EMERGENCY MEDICAL TRAINING

Air Rescue Training the HEMS Way

VIRTUAL SIMULATION

Spanning Boundaries with Virtual Simulation

MEDICAL SIMULATION

Making Difficult Simulations Look Easy
With its approximately 19 million members, Germany’s automobile club, the ADAC, is Europe’s largest motoring organization. Nearly one in four Germans is a member of this non-profit organization, which has been working in the interests of motorists since 1903. Its core business comprises consumer protection, roadside rescue and air ambulance services. One early milestone was reached in 1927 when the ADAC launched its breakdown services, a second in 1970 when it pioneered civil air rescue.

**Rapid Air Rescue Services Save Lives**

When in the late 1960s the number of road fatalities increased dramatically (to 20,000 in 1967 alone), emergency doctors started to seek new ways of caring for those injured in road accidents. The plan was to transport doctors to the patient, not vice versa. The idea was soon taken up by the ADAC, and its first civil rescue helicopter went into continuous operation as early as 1970. In 1982, the ADAC founded ADAC Luftrettung (Air Rescue) as a registered charity and subsidiary of ADAC. Its guiding principle has always been “A race against time and for life”. The sooner patients are treated and transported to a suitable clinic, the better their chances of survival.

Over the years, ADAC Luftrettung has become Germany’s largest airborne rescue organization. In 2014 ADAC Luftrettung helicopters flew 52,577 missions, helping 47,448 patients by providing rapid airborne medical assistance. The decision, where helicopters are to be deployed or whether an ambulance would suffice is taken in regional dispatch centres. Whenever speed matters, rescue helicopters will do the job. They are also an option when it comes to inter-hospital transportation of critically ill patients. Today, Germany has a nationwide network of 70 plus helicopter rescue bases, more than half of which are run by the ADAC.

Air rescue services are contracted by the competent bodies in the federal state ministries or municipalities. As a rule, the statutory health insurance scheme or accident insurance schemes pay for any rescue measures required. In 2014, ADAC Luftrettung’s revenue from rescue services totalled 90m euros. Nevertheless, the ADAC has contributed more than 300m euros to ADAC Luftrettung since 1980 to cover its airborne rescue services, largely derived from membership fees. Considering the 800,000 missions flown since the ADAC took up air rescue operations in 1970 – and the thousands of lives saved – this seems to have been money well-invested.

**Air Rescue Training the HEMS Way**

The name “ADAC HEMS Academy” (AHA) reflects its objective of serving the helicopter emergency medical service (HEMS) sector. Walter F. Ullrich reports.
Good Reasons for a Club-Owned HEMS Centre

Over the years, the number of helicopters and crews employed by ADAC Luftrettung has steadily increased. So it was only a matter of time before the ADAC decided to set up its own training institution.

The centre was to replace even more real flying time by flight simulation, thus reducing flight and maintenance costs. It would make training possible irrespective of the weather and time of day; and scenarios too dangerous in real flights would be exercised. The fact that simulators do not emit noise or CO2 was another increasingly important factor. One particularly important aspect, however, was that in its own centre the ADAC would be able to best implement education and training elements for helicopter emergency medical services. The ADAC chose Bonn-Hangelar airport as the site for its centre, since it is conveniently located in Sankt Augustin, a town near Bonn, the former capital of West Germany.

The new training centre opened its doors in 2009. For less than 15m euros, ADAC Luftrettung built a training centre equipped with two full flight simulators, two 1:1 medical helicopter mock-ups and equipment for reproducing the entire rescue chain, from roadside medical treatment to intensive care in a hospital. Other features include computer-based training (CBT) stations, a lecture hall, briefing rooms, a lounge and customer office facilities.

The name “ADAC HEMS Academy” (AHA) reflects its objective of serving the helicopter emergency medical service (HEMS) sector. Given ADAC Luftrettung’s staffing level (150 pilots, 280 HEMS crew members and 760 doctors), the AHA is in fact oversized. In order to achieve full capacity utilization the Academy had to mobilize other national and international HEMS operators. They were not long in coming. Today, only 30% of the participants come from ADAC Luftrettung, 20% are members of other national air rescue providers and about half are from international helicopter operators. The unique idea of providing training for helicopter pilots, emergency doctors and rescue paramedics under one roof and from a single source attracts clients from 19 nations worldwide.

High-Level Training for Helicopter Pilots

Requirements for air rescue helicopter pilots are among the most stringent in aviation. Rescue pilots are much more likely to have to fly in deteriorating weather conditions and to land at unfamiliar or unprepared landing sites. HEMS training activities take into account the challenging and quite specific requirements associated with air rescue training, i.e. operating in built-up areas, landing on the central reservation on a motorway or carrying out a rescue operation in mountainous terrain or off-shore.

All the training programmes and sessions are conducted in compliance with EASA regulations and encompass proficiency checks, skill tests, type rating training, instrument rating training and recurrent training. Crew resource management (CRM) training, multi-crew cooperation (MCC) training and training for mission-specific flight deployments are also available.

The AHA has two full flight simulators (JAR-FSTD H Level A) for EC135 and EC145 helicopters. Both were produced by the UK-based company cueSim Ltd. Each simulator features a six-degrees-
of-freedom electric motion platform and a projector system that ensures realistic presentation of all possible visibility conditions. In addition, there are several CBT units and two system trainer devices for EC135 on site.

Pilot training at the AHA is open to all Eurocopter EC135 and EC145C2 operators (air rescue, law enforcement, off-shore, executive organizations etc.). Simulators can be leased under a dry or wet lease agreement. The AHA offers introductory courses for those customers who want to use their own instructors to train their staff on the AHA’s simulators. Training content can also be adapted if, for instance, national requirements necessitate this.

The ADAC began introducing the H145 helicopter in 2014. A full flight simulator for this simulator will be installed in 2017 as a part of a 15-year cooperation with the German company Reiser Simulation & Training.

**Specialized Medical Training**

Medical education and training at the AHA mainly addresses medical personnel from the HEMS sector and is also available to external clients. Moreover, regular emergency transport staff and hospital personnel can receive full emergency and intensive care training. The training includes HEMS crew member courses, intensive care transport courses, children’s emergency response courses, mechanized reanimation courses, hygiene training and medical product law training. The AHA’s medical courses are based on the guidelines of the DIVI, the German Interdisciplinary Association for Intensive and Emergency Medicine. In addition to these courses, the AHA also provides basic and refresher health care management courses for rescue helicopter and intensive care helicopter services.

The AHA offers initial and refresher training to technical crew members (TCMs). TCMs handle demanding tasks which require specialist knowledge in both the aeronautical and the medical field. Their training is based on EASA regulations and encompasses HEMS flight operation, the medical characteristics of air travel, helicopter technology and flight physiology, amongst other things. TCMs assist the pilot before and during the flight. Once at the scene of the accident they support the emergency doctor. TCMs are flight assistants, emergency paramedics and, if required, salvage experts.

Most emergency physicians escorting ADAC Luftrettung’s rescue and intensive care helicopters work in the hospitals which are linked to the helicopter base. Many of these flying doctors are anaesthesiologists, trauma surgeons or internists. At the AHA, experienced instructors from the aeronautical and the medical sector provide initial and refresher courses to emergency doctors working in rescue helicopters. Here, too, the focus is on the particularities of in-flight patient care. For example, doctors are given enough aeronautical basics in order to be able to balance the patient’s needs with those of the flight.

The equipment used to train doctors and TCMs is in some cases really unique. The medical simulator Christoph Sim, a 1:1 wooden mock-up of an EC135 helicopter, enables realistic professional and further training to be carried out. The simulator is equipped with the full range of equipment found in a rescue and intensive care unit, and it perfectly reflects the confined space and noisy operational workspace on board a rescue helicopter. Christoph Sim also features an audio and video installation for monitoring training. A second mock-up replicating a BK117 helicopter is primarily used for decentralized training at regional stations.
Dr Holger Conrad is Chief Emergency Doctor in the Rhein-Sieg region and has been working as an emergency doctor on rescue helicopters since 1990. “Air rescue teams have to master complex concurrent aeronautical and medical tasks under extreme time, space and noise constraints. Traditional initial and continuing education and training prepare pilots, doctors and paramedics for their mission only insufficiently. To get comprehensive training, we need centres that can replicate realistically the typical complex activities of everyday life in the rescue services. The ADAC HEMS Academy in Sankt Augustin is such a centre. Here simulators and modern media technology can be used to reproduce conditions which are close to reality and air rescue team members can train their various roles and responsibilities under risk-free conditions. Stress scenarios can be produced as they are in real life. Helicopter teams can train with rescue teams at the site of the accident or practise transportation, emergency-room processes and interaction with control centres. An indispensable part of the training is aeromedical crew resource management, the situation- and target group-oriented specialist training of mostly non-technical skills.”

The Academy's patient simulators, which include adults and babies, allow the true-to-life treatment of patients from the accident site to the clinical shock room simulator. The shock room can also be used for intensive care training. Two simulation control rooms and a large seminar room for up to 40 participants are also available at the medical training facility. In 2018, medical training will move to a new building in which even more students can be trained.

Human Factor Training
The overall objective of HEMS training is to provide the best care to patients in the helicopter environment. Developing and strengthening professional skills through advanced training is one pillar of the AHA's training. The other is improving human skills by incorporating the human factor into training. Crew resource management (CRM) training is generally used in environments in which human error can have harmful effects. It aims to sustainably improve the non-technical skills of the onboard team, including communication, teamwork, leadership, situation awareness and decision-making. The AHA provides aeromedical crew resource management (ACRM) training based on the fundamentals of classic CRM, but it adds on medical requirements as an important element of the mission. This common training concept contributes to team-building, building mutual trust and a common mental model, which in the end creates positive effects for flight and patient safety. CRM is

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compulsory for pilots and crew members in HEMS. For doctors the ACRM introductory training course is also mandatory. Refresher training, however, is on a voluntary basis.

**Integrated HEMS Training**

Integrated training sessions at the AHA regularly encompass both HEMS aspects and ACRM elements. Although the scripts contain events which have a common theme, they can be changed on the fly, either by being adapted to the trainees’ needs or following decisions and instructions given by the players themselves. The doctor’s decision can change the scenario entirely, for example if he decides that air transport may be too harmful for the patient. The level of intensity of an exercise can be increased or reduced. The number of victims may suddenly exceed the helicopter’s transport capacity, or the instructor can simply raise the patient simulator’s blood pressure although a paramedic would in fact be expecting it to drop. The aim is also to keep the exercise exciting – especially for those professionals who think they know it all. That is why hardly one training session is like another.

Decision-making is a typical skill which needs to be developed in this field. Other educational objectives are being able to cooperate professionally with others, for example, ground-based EMS units and staff. The number and origin of participants can vary depending on the training objectives. Rescuing injured persons from a vehicle which has been involved in an accident can be replicated on the Academy’s premises in an exercise involving real fire fighters and vehicles. Such training can cover the entire process from initial treatment at the accident site to in-flight care to handing over patients to an intensive care team at the hospital. It is very well received by all participating players. One of them, Dr Holger Conrad, who has trained here regularly, would wish that there were more of these training institutions. He should know, since apart from running a practice as a family doctor and internist, he is Chief Emergency Doctor in his county and has been working as an emergency physician in rescue helicopters since 1990 (see sidebar).

It is probably only a question of time before other organizations adopt the as yet unique training concept applied in the ADAC HEMS Academy.

**About the Author**

Walter F. Ullrich is senior correspondent for MS&T magazine of the Halldale Group, and is an expert in simulation & training for both the civil and military sectors. He is a Lieutenant Colonel (Ret.) of the German Air Force, where he served as professional officer in several command and staff positions within the national air defence organization and NATO.

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