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Strategic Aeromedical Evacuation in Natural Disasters:

New Tasks for Military Aeromedical Evacuation Systems

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History

Prior toWorldWar II, Germany had little experience in aeromedical evacuation (AE) of sick and wounded patients. The need for a specialised AE organisation was recognised, organised and used extensively on all fronts during World War II. Nearly 2.5 million casualties were transported by regular troop carriers and 11 specialised AE Units, which concentrated on the intensive care air transport of the seriously wounded, especially those with brain, eye, jaw, thoracic and abdominal injuries, or with gunshot fractures. The AE Units were equipped with Junkers Ju-52s, which could carry up to 12 litter patients, plus 3 to 5 ambulatory patients, each. The AE Units of the Luftwaffe – the "*Sanitaetsflugbereitschaften*" - made an outstanding contribution to military medical care in evacuating this significant number of casualties under the humanitarian symbol of the Red Cross. This was the birth of the modern AE systems.

The Modern System

Nowadays, almost all continuously available AE systems operating around the world are still run by military institutions. The worldwide military engagements ofWestern countries – for example, the NATO partner countries – make AE systems inevitable. Therefore, the German Air Force - together with the Medical Service - created a Strategic Aeromedical Evacuation System (StratAirMedevac). The primary goal of this AE system is to provide high standard medical care for Bundeswehr soldiers. It was set up to conduct long-range evacuation operations for soldiers in critical medical condition, transporting them from deployments like Afghanistan back to Germany. StratAirMedevac employs a variety of aircrafts, such as the CL-601 Challenger jet, the C-160 Transall turbo prop aircraft and, most important for long-range StratAirMedevac, the Airbus A 310 (see figure 1).

Onboard a StratAirMedevac Flight

The multi-role AE air carrier is the logistic basis of a flying intensive care unit for a total of 44 recumbant patients. It is subdivided into a litter kit section for 28 patients, an intermediate care section for 10 patients and 6 patient transport units (PTU) meeting level 1 trauma ICU standards (see figure 1). The litter kit section has basic monitoring capabilities (3-lead ECG, NIBP and pulse oxymetry), as well as a limited number of emergency respirators (Draeger Oxylog 2000).

All six PTUs are equally equipped and standardised (see figure 2). They provide full ICU care and monitoring and are able to function independent from aircraft electric and oxygen supply systems for a minimum of six hours. Even emergency surgical procedures are possible. All PTUs are connected to a central monitoring unit for surveillance and documentation purposes.

This "flying ICU" is operated by a medical crew consisting of: a Senior Medical Officer "Flight Surgeon," serving as organising "Medical Director;" an Emergency Care Specialist Nurse "Crew Chief;" a Medical Equipment Technician; two Anaesthesiology and intensive care medicine Specialists; two Emergency Care Physicians; an ICU Care Specialist Nurse; six Emergency Care Specialist Nurses; five Emergency Care Assistant Nurses; and six Medical Staff Soldiers. The Medical Director, assisted by the Medical Crew Chief, is responsible for coordination and organisation. an experienced flight surgeon, he is the link between the flight crewand the medical team. Together with one of the Anaesthesiology Specialists, he takes responsibility for pre-flight patient triage and positioning in the aircraft, as well as for patient loading and unloading.

Moving such a large number of severely injured patients involves challenging behind-the-scene logistics. Adequate patient collection, staging and loading facilities on-scene are essential (e.g. patients have to be moved into the airplane with a high lifter through the cargo door). Sufficient energy and oxygen supply during long flights and distinct planning of patient movement after arrival at the destination airport are other key issues in setting up an AE operation. Finally, this highly sophisticated tool for individualised patient transport needs adequate airport infrastructure, as landing is only possible at airports with long enough, concrete runways. If there is no fixed building available for patient handover, the consequences of patient transfer outside of clinical conditions – often in extreme climatic surroundings and under massive public and media interest – have an enormous impact on AE staff's work performance. Therefore, advance access to detailed medical information about all patients to be transported is extremely helpful to the AE crew. Aside from certain infectious diseases (e.g. hemorrhagic fever), there is almost no contraindication for StratAirMedevac transport. StratAirMedevac evacuation may be contraindicated for conditions such as untreated intracranial air, uncontrolled bleeding and massive ARDS, depending on the local situation, drug supply, surgical capacity onboard and flight time.

New T$asks for the "MedEvac-Airbus"

Although AE began primarily as a military function, more and more governmental and private organisations, such as travel agency reinsurance companies, are requesting the "MedEvac-Airbus" to repatriate their customers from disaster areas. Prior to the 2005 Southeast Asian tsunami disaster, the "MedEvac-Airbus" was used for repatriating casualties from bomb attacks (e.g. Karachi, Pakistan, 2002 and Djerba, Tunisia, 2002) and major accidents (bus crash in Puebla, Mexico, 2004). With the 2005 tsunami disaster, the "MedEvac-Airbus" took on a new role, responding to natural disasters.

In the aftermath of the tsunami, a total of three Airbus flights were conducted over six days, carrying a total of 123 severely injured (ISS >25 in more than 30%) European citizens back home. Although later StratAirMedevac flights focused purely on transport of severely injured citizens, the medical crewmembers of the first flight were also involved in patient selection and emergency medical care in Thai hospitals prior to the repatriation flight. In this situation, based on a functional infrastructure in the home country, the "MedEvac-Airbus" was the perfect tool not only for returning Western European tourists to their homes, but also to relieve the Thai medical system from an overwhelming number of patients in a very short period of time.

Conclusion

The mission of a StratAirMedevac in natural disasters is twofold. In the initial phase following a natural disaster, an operation is primarily focused on bringing material, personnel and expertise to the affected area. Even if this is not the primary goal of an AE operation, basic medical aid for the suffering and search and rescue activities on-site are the most crucial tasks. In the second phase, after initial stabilisation of the local situation, a neatly planned AE operation is an option, to relieve the local medical system from difficult and resourceconsuming patients. AE with a highly sophisticated system as the "MedEvac-Airbus" only makes sense for use in repatriating foreign citizens, because of limited air transportation capacities in areas with destroyed infrastructure. Ongoing globalisation spreads Western European citizens over the whole world. Therefore, the legal and commercial interests of reinsurance companies and governmental authorities for evacuation of their citizens or customers after major incidents make the future civil use of AE systems a more and more likely scenario.

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