



NCC Pediatrics Continuity Clinic Curriculum: Air Power Operational Medicine



Purpose: To provide familiarization with Air Force operational aeromedical evacuation capabilities

Objectives:

- Understand the difference between MEDEVAC and CASEVAC.
- Identify the role of AES and AMC in coordinating/completing all DoD aeromedical evacuations
- Understand the aeromedical capabilities of US Air Force Aircraft (C-17, KC-135, C-130)

MEDEVAC- timely and efficient movement and en route care provided by medical professionals to wounded being evacuated from a battlefield or injured patients being evacuated from scene of an accident. Each MEDEVAC goes to a receiving, better equipped medical facility for care. Ground or air movement.

-- **Aerovac**- primarily by Air Force to move patients out of combat theater aboard a fixed wing aircraft.

CASEVAC: an emergency patient evacuation of casualties from a combat zone with limited or no en route care and medical equipment. Uses any available, non-standard, and non-dedicated vehicles - no time to wait for a MEDEVAC.

4 active duty USAF aeromedical evacuation squadrons (AES) + 27 Air National Guard/USAF Reserve Sq

-- An AES has no aircraft assigned to it; all aircraft used for medical evacuation missions are cargo or aerial refueling aircraft that have been reassigned by the AMC Control Center.

- 375th Aeromedical Evacuation Squadron at Scott AFB, Illinois
- 43rd Aeromedical Evacuation Squadron at Pope Army Airfield, North Carolina
- 18th Aeromedical Evacuation Squadron at Kadena Air Base, Okinawa, Japan (Pacific)
- 86th Aeromedical Evacuation Squadron at Ramstein Air Base, Germany (Europe)

-- Typical AES missions are run by Flight nurses and technicians - not docs! If critical care is needed, a Critical Care Air Transport Team (CCATT) will be used which requires one ICU doctor, one ICU RN, and a respiratory therapist for every 6 patients

Joint Base Andrews is home to the AF District of Washington's 316th Wing:

- 459th Air Refueling Wing, whose mission is to recruit, train, and equip Airmen to fly and maintain the KC-135 Stratotanker.
- 89th Airlift Wing, responsible for worldwide special air mission airlift, logistics and communications support for the president/VP/cabinet members, and other senior military and elected leaders
- 316th Medical Wing, oversight for medical care at bases and work sites across DC/MD/VA

Responsibilities for Aeromedical Evacuation:

- a. Air Mobility Command (AMC) is responsible for training, organizing, and equipping all Air Force aeromedical services and is responsible for all DoD patient movement on fixed wing aircraft. This includes domestic aeromedical evacuation for the United States Armed Forces, intertheater aeromedical evacuation, and intratheater aeromedical evacuation except as indicated in b and c below.
- b. The Army component commander is responsible for providing aeromedical evacuation by organic Army aircraft within Army combat zones.
- c. The Navy overseas components commander is responsible for providing aeromedical evacuation over routes solely of interest to the Navy, where the facilities of the Air Force cannot provide this service.

Boeing C-17 Globemaster



Capacity: 36 litters and 54 ambulatory patients or medical attendants

Length: 174 ft

Height: 55.1 ft

Max takeoff weight: 585,000 lb

Range: 2785 mi

Service ceiling: 45,000 ft









Boeing KC-135 Stratotanker



Capacity: 37 ambulatory patients or medical attendants, up to 15 litters

Length: 136 ft 3 in

Height: 41 ft 8 in

Max takeoff weight: 322,500 lb

Range: 1500 mi

Service ceiling: 50,000 ft





COPYRIGHT BRUCE LEIBOWITZ AIRLINERS.NET





Lockheed C-130 Hercules



Capacity: 74 litters or 92 ambulatory patients/medical attendants or mixture

Length: 97ft 9in

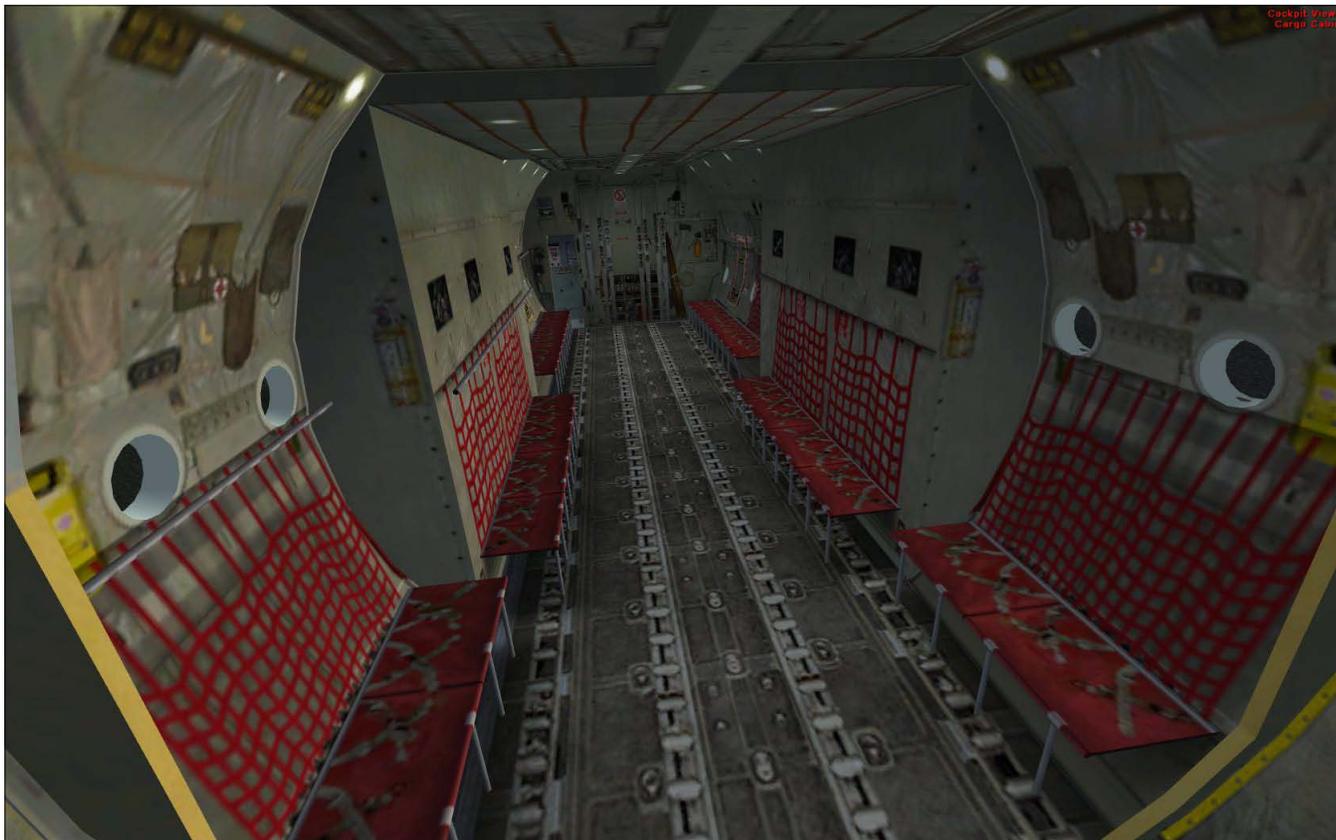
Height: 38ft 3in

Max takeoff weight: 155,000lb (175,000lb wartime)

Range: 2360mi

Service ceiling: 33,000ft empty, 23,000ft with 42,000lb





Bringing Them Home: U.S. Air Force Aeromedical Evacuation

Barry Smith
08/30/2018

EMS World Online, Vol 43.

<<https://www.hmpgloballearningnetwork.com/site/emsworld/article/221142/bringing-them-home-us-air-force-aeromedical-evacuation>>

You and your crew receive an interfacility transfer mission for your fixed-wing air ambulance. You arrive at your aircraft and look inside. It has a completely bare cargo area 88 feet long by 18 feet wide. You must convert this space into a fully functional flying ICU. It can carry a maximum of 36 litter and 54 ambulatory patients. Its four engines can push the aircraft's 500,000-plus-pound weight to a cruising speed of 515 mph at over 40,000 feet.

Welcome to another day with a U.S. Air Force (USAF) aeromedical evacuation squadron.

There are a total of 31 aeromedical evacuation squadrons (AES) in the USAF, 27 of which are attached to the Air National Guard or USAF Reserve. All aeromedical evacuation functions for military personnel are controlled by the USAF Air Mobility Command (AMC). This command controls the USAF's almost 1,100 cargo and aerial refueling aircraft.

The office of the AMC's command surgeon establishes treatment protocols, determines equipment, and sets all procedures and standards that relate to aeromedical evacuation. An AES has no aircraft assigned to it; all aircraft used for medical evacuation missions are cargo or aerial refueling aircraft assigned by the AMC's Tanker Airlift Control Center. The control center is like a dispatch center for all cargo and refueling aircraft and is staffed 24/7.

During the Vietnam War it took an average of 45 days to return patients to the U.S., and only 75% of wounded soldiers survived. Today specialized teams can transport patients from the point of injury to the U.S. in three days with a 98% survival rate.

Crew and Training

A typical aeromedical evacuation (AE) crew consists of two nurses and three aeromedical evacuation technicians (AETs). They can handle about 25 patients. If there are more patients or it will be a long flight and the crew will need relief, they add an extra flight nurse and AET. For example, it's an eight-hour flight from Germany to Afghanistan, about two hours to load the patients, and then another eight-hour flight back to Germany. Those flights will have extra crew due to the length of the mission.

Nurses coming into the USAF first attend officer training for five weeks. Depending on their experience, they may start at a higher rank such as captain instead of the bottom as a second

lieutenant. They complete wilderness and water-survival training in case their aircraft crashes. They then go through the medical training needed to fly on USAF aircraft.

AETs complete this same training with the nurses. It's helpful to have nurses and AETs in the same classes so they learn to work together from the beginning. Nurses then complete another four weeks of scenario-based training on simulated and real aircraft with human patient simulators at Wright-Patterson Air Force Base in Ohio.

AETs have very similar training except they usually have no medical background before they enter the USAF. They begin by becoming nationally registered EMTs and receive additional training on nursing care, IVs, and drug administration. For the National Guard and Reserve, some AETs are EMTs or paramedics in the civilian world, obviously a big advantage.

Every flight team staffs a lead flight nurse that determines patient care. AETs deliver most of the hands-on patient care during flight. They also physically set up the aircraft for patient care by installing the litter systems as well as working with the aircraft crew on oxygen and electrical needs. They can start IVs and push medications. The closest equivalent in the civilian world would be an Advanced EMT.

In situations that fall outside of or don't fit protocols, AETs must rely on good clinical judgment and work as a team to quickly develop a treatment plan. They then can use a satellite phone to call the unit's flight surgeon to receive plan approval.

"A big part of the preflight briefing for the medical team is talking about worst-case scenarios if the patient deteriorates and what we will do if it happens," explains Capt. Melanie Munns, a flight nurse with the 452nd AES. "In addition to medical situations, the preflight briefing discusses what will happen in case there's an emergency with the aircraft, such as a loss of power or a fire, so all the patients will be cared for appropriately and everyone knows what their role is."

Mission Considerations

A mission begins with a crew briefing to find out how many patients and what types of medical and/or trauma conditions they have. They calculate the amount of oxygen patients will need as well as the electrical load to ensure the type of aircraft can handle both patients and equipment. The lead flight nurse will assign patients to each member of the team and discuss what kind of care they will need during flight.

The next step is to physically configure the aircraft for the patient load. The cargo area is bare, so they will set up vertical stanchions to support the litters as well as run oxygen and electrical lines to the litters. They double-check all equipment and supplies before and after loading the aircraft.

Some aircraft have built-in liquid oxygen (LOX) tanks for patient care. If they are using another type of aircraft, the AES must bring oxygen with them; this consists of a LOX system that can hold 20 liters of liquid oxygen. Each liter of LOX provides approximately 800 liters of gaseous oxygen.

Lighting can be challenging, especially when the aircraft is operating in a tactical environment at night. The flight crew strives to keep lighting to a minimum during takeoffs and landings in potentially hazardous areas where lights might draw gunfire. AES crews usually work with headlamps with red or green bulbs. Cargo aircraft have very few windows, so they often use headlights even in daylight. Noise presents a formidable challenge; there is no sound insulation as you find on airliners. Using stethoscopes in flight is usually not an option.

Vibration also plays a factor in patient care. Litters are essentially the same design used on the battlefield, with a two-inch foam pad under the patient. A large degree of vibration and movement of the aircraft occurs during flight. When operating from an airport with the potential of hostile fire, the flight crew will make very steep approaches and departures with turns to throw off the aim of gunfire. These aircraft can also operate from dirt and gravel runways.

Care in Flight

Where patients are placed on the aircraft depends on their diagnosis. AES crews are very familiar with the aircraft they use; for example, patients with fractures are placed in locations with the least amount of vibration.

There are typically three tiers of patients on the stanchion system. The crew also have to anticipate patient needs and care during long flights to determine which tier is best for each patient.

Another concern is that environmental controls—heating and cooling—are not well regulated in these cargo aircraft. Even how high the patient is above the cargo deck can result in a significant temperature difference. Closer to the floor tends to be cooler, as fuel is often stored under the floor. Near the ceiling can be much warmer as the sun heats the skin of the aircraft.

“We carry an iPad-like device called an electronic flight bag,” says Tech Sgt. Sherenda Fausnaugh. “This has information on all the different types of aircraft they might use for evacuation: how to set them up, how to access electrical power, oxygen, etc. It also has detailed directions on how to use different equipment.

If they are going to use an aircraft they haven’t trained on in a while, they can review procedures and equipment during the crew briefing to refresh everyone’s knowledge. This device can be updated rapidly to incorporate lessons learned from other units as well as new protocols and other valuable information.”

“We transported a lot of orthopedic injuries from Iraq and Afghanistan and had to be very creative in patient packaging because of the aircraft vibration and movement,” says Col. Jeanne LaFountain, commanding officer of the 349th AES. “When any of my people deploy, I give them a Gumby figure to remind them to be flexible and creative in making sure their patients receive the best care possible and aren’t further injured during transport.”

The emotional toll on military caregivers is just as powerful as in the civilian world. LaFountain says they’re careful to watch each other for signs of stress, particularly after difficult missions. One helpful strategy is to follow up on patient outcomes and visit their patients later if possible.

There is also a formal mental health assessment form each crew member fills out before and after every deployment. Five follow-up contacts are conducted during the next two years. They also undergo regular mental health awareness training.

Critical Care

For more seriously ill or injured patients, AES personnel may be augmented with a critical care air transport team (CCATT). “CCATTs have three members: a critical care doctor, a critical care nurse, and a respiratory therapist (RT),” explains Staff Sgt. Arvin Jacinto, a CCATT RT. “We collectively help each other care for the patient during the flight. The team will go to the facility where the patient is being cared for, perform an assessment, and prepare the patient for transport. It is very similar to what civilian air ambulance crews do for an interfacility transfer. It can take up to two hours to assess and prepare the patient, depending on their condition. We work with the AES personnel before, during, and after the flight. The AES personnel are the bridge between the CCATT and the aircraft and its crew.

“Members of CCATT teams are all very experienced with patient care and must be comfortable working with critical patients in a small team for many hours in a very austere environment. Some flights can last 10–12 hours. They have to carry everything they might need with them: equipment, drugs, blood products, etc. It is completely different than working in a hospital environment—basically they’re setting up an ICU in the back of a cargo plane. A CCATT can be augmented with specialists for certain types of patients such as burn victims. A special team will also augment a CCATT for ECMO patients.”

Training to be part of a CCATT consists of two parts, basic and advanced. Basic CCATT training is conducted at Wright-Patterson AFB in Ohio at the USAF School of Aerospace Medicine. Training for AE and CCATT teams includes the use of aircraft simulators that look exactly like the interior of several of the types of aircraft used for AE. They feature the same lighting, sound, and environmental controls as the real aircraft. The newest generation can move to simulate takeoff, landing, and turbulence.

Advanced training is called CSTARs and is completed at one of three civilian Level 1 trauma centers contracted by the USAF. This intense two-week course tests a candidate’s mental and physical ability to perform critical care in an austere setting. It involves actual patient care and scenarios using high-fidelity human patient simulators. All CCATT teams have the same equipment, training, and procedures, so any CCATT member can team up with members of other CCATTs to work together.

With a standard equipment load, they can support up to six patients, depending on acuity. All equipment and supplies are packed in bags that can be easily carried onto an aircraft. They can perform any emergency airway procedure as well as run labs using an i-STAT.

The USAF recently created a new type of critical care team in Europe: the tactical critical care evacuation team—enhanced. This consists of a surgeon, an emergency medicine physician, two nurse anesthetists and an operating room technician.

Spread throughout Africa are many small teams of American military personnel on training and advisory missions with no sophisticated medical care available to them. This team can fly to any of those seriously injured patients and perform surgery upon arrival or even in the aircraft on the return flight.

Aeromedical evacuation squadrons are also involved in humanitarian and disaster relief missions. Following the devastating hurricanes that struck the Caribbean in 2017, most of the islands remained without power for an extended time. USAF AE squadrons transported 100 dialysis patients from the Virgin Islands so they could continue treatment in the U.S. until power was restored.

Honor and Privilege

From humble beginnings evacuating patients in cargo planes during world War II, the U.S. Air Force has developed a sophisticated patient care and transportation system that can reach anywhere in the world.

“I feel it is an honor and privilege to provide the best medical care and bring our men and women to the next level of care so they can go home to their families,” LaFountain says. “Our survival rate is between 98%–99%. The technology and level of medical care we are able to provide with our AE personnel and our specialty teams is amazing.”