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CONTENTS

Volume 6 Number 6
December 2012 – January 2013

Comment 3

News 4

- Avicopter displays rotorcraft concepts
- PHI Air Medical prepares for Saudi operations
- Bell appeals FAA decision on 429 weight increase
- AgustaWestland launches new Koala variant
- OEMs forecast Chinese helicopter boom

Platform for Industry: 8

Joining the rotary club

Entering the market in dramatic style, Lease Corporation International has placed a significant order for helicopters that it hopes will attract the attention of a number of operators. *RotorHub* spoke to CEO Michael Platt about his company's new business venture.

Leasing: Lending a hand 13

Calling on the services of helicopter leasing companies appears to be an increasingly popular option for operators looking to break out of current financial constraints. *RotorHub* talked to several industry figures about the pros and cons.

Type Focus: Second coming 17

Utilising experience from the development of the military Ka-60, Kamov's Ka-62 has been designed from the outset to meet the needs of demanding civil and parapublic customers at home and abroad. *RotorHub* provides a programme update.

Satellite communications: Star quality 20

Future data services are promising some exciting new capabilities for rotorcraft. *RotorHub* considers what next-generation satellite communications will bring to helicopter operations.

34



SAR: Mix or match? 24

Operating with a fleet mix or single type both present contrasting advantages in the SAR world. OEMs are now looking to greater design commonality as a suitable compromise while pitching their bids for future contracts.

MRO: Talking shop 29

What are the key factors an operator should consider when selecting an MRO provider? *RotorHub* canvasses industry opinion.

HUMS: Bad vibrations 34

With inconsistent results and some very public failures, the value of onboard HUMS in its current form is being called into question. *RotorHub* explores the new breed of systems that could change this.

Rotorcraft Guide (part 32) 39

From Harbin (Avicopter) HC120 to Hesa/SAIRC 278

Collective Pitch 40

The future of the Norwegian offshore helicopter market is looking bright and ready for a new operator, according to Bjørn Veum Seljevold, chairman and managing director of Norsk Helikopterservice.



Cover story 24

SAR fleet commonality is being highlighted as a significant theme for OEMs pitching for future contracts. (Photo: Sikorsky)

8



20



24



29



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ROTORHUB

THE HUB OF THE HELICOPTER BUSINESS

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Money talks

One truism known by fans of cheesy television police dramas and the Watergate scandal alike is that to solve any mystery, it is often a case of simply 'following the money'.

There is little secrecy where the smart money is currently being invested in the civil helicopter sector, with OEMs, operators and financial providers eyeing the expansion in oil and gas activities around the world.

For example, on 3 December the US Export-Import Bank announced it would guarantee financing to support the export of American-built AW139s to Brazil. The helicopters are being purchased by Omni

Helicopters International to be operated by its subsidiary Omni Taxi Aéreo on transportation contracts with Petrobras, which operates deep-water drilling rigs off the Brazilian coast.

RotorHub has previously reported on a requirement for 80-90 additional medium/heavy helicopters in the next seven to eight years to support Petrobras' planned expansion in the region.

Such developments have also caught the interest of two of the helicopter leasing specialists interviewed in this issue - Lease Corporation International (LCI) and Milestone Aviation.

In looking at the leasing sector and the recent growth of these companies, the headline figures speak for themselves. After raising \$540 million in equity upon its inception, Milestone closed on a series of debt facilities totalling \$400 million this year. Such funding has gone into the purchase of 16 EC225s and 22 S-92s in 2012, as the company looks to support the oil and gas industry.

'I don't want to overstate the role we have played, but we have put \$1 billion of liquidity into the rotary market, and you have to think that that will have played a supporting role in the growth of the industry,' Milestone's MD Robert Dranitzke told *RH*. 'Now, the main drivers are going to be the demand we see from the oil and gas industry and the continuing good work that helicopters can do in other sectors, which is only going to increase demand, whether it is in EMS or SAR.'

LCI takes a similar approach to Milestone, and its CEO Mike Platt is the focus of our Platform for Industry feature in this issue. In February, the company announced its entry into the market, with the signing of a \$400 million agreement for a fleet of AW139, AW169 and AW189 helicopters.

Both companies have developed a strategy of long-term partnerships with operators and spent a large amount of time working to identify the growth areas of the market.

The leasing option is nothing new for civil helicopter operators, as pointed out by the chairman of HAI's finance and leasing committee Chuck McGuire. 'When people are looking at leasing versus financing, I don't think Milestone or these other types of companies have necessarily converted them to consider leasing,' he observed.

'I just think they have more sources to talk to, and that competition is wonderful as it allows the operator to optimise his structure, whether it be lower monthly payments, better return conditions or a lower security deposit.'

He continued: 'My personal opinion is leasing has always been a mainstay of the industry - it has been for 30 years - but you have new interest in the leasing business, which certainly creates interest and they also take away business from other leasing companies that are complacent, no longer competitive and maybe have a different price structure.'

Indeed, many financial institutions simply lump rotary-wing operations into the same category as corporate or business aviation and miss the complexities and multifunctional nature of helicopters that genuinely do 'work for a living'.

In this context, the entry of specialist leasing companies, which are raking up the air miles getting out and talking directly to the operators, can only be good news for the industry and a strong hint towards future growth.

On a separate note, this is the first issue of *RH* compiled without the assistance of Deputy Editor Tony Osborne, who has moved on to another challenge.

Tony has been a driving force of the magazine for the past five years, with a real passion for the civil helicopter industry, and everyone here wishes him well with his new venture.

Tony Skinner, Editor

NEXT ISSUE

- ◆ Communications
- ◆ Composites & structures
- ◆ Australasia focus
- ◆ Fire-fighting

Avicopter displays rotorcraft concepts



Photo: author

Chinese helicopter manufacturer

Avicopter gave a glimpse into its level of ambition in November with the unveiling of three high-speed rotorcraft designs at Airshow China in Zhuhai.

Alongside its more established product family, the company showcased models of the new designs, which each have elements in common with similar concepts under development in the US.

The Avant-Courier 1 features a co-axial main rotor configuration with a tricycle landing gear arrangement, and appears to be a single-engine design.

Two versions were evident – the model on display featured side-mounted propellers for thrust, while information boards showed a version with a rear-mounted propeller in a similar configuration to the S-97 Raider that Sikorsky is developing for the US Army's Armed Aerial Scout requirement, as well as the Future Vertical Lift project. Like that concept, the Avant-Courier 1 is designed to transition to high speeds by moving power from the co-axial main rotors to the thrust propellers.

The Platypus high-speed twin-engined aircraft (pictured) also bears more than a passing similarity to a Western design, in this case the DiscRotor compound helicopter under development by the Defense Advanced Research Projects Agency. It features an aft-swept wing and a mid-fuselage disc with extendable rotor blades, enabling it to take-off and land like a rotorcraft. Transition from helicopter to full fixed-wing flight is achieved by fully retracting the blades within the disc.

The Bateleur, meanwhile, is perhaps the most radical of the three designs,

featuring a transverse rotor layout, with two pairs of rigid main rotor blades mounted symmetrically on each side, rotating in reserve to counter torque. Mounted at the rear of each engine nacelle is a pusher propeller to provide thrust.

Avicopter also displayed models of its current product family, from the ultra-light AC310 to the 13t AC313. During the show, the company revealed that the AC311 light helicopter had been granted its type certification by the Civil Aviation Administration of China in June.

The 2t single-turbine machine is powered by one Honeywell LTS101-700D-2 engine, giving the aircraft an MTOW of 2,200kg and a cruise speed of 130kts. It can also be powered by a licence-produced Turbomeca Arriel 2B1A (WZ-8D) engine.

It was also confirmed that Avicopter has delivered the initial AC301 (Z-11) to the China Marine Surveillance Corps in September, while the first AC301 was shipped to Argentina in July.

By Tony Skinner, Zhuhai

PHi Air Medical prepares for Saudi operations

PHi Air Medical is set to begin its

first operations for the Saudi Red Crescent Authority (SRCA) by the end of the year.

The company was awarded a contract in April to provide EMS services, as well as support, maintenance and training of crews, with eight helicopters across Saudi Arabia.

'This is PHi Air Medical's first foray into EMS operations outside the US, but we are certainly interested in other opportunities in the region,' explained Paul Julander, director of traditional programmes at the company, speaking to *RotorHub* at the Dubai Helishow.

The contract will use Saudi-owned Bell 412 helicopters, and the



PHi already uses a mix of Bell 407s (pictured) and EC135s for EMS operations in the US. (Photo: Bell Helicopter)

programme further adds to EMS cover already put in place by the SRCA. The first PHi Air Medical contract aircraft will go into service in Ha'il Province, north of the country's capital Riyadh.

As well operating the aircraft, the company will also train the clinical personnel who fly on them, which means that missions will be flown with one Saudi and one PHi employee,

working together to provide medical treatment.

While its oil and gas operations are international, the contract is the first such programme for the Air Medical division. The organisation uses a mix of single-engined Bell 407s and twin-engined EC135s on EMS operations around the US. A handful of specially equipped Sikorsky S-76s are also in use.

According to the SRCA, the project to boost air ambulance provision is the fifth phase in a wider plan to enhance EMS across the region. Part of the new agreement sees the establishment of helipads in Makkah, Madinah, Riyadh, Jeddah, Qassim and Ha'il.

By Tony Osborne, Dubai

Bell appeals FAA decision on 429 weight increase

Bell Helicopter has formally appealed against the US FAA's decision to deny its request to permit an increase in the maximum gross weight (MGW) of the Bell 429 from 3,175kg to 3,400kg.

At Airshow China in Zhuhai, the company made the 429 the centrepiece of its display, alongside the new Bell 407GX – both in corporate configuration.

Speaking to the press on 14 November, Bell president and CEO John Garrison highlighted that the Civil Aviation Administration of China had approved the increased MGW of the aircraft, following the decision of 11 other countries to do likewise.

However, the FAA announced in August it was denying the exemption due to being concerned about setting a precedent with such a decision, and pointed out that an aircraft's gross weight is an 'early design consideration'.

Garrison argued the increase was due to demand from operators, noting that the exemption was denied for competitive reasons rather than any underlying safety concerns.

'We have had tremendous success in the countries that have given the weight increase approval for the 429 because it allows operators to use the full capacity of the aircraft, which usually means increased fuel for the most part,' he

explained. 'That allows operators to use the IFR capability, the range, the fuel reserves, and overall increase the safety of the aircraft.'

Garrison said the company had now submitted a petition for redress with the FAA, and was also 'working multiple channels' across the agency to have it re-evaluate the decision, 'which they are doing'.

He added: 'The FAA is also working with Transport Canada and the EASA to harmonise some of the requirements going forward. So we are aggressively pursuing FAA and EASA to increase the weight of the 429.'

By Tony Skinner, Zhuhai



AgustaWestland launches new Koala variant

The AW119Kx features the Garmin G1000H with new avionics and pilot aids. (Photo: AgustaWestland)

AgustaWestland has unveiled a new variant of its single-engined AW119 Koala family. The AW119Kx was debuted at the Air Medical Transport Conference in Seattle on 22 October. The new aircraft is fitted with the Garmin G1000H flight deck, new avionics and pilot aids, including synthetic vision systems, a moving map, as well as a terrain and obstacle avoidance system.

The upgrade was incorporated in an order for 15 aircraft by the Life Flight Network, signed at Heli-Expo in Dallas in

February. The system, previously known as the 'Next Generation Cockpit Display', was ordered to give the company's aircraft an all-weather capability ready for when they begin operations in 2013 across Oregon, Washington and Idaho.

Michael Griffiths, CEO of Life Flight Network, said: 'We were looking for a helicopter designed to provide exceptional speed and performance, proven safety and a fully equipped medical cabin, supporting up to two patients. Our new AW119Kx helicopters

met our high standards and will greatly support Life Flight Network's life-saving mission.'

AgustaWestland says the new avionics are also optimised for diagnostics and data analysis for maintenance purposes. The AW119Kx EMS configuration will include night vision imaging system lighting and allow use of NVGs.

Certification of the AW119Kx is scheduled for the first quarter of 2013.

By Tony Osborne, Washington, DC

NEWS on the WEB

FRESH AIR VENT KITS APPROVED FOR EC130
30 November 2012

STARSPEED ORDERS NEW AW169 HELICOPTER
29 November 2012

SELEX GALILEO ANNOUNCES NEW SIMULATION CONTRACTS
26 November

SEVEN AW139s FOR SWEDISH MARITIME ADMINISTRATION
20 November 2012

NEW AW139 FOR BEIJING'S PUBLIC SECURITY BUREAU
15 November 2012

SIKORSKY INCREASES PRESENCE IN CHINA
14 November 2012

NHV HELICOPTERS ANNOUNCES EUROCOPTER ORDER
13 November 2012

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7 November 2012

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6 November 2012

MICROTURBO E-APU60 REACHES TESTING MILESTONE
30 October 2012



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OEMs forecast Chinese helicopter boom



Bell Helicopter sold two Model 429s during Airshow China. (Photo: author)

Western manufacturers continue to eye China's civil helicopter market in anticipation of an 'explosion' of new sales, following the reforms shown in the government's current five-year plan.

Expectations are being fuelled both by the promise of progressive reform of the country's low-altitude airspace – currently controlled by the military – as well as the rapid pace of economic expansion. The fastest growing city in the world, Shanghai, now has more than 90 dollar billionaires and 370,000 millionaires.

Unsurprisingly then, all the major helicopter manufacturers had a significant presence at Airshow China in November.

Eurocopter, which claims a 40-50% share of civil rotorcraft currently in service in China, is estimating a market worth \$3.3 billion over the next five years. In 2011, the company sold 15 helicopters to private users, and expects this year to reach similar levels.

Other sectors are also seeing an increase in helicopter usage, including oil and gas, SAR and public services, particularly power line maintenance. There is also a recognised shortage of training helicopters, pilots and technicians.

'Our assessment is that from 300 [helicopters] today, we believe there will be 500 in 2015, and our expectation is that China will be at 1,000 in 2020, which is still ten times less than the US,' Dominique Maudet, executive VP of Eurocopter's global business and services division, said during the show.

'I don't think China will develop, economically speaking, without this change. It is a consistent package for how a country can reach a level of development – this has been observed in other areas of the world.'

Eurocopter is currently in competition with Sikorsky for an eight medium helicopter requirement by China Rescue and Salvage, which already operates S-76C+ and C++ aircraft and four EC225s and is considering additional S-76s or the AS365 N3 Dauphin for the order.

Sikorsky used the show to announce the sale of its first S-76D into China, with Ruili Jingcheng Group buying one example, as well as an S-92, in the first sale of that type to a private Chinese operator. The company also formally signed a contract with Zhuhai Helicopter Company (ZHC) for two S-92s.

After deliveries in 2013, ZHC will operate five S-92s and 12 S-76s, making it the largest Sikorsky

commercial fleet operator in Asia, up from seven aircraft in 2006. The manufacturer argues that with 31 S-76 helicopters of various configurations flying in China, the aircraft occupies a leading share of more than 40% of the intermediate market segment (3,175-6,800kg gross weight).

Bell Helicopter, for its part, claimed to have 24 of its aircraft operating across China at the start of 2012, and expects this number to double by the end of the year. The company signed agreements with six different operators during the show for a range of aircraft,

including two Bell 206L-4s, two 429s and 11 407GXs.

At a press conference, CEO John Garrison noted that it did not have a formal agreement with the state-owned Avicopter, preferring instead to 'build from the ground up'.

Bell has appointed Shanghai Kingwing General Aviation as an authorised customer service facility (CSF), which will allow the eastern China-based organisation to perform field maintenance on the 429.

The company also gave authorised CSF status to H&P General Aviation Service in Guangzhou province for work on the Bell 407, and signed an MoU during the air show with Guangzhou Civil Aviation College for the establishment of a maintenance training facility for Bell 206L and 407 helicopters. Such developments reflect moves by other OEMs looking to increase their footprint across the country.

Despite cynicism in some quarters about the pace of airspace reform and possible advantages that may be afforded to domestic OEM Avicopter once the skies are open to private aviation, Western manufacturers are scrambling to take advantage of the predicted boom in rotorcraft sales.

By Tony Skinner, Zhuhai

Helicopter orders placed since 2 October 2012

Aircraft	Operator	Date	Total
AW169	Starspeed	28 November	1+1
AW139	Swedish Maritime Administration	20 November	7
Bell 429	Aerochine Aviation	15 November	2
Bell 407GX	Astro Airlines	15 November	1
Bell 407GX	General Dynamics	15 November	1
Bell 407GX	Guanchen Aviation	15 November	4
Bell 407GX	Reignwood	15 November	4
Bell 206L-4	Reignwood	15 November	2
Bell 407GX	Riverside	15 November	1
S-92	Ruili Jingcheng Group	15 November	1
S-76D	Ruili Jingcheng Group	15 November	1
S-92	Zhuhai Helicopter Company	15 November	2
AS332 C1e	Starlite Aviation Group	8 November	2+2
AW139	Brunei Shell Petroleum	6 November	2
AW169	ITC Aerospace	10 October	2
GrandNew	Kaigai Corporation	9 October	1
AW139	Japan National Police Agency	9 October	2
AW139	Mitsui Bussan Aerospace	9 October	2

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Joining the

Entering the market in dramatic style, Lease Corporation International has placed a significant order for helicopters it hopes will attract the attention of a number of operators. Tony Skinner spoke to CEO Michael Platt about his company's new business venture.

The reverberations of the financial crisis of 2007-2008 are still being acutely felt by economies and markets around the world. In the civil helicopter sector, this has meant many smaller operators, which have generally struggled to secure credit in this climate, have had to look beyond traditional financing to modernise and invest in new equipment.

Meanwhile, larger companies have sought to inject more flexibility in the way they operate in order to better respond to, and take advantage of, the demands of a changing market.

Such factors have led to a renewed awareness of the benefits of aircraft leasing by operators when considering their financing options – despite some industry observers arguing that this course is not necessarily being selected any more frequently than 20 years ago.

In 2010, one alternative to the major leasing providers, such as Banc of America Leasing & Capital, emerged with the formation of Milestone Aviation Group by well-known industry players Richard Santulli and William Kelly.

Entering the scene

Now, helicopter operators have even greater choice, with the announcement at the start of the year that Lease Corporation International (LCI) was establishing a helicopter division. The company entered the market with a bang, announcing in February at the Heli-Expo exhibition in Dallas that it had signed a \$400 million agreement with AgustaWestland for a fleet of AW139s, 169s and 189s.

Already active in the narrow- and wide-body fixed-wing leasing market, LCI is looking to target a helicopter sector driven by an increase in energy exploration and governments looking to increasingly contract out services such as SAR and EMS.

New CEO Michael Platt, who took over from Crispin Maunder in January, brings more than 20 years of experience in the aircraft leasing industry,



Lease Corporation International CEO Michael Platt is bringing his experience in the fixed-wing leasing business to bear on the rotary world. (Photo: LCI)

including three at Aircastle and 15 at International Lease Finance Corp (ILFC).

While much of his focus will be on the commercial airline sector as the company gears up for deliveries of the Bombardier CSeries jet from 2014, Platt is clearly animated at the opportunities provided by the rotary market.

'We have a great team, with a variety of people and a lot of years of experience in the aircraft leasing and financing sector, so we take a view of where the market is going to go at any given time and react accordingly,' he explained.

'After having a long look at the market, we decided that was the best thing for us, with a particular focus on the offshore oil and gas market. We saw the global fleet of medium and medium-heavy helicopters and the age of some of the aircraft, and it was clear that what was required, in terms of the replacement cycle, isn't always aligned with the investment cycle.'

LCI saw that while oil and gas companies were starting to look further offshore for new fields,



some operators were struggling to finance the new helicopters being developed to meet this demand, such as the AW189, EC175 and, more recently, the Bell 525.

'The oil and gas drilling is going further and further offshore, and the existing technology is stretched in terms of capabilities, so we saw that as an opportunity,' continued Platt. 'We saw banks cutting back on their ability to finance, and so there was a need for an industry that traditionally does bank financing to have another source of financing.'

'So far, that has proven accurate because there has been a tremendous amount of interest from operators and oil companies that see we have a lot of additions – the AW139, the 189 and 169 – over the next five years.'

Flexible fleet

While the value of the AgustaWestland helicopters, including options, tips the scales at over \$400 million, LCI has not yet committed to any final

rotary club



LCI signed a \$400 million agreement with AgustaWestland for a fleet of AW139 (pictured), AW169 and AW189 helicopters in February. (Photo: AgustaWestland)

‘There was a need for an industry that traditionally does bank financing to have another source of financing.’

breakdown in terms of aircraft types, in order to give itself some flexibility in the years to come.

While the final mix will be predominately focused on the oil and gas market, this flexibility will allow LCI to react if they are approached to support a national SAR or EMS programme, for example.

‘It is too early to tell exactly where it is going,’ added Platt. ‘We are talking to a variety of types of users, but our original thesis for entering the business was mostly focused on the oil and gas market, and that’s where the fleet will be predominately focused. We are actively taking bookings for our 2013 aircraft right now – there are three firm deliveries in 2013, and we are

working with a number of operators who have an interest in those three helicopters.’

The obvious customers for services provided by the likes of LCI and Milestone are the smaller operators which find themselves in the ‘catch-22’ of not being able to get financing without a contract, yet unable to get a contract without having secured an aircraft.

However, the leasing model has also attracted some of the largest helicopter operators in the world that want to balance the burden of their balance sheets. Bristow Group, for example, has a stated aim of increasing its use of leasing from around 5 to 30% in the next few years.

‘We are talking to everybody,’ continued Platt. ‘I would guess that we have had conversations with 50 or so helicopter operators around the world – from the very small to the largest – and we are having conversations with several oil companies and others that are interested in it.

‘So, it is not just the little guys that can’t get the bank financing, it’s guys that either want

flexibility – so they have helicopters that need to be replaced, and want to manage their fleet size by putting some of them on lease – or guys that don’t want to have their finance tied up in the ownership of the helicopter. They can make more money operating helicopters than they can investing in helicopters, so we are seeing everybody has an interest in this.’

Fresh buzz

While leasing has been a mainstay of the helicopter industry for more than 30 years, there is no doubt that Milestone and LCI’s entry into the market, with the associated announcements of large helicopter orders, has created a fresh buzz around what this model can offer.

Like Milestone, LCI’s initial focus has been on educating the market – the financial institutions, contractors and operators – on the benefits of the concept.

‘We put together all sorts of presentations on what is operating leasing, what are the benefits ➔



LCI's expectation is that the AW169 will prove popular for missions such as EMS. (Image: AgustaWestland)

'The helicopter industry will likely follow the fixed-wing sector, in which more than 30% is on operating leases.'

of operating leasing, why would you want to do it, what is the tax sheet treatment, what is the balance sheet treatment, what does it give you? But at the same time, we are learning a lot from a new customer base – the helicopter operator base is different from the airline industry.

'As much as we are trying to impart knowledge, it is a two-way street, and we are learning about the needs that they have, how the tender process works and the timing, the flexibility requirements, all sorts of stuff.'

Platt continued: 'We have brought in some experts to work with us. It is a great, fun new frontier for us, and we are doing our best to show customers it is a small, private company furnished with our own equity, and we can be incredibly flexible. We want to be partners, we don't want one-off deals.'

For Platt, the current state of the rotary sector reflects what was happening in the fixed-wing leasing market when he first got into the business in the late 1980s. Even when he joined ILFC in 1992, there was little competition for the company.

'We used to sit and essentially be order-takers for the first couple of years, there was so much demand. They knew what airframes you had. Those days it was all done by fax, and they would send you requests for aircraft.'

'Over time that has changed – more and more companies have gotten into this. There are a lot of worthy competitors out there who buy new aircraft, a lot of people in the secondary aircraft market. So there has been a maturation of the fixed-wing aircraft leasing market.'

'So if you need a [Boeing] 737-800, there are eight companies that have them, they will all build

them to your spec, and you go for the lowest cost provider. And the one who is the lowest cost provider is the one who has the lowest cost of capital. That is, to a large extent, what this business has turned into.'

Unique selling point

He argued that companies competing in the fixed-wing aircraft leasing sector either have to be that lowest cost provider or offer something unique in terms of flexibility, contractual options or finding a niche that works for them.

'So for us, it is finding our niches, being smart, timing the market, having very good banking relationships, being able to act when others are ready to hide under the covers – those kinds of things have made LCI the success it is.'

He said the helicopter industry would likely follow the fixed-wing sector, in which more than 30% of the world's fleet is now on operating leases.

'There's no reason it shouldn't follow the same pattern,' explained Platt. 'When you look at helicopters, the industry is really where we were when I entered the industry on the fixed-wing side. There is very little competition there now, but there's a great deal of interest as people learn about it. It is almost like the early days for me – it is a lot of fun.'

In terms of future outlook, he said there was a large number of aircraft 20 years or older currently in operation that will need to be replaced in the near term. In such an environment, with OEMs' ability to increase production numbers limited, third parties that have already secured delivery slots become more attractive.

'Again, we see as more and more oil rigs get built and put further out, there will be more demand,' he continued. 'We think that we have got some great aircraft – with the AW139, it's already proven and in high demand. We are getting a tremendous amount of enquiries about the AW189 from operators starting already to think about how they secure positions and get access to that aircraft. The early indications are that it is going to be very popular.'

'And it is still too early for the AW169 – that doesn't start delivering to us until 2015. We will have to see how that develops, but we have expectations it is also going to be a very popular helicopter, maybe in different markets – EMS, for instance.'

Common approach

The common design philosophy, and largely common cockpits, followed by AgustaWestland for the three aircraft was also attractive to a company that has seen the family concept succeed for Airbus and Boeing in the fixed-wing sector. However, Platt noted that as LCI looks at purchasing additional aircraft, it is already in discussions with other OEMs.

'We have been asked to look at purchases and lease-backs from some of the operators, and we are looking at all those different avenues,' he said. 'We will be placing additional orders, exercising options, doing purchasing and lease-back transactions. We will do what makes sense and helps build the company and grow the bridge and relationship with our customers.' **RH**

LCI has had many enquiries about the AW189 from operators wanting access to the aircraft. (Photo: AgustaWestland)





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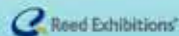
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Calling on the services of helicopter leasing companies appears to be an increasingly popular option for operators looking to break out of their current financial constraints. Tony Skinner talked to several industry figures about the pros and cons.

There is one inescapable fact facing every helicopter operator – purchasing the aircraft required to get the job done is going to be an expensive proposition.

With market uncertainty still restricting the amount of lending available, many are looking to obtain helicopters on lease and the recent entry of Milestone Aviation and Lease Corporation International (LCI) into the sector has helped raise the profile of this option.

Tax efficient

Brian Foley of Brian Foley Associates, a general aviation management consultancy, said there was a clear trend towards operators keeping helicopters off the books.

'In an operating lease, the lessor owns the aircraft and has the registration. At the end of the lease the aircraft is returned to the lessor and the lessor takes the depreciation tax deduction.

'The advantage to the lessee is that the monthly lease payments are typically less than conventional financing payments. The lessee can deduct lease payments for tax purposes. This type of off-balance-sheet financing can improve the company's debt-to-equity ratio and credit position.'

Chuck McGuire, chairman of HAI's Finance and Leasing Committee, told *RotorHub* that if the individual operator did not need the tax benefits of ownership, then leasing had its attractions.

'The person who is leasing the aircraft is utilising those tax benefits so therefore they are passing some of that to the operator – certainly not all of it because they want to make a profit,' he said.

'And secondly it has a residual component in that it has an estimated value at the end of the lease that they are hoping to meet or exceed. So by having both a residual position and tax benefits, that allows the monthly payments to be substantially less than what you would get with a traditional loan.'

Keeping a balance

Such sentiments were echoed by LCI CEO Mike Platt, who noted that many operators were finding

that outright ownership was not the most efficient way to use their balance sheet.

'They also understand that there are cycles, and want the ability to know that some portion of their fleet can simply be returned in any given year,' he explained. 'So if you have 100 helicopters and 30 of them are leased and ten come off lease every year, you can reduce your fleet by ten units. Without having to worry about where the market is or residual values, you can just return the helicopters and narrow your fleet size. Or you can choose to extend the leases if you want.

'The other thing that is important is you can lease helicopters on relatively short notice – in six to nine months – without having to place orders years in advance. So you can wait to see the need develop.'

Other benefits cited by leasing companies include: the lack of a down-payment; no residual →

Lending a hand

Omni Helicopters International is financing its purchase of EC225s through Milestone Aviation Group. (Photo: Eurocopter)



Bristow Group is one company with a stated aim of increasing its use of leasing in the next few years. (Photo: Bristow Group)

value risk; no balloon payment (often present in debt financing); and access to the latest aircraft, which may have limited available delivery slots.

Working for a living

At Milestone Aviation, MD Robert Dranitzke said the company had seen the market embrace these benefits. Like LCI, it is looking to build long-term relationships, rather than simply doing one-off transactions, and help operators find the best funding option.

'We have demonstrated that and with many of our partners we have done multiple transactions,' he told *RH*. 'In many cases we are on second and third transactions. It is not about doing one deal – it is about doing lots of deals and building that relationship, then moving on and helping them grow their business.'

Milestone currently has over 55 helicopters in its fleet, valued at more than \$900 million. The company expects that figure to be \$1.1 billion by year-end.

'We have spent a lot of time with the OEMs, both engine manufacturers and airframe manufacturers, to try to put together a fleet agreement on PBH [power-by-the-hour] and FBH [fly-by-the-hour] for Milestone. The reason for that is that we, as the aggregator, as someone with a large fleet of engines and a large fleet of aircraft, believe we can get discounts from the manufacturers, which we can pass on to operators.'

Dranitzke argued the model was 'win-win' for everyone. While operators are able to take advantage of the various benefits of leasing, OEMs benefit in that it brings them new business.

Although Milestone has placed a number of orders for new aircraft to offer them for future tenders, this is only a minor part of the business.

'Between 15 and 20% of our fleet is actually procured before we have got a lease agreement. So the vast majority of our business is us stepping into the shoes of our partners when they have already won a contract and ordered the right

'With a variety of end-of-term options, operators have to be aware of the complexities of each.'

aircraft for the mission. And then we just come in and support them on the financing side.'

Milestone's attitude is that it will support any helicopter that 'works for a living'. This has generally led them to work with operators with contracts in oil and gas, SAR and EMS, rather than financing VIP or corporate helicopters.

Lessee beware

While the argument that the model is 'win-win' is certainly evocative, there are still pitfalls for operators to be aware of. Foley cautioned, for example, that the criteria for lease approval have tightened along the same lines as those for traditional loans.

'What's important here is the sea change that's occurred in just four years,' he argued. 'As recently as 2008, an aircraft could be purchased with as little as 0% down for a loan-to-value [ratio] as high as 115%. Terms were long and most models were financeable, even older ones. Lenders tended to secure the loan with the value of the helicopter rather than the creditworthiness of the borrower. As such, many prospects qualified for leases.'

'Fast forward to today and that's all changed. A reasonable down-payment is expected in the 10-15% range, knocking loan-to-values to a more reasonable 85-90%. Terms are shorter and lenders are picky about aircraft model and age. Leases and loans are now primarily based on the ability of the borrower to make their payments, which has consequently reduced the number of qualified applicants.'

In terms of criteria for lease approval, McGuire noted that as owner of the helicopter,

the leasing company pays particular attention to maintenance and who is carrying out repairs and overhauls.

Throughout the lease period, the lessor would also arrange for inspections to ensure the asset is being treated properly, and the lessee needs to check in advance whether there is an additional charge for this.

Other aspects to consider are whether legal fees are covered by the financial institution or included in the monthly rate, and the conditions associated with any security deposit. In addition, choosing to place annual flight hour limitations on the helicopter may result in an overall lower lease cost.

Exit options

McGuire also warned that, with a variety of end-of-term options, operators had to be aware of the complexities of each, especially if they opt for an early buyout option (EBO).

'There is a critical juncture that traps a lot of people. Many of the financial institutions require advance notice if you want to exercise your EBO and give stipulations like "you must tell us 12 months before time – if you tell us 11 months and 30 days before time, you lose the benefit",' he explained.

'That is a real sticking point – we have seen many, many people that have put a reminder for the end of the month and their expiration was the first of the month and they lose the right to buy it early. So that notice period is very critical. That is a trap that we have seen sophisticated lessees, as well as major operators, fall into.'

The other stumbling block is that if the operator chooses to exercise its EBO in the advance notice period, they are committed to purchasing the aircraft when the time comes.

The three main end-of-term options include: fair market value purchase; fixed purchase price option; and no-purchase option. While not mandatory, the various options are generally set out in the contract at the start of the agreement.

Some operators have fallen foul of return conditions, which could require components to be zero-timed, be average mid-time or be in identical shape as when purchased. If the aircraft does not comply, the operator needs to know how to reconcile that and what any additional payments might be.

'Those are some of the surprises that we see some of our clients really have troubling experiences with, and if they had known about it ahead of time, or could have planned for it or had mathematically known what it meant, it may have changed their decision to either go for another financial institution or decide it might be better to own it,' McGuire concluded. **RH**

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Russian Helicopters unveiled the newest version of the medium multirole Ka-62 at HeliRussia 2012 in May. (Photo: Russian Helicopters)



Second coming

Kamov's Ka-62 medium twin may be based on the design of its military predecessor, the Ka-60, but the company is hopeful that new features could turn it into a commercially attractive option in what is a crowded market.

Unlike other models developed by Kamov that use a co-axial rotor configuration, the Ka-62 features a conventional design, with a five-blade main rotor and shrouded fan tail rotor. This particular layout is intended to provide higher speeds, low levels of vibration and a large useful volume in the fuselage.

Sergey Mikheyev, Kamov's long-serving designer general, told *RotorHub* that among the Ka-62's most rigorous requirements was the need to operate in Russia's far northern territories, where temperatures can fall as low as -50°C. He also believed the aircraft would be a worthy successor to the Mil Mi-4, an unsung piston-engined workhorse and embodiment of the Soviet helicopter transport industry in the 1950s and 1960s.

The Ka-62 has an MTOW of 6,500kg, while the maximum load on external sling is 2,500kg. The

Utilising experience from the development of the military Ka-60, the Ka-62 has been designed from the outset to meet the needs of demanding civil and parapublic customers at home and abroad.

Alexander Mladenov provides an update.

passenger cabin is 1.3m high, 4.1m long and 1.75m wide, and can accommodate up to 15 people (ferried up to 600km) or a maximum useful load of 2,000kg. The cruise speed is 155kts (maximum speed 170kts), and range on a standard fuel tank is 750km.

Prototype progress

'There are three prototypes currently in production at the AAC Progress plant in Arsenyev, as well as an "iron bird" for system testing and verification and a fuselage for static tests,' explained ➔

Alexander Vagin, Ka-62 chief designer at Kamov. 'The maiden flight is planned for the first half of 2013, while a Russian certificate of airworthiness is to be obtained by the end of 2014, after two years of flight tests.'

Kamov is also aiming for EASA certification soon after receiving its Russian type certificate. The company is optimistic about this, as the helicopter features a wide range of components and systems manufactured by Western European companies, such as the Turbomeca Ardiden 3G engine, a fuel system by Aerazur of France and transmission (including the main and intermediate gearboxes) by Zoerkler of Austria.

'It's an entirely civil helicopter, and we have had a lot of freedom to select the best systems available on the market, applying the price/performance selection criteria,' noted Vagin. 'Of course, we would like to provide a sort of advantage to the Russian-made systems... but the Ka-62 will be offered for export worldwide, and that is why no compromises on quality are allowed. Our task is to provide a high-quality helicopter at a competitive price, with performance equal to that of the best members of the medium class today.'

According to Vagin, the design team utilised experience gained during the development and testing of the military-standard Ka-60, which was terminated in 2011, chiefly due to problems with the engines. The biggest lesson learned was regarding the crashworthy fuselage, which now has improved structural integrity and an energy-absorbing undercarriage. The Ka-62 also features a birdstrike-resistant windshield and redundant main systems, as well as main and intermediate gearboxes with 30-minute dry-run capabilities.

Core choices

Engine selection was an important consideration for the designers in order to ensure that the Ka-62 allows for fuel-efficient operations and low maintenance costs. All the possible options



Compared to its military predecessor, the Ka-62 also boasts an all-new five-blade main rotor.'

were evaluated, with the Ardiden 3G, rated at 1,750shp and featuring a dual-channel FADEC, ultimately being selected. A new-technology engine with 5,000 hours TBO, it supplies extra power to ensure sufficient performance in hot-and-high conditions, and is slated to receive its EASA type certificate in 2014.

'We have analysed all the available turboshafts on the market that are designed to power helicopters in the 6-8t class,' said Vagin. 'The Turbomeca Ardiden 3G proved to be the best one, in terms of power rating, specific fuel consumption and maintenance costs. For the Ka-62, it provides

plenty of excess power that is a welcome advantage for operations in hot-and-high conditions.'

The turboshaft provides a one engine inoperative capability at altitudes of up to 9,500ft in international standard atmosphere (ISA) conditions, or 6,500ft in ISA+20 conditions.

Compared to its military predecessor, the Ka-62 also boasts an all-new main rotor with five composite blades, featuring a much improved profile for increased lift, as well as a partially altered fuselage layout that is optimised for safety. The windows in the passenger cabin are larger, so can be used as emergency pop-out exits. Vagin claimed that the cabin volume per passenger of 0.79m³ for 12 occupants is unbeatable in its class.

Safety benefits

The Ka-62's weight and size are just on the limit of where a fenestron tail rotor can be regarded as an effective design solution. This specific feature was selected due to its extra safety benefits when operating in urban environments, where helicopters are routinely required to land in confined locations that may be surrounded by people, trees and buildings. In case of a tail rotor, gearbox or shaft failure, Vagin maintains that the fin provides enough directional stability to allow the aircraft to continue the flight and perform a rolling landing – at a speed of 43kts. The undercarriage, which uses a tail wheel, is also designed to provide a high degree of stability during emergency rolling landings, and is regarded as yet another safety-boosting feature.

Around 60% of the fuselage by weight is made from polymeric composites. All the load-carrying main structures are manufactured from aluminium alloys and titanium, while composites



The Ka-62 is based on the now-abandoned military Ka-60, but with a number of additional features. (Photo: via author)



Image: Russian Helicopters

are used in non-critical areas of the fuselage. The passenger cabin can be equipped with up to 15 crashworthy seats.

The Ka-62's operating temperature range will be between -50 and +45°C, as it will be optimised for flying in Russia's extreme climatic conditions. Its systems and engines are claimed to be capable of operating without pre-start oil heating at temperatures as low as -35°C. The design ensures autonomous operations without hangar storage and from unpaved airfields and helipads with minimum maintenance requirements.

Maintainability was among the principal design considerations, according to Vagin, and the Ka-62 will feature a high level of built-in-test functionality, HUMS, quick access to main systems and controls, as well as reduced maintenance workload and increased use of line-replaceable units for maximum interchangeability. Main systems and components are offered with 5,000 hours TBO, and periodic maintenance intervals will be set at 500 hours or 12 months.

The aircraft will feature an integrated avionics system supplied by Russian company Transas. It is a derivative of the suite originally developed for the Mi-172 and Mi-38, designed to allow single-pilot VFR operations for cargo transport missions. For IFR and passenger/VIP transport, the aircraft will require a two-pilot crew.

In addition to the baseline passenger version with 12 or 15 seats, there will be VIP and SAR derivatives, as well as a number of specialised versions outfitted for medical and utility transport. The HEMS derivative can be equipped with an intensive care module for a single patient, or air ambulance kits, consisting of up to four stretchers.

The Ka-62 is primarily targeted at the existing Mi-8T/P commercial operators in Russia that

specialise in passenger/VIP transport and serving the country's vast oil and gas sector. It is seen as a suitable option for replacing the bigger Mi-8, especially older versions that are powered by the TV2-117 turboshaft, as it is broadly comparable by passenger capability and payload, but offers much higher safety standards. In fact, the Mi-8T offers some 20-24 seats and a payload of up to 3,000kg, but typical loads in real-world operations are significantly less, falling well within the Ka-62's territory.

The Ka-62 remains a commercial project, funded by several streams. Russian Helicopters

provides the majority of developmental funding, and there is also additional finance by the Russian government through a federal programme that supports civil aviation developments.

The project will have a real chance of rapid development in the coming years and commercial success if it succeeds in attracting attention from big government customers in Russia, such as the ministries of defence, interior and emergency situations – all operate significant fleets of worn-out Mi-8s that will need replacement in the next decade. The Ka-62 is a prime candidate to fill this niche. **RH**

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Future data services are promising some exciting new capabilities for rotorcraft.

Rob Coppinger considers what next-generation satellite communications will bring to helicopter operations.



Star quality

Data and voice services from helicopters are currently limited to dial-up internet speeds, but with new satellite constellations and next-generation antennas and avionics, the next few years could see broadband reach rotorcraft.

With omni-directional antennas and new powerful satellites, combined with more capable, less power-hungry communications units, future data services will deliver HD images for medical crews and real-time engine performance data for fleet managers.

Canada's SkyTrac is a satellite-based aircraft flight tracking and communications provider that uses the Iridium satellite constellation. 'The Iridium Next constellation, which is due to start launching in 2015, will allow data transfers of 1.5Mbps, up to 8Mbps, and users will be able to send images and surf the web,' explained Kim Bagnall, international sales account manager at the company.

Today, the Iridium constellation has 66 satellites orbiting around 780km away. This is considered low Earth orbit (LEO), which is defined as between 80 and 2,000km from sea level. Iridium Next will be fully deployed by 2018.

Photo synthesis

For medical crews, a data link of up to 8Mbps would allow HD images of an onboard patient. 'They want

a photo to see the patient, as a picture is a thousand words,' said Rod Danielson, chief technology officer at Outerlink, a US-based mobile communications company that provides satellite voice, data and tracking for aircraft. 'There is interest in moving patient data to and from the hospitals – it doesn't require a lot of bandwidth, but with satellites it's more than you think.'

'We are waiting on Globalstar, and they should be able to provide a higher bandwidth. Outerlink wants to use these, but there is a bit of a waiting game.'

Globalstar's constellation is also in LEO, this time at the higher altitude of 1,400km. Its first-generation satellites, launched between 1999 and 2001, are experiencing problems that are affecting two-way voice and data services. This means at certain times, at any given location, it might take longer to establish calls, and the duration could be limited.

The company has been launching its second-generation satellites since 2010, and the final spacecraft will be put into orbit next year.

Another satellite provider, LightSquared, launched its SkyTerra-1 satellite into geostationary orbit (GEO) in 2010, serving the North American market. The company also has the MSAT-1 and MSAT-2 satellites, which provide services to the same region. Outerlink uses these GEO satellites as well as Iridium's LEO satellites.

However, current antenna technology makes GEO satellite use more challenging. Danielson noted: 'One of the problems with GEOs [geostationary satellites] is you tend to want to use a directional antenna, and that is nearly impossible with a helicopter, so you have to use omni-directional antenna.'

A drawback with such antennas, however, is lower bandwidth. Danielson is expecting omni-directional antennas that can provide higher bandwidth to become available in the 2013/2014 timeframe.

While fleet tracking, data and voice service providers await more capable satellite constellations and antennas, the general public is being offered ever faster, greater broadband mobile phone networks, such as 4G.

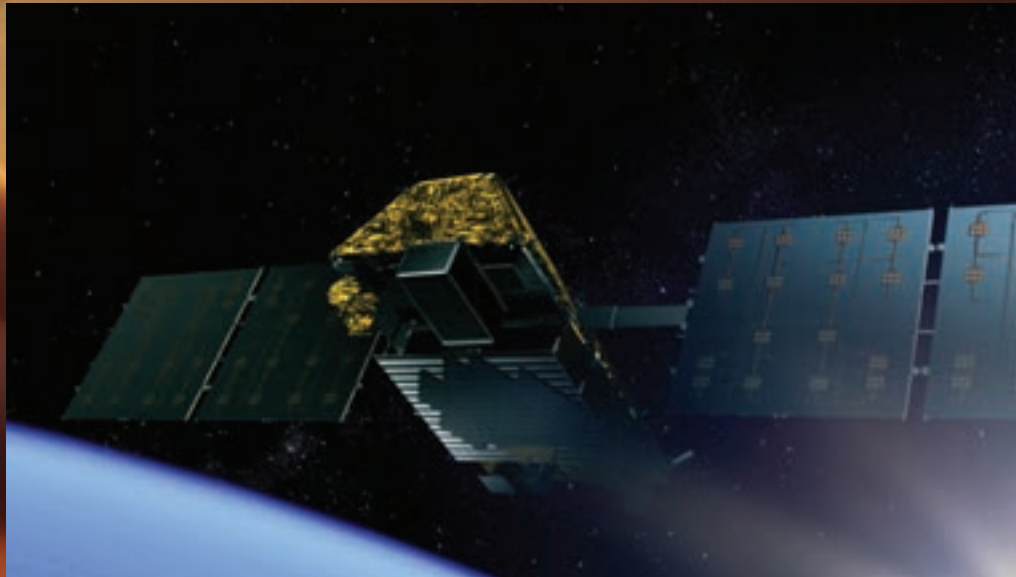
Regulatory restrictions

According to Ofcom, the UK's telecommunications regulator, 4G will provide up to 6Mbps. However, in the US, fleet tracking and voice/data providers cannot use mobile networks, whether they are 4G or not, because the country's telecoms regulator, the Federal Communications Commission (FCC), has banned the practice.

Only once on the ground can a helicopter's communication system link to a local mobile phone mast. 'We would love to be able to do that

(Photo: Sikorsky)

(Right) The Iridium Next constellation, which is due to start launching in 2015, will allow data transfers of up to 8Mbps. (Image: Iridium)



[mobile phone networks], but there is an FCC requirement that if your transmitter is not attached to the ground, you're not supposed to use it,' explained Danielson. 'The FAA doesn't ban all cell phone use, but the FCC does.'

Until the higher bandwidth satellites are fully operational and mobile phone technologies allowed, the telecommunications network common across the tracking, voice and data companies is Iridium's existing narrowband service.

According to Paul Duran, VP of marketing and sales at Blue Sky Network, the Iridium bandwidth 'is definitely less than dial-up data rates'. Dial-up services would provide up to 56kbps, and David Thomas, senior account manager for another provider, Latitude Technologies, told *RotorHub* that Iridium's bandwidth was 'like the old modem 2,400-baud rate'.

Steve Durante, CEO of Outerlink, also sees a problem with relying on one satellite operator. 'If you're relying on one satellite constellation, that's a risk a lot of people don't think of,' he said.

To make its service as reliable as possible, Iridium cross-links its satellites, allowing them to speak to each other and downlink to a ground station at any time. It also has an advantage with helicopters that will be flying at different latitudes. Satellites in certain orbits will not be able to transmit to or receive signals from latitudes beyond what is visible to the

spacecraft's antenna. With a total of 66 satellites, Iridium can cover all latitudes. 'Other satellites have problems with certain latitudes, but with [Iridium's] there aren't,' noted Duran.

Latency lengths

Even with very reliable satellites, latency can be an issue, according to Danielson. He said: '[LightSquared's] MSAT has very low latency, but it is [a service] limited to North America. Some customers on the data side, they use MSATs and get a 2-3-second latency from transmit to display, versus Iridium, where it can be up to 45 seconds – however it can be faster on Iridium.'

Outerlink has a proprietary system it uses with the MSATs to overcome this latency for clients wanting near-real-time updates, especially those operating in the Gulf of Mexico. This proprietary system allows users to see where their helicopters are every 10-15 seconds and get messages 'to and from the asset as quick as possible'. Improvements in latency and availability are why Danielson said his company wants 'to go down the path of a hybrid solution'.

The desire for short, regular messages that can confirm location or provide other data means that SMS is becoming popular, according to Duran.

While users transmitting SMS at a high frequency might test a satellite service – especially

'The desire for short messages that can confirm location means that SMS is becoming popular.'

where latency is an issue – it is a different sort of data demand that represents a bigger challenge. 'There certainly is a greater requirement for adding more data and bringing it off the ship to the ground in flight,' added Durante. 'There is a bigger market for growth at that end.'

That market includes specialist helicopter users. They can be fire-fighting platforms transmitting remaining water payload levels or hospitals requesting patient data from air ambulance crews. Durante explained that medical staff 'want to see the blood oxygen data, the different pieces of data that come off of medical equipment'. However, specialist users are not where the main data demands are from – those are always going to be aircraft performance.

The fleet managers want to know how their aircraft are performing and where they are, and, according to Durante, operators are looking for life-cycle enhancements. ➔



For medical crews, a data link of up to 8Mbps will allow transmission of high-definition pictures of an onboard patient. (Photo: Eurocopter)

Data request

SkyTrac has found its clients are asking for more data, such as engine parameters and exceedance notifications, utilising it for maintenance, flight operations quality assurance and safety management system programmes. 'Our equipment has the ability to take this type of data from the aircraft and forward it to the ground in real time, or download it at the end of the flight,' said Bagnall.

Those exceedance notifications will be for a range of aircraft performance parameters, and this is another driver for SMS use. 'They want different types of exceedance data to trigger messages from the aircraft,' explained Durante, adding that he is also seeing demands from customers for weather data with real-time updates.

Meanwhile, Duran is certain that 'with SATCOM [satellite communications] data links, fleets will become more efficient in the future. Users can monitor their fleet for savings in money, time and cost.'

For these kinds of data services, products can also interface with other onboard equipment, such as moving maps and flight data management systems, according to Bagnall. For the pilot, SMS need never be read. While displays are available for the cockpit, text-to-voice services are also

'For now, neither the helicopters nor onboard SATCOM units are the bottleneck.'

provided, where the pilot can hear messages in their headset. Voice SATCOM can also be tied into the cabin's intercom systems with the narrowband Iridium service.

SkyTrac offers a cockpit display panel and keyboard that can be used to provide two-way voice and messaging services. The unit is wired through the aircraft audio panel, and the crew can talk through their headsets. Another option is push to talk. 'The system is attractive to a lot of people because there is a delay with a half-duplex [voice communication] system – it allows pilots to deal with the conversation when they can,' explained Danielson.

Wireless technologies can also be linked to the SATCOM service. 'You can allow the user to connect Bluetooth from the cockpit and tie them into the Iridium infrastructure,' added Duran.

Outerlink, Blue Sky Network, SkyTrac and Latitude all see SATCOM units staying the same in size, weight (generally under 1kg) and maximum power consumption because of FAA certification requirements. It is easier for service providers to obtain approval for the same box, even as electronics become more capable and take up less room inside. Reduced space requirements mean that some boxes have become lighter.

Speeding up

In Durante's experience, long-term SATCOM technology developments have seen power requirements 'coming down and bandwidth capability going up'. That growth is all about meeting customers' needs. 'Looking forward, the requirements look more like broadband in the cockpit, such as real-time weather,' he continued. 'That is what we're hearing for our customers who are moving a lot of people in the gulf.'

The new satellite constellations also present a fresh challenge to SATCOM unit design, and Outerlink aims to have a satellite-agnostic product. 'SATCOM boxes can now switch from one to the other [constellation],' added Durante. 'We've combined our product suite into one unit, and we've built a multi-modal, tri- and quad-modal system, so it not only operates on an Iridium, but any number of the new "geos" on orbit or terrestrial systems, for when the vehicle is on the ground.'

As electronics have become more capable and smaller, the multi-modal systems have become small enough to fit into the certified box. Despite helicopters being tough environments for SATCOM units due to vibration and noise, all of the service providers say their units have no problems. They are installed in aircraft for many years – more than a decade in some cases – and only connection checks are required.

For now, neither the helicopters nor onboard SATCOM units are the bottleneck. 'The [customer] requirements exist today for greater bandwidth, but the [satellite] services really have to be turned on,' noted Durante, referring to the ageing and new constellations that are seeing spacecraft launched, but are still some way from being completed, such as Globalstar, LightSquared and Iridium Next. 'They could be turned on tomorrow, but the MSS [mobile satellite services] industry is a little upside down at the moment.'

For SkyTrac, exploration is one growth area for helicopter SATCOM. 'As the exploration market grows – offshore drilling, northern mining etc – helicopter services become more in demand, and with that an effective communications system is required,' concluded Bagnall. **RH**

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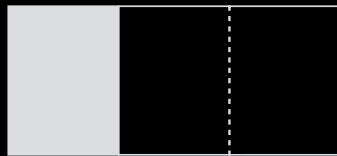
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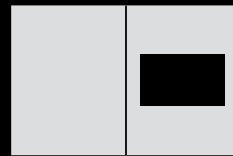
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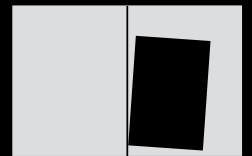
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Operating with a fleet mix or single type both present contrasting advantages in the SAR world. OEMs are now looking to greater design commonality as a suitable compromise while pitching their bids for future contracts, finds Peter Donaldson.

With a winner expected in early 2013, the competition to replace the military element of the UK's mixed SAR helicopter capability with a contractorised service is attracting international attention.

This represents a large cultural change, and is also significant because the complete replacement of an old fleet with either one new type or two, operated by either one company or two, is unusual.

The RAF and Royal Navy Sea Kings are due to retire in 2016, and, in a comparable timeframe,

Norway also wants to replace a similar fleet, although its service will remain military. The latter will likely choose a single type, although one competitor has hinted at the potential advantages of selecting two closely related aircraft.

One industry source commented to *RotorHub*: 'Why spend resources on a unique fleet of maritime long-range SAR aircraft if half your national requirement is for small numbers of survivors, over land and relatively close to the aircraft's base?'

Such a situation would present a clear case for operating a mixed fleet of large and medium aircraft. However, as the source pointed out, the advantages of a fleet mix would exist only where the geography of the nation lends itself to it, otherwise the economic benefits of a single-type fleet would predominate. This can be offset by commonality between types, which is greater if the aircraft are of the same generation.

Consistent philosophy

However, even if the aircraft are very different physically, as Sikorsky's S-76 and S-92 are, they can benefit from family connections. Dan Hunter, director of Sikorsky's commercial programmes told *RH*: 'Under the surface, things are done the same way – the philosophy remains consistent.'

'For example, in SAR, pilots fly automated search patterns. In both our commercial products, we implement that functionality in exactly the same way, even though the cockpit displays are made by different people. So, if you press a button for a search pattern, in general an S-76 will fly the search pattern in the same way as an S-92.'

There is also leverage to be gained from commonality in product support. 'This includes collecting health and usage data in both aircraft in similar ways,' continued Hunter. 'There is an infrastructure that wraps around the specific aircraft, and then pilots and mechanics who work on Sikorsky products have an affinity for knowing how we do things.'

The company is building on this with its new products. 'When the S-76D enters service, it will probably be easier for us to speak to the dual-product use among our customers for SAR,' he added.

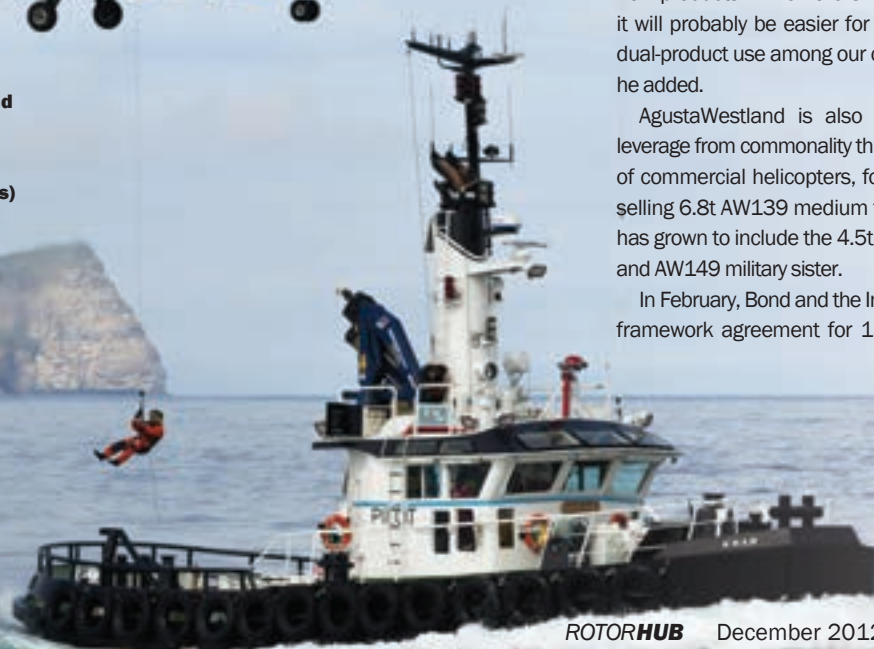
AgustaWestland is also beginning to gain leverage from commonality through its new family of commercial helicopters, founded on its best-selling 6.8t AW139 medium twin – a family that has grown to include the 4.5t AW169, 8t AW189 and AW149 military sister.

In February, Bond and the Inaer Group signed a framework agreement for 15 aircraft (ten firm

Mix or match?



Bond Offshore Helicopters (pictured), Bristow Helicopters and CHC Scotia have been selected to compete in the second stage of the UK's SAR competition. (Photo: Bond Offshore Helicopters)





Sikorsky's S-92 completed sea state expansion trials with its emergency flotation system earlier this year. (Photo: Sikorsky)

orders and five options) that includes all three commercial types. This follows an MoU signed in September 2011 establishing a global framework agreement, under which all Bond and Inaer companies would establish a multi-year contract covering the purchase of AW139s, 169s and 189s for a wide variety of missions, including SAR.

According to AgustaWestland, Bond will benefit from design commonality across the three types, which share the same flight characteristics and safety features, along with a common cockpit layout, design philosophy and maintenance concepts.

Bond has also made a large commitment to Sikorsky's S-92, taking delivery of the first two of 16 aircraft in early October.

'Our group is committed to safety as the utmost priority for our customers, and the S-92 represents the latest technology in terms of design and safety,' said Richard Mintern, CEO of Bond Aviation Group. 'This, combined with its payload, speed and range capabilities, makes the S-92 an ideal choice for oil and gas or SAR missions.'

UK complexity

Potentially worth around £3 billion (\$4.8 billion) over the ten-year life of the service contract, the procurement that replaced the abortive SAR-H competition is split into three lots, and is likely to involve some 20-25 aircraft.

Lot 1 encompasses services based at or near: Sumburgh in the Shetland Islands; Stornoway in the Isle of Lewis in Scotland's Western Isles; Culdrose in Cornwall in the southwest of England; Leconfield in East Yorkshire in northern England; and Valley on the island of Anglesey in northern Wales.

Lot 1 aircraft must be able to rescue at least eight casualties, including two on stretchers, within two hours of take-off in still air and anywhere within the 'threshold SAR operating area' (TSOA). This is

the area within the UK SAR region (SRR) defined by boundaries off the south and east coasts of the UK – 460km off Stornoway, 370km off Prestwick, the Irish SRR boundary off the west coast of the UK and 370km off Culdrose.

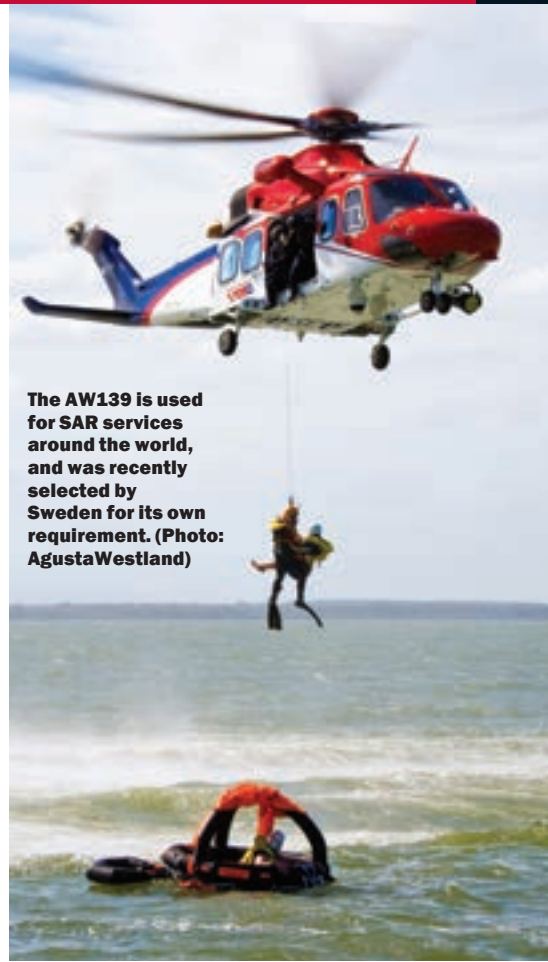
Less demanding in terms of payload range is the Lot 2 requirement for service from: Lee-on-Solent, near Portsmouth on England's south coast; Chivenor on the north coast of Devon in the southwest of England; Prestwick on the Firth of Clyde in southwestern Scotland; Lossiemouth in northern Scotland; and Wattisham in Suffolk, eastern England.

From these bases, the aircraft must be capable of rescuing four people, including two stretcher cases anywhere within the TSOA. The minimum radius of action (RoA) for Lot 2 aircraft would be 315km, according to the Department for Transport (DfT). Lot 3 is a combination of the first two.

'The UK could select either two aircraft types or one, operated by two contractors or one.'

From six first-stage competitors, Bond Offshore Helicopters, Bristow Helicopters and CHC Scotia have been selected to compete in the second stage, and the government expects to announce the winners of either Lots 1 and 2 or Lot 3 'in early 2013'.

All three operators already provide SAR services in the UK and around the world. The DfT has said in its guidance documentation that it expects to notify bidders of its intention to award a contract on 7 March, with signature on 19 March, although that could change.



The AW139 is used for SAR services around the world, and was recently selected by Sweden for its own requirement. (Photo: AgustaWestland)

The department also wants bidders to put a robust commercial structure in place to ensure that they can raise enough finance at the right time to fund the service through the transition period and continue operating even in 'unforeseen adverse circumstances'.

Norwegian simplicity

While the UK requirement could select either two aircraft types or one, operated by two contractors or one, the Norwegian All Weather SAR Helicopters (NAWSARH) procurement appears somewhat simpler.

Within a stated budget of Nkr16.8 billion (\$2.9 billion), Norway intends to buy 16 SAR helicopters in the 10-20t class, plus an option for six more. Aircraft, spares, equipment and training are to be phased in between 2016 and 2020.

Norway and Iceland had been cooperating on the NAWSARH procurement, under which Iceland would buy a single aircraft, with the option for two more, until its withdrawal for financial reasons was announced on 18 September.

The statement of operating intent directs the procurement towards a single aircraft type with single equipment fit. It stipulates a six-person crew and the capacity to rescue 20 people at sea within 280km of 'any point directly out from the straight baseline' within two hours. The aircraft must also be able to assist two people at the far ➔



AgustaWestland is beginning to gain leverage from commonality through its 'family of helicopters' approach. (Photo: AgustaWestland)

perimeter of Norway's SRR – meaning long-range missions over the Barents Sea – 'with better effect than today'.

On 15 February, Norway's Ministry of Justice announced that AgustaWestland, Eurocopter, NHIndustries and Sikorsky had been pre-qualified to submit tenders. The ministry expects to get the first new aircraft in 2016 and phase out its Sea Kings by the end of 2020. Contenders include: AgustaWestland's AW101, Eurocopter's EC225/725, NHIndustries' NH90 – in which both European giants have a stake – and Sikorsky's S-92.

At the end of May, Eurocopter announced its cooperation with Heli-One Norway, the Norwegian division of international maintenance and logistics support provider Heli-One, to form Team Nordic Search and Rescue (NORDSAR), centred on a variant of the EC225.

'Team NORDSAR enables Eurocopter and Heli-One to join forces on mission capability, quality, safety and security for a solid and strong NAWSARH joint bid,' said Thomas Hein, VP of sales and customer relations for Europe at Eurocopter. 'Heli-One already is servicing many of the over 120 Eurocopter helicopters operating in Norway, so we have a shared, strong history of cooperating in this context.'

High hopes

Eurocopter has hopes that the military-qualified EC725, to which the company also applies the NORDSAR moniker, will also be selected in future by Norway. The two aircraft have more than 80% commonality, and with the EC725's additional anti-terror capabilities, the pair will offer Norway a multirole solution, says the company.

Team NORDSAR emphasises that the EC225 can take off just three minutes after the crew has boarded thanks to a simplified start-up procedure. It is also adapted to Norwegian

conditions, and therefore capable of rescue operations in extreme weather.

Sikorsky's S-92 added to such credentials earlier this year when it completed sea state (SS) expansion trials with its emergency flotation system. These led to US FAA certification to operate in SS6 on 30 May, followed swiftly by the equivalent EASA ticket.

Meanwhile, the AW101 in its Cormorant guise passed the milestones of ten years and 50,000 hours in SAR service with the Canadian Forces, where the aircraft achieves a 99% dispatch reliability rate, according to AgustaWestland.

Shortly before his appointment as deputy commander of the joint North American Aerospace Defence Command, Canada's Lt Gen Alain Parent praised the aircraft. 'The Cormorant in SAR operations in Canada performs well, with a capability second to none,' he noted.

The AW101 is also a candidate for the US Air Force's combat rescue helicopter requirement and 'Marine One' presidential transport mission, where AgustaWestland has teamed with Northrop Grumman for both.

While operators bid for the main UK SAR service contract, manufacturers are lining up to offer the latest generation of aircraft. When AgustaWestland showed the AW189 for the first time at the Farnborough air show in 2012, it was in SAR configuration, and the company said that all AW189s ordered would be assembled at its Yeovil factory if the UK selects the type.

While the company has not released range numbers in a specific SAR configuration, it does claim a 200nm RoA for an IFR transport mission carrying 12 passengers (each weighing 100kg). This includes return fuel, a 10% contingency and 30 minutes in reserve.

With four people replaced by fuel and allowing that a transport aircraft would complete

both legs of a rig trip with passengers – a SAR helicopter would fly its outbound leg with just crew – those numbers suggest the AW189 should be capable of fulfilling the UK's more demanding Lot 1 requirements.

Relative opportunities

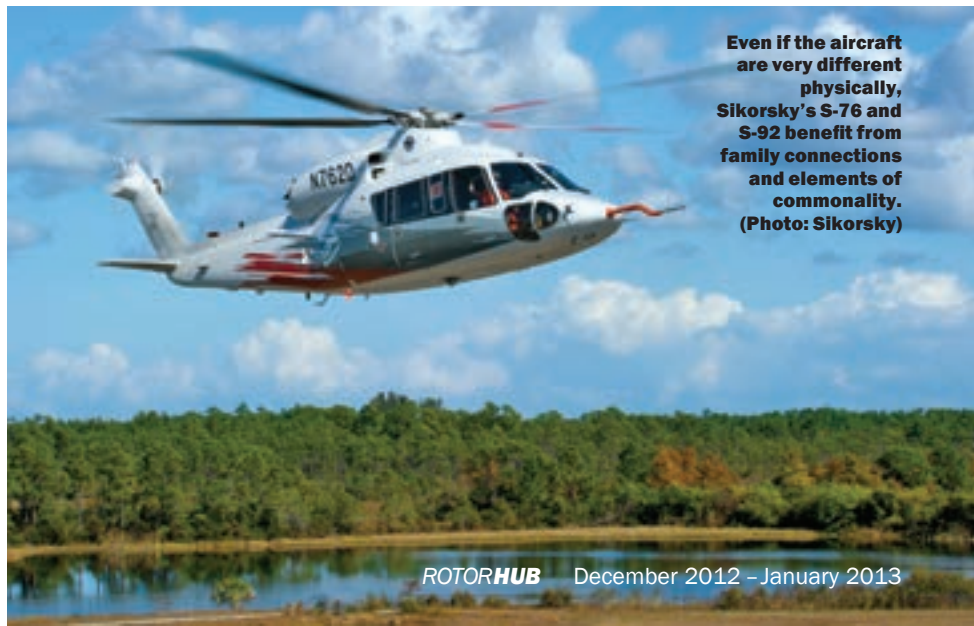
Although nominally 0.5t lighter in MTOW and with a marginally shorter quoted RoA with 12 passengers (190nm) and the same JAR-OPS 3 reserves, Eurocopter's rival EC175 would comfortably offer a 250nm RoA in SAR configuration, according to the company.

Given the same allowances as the AW189, this is a credible claim. However, the company has said that the longest missions might be flown by the EC225.

One intriguing mix might be the AW189 for Lot 1 missions, complemented by the AW139 for Lot 2, as the smaller aircraft is well established in the UK for this kind of mission. It has also just been selected by Sweden for its own SAR service, where operations are comparable to the UK's Lot 2 missions.

Interestingly, helicopter SAR in Sweden passed from the military to private contractor Norrlandsflyg's hands in 2002 until 2011, when the Swedish Maritime Administration (SMA) acquired the company and changed the name of its helicopter division to SMA Helicopter Rescue, bringing SAR back into state ownership. The SMA announced on 16 October that it would buy seven AW139s to replace nine S-76C+ and C++ aircraft beginning in May 2013.

Noomi Eriksson, deputy director general and head of the maritime and aeronautical SAR department at the SMA, commented: 'It is very satisfying that in the future we will have an improved capacity and ability to save lives without increasing the total cost of operations.' **RH**



Even if the aircraft are very different physically, Sikorsky's S-76 and S-92 benefit from family connections and elements of commonality. (Photo: Sikorsky)



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A healthy, well-functioning MRO should 'appear both relaxed, yet busy', according to Heli-One. (Photo: Heli-One)



Talking shop

All helicopters need maintenance, repair and overhaul (MRO) work done during their lifetimes. Clearly, finding the right repair station is vitally important for any operator, regardless of whether they fly a hundred helicopters or just one.

Selecting an MRO provider should not be a matter of luck, or simply choosing someone off the web at random. So much is riding on the quality of helicopter MRO work – literally the fate of the aircraft and all who fly aboard her – that careful research is a must.

Four essentials

Sikorsky Aerospace Services' (SAS) director of global service and support Steve Bohlman said the company offered clients four 'essentials': safety, quality, service and value. SAS is the aftermarket business of the eponymous helicopter manufacturer.

What are the key factors an operator should consider when selecting an MRO provider?

James Careless canvasses industry opinion.

Of the four elements, 'safety must come first'. In other words, MRO work performed by Sikorsky – both on its own aircraft and those made by others – should be executed in line with manufacturer specifications and FAA standards, with proper oversight and verification.

This is where quality comes into play, because MRO work is less likely to be safe if this aspect is not given the highest attention.

'Service' comes down to how well the customer's needs are satisfied, but it also relates to convenience. 'When you're not flying, missions aren't being executed and time is money. As an OEM, our service and support capabilities

include a solid network of engineering expertise,' Bohlman noted.

This brings us to value – ie getting the service required at a fair price. No one can afford to be overcharged for MRO work, especially in today's economy, which is why getting detailed quotations from providers is a must.

Paramount parameters

Despite Bohlman's emphasis on safety, there are differing opinions as to which of these four elements is the most important.

'Safety and value for money are the two paramount parameters for MRO services,' ➔

said Serge Panabiere, Eurocopter's VP of MRO. 'All other important characteristics such as quality, turnaround time, responsiveness and transparency flow down from these two.'

Location also matters. 'If an MRO is too far from a helicopter operator's base and coverage area, too much time can be lost in getting the aircraft there and back,' said Craig Fabian, VP of regulatory affairs and assistant general council with the Aeronautical Repair Station Association. 'Value is important, but you need MRO support that is available and accessible.'

Logically, an MRO should hit all the targets of safety, quality, service and value to earn any helicopter operator's business.

'MRO companies should be properly equipped with sufficient tooling and machinery to perform maintenance at the overhaul level,' said Bryn Hyra, manager of business development for helicopter programmes at StandardAero, a global independent MRO.

In addition to up-to-date tooling and machinery, an MRO must have qualified personnel running it. Not only can a solid engineering team answer the most pressing technical questions, they can also develop repairs that save time and money.

According to Hyra, replacement parts account for roughly 60% of a typical invoice amount. This is why 'a quality MRO will repair parts where possible, rather than replace them'.

Fixing parts safely and quickly requires MROs to get creative and develop new ways of doing things. When properly designed, such new processes meet three objectives, according to Hyra: 'The final repair costs are lowered, the repair turnaround time can be drastically reduced and quality is greatly improved.'

Peter Kamenz, VP of sales and marketing at Heli-One, an MRO with service sites in Europe and North America, noted the importance of turnaround time: 'This is an aspect of service that affects your bottom line. A good MRO does their best to get your aircraft back to you as soon as possible, without compromising safety and the quality of repairs.'

Finally, consider choosing an MRO that has implemented its own safety management system (SMS). 'Flight safety should always be the top priority of an MRO,' said Hyra. 'SMS applies a proactive risk management system to focus on error prevention, and in turn minimise flight safety risks.'

Certified success?

Since OEMs build the aircraft, common sense might dictate that a manufacturer-certified MRO would be the best choice for servicing. There are many who support this argument, including



Eurocopter has established a network of company-certified independent MROs. (Photo: Tony Skinner)

'An MRO should hit all the targets of safety, quality, service and value to earn an operator's business.'

Eurocopter, which has established a network of certified independent providers.

'OEM approval is the guarantee that the level of training, the expertise, the process and the quality of the work of a given repair centre fit OEM standards and requirements,' said Panabiere.

'For the Eurocopter group, these requirements significantly exceed the pure airworthiness standard, as we want to [give] our customers the highest level of service, wherever they are operating. [As well], our approved network delivers the exact same service as if the helicopter were in our premises in Marignane or Donauwörth.'

Bohlman agrees. 'Using an OEM-certified MRO guarantees that technicians have received OEM-approved training and will service the aircraft using OEM-approved parts,' he said. 'It is the best way to ensure consistent, reliable and high quality service. We have a great product and when properly maintained, operators benefit from exceptional reliability for a long time.'

Hyra added that OEM certification provides assurance to an operator that an independent MRO has met the stringent requirements to gain that seal of approval: 'The authorised facility has had their plants and processes officially audited... In addition, OEMs will often conduct maintenance conferences specifically for the OEM-certified MROs.'

When parts are in short supply, larger certified MROs may have better access to available stocks, he also noted. 'Another element not to be overlooked is the effect on an operator's engine or airframe resale value. There could be a significant degradation if maintenance is performed by unauthorised companies, or by embodying unauthorised material.'

However, not everyone agrees with the importance of OEM certification.

'If you go with an OEM-certified MRO, you may be cutting yourself off from PMA [parts approval manufacturer] parts that can work as well or better than their OEM equivalents, but for less,' said Kamenz. 'What truly matters is not just the level of OEM capabilities that an MRO has, but also their ability to source the right parts at competitive prices.'

PMA are replacement components developed for aircraft by non-OEMs, whose designs and manufacturing have received FAA approval.

Value for money

In terms of the discriminators that operators should consider when looking at prospective MROs, for most price is a big issue – and the temptation is always there to go with the lowest bidder. However, some providers put out low bids that are padded with 'exclusions' – items that cost extra, and are not covered by the quotation itself.

'A lot of independent repair centres use aggressive quotation prices to get the job, knowing very well that they will charge over and above because of their exclusions,' warned Panabiere. 'At Eurocopter, price transparency is our line of conduct. We have done a lot these last two →'



Photo Credit: Eurocopter

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'Some MROs can have serious internal issues that hamstring their operations.'

years to make our quotations more detailed – and any customer can contact us to get even more details if he feels it is necessary.'

Operators should make sure they receive a detailed quotation that outlines all exclusions – with a price that stays firm no matter what happens on the shop floor.

Other safeguards include asking for references/testimonials and in-house documentation of customer satisfaction – if a provider doesn't bother to measure how clients feel about its work, that may tell you something about that MRO. Also ask if they have received any awards from aviation regulators/OEMs in recognition of service excellence. Again, a lack of awards may indicate something.

On the operational side, ask MROs what rental policy, if any, they have to keep a customer flying while the helicopter is in the shop. It is also

important to check on an MRO's aircraft-on-ground (AOG) offsite services. There are times when a helicopter breaks down far from home – will the MRO come to the rescue when this happens?

'Ask about their parts inventory,' advised Fabian. 'What do they do to ensure that customers can get the parts they need quickly? Do they keep such parts in hand? If not, what kind of supply chain do they have in place to ensure that you're not waiting for weeks?'

Finally, ask what the MRO is doing about staying up to date, through processes such as 'continuous improvement', where a repair station constantly reviews its methods to find and correct errors, and identify better ways to provide service.

'Continuous improvement speaks to an MRO's commitment to its customers,' said Bohlman. 'How well does the MRO maintain its equipment and keep its staff trained on current procedures? The way an MRO faces challenges when additional repairs are uncovered speaks to the level of service they provide.'

'When an issue develops, are they proactive? Do they have the resources and know-how to effectively solve the problem and prevent it from occurring again? The MRO handling your support



needs should always be forward-thinking – searching for ways to improve and advance its techniques, knowledge and workforce.'

Health warning

Even if an MRO appears to meet the criteria outlined above, it can still prove to be a bad bet for

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A good MRO constantly reviews its methods to find and correct errors, and identify better ways to provide service to its customers. (Photo: SAS)

operators. This is because – like businesses everywhere – some can have serious internal issues that hamstring their operations.

What are the warning signs? 'A healthy, well-functioning MRO should appear both relaxed yet busy,' noted Kamenz. 'If you observe tension on the shop floor, this could be a sign that the

employees are distracted by stress. This makes them unhappy, and unhappy technicians are not as focused and motivated as happy ones.'

Bohlman advised: 'When a company starts to miss deadlines and has difficulties meeting schedules, this is a warning sign. Observe how the team interacts and how well they work

together. If there is some disharmony among the staff, this may also be an early sign that an MRO is in trouble.'

Another warning sign can be price. 'The most common red flag is an MRO repair quote that seems too good to be true,' said Hyra. 'Signs that a quote is too good to be true are sometimes overtly apparent, but at other times can be difficult to decipher.'

Experience counts

He advised that when the latter happens, be sure to ask for a detailed breakdown that itemises material, labour and component restoration rework. 'Other red flags are a poor reputation, poor and untimely communication, and an inability to thoroughly explain estimates.'

High staff turnover is another potential sign that an MRO is in trouble. It can indicate that people are not happy – and that the best and most employable are leaving.

'I like to see grey-haired mechanics and shop managers,' said Guerin. 'It is a sign of experience and that people love what they do, which is the most important thing to deliver quality in this business.' **RH**

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Bad vibrations

With inconsistent results and some very public failures, the value of onboard HUMS in its current form is being called into question. **Peter Donaldson** explores a new breed of systems that could change this.

HUMS represents perhaps the most enigmatic technology in the industry, delivering significant benefits tempered by frustration. Such implementations have saved lives by predicting failures in critical components, which the unsentimental actuarial outlook of insurance companies recognises. Yet, failures in main gearboxes (MGBs) continue to force helicopters down, occasionally catastrophically.

Furthermore, HUMS remains advisory because there are few rigorous proofs connecting the condition indicators that emerge from processed data with the damage in rejected components, largely frustrating hopes of winning maintenance credits.

'It would be fair to say that HUMS has not lived up to early expectations,' an engineer with a long and deep involvement in the technology told *RotorHub*. However, new processing techniques are demonstrating encouraging results.

Safety shortfall

One of the biggest gaps is its inability to reliably predict failures in MGB epicyclic modules, cruelly exposed by the loss of Bond Helicopters' EuroHUMS-equipped AS332 L Super Puma (G-REDL) off Scotland's North Sea coast on 1 April 2009. The crash killed all 16 occupants after a failure in the MGB that caused the main rotor to separate from the fuselage.

The UK Department for Transport's Air Accidents Investigation Branch (AAIB) reported a year ago that the failure initiated in a second-stage planet gear in the epicyclic module. 'The gear had fractured as a result of a fatigue crack, the precise origin of which could not be determined,' states the report.

Epicyclic modules are difficult for HUMS because they contain multiple meshes between the sun, planet and ring gears, the bearings that support the planet gears in their carriers and

others supporting the sun gears – most MGBs in large helicopters have two epicyclic stages. This makes it difficult to extract the vibration signatures of individual components.

HUMS also cannot predict failures in components that it is not monitoring. That might seem like an unreasonable criticism, but it has implications for the system design and selection of components to be monitored – MGB lubrication systems, for example.

Cougar Helicopters' Sikorsky S-92A (C-GZCH) crashed off Newfoundland in March 2009 killing 17, following the failure of oil filter mounting bolts, which led to a total loss of MGB oil. Sikorsky has since changed the design of the filter bowl and its mountings. However, as this kind of failure produces no vibration, HUMS could not predict it.

On 10 May 2012, the crew of a Bond EC225 LP (G-REDW) carried out a controlled ditching 37km east of Aberdeen, prompted by the warning

system, which indicated a loss of MGB lubrication. All the occupants escaped, but two suffered minor injuries.

The AAIB investigation identified a 360° circumferential crack in the bevel gear vertical shaft in the MGB (in the vicinity of a manufacturing weld), causing disengagement of the drive to both mechanical oil pumps at the bottom of the MGB.

Identical incident

On 22 October, a CHC Scotia EC225 LP (G-CHCN) ditched 60km southwest of Sumburgh in the Shetland Islands without causing injury after an almost identical set of warnings. The AAIB's engineering investigation found a similar crack located in the same area.

In both cases, the HUMS had picked up increasing vibration levels that were being monitored. In neither case, however, did they trigger warnings that might have led maintainers to reject the gearbox.

The AAIB report on G-REDL contained recommendations directly and indirectly affecting gearbox monitoring. Besides suggesting Eurocopter improves the gearbox monitoring and warning systems on the AS332 L2, the report also said the UK CAA should update its CAP 753 airworthiness rules to ensure operators receive 'detailed component condition reports in a timely manner to allow effective feedback as to the operation of the vibration health monitoring [VHM] system'.

Simply, the operator should be able to find out exactly what an inspection reveals is wrong with components flagged as faulty by HUMS.

While agreeing with this recommendation's intent, the CAA rejected it at first on the grounds that it was ultimately subject to EASA airworthiness rules. The organisation relented, however, recognising that until EASA rules could be changed, CAP 753 was the only means at its disposal to support its

A Cougar Helicopters' S-92A crashed off Newfoundland in 2009 after oil filter mounting bolts failed. (Photo: Cougar Helicopters)





On 22 October, a CHC Scotia EC225 ditched 60km southwest of the Shetland Islands due to a crack in the MGB. (Photo: CHC)

requirements for the UK fleet. The CAA published its revised response on 30 August 2012, and is looking to update CAP 753 by 31 December.

Stateside focus

The US military is the world's biggest user of HUMS. The army alone has more than 3,000 helicopters fitted, and tracks components through maintenance and repair using the Reliability Improvement through Failure Identification and Reporting (RIMFIRE) process. This enables maintainers to relate HUMS warnings to mechanical defects statistically.

Team RIMFIRE members QuantiTech, CGI Federal, Dayton T Brown and LMI support US Army Aviation and Missile Command's Integrated Materiel Management Center, as, in turn, it supports army aviation programmes.

RIMFIRE went into service in late 2003, initially collecting data on GE Aviation T700 engines. The system now covers Honeywell T55s, as well as transmissions, gearboxes, rotor heads and some hydraulics on all Chinook, Apache, Kiowa and Black Hawk variants in support of condition-based maintenance (CBM).

When Corpus Christi Army Depot in Texas receives components, inspectors assess them during disassembly and note their condition and date of failure, recording and photographing them

in enough detail to track individual failure modes, according to Team RIMFIRE.

Users can run the process's web database in search of all conditions on a specific engine to find particular failure modes, for example. 'This versatility has allowed engineers, reliability specialists, logisticians and managers to find information on what failures and conditions are driving equipment back to the depot, component failure modes and trending of component failures,' said Team RIMFIRE.

The UH-60s have HUMS from Goodrich Sensors and Integrated Systems. In recent deployments, equipped aircraft have benefited from 17% lower costs than others, along with a 50% reduction in unscheduled maintenance, according to the company. Goodrich also provides HUMS for CH-47s, US Marine Corps CH-53s, AH-1s, UH-1s, and V-22 Ospreys, as well as the navy's Seahawks. The company has delivered more than 2,000 units to the US Army alone.

Reduction rates

The other major HUMS supplier to the US military is Honeywell, which announced in September that it had fitted its Zing system on the 160th Special Operations Aviation Regiment's MH-47G fleet. This follows an agreement to equip the 160th's MH-60M Black Hawks.

Honeywell says that the system has contributed to a 66% reduction over five years in US Air Force mission aborts due to vibration, avoidance of 2,975 maintenance man-hours on 71 Chinooks and a 30% reduction in Apache mission aborts. It is also on other aircraft, including Bell 412s and 427s.

While processes such as RIMFIRE help relate HUMS diagnostics and prognostics to the condition of components, other techniques, such as advanced anomaly detection (AAD), and UK company Humaware's proprietary Constant False Alarm Rate (CFAR) and Autotrend software are improving HUMS fault detection performance. The former is the subject of a study commissioned by the UK CAA, while the latter has been put through its paces in separate studies sponsored by the UK Ministry of Defence and the US Army.

In May, the CAA published the results of a five-year research programme it commissioned to demonstrate the intelligent analysis of helicopter HUMS VHM data. With the cooperation of Bristow Helicopters, GE Aviation carried out the work, with funding from the CAA's Safety Regulation Group, the US FAA, Oil & Gas UK, the Norwegian CAA and Shell Aircraft.

In the first of two project phases, the AAD capability was developed, as well as an implementation system, and an offline ➔

demonstration using historical data from Bristow's AS332 Ls was conducted. The second phase focused on a six-month in-service trial on these aircraft, data from which was transferred daily from Aberdeen to a web server at GE Aviation's Southampton facilities. The team later developed further data analysis capabilities, leading to a second six-month trial.

Setting thresholds is vital in vibration data processing, and most conventional VHM systems are forced to compromise between over-sensitive levels that generate too many false alerts and under-sensitive ones missing faults. GE, however, applied new probability of anomaly (PA) and influence factor outputs and set a 'global anomaly threshold' based on the PA.

Mixture modelling

The AAD capability is, inevitably, mathematically intensive. Based on density estimation, it uses a probabilistic technique known as Gaussian mixture modelling.

Describing AAD as 'robust', the CAA concluded it clearly highlighted trends associated with aircraft defects and instrumentation faults that are more difficult to find using 'traditional' HUMS techniques.

For example, it detected condition indicator data trends associated with a cracked MGB bevel pinion that current techniques missed.

'The two trial periods confirmed that AAD represents a significant advance in HUMS data analysis, resulting in improved fault detection performance, a reduced "false alert" rate and increased system effectiveness,' states the report.

The researchers demonstrated new concepts and capabilities that apply data mining and automated reasoning technologies to the AAD system's outputs. This secondary analysis, said the CAA, can reduce operator workload, automatically highlight anomaly alerts and provide new information to support maintenance decisions. The authority has requested further development of this capability.

In light of the programme's results, the CAA wants to implement HUMS AAD capability on all helicopter fleets involved in UK continental shelf offshore support activities. As AAD is a set of techniques applied to data from existing HUMS installations, it can be applied as an extra standalone analysis tool.

However, the CAA believes that implementing AAD as a fully integrated solution would yield most

benefit, so it is being introduced through each aircraft's HUMS supplier. The authority says that the implementation of GE's AAD system, or an equivalent, will elevate the effectiveness of transmission HUMS to a 'satisfactory' level.

As a footnote, however, the AAIB commissioned GE Aviation to analyse G-REDL's HUMS data using AAD. The company reported 'no anomalies that could be related to the upper planet bearing/gear failure'.

Analysis adaptation

Humaware's CFAR and Autotrend systems take a set of techniques that have been proven in radar and sonar signal processing and adapt them to the analysis of HUMS vibration data.

CFAR processing works in two key stages. In the first, it sets a low primary alert threshold to produce an exceedance rate it can measure, and then uses a feedback loop to move that threshold up and down to maintain a constant exceedance rate. This is likely to contain many false alerts caused by random noise, so the second stage processes the data crossing the primary threshold again to pull any patterns that represent developing faults out of the noise.



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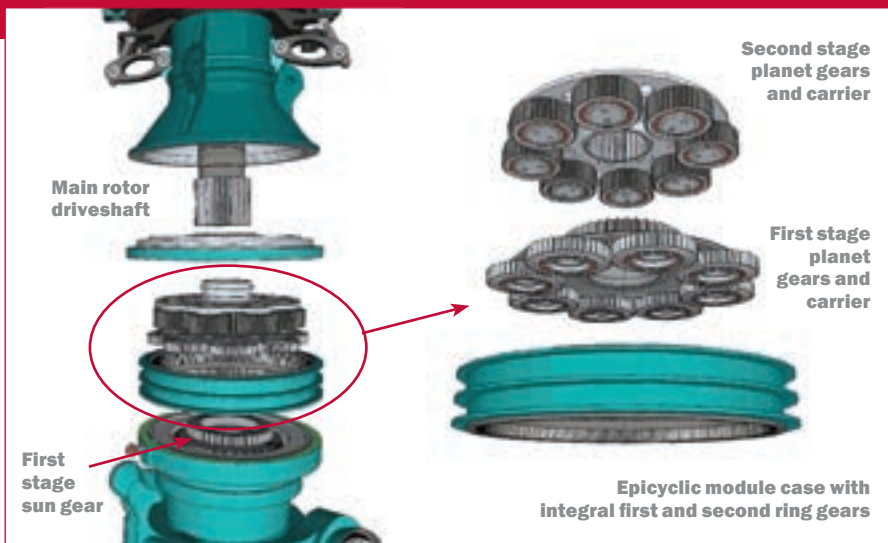
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A diagram of an AS332 L2 epicyclic module shows that these are difficult for HUMS to monitor because they contain multiple meshes between the sun, planet and ring gears. (Image: AAIB)

Autotrend uses the 'box-car' technique to distinguish a short-term trend (the box) from a longer preceding series of trend data (the car). The clever part is a statistical separation factor that shows the box is significantly different from the car. The evidence is often a line with a kink in it – the classic 'hockey stick' shape.

CFAR and Autotrend have been applied in separate trials to vibration data from the UK RAF's Chinook fleet and, subsequently, the US Army's Apaches with encouraging results. Humaware

worked with the latter's Aviation and Missile Research, Development and Engineering Center (AMRDEC) between October 2010 and February 2011 to assess the technologies' value as an augmentation to the Apache's existing fault detection package, known as the Modernized Signal Processor Unit (MSPU).

The data set used for the evaluation contained events for all condition indicators and a large number of modules for 29 MSPU-equipped AH-64Ds.

AMRDEC found that CFAR and Autotrend provided greater fault detection accuracy and significantly earlier detections than conventional fixed-threshold techniques, while also detecting maintenance events (material faults) fixed-threshold techniques miss.

Significantly, AMRDEC also determined that the technologies could meet the 10% false alert target specified in the army's ADS-79C aeronautical design standard handbook for CBM systems. The organisation also deemed the technology ready for use as an engineering tool in its current form and would benefit from further development.

Ken Pipe, principal consultant at Humaware, called for a direct comparison between AAD and CFAR Autotrend. 'There should be a benchmarking trial of the competing technologies that can improve performance,' he told *RH*.

'The industry lacks adequate verification and validation of HUMS detection capability to provide the basis for either safety or maintenance credits for the use of HUMS data. Trust in the data is a major issue, and HUMS has not proven to be dependable enough. The technology needs to be matured from a state in which it *can* detect a defect to one in which it *will* predict a failure.' **RH**

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In a recent evaluation the CFAR Autotrend technology:

- Exceeded static thresholding detection accuracy
- Provided earlier detection than static thresholds
- Detected maintenance events (material faults) not identified by static thresholds
- Demonstrated that the False Alert target of 10% of true alerts can be met

(ref: US Army RDECOM; TECHNICAL REPORT RDMR-AE-11-0; dated December 2011)

For more information call
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and defence communities since 1981.*

In each issue, *RotorHub* presents part of what will become a comprehensive guide to the world's civil-operated rotorcraft – in production, in service or under development.



Harbin (Avicopter) HC120

Eurocopter developed the EC120 light helicopter in conjunction with ST Aerospace and China National Aero-Technology Import and Export Corporation. Chinese examples are locally built by the Harbin Aircraft Manufacturing Corporation as the HC120, but it is unclear how many have been delivered, and if there are any in service outside the military. The aircraft is used by the People's Liberation Army for training purposes. Reports suggest around 30-40 may be in service, with over 100 on order.

Weights
Maximum Take-off Weight: 3,780lb (1,715kg)
Useful Load: 1,650lb (750kg)
Empty Weight: 2,130lb (965kg)
Maximum Fuel Capacity: 710lb (330kg)

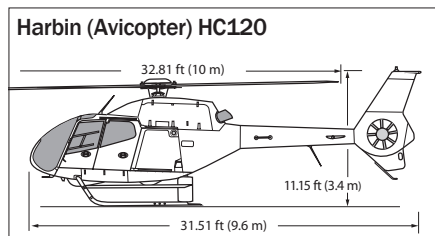
Powerplant
 One Turbomeca Arrius 2F turboshaft producing 504shp (376kW) and driving a three-blade main rotor and eight-blade shrouded fenestron tail rotor.
Maximum continuous power (MCP): 460shp (335kW)
Take-off power (TOP): 505shp (375kW)

Performance
Maximum Speed: 150kts (280km/h)
Maximum Cruising Speed: 130kts (235km/h)
Fuel Consumption at Fast Cruise: 235lb/h (110kg/h)
Economical Cruise Speed: 110kts (200km/h)
Fuel Consumption at Econ Cruise: 190lb/h (87kg/h)
HIGE: 16,900ft (5,150m)
HOGE: 15,700ft (4,790m)
Service Ceiling: > 20,000ft (>6,100m)
Range: 416nm (770km)
Maximum Endurance (no reserves): 4hr 56mins
Rate of Climb (all engines operative, MCP): 1,450ft/min (7.36m/s)
Temperature Limitations: Min: -40 °C (-40 °F)
 Max: 50 °C (122 °F)

External Dimensions
Rotor Diameter: 32ft 10in (10m)
Fuselage Length: 31ft 6in (9.6m)
Overall Length: 37ft 9½in (11.52m)
Disc Area: 845.4ft² (78.54m²)
Fuselage Width: 4ft 11in (1.5m)
Height: 11ft 2in (3.4m)
Fuselage Ground Clearance: 1ft 9½in (0.56m)

Internal Dimensions
Cabin Width: 4ft 5in (1.35m)
Cabin Height: 3ft 9in (1.16m)
Cabin Length: 7ft 6½in (2.3m)
Cabin & Baggage Volume: 103.82ft³ (2.94m³)
Cabin Floor Area: 32.29ft² (3m²)

Maximum Seating: Five people



Harbin (Avicopter) AC312/H425/Z-9

The H425 or AC312 is the civilian designation for the military Z-9, a licence-built version of the Eurocopter AS365 N Dauphin. Since licence production began, Harbin has built a range of variants for the armed services as well as parapublic agencies in China. The AC312 comes in two variants, offering different engine types, while the H425 has the option of a Rockwell Collins glass cockpit. China has since sold the aircraft to other countries, including Bolivia, Kenya and Pakistan.

Weights
Maximum Take-off Weight: 9,370lb (4,250kg)
Useful Load: 4,520lb (2,050kg)
Empty Weight: 4,850lb (2,200kg)
Sling load Weight: 3,530lb (1,600kg)
Maximum Fuel Capacity: 1,965lb (890kg)

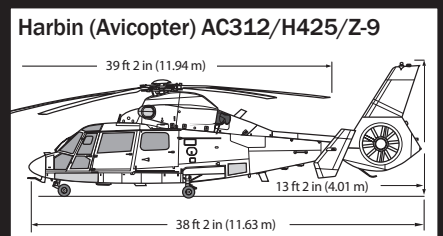
Powerplant
 Two Turbomeca Arriel 2C (AC312A) turboshafts each producing 963shp (718kW) or two WZ-8 (licence-built Turbomeca Arriel 1C2) (AC312) turboshafts each producing 735shp (546kW), driving a four-blade main rotor and fenestron shrouded fan tail rotor system.
Ratings for AC312A
One Engine Inoperative (2min power): 860shp (655kW)
One Engine Inoperative (MCP): 810shp (635kW)
Maximum Continuous Power (MCP): 800shp (595kW)
Take-off Power (TOP): 850shp (635kW)

Performance
Maximum Speed (VNE): 155kts (285km/h)
Maximum Cruising Speed: 150kts (280km/h)
Economical Cruise Speed: 140kts (260km/h)
HIGE: 8,990ft (2,740m)
HOGE: 4,330ft (1,320m)
Service Ceiling: 19,700ft (6,000m)
Range: 430nm (800km)
Maximum Endurance: N/A
Rate of Climb: 1,515ft/min (7.69m/s)
Temperature Limitations: N/A

External Dimensions
Rotor Diameter: 44ft 2in (13.46m)
Fuselage Length: 37ft 6½in (11.44m)
Overall Length: 44ft 2in (13.46m)
Disc Area: 1,528ft² (142m²)
Width: 10ft 6½in (3.21m)
Height: 13ft 2in (4.01m)

Internal Dimensions
Cabin Width: 6ft 8in (2.03m)
Cabin Height: 4ft 7in (1.4m)
Cabin Length: 7ft 6½in (2.3m)
Floor Area: 45.2ft² (4.22)
Baggage Volume: 56.5ft³ (1.6m³)
Volume: 176ft³ (5m³)

Maximum Seating: Up to 12 passengers



Hesa Shahed 278

Designed by the Shahed Aviation Industries Research Centre and built by Hesa, the Iran Aircraft Manufacturing Industrial Company, the Model 278 is part of an Iranian programme to build a new fleet of helicopters for the military and other agencies. First flight was reportedly made in late 1997. Although it features a new airframe, reports suggest the engines and running gear are from Bell 206s purchased before the fall of the Shah in 1979. Few details are known about the aircraft, but it has entered service with Iran's Environment Protection Organisation and with the Revolutionary Guard Navy. Low-rate production is believed to continue.

Weights
Maximum Take-off Weight: 3,200lb (1,450kg)
Useful Load: N/A
Empty Weight: 1,500lb (680kg)
Maximum Fuel Capacity: 515lb (235kg)

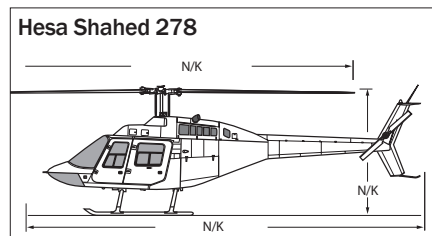
Powerplant
 One Rolls-Royce (Allison) 250 turboshaft driving a two-bladed main rotor and two-bladed tail rotor.
One Engine Inoperative (2.5min power): N/A
One Engine Inoperative (MCP): N/A
Maximum Continuous Power (MCP): N/A
Take-off Power (TOP): N/A

Performance
Maximum Speed: 130kts (240km/h)
Maximum Cruising Speed: 125kts (230km/h)
Fuel Consumption (Fast Cruise): N/A
Economical Cruise Speed: N/A
HIGE: 15,750ft (4,800m)
HOGE: 20,350ft (6,200m)
Service Ceiling: 21,000ft (6,400m)
Range: 175nm (325km)
Maximum Endurance: N/A
Rate of Climb: 2,800ft/min (14.2m/s)
Temperature Limitations: N/A

External Dimensions
Rotor Diameter: N/A
Fuselage Length: N/A
Overall Length: N/A
Disc Area: N/A
Width: N/A
Height: N/A

Internal Dimensions
Cabin Width: N/A
Cabin Height: N/A
Cabin Length: N/A
Floor Area: N/A
Volume: N/A
Baggage Volume: N/A

Maximum Seating: Up to four people



The future of the Norwegian off-shore helicopter market is looking bright and ready for a new operator, according to Bjørn Veum Seljevold, chairman and managing director of Norsk Helikopterservice.

Shelf life

Just two years ago, the long-term oil and gas prospects of the Norwegian Continental Shelf (NCS) were looking gloomy. Most of the large fields were developed in the 1980s, and the last large discovery made in Norway was Ormen Lange in 1997. The NCS was seen as a decidedly mature oil and gas region, and future prospects for expansion were pretty low. The majority of discoveries were small, and would only be developed as subsea tie-ins, with a limited requirement for helicopter crew transfer.

This all changed in April last year. After 30 years of exploration in the Barents Sea, which had only resulted in two field developments, Norway's largest oil and gas company, Statoil, struck a large oil reserve at the Skrugard prospect. Later that year, Statoil and Lundin found the Sverdrup field further south in the Norwegian North Sea – this is one of the largest oilfields ever discovered on the NCS.

Going steady

These new discoveries will be developed as standalone fields, and will need helicopter services for the length of their operational lifetime. This proved to industry that the NCS still holds significant prospects, and consequently there have been a record number of licence applications. Ultimately, this will result in a steady level of exploration activity, which also requires helicopter transport.

All of this is good news for the Norwegian off-shore helicopter market, which is dominated by two large international players. Approximately 50 heavy helicopters are currently active on the NCS, transporting personnel to oil rigs, field centres and ships, as well as providing SAR services. According to figures from Statoil, the off-shore helicopter fleet accounts for approximately 45,000 flight hours every year, and transports 750,000 passengers to and from six onshore helicopter bases along the Norwegian west coast.

Both of the two dominant helicopter operators started out as Norwegian companies, which were then acquired by international corporations, creating a Norwegian offshore market with only two

significant players. In order for the oil companies to have a competitive market, it needs, and has room for, another offshore helicopter operator.

Raising incentives

First, customers benefit by increased competition both in regards to price and quality. In a market with two dominant players, an equilibrium is often created where both believe there is little to gain from reducing their price, thus weakening incentives to cut them or provide premium customer service. A third operator in the mix would change this dynamic.

The capacity of the world's helicopter manufacturers is also limited, and the Norwegian offshore helicopter fleet is ageing. Through being part of the Avincis group, the world's largest supplier of mission-critical services, Norsk Helikopterservice has access to orders and options for up to 16 new Sikorsky S-92s, if required. The Norwegian off-shore market will need more helicopters to satisfy future demand created by offshore growth and new discoveries. By filling this gap with new aircraft rather than old, customers will get a more effective and resilient helicopter service.

Finally, a prolific market such as Norway deserves a local operator with global backing – a company with short decision lines rooted in the local helicopter community, but with the clout needed to reinvigorate the market with new helicopters through Avincis. Over time, the Norwegian market has generated several local alternatives to the dominant operators, including Helicopter Service, Norsk Helikopter and Braathens Helikopter.

That is why I, together with a handful of senior managers, started Norsk Helikopterservice in October 2009, and why Avincis chose to invest in our company. Since then, we have worked on building infrastructure for the company, and this June we received the required AOC from the Norwegian Aviation Authority. The time is right for another operator to enter the scene. **RH**

Bjørn Veum Seljevold is chairman and managing director of Norsk Helikopterservice.



The editor welcomes *RotorHub* 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. *RotorHub* reserves the right to edit copy for style, length or legal reasons.



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