



**SHEPARD**

Volume 7 Number 2  
April/May 2013

# ROTORHUB

THE HUB OF THE HELICOPTER BUSINESS



## Blue sky thinking

UK determines future SAR direction

### PLATFORM FOR INDUSTRY

Sikorsky's Mick Maurer

### ACTIVITY CENTRE

Latin American focus

### A PRICE WORTH PAYING?

AgustaWestland's AW609

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Bristow will provide UK SAR coverage from 2015 using a fleet of S-92s and AW189s. (Photo: Bristow)

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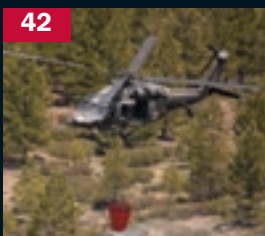
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# Crown replacement

In a move that will be watched closely by other government agencies around the world, the UK has moved ahead with plans to privatise SAR services across the country.

As we report this issue in the news pages, the UK Department for Transport (DfT) announced the award of the £1.6 billion (\$2.4 billion) contract to Bristow Group, bringing an end to military involvement in the SAR arena. Bristow will now provide a fleet of new S-92s and

AW189s to operate from ten bases across the country from 2015 to 2026.

The knee-jerk reaction from some sections of the wider UK media was as predictable as it was amusing – painting the move as a US corporate giant doing Prince William, a flight lieutenant who commands a SAR crew at RAF Valley in Anglesey, North Wales, out of a job (one television correspondent helpfully informed us that ‘there are two types of Sea King helicopter: one is yellow and one is red/grey’).

I am certainly not a fan of privatisation for its own sake, especially when it comes to critical national infrastructure, but the announcement should be regarded as a positive development for the UK as it looks to life beyond the Sea King from 2016.

While the smaller internal capacity of the AW189 in particular has been seized on by some, the capabilities of the new aircraft, including increased speed and modern avionics/flight control systems, will make life a lot easier for pilots on more demanding SAR missions.

Certainly, the question of whether the ‘ethos’ surrounding the SAR mission will change once civilian crews take over from the military is an emotive but valid one. However, there is no doubting Bristow’s commitment or expertise in the SAR arena, any more than there would have been if Bond or CHC had secured the contract.

For a feature published in this issue, Matthew Smith spoke to many of the operators providing SAR services for government and oil and gas customers (before Bristow’s latest success was announced), and their dedication to the SAR mission is clear.

Bristow itself, which had a long British heritage before being acquired by Offshore Logistics in 1996, has been providing SAR services in the UK since 1971. This includes more than 15,000 missions, during which more than 7,000 people were rescued by company-operated helicopters.

With the AW189 slated to be built at AgustaWestland’s UK facility in Yeovil, Somerset, the contract will help shore up the helicopter manufacturing capability resident in the UK.

The DfT has also done well in putting the previous botched privatisation attempt behind it in awarding the contract.

For those who weren’t watching, the earlier SAR-H programme was abandoned after allegations that a former member of the joint Ministry of Defence/DfT integrated project team had assisted the Soteria consortium in its bid preparation by providing access to commercially sensitive information. Losing the preferred bidder status effectively amounted to a £6 billion penalty for Soteria team members CHC, Thales and the Royal Bank of Scotland.

The delay caused by the SAR-H drama did not remove the simple fact that the Sea Kings will reach the end of their working lives in 2016. Handing the keys over to Bristow will allow the military, which is itself increasingly being squeezed by reductions in staff and cuts to equipment programmes, to focus its attention on frontline duties.

In other news, it is worth noting Lutz Bertling’s departure from Eurocopter to take up the position as president and chief operating officer of Berlin-based Bombardier Transportation.

Bertling has transformed the company he took over in 2006, nearly doubling its revenues to \$8.3 billion in 2012 during his tenure. His annual ‘greeting to the press’ in Paris every January was a masterclass in how to deal with the media – he has refreshed the company’s product line and revamped its structure and market focus. *RotorHub* wishes him well for the future.

**Tony Skinner, Editor**

**NEXT ISSUE**

- ◆ Law enforcement
- ◆ European market
- ◆ SAR role equipment
- ◆ Ground support

# AgustaWestland bullish about future

AgustaWestland played down any question of wrongdoing in relation to the Indian government's procurement of 12 AW101 VIP helicopters, as its new head fronted up to the media for the first time at Heli-Expo on 4 March.

Daniele Romiti formally took over as CEO on 28 February after his predecessor Bruno Spagnolini stood down in order to deal with allegations of bribery relating to the purchase.

New Delhi has suspended further payments and deliveries, and is seeking further clarification from the helicopter manufacturer. Three of the 12 aircraft have already been handed over.

In a press conference in Las Vegas, Romiti denied any improper conduct

had taken place after the inevitable questions about the Indian investigation.

'The contract is going on even though the payments have been announced as being put on hold. We are confident that in a short period of time there will be a clearer situation,' he said. 'No wrongdoing was made by the company. We are confident that the selection was made in a competitive environment and whenever the customer selects our products it's because the performance is exceeding the competitor's performance.'

The head of parent company Finmeccanica, Giuseppe Orsi, formally resigned after his arrest in February as part of the investigation, although he has also denied any wrongdoing.

On 12 March, a first information report was formally registered by India's Central Bureau of Investigation against former Indian Air Force chief S P Tyagi and 12 others in connection with the alleged kickbacks. Investigators also raided 14 properties in Delhi and elsewhere the following day.

Beyond the queries about the corruption charges, the company used the press conference to provide an update on recent activities.

It announced that it had successfully demonstrated to the EASA a 50-minute loss of oil or 'run-dry' capability for the AW189's main gearbox - which is 20 minutes more than any other currently certified helicopter.

The company is working towards type certification of the new AW119Kx, which made its Heli-Expo debut, and expected to achieve this in the next few months.

The AW119Kx features Garmin's G1000H integrated flight deck system and avionics including synthetic vision, moving map, highway in the sky and obstacle/terrain avoidance for enhanced situational awareness and safety. Launch customer Life Flight Network has signed for 15 of the aircraft.

The AW189 is also on track for certification in the second half of the year, with the company revealing that contracts for more than 60 aircraft (firm orders and options) had been secured so far.

**By Tony Skinner, Las Vegas**

## Thales outlines avionics upgrades



Photo: Sikorsky

Thales has revealed its upgrade plans for the TopDeck helicopter avionics suite, which took centre stage at Heli-Expo installed on the new Sikorsky S-76D.

The helicopter was unveiled on the first morning of the exhibition, featuring

Thales' modular avionics suite in a glass cockpit, with four 6x8in multi-functional displays (MFDs) and a new cursor control device (CCD).

All functions, such as primary information, engine and vehicle

management, virtual control panels, crew alerting system and flight management system are integrated and accessible through the CCD's intuitive man-machine interface.

The CCD removes the need for any cumbersome knobs or buttons around the MFDs, while a flight plan can be changed with four clicks, compared to previous methods, which required as many as 40.

In a simulated cockpit at the Thales booth, the company demonstrated the further functional enhancements that will be provided by planned future increments of the TopDeck suite.

Yves Joannic, VP of helicopter avionics at the company, said the next step was known as 'V400', and would be certified by the end of the year.

This iteration will include features such as 'localiser performance with vertical guidance', XM Weather on-screen satellite weather services, ADS-B-out functionality and a flight following system interface.

Joannic noted that the V400 upgrade would also include automatic piloting in a SAR mode, allowing pilots to plot a set altitude and location that the aircraft will automatically fly to and hover at. This allows the crew to concentrate on the other aspects of a SAR mission.

Once V400 certification is completed, the improved functionality will be available as a software upgrade, giving Sikorsky the alternative of offering it as an option to customers or including it as a default.

In the longer term, Thales is looking to introduce a terrain awareness and warning system specially developed for rotorcraft operations, a helicopter synthetic vision (HSVS) system, ADS-B-in functionality, an improved data link and integration with an automatic identification system.

The HSVS will be available soon for the US market.

**By Tony Skinner, Las Vegas**

The Bell 412 EPI offers enhanced hot and high performance.

(Photo: Tony Skinner)



# Bell introduces two new variants

**Bell Helicopter launched two new** helicopter variants at Heli-Expo 2013 in Las Vegas.

The first is the Bell 407 GT, an armed version of the 407 GX, and the second is an upgraded Model 412 EP, the 412 EPI.

The 407 GT includes a Garmin G1000H flight deck, as well as options to install IR cameras, light munitions and precision weapon systems such as laser-guided rockets and missiles.

John Garrison, president and CEO of Bell, told a media briefing on 4 March that the 407 GX, which was launched at Heli-Expo in 2011, had been a 'tremendous success'.

He added that it had helped boost sales for the 407 family, with some 1,000 aircraft delivered of the GX and other variants.

'What it does is give a great deal of flexibility for any armed forces for the use of this aircraft as both a search and rescue aircraft but also as a light tactical aircraft. With the speed and manoeuvrability of the 407 it's a very capable and cost-effective platform for firepower for many nations.'

Meanwhile, the 412 EPI includes Bell's Basix Pro fully integrated flight deck for increased situational awareness, as well as the Pratt & Whitney Canada PT6T-9 Twin Pac engine and the BLR Strake and FastFin system, which improves performance in hot and high conditions by adding some 640kg of payload capacity, according to Bell.

The flight deck upgrades have already been integrated into the Model 429, and Bell hopes that its experience with this will transfer to the EPI.

'It was time to provide it with an upgrade and that's what we've done,' Garrison explained. 'Overall it gives the aircraft much more capability, especially in high/hot performance.'

The changes have been made under an FAA supplemental type certificate, and the EPI will move towards becoming a production aircraft in due course.

Turning to the broader market, Garrison added: 'I do think the DoD [business] is going to shrink, but there are opportunities in the rest of the world on the commercial side. We are really being aggressive in the commercial business and it is paying off.'

'There is no doubt military spending is going down; fundamentally the commercial market will continue to grow.'

**By Beth Stevenson, Las Vegas**

# Hughes achieves distortion-free SATCOM on rotary platforms

**Hughes Network Systems has** successfully demonstrated the loss-free transmission of high-throughput data and video over SATCOM links from a variety of helicopter platforms, the company announced 18 March.

According to Hughes, its new Communications-On-The-Move (COTM) microstat system utilises an advanced waveform technology developed internally to achieve zero packet loss on transmission and reception through

rotor blades, over both Ka- and Ku-band satellite channels.

Based on the company's HX satellite broadband platform, the system utilises a variety of commercially available airborne antennas, and integrates with government, military and commercial platforms.

During a series of tests on military and commercial helicopters, the COTM system consistently transmitted full-motion video beyond line of sight

through the aircraft's rotors in both static and in-flight environments, the company said in a statement.

Rick Lober, VP and chairman of Hughes Defense and Intelligence Systems, described the technology as combining 'patented waveform design on a proven, common platform for all applications', and as 'ideal for C2 and ISR missions in all airborne as well as maritime and land environments'.

**By Jonathan Tringham, London**

## NEWS on the WEB

**HELITUNE ANNOUNCES ENHANCED ROTOR TUNING ALGORITHM**  
25 March 2013

**AIR METHODS ADDS EC135 SIMULATOR TO TRAINING PROGRAMME**  
20 March 2013

**POLICE SERVICE OF NORTHERN IRELAND ORDERS EC145**  
14 March 2013

**AGUSTAWESTLAND SECOND-HAND DEALER APPOINTED**  
11 March 2013

**ERICKSON AIR-CRANE EXPLORES COMPOSITE MAIN ROTOR FOR S-64**  
8 March 2013

**ERICKSON AIR-CRANE ENTERS MEDIUM LIFT MARKET**  
7 March 2013

**VECTOR MOVES FURTHER INTO LEASING BUSINESS**  
7 March 2013

**FLIGHT SAFETY FOUNDATION TARGETS LASER POINTERS**  
7 March 2013

**BLUE SKY NETWORK DEBUTS PALM-SIZED TRACKER**  
7 March 2013

**RUSSIAN HELICOPTERS PROJECTS 2015 DELIVERIES FOR TWO NEW PLATFORMS**  
7 March 2013

**SLOANE HELICOPTERS SIGNS FOR NEW AIRCRAFT**  
7 March 2013

**BELL HELICOPTER, VAN HORN AVIATION SIGN COMPOSITE TAIL ROTOR MOU**  
7 March 2013



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Bristow's AW189s will be fitted with the latest role equipment. (Image: Bristow)



# Bristow wins UK SAR contract

**Bristow Helicopters has been awarded** a £1.6 billion (\$2.4 billion) contract to provide future SAR coverage across the UK, bringing an end to the long-running drama of privatising the service.

The Department for Transport (DfT) announced the award on 26 March, which will see 22 Sikorsky S-92s and AgustaWestland AW189s operating from ten bases across the country, ending the current military involvement in SAR.

The DfT claims that under the new service, which will commence in 2015 and run until 2026, the helicopters will be able to reach a larger area of the UK's SAR region within an hour of take-off than is currently possible.

'Based on historic incident data, it is estimated that there will be an overall improvement in flying times to incidents of around 20% (from 23 to 19 minutes),' a DfT statement reads. 'Presently, approximately 70% of high and very high risk areas within the UK SAR region are reachable by helicopter within 30 minutes. Under the new contract, approximately 85% of the same area would be reached within this time frame.'

The agreement is expected to create 350 new jobs at Bristow, and new facilities will be established at Caernarfon, Humberstone, Inverness, Manston, Newquay, Prestwick and St Athan. Existing facilities at Lee-on-Solent and Sumburgh will continue to be used, while the base at Stornoway will be refurbished.

The SAR services contract has a phased-in transition period beginning in April 2015 and continuing to July 2017.

The company said that the new helicopters would be equipped with the latest in SAR technology, while a transition agreement with the Ministry of Defence would 'ensure continuity of service and experience' for military personnel transferring to Bristow.

'Bristow Helicopters knows the responsibilities that go with providing this service, and we are committed to working in full partnership with the Maritime and Coastguard Agency and ensuring a smooth transition process and the long-term continued delivery of a world-class SAR operation in the UK,' said Mike Imlach, European business unit director at the company.

The basing pattern of the 22 helicopters is expected to allow the ability to 'immediately surge' up to seven aircraft to a single incident.

The move to see SAR completely provided by contracted civilian crews has been some time coming, with an earlier procurement under the SAR-H programme abandoned after irregularities were found in the bidding process. This would have seen services replaced by a new single-type fleet purchased by preferred bidder Soteria – a consortium of CHC, Thales and the Royal Bank of Scotland – and was due to be fully in place by 2016, when the Sea King is planned to be retired.

The failure of SAR-H resulted in the need for an interim contract, which was split between Bristow and CHC, and runs from July 2013.

In acknowledging its award of the longer-term contract, Bristow highlighted its history of providing SAR services in the UK since 1971:

'In total, Bristow Helicopters has flown more than 44,000 SAR operational hours in the UK and conducted over 15,000 SAR missions, during which more than 7,000 people have been rescued by the company's crews and helicopters.'

**By Tony Skinner, London**

## Helicopter orders placed since 9 February 2013

Aircraft	Operator	Date	Total
EC225	Weststar Aviation Services	26 March 2013	2
EC145	Police Service of Northern Ireland	14 March 2013	1
Bell 407GX	Air Medical Group Holdings	6 March 2013	24
Bell 206L-4	Air Medical Group Holdings	6 March 2013	6
MD 500E	Polk County Sheriff's Office	6 March 2013	1
MD 500E	Bering Air	6 March 2013	1
AW139	Bristow Group	6 March 2013	6
GrandNew	National Police Agency of Japan	6 March 2013	1
AW139	Caverton Helicopters	5 March 2013	3
EC135	Apoyo Logístico Aéreo	6 March 2013	1
EC135 T3/P3	Air Methods	6 March 2013	6
EC135 T3/P3	Norsk Luftambulans	6 March 2013	6
EC135 T3/P3	Aiut Alpin Dolomites	6 March 2013	1
EC135 P2e	Midwest Medical Transport	6 March 2013	1
EC135	Phoenix Heli-flight	6 March 2013	1
EC135	Med-Trans Corporation	6 March 2013	1
EC145 T2	Avincis Group	6 March 2013	10
EC145	Memorial MedFlight	6 March 2013	1
EC130 T2	Fox Aviation	6 March 2013	1
EC130 B4	Memphis Medical Center	6 March 2013	1
EC130 T2	Peak Aviation	6 March 2013	1
AS350 B2	Phoenix Heli-Flight	6 March 2013	2
AS350 B3e	Universal Helicopters	6 March 2013	1
EC155	Transportes Aéreos Pegaso	6 March 2013	2
S-76D	Bristow Group	5 March 2013	10
S-76D	China Rescue and Salvage Bureau	5 March 2013	4
EC175	Bristow Group	5 March 2013	12
EC225	Milestone Aviation Group	5 March 2013	14
EC175	Milestone Aviation Group	5 March 2013	5



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**Mick Maurer, the recently appointed president of Sikorsky Aircraft Corporation, explains to Tony Skinner how his company is sustaining impressive sales figures despite the volatile economic climate, while looking to further boost its commercial business.**

# The



Photo: Sikorsky

When the new president of Sikorsky Aircraft Corporation took over from Jeff Pino on 1 July 2012, he could perhaps be excused for feeling the weight of history on his shoulders.

Fronting up to the media for his first 'state of Sikorsky' briefing at Heli-Expo in Las Vegas on 5 March, Mick Maurer was even more aware of the company's past legacy.

'Today is our 90th anniversary,' he revealed. 'Igor Sikorsky started the Sikorsky Aero Engineering Corporation on 5 March 1923 on a chicken farm in New York with a dozen employees – all volunteers. Today, we have grown into a global enterprise with 16,000 employees still dedicated to his vision of producing aircraft that save lives.'

Maurer takes the helm at an interesting time for the company, with declining US defence budgets and various new commercial markets continuing to emerge.

As he told the press during Heli-Expo, and later expanded to *RotorHub*, his strategy

to take advantage of the changing landscape was clear.

'The real growth as we go forward is going to come from our commercial business and international military business, where we see annual growth of mid-teens,' he explained.

## Company highlights

In 2012, highlights for Sikorsky Global Helicopters, the company's commercial helicopter arm, included the certification of the new S-76D – revealed to the public for the first time during the show – and the level of orders for the S-92.

'Our backlog now as Sikorsky Global Helicopters is over \$2 billion, and we expect our sales to increase in 2013 by more than half a billion dollars versus 2012. We are really counting on the commercial business and international military business to take up the slack as we see some decline in the US military side of the house.'

Maurer was previously an officer in the US Navy's nuclear submarine programme before



The S-76D was displayed in Bristow colours at Heli-Expo 2013. (Photo: author)

# top flight

starting his United Technologies Corporation career in 1989 at Otis Elevator. Most recently, he served as president of Sikorsky Military Systems before taking a wider view in the top job.

'If we look at how things are going forward in the commercial market, we see some good signs there. About three quarters of our commercial business is driven by the oil business, and there are a lot of good things happening in that market.

'The demand for oil keeps flowing. We are seeing a big ramp-up in the oil market and the highest growth coming from the developing markets. And that tends to be open space where there isn't already a local helicopter company, and means free and open competition – we like our chances when we see that.'

He noted a further trend in the oil and gas market was the installation of drilling rigs further offshore, which he argued placed the S-92 at an advantage over many of its competitors.

As Sikorsky looks to increase the proportion of sales on the commercial side of the business,

Maurer noted the company planned to boost its presence in emerging markets, reflecting many of the other United Technologies companies in becoming a 'multi-local'.

'In order to compete, you need to have a local presence, certainly in some of the bigger markets,' he explained. 'So we are looking at not just what do they need and how do I respond to an RfP, but how do I become part of the fabric of the industry and the business in that market, so we are ready when opportunities do present themselves and that we behave and operate more as a local player?'

'So [that means] being part of the local economy, part of the local industrial base and part of the solution for whatever the requirements are for the local customer. As a result, we have started to forward-deploy more and more of our people, started to engage more international suppliers, as well as some of our own joint ventures and facilities spread around the world. That has started to result in an increase in business there.'

Among the markets the company is eyeing is China, where it hopes to enjoy a share of the predicted future explosion of commercial sales there, as well as Brazil, India (which Maurer described as market 'number 1A' for Sikorsky), Saudi Arabia and Turkey, where it is still negotiating the sale of Black Hawks as part of the TUH programme).

'[India] is the world's largest democracy, it has a huge coastline, so there are lots of maritime requirements and we do well there,' he noted. 'There will be more commercial requirements, so we are very focused on India as a long-term market for us.'

'India's infrastructure in general has lots of room to develop or improve – whether you are talking about the VIP market or some of the other markets. Certainly, in the energy sector there is more and more development expected, and I think inevitably there is going to be a pull for our products.'

Sikorsky has also established a partnership with Tata in India for the manufacture of S-92 ➔

cabins, and this is now at '100% full-rate production'.

### Making money

Maurer outlined a successful 2012 for the company, with operating profit increased by \$100 million and return on sales reaching 13.6%.

'Basically, what we had targeted in 2014 we reached in 2012, demonstrating that long-term Sikorsky can be a mid-teens return-on-sales business,' he continued.

'In fact, we had a record year for sales, for orders in 2012. Following the decline in 2008, we had three consecutive years of increasing orders, and we have seen that go across the board – commercial, aftermarket, US military, international military.

'Two of the things we look at to measure our execution are what we call "customer escapes" and our on-time delivery performance. It's no coincidence that these two are moving in the right direction and driving the increase in sales. We are seeing our quality improve every year – a 40% reduction in our customer escapes last year and on-time delivery getting close to 100% for our major core programmes.'

While its US military work serves as the foundation of the company – a trend that will continue with the CH-53K, which is predicted to exceed the overall value of the Black Hawk over the life of the programme – Maurer believes its share of the commercial market is often underestimated. He argued that in dollar terms, Sikorsky would be placed number two or three in the leader board of OEMs.

Turning his attention to the company's commercial portfolio, Maurer predicted strong levels of sales for the S-76D, despite lengthy delays in bringing the aircraft to market. FAA certification was gained in October 2012, and the company already has a \$700 million order backlog.

'If you order one today, unless you manage to swap with an existing customer, the first time we would be able to deliver it would be a year from now,' he explained. 'That's gone from when we hadn't certified, we had a lot of customers going, "yeah, I hear ya, I like it, here's a deposit", but no firm order. Once we got it certified, the floodgates opened.

'And also as they started to fly it, because the D gives you better than the efficiency and operating cost of a C++, and better than the power they had with the S-76B. The B model wasn't a favourite in the offshore oil business because of the fuel economies and the operating costs, but the VIP customers really want that power. Now you get the best of both.'

The worldwide S-92 fleet has chalked up 500,000 flight hours. (Photo: Sikorsky)



### Project starvation

He acknowledged the delays in the programme, which were due to the company 'starving' the project of funding as it invested in other areas, as well as issues typical of any major aircraft development.

'We had a couple of setbacks in the certification process, where we found some things that we didn't expect to happen,' added Maurer. 'And we also decided to make a few changes a little bit late in the game, which cost us some time, to improve the capability to fit what some of our offshore operators were looking for. So a little bit more performance, and as a result we took a little bit more time to do that.

'We hate to be late, but we are not going to bring something out that is not ready. That is one thing we have learned and are pretty hard on. The good news with the D is we have orders from every big segment that has historically mattered to us. SAR, which is a highly configured, pretty complex aircraft, we have got orders from the Japan Coast Guard for that.'

He continued: 'We have got the oil sales, we have got VIP, we have got a major EMS customer, Arkansas Children's Hospital, which is a very heavy EMS configuration. As a result, we need to develop the customisation and features needed for each of those different segments. So there is a fair amount of work continuing on the D, but it is really looking at final configurations and not the base aircraft.'

### Lighter line

Meanwhile, Sikorsky purchased the Schweizer line of light helicopters in 2004, leading many to predict a renewal at the smaller end of the scale. However, the company is 'backing off' from its light commercial products as it re-establishes production at its Coatesville, Pennsylvania, facility.

'What we are trying to do is really stabilise that line, and we are not doing anything until we have it fixed and under control – we are moving it to where the rest of our commercial business is in Coatesville. And we are also establishing a new supply line and standing them up. So until we get that stabilised and fixed, we are really backing off a little on the lights and then we will come back once we have got that in order.'

At the heavier end of the market, the other three big OEMs predict that the future of the oil and gas market lies in the weight class that has become known as the 'super medium' segment since Bell unveiled the 525 Relentless amidst much fanfare at last year's Heli-Expo.

Sikorsky, however, is not rushing to compete directly here, nor is Maurer convinced that this weight class will necessarily translate as the best 'cost per seat-mile' for the longer oil and gas missions.

'Our focus understandably has been on getting the D onto the market – that's been the primary focus. That doesn't mean we are not also looking long term at what the next big thing is. We have been studying some ideas – we have been looking at those segments and the different technology we might apply.

'What we need to do is make sure that whatever we introduce is differentiated from the other competitors in that segment. We don't want to come out with another product that is equal to the others, because if you start something now, by the time it comes out you are really going to be behind.'

For the S-92, which recently achieved 500,000 flight hours for the fleet, the company has certified the aircraft to Sea State 6, and is about to receive certification for 'rig approach'. The latter function is expected to result in a 60% reduction in pilot workload as the aircraft is brought into an automated level and slow approach to an oil rig.

'What that means is the customer can essentially have the aircraft fly autonomously, from a location to a point near the rig, stand off at a quarter of a mile [0.4km], an eighth of a mile at a certain height, so they can make a final approach into the rig,' explained Maurer.

'This is interesting because it is a combination of the technologies we have been working on in unmanned systems, along with advances in the commercial avionics side of the house. You are going to see that more and more over time, essentially like designing apps – not quite apps for your iPhone, but apps for your helicopters – as we figure out how to do smarter and smarter things with the aircraft. We are going to be able to provide more and more value for the customer.' **RH**

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The AgustaWestland AW609 is unique in that it is the only tiltrotor designed for civil use. Falling between fixed-wing turboprop aircraft and helicopters, and first flown as the Bell/Agusta BA609 a decade ago, the type has made slow progress.

However, after a change of programme ownership and a burst of flight-test activity, the renamed AW609 is approaching certification and production with new vigour.

Although the type can count many experimental aircraft as its ancestors, including the Bell XV-3

Convertiplane of 1955, its true parents were two Bell XV-15 tiltrotor concept demonstrators, the first of which was flown in 1977.

Despite not being equipped as passenger aircraft, they nonetheless flew many VIPs, including military officers and politicians, to give them an appreciation of tiltrotor capabilities – Bell and its partner Boeing were seeking backing for the V-22 Osprey programme at the time. Over 180 pilots flew the XV-15s, which were displayed at the 1981 and 1993 Paris Air Shows.

One of the XV-15s was lost in a non-fatal accident in 1992, but the second only retired in 2003, having been brought back into service to aid the V-22 programme during some of its troubles in the 1990s.

### Changing teams

In November 1996, Bell and Boeing announced they would collaborate on a civil tiltrotor called the Bell Boeing 609, and opened an order book in January 1997. A full-size mock-up was shown at the Paris Air Show that year. However, the latter

**Championed by some and dismissed by others, the first civil tiltrotor design has divided opinions since it was first conceived. With a price tag still to be confirmed, Jim Winchester considers what place it might have in future markets.**

# A price worth paying?



AgustaWestland is targeting FAA and EASA certification of the AW609 in early 2016. (Photos: AgustaWestland)

company dropped out in March 1998, and Agusta announced at that year's Farnborough Air Show it was teaming with Bell to build the BA609.

By 1999, Bell/Agusta was claiming 77 BA609 orders from 42 customers, including Bristow, Helikopter Service of Norway and Petroleum Helicopters in the US, reflecting the 609's appeal to the offshore oil industry market.

More recently, the official tally of options stood at '60-70', according to AgustaWestland spokesman Geoff Russell.

New York City mayor Michael Bloomberg is said to be on the waiting list, and would presumably use the 609 for his regular trips to Bermuda, currently undertaken in a Dassault Falcon 900 and other aircraft. Other high-profile names said to have signed up with a \$100,000 refundable deposit include golfer Greg Norman, Blockbuster Video entrepreneur Wayne Huizenga, investor Don Carter and property developer Ross Perot Jr, although whether they maintain their interest in tiltrotor ownership is unknown.

In 1999, the price of a BA609 was estimated at around \$8-10 million depending on configuration and specifications, but the actual price will not be announced until some time in 2014, 24 months before production begins, the company has said.

Planned for 2001, the first flight of a BA609 did not take place until 6 March 2003 at Arlington when N609TR flew in the hands of Roy Hopkins and Dwayne Williams. The second aircraft (N609AG) flew on 9 November 2006 in Cameri, Italy.

### False starts

Although the flight testing progressed without incident, the overall programme suffered several false starts, with expected delivery dates repeatedly slipping. In 2000, certification was expected by 2003, in 2004 it was 2007 and in 2008 it was 2011. Today, it is still three years away, but this date seems more likely to be met than any of the previous ones.

The slow pace can in part be attributed to the problems the V-22 was undergoing during this period, which remained Bell's priority, resulting in a substantial redesign of the Osprey. Approximately 700 hours were flown by the two BA609s under the Bell/Agusta partnership, including appearances at the Farnborough and Paris air shows. A realistic mock-up in VIP passenger configuration was taken around these events, but has since been placed on permanent display in Italy.

Nearly two years ago, AgustaWestland bought out Bell's share in order to move the project along, renaming it the AW609. From November 2011, it



The original prototype BA609 first flew in 2003.



Production aircraft will feature Rockwell Collins Pro Line avionics.

'The actual price will not be announced until some time in 2014, 24 months before production begins.'

became an AgustaWestland product, although around 100 Bell employees remain working on it at Arlington where a new business, the AgustaWestland TiltRotor Company, has been

established to manage and conduct the certification process, including flight testing with the first aircraft.

The transfer of intellectual property from Bell to AgustaWestland was completed during 2012, and a new test facility has been built across the runway from the old one. A flight simulator will be installed this year.

The flight test programme has accelerated since the new arrangements began. By December 2012, a total of 750 hours had been flown by the two prototypes, amounting to ➔

10% of the total. Flight envelope expansion had reached 90%, with high rate of descent and short take-off and landing (STOL) capabilities at increased weights both being explored. The aircraft have flown as high as 25,000ft and at speeds of up to 300kt in a dive.

### Separate sites

AgustaWestland has established two main sites dedicated to the programme's development – Cascina Costa di Samarate in Italy and Arlington in Texas. Work at these locations has been focusing on using both aircraft to

expand the flight envelope. However, each has been concentrating on specific areas.

N609TR at Arlington has been focusing on ice accretion characteristics, flight control and handling quality, external noise measurement,

'At the heart of the AW609's ability to fly where helicopters cannot will be the Pro Line Fusion avionics.'

autorotation characteristics and general performance. At Cascina Costa, the integrated development team of 250 people has been using N609AG to explore stalls and buffet, load factors and vibration, and stress testing the flight guidance system. The Italian aircraft has also been leading the avionics development.

The next two AW609s are to be built in Italy. Aircraft 3 is under construction and is due to fly by the fourth quarter of 2013, with No 4 to follow in 2014. The latter aircraft will test the production avionics, which will feature satellite-based navigation and an enhanced vision system. The avionics will be critical in allowing the 609 to penetrate weather and fly above it.

As well as a full production cockpit with Rockwell Collins' Pro Line Fusion touchscreen embedded display system, Aircraft 4 will have new AgustaWestland flight control software, a BAE Systems flight control computer and upgraded PT6C-67A engines with modifications to better handle the transition between vertical and horizontal flight. New STOL methods are being developed as a way to increase the payload.

In late 2012, a boost came in the form of an agreement from the British government to make regional growth fund money available to AgustaWestland to create a civil helicopter hub and support design and development work for the AW609 and future tiltrotor designs.

The company will work with the National Composites Centre at the University of Liverpool

**The FAA has come up with a new certification category to cover the AW609. (Photos: AgustaWestland)**





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and a number of key UK suppliers. This project will allow UK industry and academia to be involved in tiltrotor development, although the proportion of the £46 million (\$73.3 million) allocated to tiltrotor technology has not yet been announced.

### Enabling technology

At the heart of the AW609's ability to fly where helicopters cannot will be the Pro Line Fusion avionics. Using three 14in touchscreens and head-up displays, the manufacturer claims the system will enable natural, eyes-forward operation and enhanced situational awareness through all phases of flight. This will allow single-pilot IFR operation

Specifications for production components have now been supplied to manufacturers, including BAE, Rockwell Collins and Pratt & Whitney. Bell still has a role as a supplier, manufacturing the prop-rotor blades and flight control yokes.


It is not yet certain where production models will be assembled. Robert LaBelle, managing director of AgustaWestland TiltRotor, told the press in early 2013 that the aircraft will initially be built in both Italy and the US, but a decision on final assembly would be 'driven by the customer base'. The US share of the market is expected to be around 35%, according to LaBelle.

Falling as it does between fixed- and rotary-wing aircraft, certification of the AW609 presents a challenge. The FAA has come up with a new ➔



The third prototype is due to join the test programme at Cascina Costa by the end of this year.




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'Powered Lift' category for tiltrotor-class aircraft designed to transport standards. This combines FAR Part 25 (transport-category aeroplanes) with Part 29 (transport-category helicopters) and extra requirements specific to tiltrotors and other potential aircraft with vertical lift abilities, but different horizontal flight characteristics than helicopters, relying on aerofoils rather than engine thrust or lift devices.

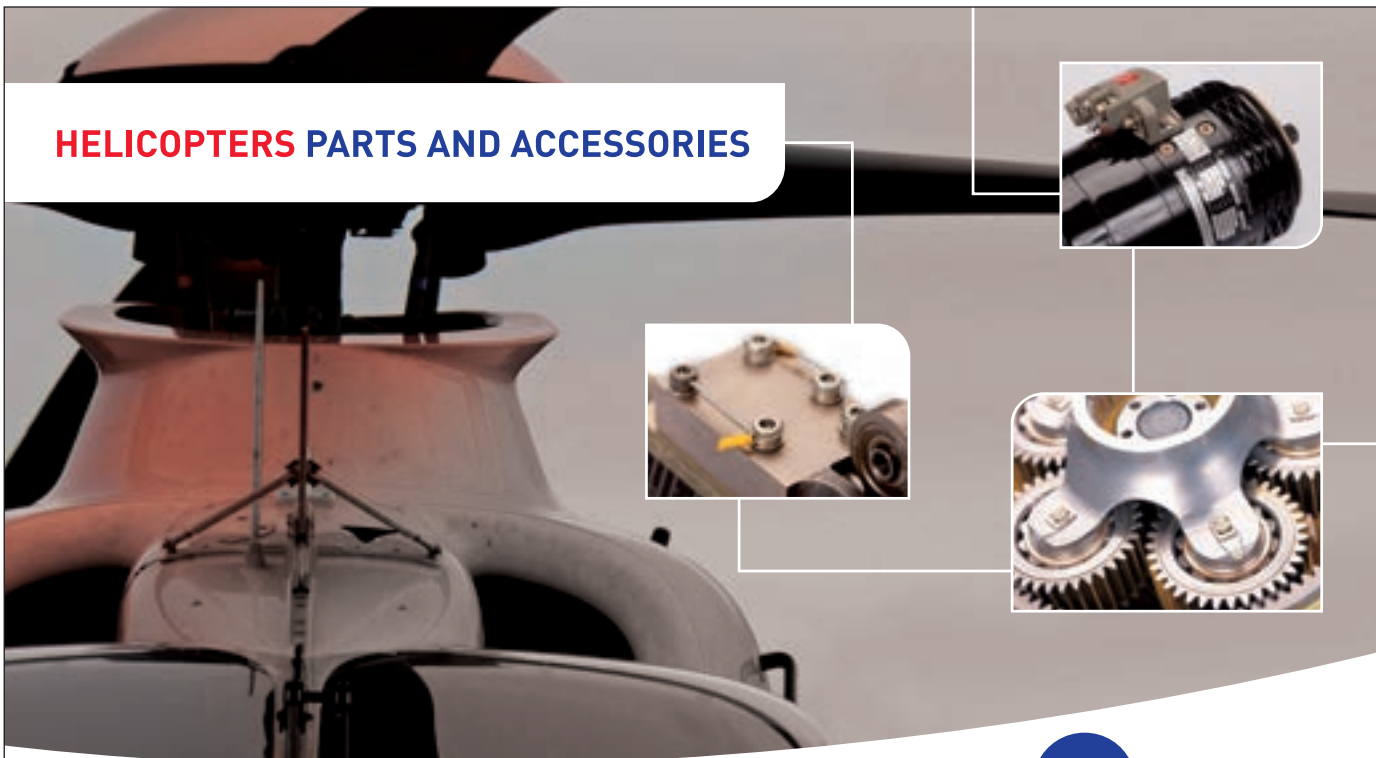
Icing is a particular focus of attention. AgustaWestland is developing a de-icing system using computational fluid dynamics. This will be tested by Aircraft 3, as will be an anti-icing system for different airframe areas. Hot and high trials are also allocated to this prototype.

A concern that was expressed during FAA consultation was that the cross-shaft between engines was composite, as opposed to metal, which would prevent it failing in the case of an engine fire, as happened in one V-22 accident.

AgustaWestland is aiming for FAA type certification with simultaneous EASA validation in the first half of 2016, and the first production aircraft to be available to customers immediately afterwards.



**The AW609's ancestry can be traced back to the Bell XV-15. (Photo: US DoD)**



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## Aerial advantages

What does a tiltrotor bring to an operator that a conventional turboprop or helicopter does not? Its proponents answer that the cruise speed advantage over a helicopter and the VTOL capability are reason enough to join the queue of customers. Detractors would say that it does neither thing as well as an individual aeroplane or helicopter, but then neither of those craft can do both.

Describing a mission to rescue the crew of a yacht sinking 240km offshore, Russell noted: 'The tiltrotor has got the survivors to hospital by the time a helicopter has reached the scene.'

With a higher anticipated ownership cost than its conventional competitors, and without an overwhelming performance advantage, the civil tiltrotor market is likely to be relatively small. Apart from corporate/VIP transport, potential users include EMS and SAR operators. Perhaps the most promising market is for the support of deepwater oil drilling.

At one time, it was considered for use as a trainer for the V-22 Osprey, but the cost and timeline worked against it, and military tiltrotor pilots are trained on conventional aircraft – the

TC-12 (King Air) for multi-engine training then an abbreviated course on the TH-57 (Bell 206) for rotary-wing training. An armed version to escort Ospreys was proposed, but seems unlikely as new self-defence measures, such as a retracting gun, have been fitted to the V-22.

The AW609's dimensions are larger than a medium civil helicopter, but the footprint is not significantly bigger. The diameter, or largest overall dimension of the craft, when rotors are turning is 18.29m for the 609 compared to 16.66m for the AW139.

One of the closest fixed-wing aircraft in terms of accommodation and performance is the Beechcraft King Air 350i, which seats up to 11 passengers, cruises at 313kt and has a range of 1,750km. With nine passengers, the AW609 offers 1,295km range at 275kt.

## Sizing up

Therefore, excluding height, the 609 has slightly smaller dimensions than the King Air 350i, a comparable cabin, about three-quarters the range and two-thirds the speed. Of course, it can fly point-to-point or at least helipad-to-helipad, reducing the fixed-wing turboprop's advantage.

'The tiltrotor has got the survivors to hospital by the time a helicopter has reached the scene.'

When compared with AgustaWestland's figures for a 'typical' helicopter performance of 140kt and 740km range, the 609's performance is far superior, and with pressurisation it can climb through and over weather.

The AW609 price is still a mystery, but for rough comparison purposes, according to Beechcraft a 'very well-equipped' 350i will cost you around \$6.5 million. A fully equipped 13-seat Eurocopter EC155 B1 costs approximately \$10.2 million.

Despite all the delays and uncertainty over price, AgustaWestland says that most of the original customers who placed deposits when the programme began in 1996 are still signed up. No significant new orders have been booked since the 1990s, but the company says that its marketing programme has barely got going. **RH**



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Photo: Bristow

The provision of SAR services, once the domain of the military, is increasingly being undertaken by commercial businesses. These companies, which in the UK include Bond, Bristow and CHC, work with both governmental and private sector customers in the oil and gas industry.

Luke Farajallah, managing director of Bond Offshore Helicopters, underlines the importance of SAR to his business. 'Life and rescue, which includes SAR as well as emergency medical services, accounts for 42% of Avincis Group's [Bond Offshore Helicopters corporate parent] revenues,' he said.

Commercial SAR providers work with a range of customers that have varying requirements depending on where and when they fly. The demands that delivering these services place on SAR operators – in 2011, Avincis companies conducted more than 3,900 SAR missions over water and mountains – are driving changes to the way that they do business with their customers and platform suppliers.

### Meeting requirements

Speaking to *RotorHub*, Ian McLuskie, SAR UK business unit leader for CHC UK, described some of the diverse requirements he sees from customers. 'In the context of SAR provision in the UK for the DfT [Department for Transport] and previously MoD, it is long-range, multi-platform over water, coastal, estuary, land and mountain areas,' he said. 'It is national coverage within specified times in all weathers on a 24/7 basis. It not only covers the whole of the UK, but also extends a long way out to sea, covering nearly 3 million square kilometres.'

'So that's really different from a requirement in Cyprus, where they have a smaller aircraft covering a very localised area around the [UK] sovereign base area. So each of those are providing a SAR service, but the depth and sophistication of the service is quite different.'

**SAR provision is no longer just about the helicopter, but the entire supply chain and surrounding infrastructure. Matthew Smith explores how operators are preparing for future requirements as the UK ends military involvement in its coverage.**

# Leading the way?

This is especially true of a country such as Australia, where SAR is organised differently to the UK. 'In the Australian template, there is a sophisticated level of SAR and EMS coverage, but it is largely piecemeal due to the scale of the country,' continued McLuskie. 'You will never achieve the level of coverage that you get in Western Europe in places like Australia or Africa or other oceanic regions.'

This is also true for the different industries that are served by commercial SAR providers, particularly oil and gas. Bond Offshore Helicopters has a long-term contract to provide SAR services for BP in the North Sea using two dedicated,

especially modified Eurocopter AS332 L2 Super Puma Mk IIs under the Jigsaw programme.

Farajallah told *RH* that the operator's two Jigsaw aircraft are expected to 'provide an airborne SAR capability with enhanced levels of all-weather rescue capability and clinical care, 24 hours a day, 365 days a year, at ten minutes readiness from 07:00-19:00 and 30 minutes readiness during the "silent hours" of 19:00-07:00'.

### Going deeper

Tim McMillan, UK commercial director of CHC, also noted that as oil and gas extraction technology improves and companies look further offshore for deposits, there is a corresponding increase in demand for SAR provision.

'Because the oil and gas industry is now travelling further offshore and into deeper water, with more sophisticated rigs, often on a temporary basis and in areas without a sophisticated national SAR service or even infrastructure, the oil companies are →

'You will never achieve the level of coverage that you get in Western Europe in places like Australia.'

# Focus



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'For the first time in Europe, a large multi-engine civil helicopter will be able to fly under NVG technology.'

having to consider provision of SAR themselves,' he said.

'The UK is one of the most sophisticated SAR environments in the world, but many other countries are not that sophisticated yet, and may never get there because they're just too big or not rich enough.'

This is reflected in Bond's experience, and Farajallah noted that the Jigsaw programme came about because 'BP wanted to enhance rescue and recovery capability' as part of a wider contract with Bond to provide crew change services. This new capability required specialist aircraft, and so Bond modified two of its AS332 L2s to fit the role.

The need to deliver a SAR service that meets a broad range of requirements from different customers means that providers are developing increasingly close relationships with both the customer and platform OEMs. This model enables a company to shape an effective requirement with the customer and then develop a service to meet

it, including providing input into the OEM aircraft development process.

Elaborating on this point, McLuskie noted: 'During the introduction to service of the S-92, we collaborated with Sikorsky, applying our knowledge from existing UK, Irish and international SAR service operations to shape the development of the green aircraft, so that it is now the basis of Sikorsky's baseline SAR offering. We had input from a wide variety of people – incident commanders, pilots and rear crew, through to engineers and paramedics who have many decades of civil and military SAR experience.'

### Standard practice

This is an approach that McMillan believes is becoming standard practice. 'CHC seriously entered the UK SAR market in 2007 with a mix of new-technology S-92 and AW139 aircraft,' he said. 'We developed a close relationship with both Sikorsky and AgustaWestland to co-develop the SAR aspects of the aircraft.'

'Prior to that, it had been an S-61 or Sea King delivery, and so there was probably less of a relationship with the OEMs. I don't believe there was that close relationship prior to the new-technology aircraft now in service, but I'm sure it will continue going forward with every operator.'

Certainly, one company with recent experience acquiring new aircraft for the SAR mission is Bristow, which in November 2012 bought four Sikorsky S-92 helicopters to service the UK Gap SAR programme due to start on 1 June 2013.

As RH was went to press, it was announced that the operator had secured the £1.6 billion (\$2.43 billion) contract to provide future SAR services across the UK from 2015. Announced on 26 March, the award will see 22 Sikorsky S-92s and AgustaWestland AW189s operating from ten

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**The RAF will finally retire its Sea King fleet in 2016. (Photo: UK MoD)**

bases across the country, and will end current military involvement in SAR (see p6).

According to the operator, the acquisition of new platforms, plus the technologies that can be integrated, will allow missions under conditions where it was previously not possible.

'For the first time in European civil aviation, a large multi-engine helicopter will be able to [fly] under NVG technology,' said Gap SAR project manager Ian Middleton. 'The DfT and the Maritime and Coastguard Agency contracted Bristow to provide SAR helicopters that can operate in northern Scotland in all weather conditions, day and night. Our Gap SAR helicopters are entering a completely new theatre of operations using this technology.'

This follows the award of a SAR contract in Norway, where Bristow will provide services using three new Eurocopter EC225 helicopters (one EC225 All-Weather SAR and two EC225 Limited SAR models) from 2014.

### Customer relationship

However, a successful business is not just built on the relationship with the platform OEM. For McMillan, deeper engagement with the customer is one area that is critical to the way CHC does business, and he argued that it is a classic case of 'a little knowledge being a dangerous thing'.

'Many customers have aviation advisors, but SAR is a very specialist area within aviation,' he explained. 'As an operator, we are preparing to engage with customers to help shape their requirement. Very often these are centred on an aircraft and not the service required - the result being customers actually don't get what they need. The world is full of poorly thought through aircraft fits delivering extremely poor service in terms of availability, range of operation

or capacity, while the customers think they've got SAR coverage.'

This viewpoint has had a major impact on CHC's approach to its contracting processes. 'It becomes more of a consultative sell,' continued McMillan. 'Our sales work with the customer is moving much further up the acquisition cycle in terms of engaging with them to have these requirements conversations much earlier in the process. This means that if they develop a requirement with us with an operating knowledge, then (a) they know they've formed the requirement properly, and (b) they are generally not surprised

when they get the response as a result of any competition they run.

'For example, if you take the subject of medical equipment in the back of the aircraft, CHC has, as a result of its recent UK work, developed a high-end "ambulance in the sky" solution. This enables CHC and customers to work together to review the high-end option and step down the options to assess where they want to settle with regard to the operational performance-versus-cost equation.'

CHC has had to adapt its business to changing customer needs, particularly a growing demand for increased aircraft availability. McLuskie noted: ➔

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Bond uses two AS332s to provide SAR cover for BP's UK offshore facilities. (Photo: Eurocopter)

more,' argued McMillan. 'Everybody focuses on the aircraft, but it's all to do with the service wraparound. The aircraft is what everyone sees, but it's just the tip of an iceberg of infrastructure, aircraft mission systems and the training and quality of the crew. That is what lets you keep that availability level. It takes all three elements to deliver that service.'

### Stress levels

However, McLuskie also pointed out that advances in technology are key to this, noting that helicopters are naturally high-stress machines and break frequently.

'The availability of new-technology aircraft is far higher, but it's also their design for serviceability – the speed with which you can fix them when they break – where the new technology has also helped,' he said. 'Previously, you were changing components on circuit boards or mechanical systems, now it's line replaceable units – [you can] just pull the whole board out. The aircraft are much better designed and the panels for service entry are better.'

Looking forward, it appears that two factors will drive the market in the future – the expanding

'The key expectation in today's SAR scene is probably around availability – by availability we mean the aircraft platform, the systems on the aircraft and the readiness of the crew to deliver the service. We have expectations now from customers of 15 minutes [response times] by day, and 40 minutes by night, 24/7. Expectations are

for over 98% availability, which is effectively being available full-time – that is quite a demand, not only on aircraft systems at standby readiness.'

As a result, the SAR provision is no longer just about the helicopter, but the whole supply chain and infrastructure surrounding it. 'The business is about the service provision, not the aircraft any

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‘Exploitation of offshore resources will move further and further away from the safety of the coast.’

reach of the oil and gas companies and the ongoing impact of the financial crisis.

‘The absolute certainty is that the exploitation of offshore resources will continue to move further and further away from the safety of the coast and into deeper waters, and to do that is a whole new challenge,’ said McLuskie. ‘This is best approached by operators and customers developing the requirement together in consultation rather than CHC just pitching at a previously unseen requirement.’

McMillan also pointed out that one of the major considerations facing the industry is the global economic environment, and believes that the desire to outsource will drive the market in the future. ‘A good proportion of countries deliver their SAR via the military, and I think the UK is one of the lead nations in converting away from military



More red and white S-92s will be arriving in the UK from 2015. (Photo: CHC)

provision to commercial provision on a national basis,’ he explained.

‘I think a lot of the world is watching the UK in terms of making that assessment. There are some countries, Sweden for example, which have tried commercial provision of SAR and have just re-nationalised it because they didn’t have a very

good experience. But right across the globe, there are a whole bunch of governments trying to decide how they want to deliver SAR and whether they continue to have military SAR or switch to commercial provision. And that’s an area of the business or the market that we are watching very closely.’ RH

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An AB412 accompanies a patrol boat off the coast of Sicily. (All photos: authors)



# Hot waters

**With its extensive coastline, Italy has had to create a significant maritime infrastructure to ensure public safety alongside fighting against illegal activity in home waters. Mauro Finati and Paolo Rollino provide an overview of the Italian Coast Guard's rotary-wing fleet.**

With almost 7,500km of coastline, and situated in the middle of a 'hot sea' of legal and illegal trading, Italy has been forced to maximise its resources in order to manage and maintain its national interests in the marine environment.

As a result, operational units of the Italian Coast Guard are fighting on the front lines of a war against illegal trafficking of arms, drugs and people, while concurrently managing environmental disasters, monitoring pollution levels and carrying out SAR duties.

The coast guard is an operational branch of the Corpo delle Capitanerie di Porto (Corps of the Port

Captaincies/CPC), and the air component of the force derives its mandate from this authority to protect Italian territorial waters.

The CPC was originally tasked with supervision of territorial waters, rescue at sea and the prevention and control of marine pollution. To execute these functions, a new operational branch was created and specially equipped with aircraft and surface vessels. In 1988, this branch merged with the coast guard.

The new service was given the difficult task of coordinating and managing SAR activities at sea, in the air and on land, with its own craft or with the help of other civil and military rescue units.

## Extended duties

As well as SAR missions, the operational duties of the Servizio Aereo della Guardia Costiera (Coast Guard Air Service) were extended to include: maritime patrol for immigration control; policing maritime traffic (fishing, commercial and recreational); monitoring of bathing waters and pollution; urgent transportation of the injured; and fire-fighting.

The coast guard's field of operations typically extends beyond Italy's 22km of territorial waters and out into the open sea. As a consequence, it is frequently active right up to the territorial limits of other countries bordering the Mediterranean. ➔



One of four AW139s currently in the fleet overflies a cruise ship.

The CPC is a hybrid entity, and is in fact a military corps administered by the Italian Navy. It also has duties and jurisdiction in the civil field, monitored by the Ministero delle Infrastrutture e dei Trasporti (Ministry of Infrastructure and Transport).

The HQ of the CPC, situated in Rome, also functions as the national Maritime Rescue Coordination Centre, and oversees a number of maritime directorates, which act as maritime rescue sub-centres.

These departments have a total of 15 operational sites located along the entire coastline, running from Genoa to Trieste (including the islands of Sicily and Sardinia). Coast guard units act as harbour commands and sit at the bottom of the hierarchy, along with maritime traffic regional offices and beach delegations. The units coordinate sea operations and employ vehicles, aircraft and ships.

The corps' flying units fall under the Componente Aerea (Air Component). There are three air stations with five air sections: Luni-Sarzana with 1° Nucleo Aereo (maintenance) and 1ª Sezione Volo Elicotteri (two Agusta-Bell AB412CPs and two AgustaWestland AW139GCs); Catania-Fontanarossa with 2° Nucleo Aereo (three Piaggio P166 DL3s, one ATR-42MP and one P180 CP) and 2ª Sezione Elicotteri (two AB412CPs and two AW139GCs); and Pescara-Fontanelle with 3° Nucleo Aereo (two ATR-42s).

Future pilots begin training at the Naval Academy in Rome, and continue in the US at Naval

## Fixed- and rotary-wing aircraft have different operational tasks.'

Air Station (NAS) Whiting Field, Florida, for basic instruction on the US Navy Beechcraft T-34C, which is being replaced by the T-6B Texan II.

After this initial period, fixed-wing cadets continue their training at NAS Corpus Christi, Texas, flying the Beechcraft T-44A/C Pegasus and getting their naval aviator wings. Helicopter pilots instead return to Italy and achieve their military helicopter wings at Frosinone, flying the Nardi-Hughes NH 500Es of the Italian Air Force's 72nd Wing.

### Conversion course

The next step in the training is a conversion course on the aircraft that pilots will fly on operations. Rotary-wing pilots go to the Centro Addestramento e Standardizzazione Equipaggi di Volo (Flight Crew Training and Standardisation Centre/CASEV) at Luni for theoretical and practical courses on the AW139 or AB412, depending on which machine they will fly. The simulator phase for emergencies and VFR flight is completed at the AgustaWestland facility in Vergate.

This training phase lasts between eight and 12 months, at the end of which pilots are declared

'limited operational ready', a qualification equivalent to co-pilot. After two to three years of flight experience, pilots are considered competent to work independently, and become 'operational ready'.

CASEV and fixed-wing training units are tasked with the theoretical and operational training for pilots, coast guard crews, specialists and systems operators. They are also responsible for the periodical qualification checks for all personnel. The training never ends, as every six months pilots must attend simulator emergencies training at the manufacturer's plants and refresher courses on the use of special sensors.

While fixed- and rotary-wing aircraft can be utilised together in complementary ways, they have different operational tasks: long patrols to cover a broad area of water for the former; shorter range missions, with a specific target and very often in support of emergency calls, for the latter.

Rotary-wing aircraft are essential for effective air rescue at sea. Due to their flexibility and specific flight characteristics, helicopters are primarily tasked with supporting SAR missions. In addition, they support the activities of the maritime police, including supervision and control of fisheries, surveillance of protected marine areas or special environmental or archaeological zones, fire-fighting, civil protection and the transportation of casualties.

The first helicopter to enter service with the Italian Coast Guard was the AB412, nicknamed 'Koala'. The acquisition of 24 aircraft was ➔

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initially planned, to be distributed across air stations along the entire coastline. However, only eight machines were purchased due to a lack of resources. This included four SP versions and then four HP models, all delivered between July 1992 and October 1998. Two more of the latter were added in November 2002 and February 2003, while one helicopter was lost in 2001.

### Young at heart

All the helicopters are now updated to AB412CP standard, and the nine still in service form the backbone of the coast guard's rotary-wing fleet.



**The helicopters based at Catania are complemented by the co-located ATR-42, P166 and P180 patrol aircraft.**

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Although they are now relatively outdated in terms of design philosophy and avionics, the AB412s are still young in terms of hours flown and reliable, albeit expensive to maintain.

The machines are equipped with AN/SPS-71 Doppler radar, which calculates and compares in real time the position of the helicopter with a GPS card, interfaced with a search radar and a FLIR/low-light-level TV (LLLTV) sensor that allows the viewing of objects, even in almost total darkness.

Plans to replace the AB412CPs with the latest AW139CP have been shelved due to budget cuts caused by the economic climate in Italy. Instead, the existing fleet will receive upgrades to electronic and avionic equipment.

The other helicopter supplied to the coast guard is the more modern and efficient AW139GC, known by the nickname 'Nemo'. The first of four machines entered service in July 2010 at Luni-Sarzana, and subsequently re-equipped the Catania unit. The last of these helicopters was delivered in February 2011. The initial plan was to replace the Koala fleet through the acquisition of 12 aircraft, but a lack of funds has made it impossible to complete the programme.

The qualitative leap obtained with the AW139 has been remarkable thanks to its operational characteristics and performance. The generous size of the cabin and the surplus of available power provided by the two Pratt & Whitney PT6C-67 turboshaft engines, rated at 1,530shp, make the AW139 a top performer in its class. The interior is spacious and there is sufficient room for the rescue team and equipment. The advanced design of the five-blade rotor allows stable, fast and comfortable flight, with very low vibrations that are only noticeable during hovering.

### Sufficient autonomy

From an operational point of view, the Nemo can fly around a three-hour mission (the option of an internal auxiliary fuel tank is not yet available).

‘One drawback for the AW139 is the lack of skids, making for less stability when landing on ships.’

The AW139GC can still carry out missions up to 260km away, with 30 minutes of SAR activities on-site. The cruise speed is 145kt, only a little lower than the P166 DL3/SEM at 162kt, and the maximum speed is 167kt. One drawback for the Nemo is the lack of skids – the wheeled landing gear makes for less stability on soft terrain or when landing on ships in rough seas.

The AW139CP avionics suite is sophisticated, comprehensive and fully digitised. The four-channel digital automatic flight control system allows the crew to select various modes of automatic flight for SAR activities. Moreover, it is essential in the hover, especially in extreme conditions, allowing the aircraft to hold a perfect fixed point, and is significantly more effective than the AB412CP.

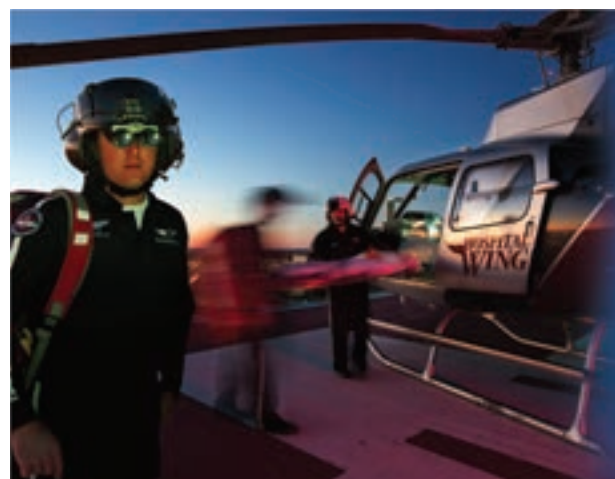
#### Comprehensive equipment

The mission equipment is comprehensive: the nose fairing houses an advanced Fiar-Bendix 1500B-plus search radar; the nose turret contains a Star Safire FLIR with a laser illuminator and pointer, plus two LLLTV cameras, an Automatic Identification System and a direction finder; aeronautical and naval VHF radios complete the avionics devices. A Nightsun searchlight is mounted on the lower-left forward fuselage, while a 272kg-capable hoist is mounted on the upper-right fuselage. The crew can use AN/AVS-9, cockpit-integrated NVGs.

Both helicopters are operated by two pilots, one of whom is a qualified air-rescue man. **RH**



The AW139 is crewed by two pilots, one of whom is also a qualified rescuer.



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ASESA flies its Bell 412s to over 200 offshore landing pads in the Bay of Campeche. (Photo: ASESA)



**With the Mexican oil industry thriving, offshore helicopter operators are vying for the latest contracts. Meeting the imposed requirements, however, is no easy task, discovers Jim Dorschner.**

# Mexican waves

The helicopter offshore oil support sector along Mexico's Gulf Coast is intensive, demanding and thriving, as national oil company Petróleos Mexicanos (PEMEX) continues to fuel the country's growing economy. At the forefront of the effort are four companies based at Ciudad del Carmen airport on the western side of the Yucatán Peninsula that operate every day throughout the Bay of Campeche.

At one end of the spectrum, Aeroservicios Especializados SA (ASESA) is a large corporation with 35 years of offshore experience. It currently operates around 20 helicopters offshore, with additional new aircraft expected later this year, all backed by a network of facilities throughout Mexico, including a helicopter MRO business. At the other end, newcomer Apoyo Logístico Aéreo (ALA) has only been around since 2009, with just two EC135s, but has carefully established the infrastructure for future expansion.

One of the first acts by the recently elected Mexican President Enrique Peña Nieto was to reaffirm that his administration would not privatise the state-owned petroleum industry controlled by PEMEX. This ironclad monopoly makes the oil

company the only customer for helicopter operators working offshore. As a result, they compete for contracts with little room for manoeuvre. In accordance with the oil company's business model, operators routinely work under multiple contracts, while actively positioning for the next opportunity.

## Intensive operations

Helicopter operations dominate the mixed-use airport at Ciudad del Carmen, with Bell 412s predominating. Workers coming and going from 14-day tours on rigs offshore are processed through a central passenger terminal. Flight operations occur in two daily cycles, morning and afternoon.

As described to *RotorHub* by Lorenzo Ramos Lepe, customer relations manager at ASESA, PEMEX contracts specify a narrow window of just a few minutes for operators to have aircraft in position, ready to load and depart. Failure to meet time requirements can result in loss of payment for that flight and additional fines. Repeated failures can affect current and future contracts.

There are over 200 certified landing pads on oil platforms and vessels within the vast Cantarell and

Ku-Maloob-Zaap fields lying 92 and 120km respectively from Ciudad del Carmen. In December 2012, production at the latter reached 867,000 barrels per day, and it is now Mexico's most productive field. In recent years, the Cantarell field has slipped to second place, being older and increasingly difficult to exploit. It was producing 408,000 barrels per day as of April 2012.

A typical Bell 412 sortie carrying 13 passengers into the Bay of Campeche takes around two hours to complete, and routinely requires eight or nine approaches and landings. The furthest pad from Carmen is over 200km away, with a transit time of about one hour and 20 minutes.

The high number of often hard landings, coupled with salt air and high humidity and temperatures are taxing on helicopters. PEMEX stipulates that aircraft must have less than 10,000 hours and be less than ten years old from date of manufacture, which requires companies to regularly retire and replace machines.

Most flights are in daylight hours, but some night flying is conducted, and pilots are required by PEMEX and Mexico's Civil Aeronautics Directorate to maintain night and IMC currency. PEMEX also ➔

requires operators in Carmen to rotate responsibility month to month for maintaining a 24/7 medevac capability with a six-minute alert to launch time.

Specially configured and equipped Bell 412s are employed for this task, with patients usually delivered to the hospital in Villahermosa, around 140km southwest of Carmen. However, medevac flights have also brought patients to hospitals in Campeche, 185km to the northeast, and even to Mérida, a further 148km beyond Campeche.

### Weather disruption

There are no navigation aids or precision approach systems installed in the Bay of Campeche, although all aircraft have GPS capability, and pilots have been known to use weather radar reflections from oil platforms during approaches in poor visibility.

However, weather is generally not a major issue, other than ocean fog and the high winds common in this area. The rainy season from May until October can also disrupt flight operations, particularly in the afternoon, and of course the Gulf hurricane season from June through November can be problematic to say the least.

Founded in 1977, ASES is a subsidiary of Grupo Lomex. 'ASESA has long experience with numerous helicopter models, having accumulated more than 470,000 flight hours, and is an established provider of helicopter maintenance services in Mexico, with three maintenance centres in Monterrey, Mexico City and Ciudad del Carmen,' explained marketing manager Anna Rizzo.

Offshore operations have historically been from ASES's large Ciudad del Carmen base and are currently conducted by a core fleet of 17 Bell 412EPs. Normally, seven aircraft are on the line ready for each flight cycle – five or six primary

**'Stress on the skids of Bell 412s as a result of the high number of landings is an area of concern.'**

412s, with back-up aircraft available in order to meet PEMEX's stringent launch windows and thereby avoid penalties.

Two low-time, second-hand Sikorsky S-76C+ helicopters were recently added to the fleet, with a third expected to enter service shortly. In addition, on 6 March it was announced that ASES had signed a contract with Sikorsky for six S-76D helicopters.

If the operator gets the contract as expected, these will support a new PEMEX deepwater field 46km off Mexico's northern Gulf Coast, about 290km south of Matamoros. The S-76Ds would operate from a base at Reynosa on the US border, 80km west of Matamoros.

In addition to the Gulf, ASES also operates three Bell 412s on energy sector tasks in Peru and a leased 412 in Colombia. It also operates six Bell 407s from Mexico City and Monterrey for flight training and charter work.

### PEMEX personnel

As an authorized training centre for pilots and maintenance personnel, ASES carries out a lot of staff training internally. Around 65 pilots are employed at Carmen, working 14 days on and 14 days off, just like PEMEX rig crews. Many pilots choose to commute from homes throughout Mexico, and one flies in from Los Angeles, California.

PEMEX specifies two pilots for all flights. A minimum of 500 hours flying passengers offshore is required for promotion to captain, and all new captains are subject to a 250-hour probationary period. Simulator training sessions are undertaken at least annually with Flight Safety International at Fort Worth, Texas, for 412 pilots, and in West Palm Beach, Florida, for S-76 crew.

Aircraft maintenance is taken seriously at ASES. It is conducted under a No 53 Aeronautics Shop Permit granted by Mexico's Civil Aeronautics Directorate. The company is a Bell Helicopter-authorized service centre for the Model 206, 212, 407 and 412, and a Pratt & Whitney-recognised maintenance facility for engine work. It is also authorised to provide maintenance service for AgustaWestland AW109s and Sikorsky S-76s.

### Maintenance management

Generating an average of seven fully serviceable aircraft twice a day every day requires near-perfect maintenance management, and ASES has achieved a 100% availability rate every year since 2009. A lot of this work is accomplished overnight by technicians and the quality assurance team. The operator uses a variety of software programs, many of them developed in-house, to track individual aircraft status, maintenance jobs and spare parts inventory. PEMEX also requires detailed monthly maintenance reports on every aircraft.

According to quality assurance manager Santos Martinez Hernandez, maintenance management begins and ends with the dispatch department. This is where pilots are allotted aircraft to fly and where they report aircraft status after they return. Data is fed into an internal online management network for access by all departments, as jobs are tracked to completion and individual aircraft are verified as serviceable for the next flight cycle.

Martinez told *RH* that two areas of concern are corrosion and stress on the skids of Bell 412s as a result of the high number of landings. The former is handled by a combination of applying a dry compound product and a weekly wet wash – the operator is looking into a water filtration system for handling wastewater. The latter is addressed through a vigorous monitoring and inspection programme, with early replacement when necessary.

Given the high demands placed on these Bell 412s and the strict end-of-life limits imposed by PEMEX, companies have to plan ahead for the acquisition of replacement helicopters. Like other operators *RH* interviewed, ASES managers were quick to affirm: 'The best replacement for a 412 is another 412.'

They consider the Bell 412 ideal for operations in the Bay of Campeche, and ASES recently took



ASESA is an authorised service centre for Bell helicopters and P&W engines. (Photo: ASES)

delivery of two new EP models, complete with Fastfin and other improvements. Further orders are sure to follow.

ALA is the youngest and smallest helicopter operator on the ramp at Ciudad del Carmen. Its home base is a modern, 'state-of-the-art' hangar and office complex able to accommodate up to five aircraft. The operator's pilots have logged over 38,000 hours on the company's two striking silver and blue EC135s since 2009, while maintenance technicians claim over 100 years of accumulated experience. Since start-up, ALA has successfully lured a number of key staff from other operators, including ASES.

ALA EC135s are normally configured for six passengers, with a five-seat layout available for VIP work. The operator has racked up over 16,000 flight hours offshore since 2009, carrying over 8,000 passengers for PEMEX. It also uses an operating location at Apodaca, on the US border opposite Laredo, Texas, for charters.

ALA is clearly well positioned to expand, including the acquisition of additional helicopters. However, in conversations with RH, operations director Dionisio Farias Campos was reluctant to reveal any details, citing restrictions imposed by

**Transportes Aéreos Pegaso has been operating out of Ciudad del Carmen since 1983. Its current fleet includes this EC135. (Photo: Eurocopter)**



PEMEX and internal company considerations. Publicly, ALA has indicated an interest in developing medevac and tourism markets to complement its offshore work.

The other companies on the ramp at Carmen are Transportes Aéreos Pegaso and Heliservicio Campeche. The former has worked offshore since 1983 and recently introduced three EC145s and a single AW139 to its fleet of three EC135s and five BK 117s.

With a profile very similar to ASES, Heliservicio Campeche operates a fleet of around 25 Bell 412

helicopters and a handful of S-76s that fly an average of 3,000 hours a month, carrying more than 1.1 million passengers per year. In 2012, Heliservicio contracted simulator services to CAE, with Bell 412 training now taking place at the Toluca training centre outside Mexico City, while S-76 crew train at the CAE Northeast Training Centre outside New York City.

Altogether, the vibrant offshore support market in Mexico is set to grow and steadily modernise, while reflecting the latest global trends and practices. **RH**

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A combination of geography and economics makes Latin America one of the world's most burgeoning civil helicopter markets. **José Higuera** reviews local operational trends and outlines the major OEMs' efforts to establish an industrial foothold.

# Activity centre

The growth trend enjoyed in recent years by the corporate and private rotorcraft sector in Latin America is set to continue. This is thanks to needs dictated by long distances between major population centres, combined with a complex geography and a relatively undeveloped infrastructure for road, rail and fixed-wing air transport.

Helicopters are the most logical and natural solution to these problems, and the regional market for rotary-wing aircraft looks set to keep on expanding. This process is being sustained by regional and local economies that have not only resisted the global financial downturn

surprisingly well, but are also growing, especially in South America.

Demand for helicopters dropped in 2008 due to the credit crunch, but recovered in 2009 and has continued growing steadily since then. With a civil rotorcraft fleet of well over 1,300 aircraft, Brazil is leading the region in terms of numbers, followed by Mexico with 900 machines and then a close group comprising Argentina, Chile, Colombia, Peru and Venezuela.

A significant proportion of the helicopter fleets in all these countries is operated by commercial firms supporting the exploitation of natural resources by the mining, forestry and offshore oil

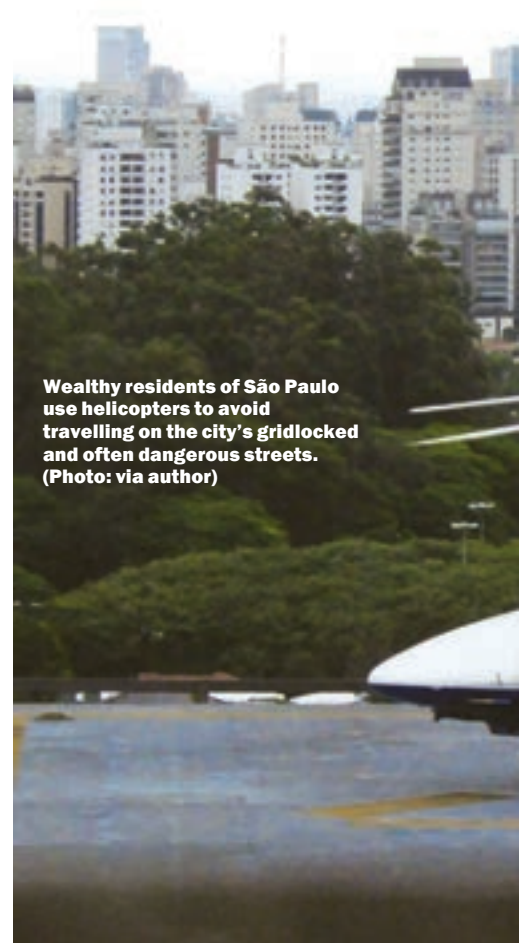
and gas industries, as well as the building of dams and other energy infrastructure in distant, difficult to access places at sea, in the Amazon or in the Andes.

Helicopters are used in support of mining activities in Peru and Chile, mainly copper, and for forestry work in Argentina, Brazil, Chile and Uruguay. Part of this work includes transporting fire-fighting personnel during the hot summer months to combat forest fires. Rotorcraft also play a key role for industries operating in the Amazon jungle of Brazil, Colombia, Peru and Venezuela, where the climate and terrain make road transport almost impossible and where river transport is excessively slow.

## Offshore reserves

Research results made public in 2009 indicated the existence of important oil and gas deposits in the Atlantic basin off the coast of Uruguay, triggering interest in licences for exploration and drilling from a number of energy companies. This potential offshore discovery in turn attracted the attention of several helicopter operators, including Argentina's Helicópteros Marinos, a firm with wide experience in the field, which opened an office at Montevideo in 2012.

Brazil is faced with the support demands resulting from the opening of offshore deepwater



Wealthy residents of São Paulo use helicopters to avoid travelling on the city's gridlocked and often dangerous streets. (Photo: via author)

Future EC225s ordered by Brazilian offshore operators could be built locally by Helibras. (Photo: Eurocopter)





pre-salt oil and gas fields, believed to contain some of the world's largest reserves. As a consequence, in late 2010 the country's oil industry sought an increase in its helicopter support fleet during the period 2011-2015 from 70 to 160 aircraft. However, the total of active aircraft had only risen to 105 by the end of 2012.

The reason is an acute personnel shortage, especially of crews qualified to fly the Sikorsky S-76 and other large helicopters. For example, local oil company Petrobras only contracts pilots with a minimum of 500 flight hours on single- or twin-engined types and requires a twin IFR rating for its offshore operations, but such aviators are in very short supply. The situation has forced some operators to turn down work.

The Brazilian civil aviation authority, ANAC, which oversees the training of new pilots for a single-engine IFR rating, demands that the check ride be made at the controls of a twin-engined helicopter. That might seem reasonable enough, but local flight schools do not have twin-engined machines. This leaves student pilots dependent on fleet operators of these types being willing to let them log flight time for that purpose, to get their checks and earn their licences.

Operators have turned to hiring crews from overseas, but this has been a limited solution until recently, as Brazil's civil air regulations only allowed

for contracting foreign pilots as 'instructors' for a period of up to six months.

A change to the rules was proposed by ANAC over two years ago, allowing operators to hire foreign pilots for up to five years. The requisite bill went before the Brazilian parliament late in December, but faced serious criticism from legislators, and was left pending further review during 2013. However, another reason for the shortage of pilots qualified and available for offshore operations in Brazil is that many prefer to work in the thriving onshore civil market, flying private and corporate machines.

### A tale of two cities

São Paulo in Brazil and Mexico City – Latin America's two megacities with around 20 million inhabitants each – rank first and second in the world in terms of per-capita private helicopter ownership, displacing Tokyo and New York.

The reasons for this include the fact that both Latin American cities have streets overflowing with traffic, with over six million cars in São Paulo, where the population is boosted every day by an additional 10 million people coming from satellite 'dormitory cities' to work in the centre. The morning and afternoon rush hours turn into enormous jams, meaning the drive from home to work can easily take two or three hours. However, both cities

'The aircraft not only saves precious time for its owner, but also allows them to enjoy better security.'

are also home to elites with an increasing amount of wealth who place a high value on their time.

For these individuals, buying a helicopter is a sound investment, one that helps them to avoid the streets and travel from office to home in just ten or 15 minutes. The aircraft not only saves precious time for its owner, but also allows them to maintain a good quality of life, achieve higher productivity, spend more time with their families and enjoy better security.

For example, a businessman or woman who would spend a whole week visiting four places in Mexico's Federal District or São Paulo State if travelling by road can do it in a single day by taking the helicopter. Travelling by air also spares them from long and tiring journeys through often unsafe streets, where violent crime, kidnapping and car theft are commonplace.

Only a modest percentage of the rotary-wing aircraft operating in the two metropolitan areas are smaller, lighter types, costing around ➔

\$200,000-300,000. Most are more expensive and sophisticated models, with price tags of up to \$2 million, but their owners are compensated by the higher safety levels and better capabilities of these machines.

The cost of operation and ownership of the aircraft can add up to over \$100,000 a year, including hiring pilots – despite the fact that many owners hold licences themselves – and paying for regular maintenance. As a result, in São Paulo there are currently over 800 professional helicopter pilots earning around \$100,000 per annum working for private owners or the air taxi companies that flourish in the city.

Mexico's Federal District and the valley surrounding it register around 100,000 helicopter movements a year, while São Paulo's aviation authorities reported that around 90,000 flights took place over the metropolitan area during 2011. There are currently around 420 helipads in metropolitan São Paulo, representing 75% of the total in Brazil and twice the number of such facilities in the whole of the UK.

### Taking part

Several helicopter OEMs from Europe and North America have a major presence in the growing Latin American market. Leadership at present belongs undisputedly to Eurocopter which, with over 1,200 of its helicopters flying in the region with civil and parapublic operators, accounts for over 50% of this market. Around 1,000 of these aircraft are used for executive transport, either under private or corporate ownership, and the rest are flown by commercial operators serving different industrial sectors or on civil security missions.

To best serve this market, Eurocopter established a wholly owned Brazilian subsidiary, Helibras, in 1978. The company has been based at Itajubá in Minas Gerais State since 1980, and has produced around 500 helicopters during its 35-year existence, including more than 300 AS350 Ecureuil variants, known locally as the Esquilo. Roughly 10% of production is exported to other Latin American countries, mainly Argentina, Bolivia, Chile, Mexico, Paraguay, Uruguay and Venezuela.

A new production line at Itajubá started delivering EC725 medium transport helicopters to the Brazilian military early in 2013, fulfilling an order from the government for 50 machines. The proportion of locally manufactured components is set to increase to 60% by 2016-2017. By then, Helibras will be offering EC725s and EC225s to regional and domestic customers, in the latter case with an eye on the offshore support sector.

Eurocopter's efforts in the region are also



**Over 400 Eurocopter aircraft are in service in Mexico. (Photo: Eurocopter)**

**'There are around 420 helipads in metropolitan São Paulo, representing 75% of the total in Brazil.'**

underpinned by Eurocopter Cono Sur, with offices in Santiago de Chile, dealing with sales and service support in Argentina, Bolivia, Chile, Peru and Uruguay and Eurocopter de México (EMSA), a subsidiary dealing with Mexico and other countries in Central America and the Caribbean,

Eurocopter has a strong presence in the Mexican market, where over 400 of its helicopters serve with local operators, and in early 2011 it announced plans to expand EMSA's operations, until then focused on repairs, maintenance and other post-sales service support. Under this initiative, a new plant was opened at Queretaro in February 2013 for the production of tail cones, vertical stabilisers and door mechanisms to supply assembly lines in other regions.

Other OEMs are also looking to increase their footprint in South America by way of industrial participation. In December 2012, Russia's Rostec and Brazil's Odebrecht Defesa e Tecnologia signed an MoU to establish a joint company in the South American country. This will carry out assembly of the Mil Mi-171 medium transport and provide support and maintenance services for a range of Russian-made rotary-wing types, including the Mi-35Ms acquired by the Brazilian Air Force.

It is understood that Brazilian-assembled Mi-171s, which are expected to include locally manufactured parts and components, will be

available both to fulfil domestic orders and for export to other countries in the region.

Hot on the heels of this agreement, in January 2013 AgustaWestland signed a similar accord with Brazilian aerospace company Embraer, creating a JV for the local assembly of helicopters produced by the European OEM. The move will allow its Brazilian partner to expand its activities, currently focused on development and production of a successful range of military, commercial and corporate fixed-wing aircraft, to include helicopters. For AgustaWestland, the alliance offers a good chance to increase its share of the rotorcraft market, in Latin America and elsewhere.

### Similar scenario

A similar scenario is developing in Mexico, where in 2006 MD Helicopters opened a plant at Apodaca, in the northeastern state of Nuevo León, to produce parts and fuselage sub-assemblies for the MD 500E, MD 520N, MD 530F and MD 600N, as well as components for Boeing and other airframers. In 2009, the facility started to supply fully assembled fuselages for completion in the US, and there are plans to open a full final assembly line in the future.

Bell's local subsidiary Textron Aerospace de Mexico launched a project to open a plant in the northern state of Chihuahua in 2008. The facility, which started operations late in 2009, manufactures minor assemblies, structural elements and wire bundles for the Bell 429. The parts are shipped to Bell's Canadian helicopter plant, where final assembly takes place, but there are plans to open a Mexican assembly line, also at Chihuahua, between 2015 and 2016. **RH**



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FlightSafety has developed high-definition micro-textures to improve image quality. (Image: FlightSafety)



# Graphic detail

**With every technological development in the helicopter simulation market, the sense of immersion, and therefore effectiveness, also improves. Peter Donaldson spoke to industry about recent advances.**

**A**lthough the simulation industry now offers a wide variety of affordable training devices, its ability to satisfy operators' growing need for cost-effective synthetic training still faces challenges.

One of these is the structure of the market, which contains numerous operators with small, diverse fleets and many different helicopter types to be simulated.

Against this background, *RotorHub* spoke to leading rotorcraft simulation houses about the technology's recent evolution and new developments from which operators might soon benefit. Of all the new capabilities that make the illusion of flying in the real world ever more convincing, they put visuals at the top of the list.

Peter Tarttelin, project technical lead at cueSim in the UK, emphasised the capability of real-time rendering of data in a physically realistic manner.

Fernando Maderuelo, senior project manager at Indra in Spain, concurred, citing the latest devices that extend vertical fields of view (FoVs) to 80° or more as a clear improvement for helicopter-specific manoeuvre training.

Rick Armstrong, FlightSafety International's VP of simulation, pointed to visuals specifically designed for helicopter training, with increased fidelity near the surface, enhanced rotor wash and wave effects, higher resolutions, photo-realistic texture and improved ground lighting as game changers, along with FoVs that now match those of the real aircraft.

Further refinement, he said, has come through mirror development. FlightSafety is now delivering 'glass or ridged' mirror systems in military simulators, and is working to qualify them to FAA Level D standards in the second quarter of 2013 – these systems allow horizontal FoVs to expand to 310°. 'While dramatically increasing the FoV, our glass systems also eliminate edge distortions common in legacy soft-film Mylar mirror systems,' he noted.

'Even if it is not only specific to the helicopter's domain, visual technology has in recent years allowed us to dramatically improve visual cues and realism,' said Christophe Bruzy, technical director of Thales' Training and Simulation (TTS) division, citing improvements in display size and resolution, terrain database content and richness and special effects.

Projectors based on LED technology are earning their place in helicopter simulators. Indra is incorporating them in three simulators it is developing with AgustaWestland for the British Army and Royal Navy's Lynx Wildcat.

## Matrix projections

For this application, Indra has chosen US manufacturer Christie's Matrix Stim, which the company describes as an advanced 600-lumen digital light processing projection system based on LED technology.

According to Christie, Matrix Stim is the first LED simulation projection system to provide independent control over the visible and IR spectrum. The company's ArrayLOC technology automatically adjusts and balances the brightness, colour space and black levels of all the projectors in real time, with no additional latency.





**Animating virtual trees to accurately replicate the effects of rotor downwash is a focus area for developers. (Photo: FlightSafety)**

**More realistic simulated oil rig landings will be possible in future. (Image: CAE)**



One of the toughest simulation problems in the low-altitude environment has been solved with the aid of computing muscle and new graphics algorithms.

'We are able to represent trees, including branches and leaves, and grass with different levels of detail, depending on the relative distance to the observer – those elements are also affected by the wind, both globally and locally,' Maderuelo told *RH*.

FlightSafety has also put a lot of effort into this area. 'Our distortion-free optical systems are a major factor, but we are also implementing animation cues in our visual environments for blowing grass and trees in close proximity to the rotors,' explained Armstrong. 'Another important feature we are providing is extremely high-resolution textures. Our HD micro-textures significantly enhance the visual cues during hover/land manoeuvring.'

'The challenge is to give to the pilot all the necessary speed and altitude cues,' contributed Bruzy. 'These cues are not only visual, but also include sound, vibration and motion. All must be fully correlated to avoid negative training.'

'Thales has developed specific algorithms, enabled by the latest CPU/GPU capabilities, which provide rich 3D content, depending on the altitude, with proximity effects such as brownout or wind/downwash effects on local vegetation.'

'Another means of ensuring correct altitude perception is to provide the pilot with a parallax-error-free image. Thales has patented a specific technology called Immersive View.'

Projectors suitable for day, night and NVG applications are potential game changers, according to Tarttelin, but it will take some time for that capability to be honed.

### Tough terrain

Regardless of computer power, some things remain tough to simulate. 'Physical phenomena involved in helicopter flight are very complex, and a model that covers the entire flight envelope doesn't exist today,' added Bruzy. 'Operations that reach the extremes of the flight envelope, such as SAR in mountainous areas or near cliffs, are still difficult.'

He argued that simulator manufacturers can help here by, for example, using new non-invasive sensors, making capture of accurate flight data easier, and utilising available computer power to build better models.

Tarttelin said situations requiring rapid changes in visual display still present challenges, along with emergencies that can be hard to verify outside the normal flight envelope, such as tail rotor drive failure and recovery.

He also argued that helicopter simulation still stretches computer technology. 'Processing power and memory [speed] are still definitively limiting factors for the visuals, and are likely to be so for the foreseeable future.' He emphasised that this does not apply in other areas of the simulator.

FlightSafety commented that the hover/land manoeuvre remains one of the most difficult tasks because of the need for tight and precise interaction between the visual, motion, flight control and display systems.

'Any modelling flaws or simulation systems interaction shortcomings can be exaggerated during this phase,' explained Armstrong. 'Autorotation also remains a difficult task due to insufficient or incomplete data sets and the potential safety issues in performing flight tests.'

Although wider FoVs are desirable, he acknowledged that the extra projectors and image

generator channels drive up costs. Avionics are another factor. 'Helicopters use the latest state-of-the-art avionics and autopilot and navigational systems – these are all very complex systems to simulate,' he added.

Maderuelo pointed to the Royal Aeronautical Society Flight Simulation Group's assessment that the toughest challenges include prediction of off-axis responses, the vortex ring state, sling-load operations and the ship-helicopter dynamic interface.

Other challenges are as human as they are technological, he argued. 'On the engineering side, there are limitations due to the limited number of skilled professionals able to understand what we call computer language and pilot language,' he said. 'In our business, attracting talent and managing it are key factors.'

### Hydraulic to electric

The replacement of hydraulics with electric motion systems is almost complete. FlightSafety eliminated hydraulics from new production in 2006. Indra was an early adopter and all of its systems use electric motion. Thales, however, recently delivered two hydraulic full flight simulators (FFS) to the Swiss Army.

'For the time being, hydraulic motion has not been over[taken] by electric motion for very high payloads,' argued Bruzy. 'The FFS are mounted on hydraulic motion bases because the required level of performance cannot be met by a state-of-the-art electric motion base.'

This may soon change, however. He described the new TTS oil- and air-free Hexaline system as a breakthrough: 'Hexaline exceeds the regulation standards with very low maintenance costs, very high reliability and quality – no noise ➔'

or vibration – equivalent to a “state-of-the-art” hydraulic motion system.’

There is much commonality between civil and military simulation that goes beyond reproducing the performance and handling of the aircraft and extends into missions.

‘Our civilian helicopter product line has been cross-pollinated by the military line – and vice versa – in both concept and capabilities,’ noted Maderuelo, adding that operators can expect new aspects of mission-specific civil helicopter training and improvements to existing ones to reach the market in the near future.

These include more realistic oil rig landings, high-resolution city centres, gaming-quality representation of crowds and interactive players on the ground, and even networked onboard devices.

### Breaking tradition

Traditionally, regulations have driven helicopter training more than mission requirements have, but this is changing as civil operators learn more about the capabilities matured in the military, argues TTS president Jean-Jacques Guittard.

He emphasised the benefits to crew coordination of mission-oriented training, particularly when rear

cabin crew members, such as hoist and sensor operators, can be part of the simulation and when other entities involved in the mission, such as aircraft, ships and vehicles, can also interact. In this context, simulator interoperability is a powerful asset.

‘These technologies, successfully applied in the military domain, can and will soon be used in civil applications,’ he said. ‘With new technologies like virtual-reality helmet displays, significant improvements can be achieved, particularly in rear cockpit simulation.’

Tarttelin urges conservative operators to embrace mission simulation more to get the most from it, detecting some scepticism among them. ‘I fear that some will only ever do so if it can be demonstrated that there is a tangible financial benefit.’

The relationship between simulator manufacturers and helicopter OEMs is a crucial one, but views on that relationship within the simulator industry differ.

Guittard pointed to simulator manufacturers’ dependence on access to data that helicopter OEMs control, and this can heavily impact the price of simulators.

Although the cost of simulators has been falling for years, data has been increasing in some cases, something that might threaten simulation’s business model if alternatives are not available, according to Guittard.

### Single source

Alternatives, such as working with operators or acquiring aircraft to build their own flight data packages, are used when developing a simulator for a type already in service, but the OEM is the sole data package source for new types under development.

‘What is important in the development of a simulator is the quality of the conception and validation data,’ added Guittard. ‘This data has to be evaluated in the qualification process no matter what its origin.’

Tarttelin was similarly candid. ‘They can be difficult and expensive relationships, if indeed the OEMs are willing to engage at all, especially where they themselves are entering the simulation market,’ he said.

The view from Indra is more upbeat. ‘We think that the aircraft OEMs are collaborating more closely with the simulator manufacturers than ever, from the beginning of the development of new platforms,’ said



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**Thales still favours hydraulic motion systems for some simulator applications. (Photo: Thales)**

Maderuelo. 'In our experience, they are taking into account simulator development as one of the most relevant elements of the aircraft programme, and tend to release the simulator into service even before the first aircraft has been delivered to the customer.'

Simulation is continuously evolving, with more improvements to be expected as computer and graphic engine performance increases, with others emerging from customer requirements, Armstrong argued.

He also believes that enhancements in areas such as ATC correlation, weather simulation and

visual acuity are needed, and the use of NVGs in the commercial sector, the potential for 3D visual displays and the simulation of malfunctions deserve further research, while better reproduction of autorotation requires more flight test data.

Among the issues Indra is currently working on are increasing the number and complexity of synthetic entities, more accurate simulation of the interaction of wind and terrain, more realistic ship air wakes and fire-fighting scenarios and the cost-effective generation of detailed databases.

### Human factors

TTS asserts that further improvements in effectiveness are to be had from better understanding of human factors. 'The integration of the human factor concept in simulators would give instructors the tools to precisely and objectively evaluate the chances of a student's success through the study of physiological signals,' noted Bruzy.

Tartelin struck a similar note. 'Many manufacturers could improve their products more by focusing on instructor aids – coupled with operators recruiting and training instructors more effectively – and also on a more holistic environment,' he explained.

While safety issues and regulations are pushing towards greater use of simulation, some argue that inconsistencies, particularly in authorities' award of training credits for flight training devices and non-Level D full flight simulators, hinder progress.

Some worry that authorities might insist on simulator manufacturers using costly OEM data packages. However, at the same time the adoption of new standards under ICAO 9625 will allow greater technological freedom in simulator design, although its implementation by national authorities could be slow. **RH**

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# Final call

The Nevada Army National Guard uses UH-60s equipped with 2,900l Bambi buckets for fire-fighting. (Photo: author)

Fire-fighting duties in the US have been supported over the years through assistance provided by the US Army National Guard. **Barry D Smith** visited one of the units tasked with such a role to find out more.

The US Army National Guard (ArNG) can trace its roots as far back as 1636 as colonial and then state-funded militias. The current structure and organisation was established by federal law in 1903. It is divided into subordinate units stationed in each of the 50 states, three territories and Washington, DC, operating under their respective governors.

ArNG units can be activated by the governors to respond to domestic natural and man-made emergencies and disasters. Most state emergency management agencies have liaison officers assigned to them by their state national guard to coordinate responses.

One of the more common missions for ArNG aviation units is fire-fighting, and helicopter units based around the country are used every fire season to drop water on major wildland fires.

However, these units can only be used under very specific circumstances. There are many private, commercial helicopter operators under contract with state and federal agencies to provide fire-fighting services. Military resources cannot be called upon until the commercial operators have all been requested, or their assets have been allocated elsewhere. In other words, the military is not allowed to compete with civil operators.

### Unit composition

UH-60 Black Hawk and CH-47 Chinook units provide the vast majority of ArNG helicopter resources committed to fire-fighting. However, the UH-72 Lakota (a military version of the Eurocopter EC145) is beginning to be used as well. Most states have agreements that allow national guard units from one state to be deployed to another, and it is common for ArNG helicopters from several states to be used simultaneously on large fires.

A typical unit assigned to fight fires is Detachment 1, C Company, 1st/168th of the Nevada Army National Guard. Based at Reno-Stead Airport, the air ambulance unit has six UH-60 Black Hawks with Bambi Buckets, which are used to drop up to 2,900l of water at a time.

'Formal requests come through our state Office of Emergency Management,' explained CWO4 Jeff Ducharme from the unit. 'However, during the fire season, we keep an eye on the news and have a good idea when we might be needed, and will begin the preparation to deploy to a fire or fires.'

'Filling a request depends on how many pilots and aircraft we have available and any other missions the unit has been tasked to perform. Once a request is received, the unit commanders and their staff begin to assemble the needed aircraft, crews and equipment. We can realistically be en route to a fire within 8-24 hours.'

He continued: 'Pilots new to fire-fighting get training in fire behaviour in different terrain and different kinds of fuels. We have outside instructors from the Nevada Department of Forestry come in to teach, as well as online courses. Then, an instructor pilot will work with them and practise flying the aircraft with the bucket into dip sites, dropping water, aircraft behaviour with the bucket full and empty, and power requirements.'

'Pilots new to the mission usually get about five hours of flight time during this phase. These are experienced pilots and much of the flying is similar to other sling load missions. Pilots must fly on at least one fire with an instructor pilot or experienced fire-fighting pilot before they can be signed off as a pilot in command for wildland fires. There is also annual refresher training for experienced fire-fighting pilots.'

In addition to the helicopters and crews, the unit will send an 11,350l fuel truck, as well as maintenance personnel and equipment. This allows operation for several days, or even weeks, away from the home base. Commonly used spares are carried, and other parts can usually be

sent from the home base within 24 hours. New crews and aircraft can be rotated in and out depending on the maintenance schedules of the helicopters.

### Role to play

'Once we arrive at a fire, we land and meet with the helicopter manager and get a briefing on the fire and what role we are to play,' added Ducharme. 'We give them a briefing on our capabilities based on temperature and altitudes, so they know what kind of water loads we can carry.'

'We try to go out to fires with a hoist installed on at least one of the Black Hawks and bring a medic along. This gives us a medical/rescue capability on the fire. One of the daily assignments for fire-fighting helicopters, on larger fires, is to have one designated as the "rescue" machine. This is usually just a helicopter with a cabin large enough to fit a stretcher and does not include a hoist or medical crewman. So, we can offer an advanced life-support capability with a rescue hoist.'

A military helicopter manager will be assigned to each aircraft. Their job is to assist the crew so they can be seamlessly integrated ➤



**The CH-47 is another type used by the US military to combat wildfires. (Photo: US DoD)**



Using a control valve means multiple drops can be made from a single load of water. (Photo: author)

dipping in a river and the only way in and out is the course of the river. Since we are over water, the crew must wear inflatable personal flotation devices on fire-fighting missions.

'We pick up the load, calling out the torque to the crew. We use very small control movements until we have translational lift, and then start climbing out and head for the fire. There are airspeed limits when the bucket is attached. When it is full, it is 100kt; when it is empty, the limit is about 60kt because it tends to fly up towards the bottom of the aircraft. We will also fly it with the gate valve open when empty to decrease the wind resistance.'

There are several drop techniques used that are based on the terrain. A line drop puts the water on a straight section of fire to get maximum use of the load. This can be done on a level section or up or down a hill.

### Spot drop

Another type is the spot drop. If there is a small spot of fire or a tree that needs to be doused, the pilot comes in a little slower than normal, pulls back on the cyclic to swing the load forward and then pushes forward to get the aircraft over the load and drop the water. This will allow it to drop almost vertically, but ensures the aircraft can maintain a forward airspeed.

Hovering over a blaze, however, is problematic, as it can fan the embers and flames, spreading the fire further. This technique also allows some forward airspeed to escape the area if there is an aircraft malfunction. The pilots do not like to get below 40kt and typically fly at 50-70kt about 50ft over the target. It varies with the type of drop and what they are trying to do with the load of water.

Another drop technique is tossing the load by banking the aircraft. This is used to hit a fire in a ravine or on a hillside, meaning pilots do not have to do a steep climb afterwards. The helicopters fly parallel to the terrain, turn into it and then sharply away – this swings the bucket towards the fire as the load is released and tosses it into the fire. If the bucket malfunctions and does not drop the water, the helicopter might otherwise not have enough power left to climb over the terrain – this method provides a better escape route.

ArNG pilots and crews like conducting fire-fighting missions. They are challenging and offer a real-world mission to support their home as well as surrounding states in a time of need. With the heavy involvement of the national guard in the worldwide war on terrorism, it is also nice to not get shot at while performing a vital mission. **RH**

into the aerial attack on the fire. They can communicate with ground units, as well as the airborne supervisor who is controlling and coordinating all the helicopters and aeroplanes being used on the fire.

'The helicopter manager is in the cabin with us,' explained Sgt Charles Whipple, a crew chief with the Nevada ArNG. 'He can make suggestions on the type of drops to use, how to line up, etc. If we are doing OK, he is usually pretty quiet. If we are talking directly to a ground unit, he can help us understand exactly what they want and make sure we are both on the same page.'

The pilots will switch flying duties to reduce fatigue. The pilot who is flying just handles the flying. His head is outside the cockpit most of the time, and he has to judge the winds to make sure the load lands on or ahead of the fire. The non-flying pilot handles all radio calls and monitors the aircraft systems. This is particularly important coming in and out of the water dip sites to make sure the engines are functioning properly and are not over-torqued.

'The crew chief in the cabin will help the pilot with the line up to the drop point,' added Whipple. 'Since we can lean out of the windows, we can see the bucket and advise the pilots on height above the water, how much water is in the bucket, clear the main and tail rotors around the dip site etc. The crew chief controls the bucket opening and works

with the pilots to load it with the maximum amount the helicopter can safely lift.'

### Stop valve

The Bambi Buckets the Nevada ArNG unit uses contain the Torrentula valve, which allows control of how much water is released, thereby making multiple drops with one load of water possible. The unit determines their maximum load based on the torque, turbine temperatures, altitude, air temperature and fuel load. A little extra power is always kept in reserve for emergencies, such as a bucket valve becoming stuck in the closed position.

Ducharme said the biggest challenge for new pilots is being over an actual fire, getting used to the updraughts, heat, smoke and how the aircraft handles in these conditions. They have to feel out the capabilities of the aircraft... and their comfort level.

The heat does not necessarily affect the engines as much as the smoke, which can produce compressor stalls when it is thick.

'We have a crew routine when we approach the dip site,' he explained. 'The pilot calls out the amount of fuel and makes sure the fuel tanks are evenly loaded. I try to make the approach into the wind because I will be heavy coming out and want that extra lift. I like a flat, open space so I can have an escape route in any direction, but many times that is not possible – we may be in a canyon

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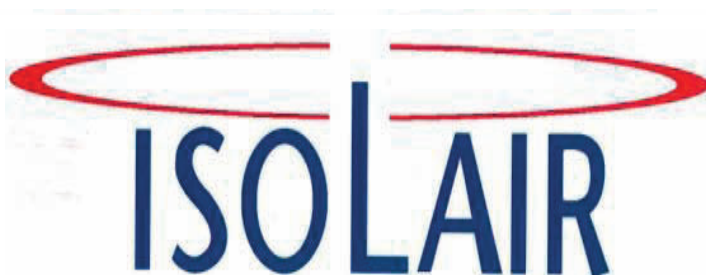


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<b>Maximum Fuel Capacity:</b>	242l (65gal)

**Powerplant**  
One Allison 250-C20 turboshaft, producing 278hp (207kW), driving a four-bladed main rotor and two-bladed tail rotor.

**Performance**

<b>Maximum Speed:</b>	132kt (244km/h)
<b>Maximum Cruising Speed:</b>	125kt (232km/h)
<b>Fuel Consumption (Fast Cruise):</b>	N/K
<b>HIGE:</b>	13,000 ft (3,960m)
<b>HOGE:</b>	6,700ft (2,040m)
<b>Service Ceiling:</b>	16,000ft (4,875m)
<b>Range (Standard Fuel):</b>	325nm (603km)
<b>Maximum Endurance (Standard Fuel):</b>	N/K
<b>Rate of Climb:</b>	1,700ft/min (8.63 m/s)
<b>Temperature Limitations:</b>	N/K

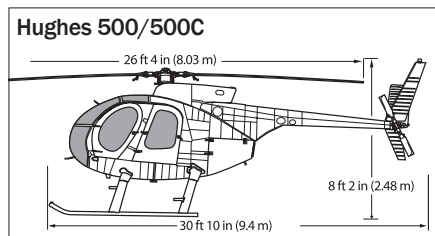
**External Dimensions**

<b>Rotor Diameter:</b>	26ft 4in (8.03m)
<b>Fuselage Length:</b>	23ft (7.01m)
<b>Overall Length:</b>	30ft 3¼in (9.24m)
<b>Disc Area:</b>	N/K
<b>Width (Skid Track):</b>	8ft 6in (2.6m)
<b>Height:</b>	4ft 3½in (1.31m)

**Internal Dimensions**

<b>Cabin Width:</b>	4ft 6in (1.37m)
<b>Cabin Height:</b>	3ft 11in (1.19m)
<b>Floor Area:</b>	N/K
<b>Baggage Hold Volume:</b>	N/K

**Maximum Seating:** Six people



**Hughes 500D**

The Hughes 500D sported key differences to the 500, despite retaining a similar appearance. A five-blade main rotor and a 'T' tail with a two-blade teetering tail rotor provided enhanced flight stability, as well as much improved handling during difficult manoeuvres. The first prototype of the 500D was flown in August 1974, and was awarded FAA production certification on 8 December 1976.

**Weights**

<b>Maximum Take-off Weight:</b>	3,000lb (1,360kg)
<b>Useful Load:</b>	1,680lb (762kg)
<b>Empty Weight:</b>	1,320lb (598kg)
<b>Maximum Fuel Capacity:</b>	240l (64gal)

**Powerplant**  
One Allison 250-C20B turboshaft, producing 420hp (313kW), driving a five-bladed main rotor and two-bladed tail rotor.

**Performance**

<b>Maximum Speed:</b>	152kt (282km/h)
<b>Maximum Cruising Speed:</b>	139kt (258km/h)
<b>Fuel Consumption (Fast Cruise):</b>	N/K
<b>HIGE:</b>	9,000ft (2,745m)
<b>HOGE:</b>	7,000ft (2,135m)
<b>Service Ceiling:</b>	15,000ft (4,570m)
<b>Range (Standard Fuel):</b>	260nm (482km)
<b>Maximum Endurance (Standard Fuel):</b>	N/K
<b>Rate of Climb:</b>	1,700ft/min (8.63m/s)
<b>Temperature Limitations:</b>	N/K

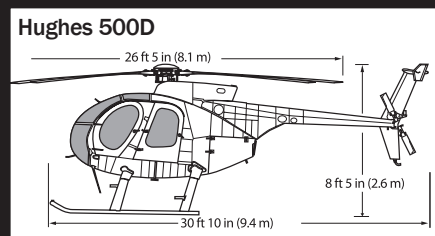
**External Dimensions**

<b>Rotor Diameter:</b>	26ft 5in (8.05m)
<b>Fuselage Length:</b>	23ft 0in (7.01m)
<b>Overall Length:</b>	30ft 6in (9.3m)
<b>Disc Area:</b>	547.8ft² (50.9m²)
<b>Width (Skid Track):</b>	8ft 6in (2.6m)
<b>Height:</b>	8ft 3½in (2.53m)

**Internal Dimensions**

<b>Cabin Width:</b>	4ft 3½in (1.31m)
<b>Cabin Height:</b>	5ft (1.52m)
<b>Floor Area:</b>	N/K
<b>Baggage Volume (Under Seats):</b>	42ft³ (1.19m³)

**Maximum Seating:** Seven people



**Hughes 500E**

Replacing the 500D as the basic production version, the Hughes 500E retained the D's Allison 250-C20B engine, and featured a longer, more streamlined nose. Internal capacity was increased, with more legroom front and rear, and greater visibility and headroom for rear-seat passengers due to a lower bulkhead. The 500E was also equipped with a new auxiliary fuel tank; improved soundproofing around the transmission and cooling fans; better heating; longer main rotor abrasion strips; new end plate fins; and a new 'T' grouping of flight instruments. The aircraft achieved FAA certification in November 1982.

**Weights**

<b>Maximum Take-off Weight:</b>	3,000lb (1,361kg)
<b>Useful Load:</b>	1,559lb (707kg)
<b>Empty Weight:</b>	1,441lb (654kg)
<b>Maximum Fuel Capacity:</b>	242l (65gal)

**Powerplant**  
One Allison 250-C20B turboshaft, producing 420hp (313kW), driving a five-bladed main rotor and two-bladed tail rotor.

**Performance**

<b>Maximum Speed:</b>	152kt (282km/h)
<b>Maximum Cruising Speed:</b>	139kt (258km/h)
<b>Fuel Consumption (Fast Cruise):</b>	N/K
<b>HIGE:</b>	8,500ft (2,590m)
<b>HOGE:</b>	6,100ft (1,860m)
<b>Service Ceiling:</b>	14,300ft (4,360m)
<b>Range (Standard Fuel):</b>	255nm (473km)
<b>Range (Aux Fuel):</b>	N/K
<b>Max Endurance (Standard Fuel):</b>	2.8hrs
<b>Rate of Climb:</b>	1,875ft/min (9.52m/s)
<b>Temperature Limitations:</b>	N/K

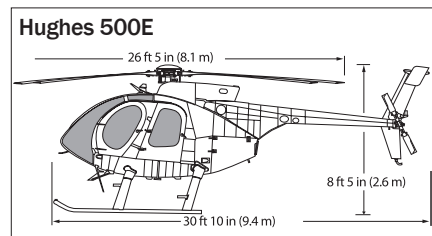
**External Dimensions**

<b>Rotor Diameter:</b>	26ft 4in (8.03m)
<b>Fuselage Length:</b>	23ft 11in (7.29m)
<b>Overall Length:</b>	30ft 10in (9.4m)
<b>Disc Area:</b>	574.8ft² (50.8m²)
<b>Width (Skid Track):</b>	6ft 3in (1.96m)
<b>Height:</b>	8ft 9in (2.67m)

**Internal Dimensions**

<b>Cabin Width:</b>	4ft 3½in (1.31m)
<b>Cabin Height:</b>	5ft (1.52m)
<b>Floor Area:</b>	N/K
<b>Baggage Hold Volume:</b>	11ft³ (0.31m³)

**Maximum Seating:** Seven people



**Ray Matthews** of Frazer-Nash Consultancy discusses the possibility of better synchronicity between military and civil certification, and what this could lead to.

# Joining up

With extensive operational demands and continued pressure to reduce costs, many military operators are keen to find efficient ways of bringing new helicopters into production. For example, rather than creating entirely new aircraft, several new and upgraded types make considerable use of civil machines and civil-certified COTS systems.

Of course, this brings opportunities for manufacturers and suppliers in the civil market to extend the reach of their products into the military domain. In many cases, where there are similarities between the civil and military missions being undertaken, there are clear commercial advantages in offering dual-use platforms. For example, the Eurocopter Puma/Super Puma already has both civil and military variants, offering similar operational capability in both domains.

However, in order to address this market trend, manufacturers and suppliers also need to adapt their product assurance processes to address the additional qualification/certification requirements associated with military use.

## Greater demands

Utilising civil-certified aircraft and products for military use is often not straightforward. First, it is possible that military missions may place greater demands on technical equipment and systems. An example of this is the radar altimeter. Civil requirements for this include use as a ground proximity warning system, yet military use might include low-level night flying using NVGs. The latter requirement is therefore clearly more onerous than the civil one.

Secondly, military missions may also require more challenging manoeuvres that exercise (and potentially exceed) civil operational limits. Military airworthiness requirements are therefore sometimes more stringent than the civil equivalents, and often require graceful degradation while operating in this regime.

Both the increased technical requirements and the ability to perform more strenuous manoeuvres may therefore require bespoke development or

additional qualification for an aircraft or part that has previously been certified for civil use.

Thirdly, in comparison to the civil certification process, equivalence in military certification standards is not well established and tends to vary from country to country. Unlike civil aviation, where there are de facto global certification standards, military authorities use different airworthiness standards – in the US, Mil HDBK 516B is used, and in the UK Def Stan 00-970.

## Re-qualification delays

While there is some similarity between the standards, in many areas they set dissimilar requirements. This has led to considerable expense and delay as platforms and systems that have already been qualified against one standard are re-qualified against the other.

There is, therefore, recognition within Europe that harmonisation of civil-military certification/qualification would be beneficial in order to help increase the efficiency of the process and optimise the testing and flight trials required by both markets.

This problem is particularly acute in Europe, as some national military authorities use the US standard, some the civil standard and some the UK standard. To this end, the European Defence Agency (EDA) commissioned a study to investigate the differences in certification. This looked at the existing certification and qualification processes that are used by EU member states to firstly identify where there are gaps or duplication in the processes employed. Once each had been captured, the study assessed the aspects of each current multinational programme that might be viewed as best practice.

Ultimately, the study used this assessment to make recommendations on how the processes for developing future helicopters might be optimised to ensure greater efficiency. These recommendations will be subject to review by the EDA, individual EU member states and representatives from the aviation industry.

In addition, to help harmonise the various standards, the EDA commissioned Frazer-Nash Consultancy to work with Marshall Aerospace



Photo: US Navy

and Defence Group to develop a handbook detailing European military airworthiness certification criteria. The handbook is intended to be used as a guidance document to tailor the airworthiness basis for military type certification activity and cross-references existing military and civil standards used by member states.

The handbook supports the Military Airworthiness Authorities forum and its aim of developing harmonised European military airworthiness requirements and supporting documents. These will help create a military regulatory regime that will allow aircraft designed and manufactured in one state to be deemed airworthy by another. This would reduce duplication across countries, cut initial aircraft procurement costs and, potentially, through-life costs.

This is, therefore, just the beginning of a long period of dialogue, although one that will hopefully lead not only to increased harmonisation between military and civil processes, but harmonisation across Europe and greater efficiency in the long term.

**Ray Matthews is group leader at Frazer-Nash Consultancy.**

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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