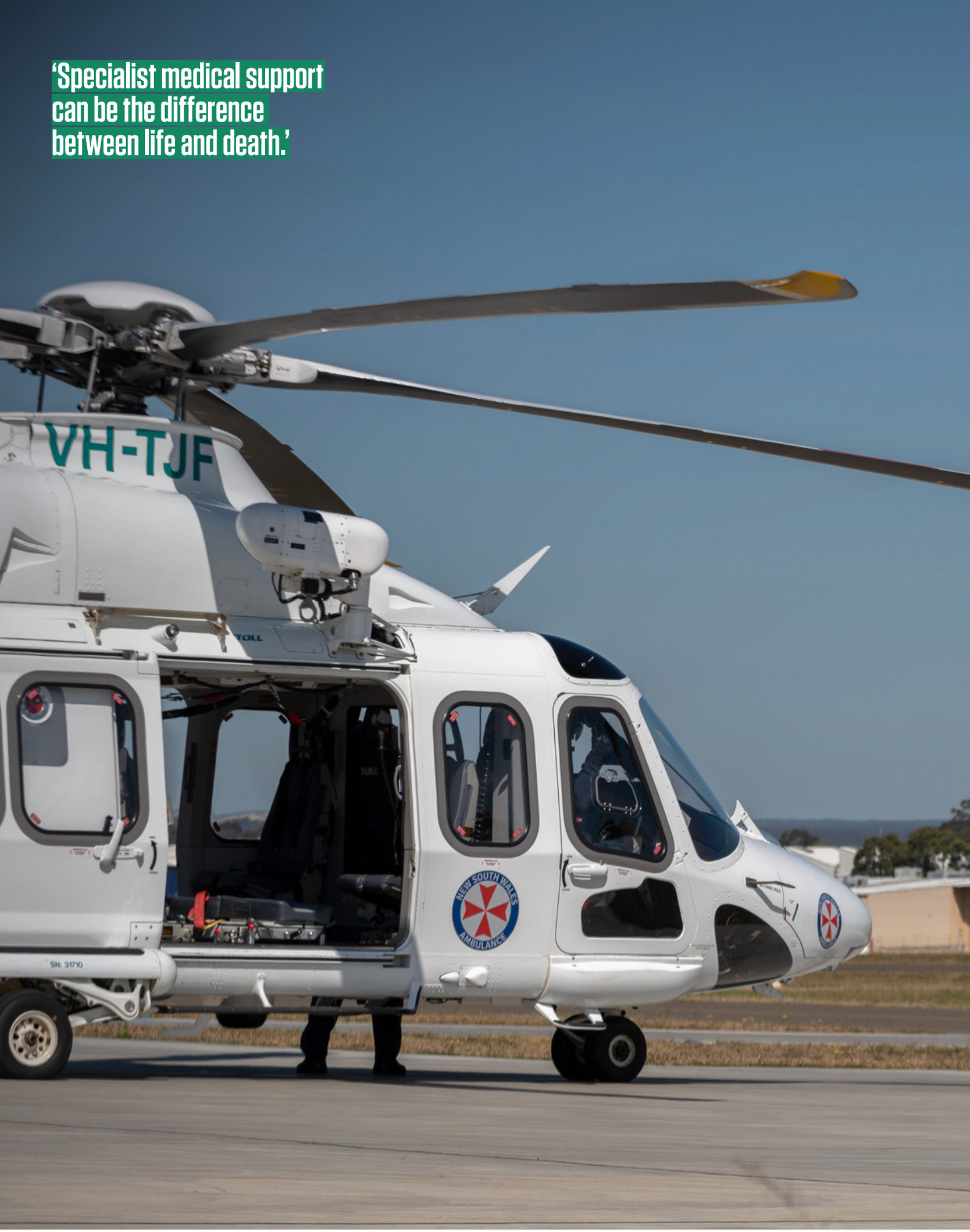
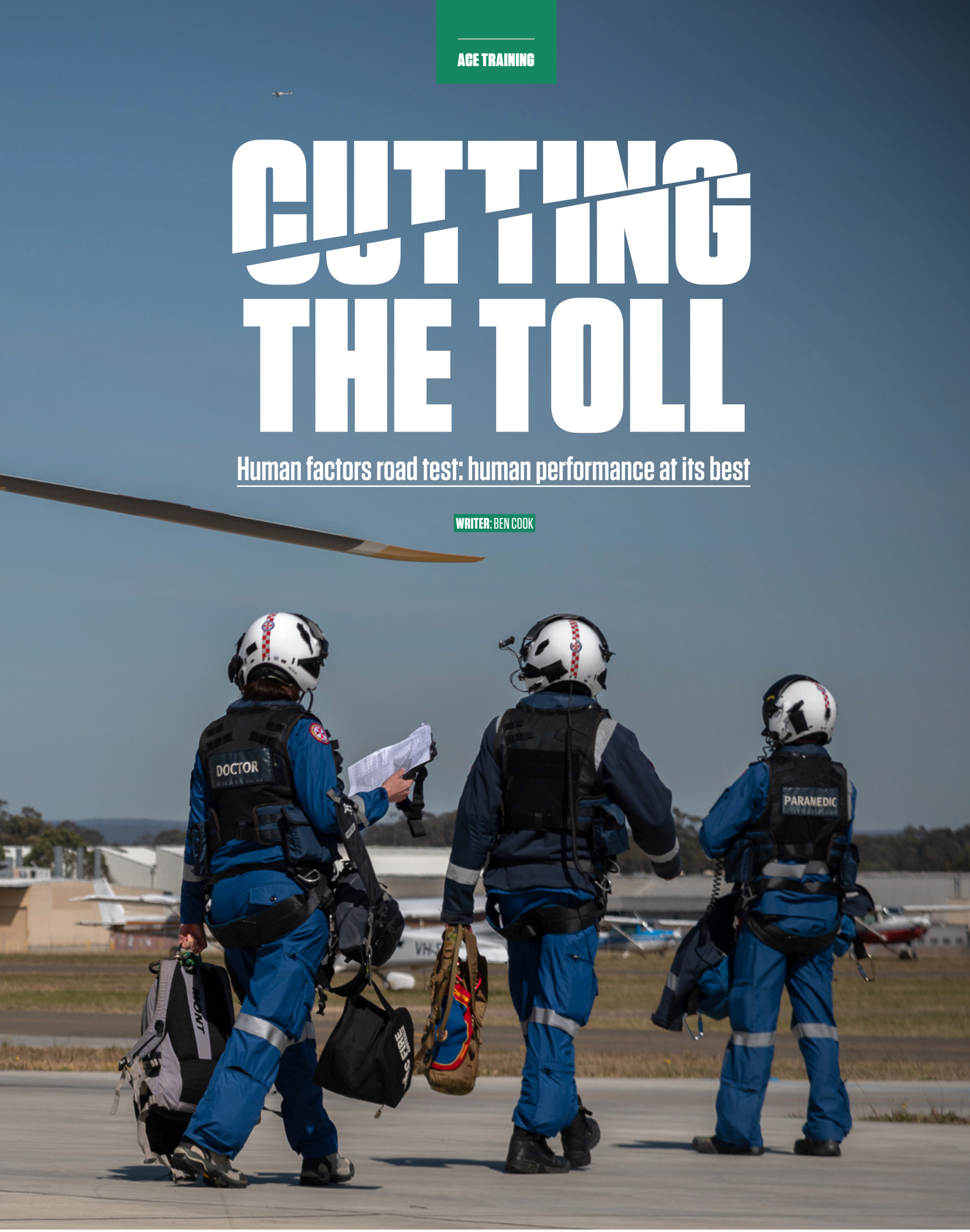


'Specialist medical support can be the difference between life and death.'

CUTTING THE TOLL

Human factors road test: human performance at its best

WRITER: BEN COOK



Imagine it's a quiet Saturday morning and the toils of another busy week have taken their toll. At last (and for what feels like the first time this week) it's time to relax, and to let the mind unwind over a fresh cup of coffee. The blue sky and warm rays of the sun beam through the lounge room windows and combine with a gentle breeze rustling the trees in the garden. It's a pleasant relief from what's been a cold winter. Relaxing on the couch, warm and calm, it's a contrast to the usual pace of juggling a busy job, a partner who travels regularly, the never-ending demands of a hobby farm and a couple of teenagers who are quickly becoming adults.

Then the pleasant moment is suddenly disrupted.

The screams are deafening…the panic in their voices… "Mum, we need help"…no time to think…a huge shot of adrenaline pulses through the body. Its frantic, running to the noise, outside the kids are screaming as they try to get a response from their father who is lying motionless on the ground, the tractor lying on its side. My god, Jim was always so careful with the tractor…I must stay calm, constantly telling myself not to panic.

"Call triple zero".

As the kids run for the telephone I'm doing my best to recall basic first aid. DR ABC – Danger, Response, Airway, Breathing and Circulation. We're not in any further danger but I cannot get a response from Jim who remains unconscious. His airway appears to be clear although his breathing is very short and raspy. There is a faint pulse, thank goodness! The kids are starting to panic and they've passed me the telephone. Jim's face is very pale and while my heart's racing, I must control my breathing and stay focused on following the directions from the operator.

'Minutes can mean the difference between life and death.'

The 10 minutes it takes for the ambulance to arrive seem like an eternity, I've done as much as I can. They've already called for a helicopter as Jim has internal injuries that are well beyond the capacity of our smaller local medical facility. The kids are still crying, it's a shock to us all to see Jim looking so helpless. They're telling us everything is going to be OK but my hands are still shaking uncontrollably….

For anyone living in remote areas, the sound of a helicopter arriving to provide lifesaving medical care is something you hope you never need to call on. But when confronted with the terror of an injured or sick loved one the relief of specialist medical support can be the difference between life and death.

Professionalism at its finest

The professionalism and specialist skills of aeromedical rescue pilots, crewmen, critical care helicopter paramedics and doctors is something we may take for granted. These small teams typically work under intense pressure.

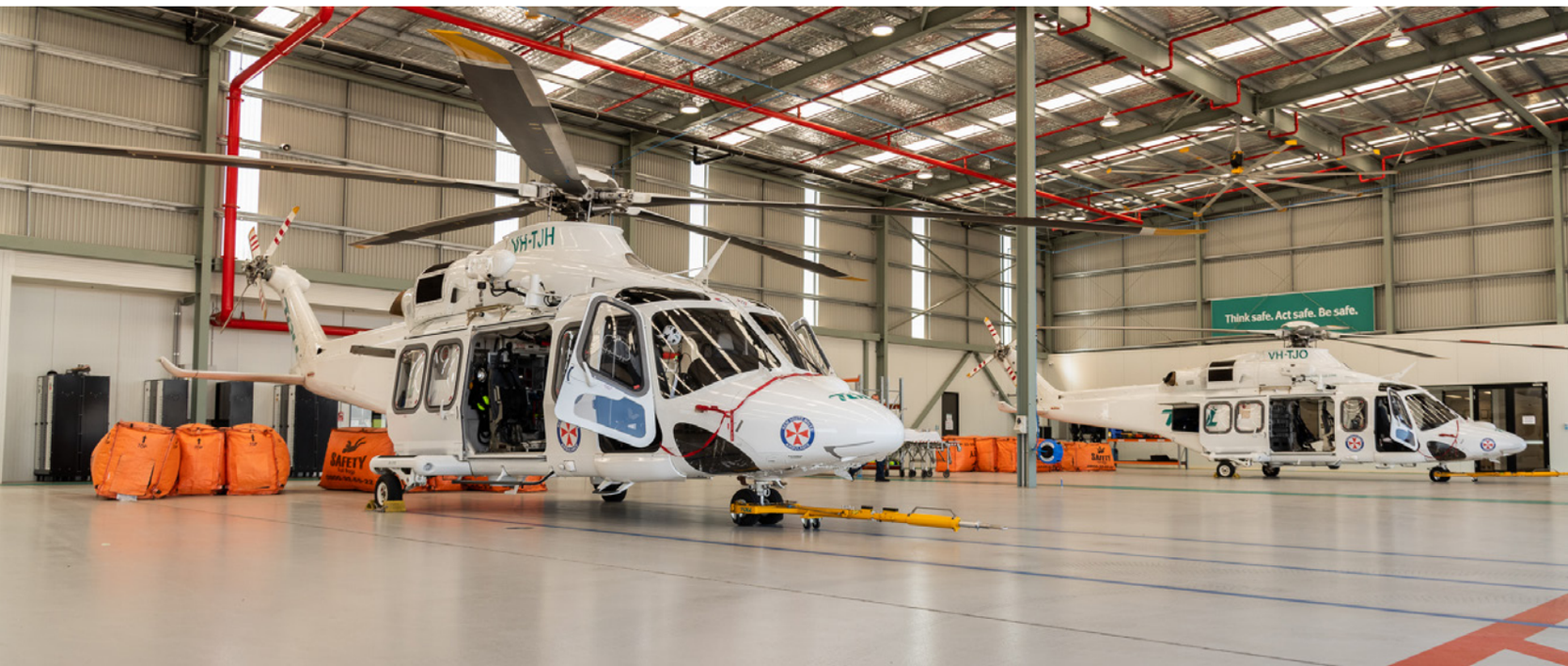
Imagine it's 3am and you've just made an emergency landing to a remote field using night vision goggles (NVGs). This requires a high cognitive workload where all crew play a role to ensure the helicopter avoids external obstacles to make a safe landing. Once on the ground, minutes can mean the difference between life and death, especially if the patient has traumatic wounds that require immediate action to stabilise blood loss and to manage post-traumatic shock. Once on board the helicopter, every action is focused on stabilising the patient and keeping them alive until they arrive at a specialist hospital.

It's now very early in the morning and the fatigue risk management system (prior sleep, individual fatigue risk profiles, crew monitoring each other, appropriate use of caffeine etc) combined with an ongoing release of adrenaline ensures the insidious effects of fatigue are managed to keep the crew alert. The acute stress hangover will kick in later in the morning. Tasks such as this, driven by the sympathetic nervous system, tap into stored reserves and drain the body of the critical irons and chemicals needed to allow the brain to continue to function at its best. It keeps them alert in the moment but there will be a price to pay once they're back inside the confines of their home base that will eventually involve a long period of deep sleep.

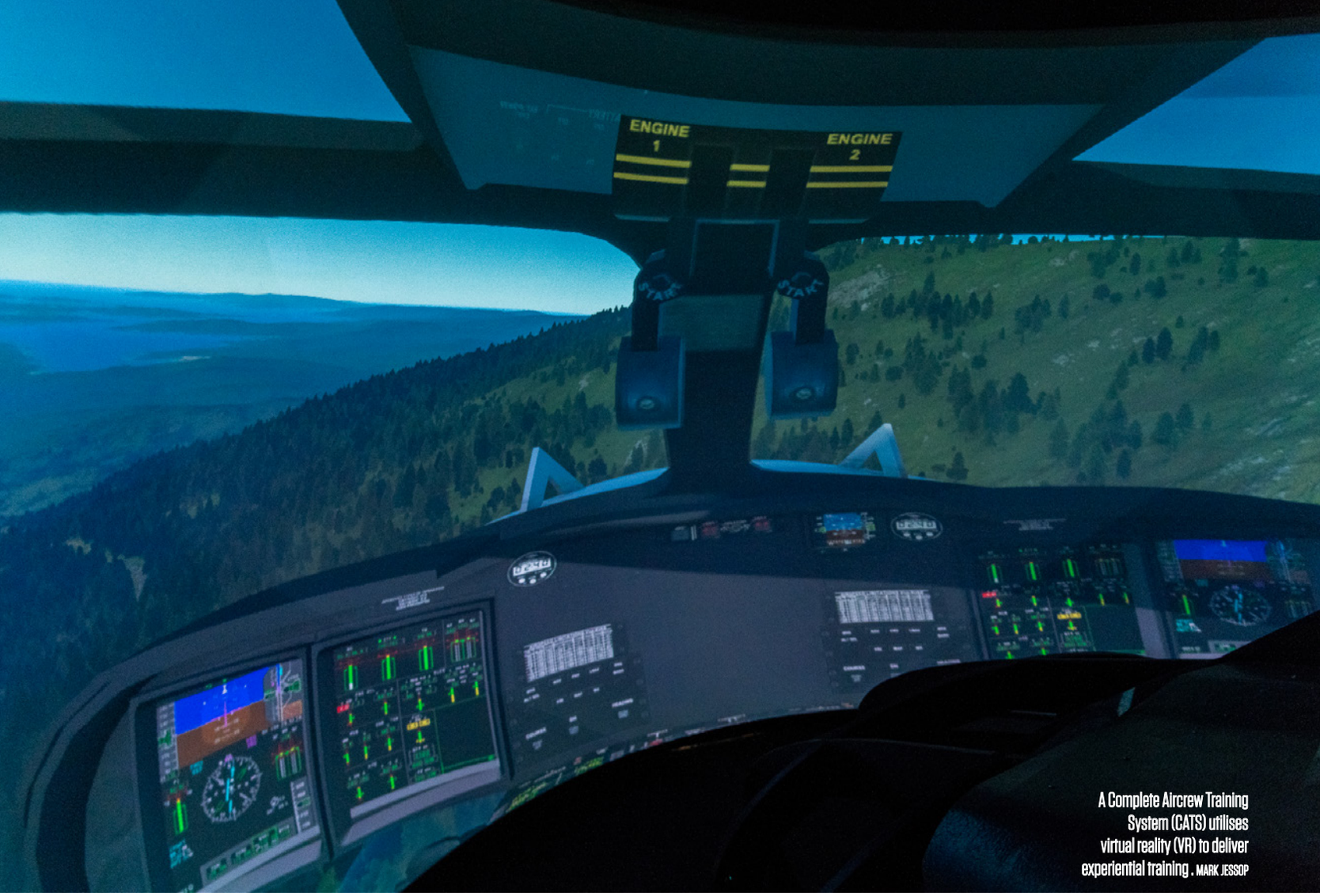
Confronting complex situations to rescue you

Back in the helicopter as the rescue continues to unfold, there is a brief moment of quiet when the autopilot assists with the management of the workload and this affords the pilot a brief opportunity to think ahead, to plan the approach into the hospital. Yet in an instant, there is an orange light and a master caution alarm. Training in decision-making kicks in – the alarm and caution light are cancelled and it's straight into the emergency checklist.

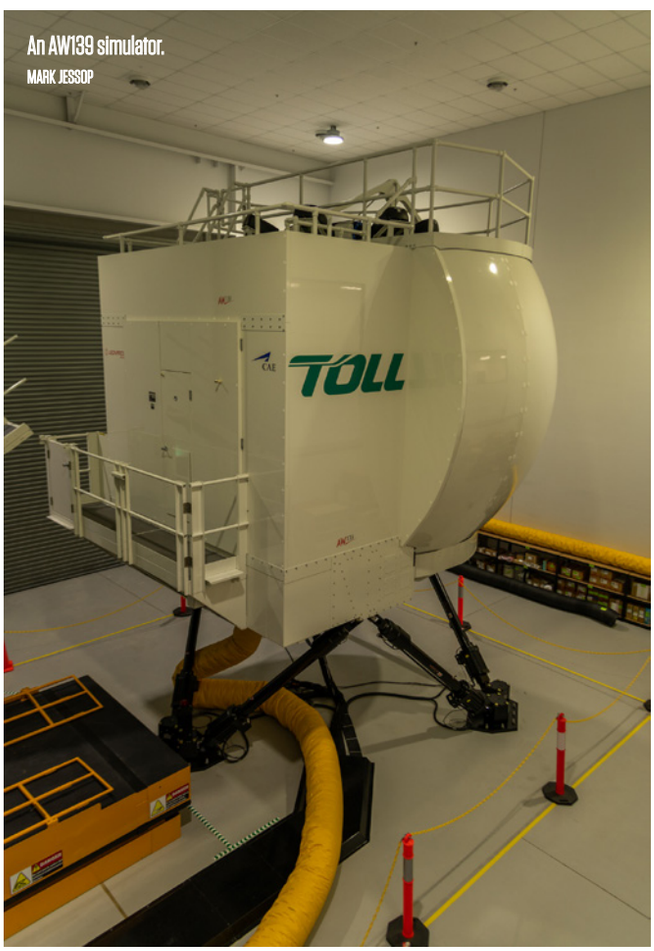
It's a chip light (a possible



AW139s inside the Toll Ambulance Rescue Helicopter Service's Bankstown hangar. MARK JESSOP



A Complete Aircrew Training System (CATS) utilises virtual reality (VR) to deliver experiential training . MARK JESSOP



An AW139 simulator.
MARK JESSOP

indication of impending mechanical failure) and the adrenaline is now pumping back into the bodies of the aircrew, while the paramedic and doctor are still focused on the patient's needs as the pilot and aircrewman consider their options. The aircrew know that any further delays may cost the life of this patient, but the chip light has other implications for the ongoing safety of the crew and the helicopter. It's dark, and several time-critical decisions will now need to be made under increased workload associated with the aircraft emergency.

Although this scenario could easily be a real event, it is taken from one of the recent virtual reality (VR) training scenarios that crews must deal with, to assist them to develop their non-technical skills (NTS) during their regular NTS training program at the Toll Ambulance Rescue Helicopter Service's Aeromedical Crewing Excellence (ACE) Training Centre at Bankstown.

Welcome to the world of emergency medical services. These men and women face significant challenges in complex situations every day to help save your loved ones. There is no doubting the professionalism and the track record in delivering successful outcomes, even when confronted with high pressure, high stress and time-critical situations.

A real-life cost

While our example shows the intense pressure faced and the professionalism required to get people to safety, there are situations where rescues do go wrong. Accidents have occurred internationally and locally here in Australia with investigations identifying safety issues relating to training that could adversely influence crew performance.

These lessons have served as a catalyst that led to a significant investment by NSW Health to learn from various tragedies and to build a training facility and operations support centre that is second to none – easily among the very best in the world.

The ACE Training Centre – setting the new benchmark

Australian Aviation regularly 'road tests' aircraft and this is our first 'road test' of a human factors training centre, in this case the ACE Training Centre, supported by Convergent Safety, which delivers an impressive

balance of experiential technical and non-technical skills (NTS). It offers training that maximises the ability of the crews to enhance their standards of professionalism and their ability to perform well under intense pressure.

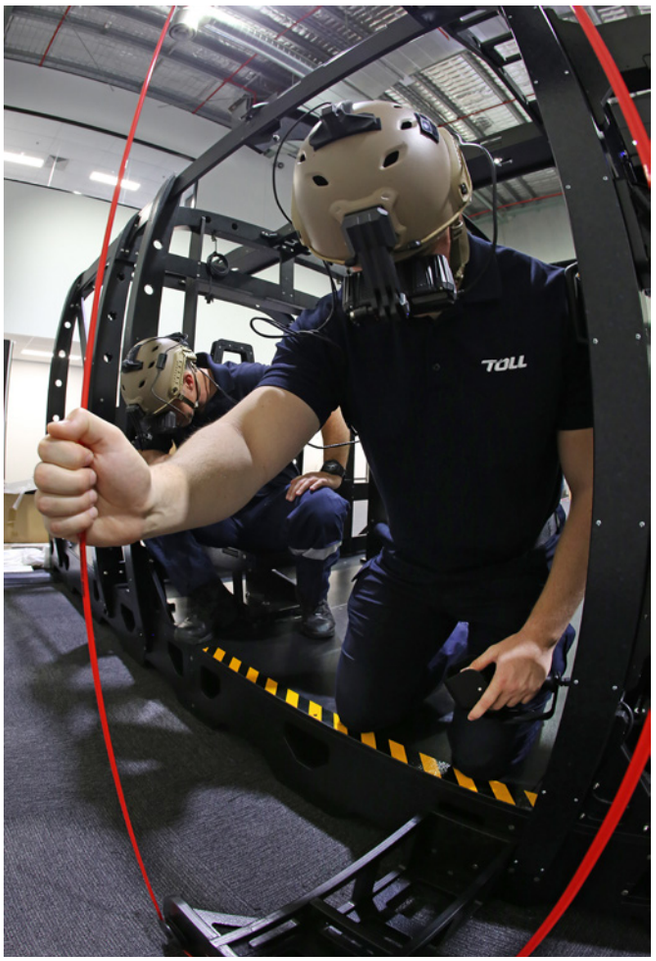
It's well known that good management of NTS – essentially human factors such as stress, fatigue, human error, critical decision-making under time pressure, crew dynamics and communication – are critical in achieving optimum performance. Equally, inadequate management of NTS continues to be cited as a primary contributor to serious incidents and accidents. This is why the International Civil Aviation Organization (ICAO) requires aviation regulators to integrate NTS within safety management systems (SMS) and training programs.

The ACE Training Centre provides fresh insight into the NTS performance that must be achieved by any operator seeking the high standards required by aviation operators. Arguably NTS training programs reached their peak 10 to 15 years ago and continue to involve too much classroom-based, case study-driven generic discussions. While this style of training is a good start, it is not adequate to bridge the gap between attitudes and knowledge with experiential, skills-based application. Good NTS training programs provide tangible and practical tools that you can take away to better understand yourself, your team, and a realistic opportunity to apply these new skills.

The ACE Training Centre hosts perhaps Australia's most advanced Helicopter Underwater Escape Training (HUET). MARK JESSOP

In addition, when NTS programs were first introduced – formerly known as crew resource management (CRM) or team resource management (TRM) – they warranted a degree of trust when implementing formal training and assessment. Trainees could only fail on a technical consideration, not an NTS failure. As programs have matured, so have standards and inter-rate reliability (making sure all check and training personnel assess to a similar standard). Put simply, in the past, you could fly a simulator task within technical limits, use some profanities to belittle the first officer, and still not

fail the sequence. Yet, some operators continue to remain stuck in the past with low trust in their NTS training system, continuing to require a technical failure alongside poor NTS to receive an overall fail, even if the NTS elements alone were well below expected standards.



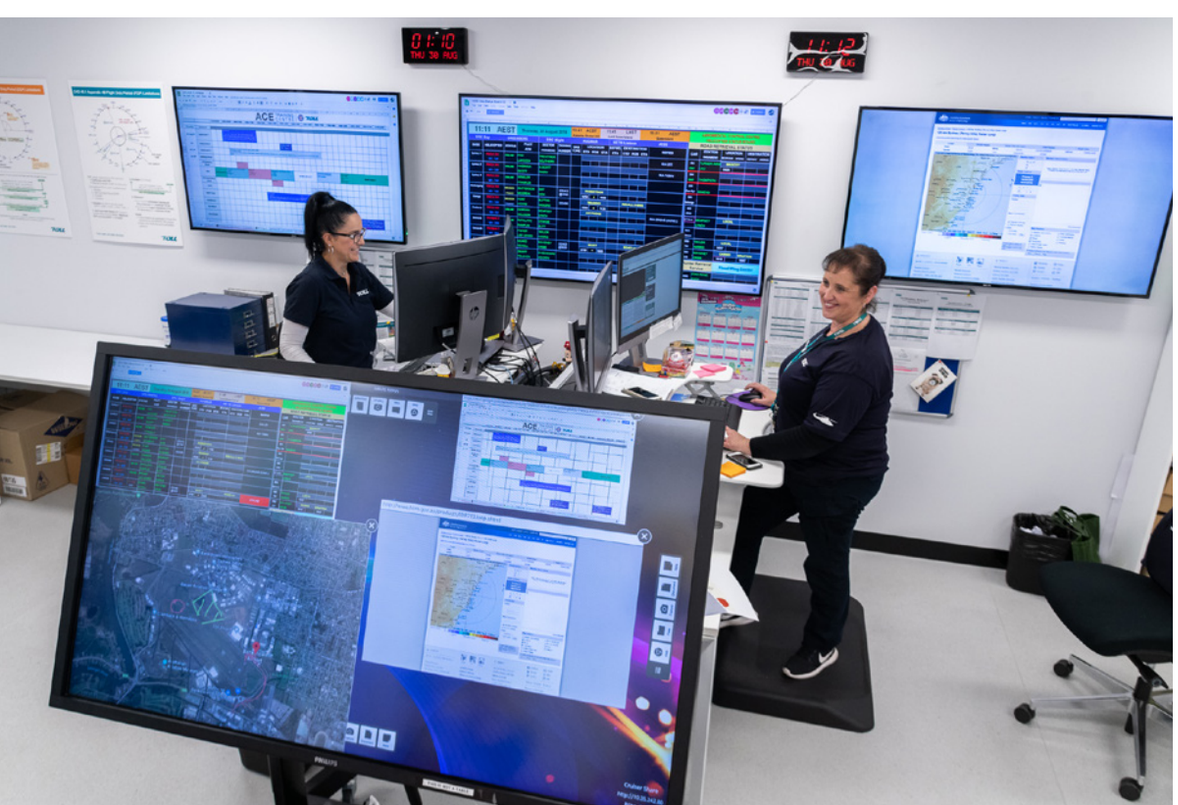
The Complete Aircrew Training System utilises virtual reality to deliver experiential training, including decision-making under stress. PAUL SADLER

Bright spots

If we review a relatively simple definition of human factors, the application can be defined as the minimisation of human error and its consequences by optimising the relationship within systems between people, activities and equipment.

The experience of many aviators is they find human factors training interesting, but it can lack the practical tools to help optimise the performance of personnel. The Toll Ambulance Rescue Helicopter Operations and ACE Training Centre provide many examples of embedded support systems that maximise team communication and situational awareness, such as:

- A Complete Aircrew Training System (CATS) that utilises virtual reality (VR) to deliver experiential training, including decision-making under stress.
- Helicopter Underwater Escape Training (HUET) that can replicate sea state three, with a far more experiential setting surrounded by waves, mist, 40 knot winds, thunderstorms (strobe lights, thunderclap sounds). Many previous HUET trainees have only been in stable swimming pools.
- An engineering tool control utilising automation to help monitor and track the use of various tools across different aircraft. A licensed maintenance engineer swipes their identification card to open the toolbox, selects the relevant tools and allocates them to the aircraft they're working on. In some cases, where a tool is identified as missing, video footage from the maintenance facility can help identify if the tool has been misplaced and where it is located, significantly reducing the risk of foreign object damage (FOD) from a tool being left in an engine compartment. It creates a workplace culture aligned with professional tool control.
- A purpose-built work platform that has been further modified based on the feedback of the aircraft maintainers.
- A bird bath for washing helicopters post-flight, removing deposits of salt water. It is linked to a mobile phone application, making it easy for the crew to keep the aircraft in good shape, day or night, particularly given the potential impact of corrosive salt.
- Innovative Australian-designed work stations, including electronic screens interconnected through a master display to ensure relevant information can be displayed to manage the myriad of tasks completed by the small support team. This includes rostering across four bases, fatigue risk management, refuelling, debriefs, flight data analysis, liaison with engineering, base security, and many more.
- Appropriate crew rest facilities such as 24 rooms with ensuites to ensure fatigued crews can gain access to sleep prior to their drive home. And if the pressure to be home remains too high, all crew have access to taxi vouchers to and from work to further manage the risk.



The ability for personnel at all levels to seek better, more efficient, innovative ways of doing business is clear. Contributing to this very professional workplace culture is an NTS program that goes well beyond minimum regulatory compliance by empowering all personnel to understand how their own human factors contribute to a culture of professionalism, continuous improvement and high-performance teams.

Developing a culture of professional excellence

As part of Toll's vision for The ACE Training Centre, Convergent Safety was contracted to develop and deliver the ongoing NTS training package.

Convergent Safety's managing

director, Rick Sellers and his team have extensive experience with NTS for high performance teams, and the opportunity to tailor a program from the ground up and to learn from the lessons gained from the past 35 years of human factors training was an opportunity like no other.

The full integration of NTS within The ACE Training Centre provides a whole new generation of training quality, which importantly includes practical strategies to transition key training lessons into skills-based application within an actual helicopter.

"Before we develop a course of training for a client, we take the time to discuss their specific requirements and work with their safety management team to identify the key areas of risk within their operational context," Sellers says.

"In addition to this, we normally conduct a review of recent incidents within similar areas of operation using both Australian and international data. Based on this review, we build an NTS training program which is customised for the client and is designed to assist the organisation by providing appropriate training, tools and processes which can be used to help mitigate the identified operational risks."

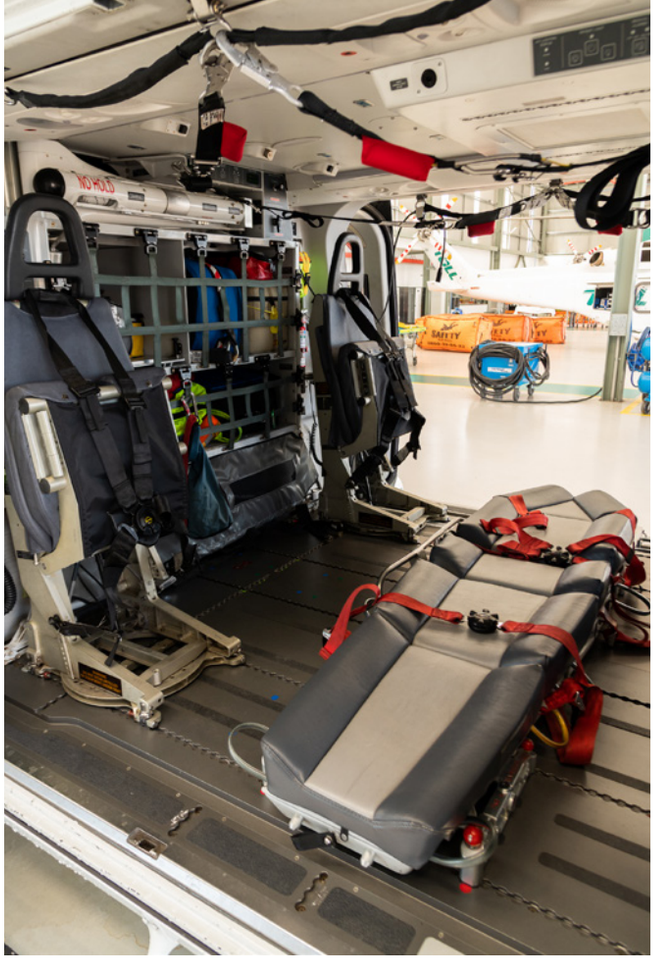
Sellers says that properly integrating new training programs will always present challenges.

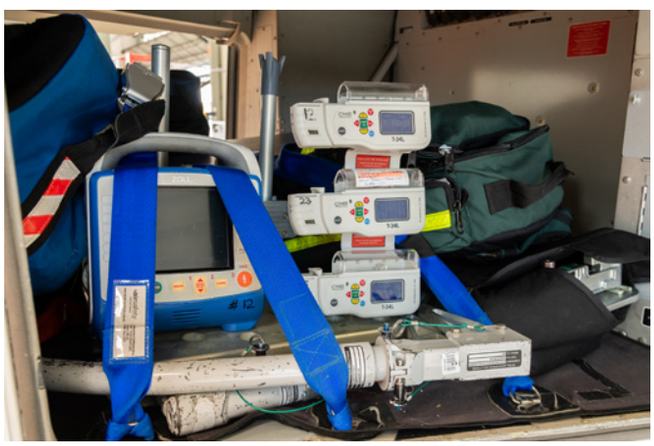
"Having said that, we make sure that all our training is relevant to the context of operations and is linked to both the SMS and the technical checking and training system. We also use surveying and feedback to keep the training material relevant and up-to-date. In any high hazard operation it is vital that these training programs remain up-to-date and relevant to current operational risks, this is why these continuous improvement processes are so important. If you just stay with what has been done in the past, you are steadily going backwards."

Essential skills

Toll Helicopters, through Convergent Safety, has developed a number of:

- technical skills;
- non technical skills (NTS);
- manipulative skills;
- communication and teamwork;
- knowledge of systems and procedures;
- leadership authority and assertiveness;
- automated system usage;
- situational awareness;
- execution of procedures;
- decision-making; and
- hazard (threat) awareness and risk management.





Inside one of eight Toll Ambulance Rescue Helicopter Service AW139s it operates for NSW Ambulance. MARK JESSOP

Given the high professional standards required from their crews, the system assesses each on their own merit and ultimately a failure can result if a standard in either category is not adequate. If there is any outcome (technical or NTS) that compromises safety, the result is a fail. A single zero in an NTS assessment criteria or two or more scores of one is an outcome of not yet competent, requiring remedial training and re-assessment. For example, consider a pilot is flying a standard instrument departure and makes an abrupt or aggressive comment to the aircrewman. Then consider this assessment criteria:

Communication/Teamwork: scores a zero when unable to work as a team member, creates barriers between crew thereby not using feedback or input from others.

The pilot in this case would score a zero, and the crew would be collectively debriefed with further remedial training conducted to address the feedback. These processes are necessary for establishing a culture that expects and requires high professional standards.

The ACE Training Centre NTS program is setting a new benchmark for professional excellence. Its strengths are:

- All staff, including senior management, are provided training to understand their role in contributing to high performance outcomes for the entire team. The training system is adapted and contextualised to align to their separate needs.
- The NTS element is not a regulatory 'bolt-on', but rather a key contributor to making sure the system tailors programs aligned with workplace needs. This includes regular feedback on the types of scenarios that should be placed into the cyclic training system. To achieve this, there are strong links between the NTS Program Manager and key decision makers, including the Managing Director, Head of Check and Training, Safety Managers and representatives of the operating crews.
- Heavy emphasis on inter-rate reliability delivers consistent standards across all four bases, making for seamless transitions when any member is required to provide support at other bases.
- It is one main training location and program, so there is reduced duplication of effort by smaller organisations developing and delivering their own NTS training.
- There is extensive use of lead indicators to ensure the system doesn't just react to known hazards and risks but is proactively learning new lessons prior to an incident.
- There are advanced training systems and tools including a full motion simulator.

Testimonials from trainees speaks for themselves:

"First CRM/ARM course that I've done that is Helo specific – GREAT! Nice to see data drawn from various sources not just American/Canadian sources or from Airlines. Puts it all in

perspective and makes it all relevant, which makes it much easier as an audience to listen, participate and retain. Thank you Rick and Natalie."

And, "I've done many Human Factors/CRM/MCC courses in the last 10 years. This one was a great mix, the most enjoyable and involved that I've done! CONGRATS!"

NTS and high reliability

Every organisation can benefit from an integrated, experiential NTS program. Not only does the ACE Training Centre inculcate a culture of professionalism and continuous improvement for enhanced business efficiency, but the outcomes are aligned with high reliability.

Highly reliable organisations, such as Toll, are those that have less than their 'fair share' of failures despite:

- managing complex and demanding technologies;
- meeting peak requirements and time pressures;
- routinely handling significant risks and hazards; and
- executing dynamic/intensely interactive tasks.

The investment in experiential NTS programs ensures personnel understand the human factors that underpin and enable the establishment of high performance teams, while empowering all personnel to truly believe in a drive at all levels to establish a culture of excellence and continuous improvement.

The ACE Training Centre model is one of the few that is truly integrated across other critical departments to ensure actions are taken quickly to address known or perceived hazards and risks. This empowers personnel to know they're being heard and resources are made available to address known risks, including an investment in new ways of doing business. People speak up because they know it leads to action being taken – increased knowledge of human factors through NTS allows the root causes to be identified, ensuring management at all levels are kept well informed.

"Toll's ACE Training Centre opened its doors almost two years ago with a view to taking NTS training to the next level and realising the goal of providing world-class training to the aviation and aeromedical industries," ACE Training Centre general manager Scott Watkins puts it.

'People speak up because they know it leads to action being taken.'

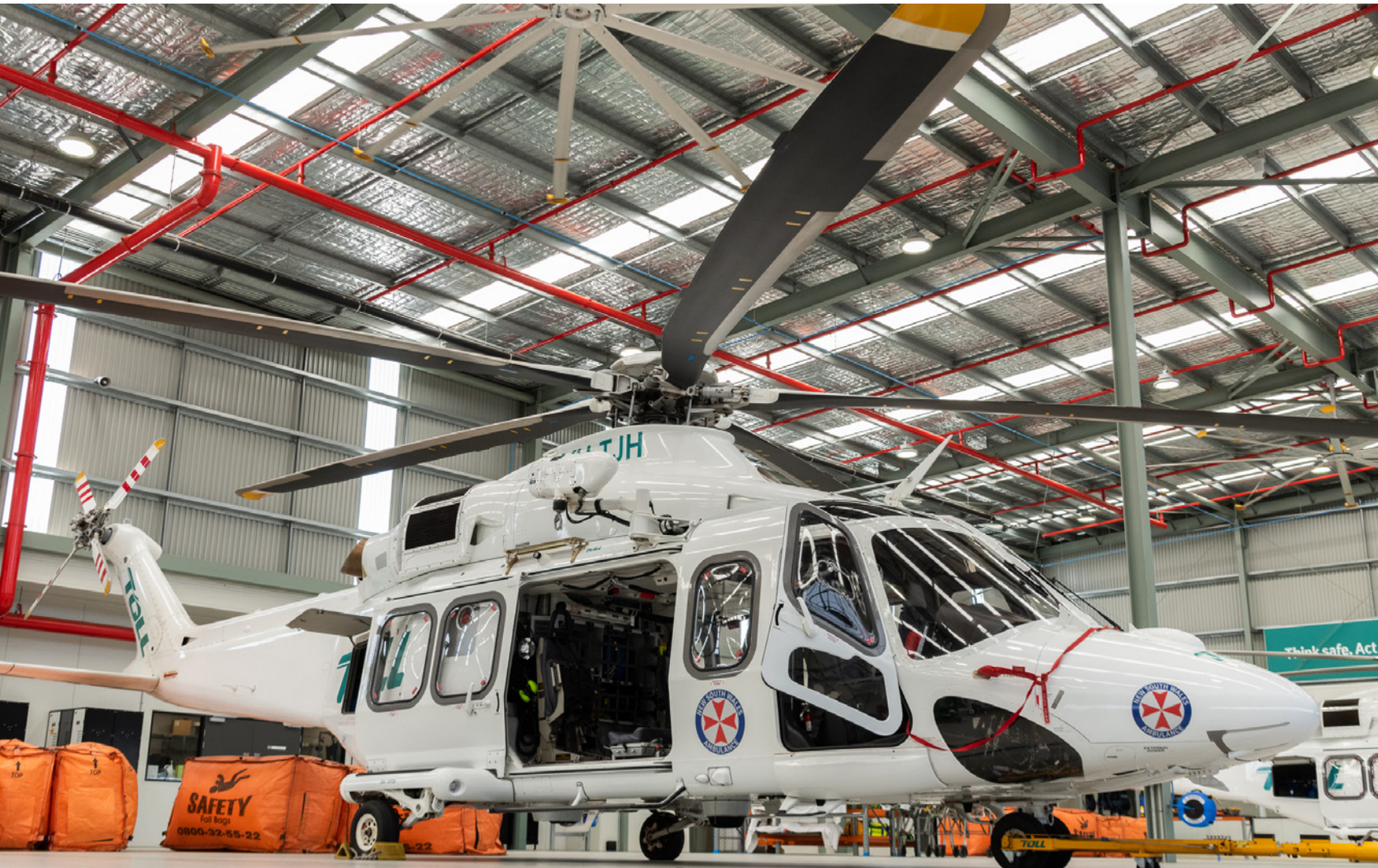
"To a large degree we have achieved this goal but, like safety, this is a goal that requires continuous and relentless pursuit. We want to remain at the forefront of NTS training and continue to make significant investments to keep this training highly relevant to our industry."

The following from a trainee encapsulates what can be possible when delivering high quality training that allows emergency medical services teams to perform well under extreme levels of pressure:

"I was somewhat sceptical but can say with confidence I am now alarmed that in my 10,000-plus hours I had not undergone training on the system in such a realistic environment."

The ACE Training Centre is an investment in excellence, empowering and enabling future generations of emergency helicopter pilots, aircrewmen, critical care helicopter paramedics and doctors to continue to protect our loved ones when confronted with a crisis. It's a true testament to an investment in professional standards.

Do you have an example of contemporary, innovative human factors training programs in operation? Tell us more at media@australianaviation.com.au.



Toll Ambulance Rescue Helicopter Service performs over 2,500 missions per year. MARK JESSOP