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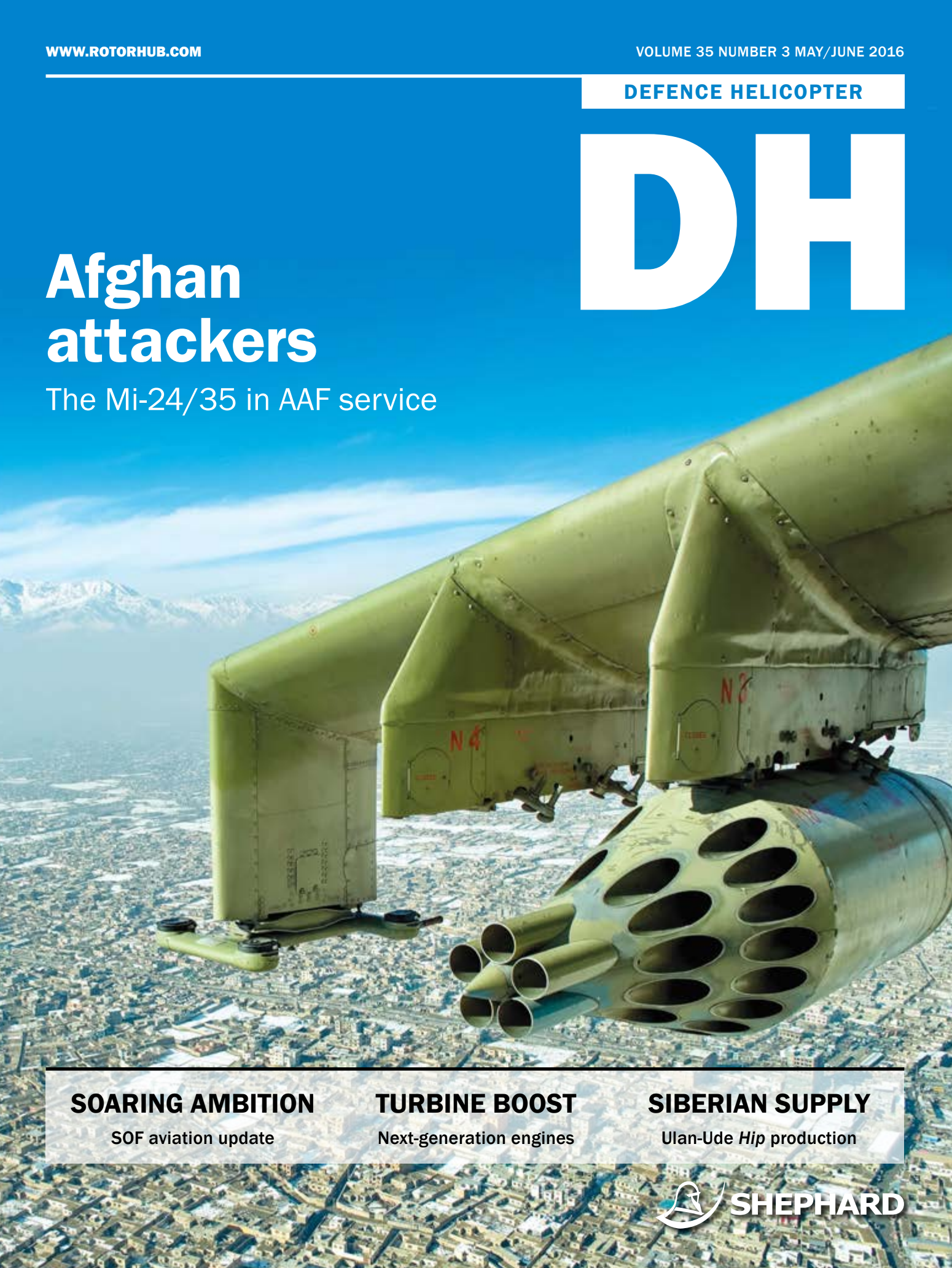
DEFENCE HELICOPTER

DH

Afghan attackers

The Mi-24/35 in AAF service



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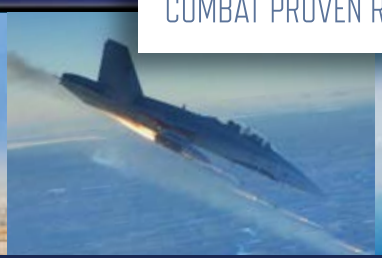

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Front cover: A UB-32 rocket launcher under the stub wing of an Afghan Air Force Mi-24V flying over Kabul during a training exercise in 2013. (Photo: Csaba Hegedüs)

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WHEN RESULTS MATTER

Helen Haxell, Deputy Editor

Moving with the times

As *DH* enters its fourth decade and Shephard celebrates its 35th anniversary, it seems a good opportunity to reflect on the developments in the global military helicopter community over this period.

Our own evolution is discernible by looking back at previous editions of the magazine, which have covered both developments in the contemporary operating environment and monitoring of potential future trends across the industrial and military domains.

Interestingly, a 1983 edition of the magazine, then known as *Defence Helicopter World*, looked at US Army rotorcraft operations with the then almost new Sikorsky UH-60A Black Hawk.

Moving forward in time to what might be the Black Hawk's replacement, wind tunnel testing by AVX on a scale model of its Compound Coaxial Helicopter design is evidence of the company's commitment to the army's Future Vertical Lift programme. Innovations that encompass drag reduction, aerodynamics and scope to reduce spacing between the rotor blades may pave the way for potentially exciting developments (see news, p6).

One technological issue that has always been troublesome for manufacturers and operators alike is that of data and information disruption to SATCOM feeds due to the effect of main rotor blades.

From my own discussions with manufacturers of tracking devices as well as providers of antennas and modems, the message is clear. Systems are getting smarter and technology is evolving to address this issue to ensure a high throughput of data even in the most challenging conditions, such as long-distance communication or DVE.

The current dialogue focuses on developing lighter and smaller systems in this area – something welcomed by pilots and crews who will be able to use the extra space and weight elsewhere, such as for additional fuel (see p28).

Spent simulations

Ten years on from that 1983 edition, *Defence Helicopter* covered then-new training devices such as the Combat Mission Simulator, which was introduced for the MH-60K and MH-47E back in late 1993 and early 1994 respectively.

Evidently, the dangers surrounding special operations have not changed, and militaries around the world are tackling these threats partly through the installation of more advanced avionics.

The Italian Air Force's 15th Wing at Cervia air base, which makes up part of the 1st Special Operations Air Brigade, recently declared IOC with the HH-101A Caesar CSAR and SOF support helicopter.

As Jim Dorschner reports on p8, the type is one of the world's most advanced SOF platforms, assisted by an aerial refuelling capability, self-protection systems and a 360° active electronically scanned array radar – a list which is not exhaustive.

Looking at a 2003 edition of *Defence & Public Service Helicopter*, the resourceful nature of the RAF's Chinook Mk 2 during Operation *Veritas* in Afghanistan is apparent – this issue of *DH* considers the Afghan Air Force's (AAF) Mi-24s and Mi-35s and their compatibility with the hot and high environment of the country, including the mountain ranges near the city of Kabul.

It considers NATO and US training of the AAF, undertaken by the USAF's 438th Air Expeditionary Wing. The unit instructed air and ground crews for the Mi-24/35 fleet, who also benefited from the experience of Czech and Hungarian mentoring teams.

The article also considers the challenges the AAF has faced when utilising its aircraft to reach higher altitudes (see p34).

Looking to the future, SATCOM systems – among other devices – are inevitably going to become smaller and more lightweight as technology advances, a small but valuable assistance to special operations undertaken in extreme and dangerous conditions.

The conflicts might be different, as well as the threats posed; however, as the market changes and technologies evolve, be assured that *DH* will be covering different perspectives and reporting on major issues facing the military rotary-world for many more years to come. ■

In the next issue

- **Rotor blades**
- **Training**
- **Avionics systems**
- **MRO provision**

Brazil certifies weaponised Fennecs...

Photo: Helibras

The Brazilian Army has completed qualification trials of an integrated weapon system fitted to its upgraded AS550 C3e (H125M) Fennec helicopters. Airbus Helicopters' Brazilian subsidiary, Helibras, announced the completion of trials on its social media channels on 13 April.

A Helibras spokesperson told *DH* that the qualification was carried out by several agencies including the Brazilian Army's flight test department, a company flight test team and the DCTA/IFI, Brazil's military airworthiness authority.

The company was unable to disclose more information on the specific weapon types that have been qualified. Photos published by Helibras appear to show an army AS550 fitted with weapon pylons with two 12.7mm gun pods on either side.

The modification significantly increases the firepower of the single-engine helicopters and allows the Brazilian Army to conduct armed scout missions.

Although this has not been confirmed as the weapons fit for Brazil, the 2t AS550 Fennec – now rebranded as the H125M – can also be equipped with a 20mm gun pod, 70mm rocket launchers or guided air-to-ground missiles.

There is also future potential for the helicopter to fire air-to-air missiles and guided rockets.

Helibras would not comment on when the weapon qualification process began or how many AS550 Fennecs will eventually receive this armed scout capability.

Ten out of 36 AS550 Fennecs and AS350 L1 Ecureuils have been upgraded by Helibras at its Itajubá site in southeast Brazil. At least three aircraft will be completely reconstructed and upgraded. Helibras also manufactures the H225M for the Brazilian armed forces as well as upgrading legacy AS365 Panther K2 aircraft.

The Fennec upgrades include a new glass cockpit, two-axis autopilot, new communication and navigation systems, a digital backup system, improved crew seats for enhanced crash protection and additional ballistic protection.

By Grant Turnbull, London

... and new armament for Thai AS550s

Photo: via author

DH recently witnessed new 12.7mm FN Herstal HMP400 gun pods and FZ220 70mm rocket launchers fitted to Airbus Helicopters AS550 C3e (H125M) platforms of the Royal Thai Army (RTA).

These weapons will provide greater firepower for the RTA's eight Fennec helicopters that are mainly used for armed reconnaissance missions, as well as forward air control, close air support, cavalry convoy escort, suppressive fire missions and supporting counter-drug units in peacetime. The AS550 C3e fleet is operated by the 1st Airmobile Company, RTA Aviation Centre.

Forges de Zeebrugge (FZ) makes the FZ220, a seven-tube, 70mm, lightweight rocket launcher that weighs 20kg. The FZ220 can fire FZ's proprietary FFAR and WA rockets.

The HMP400 pods mount a 12.7mm FN M3P machine gun, specially designed by the company for airborne applications. It offers accurate suppressive and defensive fire against troops at ranges of up to 3,000m and suppressive fire against light armoured vehicles out to 1,000m. The RTA will need more Fennec helicopters in the future to replace the ageing UH-1 gunships of the 2nd Airmobile Company.

By Sompong Nondhasa, Bangkok

Vikhr-1 ATGMs for Russian Ka-52 fleet

Photo: author

The Kalashnikov Concern reported on 5 April 2016 that it had finalised a delayed contract for the delivery of Vikhr-1 ATGMs to the Russian MoD, amounting to RUB13 billion (worth $419 million at the time of the initial proposal in 2013).

The company's director general, Alexey Krivoruchko, claimed that during the manufacturing process, the imported components used in the missile were replaced by Russian-made equivalents.

The contract for delivery of 1,972 missiles dates back to October 2013, with a delivery deadline set for the end of 2015. It was delayed due to technical issues faced by the Kalashnikov Concern. The organisation is based in the city of Izhevsk and was created by merging Izmekh and Izhmash, two companies in the ordnance manufacturing business.

In July 2015, Yury Borisov, Russia's Deputy Defence Minister responsible for the procurement of new weaponry, acknowledged in front of the national press that the Kalashnikov Concern had reportedly failed to meet its contractual commitments to deliver the ordered numbers of Vikhr-1 ATGMs, due to numerous technical issues encountered during the production process.

In October of the same year, Borisov announced that the faults had at last been fixed, and the technical documentation had been modified to allow the Kalashnikov Concern to start producing missiles that were compliant with the quality requirements imposed by the Russian MoD in the contract. The revised delivery schedule, agreed with the ministry, called for contract completion in spring 2016.

Unique platform

The 9A4172 Vikhr-1 missile was commissioned by the Russian military in 1995. The Ka-52 is the only platform capable of using it, mainly to destroy heavily armoured small-size targets at a maximum distance of 10km in clear weather.

The Vikhr-1's laser beam-riding guidance is integrated with the Ka-52's GOES-451 multi-sensor payload, which features a built-in device for tracking the missile and generating steering commands.

The missile has a tandem warhead, weighing 12kg, with 6kg of explosive charge, said to be capable of penetrating 1,000mm of reactive armour, dealing with dynamic protection at a 90° angle of arrival. It is fitted with both contact and proximity fuses and the specific type can be selected by the pilot before launch, depending on the target. The proximity fuse is activated at about 5m from the target, rendering the missile suitable for use against slow-speed airborne targets, too.

Meanwhile, the Russian Air Force Ka-52 Alligator attack helicopters, deployed in mid-March to Syria to participate in the campaign there, are reported to have flown their first combat sorties on 1 April. Three Ka-52s are known to have been deployed at Al Hmeimim/Latakia airport and these saw active use in the battle of Al-Qaryatayn, an important town that was recaptured from Daesh by Syrian government forces on 3 April.

The Ka-52s were seen in video footage employing 80mm rockets from a B-8M20A pack, and carried four 9M120-1 Ataka-1 ATGMs.

By Alexander Mladenov, Sofia

News on the web

18 April 2016
FDR image capability progresses

12 April 2016
Two Mi-171MTPR-1s delivered to the Russian MoD

8 April 2016
Airbus tests HFI concept for Germany

7 April 2016
Singapore to replace US-based Chinooks

5 April 2016
Four Mi-171Shs delivered to Angola

4 April 2016
AAR commences Falklands SAR operations

1 April 2016
Hard landing for Airbus in Latin America

1 April 2016
Sener delivers second AB212 to Spain

Pakistan boosts Viper order

Pakistan will receive nine new-build Bell AH-1Z Viper attack platforms from the US, according to a DoD announcement on 4 April. The FMS of nine helicopters and the same number of auxiliary fuel tanks is valued at $170.2 million.

This deal modifies a previous firm-fixed-price contract announced last August, when Islamabad ordered the first batch of three AH-1Zs. According to this contract modification, there are nine now on order. This work, overseen by US Naval Air Systems Command, should be completed by September 2018.

On 6 April 2015, the US Defense Security Cooperation Agency (DSCA) notified clearance for the sale of 15 Vipers and 1,000 Lockheed Martin AGM-114R Hellfire II missiles.

The DSCA commented: 'By acquiring this capability, Pakistan will enhance its ability to conduct operations in North Waziristan Agency, the Federally Administered Tribal Areas and other remote and mountainous locations in all-weather, day and night environments.'

Photo: USMC

Pakistan is heavily using 32 older AH-1F Cobras in its campaign against insurgents in lawless tribal belts in the country, so new attack helicopters are needed. It is not yet clear whether the country will exercise an option for six further Vipers to make up the total of 15 approved by the DSCA.

The Pakistan Army Aviation Corps has a number of options, including Changhe Aircraft Industries Z-10 helicopters. China gifted three Z-10s last April and they have been used operationally as well as appearing in the Pakistan Day military parade on 23 March.

Pakistan is also rumoured to be interested in the Mil Mi-28NE Havoc, and signed an agreement with Russia last August to procure four Mi-35M attack helicopters, with an option for 16 more to follow. Pakistan is the first overseas customer for the AH-1Z Viper, which is already widely used by the USMC. The latter will have completely replaced its AH-1W SuperCobra legacy fleet by 2020.

By Gordon Arthur, Hong Kong

AVX reports FVL progress

Following successful wind-tunnel testing of its Compound Coaxial Helicopter (CCH) design, AVX Aircraft remains bullish about its involvement in the US Army's Future Vertical Lift (FVL) programme. The testing was completed in February at the Texas A&M University wind tunnel.

'We have a contract [with the army] which funds us to conduct three studies,' Troy Gaffey, CEO and chief engineer at AVX, told *DH*. 'The first one is essentially complete where we refined the aerodynamics of the body and the fuselage, made sure we had adequate control surfaces and reduced the amount of drag.'

The company is currently in the process of analysing the results of the wind tunnel tests and from a first look, Gaffey commented that he was pleased with the results. AVX was bidding for a contract to build next-generation aircraft for the army's Joint Multi-Role Technology Demonstrator (JMR-TD) programme in 2014. However, Bell and Sikorsky/Boeing, with the V-280 Valor and SB>1 Defiant respectively, were selected to go forward and these two teams are preparing for first flights in 2017.

'The long-term objective is to be involved in FVL, and perhaps to build some of the smaller-size rotorcraft and compete even for the larger ones,' Gaffey said. 'In that case, we would be teamed with an OEM, either a rotorcraft or non-rotorcraft aerospace OEM. We had hoped to win one of the demonstration contracts that the army awarded in 2014, but we don't have deep pockets to throw our money into the programme.'

Task two of the currently funded study programme will involve exploration of downwash effects on the rotorcraft. A third task will look at the effect of vibration on the CCH and whether the spacing between the rotor blades can be reduced.

'The Russians on their Kamov aircraft use a spacing of about 9%. That is always an issue because the aircraft has to fit into the hangar of a destroyer, in the case of a smaller aircraft,' explained Gaffey. 'We have been pretty successful so far. Our analysis indicates that we can actually perform some reduction in spacing.'

The company now has task four in its sights, and has created a government/AVX integrated product team, which will be meeting over the next few months to decide upon funding and what exactly will be tested. The company is expecting a final decision in the second half of 2016. 'Task four would involve building a large-scale model with a 7-10m diameter rotor and putting that in the full-scale wind tunnel at NASA Ames Research Centre,' Gaffey said.

By Beth Maundrill, London

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The complex nature of today's overlapping security challenges around the world means ever increasing demands for special operations forces, particularly when dealing with Islamist extremist movements in the Middle East and Africa and hybrid war threats along NATO's eastern flank. **By Jim Dorschner**

SOARING AMBITION

Thirty-six years ago, the need for dedicated special operations aviation (SOA) capability was born out of shortcomings identified in the aftermath of the failed 1980 Operation *Eagle Claw* to free US hostages in Iran.

The years since the wreckage of eight modified RH-53D helicopters and a single MC-130E that were abandoned at the Desert One staging site have seen a steady evolution in the technology, skills, training and doctrine required to provide effective rotary-wing support to special operations forces (SOF).

Current security demands mean SOF continue to proliferate with armed forces around the world and will remain a top priority for many years to come. When SOF deploys these days, highly capable, integrated SOA is automatically considered part of the force package.

Arguably the world's premier SOA organisation, what became the US Army's 160th Special Operations Aviation Regiment (SOAR) was initially established as an aviation battalion task force, reflecting detailed lessons learned from *Eagle Claw*.

Now widely regarded as the SOA benchmark, no other country in the world can match the 'Nightstalkers' in terms of numbers, experience and breadth of capabilities. That said, the roster of SOA forces flourishing in so many militaries reflect and validate the hard-earned experience obtained by the 160th SOAR during numerous operations and exercises since the 1980s.

Fully equipped

The regiment has almost 3,000 soldiers and more than 200 aircraft in four subordinate battalions. 1st Battalion, equipped with MH-60 Black Hawks and AH/MH-6 Little Birds, and the all-Chinook 2nd Battalion primarily support Joint Special Operations Command (JSOC) army and

Integrated SOA is automatically considered part of the SOF package nowadays. (Photo: US DoD)

navy components, including army rangers, with a focus on high-profile, mostly national-level SOF missions.

3rd and 4th Battalions, each with a mix of MH-60Ms and MH-47Gs are principally dedicated to supporting traditional army special forces group missions: foreign internal defence – training friendly armed forces, and increasingly, unconventional warfare – working with friendly guerrilla forces.

To a lesser extent, 3rd Battalion and 4th Battalion also support non-JSOC navy special warfare and marine corps special operations teams during training and operations, as well as allied special forces and commando elements.

Most of the 160th SOAR is based at Fort Campbell, Kentucky. However, 3rd Battalion is based on the US east coast at Hunter Army Airfield, Georgia, while 4th Battalion is at Joint Base Lewis-McChord, Washington, with one company forward deployed in South Korea.

"With decades of combat experience to draw from, including many years of mostly night operations in Iraq and Afghanistan, the 160th SOAR is often at the forefront of SOA technical developments."

The 160th's rotorcraft fleet has stabilised for the time being around highly capable Black Hawk and Chinook platforms.

The 2010 Quadrennial Defense Review authorised an additional eight MH-47G Chinooks that increased the fleet to 69. At the same time, replacement of ageing MH-60L/K models is nearly complete, providing the 160th with a fleet of 72 MH-60M-model Black Hawks.

The MH-60M programme modifies new-production Sikorsky UH-60Ms with special operations mission equipment featuring Common Avionics Architecture Systems (CAAS); a suite of integrated RF countermeasures; wide-chord rotor blades; active vibration reduction and an improved EO sensor system.

The most significant Black Hawk modification is the incorporation of two 2,500shp General Electric CT7-8B-5 engines providing significantly improved high/hot performance.

A follow-up MH-60M Block 1.0 upgrade programme adds greater directional control safety margins during certain high/hot environmental conditions and mission equipment enhancements, including secure real-time video transmission, a hostile fire indicator system and other technology insertions.

Replacement wings

As for the 160th SOAR's third primary platform, 51 surviving MH/AH-6 Little Birds are showing their age, with retirement looming as they struggle with weight and performance issues, defining a new rotorcraft requirement from around 2025.

While a replacement programme has yet to take wing, this has not stopped industry from testing the waters. An early candidate revealed at the recent Heli-Expo in Louisville, Kentucky, is a clean-sheet design contemplated by MD Helicopters, successor to the maker of the original Little Birds, which were based on the highly successful MD 500 series.

Dubbed the 6XX, the new design will have a four-blade main rotor and is likely to be powered by Rolls-Royce's long-awaited M250-C47E3 engine for a target payload of 2,500kg, compared to around 900kg for the MH-6.

Meanwhile, according to a May 2015 programme update by US Special Operations Command's Program Executive Office for Rotary Wing, the Little Bird fleet is in the final stages of upgrades to maintain viability into the next decade.

A Block 2.0 configuration provided an improved mission processor, transponder, Ethernet data bus, embedded global inertial navigation system and new ergonomic crashworthy seats. Block 3.0, begun in 2012, addresses improved cockpit avionics, airframe structures and rotor systems.

While details of the new Little Bird cockpit are imprecise at this stage, it is described as a smaller, lighter version of the Rockwell Collins CAAS cockpits found in the 160th's Black Hawks and Chinooks. Beyond that, Rockwell Collins declined to provide further information when queried by *DH*, citing client concerns.

The CAAS system incorporates cockpit flight and mission management systems, integrates multiple communications, navigation, weapons and mission sensor subsystems while providing a consistent, intuitive user interface for displays and allowing control of avionics subsystems by aircrew.

With decades of combat experience to draw from, including many years of mostly night operations in Iraq and Afghanistan, the 160th SOAR is often at the forefront of SOA technical developments.

One such focus is solutions to counter the effects of degraded visual environments (DVE), or brownouts, caused by swirling dirt thrown up by rotor-wash that can cause serious crew disorientation when hovering, landing or taking off. The DVE system developed by Rockwell Collins, Boeing ►

Recently, the Italian Air Force's 15th Wing declared IOC with the Finmeccanica HH-101A Caesar CSAR and SOF support helicopter. (Photo: Finmeccanica)

and Sierra Nevada for the 160th integrates information from aircraft sensors into the CAAS displays to increase situation awareness for aircrews facing limited exterior visual cues.

Another area involves countering small arms and rocket-propelled grenade attacks while operating into or out of 'hot' landing zones or at low level, particularly over built-up terrain such as towns and cities.

Raytheon's Boomerang Air system helps 160th aircrew locate a shooter using passive acoustic detection, combined with computer-based signal processing. This is aided by both auditory and visual indications to detect and report relative shooter azimuth and elevation information with a 360° field of view.

Boomerang Air detects single shots, burst fire, multiple bursts or multiple shooters; reports relative to shooter range, azimuth and elevation; and provides threat weapon classification while cruising, during take-off and landing and in the hover.

The system uses an array of sensitive microphone sensors distributed throughout and integrated into the helicopter body to detect small arms fire directed at the aircraft. False alarms caused by non-ballistic events such as wind noise, blade vortex interaction, tactical radio transmissions, outgoing fire and other extraneous noise events are minimal, according to Raytheon.

Shooter locations are provided to crew members through audio warnings and graphic displays, thereby permitting accurate onboard weapons counter-fire or evasive manoeuvres.

French consolidation

As a result of the growth of integrated, well-equipped and highly professional SOF in recent years, the US no longer has a monopoly on SOA capability. Numerous NATO countries now operate or are building effective SOA (see *DH* Mar-Apr 2015, p11).

France, Italy and the UK work hard at the higher end, with lots of capability in the middle, and emerging collective efforts are gaining traction in Eastern Europe. Further afield, countries with pressing requirements like Australia, Jordan and the UAE are also steadily building capacity.

The big story in France is that at some point in the near future, the eight advanced Airbus Helicopters H225M Caracals of the army's SOA unit, 4e Régiment d'Hélicoptères des Forces Spéciales (4th RHFS) at Pau-Uzeinis, will join the 11 Caracals operated by the air force's dedicated SOA squadron, 1/67 'Pyrenees' at Cazaux, which officially joined France's joint Special Forces Command on 1 January 2016.

In preparation for forthcoming Caracal consolidation, army aviation is now actively pursuing an SOA variant of the NH90 TTH for the 4th RHFS, with entry into service as early as 2018. Numbers are not yet specified, but around 25-30 NH90s are required to fully replace existing Caracals, Pumas and Cougars with a standardised type. In January 2016, six additional NH90 TTH helicopters were added for French Army Aviation, bringing total orders to 74, with further batches expected.

Reportedly, NH90 performance and reliability impressed 4th RHFS SOA aviators during a recent inaugural combat deployment of the type to Mali. Desired SOA modifications to the NH90 are expected to include additional fuel; specific weapons such as Gatling guns; fast rope kits; and advanced sensors, navigation, communications and data transfer systems.

At the same time, Airbus Helicopters is promoting a range of new rotorcraft to replace several ageing types in French Army Aviation service. For the 4th RHFS, this means a new SOA light utility helicopter to finally replace around 20 elderly Gazelles.

Further to Germany's lead, a likely candidate is the H145M, now entering ▶

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service with the Luftwaffe in an SOF support role. Another possibility recently floated by Airbus Helicopters at Heli-Expo in Louisville, Kentucky, is the brand new H160, although a military version is yet to be developed.

Lacking a capable heavy-lift platform like the Chinook, consolidating all 19 Caracals in the air force SOA squadron makes sense from a training, support and operations perspective.

In addition to serving as the premier French CSAR unit, 1/67 will also specialise in long-range SOF insertion and recovery. To do so, French Air Force Caracals have steadily ramped up day and night air-to-air refuelling (AAR) certification with the help of US and Italian KC-130J tankers.

In late February 2016, 1/67 qualified its first H225M aircrew in night AAR, during an exercise in France involving two MC-130J tankers from the USAF's 352nd Special Operations Wing based at RAF Mildenhall in the UK. Meanwhile, the French Air Force now has two KC-130Js on order for delivery by 2019.

European endeavours

In neighbouring Germany, SOA responsibility shifted from army aviation to the Luftwaffe in January 2013, built around 20 highly modified Sikorsky CH-53GS models now operated by Helicopter Wing 64 (Hubschraubergeschwader 64) at Laupheim air base in southern Germany. These are now being joined by 15 new Airbus Helicopters H145Ms, the first two of which were delivered in December 2015, with the remainder following progressively through to early 2017.

The type is known as the H145M LUH SOF in German service and in March the first six Luftwaffe pilots completed two months of transition training ahead of schedule at the Airbus Helicopters Training Academy in Manching. Having returned to Laupheim with two brand new H145Ms, this cadre can now conduct maintenance test flights and train more pilots, building towards initial operational capability (IOC).

As Claas Belling at Airbus Helicopters told *DH*, other than door guns and SOA features such as fast rope kits, the Luftwaffe is undecided on FLIR sensor installation or guided weapons for its LUH SOF version. Eventually it would like to develop fire support capability with 12.7mm gun pods, guided and unguided rockets, and precision-guided PARS 3 missiles. For now, plans are to certify the H145M by mid-year to fire MAG58 and M134 pintle-mounted guns and add an external weapons pylon.

Earlier this year, a French CSAR unit qualified its first H225M aircrew in night air-to-air refuelling during an exercise. (Photos: Airbus Helicopters)

IOC is expected by early 2017, after which the new helicopters will add significant flexibility to German SOF. Easily transported by the Luftwaffe's new A400M airlifters, the H145Ms can deploy with integrated SOF task forces on rapid reaction missions, offering assault lift, medevac, ISR and a sniper team platform.

Mirroring decades of successful employment by the 160th SOAR, various models of Boeing's CH-47 Chinook are proving popular with the international SOA community. Germany may be next to join SOA Chinook operators Australia, Canada, Greece, Italy, the Netherlands, Singapore, Spain and South Korea.

In November 2015, Berlin downselected Boeing's CH-47F and Sikorsky's CH-53K for a final competition to replace 66 surviving CH-53G models, in service since the 1970s. While the CH-53K was long favoured in Germany, continuing programme delays leading to extended delivery dates and the overwhelming popularity of the type with NATO users, has given the Chinook added leverage. A formal tender is expected this year, with IOC desired by 2020. Around one-third of the 60+ new helicopters will be dedicated to SOF support.

In December 2015, the RAF received the last of 14 Mk 6 Chinooks ordered in 2011. They are derived from the CH-47F with UK-specified avionics, a FLIR system, rescue hoist and interoperable communications and navigation equipment. The Mk 6s will support UK special forces in addition to conventional troop transport, air assault and medevac missions. They join eight Mk 5s originally derived from the MH-47Es employed by the 160th SOAR. The RAF is the world's second largest Chinook operator, with 60 in service.

Similarly, the Royal Netherlands Air Force has bolstered its Chinook fleet, which provides crucial support to highly regarded Dutch special forces. Some 14 new CH-47F (NL) helicopters ordered in 2015 will join six already in service and replace 11 surviving CH-47Ds. Three CH-47F (NL) Chinooks were deployed to Mali in October 2014, where they supported Dutch SOF teams in a variety of missions, including insertion of long-range reconnaissance patrols.

The CH-47F (NL) differs from US Army models in having Honeywell's Avionics Control and Management System Block 6 cockpit avionics suite rather than CAAS. They are also equipped with a range of SOA-specific equipment, including a Robertson extended range fuel system; Pall engine air particle separators; and an L-3 Wescam MX-15HDi FLIR turret with laser illuminator; Terma (CHASE) and Northrop Grumman (AAR-54 RWR) air defence systems; M3M 12.7mm machine guns; and secure communications, including SATCOM.

Expanded envelope

As reported in *DH* Jan-Feb 2016 (see p28), the 15 new CH-147F Chinooks operated by the Royal Canadian Air Force are also expanding their operational envelope to include SOF support.

Additionally, the service is planning to procure a number of new Tactical Reconnaissance Utility Helicopters (TRUH), some of which will supplement the CH-146 Griffons operated by 427 SOA Squadron,

The H145M is now entering service with the Luftwaffe in an SOF support role.

which are also slated for a comprehensive life extension programme.

The most likely TRUH candidate is a variant of the Canadian-produced Bell 429. In SOA configuration, these would operate similarly to the Luftwaffe's H145M LUH SOF as a rapidly deployable reconnaissance, assault, medevac and fire support platform.

Back in Europe, Italian SOA capability is found in all three services. Army aviation's 3rd 'Aldebaran' Special Operations Helicopter Regiment (REOS) is preparing to integrate new Finmeccanica-built ICH-47F Chinooks, replacing CH-47C++ models, with at least six slated to join the unit. Italy has a total of 16 ICH-47Fs on order, with additional orders expected.

Meanwhile, the air force's 15th Wing at Cervia air base on the Adriatic, part of the 1st Special Operations Air Brigade, established in 2014, declared IOC with the new Finmeccanica HH-101A Caesar CSAR and SOF support helicopter on 26 February 2016.

At least four of the 15 Caesars on order are now in service, with the remainder due by 2019. Among the most advanced SOA rotorcraft in the world, they are armed with three M134 7.62mm pintle-mounted Gatling guns, have AAR capability for long-range operations and a nose-mounted FLIR system, plus a robust suite of communications, navigation and self-protection systems. These include a 360° active electronically scanned array (AESA) radar and Elbit Systems ELT/572 DIRCM IR countermeasures system.

While Cervia is the Caesar's main operating base, as the force grows, detachments will forward deploy to Trapani air base in Sicily, just 500km from the Libyan coast. This is increasingly important as Italian SOF are reportedly already operating in Libya, alongside French, UK and US counterparts in advance of an expected multinational military campaign against the growing Daesh threat, combined with an effort to shore up the recognised government in what is now a three-way civil war.

Regional round-up

Similarly, the UAE and Jordan are well along with their SOF buildup, including robust SOA, as part of regional efforts to combat Daesh and other threats. Principal SOA platforms in service with the UAE Air Force are Sikorsky Black Hawks, including 40 well-equipped UH-60Ms, and Boeing Chinooks, amounting to ten CH-47Fs and eight CH-47Cs, with additional F-models expected.

Jordan, with Daesh forces in close proximity in neighbouring Iraq and Syria, operates a muscular SOA force built around some 20 Black Hawks of various models, including eight refurbished UH-60As delivered by the US in February, to be followed by eight new UH-60Ms in 2017. Jordanian Special Operations Command also operates at least eight MD 530F Little Bird attack helicopters.

Shifting to the Pacific, Australian Army Aviation has long maintained a strong SOA force built around Black Hawks, augmented by a small Chinook squadron. Given ongoing problems with entry into service delays for the new MRH-90, the army decided in December 2015 to retain 20 S-70A-9 Black Hawks, dating from the late 1980s, for special forces support until at least 2022.

A total of 18 will remain with the 6th Aviation Regiment at Holsworthy outside Sydney, with two more at the Oakey Army Aviation Centre in Queensland.

Meanwhile, the Integrated Investment Program, released by the MoD in February 2016, describes a special forces helicopter requirement in the 2019-2028 time frame with an associated budget of A$2-3 billion ($1.5-2.3 billion). According to the document: 'The new helicopters will likely feature some light armament and modern intelligence, surveillance, reconnaissance and communications capabilities for integration with the joint force. They will be able to be deployed rapidly as a small force element of three to four aircraft and personnel by the [C-17] Globemaster.'

Interestingly, the requirement seems to mirror the capability now coming to fruition in Germany with the Luftwaffe's new Airbus Helicopters H145M SOF LUHs. ■

TURBINE BOOST

Completely new dedicated military engines are rare beasts as they invariably need kick-starting by defined service requirements. However, the US Army has taken an important step towards a new generation of powerplants for its attack and utility fleets. **By Peter Donaldson**

The US Army's Improved Turbine Engine Program (ITEP) is pursuing the development of a new 3,000shp-class turboshaft engine, which would seek to replace the iconic General Electric T700 in the Apache and Black Hawk and to power new rotorcraft developed under efforts such as the Future Vertical Lift (FVL) programme.

The long-awaited RfP was issued in late September, with industry contenders given a deadline of 9 November to submit their bids. This kicked off a 24-month competition and preliminary design phase, following which the army will choose a single manufacturer. It is expected to do so by Q4 of the US FY2018.

The next step would be a 'Milestone B' decision that will mark the start of the engineering and manufacturing development phase, leading to a low-rate initial production (LRIP) phase. LRIP is expected to begin in Q3 of FY2024 and full-rate production is anticipated in the final quarter of FY2026.

The army's current plans call for it to buy 6,125 engines, with two for each Apache and one for each Black Hawk in the inventory. The latter figure presumably means that only half the Black Hawk fleet will get the improved turbine engine.

With a pair of Improved Turbine Engines, Black Hawks will be able to carry more troops over greater distances, with fewer stops for fuel, at high density altitudes. (Photo: US Army)

ITEP is a direct follow-on from the Advanced Affordable Turbine Engine (AATE) technology development programme, which sets a number of goals in terms of performance, efficiency and weight.

Another goal was longevity, and that stretches the state of the gas turbine engine art because the resulting powerplant must be a drop-in replacement for the T700. All the improvements must be packed into the same space.

Those goals included generating half as much power again as the incumbent engine, while improving its fuel efficiency. The latter is defined as a 25% reduction in specific fuel consumption, which relates to the quantity of fuel used to generate a given amount of power over a set period of time.

The importance to the army of weight saving is also clearer from the fact that the required increase in the power-to-weight ratio of 65% is even greater than the desired 50% increase in power. Similarly ambitious is the durability goal, which stipulates a 20% longer life, a 35% reduction in acquisition and maintenance cost and a 15% reduction in development cost.

The main contenders are General Electric Aviation (GE Aviation) in one corner and the team of Pratt & Whitney and Honeywell under the Advanced Turbine Engine Company (ATEC) banner in the other – the participants in the AATE programme. The engines they are offering are known respectively as the GE3000 and the HPW3000.

Single or twin?

For two engines designed to meet exactly the same set of requirements, they are remarkably different in core architecture, with the most significant difference lying in the compressors and the turbines that drive them.

Like the T700 before it, the GE3000 uses a single-spool compressor, while the HPW3000 features a twin-spool compressor. Championing the single-spool configuration for the GE3000, Harry Nahatis, GE Aviation's general manager of advanced turboshaft programmes, told *DH* they had emerged from trade studies in which the company tried not to rule anything out at the beginning of the search for an optimum solution. 'After those studies, essentially, if you have the technology to get the pressure ratio, efficiency and stall margin on a single spool, there's no reason to do two spools.

'Two spools have more parts [and] will be more costly, less reliable and more difficult to maintain. In our trade studies, there were many drawbacks to a two-spool core.'

He pointed out that the 7,500shp class GE38/T408 for the Sikorsky CH-53K King Stallion also has a single-spool core. 'I'm not saying there's no scenario where you wouldn't have a dual-spool engine, that's why we continue to look at it. Our trade studies had more benefits for single spool.' Nahatis explained.

'In pursuit of lower weight, greater durability, better fuel efficiency and lower emissions, the company is investing heavily in ceramic matrix composite (CMC) materials. On the GE3000, CMCs primarily are used in the hot section. The two primary benefits of CMCs are that you do not need to cool them and that they weigh one-third of what the same part in metal would weigh,' he said, 'and that they do not need cooling airflow.'

GE Aviation has hot-section CMC components under test in other military engines and also makes some parts using additive manufacturing techniques (of which 3D printing is the best known), based on experience from other gas turbine technology efforts.

Turbomeca's RTM322 could benefit from technologies developed under the Tech 3000 programme. This sectioned engine shows (right to left) three axial and one centrifugal compressor stages, the annular reverse flow combustor and two-stage compressor and power turbines. (Photo: Turbomeca)

'We continue to run tests at the component level in support of the ITEP programme, but the biggest priority this year is learning from the first full engine test on the Future Affordable Turbine Engine [FATE] programme', he said. GE Aviation was selected by the US Army for the FATE programme in 2011.

'The FATE engine that will be tested is designed to meet a series of aggressive goals, including a 35% reduction in specific fuel consumption, 80% improvement in power-to-weight, 20% improvement in design life and a 45% reduction in production and maintenance costs, relative to currently fielded engines.'

Doubling up

The HPW3000's twin-spool design means that the compressor section is essentially two turbo-machines with an impeller and a turbine each for the low-pressure and high-pressure spools running on a pair of concentric shafts.

Long proven in other applications, such as large turbofan engines for airliners, twin- and even triple-spool engines are generally heavier, more complex and more expensive than single-spool designs but compensate for this with a number of advantages.

ATEC emphasises that the use of multiple spools forces fewer aerodynamic compromises, stressing that each spool can be allowed to operate at its most efficient ▶

rotational speed. Allowing the two spools to run at different speeds in this case, says the company, leads to an improvement in fuel efficiency of 3-4% over an equivalent single-spool design.

Improvements in engine handling and flight characteristics, resulting in reduced rotor droop, are also claimed for the twin-spool configuration. In part, this is due to the optimisation of the speeds and aerodynamics it allows. However, it is also influenced by the reduced rotational inertia of the lighter components that allows them to speed up and slow down more quickly in response to changes in power demands.

The GE3000 design uses one single-spool compressor. (Photo: GE Aviation)

Spool of thought

ATEC also points to easier starting, claiming that the HPW3000 can start with or without an APU. This is likely to be connected with the engine's pressure ratio, or rather the fact that the overall increase in pressure that the compressor exerts on the air it takes in is divided between the two spools.

For example, in a single-spool engine with an overall pressure ratio of 17:1, the starter motor is worked harder to achieve that. However, if the twin-spool engine is designed so the starter only has to turn one of the spools, relying on induced airflow to spin the other one up, it might only have to overcome half the compression to get the engine running and therefore would have an easier life.

A further claim is that of better performance in hot and sandy environments resulting from the ability of the two spools to run at different speeds. ATEC explicitly states that a twin-spool design is 'better at handling sand ingestion than a single-spool engine, which would incur much greater degradation to engine components'.

In a white paper on the subject, the company provides further detail: 'A dual-spool engine uses computers to distribute load between the two compressors and constantly adjusts the load borne by each to optimise performance. This allows the engine to run cooler, reducing wear and tear.

'In sandy conditions, for example, the rear compressor can turn faster allowing the front compressor to turn more slowly, improving performance and allowing the front compressor to take less of a beating from sand ingestion.'

Growth margin is another strong point that ATEC highlights for twin-spool designs, arguing that they support scaling up for future engines without the need to need to use what the company calls exotic or unfamiliar materials or technologies.

Emphasising the point, the paper adds that 'in order for variations on the single-spool architecture to meet the army's demanding requirements, the manufacturer must wring every ounce of remaining potential by using unproven and exotic materials'.

This increases risk, says the company, which claims that the HPW3000 has 25% more power growth capability than comparable single-spool offerings. While GE Aviation claims 55% more power than the incumbent T700, ATEC claims only 50%, but the caveat about temperature and altitude is important here.

ATEC also claims the same 25% reduction in fuel consumption despite what it says about the twin-spool design's 3-4% efficiency advantage – it is possible that it is being conservative here, or that the extra efficiency will emerge as the engine grows though its development life. Its claimed service life, however, meets the 20% increase demanded in the requirement.

ATEC goes on to emphasise the fuel savings that it calculates will result from selection of its design. Compared with the current engine, says the company, it is likely to save 50 million US gallons of fuel per year, translating into $90 million per month or $1 billion per year, depending on how much the fleets fly.

Turbo testing

GE Aviation's other new turboshaft, the GE38/T408, has surpassed 5,000 test hours, including 4,500 hours of engine factory testing and more than 1,000 engine hours powering the USMC's CH-53K ground test vehicle and two flight test vehicles at Sikorsky's Florida assembly and flight operations facility, the programme's director Paul Acquaviva told *DH*. He said that factory testing supports the design, airworthiness release and qualification for production.

Five factory test engines have been built, two of which are due to be consumed in live-fire testing to see how they stand up to battle damage, while the other three will remain available for emerging needs and future programmes.

The company is also looking to extend its support for the CH-53K System Demonstration and Test Article (SDTA) aircraft and to move into LRIP with the GE38/T408. Nine SDTA engines have been delivered so far, and GE Aviation is on contract to deliver 22 more through 2017.

'GE is in negotiations with NAVAIR [Naval Air Systems Command] on a contract to support SDTA aircraft and navy op-eval testing. GE has received the CH-53K LRIP RfP from NAVAIR for engine deliveries starting in 2018. The LRIP contract will also include logistics support, technical publications and NAVAIR organic support development.'

Acquaviva described 2015 as a landmark year for the programme and is optimistic about this year. 'With the momentum of the successful first flight of the CH-53K, followed by live-fire testing at China Lake, 2016 will represent the culmination of years of design and testing with the USMC and Sikorsky as we achieve engine qualification.'

Furthermore, the FATE engine is based on the GE38/T408 architecture and is due to run this year. 'This technology demonstrator programme provides a pipeline of new technologies available for incorporation into the T408 product line.'

Nahatis emphasised that FATE's performance goals are even more ambitious than those of ITEP, with a focus on 3D aerodynamics, CMCs, innovations in condition-based maintenance, high effective cooling in the aerofoils, sand-tolerant technologies and additive manufacturing. 'There are more of ▶


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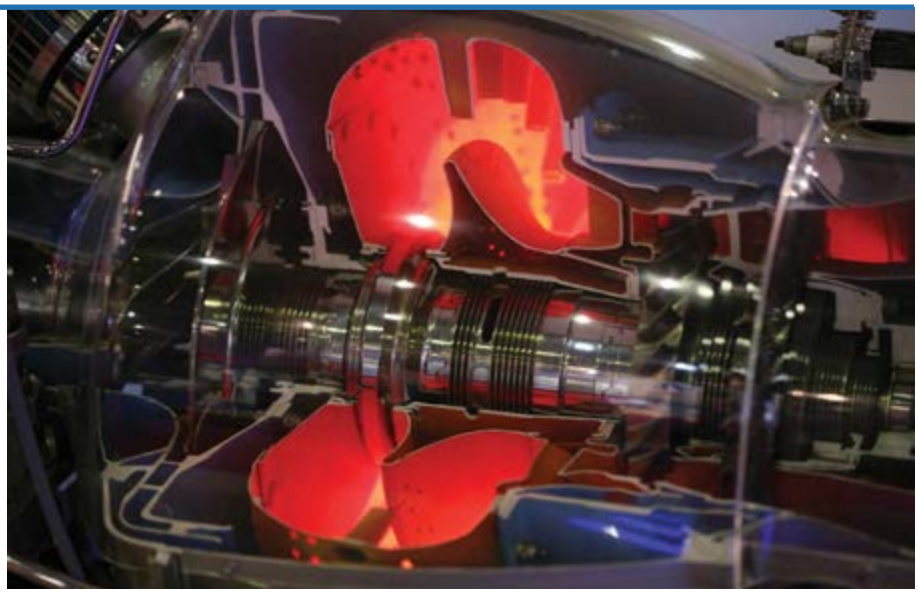
those technologies listed in FATE and they're stretched even further', he said.

'We had a number of component rig tests over last summer that were very successful and we're on track to meet the goals of the FATE programme. We're running a full engine test this year to prove those technologies.' With lower specific fuel consumption and a higher power-to-weight ratio than the ITEP GE3000, FATE is the most advanced turboshaft GE has ever built, he said.

'Via the FATE programme compressor test, we've achieved the highest recorded pressure ratio on a single spool. We can't say what the number is, but it exceeds the previous record on the GE9X turbofan, which recorded a 27:1 compressor ratio.' As a note, turboshafts do not get the supercharging effect from a turbofan engine's large fan, which can take overall pressure ratios to 60:1.



Turbomeca's Tech 3000 programme is intended to result in engines capable of delivering 25% better fuel economy than that of today's turboshafts such as this Makila. (Photo: Turbomeca)

Heavy duty

Turbomeca is also working on what it describes as ground-breaking new engine technologies for the coming generation of 10-tonne+ heavy helicopters, with its Tech 3000 demonstrator at the heart of efforts to develop new engines in the 3,000shp range.

VP Florent Chauvancy said that the Tech 3000 will enable the company to validate design and basic performance data in engines capable of delivering 25% better fuel economy than that of today's turboshafts in this power class.

'We are taking a step-by-step approach to this programme. Some modules have already been ground-tested: axial compressor, combustion chamber and high pressure turbine', he told *DH*. 'Other tests will be completed this year, leading to bench runs of a complete demonstrator in 2017.'

As a pure technology demonstrator, the Tech 3000 is not intended to fly. Instead, its role is to feed the technologies that emerge from its development into a new family of high-power engines (HPEs), he explained.

'Flight tests will come with the development of production derivatives to address the market of the new-generation heavy rotorcraft. This new engine family will be available for entry into service in the 2020-2025 time frame.'

The precise configuration of Tech 3000, in terms of the type and number of compressor stages and spools, or combustor and turbine design, is tricky to pin down. This is in part because of the usual commercial sensitivity of its new technology and also because that configuration is likely to change as the programme goes on.

'One the key objectives of the Tech 3000 programme is to evaluate several configurations for each module of the core engine. So far, we do not wish to discuss any specific configuration with a specific number of stages,' Chauvancy said. While the new HPEs are to be the primary recipients of the technologies that emerge from the Tech 3000 programme, some could also benefit the RTM322.

'It will also allow us to increase our knowledge in some specific areas like cooled gas generator turbine blades or leading-edge compressors that could also lead to some upgrade initiatives on the RTM322 based on the market and customer's requirements', he said. 'RTM322 is definitely part of our development strategy on the heavy rotorcraft market and should benefit from some of these new technologies.'

Going to sleep

An intriguing innovation under development for the HPE family is the so-called sleep mode that will allow one engine in a twin-turboshaft helicopter to be powered down so that the other can run at a higher and much more fuel-efficient power setting.

Another is hybridisation, which involves the generation and storage of much greater levels of electrical power. 'One of the main aspects of the new hybridisation concept is that whenever needed, a "sleeping engine" can be re-activated with an ultra-fast re-activation system, during key phases of flight such as the transition to a hover, take-off, landing or an emergency manoeuvre.'

Precisely how this system works, and how quickly, is at this stage reserved by Turbomeca, as Chauvancy made clear. 'We are not in the position to give a specific figure at this time', he explained. 'But we can say that our key technologies have already demonstrated an ultra-fast reactivation time, which is revolutionary compared to what conventional starters can provide.'

Without specific military requirements like the one at which the ITEP candidates are aimed, Turbomeca is developing its new engines with both civil and military applications in mind and intends the HPE family to address any new market opportunity in the heavy rotorcraft segment in the next 20 years.

'We are expecting a robust demand in the future in the civil and parapublic market including utility, offshore and SAR', he told *DH*. 'Obviously, the military helicopter market would also represent valuable opportunities.'

With similar developmental time frames, the winning Improved Turbine Engine and Tech 3000-derived engines are likely to find themselves competing for places on future military rotorcraft programmes for decades to come. ■

A USMC UH-1N Huey crew chief fires an M134 Minigun at a target. (Photo: US DoD)

Armament advance

While recent emphasis has been placed on emerging rockets and missiles, an increasing number of real-world scenarios have served to emphasise the continuing importance of helicopter cannon and machine gun systems.

By Scott R Gourley

Guns are a ubiquitous element of military helicopter designs. While cannons continue to do the job on larger attack platforms, smaller rotorcraft are witnessing something of a renaissance in the development and application of guns.

Roger O'Dell, director of programme management for MD Helicopters, explained to *DH*: 'I think the unique things about rotorcraft are that [the hostile engagements] are generally at closer range, generally in a denied area or in a [restricted engagement] environment, where a controlled response like a gun is always going to be a first or second line of response as you go up the kill chain.'

He added that one significant factor in gun selection involves the size of the helicopter, as 'the calibre and capabilities of the gun are going to change invariably along with the mission set for the aircraft'. Regarding the single-engine MD 530, he said that the armament and gun are consistent with the mission – a concept that has remained since the origins of the platform. Furthermore, for the D and the E model – as well as other variations at MD or within other countries – the gun solution has 'always been constrained to that relatively small platform or small mission'.

Trade-off time

Regardless of helicopter type, O'Dell asserted that the selection of any gun solution involved trade-offs and ▶

analysis. 'The classic trade we have to make is "gas or bullets?"' he said, adding that the process has to include an analysis of the threat.

Referencing FN Herstal, O'Dell explained that its HMP 400 carries 400 .50cal rounds and this is a selected product of MD Helicopters. 'But we also offer the "134" [7.62mm minigun] from the Dillon Aero folks. And we constantly have conversations with our customers, and internally, as to what is the best mission payload? What is the current loadout for the threat? Do you go with 3,000 rounds of 7.62? Do you go with a full rocket assembly on one side? Or a full 400 rounds on your HMP? And the fact is that there is no single answer. It's really mission-specific.'

O'Dell provided some insight to the lessons learned from ongoing experiences with the gunships that the company has provided to the Afghan Air Force (AAF). 'We're getting a lot of real-time data and we are seeing a trend where the Afghans are really getting adept at using the weapon system,' he began.

'We're seeing the number of rounds they are firing go much higher than we had originally expected, not because of inefficiency or lack of capability, but rather that they are getting good and having successful, effective engagements. So the real lesson is sort of a check on our own perception or belief of what the mission is versus the operational feedback.'

He continued: 'Again, it gets back to the fact that you don't necessarily need 3,000 rounds of suppressive fire to take out or neutralise a target, where ten rounds of .50cal well placed might do the same thing.

'Now that is an exaggeration, but it reflects that operational trade in giving users flexibility not only in the weapon system, but how they employ the weapon system. That's becoming really evident to us. So giving them that capability to alter or tailor their weapon, their calibre or their loadout has been very instructive for us.'

In terms of the system loadout, O'Dell noted that users in Afghanistan, further to orders, are seeing their aircraft equipped with 2.75in (70mm) rockets. He said: 'They have found that even though the gun system was "meeting mission", they are still finding two gaps.

> ***"The calibre and the capabilities of the gun are going to change invariably along with the mission set for the aircraft."***

'One, you still have the overmatch requirement, where a rocket is just going to be able to do much more damage, physically, for the amount of physical payload space. Two, we've got stand-off issues. Our gun systems are probably going to be most successful at 500-1,000m, where rockets – even unguided – go out 2-3km. And certainly with the precision weapons we're talking about for our G model, we're looking at 5km.'

He summarised how it is about understanding what the Afghans want to do in the layered defence or attack.

'How do they want to walk that capability into the target? And at the extreme for us, we're talking about taking it to the extent of actually integrating the Hellfire solution, which will put us out there at 10km. But it comes to a whole new mission set at that point. We've got a different kind of operator, a different threat and certainly a different price point in terms of cost per kill.'

O'Dell pointed to the same concept of a layered solution on modern attack helicopters. 'Apache is the same way, with a layered solution, starting with the M230,' he said. 'If that's not what they need, they will go with a 2.75. And then they ultimately have Hellfire.'

A close-up of the gun trigger on one of the Afghan Air Force's MD 530 gunships. (Photo: author)

Fire control

Speaking with *DH* regarding his observations on fire control trends, O'Dell returned to lessons being learned and observations being made in Afghanistan. '[There], you have a range of everything, from very simplistic fire control, which is the grease pencil. That's still going to be a necessary fallback in the event that all else fails. And it goes from there all the way up through some of the stuff we're doing now with fire control.'

In relation to the future, O'Dell commented that soon MD Helicopters and its partners will showcase some 'familiar armament capabilities', however they will be packaged differently to address the payload constraints of smaller platforms.

He concluded: 'In my opinion, the small platforms have a long way to go in terms of longevity... So we certainly plan on using [the new packages] and showing them at some point in the future.'

Elsewhere, asked about some of the representative gun activities at Dillon Aero, Randy Nance, international business development manager, highlighted the recent receipt of 'two fairly significant

contracts' from Naval Surface Warfare Center: Crane and US Army Tank-Automotive and Armaments Command (TACOM).

In the first instance, the company received a $12.5 million firm-fixed-price, indefinite-delivery/indefinite-quantity contract for the MK44 minigun system and parts sustainment. The weapon is the navy's designation for the M134D.

'The MK44 is an externally driven, multiple-barrel gun,' reads the contract announcement. 'The MK44 minigun system and sustainment parts are integrated onto various land, sea and air weapon platforms that provide area suppression and support.'

The recent award from TACOM was a $41.5 million firm-fixed-price FMS contract (Afghanistan, Australia, Brazil, Chile, Iraq, Japan, Jordan, Kenya, Macedonia, Mexico, Pakistan, Peru, Philippines, Qatar, Saudi Arabia and Tunisia) for M134D and M134D-H minigun spare parts and training.

'Internationally, we have expanded our reach, with representation in roughly 45 countries and sales actually in about 30 of those countries,' Nance said. 'We have secured a number of contracts internationally, but I can't give out the specifics to those contracts.

'Dillon has rolled out a number of new products, such as the gun pod, gun sight, new aircraft mounts and naval [treated] version for salt and corrosion resistance to name a few, to complement the existing gun system, and also open new doors into naval and aircraft operations.'

Nance declined to describe ongoing research and development activities, citing both privacy and possibly International Traffic in Arms Regulation restrictions. He explained how at Dillon they were working on customer needs solutions as well as operational requirements, and ways of improving the M134D ensuring it is lighter and more durable.

Marine Light Attack Helicopter Squadron 467 personnel conduct gunnery training with GAU-17 and GAU-16 weapon systems back in 2011. (Photo: US DoD)

Experienced engineers

A company that has completed some recent work with Dillon is Fulcrum Concepts. Travis Johnston, systems engineer at the company, outlined a wealth of operational experience that the small firm brings to its helicopter weapon designs; ranging from special operations helicopter and gun experience on the part of senior management, to engineering experience in lightweight aviation structures, citing his own nine years of experience working on gun programmes at General Dynamics.

He explained that he was lead engineer on the GAU-19 and on the development effort of the GAU-19B, the latter being a super lightweight version of the .50cal three-barrel Gatling gun. Coining it the 'big brother' of the M134 minigun that Dillon creates, Johnston said that the company had a wealth of operational experience regarding both guns.

That experience is also evident in Johnston's assertion that Dillon has used the small company 'as their development wing' on certain projects. He added that much of Fulcrum's current focus is on ▶

Gatling gun technologies, specifically the 7.62mm M134 series and .50cal GAU-19. Johnston indicated there was also a vast amount of in-house experience with rockets at the company.

Returning to Gatling gun technologies, Johnston identified a recent effort on Dillon's M134 gun pod that utilises the standard M134, but packaged into a small, lightweight and space-efficient solution that is 'aerodynamically pleasing' and capable of fitting on a multitude of aircraft, including some light jet aircraft or high-speed 400kt turboprops.

Johnston said that the gun pod concept is 'pleasing from an integration standpoint, because it doesn't take away a lot of space in your aircraft for storing the ammunition, it clicks in and it allows you to jettison it if that's a requirement.

'So if somebody gets in trouble with the aircraft and they want to make it lighter in a hurry, they can push a button and the pods fall away. That's a pleasing aspect of the design for both fixed- and rotary-wing.'

The fire control grease pencil marks on an Afghan MD 530 at MD Helicopters' facility in Mesa, Arizona. (Photo: author)

Acknowledging the existence of an earlier M134 pod during the Vietnam era, Johnston explained that it had been so long 'that it's not a thing anymore. Dillon saw the market and said, "We want to do this thing." So they asked us for some help and we went through a development programme. In about eight months, from start to finish, we put two operational prototypes on their PC-7 and flew/fired it at their range. And we had flawless results.'

Designated the Dillon DAP-6, the new M134 pod holds 3,000 rounds of 7.62mm ammunition, which Johnston identified as 'a very standard number for a typical load for the M134'. He added: 'It's one minute of trigger time. It fires 3,000 shots a minute, which is a considerable amount of station time for a gun. And the idea with a lot of these aircraft is to hold two of these pods, so they could have a total of two minutes. Although the majority of the engagements are dual-gun engagements so that at a target you get "max effectivity".'

In terms of marketing the new pod, he affirmed that the company has been in communications with potential FMS countries, as well as in discussions with OEMs of various aircraft.

'The intent of the design was to allow the pod to be put on every aircraft that we could think of that flies below 400kt,' Johnston said.

'For Phase II, we're going to do the same thing for the GAU-19. Right now we're in the middle of a design effort for that GAU-19 pod, which is going to fall into the same role that the M134 pod did.

'We're working collectively with General Dynamics on that one. They are the OEM for the GAU-19 and we have got a teaming arrangement with them, where we are going to develop a pod that houses their gun, a lot like we developed a pod that houses Dillon's gun.'

He explained that this will provide another pod option, offering the same advantages of a weapon pod while retaining a Gatling gun. In terms of the developmental timeline, Johnston said that Fulcrum Concepts is currently active and on schedule on the new pod effort, with the intent of having a firing prototype by the end of the year. At this point, the company design is looking at a capacity of 575 rounds of .50cal ammunition.

'A typical load is 500 rounds for the GAU-19B,' Johnston said. Dillon is looking to slightly increase this as the demand is for more ammunition as well as more bandwidth.

Develop and deliver

In addition to the broad technical expertise cited by Johnston, Mike Zinanni, managing member at the company, pointed to the speed at which the company can develop and deliver designs.

'We are a very small, very efficient group, with both operational experience and dedicated and experienced engineers who can work at speed and ultimately bring something to market very quickly – ahead of most competitors,' he said.

'It's not just the design, [but] the fabrication and the integration. We also do all the testing, with an experimental test pilot and a test director on staff.'

Both Zinanni and Johnston noted that the broad range of company capabilities are also critical in obtaining necessary air worthiness approvals for the firm's designs. 'Ultimately we're trying to provide a total armament solution,' Zinanni said.

Looking towards the future, Dillon Aero's Nance observed: 'From my perspective and extensive international travels to trade shows, embassy visits, country visits and comparing notes with other manufacturers, the future of the helicopter gun is, and will continue to be, as strong as ever around the globe.

'The US and our allied partners are looking for ways to upgrade and modernise their helicopter fleets, and the weapons used on them to protect the lives of soldiers on the ground.' ■

Worldwide challenge

Providing cost-effective logistical support for helicopters supplied to allied nations under the US FMS programme requires many agencies to work together. **By Gregory D Gore**

In our quest to provide for common defence, one of our most successful efforts, in terms of return on investment, is helping allies build the capacity to defend themselves. The UH-60 FMS programme, which excels as an example of how we can meet our worldwide security challenges, helps our partners within their budget constraints.

Our FMS logistics enterprise has been a key part of accomplishing this task for our partners through the Total Package Approach (TPA). Clearly, mutual security requires co-investment to meet an uncertain future. These are requirements we cannot avoid, and when made, garner reliable, consistent and powerful partners.

In previous centuries, we depended on our shoreline and abutting oceans as natural barriers to enhance our safety, and often limited our security efforts to internal matters. The Global Information Grid now places us mere seconds away from many potential adversaries. Consequently, the nature of our shrinking world and the realities of the information age demand a re-evaluation of time-tested strategies.

International programme

Today, the Utility Helicopters Black Hawk FMS programme helps shape the international environment by enabling our friends across the globe. We have worked to provide our associates with more than 375 aircraft in 29 countries through these efforts. We do this by engaging with our partners, including the Security Assistance Management Directorate, US Army Security Assistance Command and the Deputy Assistant Secretary of the Army for Defense Exports and Cooperation.

These agencies help us foster mutual understanding through military-to-military contacts. Moreover, they have worked with us to provide our allies with a TPA. This approach combines their requirements for training, fielding, spares and logistics into a time-sequenced workable package.

Aircraft configuration plans similar to those we use in the army often provide the best value and usually result in the best schedule. In addition, our logistical teams practice standard processes through all areas of Integrated Logistical Support (ILS), therefore gaining synergies and reducing footprint. This comes back to our allies in overall programme savings.

Accordingly, our team works with our associates to configure the entire enterprise effort in a timely and cost-effective manner. In the FMS arena, we begin the TPA process by engaging our allies up front and early and send our futures team on a pre-deployment site survey. These actions, along with a multitude of moving parts, bring a case to a satisfactory conclusion for our partners.

From a logistics perspective, we conduct a provisioning conference where all stakeholders work out the best solutions to support our allies' UH-60 assets, with common and unique deliverables. All ILS facets are worked through case development with our security assistance partners, whether it be training aids and devices, proper facilities for storage of aircraft and spares, ILS data management or pilot and maintainer training.

Our team has developed standardised but malleable TPA processes that can be adapted to each country's case. These logistical processes help standardise our spares configuration package and allow us to advance required materials to a standard consolidation point. This is a critical step in leading the effort and ensures proper lead times for support are in place ahead of aircraft delivery.

High tempo

As a consequence, our partners receive what is needed to maintain a high operational tempo and meet their mission requirements by using TPA to great advantage. Moreover, they have not only helped us across the globe in the tactical battle against our enemies, they have helped us shoulder the financial burden of procuring these capable but expensive assets.

For example, the Swedish Armed Forces contracted the US to manufacture and deliver a large number of UH-60M Black Hawks, associated equipment, spares, training, technical manuals and support. These aircraft were used to accommodate the year-long Swedish ISAF mission in Afghanistan to fight the war on terror.

The UH-60 is arguably the world's best utility helicopter. It provides commanders with rapid and agile manoeuvre capability through air assault, general support, C2 and MEDEVAC missions. This successful programme provides a glimpse of what is possible in future successful nation-to-nation efforts. ■

Gregory D Gore is deputy project manager at the Utility Helicopters Project Office, Redstone Arsenal, Alabama

Siberian supply

Russian manufacturer U-UAP is still finding new ways to update its latest production models of the venerable Mi-8/17 family.

By Alexander Mladenov

The long-standing *Hip* family of helicopters for both military and paramilitary uses, made at the Ulan-Ude Aviation Plant (U-UAP), has enjoyed increased market demand in recent years. Between 2009 and 2014, the company operated at its peak capacity, struggling to cope with significant orders for the best-selling Mi-8AMTSh/171E/171Sh line.

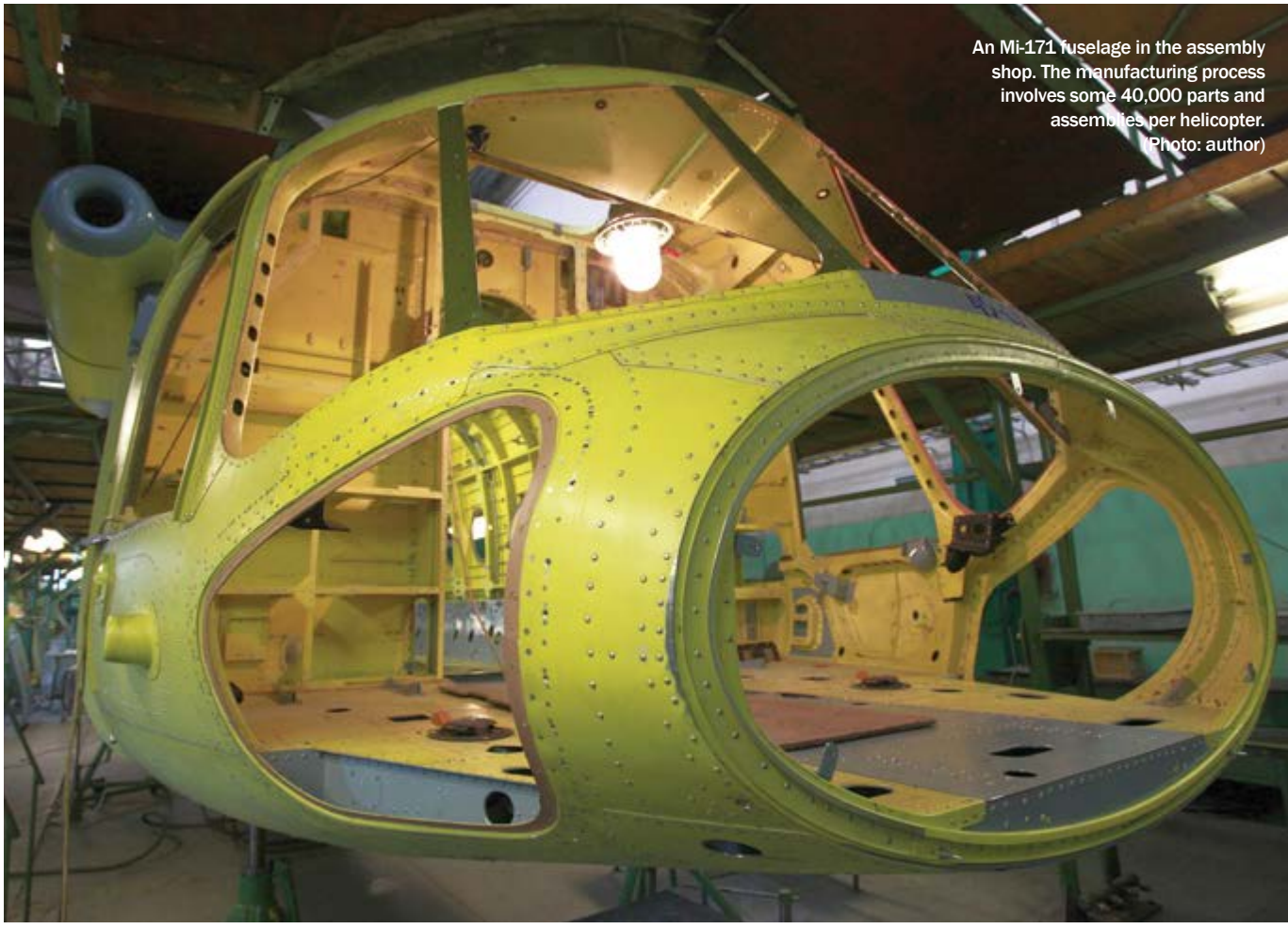
The main factors in the commercial success of the *Hip* 'facelifts', brought to the market in the early 2000s and undergoing a rolling improvement programme, are hot-and-high performance, simple design and cost-effectiveness.

Today's U-UAP is a well-established global aerospace manufacturer whose capable *Hips* are flown in more than 40 countries worldwide. The company is located in the southern part of Siberia, near Lake Baikal and the Mongolian border.

Since the late 2000s, it has been operating under the umbrella of the Russian Helicopters holding company, which acts as the managing body of the entire country's rotorcraft manufacturing industry and holds 96.67% of U-UAP's shares.

Main game

The core strength of U-UAP is its long-established production of the Mi-8AMT and Mi-171 family of 13t class helicopters, sold to a variety of civil, military and paramilitary operators. The factory has nearly 7,000 employees and in 2013 it produced a record 110 Mi-8AMT/171s, while in 2014 output was about 80 and in



An Mi-171 fuselage in the assembly shop. The manufacturing process involves some 40,000 parts and assemblies per helicopter. (Photo: author)

2015 it was further reduced to 75 units.

An annual production rate of between 60 and 75 examples is expected to be maintained for the foreseeable future, due to the lack of any significant new orders from either domestic or export customers that would allow output to grow to the levels experienced in the period between 2011 and 2014.

U-UAP's 2014 revenue amounted to RUB40 billion ($1 billion) and profit amounted to RUB17 billion. In 2015, revenue grew to RUB50 billion.

The US dollar equivalent of the 2015 revenue, however, was more or less equal to that of 2014 due to the rapid fall of the value of the rouble, which saw a 20% decrease between December 2014 and December 2015.

In 2015, some 60% of U-UAP's production was delivered to military and government customers in Russia. This year the domestic share is expected to be maintained at the same level. The plant's workload in the period up to 2020 relies upon the continuation of rotorcraft procurement by the Russian military and law enforcement agencies, augmented with small-volume deliveries to a large number of export customers.

There have been no big export contracts in the implementation phase or awaiting signature since the completion of the delivery of 24 Mi-171Sh-Ps to the Peruvian MoD, reported in January 2016. In 2015, Mi-171s were also delivered to the Angolan, Iraqi and Rwandan militaries as well as Kazakhstan's border guard service.

Later in 2016, U-UAP will begin deliveries to the Nigerian Air Force, which has six Mi-171Shs on order. Angola received four Mi-171Shs this March, in addition to four more examples taken in 2015. According to Vyacheslav Kozlov, U-UAP's deputy managing director, the 2016 delivery plan covers 76 helicopters. It is expected that 50 of these will go to Russian military and paramilitary customers.

Value proposition

Currently, the unit price for a standard-equipped Mi-171Sh is around $15 million, while the armed Mi-8AMTSh for domestic military customers, as ordered in 2011, are priced at the equivalent of $9-10 million.

Mi-171Shs ordered by the Russian MoD for police aviation detachments are equipped with analogue instrumentation to keep the price down. (Photo: author)

A similar version for the Federal Security Service (FSB) contracted in December 2015, designed for border protection duties, has been priced at RUB410 million, while a version outfitted with legacy TV3-117VMA engines and a Safir auxiliary power unit (APU) for the Russian Ministry of Interior (MoI) was ordered for RUB310.13 million.

The Mi-8AMTSh is the main version delivered to the Russian Air Force's (RuAF's) Army Aviation branch, while the Mi-171Sh is the armed version available to military export customers.

The Mi-171E is an unarmed export-standard version for military and paramilitary operators, although it can also be ordered with armour protection and NVG compatibility. Geophizika-NV GEO-ONV1-01 NVGs are now standard equipment on U-UAP-built Mi-8/171 derivatives destined for military customers.

The RuAF is the chief customer, with the first long-term contract dating from late 2011. This calls for the delivery of 132 Mi-8AMTShs between 2012 and 2020, priced at about RUB44 billion (in 2009 and 2010 there were two contracts covering 20 more helicopters for the same operator).

In August 2013, another contract was signed covering 40 further improved *Hips* for the RuAF at a total price of RUB12.6 billion. In 2014, five more Mi-8AMTSh-VAs in so-called 'Arctic' configuration were ordered and the first of these was handed over in November 2015. In March 2016, a new order for three more Mi-8AMTSh-VAs was placed by the Russian MoD for delivery to the air force.

In 2013, U-UAP delivered 53 helicopters to the Russian MoD, with six to the FSB and three more for the MoI, while in 2014 the Russian MoD took 40, the FSB took at least six and the MoI got one more *Hip*. In 2015, the Russian MoD received about 25 examples, the FSS ten and the MoI got four more U-UAP-built *Hips*.

Tailor made

From the late 1990s, U-UAP-built *HIPs* were offered with numerous customer-specified 'facelift' options for improved functionality and increased operational capabilities. As Sergey Solomin, U-UAP's long-time chief engineer, told *DH*, in 2015 there were nine different Mi-8/171 configurations in production at the same time.

The list of the customer-selected options in these configurations includes such things as a new wider starboard sliding door and single flat ramp in the rear fuselage to replace the earlier model's clamshell doors. ▶

Mi-171Sh aircraft for the Bangladesh Air Force feature the old-style nose and rear fuselage. (Photo: Russian Helicopters)

The forward fuselage was also redesigned with a dolphin nose fairing added to accommodate a weather radar and other avionics boxes. In 2000, a Russian-made glass cockpit was introduced as an option for the Mi-171E and Mi-171Sh versions ordered by military and paramilitary customers, but has enjoyed limited success due to its high price.

Also on offer are the effective, but rather costly Pall sand filters and a Czech-made Safir APU, while in 2014, the more effective Russian-made Aerosila TA-14 APU was introduced.

It is worth noting that there are still customers who prefer their helicopters with the old-style nose and/or rear fuselage, as the resulting configurations are cheaper and lighter. Another significant reason for retaining the old-style nose, according to Solomin, is the better visibility offered by its extensive glazing. Angola, Iraq and Peru all ordered their Mi-171Shs (delivered between 2014 and 2016) with the old-style nose, combined with the single-piece flat rear ramp, while Kazakhstan selected both the old-style nose and clamshell rear doors.

In 2017, U-UAP plans to launch into production the civilian-standard Mi-171A2, the latest *Hip* version, that will include some radical novelties such as a new rotor hub, composite main blades and an X-shaped tail rotor.

It is expected to be offered to military and paramilitary customers, mainly for VIP transport, but export demand is likely to be weak, as it will lack the array of military-specific design features and equipment fit offered for today's Mi-171Sh, and will be considerably more expensive.

It has not been ruled out, however, that some of the new features implemented in the Mi-171A2 would migrate to future military derivatives of the *Hip* produced at U-UAP, in a bid to get further improved performance and reduced direct operating costs.

Further upgrades

The second U-UAP contract for 40 *Hips*, signed by the Russian MoD in 2013, called for a further advanced configuration to be delivered in 2014 and 2015. Designated the Mi-8AMTSh-V, it is endowed with improved hot-and-high operating capabilities, extended time between overhauls (TBO) and a longer service life.

Designed jointly by Mil Moscow Helicopter Plant and U-UAP, and taking on board all the lessons that have been learned from the Army Aviation's intense operation of the Mi-8AMTSh since 2010; this new *Hip* derivative comes powered by uprated VK-2500-03 engines, endowing it with a notably better hot-and-high performance.

The Mi-8AMTSh-V also boasts lighter and better metal/ceramic armour protection for the cockpit, cabin and all vital systems with increased area coverage, more modern avionics (including the BMS Navigator satellite navigation system with a combined GLONASS/GPS capability), an expanded unguided ordnance selection, a new TA-14 APU and a full provision for the Vitebsk-8 integrated self-protection aid suite.

The L370E-8 Vitebsk-8 was shown for the first time in its full-scale form on an Mi-8AMTSh-V at the MAKS 2015 air show and then utilised in combat during the Russian campaign in Syria, which began in September 2015.

The suite incorporates four L370-2 UV missile approach warning sensors, with two each on the forward and rear ends of the weapons racks. The three L370-5 directional IR jammers are installed on the stub wings next to the UV warning sensors plus one more under the tail boom for

providing continuous 360° coverage in the horizontal plane.

The Mi-8AMTSh-V is permanently outfitted with six UV-26M 32-round countermeasures dispensers installed on the fuselage sides. It also features a reshaped rear fuselage with the old-style clamshell doors containing an integrated hatch on the centre line cleared for installation of a rear-firing PK 7.62mm machine gun, in the place of the rear loading ramp.

This specific design change was undertaken in order to improve the helicopter's stability in strong tailwind and crosswind conditions, especially when hovering at high altitude. The new-style clamshell doors are manufactured from composites in order to reduce weight.

The Klimov VK-2500-03 engine is a significant improvement over the TV3-117VMA used to power the baseline Mi-8AMTSh. Rated at 2,700shp in one engine inoperative (OEI) mode for 2.5 minutes, 2,400shp for take-off (maintained for up to 30 minutes), the new engine offers a 1,500shp continuous power rating for cruise flight and also boasts a longer service life and TBO of 6,000 and 2,000 hours respectively, compared to 4,500 and 1,500 hours for the TV3-117VMA.

Use of the new engine required design changes to the Mi-8AMTSh's transmission in order to cope with the increased power rating. The new TA-14 APU is also more powerful and enables engine start-ups at altitudes up to 19,680ft. In addition the batteries also have increased capacity.

The first Mi-8AMTSh-Vs were handed over to Army Aviation on 1 September 2014, while by year-end the number of deliveries of this new derivative had reached about 20. In November 2015, U-UAP's managing director Leonid Beliy claimed that the Mi-8AMTSh-Vs for the Russian MoD are produced free from imported parts and systems. This claim covers the helicopter's VK-2500-03 engines, APU, digital autopilot, satellite navigation system, weather radar, digital navigation system and communications suite.

Arctic optimisation

In early 2015, U-UAP began production of a further improved Mi-8AMTSh-V derivative, optimised for operation in extremely cold conditions. It is earmarked to be used in support of Russia's recent and very ambitious push for exploration of the resource-rich, but otherwise remote Arctic regions, situated well beyond the Polar Circle. The new Mi-8 derivative, specially designed for Arctic operations, commenced its flight testing programme in August 2015. On 25 November, the first example was officially handed over to the Russian MoD.

The first Mi-8AMTSh-VA batch built at U-UAP includes five helicopters and the Russian military and internal security organisations are set to order up to 100 examples in the long term, with full-scale production slated for this year.

The Mi-8AMTSh-VA's primary roles are assault transport and general Arctic air support. In addition, its range of secondary roles would include aerial monitoring of the Russian areas of responsibility in this region, as well as providing SAR support for the Northern Sea Route and for commercial air transport along Russia's enormous northern coast.

On internal fuel the helicopter can transport 2,900kg of payload over 540km, while with external fuel tanks the payload is reduced to 1,500kg and the range increases to 980km. When using a cabin auxiliary fuel tank, the payload is further reduced to 800kg while the range extends to 1,420km.

The Mi-8AMTSh-VA's configuration is optimised for prolonged low-temperature operations, in low-visibility conditions, over featureless terrain and in areas that lack coverage from satellite navigation systems.

It comes powered by two VK-2500-03 turboshafts and has a modified TA-14 APU, with its running time extended in order to provide electric supply to all essential systems on the ground in extremely low temperatures, down to -50°C.

This feature enables the Mi-8AMTSh-VA to stay on the ground at non-equipped landing sites in very low temperatures for up to five hours in a ready-for-take-off state. The helicopter also features heating for engines, gearboxes and other systems for reliable start-up after a prolonged stay in extremely low temperatures.

The heating system uses hot air supplied by the APU for the cabin, cockpit, engine bays and transmission, combined with extensive insulation, using new materials proven in spaceship manufacture. In addition, the hoses of the hydraulic, fuel and oil systems are made from frost-free Teflon material.

There are special covers and blankets for thermal insulation when on the ground for enhancing the pre-flight system's heating efficiency. There is also life support equipment for crew members, who wear VMSK immersion suits when flying over cold water for prolonged periods. The undercarriage can be equipped with snow skis or slump pads and the helicopter has enhanced alcohol anti-icing for the cockpit glazing.

The updated avionics suite includes a four-channel PKV-8 digital autopilot and an enhanced TsNS-02 navigation system, incorporating a BINS-SP-1 inertial gyro reference platform for autonomous operations without ground navigation aids and a dual BMS-Navigator GLONASS/GPS satellite navigation receiver.

The communications suite includes a set of radios working in the 2-400MHz range, such as the Prima-DV and Prima-KV. The Mi-8AMTSh-VA also comes equipped with an RPA-500 direction finder for SAR operations, an SLG-300 electrical rescue hoist and searchlight. In medevac configuration, it can be equipped with up to 12 stretchers.

There are no external pylons for forward-firing weapons. However, it can be equipped with up to three pintle-mounted PK 7.62mm machine guns – two in the side doors plus one rear-facing in a hatch in the clamshell doors. ■

The Mi-8AMTSh-VA's development was mainly internally funded by U-UAP. This is the first example handed over to the RuAF in November 2015. (Photo: Russian Helicopters)

Interference theory

Use of SATCOM on helicopters has traditionally been restricted due to the difficulties of transmitting through turning main rotor blades. Has this hurdle now been overcome?

By Helen Haxell

Disruption to transmissions over SATCOM links to and from rotary-wing platforms is proving to be a technical controversy of the past. The industry is seemingly combating the issue with innovations facilitated through communications-on-the-move (COTM) systems.

Technically, the rotor blade issue, which particularly affected video transmissions, was a problematic area for intelligence, surveillance and reconnaissance (ISR) missions, amplified when these took place in tough terrain like mountainous environments or when far from a ground team, never mind during white/brownouts.

However, the capacity to transmit a high throughput of data in crucial mission situations has long been a challenge facing the military and industry. Scrambled images and distorted signals from heavy and clunky technologies might soon be a thing of the past.

Manufacturers are developing sophisticated SATCOM systems and intelligent tracking devices which complement the mission of aviation units, who are now able to communicate trouble-free with ground teams regarding their location, the helicopter's position and scheduling. Safety still remains a key theme for developers, however, which has meant working with the military customer, ensuring each individual client is assisted with its purchase to ensure it becomes the right fit.

Echoed across the industry, *DH* heard manufacturers reinforce each other's words on how it is no longer a situation where units are sold and the process ends – it is in fact a consultative process where clients are dealt with on a case-by-case basis.

In the field

IAI Elta has been operating within the SATCOM field since early 2000 when its first programme was initiated then commissioned in 2004 on a helicopter.

Yuval Dagan, deputy director of marketing, commented on the organisation's history with SATCOM technologies: 'This means that we [had] already managed to develop and implement algorithms that overcome the interference of the rotor [blade] more than ten years ago.

'We were one of the first, leading companies that managed to provide working SATCOM that managed to overcome the interference of the rotor in between the antenna, the SATCOM and the satellite itself.

New SATCOM technologies are allowing military helicopters to maintain communications with ground teams at longer distances. (Photo: US DoD)

The Aspire 200 SATCOM system has a high-data-rate software package, which allows high-speed and high-bandwidth connections on rotary platforms. (Photo: Honeywell)

'This continuous blockage constitutes an interference that our algorithms are able to overcome and mitigate, providing no loss of packages of data and allowing smooth communication through the satellite media.'

The portfolio of SATCOM technologies manufactured by IAI Elta has provided secure and low probability of intercept, beyond line-of-sight (BLOS) communication to airborne platforms in adverse conditions.

Persistent packets

Three years ago, Hughes Network Systems announced its own advancements, stating that it had resolved the issue of packet loss on transmission, through engaging high-throughput video and data transmission via SATCOM links.

In testing, conducted on military and civil helicopters such as the Bell 407 and which involved the rotorcraft performing manoeuvres such as bank and roll, the COTM microsat system successfully transmitted BLOS full-motion video via Ku-band global beam and Ka-band global/spot beam satellites with no noticeable interruption caused by the rotor blades.

At the time, Rick Lober, VP and general manager of Hughes Defense and Intelligence Systems Division (DISD), commented: 'Our new microsat technology is ideal for C2 and ISR missions in all airborne as well as maritime and land environments, combining patented waveform design on a proven and common platform for all applications – unlike other single-use solutions.'

Manufacturers commented that the weight of SATCOM devices is crucial for military customers, as is size and shape, in ensuring smooth in-flight missions, especially when faced with challenging terrain that poses enough problems without the consideration of SATCOM applications adding to the situation.

Significantly, for every gram of weight within SATCOM technologies, the airborne platform is compromising on another vital element such as fuel. Therefore, manufacturers of COTM systems are having to be savvy with space without being detrimental to the product's delivery and effectiveness.

Hughes recently developed a new modem, the HM200, which at half the size of a shoebox and weighing 3.6kg is easily installed into any rotary platform.

'This particular modem meets military requirements up to about 30,000ft. So it has a lot of unique applications for not only in the air, but also COTM for vehicles on the ground,' explained Wayne Marhefka, senior director of business development at Hughes DISD.

The HM portfolio, not to be confused with the company's HX technology, consists of the HM200 – a 'hub modem' that operates from a ground station and can be utilised for COTM in ground and airborne applications.

Marhefka noted that the HM200 is an L-band modem that can also be up-converted to other frequencies being operated on, for example, an airborne terminal, including X-, Ku- and Ka-bands.

On track

Although perhaps not traditionally associated with SATCOM, tracking is very much part of the COTM landscape, as it captures data for rotary and other airborne platforms, including UAVs, delineating locations and positioning for ground teams.

For companies like Blue Sky Network, which produces the 0.45kg HawkEye 7200 (HE7200) transceiver, the capacity to install such devices is making tracking applications easier to integrate as part of a wider SATCOM solution.

The portable unit's dimensions stand at 12.7x12.7x5.1cm and it can be integrated with Blue Sky's web portal, SkyRouter. Its quick position (QPOS) button can be utilised to rapidly send a position report whilst alerting a contact list.

The technology has proven to be particularly popular with military customers because it does not require fixed installation, thus as a result it is independent from the helicopter.

Blue Sky Network's clients vary from an international peacekeeping organisation to militaries operating in remote areas.

Marketing associate Drew Wilkinson explained to *DH* that the HE7200 achieves two-way communication through its compatibility with SkyRouter and a Bluetooth capability, which allows the creation of ►

'geo fencing' – best described as a virtual fence to track a helicopter's route.

Geo-fencing can monitor the rotorcraft within a certain set of boundaries and a ground team can be alerted if it goes off the planned path, a function that is proving fruitful for ISR missions.

'It's big for militaries because when an aircraft is in a remote area and leaves camp, and they don't have any communication or know where that aircraft is, they then need a message field to communicate with it and more importantly know where it is.'

Wilkinson said that within conflict areas the geo-fences need to be extremely flexible, based on an understanding that militaries require sophisticated systems to allow personnel to direct the device and have the capacity to position it somewhere specific.

'The geo-fence of that aircraft will change its recording frequencies dependent on the risk,' he further noted. 'If they went into a high conflict area, the device can report more frequently; if they want to know where the aircraft is with a greater degree of accuracy, and when the aircraft is in low risk they can curtail that reporting frequency.'

Wilkinson added that the HE7200 is not known to have had any problems caused by the rotor blades of helicopters.

Civil crossover

Honeywell has also recognised the equipment size constraints on board helicopters, factoring this into the design of its Aspire 200 SATCOM system.

Utilising the Inmarsat SwiftBroadband service, it allows voice and data connectivity simultaneously at rates of up to 650kb/s across airborne platforms and is compatible with any of the company's antennas.

This system enables accessibility of voice services through Honeywell's own brand of handset, but it is also compatible with other avionics.

In addition, accessibility via wired or Wi-Fi Ethernet for data services is also available. The system has the capacity to deliver a range of connectivity options operating on the Inmarsat 1-4 satellite network with a high-data-rate (HDR) upgrade.

Hughes' HM200 modem weighs 3.6kg and can meet military requirements at up to 30,000ft. (Photo: Hughes Defense and Intelligence Systems Division)

About 18 months ago, Honeywell secured US FAA HDR approval for Aspire 200 on the AW139. This was the first helicopter to receive a supplemental type certification (STC) using the Inmarsat service.

Aspire 200 reduces rotor blade interference via its high bandwidth, which enables up to 500Kb/s per channel, enabling in-flight voice and data transmissions for the crew and passengers.

When asked by *DH* if there were any other platforms other than the AW139 that Honeywell was considering exploring in the near future, Tim Roberts senior manager, technical sales, defence and space SATCOM systems at the company, listed the aircraft being worked on.

'We have got several helicopters right now that we've already begun the certification process [with] the FAA and the EASA – and I can list those off: the S-92, the Super Puma AS332. We are currently working on a Black Hawk project as well as on the civilian head-of-state aircraft equivalent, the S-70. We are working on the S-76, the Bell 412, the Bell 429, the Mi-8, Mi-17, the Dauphin, and the last one that we are putting in work right now on is the NH90.'

A collaboration with Safran Engineering Services has enabled Honeywell to work in partnership on STC facilitation. Expedition of the certification process by Honeywell has meant that STCs have been completed in half the time it is usually expected to take (over a year). As a consequence, the product line's path to market will now be a lot quicker.

Honeywell's Tom Neumann, director, commercial helicopters, defence and space, commented: 'This is a real focus for us to really make sure we're going to market with this product line as quickly as possible and we are using this method of partnering with an engineering house to work the STCs to get us there.

'It's a design strategy to do about two helicopters a month to get that ball rolling as we go through those fleets, and we'll continue to look at other opportunities as they present themselves for the follow-on beyond these first ten.'

Core component

Antennas form an integral part, metaphorically and physically, of SATCOM on military helicopters. Their positioning has always been a cause for concern, but nowadays size is no longer related to the strength of signal – a welcome relief for military and civil helicopter operators alike.

Now in its first stages of going to market, IAI Elta has launched a new product suite designated ELK-1882 that includes a phased-array antenna. A low-profile antenna system, the NC² Array (NC² A), facilitates processing for beam- ▶

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forming and beam-steering scalable to the platform's restrictions.

NC² A is part of the wider NC² Network Centric Communication portfolio, which also includes: the NC² Terminal – a dual-channel SDR transceiver with multi-band and multi-waveform functionality; the NC² Hub – a communications hub operating multi-channel and multi-waveform; and the NC² ISL dual-mode SATCOM and line-of-sight subsystems.

The radio channel's downlink data rate is up to 100mb/s, with the uplink running at 20mb/s. Expecting the ELK-1882 to have 'substantial success', Dagan commented how it is an 'easy and straightforward' process to install this SATCOM kit on various types of platform: 'Specifically, when we talk about helicopters it can be effective and provide a unique solution.'

Blue Sky Network's HawkEye 7200 has the capacity to send position reports at a press of the quick position button. (Photo: Blue Sky Network)

Aspirational bandwidth

Honeywell's Aspire 200 utilises the L-band, which Roberts stated is superior to Ku- and Ka-bands when operating in rough terrain.

'The beauty of L-band is it is such a robust signal that it's not impacted by your typical environmental [elements] – so dust, sand or water in a marine environment. It's not impacted by those particulates, if you will, to the level that Ku and Ka are. So that robust signal is great in that type of grounded environment.'

As regards Inmarsat's L-band services, the enhancement to SwiftBroadband channels has seen an increase from 432Kb/s to 650Kb/s.

The Inmarsat 1-4 network operates with global coverage that gives an extra reassurance to militaries on long-range missions, which, as Roberts reiterated, has the ability to provide real-time imagery for the end user within a poor visibility environment.

'They're able to put that information that they're seeing in real time back onto the ground – that's the beauty of HDR, the high data rate is in itself a very scalable service,' he said.

The crew can determine whether or not it needs a symmetric or asymmetric service on and off the helicopter. Therefore, if there is a requirement for a VIP or head of state to conduct a video conference, the system can be dynamically changed so that the full channel of HDR is available both on and off the helicopter.

Honeywell's AMT-700 antenna can be positioned on the fuselage. It weighs around 1.95kg achieves 13.5dBic over 100% of the Inmarsat coverage volume.

Speaking of the advantages of the fully mechanical Class 6 antenna, which has the capacity to be installed on military aircraft, Roberts highlighted its ability 'to maintain connection with the satellite even in very robust and aggressive manoeuvring with the helicopter'.

'You can imagine a precarious situation where the aircraft needs to roll out, but if they need to roll out up to a 45/60˚turn... they could be physically rolling out of connection. Our AMT-700 antenna is actually able to maintain [signal] and roll with it – whereas an electronically phased array may have an issue with maintaining connection.'

Architectural study

Open architecture is one of the key elements for Hughes when installing its devices because it allows for flexibility in using the antenna type desired by the customer, opening up freedom of choice as technologies evolve.

For instance, a customer might want to change from Ku-band to Ka-band and the Hughes system allows this switch to take place.

'Having an open architecture is critical to a lot of customers because as technology evolves, – and we all know that technology is moving very quickly these days – they [the customer] can change out various components of the system based on that evolving technology, and our system allows that,' Marhefka said.

He commented that Hughes tries to avoid the 'closed system' approach, which some manufacturers adopt to ensure their whole portfolio of products is used, from modem to antennas.

According to Marhefka, Hughes was approached by military customers who required HDR transmission from an unmanned helicopter platform, stressing the need for constant video in which they could not have any 'outages'.

This resulted in the development by Hughes' Advanced Development Group of a new waveform called Scrambled Code Multiple Access (SCMA).

SCMA operates with signals being transmitted through helicopter rotor blades which are reconstructed at the other end with zero packet loss. Marhefka explained further: 'So the helicopter can be manoeuvring, turning left or right, up or down, pitch and roll, and we don't lose any packets.

'We have a constant video stream with this advanced waveform – the customer at the other end doesn't want to have a blue screen coming up or video coming in and out. They need to have a solid video picture.'

Hughes has conducted a number of flight tests. Discussing the previous problems of using SATCOM technologies on helicopters he said the signal would be 'chopped up' and struggle to be recovered.

SCMA puts the pieces back together and can retrieve large amounts of data from the platform to a remote area, hundreds of thousands of miles away from where the aircraft is flying, with real-time video feed being unaffected.

Network connections

IAI Elta's ELK-1891 connects hundreds of users through a single hub operating on the Ku-band, with the option of Ka-band. The HDR service has a potential capacity of up to 3Mb/s, which allows an easy exchange of voice and data.

It is a slightly larger modem than some of its counterparts at around 35-40kg, dependent on the antenna. Elta has worked with manufacturers such as Sikorsky, Airbus Helicopters and Boeing. Dagan confirmed that the company's SATCOM systems are being deployed on C2 and ISR missions.

Elsewhere, at Blue Sky Network the future for tracking as part of the wider avionics community is the HE7200 Aviation. Not yet introduced to market, it meets ICAO-GADSS requirements. Weighing less than 1lb like its predecessor, this newer version will have the capacity for remote upgrades, with the ability to automatically recognise anomalies (such as altitude deviations), and the operator will receive alerts at an accelerated rate.

Honeywell's Neumann noted that SATCOM on board helicopters is still a new technology, but there is a need within the market place and products such as Aspire 200 are responding to that.

'I think as we get through it we begin to go from its current genesis of it being new, with early adapters trying it out. As people see truly what the capabilities really are it'll become a much more prevalent technology with military and civilian usage as we go forward.'

He observed how people now assume connectivity at all times and that data can make all the difference in tactical situations. 'So I think it's here to stay. It's going to grow and I think it has a very bright future as we go forward.'

On the future challenges surrounding SATCOM, it appears thought is being given to the 'less is more' mantra currently guiding the rotary COTM application process, emphasised by Marhefka who said: 'I think the best challenge is trying to get smaller and lighter for the platforms. And that goes for any piece of equipment going on a platform, not just SATCOM – the radios that go on there, the weapons, and all the other things. The smaller the better.' ■

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WAITING PERIOD

An Mi-24V carries PTB-450 external fuel tanks on its pylons during navigation flight training in July 2011. (Photo: Csaba Hegedüs)

Vintage Soviet-era Mi-24V and Mi-25 heavy attack helicopters have been subject to four decades of Afghanistan's hot climate and high-intensity conflicts. Now, the Afghan Air Force faces a skeleton fleet, with several platforms indefinitely grounded and awaiting overhaul. **By Babak Taghvaee**

In 2001, before Operation *Enduring Freedom*, the Northern Alliance Air Force had two Mi-24Ps and five Mi-35s in service, with only three airworthy and in use against the Taliban. Meanwhile, the Islamic Emirate of Afghanistan Air Force (also referred to as the Taliban Air Force) had four Mi-35s. However, all these platforms were grounded due to lack of spares, ammunition, technicians and fuel. The majority of the Taliban *Hinds* were destroyed under USAF fire.

The Northern Alliance *Hinds* survived, however, and formed the core of the Afghan National Army Air Corps (ANAAC, later the Afghan Air Force/AAF) 377th Helicopter Regiment in 2004. Based at Kabul airport as part of the ANAAC's 1st Air Wing, just two Mi-24Ps and a single Mi-35 (with serial number 101) were operational and flying with US support.

Overhaul operations

The USAF 438th Expeditionary Air Wing's responsibility was to assist the Afghans in maintaining their *Hinds*, rather than training their pilots and technicians. In 2004, an overhaul of four Mi-35s in Russia was scheduled, and subsequently aircraft

68 (c/n 808768), 89 (c/n 520865), 101 (c/n 520961) and 110 (c/n 520964) were all sent to the Eastern European country. Several months after the overhauls were completed, they were shipped back on board An-22 and An-124 airlifters.

The 30mm GSh-2-30 (GSh-30K) twin-barrel cannon-equipped Mi-24Ps were withdrawn from service because they had greater MTBO limitations compared with the Mi-35s. While the MTBO of both aircraft was 1,000 flight hours or seven years, the former had the additional limitation of the GSh-30K shooting cycle.

An Mi-24/35P has a total of 9,000 shooting cycles with the cannon, but requires maintenance or be withdrawn from service after 4,000, due to the extreme recoil power the gun exerts. After every shooting sortie, the weapon needs to be disassembled, cleaned, inspected, lubricated and re-assembled.

The weight of the cannon is 126kg, with 250 rounds weighing approximately 250kg. The recoiling force which is passed from the cannon to the airframe is 7,200kp, equal to 7,200kg.

For many years, during which ISAF attack helicopters were directly involved in combat operations against the Taliban and al-Qaeda, Afghan pilots were required to maintain their flying capability and skills through daily flights on board the aforementioned four Mi-35s. The aircraft were occasionally used for public ceremonies, such as the Afghan National Day parade in Kabul, and also to escort AAF Mi-8/17 transport helicopters.

There were at least four or five Afghan-experienced *Hind* pilots who had been trained in the Soviet Union and also tens of ex-Democratic Republic of Afghanistan Air Force technicians serving in the newly created AAF. Consequently, attack helicopter procurement options were restricted to just the Mi-24 and Mi-35.

The war provided a limited budget for AAF re-equipment, with the budget for military aid programmes specified by the US and NATO. In 2007, while the ANAAC still had four Mi-35s operational, there was a plan to procure six more *Hinds*, which were to be supplied through one of the NATO members. On 4 April that year, the Czech Republic made a donation of 12 of its surplus helicopters, including six Mi-24Vs,

Maj Caleb Nimmo, Mi-35 team lead assigned to the 438th Air Expeditionary Advisory Squadron flies back to Kabul International Airport after a training mission in May 2010. (Photo: USAF)

to Afghanistan following negotiations between Prague and the US. These were to be overhauled and modernised by LOM Praha, with the work financed by NATO.

Overhaul of the first three was completed in June and September 2008, but delivery was delayed due to lack of funds. This first batch of three was delivered on 1 December 2008. Before delivery they received serial numbers 113, 114 and 115, together with ANAAC markings. The second batch of ex-Czech Mi-24Vs (0834, 0838 and 0812) received serial numbers 116, 117 and 118 respectively after their overhauls in November 2008. All six helicopters were equipped with NATO-compatible UHF/VHF radios to enable communication with other ISAF flight crews and joint terminal attack controllers.

Training begins

From the first day of the AAF's re-formation, the 438th Air Expeditionary Wing had responsibility to train Afghan air and ground crews for the Mi-24/35 fleet. US mentors and instructors were assigned, as were an operations mentoring and liaison team and an air mentoring team.

An air adviser team from the Czech Air Force's 221st Attack Helicopter Squadron were assigned to the 438th Wing to train the next generation of Afghan *Hind* operators after delivery of the donated rotorcraft. Until August 2013, nine different Czech mentoring or advisory groups were assigned to the 438th Wing.

On 1 May 2010, Hungary joined NATO's Training Mission – Afghanistan and deployed a combat helicopter mentoring team, which consisted of Hungarian Air Force 86th 'Szolnok' Helicopter Base personnel to help with the training of new combat pilots.

The new pilots had undergone primary training in the US and flown on the Mi-17 transport helicopter. Some of the experienced AAF pilots, who had been trained in the Soviet Union, had logged 6,000 flying hours, making them in some cases more highly skilled and experienced than their instructors, according to one of the mentors in the 440th Air Expeditionary Training Squadron.

The ANAAC's 2nd Air Wing was established at Kandahar Air Base. Three *Hinds* arrived at the base for weapons training on 2 October 2010 and were intended to provide escort duties for Afghan transport helicopters from there.

Czech and Hungarian mentoring teams trained Afghan crews shoulder to shoulder, six days a week in two shifts. Two days a week were assigned to theoretical training and three days for flight training sorties. These included rocketry and gunnery ▶

One of the four Mi-35s that the AAF inherited from the Northern Alliance Air Force. It was overhauled for last time in 2005 and remained in service until 2011. (Photo: Csaba Hegedüs)

training with unguided S-5 rockets and gun firing using the nose-mounted four-barrelled 12.7mm Yak B-12.7 machine gun and its USPU-24 remotely controlled turret. A further day was spent analysing the sorties.

From 2013, they were trained to use UPK-23-250 gun pods, which housed highly accurate and lethal GSh-23L 23mm rapid-fire guns.

The Afghan *Hind* aircrews were trained for close air support as well as escort missions, after a team of ANAAC personnel passed a forward observer course successfully in March 2010. The Afghan observers graduated from the course on 16 March after a small joint US Army/ANAAC close air support exercise, during which a pair of US AH-64Ds and a pair of Mi-24Vs conducted rocketry and gunnery training under the direction of Afghan observers.

In practice

For the first time, the ANAAC was now prepared to face incoming security threats with all its helicopters, including the Mi-17s, in combat. This was prior to the Afghanistan parliamentary election. Subsequently, on 13 May 2010, two Mi-24s and two Mi-17s took part in a combined operation. The latter, which were being flown by Afghan aircrews, transported 70 Afghan National Army (ANA) troops from Jalalabad to FOB Bostick under the escort of the *Hind*s.

Later that month, the 377th Rotary Wing Squadron of the ANAAC was prepared to perform a new task of escort support for the Presidential Airlift Squadron's Mi-17s. During the first mission on 27 May 2010, an Mi-35 was used to accompany a pair of presidential Mi-17s.

Following the parliamentary election on 18 September 2010, the AAF's Mi-24Vs were available to provide President Hamid Karzai with safe transportation to the opening of the new parliament on 26 January 2011. It was then that the AAF *Hind* pilots displayed what they had learned during almost seven months of training under the schooling of Maj Kurt Geisen, NATO Air Training Command – Afghanistan's Mi-35 adviser.

The Afghan *Hind* fleet experienced combat on 10 March 2011, when the AAF was tasked with a combat resupply mission in collaboration with the Ministry of Interior and coalition forces to Barg-e Matal in the northern Kumar Valley. During the mission, Geisen flew on one of the Mi-24Vs.

A similar resupply mission to Barg-e Matal was undertaken on 27 March 2012, this time with three Mi-17s and two Mi-35s. The transport helicopters, escorted by the *Hind*s, airlifted food, ammunition and supplies for the soldiers in an ANA outpost located in northern Afghanistan, which was surrounded by mountains as high as 12,000ft and inaccessible by road.

On 27 March 2013, the AAF conducted a multi-aircraft, multi-capability exercise, during which the service and coalition forces conducted Operation *Shadie Barfie* (*Snow Ape*). Two Mi-24s and Mi-17s were used in an air assault capacity, plus Cessna 208s for casevac. During the exercise, the gunships provided site clearance and armed patrol flights over ground troops.

Three years later, the efforts of NATO and the US increasing combat readiness of

> ***Some of the AAF pilots, who had been trained in the Soviet Union, had logged 6,000 flying hours, making them in some cases more highly skilled and experienced than their instructors.***

Afghan *Hind* crews resulted in the ANA's Operation *Seemorgh* on 23 July 2013, the largest Afghan joint operation in the past 30 years. Some 250 ground troops and 6,000kg of associated combat equipment were deployed over mountains between the Azrah and Hezartak districts.

The AAF's pilots, engineers and gunners supported ground troops from the sky aboard four Mi-24Vs and eight Mi-17s. During the first wave of the operation, two Mi-35s and six Mi-17s were used to clear the area of the Taliban and block them from the Azreh district, according to Lt Col Rohullah, the helicopter platoon leader.

Later that year, NATO officials said that the number of training sorties for the AAF's Mi-24/35 air and ground crews had surged in order to increase the level of autonomy from coalition forces in combat operations.

On 18 September, three ANA fire support officers and two staff officers from the 4th Infantry Brigade, 203rd Corps, conducted an air-to-ground integration exercise near Hunter Base in eastern Afghanistan. ANA soldiers successfully coordinated with two Afghan Mi-35s and conducted live-fire drills, including how to abort a mission.

Earlier, on 26 December 2010, an AAF Mi-35 (serial 68) had been damaged on a combat mission with a pair of Mi-17s, and was sent to Russia for overhaul. However, this was then cancelled due to lack of funds. That same year another Mi-35 (110) had been withdrawn from service due to a crash landing in a training mission. MTBOs of the remaining two Mi-35s were reached in 2011 and 2012 and were gradually grounded.

For its fleet of six Mi-24Vs, the AAF had a total of 19 pilots in 2013, with 12 kept combat-ready in case of emergency air support demand from the ANA. By means of extensions after reaching their MTBOs, five Mi-24Vs were kept operational simultaneously until mid-March 2015.

Testing ability

After each winter season, Taliban insurgents or jihadists began to mobilise their supplies and ammunitions to attack ANA positions. Coalition forces attack helicopters were in use permanently to perform area clearing operations, but since 2013 the AAF performed the mission independently. ▶

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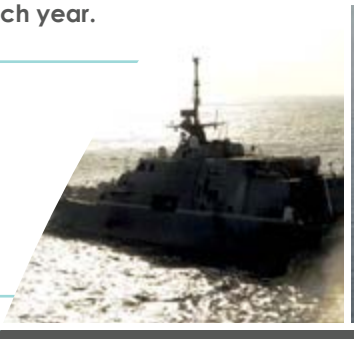

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By May 2015, the remaining five Mi-24Vs of the AAF had surpassed even their extension time limits, but there were no plans for overhaul or even procurement of the new Mi-35s from Russia. Earlier in 2013, the Embraer A-29 (EMB-314) Super Tucano had been selected and procured through a $427 million contract, financed by the US.

The A-29s alone were not intended to replace the Mi-24Vs – the plan was to fill the capability gap with the armed version of an MD 530F scout helicopter. Six of these had served in the AAF as training and liaison platforms since 2011.

Moreover, on 26 September 2014, MD Helicopters received a $35.7 million contract for 12 MD 530Fs, with conversion options to the MD 530G armed version. This was modified on 1 October to increase the value to $44.2 million to cover the cost of arming all 17 of the AAF's MD 530Fs, which included the 12 on order – these were delivered in April 2015 and demonstrated their weapons and equipment during an official ceremony at Kabul International Airport that month.

Conversion flight training for several existing Mi-24 pilots on the new MD 530Fs was initiated, but soon the Afghan crew's showed their dissatisfaction with the type's performance in the mountains, despite it being equipped with a 650shp Allison 250-C30 turboshaft suitable for hot-and-high conditions. Furthermore, its more limited payload only enabled the user to install two armament pods each with the ability to carry three rockets and a .50cal or 12.7mm FN M3P 50 cannon.

Cause for complaint

During a press conference at Kabul International Airport on 26 September 2015, Afghan pilots expressed their feelings about the MD 530F to the media. Col Qalandar Shah Qalandari, one of the most decorated Mi-24 pilots of the AAF, explained to the *New York Times* that the US helicopter struggled to reach the altitude of precarious Taliban positions in the mountains around Kabul.

However, in a statement provided to *DH* in October last year, MD Helicopters said: 'The customer specified certain performance requirements for the [MD 530] Cayuse Warrior, including the effective operating altitude in summertime temperatures and the effective range. The MD 530F actually exceeds these requirements, delivering operational capabilities at altitudes well in excess of the requirement.'

One of the donated ex-Czech Air Force Mi-24Vs seen during Operation *Seemorgh* in Jalalabad in July 2007. (Photo: USAF)

Between September 2015 and January 2016, the AAF and USAF 438th AEW technicians retained one Mi-24V in service through continued life extensions and the cannibalisation of other Mi-24Vs to ensure *Hind* pilots were current.

The last operational Hind (serial 116) was grounded upon delivery of the first four AAF A-29s on 15 January 2016. In total, the six helicopters logged 5,750 flying hours over eight years until aircraft 116 was decommissioned.

Following AAF pilot demands for new *Hinds*, Russia offered *Hind E* (Mi-35M) models to the air force, but due to the deterioration in relations between Moscow and Washington, as well as Afghanistan's limited budget, this procurement did not happen.

The second option was a donation of surplus *Hinds* from India. In mid-2015, Afghanistan and the South Asian country started negotiations for rebuilding the AAF's heavy attack helicopter fleet, which continued until November 2015. The latter government agreed to donate three of its surplus Mi-25s from the 125th Helicopter Unit based at Pathankot Air Force Station.

The first helicopter, which had been overhauled prior to the handover to the AAF, was delivered at Kabul International Airport on 21 December, four days before the official visit of India's Prime Minister Narendra Modi to Kabul.

After the delivery of two more helicopters, the AAF officially announced the start of the operations on 20 January 2016 after the aircraft were assembled by Indian and Afghan technicians. Painted in 'Gunship Grey' camouflage, they were serialled 119, 120 and 121.

According to Ghulam Sakhi Ahmadzai, deputy chief of procurement at the Afghan MoD, all helicopters were quickly used in a counter-insurgency (COIN) operation against the Taliban in Helmand Province.

With six Mi-24Vs and two Mi-35s in storage, which are not planned to be overhauled, the AAF now has a fleet of three fully mission-capable Mi-25Ds as the backbone of its combat aircraft force, which will remain in service until 2023. Despite deliveries of A-29 Super Tucano COIN aircraft, they cannot meet the needs of the AAF for a heavy attack helicopter. Donation of three more surplus Indian Air Force Mi-25s is also predicted to happen by the end of 2016. ■

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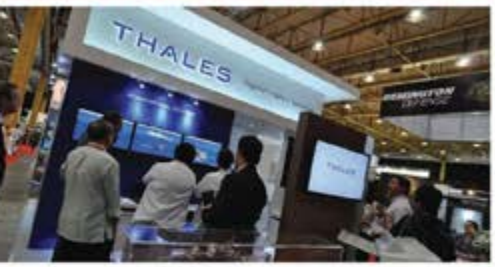


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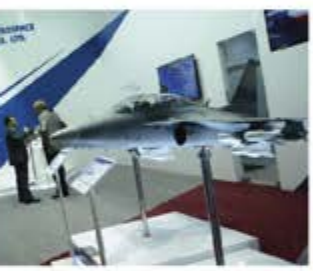




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Capt Steven Howard, second in command of the UK's 7 Flight Army Air Corps in Brunei, speaks to **David Oliver** about the unit's support role in military exercises in the jungle and its ad-hoc support to the country's government.

In the jungle

In 2010, Capt Howard, as part of the Intelligence Corps, was deployed with 40 Royal Marine Commandos to Afghanistan. After the completion of an army pilots' course, he transferred to the Army Air Corps. Howard then became an *ab initio* Bell 212 pilot, providing aviation medevac at the British Army Training Unit Kenya, as well as support helicopter tasking to British troops and their families.

Since August 2014, Howard has been the second in command of 7 Flight, Brunei, continuing in the small Asian state with his Bell 212 tour. 7 Flight is a sub-unit of the Joint Helicopter Command and operates as a permanent jungle aviation unit.

The sub-unit consists of eight Bell 212 pilots, four aviation crew and 13 military ground support personnel to enable a four-crew operation. 7 Flight is under the tactical command of Commander British Forces Brunei. Most personnel are assigned to the sub-unit for two years.

There are three Bell 212 Mk 1 helicopters on strength, which are owned and maintained by Cobham Aviation Services under a civilian-owned, military-operated contract. These airframes have been used by 7 Flight since 1994.

Treacherous tasks

Two lines of aircraft are assigned per day, and from the base in Seria they undertake day and night medevac cover, trooping and tasking in support of British Forces Brunei and exercising units. One of the key aspects of 7 Flight's role is to support troops within the jungle training areas. The locations are renowned for being challenging, treacherous and hostile, further amplified by their isolation.

Howard explained the unit's role: 'Due to the remoteness of the areas used, the only way for soldiers to train within the jungle interior is through insertion and extraction by support helicopters. The jungle is a dangerous place to live and operate in and aviation medevac is the only option, often requiring personnel to be winched from within the jungle interior by day, or by night through the use of NVG. The jungle specialist aircrew are permitted to operate to a minimum separation criteria of 10ft.'

Complementing the terrain

Tasks also include general trooping, resupplying sorties, heli-abseiling, winching and underslung loads. The Bell 212s' Huey pedigree is complementary to the jungle environment, as they can carry up to six soldiers fully equipped at 150kg each, accompanied by the three crew members.

7 Flight has a wider role in providing the Brunei government with support in combating jungle fires through equipping the Bell 212s with Bambi Buckets. This support forms part of a broader humanitarian assistance and disaster relief capability.

Howard explained how the sub-unit does not partake in any multinational exercises because 7 Flight needs to be prepared to respond at any time to medevac requests, due to the jungle training areas being utilised throughout the year.

The Bell 212s' deep maintenance takes three months per aircraft, by the contractor, at the flight's EASA Part 145-compliant facility at Medicina Lines, Brunei Garrison. This is part of a mandated military requirement which takes place every six years.

> ***"The jungle is a dangerous place to live and operate in and aviation medevac is the only option... by day or by night."***

Strong relationship

Regarding relations with the Royal Brunei Air Force (RBAF), Howard commented on the strong relationship between the two parties. Both 7 Flight and RBAF are operating in similar training areas such as Ulu Labi and Ulu Tutong.

'Ground crew personnel from both 7 Flight and the RBAF conduct regular training together, which enables the RBAF Black Hawk and Bö 105 helicopters to uplift fuel at the Flight's operating base and the Flight's Bell 212 helicopters to uplift fuel from Rimba air base in the capital, Bandar Seri Begawan.'

He continued: 'The flight meet with members of the detachment at the Brunei Airspace Safety Group, a unique military/civil quarterly air safety forum, attended by personnel from the RBAF, the Royal Flight, Shell Aviation, Royal Brunei Airlines, Bruneian Civil Aviation Authority and other key aviation stakeholders in Brunei.' ■

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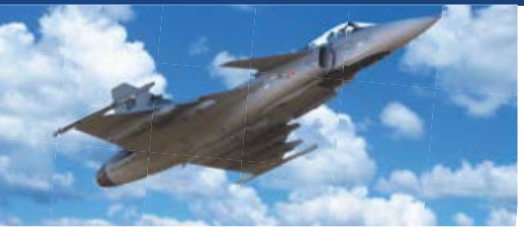
2016
AT A GLANCE

UNLOCKING AFRICA'S AEROSPACE AND DEFENCE POTENTIAL

AFRICA'S TIME IS NOW!
ARE YOU IN ?

AAD2016
14 - 18 SEPT 2016
WATERKLOOF AIR FORCE BASE
CENTURION, PRETORIA



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