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Aviation Safety Through Aerospace Medicine
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For FAA Aviation Medical Examiners, Office of Aerospace Medicine Personnel, Flight Standards Inspectors, and Other Aviation Professionals.
U.S. Department of Transportation
Federal Aviation Administra-

HEADS UP

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SHARE This Information With Your Staff and Patients

Aeromedical Certification Update

Revised Policy Announced on Special Issuance Procedures

By Warren S. Silberman, DO, MPH

Dr. Jon Jordan, the Federal Air Surgeon, is continually looking for ways to improve medical certification while still maintaining the integrity of the process outlined in 14 CFR 67.401. He gave us a "heads-up" in his column in the previous issue of the *Federal Air Surgeon's Medical Bulletin* on one such initiative ["Responding to Medical Progress," *FASMB*, winter 2001, page 2]. Well, ladies and gentlemen, here is the essence of our initiative. Upon publication of this edition of the *Bulletin*, we plan to implement this action.

Dr. Jordan has identified 21 medical conditions that are suitable for this new initiative. Each of these conditions requires the issuance of a medical certificate and an Authorization for Special Issuance of a Medical Certificate (Authorization). They will also require special follow-up medical evaluations to help ensure that the airman's medical condition remains stable.

In the past, the special medical evaluations had to be submitted to the Aerospace Medical Certification Division (AMCD) for review before a new medical certificate was issued. Because of the heavy workload at the AMCD, some airmen experienced delays in obtaining their new medical certificates. These delays are frustrating for the airmen, for the aviation medical examiners (AMEs), and for the certification staff at Oklahoma City.

So, a little over a year ago, Dr. Jordan directed that improved lines of communication be established between AMEs, AMCD certification staff, and regional medical staffs to expedite the certification of airmen with medical problems. This process encourages an AME to contact an AMCD physician or regional flight surgeon directly by telephone to get authorization to issue special issuance medical certificates.

Before this change, these cases would have been deferred to the AMCD for disposition. This change, however, substantially increased the workload of the ACMD and regional staffs—but is very effective and will be continued.

The initiative we are implementing with this issue of the *Bulletin* will help to further reduce certification delays and AMCD workload. For all 21 medical conditions, identified below, Federal Aviation Administration (FAA) staff physicians will make the initial certification decisions and grant the Authorizations. The Authorization letter will be accompanied by attachments that specify what treating physician(s) information the airman must provide to request the re-issuance of the medical certificate. Also included will be the criteria for when the AME should defer issuance. This new initiative is limited to airmen seeking third-class medical certificates, and FAA medical staff will review each issuance.

The 21 conditions include the following:

√ Asthma, chronic obstructive airway disease, and sleep apnea
√ A history of atrial fibrillation and paroxysmal atrial tachycardia
√ Chronic lymphocytic leukemia, colon cancer, Hodgkin's lymphoma, lymphoma, and prostate cancer
√ Heart murmur (non-physiologic)
√ Arthritis (rheumatoid and variants), colitis, and urolithiasis
√ Diet-controlled diabetes mellitus
√ Glaucoma and ocular hypertension
√ Hyperthyroidism and hypothyroidism
√ History of migraine syndrome

Continued on page 3...

Doing Things

R i g h t

...Pays huge dividends for everyone concerned

SINCE FIRST JOINING the Federal Aviation Administration in 1969, I have witnessed a dramatic change in the character and quality of the Aviation Medical Examiner (AME) system. I think this change is attributable to a number of factors. These include the establishment of more comprehensive AME selection criteria, better oversight of the system by both our regional flight surgeons and the Aerospace Medical Education Division, enhanced training methodologies, and better communication between AMEs and FAA medical personnel.

Federal Air Surgeon's Medical Bulletin

Secretary of Transportation
Norman Y. Mineta

FAA Administrator
Jane F. Garvey

Federal Air Surgeon
Jon L. Jordan, MD, JD

Editor
Michael E. Wayda

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Authors may submit articles and photos for publication in the Bulletin *directly to:*

Editor, FASMB
FAA Civil Aerospace Medical Institute
AAM-400
P.O. Box 25082
Oklahoma City, OK 73125
e-mail: Mike.Wayda@faa.gov

The Federal Air Surgeon's Column

Jon L. Jordan, MD, JD

'The consequences...were that the image of the certification system was significantly damaged, pilots were substantially inconvenienced, and resources were expended to correct the problems.'

Perhaps, however, the most important factor has been the willingness of AMEs to adapt to technological change and to become more involved in providing services to pilots that facilitate their medical certification. While the AME system has improved significantly over the years, every now and then problems surface that need to be addressed and corrected.

As you know from reading the *Guide for Aviation Medical Examiners* and by attending AME seminars, we expect AMEs to promptly forward the results of medical examinations to the Aerospace Medical Certification Division (AMCD). Failure to do so can have significant impact on airmen and damage the effectiveness of the medical certification system. In addition, it may have significant implications for the AME, both in terms of continued designation as an AME and possible liability if a medically related accident occurs.

In the last year or so, I have become aware of two instances in which AMEs have failed to submit examination results to the AMCD. In one case, the AME blamed a secretary for the problem. He made an attempt to repair the damage by searching his files and belatedly submitting "lost" examinations. In some cases, examination reports had to be reconstituted from notes and in other cases, no information on examinations could be found.

In the case of the second AME, no files could be made available to the FAA indicating that examinations had been performed or what the results of the examinations may have been. Therefore, we had no way of knowing whether the pilots had been properly issued their medical certificates.

Although we made every attempt to accommodate the pilots impacted by the AMEs' inaction, for a number of the pilots there was a cloud over their certification, and it was necessary that they undergo repeat examinations.

The consequences of these episodes were that the image of the certification system was significantly damaged, pilots were substantially inconvenienced, and resources were expended to correct the problems. Because of the magnitude of these problems, the designations of the AMEs were terminated.

Doing things right pays huge dividends for everyone concerned. As you will see by reading **Dr. Silberman's** article in this issue of the *Bulletin* [page 1], we are broadening the involvement of AMEs in certain elements of the certification process, with the objective of improving our services to airmen. Our success in doing this is highly dependent upon the willingness of AMEs to participate and the care that is taken to ensure that correct certification decisions are made.

In initiating this action, we are relying on AMEs to carefully follow the requirements of the Authorizations granted by the agency. Unless this care is taken, we run some risk that the initiative will "bog down" the certification process—and the process will be impeded, rather than improved.

We are counting on all of you who participate in the process described by Dr. Silberman to "do it right." In spite of the two situations I related in this article, I believe that you will.

I also believe that we will be much further along in our objectives of providing quality service to the aviation community.

JLJ

Certification *from page 1*

Each pilot's medical condition will be assessed on an individual basis, and the special medical information requested may vary, depending on the circumstances.

AMEs may not issue medical certificates to airmen who have one of the identified conditions unless:

(1) The airman has an Authorization granted by the FAA,
(2) The airman has all the information required by the Authorization, and
(3) The required medical information indicates no adverse change that necessitates deferral to the AMCD or to the regional flight surgeon.

The following questions and answers are provided to help further explain the new process.

Q— How will I know if it's okay for me to issue a medical certificate to a pilot who has one of the 21 listed medical conditions?

A— You may only issue if the pilot has an Authorization letter granted by the FAA. The letter will specifically permit you to issue a certificate, usually with a time limitation, if the pilot has all the information requested by the FAA and if the information is favorable according to the FAA criteria.

Q— How will I know what special follow-up information is required and what criteria should be used to determine that it's okay to issue a new certificate?

A— When the medical certificate Authorization is granted, the pilot is provided with specific information on what is required for a special issuance in the future, how often it is required, and what criteria are used to decide whether a new certificate may be issued. The pilot is directed to make all of this information available to the AME.

Q— Suppose the pilot has an Authorization, and the medical information presented by the pilot looks okay, and I believe there's been no change in his or her condition—but one of the requested pieces of information is missing— may I issue a certificate?

A— No. The information must be complete and comply with all the requirements in the Authorization. All information must be favorable to the pilot, and it must be consistent with the guidance information provided to the pilot at the time the Authorization was granted.

Q— If the treating physician and I don't agree with the criteria established by the FAA for recertification of the pilot, is it okay if I issue a certificate?

A— No. For purposes of assuring uniformity in our decision making, the guidance must be followed consistently, and you must defer the issuance. If, upon further review the FAA agrees that there has not been a significant change in the pilot's condition, the FAA will issue the certificate.

Q— I am concerned that I may overlook something and make a mistake. Will the AMCD medical staff or the regional flight surgeons be reviewing my work?

A— Yes. The medical staff at the AMCD or the region will review each issuance of a certificate under an Authorization.

Q— Will this procedure extend to all classes of medical certificates?

A— No. Initially, this procedure will apply only to third-class Authorizations.

Q— If I am uncertain whether to issue the airman a medical certificate, may I call the AMCD or my regional flight surgeon for advice?

A— Yes, but if you cannot make contact with FAA staff, you must defer the decision to the FAA.

Q— What if the time for the pilot to submit the follow-up information does not coincide with the time for another regular FAA examination? Should I conduct a new examination anyway?

A— No. The interval between required follow-up examinations may be less than the intervals between regularly required FAA examinations. If this is the case, a new regular FAA examination is not required.

Q— If no regular examination is required, may I charge the pilot a fee for reviewing the medical information and issuing a new certificate?

A— Yes. You may charge a reasonable fee for providing this service to the pilot. The amount of the fee is a matter to be determined by the AME and must be acceptable to the pilot.

Q— I have a very busy medical practice and can devote only so much time to performing FAA examinations. Do I have to participate in this new initiative?

A— No. Pilots with Authorizations have the option of having their required follow-up information reviewed either by AMEs or by the FAA medical staff. We would like for you to participate in this initiative, but if you are unable to do so, it is okay.

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AN EXAMPLE OF THE TYPE OF INFORMATION THAT WILL BE REQUIRED AND CONSIDERED ACCEPTABLE FOR AN AME TO ISSUE A CERTIFICATE AFTER AN AUTHORIZATION HAS BEEN GRANTED

History of Paroxysmal Atrial Fibrillation

Information required

1. A summary of how the airman has done since the last FAA examination to include mention of any further episodes
2. Current medications and any side effects
3. 24 hr. Holter Monitor

No Issuance permitted if:

1. There is a recurrent episode of fibrillation
2. Chronic fibrillation occurs
3. The airman is placed on anticoagulation

Dr. Silberman manages the Civil Aerospace Medical Institute's Aerospace Medical Certification Division.

Vasovagal Syncope Episode in an Airman

Case Study, by Leonid M. Katkovsky, MD

This is the case study of a 43-year-old white male who applied for a third-class medical certificate on 11/03/99. His application was deferred to the Aerospace Medical Certification Division (AMCD) for further evaluation because he had experienced an episode of syncope in September 1998.

History. The applicant's cardiologist provided the most recent (11/23/98) complete history and physical examination. The applicant has had 4-5 episodes of pre-syncope since 1997. He described them as a lightheaded feeling with a change in his vision but no syncope. The episode of frank syncope took place while he was recuperating from a viral syndrome with diarrhea, fever, and malaise. He had no episodes on exertion and denied any chest pain, shortness of breath, or vertigo. He also denied any TIA symptoms or focal neurologic symptoms. He was allergic to sulfa drugs; took 1 multi-vitamin/day. Medical history was unremarkable, with no hypertensive or cardiac risk factors. A review of systems was otherwise negative.

Social history. He is a non-smoker; married, with no children; no record of alcohol abuse.

Surgical history. In 1965, "lazy eye" surgery was performed.

Physical exam. Well-appearing airman in no distress. Blood pressure: 132/88 and 122/86 in right and left arms (respectively) without orthostatic changes. Pulse: regular at 68 BPM; weight: 189 lb; height: 6'2". Neck: no jugulovenous distention. Carotids: 3+ and symmetric without bruits. No thyromegaly or masses. Chest: Clear. Heart: PMI–normal. S1&S2 –normal; no S3 or S4 clicks, murmurs, or rub. Abdomen: soft, nontender, no organomegaly or masses. Extremities: pulses 3+, symmetric; no edema, cyanosis, or clubbing; no venous varicosities. Neurologic: oriented x 3 with normal mood and affect. Generally non-local exam. ECG: normal sinus rhythm with normal tracing. CXR: negative. Holter monitor: no arrhythmias. 2-D echocardiogram of 12/09/98: normal. Tilt table study of 12/09/98: strongly suggestive of hypervagotonia syndrome with a drop in blood pressure to 70/31 and a junctional rhythm of 63 during Isuprel infusion with tilting. He became lightheaded (with no visual symptoms mentioned) and presyncopal but did not have frank syncope.

At that time, trial beta-blocker therapy with Lopressor 25 mg PO BID was recommended, based on the results of the tilt table test (TTT).

Aeromedical Disposition. If an airman suffers a syncopal episode and reports this to the AME, he/she should obtain all the information surrounding the event (s). We needn't tell you that the history of the event is most important. When you have all of this in hand, you can give the AMCD or the regional medical office a call. If the syncope is shown to be vasovagal, the likelihood of medical certification is good. Should the airman procrastinate with the supporting documentation, the AME should defer the case.

The terms *vasovagal syncope*, *neurocardiogenic syncope*, and *neurally mediated syncope* are synonymous. However, if the individual has a cardiac arrhythmia such as asystole or bradycardia, it is called *malignant cardioinhibitory syncope*. It is the latter form of syncope that the AMCD does not grant medical certification until a sufficient period of observation is done. If, with adequate history, the airman can prove that it was only vasovagal syncope, then certification is usually granted. An airman with recurrent episodes of vasovagal syncope is not granted medical certification.

Continued on page 12...

Dr. Katkovsky was a resident in Aerospace Medicine at the Civil Aerospace Medical Institute when he wrote this report.

Environmental and Safety Issues Associated With PBDE Flame-Retardants

By Arvind K. Chaturvedi, PhD

Abstract: Polybrominated diphenyl ethers (PBDEs) are extensively used as flame-retardants in many commercial products, including aircraft materials. These ethers have been detected in various parts of the environment, but not much information is available about their environmental toxicity. PBDEs are effective in saving lives by preventing fires. Therefore, there is a critical need for the evaluation of the merits and demerits of PBDEs.

TO PREVENT the occurrence of fire, PBDEs (polybrominated diphenyl ethers) are used as flame-retardants (Fig. 1; 1-4) in the housing, back covers, and electronic parts of color televisions and personal computers; in textile coatings; and in seats of cars, buses, and aircraft. In aircraft seats, PBDEs are generally used in upholsteries and polyurethane foam-based cushions. The PBDE-treated urethane foam is preferred in seating, since PBDEs neither discolor the foam nor decrease its durability. PBDEs could also be present in commercial products used in other foams, fabrics, panels, potting compounds, and other materials used on aircraft.

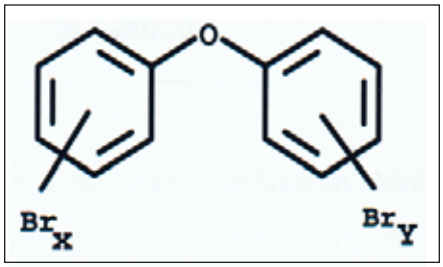


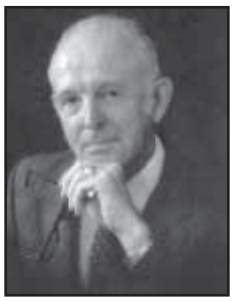
Figure 1: Chemical Structure of PBDEs

Chemically, PBDEs are aromatic hydrocarbons and are only slightly soluble in water (1-4). Most of the PBDE congeners found in commercial flame-retardants are lipophilic, bioaccumulating, and biomagnified. These industrial chemicals are considered to be environmentally persistent organic pollutants, as they tend to concentrate at nonpolar surfaces of soil particles and in living organisms, and to degrade slowly in the environment. PBDEs accumulate in sediment and biota, and apparently

Continued on page 16...

AME Profile: Louis S. Moore, MD

*Dr. **Louis Moore** is a practicing aviation medical examiner who has specialized in aviation medicine for more than 41 years. He is a pilot who enjoys flying Cessnas, also has a glider rating, and as the president of his flying club, is active in the aviation community. His first solo flight was in 1942. This 78-year-old physician had a few observations to make about some of the articles that appeared in the winter 2001 issue of the Bulletin, and we present them here, verbatim, to describe his views about flying, aviation medicine, and related issues. —Ed.*



I enjoy reading the *Bulletin* and usually find one or two articles of special interest to me. I have been a pilot for 53 years and an AME for 41 years, but still have a few things to learn. I would like to comment on several items in the current issue and would ask you to pass on my comments where appropriate.

Dr. Jordan [editorial, page 2]- **Changes in certification process**: Most of the changes through the years I have considered to be helpful in improving efficiency without jeopardizing safety - such as reducing the hearing test to spoken voice, both ears.

I would like to find a way to make the color vision test more practical since the pseudoisochromic plates are much too sensitive and result in a lot of expensive hassle for marginal pilots. A simple red-green-blue-yellow-white lamp would be great. I think I could build one from Radio Shack parts for about $15.00. At present my pilots must make arrangement and go 100 miles away to take a simple test. The other option would be to authorize the AME to conduct the test at a local tower-controlled airport.

I think the new standards for blood pressure are a bit low since this level does not indicate a risk in the near future, which is what the exam is all about.

Assistance from Oke City is always great! — prompt and courteous.

Delegating responsibility: This is a tough one and will depend as much on the experience and skill of the AME as the specific item involved. An AME who is a pilot and does 600 exams a year is obviously better equipped to make a judgment call. I wish all AMEs (and tower operators) were active pilots.

Pg. 3 - Aviation bill:
With the locked cockpit doors, the designers had better start putting a portta potty in the cockpits. The hassle to get to the restroom is so bad that service in the cabin is disrupted and the pilots are even cutting back on their fluids - which is not at all a good idea.

Pg 8 - Transoceanic Emergency:
That passenger sure picked the right flight to have his syncopal episode. The handling of that situation was textbook perfect!

Which brings me to my subject. Many doctors now routinely refuse to identify themselves to the cabin crew and might even refuse to respond to a call for help. I consider this unethical, unprofessional, immoral, and a few worse epithets. I am proud of my position and feel I have an obligation to help in every situation — deal with the lawyers later.

They claim they fear a lawsuit, but I think this is a paper tiger. I doubt if there has ever been a successful lawsuit against a doctor for rendering assistance in flight.

The airline industry, with a little help from you people, might put this myth to rest with a little research. Check out the malpractice carriers and see if they have ever had a claim paid, or even one filed.

If my guess is correct, this could be widely publicized to the medical profession and maybe get some of these cowards to stand up and be counted. At the same time, put out information about the on-board medical equipment and the telephone consultations available.

Another aspect of this is the shabby treatment the doctor may get for his help. I have intervened in three cases that might have had to turn back and in each case was able to assure the pilot that it was safe to go ahead. Think of the thousands of dollars it would cost to turn a plane back when it is three hours out of New York for Paris.

In two cases, I was given a bottle of wine by the cabin crew and in two I received a formal letter of thanks six weeks letter. In one case, there was no response at all. No one offered me an upgrade or passes or even tickets to Disney World.

If a passenger offers to get "bumped" when there is overbooking, he may get a free ticket to anywhere plus a few hundred dollars. If the industry would offer some really worthwhile rewards for our help, it would make us feel more appreciated. They could even offer an upgrade to a doctor who volunteers as he comes on board if there are seats available - or maybe just a good meal, for a change.

Please pass this along to someone in the industry who might see some value in it.

Pg. 13 - AME fees [Training Notes]:

Years ago I charged class one and two pilots a bit more than class three. Then I got to thinking —*These guys are trying to make a living and they are putting money in my pocket twice a year, why should they pay more?* For the class three, flying is optional, and I only see them every two years. Now I have a flat fee and I chose the low end of the scale. I sometimes charge extra when I handle a complicated case with more paperwork. *Hey, fellows, give it a thought.*

Louis S. Moore, MD
Naples, Fla.

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The Alaska Capstone Program: Increasing Safety Through Technology

By Kevin W. Williams, PhD

IN THE SOUTHWEST corner of Alaska, centered around the small town of Bethel, lies one of the largest laboratories in the world. This laboratory is not a building but consists of approximately 40,000 square miles of land, and its accompanying airspace, in an area known as the Yukon/Kuskokwim (or Y/K) delta.

Within this laboratory the Federal Aviation Administration is conducting an ongoing experiment aimed at testing new avionics technology for general aviation (GA) aircraft. Participants in the experiment, which is called the Alaska Capstone Program, are pilots and flight companies in the Y/K delta. Approximately 150 GA aircraft have been equipped with the advanced avionics equipment. Figure 1 shows the avionics that are installed in each aircraft participating in the Capstone program. The avionics consist of a multi-function display unit, the Apollo MX-20, and an accompanying Global Positioning System (GPS) display, an Apollo GX-50/60.

Figure 1. Capstone avionics displays. Installed in each aircraft participating in the Capstone program, the avionics consist of a multi-function display unit, the Apollo MX-20 (top) and an Apollo GX-50/60 Global Positioning System display.

Capstone's Objectives

The purpose of this program is twofold. The first is a test of whether or not the technology can improve flight safety in Alaska by providing better information to the pilot regarding terrain, traffic, and weather in the vicinity of the aircraft. The second is to test the new avionics in a relatively controlled environment to aid in the transition of the technology to the entire country. Both aspects of the experiment are assisted by human factors scientists from the Office of Aerospace Medicine, at the Civil Aerospace Medical Institute (CAMI) in Oklahoma City.

Flight Safety in Alaska

A look at some basic facts regarding flight safety in Alaska demonstrates the need for improved safety. The following facts were released recently by the Alaska Capstone Program Office in Anchorage, Alaska:

- 1 out of every 58 people in Alaska is a pilot
- There are 6 airplanes for every 10 pilots in Alaska
- There was an average of 1 aircraft accident every other day in Alaska during the past 10 years
- There was an average of 1 aviation fatality every 9 days in Alaska during the past 10 years
- Of the commercial pilots that spend their 30-year career flying in Alaska, more than 11% will perish in their aircraft, as compared to 2.5% of the pilots in the other 49 states.

Improving flight safety in Alaska is of major importance to the FAA. If the technology being tested under the Capstone program can accomplish this goal in Alaska, it will pave the way for implementation on a nationwide basis.

Automatic Dependent Surveillance – Broadcast

The capabilities being offered to the GA community under the Capstone program have only been generally available before to commercial airlines and high-end GA aircraft. The ability to see traffic and weather on a cockpit display is usually provided by expensive onboard detection systems. To provide such capabilities in a less expensive manner, a ground- and satellite-based infrastructure was created called Automatic Dependent Surveillance - Broadcast, or ADS-B. Unlike radar systems, which bounce radio waves off of airborne targets and then interpret the reflected signal, ADS-B relies on position information that is transmitted by each individual aircraft based on global positioning system (GPS) technology.

Each ADS-B equipped aircraft broadcasts its precise position in space via a digital datalink, along with other data — airspeed, altitude, and whether the aircraft is turning, climbing, or descending. This information can be transmitted directly from one aircraft to another, or it can be transmitted

Continued ➢

Dr. Williams is a research scientist with the FAA Civil Aerospace Medical Institute's Human Factors Research Laboratory.

to a ground station, combined with other aircraft data, and re-transmitted back to any aircraft within range of the ground station. The information can also be transmitted by land lines or other means to air traffic controllers in distant locations.

ADS-B allows pilots in the cockpit and air traffic controllers on the ground to "see" aircraft traffic with much more precision than has ever been possible before. Unlike conventional radar, ADS-B works at low altitudes and is effective in remote areas or in mountainous terrain where there is no radar coverage, or where radar coverage is limited.

Flight Information Services – Broadcast

In addition to information related to other aircraft, other types of information can be broadcast from ground stations to Capstone-equipped airplanes. Flight information services include graphical weather depictions, as well as text-based weather and other information such as Notices to Airmen (NOTAM). Since weather plays a major part in many aircraft accidents in Alaska, the availability of current weather conditions, presented in an easily interpreted graphical format, is expected to be of great help to Alaskan pilots. The graphical depiction of NOTAMS, showing, for instance, that a runway has been closed at a particular airport, should also make it easier for pilots to maintain awareness of important information both before and during their flights.

CAMI's Role

Human Factors scientists from CAMI have been assisting in the Capstone Program for several years. CAMI scientists participated in the team that selected which set of avionics would be used in the Capstone Phase I Program, developed criterion measures for use in demonstration flights of the selected avionics, and developed and assisted in the administration of performance measures of the equipment.

CAMI scientists currently participate as members of the Safe Flight 21 Human Factors Team in the collection of data from the Bethel region. Members of the team have conducted personal interviews with Capstone pilots, administered questionnaires, and flown on observation flights during actual day-to-day operations of the Capstone equipment.

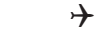
Experiments are also under way to collect both objective and subjective data regarding the use of Capstone equipment under various environmental and workload conditions. CAMI's two flight simulators are being equipped with Capstone avionics for use in the conduct of these investigations.

The Future

The second phase of the Capstone Program is about to begin in the southeast portion of Alaska, centered around the Alaskan state capitol of Juneau. Capstone Phase II will include both a multi-function display and an optional highway-in-the-sky display as part of its avionics package. Another 150 GA aircraft, both fixed-wing and rotary, will be equipped with the Phase II avionics.

While the primary focus of the Capstone Program is on increasing flight safety in Alaska, the Safe Flight 21 Human Factors Team is looking at the program as a proving ground for these new types of avionics. A thorough human factors assessment of the instrumentation and procedures will ensure that the pilot-aircraft interface is optimized for safety of flight—wherever that flight will occur.

It is expected that, in the near future, these avionics systems, as well as the ground infrastructure to support them, will be seen in the lower 48 states, and eventually around the world. What we are seeing in the Capstone Program is the start of a paradigm shift in general aviation cockpit displays. The CAMI scientists supporting this effort are excited to be a part of this event.



The Civil Aerospace Medical Institute's Web Site is *Simmering*

Those creative "chefs" at the Civil Aerospace Medical Institute have been busy "cooking" video programs so they can be viewed online at the Institute's Web site (www.cami.jccbi.gov). Several appetizers showing such events as impact tests have been available online for more than a year, but with the help of advancing technology, the main course of items will be available soon for viewing on your computer screen.

Cooking video means reducing the image size to consider network bandwidth restrictions, so a program "stream" can be easily viewed on home or corporate computers at the user's connection speed.

The menu of main course items will include the latest productions made for pilot education by the CAMI Airman Education Program people. Some of the titles for the pilot physiology series are *Fit for Flight, Flying and Hypoxia, Spatial Disorientation*, plus global survival topics about hot and cold weather survival, water survival, and how to stock a survival kit with practical items for emergency use—a very useful subject with spring and tornado season approaching.

Other video series are being prepared for use by FAA aviation medical examiners: 29 vignettes reviewing clinical aerospace physiology, and 30 skits demonstrating correct actions to take in aeromedical certification cases. Also to be shown are the Mike Monroney Aeronautical Center's Mission Briefing program and the CAMI video describing programs and activities at the Institute.

The programs will be viewable online using Microsoft Windows operating systems 98, 2000, XE, and ME; the common viewer is Microsoft Media Player.

The FAA IntrAnet is available now. IntErnet (the world) will be available this spring after beta testing.

Sleep Disorders In Pilots

By Virgil D. Wooten, MD

Aviation-related accidents are caused by human error 80% of the time. The role of sleep disorders in these mishaps is unknown and probably underestimated. Recognition of the causes and signs of fatigue and sleep disorders is central to safe and effective air operations. Recognition and treatment of sleep disorders may lower the rate of aviation accidents and improve operational effectiveness.

Obstructive Sleep Apnea

OBSTRUCTIVE SLEEP APNEA (OSA) results from repetitive partial or complete upper airway collapse upon inspiration, resulting in loud snoring, hypoxemia, and subsequently, brief arousals. It is typically progressive, especially with weight gain.

As OSA becomes worse, oxyhemoglobin desaturations become more frequent, longer and lower. Hypertension may develop or worsen, especially in the morning.

The repetitive brief arousals caused by sleep apnea lead to the same effects caused by sleep deprivation. OSA patients typically complain of daytime fatigue, sleepiness, morning tiredness, concentration impairment, memory impairment, and irritability. The amount of sleep required to maintain function may begin to increase. As in sleep-deprived individuals, those having OSA may tend to deny or underestimate the extent of impairment caused by the illness. Several studies have indicated that individuals with OSA have much higher rates of automobile accidents, but adequate data on aviation mishaps in afflicted individuals are currently lacking.

OSA is caused by multiple airway anatomical and medical problems. Allergic rhinitis, nasal septal deformity, nasal polyps, maxillary hypoplasia, micrognathia, retrognathia, soft palate elongation, adenotonsillar hypertrophy, and other causes of airway reduction contribute to the development of OSA. All must be considered and addressed if the illness is to be effectively treated. OSA should also be viewed as a chronic and relapsing illness, needing periodic reassessment. Before treatment is attempted, OSA should be verified and the severity quantified by polysomnography. There is wide variation in individual impairment caused by OSA, and the true severity of the illness is not predictable based on history alone. The patient's report of improvement following treatment interventions is not reliable, due to partial treatment response, placebo effects and fear of loss of occupation or benefits. The Multiple Wakefulness Test, a modification of the Multiple Sleep Latency Test, assesses the ability to stay awake. It is probably less useful than sleep testing during real and simulated driving and piloting tasks, but the lack of simulator testing availability and validated measures of fitness for duty makes the MWT the most widely used assessment for alertness.

Weight loss is helpful in obese OSA persons, but unfortunately the failure rate is high. Airway devices or surgical correction are usually needed to correct the disorder. The devices offer rapidity of treatment, reversibility, flexibility, low risk, and low cost when compared with surgeries. Compliance problems, unpredictable effectiveness, and the possibility of relapse limit both surgical and nonsurgical approaches. Nasal Continuous Positive Airway Pressure (CPAP) is highly effective; however, compliance can be a problem. Nasal occlusion, drying, claustrophobia, discomfort, and rhinitis often interfere with its use. Oral appliances that protrude the mandible are effective in mild to moderate cases of sleep apnea and can be used in most operational situations.

Nasal septal repair, turbinate reduction, and nasal polypectomy, together or alone, are important adjunctive surgical treatments but rarely work when done without also enlarging the oropharynx and/or hypopharynx. Uvulopalatoplasty (UPP), currently the most commonly performed procedure for OSA treatment, is successful less than 30% of the time when strict criteria (respiratory disturbance index of < 5/hr) for cure are used. The success rate is reduced in the obese, elderly and those with multiple airway anatomical problems. Concomitantly performing genial tubercle advancement increases the chance of cure.

Maxillomandibular advancement is usually performed after UPP has failed, but may be done as the primary procedure in individuals with maxillofacial problems. Glossectomy, hyoid suspension, and hyoid anchoring may pose more risk of morbidity. In-office surgical procedures that minimally alter the airway are unlikely to help OSA. Radiofrequency Volumetric Tissue Reduction applied to the tongue base may assist in the treatment of OSA but still needs further investigation.

Narcolepsy

An uncommon neurological illness, narcolepsy most often begins in youth. It most cases, the sleepiness is extremely severe and pervasive. Afflicted individuals often report the inability to stay awake even in the most stimulating circumstances. Difficulty awakening in the morning is common. Sleep attacks, or irresistible urges to sleep, are characteristic and are often aborted or prevented by naps of less than 30 minutes. Narcoleptics often report dreaming during naps.

Cataplexy, a sudden voluntary muscle weakness lasting up to five minutes, is brought on by emotions such as laughter, anger, or excitement. There is no associated dizziness, or post-event fatigue. The weakness can be generalized or affect specific muscle groups. Sleep paralysis can occur in narcolepsy. The patient awakens fully, yet is unable to move for a

Continued ➢

Dr. Wooten is a special medical consultant in sleep disorders to the Federal Air Surgeon, is an FAA aviation medical examiner, and is the Medical Director of TriHealth Sleep and Alertness Center, Good Samaritan and Bethesda Hospitals, Cincinnati, Ohio.

few seconds or minutes. Hallucinations are common in the transition into and out of sleep. Cataplexy, sleep paralysis, and hallucinations are not always present in narcoleptics. The symptoms are all manifestations of aberrant control of REM sleep-related processes.

Only partial and temporary control of the sleepiness can be achieved with stimulants such as modafanil, pemoline, methylphenidate, and amphetamines. Cataplexy, sleep paralysis, and hypnagogic hallucinations are improved by antidepressants and gammahydroxybutyrate, but these medications are prohibited.

Following an overnight polysomnogram to verify adequate sleep and absence of sleep pathologies that could cause sleepiness and REM sleep onsets during the nap trials, the diagnosis of narcolepsy is made by performing a multiple sleep latency test (MSLT). Two or more REM sleep onsets with evidence of pathological sleepiness are desirable to confirm the diagnosis. The MSLT is a better measure of the ability to sleep than the ability to stay awake; therefore, it should not be used as a test for the ability to maintain alertness or vigilance. Genetic testing for narcolepsy is not diagnostic, but there is a genetic predisposition for the disorder. The cause of narcolepsy is now believed to be due to degeneration of CNS hypocretin-orexin cells, triggered by unknown environmental causes in susceptible individuals.

Insomnia

Chronic insomnia affects 10 to 30% of the population. Its prevalence and importance in the aviation population is less certain. Studies of performance in chronic insomniacs have given mixed results, with some studies suggesting performance impairments and others showing little, if any. Insomnia is a complaint that may have multiple causes. Insomnia due to anxiety and depression, for example, has more bearing on flight operations than insomnia due to sleep state misperception, in which there is adequate sleep but impaired ability to perceive that sleep has occurred.

More senior flight personnel have more difficulty adapting to unfamiliar (hotel insomnia), uncomfortable, noisy, or bright sleeping accommodations. Nearly all insomniacs develop poor sleep habits and frustration, which may perpetuate the problem. Therefore, good sleep habits and relaxation training are essential to the effective treatment of insomnia.

Sleep Hygiene

- Use the bedroom for sleep and sex only—no TV, music, business, or arguing in bed.
- Avoid looking at the time.
- Avoid alcohol, caffeine, and heavy meals before bed.
- Schedule a worry time, planning session, and wind-down time *before* getting into bed; make lists of things to do the next day.
- Make the bedroom quiet, comfortable, dark, and secure. Use white noise generators if the environment is noisy. Minimize disruptions, e.g., pets.
- Get out of bed after lying awake for more than 20 minutes—do something boring or run through relaxation techniques.
- Avoid exercise and hot baths within 3 hours of bedtime.
- Exercise regularly, in the morning or afternoon.
- Keep a regular bedtime and get-up time.
- Do not spend excessive amounts of time in bed, e.g., if you can sleep only 7 hours spend no more than 7.5 hours in bed.
- Avoid excessive napping, which can interfere with the ability to sleep at night.

Restless Legs Syndrome (RLS)

RLS is an annoying but non-painful condition that occurs in the evening hours and with prolonged sitting or lying. Involuntary jerks and twitches are frequently observed while awake, and usually there are rhythmic leg jerks occurring about every 20-40 seconds after sleep onset (periodic limb movements of sleep, PLMS). The afflicted individual experiences an overwhelming need to move the legs, which gives temporary relief. Caffeine, alcohol, anticholinergics, antihistamines, antidepressants, antipsychotics, diuretics, decongestants, and theophylline can aggravate the condition. Iron deficiency, anemia, uremia, vitamin deficiencies, and electrolyte abnormalities can aggravate RLS. Iron supplements have been reported helpful, but because of the risk of iron overload, it is recommended that ferritin and iron panels be obtained and followed. A number of drugs have been reported effective in small case studies. Dopamine agonists (levodopa, bromocriptine, pergolide, pramipexole, ropinirole), clonazepam, and narcotic analgesics have been demonstrated to be the most effective, but the last two are contraindicated.

In the last 20 years, there have been major advances in the understanding of sleep disorders and their treatment. The aviation medicine specialist can play a pivotal role in evaluating pilots with sleep disorders. The recognition and treatment of sleep disorders can prevent the potentially catastrophic outcomes, especially when these disorders are combined with fatigue-inducing operations.

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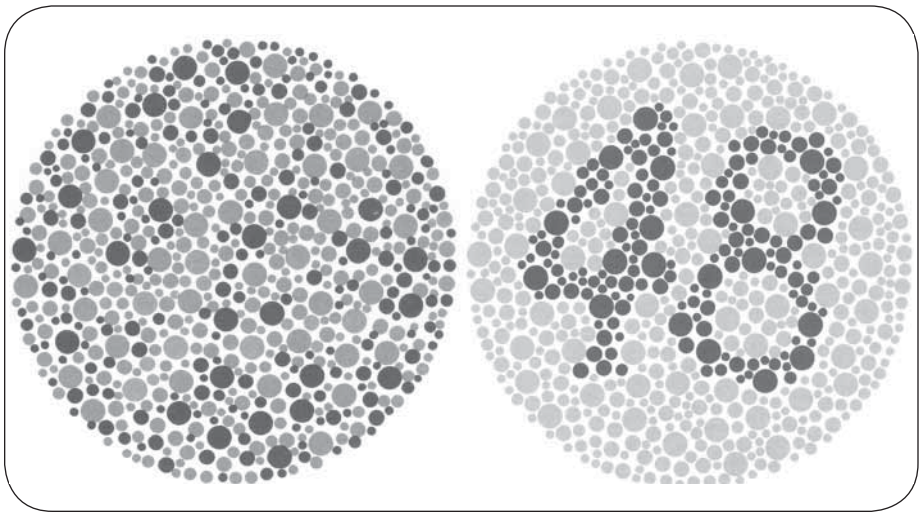
Color Vision in Black and White: An Update

By Ingrid Zimmer-Galler, MD



Examples of Dvorine pseudo-isochromatic plates for color vision testing (left: 92, right: 48).

THE MEDICAL STANDARDS in Part 67 specify that applicants for all classes of medical certification have the "ability to perceive those colors necessary for the safe performance of airman duties." There is no doubt that color discrimination plays an important role in "the safe performance of airman duties."

Navigation lights, airport beacons, runway lights, taxiway lights, aircraft position lights, and colored light signals need to be identified. Similarly, various colors are used on aeronautical charts as well as in the electronic flight information systems in modern aircraft. Therefore, even though form vision is most important in the performance of a pilot's tasks, color vision clearly increases efficiency and safety.

Although aging and various eye diseases may lead to acquired color vision defects, virtually all clinically significant color vision abnormalities are congenital. The pilot population is still predominantly male, and color vision abnormalities are predominantly a male disorder. With nearly 8.5% of all males having a congenital color deficiency, it is easy to understand why color vision concerns are a common problem for the aviation medical examiner (AME).

Congenital color vision defects are sex-linked recessive traits, and only 0.5% of females are color-deficient. Most persons with a color vision deficiency can distinguish some colors and should not be labeled as "colorblind." In fact, approximately one-third of affected individuals have only a mild color vision deficiency. Such individuals have been shown to be safe in the aviation environment. The remaining two-thirds of affected individuals have moderate-to-severe color vision defects and may be unsafe for aviation duties. Many of these individuals will also have poor visual acuity.

There are three classes of cones in the retina, each of which absorbs light with a different peak sensitivity to perceive blue, green, and red color. Any color of the spectrum may be constituted with varying combinations of these three primary colors. Color deficient individuals recognize three distinct hues but have a weakness in one of the hues. Colorblind individuals, on the other hand, have a complete absence of color sensation in addition to poor central vision.

For the AME, it is not important to classify the type of color vision deficiency (for example, protanomaly, deuteranomaly, dichromatism, achromatopsia) but only to determine whether the applicant has sufficient color vision to safely perform aviation duties. FAA-approved color vision screening tests reliably separate mild color vision abnormalities (safe for flying) from moderate-to-severe deficiencies (not safe for flying).

Because it does not affect their daily activities of living, it is not unusual for student pilots to first learn of a color vision abnormality at their first physical by an AME. Individuals who cannot pass the color vision test administered by their AME will receive a limitation on their medical certificate stating "not valid for night flying or by color signal control." There are two options available to the airman for removal of these restrictions from the medical certificate:
1) Successful completion of an alternate FAA-approved color vision test or
2) Issuance of a SODA (Statement of Demonstrated Ability) after successful completion of a light signal test.

The first option is more desirable for the pilot applicant. If an applicant is unable to pass the color vision test during the flight physical, provide a list of acceptable alternative color vision tests (see list, below), and advise the applicant to seek out an ophthalmologist or optometrist to administer one of the alternate tests.

The tests most commonly used by ophthalmologists and optometrists to screen for color vision abnormalities are all on the list of alternately approved tests. Applicants with more severe color vision defects (those considered unsafe for flying) will not be able to pass any of the alternate screening tests. How-

Continued ➤

Dr. Zimmer-Galler is an Assistant Professor of Ophthalmology at the Wilmer Eye Institute, Johns Hopkins University School of Medicine. *This article previously appeared in the February 2002 Flight Physician, the newsletter of the Civil Aviation Medical Association, and is reprinted with permission.*

Color Vision Screening Tests Approved by the FAA

Pseudoisochromatic plates:

AOC, 1965 edition, plates 1 – 15 (need less than 7 errors)

AOC-HRR, 2nd edition, plates 1 – 11 (no errors in plates 7 – 11)

Dvorine, 2nd edition, plates 1 – 15 (need less than 7 errors)

Ishihara, 14 plate, plates 1 – 11 (need less than 6 errors on plates 1 – 11)

Ishihara, 24 plate, plates 1 – 15 (need less than 7 errors on plates 1 – 15)

Ishihara, 38 plate, plates 1 – 21 (need less than 9 errors on plates 1 – 21)

Richmond, 1983, plates 1 – 15 (need less than 7 errors)

Farnsworth Lantern test (no longer available)

Titmus Vision Tester, Titmus II Vision Tester, Titmus 2 Vision Tester, OPTEC 2000 Vision Tester, Keystone Orthoscope, and Keystone Telebinocular:

No errors in any of the six plates

LKC Technologies, Inc., APT-5 Color Vision Tester:

Correctly identify letter in 2 of 3 presentations of each test condition

ever, individuals with mild color vision abnormalities who fail one alternate screening test should be encouraged to try other alternate tests, as they will sometimes perform better on some screening tests than on others.

Caution the applicant that some screening tests are used infrequently, and it may be necessary to contact several eye care professionals to find multiple alternately approved screening tests. Satisfactory results can then be recorded by the eye care professional and sent to the FAA.

In turn, the FAA issues a letter to the applicant to be presented to the AME at each physical examination attesting compliance with vision standards. There is no need for color vision testing on subsequent flight physicals. The advantages for the pilot to this approach are:

• Unsuccessful attempts do not need to be reported to the FAA or the aviation medical examiner, and a SODA will not be issued and thus does not need to be reported when applying for a professional position in the aviation industry.

• If an airman is unsuccessful in passing one of the alternate screening tests, the night flying and color signal limitations may be removed from his or her medical certificate by passing a practical color signal identification test or medical flight test.

The applicant needs to request an authorization for this test from the Aeromedical Certification Division in Oklahoma City. They will send an authorization letter, which is valid for 90 days, to both the local Flight Standards District Office (FSDO) and the applicant. The airman is then responsible for scheduling the test with this FSDO. Successful completion of the test authorizes the examiner to issue a SODA, which removes the limitations from the medical certificate.

Since the color signal light test can only be taken twice, applicants are urged to first try this test at a local airport with a person known to have normal vision to verify correct identification of the light signal colors. If possible, it is also suggested that the light signal test be taken in the late afternoon or on a cloudy day, which offer the best viewing conditions for the light signals. A medical flight test is required for an upgrade to a first-class medical certificate.

Although less frequently significant than the congenital conditions, color vision defects may be acquired. Common etiologies include cataracts and retinal or optic nerve diseases. Medications (such as Viagra) and drug toxicities are also possible. Finally, central nervous system disease or injury may cause color vision abnormalities. In general, eye pathology significant enough to cause severe loss of color vision will also cause a loss of visual acuity to a level less than the minimum allowed by the medical standards.

Unfortunately, there are no effective treatments for congenital color defects. A filter technique called the "X-Chrome lens" claims to "cure" color vision defects. It is a red 15-20% transmitting-filter contact lens that is worn on one eye. With this lens, some individuals can pass various pseudoisochromatic plate tests. However, evaluations have shown that the lens does not return color vision to normal. In fact, the lens can induce significant visual aberrations, which may be hazardous while flying.

The FAA has, therefore, ruled that the X-Chrome lens is not an acceptable means for correction of a pilot's color vision deficiencies and cannot be used by an applicant when color vision is being tested.

Color vision defects are common, and AMEs will frequently encounter them. They are a relatively straightforward medical problem, and AMEs should feel comfortable assisting applicants with this condition.

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Syncope *from page 4*

Syncope

Syncope is defined as a loss of consciousness and postural tone followed by spontaneous recovery. The term *presyncope*, in contrast, refers to lightheadedness, with a sensation of impending loss of consciousness.

At the beginning of a syncopal attack, the patient is nearly always in the upright position, either sitting or standing. A sense of "feeling bad" usually precedes the impending syncope. A sense of giddiness and movement or swaying of the floor or surrounding objects ensues. The patient's senses become confused; the patient yawns or gapes, there are spots before eyes, vision may dim, and the ears may ring. Nausea and sometimes vomiting accompany these symptoms. There is a stricken pallor or ashen gray color of the face with associated profuse perspiration. The slow onset may allow the patient time for protection against injury; hurtful falls are exceptional. The depth and duration of unconsciousness may vary. Usually, the patient is motionless with skeletal muscles relaxed, but a few clonic jerks of the limbs and facial muscles may occur. Sphincter control is usually maintained. The pulse is feeble or cannot be felt; the blood pressure may be low, and breathing almost imperceptible.

Syncope results from sudden impairment of blood flow to the brain, usually caused by hypotension. Approximately three-fourths of the systemic blood volume is contained in the venous bed, and any interference with venous return may lead to reduction in cardiac output.

There are many causes of recurrent syncope and faintness. The 2 major groups of causes include circulatory and non-circulatory. Circulatory causes are: inadequate vasoconstrictor mechanisms, hypovolemia, mechanical reduction of venous return, reduced cardiac output, and arrhythmias. Non-circulatory causes consist of inadequate vasoconstrictor mechanisms, including vasovagal, postural hypotension, primary autonomic insufficiency, sympathectomy, diseases of the central and peripheral nervous system, carotid sinus syncope, and hyperbradykininemia.

Vasovagal syncope, the most common form, is frequently recurrent and is usually provoked by emotional stress (especially in a warm, crowded room), injurious accident, pain, mild blood loss, poor physical condition, prolonged bed rest, anemia, fever, organic heart disease, and fasting. Cardiac output may be normal but declines due to the onset of marked bradycardia, replacing tachycardia, resulting in further drop of blood pressure and hypoperfusion of the brain.

The diagnosis of vasovagal syncope is frequently made by excluding other causes and is based on detailed history, physical, ECG, Holter, echocardiography, and the TTT results. The absence of cardiovascular problems leads to vasovagal syncope as the most likely diagnosis. The tilt table test, which has been widely used over the past 50 years, frequently allows the reproduction of the vasovagal syncope symptoms via the provocation of neurally mediated hypotension or bradycardia, or both. The test is considered to be positive if symptoms are reproduced or if syncope occurs due to hypotension or bradycardia (or both), or if hypotension or bradycardia (or both) is of sufficient severity that the associated presyncopal symptoms lead the attending physician to believe that complete syncope is inevitable. In the absence of appropriate symptoms, heart rate or blood pressure alone cannot be accepted as a positive test response.

The medication isoproterenol (Isuprel) is given during a TTT to potentially provoke a syncopal spell. (Note: An individual who initially has a positive TTT can, so to speak, learn what symptoms initiate a spell and thus, on subsequent testing, report a negative test. Having this testing can complicate matters, and this is what makes the TTT unreliable in medical certification. It is preferable to have a good history recorded.)

Cases with a positive TTT that caused symptoms similar to those that precipitated the workup are usually denied for a period of 2 years. This will be done even if the airman is on a prophylactic medication to alleviate the symptoms. Therefore, this airman's application was denied. However, if he does not have new episodes of syncope within a 2-year period, a special issuance certificate could be granted under the special issuance section of Part 67 (14 CFR 67.401).

Treatment

The treatment of vasovagal syncope due to hypervagotonia is simple: Assumption of the supine posture with elevation of the legs and removal of the offending stimulus will rapidly restore consciousness. The prevention of this type of syncope may involve the avoidance of emotional excitement, fatigue, hunger, and others responsible for its development.

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Letters to the Editor

In-Flight Emergency

Dear Editor:

Dr. **Stephen Véronneau's** article ["Responding to a Transoceanic In-Flight Emergency," *Federal Air Surgeon's Medical Bulletin,* winter 2001, page 6] regarding the problem he had flying home from New Zealand and the use of the blood pressure cuff at the back of a 747-400 reminds me of a situation I had on a TWA 747-200 when I had to use the cuff to take the B.P. of a passenger in the seat in front of me who had a seizure.

My wife, an RN, and I went to the assistance of the patient, but when I tried to take his B.P. with the usual blood cuff, the noise of the engines at the back of the plane made auscultation impossible. I also used the palpation method to attempt to get a B.P.

When I returned to Arizona I wrote to TWA and suggested they get the electronic blood cuffs for the medical kits they had on their planes. I was advised they cost too much. I contacted a manufacturer to get a price of bulk sales WITHOUT stating what I wanted them for. A very reasonable price was also turned down by TWA. By that time, a member of the flight crew must have told TWA about the incident, because they sent me a thank you note and some passes for my use.

I think an electronic cuff is the only way to go because it is impossible to use a stethoscope at the back of a modern jet. Good article and as per usual a very good magazine.

Gerald R Myers, MD
Scottsdale, Ariz.
P.S. The passenger recovered.

Dear Editor:

I read the article by **Dr. Véronneau**… [and] I was disappointed that there was no mention of the 1998 Aviation Medical Assistance Act. This major piece of Good Samaritan legislation was sponsored by Senator Bill Frist, MD, of Tennessee. Surely some mention of this Federal Act should have been included in the article….

MedAire certainly provides an important service, but I believe any legal liability issues are effectively covered by the Aviation Medical Assistance Act.

Jon Ahrendsen, MD
Clarion, Iowa

Dr. Ahrendsen,

Thank you for your comments. The 1998 Medical Assistance Act is an important legislative contribution to the body of federal law. Dr. Veronneau did not intend to make this an all-inclusive article about the topic of in-flight medical emergencies; in fact, he agreed to elucidate in a future issue of the Bulletin and to limit his discussion mainly to the actual events that occurred during his transoceanic flight. So rather than having a long discussion (albeit an all inclusive one), we opted for two separate, shorter articles that would cover the same territory. —Ed.

Aviation Medical Examiner

2002-3 Seminar Schedule

May 6 – 9	Montreal, Canada	OOE (3)
June 10 – 14	Oklahoma City, Okla.	Basic (1)
July 12 - 14	Bellevue, WA	N/NP/P (2)
August 16 - 18	McLean, VA	AP/HF (2)
September 9 - 13	Oklahoma City, Okla.	Basic (1)
December 2 - 6	Oklahoma City, Okla.	Basic (1)

2003

January 10 - 12	Phoenix, Ariz.	CAR (2)
March 10-14	Oklahoma City, Okla.	Basic (1)
April 25-27	Atlanta, Ga.	OOE (2)
May 5-8	San Antonio, Texas	N/NP/P (3)
June 9-13	Oklahoma City, Okla.	Basic (1)

CODES

AP/HF Aviation Physiology/Human Factors Theme

CAR Cardiology Theme

OOE Ophthalmology - Otolaryngology - Endocrinology Theme

N/NP/P Neurology/Neuro-Psychology/Psychiatry Theme

(1) A 4½-day basic AME seminar focused on preparing physicians to be designated as aviation medical examiners. Call your regional flight surgeon.

(2) A 2½-day theme AME seminar consisting of 12 hours of aviation medical examiner-specific subjects plus 8 hours of subjects related to a designated theme. Registration must be made through the Oklahoma City AME Programs staff, (405) 954-4830, or -4258.

(3) A 3½-day theme AME seminar held in conjunction with the Aerospace Medical Association (AsMA). Registration must be made through AsMA at (703) 739-2240.

The Civil Aerospace Medical Institute is accredited by the Accreditation Council for Continuing Medical Education to sponsor continuing medical

AMSIT: *Scoring Points for Aviation Safety*

Certainly the mental status of pilots deserves as much attention in aviation safety as cardiovascular conditions, but it is maybe the last thing thought of when filling out the 8500-8....

By Glenn R. Stoutt, Jr., MD, Senior FAA Aviation Medical Examiner

TO EVALUATE AIRMEN for its vast medical certification system, the FAA appoints about one aviation medical examiner (AME) for each thousand of the 600,000 pilots in general aviation. A great number of AMEs are pilots. All examiners share two things: a love for aviation and a commitment to aviation safety.

To be appointed, each physician must first spend 4½ days at the Civil Aerospace Medical Institute (CAMI) in Oklahoma City, undergoing an intense (somewhere between medical school and Marine boot camp) and thorough program in all aspects of the certification requirements.

Thereafter, every three years all appointed AMEs must attend a 2½-day seminar for continuing education as a refresher course and to learn of new changes in certification standards. Every other three years an examiner may elect to substitute the *Multimedia Aviation Medical Examiner Refresher Course* (MAMERC), completed at home, thus requiring an AME to attend the 2½-day seminars only every six years. At least one staff member at the AME's office must obtain training in standards and procedures (MCSPT).

For the past two aviation medical examiner seminars, I chose to attend the one with the theme *Neurology, Neuropsychology, and Psychiatry.* The presentations were both fascinating and very helpful to me as an AME. The single subject that riveted my attention at both meetings was *AMSIT: A Guide to the Formal Mental Status Examination*, presented by **David R. Jones**, MD, who is a consultant in aerospace psychiatry. He very graciously has helped me with questions about psychology and psychiatry in the past and has given me permission to use his modified AMSIT[1] presentation in this spring *FASMB*. I found it to be a superb foundation for the office psychiatric interview and am sure it will be useful to all AMEs, and pilots will also find this informative.

Most (about 70%) of aviation accidents are attributed to pilot error. Certainly the mental status of pilots deserves as much attention in aviation safety as cardiovascular conditions, but it is maybe the last thing thought of when filling out the 8500-8 application for a medical certificate.

Formal Mental Status Examination

AMSIT = Appearance, Mood, Sensorium, Intelligence, Thought

Appearance, Behavior, and Speech

Physical Appearance: apparent age, sex, and other identifying features. Appearance of being physically ill or in distress; and a careful description of the patient's dress and behavior.

Manner of Relating to Examiner: placating, negativistic, seductive; motivation to work with examiner.

Psychomotor Activity: increased or decreased, including jumpiness, jiggling, tapping, looking at watch, etc. Is the person hyperactive or lethargic?

Behavioral Evidence of Emotion: tremulousness, perspiration, tears, clinched fist, turned-down mouth, wrinkled brow, etc.

Repetitious Activities: mannerisms, gestures, stereotypy, "waxy flexibility," compulsive performance of repetitious acts.

Disturbance of Attention: distractibility, self-absorption.

Speech: *description*—volume, rate (pressured or slowed), clarity, spontaneity and *disturbances*—mutism, word salad, perseveration, echolalia, affectation, neologisms, clang speech.

Mood and Affect ("Mood is to Affect as Climate is to Weather")

Mood (overall emotional tone): use adjectives: *mild* (it's there), *moderate* (it needs treatment), or *severe* (it needs treatment today!). Consider depression, elation, or other sustained emotions such as anger, fear, or anxiety.

Affect (changes in mood during the exam): its Range, Intensity, Lability, and Appropriateness to immediate thought. To describe a normal, stable emotional status, say something like "The examinee's mood is euthymic. Affect is unremarkable in range, intensity, and stability, and is appropriate to material being discussed."

Sensorium

Orientation: for time, place, and situation

MEMORY: *immediate* (digits recall), *recent* (remember three items for 10 minutes, current events) and *remote* (history)

Calculating Ability: serial 7's, 11 times 13 out loud (valid only if patient is adequately educated)

Concentration: spell *WORLD* backwards, then arrange its letters alphabetically. Repeat with *EARTH*.

Intellectual Function

Estimate current level of function as *above average*, *average*, or *below average* based on general fund of information, vocabulary, and complexity of concepts. Do not confuse *intelligence* with *education*. Can the examinee handle abstract ideas, reason by analogy, "make the connection" in conversation: Is the examinee about as smart as the examiner?

Thought

Coherence: clear thoughts may be expressed incoherently.

Logic: even clear, grammatical speech

☞

Dr. Stoutt is a partner in the Springs Pediatrics and Aviation Medicine Clinic, Louisville, Ky., and he has been an active AME since 1960. No longer an active pilot, he once held a commercial pilot's license with instrument, multi-engine, and CFI ratings.

may express illogical thoughts.

Goal Directedness (has a point and makes it); tangential or circumstantial thought.

Disturbance of Attention: distractibility (interrupts own sentences), self-absorption.

Associations: loose associations, blocking of obvious ideas or connections, flight of ideas.

Perceptions: hallucinations (false sensory perceptions), illusions (misinterpretation of real sensory stimuli), depersonalization, distortion of body image.

Delusions: firmly held false beliefs about real situations.

Other Content: noteworthy memories, thought and feelings; suicidal or homicidal intent.

Judgment: formal (specific set-piece situations such as "mailing a letter you find on the street"), social (how examinee behaves with examiner, how he or she "reads" other people—predictable, reasonable, comfortable).

Abstracting Ability: ask the pilot to define similarities/differences between *tree-bush*, *child-midget*, *king-president*, *character-personality*. This is more reliable than interpreting proverbs (stitch in time, bird in the hand).

Insight: understanding of any personal dysfunction affecting self or others, and its need for treatment. Insight is *lacking* if there is an unacknowledged problem, *superficial* if it is only acknowledged. ("It is a problem."), *moderate* if it is personalized ("I have a problem"), and *profound* if "It's my problem, and it's up to me to fix it."

The AMSIT (fewer than 700 words) has been so useful to me that I have read it dozens of times and have it taped to the wall in my office. Medical examiners are not required to be psychiatrists (or cardiologists, for that matter), but we are expected to see *deviations* from normal appearance and behavior in airman applicants.

The next pearl of information I got from the presentation was: **Trust your judgment as an examiner.** If something just doesn't seem right, it might just not be right. First impressions are sometimes best. Certainly the entire AMSIT will not have to be done on each pilot, but if something different about the pilot stands out, take a little time to find out more about it. This is especially true of a student pilot or a pilot with many hours flight time who has not flown in a few years.

Another pearl from Dr. Jones: "Ursane and Jackson (1986) demonstrated that the more experience a military flight surgeon has, the more value he or she places on psychiatric knowledge. The same is true in civilian aeromedical practice."

My most vivid experience was with a paranoid schizophrenic (corroborated by a few phone calls). A tip-off was the first thing he said to me: "*I would be extremely upset if I did not pass my physical.*" I talked with him at length (he obviously had problems) and then told him that he was in *fine physical condition* (leaving till later my written comments and phone calls about his severe mental and emotional problems). I told him that the certificate would have to be issued from Oklahoma City because of his hospitalizations. "No need to pay us until all the paperwork is completed."

I was frankly afraid of him, as paranoid schizophrenics are maybe the most dangerous of all psychiatric patients. His flight instructor said he never came back for a second lesson.

Some things that have been helpful to me:

- Observations and comments by the office aeromedical staff may be extremely useful. Was the applicant rude, hostile and loud in the reception room? Did he take an hour to fill out the 8500-8? Evasive? Anxious?
- My number-one criterion in evaluating a pilot is his eye contact with an easy, natural, and appropriate smile. (Not the bored, nanosecond, turned-up mouth of the "receptionist smile.")
- *Ask all student pilots why they want to fly*. "I flew a lot with my dad, and really liked it." This is appropriate. "To be closer to God" or "I know it's maybe dangerous, but the way things have been going lately it's as good a way as any to go." Not only inappropriate, but also red flags. (One young lady burst into tears and said that her husband gave her flying lessons for her birthday, but she was terrified of flying and afraid of his reaction if she refused. This problem was easy to handle.)
- Total lack of a sense of humor or a "flat affect" may be signs of trouble. Humor can be our greatest emotional safety valve.
- The examiner must not let feelings for a friend or concern about the pilot's loss of a medical certificate cloud her judgment.
- In the case of any doubt, probe into the use of medications now or in the past, physician visits, and hospitalizations. If the applicant raises your suspicions, he or she has probably had mental or emotional problems in the past. A lengthy non-threatening conversation may yield a goldmine of information. (Such as omitted hospitalizations for "tests," when the tests were done in a psychiatric ward, or the medicine discontinued last month was Prozac.)
- When in doubt, call the Regional Flight Surgeon for help.
- Never hesitate to make some remark in the Comments section. Example: "OK on AMSIT, but does seem somewhat apprehensive, talks rapidly, some trouble with eye contact." May be valuable in future.

The purpose of the entire certification procedure is to ensure aviation safety. There is really only one basic question: "**Is this pilot safe to fly?**"

Yours for good health and safe flying,

Glenn Stoutt

[1]This version of the AMSIT has been adapted by David R. Jones, MD, MPH, from a formulation by David Fuller, MD, as presented in R.L. Leon, MD. *Psychiatric Interviewing: A Primer*. 2nd ed., New York: Elsevier/ Science Publishing Co. 1989.

Note: The views and recommendations made in this article are those of the author and not necessarily those of the Federal Aviation Administration.

PBDE from page 4

in aquatic ecosystems. Because of their lipophilic nature, these chemicals have a strong affinity to accumulate in adipose tissues and in human breast milk. Several studies have demonstrated the presence of PBDEs in human breast milk (1,3). Apart from anthropogenic sources, PBDE-related brominated compounds also appear to be formed by nature and have been detected in certain marine sponges (1).

Although some data are available on the general toxicity of PBDEs, not much information is available on their environmental toxicity (1-4). Primarily based on animal research and with only limited human data, these diphenyl ethers have been reported to induce hepatic drug metabolizing enzyme activities, to cause immunosuppression, to produce chloracne, and to have adverse effects on the male and female reproductive systems.

PBDEs have been shown to disrupt the endocrine system, as well. Neonatal exposure of mice to PBDEs has caused permanent aberrations in spontaneous behavior and, later in adult animals, affected learning and memory functions (5). There is equivocal evidence for PBDE-induced carcinogenicity in rodents at high dietary levels. In general, chemical, biological, toxicological, environmental, and aquatic properties of PBDEs are similar to those of polybrominated biphenyls (PBBs), polychlorinated biphenyls (PCBs), and DDT (1-4). Therefore, the environmental toxicity of PBDEs could be serious, similar to that of PBBs, PCBs, and DDT.

The main source of PBDEs in the environment is from the wide range of commercial products treated with these fire-retardants (1). Although specific data are missing, incineration of municipal waste is thought to be an important route of release of PBDEs into the environment. No study on leaching of PBDEs from landfills is available, but the leaching of PBDEs from the commercial products may be an obvious, important long-term pathway of contamination. It appears that the primary source of PBDE environmental contamination is discarded furniture. When discarded PBDE-treated furniture is exposed to environmental stressors (sunlight, wind, soil, rain, and temperature extremes), the furniture material starts breaking into small pieces and then into small particles, which then become part of the soil and of air. Subsequently, these pieces and particles may be washed out, or leached out, as a component of surface water. They may be ingested by insects, as well. In this way, PBDEs become a part of the environment and of the food chain, and then they bioaccumulate in humans.

PBDE environmental concentrations have not yet reached levels high enough to produce serious adverse effects on health. However, because of the heavy use of PBDE-treated products in various facets of life, environmental concentrations of PBDEs are increasing logarithmically and will soon reach alarming levels if their use continues (1). Therefore, these brominated ethers naturally require a closer scrutiny, and an evaluation of merits and demerits of PBDEs is clearly warranted.

In contrast to discarded furniture in an outside open area, the interior aircraft products—textile, polyurethane foam cushions, and possible wiring components—do not face harsh environmental challenges: The aircraft interior materials are relatively preserved. They face less harsh environmental conditions because they are mostly confined to the less drastic environmental conditions of the aircraft interior.

In this way, aircraft interior materials have a lesser degree of exposure to environmental stressors—such as sunlight, wind, soil, rain, temperature extremes, and even insects—than discarded furniture in an outside open space. Although all flame-retardants do evaporate into the air in trace amounts, PBDEs do so at lower levels than other retardants.

Therefore, the potential for environmental contamination caused by the PBDE-treated materials from commissioned aircraft is at a minimum level. However, PBDE-treated materials from decommissioned aircraft should be properly and carefully discarded, so that those materials also have minimal PBDE-related adverse effect on the environment.

Contributions from the aircraft materials to the PBDE environmental contamination are relatively very small, but benefits from the use of these fire retardants are very great because these chemicals have a strong potential for saving many lives by preventing fire and, thereby, preventing associated aircraft accidents and fatalities.

Considering the limited apparent drawbacks and the significant clear-cut benefits, the use of the fire retardants in the aviation industry is definitely justifiable. So, while it appears that the use of PBDEs is, indeed, a "burning" environmental issue, their use in aviation to enhance passenger safety continues to be of great importance—until and unless environmentally friendlier, potent, and effective flame-retardants can be developed to replace PBDEs. Newly developed flame-retardants must be carefully evaluated for their toxicological and flame-retardant properties prior to banning and/or limiting the use of the well-established, effective flame-retardants, PBDEs.

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Dr. Chaturvedi is the Coordinator of the Biochemistry Research Team at the Civil Aerospace Medical Institute,. He is also an Adjunct Professor of Pharmacodynamics and Toxicology at the University of Oklahoma Health Sciences Center's College of Pharmacy. He is a member of the Society of Toxicology; American Academy of Forensic Sciences; Aerospace Medical Association; International Union of Pharmacology; and American Society for Pharmacology and Experimental Therapeutics.

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CAMI Tox Lab Re-certified

The Civil Aerospace Medical Institute's Toxicology and Accident Research Laboratory was accredited by the College of American Pathologists after an extensive on-site inspection. The "Tox Lab," as it is known, is nationally certified for forensic drug testing—they evaluate the medical findings from fatal aircraft accidents to help determine the cause of the accidents. The lab's director, Dr. **Dennis Canfield**, was congratulated by the auditors for achieving and maintaining professional status among the nation's 6,000 accredited laboratories.