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Front cover: Thailand Air Services' S-76D. (Photo: Ned Dawson)

THE FUTURE TAKES OFF

H160

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AIRBUS

Helen Haxell, Deputy Editor

Playing the long game

While the flatlining price of oil and gas has been an unwelcome theme of HAI Heli-Expo over the last few years, the civil helicopter industry now seems refreshed with a positive – albeit cautious – outlook.

This is demonstrated by major OEMs investing in longer-term projects and programmes that focus on the next generation of aircraft – as opposed to a short-term obsession with current orders.

This year's HAI, renowned for being the largest civil helicopter show in the world, saw the presentation of two 'concept' aircraft, as coined by the companies that showed them – Bell's FCX-001 and MD Helicopters' MD 6XX.

In simple terms, these displays are indicative of industry looking beyond the trough and instead focusing on recovery. This measured approach is bound to benefit the manufacturers in the long term, because they will be ready with something new to offer when the market inevitably picks up.

Bell Helicopter's confidence in unveiling the FCX-001, a platform highly unlikely ever to fly, certainly conveys the company's renewed optimism. More than just an extravagant PR stunt, however, the technologies developed under the project will be applied to future aircraft programmes (see *RH* Feb-Mar 2017 for much more).

With the overall sector refocusing on single and light twin aircraft, the showcasing of MD Helicopters' 6XX was also notable. While the type has yet to be flown for the first time, the company is aiming for an MTOW of 2,500kg, cruise speed of 140kt and maximum dash of 160kt, 930km range and four and a half hours of endurance.

At the public launch of the helicopter at Heli-Expo, Lynn Tilton, owner of MD Helicopters, said that it was being targeted to meet a significant requirement with a long-standing existing customer. Speaking to *RH*, she poured cold water on the likelihood of this resulting in a firm contract. Nevertheless, the 6XX will be marketed to both the civil and military sector.

> ***"Displays [of new aircraft] are indicative of industry... focusing on recovery."***

Cautious optimism

Despite these displays, a conservative approach was taken by many companies, emphasised by the release of Honeywell's latest market outlook report during the show. It estimates that 3,900 to 4,400 civilian-use helicopters will be delivered from 2017 to 2021. This equates to around 400 fewer than predicted in the company's 2016 five-year forecast.

'The current global economic situation is causing fleet managers to evaluate new helicopter purchases closely, and that's why we're seeing a more cautious five-year demand projection compared with previous years,' Ben Driggs, president of Honeywell Aerospace – Americas, stated.

However, investment in the commercial helicopter market in the North American region was shown through a rise in the number of attendees at HAI 2017 – evidence of interest in the US more specifically. In comparison to HAI 2016, there was a 27% increase in footfall at this year's show, which had almost 18,000 visitors.

Furthermore, the number of exhibitors rose by 5% and the amount of aircraft on display by 13% – so, despite there being numerous shows throughout the year at which manufacturers can exhibit, presentation of their offerings at HAI is still seen as integral to their diaries. These statistics are also indicative of companies being positive that money spent on show presence is worth it.

Overall, what was clear from HAI 2017 is a mood of cautious optimism as a result of manufacturers holding their nerve and finding new markets for current types while exploring the next generation of aircraft by heavily investing in R&D projects for the future.

With various rotorcraft types on demonstration tours of key regions, the industry is doing its best to keep orders ticking over until the market fully recovers. ■

In the next issue

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AW139 enforces law in Malaysia


Photo: author

The Air Wing of the Royal Malaysian Police (RMP) publicly exhibited half of its fleet of AW139s at the LIMA 2017 exhibition in Langkawi, Malaysia.

The police received two white-and-red-painted AW139s last November, the fruit of a $32.5 million contract between the Malaysian government and Galaxy Helicopters, signed in October 2015.

The RMP, and Leonardo Helicopters, expect a contract for four additional aircraft to be placed, although no formal tender process has yet been initiated. In fact, according to an RMP pilot who spoke to *RH*, Prime Minister Najib Razak promised a fifth helicopter when he was attending the LIMA 2017 show.

The RMP's two AW139s are based at Subang, and currently there are four trained pilots and six co-pilots. A few more are currently undergoing training. From Subang, the aircraft are able to operate throughout Peninsular Malaysia. They can also fly the 3.5-hour journey to East Malaysia, since the AW139 has an endurance of four hours. Once more become available, helicopters will be based at both Subang and Sabah.

A pilot told *RH* that the rotorcraft type is mainly being used for special forces-type missions, for which it is suitable thanks to its ability to carry ten passengers and a hoist that enables fast roping. It is not used for more routine missions, such as traffic or surveillance, owing to the helicopter's size and greater expense compared to the RMP's fleet of Airbus Helicopters AS355 N2 and F2 aircraft.

Leonardo Helicopters also supplied Weststar Aviation Services with 26 AW139s, and on 21 March, the fleet celebrated the achievement of 100,000 flying hours. Weststar is Asia's largest user of the type.

The OEM is also eyeing replacement of the Royal Malaysian Navy's Super Lynx 300 fleet with the AW159 Wildcat some time in the future.

Daniele Romiti, managing director of the Leonardo Helicopters division, described Malaysia as a particular 'bright spot' for the company, and said that strong relationships had been forged in the country.

By Gordon Arthur, Langkawi

India to shop for multirole helicopter engines

Hindustan Aeronautics Ltd (HAL) is aiming to freeze the preliminary design of its Indian Multi-Role Helicopter (IMRH), so that it can be built over the next 18 months. A full-scale mock-up was unveiled at Aero India 2017 in February.

The state-owned aerospace firm is also looking for engines to power the aircraft, and is likely to issue an RfI within six months. Sources familiar with the project told *RH* that the 12.5t helicopter would be powered by a pair of turboshafts delivering 2,500hp each. In that case, likely contenders could include Safran's Makila/RTM 322, Klimov's VK-2500 and General Electric's CT7-8.

HAL officials indicated that an IMRH prototype could fly in about four years, and


Photo: via author

the target is to deliver the first helicopter by 2024. The current plan is to build at least 400 of the aircraft type.

Officials said that HAL was not looking at overseas help for the project at the design stage, but they did not rule out collaboration with a foreign partner later, if required. The new helicopter will cater to Indian tri-service requirements. HAL will also focus on exports, having set its sights on replacing the ageing fleet of similar classes operated by more than 40 air forces.

The IMRH will directly compete against the Mi-17, the backbone of the Indian Air Force's rotary-wing fleet, for both domestic and global orders.

HAL has been working on the project in fits and starts for almost a decade. It issued an expression of interest eight years ago and received responses from Sikorsky, Eurocopter (now Airbus Helicopters), Mil and AgustaWestland (now Leonardo Helicopters). However, changes in service requirements led to delays and eventually the decision to deliver an indigenous platform.

By Rohit C Silva, Delhi

Orders abound in Dallas

Photo: Tony Skinner

The large number of contract announcements made during Heli-Expo 2017 suggests cautious optimism is returning to the civil helicopter market.

The headline announcement was a €200 million firm order from leasing company Milestone Aviation for various Airbus Helicopters aircraft, including the H135, H145 and H175 models. The company will integrate these into its current fleet of over 60 Airbus aircraft and will deploy them in EMS and parapublic roles.

Waypoint Leasing committed to an additional 16 Airbus helicopters, including the H135 and H145. It also added the H175 to its order book for the first time.

Leonardo announced at the exhibition that its presence in Japan was expanding, with the introduction of the AW139 into the country's corporate market. A private customer signed a contract for the aircraft, which is expected to be handed over later this year. This brings the order total for the region to nearly 160 units.

In addition, the AW139 has been delivered by Lease Corporation International to support Heli-Union's growing activities in Asia.

Six of the type contribute to a €90 million order placed by Milestone Aviation, who expect to accept the AW139s over the next two years. The contract also includes three AW169s.

One landmark sale was the contract signature for the 200th Cabri G2 helicopter by Hélicoptères Guimbal to UK distributor Heli-Group.

In addition to launching the FCX-001, Bell Helicopter also commemorated a milestone at the show, as the first delivery of the Bell 505 Jet Ranger X was received by private operator Scott Urschel, owner of Pylon Aviation.

The signing of a purchase agreement for two Bell 429s by Nakanihon Air Service was announced at the show. The rotorcraft will be delivered by the end of 2017 for use in HEMS operations.

An additional order placed in Dallas will see the same platform received in 2017 by the Arizona Department of Safety Aviation Bureau for SAR, law enforcement and border protection applications.

RH can also confirm that a second Bell 407HP conversion will be delivered imminently to Helicopter Express, the latest customer for Eagle Copters. So far, Honeywell – provider of the HTS900 engine – and Eagle have modified eight aircraft, with more in the pipeline.

In terms of technology, Trakka Systems announced two new customers for its TrakkaBeam A800 tactical searchlight: the Italian Navy and the German DRF Luftrettung air rescue service.

Finally, Elbit Systems showcased its Heli-ClearVision EFVS suite – technology which will be fitted on Leonardo's commercial helicopters, according to a long-term agreement that was signed by the two companies at the show.

By Georgina Smith, Dallas

For more news, please visit ***www.rotorhub.com***

Additional SKYe SH09 launch customer revealed

Marenco Swisshelicopter has announced a new order for the SKYe SH09 helicopter from Alpinlift Helikopter, which is joining Air Zermatt as a launch customer of the new platform.

Established in 2005, the Switzerland-based company is now part of the 'Launch Customers Team' and will receive one of the first deliveries for the helicopter.

Alpinlift intends to convert its fleet to SKYe SH09s in order to expand its sling load operations and confirm its position as a leader and reliable partner for private flights, cargo transport and business trips, according to Marenco.

Andreas Loewenstein, CEO of Marenco, was confident that the order was the first step to a 'valuable long-term collaboration' with Alpinlift.

'This mutual engagement will support the market introduction of the SKYe SH09 as the best day-to-day workhorse for many operators in the world,' he said.

The single-engine light helicopter has a shrouded tail rotor and a maximum take-off weight of 2,650kg and is equipped with a Honeywell HTS900-2 engine.

The SKYe SH09 had its first flight in 2014 and certification is expected over the next 12 months.

By Georgina Smith, Dallas

New civil Black Hawks revealed

Ex-US Army helicopters continue to be big business, evidenced by an increased presence of commercially-configured UH-60 Black Hawks at this year's Heli-Expo, with five on display, up from three in 2016.

Arista Aviation, BHI2, Global Aviation Solutions, Rogerson Kratos and Unical Defense are all hoping to sell their overhauled aircraft to the commercial market.


Photo: Tony Skinner

First-time exhibitor Unical Defense stated that it is mainly targeting the firefighting and law enforcement sectors, while Arista sees potential in the international market for the US Army's trusted workhorse.

Bill Parsons, COO at Arista Aviation, said: 'There is a big market in both military and public use of the aircraft overseas... we are seeing 80% of the demand for our aircraft outside of the US with 70% of that for military use.'

He added that while the company still owns some UH-1 Hueys, business is starting to die down as the aircraft become older, and focus is now on Black Hawks. Arista sold four of the aircraft to an undisclosed customer at the show, where it had two type-certified helicopters on display, one flying.

The organisation has a modest portfolio of nine UH-60As at its site at Enterprise Municipal Airport, Alabama. Unical Defense has a fleet of 34 UH-60As alongside six CH-47Ds at its site in San Bernardino.

According to Parsons, there are likely to be around 800 UH-60s divested by the US Army, with A-models the first to go, followed by the Lima aircraft. Currently, four of the A type are being auctioned per month.

At the same exhibition in Dallas, Global Aviation Solutions (GAS) presented its Acehawk, which is likely to remain the only aircraft offered with the Garmin G5000H avionics suite.

Darrell Kindley, CEO of GAS, told *RH* that the platform on display was the first installation of the Acehawk kit, and an STC is expected to be gained by Q2 of 2018.

'The Acehawk is a retrofit kit available for UH-60A/Ls and S-70 aircraft. We are marketing that all over the world to various countries and also domestically here in the United States, for some users here locally,' Kindley said.

The Acehawk cockpit features four 12in, 4K displays and two touchscreen controllers; Panoramic View and Synthetic Vision Technology; and the option to integrate third party radios, sensors and other mission equipment without affecting the G5000H core software.

In addition, GAS was issued with a Restricted Category Type Certificate (RCTC) for the UH-60A by the FAA in October 2016, allowing the company to offer the aircraft as an option to US and international customers.

Meanwhile, Sikorsky is committed to serving the growing technical and logistical support needs of more than 30 commercial operators who have acquired surplus UH-60A. During Heli-Expo, the company held a meeting with commercial Black Hawk operators.

Since 2014, commercial operators have acquired approximately 140 UH-60A aircraft at auction from the General Services Administration.

By Beth Maundrill and Tony Skinner, Dallas

Leonardo looks to the future

Leonardo Helicopters used Heli-Expo 2017 to quietly drop hints about a new aircraft design, referred to as the AW209.

Speaking to journalists during the event, the company's managing director Daniele Romiti suggested that the AW209 would be a new light twin helicopter, although this could be some way off as he noted that the aircraft was 'not a dimension we are working on at the moment'.

Additionally, following its development of the AW609, the company continues to invest research and development funds into a next-generation civil tiltrotor. According to Romiti, the aircraft could be unveiled as soon as 2023.

The design will be a testbed based on the AW609, equipped with a fly-by-wire system, new avionics and new wings. The company will also explore how to tilt the gearbox only, rather than the entire engine. 'It will be a spiral development of these technologies,' said Romiti.

At Heli-Expo in 2016, the company showcased its revamped SW-4, dubbed the AW009. Leonardo is now considering a new engine for the aircraft (replacing the current Rolls-Royce M250-C20R) as well as the option of installing a Genesys avionics suite.

The company is expecting certification of the aircraft in 2018, and is aiming to fly the first prototype in the second half of 2017. Leonardo is looking to law enforcement as one of its potential markets for the AW009, and Romiti said demonstrations of the aircraft had been performed to police units.

While the oil and gas situation has clearly hit every rotorcraft OEM, Romiti said that Leonardo has been able to complement its market share with increased sales in other sectors, such as EMS, which he highlighted had allowed the company to sell 20-25 AW119 Koalas to China for such operations.

The company is also growing in the US, with an increased ability to maintain its fleet at its Philadelphia site through the maintenance outlet, which now can support all of Leonardo's aircraft at component level.

Romiti said the manufacturer is continuing to work on its flagship family of aircraft, the AW139, AW169 and AW189, and is planning on entering the AW139 into new markets as it conducts high-altitude capability demonstrations.

The Elbit Systems Heli-ClearVision enhanced flight vision system will also be installed on the aircraft family, beginning with the AW139.

By Beth Maundrill, Dallas

SKYe SH09

The Swiss response to making a helicopter

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Bristow has a concentrated effort in the Americas, where it provides AWSAR and RRS helicopters. (Photo: Bristow Helicopters)

While oil and gas has long dominated the helicopter business, companies in different segments of the market are seeing growing opportunities in the parapublic world. **By Gerrard Cowan**

Unlike much of the energy industry, SAR and EMS are largely controlled by governmental organisations, which tend to own and operate their platforms. However, there has been a shift to the private sector in a number of nations. This has come against a backdrop of straitened government budgets, in which privatised operations can offer effective services at a lower cost.

The transition has occurred at varying speeds in different parts of the world. Perhaps the most notable example to date is the UK's contract with Bristow Helicopters, with the latter providing civilian SAR services on behalf of the coast guard.

Operations will be conducted from ten bases throughout the country; the first two became operational in April 2015, while the final base at Lee-on-Solent will go live on 1 April 2017, according to Samantha Willenbacher, Bristow's regional director for the Americas, who previously headed up the UK contract for the company.

'I would say that there are a lot of countries that are actually looking to see how the contracting out of the services by the Maritime and Coastguard Agency to industry works... not only have they been able to see an increase in the capability of the service based upon the new technology that we have in the aircraft, but also from a cost-saving perspective for the taxpayers,' Willenbacher told *RH*.

SAR has been a focus for Bristow since the 1970s, she said, although it has come to the forefront recently with the UK contract and a range of other work the company conducts in the sector around the world, for example in Australia and Nigeria. ▶

Another major effort for Bristow is its work in the Americas region, where it provides all-weather SAR (AWSAR) and rescue recovery services (RRS). The company has a standalone facility for these activities at South Lafourche Airport in Galliano, Louisiana, with a Sikorsky S-92, S-76C++ and Leonardo AW139.

'The S-92 dedicated to this service is the only all-weather heavy SAR aircraft operating in the Gulf of Mexico, with the speed and extended operational range to reach ultra-deep-water rigs and installations, and the necessary capacity to respond quickly to multiple-casualty situations,' said David Jacob, Bristow's rescue operations manager for the Americas.

Outside the US, the company supports RRS operations in Trinidad and Guyana, as well as AWSAR in Newfoundland, Canada, which is carried out with its partner, Cougar Helicopters.

The parapublic market has been driven by North America, Oceania and Western Europe. (Photo: Airbus Helicopters)

Commercial solution

Another operator to see significant opportunities in the parapublic sphere is CHC, which is currently the largest commercial provider of SAR in Australia, Ireland and Norway, and operates missions for customers in countries like Brazil, Kazakhstan and Uruguay. In addition, the company has provided such services to oil and gas companies around the world, according to Mick Fry, its sales director for SAR/EMS.

'We see clear future growth both within the public sector and also in SAR support for offshore oil and gas customers, particularly in more challenging regions with extreme climates, long-range offshore drilling campaigns and other service needs,' Fry told *RH*.

'We continue to provide advice and offer solutions for both government and private customers as they consider increasingly complex SAR requirements, and will continue to focus on growing EMS and SAR operations moving forward.'

There has been a significant transition to commercial SAR recently by a number of governments, usually driven by a need to update technology, bridge a specific gap in coverage or mitigate large investments by using the flexibility and innovation of the commercial sector, Fry explained.

Some governments are seeking a complete turnkey commercial solution for their needs, he said, while others require a partial solution to augment their existing provision.

'The demand for SAR and EMS service is truly global, with numerous governments around the world looking to develop cost-effective SAR and HEMS solutions,' Fry said. 'We've seen increasing enquiries from emerging markets around the world, rather than one specific market leading the growth.'

CHC supports various areas in the market, including AWSAR for overland, coastal and maritime environments, and limited SAR (in daylight and fair weather) for offshore energy installations and vessels.

'Traditionally, customers for all-weather SAR have been government departments, but increasingly we have seen an uptake in capability by oil and gas producers,' Fry said. Looking forward, he expects the growing area to have demands for a number of services: 'Our experience with global customers of all types has taught us that effective SAR provision includes everything from commercial provision to government agencies, crewing, initial and recurrent training, base infrastructure, clinical governance and procedures.'

OEM opportunities

The parapublic realm also holds opportunities for manufacturers. Nathalie Previte, VP of strategy and business development for commercial and international military at Sikorsky, outlined that demand has shown slow but steady growth over the past five years. SAR could be considered a recent standout, she said, particularly for heavier and medium aircraft.

Previte highlighted a range of Sikorsky platforms with applications in the parapublic market, such as the S-76D, which has a long heritage in SAR, EMS and airborne law enforcement: 'Custom-tailored for critical care air ambulance and maritime SAR operations, it is right-sized as a medium helicopter for these roles.'

She also pointed to the S-92, which 'offers state-of-the-art SAR equipment for the critical lifesaving mission' and performs a specialist medevac role in large casualty events like natural disasters. Additionally, Previte said that the Black Hawk (S-70/H-60) is appropriate for more than just military use, since it is currently being deployed effectively on parapublic missions around the world.

Previte noted that demand for the S-76D in rescue operations has been very strong, particularly in Asia, which she emphasised as a region of potential expansion in a broader respect.

'Asia is a strong growth market for EMS, SAR and law enforcement, as the populations in this region continue to rise and infrastructure is developed. Even with the downturn in oil prices, and the subsequent decline in oil and gas transport operations, we see growth in the Asian market place for our helicopter platforms and services, specifically in parapublic mission categories,' she said.

Other regions are at different stages of development. While North America and the EU have mature and highly developed critical care helicopter air ambulance operations, Latin America is showing future demand for those services.

'Across the globe, we see many regions where civil helicopters are needed to serve

the emergency medical and fire services, coast guard search and rescue, anti-piracy and law enforcement,' Previte said.

Overall, the parapublic market has been driven by Canada, Oceania, Western Europe and the US, according to a spokesperson for Airbus Helicopters, who also asserted that Asia is 'still very much under-equipped, with a large potential for growth'.

The European manufacturer has a range of platforms servicing the different aspects of the parapublic market, including the H135 and H145. The spokesperson said that the success of these rotorcraft has been in the EMS market in particular, boosted by strong renewal demands in Western Europe, as well as the emergence of demand in Asia in selected countries.

However, there has been a slowdown in North America, a consequence of ongoing fleet consolidation due to operators' overcapacity and fleet optimisation: 'We can see that the American EMS helicopter market is overloaded and that the number of helicopters being used is decreasing,' the spokesperson said.

Although there has been a decreasing level of bookings in the last few years, in line with a deficit in government budgets globally, noted the spokesperson, Airbus has 'seen a growing share... where significant opportunities lie in replacing the ageing fleets in every region'.

This is less true of Asia, where new fleets are currently being acquired, though Airbus still identifies a great number of opportunities there. The overall view is that parapublic markets would remain stable for the company, with the Americas and Western Europe representing the main areas with mid-level replacement opportunities, while there would be a large potential for growth in emerging markets.

Replacement market

Parapublic is also a focus for the pre-used market. For example, Avinco – which buys, sells and places helicopters and commercial aircraft worldwide – predicts a very active sector in the coming years, according to CEO François Gautier.

'It's mainly a replacement market. I would not say there is a big growth expected in this segment, but at least there is a replacement [market], both in Europe and in the US, which will create opportunities for us,' he told *RH*.

For EMS in Europe, there is demand for larger units, for example, operators moving from H135s to H145s. In the US, there is a potential move from single engines to twin engines, with a requirement for H145s and potentially AW109s.

'That will be one of our targets this year and the coming years,' he said. 'We have some emerging markets, but we feel that this is quite marginal compared to those two biggest markets.'

With regard to SAR, Gautier noted that though active, it is limited in terms of volume: 'Where we are able to be really successful is whenever we can access the right assets for specific contracts, because an SAR helicopter is very specific in ▶

terms of equipment, and it is very difficult and costly to retrofit a helicopter into SAR if it has not been already equipped [by] the manufacturer,' he explained.

Gautier highlighted the move to transfer operations to private contractors, which is particularly prevalent in Europe and could create opportunities for the company: 'It's a market where we can eventually place more used equipment, compared to a pure governmental market.'

Turning to other parapublic domains, Gautier said that law enforcement is usually controlled by public authorities, who tend to buy new helicopters. However, Avinco is interested in acquiring good used assets from these services, so long as they are civil-registered and do not come with too much police-specific equipment that would need to be removed.

Gautier concluded by summarising the major focus for the company over the coming years: 'You may expect these emerging markets to provide some opportunities, but we have been saying that for quite some time, and it's not coming yet,' he said. 'We see some operators now in India, but compared to what you see in Europe and the Americas – these mature markets – I think if you look at the next three to five years, I expect these to continue to be the main markets for us.'

Leasing potential

Although leasing companies largely focused on oil and gas when they first rose to prominence, they too are increasing their work in the parapublic sphere. Oil and gas is a relatively mature and very large market, so it provided the opportunity for new companies to scale up quickly, said Clark McGinn, senior VP of sales and relationship management at Waypoint Leasing.

However, parapublic areas provide diversification opportunities and have always been an important part of the company's focus: 'The EMS market and the other parapublic markets are always going to be smaller than oil and gas, but it's an important part to diversification,' he said.

EMS is highly complex, McGinn said – even within a given country, different hospital trusts or ambulance charities will have varying equipment requirements. A lack of standardisation can slow down growth somewhat, he explained, 'because you're highly customising an ambulance for Charity X and then at the end of eight years when the lease comes off, that specific configuration may not be suitable for any other ambulance authority in the country'.

He added that in oil and gas, by contrast, 'you get an AW139 back from Company A in Botswana and it's pretty easy just to turn that straight round to Company Q in the North Sea with relatively minor modifications, because the oil and gas industry has a pretty standard template for the equipment [that is required]'.

However, parapublic is likely to be a growing area going forward, with countries like China holding potentially massive demand in EMS. Leasing could be an attractive option, McGinn argued, because governments do not need to provide the entire capital sum up front when the project is established.

A number of government agencies are outsourcing their EMS and SAR operations to private organisations. (Photo: Bristow Helicopters)

He added that leasing moves the 'technological obsolescence over onto the lessors', in line with Waypoint's mission 'to show people that leasing can help take capital burdens off the government's budget and take away the technological risk, so that they can keep having an upgraded, fit-for-purpose EMS service for their citizens'.

EMS is a major focus for LCI Aviation, according to CEO Mike Platt, with almost half the lessor's aircraft currently dedicated to that segment. For example, it has ten AW139s flying EMS missions in Australia and a growing business in Europe.

Platt also pointed to a deal late last year to lease three H130 aircraft to Aviators Air Rescue in India, the country's first civil HEMS with advanced life support capability and its first to be operated by a commercial company for public use.

Like Waypoint, LCI is looking at the potential of China, as well as other emerging markets: 'It's not just China and India; there are other places as well that just have very little of this service available, and we see a trend moving in that direction,' he said. 'We think EMS is one of the brightest spots and we're heavily invested in that.'

SAR is an area of interest for LCI; the company has had a couple of helicopters operate in this area, with one platform soon to be flying for the Spanish Coast Guard. The market is relatively small and specialised, but there are opportunities, Platt said, pointing to the SAR needs of oil companies and moves by countries like the UK to privatise their operations: 'It's not huge, but it is something that we have done and will continue to do in relatively small numbers,' he told *RH*.

However, as with EMS, there is potential for SAR in untapped markets, according to Platt. 'If you think about China for instance, the coastline of China is enormous, and there's very little SAR equipment there now,' he said. 'Anywhere where there's big maritime activity, anywhere where there's oil and gas activity, we think that will pick up.' ■

TAKING CARE OF BUSINESS

From the US to Europe to Australia, EMS strategies tend to remain consistent, although platform requirements vary significantly. **By Helen Haxell**

Helicopters can support emergency medical missions in ways that other options, such as fixed-wing transport and road ambulances, cannot. Able to land in treacherous environments and provide a rapid response capability for road traffic accidents or mountain rescue, they provide a particularly flexible option for operators.

Meanwhile, OEMs and aircraft suppliers are now looking for opportunities beyond the oil and gas sector, in some cases towards the EMS market. This trend was visible at Heli-Expo 2017 in Dallas in March.

MD Helicopters' new 6XX single-engine rotorcraft, which will be marketed to both the civil and military market, was publicly unveiled at the show, outfitted with an EMS interior developed in conjunction with Air Ambulance Technology.

Contract awards

In another example reflecting a refocus in the market towards EMS applications, leasing company Milestone Aviation announced two orders – one with Airbus Helicopters valued at €200 million ($214 million) and another with Leonardo Helicopters worth €90 million. Both include a mixture of light and medium aircraft, with the former order making the operator the largest owner of commercial Airbus helicopters.

'Milestone was very active in emergency medical services and other parapublic segments in 2016, and this order gives us near-term availability for H145 and H135 aircraft to support growing demand for new technology in these segments,' said Milestone president and CEO Daniel Rosenthal.

The Airbus order is to include H135s, H145s and H175s. Milestone's ▶

CareFlite operates EMS helicopters from six bases across Texas, and has around 32 pilots. (Photo: Sheldon Cohen)

current helicopter fleet includes over 60 Airbus platforms, which cost almost $1 billion.

Leonardo will supply the operator with six AW139s and three AW169s. According to Rosenthal, most of the helicopters in this order have already been placed with customers to support contracts beginning in 2017 and 2018.

Milestone leased a total of seven AW169s in 2016 into geographically diverse EMS segments, most recently to HeliKorea for such operations in South Korea under a new partnership. This is HeliKorea's first commercial lease.

Elsewhere, leasing company LCI, which is primarily focused on medium-class helicopters, is also targeting the EMS sector with enthusiasm and a deeper understanding of this side of the market, Crispin Maunder, executive chair of the company, explained to *RH*.

'Almost half of our portfolio is dedicated to EMS,' he said. 'That's a growing sector, a target sector. We are seeing continued growth there, for example with the Bell 412.'

Focused approach

In addition, he noted that there were certain aircraft which were EMS-oriented. 'Some of the smaller twin-engines have progressively been replaced with the likes of the AW169, AW139, the H145 – those are what I consider to be three typical EMS aircraft. We are very excited about that market,' Maunder noted.

The twin-engine AW139 has been on the market since 2004. 'At the top end of the EMS market, there's still tremendous potential for the 139,' said Maunder. 'It's quite amazing when you look at the market as a whole – EMS has moved from... almost a luxury to commonplace.'

LCI retains its positive market outlook, but conservatively notes that the sector was still not in a state of complacency, despite the stabilisation of oil prices.

At Heli-Expo 2017, Leonardo Helicopters' managing director Daniele Romiti noted that the company has been able to complement its market share with increased sales in other sectors beyond oil and gas, highlighting the sale of 20-25 AW119 Koalas to China for EMS operations.

For some OEMs, EMS is plugging the gap left by the oil and gas downturn. (Photo: Keysers Frederik)

Further to this contract, the OEM announced last year that it had signed an agreement with Sino-US Intercontinental Helicopter Investment, which included AW139 and AW169 models. The aircraft are expected to be delivered this year and will operated by Kingwing General Aviation.

One model that has proven to be particularly popular for EMS missions is the twin-engine H145. Previously designated EC145 T2, the latest iteration of the type received EASA certification in April 2014. Deliveries to the first customer, German air rescue operator DRF Luftrettung, started in July 2014.

On the inside

Bucher Leichtbau provided its AC70 package for the H145's EMS interior. This resulted in DRF reselecting Bucher to equip the H135 with the AC67 HEMS kit.

Rolf Kraus, director of sales and programme management at Bucher, commented to *RH* that every now and then the company conducts interior upgrades, mostly with regards to new medical devices or configurations. There are always some bespoke customisations to a particular contract or customer.

'About 80% is standard kit with the platform, but then from time to time with all the different customers you design new features and new configurations,' he said.

Bucher's standard kit comprises an integrated base plate, crew seats, patient stretcher and loading systems, medical equipment storage and medical systems. This can be broken down into pieces to aid conversions, Kraus said, demonstrating the equipment's modularity and thus flexibility.

Bucher's customer base centres on Europe, but the company is noticing a shift to Asia. This was recently highlighted at the Zhuhai Air Show in China last year, when Skyway General Aviation signed a contract with Airbus Helicopters, Bucher Leichtbau and Waypoint Leasing for one H135 in EMS configuration. One of the main benefits of this type is its capacity to provide a notable weight reduction.

'It will be the first time an EMS floor has been installed by Airbus Helicopters. This was designed together with operators and us. We directly install our equipment into the helicopter and save a lot of weight – up to 20kg – compared with solutions in the past,' said Kraus.

One of the largest providers of HEMS services in Australia, CHC Australia, also operates the EC145 from some of its bases in New South Wales.

Leon Bush, senior base pilot at CHC's Bankstown operations, told *RH* that the fleet there comprises three AW139s and two EC145s.

'At the Sydney base, we get dual rated on both aircraft and we alternate on a daily basis which one we are in,' he said. '[Regarding] the other bases in New South Wales, the pilots tend to be rated on just one platform, as they only operate the AW139. At Orange, they only operate the 145.'

Seasonal missions

The types of missions tend to be seasonal, with the aircraft tending water-related

incidents in summer and more mountain-centric accidents in spring and autumn.

On the market now for over 13 years, the AW139 has a cabin that spans 2.7m in length, 1.42m in height and 2m in width. Meanwhile, its cruise speed is just over 165kt, although Bush explained that the average speed during an operation is 25kt less than that.

'We plan to fly around 140kt. This is still quite quick when compared with other aircraft used. The AW139 is an amazing machine in respect to its performance and size. While it's got a relatively small rotor diameter, it's got quite a large fuselage, which gives us a great deal of capability in the back of the aircraft, with the configuration for patients and seating arrangements,' he said.

The AW139 features two 1,678hp Pratt & Whitney Canada (P&WC) PT6C-67C engines, which Bush claims provide the aircraft with excessive power for challenging missions: 'The amount of power that is available to the pilot, with wind and winching tasks... is something that AgustaWestland really excelled at when they built that machine.'

Regarding the interior, Bush said that the wide variety of medical devices available means that the emergency team can deal with most situations without requiring additions.

'Generally speaking, in the AW139 we have a consistent layout that gives us a range of equipment to respond to the water, to the mountains or for a hospital transfer – it's a one-stop machine in that respect,' he commented.

In relation to the cabin, the aircraft is equipped with the standard technologies. However, the onboard radio is able to communicate with government and emergency networks.

For night-time missions, the crew uses ANVIS 9 goggles. There is also a hoist and additional floats – they can pop out for water missions, if required when ditching.

According to Bush, CHC Australia was the first company to implement water hover within Australia and is the only non-government operator of water auto-hover in the country.

Pilot's point of view

Andy Greenall, a senior pilot at CHC based at Jandakot in Perth, Western Australia, is one of the operators of the single-pilot IFR/NVG-equipped Bell 412 for EMS missions. In his career, he has totalled more than 7,500 flight hours, with 2,500 specifically on the Bell 412.

The type does not really need to reach any high altitudes in Western Australia, and Greenall said that the 412 copes well in the hot temperatures of the country. The aircraft generally reaches 120kt and can cover a maximum radius of 250km. Although the extra speed does help, he noted that getting into the challenging environments was more of a major factor.

The Bell 412EP also features the Star SAFIRE 380-HDc, a stabilised HD imaging system designed to maximise ground clearance on helicopters. The image processor core provides image quality with automatic gain control, auto-focus, ▶

filtering, edge enhancement and optional real-time image blending.

The past couple of years have seen the combination of this FLIR gimbal capability and the Churchill mapping system, providing augmented reality technologies. Designed primarily for law enforcement platforms, the advanced mission management system is built to interface with gyro-stabilised cameras and increase crew situation awareness. The hardware weighs 2.5kg and measures 18x12.7x20cm, with six RS232 interfaces, one RS422 interface, four SDI inputs, seven USB ports and two Ethernet ports.

CareFlite does it

Over in North America, CareFlite operates EMS helicopters at six bases across the state of Texas and has around 32 pilots. Its fleet renewal programme cost $35 million and this is now complete with seven new helicopters.

James Swartz, president and CEO of CareFlite, told *RH*: 'We have five Bell 407GX helicopters and two Bell 429s – we believe we have the youngest helicopter EMS fleet in the US. We are also the oldest joint-use air medical programme in the US.'

The fifth Bell 407GX was delivered to the operator in December 2016. Explaining why another Bell 407GX was purchased, Swartz commented: 'The immediate reason was that we wanted a spare aircraft. We operate six helicopter bases... So, we wanted a spare to make sure we had the reliability we need.'

The aircraft features an additional 22.5kg of payload, coupled to a new Rolls-Royce M250-C47B/8 engine that delivers hot-and-high performance with improved hover characteristics. Its cabin length is 1.5m, while the width and height both stand at 1.2m.

During January 2016, the fleet amassed 245 flight hours (including two in-service Agusta 109s and one spare), compared to a total of 203 in the same month in 2017. The availability rate of the 407GX was 99%, but without the backup aircraft this year, it was at 97%. Now this is in operation, the availability rate is likely to climb back up.

> ***"In the AW139, we have a consistent layout that gives us a range of equipment to respond to the water, to the mountains, or for a hospital transfer – it's a one-stop machine in that respect."***

Best of both

The other type in the fleet, the 429, has two P&WC PW207D1 engines with a five-minute take-off rating. It has a cruise speed of 150kt, and the fuselage length is 11.7m.

The company used to operate Bell 222s, but decided against upgrading the

Ample cabin space is key for EMS operators. (Photo: via NHV)

electronics. In January 2017, the two Bell 429s had a 98% availability rate.

'We like both aircraft. The Bell 429 responds to anything. But, of course, it has a larger cabin, it's fully IFR, it has great automation in it and more cabin space,' noted Swartz.

'The 407GX has a Garmin 1000 [system] and autopilot... They're great machines and the only reason they are not IFR-certified is they have two separate sources of electrical power. It's a great platform, it's a great IFR platform, even if it's not certificated.'

He commented further that a lot of flying is conducted in marginal VFR, although CareFlite has a long history of IFR.

'So, part of the thinking was to have strategically located 429s that are IFR when that demand is there... It seems a sufficient number where we are in Dallas – we have pretty good weather here.'

Regarding the fleet's upgrade, he said it was a long decision-making process and in the past the company has operated Agusta and Eurocopter helicopters. ■

The AW109SP Da Vinci is Rega's workhorse for mountain rescue work. (All photos: author)

Rules of the sky

Expanding operations and renewing its fleet to improve quality and scope of service, Swiss air-rescue service Rega is focusing on IFR capabilities.

By Alexander Mladenov

Rega is an independent, not-for-profit, privately operated foundation, working under the supervision of the Swiss Federal Office of Civil Aviation (FOCA).

With 24-hour operation across 12 helicopter bases throughout Switzerland, Rega claims to be able to reach any destination within each site's area of responsibility within 15 minutes (with one exception in the region of Valais). During the day, bases maintain five-minute readiness for take-off, and 30-minute readiness at night.

Four of the bases are in lowland regions (Basel, Bern, Lausanne and Zurich), while eight more provide coverage of the mountains (Erstfeld, Locarno, Mollis, Samedan, St Gallen, Untervaz, Wilderswil and Zweisimmen). The headquarters, operations centre and maintenance facility are situated at Zurich Airport.

Rega has a unique funding model allowed by its status as a private foundation. Receiving no government subsidies, the organisation instead relies on almost 3.3 million donors and patrons in Switzerland – a country with a population of more than eight million people.

Patrons voluntarily contribute CHF30 (about $30) each, or CHF70 per family, but this is not an insurance policy. In accordance with its conditions of patronage, Rega can waive or reduce the costs of a rescue mission if they are not covered by the patron's insurance, whether wholly or in part.

Funding raised from patrons accounts for 60% of revenue, and is used to cover the fixed costs of bases and salaries of around 350 personnel, as well as capital investments for the purchase of new aircraft, rescue technologies, medical equipment and infrastructure improvements. In 2015, Rega's revenue amounted to CHF147 million.

Rotary-wing fleet

Rega's rotary-wing fleet currently comprises 11 Leonardo Helicopters AW109SP Da Vincis and six Airbus Helicopters EC145s – the former type for use on mountain rescue missions (some 4,600m above sea level) and the latter for lowland applications. Five rescue helicopters are used as spare machines.

In addition, one Airbus H125 without medical equipment is in use for training purposes. There are two AW109SPs with dual controls (one of these delivered in 2016) that are used for training, but can

also be configured for missions on an as-needed basis.

The annual flight time of each helicopter is about 450 hours. In 2015, the fleet amassed 11,186 rescue missions, 20% of which were completed at night. Until recently, flights took place under VFR conditions, with the most experienced Rega pilots limited to horizontal visibility of 800m during the day (out of cloud) and 2,500m at night, with a 1,200ft cloud base.

On 1 December 2015, Rega announced the signing of a contract with AgustaWestland (now Leonardo Helicopters) covering the purchase of three AW169-FIPS for all-weather operations. These rescue helicopters, featuring a full ice protection system (FIPS), are slated for introduction into service in 2021. Acquisition costs total CHF50 million, including medical equipment. The organisation will also receive an enhanced AW169 derivative specifically configured for its requirements.

The EC145s will be replaced with the Airbus Helicopters H145, with first deliveries planned for 2018. The order covers six aircraft, coming to a total of CHF52 million.

Flying through fog

In 2010, Rega began expanding its operations to include low-level IFR. This has been described as an integral part of a wide-ranging effort to facilitate missions in bad weather, since it is estimated that every year Rega cannot provide emergency assistance to about 600 people in distress due to adverse conditions.

The organisation is addressing this situation by adopting the latest air navigation technologies. A series of targeted measures are in place to enable helicopters and crews to operate in fog and a low cloud base, ▶

LFN OPERATIONS – FROM IDEA TO REALITY

Heinz Leibundgut, chief helicopter pilot at Rega, shared with *RH* how the Low Flight Network (LFN) transitioned from concept to reality. 'Initial discussions were held in 2002. The concept paper was finalised in 2004 and after that it took ten years for the first IFR hospital point-in-space approach and departure in Switzerland – to the heliport at the Insel hospital in Bern – to be approved by the Swiss FOCA,' he said.

When asked to shed more light on the main hurdles that have been encountered during project implementation, he pointed to legislation. 'In Switzerland, IFR generally needs ATC, but this is not foreseen in the uncontrolled "Golf" [Class G] airspace, where our IFR procedures and routes (LFN) operate. We are still working on a solution for this, as currently we are depending on ATC and the LFN is only in use during the day when ATC is available.'

Leibundgut also highlighted technology, finance and training as challenging, but said, 'at least we had full control of that and we're not dependent on other parties'.

Flight safety is of vital importance to the new style of operation; Leibundgut explained Rega's approach to this area. 'In order to ensure a high level of flight safety, we are focusing on training our pilots properly. Many flight hours have been spent practising in our AW109SP full flight simulator. We also make sure that our pilots are familiar with the area where they are flying. Knowing the area can make it easier to fly a helicopter in poor visibility and to gain confidence, especially at the beginning.'

In addition, he identified obstacle maps as an area for improvement. 'In Switzerland, obstacles below 25m are not required to be reported, and so are not always indicated on the official maps. However, there are countless low-lying cables in the Swiss Alps that have been installed for transportation of logs and hay. In order to complete our maps, we have gathered information about hundreds of obstacles and mapped them all. We also work closely with the Swiss Air Force to remove cables and obstacles that are no longer in use,' he said.

The newly ordered Leonardo Helicopters AW169-FIPS, an aircraft equipped with an icing protection system and modern avionics suite, will increase Rega's poor-weather operational capabilities. Leibundgut elaborated on how this is going to be achieved: 'The AW169-FIPS will help us to expand our scope of operations and bring us closer to the Rega vision of "anytime, anywhere, any conditions".

'It will also improve primary health care in Switzerland... we will be able to fly patients from remote regions such as mountain valleys to a central hospital, even if the mountain passes are covered in cloud or if visibility is poor. However, there will still be certain conditions where even missions with de-iced helicopters are impossible, such as freezing rain or in very strong winds.'

Asked to explain how new technologies, which Rega plans to introduce in the near to-mid-term, will enhance IFR HEMS operations and boost safety, he said: 'In general, we want to adapt the regulations in line with the helicopter's capabilities.

'Nowadays, helicopters can do much more than they are allowed to. Technically speaking, we want RNP-AR 0.1 for helicopters, multi-constellation GNSS receivers (working with GPS, GLONASS, Galileo and EGNOS satellite navigation systems), the low-cost, small-size, low-weight inertial reference system using fibre-optic gyro and micro-mechanical accelerometer technology, reliable obstacle detection systems and head-mounted displays with flight path and additional information.'

Considerations for when an IFR mission should not be performed, in terms of weather, terrain or other limitations, include freezing rain or strong winds, according to Leibundgut. He added that not being familiar with the area can pose limitations.

'[At Rega] we are pursuing our vision of being able to perform all-weather rescues in order to be able to help more patients – that is our main goal,' he concluded.

The AW109SP full flight simulator was used in IFR training for Rega pilots.

while operations in falling snow will also be possible in the foreseeable future. Rega's vision calls for gaining capabilities to fly a helicopter to an accident site in rough terrain.

Measures implemented to achieve flight in IFR conditions include the retrofit and certification of the AW109SP Da Vinci, crew training, deployment of a network of weather stations and webcams and deployment of the Low Flight Network (LFN).

The LFN was developed in collaboration with the Swiss Air Force and the Skyguide air navigation service. The main idea of the LFN and its corresponding approach procedures is to fly the helicopter on autopilot along a route consisting of stored waypoints, just like a car on a motorway, without using ground-based navigation aids. Rega's long-term aim is to develop an LFN that connects airports, bases and hospitals throughout Switzerland.

Since 1 December 2016, the first two LFN routes have been cleared for regular use. Mario Agustoni, Rega's AW109SP lead pilot, completed the first LFN mission, transporting a patient from Lugano in the south to a central hospital in Lucerne via an IFR route stretching over the Alps. Rega also operates a GPS approach to the Insel hospital in Bern.

Currently, LFN operations are restricted to the daytime, within the working hours of Skyguide, but Rega has plans to eventually fly LFN missions without ATC in non-controlled airspace at any time of day or night. This will be a slow and protracted process, as many amendments to the rules and legislations of Skyguide and FOCA are needed.

Tomas Gnägi, the nominated representative for crew training at Rega, explained that IFR flying and GPS approaches are in the near future for the organisation. 'IFR gives us a lot of flexibility. We plan, when hospital-to-hospital transfer missions have to be performed in bad weather, to depart base on IFR rules (in instrument meteorological conditions), approach the first hospital to pick up the patient under IFR conditions, then depart IFR to fly to the second hospital to hand over the patient and then return to the base, again in IFR,' he said.

'Our vision is to be able to do this everywhere in Switzerland, even to accident sites. This is the vision as of now. In fact, IFR to hospitals was also a vision in the past but now it is a reality.'

Looking further ahead, he added: 'I'm sure that in the remote future it will be possible to perform a fully automated flight – from take-off to landing. Maybe this [will] be possible in 30 to 40 years from now, although young engineers say this can be a reality in just 20 years.'

Preparing for IFR

To undertake IFR operations on a day-to-day basis, Rega invested in a comprehensive training programme for its pilots, which was completed at the end of 2015. Those starting from scratch were initially required to complete the theoretical part of the course through distance learning.

The flying part – comprising 55-70 hours in total – required 40 hours to be logged on the Rega-owned AW109SP Level B flight simulator (able to recreate a mountain environment, with whiteout effect and NVG compatibility) in Zurich-Kloten, with the remaining time flown in the actual aircraft.

The ex-Swiss Air Force pilots who already held IFR qualifications took a shortened course, consisting of one or two weeks flying only on the simulator. Whenever possible, training was carried out with an onboard paramedic sitting in the left-hand seat. Pilots are required to fly at least five IFR legs every 90 days, with at least three IFR approaches. If this is not possible, they must perform a check flight on the simulator.

While the EC145 was already equipped for IFR operations (only the two CMC Electronics CMA-3000 flight management systems had to be modified with CMA 5024 Satellite-Based Augmentation System (SBAS)-capable receivers), the AW109SP fleet had to undergo a more extensive avionics upgrade. This was done at Rega's maintenance centre, using a service bulletin issued by Leonardo Helicopters.

The upgrade involved the installation of a second navigation computer and a second GPS/SBAS input device; the aircraft was subsequently certified by FOCA. The new equipment added 15kg to the helicopter's empty weight.

The upgrade enabled Required Navigation Performance (RNP) 0.3 – the capability to calculate the aircraft's position to a radius of 0.3nm – for performing approaches using the SBAS and localiser with vertical guidance technologies. The AW109SP is therefore now equipped to fly LFN routes under IFR conditions in non-controlled airspace with RNP 0.3 precision.

Smart innovation

Rega pioneered the use of a smartphone application launched in 2011, which works with enabled GPS on iPhones and Android phones. The application is available for Windows phones since February 2017.

In the event of an emergency, two finger clicks/swipes on the app trigger an alarm at Rega's operations centre. The phone automatically transmits GPS co-ordinates, together with other essential information, such as its default language, battery status and model. The app establishes a call to a dispatcher in the operations centre who launches a rescue, then transmits co-ordinates to the helicopter prior to take-off and during its flight to the accident site.

Since 2011, the app has been downloaded more than one million times and has seen use in some 2,000 rescue operations. Rega has also created the possibility of organising phone conferences between the accident site, operations centre and dispatched helicopter, to ensure that the crew has maximum situation awareness and can easily find the site and a suitable landing spot.

Widely regarded as the most resourceful and experienced HEMS operator in the world, Rega is utilising the latest technologies in a bid to boost its operations in the harsh Alpine environment, flying an increasing number of HEMS and SAR missions in adverse weather conditions during the day and night. ■

The Airbus EC145 serves four Rega lowland bases, but is set to be replaced in 2018 by the H145.

More than just a facelift

From its emergence 40 years ago, the Sikorsky S-76 has continually evolved, utilising new technologies and responding to the ever-changing requirements of its diverse customer base. **By Barry D Smith**

The Sikorsky S-76 first flew 40 years ago. Today, more than 850 of the type have amassed more than 7 million flight hours, of which more than 20,000 have been contributed by the latest S-76D model.

Since its first flight, many variants have been produced, most involving engine upgrades. However, when it came to developing the newest version, the OEM took a broader look at improving the helicopter.

David Franc, product marketing manager at Sikorsky, remarked that there has been a continual evolution within S-76 variants. 'Each new model was based on a requirement or demand of the market for new developments, improved performance, enhanced safety, etc,' he said.

Feedback loop

In relation to the origins of the type, Franc explained that Sikorsky looked at the S-76C++ in the mid-2000s and collated customer feedback on the next model. He added that clients wanted to retain the reliability of the C++ but required newer technologies, better efficiency and lower levels of exterior noise.

In relation to these areas, Franc commented that Sikorsky considered the engines as a significant aspect of buyer requirements: 'We looked at performance and efficiency, and brought in the latest technology with the dual-channel FADEC Pratt & Whitney PW210S engines. These are the most powerful – 1,050shp – we have ever used in the S-76 family. In addition, they are very efficient and we get an even lower fuel burn than in previous S-76 engines. The newer technology of the PW210S gives us a good range and a lower operating cost.'

The next step of the review was consideration of the main rotor blades. Franc

Angel One has been an operator of S-76 variants since 1992. (Photo: Skip Robinson)

stated that particular attention was paid to making these quieter and more efficient, which was achieved through a change in materials and the shape of the blades. 'We went from a titanium spar to a composite spar. We changed the airfoil shape on both the main and tail rotor blades.

'We swept the tip of the tail rotor blade, which reduced the noise profile. The result was a significant increase in lift and decrease in noise. The S-76D is best in its weight class for exterior noise,' he added.

The variant was designed with four major roles in mind – VIP, offshore/utility, EMS and SAR. Over 50% of the aircraft are used in the offshore oil utility support role and more than 65% of its flight hours have been in this area.

'The offshore role is very challenging,' explained Franc. 'Corrosion control is very important in this market and we have continued to develop this as the S-76 family has progressed. The oil and gas industry has developed safety and comfort standards that have become requirements for the helicopter operators they contract to provide service.

'Those standards often then become regulations. It is a very fluid and fast-moving market. As an example, for the S-76D utility model, we increased the fore and aft cabin window size to allow persons wearing exposure suits to easily and quickly exit the aircraft.'

He added that companies are looking for efficiency and performance for aircraft, which must be able to work in a salt water environment around the world. 'It used to be that an aircraft purchased to work in the Gulf of Mexico would stay there for its working life. Today, aircraft are being transferred all over the world as the company's needs and contracts change. We have to build aircraft that can operate anywhere in the world.'

Continual dialogue

When Sikorsky was developing the D-model in 2006-7, it created several customer focus groups. The company had a group for every major application, including offshore, VIP and EMS/SAR. They were asked to tell Sikorsky what they wanted and to predict their future needs.

As a result, the OEM made changes such as adapting the S-92's active vibration control system to the 76D for increased comfort, as well as including an advanced avionics suite from Thales. 'We had our pilots work with Thales to create a cockpit by pilots for pilots,' Franc said. 'We wanted to present a lot of information to the pilot but, at the same time, decrease his or her workload.'

The S-76D has accumulated more than 20,000 flight hours. (Photo: Sikorsky)

Furthermore, Sikorsky was focused on increasing outside visibility from the cockpit and ensuring future technological growth in the avionics suite with an open architecture. 'With the pulldown menus, pilots are only two clicks away from the important information they need. The displays can present several different types of information at the same time. For example, the pilot can have the XM Weather and approach plates superimposed over the moving map display,' Franc explained.

He continued that in relation to SAR operations, a four-axis autopilot can fly search patterns, in addition to hovering at a designated spot, at the press of a button on the cyclic.

The Thales TopDeck avionics system is based on the company's work with commercial airlines. The system includes four LCD screens with the option for a fifth. They are either 6x8in or 8x10in, taking up less space and permitting a smaller instrument panel for better visibility and legroom.

The S-76D includes a health and usage monitoring system (HUMS), which integrates all the data it produces into Sikorsky's customer care centre. This programme began with the S-92. A customer downloads the HUMS data on a regular schedule and it is stored and trended across the fleet.

This data is important to the customer as well as Sikorsky. A client can compare its aircraft to the rest of the fleet but the information is sanitised so it does not know who the other customers are. The user can then see if their aircraft is performing as well as others and ask for technical assistance from the customer care centre.

Sikorsky can also warn its users about parts that are wearing abnormally and suggest solutions. The company has an analytics group that looks at fleet information to try to extend component life. It can also suggest changes to maintenance schedules to decrease downtime for aircraft.

There are more than a million flight hours of data for the S-92 and this is starting to benefit how the company designs and develops life limits for components. However, the basic concept behind this system is that it improves safety.

Optimising angels

One of the most demanding roles for a helicopter is EMS. Angel One, the critical care transport programme of Arkansas Children's Hospital, uses two S-76Ds to complete its rotary-wing missions.

Collin Bailey, director of aviation operations at Angel One, noted the longevity of the relationship with Sikorsky and the motivation behind the initial utilisation of the aircraft. ▶

In a year, Angel One's helicopter fleet will conduct 1,100 missions on average. (Photo: Skip Robinson)

'We have been a long-time S-76 user,' he said. 'We started with the A-model back in 1992... We wanted to be able to transport extracorporeal membrane oxygenation [ECMO] patients. This is a machine that temporarily does the work of the heart and lungs. We were one of the first to transport ECMO patients by helicopter and our hospital wanted to move into a dual-engine aircraft as a safety concern. Our contractor at the time had S-76s in their inventory,' Bailey commented.

Angel One now operates under its own FAA Part 135 flight operation. This was orchestrated by the hospital because it wanted to control safety and operational aspects in-house.

'There is no substitute for the investment you have when it is your programme,' Bailey remarked. 'We went to Part 135 operation in 2003 and bought two S-76C+ aircraft. When those aircraft came up for replacement, we put out a request for proposals and looked at several different aircraft.

'The hospital board and a committee made up of aviation and medical personnel from Angel One decided to go with the S-76D in 2013. When we first got the S-76A back in 1992, one of our goals was to be able to fly IFR missions. This continues today,' he explained.

He pointed out that an aircraft was needed that had the capacity to carry the size and weight of specific critical care equipment. In addition, the safety of twin engines and the ability to do single-pilot IFR flights with a modern avionics platform was required.

The hospital has commented that there are more economical options, but it believes that safety-wise these aircraft are the way forward. Two S-76Ds were put into service in September 2015 by Angel One.

'We bought two aircraft because of our call volume and the nature of critical care. We don't do any scene missions. They are all interfacility transports. We take about an hour to reach the patient, an hour with the patient at that medical facility to stabilise and prepare for transport, and then an hour back to our hospital,' Bailey said.

Therefore, on average, each mission is about three hours. Both helicopters tend to be flying simultaneously – there are three transport teams on duty during the day, while two are on duty at night.

The rotorcraft are accompanied by ground and fixed-wing vehicles also operating EMS missions. Angel One conducts around 2,000 missions a year, and 1,100 of those include helicopters.

Rigorous training

Todd Adams, chief pilot at Angel One, stated that training on the S-76D started four years ago, and pilot training is contracted through FlightSafety International (FSI). Prior to pilots flying the D-model, each one undergoes three rounds of training, one initial and two recurrent with FSI. After this, the pilots accrue seven hours of actual flight time on the model before their check ride, Adams noted.

FSI has a full-motion level D simulator for the S-76D in West Palm Beach, Florida. All of Angel One's pilots attend recurrent week-long training at the Florida facility.

'FSI really helped us in the transition to a glass cockpit. Since we started training well before we took delivery, we were able to see it and use it in the simulator. They also provided manuals and other study materials which was key.

'Our check airmen also spent a lot of time with their instructors so, in the end, the pilots were able to transition to the Thales TopDeck system fairly easily. The track ball cursor system... was a little unusual,' he said.

It was only a matter of time before the crew got used to the Thales system, and Adams explained that there is a wealth of information provided by the technology. When the software system needs updating, it can be done via a data card system that is inserted into the aircraft – that is how the maps and approach plates are updated.

'We have found the 76D is much quieter with the newly designed composite rotor blades,' Bailey commented. 'The tail rotor is also much quieter. With the extra lift of the new blades, they can turn more slowly to produce the same amount of lift, which reduces noise as well. It also has a new active vibration control system. At higher airspeeds, it makes quite a bit of noticeable difference in the smoothness of flight.'

Today, more than 850 S-76s have amassed over 7 million flight hours. (Photo: Sikorsky)

Enhanced performance

Cindy Covert, a flight nurse at Angel One, noted that the active vibration control system also assists with patient care in the cabin, especially with newborn babies. '[The system] makes patient care easier and decreases the chance of displacing breathing tubes with intubated patients. It is also quieter in the cabin which, along with the smoother flight, makes it easier for the patients to tolerate the flight,' she said.

Bailey explained that the gross weight slightly increased with the S-76D, allowing heightened capability. He added that the team were particularly receptive to the engines and the power exerted by the type and this had formed the basis of why the model became the chosen aircraft.

Furthermore, the aircraft's potential complements the hot and humid summers in the area, he said. 'The new engines give us very good single engine fly away capability. With our flight profiles, we want the aircraft to be able to fly away on a single engine or, at the least, be able to make a controlled landing. The 76D gives us that capability.

'We often take-off at max gross weight on our missions. We have no concerns about the power available. It has plenty of power. We just run up against the limit of the allowable gross weight. With the 76C+, in the summer we would have to decrease our fuel load on some flights due to the density altitude. With the 76D, we keep the fuel tanks full year-round,' Bailey noted.

He explained how the greater fuel efficiency of the 210S means that Angel One's fleet reaches more power while using less fuel. Within the OEM's S-76D's cabin, there are energy-attenuating seats for the medical crew. This means there is a slightly smaller fuel cell under the cabin's floor.

IFR accounts for 30% of Angel One's flights. Adams commented that these comprise a large part of the EMS missions and this is further emphasised by an IFR approach to the hospital.

'The autopilot on the 76D gives us the ability to do GPS and LVP approaches if we want to develop those,' he said. 'We couldn't do those with the 76C+. The Thales TopDeck system gives us a much better integrated picture of what is going on. For example, the way the moving map display can show the weather, approach plates and TCAS information, gives good situational awareness. That's the biggest increase in capability from an IFR standpoint.'

Support systems

The enhanced ground proximity warning system has provided Angel One with extra support, because in situations where there is very little ambient light, such as in the evenings, it assists with pictorial displays and audio warnings.

The crew are working towards using NVGs in the near future, and the first S-76D will be certified for NVG use shortly.

In terms of other support mechanisms, Bailey said: 'The HUMS is very useful. We do all our inspections and maintenance internally. We are able to get a tremendous amount of information using the HUMS. We have six mechanics. All of them have gone through Sikorsky and FSI training.

'Five of the six are certified master maintenance technicians on the 76D. The ability of the HUMS to see trends and troubleshoot problems is excellent. If there is a problem with a component, there is no guessing about what needs to be replaced, which saves time and cuts down costs.'

Angel One and Sikorsky have a monthly conversation with the lead engineer for the S-76D programme, and the OEM's team also visits Angel One frequently.

'The S-76D was a natural progression for us,' Bailey stated. 'We went into the replacement process with an open mind. The safety and performance of the 76D made it an easy decision for us.' ■

Operators have commented that the S-76D is much quieter, with its newly designed composite rotor blades. (Photo: Dan Megna)

Life support

Reflection on market downturns and developments over the past year leaves an uncertain outlook for the year ahead in the rotorcraft MRO industry.

By Peter Donaldson

Despite the helicopter's inherent flexibility and the diversity of operations that it is uniquely capable of carrying out, low oil and gas prices are rarely good news, because they always hit exploration activity – an area that has historically been the largest source of demand for flying hours.

Coupled with weak economic growth on a global level throughout 2016, and what the International Monetary Fund calls 'a wide dispersion of possible outcomes' in its projections for the next couple of years, the result is a continuation of tough times for helicopter operators and maintenance, repair and overhaul (MRO) providers, both OEMs and the independents that depend on them.

This particular downturn has claimed some high-profile victims, evidenced by long-established operators CHC and Erickson filing for Chapter 11 bankruptcy protection in the US. In addition, Airbus Helicopters' CEO Guillaume Faury described 2016 as probably the most difficult year of the last decade for the rotorcraft industry as a whole.

In conditions such as these, strong product support is arguably even more important than it is in times of plenty, because it enables operators to respond quickly to any opportunities that do arise and to make the most of them.

Showing resilience

'The helicopter MRO market is resilient,' Dana Fiatarone, VP for commercial systems and services at Sikorsky, told *RH*. 'The oil and gas downturn has slowed the demand for new aircraft in some segments as well as the related requirement for MRO support; however, our customers continue to utilise our aircraft to meet their many mission requirements.

'That is why we continue to focus on, and invest in, providing world-class customer support, including continued aftermarket MRO support,' she said. 'In addition, we are seeing a number of our customers and others in industry modify, upgrade and reconfigure existing helicopters to fill demands in missions like

When economic times are tough, strong product support is arguably even more important. (Photo: Life Link III)

search and rescue operations, and that does provide opportunities to the helicopter MRO market.'

It has been a little over a year since the company launched two new customer support initiatives in the form of a commercial customer care centre in Trumbull, Connecticut, and a forward stocking location (FSL) in Stavanger, Norway, which supports one of the largest regional S-92 fleets.

Fiatarone is upbeat about the response to both. 'We're hearing positive feedback and seeing substantive results,' she said, commenting on the Trumbull facility. 'Sikorsky has significantly reduced the volume of AOG [aircraft on ground] events by 72% and reduced AOG turnaround time by 66%. At the same time, response time for routine and urgent orders has also improved.'

Fiatarone declared that Sikorsky was 'thrilled' with the performance of the Stavanger FSL, which is operated by Aviation Logistics: 'Since beginning operations to serve Scandinavia in September 2016, it has serviced more than 300 part requests with an average response time of less than one hour.'

She also told *RH* that Sikorsky is committed to positioning more of its aftermarket inventory within 12 hours of operational aircraft, using a number of forecasting methods and tools to find the best sites. 'We are constantly communicating with our customers to understand their needs and would most likely look to fleet-concentrated areas like the Gulf of Mexico or parts of Asia for future locations.'

The company also added to its MRO network in Asia, appointing UI Helicopter as an authorised customer support centre in South Korea in mid-February 2016.

Operators in Korea fly 14 S-76s on executive transport and utility missions, while the Republic of Korea Air Force flies three S-92s as executive transports. The Korea Coast Guard also operates one as an SAR machine and has a second on order that is due for delivery this year.

UI joins more than 20 Sikorsky customer support centres around the world and is one of the few approved to provide MRO services for both of the manufacturer's commercial types.

Long-term support agreements are another aspect of Sikorsky's strategy for coping with tough times. The company signed ten-year contracts in July with Bristow Helicopters and Babcock Mission Critical Services (formerly Bond Offshore Helicopters), covering the S-92 under the OEM's Total Assurance Program.

Both deals provide the operators with extended support for aftermarket material needs, enabling them to run their S-92 fleets within a known budget, reducing the risks associated with unexpected costs.

Furthermore, this type of contract provides a degree of predictability for both operators and MRO providers. Vector Aerospace, for example, owned since 2011 by Airbus Helicopters but still operating as an independent, signed a five-year deal with Canada-based Eagle Copters in February to repair, overhaul, test and modify power sections and combine gearboxes of Pratt & Whitney PT6T turboshafts for the Bell 212/412 aircraft that Eagle supports.

Seeking approval

Other manufacturers have also been expanding their support networks through agreements with independent providers. Leonardo, for example, appointed Textron subsidiary Able Engineering as an approved supplier for MRO and testing of dynamic components in June last year.

Based at Phoenix-Mesa Gateway Airport in Mesa, Arizona, the company provides FAA-approved component repair and overhaul services plus approved replacement parts to commercial and military aviation fleets in more than 60 countries.

Gabriel Massey, director of strategy at Able Engineering, outlined the company's approach to business in tough times. 'The success of the MRO market is directly linked to fleet activity. If operators don't fly, they don't need repairs,' he told *RH*.

'Our company is in a somewhat different position. Because we are focused on saving operators money – in a market where people are flying less – we provide value by delivering opportunities to safely cut costs.'

Being an approved MRO solutions provider has been Able's model since its inception in 1982, Massey said, describing the company's mission to safely reduce

HCare Smart offers 'by the hour' contracts with lower minimum hour stipulations. (Photo: Airbus Helicopters)

aircraft operating costs by providing resourceful component repair and overhaul services and approved replacement parts.

'Because of this, we have numerous approvals from multiple OEMs,' he said. 'In the case of Leonardo, we have enjoyed a very positive working relationship for years, but any time we sign formal approval agreements, as we did with Leonardo last year, it is a welcome and positive event.'

'Many customers only work with approved OEM providers, so this official designation gives us the credibility that a lot of companies are looking for. It opens up access to a new segment of the customer market and can quickly accelerate our new client relationships,' Massey elaborated.

While Able is authorised to support all Leonardo types, it is actively supporting the AW109, 119 and 139 models.

Safety-critical life-limited components in rotor and transmission systems tend to be the most demanding to work on, thanks to their complex design and common use of exotic materials, such as superalloys, that require advanced processes and controls. This means the company has to carry out more engineering analysis to support repairs with greater FAA oversight.

The company's established specialisation in the aftermarket sector has enabled it ▶

to build up the resources it needs to take these tasks on, including a staff of more than 400, with hundreds of mechanics, more than 40 engineers and designated engineering representative specialists and an extensive range of test equipment and services, a combination which allows Able to complete 99% of jobs in-house, according to Massey.

In-house capabilities include electroplating, chemical processing, machining, grinding, non-destructive testing, hydraulics, bearings services and painting. The company works to airworthiness standards from a wide range of authorities around the world, including the FAA, EASA, CAAC, JCAB, DCAT, ANAC and the Brazilian Navy.

'For Leonardo, we've invested heavily in expendable replacement parts, particularly for the parts we repair for the AW139, and continue to invest in – and expand on – our pool of rotable components,' Massey said.

'Across all of our supported products, we are constantly investing in authorised tooling, a large catalogue of expanded repairs and the continued education and training of our mechanics. We are also continually developing new supplier relationships to streamline and improve our parts manufacturing process.'

Core business focus

Massey noted that a growing number of operators are focusing on what they do best and as such are beginning to view in-house maintenance as a secondary business, a trend he expects to see continue.

'This is a great window of opportunity for a company like Able to prove that shifting maintenance and repair to a trusted outsource partner can save them money while maintaining – and often exceeding – their safety and performance expectations. We see this as one of the most significant market changes in the foreseeable future.'

Further additions to Leonardo's MRO network supporting the AW139 came later in the year, with RUAG Aviation named an authorised service centre for the type on 28 November, and CHC subsidiary Heli-One Poland receiving EASA approval for base maintenance on 6 December.

RUAG's sites at Sion and Lugano in Switzerland are both approved to work on the type, providing airframe and component MRO, cockpit and cabin upgrades, refurbishments and painting, as well as warranty-plus support and consulting services.

Able Engineering in Mesa, Arizona, is authorised to support all Leonardo types. (Photo: Dana Warr)

The company also supports other Leonardo types as well as machines built by Airbus, Bell, MD and Sikorsky, and several fixed-wing aircraft manufacturers. In addition to MRO services, RUAG lists upgrades and the development, manufacturing and integration of subsystems among its core competencies.

Since its opening in 2014, Heli-One Poland's 6,040sq m Rzeszow facility – in the heart of Poland's 'aviation valley' – has evolved to provide base maintenance support for Airbus's AS332, H225 and H135 types, with the AW139 as the newest addition.

Offerings include all levels of inspections, checks, testing and re-certification, full structural support, corrosion removal and repair, minor and major structural repairs and modifications, non-destructive testing, painting, upgrades, service bulletin compliance, fault diagnosis, vibration evaluation and modification and repairs to avionics. Services specific to the AW139 include exhaust duct repairs and tail assembly modifications.

Independents too are adding extra types to their portfolios to attract more business from the healthier sectors of the market. Lithuania's Helisota, for example, which is well known as an MRO provider for Russian Helicopters' Mil Mi-8 and Mi-17 types and the Robinson range, added Airbus's H120, H135 and H145 to its EASA Part 145 certificate at the end of March. This enabled the company to begin providing both base and line maintenance support for private and government operators of these types, which are widely used in the private and parapublic sectors.

International coverage

Bell Helicopter, which continues to win awards for its product support, has built on its capabilities in Europe, with the completion of three EMS-configured Model 429s for Slovakian operator Air Transport Europe, announced on 25 January 2017. The aircraft are the first to emerge from Bell's facility in Prague, which the company refers to as the official regional customisation, delivery and aftermarket service centre for Europe.

Working with the rest of Bell's regional network, it also provides full MRO capabilities in a sector of the helicopter market that remains healthy and growing, thanks in part to the development of new types, according to the company's regional director for Europe and Russia, Jakub Hoda.

'Establishing the Bell Helicopter facility in Prague lends to our anticipation of further market growth, in addition to the introduction of the new Bell 505 and Bell 525. With this growth, we intend to have the people, products and facilities necessary to continue to win in the region and support our growing footprint,' he said.

Much of the growth has come in the parapublic and EMS sector. The company reports increased demand for the 429, 407GXP and 412EPI throughout the region.

Earlier in January, Bell announced progress on its Customer Advantage Plan

(CAP), which was launched in March 2016, a year which also saw the addition of four service centres around the world.

Guaranteeing fixed maintenance costs per flight hour, CAPs come in Standard and Premier varieties, respectively covering the helicopter's basic configuration and optional coverage of non-standard kits. Other benefits include preferential rates for aircraft serviced by any of the more than 100 Bell customer service facilities, streamlined budgeting and better financing terms, protecting an aircraft's residual value. Buy-ins have been eliminated for select premier fleet customers, and the plans are transferable to the new owner when the aircraft is sold.

So far, CAP has attracted customers in Asia-Pacific, Europe, Latin America and North America, with fleets of varying sizes in mission areas such as EMS, corporate/VIP and oil and gas.

The new service facilities are located in Australia, China, Egypt and Turkey: Eagle Copters Australasia in Coffs Harbour, New South Wales; Zhenjiang Aerochine Aviation in Zhenjiang City; Petroleum Air Services in Nasr City, near Cairo; and Genel Havacilik in Istanbul, respectively.

In May 2016, Bell reported MRO business growth in the Asia-Pacific region following completion of 5,000-hour inspections on a pair of 412EPs at Seletar Aerospace Park, Singapore, for a customer in Australia. Speaking at the time, general manager Mike Greene said that the service centre continues to drive growth in heavy MRO for customers throughout the region.

In addition to MRO, the facility provides refurbishment and customisation services, new aircraft deliveries, spares distribution and maintenance training within the region, with certifications from Australia's CASA, Indonesia's DGCA, the Philippines' CAAP, Singapore's CAAS, Thailand's DGCA and more in the pipeline.

Product support

Airbus enhanced its HCare material support packages last March with what the company describes as a simplified and reshaped offering that is tuned in to the expectations of operators of light single-engine aircraft and light twins.

The Easy Repair scheme, for example, guarantees turnaround times on 800-plus components, while HCare Smart offers 'by the hour' contracts with lower minimum hour stipulations and bigger discounts during the warranty period. Other attractions include removal of the buy-in requirement for single-engine aircraft, flexible buy-in options for light twins and availability support for fleets of more than ten aircraft. The enhanced HCare contracts include binding performance commitments on Airbus.

Around the same time, MD Helicopters launched new customer support portal MyMD.Aero, which the company describes as a user-driven, web-based network designed to modernise and improve maintenance planning, parts availability and communication for all its operators.

Poland's 'aviation valley' has evolved to provide base maintenance support for Airbus's AS332, H225 and H135 types, amongst other models. (Photo: Airbus Helicopters)

The membership-based service is free to join for all MD helicopter owners, operators and authorised service centres and distributors. Accessible from mobile and desktop devices around the world, it is designed to provide real-time access to essential fleet performance data.

This is part of a raft of efforts the company has been making to improve its product support, work which was rewarded in June by improved customer satisfaction due to availability and cost of parts, response to AOG and general quality of service, as measured in an independent survey.

'Compared to 2015, we have seen a 34% increase in 24-hour response time for reported AOGs,' said Nick Nenadovic, VP of aftermarket and customer support at MD Helicopters.

Among the company's longer-term efforts is its deal with Sapura Aero in Kuala Lumpur. Initially, Sapura is to act as an authorised independent sales representative of MD's commercial range along with optional equipment and accessories, serving Brunei, Cambodia, East Timor, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam. Sapura Aero is also to provide aircraft handling, hangarage, aircraft management and aircraft charter services.

MD Helicopters' CEO Lynn Tilton expects the deal to accelerate development of what she described as a robust and self-sustaining commercial rotorcraft market in the region. A key element of this will be a regional MRO and training hub, according to managing director of Sapura Aero, Shahriman Shamsuddin.

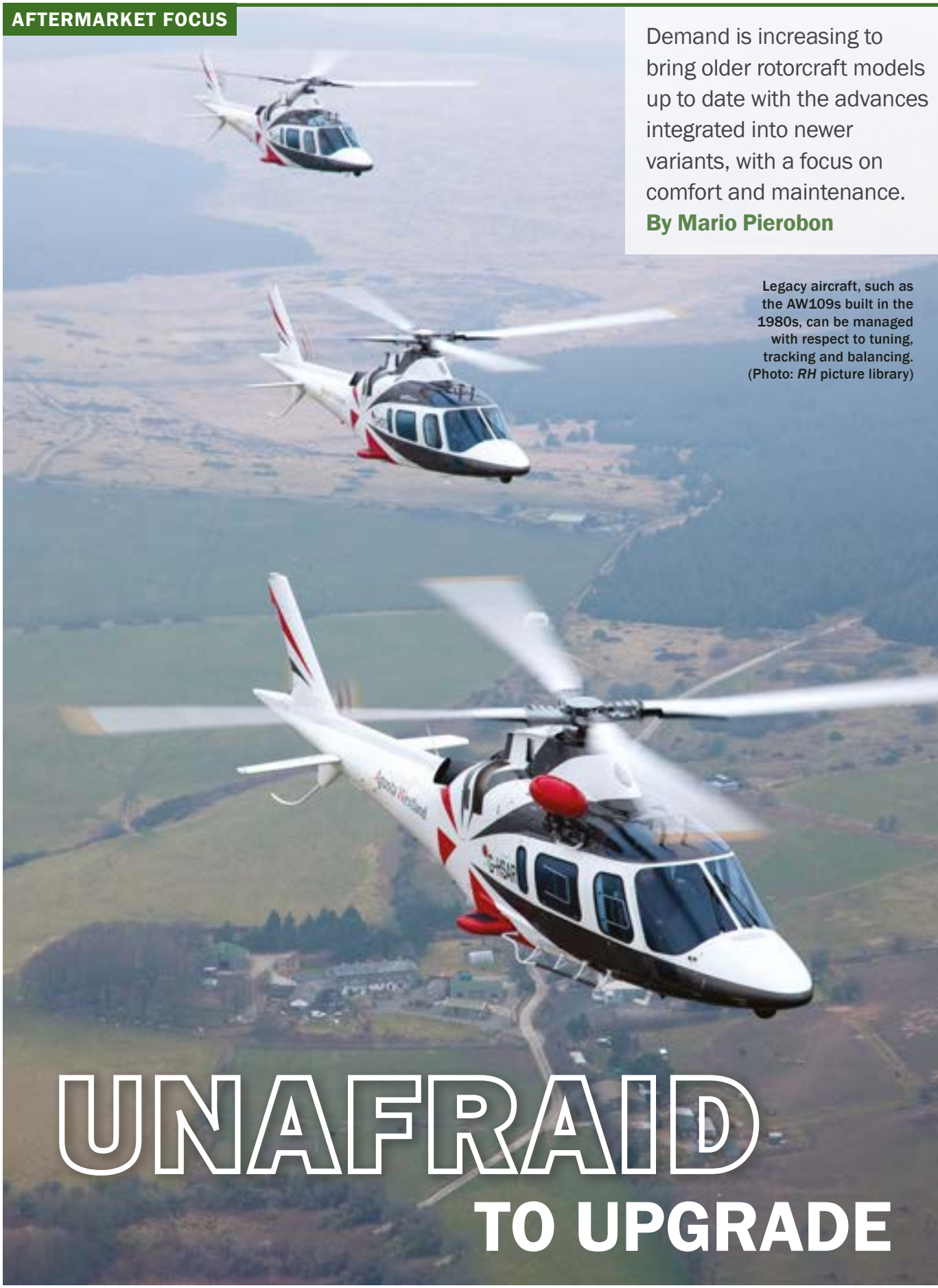
As Danish politician Karl Kristian Steinke and various other luminaries have said, it is difficult to make predictions, especially about the future. Like any other business, MRO providers must be prepared.

'We do not expect there to be significant change looking forward in 2017, and it is difficult to speculate how the helicopter MRO market will react and reposition itself during this market downturn,' Fiatarone concluded. 'In the interim, we will continue to focus on providing our customers with the support they need. Our goal is to ensure that when our customer has a mission to fly, their Sikorsky aircraft is able to fly that mission.' ■

UNAFRAID TO UPGRADE

Demand is increasing to bring older rotorcraft models up to date with the advances integrated into newer variants, with a focus on comfort and maintenance.

By Mario Pierobon



Legacy aircraft, such as the AW109s built in the 1980s, can be managed with respect to tuning, tracking and balancing. (Photo: *RH* picture library)

The installation of ELTs has become standard practice, through retrofitting or even designing components. (Photo: *RH* picture library)

Continuous improvement is one of the most commonly used, perhaps also often abused, business management principles of the 21st century. In the helicopter sector, this is achieved by means of aircraft retrofitting, to keep up with ever-advancing technologies.

Indeed, latest-generation rotorcraft models feature equipment that was not available when earlier versions were manufactured, such as significantly improved avionics and impact-absorbing structures, and meet crashworthiness criteria that did not exist before.

Fabrizio Segre, quality manager and airworthiness review staff at helicopter maintenance organisation Euroavia, spoke to *RH* about these changes. 'The [Leonardo Helicopters] AW109SP, as compared with the AW109S, has significantly more advanced avionics installations coming out directly from the assembly lines. However, there is not really a significant deal of avionics upgrades on older aircraft.'

There is therefore a tendency in the aftersales domain – and there are certainly recommendations from manufacturers – to upgrade earlier variants.

Bad vibrations

One of the main requirements of helicopter operators in the corporate and business domain is passenger comfort. Aircraft transportation requires a considerable financial outlay, particularly over short distances where ground vehicles are often an option.

Therefore, maximum comfort is of the utmost importance and correlates with the level of vibration experienced by passengers.

'In helicopters, there is the physiological problem associated with the considerable number of vibration harmonics induced by the transmission of the... rigid – no longer articulated – rotors that now have constant use and... have led to a technological leap forward by significantly improving and simplifying maintenance and design,' Segre said.

'We have far fewer mechanical components such as bearings that are mostly rigid and base their functionality (flapping and tilting) upon the flexibility of the materials. By contrast, however, these types of rotors, together with the use of construction technologies that make use of composites, have caused a step back with regard to vibrations.'

Legacy aircraft, such as the AW109s built in the 1980s, can be managed with respect to tuning, tracking and balancing, because they have a fully articulated rotor with metal bearings.

However, latest-generation helicopters incorporate significant structural upgrades – rigid rotors and composite materials – so are 'characterised by a higher level of randomness with respect to vibration responses', according to Segre.

'Paradoxically, these helicopters are more critical when it comes to vibrations; a certain amount of roughness on a rigid-rotor helicopter is nearly physiological, whereas a fully articulated rotor is smoother, more linear and therefore provides more comfort,' he noted.

'The issue of roughness induced by rigid rotors holds true particularly on the latest generation of aircraft such as the AW109SP GrandNew, which has a composite structure and whose level of vibration can be quite severe, more than on aluminium structures.'

The mast vibration absorber (MVA) kit is an aerodynamic cover that is placed on top of the rotor and does not have artificially generated motion. It is fitted by default on new helicopters and is increasingly being retrofitted to older machines.

There are also vibrating masses installed on the fuselage (on the AW109SP these are on the nose and under the rear passenger seat row) which move in antiphase, freely excited by the vibrational harmonics that enter into the structure from various sources: the main rotor, transmission, tail rotor, etc.

'The MVA moves against the vibrations emerging from the rotor and it tends to reduce the high-frequency vibrations, which are the ones that are mostly perceived by the occupants of the aircraft, especially in the front,' Segre explained.

'This intervention is made to bring the cruise level of comfort in line with available technologies and the expectation of helicopter passengers: for example, a customer paying several thousand Euros for a one-hour flight at 160kt demands that at that speed the helicopter flies smoothly and the overall experience is a comfortable one,' he said.

He noted that high-frequency vibrations in the range of 5-8Hz can slip into the harmonics, which results in a slight vibration after a few minutes of flying, rendering the experience very uncomfortable. Therefore, 'there is indeed a trend to add solutions that improve comfort for the structural technological improvements that modern helicopters feature', he added.

Among the other systems and modifications that are often requested for retrofitting are active vibration (noise) absorbers, which are integrated into newer platforms. According to Segre, this includes the introduction of passenger and pilot headset kits that provide for active ►

noise absorption to alleviate noise and high-frequency roughness during flight.

He also discussed the installation of flotation kits, which are often requested as a consequence of regulations for aircraft flying over the sea, as well as in light of mandatory requirements laid out by certain heliports and airports.

'As an example, the heliport of Monte Carlo constantly requires pretty much all helicopters in the corporate or executive category [to] be equipped with the [flotation] kits in order to have access to the heliport,' Segre explained.

Furthermore, on some legacy and single-engine aircraft, the installation of emergency locator transmitters (ELTs) has become standard practice, through retrofitting or even designing components from scratch, as in the case of the Bell 206 JetRanger.

It is becoming possible to customise maintenance downtimes for helicopters on a case-by-case basis. (Photo: Airbus Helicopters)

Improving performance

In the domain of aerial work, the 'pitch change tail rotor' system is a new modification that improves reliability of the tail rotor pitch rod and simplifies its maintenance. This comes as standard on the latest versions of the Airbus Helicopters AS350 B3 and is treated as optional on older versions.

Lorenzo De Stefani, maintenance manager at helicopter operator and maintenance organisation Elitellina, commented on the material replacement process: 'In the older versions, there are some ball heads which act as rotating bearings; these have some balls within them where a bolt passes through. Externally, there is a Teflon part which acts as a hub.

'In the latest versions, this mechanical element is substituted by an elastomeric one which is oversized compared with the piston rod with the ball bearing, but significantly performs more in terms of wear per hour,' he said.

De Stefani explained that the purpose of such upgrades is to reduce maintenance and ensure a longer service life for each component. He went on to say that there has been noticeably improved performance of the parts, in terms of wear, on board a new helicopter that has reached 600 flying hours over four months.

'The parts concerned are ball bearings which are normally to be replaced once you reach the 600h target. The new parts instead have no wear at all even though they have passed the 600h threshold. We have upgraded [an] older helicopter with this new type of pitch change tail rotor because we have assessed it is a worthwhile upgrade in terms of performance benefits,' he stated.

With regard to the AS350 B3, which has not presented many upgrade opportunities, there have been some modifications to the hydraulic pump. De Stefani noted that the aircraft is equipped with only one hydraulic system and therefore this area required special attention. 'There are optional bulletins [which] are associated with the need to provide more safety, greater performance and less stress with respect to the holding capacity of the pump.'

Interval inspections

Upgrades requested by helicopter operators and carried out by approved maintenance organisations are taking place in the context of new concepts that are nearing a critical mass in helicopter maintenance and allowing for a more flexible use of aircraft.

'An evolution being witnessed in the field of helicopter maintenance technology is that we are slowly progressing from the old philosophy of maintenance programmes with scheduled and cyclical inspections towards an evolution that mirrors that of aeroplane maintenance,' Segre said.

He explained that helicopter downtime is now being scheduled in accordance with inspection tasks with specific deadlines. Moreover, fleets are no longer inspected once a certain number of flying hours are achieved. Instead, it is becoming more commonplace for a series of inspection tasks to be performed at a variety of intervals.

Segre noted that it will consequently become possible to customise downtimes to each helicopter on a case-by-case basis. 'Even within old aircraft maintenance programmes, there were the two options of progressive or prolonged maintenance. There were already options for choosing when and how to stop a helicopter, at which intervals and for how long. We are going beyond this and we are approaching the same task-based aircraft maintenance philosophies of aeroplanes.

'Every task has its own deadline and the downtimes are planned by clustering the tasks of interest based on the accessibility points – the locations where the helicopter is operating. The end result is indeed a more flexible use of the helicopter. This trend is sustained in particular by very modern helicopters like the [Leonardo Helicopters] AW139 and the AW169,' Segre explained.

A wealth of upgrade opportunities are available to operators of older helicopter models, through which real continuous improvement can be achieved, providing for greater passenger comfort, compliance with operational and installation requirements, increased reliability and simplified maintenance. ■

Peter Lewis, CEO of Alpine Air Support, offers some industry insight into the process of finalising helicopter part price lists.

The price is right

You would probably fall off your purchasing manager's chair if you really knew how much helicopter spare parts actually cost, and that would not be because they are too cheap. The material and labour costs associated with the physical part you are trying to procure are only part of a complex myriad of factors that OEMs have to incorporate into their final catalogue price.

Research, testing and development costs are normally the highest and the toughest figure to pin down. To recuperate them requires a considerable final mark-up factor. If an item is made as part of a speculative bid rather than for an in-house order, then the risk factor is much higher.

Material and labour costs are then taken into account, including tooling for each item. Finally, market placement strategy will impact sales price levels. This covers the consideration of your long-term targets and desired profits as well as competitor pricing.

Potential variations

There are at least four potential sales prices.

First, there is the price point at which an OEM sells a part to a helicopter manufacturer for its production lines. This figure is the lowest on the scale, probably somewhere in the region of 25% of the regular list price, as a guide.

Consider it to be like putting your corporate logo on the side of a racing car: it costs a fortune, but you hope to at least recover these costs when you start selling to the aftermarket after a few years.

Secondly, a price is set for a helicopter OEM to buy for its spare parts pool. Now, you are probably thinking the same as everyone else: why don't the helicopter OEMs just buy everything at production cost and save a fortune?

> *"Research, testing and development costs are normally the highest and the toughest figure to pin down."*

Well, it is not unheard of. In fact, it is simple commercial prowess to do exactly that – I have only ever met a couple of equipment OEMs that insisted on tying up sales of their production units with actual helicopter serial numbers to ensure that the numbers matched.

There is also a separate spare part price for authorised distributors or agents, who are probably under a commercial agreement to hit specific turnover and targets over a given period. This is frequently done when an OEM does not have a specific aftermarket sales department with networked or international customers.

The last price is the OEM's actual spare parts catalogue price. If none of the above three apply to you, then you pay what is generally considered to be the 'full', or 'regular', list price.

Tricky exceptions

That seems all nice and clear-cut, but what is happening these days, especially in Europe, is that many helicopter manufacturers are insisting that OEMs sign commercial agreements to ensure sole purchasing rights.

This step kills the aftermarket in one fair swoop (see Collective Pitch, *RH* Apr-May 2016). Without the ability of recouping all their R&D costs which have accumulated over the years, the effective sales price is exponentially increased based on some loose 'guesstimate' that attempts to predict how many specific helicopters will be sold over the production period.

Pitch too low at the outset and you are on a hiding to nothing, bid too high and no work. It needs a little smoke and mirrors to ensure that you get your product onto the helicopter in the first place.

There are also helicopter manufacturers' own spare parts, meaning parts that they actually produce, rather than outsourcing and then just assembling them on the production line.

Airframe panels and fuselage structure parts are usually made in-house, and the cost of making spares for unknown future usage is a valid cost point that they normally have to bear without the luxury of having someone specifically paying for them. ■

The editor welcomes *RH* reader contributions for consideration on the Collective Pitch page. Submissions should be in the region of 750 words and offer comment and reflection on a particular issue affecting the civil helicopter industry. *RH* reserves the right to edit copy for style, length or legal reasons.

- Flight Crews
- Procedures
- Equipment
- Aircraft & Operations Management

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