contractures, hypertrophy, or related dysfunctions.
2. Motion: Abnormalities of coordination, loss or restriction of joint motion; ligamentous laxity or subluxation, especially of knee or shoulder; deformity; evidence of joint inflammation; tremor or pattern of rigidity or any degradation of performance caused by loss of range of motion.

3. Sensory: Sensory loss of a degree that would significantly interfere with tactile recognition of aircraft controls.
4. Amputation: Level, stump appearance, healing, phantom pain.
5. Prosthetics, orthotics or braces: Comfort and ability to use these effectively.
6. Scars: Indications of trauma or surgery.
7. Pain: Indications of potential chronic problems, such as: history of neuralgia, myalgia, paresthesias; history of use of hypnosis, autogenics, relaxation techniques or polypharmacy; related circulatory or neurological findings; evidence of surgical scar; evidence of use of a Transcutaneous Nerve Stimulator (TENS) Unit.

Disposition

For musculoskeletal disorders that are not immediately disqualifying according to the standards, the AME should defer certification, unless the AME is specifically instructed by the FAA to issue a certificate limited to student pilot purposes only. For most musculoskeletal conditions residual function can be measured accurately, but the effect of the limited functioning on the ability to pilot an aircraft is best assessed by an FAA-administered medical flight test. The FAA may issue a certificate with specific limitations, such as requiring use of prosthetic devices or requiring the pilot to fly only a certain aircraft. The AME should be aware that TENS units and myoelectric prosthetic devices may emit radio frequency signals, and should inform the FAA that an applicant uses

such a device.

The list below contains a variety of conditions that are easily detected but whose functional limitations can vary greatly; this list is not all inclusive:

- o Amputations: Any amputation of any extremity or portion thereof that is sufficient to interfere with the performance of airman duties. An example is a partial hand amputation with the loss of ability to oppose the thumb to the small finger. An amputation with or without a prosthesis is best evaluated by means of a special medical flight test.
- o Atrophy: Atrophy of muscles that is progressive or sufficient to interfere with the performance of airman duties.
- o Motion: Any limitation of motion of a major joint, or curvature, ankylosis, or other marked deformities of the limbs or spinal column that may interfere with the performance of airman duties.
- o Pain syndrome: Chronic or acute neuralgia, particularly sciatic neuralgia, if it results in interference of function or is likely to become incapacitating.
- o Herniation of an intervertebral disc:
 - 1. Disc disease is not disqualifying if the applicant is either asymptomatic, or:
 - a. has minor residual pain that does not interfere with safe function as an airman;

- b. has completely recovered from surgery or other treatment;
- c. is taking no medication, except as listed below, and has no residual neurological deficit that would interfere with safe function as an airman. The examiner should confirm these findings with a brief statement on the medical examination form or by a letter attached to the application. The examiner is then authorized to issue any class of medical certificate assuming the individual meets all the medical standards for that class.

2. A herniated nucleus pulposus is disqualifying:

- a. when it causes incapacitating pain;
- b. when it causes progressive neurological deficits or incapacitating motor loss;
- c. within four months of onset of symptoms;
- d. within four months of intradiscal injection of chymopapain;
- e. within three months of intradiscal injection of collagenase;
- f. within three months of surgical removal.

3. Following the specific period of time after recovery from surgery or intradiscal injection, the airman may submit a request for medical certification. It must be accompanied by a current evaluation by the treating surgeon.

- o Spinal fusion is disqualifying within 6 months of surgery, and after 6 months the airman must be free of incapacitating pain or significant motor loss.

- o Spinal stenosis is disqualifying within four months of surgery, and after six months the airman must be free of incapacitating pain or motor loss.
- o Tumors: All malignancies of bone, muscle, or connective tissue are disqualifying. To be considered for special issuance, the applicant must submit documentation to the FAA that he or she has been free of malignancy for at least 6 months. The applicant must be re-evaluated every 6 months after medical certification.
- o Arthritis: Inflammatory arthritis, such as rheumatoid arthritis, ankylosing spondylitis or any of the rheumatoid variants, when symptomatic or requiring medication except as listed below, is disqualifying. Degenerative arthritis, or osteoarthritis, or deformities or functional limitations from previous inflammatory arthritis that may make the applicant unable to perform safely the duties of an airman should be referred to FAA. If applicants with these conditions are certified by the FAA, they will be re-evaluated at least annually.
- o Generalized connective tissue disease: The collagen vascular diseases, including but not limited to systemic lupus erythematosus, polymyositis, dermatomyositis, polyarteritis nodosa, scleroderma, and polymyalgia rheumatica, are disqualifying when the disease is active or requires medication except as listed below. The applicant may be granted a special issuance by the FAA for a period of one year when the disease condition is stable and nondisabling. However, residual functional limitations from these diseases may make the applicant unable to perform safely the duties of an airman. When there are central nervous system complications, the

conditions are immediately disqualifying for certification.

- o Paraplegia: The applicant with a functional level higher than T10 may have significant balance problems that must be assessed carefully if a medical flight test is performed.
- o Any form of spinal trauma with hemiplegia or hemiparesis, including the Brown-Sequard syndrome that may interfere with the performance of airman duties.
- o Other congenital or acquired musculoskeletal dysfunction that may interfere with the performance of airman duties or is likely to progress within two years to such a degree that it will interfere. Some examples are cerebral palsy, neuropathy, muscular dystrophy, and other myopathies. Landry-Guillain-Barre syndrome, myasthenia gravis, poliomyelitis, neuropathy, or cerebral palsy also have neuromuscular consequences.
- o Acceptable medications: An applicant using the following medications on a continuing basis for treatment of musculoskeletal conditions may be considered for special issuance by the FAA if the applicant presents evidence documenting that the underlying condition for which the medication is required is not itself disqualifying, and if the applicant has been on drug therapy for a sufficient length of time to establish tolerance for the drug(s) and the absence of side effects:
 - 1. aspirin
 - 2. nonsteroidal anti-inflammatory drugs

3. hydroxychloroquine
4. injectable gold compound
5. oral steroid compounds equivalent to 10 mg or less of prednisone per 24 hour period.

Gastrointestinal System

Recommended Standards

There are no specific standards recommended for gastrointestinal system disorders.

Introduction

Because of the numerous organs that comprise the gastrointestinal system, the number and variety of disorders of this system are far too great to present in detail. This section of the Guide will discuss disorders of the gastrointestinal tract that are common enough to be encountered by the AME. Rare or unusual disease processes that are not discussed should be deferred to the FAA for consideration.

A disorder of the gastrointestinal tract is considered disqualifying, either permanently or temporarily, if 1) it disables, weakens or emotionally distracts the airman so that he or she cannot perform the duties of a pilot competently at all times; 2) there is a potential for sudden or unexpected changes in the pilot's condition that would affect the performance of the airman duties; 3) there is an expected progressive deterioration of the pilot's condition, even though there is no chance for sudden incapacitation, and; 4) the pilot is likely to require unauthorized medication for control of symptoms.

Although this Guide recommends waiting time limits for issuing certificates following acute gastrointestinal disorders and procedures the AME should not hold the pilots' application for those periods of time. Rather, the AME should defer or deny the application, and instruct the pilot to return at or after the specified period of time for a re-examination.

Answers to Medical History Questions

o Heartburn

A history of infrequent episodes of pyrosis or "heartburn," related to dietary indiscretion, and relieved promptly by antacids, milk or similar substances, may be dismissed without further evaluation. However, if the applicant complains of recurring or frequent episodes, or if the episodes last for more than 24 hours, or if there are other associated symptoms such as difficulty with swallowing or vomiting, further evaluation should be directed to determining the presence of severe esophagitis or complications thereof. The studies should include an esophagram and/or esophagoscopy. The certificate should be denied until this evaluation is complete.

o Severe vomiting

Episodes of severe vomiting readily related to occasional attacks of acute viral, bacterial, or toxic gastroenteritis are not significant, and no further evaluation is required. However, applicants who complain of frequent episodes or prolonged periods of vomiting must be suspected of having diseases of the stomach or duodenum, such as peptic ulcer disease or neoplasm. An upper gastrointestinal series or endoscopy must be performed to rule out intrinsic disease of the stomach or duodenum before the certificate can be issued.

o Diarrhea

Occasional episodes of diarrhea that are readily attributed to viral, bacterial, or toxic conditions of the gastrointestinal tract, and that respond within a few days to dietary measures and common medications, may be

dismissed without further evaluation. However, persistent or recurring episodes of diarrhea, particularly if associated with melena, mucus in the stools, abdominal pain, fever, or weight loss, should cause the examiner to suspect such disqualifying conditions as Crohn's disease, ulcerative colitis, or persistent pathogens. Stool examination, proctosigmoidoscopy, and, when indicated, either a barium enema or total colonoscopy, are required before the medical certificate may be issued.

o Constipation

Occasional episodes of constipation relieved by dietary measures or mild laxatives are not considered significant, and warrant no further evaluation. Similarly, a history of constipation "all of my life" is not uncommon response and may be similarly dismissed as normal for that applicant. However, constipation as a change in bowel habit, particularly in applicants over age 30 years, warrants a closer evaluation, including proctosigmoidoscopy. Barium enema or total colonoscopy is indicated if there is suspicion of neoplasm of the colon.

o Bleeding from the rectum

Any complaint of rectal bleeding, except for occasional episodes obviously attributed to hemorrhoids, requires total examination of the colon by a barium enema or total colonoscopy. Persistent bleeding in persons with known hemorrhoids also requires a complete study of the colon. If the evaluation of colon is negative, attempts must be made to identify the rare noncolonic source of rectal bleeding. This should include upper gastrointestinal and small bowel radiograph studies.

o Weight loss

Recent loss of weight in an otherwise healthy person who reports known dietary restriction may be dismissed without further concern. However, since weight loss is a common sign of gastrointestinal tract malignancies and other disorders, unexplained weight loss must be investigated. A careful history should be obtained to identify the possible areas of concern, and a blood count, other laboratory chemistry studies, and evaluation of the gastrointestinal tract by radiography or endoscopy should be undertaken.

- o Disease of the stomach, duodenum, intestine, gall bladder, liver or pancreas
- A positive response to this question usually indicates that the applicant has specific information of a previous or current gastrointestinal tract disorder. This may include a previous cholecystectomy for stones, conservative or surgical management of peptic ulcer disease, or even surgical treatment of carcinoma of the colon. The examiner should determine whether the history of these conditions warrants further evaluation, and this is best done by referring to the series of non-disqualifying and disqualifying conditions of the gastrointestinal tract listed in the Guide. If it appears that the condition is chronic and possibly disqualifying, or that the status of the disorder is not clear either to the applicant or the examiner, either further studies must be performed or information must be obtained from the treating physician.

The examiner may mention to the applicant at the time of examination any recommendations regarding further evaluation, including radiography, endoscopy, or blood chemistries, to inform the applicant why the certificate is not being issued. However, the FAA will communicate directly with the

applicant officially requesting that the studies be obtained.

Examination Procedures

o Equipment

The only equipment needed for the conduct of the examination are gloves or finger cots, lubricant, and wipes for the rectal examination. However, the medical history and/or the physical findings may indicate a need for special tests, such as x-ray or other laboratory tests.

o Examination techniques

In order to help reduce the likelihood of omissions and to conserve time, it is recommended that the examiner follow a set protocol. The examiner must review the applicant's history prior to conducting the medical examination.

The physical examination should include:

1. Observation: The examiner should note and record any unusual shape or contour, skin color, moisture, temperature, presence of scars, hernias, hemorrhoids, and fissures.
2. Palpation: The examiner should note enlargement of organs, unexplained masses, tenderness, guarding, rigidity, and ascites.
3. Digital examination: During the digital examination of the anus and rectum the examiner should note the following:
 - a. sphincter tone
 - b. internal hemorrhoids
 - c. prostatic size and contour, consistency, tenderness
 - d. evidence of infection

- e. unexplained masses
- f. color of feces

- 4. The stool guaiac: Current data fail to demonstrate that routine stool guaiac is a worthwhile screening procedure for detecting occult disease of the gastrointestinal tract during the physical examination of pilots. The test is indicated when disease is expected and should be obtained with other laboratory studies. The hematocrit (see the hematology section) and hemoglobin determinations are of greater clinical value.

Disposition

Diseases of the esophagus

- o Disqualifying conditions are:
 - 1. Symptomatic paraesophageal hiatal hernia
 - 2. Esophageal stricture
 - 3. Esophageal varices
 - 4. Esophageal candidiasis and herpes infection
 - 5. Diffuse esophageal spasm
 - 6. Radiation esophagitis
 - 7. Reflux esophagitis not controlled by medical treatment
- o Nondisqualifying conditions are:
 - 1. Peptic esophagitis, uncomplicated, with symptoms controlled by antacids and/or acid-blockers, such as cimetidine and ranitidine
 - 2. Esophageal hiatal hernia with reflux esophagitis, with symptoms

controlled by antacids and acid-blockers

3. Asymptomatic sliding or paraesophageal hiatal hernia
4. Zenker's diverticulum
5. Achalasia of the esophagus
6. Schatzki ring

Diseases of the diaphragm

- o Disqualifying condition: chronic hiccoughs
- o Nondisqualifying conditions: hernias other than esophageal hiatus, including Bochdalek, Morgagni and eventration hernias.

Diseases of the stomach

- o Disqualifying conditions are:

1. Active gastric ulcer

A certificate may be issued by the FAA after the applicant is asymptomatic for 6 to 8 weeks, with medication limited to antacids and acid-blockers, and with a demonstration of complete healing of the ulcer by radiologic or endoscopic examination.

2. Gastric ulcer with bleeding

A certificate may be issued by the FAA after the applicant is asymptomatic for three months, with medication limited to antacids and/or acid-blockers, with a demonstration of complete healing of ulcer by radiologic or endoscopic examination, and with the presence of a normal, stable hematocrit (see hematology section).

3. Intractable gastric ulcer

A certificate may be issued by the FAA on receipt of documentation that the applicant has undergone a successful surgical procedure and is free of residual complications. He or she must be asymptomatic for three months following the operation with medications limited to antacids and acid-blockers. There must be radiologic or endoscopic evidence of complete healing of the ulcer if it has not been removed.

4. Gastric ulcer with outlet obstruction

A certificate may be issued by the FAA on receipt of documentation that the applicant has undergone a successful surgical procedure and is free of residual complications. He or she must be asymptomatic for three months following the operation with medications limited to antacids and acid-blockers. There must be radiologic or endoscopic evidence of complete healing of the ulcer if it has not been removed, and of adequate gastric emptying.

5. Simple (Graham) closure of perforated gastric ulcer

A certificate may be issued by the FAA when the applicant is asymptomatic for 6 to 8 weeks with medication limited to antacids and acid-blockers. Biopsy of the ulcer either at operation or later by endoscopy must confirm benign peptic ulcer disease.

6. Acute gastritis with bleeding

- a. Drug-induced, such as by salicylates or non-steroidal anti-inflammatory agents, or of undetermined etiology

A certificate may be issued by the FAA when the applicant is asymptomatic for 4 to 6 weeks after discontinuing all offending medication, and has a normal, stable hematocrit. Diagnosis must be confirmed by endoscopy, preferably, or radiology.

b. Alcoholic gastritis

A certificate may be issued by the FAA under same circumstances as above; however, the applicant should be carefully evaluated for chronic dependence or abuse.

7. Acute gastritis without bleeding

A certificate may be issued by the AME if the applicant has been asymptomatic for at least two weeks with medications limited to antacids and acid-blockers.

8. Postoperative syndromes (postgastrectomy or postvagotomy)

a. Severe diarrhea

b. Dumping syndrome

A certificate may be issued by the FAA when the applicant is asymptomatic for three months, and the condition is controlled by diet, antacids and acid-blockers only.

c. Chronic afferent loop obstruction; intractable reflux alkaline gastritis; marginal ulcer

A certificate may be issued by the FAA after receipt of documentation that the applicant has undergone a successful corrective procedure and is asymptomatic for three months.

Diseases of the duodenum

o Disqualifying conditions are:

1. Active duodenal ulcer

A certificate may be issued by the FAA when the applicant is asymptomatic 6 to 8 weeks, with medication limited to antacids and acid-blockers, and with a demonstration of complete healing of ulcer by radiologic or endoscopic examination.

2. Duodenal ulcer with bleeding

A certificate may be issued by the FAA when the applicant has remained asymptomatic for three months following a bleeding episode, with medications limited to antacids and acid-blockers; has a normal and stable hematocrit; and has complete healing of the ulcer demonstrated by radiologic or endoscopic examination.

3. Perforated duodenal ulcer

A certificate may be issued by the FAA when the applicant is asymptomatic for three months, with medication limited to antacids and acid-blockers; and has evidence of complete healing of the ulcer by radiologic or endoscopic examination.

4. Duodenal ulcer with obstruction

A certificate may be issued by the FAA when the applicant is asymptomatic for three months, with medication limited to antacids and acid-blockers; and has radiologic evidence of normal gastric emptying. Complete healing of the ulcer must be shown by radiologic

or endoscopic examination.

5. Intractable duodenal ulcer

A certificate may be issued by the FAA when documentation is received showing that the applicant has undergone a successful surgical procedure and is free of symptoms and complications at least three months following the operation. Medications are limited to antacids and acid-blockers.

6. Acute duodenitis with bleeding

A certificate may be issued by the FAA when the applicant is asymptomatic for three months following the bleeding episode, with medications limited to antacids and acid-blockers; and has a normal and stable hematocrit.

o Nondisqualifying conditions are:

1. Uncomplicated, nonspecific duodenitis
2. Duodenal diverticula

Diseases of the small intestine

o Disqualifying conditions are:

1. Intractable irritable bowel syndrome (functional or psychophysiologic gastrointestinal tract disorder).

The diagnosis "irritable bowel syndrome" is synonymous with "functional" or "psychophysiologic" gastrointestinal tract disorder. The site of involvement is anywhere along the gastrointestinal tract from esophagus to lower rectum. Symptoms are often minor and

include non-specific abdominal pain, constipation or diarrhea, nausea, and/or vomiting. This condition is episodic, sporadic, and usually does not interfere with normal function. Treatment usually consists of bulk laxatives, antacids, and dietary management.

Individuals with a more severe form of the disease may experience attacks of increased frequency and severity that often require treatment with other medications. They are considered to have the "intractable irritable bowel syndrome," and they should be disqualified from flying until they are asymptomatic and not taking medications except for antacids and/or bulk laxatives for three months. Furthermore, if there is suspicion of other gastrointestinal tract disease a complete gastrointestinal tract evaluation should be performed.

2. Crohn's disease (regional ileitis or enteritis)

- a. Symptomatic, uncomplicated Crohn's disease
- b. Asymptomatic Crohn's disease

A certificate may be issued by the FAA when the applicant is asymptomatic for three months, with treatment limited to dietary restriction and medications to include only salicylazo sulfasalazine (Azulfadine) or cholestyramine.

- c. Crohn's disease complicated by obstruction, abscess formation, bleeding, perforation, or fistula (perineal Crohn's)

A certificate may be issued by the FAA when all these complications have cleared and the applicant is asymptomatic for three months, and treatment is limited to diet and

salicylazo sulfasalazine or cholestyramine.

3. Recurrent or chronic intestinal obstruction due to adhesions, which is defined as two or more episodes of acute obstruction within two years, treated either medically or surgically.

A certificate may be issued by the FAA when the applicant is free of symptoms for two years.

4. Radiation enteritis
5. Short bowel syndrome from Crohn's disease, radiation enteritis, vascular accident, or following resection.
6. Infections, such as salmonella, shigella, giardia, or others.

Certificate may be issued by the AME if the applicant has been free of symptoms for two weeks.

7. Ischemic enteritis

o Nondisqualifying conditions are:

1. Lactose intolerance
2. Asymptomatic celiac sprue requiring gluten restriction only

Diseases of the vermiform appendix

o Disqualifying conditions are:

1. Postoperative abscess or fistula formation

Diseases of the colon

o Disqualifying conditions are:

1. Intractable irritable bowel syndrome (functional or psychophysiologic gastrointestinal tract disorder)

A certificate may be issued by the FAA when the applicant is asymptomatic and off all medication for three months. See explanation under Diseases of small intestine.

2. Diverticulosis with major bleeding episode

A certificate may be issued by the FAA upon receipt of documentation that the applicant has undergone surgical resection and is free of symptoms and complications for three months following operation. The hematocrit is normal and stable.

3. Single episode of diverticulitis

A certificate may be issued by the AME if the applicant has been asymptomatic and off all medication for three months, and has a normal white blood cell count.

4. Recurrent episodes of diverticulitis

A certificate may be issued by the FAA on receipt of documentation that the applicant has undergone surgical resection and is free of symptoms and complications for three months following the operation.

5. Diverticulitis complicated by obstruction, perforation or abscess, or fistula

A certificate may be issued by the FAA upon receipt of documentation that the applicant has undergone surgical procedure for the condition and is asymptomatic for three months following operation.

6. Uncomplicated chronic ulcerative colitis

A certificate may be issued by the FAA if the applicant has been asymptomatic for three months with medication limited to salicylazo sulfasalazine.

7. Chronic ulcerative colitis, complicated by major bleeding, perforation or abscess, or a severe acute episode (toxic megacolon)

A certificate may be issued by the FAA if the applicant is asymptomatic for three months, with medication limited to salicylazo sulfasalazine. For chronic ulcerative colitis complicated by a stricture, a certificate may be issued by the FAA upon receipt of documentation that the applicant has undergone surgical resection and is asymptomatic for three months after the operation.

8. Symptomatic, uncomplicated Crohn's disease of the colon

A certificate may be issued by the FAA when the applicant is asymptomatic for three months with medication limited to salicylazo sulfasalazine or cholestyramine.

9. Crohn's disease, complicated by a major bleeding episode, perforation/abscess, or fistula (perineal Crohn's)

A certificate may be issued by the FAA when the complication has healed and the applicant is asymptomatic for three months, with medication limited to salicylazo sulfasalazine and cholestyramine. For Crohn's disease that is complicated by a stricture, a certificate may be issued by the FAA upon receipt of documentation that the applicant has undergone surgical resection and is asymptomatic and free of complications three months following operation.

10. Radiation colitis

11. Antibiotic-induced enterocolitis

A certificate may be issued by the AME if the applicant has not taken the offending medication and has been asymptomatic for at least four weeks following completion of treatment.

12. Angiodysplasia with bleeding episode

A certificate may be issued by the FAA upon receipt of documentation that the applicant has undergone surgical resection or a similar ablative procedure and is free of symptoms and complications for three months following the operation.

13. Infectious diseases, such as salmonella, shigella, giardia, amebae, campylobacter, or others

A certificate may be issued by the AME if the applicant has been asymptomatic for two weeks.

- o Nondisqualifying conditions are:
 - 1. Uncomplicated diverticulosis of the colon
 - 2. Angiodysplasia without bleeding

Diseases of the anus

- o Disqualifying conditions are:
 - 1. Hemorrhoids complicated by chronic bleeding, or thrombosis, or Grade IV hemorrhoids

A certificate may be issued by the FAA upon receipt of documentation that the applicant has undergone hemorrhoidectomy and is asymptomatic for 6 weeks after operation. The classification of hemorrhoids is:

 - Grade I - not prolapsed
 - Grade II - prolapsed with bowel movements but reduced spontaneously
 - Grade III - prolapsed with bowel movements and reduced manually
 - Grade IV - prolapsed at all times
 - 2. Recurrent perianal or perirectal abscess

A certificate may be issued by the AME two weeks after the abscess has cleared by surgical or medical treatment, if the applicant is asymptomatic and white blood cell count is normal.
 - 3. Anal fissure

A certificate may be issued by the AME four weeks after

fissurectomy if the applicant is asymptomatic.

4. Bowen's disease (carcinoma-in-situ)

A certificate may be issued by the FAA 6 weeks following operative excision if the applicant is free of symptoms and complications.

o Nondisqualifying conditions are:

1. Uncomplicated hemorrhoids, Grades I, II, III
2. Fistula-in-ano
3. Pilonidal cyst or sinus
4. Chronic pruritis ani

Diseases of the pancreas

o Disqualifying conditions are:

1. Single or multiple episodes of acute edematous pancreatitis

a. Pancreatitis associated with biliary tract disease (gall stones)

A certificate may be issued by the FAA three months after cholecystectomy if the applicant is free of symptoms, and the serum amylase promptly returns to normal.

b. Drug-induced pancreatitis

A certificate may be issued by the FAA if drug is removed and the applicant is free of symptoms for three months and the serum amylase promptly returns to normal.

c. Alcoholic pancreatitis

d. Idiopathic pancreatitis

2. Episode of acute hemorrhagic pancreatitis

A certificate may be issued by the FAA if the applicant is asymptomatic for 6 months after episode, has no evidence of diabetes or pancreatic insufficiency, and has a normal serum amylase.

3. Chronic relapsing pancreatitis

4. Chronic pancreatitis

5. Pancreatic pseudocyst

A certificate may be issued by the FAA upon receipt of documentation that the applicant has had a successful operative procedure, and has been asymptomatic for three months following surgery, and has a normal serum amylase.

6. Pancreatic abscess

A certificate may be issued by the FAA 6 months after an episode if the applicant is asymptomatic and has a normal serum amylase.

o Nondisqualifying conditions are:

1. Pancreatic exocrine insufficiency controlled by enzymes

Diseases of the gall bladder and biliary tree

o Disqualifying conditions are:

1. Cholelithiasis
2. Chronic cholecystitis with or without cholelithiasis
3. History of acute cholecystitis
4. Choledocholithiasis

A certificate may be issued by the FAA after receipt of

documentation that the four conditions above have been corrected by cholecystectomy or removal of common duct stones, and that the applicant has been free of symptoms for three months following the operation.

5. Sclerosing cholangitis

o Nondisqualifying conditions are:

1. Cholesterolosis of the gall bladder
2. Adenomyosis of the gall bladder

These two conditions are not necessarily disqualifying, but should be evaluated carefully.

Diseases of the liver

o Disqualifying conditions are:

1. Hepatomegaly

An applicant is considered to have hepatomegaly that is strongly suggestive of clinically significant liver disease if the liver span is 13 cm or greater by percussion of the right lobe on physical examination. This applicant is disqualified pending the results of a total serum bilirubin, SGOT, and alkaline phosphatase.

2. Jaundice
3. Ascites
4. History of portosystemic encephalopathy
5. Acute viral hepatitis

A certificate may be issued by the AME if the applicant has been asymptomatic for three months.

6. Chronic hepatitides
 - a. Symptomatic
 - b. Associated with jaundice
 - c. Associated with cirrhosis
 - d. Asymptomatic, with elevated total serum bilirubin
7. Alcoholic liver disease
8. Symptomatic primary biliary cirrhosis
9. Fatty liver
10. Induced toxic hepatitis, drug or chemical

A certificate may be issued by the AME if the applicant has been asymptomatic for three months.

o Nondisqualifying conditions are:

1. Asymptomatic chronic hepatitis, with normal total serum bilirubin
2. Asymptomatic primary biliary cirrhosis
3. Gilbert's disease (congenital unconjugated hyperbilirubinemia)
4. Positive serologic test for hepatitis A or B in an asymptomatic applicant

Gastrointestinal tract tumors

Malignant tumors of the esophagus, stomach, and small intestine are disqualifying. An applicant in whom there is no evidence of disease for five years or longer after curative resection, and who is asymptomatic, may request a special issuance.

<u>Organ</u>	<u>Disqualifying</u>	<u>Nondisqualifying</u>
Esophagus	Epidermoid carcinoma Adenocarcinoma	Leiomyoma
Stomach	Adenocarcinoma Lymphoma Adenomatous polyps* Leiomyoma*	Hyperplastic polyps
Small Intestine	Adenocarcinoma Lymphoma Carcinoid* Leiomyosarcoma	Adenoma Leiomyoma Lipoma
Vermiform	Adenocarcinoma	Carcinoid Appendix
Colon	Adenocarcinoma, with palliative resection	Adenocarcinoma, with curative resection, 3 to 6 months after the operation, depending upon the procedure

An applicant who has had a successful resection of carcinoma of the colon, with the tumor limited to the bowel and regional lymph nodes, and who has been issued a certificate, will be required to have follow-up examination by a physician with a

carcinoma embryonic antigen (CEA) done at least every 6 months following issuance. The result must be forwarded to the FAA along with results of any other studies relating to the status of the airman's tumor. The airman should understand that any suspicion of recurrence of tumor is disqualifying until tests are obtained indicating he or she is free of disease.

<u>Organ</u>	<u>Disqualifying</u>	<u>Nondisqualifying</u>
	Adenocarcinoma, recurrent	Carcinoid
	Lymphoma	Hyperplastic polyps
	Adenomatous polyps 2 cm or greater*	Lipoma
		Leiomyoma
		Adenomatous polyps less than 2 cm. Annual proctoscopy or colonoscopy should be required.
Anus	Epidermoid carcinoma Melanoma Bowen's disease*	Hyperplastic polyps
Liver	Hepatocellular carcinoma Cholangiocarcinoma	Hemangioma Hamartoma

Adenoma

Simple cyst

Benign nodular

hyperplasia

<u>Organ</u>	<u>Disqualifying</u>	<u>Nondisqualifying</u>
Gall Bladder	Adenocarcinoma	Adenomyoma
Bile Duct	Adenocarcinoma	
Ampulla of Vater	Adenocarcinoma	
Pancreas	Adenocarcinoma	
	Insulinoma	
	Gastrinoma (Zollinger-Ellison)	
	Non-functioning islet cell tumors	

* Indicates that the tumor may be only temporarily disqualifying and that a certificate may be issued after appropriate surgical removal. See section on Surgical Procedures.

Hernia

o Disqualifying conditions are:

1. Inguinal hernia
2. Femoral hernia
3. Umbilical or ventral hernia, incarcerated or with history of incarceration
4. Incisional hernia, incarcerated or with history of incarceration

A certificate may be issued by the FAA three months after surgical repair of any of these four conditions if the applicant is asymptomatic and has no complication or recurrence.

o Nondisqualifying conditions are:

1. Diastasis recti
2. Uncomplicated umbilical or ventral hernia
3. Uncomplicated incisional hernia

Surgical procedures on the gastrointestinal tract

Esophagus

o Permanently disqualifying procedures are:

1. Esophageal replacement
2. Operation for esophageal varices (direct or shunt)
3. Esophagectomy for carcinoma
4. Esophagogastrrectomy for stricture

o Temporarily disqualifying procedures are:

1. Esophagocardiomyotomy (Heller procedure)
2. Esophageal diverticulectomy

3. Repair esophageal hiatal hernia
4. Excision of benign esophageal tumor

A certificate may be issued by the FAA three months after any of these four procedures if the applicant is asymptomatic and an upper GI series demonstrates no obstruction or other complications.

5. Brisk balloon dilatation

A certificate may be issued after by the FAA four weeks if the applicant is asymptomatic and an upper GI series demonstrates satisfactory esophageal emptying.

Stomach

- o Permanently disqualifying procedures: subtotal or total gastrectomy for gastric carcinoma
- o Temporarily disqualifying procedures are:
 1. Wedge resection of gastric ulcer
 2. Gastrotomy and polypectomy
 3. Pyloroplasty and vagotomy
 4. Gastrojejunostomy and vagotomy
 5. Antrectomy and vagotomy
 6. Hemigastrectomy and vagotomy
 7. Highly selective vagotomy
 8. Subtotal (75%) gastrectomy
 9. Hemigastrectomy
 10. Closure of perforated peptic ulcer
 11. Gastrotomy with suture of bleeding gastric ulcer
 12. Roux-en-y, Tanner-19 or other procedure for reflux alkaline gastritis

or esophagitis

A certificate may be issued by the FAA following any of these 12 procedures if the applicant is asymptomatic for three months, and medication is limited to antacids and acid-blockers. If the ulcer has not been removed surgically there must be radiologic or endoscopic evidence of complete healing. The hematocrit must be normal and stable.

Small intestine

o Temporarily disqualifying procedures are:

1. Operation for intestinal obstruction (enterolysis or resection)

A certificate may be issued by the FAA three months following an operation for a single episode of obstruction if the applicant remains asymptomatic. When the operation is for chronic or recurrent adhesive disease, requiring two or more procedures within two years, the applicant must be asymptomatic for two years before a certificate may be issued.

2. Ileostomy

A certificate may be issued by the FAA 6 months following an operation if the applicant is asymptomatic with a well-functioning ileostomy.

Colon

o Temporarily disqualifying procedures are:

1. Colectomy and polypectomy

2. Partial colectomy

3. Subtotal colectomy and ileoproctostomy

A certificate may be issued by the FAA three months following the operation if the applicant is asymptomatic and free of post-operative complications.

4. Total colectomy and ileostomy

5. Colostomy

6. Total colectomy and ileoanal anastomosis

A certificate may be issued by the FAA 6 months following these three procedures if the applicant is asymptomatic and free of post-operative complications, and has a well-functioning colostomy or ileostomy.

Liver

o Permanently disqualifying procedure is: portosystemic shunt

o Temporarily disqualifying procedures are:

1. Open liver biopsy

2. Partial hepatectomy

3. Wedge resection of the liver

A certificate may be issued by the FAA three months after any of these three procedures if the applicant is free of symptoms and postoperative complications.

4. Drainage of intrahepatic abscess

5. Drainage of subhepatic abscess

A certificate may be issued by the FAA 3 months after any of these procedures if the applicant is free of symptoms and has a normal white blood cell count.

Gall bladder and biliary tree

o Permanently disqualifying procedure: cholecystostomy

o Temporarily disqualifying procedures are:

1. Cholecystectomy
2. Cholecystectomy with common bile duct exploration
3. Repair of common bile duct stricture
4. Choledochojejunostomy

A certificate may be issued by the FAA three months after any of these four operations if the applicant is free of symptoms and postoperative complications.

Pancreas

o Permanently disqualifying procedures are:

1. Pancreaticoduodenectomy (Whipple procedure)
2. Total pancreatectomy
3. Pancreaticojejunostomy (Puestow procedure)

o Temporarily disqualifying procedures are:

1. Transduodenal sphincterotomy
2. Drainage of a pancreatic abscess
3. Drainage of a pancreatic pseudocyst
4. Open biopsy of the pancreas

A certificate may be issued by the FAA three months following these four procedures if the applicant is free of symptoms and postoperative complications. The serum amylase must be normal, and

in the case of pancreatic abscess, the white blood cell count must be normal as well.

Spleen

o Temporarily disqualifying procedures are:

1. Repair of splenic laceration
2. Splenectomy

A certificate may be issued by the FAA three months following these procedures if the applicant is free of symptoms and postoperative complications. After splenectomy, vaccination against pneumococcus is recommended.

Anus and pilonidal area

o Temporarily disqualifying procedures are:

1. Hemorrhoidectomy
2. Anal fistulectomy
3. Anal fissurectomy
4. Excision or marsupialization of pilonidal cyst or sinus

A certificate may be issued by the AME 6 weeks after surgery if the applicant has been free of symptoms and postoperative complications.

5. Drainage of a perianal abscess
6. Drainage of a perirectal abscess

A certificate may be issued by the AME two weeks after surgery if the applicant has been asymptomatic and the white blood cell count is normal.

7. Repair of rectal prolapse

A certificate may be issued by the FAA three months following operation if the applicant is free of symptoms, complications or recurrence.

Endoscopic and biopsy procedures

o Temporarily disqualifying procedures are:

1. Upper gastrointestinal endoscopy without biopsy

A certificate may be issued by the AME after one week if the applicant has been asymptomatic.

2. Upper gastrointestinal endoscopy with polypectomy or biopsy

A certificate may be issued by the FAA one month after procedure if the applicant is asymptomatic.

3. Colonoscopy without biopsy or polypectomy

A certificate may be issued by the AME after one week if the applicant has been asymptomatic.

4. Colonoscopy with biopsy or polypectomy

A certificate may be issued by the FAA after two weeks if the applicant is asymptomatic.

5. Laparoscopy

A certificate may be issued by the FAA after two weeks if the applicant is asymptomatic.

6. Percutaneous needle biopsy of the liver

A certificate may be issued by the FAA after two weeks if the applicant is asymptomatic.

7. Percutaneous needle biopsy of the pancreas

A certificate may be issued by the FAA after 6 weeks if the applicant is asymptomatic and the serum amylase is normal.

Reproductive-Urinary System

Recommended Standards

There are no specific recommended standards for the reproductive-urinary system.

Responses to Reproductive-Urinary Questions in the Medical History

- o Kidney stone or blood in the urine

A specialty evaluation is required for issuance of a medical certificate to an applicant with renal stones, unless the applicant provides documentation from the FAA that he or she has already been given a special issuance for this condition.

The presence of blood in the urine is grounds for deferral until the etiology of the problems has been determined.

Examination Procedures

- o Medical history

The examiner should elicit history of: 1) painful urination, burning on urination or difficult urination; 2) dribbling or incontinence of urine; 3) polyuria, frequency of urination, or nocturia; 4) hematuria, pyuria or glycosuria; 5) kidney stones, or flank or abdominal pain; 6) absence of, or excessive or painful menses, and; 7) current pregnancy and abnormal past pregnancies.

- o Examination equipment

A vaginal speculum should be used for the pelvic examination.

A dip-stick for urinalysis should be used.

- o Examination techniques

The urethra, penis, and scrotal contents should be palpated, and any abnormality should be noted.

The female external and internal genitalia may be examined by the AME and any abnormality should be noted. Alternatives to the pelvic examination are a pelvic ultrasound examination or a written report from the applicants gynecologist or primary care physician of a pelvic examination performed during the previous three months.

Disposition

The examiner should defer issuance of a medical certificate to an applicant who has any of the following disorders:

- o Urinary system

1. An abnormal urinalysis is not a cause for denial of a certificate, but it is a cause for deferral until the cause of the abnormality has been determined. For example, the examiner is referred to the section on the endocrine system for the follow-up of glycosuria or a specific gravity less than 1.010.
2. Renal or ureteral calculus: A history or presence of upper urinary tract stones requires special issuance of a medical certificate.

Complete studies to determine the etiology and prognosis are essential to the consideration of issuance of a certificate to persons with upper urinary tract stone or a history thereof.

The FAA will make the final determination of whether or not the stone disease is disqualifying, taking into consideration the metabolic or clinical activity of the stone. Determining factors will include the number and location of the stones, the frequency with which stones are passed, the frequency with which episodes of pain and/or infection occur, the presence of an uncorrected metabolic abnormality related to stone formation, and the presence of reduced renal function. The AME can assist the FAA by collecting the necessary documentation and forwarding it to the Aeromedical Certification Branch, AAC 130, Oklahoma City.

3. Hydronephrosis is disqualifying only if it is progressive or associated with pain, infection or a serum creatinine of 2.5 mg/dl or higher.
4. A past history of nephrectomy is disqualifying only if it is associated with a disqualifying condition of the remaining kidney.
5. Chronic renal disease is disqualifying when it is associated with a serum creatinine of 2.5 mg/dl or greater; therefore, applicants on renal dialysis are disqualified.
6. Acute infections or inflammatory diseases of the genitourinary system are disqualifying until satisfactory response to therapy has

been achieved.

7. Polycystic renal disease is disqualifying if it is symptomatic or associated with a serum creatinine of 2.5 mg/dl or greater.
8. Primary tumors or malignancies of the genitourinary system are disqualifying until they are adequately treated or stabilized. Metastatic prostatic carcinoma should not be disqualifying if it is stable and asymptomatic. Follow-up reports may be required at specified intervals.
9. Congenital anomalies of the genitourinary system are disqualifying if they are associated with infection, pain, or a creatinine of 2.5 mg/dl or greater.
10. Neurogenic vesical dysfunction is disqualifying only if it is associated with urosepsis, vesical stones or pain.
11. Renal transplantation is disqualifying until complete recovery is documented.

o Reproductive system in women

1. The occurrence of dysmenorrhea or premenstrual syndrome requiring medication should be discussed with the applicant. Possible adverse effects on performance should be taken into consideration before issuance of a certificate. Dysmenorrhea and premenstrual syndrome by themselves are not disqualifying. The use of oral contraceptives or

other hormones not causing adverse symptoms, such as nausea, vomiting, and malaise, is not disqualifying.

2. Abnormalities such as a benign uterine mass or an abnormal cytologic examination should be discussed with the applicant, and if there are no symptoms, they are not disqualifying. However, an ovarian mass is disqualifying if the possibility of torsion exists.

3. Pregnancy under normal conditions is not considered disqualifying. The level and type of flying activity should be discussed and related to the risk of spontaneous abortion, ectopic pregnancy, and teratogenic effect on the fetus in the first trimester. The following items should be discussed with the examinee and may be reasons for deferral of issuance or temporary grounding during the period of disability:

- a. The physical limitation imposed by the enlarging uterus:
 - 1. problem with proper placement of seat and shoulder restraints.
 - 2. full control operation of the aircraft.
 - 3. the ability to exit the aircraft and ensure the safety of the passengers or crew.
- b. The presence of placenta previa is disqualifying. Pregnant women should have an ultrasound examination at approximately 24 weeks to ensure the absence of a placenta previa.
- c. Pregnant women should not fly beyond 36 weeks gestation, because of high likelihood of going into labor.

- d. Complications of pregnancy, such as prior history of pregnancy wastage, ectopic pregnancy, bleeding in the current pregnancy, as well as hypertension, bleeding in the third trimester and other complications, should result in a denial and postponement of the issuance of a certificate during the period of disability.

4. Breast examination

Examination of the female breast at the routine examination is optional. If it is done, the result of the examination and breast self-examination should be discussed with the applicant.

The following breast pathology is disqualifying:

- a. Acute conditions affecting the normal placement of shoulder restraints or causing difficulty in full control movement.
- b. Carcinoma of the breast during chemo- and/or radiation therapy.

Ear, Nose, Throat and Related Structures

Recommended Standards

o For Classes I, II, and III:

1. An applicant shall

a. Demonstrate an acceptable understand of speech as determined by audiometric speech discrimination testing to a score of at least 70% obtained in one ear or in a sound field environment.

b. Provide acceptable results of audiometric testing of unaided acuity according to the following table, using the standards of the American National Standards Institute, 1969:

<u>Frequency (Hz)</u>	<u>500 Hz</u>	<u>1000 Hz</u>	<u>2000 Hz</u>	<u>3000 Hz</u>
Better Ear (dB)	35	30	30	40
Poorer Ear (dB)	35	50	50	60

2. An applicant shall have

a. No disease of the middle ear or internal ear that will cause acute paroxysms or unpredictable attacks of vertigo.

b. No disease or malformation of the nose, oral cavity, pharynx or larynx that might interfere with, or be aggravated by, flying.

c. No disease or malformation of the oral cavity, pharynx, or larynx that interferes with clear and effective speech communication.

Responses to ENT-related Medical History Questions

o Dizziness, unsteadiness or fainting spells

One or two episodes of dizziness or even fainting may not be disqualifying. For example, during an acute illness, dizziness upon suddenly arising is not a true dysfunction. The orthostatic faint associated with moderate anemia is no threat to aviation safety as long as the individual is temporarily disqualified until the anemia is corrected. Episodic disorders of dizziness or dysequilibrium unrelated to postural change require careful evaluation and consideration by the FAA. A complete neurologic evaluation is required, and arrhythmias, such as bradycardia, tachycardia, or ectopic beats, should be considered. Episodes of vertigo that are recurrent and associated with a spinning sensation, nausea or vomiting are disqualifying. Transient processes such as those associated with acute labyrinthitis or benign positional vertigo may not be disqualifying after full recovery.

o Ear or hearing trouble

Any history of hearing loss, tinnitus, otalgia or discharge from the ear requires a complete investigation. A history of previous ear surgery should be documented.

o Nose or sinus trouble

A history of purulent nasal or paranasal sinus drainage, facial pain, epistaxis or obstruction to the airway requires further investigation, which may include radiographs of the sinuses.

- o Hayfever

Hayfever controlled solely by desensitization or topical intranasal steroids without requiring antihistamine or other medications is not disqualifying. Individuals who have hayfever that requires only seasonal therapy may be certified by the FAA under the stipulation that they not fly during the time when symptoms occur and treatment is required. The examiner should defer issuance in these cases even though the individual may be asymptomatic at the time of the FAA medical examination.

- o Voice or Speech Disorders

Any history of motor or sensory aphasia and neuromuscular disorders, including stuttering, needs further study. Intermittent or chronic hoarseness, stridor, dysphagia or odynophagia should be evaluated in more detail.

Examination Procedures

- o Equipment

It will be necessary to have an otoscope, nasal speculum, tongue blades, cerumen loops or irrigation device, and an otoscope. Cotton pledgets soaked in .25% phenylephrine hydrochloride solution or other similar vasoconstrictor medication are useful for shrinking the nasal mucosa for a better examination of the nasal passages. The use of a head mirror or a head light as a light source for examination of the head and neck region is recommended.

- o Examination techniques

1. The AME should examine the head, face, neck, and scalp to determine the presence of any significant defects such as gross deformities,

bony irregularities of the skull, fistulas, or limitation of movement of the head and neck.

2. The examiner should inspect the auricle for size and shape, the external auditory canal, and the tympanic membrane, and palpate the area about the ear for swelling or tenderness. Pulling of the auricle in an upward direction and pressing over the tragus may elicit pain.

Inspection of the ear canal and tympanic membrane is done with an otoscope. The canal is straightened by pulling the auricle upward and back and the ear speculum of the proper size is inserted. By tilting the speculum, the entire tympanic membrane can be visualized. Cerumen or other debris in the ear canal may have to be removed for adequate visualization of the tympanic membrane. The examiner should observe the color of the tympanic membrane, and look for evidence of any retraction, the presence of a perforation, scars, or areas of tympanosclerosis. The mobility of the tympanic membrane may be assessed with the use of the pneumatic otoscope. Ventilation of the middle ear should be established by having the airman perform the Valsalva maneuver.

3. Auditory function can be determined with tuning forks and audiometry. The tuning forks that are routinely used are pitched at 256 Hz or 512 Hz. The common tests are:
 - a. Schwabach test: comparison of bone conduction with normal.
 - b. Weber test: in unilateral hearing loss, the tuning fork will be heard best in the diseased ear when the hearing loss is

conductive, and in the better hearing ear when the hearing loss is sensorineural.

- c. Rinne test: comparison of hearing by bone conduction and by air conduction. When there is a significant conductive hearing loss, the patient will hear the tuning fork better by bone conduction than by air conduction.

Audiometric testing will be discussed below.

- 4. The AME should examine for vestibular function. The presence of nystagmus is one of the most constant findings in establishing the status of the vestibular system. The nystagmus may either be provoked or induced. Nystagmus is usually provoked by positional testing; the examiner observes for the presence or absence of nystagmus, and notes the presence or absence of subjective vertigo. The fistula test, when positive, is another means of provoking nystagmus; this test is performed with the pneumatic otoscope. If there is a communication, or fistula, between the internal ear and the middle ear, positive and negative pressure in the external ear canal will produce a nystagmus with associated subjective vertigo.

Nystagmus is induced by caloric testing and rotational testing. The Kobrak ice water test is a simple method of caloric testing for assessing the function of the vestibular system.

- 5. Examination of nose and paranasal sinuses should include an examination of the general facial appearance as well as external palpation. The examiner should inspect the contour of the bridge of

the nose, tip, and base for any deviations or abnormalities, and palpate over the anterior walls of the sinuses for localized tenderness.

The nasal speculum is used to inspect the nose, and the nasal vestibules are examined first. This is a common site for furuncles and fissures. Deformities or dislocation of the septum or alar cartilages should be noted. Both nasal passages should be examined for the presence of airway obstruction and nasal polyps, and the mucosa should be examined for evidence of congestion, dryness, or atrophy. Any purulent or bloody nasal discharge should be noted. Inspection of the nasal passages can be facilitated by shrinking the mucosa with a cotton pledget soaked with a vasoconstrictor. If there is a history of a decrease or absence of the sense of smell (hyposmia or anosmia respectively), it can be tested using odors such as menthol, oil of wintergreen, or various spices.

When sinus disease is suspected, sinus radiographs should be obtained.

6. The examiner should inspect and palpate the oral cavity. For palpation a rubber glove or a finger cot is worn. The lips and mucosa of all of the areas of the oral cavity, the salivary duct orifices, the teeth and gingiva, hard palate, tongue, including its movements, the floor of the mouth, and the soft palate are all inspected. Any swellings or ulcerations should also be palpated carefully. The tongue depressor can be used as a retractor for better visualization of the oral cavity. When dentures are worn, these should be removed prior to the inspection.

To examine the pharynx adequately, skill in the use of the tongue depressor is essential. The tongue depressor is placed on the mid-dorsum of the tongue, and with forward and firm pressure the tongue is depressed. Unless this is done properly, it will be impossible to visualize adequately the posterior oropharynx.

Examination of the nasopharynx and the hypopharynx and larynx is performed by indirect mirror examination. Indirect nasopharyngoscopy and indirect laryngoscopy should be done whenever there is a history of eustachian tube dysfunction, posterior nasal obstruction, postnasal bleeding or discharge, dysphagia, hoarseness or stridor.

7. Hearing should be tested by a word (speech) discrimination test or by pure tone audiometry. Either of these methods is acceptable in the assessment of the applicant's hearing.

The word (speech) discrimination test is a test designed to measure how well the listener hears words. The discrimination test does not detect the minimal intensity at which words becomes intelligible, but rather it scores the maximum number or percentages of words that are intelligible to the listener at the most favorable intensity. The most favorable intensity at which the listener is able to recognize the words that are presented to him or her is usually about 25 to 30 decibels (dB) above the level at which the listener may recognize only an occasional word.

The best known lists of words that are used for discrimination testing are Phonetically Balanced (PB) words. These are lists of 50 reasonably familiar, monosyllabic words. The Northwestern University Auditory Test No. 6 (NU-6) is perhaps the most carefully prepared and reliable of the word discrimination lists. Another set that uses a more familiar vocabulary is the CID Auditory Test W-22 (Test W-22). Either the NU-6 or W-22 word lists are acceptable for the speech discrimination test. A discrimination score of at least 70% in either ear must be attained to pass the hearing test. The applicant's ability to discriminate words can be tested monaurally or binaurally. In either case, it is important that the applicant understand the procedure and how he or she is to respond.

The binaural test can be given using a tape recorder and a prepared tape of either the NU-6 or W-22 word lists. The applicant should be tested in a quiet room. The volume of the tape recorder is adjusted to the applicant's most comfortable loudness level, that is, the level at which the words are best heard and are most intelligible. The examiner then instructs the applicant to repeat each word as it is presented. A total of 50 words is given and two percentage points are awarded for each word repeated correctly.

The discrimination test can also be done in a sound field by having the speech channeled through auxillary amplifiers to one or more loud speakers in a sound-treated room.

When the speech discrimination test is administered binaurally the results are recorded as Sound Field ____%.

The speech discrimination test can also be administered monaurally with an audiometer that has speech testing capabilities, with words presented in either ear through ear phones. The results are recorded as Right Ear ____%, Left Ear ____%.

If the applicant is unable to attain a speech discrimination test score of at least 70% either by sound field testing or in the better-hearing ear by ear phone testing, the applicant should be tested by pure tone audiometry. Pure tone audiometry is also an alternative method of testing hearing.

Three types and several models of pure tone audiometers are available and their cost varies greatly, reflecting the types and numbers of measurements that each provides. Pure tone audiometers may be screening audiometers, threshold audiometers, or automatic audiometers, and all three types are acceptable. However, all audiometers must meet specifications of the American National Standards Institute (ANSI), and must be calibrated annually.

Screening audiometers are designed to determine if the individual's hearing is within a normal range, or if more detailed testing is indicated. The simplest screening audiometers are battery powered and contain one earphone that is held against the ear by hand. These instruments usually have only a few frequencies (500, 1000, 2000,

3000 Hz) and produce test tones at only two or three levels of intensity (25, 40, 70 dB). The screening test is scored by a pass or fail. The results are recorded as follows:

Frequency Hz	500	1000	2000	3000
Right Ear <	—	—	—	—
Left Ear /	—	—	—	—

(< indicates that a screening pure tone audiometer was used and that hearing threshold for that frequency is better than the dB figure recorded.)

Threshold audiometers are powered by alternating current and have a wider frequency range, usually from 125 Hz to 8000 Hz. The range of intensity is usually from -10 dB to 110 dB. The test is given through a matched pair of ear phones. The tone can be presented to either ear phone. The listener is asked to repond with a signal, usually a raised hand, when the tone is just audible. This is the listener's threshold of hearing for the frequency being tested.

Automatic audiometers have been developed that allow an individual to track his or her own threshold of hearing while they automatically record the results on special forms or graphs. These audiometers are used quite extensively in screening programs. The individual holds a switch that he or she presses whenever a tone is heard. The tone automatically increases in intensity until the switch is pressed, whereupon the tone automatically decreases in intensity until the switch is released. In this manner the thresholds of hearing can be bracketed.

When a threshold audiometer or an automatic audiometer is used to perform the hearing test, the results are recorded as follows:

500 Hz

1000 Hz

2000 Hz

3000 Hz

4000 Hz

6000

(not req) (not req)

Right Ear (dB)

Left Ear (dB)

Disposition

The following conditions may be considered disqualifying for issuance of a medical certificate by the examiner.

o Nose

1. Allergic rhinitis. The examiner should include a description of the appearance of the nasal mucosa and note the presence or absence of nasal polyps. Seasonal allergies are not disqualifying unless the symptoms are acute or systemic medications are required. Desensitization injections or topical nasal steroids are not disqualifying if the applicant is not experiencing residual symptoms or adverse reactions.
2. Malformations of the nasal passages that might prevent nasal respiration. A nasal septal deviation should be noted but is not disqualifying unless it causes significant obstruction or contributes to acute or chronic sinus disease.
3. Obstruction of the sinus ostia, including obstruction with nasal polyps that might result in complete sinus obstruction with rapid changes in atmospheric pressure. Any obstruction of the sinus ostia during flight may create a pressure differential between the sinus cavities and the atmosphere that is sufficient to produce sudden, severe pain. This

occurs most commonly in the frontal sinuses and may be associated with acute rhinitis and sinusitis, pre-existing chronic sinusitis, deformity of the nasal septum or turbinates, and tumors. Nasal polyps require special consideration due to their propensity to recur and usually require an evaluation by a specialist.

4. Severe epistaxis. Occasional short episodes of bleeding associated with the trauma of nose blowing, dryness of the nasal mucosa, superficial ulcers or perforations of the nasal septum are not disqualifying.

o Mouth and Throat

If the voice is altered, the examiner should evaluate the upper aerodigestive system and larynx to ascertain the cause and the need for further evaluation. Any applicant seeking certification for the first time after mouth, tongue, nose, pharynx, or larynx surgery or who uses an artificial voice-producing device should be assessed carefully to assure intelligibility of voice communications.

o Ears

1. Any previous surgical procedure of the ear should be noted. If the condition is stable and not a threat to aviation safety, the applicant may be certified. If there is active middle ear and/or mastoid disease, as evidenced by drainage and/or granulation tissue, issuance of a certificate should be deferred and an otolaryngologic consultation obtained.

2. A history of stapedectomy should initially be evaluated by an otolaryngologist and referred to the Aeromedical Certification Branch, AAC-130, Oklahoma City, for final disposition.

o Hearing

If the applicant is unable to pass the minimal hearing standards as set forth for either the speech discrimination test or the pure tone audiometry test, the issuance of a medical certificate should be deferred and an otologic and audiologic consultation obtained. A Statement of Demonstrated Ability (SODA) may be requested from the FAA for an individual who is unable to meet the minimal hearing standards.

Dermatology

Recommended Standards

There are no specific recommended standards for the skin.

Responses to Skin-related Medical History Questions

- o **Syphilis**

A past history of treated or untreated syphilis requires a deferral of certification until the adequacy of treatment is documented and the presence of tertiary syphilis is ruled out. Treated tertiary syphilis will require further neurological and cardiovascular evaluation.

- o **Hives**

Acute and chronic urticarial eruptions are not disqualifying. However, the examiner should explore their relationship to cold exposure and trauma, and their association with abdominal pain and/or diarrhea. Familial angioneurotic edema, acquired angioedema, and cold urticaria are disqualifying.

Examination Procedures

- o **Equipment**

Good lighting is essential for the examination of the skin. A ruler is useful in measuring lesions for accurate documentation.

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o Examination techniques

A careful examination of the skin may reveal underlying systemic disorders of clinical importance. Needle marks that suggest drug abuse should be noted and body marks and scars should be correlated with known history. More history should be obtained as needed to explain findings. Tattoos should be measured and recorded since they may be useful for identification purposes in case of crash or injury.

Disposition

The following is a partial list of conditions that warrant denial or deferral to the Aeromedical Certification Branch, AAC-130, Oklahoma City:

o Scars and tattoos

The examiner should defer certification of an applicant with scars or scar tissue that create loss of function sufficient to interfere with the safe performance of airman.

o Other skin conditions

1. Any acute dermatosis that renders the applicant unable to perform safely or exercise the privileges of the airman certificate that he or she holds or for which he or she is applying will be deferred until such time as that acute episode has resolved.
2. Any malignancy of the skin or mucous membrane with evidence of regional or systemic metastases, or one that interferes with sight, speech, hearing or manipulation of the flight controls is disqualifying

until such time that the tumor and its metastases are cured and the deficiency corrected.

3. Cold urticaria and hereditary angioneurotic edema are disqualifying. Acquired angioedema is disqualifying until such time that the etiology is found and the condition has not recurred for a period of one year.
4. Untreated syphilis, chancroid, lymphogranuloma venereum, granuloma inguinale or gonorrhea should be deferred until the diseases are adequately treated.
5. Cutaneous evidence of the following systemic diseases should be deferred. This list is not all inclusive:
 - a. lupus erythematosus
 - b. dermatomyositis
 - c. scleroderma
 - d. Raynaud's phenomena
 - e. sarcoid
 - f. eruptive xanthomas
 - g. Hansen's disease
 - h. deep mycotic infections
6. Use of the following medications on a continuing basis is disqualifying:
 - a. antihistamines (H 1 antagonists)
 - b. systemic steroids in dose of greater than 10 mg per day or greater

- c. Dapsone USP
- d. vitamin A in excess of 50,000 IU per day
- e. systemic retinoids

Respiratory System

Recommended Standards

For Classes I, II, and III:

- A. At the first examination after the 40th birthday the applicant must demonstrate the absence of severe lung disease by the performance of spirometry. Severe lung disease is defined as a forced vital capacity (FVC) equal to or less than 50% predicted, or a forced expiratory volume in one second (FEV_1) equal to or less than 50% predicted, or a forced expiratory volume in one second/forced vital capacity percent ($FEV_1/FVC\%$) equal to or less than 50%. Spirometry shall be repeated every 6 years in order to demonstrate the continued absence of severe lung disease.
- B. An applicant shall have no established medical history or clinic diagnosis of:
- o Lung disease that is severe enough to produce, or likely to produce, chronic hypoxia to a level of PaO_2 less than or equal to 65 mm Hg while breathing room air at sea level.
 - o Poorly controlled asthma. As used in this section, poorly controlled asthma is defined as chronic wheezing or recurrent acute episodes of wheezing occurring at least once weekly despite administration of bronchodilator medications.
 - o Hypersomnolence sleep apnea syndrome or hypoventilation syndrome.
 - o Chronic pulmonary hypertension as defined by a mean pulmonary artery pressure greater than or equal to 35 mm Hg.

- o Recurrent unilateral pneumothorax or bilateral pneumothoraces occurring separately or simultaneously, unless surgical or chemical pleurodesis has been performed.
- o Recurrent pulmonary emboli.
- o Metastatic carcinoma of the lung, and surgically unresectable carcinoma of the lung not yet proven to be metastatic.

Introduction

The evaluation of the respiratory system of the applicant for an airman medical certificate is critically important to aviation safety. Since altitude affects respiratory function, careful assessment of pulmonary status is required to prevent incapacitation during flight. Two general considerations are useful in approaching this evaluation:

(1) Maintenance of adequate oxygenation throughout the period of flight. A variety of disease processes may have a major impact on oxygenation, either acutely or chronically. The AME must recognize those individuals who are at risk for chronic hypoxia and assess the likelihood of dangerous deterioration of oxygenation during flight. Furthermore, acute lung diseases, such as asthma, that cause hypoxia must be evaluated with respect to the likelihood that hypoxia will occur without warning and affect the ability of the airman to perform his or her duties.

(2) Carbon dioxide is a substance that diminishes the airman's ability to fly safely, and its retention is a warning sign of serious abnormality of respiratory function. Since direct measurement of arterial oxygen and carbon dioxide levels is costly and generally unavailable in the AME's office, clinical assessment of respiratory function, including the medical history, physical examination and spirometry, will ordinarily be used to separate

those applicants requiring further evaluation of their arterial oxygen and carbon dioxide levels from the majority who do not. Furthermore, a history of prior severe respiratory tract disease of any type, dyspnea on mild exertion, persistent cough, hemoptysis, and prior diagnosis of pneumonia within the past month, or a neoplasm, should result in deferral of issuance of a certificate until a chest radiograph has been obtained and interpreted.

Responses to Respiratory-related Questions on the Medical History

o Asthma, emphysema or other lung conditions

A history of asthma generally will require deferral of issuance of the medical certificate. An exception is asthma of childhood or adulthood that has remitted spontaneously with no attacks of shortness of breath with wheezing in the two years prior to the airman medical examination, and that requires no medication. In all other situations the issuance should be deferred pending evaluation by a qualified specialist.

An applicant with a history of emphysema or any other form of chronic obstructive pulmonary disease (COPD) should be deferred pending a thorough evaluation.

An exception would be an applicant who supplies documentation from an attending physician that the condition was evaluated within the past 12 months and was stable, and that the pulmonary impairment was mild ($FEV_1\%$ predicted greater than 69%, or $FEV_1/FVC\%$ greater than 60%).

The AME should elicit history about lung infections, sleep disorders, pulmonary embolism, pulmonary arterial hypertension, lung tumors, interstitial lung disease, and the use of respiratory-related medications.

- o Collapsed lung

The AME should obtain a detailed history of all episodes of pneumothorax, particularly about their frequency, cause, and treatment. A history of pneumothorax is a cause for deferral unless there was a single episode occurring five years or longer prior to the examination, with no more recent symptoms of chest pain or dyspnea, or evidence of pneumothorax.

Examination Procedures

- o Equipment

The examiner should have available a simple spirometer, from which he or she can obtain a forced vital capacity (FVC) and a forced expiratory volume in the first second (FEV_1). To assure accuracy in data collection, the AME should use a water-sealed spirometer or a rolling seal spirometer; the use of any other type of spirometer is specifically discouraged. Peak flow meters are not capable of providing information that is required for an accurate assessment of lung function, and their use is also discouraged.

o Examination techniques

1. The standard techniques of inspection, palpation, percussion and auscultation are important in assessing the chest and lungs. The breasts may be examined at this point. The AME should look especially for any evidence of disorders of the respiratory muscles, spine or thorax that may interfere with respiratory function.
2. The AME should be familiar with the instructions that come from the manufacturer for using the spirometer. The AME may wish to train an assistant to conduct the spirometry. While standing, the applicant is asked to take a deep breath and expel the air as hard and as fast as possible into the spirometer. Usually this is done three to five times with rests in between.

Interpretation of the spirometer graph or print-out should be done according to techniques developed by the American Thoracic Society.

Disposition

Infectious Diseases of the Lung

- o Circumstances under which the applicant should not be disqualified (assuming other medical standards are fulfilled):
1. A history of resolved bacterial or nonbacterial pleuropulmonary infection(s) in an asymptomatic applicant, who has taken no antimicrobial therapy during the past month.

2. Tuberculosis chemoprophylaxis with INH after four weeks if there has been no adverse effect from the medication.

o Circumstances under which the applicant should be deferred pending further evaluation:

1. A history of recent resolved pneumonia, occurring less than one month prior to the examination.
2. Active or chronic (defined as longer than one month) antimicrobial therapy for a pneumonia.
3. Active tuberculosis currently under therapy.
4. Residual complications from a recent or old pleuropulmonary infection, such as symptomatic bronchiectasis requiring chronic antibiotic therapy, empyema, abscess, lobar atelectasis, lung cavity, bulla or bleb.

The applicant should be evaluated by a specialist in pulmonary diseases and/or infectious disease, whose report must document the following information: nature and severity of the illness, dose and duration of the medications and other therapy, response to therapy, risk of communicability of the infection, clinical stability, and the amount of incapacitation during flight. The documentation of clinical stability should include a report of the follow-up chest radiograph and, if appropriate, culture results.

The applicant may be certified under the stipulation that the applicant ground himself/herself if cough, sputum production

or shortness of breath recur or worsen.

- o Circumstances under which the applicant should be disqualified without exception:
 - 1. Acute or active pleuropulmonary infection.
 - 2. Persistent symptoms of a prior pneumonia, despite apparent resolution of the pneumonia on physical examination or chest radiograph.

The applicant may reapply when the infection or its complications are completely resolved. The applicant should be evaluated according to the previous recommendations.

Asthma

- o Circumstances under which the applicant should not be disqualified (assuming other medical standards are fulfilled):

A history of childhood or adult asthma that has remitted spontaneously, with no attacks in the previous two years, and that no longer requires medications.
- o Circumstances under which the applicant should be deferred pending further evaluation:
 - 1. A history of asthma within the previous two years or with a current FEV_1 of less than 70% of predicted or current $FEV_1/FVC\%$ of less than 61%.
 - 2. Infrequent or controlled asthma requiring either no medications or the continuous use of bronchodilators and/or

corticosteroids.

The applicant should have an evaluation by a qualified specialist whose report must document the following information: the nature and severity of the asthma; duration, type and dosage of medications; response to and side effects of the medications; clinical stability; and the likelihood for incapacitation during performance of pilot activities. Each case should be evaluated on an individual basis and the FAA may issue a certificate with certain restrictions that require follow-up evaluations, such as a physical examination and spirometry at six-month intervals or as necessary. At these evaluations evidence of clinical stability should be documented for continued certification.

- o Circumstances under which the applicant should be disqualified without exception:

Uncontrolled or unstable asthma despite therapy due to patient noncompliance.

Chronic Obstructive Pulmonary Disease (COPD)

- o Circumstances under which the applicant should not be disqualified (assuming other medical standards are fulfilled):

A history of COPD that has been evaluated within the past 12 months and was found to be mild in severity and is stable.

- o Circumstances under which the applicant should be deferred pending further evaluation:

1. When the medical history or physical examination reveals signs or symptoms of COPD, spirometry must be performed in order to evaluate the severity of the process.
2. If the applicant is a current or former smoker or has a history of 20 pack-years or more of cigarette smoking, spirometry is required in order to evaluate the severity of the effect of the smoking on pulmonary function.
3. For any applicant whose spirometry reveals a moderate degree of airway obstruction, a pulmonary consultation is indicated.
4. For any applicant whose spirometry reveals a severe degree of airway obstruction, arterial blood gas analysis is indicated in addition to a pulmonary consultation.

The degree of airway obstruction is defined as follows:

	FEV ₁ % Predicted	FEV ₁ /FVC%
Normal	80	69
Mild	70-79	61-69
Moderate	60-69	50-60
Severe	59 or less	50 or less

- o Circumstances under which the applicant should be disqualified without exception:

An applicant whose PaO₂ is less than 65 mm Hg during rest while breathing ambient air at sea level should be considered so severely impaired as to be denied certification.

Disorders of the Control of Respiration

- o Hypoventilation syndromes and hypersomnolence sleep apnea syndromes

A history of symptoms or of a diagnosis of these disorders is disqualifying for all classes of airmen because of the high incidence of hypersomnolence and because of the associated cor pulmonale and hypoxia in the hypoventilation syndromes. For special issuance certificates, documentation of normal arterial blood gases must be sent to the FAA along with a report from a recognized sleep laboratory that verifies the absence of the hypersomnolence. Furthermore, when the diagnosis of any of these disorders has been verified and treatment has been instituted, therapeutic success must be documented by sleep latency tests in a recognized diagnostic sleep laboratory. Reversal of chronic hypoventilation may be documented by two normal arterial blood gas values that are at least one month apart, and by reversal of symptoms and signs of cor pulmonale.

Pulmonary Thromboembolism

- o Circumstances under which the applicant should not be disqualified (assuming other medical standards are fulfilled):

A history of pulmonary thromboembolism two years or more prior to application, with no clinical sequelae, no current use of anticoagulation medication and no need for future anticoagulation therapy.

- o Circumstances under which the applicant should be deferred pending further evaluation:

A history of pulmonary thromboembolism less than 6 months prior to application with completion of anticoagulant therapy, and absence of predisposing causes for recurrent embolization.

- o Circumstances under which the applicant should be disqualified without exception:

1. Pulmonary thromboembolism in the presence of active deep-vein thrombosis.
2. Pulmonary thromboembolism under current therapy with anticoagulant medication.
3. History of recurrent pulmonary thromboembolism within the past two years regardless of anticoagulant status.

Pulmonary Arterial Hypertension

- o Circumstances under which the applicant should not be disqualified:

Once the diagnosis of pulmonary hypertension has been made the dangers of incapacitation during flight are so great that no certificate should be issued as a matter of routine. An applicant with a history of pulmonary hypertension should be deferred or denied a certificate until a complete investigation of his or her present medical status is performed by a qualified cardiopulmonary physician.

- o Circumstances under which the applicant should be deferred pending further investigation:

An applicant with a history of mild pulmonary arterial hypertension

may be considered for medical certification following a full investigation by a qualified cardiopulmonary physician. The data required for consideration of certificate issuance must include information obtained at cardiac catheterization documenting a mean pulmonary artery pressure below 35 mm Hg.

- o Circumstances under which the applicant should be disqualified without exception:

Individuals in whom the diagnosis of pulmonary arterial hypertension has been made must be disqualified if no cardiac catheterization data are available or if the mean pulmonary artery pressure is 35 mm Hg or greater.

Neoplastic Lung Disease

- o Circumstances under which the applicant should not be disqualified:
History of carcinoma of the lung that was resected five years or more prior to application with no clinical evidence or current radiographic evidence of recurrent disease.

- o Circumstances under which the applicant should be deferred pending further evaluation:

An applicant with a history of malignant disease of the chest resected between two and five years prior to application should be provisionally disqualified. The disqualification may be reviewed following evaluation by a pulmonary specialist or oncologist who provides a written statement that no evidence of active neoplastic disease has been found.

- o Circumstances under which the applicant should be disqualified without exception:

1. Suspected or confirmed malignancy in the chest that is untreated or currently being treated.
2. Malignancy in the chest that has been treated within the past two years.

Chronic Interstitial Lung Disease

- o Circumstances under which the applicant should not be disqualified:
An applicant may be qualified for certificate issuance if there has been a radiographic diagnosis of chronic interstitial lung disease but no demonstrable deterioration in pulmonary function tests and arterial blood gases over the prior two years or more, and there is no dyspnea on exertion. A forced vital capacity (FVC) of greater than 70% of predicted is required.
- o Circumstances under which the applicant should be deferred pending further evaluation:
 1. When the diagnosis is made for the first time within the 12 months prior to application.
 2. When diagnosis is made for the first time more than 12 months prior to application, but no evidence is provided of clinical stability as demonstrated by follow-up chest radiograph, pulmonary function studies or arterial blood gases.
 3. When diagnosis is made at any time in the past, and the applicant has current symptoms of dyspnea on exertion, or

physical findings of cyanosis, inspiratory rales or clubbing of the digits.

The applicant should be evaluated by a qualified pulmonary specialist whose report must document the findings on chest radiograph, pulmonary function studies and arterial blood gas analysis while breathing room air at rest.

- o Circumstances under which the applicant should be disqualified:

The applicant should be disqualified if there is progressive disease, as noted on the chest radiograph; if the FVC is less than or equal to 50% predicted; or the diffusing capacity (D_{CO}) is less than or equal to 50% predicted; or if the PaO_2 while breathing room air at rest is less than or equal to 65 mm Hg at sea level.

Pneumothorax

- o Circumstances under which the applicant should not be disqualified:

A single episode of primary spontaneous pneumothorax that occurred five years or longer before application is not disqualifying if there has been no further evidence of pneumothorax, chest pain or shortness of breath.

- o Circumstances under which the applicant should be deferred pending further evaluation:

1. An applicant with a history of primary spontaneous pneumothorax within five years before application may be certified by the FAA only if the applicant is evaluated by chest

radiographs every 6 months for a period of two years from the last episode and annually thereafter until five years have elapsed. The requirement of radiographic follow-up may be waived by the FAA for an airman who has undergone surgical pleurodesis.

2. An applicant with a history of two or more pneumothoracies must be disqualified for a period of two years from the last episode or until surgical pleurodesis has been performed.
3. An applicant with a history of secondary spontaneous pneumothorax should be evaluated according to the severity and prognosis of the underlying lung disease.

o Circumstances under which the applicant should be disqualified without exception:

1. Applicants with pneumothorax noted on a current or last available chest radiograph should be disqualified and should remain disqualified until the pneumothorax is completely resolved and a normal post-pneumothorax spirogram has been provided to the FAA.
2. Applicants with a past medical history of pneumothorax who experience the sudden onset of recurrent pneumothorax symptoms should not be issued a medical certificate until thorough evaluation has been carried out and the diagnosis of recurrent pneumothorax has been excluded.

Respiratory-related Drugs

o Circumstances under which the applicant should not be disqualified:

1. Allergy hyposensitization therapy without side effects.
 2. Infrequent and temporary use of cold-cough preparations for symptomatic relief of symptoms (both resolved at time of application).
- o Circumstances under which the applicant should be deferred pending further evaluation:
1. Infrequent, as-needed or continuous use of inhaled beta-adrenergic bronchodilators or corticosteroids (in the form of metered dose inhalers), cromolyn sodium or oral antibiotics.
 2. Seasonal or intermittent use of antihistamines or related medications for hay fever and other atopic conditions.
- o Circumstances under which the applicant should be disqualified without exception:
1. Chronic or frequent use of antihistamines, cold-cough medications or related drugs with sedating properties.
 2. Use of anticoagulants such as coumadin or heparin.
 3. Use of supplemental oxygen, regardless of duration or amount.

Disorders of the Respiratory Muscles and Bony Thorax

- o Circumstances under which the applicant should not be disqualified (assuming other medical standards are fulfilled; see especially the section on the musculoskeletal system).
- Mild disorders of the bony thorax that do not interfere with normal physical activity.

- o Circumstances under which the applicant should be deferred pending further evaluation:

1. Kyphoscoliosis of a severity that has produced a major decrease in stature, or when there is an angle of spinal curvature of 100 degrees or greater. Spirometry must be performed on these applicants and if moderate or severe pulmonary function impairment is noted, evaluation by a qualified pulmonary specialist is required.
2. An applicant with a history of a diaphragmatic hernia must undergo spirometric testing. Abnormalities of pulmonary function to a moderate or severe degree require further evaluation by a qualified pulmonary specialist.

- o Circumstances under which the applicant should be disqualified without exception:

An applicant with myasthenia gravis, multiple sclerosis, amyotrophic lateral sclerosis or muscular dystrophy.

Cardiovascular System

Recommended Standards

For Classes I, II and III:

- A. An applicant shall have no established medical history or clinical diagnosis of:
- o Myocardial infarction.
 - o Angina pectoris.
 - o Coronary heart disease that has required treatment or, if untreated, is or has been symptomatic or clinically significant.
 - o Any form of heart or arterial surgery, including coronary angioplasty or permanent pacemaker insertion.
 - o Any form of congenital heart disease.
 - o Any significant heart murmur or valvular heart disease.
 - o Any evidence of pericarditis or cardiomyopathy.
 - o Any significant disturbance of heart rhythm or conduction.
 - o A sitting blood pressure equal to or greater than 150/95 mm Hg, or a systolic blood pressure greater than 160 mm Hg, or a history of any antihypertensive medication within the last year, or any history of surgery or angioplasty for the treatment of hypertension.
 - o Any evidence of significant peripheral arterial-vascular obstructive disease or aneurysm, or a history of surgery for these conditions.
- B. The applicant's sitting blood pressure must not exceed 150/95 mm Hg.

For Classes I and II Only:

- C. For airmen who fly in single-crew cockpit operations, at age 50 years, the applicant must have a total serum cholesterol of less than 300 mg/dl.

For Class I Only:

- D. On initial certification, and at age 35 years, at age 40 years, and annually after age 40 years, the applicant must demonstrate an absence of any significant electrocardiographic abnormality, including myocardial infarction. An electrocardiogram made according to acceptable standards and techniques 30 days or less before an examination for a first class certificate is accepted at the time of the physical examination.

For Class II Only:

- D. On initial certification, and at age 35 years, at age 40 years, and every two years thereafter, the applicant must demonstrate an absence of any significant electrocardiographic abnormality, including myocardial infarction. An electrocardiogram made according to acceptable standards and techniques within 30 days before an examination for a second class certificate is accepted at the time of the physical examination.

For Class III Only:

- D. On initial certification, and at age 40 years, and at a minimum every 6 years thereafter, the applicant must demonstrate an absence of any significant electrocardiographic abnormality, including myocardial infarction. An electrocardiogram made according to acceptable standards and techniques within 30 days before an examination for a third class certificate is accepted at the time of the physical examination.

Introduction

Disease of the cardiovascular system constitute the largest group of disorders with which pilot applicants, AMEs, and the FAA must deal. This section of the AME Guide will discuss the evaluation and disposition of the following groups of cardiovascular conditions: hypertension and hypertensive heart disease; arrhythmias; coronary heart disease, including angina pectoris, myocardial infarction, and therapies such as drugs, by-pass surgery and coronary angioplasty; valvular disease; congenital disease; cardiomyopathies; pericardial disease; and peripheral vascular disease.

Responses to Cardiovascular-related Medical History Questions

- o Dizziness, unsteadiness, or fainting spells

One or two episodes of dizziness or even fainting may not disqualify. For example, postural lightheadedness or syncope accompanying an acute illness is not a true dysfunction. Likewise, the orthostatic faint associated with moderate anemia is no threat to aviation safety as long as the individual is temporarily disqualified until the anemia is corrected. Medication-induced postural lightheadedness, particularly if associated with antihypertensive therapy, would temporarily disqualify while the medication is being used. Episodic disorders of dizziness or equilibrium unrelated to postural change are a more serious matter and require careful evaluation by the FAA. A complete neurological evaluation should be performed. Furthermore, arrhythmias such as bradycardia, tachycardia, or ectopic beats, should be considered. Transient processes such as those associated with acute labyrinthitis or benign positional vertigo may not disqualify when fully recovered.

o Heart trouble

Because of the possibility of sudden and severe incapacitation, certain heart conditions are disqualifying, based upon history alone, regardless of how remote that history may be.

Part 67 of the Federal Aviation Regulations provides that for all classes of airmen the following are causes for denial: An established medical history or clinical diagnosis of 1) myocardial infarction, 2) angina pectoris, 3) coronary heart disease that has required treatment or, if untreated, is or has been symptomatic or clinically significant, 4) any form of heart or arterial surgery, including coronary angioplasty or permanent pacemaker insertion, 5) any form of congenital heart disease, 6) any significant heart murmur or valvular heart disease, 7) any evidence consistent with pericarditis or cardiomyopathy, or 8) any significant disturbance of heart rhythm or conduction. The examiner should deny issuance to any applicant with a history of pulmonary embolus and/or deep venous thrombosis within the past year, or arterial disease. Arrhythmias that are not disqualifying are sinus arrhythmias and infrequent premature beats. An examination by a specialist in internal medicine or cardiovascular disease is required under these circumstances. The examiner should report any available information concerning this history on the application form.

The examiner should assist in the collection of data needed by the FAA whenever the applicant wishes further consideration for certification. Documentation may include hospital and other medical records, consultation reports, and reports of laboratory tests and special procedures. FAA Form 8500-19, "Specifications for Cardiovascular Evaluation," should be used.

o Hypertension

A history of hypertension does not necessarily disqualify. Disposition is based upon current blood pressure levels, whether antihypertensive medication is being taken, and the type and doses of those medications. Any complications, hospitalizations, or adverse reaction to therapy should be listed. There is no level of low blood pressure that is disqualifying, unless there are symptoms such as lightheadedness or syncope. In such cases issuance should be deferred and further cardiovascular evaluation should be done, using FAA Form 8500-19.

o Chest discomfort, irregularities of heart rhythm, or palpitations

Chest discomfort includes symptoms that are typical of angina pectoris, but other types of chest discomfort are also included. Palpitations or irregularities of cardiac rhythm should be described, as well as their relationship with any other symptoms, such as lightheadedness, dizziness, or chest pain.

o Shortness of breath

The severity of dyspnea should be graded by measuring the amount of effort required to provoke the dyspnea: dyspnea when hurrying on level ground or walking up a slight hill; dyspnea when walking with others your own age on level ground; dyspnea when walking at your own pace; dyspnea at rest. Other symptoms, such as orthopnea and wheezing, should be noted.

o Heart murmur

Any applicant who has a heart murmur other than an innocent pulmonic ejection murmur or functional left heart ejection murmur should be

disqualified.

o Heart disease in family members less than 50 years old

Because certain types of heart disease may be familial, knowledge of such disease in a close relative to the applicant may alert the examiner to pay particular attention to the cardiovascular system. A history of coronary artery disease or myocardial infarction at a young age (less than age 50 years) or a history of congenital heart disease in a first degree relative is useful information. For example, even in the absence of symptoms or significant physical findings in the applicant, the examiner may recommend further testing such as blood lipid studies when a family history of early age myocardial infarction is obtained.

Examination Procedures

o Examination equipment

For the conduct of a general examination of the cardiovascular system, the AME must have an examining table in a quiet room, and a good stethoscope with a bell and diaphragm head piece.

For blood pressure determination the AME should use a mercury manometer or a calibrated aneroid manometer. The criteria of the American Heart Association for sphygmomanometer standards and cuff sizes should be followed.

For the electrocardiogram (ECG), the FAA prefers three-channel recordings, uncut or mounted on standard mounting paper. If a single-channel recorder is used, the tracing should be prepared as described in FAA Form 8065-1,

Instructions for Preparation and Submission of Electrocardiogram." All leads must be identified properly, and the identity of both the applicant and the AME, and the date of ECG, must be clearly stated.

o Examination techniques

1. A careful and complete physical examination is necessary. It is helpful to follow a set routine, just as an airman uses a check list.

One approach is as follows:

- a. Inspection: Check for thoracic deformity, such as kyphosis, scoliosis, pectus excavatum, and surgical or traumatic scars. Observe skin, lips, and nail beds for pallor or cyanosis. Observe legs for varicosities, edema, or stasis ulcers. Observe neck veins for distention.
- b. Palpation and Percussion: Observe and palpate position of the cardiac apical impulse, as well as any thrills or abnormal cardiac pulsations. The presence of the radial, carotid, femoral, popliteal, dorsalis pedis and posterior tibial pulses should also be confirmed.
- c. Auscultation: Examine the lungs for rales, rhonchi, prolonged expiratory phase, or unusually loud or faint breath sounds. Examine the heart for abnormal heart sounds, such as presence of third or fourth heart sounds, ejection sounds, systolic clicks, or opening snaps. If a murmur is present, report its timing (systolic or diastolic), position of maximum intensity, its radiation and intensity (grade on a scale of 6), and character (harsh, soft, musical, etc). The duration of systolic murmurs, such as holosystolic, early systolic, mid systolic, late systolic,

should be noted. The examination should be performed with the applicant in the supine position and, when appropriate, in the sitting, left decubitus, and standing positions. The neck should be examined for carotid bruits.

2. Blood pressure should be taken in both arms. The applicant should be in the seated position, with the arms bared, well-supported, and at heart level. The disappearance of Korotkoff sounds (Phase V) should be reported as the diastolic pressure. The examination should include two or more blood pressure measurements with the patient seated. The average of those blood pressure measurements should be recorded.

3. ECG

- a. Date: The date of the most recent ECG must be entered for all applicants. If the applicant is not required to have a periodic ECG with the present examination, the date of the preceding ECG should be recorded.

If a periodic ECG is due for the applicant, the examiner obtains a current tracing according to established procedures, attaches the original to the FAA Form 8500-8, and enters the date of the tracing. Some applicants, such as airline transport pilots who are employed by air carriers with medical departments, may have their employer send a current ECG directly to the FAA. The examiner need not require such an applicant to undergo another ECG examination, and if the applicant is otherwise qualified, a medical certificate may be issued. The examiner should attach a statement to the FAA Form 8500-8 to

verify that a tracing has been sent from another source. The date of that ECG should be entered.

When an ECG is due but the applicant refuses to have a current ECG submitted by the examiner, the examiner should defer issuance of the medical certificate. The applicant's eligibility for medical certification will not be affirmed by the FAA until the requested tracing has been received and interpreted as being within normal limits. Failure to respond to FAA requests for a required current ECG will result in denial of certification.

- b. **Currency:** In order to meet regulatory requirements, a periodic ECG must be made within thirty days prior to the date of the application (F A Form 8500-8). Currency of all periodic ECGs is verified by the Aeromedical Certification Branch, AAC-130, Oklahoma City.
- c. **Interpretation:** All ECGs that are required to establish eligibility for medical certification, whether for periodic requirements or for diagnostic work-up, are to be forwarded for interpretation to the Chief, Aeromedical Certification Branch, AAC-130, Oklahoma City. This does not preclude submission of an interpretation by or through the Examiner, if he or she wishes to do so. Interpretation is accomplished by staff and consultant cardiologists at the Civil Aeromedical Institute in Oklahoma City. Abnormalities are investigated to determine their significance.
- d. **Technique and reporting format:** ECGs are microfilmed for permanent retention in the Aeromedical Certification Branch, AAC-130; only tracings that can be microfilmed are acceptable. Therefore, examiners must forward only original ECG tracings to the

FAA. Duplicates are not acceptable and will be returned to the Examiner, with a request for the originals. Original tracings will be returned to the Examiner or other originator when requested.

Tracings must be stapled to the ECG report form to assure that all leads are appropriately coded and interpreted.

Disposition

- o The following conditions are disqualifying for the issuance of a medical certificate by the examiner. The applicant may receive further consideration by the FAA upon making a written request for reconsideration. This list is not comprehensive and other cardiovascular findings may also be disqualifying:

1. Myocardial infarction, angina pectoris, or other evidence of coronary disease
2. Congestive heart failure
3. Congenital heart disease, whether operated or unoperated
4. Cardiac hypertrophy or dilatation, as evidenced by clinical examination and supported by ECG, radiograph and/or echocardiogram
5. Organic heart murmurs: When the examiner discovers a heart murmur, a statement should be made indicating whether the Examiner believes it to be innocent or organic, and whether a special examination is needed. If such an examination is indicated, the examiner should defer issuance of the medical certificate and forward the completed FAA Form 8500-8 to the FAA for further consideration.

6. Pericarditis, endocarditis, myocarditis, or cardiomyopathy
7. Valvular heart disease
8. Cardiac pacemaker
9. Artificial heart valves, including mechanical valves, tissue valves, or valve rings for annuloplasty
10. Arrhythmias
 - a. Ventricular arrhythmias, except occasional, isolated, unifocal premature ventricular contractions, with no R-on-T phenomenon
 - b. Atrial tachycardia, either paroxysmal or nonparoxysmal
 - c. AV junctional tachycardia, either paroxysmal or nonparoxysmal
 - d. Multifocal atrial tachycardia
 - e. Atrial flutter
 - f. Atrial fibrillation
11. Conduction defects
 - a. First degree or second degree AV block, which is not reversible with exercise, or which is associated with QRS prolongation
 - b. Type II second degree AV block
 - c. Third degree AV block
 - d. Right bundle branch block, recently acquired
 - e. Left bundle branch block
 - f. Wolff-Parkinson-White syndrome, with or without history of arrhythmia
12. Other significant findings, such as unequivocal electrocardiographic evidence of:
 - a. Myocardial infarction
 - b. Myocardial ischemia or other significant ST-T changes

c. Ventricular hypertrophy

When any of the above conditions are found, the AME must defer issuance. If the applicant wishes further consideration, a consultation will be required from a specialist in internal medicine or cardiology, who will use FAA Form 8500-19, and who must include a narrative report of his or her evaluation, accompanied by an electrocardiographic tracing, a chest radiograph, an echocardiogram, and pertinent laboratory results. The report and accompanying material should be forwarded to the Aeromedical Certification Branch, AAC-130, Oklahoma City.

- o The following arrhythmias do not require further evaluation prior to certification:
 - a. Sinus arrhythmia
 - b. Occasional, isolated, unifocal premature ventricular contractions, with no R-on-T phenomenon
- o Blood pressure: options
 - 1. The applicant whose pressures are within the limits of the standards and has not used antihypertensive medications for 30 days, and who is otherwise qualified, shall be issued a medical certificate by the examiner. If the applicant is taking a permissible antihypertensive drug, he or she may be issued a certificate. In general, these drugs include low dose diuretics, beta-adrenergic receptor blockers, calcium channel blockers, and hydralazine.
 - 2. The applicant whose blood pressure is slightly elevated beyond the limits of the FAA standards may, at the discretion of the examiner,

have pressures repeated. Morning and afternoon readings on three consecutive days are recommended. If the possibility of true hypertension remains, even if it is mild or intermittent, certification should be deferred and the application mailed to the Aeromedical Certification Branch, AAC-130, Oklahoma City, with a note of explanation.

3. The applicant whose pressure is within limits but who is on antihypertensive medication, or has taken it within the past 30 days, should be deferred, and reports forwarded to the Aeromedical Certification Branch, AAC-130, Oklahoma City. If the applicant was previously cleared by the FAA, the examiner is familiar with the applicant's antihypertensive history, and there have been no adverse changes, the examiner may issue a certificate unless the determination has already been made that only the Aeromedical Certification Branch may do so.
4. All other applicants, such as those with abnormal pressures with or without the use of antihypertensive agents, should be deferred and the report sent to the Aeromedical Certification Branch.

Considerations for Special Issuance

- o A petitioner for special issuance must first contact an AME, who should gather the following information for submission to the Aeromedical Certification Branch, AAC-130, Oklahoma City:
 1. A current completed FAA 8500-8, with reason for denial or deferral.
 2. A signed and dated "Release of Medical Information" Form 8500-21.These forms are part of the standard FAA supplies kept by each examiner.

3. If not previously provided to the FAA, complete pertinent hospital and other medical records, to include admission and discharge summaries, daily progress notes, copies of all ECGs and laboratory reports, and outpatient progress notes. Where surgery is involved, records are necessary for nonsurgical admissions as well as the surgical admissions.
4. A current cardiovascular evaluation by an internist or cardiologist will be required. The protocol for this examination is provided by the FAA.

o Previous myocardial infarction

For Classes I, II and III, individuals must be asymptomatic one year after the event. At a minimum, results of a thorough cardiovascular evaluation should demonstrate a normal cardiovascular system at rest that responds normally to an exercise test to at least Stage III and a heart rate of 90% of the predicted maximum heart rate for age without evidence of stress-induced ischemia. Ambulatory electrocardiography monitoring should reveal no significant rhythm disturbance. Exercise thallium scintigraphy and/or exercise radionuclide ventriculography should demonstrate no significant evidence of a stress-induced myocardial perfusion defect and/or significant stress-induced regional or global systolic ventricular dysfunction.

For Classes I and II, coronary angiography should demonstrate no evidence of significant coronary occlusive disease, defined as greater than or equal to 50% narrowing of lumen diameter, other than that producing the index infarction; and left ventriculography should demonstrate near-normal global systolic ventricular function with no more than a single area of regional

hypokinesia or akinesia. At 6 month intervals follow-up cardiovascular assessment and treadmill electrocardiographic stress testing should remain normal and at 12 month intervals electrocardiographic monitoring should show no significant rhythm disturbance, and exercise thallium scintigraphy and/or exercise gated blood pool radionuclide ventriculography should demonstrate no evidence of a stress-induced myocardial perfusion defect or of stress-induced regional or global ventricular dysfunction. Repeat coronary angiography should be performed after five years or earlier if there are coexisting risk factors known to accelerate atherogenesis.

For Class III follow-up cardiovascular assessment should include normal stress electrocardiographic testing at yearly intervals.

o Previous coronary bypass surgery (CAB)

For Classes I, II and III individuals must be asymptomatic 6 months after CAB. At a minimum, results of a thorough cardiovascular evaluation should demonstrate a normal cardiovascular system at rest that responds normally to an exercise test to at least Stage III and a heart rate of 90% of the predicted maximum heart rate for age without evidence of stress-induced ischemia. Ambulatory electrocardiographic monitoring should reveal no significant rhythm disturbance. Exercise thallium scintigraphy and/or exercise radionuclide ventriculography should demonstrate no significant evidence of a stress-induced myocardial perfusion defect and/or a significant stress-induced regional or global systolic ventricular dysfunction.

For Classes I and II coronary angiography should demonstrate wide patency of all bypasses and no significant unbypassed disease. The number of

bypasses is a less important factor than adequate graft patency. Left ventriculography should demonstrate near normal global systolic ventricular function with no more than a single area of regional hypokinesia or akinesia. Follow-up examinations should be identical to those for previous myocardial infarction with an additional requirement of repeat coronary artery graft angiography and left ventriculography five, 8, and 10 years after CAB. A somewhat less stringent schedule for repeat angiography might be permitted if the internal mammary artery(ies) was used as the bypass conduit(s). Occurrence of significant graft occlusion or of native vessel disease distal to the graft or of significant progress of native vessel disease in unbypassed vessels would preclude special issuance. These stringent follow-up requirements are necessary because of the palliative nature of CAB and the likelihood of progressive atherosclerotic changes in either the graft or the native vessels, especially in the second half decade after surgery.

Class III requirements for follow-up cardiovascular assessment are the same as for myocardial infarction.

o Percutaneous transluminal coronary angioplasty

For Classes I and II requirements are as outlined above for those following CAB. Coronary angiography should demonstrate wide patency of the dilated vessel and no other major occlusive disease, defined as greater than or equal to 50% luminal diameter narrowing. Left ventriculographic criteria should be identical to those for myocardial infarction and CAB. Follow-up should be identical to the requirements for CAB. The long-term status of individuals who have undergone balloon angioplasty is still unknown.

Accordingly, follow-up angioplasty at the fifth year presently appears advisable.

Class III requirements are the same as those following myocardial infarction, although special issuance may be considered at 6 months after surgery. Because of the newness of this procedure, coronary angiography should be performed at 6 months and the results should meet the criteria set forth for Classes I and II.

o Vascular disease

The most important implication of atherosclerotic peripheral vascular disease to aviation safety is usually not the disease itself but rather the close association between peripheral arterial vascular disease and coronary and carotid artery disease, which may be asymptomatic. Therefore, the presence of peripheral arterial vascular disease requires evaluation for coronary artery disease and carotid artery disease by appropriate methods before certification for all classes.

Mild atherosclerotic vascular disease that is manifested only by intermittent claudication presents no impediment to medical certification. At some point in the natural history of this disease process, the nature and severity of related symptoms may preclude continued certification. Following successful vascular surgery, it is possible that favorable consideration will be given by the FAA unless disease that was not amenable to surgery remains.

Persons with thoracic, abdominal or thoracoabdominal aneurysms that are greater than 4 cm in diameter by ultrasound should be denied certification.

Applicants with aneurysms smaller than this may be certified, provided they are monitored every six months. Four months following aneurysmectomy a pilot may be recertified, provided there are no disabling complications from the operation, ultrasonography shows no evidence of residual aneurysmal dilatation, and no other disqualifying conditions are present.

Aneurysms of the iliac artery should be removed and repaired, and the pilot with this operation may be certified after four months. Femoral and popliteal aneurysms larger than 3 cm should also be removed before a certificate may be granted.

Any applicant with aortic dissection or "healed" aortic dissection should be disqualified from certification.

The following recommendations apply to applicants for Classes I, II, and III:

1. Raynaud's disease. The certificate should be issued unless there are painful ischemic lesions on the extremities and unless any medication required for treatment of the disease, such as alpha receptor blocking agents, precludes such certification.
2. Secondary Raynaud's phenomenon. The underlying disease should be evaluated to determine the acceptability for certification.
3. Superficial thrombophlebitis. A certificate can be issued after the acute episode has subsided, providing serious underlying disease has been ruled out.

4. Deep venous thrombosis. The certificate should be denied as long as anticoagulant therapy with coumarin derivatives or heparin is necessary. In no case should certification be permitted earlier than 6 months after an acute episode (see also the hematology and respiratory section).
5. Pulmonary embolus. Certification should be denied for at least 6 months after the embolic event. If there was an identifiable event that is not likely to recur and pulmonary function has not been impaired, certification may be granted after long-term anticoagulation therapy has been discontinued (see the respiratory system section).
6. Varicose veins. A certificate may be granted unless there is an acute episode of thrombophlebitis.

Valvular heart disease

1. Innocent heart murmur. An innocent pulmonic ejection murmur is not disqualifying. A chest radiograph and electrocardiogram should be included in the evaluation and if there is any question about the etiology of the murmur, a two dimensional and M-mode echocardiogram should be performed. The same type of evaluation should be performed for a functional aortic ejection murmur.

Any murmur other than an innocent or functional murmur should be a cause for deferral and the applicant should have a cardiovascular consultation and periodic follow-up evaluations.

2. Aortic stenosis. Applicants with aortic stenosis should be denied certification. Special issuance may be granted for minimal aortic stenosis or sclerosis, which is defined by a left ventricular-aortic systolic gradient of less than 20 mm Hg at rest with a normal cardiac index, and with a normal left ventricular end diastolic pressure of 12 mm Hg or less; and for mild aortic valve stenosis, which is defined by a left ventricular-aortic gradient of 20 to 40 mm Hg. No exceptions can be made in the cases of moderate and severe aortic stenosis, due to the risk of syncope and sudden death.

All applicants must undergo a thorough cardiovascular examination annually.

3. Aortic valve regurgitation. Applicants for Classes I, II, and III certificates with aortic regurgitation may be certified if they are asymptomatic and have mild to moderate forms of the condition. However, the poor prognosis of aortic regurgitation due to diseases of the aortic root, such as is found in Marfan syndrome, Ehlers-Danlos syndrome and aortic dissection, makes this form of the condition permanently disqualifying.
4. Aortic stenosis and aortic regurgitation. Applicants with both aortic stenosis and aortic regurgitation should be denied certification unless they qualify for both aortic stenosis and aortic regurgitation.

5. Tricuspid stenosis and tricuspid regurgitation. Tricuspid stenosis and tricuspid regurgitation of rheumatic origin are invariably associated with mitral or aortic valve disease or both, and are therefore disqualifying. Also, tricuspid regurgitation secondary to pulmonary hypertension and cardiomyopathy is disqualifying.

Applicants with mild tricuspid regurgitation may be considered for a special issuance where the underlying cause for the regurgitation appears to be self-limited. Such cases may be seen in healed infectious endocarditis and as a result of previous trauma.

6. Mitral stenosis. Special issuance may be considered for those applicants for all classes with mild mitral stenosis who are entirely asymptomatic, have a normal sinus rhythm, have a negative response to a treadmill exercise test, and have electrical stability demonstrated on treadmill test and on a 24-hour Holter ECG.

In rare instances, an applicant who has had successful mitral valvotomy may receive special issuance for certification. Such an applicant must be asymptomatic, have normal sinus rhythm, have no significant mitral regurgitation and no previous history of operative atrial thrombi.

Annual cardiovascular evaluation, including echocardiography, treadmill exercise stress test and a 24-hour Holter ECG are required.

7. Mitral regurgitation, mitral valve prolapse and mitral valvuloplasty. Applicants with mitral regurgitation or prolapse may have varying degrees of severity, ranging from mild to moderate to severe. Because of generally favorable prognoses, applicants with mild and, rarely, moderate, uncomplicated mitral regurgitation, including regurgitation due to prolapse, might qualify for special issuance.

Special issuance may occasionally be given to applicants who have had previous mitral valvuloplasty. They must not be taking anticoagulants or any other disqualifying drugs.

8. Mechanical heart valves. Because of the increased mortality rates in persons with mechanical heart valves, particularly due to sudden death, and because of the need for chronic anticoagulation in most of those persons, all applicants with prosthetic heart valves should be denied certification.
9. Tissue valves. Applicants for Class I, II, and III certificates who have had mitral valve replacement with a tissue valve should be denied certification. In rare instance, special issuance may be considered one year after surgery provided the applicant has not taken anticoagulant medication for at least 6 months and has no history of thromboembolic complications.

o Myocardial disease

1. Acute myocarditis. Applicants for all classes of certificate who have acute myocarditis should be denied certification. Special issuance

may be granted 6 months after the acute illness if the applicant is asymptomatic, has a normal physical examination, and has normal chest radiograph, electrocardiogram, treadmill exercise test, echocardiogram, gated heart pool scan, and 24-hour Holter ECG.

2. Any applicant with a history of any form of cardiomyopathy, even though he or she may be asymptomatic and have no apparent residual effects at the time of examination, should be denied certification. Special issuance may be granted after the applicant has completed a total evaluation, including an ECG, chest radiograph, treadmill exercise test, echocardiogram, gated heart pool scan, and 48- or 72-hour Holter ECG.

3. Hypertrophic cardiomyopathy. The diagnosis of hypertrophic cardiomyopathy is frequently difficult to establish. Applicants with a definite or probable diagnosis of hypertrophic cardiomyopathy who have had any of the forms of medical or surgical therapy should not be issued certificates on the basis of any expected improvement in their cardiac status. None of the forms of therapy currently available have had any effect in improving survival rates and those applicants are still subject to sudden and unexpected death.

All applicants in whom the diagnosis is "uncertain" will need a complete evaluation, including chest radiograph, ECG, treadmill exercise test to 90% of the predicted heart rate for the applicant's age, gated heart pool scan, echocardiogram, 48-hour Holter ECG, and left heart catheterization with left ventriculogram.

o Pericarditis

1. Acute pericarditis. Applicants for all classes of certificates who have acute pericarditis should be denied certification. Special issuance may be granted for an applicant for any class when all symptoms and clinical findings have cleared. There should be no echocardiogram evidence of pericardial effusion or electrocardiographic evidence of serious cardiac arrhythmia.

Because of the tendency of pericarditis to recur, follow-up evaluation is required at one year after the initial episode.

2. Constrictive pericarditis. Applicants for all classes of certificates who have constrictive pericarditis should be denied certification. Special issuances should not be granted unless there has been successful surgical resection of the pericardium. In such cases, follow-up evaluation is required, including a chest radiograph, ECG, treadmill exercise test, gated heart pool scan at rest and with exercise, echocardiogram, 24-hour Holter ECG and right heart catheterization. There should be annual re-evaluations with all the above procedures except the right heart catheterization.

o Congenital heart disease

1. Cyanotic heart disease. Applicants for all classes with cyanotic congenital heart disease, either before or after surgical correction, should be denied certification. Special issuance may be considered in the extremely rare case of a person who has had an excellent result

following the surgical correction of tetralogy of Fallot or transposition of the great vessels. Documentation of the successful surgery will be required by cardiovascular examination, ECG, chest radiograph, echocardiography, 24-hour Holter ECG, and heart catheterization.

2. Pulmonary hypertension. Applicants for all classes of certificates who have pulmonary hypertension of any cause will be denied certification. Whether the pulmonary hypertension is hyperdynamic, passive, obstructive, obliterative, or reactive, the applicants are subject to sudden incapacitation, and therefore certification will be denied (see the respiratory system section).
3. Coarctation of the aorta. Applicants for all classes of certificates who have unoperated coarctation of the aorta should be denied certification. Special issuance may be considered for applicants who are asymptomatic, have a normal ECG, have a normal blood pressure at rest without medications, and have less than a 10 mm Hg resting systolic pressure difference between the arms and legs. Individuals whose coarctation has been corrected surgically may qualify if they are asymptomatic, have normal blood pressure, a normal heart size on chest radiograph, normal resting and exercise ECGs, a normal blood pressure response to exercise, and less than a 10 mm Hg systolic pressure difference across the coarctation repair.
4. Other noncyanotic congenital heart disease. Applicants for all classes of certificates who have congenital heart disease of a moderate or

severe nature, which would ordinarily be sufficient to require surgical correction, should be denied certification. This applies especially to applicants with pulmonic stenosis, atrial septal defect, ventricular septal defect, and patent ductus arteriosus. Very mild degrees of those congenital heart defects may not be disqualifying. Accurate estimation of the severity of the disease will be required by complete cardiovascular examination, including chest radiograph, ECG, echocardiogram, and 24-hour Holter ECG.

5. Cardiac arrhythmias following heart surgery. Applicants for all classes of certificates who demonstrate cardiac rhythm disturbances following open heart surgery should be denied certification. Sinus node dysfunction and ventricular arrhythmias are of particular importance.

o Arrhythmias

1. Pilots with intermittent supraventricular tachyarrhythmias may be certified by special issuance, if they are asymptomatic and noninvasive testing shows no evidence of underlying cardiac disease.
2. Pilots with simple ventricular ectopic activity (based upon the Lown Classification for 24-hour ECG monitoring) that occurs in the absence of underlying heart disease may be certified by special issuance.
3. Asymptomatic pilots with right bundle branch block (RBBB) that has been present for many years, and who have a normal cardiovascular examination may be certified by special issuance, as may pilots with

RBBB that is recently acquired or of unknown duration, provided there is no underlying heart disease and no other significant ECG abnormalities on continuous monitoring.

4. Pilots with pacemakers should not be certified. Special issuance may be considered only if it can be demonstrated that a pacemaker was implanted in the absence of currently accepted indications and provides no therapeutic benefit, and the pilot has no other disqualifying cardiac disease.

o Hypertension

For consideration for special issuance, Form 8500-8 should be sent to the FAA, along with a complete cardiovascular examination report. All pertinent medical records should also be sent. On the initial review there should be a thorough current examination to rule out end-organ disease. This examination must include evaluation of retinal vessels; a chest radiograph; ECG, treadmill exercise test to 90% of the applicants expected heart rate for age; blood chemistries, including BUN, creatinine and electrolytes; and a urinalysis.

Follow-up requires an annual re-evaluation including measurement of blood pressure, ECG, and blood chemistries. Every three to five years the applicant should have a treadmill exercise test. If a pilot is taking diuretics at a constant dose, the serum potassium should be checked every 6 months. When the dose is initiated or changed, the potassium should be checked within four weeks. All these evaluations may be done by the applicant's personal treating physician, but the records must be sent to the FAA at the

annual examination by the AME.

Nervous System

Recommended Standards

For Classes I, II and III:

- A. An applicant shall have no established medical history or clinical diagnosis of any of the following:
 - o Epilepsy
 - o A single seizure
 - o An impairment of consciousness and/or transient loss of control of nervous system function(s) without satisfactory medical explanation of the cause

- B. An applicant shall have no other convulsive disorder, disturbance of consciousness, or neurologic condition that the Federal Air Surgeon finds:
 - o Makes the applicant unable to safely perform the duties or exercise the privileges of the airman certificate that he or she holds or for which he or she is applying; or
 - o May reasonably be expected, within two years after its diagnosis, to make him or her unable to perform those duties or exercise those privileges; and the findings are based on the case history and appropriate, qualified, medical judgment relating to the condition involved.

Responses to Nervous System Questions in the Medical History

A neurologic evaluation should consist of a thorough review of the applicant's history prior to the neurologic examination. In addition to the items in Form 8500-8, specific inquiries should be made concerning the following:

1. Intermittent or progressive weakness or paralysis (generalized or focal)
2. Disturbances of equilibrium

3. Disturbances of vision
4. Disturbances of speech
5. Disturbances of bowel or bladder control
6. Acute and/or recurrent headaches, face, extremity or back pain
7. Acute and/or recurrent mental or personality changes

Also a history of certain laboratory procedures, such as radiographs of the head or spine, electroencephalograms, or spinal taps, may elicit a remote problem in the applicant's medical history. Any conditions that are identified should be noted under "Remarks" with facts such as dates, frequency and severity of occurrence.

- o Nervous trouble of any sort

The term "nervous trouble" will mean either psychiatric or emotional illness or neuromuscular disorders to the applicant. The presence of some other organic disorders, such as hyperthyroidism, may only be known through the "nervous trouble" that results.

An affirmative answer to this question requires a thorough supplemental history-taking. The examiner should ask the applicant about memory difficulties; difficulties with concentration; depression, suicidal thoughts and attempted suicide; thinking difficulties; sleep disturbances; weight changes and changes in appetite; difficulties at work or home; and any questions that could lead to an organic basis for the nervousness, including exposures to toxic substances. Dispositions will vary according to the details that are obtained and the physical and mental status examinations.

- o Dizziness, unsteadiness, or fainting spells

One or two episodes of dizziness or even fainting may not disqualify. For

example, postural lightheadedness or syncope accompanying an acute illness is not a true dysfunction. Likewise, the orthostatic faint associated with moderate anemia is no threat to aviation safety as long as the individual is temporarily disqualified until the anemia is corrected. Medication-induced postural lightheadedness, particularly if associated with antihypertensive therapy, would temporarily disqualify while the medication is being used. Episodic disorders of dizziness or equilibrium unrelated to postural change are a more serious matter and require careful evaluation by the FAA. A complete neurological evaluation should be performed. Furthermore, arrhythmias such as bradycardia, tachycardia, or ectopic beats, should be considered. Transient processes such as those associated with acute labyrinthitis or benign positional vertigo may not disqualify when fully recovered.

o Encephalitis or meningitis

A history of meningitis or encephalitis is initially disqualifying. A history of childhood meningitis or encephalitis may not be disqualifying if there was no seizure activity associated with the illness. Similarly a history of meningitis or encephalitis while on flying status within one year prior to the present examination for certification requires that the applicant wait until one year has elapsed since the illness resolved. At that time neurologic and mental status examinations must be normal for consideration for special issuance.

o Frequent or severe headaches

All persons have experienced headaches, but an applicant whose headaches are severe or frequent enough to make note of them should be denied certification pending a complete evaluation by the FAA. The AME should

take a thorough history and obtain documentation about the history of headaches, which should be forwarded to the Aeromedical Certification Branch, AAC-130, Oklahoma City.

- o Unconsciousness for any reason

A history of impairment of consciousness is always disqualifying. An applicant with such a history should be granted a certificate only by special issuance. The AME should assist the FAA by taking a thorough history, conducting a neurologic and mental status examination, and collect all records pertaining to the period of unconsciousness.

- o Epilepsy or fits

A history of epilepsy, which is defined as two or more seizures from whatever cause, is disqualifying. This includes a history of febrile convulsions as a child. A history of a single seizure is also disqualifying, including a history of one febrile seizure in young childhood. Although there are conditions under which persons with a seizure history may be certified, the decision should be left to the FAA. The AME can assist by taking a thorough history, performing a neurologic examination, and collecting pertinent medical records.

- o Family members with epilepsy

Applicants who have siblings and/or parents with epilepsy should be deferred issuance of a certificate until they undergo a complete neurologic examination and have a current EEG showing no epileptiform abnormality.

Examination Procedures

o Examination techniques

The AME should examine the following:

1. Mental status (see mini-mental status examination under the mental & behavioral section)
2. Cranial nerves
3. Gait and station
4. Cerebellum
5. Motor examination:
 - a. Strength and tone of muscles
 - b. Deep tendon stretch reflexes
 - c. Pathologic reflexes (eg, Babinski reflex; abnormal pupil responses, etc)
6. Sensory examination
7. Miscellaneous:
 - a. Auscultation of orbits, head and vessels in the neck
 - b. Palpation of head, inspection of scalp (eg, craniotomy scars, trauma, etc)
 - c. Examination of head, neck and spine motions to see if neurologic phenomena can be provoked (eg, pain, dizziness, nystagmus, radiating paresthesias, etc)

Disposition

o An established history of any of the following conditions is initially disqualifying for medical certification:

1. Epilepsy

2. A single seizure
3. An impairment of consciousness and/or transient loss of control of nervous system functions without satisfactory explanation of the cause

Applications of individuals with these disqualifying and other potentially disqualifying conditions should be forwarded to the FAA. Processing such applications can be expedited by including hospital records, consultation reports, and appropriate laboratory studies if available.

The following groups of disorders are disqualifying pending further evaluation. Criteria for possible special issuance are provided for each group.

- A. Epilepsy (defined as more than one seizure)
 1. Disqualifying conditions
 - a. Partial or focal seizures: simple partial, complex partial, partial evolving to generalized.
 - b. Generalized (convulsive or non-convulsive) seizures: absence, myoclonic, clonic, tonic, tonic-clonic, atonic.
 - c. Unclassified seizures, including pseudo seizures.
 2. Conditions that may permit special issuance
 - a. Benign Rolandic epilepsy of childhood. The applicant must be free of seizure activity and off all medication for at least 10 years.
 - b. Seizures associated with idiosyncratic reaction to a drug or drugs. The applicant must be free of all epileptogenic drugs, with a very low probability of using these drugs in the future.
 - c. Seizures associated with drug or alcohol withdrawal. The applicant must satisfy all criteria for alcohol abuse and alcohol

dependence that are found in the mental and behavioral section.

- d. Seizures associated with accidental acute drug intoxication or poisoning.
- e. Seizures associated with acute metabolic abnormalities, such as hypoglycemia. The underlying abnormality must be evaluated and corrected, and the applicant must satisfy the certification criteria for that abnormality.
- f. Seizures resulting from an acute insult to the brain, such as trauma, meningitis and encephalitis. The applicant must be free of seizures and off all medications for 20 years, and must have a normal neurological examination and EEG.
- g. History of idiopathic epilepsy. The applicant must be free of seizures and off all medications for 20 years, and must have a normal neurological examination and EEG.

B. Single seizures

- 1. Disqualifying: a history of a single seizure is disqualifying.
- 2. Conditions that may permit special issuance.
 - a. History of one febrile seizure occurring before age five years.
 - b. A single seizure due to idiosyncratic reaction to or poisoning from drugs or other toxins, hypoxia, acute metabolic disorders, etc. As with epilepsy resulting from these disorders, an applicant with a history of a single seizure must be evaluated thoroughly, have a very low probability of finding himself or herself in the situation that caused the seizure, and must satisfy all other physical and mental criteria.

- c. A single, unprovoked seizure. The applicant must have no recurrence while off medication for at least 20 years, and must have a normal neurological examination and EEG.
- C. An impairment of consciousness and/or transient loss of control of nervous system function(s) without satisfactory explanation of cause.
- D. Ischemic cerebrovascular disease
 - 1. Disqualifying conditions
 - a. Transient ischemic attacks (TIAs), reversible ischemic neurologic deficit (RIND), amaurosis fugax.
 - b. Embolic or thrombotic cerebral infarction.
 - c. Transient global amnesia (TGA).
 - 2. Conditions that may permit special issuance
 - a. Single episode of amaurosis fugax in a young person not associated with migraine. Complete neurologic and ophthalmologic evaluations are required.
 - b. Symptoms of cerebral dysfunction, excluding migraine, in a young person who has had a complete neurological evaluation including four-vessel cerebral angiography, in which no medical cause for the TIA, RIND, or infarction has been found. The applicant must be asymptomatic for three years following the event, with no persistent impairment of neurologic and mental functions.

- c. Cardiogenic, fat, bacterial, or other types of emboli, whose cause has been corrected, and which have caused no permanent neurologic or intellectual impairments. The applicant must have normal neurologic and mental status examinations, and the probability of recurrence of the embolic event must be judged as very low.
- d. Hyperviscosity syndromes, such as from heat stroke or coagulopathies, whose cause has been corrected, and which have caused no permanent neurologic or intellectual impairments. The applicant must have normal neurologic and mental status examinations.
- e. Transient global amnesia (TGA), one year after the event, provided neurological examination and psychometric evaluation, including tests for memory function, are normal at that time, and the TGA is not associated with the migraine syndrome.

E. Other cerebrovascular diseases

1. Disqualifying conditions

- a. Intracerebral or subarachnoid hemorrhage
- b. Intracranial aneurysm or arteriovenous malformation (AVM), including those with no neurologic symptoms or signs, or those found incidentally on an angiogram
- c. Asymptomatic carotid bruit
- d. History of carotid endarterectomy or any vascular anastomoses affecting the cervical-cranial vasculature.

2. Conditions that may permit special issuance

- a. Drug-induced intracerebral hemorrhage, such as caused by coumadin or amphetamines. The applicant must wait one year from the event, during which time he or she must be free of all offending medications, must have a normal neurologic and mental status examination, and must satisfy all other physical and mental fitness criteria. Four-vessel angiography is recommended.
- b. Hemorrhage resulting from hematological disorder. The applicant must have normal neurological and mental status examinations one year after the event, and must satisfy the fitness criteria for the hematologic system.
- c. Hemorrhage resulting from ruptured aneurysm or AVM. An angiogram performed postoperatively within one year after the event must demonstrate isolation of the aneurysm or AVM from the cerebral circulation. All other neurologic, physical, and mental examinations must be normal.
- d. Subarachnoid hemorrhage for which there is no demonstrable cause on repeat angiography performed 10 days to two weeks after the acute event. If the neurologic and mental examinations are normal, the applicant may be considered for special issuance.
- e. Unruptured intracranial aneurysm or AVM associated with neurologic symptoms or signs. These vascular abnormalities are disqualifying unless they are corrected by surgery and demonstrated by angiography that is performed within one year after surgery to be isolated from the cerebral circulation. The residual mental and neurologic deficits must not interfere with

the applicant's ability to perform safely the duties of an airman.

- f. Unruptured intracranial aneurysm and AVM found incidentally on angiography and not associated with neurologic symptoms or signs. A single aneurysm less than one millimeter in diameter may be considered for special issuance. A single aneurysm one millimeter or greater, or multiple aneurysms of any size, or single or multiple AVMs are disqualifying.
- g. Asymptomatic carotid bruit, either unilateral or bilateral. The applicant must have a complete medical and neurologic evaluation, including noninvasive tests such as duplex ultrasound. If this test suggests a significant stenosis (greater than 75%), invasive angiography may be required. All applicants given special issuances should be followed every 6 months.
- h. History of carotid endarterectomy performed for atherosclerotic disease or traumatic injury of the carotid artery. The applicant must have a complete medical and neurologic evaluation, including angiography, that shows no significant disease of the great vessels of the neck.

F. Head trauma associated with closed or penetrating head injury.

1. Disqualifying conditions

- a. All penetrating head injuries (dura violated)
- b. Unconsciousness, disorientation or amnesia lasting more than 1 hour following injury
- c. Focal neurologic deficit

- d. Skull fracture, either simple or depressed
 - e. Post-traumatic headache or post-traumatic syndrome
 - f. Subdural, epidural or intracerebral hematoma or subarachnoid hemorrhage
 - g. Brain contusion or laceration
 - h. Post-traumatic seizures
 - i. CSF oto- or rhinorrhea
 - j. Cranial nerve injuries
 - k. Boneplate prostheses
 - l. Osteomyelitis of the skull
2. Conditions that may permit special issuance, for nonpenetrating injuries only
- a. Unconsciousness, disorientation or amnesia lasting more than one hour but less than 24 hours, that is not associated with focal neurologic deficits, simple or depressed skull fracture, brain contusion or laceration, post-traumatic seizures, boneplate prosthesis or osteomyelitis of the skull. An applicant may be considered for special issuance after two years, provided the neurologic examination is normal.
 - b. Unconsciousness, disorientation or amnesia lasting less than one hour, that is not associated with focal neurologic deficits, simple or depressed skull fracture, brain contusion or laceration, post-traumatic seizures, bone-plate prosthesis or osteomyelitis of the skull. An applicant may be considered for special issuance after three months, provided the neurologic examination is normal.
 - c. Post-traumatic headache or post-traumatic syndrome. An

applicant may be considered for special issuance three to six months after symptoms have resolved, so long as none of the other complications listed in F1 is associated with the acute event, and the neurologic examination is normal.

- d. Linear skull fracture. An applicant may be considered for special issuance one year after the event, provided no other complications listed in F1 are associated with the injury, and the neurologic examination is normal.
- e. Depressed skull fracture. An applicant may be considered for special issuance one year after the event, provided no other complications listed in F1 are associated with the injury, and the neurologic examination is normal. If surgery was performed, the applicant may be considered after two years.
- f. Uncomplicated epidural hematomas. The applicant may be considered for special issuance two years after the event, provided the neurologic examination is normal.
- g. CSF rhinorrhea or otorrhea that resolved spontaneously or was corrected surgically. The applicant may be considered for special issuance one year after the event, provided none of the other complications listed in F1 is associated with the acute event, and the neurologic examination is normal.
- h. Chronic subdural hematoma. The applicant may be considered for special issuance two years after surgery, provided none of the complications listed in F1 is present, and the neurologic and mental status examinations are normal. A computed tomography (CT) scan or magnetic resonance imaging (MRI) must show no evidence of brain injury or hydrocephalus.

- i. Cranial nerve injuries. If injury to the cranial nerve(s) is judged to be not significant to interfere with the safe performance of airman duties, the applicant may be considered for special issuance. The applicant must satisfy all criteria of the special organs that may be affected by cranial nerve injury (see especially the visual system and ear, nose, throat and related structures).

G. Chronic or recurrent headaches or face pain

1. Disqualifying conditions

- a. Common migraine
- b. Classic or complicated migraine
- c. Migraine equivalent
- d. Cluster headaches
- e. Chronic tension headaches
- f. Conversion headaches
- g. Trigeminal neuralgia
- h. Atypical face pain
- i. Headaches related to cough, exercise, posture, menses, diet, etc

2. Conditions that may permit special issuance

- a. Common migraine, with infrequent attacks that are not incapacitating, and that do not require prophylactic medication.
- b. Cluster headaches that occur only infrequently, and do not require therapy. The applicant must not fly during cluster headache.

- c. Recurrent headaches related to menses and diet.
- d. Recurrent headaches related to other etiologies, such as cough, posture, exercise or coitus require a complete neurologic evaluation before a special issuance may be considered.

H. Neurologic tumors

1. Disqualifying conditions

- a. Intracranial tumors
- b. Spinal cord tumors
- c. Pseudotumor cerebri

2. Conditions that may permit special issuance

- a. Cerebral hemisphere extra-axial tumors, such as meningiomas. The applicant must have no history of seizures as a presenting symptom, and may be considered for certification two years after surgical removal of the tumor, provided there is no neurologic deficit and no requirement for medication. The CT scan must show no evidence of recurrence or of brain injury, and the electroencephalogram (EEG) must show no epileptiform activity.
- b. Pituitary tumors. Refer to the section on endocrine tumors. All other neurologic and visual standards must be satisfied.
- c. Extra-axial posterior fossa tumors, such as neurofibromas. An applicant may be considered for special issuance one year after total surgical removal of the tumor, provided there is no neurologic, physical, or mental deficit, and the CT scan shows no evidence of recurrence.
- d. Spinal cord tumors. An applicant with an extra-axial tumor,

such as neurofibromas, may be considered for special issuance 6 months after surgical removal, provided there is no residual neurologic deficit, or if a deficit is present, it does not interfere with the performance of airman duties (see the section on musculoskeletal conditions).

- e. Pseudotumor cerebri. An applicant with uncomplicated pseudotumor cerebri may be considered for special issuance one year after medical therapy has been discontinued. Morbid obesity is commonly associated with this condition, and the applicant must have a Body Mass Index less than 50 (See the risk factor section). "Uncomplicated" means there is no visual loss, and no surgical procedure, such as lumbar-peritoneal shunt, optic nerve sheath decompression or temporal decompression, has been performed to relieve pressure.

I. Vertigo and disequilibrium

1. Disqualifying conditions

- a. Benign positional vertigo
- b. Endolymphatic hydrops, including Meniere's disease
- c. Acute peripheral vestibulopathy
- d. Alternobaric vertigo
- e. Hyperventilation syndrome
- f. Orthostatic hypotension
- g. Nonfunctional labyrinths
- h. Vascular or neoplastic brainstem or temporal lobe disease

2. Conditions that may permit special issuance

Only self-limiting conditions, such as viral labyrinthitis, orthostatic

hypotension related to drug use, and hyperventilation syndrome, may be considered for special issuance. See also the ear, nose and throat section.

J. Other diseases

1. Disqualifying conditions

- a. Multiple sclerosis
- b. Acute optic neuritis
- c. Myasthenia gravis
- d. Landry-Guillain-Barre syndrome
- e. Allergic encephalomyelitis
- f. Collagen vascular disease, such as lupus erythematosus, periarteritis nodosa, acute polymyositis, and dermatomyositis

2. Conditions that may permit special issuance

- a. Multiple sclerosis. An applicant may be considered for special issuance three years after the initial diagnosis of the disease, and only for periods of 6 months, if there have been
 - 1) no ocular symptoms, including diplopia, or loss of visual acuity or color vision
 - 2) no episodes of vertigo
 - 3) no convulsions
 - 4) no mental disorders or alterations of mood
 - 5) no sudden alterations of sensation affecting hands or arms
 - 6) after three years from initial diagnosis, no MRI evidence of active demyelination
- b. Single episodes of acute optic neuritis. Provided there are no

other neurologic signs and symptoms, the applicant should be evaluated by an ophthalmologist and satisfy all visual criteria.

- c. Myesthenia gravis and Landry-Guillian-Barre (see the musculoskeletal system section).

K. Extrapyrarnidal and degenerative disorders

1. Disqualifying conditions

- a. Parkinson's disease
- b. Essential tremor
- c. Huntington's disease
- d. Dementia

2. Conditions that may permit special issuance

- a. An applicant with a mild extrapyramidal disorder that requires no medication may be considered for special issuance if the neurologic findings such as bradykinesia, rigidity, righting reflexes, tremor, impairment of rapid eye scanning, or difficulty with communication, are judged not to interfere with the safe performance of airman duties. The applicant must be re-evaluated every 6 months.
- b. Essential tremor. The applicant must have a thorough neurologic examination with no deficits other than the tremor. The applicant may need to take a medical flight test or simulator test, to assess ability to perform all airman duties, including intelligible voice communication. Essential tremor requiring medication is disqualifying.

L. Hydrocephalus, including arrested hydrocephalus

1. Disqualifying conditions

- a. Hydrocephalus resulting from an injury or disease process, with or without a shunt
- b. Normal pressure hydrocephalus, with or without a shunt

2. Conditions that may permit special issuance: none.

M. Spasticity, weakness or paralysis of extremities

1. Disqualifying conditions

All conditions that the AME judges may prohibit the applicant from performing safely the duties of an airman.

2. Conditions that may permit special issuance

The cause of the spasticity, weakness or paralysis must be non-progressive. The applicant may need to take a medical flight test or simulator test

N. Sleep and arousal disorders

1. Disqualifying conditions

- a. Narcolepsy tetrad of irresistible daytime sleepiness, cataplexy, hypnagogic hallucinations, or sleep paralysis
- b. Drug-induced sleepiness
- c. Drug withdrawal that affects the sleep/awake cycle
- d. Sleep apnea
- e. Other forms of sleep disorders

2. Conditions that may permit special issuance

- a. Abnormal sleep patterns due to drugs. An applicant may be certified if the offending drug is no longer in use, the

probability is low that it will again be used, and all other physical and mental criteria are met.

- b. Obstructive sleep apnea. An applicant with obstructive sleep apnea that has been corrected surgically may be considered for special issuance one year after surgery provided normal sleep patterns have returned, as documented by appropriate sleep laboratory studies, and the applicant meets all other physical and mental criteria, such as cardiovascular and body mass index (see the cardiovascular, respiratory and risk factor sections).

O. Infections

1. Disqualifying conditions

- a. Meningitis
- b. Encephalitis
- c. Solitary brain abscess
- d. Multiple brain abscesses
- e. Neurosyphilis

2. Conditions that may permit special issuance

- a. History of meningitis or encephalitis with no seizure activity, occurring during childhood. The applicant must have a normal neurologic examination.
- b. History of meningitis or encephalitis while on flying status or within one year of application for pilot certificate. There must be no seizures during the acute infection. The applicant must wait one year after the infection has resolved, at which time all neurologic and mental status examinations must be

normal. The likelihood of recurrence of the infection must be very low.

- c. Solitary brain abscess. An applicant with a single cerebellar abscess, treated medically or surgically, who has no residual neurologic deficit, may be considered for special issuance two years after therapy is completed. The CT scan and MRI must show no evidence of recurrence or hydrocephalus, and the possible cause of the abscess, such as mastoiditis, must be treated effectively.

Reference

For a review of many neurological conditions that affect flying, the AME is referred to "Neurological and neurosurgical conditions associated with aviation safety." Arch Neuro 1979;36(12):731-812.

Endocrine System

Recommended Standard

The applicant shall have no established medical history or clinical diagnosis of diabetes mellitus that requires insulin for control.

Introduction

Of all the disorders of the endocrine system, diabetes mellitus continues to be the disease of most concern to the aviation medicine community. This is due to its relatively high prevalence in the general population; its wide variability in clinical presentation, progression and prognosis; and its combination of acute, incapacitating events, such as hyper- and hypoglycemic episodes, and long-term sequelae, such as neurologic, cardiologic, ophthalmologic and renal diseases. For aviation safety the unpredictability of acute episodes is the major problem, although the AME should be concerned about the long-term health of any applicant who has a history of, or clinical diagnosis of, diabetes mellitus. At each examination the AME should review the health status of the applicant and guide the applicant toward a greater understanding of the disease, its symptoms, its consequences, and its control.

For years persons whose diabetes is controlled by diet alone have been qualified medically to fly, after appropriate review of their clinical status. This will continue. In addition, there is strong evidence indicating that the use of oral sulfonylurea drugs poses only a minimal risk of hypoglycemia in the absence of prolonged fasting, renal impairment or alcohol abuse. Therefore, the categorical disqualification of all persons with diabetes treated with oral hypoglycemic agents is not now justified, and persons with diabetes controlled by oral agents should be deferred to the FAA for a thorough evaluation for possible special issuance. This is a difficult area, because practically every conventional textbook on diabetes states that the oral hypoglycemic agents

presently available can cause hypoglycemic reactions under extreme circumstances. However, it is likewise true that hypoglycemic reactions are preventable in persons who are well informed about their disease, and who are capable of making informed judgment. In general, pilots are well-motivated and capable of understanding and dealing with diabetes requiring oral agents, and thus should be able to control the condition to prevent hypoglycemic episodes. Unless a patient is aged, undernourished, deprived of food, emotionally disturbed, or otherwise prone to hypoglycemia, such episodes are avoidable. The pilot population constitutes a mature, relatively young group who are energetic and intelligent and recognize the dangers in their profession. They have access to food as needed, and they are flying under circumstances that would not necessarily constitute a hazard.

Responses to Endocrine-related Questions in the Medical History

o Diabetes mellitus

A person who reports a present need for insulin to control his or her diabetes is disqualified. A past history of the need for insulin may not be disqualifying if control of symptoms is now satisfactory without such treatment. However, applicants with a past history of any form of diabetes, and those with diabetes presently controlled by diet alone or by diet plus oral hypoglycemic medication should be deferred for a thorough examination according to FAA Form 8500-17.

The presence of other endocrine disorders should be elucidated in the question on medication use and visits to health professionals within the past five years.

Examination for Endocrine Disorders

o Equipment

No special equipment is required. The physician's skills of taking a history, conducting an examination and using laboratory studies are the principal tools in detecting abnormalities of the endocrine system.

o Technique

A protocol for examinations is not provided since the necessary history taking, observation, and techniques used in examining other systems have already revealed much of what can be known about the status of the applicant's endocrine system. For example, the examination of the skin alone can reveal important signs of thyroid dysfunction, Addison's disease, Cushing's disease, and several other endocrine disorders. The eye may reflect a thyroid disorder (exophthalmos), or diabetes (retinopathy).

When the examiner reaches the endocrine portion of the examination a moment should be taken to review and determine if key procedures have been performed in conjunction with examinations made under other items:

1. Are there symptoms and signs of hyper- or hypothyroidism? Has the neck been palpated to determine if the thyroid is enlarged? Is there regional adenopathy? If indicated, are thyroid hormone tests normal?
2. Have the eyes been checked for diabetic retinopathy? Are there neural or vascular changes suggestive of diabetes?

3. Are there signs of abnormal pituitary function such as altered stature or acromegaly? Are visual fields normal to confrontation? Is there extraocular muscle palsy? Are the sexual characteristics normal?
4. Are there signs of calcium excess or deficiency? Is there increased neuromuscular irritability? Is the Chvostek test positive? Is there a history of nephrolithiasis suggestive of hyperparathyroidism?
5. Are there pigmented abdominal striae, truncal obesity or signs of proximal muscle weakness characteristic of Cushing's disease? Is there evidence of excessive pigmentation as in Addison's disease or the ectopic ACTH syndrome?
6. Is there evidence of fluid imbalance or edema? Is there a history of polyuria or polydipsia characteristic of diabetes insipidus?
7. Are there any symptoms of hypoglycemia? If present, do symptoms occur in the fasting or in the postprandial state? Has any treatment been recommended by a physician or dietitian?

o Laboratory tests

Every individual over the age of 40 years who is applying for certification for any class of airman must have a fasting plasma glucose determination. Applicants of any age, who, in the judgment of the AME might have diabetes, should also have a fasting plasma glucose. Indicators of possible diabetes include obesity, past history of diabetes, strong family history of diabetes, and symptoms and physical examination findings suggesting

diabetes. Furthermore, all applicants are to be tested for glycosuria.

Disposition

- o The following list enumerates some of the endocrine disorders that disqualify an applicant. The list is not comprehensive and other disorders may also be cause for denial or deferral. Applicants not issued a medical certificate may request further consideration by the FAA.

1. Acromegaly: Active acromegaly is considered a reason for denial. Persons who have had effective treatment of acromegaly with surgery, radiotherapy or both may be fit to fly. However, such treatment may have cured acromegaly and caused panhypopituitarism. In this case, the applicant must produce evidence of taking adequate replacement doses of corticosteroids and thyroid hormone, and documentation that his or her condition has been stable for a 6-month period of time.
2. Addison's disease: Effective treatment with glucocorticoids and mineralocorticoids can bring an individual with adrenal insufficiency to normal functioning. If such a person can document pharmacological and clinical stability for 6 months, certification may be given.
3. Cushing's disease: Active Cushing's disease is an absolute disqualification for certification. Following effective therapy with pituitary surgery or radiation, an airman may be qualified for certification, either with or without replacement drug therapy, as is necessary.

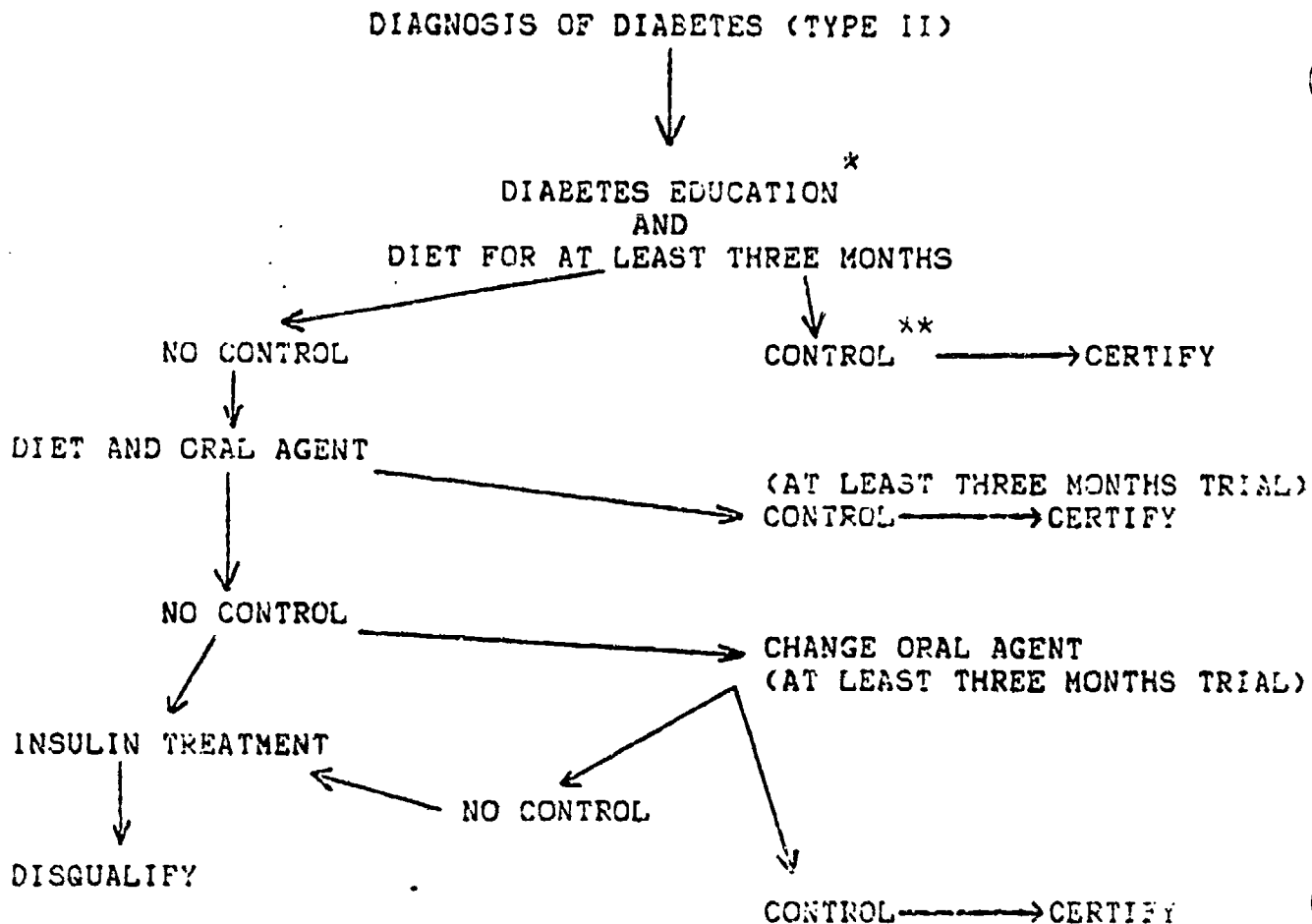
4. Diabetes insipidus: All applicants have a routine urinalysis as part of the examination, which includes specific gravity. A specific gravity of 1.010 or greater is sufficient to exclude diabetes insipidus. For those with a lower specific gravity, the urinalysis should be repeated following overnight dehydration to distinguish normal individuals from those with diabetes insipidus.
5. Hypoglycemia: A diagnosis of hypoglycemia should not be made in the absence of neuroglycopenic symptoms that are confirmed by plasma glucose levels. Symptoms in the fasting state in conjunction with a fasting plasma glucose less than 50 mg/dl suggest organic hypoglycemia and further evaluation is indicated. A history of hypoglycemia itself may not be disqualifying, if appropriate education and dietary measures have alleviated the symptoms.
6. Hyperthyroidism: Active hyperthyroidism is a reason for denial or deferral.
7. Hypothyroidism: Untreated hypothyroidism is a cause for denial, until the applicant has documented appropriate treatment and control of symptoms.
8. Hyperparathyroidism and history of hyperparathyroidism: The examiner should identify those who have had parathyroidectomy and possible hypocalcemia secondary to surgical hypoparathyroidism.

9. Hypoparathyroidism: Hypoparathyroidism is a cause for denial or deferral. However, if the treating physician can report that the applicant has been treated adequately, and that serum calcium levels have been in the normal range for 6 months' time or more, then the applicant may be certified.

o Special Consideration for Diabetes

Persons with insulin-dependent (Type-I) diabetes mellitus or noninsulin-dependent (Type-II) who require insulin for treatment are permanently disqualified for certification.

Persons with noninsulin-dependent (Type-II) diabetes mellitus may be certified provided they can be maintained in good control on diet alone or diet and an oral hypoglycemic agent. "Control" is defined in the revised FAA form 8500-18. Individuals with Type-II diabetes who are certified for flying should be examined at six month intervals, or more frequently as needed, for control. The following algorithm should be used in the certification process:



*

Diabetes education is required for all individuals seeking certification; the education program must be consistent with the guidelines of the National Diabetes Advisory Board.

**

Stable control (See FAA Form 8500-18) should be maintained for at least three months before certification; if an oral agent is prescribed, the smallest possible dose should be used.

Notes regarding "secondary failure" in individuals treated for Type II diabetes mellitus:

1. Plasma glucose >300 mg/dl or <50 mg/dl should result in immediate loss of certification and reassessment.

2. Individuals who are not meeting treatment goals at the time of their 6-month follow-up visit would be given up to three months to reach the designated guidelines. If they are not able to comply, they would lose certification and be reassessed.

The examiner should defer for further examination any applicant with a finding of glycosuria, proteinuria or a fasting plasma glucose of 140 mg/dl or greater. In an individual not known to have diabetes, a fasting plasma glucose of greater than 140 mg/dl on two or more occasions is diagnostic of diabetes mellitus. An applicant with a fasting plasma glucose level that is greater than 115 mg/dl but less than 140 mg/dl also should be deferred for further evaluation. FAA form 8500-17 should be used.

Risk Factors and Qualifications for Flying

Introduction

For the purposes of this report, the term "risk factor" is defined as follows:

"A risk factor is a biological characteristic, the presence of which in a pilot increases significantly the probability of disability with respect to flying above that expected in pilots who do not have said characteristic."

Disability for flying may be abrupt and overt, or gradual and insidious, or have any gradation between these two extremes. The consequences of disability while flying will depend not only upon this gradation but also upon the type of aircraft being flown, the number of qualified pilots present in the cockpit, and the operational circumstances, that is, whether taking off, cruising or landing. It is clear that the Aviation Medical Examiner (AME) must have adequate knowledge of the requirements for the safe operation of an aircraft if he or she is to assess the impact of a given risk factor on flight safety.

The presence of risk factors does not disqualify a pilot, but their presence will bring special considerations into the AME's examination. A risk factor may suggest adding more tests or procedures, or special instructions to the airman, and may even change the interval of time before the next required examination for flying. For example, the airman might be required to return early for a re-check of blood pressure or high serum lipids. The AME should have the authority to "date" the airman's medical certificate so that the pilot is required to have special clinical monitoring. Methods need to be developed to allow any AME chosen by the pilot to be aware of specific

recommendations made during a previous examination for flying.

Risk factors may be naturally present (eg, hypertension) or may be volitionally acquired (eg, smoking). As a rule, risk factors do not cause symptoms. While a risk factor is not disqualifying for flying, it may be prejudicial if it is present in a pilot with a manifest disease or injury.

Three classes of risk factors are defined:

1. Fixed risk factors, not subject to control by the pilot.
2. Fully controllable risk factors, the presence or absence of which is directly determined by the pilot.
3. Semicontrollable risk factors, which can be partially influenced by the pilot, but which are not caused by his or her actions.

Fixed Risk Factors

o Age

Age is not a risk factor per se. It is obvious that some older individuals are much healthier than others who are younger. On the other hand, as one ages the probability of disease increases. Cerebral vascular accidents and myocardial infarctions do occur in the third decade of life, but the probability of such events is much higher in the fifth and succeeding decades. The qualification of the individual pilot should be based upon his or her own characteristics rather than upon those of his or her age cohort. However, the cohort's characteristics may affect the interval between examinations, as well as the content of examinations. For example, while one might be comfortable with a two-year examination interval in a 28 year-old pilot, one would be less comfortable with that interval with a 68 year-old. Also one would also expect a significantly higher yield of abnormal

results from laboratory tests in the latter individual, and therefore assign greater significance to laboratory tests in the determination of flying fitness.

The aging process is not uniform with respect to all body systems. A particularly difficult matter is the intellectual functioning of private pilots who do not have the peer review structure that is available to airline pilots, many corporate pilots, test pilots, and some commercial pilots. The AME must be alert to a reduction in mental functions and analyze critically the results of the mini-mental status examination that is a part of the routine recertification examination.

o Race

Race is irrelevant regarding qualifications for flying. It is true that the frequencies of certain diseases vary among races, but this has very little bearing in the individual case. To be sure there are a few disorders of aeromedical significance that require special attention. Sickle cell anemia and hypertension in blacks, and thalassemia major in persons of southern European ethnicity are examples, and the interests of flight safety dictate that these special characteristics be considered in the design of the examination for flying. For example, a black pilot should be queried about sickle trait or disease in himself or herself or in family members at the time of the initial examination for flying, and a similar case might be made for inquiring about beta thalassemia in a person of Italian decent applying for his or her initial license for flying. The black pilot with "vascular hyperreactivity" is more likely to become a true hypertensive than his or her Caucasian counterpart, and should be monitored more closely.

- o Family history

Family history affects the probability of the development of certain diseases in the off-spring. The AME should be aware of the influence of heredity on the development of breast cancer, hypertension, diabetes mellitus, myocardial infarction, psychoses and alcoholism. The recommended changes to Form 8500-8 include questions about family history of heart disease, diabetes mellitus and glaucoma, and guidelines for the follow-up of airmen who respond affirmatively to those questions are provided in the cardiovascular, endocrine and ophthalmology sections of the AME Guide, respectively.

- o Anthropometric factors

While anthropometry in aviation usually refers to the characteristics of strength, body dimensions and range of motion, the AME must also consider the impact of disease or injury upon the pilot's ability to manipulate controls, especially under emergency conditions.

Current air worthiness standards (FAR Parts 23, 25 and 26) concerning aircraft design were developed for male pilots. It is likely that current anthropometric standards applied to aircraft design are not appropriate for a large proportion of female pilots. Thus, all air worthiness standards should be reviewed; Parts 23, 25, and 26 of the air worthiness standards should be changed to the current British standards, which apply to a more general population and which include standards pertaining to females.

For example, seat adjustments in all aircraft should be appropriate for a

pilot's height of 62 to 74 in. If a pilot applicant is less than 62 in tall, the AME should not certify that pilot as qualified for flying, but rather defer the decision to the FAA for special evaluation.

In order to assess anthropometric risk factors, the AME will need not only data on the strength and range of motion that are required to operate an aircraft, but also instructions on how these measurements were obtained. While the AME should not be required to use sophisticated apparatus to measure body dimensions and functions, he or she should be able to determine whether or not a given pilot can handle the controls of an aircraft under a range of conditions. Such evaluations would apply not only to naturally physical characteristics but also to those as modified by disease or injury.

o Factors specific for females

The physiological changes that occur during the normal menstrual cycle are not reasons for designing medical standards that are unique for women. As with transient acute illness, dysfunctions such as severe dysmenorrhea, menorrhagia, or menstrual syncope would preclude piloting at the time. The AME's counseling during the examination should remind the female pilot that these conditions may affect air safety.

While pregnancy can be a definite risk factor, in general it should not be considered disqualifying for flying. A pregnant pilot with morning sickness, vertigo, lethargy, etc, should be counselled against flying. Also the woman should not act as a pilot when the pregnancy has advanced far enough to become an anthropometric problem. Complications of pregnancy, such as

hypertension, psychiatric disorder, or toxemia, are disqualifying for flying. The female pilot who is contemplating pregnancy should be instructed to confer with her AME for guidance.

Fully Controllable Risk Factors

o Obesity

Obesity can be considered from two aspects, anthropometry and health risk.

A greatly obese pilot may be severely compromised in entering and leaving the cockpit and in manipulating controls while seated. For this reason guidelines about obesity are suggested below.

Obesity is a deleterious factor in the general assessment of health and fitness for flying. The presence of mild hypertension, asymptomatic diabetes mellitus, obstructive pulmonary disease, or degenerative disease of weight-bearing joints would have more serious impact on flight safety if combined with significant obesity.

The "body mass index" is a convenient method for the assessment of obesity and is calculated as follows:

$$\text{Body Mass Index (BMI)} = \frac{(\text{weight in kilos})}{(\text{height in meters})^2}$$

Normally the BMI is 20-25 in males and 19-24 in females. Accordingly, the following three categories are identified:

<u>Category</u>	<u>BMI</u>	
	<u>Males</u>	<u>Females</u>
Overweight	25-30	24-29
Obese	30-50	29-49
Severely obese	50+	49+

For example, a male who is 6 ft (1.83 m) tall and weighs 370 lb (167.8 kg) would have a BMI of 50.2. A male pilot with a BMI above 50 and a female pilot with a BMI above 49 should be denied certification until weight reduction has resulted in a value of 50 or 49, respectively, regardless of the absence of all other health risk factors or medical conditions. Furthermore, a re-evaluation 6 months after return to flight status is recommended if there is reason to suspect a return to a BMI value greater than 50.

o Smoking

The question of whether cigarette smoking is a health risk is no longer debatable. Lung cancer, chronic obstructive pulmonary disease and coronary artery disease have been clearly linked to smoking. While it is not feasible to preclude the smoker from being a pilot, the AME is obliged to encourage cessation of smoking and to offer assistance in this regard. Certainly, smoking should influence the frequency and content of a medical examination. For example, a chest radiograph, spirometry and an electrocardiogram are important in assessing the health status of the smoker, especially one who has smoked at least one pack per day for 20 years or more. Often the medical disorders associated with smoking are insidious and are not recognized by the pilot unless they are pointed out by the AME.

o Drugs

Drugs may be divided into three groups: illicit, over-the-counter, and prescription.

The use of illicit drugs by a pilot is to be sharply condemned. It is unlikely that the illicit-drug user would inform the AME of this behavior. During the course of the examination the AME should be alert to the overt effects of drugs such as depression, irritability, fixed pupils, tachycardia, tremor or inappropriate behavior.

Often pilots assume that because a given compound is available "over-the-counter" without a doctor's prescription, it need not be considered a "drug" and thus it has no bearing on flight safety. It is important that the AME take advantage of the opportunity to educate the pilot about the hazards of certain classes non-prescription drugs, especially anti-histamines and sedatives.

The use of prescription drugs raises two separate issues, the effects on the pilot of the drugs themselves, and the effects on the pilot of the disease being treated. Commonly it is not the drug but the treated disease that is of concern, in the case of as a vasodilator given for coronary artery insufficiency. A detailed consideration of the impact on air safety of legitimate medications is beyond the scope of this report. However, the AME is referred to an excellent reference on drugs and aviation: Mohler SR, Medication and Flying: A Pilot's Guide. Boston, Boston Publishing Co., 1982.

Alcohol, the most commonly abused drug, is considered extensively in the mental and behavioral section. Intake of alcohol that is too liberal or inappropriate for the individual calls for counselling by the AME to prevent the development of alcohol abuse or dependence. Currently, federal air regulations permit drinking alcoholic beverages up to 8 hours before performing pilot duties. It is strongly recommended that this period of abstinence be extended to 12 hours before flying, and that the AME guide pilot-applicants accordingly.

o Stress

Stress is defined in this report as the "exhaustion phase" of adaptations to one or more problems in the life of an individual, as described by Selye. That is, problems have mounted in severity and duration to the point where adaptation begins to fail, resulting in the development of a variety of dysfunctions such as fatigue, depression, inability to concentrate, memory problems, poor judgment, or decline in analytical skills. The effects of stress may be overt and easy to recognize, but they may also be subtle and require careful observation by the AME. A very fine resting tremor, sweaty palms, dilated pupils, rapid pulse, modest elevation of systolic blood pressure, borderline elevation of body temperature or irritability are possible signs of sustained stress; if they are present, they may demand considerable clinical skill in establishing their etiology and significance.

Sustained stress is indeed a risk factor, and if it is severe enough it is disqualifying for flying. If the AME has reason to believe that such a problem exists, consultation with a psychiatrist may be appropriate.

The AME is cautioned against holding the position that flying is "good therapy" for stress. This is the argument commonly put forth by the pilot himself or herself.

After being involved as a pilot in the crash of an aircraft, the pilot should undergo a thorough medical evaluation even if no significant injuries were sustained. Such an evaluation would serve three major purposes:

1. assure that no significant injury has occurred;
2. detect possible post-traumatic emotional disorders;
3. aid investigations of subsequent crashes.

Semicontrollable Risk Factors

o **Serum lipids**

All individuals should have serum cholesterol and triglyceride concentrations at time of their original applications for aeromedical certification (student pilot certificate). If the total serum cholesterol is 230 mg/dl and if the serum triglycerides are 150 mg/dl, or less, no action by the AME is necessary.

If the total cholesterol is 230-300 mg/dl or the serum triglycerides are 150-200 mg/dl, the AME should provide counselling regarding methods to reduce this moderate hyperlipidemia.

If the values for cholesterol and triglyceride serum concentrations are in excess of 300 and 200 mg/dl, respectively, the results should be sent to the

FAA, which should issue a statement of concern and require a recheck of these levels in 6 months. If a pilot does not effect correction of hyperlipidemia of this degree, serum lipid concentrations should be repeated at 6-month intervals until correction is noted. In addition, the complete FAA routine examination should be done no less frequently than annually as long as this degree of hyperlipidemia persists, regardless of the class of medical certificate for which the airman is applying. Familial hypercholesterolemia is uncommon, but 50% of affected individuals will have angina pectoris by the age of 50 years.

The serum cholesterol should also be done on all applicants at age 50 years. If the cholesterol is 30 mg/dl or greater, the applicant must demonstrate a negative response to an exercise stress test before a certificate may be issued.

o **Borderline hypertension**

The individual with a normal baseline blood pressure but whose pressure is often found elevated at a medical examination is called a "vascular hyperreactor," or is said to have "labile hypertension" or "borderline hypertension." While such individuals would ordinarily not be disqualified from flying, evidence has been reported that there is an increased probability of the eventual development of true vascular hypertension. Accordingly, the AME who detects abnormal lability of blood pressure should carefully instruct the pilot on the significance of the observation and advise certain preventive measures, such as avoidance of excess salt intake, proper weight control, and maintenance of an exercise program. Counselling regarding stress management may also be appropriate.

Miscellaneous Risk Factors

Certain elements that can be considered risk factors are not physiological or chemical traits but can still impact upon the health and performance of a pilot. These include habits related to nutrition, exercise, sleep, safety, and characteristics of the environment and social factors.

These are complex issues and are subject to significant cultural variations. The thorough AME would familiarize himself or herself with these aspects of the life of an applicant and take them into consideration in the decision to approve, defer or deny certification for flying. For example, an individual with a bizarre life style involving unusual nutritional and social patterns may be a cause for concern. However, it is obvious that all persons have the right of individuality, and that the AME would have to use careful judgment in determining when factors such as those listed above may have characteristics that impact upon flight safety and/or health. The opportunity to apply such judgment would not present itself if the AME made no effort to delve into these aspects of the life of the pilot. Certainly any pilot who has been imprisoned or otherwise disciplined or penalized for any form of misbehavior should have a medical and psychiatric evaluation before returning to flight duties, regardless of the interval since the previous certification.

Conclusion

Detecting the presence of risk factors need not be a threatening experience for pilots or AMEs. Pilots should know that, except in rare instances, the presence of risk factors is not disqualifying, and that correcting risk factors may add to the length of

time that they will enjoy piloting. By detecting risk factors and by counselling and monitoring their reduction, AMEs will feel the satisfaction of maintaining and improving the health of their special population of patients. A concerted educational effort by the FAA to increase the understanding and practice of health maintenance using the medical certification process will enhance the value of the examinations and the health of 800,000 active, productive individuals.