



# Federal Air Surgeon's Medical Bulletin

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 Administration

## Two Initiatives and a Reminder

Hello, everyone.

**M**OST OF THE editorials I have written have been devoted to one topic. This time there are three issues that I want to discuss.

### Non-Carry Permission

In 2007, the Federal Aviation Administration (FAA) was audited by the International Civil Aviation Organization. In response to that audit, the FAA made it mandatory for everyone with a Special Issuance to have the letter of Authorization for Special Issuance in their physical possession or readily available on the aircraft while exercising their pilot privileges. Since that time, we are unaware of any individuals who have been asked to produce their letter, but we have received numerous complaints from airmen who questioned this requirement. Airmen understood the necessity for having their medical certificate in their possession, but they



could see no reason to carry their authorization letter. They reminded us that in some cases, the letter contained highly sensitive medical information and that the requirement to show this letter to an inspector violated their privacy rights.

We sympathized with these concerns, and fortunately, we were given an opportunity to rectify this issue. On January 18, 2011, Executive Order 13563, (the Order) "Improving Regulation and Regulatory Review," was published, directing agencies to look for ways to streamline their regulations to lessen the burden on the public. So, in compliance with the Order, the FAA published a request for comments in the Federal Register regarding a direct, final rule that would eliminate the requirement for airmen to have their Authorization letter in their possession when they fly.

The comment period will close on May 21, 2012. So far, we have received eight comments, and they all support the final rule. We have also coordinated this change with the Chief of the International Civil Aviation Organization's Medicine Section. As long as we receive no negative comments, the rule will become effective July 20, 2012. After that date, pilots will still be required to have their medical certificate in their possession when they fly, but they will no longer have to carry their Special Issuance authorization letter.

### MedXPress—For Sure

In January, I told you that we intended to go paperless in October. We have made a great deal of progress towards achieving that goal. I have talked about this project at aviation medical examiner seminars, and my deputy, **Jim Fraser**, talked about it at Sun n' Fun. Most of the feedback has been supportive, and we have also received many suggestions that will help to make this initiative successful. The purpose of this message is to let you know that we are moving forward, and to let you know that we have posted a "Notice of Intent to Discontinue Use of Paper Applications for Airman Medical Certification" Docket No. FAA-2012-0245 in the Federal Register.

### Medical History

Finally, I wanted to take this opportunity to talk to you about block 60 on the FAA Form 8500-8. The directions state that the "AME shall comment on all 'YES' answers in the Medical History section and for abnormal findings of the examination. (Attach all consultation reports, ECGs, X-rays, etc. to this report before mailing.)" I think these directions are self explanatory, but I wanted to let you know that you can also use block 60 to comment on follow-up medical information if you are qualified or have the information to do so. For example, if you are the treating physician, you can enter the follow-up information in block 60. It would not be necessary to attach a separate note to the application. Of course, if we have requested copies of tracings or images, you would still be required to forward them to us.

I hope this editorial has been informative and helpful. I greatly appreciate all the things you do for us and our airmen. We could not do it without you.

—Fred

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## Dr. Berry Named Central Regional Flight Surgeon

**Daniel K. Berry, DO**, became the Central Regional Flight Surgeon in January 2012, according to an announcement by Dr. **James Fraser**, Deputy Federal Air Surgeon. Dr. Berry previously served in an acting capacity to replace Dr. **Larry Wilson**, who moved to a position in the Office of Aerospace Medicine's headquarters office.

Completing this cycle of personnel events, at least for now, Dr. Wilson has recently accepted a position with the Army Medical Command as a Medical Evaluation Board physician at Munson Army Health Center, Ft. Leavenworth, Kan.



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## International AME Seminar to Be Held in Berlin, Germany

*All physicians interested in aviation medicine welcome*

By Brian Pinkston, MD

The European School of Aviation Medicine (EUSAM) will conduct an International aviation medical examiner seminar in Berlin, Germany, August 23-26, 2012. EUSAM has invited Drs. **Fred Tilton, Melchor Antuñano**, and **Brian Pinkston** from the Federal Aviation Administration to participate to the degree necessary to consider the training equivalent to an FAA aviation medical examiner (AME) refresher seminar.

Continuing Medical Education Credit will be given for seminar attendance to those AMEs requesting it, if a passing score is obtained on an FAA test administered after the seminar. Guest lecturers from Germany will provide the clinical lectures normally given at FAA seminars and will also give other presentations in aviation medicine and human factors. It is expected that participation by physicians representing other civil aviation authorities will engender fruitful discussion of the aeromedical significance of a multitude of medical conditions and contrast the approaches taken by other countries regarding pilot medical certification.

The Academy welcomes all physicians interested in aviation medicine, whether or not they are FAA AMEs. However, we encourage FAA AMEs (particularly those residing in Europe and the Middle-East) to consider attending this seminar as an alternative to the regular AME seminars offered within the U.S. or if you just want a different training experience.

Closing date for applications is July 30, 2012. For more information, see the AME seminar schedule, page 18.

*Dr. Pinkston manages the Civil Aerospace Medical Institute's Aerospace Medical Education Division.*



## Dr. Scott New Certification Manager



**Courtney Scott, DO**, has been selected as the new manager of the Aerospace Medical Certification Division, according to an announcement by Civil

Aerospace Medical Institute Director **Dr. Melchor J. Antuñano**. In his announcement, Dr. Antuñano stated that Dr. Scott's "specialized knowledge, management skills, and leadership abilities greatly match the requirements and scope of the position and the program needs of the Aerospace Medical Certification Division."

Dr. Scott was the Acting Manager of the Division since January 1, 2012, following Dr. **Warren Silberman's** retirement.

## OAM Physicians Team Up at Sun 'n Fun Fly-In

THE SUN 'N Fun Fly-In reportedly drew a record number of fans and aircraft this year, bolstered by a dedicated group of four Office of Aerospace Medicine (OAM) physicians armed with laptop computers and cell phones to “field” airman medical certification issues.

The medical team at the FAA booth<sup>1</sup> handled numerous medical questions from pilots, and with online access to the electronic medical records and filing system in Oklahoma City, provided real-time answers and made certification decisions. In some cases, special issuances were determined and printed for the airman—on the spot. “When pilots found out what we were doing,” said team member Dr. **Richard Carter**, “word got around and they were lined up to talk to us.”

The FAA medical staff booth was hosted by Dr. **Susan Northrup**, Southern Regional Flight Surgeon, assisted by Drs. **Arnold Angelici**, **John Barston**, and Richard Carter. Dr. Northrup’s staff members, **Peggy Luck**, **Sharon Baker**, and **Sylvia McAllister**, assisted via email from the regional office.

Deputy Federal Air Surgeon Dr. **James Fraser** also helped out in the booth and found himself immersed in questions. He attended other Sun 'n Fun venues with Acting FAA Administrator **Michael Huerta**, who responded to the many issues concerning airmen—including a proposed exemption to the requirement for third-class medical certificates in some instances.

So as not to be idle, the on-site physicians at the airshow had a virtual “Tiger Team,” doing case work on general review files in between the airmen on site visits.<sup>2</sup> The Aerospace Medical Certification Division medical staff (also assisting via email) provided helpful guidance for complex cases: Drs. **Courtney Scott**, **Ben Zwart**, **Judy Frazier**, **Brian Johnson**, **Leigh Lewis**, and **Bill Mills**.

International pilots visiting the booth were assisted (via email) by Program Analyst **Leah Olson**, in the International Regional Flight Surgeon’s Office, and certification instructions were forwarded to International AMEs (also via email) to expedite the special issuance of new exams needed by international airmen from England, Germany, Israel, and Saudi Arabia.

Overall, the Sun 'n Fun medical specialist team generated 540 contacts with airmen during the duration of six days of Sun 'n Fun, many led to active airman case decisions.

<sup>1</sup>The FAA Office of Aerospace Medicine serves two major airshows each year for the purpose of assisting airmen with their medical certification issues. A display booth also functions to provide information to the flying public about OAM programs and services.

<sup>2</sup>A Tiger Team is held periodically and functions to proactively reduce the backlog of medical certification cases. Regional Flight Surgeons and others volunteer to work online with an Aerospace Medical Certification Division team to solve these problem cases.



*OAM PHYSICIANS AT AIRSHOW. (L-R) Drs. Richard Carter, Arnold Angelici, James Fraser, and John Barston answered questions from airmen at the annual airshow and fly-in at Lakeland, Fla., March 26 through April 1. The airshow is sponsored by the Experimental Aircraft Association. More than 500 requested certification assistance, and some were rewarded with on-the-spot certification, even some special issuance certificates being issued and printed. In addition to answering certification questions, the display booth provides information to the flying public about OAM programs and services.*



*Gregg Pinnell, MD (center), an AME and pilot from Saginaw, Mich., visits with Southern Regional Flight Surgeon Dr. Susan Northrup and Dr. Richard Carter at the OAM booth.*

In previous years, FAA physicians attending the two major airshows would return to work with a hand-written list of the names of pilots who requested help with their certification problems. Contrast that to today’s world of reliable, high-tech computing, back it up with a team of well-organized experts, and 540 airmen receive their certification decisions—an outcome not as well publicized as the airshow attendance figures. Nevertheless, it is a noteworthy achievement to compliment the Sun 'n Fun record books.



*Richard Carter, Susan Northrup, and Arnold Angelici provided information and photos for this article.*

## Response to MedXPress

*Thank you for your questions about MedXPress. The following are representative questions with appropriate replies from FAA experts. —Editor*



for more than four years now, and it is often praised by its AME users due to the time savings it affords. It is used by about 35% of all applicants, so it's being actively tested all of the time. Please refer to our brochure for further information at

[www.faa.gov/pilots/safety/pilotsafetybrochures/](http://www.faa.gov/pilots/safety/pilotsafetybrochures/)

However, the basic steps for a normal examination are as follows:

- 1) The airman accesses the MedXPress website at: <https://medxpress.faa.gov/>
- 2) The airman builds a MedXPress account;
- 3) The airman completes the medical history portion of the application, and MedXPress provides the airman a confirmation number. It also provides a printable summary sheet of his answers, which can be used to discuss his medical history with you prior to the exam if you desire;
- 4) The airman arrives for the examination and gives you the MedXPress confirmation number;
- 5) You enter the MedXPress number into the Aerospace Medical Certification Subsystem (AMCS) and the airman's history is populated automatically in the history field of AMCS;
- 6) You complete the exam and print the certificate; and
- 7) You transmit the exam in AMCS to the FAA.

Airmen that do not have computers may use a library or other public computer. Alternatively, you can provide one in your office if you choose to do so. Additionally, it has been tested on the iPhone and android-compatible Smartphones by our staff. Always let your airmen know that, if they choose to use a computer other than their own, they should erase their privacy information from the computer.

Dr. Pinkston

I would like to know exactly how...I would use the MedXPress form the airman brings to my clinic without any Form 8500 to use for doing the physical exam when they are discontinued on Oct. 1, 2012? I obviously will need some sort of work sheet or form to write down my physical findings, etc. to use when I transcribe everything to the FAA that evening.

Robert Piat, MD, Martinsville, Va.

Dr. Piat, actually, you bring up a point that is sometimes subtle in AMCS. You can print the physical exam side of the 8500-8 from AMCS to be used as a scratch sheet during your exam. As I mentioned before, there's no need to write down the medical history unless it's changed from the airman's reported history. It will be automatically populated once you enter the MedXPress number in the system. Alternatively, you can make copies of the paper 8500-8 to use for interim documentation. Of course, once the information is in MedXPress, there's no need to maintain any paper documentation at your office for FAA purposes.

Dr. Pinkston

There will be a significant problem if all exams are to be run through the MedXPress system. Ninety-nine percent of my exams are done using the MedXPress system right from the beginning of this system. As a matter of fact, I insist on this mode. The problem that would require the paper 8500 is the following: The majority of exams I perform are on Saturdays. I usually do 3-5 exams each Saturday. What bothers me is when I show up to do the exams only to learn that the FAA MedXPress website and AMCS are both down for "maintenance." I've complained on a few occasions to AMCD that it would be better to do the maintenance either late at night or on a Sunday. It was explained to me that because the software companies charge more for evenings and Sundays that the decision to shut down on Saturdays is purely economic. Most of the time we get about a 3-5 day heads up if the system will be down. Last Saturday when it was down there was no notification whatsoever. I had to use the hard copy 8500s. So, if FAA is going to go only on MedXPress, there needs to be a method to not have the system go down for maintenance.

Robert Lewis, DO, Marysville, Ohio

Dear Editor:

I understand that the person who needs a flight physical will have to go online and complete this form and print out a copy of it and bring to [aviation medical examiner] at the time of his physical. Will the copy that is printed out have the back side of the 8500-8 form with it for the doctor to sign and send in to the FAA? Since the forms will not be available any longer, there will be no more paper trail for the doctor to have on file, correct?

Shirley Lawhorn, Fort Payne, Ala.

Ms. Lawhorn, MedXPress is completed online by the airman as you mentioned, however, the airman does not have to bring a copy of the MedXPress summary sheet to the Aviation Medical Examiner. All that is required is for the airman to provide the MedXPress confirmation number to the AME. The AME then inputs the confirmation number into the Aerospace Medical Certification Subsystem (AMCS) and the history automatically populates into the history screen that the AME normally inputs history.

The MedXPress confirmation number is provided to the airman after she completes the application in MedXPress and inputs her account password. Since this password is unique to the airman, it legally suffices as a signature for the airman. Therefore, once the airman provides the confirmation number to the AME, the application is considered legally signed by the airman. There is no requirement for the airman to physically sign anything and as you said, the "paper trail" is totally contained within the AMCS system. This means filing paperwork is no longer necessary and the AME does not need to mail any paperwork to the FAA.

Printing out the summary sheet from MedXPress is a useful option for the airman, but is not necessary. Doing so allows the airman and AME to discuss her history prior to the AME inputting the confirmation number into AMCS. This may allow time for the airman to locate important medical documents prior to the application becoming official. Remember, once the MedXPress confirmation number goes into AMCS, the medical application is official and is subject to FAA timelines.

Brian Pinkston, MD

Manager, Aerospace Medical Education Division

...[W]ill I get some paper medical certificates to type? Not that I or the airman have ever made mistakes in the certification process and had to type a certificate because of a mistake, failure of the Internet, or the FAA website being down.

Earl Martin, MD, Tomball, Texas

Dr. Martin, we are currently working solutions that will not require typed medical certificates for mistakes and other issues. More to follow in the future from the *Federal Air Surgeon's Medical Bulletin*.

Dr. Pinkston

I keep the computer, which I use to submit exams, in my home so I do not have it available at the time of the exam. The proposed change apparently means that I will have to change too — probably procure a laptop which I can take to the office in order to absolutely secure the information. It might be helpful if you could outline the steps...to satisfactorily accomplish the paperless application. If the airman is not computer capable, how does he get involved with MedXPress? I have been examining airmen since 1960 and each change in procedure for entering the information has, at first, been a bit burdensome but ultimately it works out OK. Hope this will be the case with "paperless" filings.

John H. Smith, MD, Greenfield, Ind.

Dr. Smith, thanks for keeping an open mind for a system that will ultimately save you a good amount of time. MedXPress has been in use

Continued—>

Dr. Lewis, we have found that your problem is very unusual and offer these reliability statistics to show that:

- Our systems are currently available to users more than 99.9% of the time.
- In the event of planned outages, the organization responsible for maintaining our computers is required to provide AT LEAST two weeks' advance notice.

- Unscheduled outages of our computing systems are very rare.

If there is a failure, our systems have been deemed mission-critical and receive the highest level of attention. We are proactive in the maintenance of our systems; doing so helps to prevent failure of our systems and helps to secure them. We regularly apply security patches, and we continually monitor the status of our systems.

We are in discussions now with the organization that provides our computer support to look at shifting the maintenance schedules to the evening hours of the weekend. With so many exams submitted annually, there is virtually no way to avoid impact to pilots — no matter what time we perform system maintenance. However, we will take all steps necessary to minimize the impact.

In short, we do not believe there will be significant problems as a result of this initiative. Future enhancements will make these online services even more efficient: If our systems are unavailable, or perhaps your Internet provider is not functional, we are exploring methods you can use to capture information from the pilot for entry at a later time into our system. In the meantime, if you continue to have problems accessing the system, please call our Hotline at (405) 954-3238.

David Nelms, AMCD Program Analyst

AMCS online certification has been fully operational here since last June 2011. I've come to like it much better than the stubby pencil process. Perhaps, the FAA may consider upgrades to enable better user interface with Macintosh operating systems in the future. iPads and Mac office systems have become quite prevalent.

Richard Montminy, MD, Albuquerque, N.M.

Dr. Montminy, our goal is to develop our applications so they are platform independent; by doing so, we hope to provide applications that can be used, regardless of the computing platform used. Developing applications in this manner drastically reduces the cost of licensing, development, implementation.

A recent survey showed that 22% of our MedXPress users employed Mac OS-based systems to prepare their applications. We also know of several AMCS users who have successfully submitted applications using the Mac OS. When users do experience problems using AMCS in a Mac environment, it is typically related to the browser, and not the operating system itself.

Regarding the question about the use of AMCS on an iPhone, it is certainly possible to modify AMCS to be *efficiently* utilized in a smart-device environment. AMCS can be run on an iPhone, but due to the nature of the AMCS application, it is less than efficient. We are investigating the feasibility of developing a version of AMCS to run on various smart devices, but again, our development goal will always be to keep the cost to the taxpayers as low as possible.

David Nelms

### Creative Use of Email

Have you guys figured a way we can send labs, etc. via email yet? Being overseas the fax is spotty at best.

David Hardy, MC, FS, Yokota Air Base, Japan

Currently, we do not have the ability to receive and process bulk emails containing attachments. We are working through upgrading DIWS so that documents can be input from specific CD, FAX, and email programs, but at this time, the system is not compatible. The AMCD does not have the resources or programs to process (review, print, scan) documents from CDs, Faxes, or emails.

Stephen W. Smiley  
Manager, Medical Review and Appeals Branch

## Color Vision Testing

*Questions from readers regarding Dr. Richard Carlson's article ("Color Vision Testing for Pilots," FASMB 2012-1, p. 6).*

There is an unfortunate error in the very first paragraph. It states that the genetic problem lies on the Y chromosome—it is a recessive trait on the X chromosome. Hence, if it appears on both X chromosomes, the deficiency is exhibited in females.

Nelda Milburn, PhD  
CAMI color vision researcher

### Dr. Carlson replies:

Color vision is very complicated. There are different genetic faults that can cause a color problem, the most common one being on the X chromosome [thus] I was in error. Being a recessive trait, it will manifest only with the defect being in both X chromosomes. It is not on the Y chromosome, so a male only needs the defect on his single X chromosome to show the trait. Statistically, a female can have it on both of hers so females can manifest the defect but rarely. Whence the injunction to screen everyone, male and female. I have excluded more severe types of color defects in that this is a defect in the cones and it can be severe enough to decrease acuity. Such applicants will have been ruled out before we reach color screening. Remember, we started with the premise that a pilot does not need perfect color vision, but only such as is required to pass the FARs. This is obvious with every pilot who fails our screening test but has an LOE of passing what the FAA considered adequate color vision.

Dear Editor,

In the color restrictions and letter or evidence, I love flow sheets and this one was great. But, I didn't quite understand part of it. In the top limitation section, "Not valid..." is in quotes and I understand that this is what I type on the certificate. But, the other blue parts didn't have quotes. Am I to type in these exact words on the certificate? Also, does the airman have to get a new LOE before each certification?

Anonymous AME

In reverse order, the LOE/SODA is an official FAA document which is permanent and need not be repeated. So none of the FAA testing (OCVT/CVMFT) need be repeated. The policy is not to do so if an airman fails. Whence the airman needs to know, this is a one-time thing before he starts down that road. The date of this document needs to be noted in Item 60. Make a copy of the document in case the airman forgets it on future visits.

There are four boxes that prompted the rest of the letter. Let's call these #1, 2, 3, and 4. Number 3 is offset a bit to the right. The others are on the far left. All of the restrictions are in quotes which are not part of the restriction. It is preceded by more of an explanation which are not in quotes. The limitations in numbers 1, 2, and 4 are identical. Number 3 has the daylight and absence of night. All of the explanations are the same except numbers 2 and 4 have the word "remains."

The AME will type the limitation for Box #1 on the initial certificate. All of the others come from the FAA. The AME is involved in reissuing subsequent certificates. Number 1 is as it always has been. Anyone with a LOE/Statement of Demonstrated Ability must bring it so you can see it and document it with date of issue in item 60. An airman that was able to pass an alternate approved test that you did not have must return to that source, be re-examined, and bring a report that you document. I would ask to see the present certificate and not exceed the class and copy the limitation that the FAA placed on it, and make a copy for your records. Everyone needs to be rescreened, without exception.

Richard E. Carlson, MD



# Preserving Flight Skills and Preventing Cognitive Decline

## *Why Educating Pilots is Important*

By Richard Ronan Murphy, MBChB  
and David G. Mirich, PhD

### **Why this is important to pilots of all ages**

**J**UST AS THE U.S. population is aging, so are pilots, therefore interest is increasing in the effects of aging on cognitive performance and piloting skill. Accident records indicate that older pilots are generally safe pilots. As discussed in my first article (“The Aging Brain, Cognition, and Aeromedical Concerns,” FASMB Vol. 49, p. 1), it is important to be aware that diseases associated with age may affect cognitive performance, and thus flight safety, but numerous studies show that though a factor, age alone is only weakly correlated with reduction in flight or driving performance. Age-related cognitive disease, which most commonly is Alzheimer’s disease, is the greatest safety concern. A more in-depth discussion on other diseases that may affect cognition may be found in the previously mentioned article.

With increasing age, pilots understandably become more keenly concerned about cognitive disease and preservation of flying skills, though this really should be a concern for all ages. Emerging understanding of the pathophysiology of Alzheimer’s disease suggests that earlier preventative strategies, decades before clinical symptoms typically become apparent, may be the key to effectively reduce later life risk. Deciding which interventions are best is still a matter of debate and ongoing research, but widely accepted healthy lifestyle factors are likely to be beneficial.

### **The evidence regarding the prevention of dementia**

The most significant risk factors for development of dementia are older age and genetic predisposition; however, epidemiologic data connect risk of developing dementia to numerous modifiable factors such as diabetes, mid-life hypertension, mid-life obesity, smoking, depression, cognitive inactivity, physical inactivity, and poor diet. It is interesting that many of these factors have also been shown to be risk factors for vascular disease (1). The 2010 NIH consensus statement on Preventing Alzheimer’s Disease and Cognitive Decline reported that firm conclusions cannot be drawn about the association of any modifiable risk factor with cognitive decline or Alzheimer’s disease, and more research is needed before specific recommendations may be made (2). On the other hand, there is the intriguing possibility that delaying the onset of late-life cognitive disease by just a few years by modifying these factors, even a little, may significantly reduce the burden of disease prevalence (3). This is because dementia, particularly Alzheimer’s, is most often a disease of later life,

and even without a cure, delaying the onset would prevent the occurrence of much clinical dementia before death from other natural causes.

No specific diets, activities, medications, or supplements have been conclusively proven to prevent or slow the onset of cognitive decline. Patients often ask about particular vitamins or supplements. There is no convincing evidence that they help, unless of course a vitamin deficiency state exists. Presently, more data exists for diets that contain high levels of omega-3, rather than for omega-3 supplements. It is more plausible at this time to recommend a healthy diet containing vitamins and higher levels of omega-3 (e.g., Mediterranean-type diet), rather than any specific dietary supplement. However, research is ongoing with a large European prospective trial expected to produce data on omega-3 supplementation and many other preventative strategies by the year 2013 (4).

### **Pilots and experience**

With particular regard to pilots, the association of more experience with better later-life flight performance is strong (5). It is therefore plausible to encourage pilots to pursue lifelong flight training and currency to maximize safe flight performance.

### **Future research**

For providers and patients who are interested and wish to get involved in Alzheimer’s preventative research, the National Institute of Aging maintains a list of research centers nationwide that provide opportunities to participate in local clinical trials or epidemiological studies (6).

### **Education—The specific role of the aviation medical examiner, now and in the future**

The AME has expertise in the relevance of health issues to aviation safety and are in a unique position to provide relevant medical education to pilots. Perceived value is important when providing effective education, but there are factors adversely affecting pilots’ perceived value of AMEs and the medical certification process. Glider and Light Sport operations do not require medical certification, and some pilots perceive this as a mixed message from regulatory bodies. Medical certification is often perceived as a bureaucratic process, which by definition, is to some degree necessary. There has been a request from the pilot advocacy community to provide an exemption to the requirement for Class III medical certificate for certain VFR flight operations (7). On the other hand, many pilots report their opinion that the medical certification process improves flight safety (8).

The ongoing debate regarding exemption to the Class III medical examinations is relevant to a discussion on aeromedical education because it highlights pilots’ perceived value of the flight physical. It is also relevant because any planning

*Continued* →

for reducing the existing medical requirements necessitates understanding of the effects of cognitive disease on judgment and an individual's ability to self-certify.

Promotion of medical education for pilots who do not require a flight physical could improve the perceived value of the aeromedical system, efficacy of aeromedical education, and overall safety. AMEs may consider getting involved in educating these pilots, through local sport and glider pilot groups, for example.

Discussions about providing medical advice are not complete without mentioning "Motivational Interviewing" techniques, a method of improving deployment of medical advice through stronger patient relationships—helping patients better understand and verbalize the relevance and benefits of healthy lifestyle changes to them. This is not inconsistent with the intent of the aeromedical certification process. Those not already familiar with this method may wish to read an excellent review, available online from Medscape (9).

Open questions that get the pilot thinking about health can be used, such as "What do you think about medical health and flight safety?" or "What sort of flying do you see yourself doing in 10 years, in 20 years?" Responding to and affirming pilot/patient statements such as, "I know I could do with losing a few pounds" in a non-judgmental and "non-lecturing" manner can open up a more meaningful discussion about motivation to change and the specific benefits for the pilot, including benefits relevant to flight safety. This can often be done without adding too much time while performing the "mechanics" of the flight physical exam.

The FAA Office of Aerospace Medicine provides pilot education materials covering a range of topics that may be downloaded for free (10). In particular, the "Fit for Flight" brochure covers many of the benefits of physical fitness and healthy lifestyle with relevance to flight. The relevance of physical fitness to aviation safety may be even greater if it prevents cognitive decline. Other brochures likely to be useful in the AME exam room include: "Alcohol and Flying," "Fatigue in Aviation," "Hypoxia," "Medical Certification Questions and Answers," "Medications and Flying," "Obstructive Sleep Apnea," "Pilot Medical Certification—Information for the Aviation Community," and "Pilot Vision."

### In summary

The current evidence suggests that the way for the AME to improve cognitive and age-related flight safety would include education about healthy lifestyle, management of health problems, and pursuing lifelong flight training and currency.

Deployment of medical education by an expert with knowledge of flight safety matters and motivational interview techniques is much more likely to hit home and be effective. Considering the aviation-tailored health evaluation and education that an AME may provide, the value of this service should not be underemphasized. In addition, educating pilots who do not need medical certification is also encouraged.

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## Takotsubo Cardiomyopathy

Case Report, by Leigh E. Lewis, MD, MPH

*Takotsubo cardiomyopathy is a relatively new disease process that is also referred to as stress-induced cardiomyopathy, transient left ventricular apical ballooning syndrome, or broken-heart syndrome. The condition presents similarly to acute coronary syndrome but is associated with reversible left ventricular dysfunction in the absence of coronary artery disease. This article presents a case report of a third-class pilot who was diagnosed with this condition and the aeromedical concerns involved in determining continued medical certification.*

### History

A 61-YEAR-OLD FEMALE third-class pilot presented for a medical certification exam three months following hospitalization with a resulting diagnosis of takotsubo cardiomyopathy.

The patient presented to her local emergency room complaining of chest pain and was found to have ST elevation of V1-V3 on ECG. She was taken directly to the cardiac cath lab and found to have clean coronaries. Her cardiac enzymes were slightly elevated but normalized during her hospitalization. An echocardiogram revealed an ejection fraction of 40-45% with left ventricular apical wall motion abnormalities. Further questioning of the patient revealed increased stress due to a recent death in her family. After a three-day stay, she was discharged from the hospital with a diagnosis of takotsubo cardiomyopathy. Discharge medications included aspirin and metoprolol.

One month later, a repeat echocardiogram showed a preserved ejection fraction of 55-60% with no wall motion abnormalities. Repeat ECG showed normal sinus rhythm with no q waves or ST, T wave abnormalities. She has remained chest pain-free and denies side effects from her aspirin or beta-blocker.

### Aeromedical Concerns

Aeromedical issues following diagnosis of takotsubo cardiomyopathy include unresolved left heart failure, continuing chest pain, or other symptoms that could distract from flight, and the possibility of sudden incapacitation due to recurrence. Cardiac decompensation such as left heart failure caused by takotsubo cardiomyopathy requires deferral for all three classes of medical certification. Although no evidence-based studies have shown any

treatment to be superior, the FAA typically approves the use of aspirin and metoprolol, provided the patient is free of side effects. For special issuance consideration following a diagnosis of takotsubo cardiomyopathy, a complete cardiovascular exam should be conducted and submitted, including: personal, family, and social history; hospital records, including in-hospital echo and cath reports; general physical exam; assessment and statement regarding medications; lab data such as a fasting blood sugar and lipid profile; resting ECG; and a current 2-D and M-mode echocardiogram with Doppler flow studies. Special issuance is possible once echo findings are stable and have normalized, the airman is free of symptoms, and no side effects are evident on FAA-approved medications. To grant authorization, the FAA will typically require an ejection fraction (EF) of greater than 45% or an increase in EF by five points with exercise. Some cases may be referred to the FAA cardiology consultant for review. Airmen who are granted limited certification should provide the FAA with an annual cardiovascular evaluation with a Bruce protocol exercise stress test and a transthoracic echocardiogram with Doppler studies due to the risk of recurrence of stress-induced cardiomyopathy.

### Outcome

The case was deferred to the FAA Aerospace Medical Certification Division for evaluation. Based on the complete review of the available medical evidence, the airman was granted an authorization for special issuance third-class airman medical certification under Title 14 of the Code of Federal Regulations, §67.401. She will be required to submit an annual cardiovascular evaluation, a Bruce protocol exercise stress test, and an echocardiogram for continued certification. The airman is also required to report any adverse changes in her condition or medications to the FAA Medical Appeals Section.

Continued research is needed to elucidate pathogenesis, early diagnostic and treatment techniques, and prevention strategies for takotsubo's cardiomyopathy. As physicians increasingly recognize this syndrome, more cases will require aeromedical disposition. Because the majority of patients attain complete recovery and have a favorable prognosis, many airmen may qualify for a special issuance, requiring routine monitoring of their condition and may continue to exercise their flying privileges.

### DISEASE SUMMARY

In the early 1990s, a novel form of reversible cardiomyopathy from Japan termed *takotsubo cardiomyopathy* surfaced in the literature. The condition presents similarly to a ST-elevation MI with acute but rapidly reversible wall-motion abnormalities of the left ventricle in the absence of significant coronary artery disease. The term “takotsubo,” Japanese for an “octopus pot” (a large jar with a narrow opening and wide bottom used as an octopus trap), was utilized due the resemblance of the shape of the jar to the apical ballooning of the left ventricle seen on echocardiography. Several subsequent names been used to describe this entity, including stress-induced cardiomyopathy, transient left ventricular apical ballooning syndrome, or broken-heart syndrome. In Japan, takotsubo cardiomyopathy is thought to account for about 1% of admissions for acute coronary syndrome (1). In the case series by Sharkey and associates (1), about one case per month was noted in their active cardiovascular practice. The syndrome is thought to be widely under-recognized and may be much more common than initial reports as physician education of this relatively novel condition improves.

In 2004, Bybee et al. (2) proposed the Mayo criteria in which the following four criteria must be present for diagnosis:

1. Transient akinesis or dyskinesis of the left ventricular apical and mid-ventricular segments with regional wall-motion abnormalities extending beyond a single epicardial vascular distribution,
2. Absence of obstructive coronary disease or angiographic evidence of acute plaque rupture,
3. New electrocardiographic abnormalities (either ST-segment elevation or T-wave inversion), and
4. Absence of recent significant head trauma, intracranial bleeding, pheochromocytoma, obstructive

epicardial coronary artery disease, myocarditis, or hypertrophic cardiomyopathy.

Case series have elucidated a typical patient profile. In a study by Pilgrim and Wyss (3), 90.7% of patients were found to be women with a mean age range from 62-77 years. Most presented with chest pain (83.4%) or dyspnea (20.4%). ECG on admission showed ST-segment elevations in 71.1% and mild elevations of troponin were noted in 85.0%. Left ventricular ejection fraction was found to be 20–49.9%, while follow-up levels 7-37 days later were found to be from 59–76%. The in-hospital mortality rate was 1.7%, and complete recovery occurred in 95.9% of patients. Sharkey (1) also noted the association of preceding psychological or physical stress, including issues such as death of relatives, domestic abuse, arguments, catastrophic medical diagnoses, and devastating financial or gambling losses.

The cause of the takotsubo cardiomyopathy is unknown. Nef et al. (4) are proponents for the theory that catecholamine overload, which can occur with stress, may lead to structural alterations of the heart, including increased extracellular matrix, contraction band necrosis, and mild neutrophil infiltration. Several other mechanisms have been proposed in the literature: multivessel coronary artery vasospasm, obstruction of the left ventricular outflow tract, coronary microvascular dysfunction, and neurogenically mediated myocardial stunning (2).

In-hospital care includes typical management for heart failure. No long-term management strategies have been found to be superior, as cardiac function typically normalizes within a few weeks (5). Elesber et al. (6) conducted a retrospective study to determine the recurrence rate and prognosis of patients with stress cardiomyopathy. Over a four-year follow-up period from initial presentation, the recurrence rate was found to be 11.4%. Long-term survival was found to be no different than an age- and sex-matched population.

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## The Sun and Recent Space Weather

By Kyle Copeland, CAMI Radiobiology Research Team

**T**HE RECENT INCREASE in solar activity, in particular the events of late January and of early March, have drawn renewed attention to solar radiation and space weather. The week of January 22-29 contained the first impressive outbreak of the present solar cycle, including a large solar flare and an Earth-directed coronal mass ejection, resulting in the largest solar particle event in several years. Indeed, the affects of these events were serious enough that Delta, Qantas, and Air Canada diverted or cancelled some of their transpolar flights early in the week (1).

Most of the time, with respect to radiation, the Sun is our friend. Besides providing us the light and warmth that keep our planet habitable, the ionized gases that boil out into space as the solar wind serve to protect us from galactic cosmic radiation, which is the day-to-day primary source of ionizing radiation in Earth's atmosphere. For aviators, this means reduced risks of all manner of stochastic effects caused by ionizing radiation, for example: several types of cancer, heart disease, and genetic defects in future generations (see OAM report DOT/FAA/AM-11/9 for more information on the biological aspects of ionizing radiation in aviation at: [www.faa.gov/library/reports/medical/oamtechreports/](http://www.faa.gov/library/reports/medical/oamtechreports/)). For this ever-present source of risk, the FAA's CARI program is one option aviators can use to calculate flight doses from galactic cosmic radiation (2).

Periodically, the Sun becomes less well-behaved and hurls large masses of ionized particles and X-ray radiation in our direction. This so-called "space weather" presents new hazards for aviators and can increase the risks of some others. The National Oceanic and Atmospheric Administration's (NOAA's) Space Weather Prediction Center monitors space weather continually using ground- and satellite-based instruments. They maintain an extensive website on the subject and have a page for aviation users ([www.swpc.noaa.gov/aviation/index.html](http://www.swpc.noaa.gov/aviation/index.html)). They divide the hazards across 3 scales ([www.swpc.noaa.gov/NOAA\\_scales/](http://www.swpc.noaa.gov/NOAA_scales/)), the S scale for particulate ionizing radiation, the G scale for geomagnetic effects, and the R scale for radio effects. There is some overlap across the scales with regard to effects, as the root causes of the effects are interrelated. The X-ray intensity scale is also often commonly referred to, since many of the largest space weather events are associated with large solar X-ray flares, and it is also the basis of the R scale.

In addition to providing CARI software for calculation of doses from galactic cosmic radiation, the FAA's Civil Aerospace Medical Institute does a separate evaluation of the particulate ionizing radiation for the Solar Radiation Alert system (DOT/FAA/AM-09/6), continually calculating dose rates from solar cosmic radiation at aviation altitudes from

the satellite data. Whenever the dose rate exceeds threshold values, alert messages are sent out to the aviation community through the National Oceanic and Atmospheric Administration's Weather Wire Service (NWS) until they fall below threshold values again. The most recent warnings and alerts from FAA and NOAA can also be found on the Internet ([www.weather.gov/view/national.php?prodtype=space](http://www.weather.gov/view/national.php?prodtype=space)).

The unusual space weather during the week of January 22-29 began with a large solar flare, followed closely by an Earth-directed coronal mass ejection (CME). The CME was strong enough to generate a large increase in the flux of ionized energetic solar protons at the Earth that peaked within a several hours and then slowly waned for the next few days. Peak ratings on the NOAA scales were R2, S3, and G2, respectively.

For aviators, the notable effects of the week's space weather were:

**Aurorae.** The geomagnetic disturbance that accompanied the arrival of the solar particles resulted in unusually strong aurorae for a few nights during the event.

**Increased ionizing at high latitudes.** While dose rates at altitudes at high latitudes did increase slightly, FAA Solar Radiation Alert calculations indicated that for this event, the increased dose rates, even at event maximum, were insignificant compared to galactic cosmic radiation levels at the time. No alert messages were issued by the FAA regarding ionizing radiation levels. NASA officials also released a statement that the increased radiation posed no threat for the astronauts on the International Space Station (3). Private aircraft (except business jets) fly too low for solar ionizing radiation to be a health concern for occupants (4). Another consequence of increased ionizing radiation levels is the increased likelihood of single event upsets. However, as was the case with biological effects, the event was too weak to be of concern to aviation. Modern avionics systems are usually well characterized in this regard. Finally, solar ionizing radiation storms can increase radiation levels enough in satellite orbits to put satellite electronics at risk, permanently degrade solar panels, and can even affect the orbits of low-orbiting satellites. Again, this even seems to have been too weak to result in any losses of service.

**Radio blackouts.** Commercial aircraft do not fly into radio blackout areas unless there is no other recourse, since aircraft are not supposed to be dispatched unless crews can communicate with ground controllers over the whole route, with limited exceptions (5). Both strong X-ray flares and energetic ions can cause radio communications problems, since they ionize Earth's upper atmosphere, which greatly increases its ability to absorb radio waves and also alters its reflective properties. Both over-the-horizon communication and GPS navigation (which relies on radio signals) are interfered with to some degree. While the errors induced in

GPS navigation are usually not large, communication with ground controllers is sometimes not possible in some areas. Routes over large, open oceans and polar areas are particularly vulnerable. For this event, over-the-horizon communications was sufficiently degraded that some transpolar routes were temporarily closed to new traffic, leading Delta and some other airlines to cancel or reroute those flights (1).

Since the Sun is just now getting into the active phase of the solar cycle, events of this sort can be expected to occur again, although infrequently, as the active phase progresses during the next few years. As of yet, solar physicists cannot reliably predict individual space weather events or the intensities of ongoing events advance. The limited experience we have had measuring solar ionizing radiation in the modern satellite era (since the mid-1980s) suggests that events that significantly increase ionizing radiation doses to passengers at commercial jet altitudes are quite rare (no more than a few per cycle). Radio disruptions, which can be caused by all three kinds of space weather events, are much more likely. The continual increase in operational flight altitudes and the number of planes suggests that these kinds of disruption will become increasingly frequent, with more flights diverted, delayed, or cancelled for space weather-related reasons as we increase utilization of polar routes.

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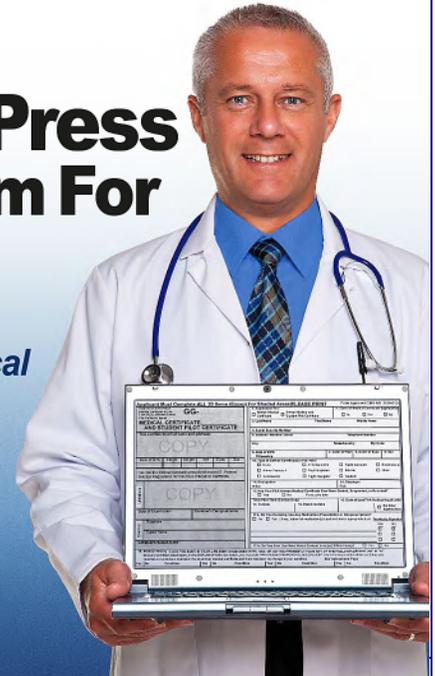
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Federal Aviation  
Administration

# FAA MedXPress Program For Pilots

*Your Express  
Lane to Medical  
Certification*



## MedXPress Brochure for Pilots Now Online

For those wondering how to use the MedXPress program, the Office of Aerospace Medicine has created a brochure, *FAA MedXPress Program for Pilots: Your Express Lane to Medical Certification*, that describes the popular program.

As of October 1, 2012, the printed version of Federal Aviation Administration Form 8500-8 will no longer be available, and airmen applying for an Airman Medical Certificate or Airman Medical and Student Pilot Certificate must use the online electronic application and transmit it to their aviation medical examiner.

The Office of Aerospace Medicine does not anticipate being able to offer aviation medical examiners or pilots printed copies of the brochure because of high costs associated with printing. However, you can find this brochure, and all pilot safety brochures, at the Federal Aviation Administration website:

[www.faa.gov/pilots/safety/pilotsafetybrochures/](http://www.faa.gov/pilots/safety/pilotsafetybrochures/)

## Glaucoma

Case Report, by Joseph A. Lopez, MD

*Glaucoma is a common medical condition affecting the visual system. The aeromedical significance of this condition lies in its insidious nature, potentially leading to irreversible visual field losses and blindness if not detected and adequately treated in a timely manner, potential for sudden incapacitation, as well as potential side effects from treatment. Most aviators with this condition are able to obtain a Special Issuance.*

### HISTORY

THE APPLICANT IS a 48-year-old commercial pilot who presented to his aviation medical examiner (AME) for his annual second-class medical examination. He reported he had recently seen a local optometrist for eye strain, who told the airman his “eye pressures” were a little high. His aviation medical examination was performed by the AME and was found to be unremarkable, including normal corrected near, intermediate, and distant visual acuities; normal color vision; and grossly normal peripheral visual field testing. Nevertheless, the AME was concerned with the possibility of ocular hypertension or glaucoma and, after voicing his concerns with the airman, the AME elected to defer the case until an FAA Form 8500-14, Glaucoma Eye Evaluation Form, could be completed by an eye specialist and submitted for final determination. The subsequent report was significant for a positive family history for glaucoma in the airman’s father, abnormally elevated intraocular pressures (IOPs) in the high 20s bilaterally, an increased optic cup-to-disc ratio of 0.6 (normal <0.4), and a mild degree of peripheral visual field loss bilaterally on formal testing by perimetry. The ophthalmologist diagnosed the airman with primary open-angle glaucoma and prescribed latanoprost eye drops for daily use.

### AEROMEDICAL CONCERNS

Aeromedical concerns for glaucoma can be divided into three main categories: those relating to the progressive and insidious loss of visual fields in primary open-angle glaucoma (POAG), the potential for sudden incapacitation from acute angle-closure glaucoma, and possible side effects resulting from glaucoma treatments. Because POAG initially causes a peripheral visual field loss, it may not become evident to the airman until central vision becomes compromised, by which time advanced, irreversible glaucomatous damage has occurred to the optic nerve. Early intervention and close ophthalmologic follow-up are essential to preserving the airman’s visual fields (1-3). Acute angle-closure glaucoma is of particular aeromedical significance because it can worsen acutely and without warning, leading to sudden incapacitation of the airman (4). The newer topical ocular medications currently being used in the treatment of glaucoma are a significant improvement over older agents in their compliance and side effect profiles (5, 6) One such class includes the prostaglandin analogues, such as latanoprost ophthalmic, a once-daily agent used at bedtime. It is well tolerated by most people, with its major side effect being possible lengthening and darkening of the eyelashes. Topical

beta adrenergic blockers are acceptable as first- or second-line treatment and generally do not cause significant systemic cardiovascular side effects. Alpha adrenergic agonist medications can cause ocular irritation, postural hypotension, and central nervous system side effects, which may adversely impact aviator duties. When used orally, carbonic anhydrase inhibitors can have significant side effects, including transient myopia, nausea, diarrhea, loss of appetite and taste, paresthesias, lassitude, renal stones, and hematologic problems. These side effects are reduced when these agents are used topically, but local irritation and eye redness are still frequent; therefore, these agents are no longer considered first- or even second-line agents. Similarly, the cholinergic agonists have side effects that preclude them being used in aviators, including ciliary spasm with headache, impaired distant vision, and reduced night/low light vision due to constriction of the pupil (5, 6).

### ROLE OF THE AME

As stated in the *Guide for Aviation Medical Examiners*, Items 31-34. Eye – Glaucoma, the Examiner should deny or defer issuance of a medical certificate to an applicant if there is a loss of visual fields, a significant change in visual acuity, a diagnosis of or treatment for glaucoma, or newly diagnosed intraocular hypertension (7, 8).

The FAA may grant an Authorization under the special issuance section of Title 14 of the Code of Federal Regulations (CFR) §67.401 after submission of a report of Ophthalmological Evaluation for Glaucoma (FAA Form 8500-14) from a treating or evaluating eye specialist (optometrist or ophthalmologist). An FAA physician provides the initial certification decision and grants the Authorization in accordance with 14 CFR § 67.401. Examiners may then re-issue an airman medical certificate under the provisions of an Authorization, if the applicant provides the following:

- An Authorization granted by the FAA;
- Certification only granted for open-angle-glaucoma and ocular hypertension;
- The FAA Form 8500-14, Glaucoma Eye Evaluation Form is filled out by the treating eye specialist; and
- A set of visual fields measurements is provided.

The Examiner must defer to the AMCD or Region if:

- The FAA Form 8500-14 Glaucoma Eye Evaluation Form demonstrates visual acuity incompatible with the medical standards; or
- There is a change in visual fields or adverse change in ocular pressure.

Applicants with primary or secondary narrow-angle glaucoma are usually denied because of the risk of incapacity from an attack of acute angle closure. Individuals who have had surgery for their glaucoma can be considered when stable and without complications. Although the FAA no longer routinely prohibits pilots who use miotic or mydriatic medications from flying at night, it may be worthwhile for the Examiner to discuss this aspect of the use of miotics with applicants. If considerable disturbance in night vision is documented, the FAA may limit the medical certificate: NOT VALID FOR NIGHT FLYING (8).

*Continued on page 13*

### GLAUCOMA

Glaucoma is a disease characterized by progressive damage to the optic nerve, leading to gradual, insidious permanent loss of peripheral visual fields. If untreated, glaucoma can result in loss of central vision and blindness. Although most cases are associated with increased intraocular pressures (>21 mm Hg), approximately 20% will have IOPs in the normal (10 to 21mm Hg) range (9, 10). Worldwide, glaucoma is the leading cause of permanent blindness (10). An estimated 2 million people in the US have glaucoma, although as many as half of them may not know it due to its slow, insidious nature with initial loss of peripheral vision only (11). The optic nerve and its delicate neural fibers are the eye structure most susceptible to elevated intraocular pressures. In individuals with primary open-angle glaucoma (POAG), who comprise approximately 75% of glaucoma cases, a defect in the drainage system (trabecular meshwork) contributes to a net accumulation in aqueous fluid, resulting in increased IOP. Other risk factors for the development of primary open-angle glaucoma include: male gender, advancing age, a family history of glaucoma, race (3 to 4-fold increase risk in African Americans), a history of

ocular hypertension (IOP > 21 mm Hg without visual field loss), and a relatively thin central cornea (10; 12-14). In the angle-closure variety of glaucoma, the angle between the periphery of the iris and the cornea is narrowed, resulting in impeded reabsorption of aqueous humor. People with hyperopia (farsightedness) are at increased risk due to having shallow anterior chambers with narrow angles (10). In contrast to the slow, insidious, and painless nature of POAG, acute angle closure in angle-closure glaucoma can occur suddenly, unpredictably, and dramatically, presenting with a severely painful red eye, headache, incapacitating nausea and vomiting, and acute visual obscuration due to profuse tearing and blurred vision with halos seen around lights. In these cases, treatment to lower the IOP must be initiated emergently to prevent permanent damage to the optic nerve. Most cases of glaucoma can be managed medically, such as with topical eye drops. Prostaglandin analogs, such as latanoprost, are currently the most commonly used agent and work by increasing the outflow of aqueous humor. Patients with glaucoma require regular, long-term follow-up because glaucomatous visual field changes can continue to progress in spite of optimal treatment (5).

### AEROMEDICAL OUTCOME

At the time of the airman's ophthalmology re-evaluation one month after his initial evaluation, his IOPs had decreased into the low-normal range. The ophthalmologist recommended the aviator continue the latanoprost indefinitely and annual re-evaluations to assess for stability/progression of his glaucoma. The aviator was subsequently granted an initial Special Issuance of his second-class medical certificate for glaucoma, with Authorization for his AME to re-issue his medical certificate on an annual basis if the requirements as described above continued to be met.

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## Louis Hopewell Bauer and the First Federal Aviation Medical Examiners

*The Genesis of Aerospace Medicine*

By Terry Kraus, FAA Historian

**E**IGHTY-FIVE YEARS AGO, on February 28, 1927, the Department of Commerce's Aeronautics Branch published a list of the first 57 physicians qualified to give medical examinations for pilot licenses. Scattered over the United States, these physicians (soon to be known as aviation medical examiners) had been selected and qualified by Aeronautics Branch Medical Director **Louis Hopewell Bauer, MD** (1888-1964).



Louis Hopewell Bauer, MD

The passage of the Air Commerce Act on May 20, 1926, had, for the first time, made civil aviation safety a federal responsibility. The act instructed the Secretary of Commerce to foster air commerce; designate and establish airways; establish, operate, and maintain aids to air navigation (but not airports); arrange for research and development to improve such aids; license pilots; issue airworthiness certificates for aircraft and major aircraft components; and investigate accidents. In August, **William MacCracken, Jr.**, took the oath of office as the first Assistant Secretary of Commerce for Aeronautics.

MacCracken selected Dr. Bauer as the first medical director in November 1926. The medical office became a part of the Air Regulations Division.

Bauer came with extensive experience for the job. He had earned his medical degree at the Harvard School of Medicine in 1912. On August 25, 1913, Bauer joined the Medical Corps of the U.S. Army as a first lieutenant and graduated from the U.S. Army Medical School in 1914. After World War I he served as a medical officer in the Philippines, and then was reassigned to Kelly Field, San Antonio. He graduated from the U.S. Army School of Aviation Medicine in 1920.

Rising to the rank of Major, Bauer later served as the head of the military aviation research laboratory and served as the commandant of the Army's school of aviation medicine. He graduated from the U.S. Army War College in 1926. Immediately prior to his Department of Commerce appointment, he published the most authoritative book on aviation medicine to date, *Aviation Medicine*. He resigned his commission to accept the Aeronautics Branch position, but joined the Army's Medical Reserve Corps where he earned the rank of lieutenant colonel.

At the Aeronautics Branch, Bauer quickly went to work to help define the first federal physical standards and examination frequencies for determining the medical fitness of civilian pilots. He did not believe the standards should be identical to then current military standards, because the military requirement related not only to flying but also to carrying out other military duties. He, however, firmly believed that "There is no occupation in which physical condition is of such paramount importance as flying."

With the help of other medical experts, Bauer identified disqualifying conditions that could cause sudden incapacitation or death while at the controls of an airplane or could compromise a pilot's ability to operate an aircraft at an acceptable level of safety. On December 31, 1926, the Aeronautics Branch issued the first air commerce regulations,

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which included Bauer's medical standards. Those standards included three levels of physical standards, one for each class of pilot: private; industrial; and transport. The Branch added a fourth class, limited commercial in March 1927. Under the new regulations, transport and limited commercial pilots had to undergo a physical examination every 6 months and industrial and private pilots had to renew their medical certificates every 12 months.

In addition: Private pilots had to have an absence of organic disease or defect which would interfere with safe landing of an airplane; visual acuity of at least 20/40 in each eye; less than 20/40 might be accepted if the applicant wore a correction in his/her goggles and had normal judgment of distance without correction; good judgment of distance; no diplopia (double vision) in any field; normal vision fields and color vision; and no organic disease of eye, ear, nose, or throat.

Industrial pilots could not have any organic disease or defect which would interfere with safe landing of an airplane; visual acuity of not less than 20/30 in each eye, although in certain instances less than 20/30 might be accepted if the applicant wore a correction to 20/20 in his/her goggles and had normal judgment of distance without correction; good judgment of distance; no diplopia in any field; normal vision fields and color vision; and no organic disease of eye, ear, nose, or throat.

Transport and limited commercial pilots were to have a good medical history; sound pulmonary, cardiovascular, gastrointestinal, central nervous and genitourinary systems;

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*U.S. Army School of Aviation Medicine Class of 1922.  
Instructor Louis Bauer is seen in the front row, center*

freedom from material structural defects or limitations; freedom from diseases of the ductless glands; normal central, peripheral, and color vision, normal judgment of distance; only slight defects of ocular muscle balance; freedom from ocular disease; absence of obstructive or diseased conditions of the ear, nose and throat; no abnormalities of the equilibrium that would interfere with flying.

Physicians in private practice as medical examiners would receive no pay from the federal government, but would collect a fixed fee from each applicant they examined

In the case of trained, experienced flyers, the Secretary of Commerce could grant waivers for physical defects designated as disqualifying by the regulations when, in his opinion, the experience of the pilot compensated for the defect.

Under the new civil air regulations, a Department of Commerce official had to flight test every pilot applicant. The applicants, however, would not be examined by a Department doctor. The Department realized that even if it could hire the requisite number of physicians the cost would be prohibitive. The alternative was use physicians in private practice as medical examiners. They would receive no pay from the federal government, but would collect a fixed fee from each applicant they examined.

Bauer initially wanted a designated medical examiner in each major city in the United States and wanted to select personally each examiner. He turned, naturally, to his former colleagues – the military flight surgeons he had trained and served with in World War I.

By February 1927, he had selected the first 57 doctors. In doing so, he disregarded an order by his boss, William MacCracken, Jr., not to hire his father, Dr. William MacCracken, Sr., who became one of the original core of examiners. By the end of June 1927, Bauer had selected approximately 125 physicians as examiners – a number that increased by six-fold by the turn of the decade.

Bauer saw aviation medicine as an expanding and evolving field. Although he expressed concern early in his tenure in the Department of Commerce whether or not the airplane could surpass a speed that a pilot could endure, and if the human factor would be the eventual limit of an airplane's velocity (*Popular Science*, October 1927), he worked to advance the field. Bauer explained the purpose of aviation medicine "is largely preventive in nature. It involves the selection and care of the pilot and his protection against the physical forces acting upon him in the air, all with a view to preventing accidents from a physical cause" (*Annals of Internal Medicine*, January 1, 1943).

To advance this new field of aviation medicine, Bauer established the Aero Medical Association in 1929 (now the Aerospace Medical Association) and started the organization's *Journal of Aviation Medicine* in 1930 (now *Aviation, Space, and Environmental Medicine*).

Though he left the Aeronautics Branch in November 1930 and went into private practice, he continued his relationship with the organization he founded by becoming an aviation medical examiner. He subsequently served as president and chairman of the American Medical Association. During his later years, he helped found and then served as Secretary General of the World Medical Association, and later joined United Medical Service, Blue Shield Plan of New York as chairman of the board.



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# Huntington's Disease

Case Report, by Robert Craig-Gray, MD

## Summary

*As the aviation population ages, it increasingly becomes affected by neurological diseases that may cause disability and reduce mobility and freedom, both mentally and physically. While some disorders progress slowly with relatively little effect, others may result in significant motor and neurological deficits that impair the ability to effectively perform aviation tasks. New advances in disease testing and diagnosis, such as genetic testing, now provide increased means for disease diagnosis but also possible therapeutic treatments. Indeed, according to some experts, genetic testing and therapy may be key to future disease detection, therapy, and even prevention. In this case report, a second-class airman with the gene that causes Huntington's disease will be discussed, as well as the aeromedical concerns associated with its long-term management.*

## History

A 40-YEAR-OLD COMMERCIAL pilot with 4,000-plus flying hours presented to the office of his aviation medical examiner (AME) for re-issuance of his second-class medical certificate. As a former USAF pilot, the airman held a third-class medical certificate and student medical certificate obtained during his primary pilot training. After separating from the service approximately 2 years ago, the airman underwent an initial employment interview and medical screening exams for a regional commuter airline, which he passed, and he was subsequently hired as a co-pilot. He has been flying for 16 months without incident and reported no problems with his recent change in career and lifestyle. The airman did not smoke and reported moderate alcohol consumption with no history of abuse or dependence and reported no significant medical or surgical history, other than elevated cholesterol, which he controlled with diet and physical activity. He had no recent hospitalizations or significant illnesses. The airman's maternal grandfather died in his early 50s from an unknown disease, but both parents are living and healthy. He has 2 siblings (1 sister and 1 brother) who are both younger and otherwise healthy and disease-free.

During further AME review of his FAA Form 8500-8, it was noted that the airman had checked positive for block 18x and annotated Huntington's gene in the explanation block. Upon further questioning, he stated that his 30-year-old sister recently underwent genetic testing associated with her first pregnancy, during which she was offered advanced genetic screening for common familial diseases. She was found to be positive for the genetic marker associated with Huntington's disease. After receiving further genetic counseling, she shared this information with the airman and the rest of her family, all of whom agreed to undergo confirmatory testing due to the inheritance pattern of the disease. The airman's father and brother were both negative for the Huntington gene; however, both the airman and his mother were found to be positive

and underwent further genetic counseling. The airman had discussed the results and his concern with his personal physician but otherwise reported no disability or medical concerns. His AME requested deferred approval of his second-class certification to the FAA regional flight surgeon.

## Aeromedical Concerns

The presence of neurological disease in an airman presents a unique challenge to the aviation medical examiner. He/she must weigh the degree of motor or sensory deficits (if present) and the prognosis versus the need for safety in the likelihood of sudden incapacitation or progressive decline, as well as consideration for the airman's right to fly. According to the *Guide for Aviation Medical Examiners*, "A history or the presence of any neurological condition or disease that potentially may incapacitate an individual should be regarded as initially disqualifying. Issuance of a medical certificate to an applicant in such cases should be denied or deferred, pending further evaluation. Applications from individuals with potentially disqualifying conditions should be forwarded to the FAA Aerospace Medical Certification Division."<sup>1</sup>

In cases of neurological disease, additional information is helpful and should include all additional medical records and history, any specialty consultation reports, along with appropriate laboratory and radiological imaging studies. Reports should detail the history of any symptoms or disturbances due to the airman's underlying condition. Special attention should be given to anything that may be acutely incapacitating in an aviation environment such as pain, weakness, vertigo or incoordination, seizures or a disturbance of consciousness, visual disturbance, or mental confusion. Additional attention should be given to any prognosis that may be chronic and progressive and/or incompatible with safe aircraft operation either due to the severity of neurologic deficit, its psychological impairment, or future unpredictability.

In this case, with respect to Huntington's disease, key points critical to airman certification include: 1) the presence of active symptoms of neurological disease, 2) the presence of mental health disorders such as depression or dementia, and 3) the ability to satisfactorily monitor the airman for progression of the disease. While medications and cognitive/psychological and physical therapy can help reduce symptoms and slow disease progression, individuals testing positive for the disease and who develop symptoms face a 100% mortality rate and endure progressive, debilitating disease. Although only 50% of those testing positive for the disease actually develop symptoms, currently there is no further predictive capacity to determine who will become ill and who will remain disease-free, and this must also be accounted for in any aeromedical decision-making. Therefore, an FAA medical certificate should not be issued to any applicant who tests positive for Huntington's disease under such criteria without first consulting with an FAA Regional Flight Surgeon or the FAA Aerospace Medical Certification Division (AMCD).

## Outcome

A medical status report was obtained from the airman's neurologist and revealed no detectable neurological disease or disability. Additional requested neuropsychiatric testing

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### ETIOLOGY OF HUNTINGTON'S DISEASE

Huntington's disease is a rare, progressive, degenerative disease that results in severe neurologic disease, disability, and eventually death in affected individuals. Until recently, the diagnosis of Huntington's disease was based on physical symptoms and a family history of the disease, but modern genetic testing can now detect the defect in the HTT allele of chromosome #4.<sup>3</sup> In affected individuals, errors in DNA replication occur that result in multiple repeats of CAG expression sequences on the affected chromosome, which may also be passed down to offspring.<sup>3,4</sup> It is an autosomal dominant disorder where only one copy of the defective gene inherited from either parent is necessary to produce disease. If one parent possesses the single defective gene, the chance that an offspring will have the defect is 50%. Worldwide, the prevalence of the disease is 5-10 cases per 100,000 persons but varies geographically.<sup>3</sup> Prevalence is similar for both men and women.<sup>3</sup>

Early onset of disease represents a small number of cases and adult onset Huntington's disease represents the majority of cases seen. Symptoms usually become evident during the mid-30s to 40s but may be seen earlier in individuals affected with larger numbers of repeating CAG expression sequences.<sup>4,5,6</sup> In these individuals, more severe and rapid disease progression occurs. Often, family and friends notice changes associated with Huntington's disease prior to those affected with the disease.<sup>5,6</sup> These symptoms can include antisocial behavior, hallucinations, paranoia, psychosis, and personality changes.<sup>6</sup> These early symptoms may be seen prior to the development

of motor symptoms, which occur later in the progression of the disease. Motor symptoms resemble those seen in Parkinson's disease and include rigidity, unsteady gait, quick uncontrolled movements, clumsiness, and tremors.<sup>6</sup> Brain MRI or PET scans often show changes associated with neurological damage as nerve cells within the brain waste away, die, or degenerate.<sup>6</sup>

The goal of treatment in Huntington's disease is currently focused on slowing its insidious progression and minimizing disability. Increasingly, respiratory difficulties, speech and motor impairment, depression, and difficulty swallowing are complications seen in the final stages of the disease, which limit the daily activities of these patients.<sup>6</sup> Medication therapy may vary depending on disease symptoms and includes dopamine blockers, such as tetrabenazine, to help reduce abnormal movements and haloperidol, to minimize violent outbursts and hallucinations, or amantadine to control extra movements.<sup>6,7</sup> Some evidence also suggests that co-enzyme Q10 or gene therapy may help slow disease progression.<sup>8</sup> Side effects from many drugs used to treat the Huntington's disease include hyper-excitability, fatigue, and restlessness. Mental disorders commonly seen among persons affected with Huntington's disease include depression and suicide and should be monitored for and treated.<sup>3,4,5</sup> As the disease progresses, patients require increased assistance and may eventually require 24-hour care.<sup>5,6</sup> Unfortunately, no cure currently exists for the disease, and death usually occurs 15 to 20 years after the initial diagnosis. Infections and suicide are the most common causes of death in individuals with the disease.

showed no changes in his cognitive abilities or evidence of psychiatric disease. Laboratory and radiographic testing were also normal. Under 14 CFR part 67.213 (b)(c), 67.313 (b)(c), and 67.209 (b), and 67.309 (b), an authorization for special issuance was subsequently granted for this airman. Given the unexpected nature and terminal prognosis of Huntington's disease, the airman should also report any changes in his medical condition immediately to the FAA and cease aviation operations per Title 14 CFR §61.53, which restricts operation of an aircraft with any medical [known] deficiency.<sup>2</sup>

### References

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## Aviation Medical Examiner Seminar Schedule

2012 SEMINARS		
May 14–17	Atlanta, Ga.	AsMA (1)
June 18–22	Oklahoma City, Okla.	Basic (2)
August 10–12	Washington, D.C.	NEU (3)
August 23–26	Berlin, Germany	EUSAM (4)
October 4–6	La Jolla, Calif.	CAMA (5)
October 29–November 2	Oklahoma City, Okla.	Basic (2)
November 16–18	Denver, Colo.	OOE (3)

### CODES

CAR Cardiology Theme

NEU Neurology Theme

OOE Ophthalmology-Otolaryngology-Endocrinology Theme

(1) A 3½-day theme AME seminar held in conjunction with the Aerospace Medical Association (AsMA). This seminar is a new Medical Certification theme, with 9 aeromedical certification lectures presented by FAA medical review officers, in addition to other medical specialty topics. Registration must be made through AsMA at (703) 739-2240. A registration fee will be charged by AsMA to cover their overhead costs. Registrants have full access to the AsMA meeting. CME credit for the FAA seminar is free.

(2) A 4½-day basic AME seminar focused on preparing physicians to be designated as aviation medical examiners. Call your Regional Flight Surgeon.

(3) A 2½-day theme AME seminar consisting of aviation medical examiner-specific subjects plus subjects related to a designated theme. Registration must be made through the Oklahoma City AME Programs staff, (405) 954-4831.

(4) This seminar is sponsored by EUSAM, the European School of Aviation Medicine, and is sanctioned by the FAA as fulfilling the FAA and the JAA recertification training requirement. For more information and to register, see the EUSAM Web site: [www.flugmed.org](http://www.flugmed.org). Once there, click on EUSAM, then click on REFRESHER FAA/JAA (from the left menu).

(5) This seminar is being sponsored by the Civil Aviation Medical Association (CAMA) and is sanctioned by the FAA as fulfilling the FAA recertification training requirement. Registration will be through the CAMA Web site: [www.civilavmed.com](http://www.civilavmed.com).

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