



Saving Lives at 35,000 Feet

A new book by David McKenas, MD '81, MPH, details efforts leading to defibrillators in all commercial aircraft. BY RENÉE GEARHART LEVY

Every year, more than 356,000 out-of-hospital cardiac arrests are reported in the United States and an estimated 70 to 90 percent of those people die before reaching the hospital. A major influence in survival is cardiopulmonary resuscitation (CPR) and use of an automated external defibrillator (AED), a portable device that can restore a normal heartbeat by sending an electric shock to the heart. When used within minutes of cardiac arrest, AEDs can dramatically raise survival rates.

Since 2010, all 50 states have enacted various legislation requiring AEDs in public locations such as athletic and fitness facilities, schools, and government buildings, and in some cases, private businesses, known as Public Access Defibrillation. The idea of placing defibrillators everywhere, like fire extinguishers, can be traced back to 1997, when American Airlines became the first U.S. airlines to place defibrillators onboard planes. That decision, credited with saving hundreds of lives in the past two decades, led to the FAA requiring defibrillators on all commercial aircraft.

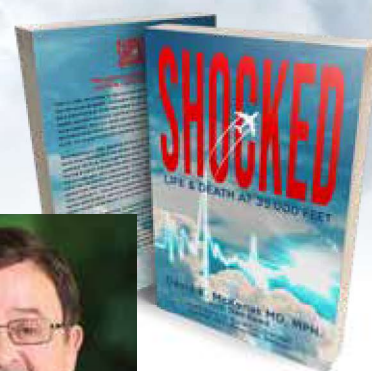
That domino effect was initiated by David McKenas, MD '81, MPH, a former

flight surgeon and self-proclaimed “data geek” who served as medical director of American Airlines from 1994 until 2002. It was McKenas’s unique expertise in understanding stresses to the body in flight, combined with statistical analysis ability gleaned through his Harvard MPH, that allowed him to pinpoint the need and ability to save lives at 35,000 feet.

“As a medical student, I never dreamed I would have started this public health program that has saved so many lives,” he says.

McKenas shares his experiences in a new book, *Shocked: Life and Death at 35,000 Feet* (Tree Canoe Press, 2021), from successfully making the case for AEDs to American Airlines CEO Bob Crandall, to navigating flight attendant unions and training flight attendants, to testifying before Congress, and ultimately, saving lives.

That McKenas became a physician in a position to make such societal impact is a story in itself. Raised in rural Oneida, New York, McKenas was a musical prodigy from a young age. Like many kids,



David McKenas, MD '81, has chronicled his life and career in a new book.

he started out singing in church and taking piano lessons. But his abilities and progression were anything but typical.

When he was in the sixth grade, the Columbus Boychoir (later renamed the American Boychoir) made an appearance in Oneida. McKenas was taken by their performance and managed to arrange an audition for both piano and as a vocalist. As a result, he was offered a full scholarship to the Boychoir’s private boarding school in Princeton, New Jersey.

McKenas left his family and moved to Princeton at 12, touring as part of the professional choir for 10 weeks at a time. Due to his prowess on the piano, he became a featured soloist, entertaining the audience during breaks when the choir would make costume changes between sets. “I found myself frequently in front of thousands of people, both singing as part of the group and playing piano pieces by Mozart and Sibelius as a soloist. Whatever stage fright I might have had quickly was extinguished,” he says.

Two years in, McKenas won a piano concerto competition with a prize of performing as a featured soloist with the Garden State Philharmonic Orchestra in New Jersey. He played the first movement of a Mozart Piano Concerto and was awarded the state of New Jersey Francis Hopkinson Memorial Medal. He was also offered the opportunity to audition for a spot at the Interlochen Center for the Arts in Interlochen, Michigan, an esteemed performing arts high school, which accepted him.

Although he was required to practice four hours a day at Interlochen, McKenas otherwise experienced a normal high school curriculum. And while passionate



As a teen, McKenas was a piano soloist with the American Boychoir and later studied at Interlochen Center for the Arts.



After residency, McKenas was an aerospace medicine specialist assigned to Cape Canaveral.

about music, he was also drawn to science and his grades were always near the top of his class. By the time he graduated from high school, McKenas realized that, despite his talents, he probably wasn’t talented enough for a career as a concert pianist.

Instead, McKenas returned home to attend SUNY-Binghamton, where he double-majored in biochemistry and music composition. As a junior, he was accepted to Upstate Medical University through an early admissions program, where he headed after graduating with honors from college and induction into Phi Beta Kappa.

To pay for medical school, McKenas applied for a Health Professions Scholarship, which committed him to four years of service in the Air Force after earning his medical degree. He set his sights on becoming a flight surgeon, with aspirations to work in the space program.

A flight surgeon is a doctor that takes care of pilots. McKenas describes it as a field of occupational health. “Most of the individuals are generally very healthy, but their work environment can cause adverse effects,” says McKenas. Pilots, for example, are exposed to G-forces and radiation, while astronauts face zero gravity and mental stresses that can result in decompression sickness, heart function impairment, decreased bone density, and space motion sickness.

Through Air Force support, McKenas attended Harvard University to earn a master’s in public health, then completed residency training at Brooks Air Force Base in Texas to become board certified in occupational medicine and aerospace medicine.

As he neared the end of his residency, the space shuttle Challenger exploded. McKenas had already been assigned to work at Cape Canaveral Air Force Station and Kennedy Space Center. Now he was needed immediately as an aerospace medicine specialist to assist with post-Challenger issues.

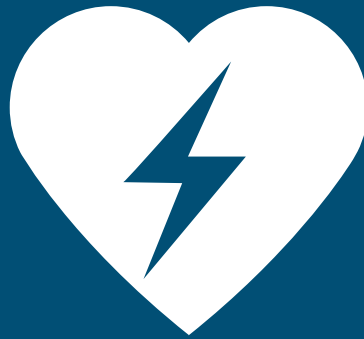
In his new role as chief of aerospace medicine, McKenas and his team initially were involved in recovering the Challenger crew members' scattered remains in Florida. He was also the aerospace medicine expert assigned to the Department of Defense's Manager for Space Transportation System Contingency Support Office (DDMS), a joint NASA/DoD agency responsible for taking care of manned space emergencies around the world. "For example, if the shuttle could not make it into orbit and had to make the call to abort . . . my job was to get the shuttle's crew to medical care at one of NASA's emergency landing sites in Africa—or wherever around the world the orbiter happened to come down," McKenas explains in his book.

"On most launches after Challenger, I was on console at Cape Canaveral Air Force Station and in communication with a wide range of world-wide medical resources ready to act on command to respond to any shuttle emergency," McKenas says.

In 1991, McKenas applied to be a mission specialist himself—a non-pilot astronaut. Although the work he'd done related to medical issues in space flight made him the Air Force's top candidate to be an Aeromedical Specialist astronaut, unfortunately, NASA selected exclusively Navy candidates for military specialist slots that year. Nonetheless, McKenas was awarded the prestigious Silver Snoopy award from the NASA Astronaut Corps for his emergency medicine support of the space program. "Few people know about that particular award, but because the honoree is chosen by the astronauts themselves, I value it greatly," he says.

By this point McKenas had been promoted to Lt. Colonel ahead of schedule, putting him on a path toward a potentially high-ranking position within the Air Force's medical service. But Operation Desert Storm was going on in the Middle East and would soon be followed by Operation Desert Shield. McKenas, now married and with a young family, wrestled

AED



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— DAVID MCKENAS, MD '81

with risking deployment to a war zone now that his military debt had been repaid.

In 1992, a civilian medical colleague at NASA, Jeff Davis, MD, was appointed medical director at American Airlines and invited McKenas to join his medical staff. Two years later, Dr. Davis returned to NASA and McKenas took over as medical director.

In that role, McKenas began studying a phenomenon reported by flight attendants working the 767 aircraft of patients collapsing from syncope in what was called the "drop dead zone."

"I pored through piles and piles of data, and what I found was that it was a phenomenon of how long you flew," says McKenas. "It wasn't a stunning conclusion, but the longer you fly, the more likely something adverse might happen."

It's no secret that the altitude and cabin pressure of air travel can play havoc on the human body. Normal cabin pressure is equivalent to an altitude between 5,000 and 8,000 feet. For comparison, McKenas notes that Mount Mitchell, the tallest mountain in the eastern United States, is 6,684 feet tall.

At that altitude, air pressure declines and "each cubic meter of air weighs progressively less against your body," he says. This creates an imbalance between the air inside your head and the air outside. As a result, air presses against your eardrum.

Worse than that, the concentration of gasses in the atmosphere, including oxygen, diminishes along with pressure. As aircraft cabin pressure diminishes, blood oxygen can routinely drop to 60 or 70 percent. For people with congestive heart failure, anemia, or chronic obstructive airway diseases, that can be a problem.

While studying the 767 data, McKenas discovered something else: American was losing approximately 60 passengers a year to sudden cardiac arrest. "That was something I knew we could impact," he recalls.

Up until the mid-1990s, defibrillators had been a bulky piece of equipment. But the development of new smaller AEDs, roughly the size of a book,

allowed for their use outside of conventional medical settings.

The next time McKenas had American Airlines CEO Bob Crandall in for a corporate physical, he made use of his captive audience. "I said, sir, you know we're losing about 60 people a year. And if we put this new little device on board, we could save a good bunch of them," McKenas recalls.

Crandall wanted to learn more, and eventually said yes, even though the devices cost a few thousand dollars each. "There was no financial incentive for the airline to do this, but it was the right thing to do," says McKenas.

He not only convinced Crandall but found support within the two flight attendant unions. For American, enabling defibrillator usage on aircraft involved training 25,000 flight attendants to use the device, as well as a newly enhanced medical kit upgraded with all the medical tools needed to care for a cardiac arrest patient for at least the first hour after such an event. McKenas trained the first 3,000 himself.

He also personally designed a lapel pin—a red heart with a golden lightning bolt—to be given to any flight attendant who used a defibrillator in flight. “Once they saw how easy it was, people were clamoring to get involved in a cardiac arrest so they could get that pin,” he recalls.

The airline also conducted extensive flight testing. In medical school, McKenas learned the first principle of medicine: First, do no harm. “In practice, that means that before you can set out to do good for the public one must be sure no one is harmed. We had to know that the batteries wouldn’t explode. That something adverse wouldn’t happen if a plane was struck by lightning. That cell phones wouldn’t interfere,” says McKenas.

American had barely announced its plan to put AEDs aboard aircraft when McKenas was summoned to testify about the defibrillator program before the House of Representatives’ Subcommittee on Aviation. “I knew the program was right for us at American, but it was new and untested,” says McKenas. “I could not yet verify our AED program had saved any lives.”

But it wouldn’t be long. American began installing AEDs and the new medical kits on its fleet in 1997, and within months, the first life would be saved.

On February 18, 1998, Carmen and Robert Giggey were flying from Dallas, Texas, to Mexico City on vacation. The plane had barely taken off when Carmen realized that her husband, who was sitting in the window seat, looked funny and was unresponsive. She screamed for help and was assisted by flight attendant Shawn Lynn and a passenger, Don Grohman, who happened to be a paramedic.

The two performed CPR on the unconscious man, with no result. The flight attendant recalled seeing the new defibrillator when she boarded the plane. It had been installed only two days prior and had never been used. Because she was a domestic flight attendant, she had not yet received training, but she had read about it and knew that the machine provided user instructions.

According to the account in McKenas’s book, *As Shawn got the defibrillator, Don*



Carmen and Robert Giggey. In 1998, he became the first passenger saved by an AED on a passenger aircraft.

unbuttoned Robert’s shirt exposing his chest. It was covered in chest hair and cold, clammy sweat. The defibrillator had a razor in the kit, so he quickly shaved where the two pads would be attached with adhesive. He pressed the machine’s on button. It started to talk.

“Apply pads to patient’s bare chest,” the machine’s voice said.

Don even noted there were graphics on the pads saying exactly where they should go on the chest. Because Mr. Giggey’s seemingly dead body was covered in moisture, he used a napkin to dry off his chest. The defibrillator spoke again.

“Analyzing heart rhythm—do not touch the patient.”

Mrs. Giggey, who had been praying for her husband, gave up her grip on his feet momentarily.

Don advised all people to clear the patient, and do not touch him. Then, the device found the lethal rhythm of sudden cardiac arrest—ventricular fibrillation.

“Shock advised, do not touch the patient. Shock advised, press shock button now. Shock advised, press the shock button now. PRESS THE SHOCK BUTTON NOW.”

Don made certain all people, including Carmen Giggey who was still touching him and praying at his feet, were clear of Mr. Giggey. He quickly pressed the shock button.

Robert Giggey’s corpse jumped up off the seat by about two feet, Don recalls.

Shawn quickly returned to his body and felt for the carotid in his neck.

“He has a pulse! There is a pulse!” she exclaimed.

The plane landed and the patient was transported to the hospital, where tests showed he had a coronary artery blockage that had impeded blood flow to his heart.

Later that year, other major U.S. air carriers began outfitting planes with defibrillators and Congress passed the 1998

Aviation Medical Assistance Act, legislation McKenas helped write as chairman of the American Transport Association to protect “good Samaritan” doctors and other medical providers who volunteer to help in a medical crisis on board flights.

McKenas partnered with Rick Page, MD, PhD, an electrophysiologist at UT Southwestern Medical School, who reviewed every onboard shock event. That data analysis served as the basis of a medical research paper published in the *New England Journal of Medicine* in 2000.

The paper found that there had been 250 uses of AEDs by airlines from July 1997 to around December 1999, or about 7.6 uses per month. It was mostly used as a cardiac monitor. A total of 15 unnecessary flight diversions were avoided and 13 diversions were recommended because the AEDs’ monitoring tools and programing detected medical issues serious enough to order the plane out of the sky immediately. Out of 19 shock opportunities that grew out of those 250 uses, resuscitation was successful 11 times, or in 58 percent of the cases.

“These results, obviously, were far better than the 10-percent survival often seen from use in the field with paramedics on the ground,” says McKenas, who currently practices medicine part time with the Carrollton, TX, Fire Department, where he ensures firefighters are medically safe to perform their strenuous work and screens for illnesses prone to firefighters.

The following year, the Federal Aviation Administration mandated defibrillators on every aircraft within three years.

“Nobody wants to have a cardiac arrest, anywhere,” says McKenas. “But it’s arguable that the second-best place to be when you have one would be aboard a U.S. commercial aircraft (the best place, of course, would be in a hospital, already hooked up to a heart monitor).” ■