USAF photo by SrA. Brian Ferguson

Because of advances in aeromedical evacuation, most American troops now survive their combat wounds.

The 90 Percent Solution

By **Bruce D. Callander** and **Adam J. Hebert,** Senior Editor

Aeromedical evacuation, led by the Air Force, in recent years has become dramatically more effective. The improvement has a tangible benefit—injured troops are much more likely to survive wartime injuries than they were even in the 1991 Gulf War.

The survival rate for troops injured in Operations Enduring Freedom and Iraqi Freedom is 90 percent. In Operation Desert Storm, only about 75 percent of injured US troops survived their wounds. The survival rate for every other war in the 20th century was between 70 and 80 percent.

Although improvements in body armor, medical treatments, and vehicle protection have undoubtedly contributed to the improved survival rate, aeromedical evacuation plays a key role. In Desert Storm, it took 10 days to return an injured troop to a Stateside medical care facility. Today, even if an injured troop cannot be treated at the massive Landstuhl Regional Medical

USAF photo by SSgt. Scott Campbell

Center near Ramstein AB, Germany, it only takes three days to return them to the US.

"Aeromedical evacuation is the best example ... of something that has totally transformed over time," said Gen. Duncan J. McNabb, commander of Air Mobility Command at Scott AFB, Ill.

The train of events that leads to an aeromedical evacuation (AE) typically begins with a battlefield injury. The wounded service member will be delivered to a primary resuscitation site and then transported to a larger hospital, perhaps the jointly staffed hospital at Balad AB, Iraq.

As soon as 30 minutes after surgery, the injured American could be on an airplane headed to Landstuhl. From there, the injured person may be back in the United States at the military's National Naval Medical Center (Bethesda, Md.) or Walter Reed Army Medical Center (Washington, D.C.) three days after the injury.

"We used to have a structure where we had dedicated airplanes," McNabb said—C-9 Nightingales and C-141s reserved for the AE mission.

The dedicated transports flew on fixed schedules, and the AE mission operated separately from the rest of the air mobility world. The segregated effort reduced flight availability, lengthening the amount of time it took to evacuate injured personnel.

In the past, medical personnel "made sure the [patients were] absolutely stable" before flight, McNabb told *Air Force* Magazine, because "we were worried we would lose them in the air."

In many cases, injured troops never made it into the airlift system because they died first, McNabb noted. Now, the

Opposite, an Air Force HH-60 Pave Hawk of the 33rd Expeditionary Rescue Squadron and an Army UH-60 take off from the Afghan desert during a medevac mission. Above, Lt. Col. Joe Kennedy, commander of the 386th Contingency Aeromedical Staging Facility, checks patients aboard a C-17 Globemaster III. The wounded are being medevaced from the Southwest Asia theater to Germany for further treatment.

Lessons From Hurricane Katrina

One change in the Air Force's aeromedical evacuation system sprang not from wartime lessons but from the experience of the Hurricane Katrina relief mission.

After 9/11, the Air Force medical community "reorganized into a rapid response force that had a 25-bed hospital and aeromedical evacuation assets put together and on call," said Lt. Gen. George P. Taylor, then Air Force surgeon general. This is the group that went to New Orleans to triage the victims and send the most critical individuals to other locations.

The deployable team was "just the medics," however, Taylor said. "We have been working really hard on an integrated force package. I call it a 'humanitarian relief package.' It is going to be a force module that will be available to combat commanders" for relief missions.

The deployable package will still "be centered around a 25-bed hospital," but it will also include base operational support capabilities, he said, "the feeding, the housing, command and control, the communications, security, in one package."

This holistic approach is "the evolution for us in terms of having rapid response capability," Taylor said, "so in a matter of hours—not days—we can have this kind of capability on the ground."

Air Force performs "critical care in the air ... as soon as we can get that person stabilized."

All of this has happened even though—or perhaps because—the C-9s and C-141s have been retired. The C-9, USAF's primary aeromedical evacuation bird, was devoted exclusively to the mission of airlifting patients out of war zones.

Designated, not Dedicated

Dedicated medical airlift has been replaced with designated airlift. This mission is performed by highly trained AE and critical care air transport teams (CCATTs) . These teams, with portable patient pallets and equipment, can use any mobility aircraft to perform an aeromedical evacuation.

USAF photo by SSgt. Lanie McNeal

USAF photo by MSgt. John E. Lasky

At top, airmen of the 55th Rescue Squadron depart from Davis-Monthan AFB, Ariz., to the US Gulf Coast to assist in Hurricane Katrina rescue operations. Here, Maj. Kathleen Browning comforts a patient at an Air Force medical facility at Balad AB, Iraq. Browning, of the 374th Medical Squadron, Yokota AB, Japan, accompanied the patient on a medevac to Germany.

When an injured service member needs to be moved, the first available aircraft can be readily identified with up-to-the-minute knowledge of where airlifters are. The pallets, medical teams, and other personnel will already be ready to go.

"There's a good bit of traffic" in and out of Iraq, noted Maj. Gen. Quentin L. Peterson, AMC operations director, so it is fairly easy to find an available aircraft for an evacuation mission.

The airlifters used for evacuations are known as "back-haul" aircraft. The AE teams often board aircraft that have just delivered supplies to the forward area, and reconfigure them to carry patients out.

If a C-17 is on final approach when an aeromedical evacuation is needed, airmen would be given prompt instructions, Peterson said. "Clear these three pallets—we're putting these [injured] folks on, and by the way, you're not going to X, you're going to Ramstein."

The AE teams can quickly convert an airframe for medical use. Typically, the aircrew must load some 800 pounds of equipment and supplies. The loads are standardized, so the AE crew is always familiar with what will be aboard: such basic gear as cardiac monitors and oxygen and suction equipment.

"You don't have to wait for that dedicated airplane," McNabb noted, and the results have been spectacular. Fully equipped, the AE aircraft has the basic elements of a hospital emergency room, complete with standard medications.

By June, AMC had already flown more than 13,000 AE missions since

9/11, out of Iraq, Afghanistan, and elsewhere—transporting nearly 72,000 patients. Lt. Gen. George P. Taylor Jr., then Air Force surgeon general, said about 6,500 battle casualties have been evacuated from Iraq alone.

The "vast majority" of patients are brought back for diseases or sickness, "which is always true in warfare," Taylor said.

The dedicated AE fleet was a limited asset. In the past, if an aeromedical evacuation bird was not available, the result was "too bad, so sad," said Peterson. "Well, that's not the answer we want to give to that injured soldier, sailor, airman, or marine."

Officials said the idea for the new approach came from Lt. Gen. Paul K. Carlton Jr., the Air Force surgeon general until 2002.

USAF photo by MSgt. Ruby Zarzyczny

SSgt. K.C. Martin (l) and SrA. Courtney Johnson, medical technicians of the 349th Aeromedical Evacuation Squadron, Travis AFB, Calif., participate in a training exercise aboard a KC-135. Crews are now trained to work in multiple aircraft.

Moving Right After Surgery

Prior to the new AE procedures taking effect, medical personnel would "stabilize the patient for days beforehand until the patient was able to travel," noted Brig. Gen. Frederick F. Roggero, AMC deputy operations director.

Now, airlift is sometimes being coordinated as a patient is still in surgery on the ground in Iraq, Roggero said.

The only reasons that an AE mission will not take off immediately is if the weather is too bad or the patient is just not stable enough to be flown, said Lt. Col. James E. Reineke, chief of AMC's Aeromedical Evacuation Operations Branch. However, "from a contingency perspective, what the medical providers will have to do" is determine if better care can be provided at the ground location. "It may be more advantageous to move the patient, even in a less-stable state," he said.

"I remember one of the admissions where the aircraft had to be held for a couple of hours because we were waiting for the patient to come out of the [operating room] and recover," said Capt. Chris Thrasher, who has flown on operational AE missions. "It's a rare instance that we can't move a patient. More often, we are taking them right out of surgery and taking them off."

The AE aircraft essentially serves as an en route intensive care unit as the patient is transported to Landstuhl or a Stateside medical care facility.

In addition to the emergency flights, there are also six scheduled medical flights between Iraq and Germany each week, for less-urgent moves.

AE is a Total Force mission. Roggero noted that 88 percent of the "backend" care personnel are Guardsmen and Reservists.

Of the 31 AE squadrons, only four are active duty units. Ten are manned by Air National Guardsmen and 17 by Air Force Reservists. Reserve component and active duty nurses and technicians all train together and periodically take part in joint exercises.

Although the overall injury survival rates did not improve significantly until recent years, the efficiency of the aeromedical evacuations has been increasing for some time. During the Vietnam War, it took an average of 45 days to get a sick or wounded service member back to the States.

In the Persian Gulf War and before, "we only moved patients who were a week or more post operative [and] who didn't have any substantial injuries that hadn't been fairly well stabilized," said Taylor. "We also ran a policy in the

Aeromedical Evacuation's Long History

Air Force aerial evacuations began early in World War II. The approach was first used informally in the Pacific Theater, where land and sea routes often were lacking.

C-47s lifted the wounded to general hospitals in New Caledonia, New Hebrides, and Australia.

A more formal program began in November 1942 at Bowman Field, Ky. There, Army Air Forces opened training for aeromedical squadrons. Flight crews included a surgeon, nurses, and technicians.

The C-47 also became the aerial ambulance in the Mediterranean region. Wounded troops were airlifted out of Tunisia, Salerno, and Anzio. Surgeons accompanied only the most seriously wounded—most flights were handled by nurses and technicians.

By the end of the war, the longer range C-54 was airlifting many patients all the way to the US. In all, more than a million sick and wounded troops were airlifted during World War II.

Early in the Korean War, most sick and wounded were moved by land or sea. Then Lt. Gen. William H. Tunner took control of Combat Cargo Command. He initiated a study of the possibilities of aeromedical evacuation as a standard procedure for transporting wounded and sick troops.

By October 1950, Combat Cargo was airlifting patients to South Korea or Japan. The Military Air Transport Service (MATS) was then carrying patients all the way to the US. By the end of that year, air transport was the usual method for moving casualties.

Vietnam saw further improvements in medical airlift, but the rule still was to move only patients who were fully stabilized. As a result, troops often spent weeks in in-country hospitals, waiting to be sent to the US.

USAF photo by SrA. Brian Ferguson

TSgt. Mark De Corte, a member of the 33rd Expeditionary Rescue Squadron based in Kandahar, deploys in an HH-60 Pave Hawk. The tan footprints painted on the helicopter represent saves.

past where, if you could return to duty within two weeks, we didn't move you from theater."

Today, things move quickly. "Your airway is protected, you're treated for shock, your extremities are stabilized, and then we put you with your ICU team and fly you back," Taylor said. "What we have done is build a system to allow patients to move as soon as half an hour after surgery."

As a result, he said, if you walk through a hospital in Iraq you will see few Americans because most of them have already been airlifted out.

Ready Teams

A typical aeromedical evacuation aircrew today consists of two nurses and three technicians, said Maj. Mary O'Loughlin, chief of the Aeromedical Evacuations Operations Branch Training Division at Scott. Multiple teams are "involved with getting the patient from the hospital to the airframe, and the airframe to their final destination," she added.

The critical care air transport teams are separate from the standard AE teams and travel with the "very critical patients," added Maj. Dale G. Gray, a nurse examiner. The CCATTs consist of a physician, a nurse, and a respiratory therapist. They are allowed to handle up to three patients, but do not fly unless a standard AE team is also on board, because the CCATTs "are not crew members. They are medical support," Gray said.

The difference between the two teams is that the aeromedical evacuation team is "there to interface between the air evac mission and the aircraft mission," said Reineke.

The AE teams "help with the configuration of the aircraft and egress of the aircraft [in] an emergency," he said. "The critical care air transport teams are specifically there to care for the patients, and they don't have the expertise—and it is not their mission—to do that interface" with the aircraft mission.

Training for the aeromedical teams is exhaustive. SMSgt. John T. Truillo, an aeromedical evacuation manager, said that in addition to the regular medical course at Sheppard AFB, Tex., graduates must volunteer for the mission, go to flight school, and undergo survival training that "teaches them the basics on how to escape, ... evade, and resist [capture] as a medical crew member." The training regimen takes "anywhere from half a year to a year" or longer, Truillo said.

"The crews used to be trained on only one type of airframe. Now, our crews are trained on multiple airframes, and this really adds to flexibility," said Col. Naomi M. Boss, deputy chief of aeromedical evacuation current operations. "We're saving more lives because of that."

The AE crews practice cardiac skills, life support, cardiopulmonary resuscitation, and other basic procedures.

Growing Importance

Aeromedical evacuation is more important than ever, said Taylor. For starters, the US has troops operating "much farther away from home than we have had in the past and farther away from robust health care facilities than in the past."

At the same time, if you can "take care of your very sick patients ... and feed them into the medical evacuation system within hours or days, you don't have to have a large hospital forward," Taylor said. "You can actually put a number of small hospitals out in the theater and flow a large number of patients through, if you have a solid aeromedical evacuation system."

The injured service member "may travel through six or eight health care teams" along the way without the care degrading, Taylor said. "Even when traveling long distances in the back of a C-17, the [sickest] travel with their own portable ICU, so it is a remarkable bit of teamwork that appears to be going very well."

The initial care on the ground is vitally important to the survival of the wounded, Taylor said. To improve this first treatment, the services have developed devices such as one-handed tourniquets and hemostatic bandages.

The Air Force also has revised its recuperating "buddy care" program, with new resuscitation kits and more medical training.

The other military services are responsible for moving their patients to the airfields where they can enter the air evacuation system, which was "originally designed to move very large numbers of casualties," Taylor said. Today, the Air Force is moving smaller numbers of patients, but they are frequently in worse shape.

"Fixed wing air evacuation has always been an Air Force mission," he said. It was an Army Air Corps mission during World War II, and the Air Force inherited it as part of the mobility portfolio.

The job is an old one, but the new tactics, techniques, and procedures of the aeromedical evacuation mission mean the Air Force is now performing it better than ever. ■

Bruce D. Callander is a contributing editor of Air Force *Magazine. He served tours of active duty during World War II and the Korean War and was editor of* Air Force Times *from 1972 to 1986. His most recent article for* Air Force *Magazine, "Whatever Happened to the Plain Blue Suit?" appeared in the July issue.*