A day in the life of a HEMS pilot

Landing anywhere, at night, while the clock is ticking. Being the first on the scene of a disaster. Saving lives. This is what flying for the East Anglia Air Ambulance service is like

Words: Patrick Peal **Photos:** East Anglian Air Ambulance

The red phone's ring shatters the quiet—it's so loud the guys in the office across the hangar can hear it. One of the orange-suited clinical team in the crew room answers the call, while the handling pilot picks up her helmet and heads straight out to the helicopter to get it started. The monitoring pilot notes the destination grids and heads out a few seconds later.

The H145 starts quickly and, during daylight hours, the four-person crew (two pilots, doctor and critical care paramedic) is normally airborne within four minutes of the call—a few more at night because of additional checks. A sign in the crew room is a constant reminder: 'Trauma is a disease of time'. The sooner the critical care team gets hands-on with the patient the better the outcome will be.

The whole operation is a well-oiled machine. Henny (Henrietta) Davies, the handling pilot in this instance explains: "The training and procedures kick in—despite it being a time-critical situation we don't rush and we focus on safety." Of course, the helicopter is flying in busy airspace but, says Davies, "we do have some HEMS [Helicopter Emergency Medical Service] alleviations to weather and cloudbase limits. We have Class D airspace at Norwich, Stansted and Luton but ATC is always spectacular at facilitating us".

Twenty-eight-metre circle to land in

The pilots know they won't usually be flying too far, but they may be called to land pretty much anywhere. "Our leg lengths are usually less than fifteen minutes so in general we fly at 1,500 feet and below—there's no point in wasting time climbing any higher," says Davies. "We are lucky in East Anglia to fly over pretty flat terrain. However, we are able to climb higher if required for transiting out of the area, or for IFR flights.

"Approaching the grid reference, all eyes including the HEMS team are out looking for the patient location, usually signified by blue lights—although sometimes we are first on scene. The lookout from our medical crew is really valuable as they have a different view out of the side windows and to the rear. We will recce a suitable landing site as close as possible to the patient location that has suitable access, that meets our rotor clearance minima and that will not harm or damage bystanders, livestock or property. We require an area that has a minimum '2D' during daylight, where D is the distance from the tail to the front of the rotor disc, about 14m for the H145."

The chain of command, and the roles during each phase of the mission, are also clearly defined. "Before takeoff and in flight the captain is in command and takes responsibility for decisions. Once we're on the ground, the HEMS team assumes control", explains Davies. "At the scene, at least one pilot will stay with the aircraft. We keep in contact with the HEMS team via radio and can take any extra equipment they request. We also deal with the public—bystanders materialise really quickly after we land and it's great to talk to them and explain about the air ambulance. We're keen to show it off—you never know when you might inspire someone to go into medicine or aviation or encourage someone to support the charity.

"I'm building my knowledge of the medical kit and I've already picked up some tips from the captains I'm flying with—for example, stand about twenty steps away from the aircraft as the public will come to where you are. It really helps if they stay away from the aircraft's aerials or the fenestron!"

Obviously the flights cannot be planned in advance, and the aircraft and the crew must be ready for all kinds of scenarios, to which may they may be called in rapid succession without any break in between. "Typically we might be tasked on two or three missions a shift—every day is different and you never know if there will be back to back calls or none," says Davies. "With a standard load we have around two hours of fuel endurance, so we can do two or three sequential taskings if necessary. On a busy day you're likely to find the pilots at Costa getting a crew 'refuel' whilst the medical crew hand over the patient! I like to keep a Nomo chocolate bar in my pocket to keep me going.

The flying, of course, is quite varied, as Davies explains: "HEMS is a VFR operation, although all our crews are trained and rated for IFR and NVIS [Night Vision]. I personally have recently completed my NVIS training and am looking forward to the challenge of more night flying. It's really exciting and rewarding—we are always dealing with very dynamic situations. A huge positive for me is also that we have a very shallow cockpit gradient and equal share of the flying." (The roles of Pilot Flying and Pilot Monitoring switch each leg.)

Structured day, unpredictable missions

The daily routine of a HEMS operation is very structured, as explained by the Cambridge base captain and line trainer of EAAA, Matt Sandbach: "The day shift starts at 0700. After the initial flurry of social contact, the medical team and the aviation team separate to get their respective 'houses' in order. Whilst the medical team prep their kit and drugs for the shift, the flight crew will check the weather, NOTAM and Tech Log, and have a crew brief detailing roles and responsibilities for the day—importantly, this is where we decide who gets to fly the first mission of the day. The pilots will then head into the hangar where the aircraft is kept overnight. Here we conduct an acceptance walk around and a fuel sampling before picking it up on the HeliLift and walking it out to the helipad in front of the EAAA base."

The preparation of the aircraft is very thorough and done not only by the ground personnel: the flightcrew is heavily involved in it. "At the pad we conduct a ground run, during which we follow an unabbreviated Normal Operations checklist to check every system on the aircraft, taking it all the way to a flight ready status. Whilst we're running through the checklist,

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we're also flushing the engine compressor section with de-ionised water to ensure maximum performance and keep the engines in good condition. Once the checklist is complete and all the systems have been tested, we can shut down and move onto the next task. We leave all our kit in the aircraft, such as helmets, NVG [Night Vision Goggles], radios, tech log and maps so that, when the red phone rings, everything is ready. As we're a multi-pilot operation, the pilot not conducting the ground run will meanwhile be checking the fuel bowser and its contents. Having our own bowsers means we can reduce response times to a re-fuel requirement and be entirely self-sufficient through the times of day and night when the Airport services are unavailable.

"With the ground run done, the medical team will have completed all of their medical equipment and drugs checks and will have loaded it all onto the wheeled patient stretcher which is taken off the aircraft at the end of a shift or after a mission to allow

ABOVE: **as each flight takes place among unpredictable challenges and constantly changing variables, HEMS flight crews rely on very structured, systematic procedures**

the bags which are stored on it to be cleaned and re-stocked as necessary. They'll wheel it out to the aircraft, load it then check the rest of the medical kit which lives on the aircraft overnight. While they do that, the pilots now head back into the base to prep the 'morning brief' and get the brews made. We brief the medical team about the day's weather and what it means to us—i.e. when and where there may be difficulties associated with low cloud or heavy rain".

The aircraft may be called to intervene in very difficult environments, and the solution to that challenge is using teamwork at best. "We discuss airspace considerations and the importance of lookout by all members of the crew, and also the actions to be taken in an emergency," says Sandbach, stressing the words 'all members'. "Although technically the medical team are passengers, they have a real sense of airmanship and make a potent addition to our crew composition during various phases of flight by day and especially at night when on NVS.

"This morning routine takes around twenty-five minutes plus fifteen minutes for the brief, and it's full on. It's difficult for people to get used to at first because naturally we all want to catch up and chat but it's almost a race against the red phone. We need to make sure the aircraft, kit and crews are ready in all respects for the first mission—once that's done, we can slow the pace down and be a bit more social and get on with daily admin.

Obviously, the service does not operate in isolation but is integrated in the regional health care emergency system. "The calls come in from the regional ambulance service's Critical Care Desk resulting either from a 999 call from the public or a request from an ambulance crew on scene, who've found more than they are trained to handle," says Sandbach. "For us, local knowledge comes in useful, as some bad road junctions do get repeat visits sadly.

"We're always trying to think ahead, to have options mapped out. As the team gains more knowledge about the patient en route and at scene, the clinicians will be thinking about the best destination for the patient for definitive care and what transport platform will be best for that leg. The decision is something we carefully ponder: weather, day/night, fuel state—all must be considered. It may be that the patient, anaesthetised and intubated, needs to go to a specialist unit some distance away, such as a Major Trauma Centre. That patient must be accompanied by the critical care team and as ever the journey must be minimum time—so, for instance, is it quicker by road ambulance or helicopter? If the patient is stable and conscious, the clinicians might decide that the patient can be handed over to the attending road ambulance crew for transfer to a nearby hospital, at which point we can return to base.

By definition, each HEMS flight deals with an emergency, so extra safety buffers are built into the whole system. "After each mission, the first task when back on terra firma is a refuel," explains Sandbach. "Although we carry over two and a half hours of fuel every time we take off, even if we've only used ten minutes' worth we always refuel because it gives us options later down the line if we get a series of missions back to back. Whilst we're refuelling and checking the aircraft over, the medical team will be re-stocking their equipment. Once all that is done and we're back to being 100% mission ready again, it's time for another brew and a de-brief. We learn so much from each mission and it helps us make tiny changes to our operations that form marginal gains, which all add up to a better patient outcome.

"At the end of the shift we take the wheeled stretcher off the aircraft with the medical kit and drugs, make sure the fuel load is correct for the next day's crew and put the aircraft to bed in the hangar for the engineer to allow him to complete any maintenance. Tomorrow, we'll do it all over again".

"It's difficult for people to get used to at first, because it's almost a race against the red phone"

Go, or no-go?

The East Anglian Air Ambulance charity operates from two bases, Norwich and Cambridge. G-HEMC, known as Anglia Two, is based in Cambridge and was the first H145 in the UK. It was also the first unit in the UK to be cleared by the CAA for night HEMS to unlit unsurveyed sites—a field, a road or a park. Its callsign suffix signifies the →

Becoming a HEMS pilot

1) Henny Davies, pilot, Anglia One, Norwich *(Commercial training, then offshore ops)*

"I've wanted to fly helicopters since I was young, sparked by seeing a helicopter drop some red noses at school. I had my first flying lesson at the age of thirteen and spent the next few years working out the best route. I trained at Bristow Academy in Florida on an integrated course that was an intense eleven months. The weeks were mixed ground school and flying and I completed sixty-seven tests and exams to pass the course. The weather and cost of fuel made Florida a good choice for training and it was a fun place to explore outside of school.

"I returned to the UK with the minimum hours required for a CPL and made the decision to complete my instrument rating with Bristows at Staverton, on the Twin Squirrel. This opened up the opportunity to fly offshore

Henny Davies started her training in Florida and worked in off-shore operations out of Aberdeen before joining EAAA

and I started flying for CHC in Aberdeen in 2011. The Sikorsky S-92 was a big step up from the Schweizer but the trainers were very experienced, and I had a great introduction to the offshore environment and multi crew operations. Initially it was daunting, but I enjoyed the challenges of operating in poor weather and to moving boats and semi submersibles. I was also lucky to spend a few days visiting London's Air Ambulance, which was a great experience and confirmed that flying in the HEMS environment was something I wished to pursue.

"I joined Bristow as a Senior First Office on the S-92 still based in Aberdeen in 2013. I got married and my husband was based in London, so I jumped at the chance to fly the AW189 based from Norwich. Once we started a family, we made the decision to move to North Norfolk which is a wonderful place to raise young kids – now three of them all under five!

"In early 2020 I saw an ad for Babcock in Norwich with the East Anglian Air Ambulance, flying the H145. I applied and got a sim check in Staverton followed by an interview with the Chief Pilot and the Head of Flight Operations. I was thrilled to be offered the position and after a type rating course in Staverton, I completed my line training in Norwich and Cambridge. The role is quite different from offshore and due to the unknown nature of the job there are so many new situations to see. The training was really thorough, and I continue to learn every day on both the aviation and medical side.

"I was used to ferrying passengers offshore who I never interacted with. Now as part of the HEMS crew it's a wholly different experience – we're a team and we work together for the best interests of the patient. On a mission there's always lots going on and communication is key. My next goal will be to work towards the requirements for command as my experience onshore grows."

2) Matt Sandbach, base senior pilot & training captain, Anglia Two, Cambridge *(Military training, then offshore ops)*

"I had joined the RAF cadets at school and won a flying scholarship in 1999. I learned on a Cessna 152 at Manston, doing twenty hours in three weeks. At uni I joined the Air Squadron and flew Bulldogs and Tutors at RAF Woodvale, amassing one hundred hours in three years. I then joined the Army Air Corps, going to Sandhurst then working up through initial training to qualifying on the Apache, which is a multi-pilot aircraft. It took nine months to learn to fly it and a further nine months to learn to fight it. I did four tours in Afghanistan and Libya seeing active service, then resigned in 2011, leaving in 2012 having flown the Apache since 2006. It really teaches you great CRM as you can't see what the other pilot is doing!

"After that, I joined Bristow working offshore in the Shetlands on the S-92 in very challenging and often icing conditions. It was five years of two weeks on, two weeks off until the draw of a young family encouraged me to get a better work-life balance. You can't get those young years back.

"I reckon being a professional pilot is a life choice, and a HEMS pilot is a vocation for which military life is great preparation.

Pilot Matt Sandbach's selfie at the Royal London Hospital helipad, a frequent destination for EAAA helicopters. Matt started flying as a RAF cadet before joining the Army, where he flew the Apache

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status of the flight: Alpha is an emergency mission, and that confers priority over all air traffic (even the Reds or a Royal flight) except an aircraft on final approach. The other aircraft is G-RESU, known as Anglia One, based usually in Norwich.

The aircraft, pilots and engineers are provided under a multi-year service agreement with Babcock Mission Critical Services Onshore of Staverton. The company also has a backup H145, G-EMSS, which provides training and maintenance backup for its HEMS fleet around the UK.

The crew is very much the 'tip of the spear'—behind EAAA's two, four-strong HEMS crews is a sizeable fundraising, ops and admin team that each year raises and spends about £14m to carry out around three thousand missions.

Sandbach explains the unique type of flying that EAAA's flightcrews are called to do: "The 145 is a fantastic modern aircraft with great handling, plenty of power and great systems—we use sims a lot too. We really need to make full use of the autopilot to reduce workload and allow us to focus on the mission and any problems, as in the offshore world. But because we operate into unknown landing sites (like the military) we also rely on aircraft handling a great deal. It's a unique combination of procedures and skills. The Helionix avionics suite is already capable of GPS approaches even though they're not available yet at many of the airports we use.

"There's never more than five seconds of quiet in the aircraft. In other roles, in the cruise you sit back, relax and look out of the window—for us it's bedlam, with comms with the ambulance Critical Care Desk, Coastguard, police and internal amongst our crew as we discuss the mission, options and possible next sectors. But that bedlam is controlled practiced chaos—my heartrate rarely gets above ninety."

The new operating base at Norwich (which opened in April 2021) features an innovative Immersive Interactive training suite with video projection on three walls, high-performance audio and climate control that can get the space down to freezing or up to around thirty degrees Celsius. It is designed to put the clinicians under pressure to keep their skill levels high. The training also includes flightcrews, as they can be assisting at the scene—one well-known

EAAA operates two Airbus H145s from bases in Norwich and Cambridge

EAAA was the first air ambulance charity to seek CAA approval for night landings to unlit unsurveyed sites, which involve a specific set of Standard Operating Procedures

former pilot, for instance, was particularly adept at performing CPR. In terms of pure flying, the flightcrews also have six-monthly and annual skills checks for day and night operations as well as licensing proficiency checks.

Every pilot needs to make difficult choices. But when you fly for the EAAA, those choices are particularly tough. Sandbach explains: "I came into this work looking for HEMS teamwork, and now I'm one of Babcock's HEMS line trainers. A big part of that is checking our decision-making; the hardest thing is to say 'no we're not going', through fatigue, marginal weather or fuel. It can be very lonely being the captain, but we need to remember there are other assets that can attend, perhaps by Rapid Response Vehicle or a HEMS unit from a neighbouring service.

Similarly to some military flying, EAAA's pilots fly very challenging missions and accrue a lot of experience, but interestingly not an enormous amount of flight hours. "I reckon on doing about 240 hours a year," says Sandbach. "The legs are on average about fifteen minutes, so this role is not an hours builder."

Night landings in unlit, unsurveyed sites

EAAA was the first air ambulance charity to seek CAA approval for night landings to unlit unsurveyed sites. It was a lengthy process as it was entirely new territory. Eventually, a comprehensive suite of training, systems and Standard Operating Procedures was approved.

In addition to the Airbus Helionix avionics suite which features TCAS, HTAWS and the powerful four-axis autopilot, the flight deck now has a number of enhancements specifically for night HEMS operations.

Each aircraft is fitted with Trakka A800 steerable 22,500 lumen searchlight, night vision systems, an iPad for each pilot running Airbox ACANS (a command and navigation system) and powerline detection. The Trakka is so powerful it's not used below 50ft to avoid burning objects but is invaluable for assessing potential landing sites as the aircraft orbits its destination. ACANS is a specialist development of the much- →

Mental and physical fitness

By definition, every HEMS mission deals with an emergency. It is a life of time pressures, unexpected challenges, and trying to save lives. Obviously, the demands on the crews are heavy, and dealing with the pressure is central to the job. "Looking after our emotional wellbeing is as important as looking after our physical energy levels", says Henny Davies. "I learned from one captain that on rare occasions we may not accept a tasking – the case in point was late in the shift on a rainy day, when we'd been tasked four times already. We were tired, wet, hungry and running out of kit as well as energy."

Matt Sandbach adds: "HEMS work is definitely not for everyone – you need the right temperament. En route it's about getting safely on the ground as close to the patient as possible, as fast as possible. At the scene, you can't unsee things. There are some incidents where I'll simply stay with the aircraft - I have to be able to deliver my primary rôle.

"You never forget attending your first burns patient... I've got a young family, so I have to be careful of my emotions if it's a paediatric case and take great care to make sure I operate safely, then swiftly."

The topic of emotional well-being, however, is not left to the single pilots managing themselves as best as they can. There is a structured process in place that relies on teamwork and sharing. "As a crew we always debrief every case straight afterwards – mental health is about looking out for ourselves and for each other," explains Sandbach. "There's real camaraderie whoever you're working with as we're all striving for the same goal: to do the very best for every patient we're tasked to.

"You have to be physically fit too – while my hardest job is climbing in and strapping in, we can be attending two or three incidents before we can get back to base for a drink and something to eat. It can be physically demanding for the Critical Care team – their kitbags weight about fifteen kilos each, plus the kit in the flight suits, plus equipment such as the monitor they hand carry, all of which needs to get from the landing site to patient side as soon as possible. That distance may be hundreds of metres with obstacles such as ditches or fences in the way. But there are always buns and tea so I have to watch my calories! The best HEMS mission is the one where you have a full tum and an empty bladder... and a good outcome for the patient."

loved Runway HD nav app and brings together many sources of information for flightcrews including powerline mapping.

With the help of government grant funding secured through the national body Air Ambulances UK, EAAA has also recently invested in the latest white-light night vision systems. The pilots use helmet-mounted binocular systems with the clinicians in the back using monocular hand-held units to add more 'eyes out'. Technology in fact helps a lot in planning and carrying out the mission, but a direct, human eye check is still fundamental: the flightcrews use Google Earth to get some idea of possible landing sites but arriving at scene it's not unusual to discover a housing development has been built since the last photomapping. The crew also carry out a normal orbit of the likely landing site followed by a second, lower-level orbit to check and check again for potential hazards, obstructions or livestock.

And although the cutting-edge systems used by HEMS aircraft may remind you of science-fiction movies, it is the human touch that makes this job great.

ABOVE: **the white-light night vision goggles used by EAAA's flightcrews**

"Being a HEMS pilot, a member of a HEMS team, is a mix of thrill and adrenalin with routine and discipline," says Sandbach. "It's immensely rewarding, exciting and often great fun, otherwise we wouldn't do it. The bonds we build are strong, the camaraderie is incredible and invaluable, both helping us all to perform as a team, and to cope when things are tough.

"Meeting just one recovered patient reminds us all how important, valuable and life-changing this job is—made possible by the generosity of the community".

Life-saving workhorses

There are a few specific aircraft types that seems to be particularly favoured by HEMS organizations. Among the twenty-odd air ambulance organisations in the UK, the much-loved Airbus H135 and the venerable MD902s have been joined recently by the new H145 and the Leonardo 169. A couple of operators also use the Agusta 109 or the Bell 429. Going back in time, many organisations started their work using the classic Bölkow 105, originally in service with the German Army as a tank buster and now seen with Red Bull for display routines (and in Bond movies). A few organisations hold their own Air Operator Certificate (AOC), but most contract with either Specialised Aviation Services or with Babcock Mission Critical Services Onshore, both based at Staverton.

And, if you are not familiar with rotors, you should know that the debate about skids or wheels will never cease: like many other aspects of air ambulance service, the specific configuration chosen usually depends on local conditions including geography (rural/urban) and through-life costs.

ABOVE: **an EAAA Airbus H145 gets its engine wash in the early morning hours, in readiness for a day's action**