Federal Aviation Administration

Federal Air Surgeon's Medical Bulletin

Aviation Safety Through Aerospace Medicine

For FAA Aviation Medical Examiners, Office of Aerospace Medicine Personnel, Flight Standards Inspectors, and Other Aviation Professionals.

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Federal Air Surgeon's Medical Bulletin

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Federal Air Surgeon
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PERSPECTIVE...

by James R. Fraser, MD, MPH

New NTSB Study Shows Increasing Drug Use in Pilots

On September 9, I attended the National Transportation Safety Board (NTSB) public meeting to consider their safety study entitled *Drug Use Trends in Aviation: Assessing the Risk of Pilot Impairment.*[1] The findings in this report were not surprising. Multiple studies done at the Civil Aerospace Medical Institute (CAMI) have reported similar findings. However, the significance of the NTSB study, as reported in a highly visible and public forum, is such that I believe all of us involved in the practice of aerospace medicine should be aware of the findings. Although the NTSB staff is currently making final revisions to the report, the following excerpt provides a high-level review of the findings.

> The use of over-the-counter (OTC), prescription, and illicit drugs is increasing in the US population. The NTSB is concerned about the possible safety implications of increased drug use in all modes of transportation. Yet, in most modes of transportation, data about drug use by vehicle operators is limited to a small proportion of operators and a short list of drugs.
>
> Aviation is the one mode in which the regulatory authority, the FAA, routinely conducts extensive post-accident toxicology testing on fatally injured pilots. This study used the results from this testing to assess drug use in aviation. By assessing evidence of fatally injured pilots' drug use prior to flying and the associated potential for impairment, this study addressed a serious aviation safety issue and a growing transportation safety concern.
>
> This study examined trends in the prevalence of OTC, prescription, and illicit drugs identified by toxicology testing of fatally injured pilots between 1990 and 2012. The goals of this study were to describe the prevalence of OTC, prescription, and illicit drug usage among fatally injured pilots over time and evaluate the need for safety improvements related to pilots' use of drugs.
>
> The study data were from the CAMI toxicology database and the NTSB aviation accident database. Toxicology tests were used to identify recent use of a wide variety of drugs. The test results were categorized by drug type and potential for causing impairment. This study assessed the prevalence and trends in accident pilots with evidence of recent drug use; it did not reassess the likelihood of pilot impairment in any of these accidents. Also, due to the complexities of interpreting the source of ethanol identified in the body after death, toxicology results for ethanol and other alcohols were not analyzed in this study.
>
> The majority of pilots in this study were flying in general aviation operations when their fatal accident occurred because very few fatal accidents involve air carrier operations. Study results showed increasing trends in pilots' use of all drugs, potentially impairing drugs, drugs used to treat potentially impairing conditions, drugs designated as controlled substances, and illicit drugs. As has been shown in multiple previous CAMI studies, the most common potentially impairing drug pilots used was diphenhydramine, a sedating antihistamine and an active ingredient in many OTC allergy formulations, cold medicines, and sleep aids. Although evidence of illicit drug use was found only in a small number of cases, the percentage of pilots testing positive for marijuana use increased during the study period, mostly in the last 10 years.
>
> Pilots who did not have a medical certificate or whose certificate had expired were more likely than those with a medical certificate to have used potentially impairing drugs, drugs used to treat potentially impairing conditions, and drugs designated as controlled substances. The number of pilots without a current medical certificate has been increasing since 2005, and the trend is likely to continue. However, there has not been an increasing trend in the proportion of accidents for which the NTSB cited impairment from drugs or medical conditions over the study period.
>
> Further research is needed to understand the complex relationships among positive toxicology findings, impairment, and accidents. Also, because the FAA does not collect information about the number of pilots flying without a medical certificate, the accident rate of these pilots cannot currently be determined.

The study identified a number of safety-related issues, but the major take-home message for me was that we should improve the precautionary information about potentially impairing drugs for various medical conditions we presently provide to pilots.

We can do better and we must. To do so, we need your help. In addition to reviewing the possible aeromedical side effects of the medications listed by pilots on their Form 8500-8, I ask that you take the time to talk to them about how important it is to maintain continuous medical fitness, and enlighten them about potentially impairing drugs or illnesses that could not only be disqualifying—but lead to disaster.

Better yet, some AMEs encourage airmen to consult with them whenever they take a new medication. I realize this may not always be practical, so we will be working with the aviation advocacy groups to develop better online resources to advise pilots.

Together, we can make a difference by reducing the pilot's use of impairing medications, thereby reducing the fatal mishap rate. Thanks for all that you do!

—Jim

[1] http://www.ntsb.gov/doclib/safetystudies/SS1401.html

Letters to the Editor

New ECG Transmission Protocol

Dear Editor,

Can you please provide me the specifications of this [electrocardiogram] transmission so that we can comply with these requirements? Is this limited to specific EKG vendors?

James Catanese, MD, FACC
Mount Kisco, N.Y.

Dear Dr. Cantanese,

This new electrocardiogram transmission system has been recently activated and is available to all senior aviation medical examiners that perform Class 1 medical examinations. The following is a summary of new ECG transmission procedures.

Before transmitting electrocardiograms via the Aerospace Medical Certification Subsystem (AMCS), please ensure that all ECGs include the following information:

- **Applicant's name and date of birth.**
- **Intervals, measurements, and interpretations.**
- **Applicant's height and weight.**

To ensure you provide us with the best quality ECG, please attach the Adobe PDF file created by your ECG equipment to the applicant's AMCS application. If you are not sure how to transfer the file from your ECG equipment to your AMCS computer, obtain assistance from any IT support you have available. Please do not contact the AMCS Support Desk or the Aerospace Medical Certification Division's ECG unit seeking assistance in attaching the file in AMCS.

If your ECG equipment is not capable of producing an Adobe PDF file containing the ECG, you may scan the paper version of the ECG. Please follow this guidance when scanning:

- **Always save the file in Adobe PDF format.**
- **Scan the image using a resolution of 300 dpi. You may scan using black and white, gray scale, or color mode. Scanning in color mode results in a much larger file size.**
- **Scanning at less than 300 dpi may result in an image that is of poor quality.**

Important! Before you attach the scanned ECG image file to AMCS, please review the scanned image for correctness and readability. If you are unable to interpret the ECG because of poor quality, we likely cannot interpret the ECG either. ECGs of poor quality may result in a letter requesting a repeat ECG.

More information is available at the Aerospace Medical Certification Subsystem website.

AMCS: Automate & Auto-Populate

Dear Editor,

I read with interest the update on the CACI [Conditions an AME Can Issue] program. I have a suggestion. Whenever you have a new program that requires a significant change in AME behavior, make sure the online certification system has automated check-boxes for the AME to use instead of "Type/enter the following code phrases into box 60." With modern computer systems it should not be difficult to add a Box 60 check-box "No CACI conditions identified" for example with a list of the current conditions listed in the article and a choice-tree for issuing or not issuing based on the required criteria.

Thanks,
Marshall Anderson, MD
Mount Vernon, WA

Dear Dr. Anderson,

Your comment is a timely one; later in calendar year 2014 we will implement changes to the Aerospace Medical Certification Subsystem (AMCS) that require AME limited input related to obstructive sleep apnea. We are in the process of defining the final requirements for this project; one thing we will do, based on selections made by the AME in AMCS, is auto-populate the comments made to Item 60.

Moving ahead, our plan is to automate input where feasible.

Sincerely,

David Nelms
Medical Systems Branch Manager (Acting)

Two New Flight Surgeons Join the Northwest Mountain Region

By AVS Flyer

This summer two new flight surgeons joined the Northwest Mountain Region: Dr. **Glenn McDermott** and Dr. **Frank Chapman**.

"Both flight surgeons come from the military," said Dr. **James Fraser,** Federal Air Surgeon. "We are very fortunate to have this experienced group of applicants. Not only do they have the medical training and the specialty training, but they have the leadership training too."

Dr. Chapman

Frank worked in private practice for 10 years, "delivering babies and making house calls, doing the Doc Welby thing," in his words. He joined the Navy in 1993, and served there for 20 years. Among his many postings, he spent six months in Iraq with Alpha Surgical Company; two years in Naples with the Sixth Fleet; and two years as the senior medical officer on the aircraft carrier, the U.S.S. Constellation. He retired in May from the Navy before joining the FAA.

"It's really true, join the Navy, see the world," he said, listing the many places across Europe, Africa, and East Asia his work has taken him. "It was just fantastic. But I'm thrilled to be back in the Northwest. It's our family home." Frank, his wife of 32 years, and three of their five children live in Seattle. His new station will also enable him to visit his parents in British Columbia regularly.

Dr. McDermott

Glenn joined the FAA following 33 years with the U.S. Army. He served as a Flight Surgeon in Aviation and Special Forces units while on active duty, and later became the Occupational Medicine staff officer at Western Regional Medical Command.

He served in the Gulf War in 1991 and returned to Iraq in 2009 as a flight surgeon. Glenn grew up in Washington state, making the new posting a homecoming for him.

"I have a long interest in aviation medicine, so this is a wonderful opportunity and I feel very fortunate to serve with the FAA," said Glenn.

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Aviation Medical Examiner Information Links

Guide for Aviation Medical Examiners
www.faa.gov/go/ameguide

Register for an AME Seminar
www.faa.gov/other_visit/aviation_industry/designees_delegations/designee_types/ame/seminar_schedule/

AME Training Information
www.faa.gov/go/ametraining

AMCS Online Support
www.faa.gov/go/amcssupport

Regional Flight Surgeon Contacts
www.faa.gov/go/rfs

Pilot Safety Brochures
www.faa.gov/go/pilotsafetybrochures

Multimedia Aviation Medical Examiner Refresher Course (MAMERC):
www.faa.gov/go/ametraining

Medical Certification Information
www.faa.gov/go/ame/

MedXPress Login & Help
https://medxpress.faa.gov

MedXPress Video Page
www.faa.gov/tv/?mediaId=554

FASMB Archives
www.faa.gov/go/fasmb

CAMI Library Services
www.faa.gov/go/aeromedlibrary

Airman Education Programs & Aerospace Physiology
www.faa.gov/pilots/training/airman_education/aerospace_physiology/

2012 Medical Certification Statistical Handbook
www.faa.gov/data_research/research/med_humanfacs/oamtechreports/2010s/media/201325.pdf

FlexSim Debuts at CAMI

By Mike Wayda

With the formal acceptance of Civil Aerospace Medical Institute's Flexible Aircraft Cabin Simulator, FlexSim, on Sept. 24, a six-year initiative to replace 100 pieces of old and outdated research laboratory equipment has gotten off to a good start.

FlexSim was successfully demonstrated two weeks earlier, thanks to 120 Mike Monroney Aeronautical Center employees who braved a 30-minute flight that never left the ground.

Volunteers enter the FlexSim for inaugural flight.

An entirely new flight experience awaited the volunteers as they boarded the mock-up of a commercial airliner on electro-mechanical stilts. They were excited to experience the first acceptance flight test of CAMI's brand-new reconfigurable cabin research facility. As everyone was seated and belted, our host greeted us on the PA with some serious news:

"Welcome to CAMI Flight 001...and we always crash."

Inside the simulator Dr. McClean briefs volunteers.

This drew some laughter from the "research assistants," as they wondered what would come next. They did learn that there would be no in-flight movies, refreshments, or bathroom breaks on this flight. Nor would the aircraft gain any altitude. It was a simulator, and it was firmly attached to terra firma.

CAMI Cabin Safety Research Team Coordinator **"Mac" McLean**, PhD, explained that this was going to be the first flight of a brand new, one-of-its-kind cabin evacuation research simulator... and no one was going to be hurt. In preparation for our demonstration flight, he asked us to assume the "brace" position. Most weren't sure what that entailed but complied anyway. McLean then demonstrated the position that worked best according to extensive CAMI research.

High-definition LED windows inside the simulator showed the surrounding outside area. The view was provided by cameras mounted on the simulator's body. The windows, high-definition video display terminals, are used to realistically simulate fires and various emergency scenarios.

Cabin lighting was controlled to simulate all possible conditions, from normal lighting to no lighting, with emergency evacuation lighting to lead passengers out of the aircraft with smoke obscuring the interior.

As the crew began the FlexSim demonstration, McLean urged his passengers to tighten their seat belts, just as a precaution. The sim pitched up, as an aircraft would during takeoff, banked hard left and then hard right, as it would during steep turns. The purpose of this is to have actual research subjects positioned to quickly evacuate in various landing configurations.

CAMI's new flexible cabin simulator in action.

This "airliner" was configured as a narrow-body passenger transport airplane with triple-seat assemblies on each side of the center aisle, complete with drop-down tray tables. As a startling bonus of the 30-minute demonstration, all of the oxygen masks deployed, just as they would during a loss of cabin pressure at cruising altitude.

"Now that you know about us," McLean said, "everyone in the world will know where we're located and what we do for aviation safety. Thank you for your help."

Key points:

- A demonstration of the correct brace position in crash landings is available on Facebook as an application.
- FlexSim's cabin walls can move in or out to simulate different types of single-aisle (narrow body) commercial aircraft with overhead storage bins, lavatories, and galleys.
- It can be filled with non-toxic smoke in less than a minute—and the smoke can be removed in that much time.
- Its doors can also be configured to simulate different types of exits.
- It can collect up to 8 terabytes of data.
- FlexSim replaces a worn-out U.S. Air Force C-124 research facility, installed in 1962.
- CAMI formally accepted the simulator on September 24.
- The formal dedication ceremony will be held in November 18, 2014.

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Inside
the Federal Air Surgeon's Cardiology Panel, Part II
By Brian D. Johnson, MD

In Part II, I will address how you, the aviation medical examiner, can help your airmen to successfully navigate through the Federal Air Surgeon's cardiology panel. First, though, let's review what I covered in Part I.

Part I stated the reason for the cardiology panel. Multiple cardiac conditions are specifically disqualifying under 14 CFR 67.111, 211, and 311: significant coronary artery disease requiring treatment to include cases with angina, myocardial infarction, or requiring bypass, angioplasty, stenting, or atherectomy. It also includes cardiac valve replacement, permanent pacemaker implantation, and heart transplants.

All of these conditions may receive special issuance under CFR 67.401 if they satisfy the conditions set forth by the Federal Air Surgeon. The Federal Air Surgeon, with the assistance of his cardiology consultants, decided that first-and second-class airmen (third-class only for heart transplants) with the above conditions would require review by the cardiology panel or the cardiology consultants for initial certification after any one of these events.

We have also included review for all classes of initial certification of asymmetric hypertrophic cardiomyopathy and significant congenital cardiac abnormalities corrected with surgery. We will also bring the third-class cardiac cases to panel that we are not comfortable with and that we believe requires a comprehensive review (such as unusual rhythm disturbances).

The Federal Air Surgeon's Cardiology Panel first started in the early 80s and originally met in Washington, D.C., as part of a bigger multispecialty consultant panel. The panel eventually moved to Oklahoma City as a cardiology panel only, and currently meets there every other month. A Federal Air Surgeon's cardiology consultant comes out to review cases in the months that the panel does not meet.

Twenty-seven physicians are on our cardiology consultant list, including 20 cardiologists, three cardiothoracic surgeons, one vascular surgeon who specializes in aortic repairs, a heart transplant surgeon, and three electrophysiologists. They come from all over the nation with vast amounts of experience and highly respected credentials.

The cardiology panel and the cardiac consultants reviewed an average of 32 cases per panel/consultant visit, for an average of 384 cases per year for the years 2011 through 2013. Over those three years, we issued certificates for 72% of the cases seen. This percentage of approvals has remained fairly consistent. About 61% of cases reviewed were first-class, 23% second-class, 1% was limited second-class, and 15% of the cases were third-class.

With that review concluded, I'll show you how to get your applicants successfully through the Federal Air Surgeon's Cardiology Panel.

Support team prepares for next cardiology panel
Back row, L to R: Kristi Burge, Bridget Stephenson, Tahmineh Zapata, Saundra Ludwick, Stacia Sledge
Front row: Jacqueline Brown, Reginald Richardson, Dr. Brian Johnson, Ahmad Kennedy

First, make sure that the airman is providing us with all the needed information at once in a usable, interpretable format. Although not required, it usually works best if you can review this material first and package it up to send to us via overnight mail or Fed Ex at:

Federal Aviation Administration
Civil Aerospace Medical Institute
AAM-313, Medical Appeals, Rm 308
6700 S. MacArthur Blvd.
Oklahoma City, OK 73169

Medical/hospital records should be typed. If the original document is not in English, an English translation must be included. For hospital reports, we typically need the history and physical, discharge summary, operative reports, pathology reports, catheterization reports and films, and any other studies or labs while hospitalized. We need the pertinent past and current medical records on the problem, as well.

The current cardiovascular narrative needs to be a thorough assessment and address current meds, a statement if there are any side effects, or if there are any current cardiovascular symptoms. It should include the airman's prognosis and treatment plan. For pacemakers, the narrative should also include the pacer worksheet. The proverbial prescription with "Patient is OK to resume flying" written on it just won't fly (pun intended). Also, if possible, the current status statement should be done after the current follow-up studies so that the cardiologists can address any abnormalities on the studies. It will delay the airman's case if we have to ask for clarification. Finally, if there are other health issues that require review, then a current status and appropriate studies should be included on these as

Continued→

well. I often have to ask for more information on an airman for these other conditions—even though their cardiac situation has been cleared.

One common mistake is getting follow-up testing too early after stenting. The recovery times have been recently changed and are firm. Early testing may result in delays and repeat testing. Three months means three months. Current wait time for left main stents is still six months; all other stents are three months. Wait time post-MI is three months, and wait time for valve replacements and bypass surgeries is still six months.

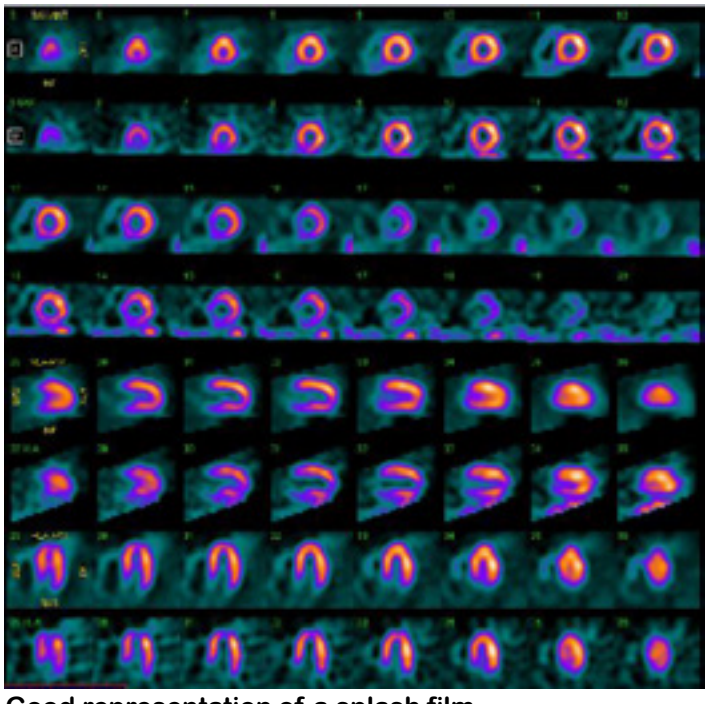
Exercise stress testing will be required for nearly all panel patients (exercise stress radionuclide scan for all first- and unlimited second-class airmen with coronary artery disease conditions). Our cardiologists nearly always prefer an "exercise" stress radionuclide scan over a pharmacologic radionuclide scan, unless the airman is unable to exercise (which needs to be explained why) or the airman has a left bundle branch block or pacer-induced left bundle branch block. The stress test needs to follow the specification sheet provided by the Aerospace Medical Certification Division and provide the narrative report, worksheets, tracings, and films (for the RS, and this will be discussed later).

Another common mistake is an inadequate stress test. We always prefer that the airman try to achieve 100% of maximal predicted heart rate (maximum predicted heart rate) and go the full nine minutes of a three-minute Bruce protocol, if not medically contraindicated. In general, however, we will accept eight minutes and at least 85% of the MPHR as a valid test. If they are age 70 or older, we will accept six minutes and 85% or greater. The tracings need to be complete as per the specification sheet with representative 12-lead tracings from each stage and well into recovery. Computer-averaged tracings are not acceptable!

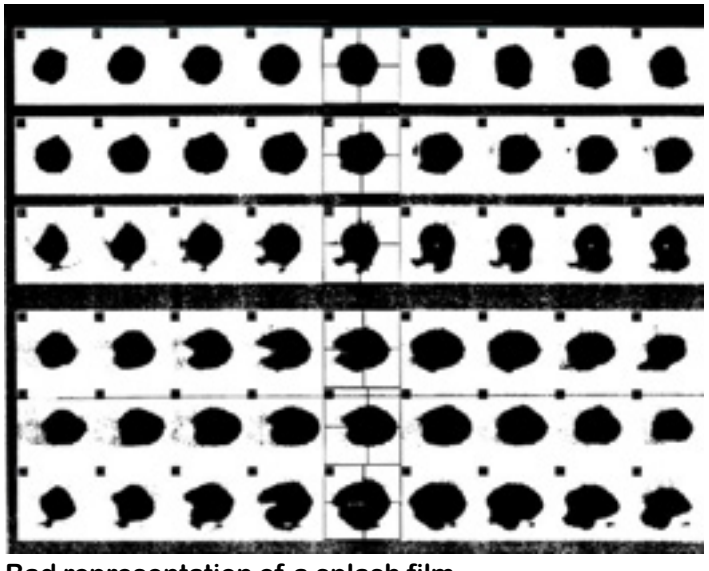
Assure that films can be read and interpreted here. Almost all films that we receive now are on CDs (angiograms, stress radionuclide scans, stress echos, and echos). Most of the catheterization films come in a DICOM format, and we are able to open the CDs with the programs that we have. The radionuclide films, however, can be a big problem. There are multiple programs to do these studies, and many of them are proprietary, so we are unable to access them. Also, the self-starting programs are often problematic since they change the computer directory to operate, and the government firewalls will not allow this. If you are unable to provide a DICOM format CD of the study, then have the testing facility print off the stress/rest three-axis splash films on photo-quality paper. They could also copy the splash films to a PDF, TIF, or GIF file.

In summary, the Federal Air Surgeon's Cardiology Panel has functioned for three decades to provide the Federal Air Surgeon with a valuable medical safety review of airmen with specifically disqualifying cardiac conditions through the use of expert consultants and panels. Most of these airmen were able to return to flying. The panels and consultants have also provided the Federal Air Surgeon with current clinical and practice updates to assist with these decisions and to adjust to the always-hanging issues affecting both cardiology and aerospace medicine. Over time, the process has been refined and updated to adjust to those challenges. The panel consultant process seems to work well, and in partnering together with the aviation medical examiners, we can streamline this even further.

Dr. Brian Johnson is a cardiac appeals physician in the Aerospace Medical Certification Division.



Good representation of a splash film



Bad representation of a splash film

Medical Certification of Pilots With Wolff-Parkinson-White Pattern

Case Report, by David C. Miller, DO, MPH

The Wolff-Parkinson-White (WPW) pattern is the well-defined electrocardiographic finding that demonstrates a shortened PR interval of less than 0.12 seconds and a delta wave with a slightly widened QRS complex that exhibits fusion. This ECG finding is the result of electrical conduction through an accessory pathway that circumvents the atrioventricular node. WPW pattern has an estimated prevalence of between 0.13% and 0.25% in the general population,[7, 8] although the actual prevalence is unknown. The WPW pattern on ECG may not be a permanent finding,[6, 9] and WPW pattern is asymptomatic by definition, which likely results in significant under-diagnosis of this finding. If a patient presents with cardiac symptoms relating to tachydysrhythmia and an ECG identifies WPW, the patient has WPW syndrome, which requires further evaluation and appropriate treatment— usually radiofrequency ablation of the bypass tract or tracts. This article presents the case of a first-class professional pilot who presented with WPW pattern identified incidentally, and reviews the aeromedical concerns and current practice consensus for special issuance.

History

A 35-year-old male professional pilot presented to his aviation medical examiner (AME) for his scheduled first-class aviation examination. He reported continued excellent physical and mental health, and denied any difficulties performing his aviation duties. He is a rated air transport pilot and instructor pilot with 3,050 total flying hours, including approximately 300 hours in the last six months.

As he was 35 years of age and applying for a first-class airman medical certificate, the Federal Aviation Administration (FAA) required a routine screening ECG to evaluate for cardiac abnormalities or evidence of significant coronary artery disease under Title 14 CFR 67.111(b).[1] He denied taking any medications or supplements, and he denied any chronic medical conditions. The pilot specifically denied any cardiac symptoms, including palpitations, irregular or skipping heartbeats, chest pain, decreased exercise tolerance, or shortness of breath. He also denied any recent cardiac evaluations by his primary physician other than his annual physical. Figure 1 shows his ECG from March 2008.

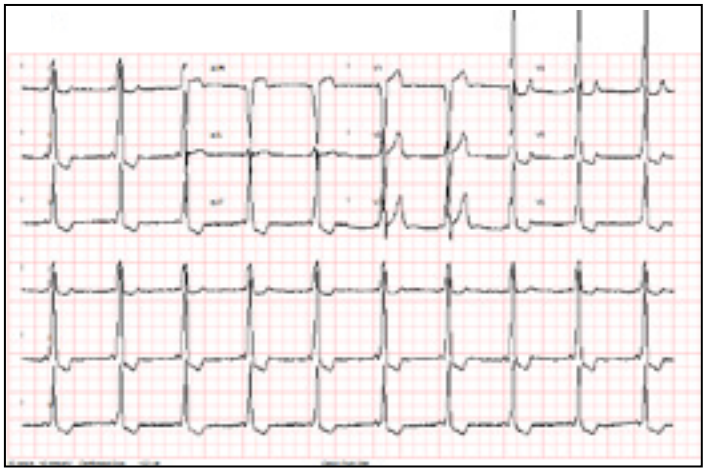


Figure 1. ECG from March 2008.

This ECG demonstrated a shortened PR interval of 0.088 seconds, prolonged QRS complex of 0.132 seconds and fusion or delta waves in all leads consistent with Wolff-Parkinson-White pattern. As the patient denied ever having any cardiac symptoms, WPW pattern is the most appropriate diagnosis. According to the Guide for Aviation Examiners, all pre-excitation syndromes require further evaluation with the cardiovascular exam (CVE) protocol, maximal graded exercise stress test (GXT), and a 24-hour Holter monitor evaluation to allow for appropriate FAA decision-making.[2]

WPW Etiology

The PRotein Kinase, AMP-activated, Gamma 2 non-catalytic subunit (PRKAG2) gene appears to play a significant role in the development of cardiac tissue.[4] A missense mutation identified on the PRKAG2 gene is responsible for the inherited form of WPW, which is more frequently associated with WPW syndrome and other cardiac conduction diseases.[4] This mutation, labeled Arg531Gly, substitutes glutamine for arginine at residue 302 on the gene at 7q34-q36.[5] Because of this mutation, the adenosine monophosphate-activated protein kinase does not correctly regulate the ion channels in cardiac tissue.[4]

This genetic anomaly is responsible for errant tracts of cardiac tissue that conduct electrical stimuli around the atrioventricular node, resulting in ventricular pre-excitation, and potentially provide a pathway for other abnormal electrical stimulus, including reentrant tachycardia. Not all cases of WPW syndrome or pattern demonstrate this genetic mutation, but it remains useful in characterizing one potential underlying mechanism for the disease process.

Aeromedical Concerns

Wolff-Parkinson-White syndrome poses a risk of aberrant electrical flow such as sustained atrioventricular node reentrant tachycardia (AVNRT), atrial fibrillation or other dysrhythmia that may progress to fibrillation or sudden cardiac death (SCD). A previous study of aviators reported 15% of patients with WPW pattern developed new symptoms, including new tachydysrhythmias and one case of SCD in a patient with WPW syndrome over the study duration.[3] The data demonstrate a 1% per patient-year risk of developing symptomatic tachycardia or dysrhythmia and 0.02% per patient-year risk of SCD. It remains critical to identify those aviators at increased risk for sudden cardiac death or incapacitation due to other underlying cardiac pathology so they may be appropriately risk-stratified prior to assuming aviation duties.

Outcome

The pilot in our case report completed a 24-hour Holter monitor, which demonstrated WPW pattern, as well as episodes of normal sinus rhythm with rare supraventricular ectopy and rare premature ventricular contractions. He completed a maximal graded exercise stress test following Bruce protocol for 12 minutes and 20 seconds without symptoms or aberrant conduction patterns on ECG. His Myoview(™) imaging demonstrated no ischemia and an ejection fraction of 59%.

His echocardiogram was essentially normal with mild mitral regurgitation. His consulting cardiologist stated that his family and personal history, cardiovascular examination, and additional testing were essentially normal.

The FAA issued the pilot an unrestricted first-class medical certificate upon completion of his medical evaluation, one month after initial diagnosis of WPW pattern, as his evaluation placed him at very low risk for complications. The FAA warned the pilot of Title 14 of the Code of Federal Regulations Part 61.53, and the importance of notifying his AME should he develop any symptoms that may be cardiac-related so that he may receive an appropriate aeromedical disposition and further evaluation and treatment, if required.

The pilot acknowledged the reminder, and he continues to fly symptom-free without any complications. His ECG for 2012 is below and demonstrates a normalization of his PR interval at 0.142 seconds, normalization of the QRS complex and an almost complete resolution of the delta wave. This ECG reinforces the intermittent nature of WPW pattern.[6, 9]

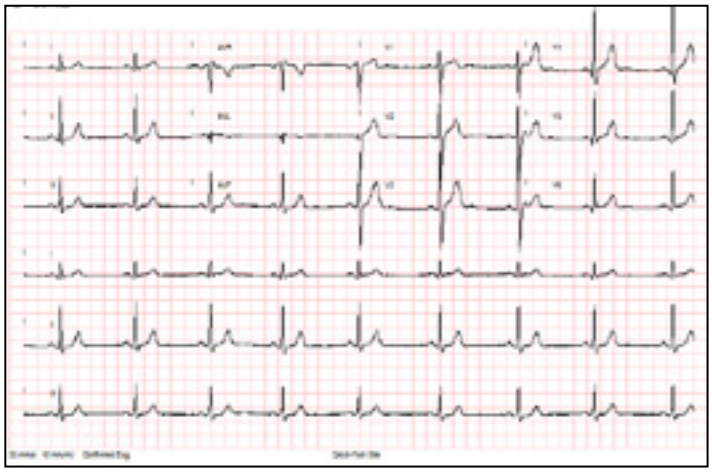


Figure 2. Applicant's 2012 ECG demonstrates a normalization of his PR interval at 0.142 seconds, normalization of the QRS complex, and an almost complete resolution of the delta wave.

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About the Author

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High Altitude Flying in the Andes Mountains

By Robert Sarlay, Jr. MD, MPH

Airmen may find themselves at risk of acute mountain sickness and require use of prophylactic medication to prevent this condition. This article reports the case of a second-class pilot applicant seeking to use acetazolamide for prevention.

History

While performing a second-class medical examination for a 50-year-old male with 5,000 flying hours total and 250 in the last six months in a Beechcraft Baron, you notice that the airman has listed Diamox as a medication on his Form 8500-8; however, the airman did not indicate the condition for which he is taking the medication. Upon further questioning, the airman reports that he plans to go to South America in the next several days to work for several months. The airman has been contracted to carry supplies and people to a research team in the mountains of Peru from their base camp to the research station at high altitude. His job will require that he make routine flights to high altitude to deliver the supplies and possibly wait overnight at altitude. His normal base of operations will be at sea level. His primary physician has advised him to take Diamox (acetazolamide) to prevent altitude illness. The airman is concerned about how this medication might affect his medical certification. He reports no prior use of the medication. Additionally, he reports no prior episodes of altitude illness.

Etiology of Acute Mountain Sickness

Acute mountain sickness is a preventable illness that occurs with too rapid ascent to altitude without time to acclimate [4]. The signs and symptoms of AMS include headache and at least one of the following: gastrointestinal disturbance (nausea, emesis, and anorexia), dizziness, light headedness, fatigue, or sleep disturbance [4]. AMS is one of several high altitude illnesses that can occur. Everyone who travels to altitude is susceptible to developing AMS, with 25 to 85% of travelers actually developing symptoms based on epidemiological studies [1]. Of travelers that develop symptoms, 0.1 to 4% progress to the more hazardous illnesses of high altitude pulmonary edema or high altitude cerebral edema [1]. AMS commonly occurs above 8,000 feet (2,400 meters) [1]. Individuals at most risk of development include those who ascend rapidly (both rate and magnitude), those who engage in strenuous physical activity, those of a young age, those who live at low altitude, or those that have history of prior AMS [1]. To prevent AMS, one should ascend at a rate of 300 to 500 meters per day; in addition, acetazolamide (125 to 250 mg by mouth twice a day) can help prevent the illness [2]. Multiple trials have established it as a good preventive medication and helped establish the 125 to 250 mg dose, with higher dosages showing no greater efficacy but increased side effects [3].

Aeromedical Concerns

Besides the many dangers of mountainous terrain such as the rugged landscape, the altitude extremes, and the temperature extremes, the airman is at high risk for cognitive defects from hypoxia, sleep loss, and high-altitude illness—specifically, acute mountain sickness (AMS) [5]. The airman is at particular risk for AMS, as his job will require him to rapidly ascend to high altitude with little time to acclimate [1]. AMS is not specifically addressed by the FAA guidelines. AMS is a time-limited condition that would prevent the aviator from flying while the condition was present. However, once treated by descent, oxygen, or pharmacotherapy, the condition would be expected to resolve without permanent defects, allowing the aviator to fly. Once the condition resolved, the airman could resume his aviation duties. He would also need to report the development of this condition during his next FAA examination.

The second concern would be the use of Diamox as a prophylactic medication to prevent AMS. Ideally, slow ascent and proper acclimation make AMS a preventable illness, but when rapidly arriving at high altitude direct from sea level by flying, these preventive measures are not possible [4]. The recommendation to use acetazolamide for prevention is sound advice to this airman, but there are some aeromedical concerns which need to be addressed. Acetazolamide is a carbonic anhydrase inhibitor that forces the kidneys to excrete bicarbonate, making the blood more acidic. This metabolic acidosis stimulates minute ventilation, increasing oxygen in the blood [1]. Acetazolamide is a centrally acting medication. The adverse effects of this medication include paresthesias, mild diuresis, and aversion to carbonated beverages. It is contraindicated in those persons who have an allergy to sulfa drugs [1].

Both the AMS and the acetazolamide are concerns in regards to flying safety. Generally, self-limiting, short-term conditions require an airman to avoid aviation duties if either the condition or the medication could affect flight safety. However, in this case, the danger of the airman developing AMS, which could incapacitate him, can be avoided by the airman taking a prophylactic dose of acetazolamide.

Role of the AME

An AME needs to assess the underlying disease or condition and the treatment to make a good determination favoring aviation safety. The AME should obtain a detailed history from the airman, including dosage, side effects, tolerance to the medication, and length of use of the medication. Additionally, the AME should provide the reason why the medication is required and include a recommendation to the FAA. The AME must defer issuance of a medical certificate for any medication or medical condition that is unacceptable.

An AME should note the importance of deferring issuance of a medical certificate for any medication that is unacceptable. Inappropriate issuance of a certificate to an airman who is on an unacceptable medication is one of the main causes of reversal by the FAA. Too high a rate of this error can result in the AME receiving a letter of reprimand, as the AME is placing the national airspace at risk.

The AME should submit the information with regards to the medication to the AMCD or their Regional Flight Surgeon for consideration of authorization for use under the special issuance section of 14 CFR 67.401. Furthermore, each case submitted to the AMCD or Regional Flight Surgeon for special issuance is determined on its own merits, taking into consideration how the airman's performance would be affected by the condition and the medication(s).

Outcome

The information about the case was discussed with the AMCD to advise the airman if the use of acetazolamide would be acceptable. A verbal authorization was granted and subsequently a special issuance was sent stating "Acetazolamide (Diamox) is allowable for altitude sickness prevention. [AMCD] will need to be advised of any actual episodes of altitude sickness." Accordingly, the airman was granted a second-class medical certificate.

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Medical Certification of Pilots following Decompression Illness (DCI)

Case Report, by Clifton M. Nowell, DO

According to the Divers Alert Network, approximately 1,000 decompression-related incidents occur yearly.[1] SCUBA diving introduces an abnormal environment where pressure and gases play vital roles. Although not a common event, much research has gone into laying out ways to prevent decompression illness and how to effectively treat it when it occurs.

History

A 45-year-old male airline transport pilot with 5,100 total hours of flight time applied for a second-class medical recertification 3 months following a barotrauma event that resulted from a rescue attempt of another diver.

The airman suffered barotrauma as a result of a rapid ascent from approximately 60 feet deep in 20 seconds. He made this ascent as he noted another diver, apparently unconscious, floating to the surface. Following the rescue, he entered the boat, feeling pain and heaviness in his right arm, and numbness in the right cheek. Approximately 3 minutes later, he experienced what was described as "pins and needles" over his entire body.

Upon arrival back in port, his symptoms had resolved and he returned home. Approximately 8 hours following the dive, his symptoms returned and he went to the emergency department. Initial evaluation in the ED suggested barotrauma, and he was started on treatments in the local hyperbaric chamber. He underwent 13 sessions of hyperbaric treatment, two sessions of United States Navy Treatment Table (USNTT) 6, ten session of USNTT 5, and one session at USNTT 9.

As a result of the barotrauma (decompression sickness Type II), the airman suffered flaccid paraplegia of the lower extremities and paresthesias of the upper extremities. Over the course of his treatments, the airman evolved from paraplegia of the lower extremities to being able to walk with the assistance of a cane or walker. His right lower extremity was the most severely affected with sensory and motor function loss, especially dorsiflexion. Following initial treatment, the airman transferred to another facility for rehabilitation and further hyperbaric treatments.

Aeromedical Issues

Decompression Illness is a term used to describe physiologic events that result from a reduction in ambient pressure around the body. This can occur when scuba diving or during a rapid decompression while flying in a pressurized aircraft. Divers are at risk of decompression illness resulting from the release into blood and tissue of inert gas bubbles previously dissolved within tissues.[2]

Decompression illness encompasses two diseases: decompression sickness and arterial gas embolism. The main difference between the two, as they both result from bubbles growing in tissue, is that decompression sickness affects the tissue in the locale of the bubble, whereas arterial gas emboli enter the lung circulation, traveling through the arteries and causing tissue damage at a distance by blocking blood flow through the smaller vessels.[3]

Of greatest concern following a decompressing illness and flying is the sequelae that may ensue. Sudden incapacitation is not of great concern because the inciting event has passed, and the airman would have received proper treatment. Deficits, especially neurological, are a major concern. Evaluation of the airman's ability to perform the tasks associated with flying is pivotal in the decision to issue/authorize an airman to resume flying duties.

An airman who intends to fly after scuba diving should allow sufficient time to be rid of excess nitrogen absorbed during the dive. The recommended wait time for flight going up to 8,000 feet is 12 hours for nondecompression diving. However, after a dive that required a decompression or controlled ascent, one should wait at least 24 hours to be safe.

Role of the AME

The general medical standards for medical certificates annotated in Title 14 Code of Federal Regulations (CFR) parts 67.109 (b), 67.209 (b), and 67.309 (b) include no other seizure disorder, disturbance of consciousness, or neurologic condition that the Federal Air Surgeon, based on the case history and appropriate, qualified medical judgment relating to the condition involved, finds (1) Makes the person unable to safely perform the duties or exercise the privileges of the airman certificate applied for or held.[4] One may also make the case for using parts 67.113 (b), 67.213 (b), and 67.313 (b), which states an airman is disqualified for organic, functional or structural musculoskeletal disease, defect, or limitation that the Federal Air Surgeon, based on the case history and appropriate, qualified medical judgment relating to the condition involved finds (1) the deficit makes the person unable to safely perform the duties or exercise the privileges of the airman certificate applied for or held.[4]

The *Guide for Aviation Medical Examiners* outlines the examination that should be done to properly evaluate an applicant's neurologic and musculoskeletal systems. The evaluation should include a thorough review of the applicant's history prior to the evaluation.[5,6,7,8] As a type II decompression involves the

spinal cord and subsequently leads to neurological deficits, it is important to have a working knowledge of any deficits that might have existed prior to the event, especially involving neuromuscular deficits. Once the pre-event history is obtained, a firm understanding of the precipitating event will lead you nicely into the physical examination.

Standard examination should note the presence of any musculoskeletal pain, weakness, paralysis, deformity, or motion coordination that leads to degraded performance. The neurological examination should include a history of or current disturbance of sensation, loss of coordination, or loss of bladder or bowel control. Emphasis should be placed on the 12 cranial nerves, motor strength, superficial reflexes, deep tendon reflexes, sensation, coordination, and mental status.[5,6,7,8]

If the decompression illness results in residual deficit and ultimately leads to a Statement of Demonstrated Ability (SODA), then reissuance of the medical certificate should be based on evaluation of the deficit. If the deficit remains stable, then the AME should issue the medical certificate. If there is not a SODA, then a medical flight test (MFT) may be needed to evaluate whether the deficit will impede proper cockpit performance and the airman's ability to fly. The SODA can be issued if the airman passes the MFT.[5]

Outcome

Based on this airman's history and physical examination, four months following his decompression event he was authorized by the FAA Aerospace Medical Certification Division to perform a MFT. It was not until seven months after the event that he was able to successfully perform the MFT. He was granted a time-limited authorization and medical special issuance based on 14 CFR § 67.401 and § 67.23. After successfully completing the medical flight test, a SODA was granted, and the airman received his second-class medical certificate.

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2014 AME Seminar Schedule

November 21-23	San Antonio, Texas	CAR Refresher (1)

2015

January 30-February 1	Salt Lake City, Utah	Refresher (1)
March 23-27	Oklahoma City, Oklahoma	Basic (2)
May 11-14	Orlando, Florida	AsMA (3)
June 8-12	Oklahoma City, Oklahoma	Basic (2)
July 17-19	Philadelphia, Pennsylvania	Refresher (1)
October 8-10	Fort Worth, Texas	CAMA (4)
October 26-30	Oklahoma City, Oklahoma	Basic (2)
November 20-22	St. Louis, Missouri	Refresher (1)

NOTES

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

NEU= Neurology, OOE= Ophthalmology-Otolaryngology-Endocrinology, CAR= Cardiology.

(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 3½-day refresher AME seminar held in conjunction with the Aerospace Medical Association (AsMA). This seminar is a Medical Certification refresher, with 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.

(4) 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 Website:

www.civilavmed.com

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